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Effects of Agricultural Conservation Practices on Fish and Wildlife

A Conservation Effects Assessment Project (CEAP) Bibliography

Effects of Agricultural Conservation Practices on Fish and Wildlife

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Volume 7b

Compiled by
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Abstract

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This bibliography, in two volumes, is part of a multi-volume set developed by the Water Quality Information Center at the National Agricultural Library in support of the U.S. Department of Agriculture's Conservation Effects Assessment Project (CEAP). The bibliography is a guide to recent scientific literature covering effects of agricultural conservation practices on fish and wildlife. The citations listed here provide information on how conservation programs and practices designed to improve fish and wildlife habitat, as well as those intended for other purposes, e.g., water quality improvement, affect various aquatic and terrestrial fauna.

Keywords: aquatic habitat, aquatic organisms, biodiversity, conservation buffers, conservation practices, conservation programs, ecology, ecosystem management, fish, habitat conservation, habitat fragmentation, natural resource management, wild animals, wildlife, wildlife habitats, wildlife management.

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August 2008

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Shields, F. D.; Langendoen, E. J.; and Doyle, M. W.
Journal of the American Water Resources Association 42(1): 25-33. (2006)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: agricultural watersheds/ aquatic habitat/ buffers/ index of biotic integrity/ modeling/ stream ecosystems/ water quality
Abstract: Annual expenditures by the federal government in the United States for agricultural conservation programs increased about 80 percent with passage of the 2002 Farm Bill. However, environmental benefits of these programs have not been quantified. A national project is under way to estimate the effect of conservation practices on environmental resources. The watershed models intended for use in that project are focused on water quantity and quality and have minimal habitat assessment capability. Major impairments to aquatic ecosystems in many watersheds consist of physical habitat degradation, not water quality, suggesting that current models for this national initiative do not address one of the most significant aspects of aquatic ecosystem degradation. Currently used models contain some components relevant to aquatic habitat, and this paper describes specific components that should be added to allow rudimentary stream habitat quality assessments. At least six types of variables could be examined for ecological impact: land use, streamflow, water temperature, streambed material type, large woody debris, and hydraulic conditions at base flow. All of these variables are influenced by the presence, location, and quality of buffers. Generation of stream corridor ecological or habitat quality indices might contribute to assessments of the success or failure of conservation programs. Additional research is needed to refine procedures for combining specific measures of stream habitat into ecologically meaningful indices. JAWRA Copyright © 2006.

1370. **Agricultural land use effects on sediment loading and fish assemblages in two Minnesota (USA) watersheds.**
Zimmerman, J. K. H.; Vondracek, B.; and Westra, J.
Environmental Management 32(1): 93-105. (2003)
NAL Call #: HC79.E5E5; ISSN: 0364152X
Descriptors: agriculture/ land use/ streams/ suspended sediment/ trout/ warmwater fish/ agriculture/ erosion/ land use/ runoff/ sediments/ water quality/ watersheds/ sediment loading/ environmental engineering/ agriculture/ land use/ sediment/ watershed/ agriculture/ fishes/
geologic sediments
Abstract: We examined the relationship between water quality and fish communities within two agricultural areas using a computer simulation model. Our analyses focused on a coolwater stream, Wells Creek in southeastern Minnesota, and a warmwater stream, the Chippewa River in western Minnesota. We used the Agricultural Drainage and Pesticide Transport (ADAPT) model in relation to land use to calculate instream suspended sediment concentrations using estimates of sediment delivery, runoff, baseflow and streambank erosion, and quantified the effects of suspended sediment exposure on fish communities. We predicted the effects of agricultural practices on stream fish communities under several possible land use scenarios, with reference to current conditions. Land use changes led to reductions in sediment loading of up to 84% in Wells Creek and 49% in the Chippewa River. The reduction in sediment loading across scenarios may be directly related to a reduction in runoff by about 35% in both study areas. We found a 98% decrease in "lethal" concentrations of suspended sediment on fish in Wells Creek with an increase in conservation tillage, riparian buffers, and permanent vegetative cover. However, the effects of suspended sediment did not significantly decrease in the Chippewa River. This difference between study areas was likely due to differences in tolerance to suspended sediment between coolwater and warmwater fish communities and differences in topography, runoff and bank erosion between the two streams.

1371. **Amendments to the fish and wildlife program call for tests of alternative dam operations.**
Northwest Power Planning Council
Council Quarterly (Spring 2003): 1-2.
Descriptors: dams/ ecosytems/ foods-feeding/ habitat alterations/ habitat management/ management/ predation/ protection/ reservoirs/ riparian habitat/ rivers/ wildlife/ wildlife-habitat relationships/ Columbia River and Basin/ Washington/ Idaho/ Montana
Abstract: The Northwest Power Planning Council amended its Columbia River Basin Fish and Wildlife Program, which was intended to protect all fish and wildlife that used the main-stem rivers as habitat. The conditions could be achieved through dam operations. It could benefit salmon and steelhead in the lower Columbia River and the fish in the upper river basin. The program was aimed to determine the relationship between fish survival and water spills at dams, the optimum fish survival and evaluate the benefits of fish survival, identify the effects of shifting summer flows and assess the impact of predation and harvest of various species in the main-stem rivers.

1372. **Aquatic condition response to riparian buffer establishment.**
Teels, B. M.; Rewa, C. A.; and Myers, J.
Wildlife Society Bulletin 34(4): 927-935. (2006)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2006)34
[927:ACRTRB]2.0.CO;2.
Descriptors: Conservation Reserve Enhancement Program/ fish assemblage/ index of biotic integrity/ Northern Virginia/ practice effects/ riparian buffers/ riparian restoration/ watershed
Abstract: Although riparian buffers established along streams in agricultural landscapes are expected to provide water-quality functions similar to natural ecosystems, few studies have documented specific changes in the condition of aquatic resources resulting from buffer establishment. In 2000 the Commonwealth of Virginia, USA, began an extensive cooperative venture under the Chesapeake Bay

Initiative to establish riparian buffers on agricultural lands, primarily through United States Department of Agriculture's Conservation Reserve Enhancement Program (CREP). Prior to CREP implementation, the Natural Resources Conservation Service (NRCS) developed a regionally tailored fish Index of Biotic Integrity (IBI) for use as a watershed assessment technique in Northern Virginia. Using this regional IBI framework, we evaluated the effects of recently established riparian buffers on aquatic condition. Within the geographic scope of the regional IBI, we evaluated all buffer segments planned between 2000 and 2003. Cumulatively during this period, we assessed stream physical condition on 36 buffer sites and 12 reference sites using the NRCS Stream Visual Assessment Protocol (SVAP); we also assessed the aquatic community at these sites using the IBI. Improvements in stream condition were clearly demonstrated at certain sites within one year of buffer establishment. Although not all buffer projects responded with positive trends, mean SVAP and IBI scores for buffered sites increased over the course of the study, whereas the trend on reference sites was level or slightly downward. We observed positive IBI response at sites with highly disturbed local conditions prior to buffer establishment combined with small, relatively undisturbed watersheds above. Simple solutions such as buffer establishment alone cannot be expected to protect streams from adverse human impacts that occur at a broader scale. Therefore, riparian restoration should be planned and carried out in concert with other conservation practices at a watershed scale in a way that maximizes buffer effectiveness.

1373. **Are stream crossing culverts a barrier to the movement of the Pacific giant salamander (Dicamptodon tenebrosus)?**
Sagar, Jina P.; Olson, Deanna H.; Schmitz, Richard A.; and Guetterman, John
Northwestern Naturalist 84(2): 113-114. (2003)
NAL Call #: QL671.M8; ISSN: 1051-1733
Descriptors: stream culverts/ Pacific giant salamanders/ Dicamptodon tenebrosus/ movement/ spatial isolation/ genetic isolation/ abundance/ habitat management
Abstract: Barriers to the movement of aquatic organisms can increase the genetic and spatial isolation of populations. Focus on culvert passage issues has increased as federal agencies attempt to inventory and replace road-crossing stream culverts that are barriers to the movement of anadromous fishes. The effect of stream crossing culverts on the movement of other aquatic organisms, however, is not known. In a mark-recapture study on 15 3rd- and 4th-order streams in the Oregon Coast Range, we examined monthly movements of larval Pacific giant salamanders (Dicamptodon tenebrosus) in streams with and without culverts. Salamander abundances ranged from 0.3 to 3.2 larvae/m. From June to August 2002, a total of 2227 D. tenebrosus were captured. Recapture rates ranged from 31 to 69%. The mean movement distance for salamanders caught on consecutive visits was 2.5 m, with a maximum distance of 51 m. Preliminary results indicate a barrier effect (limited movement between stream reaches above and below culverts) on culvert streams when compared with reference streams. Furthermore, use and movement through culverts appears to vary with culvert type (for example, pipe vs. half pipe with stream bottom). Integrated analysis of range of movement, directionality, and movement frequency through culvert type will contribute to regional dialogue on culvert design for effective passage.

1374. **Beaver herbivory of willow under two flow regimes: A comparative study on the Green and Yampa Rivers.**
Andersen, D. C.; Wilson, K. R.; and Breck, S.W.
Western North American Naturalist 63(4): 463-471. (2003)
NAL Call #: QH1.G7; ISSN: 1527-0904
Descriptors: beavers/ behavior/ cottonwood/ Flaming Gorge Dam [map]/ flow/ flow regimes/ foraging/ Green River/ herbivory/ Little Snake River/ regulated flow/ studies/ willow/ Yampa River/ forestry/ agriculture/ rivers/ lakes/ Colorado/ Insertae and Sedis/ Castor canadensis/ Salix exigua/ Populus deltoides wislizenii
Abstract: The effect of flow regulation on plant-herbivore ecology has received very little attention, despite the fact that flow regulation can alter both plant and animal abundance and environmental factors that mediate interactions between them. To determine how regulated flows have impacted beaver (Castor canadensis) and sandbar willow (Salix exigua) ecology, we first quantified the abundance and mapped the spatial distribution of sandbar willow on alluvial sections of the flow-regulated Green River and free-flowing Yampa River in northwestern Colorado. We then established 16 and 15 plots (1m x 2.7m) in patches of willow on the Green and Yampa Rivers, respectively, to determine whether rates of beaver herbivory of willow differed between rivers (Green versus Yampa River), seasons (fall-winter versus spring-summer), and years (spring 1998 - spring 1999 versus spring 1999 - spring 2000). Areal extent of willow was similar on each river, but Green River willow patches were smaller and more numerous. Beavers cut more stems during fall and winter than spring and summer and cut over 6 times more stems (percentage basis) on the green River than on the Yampa River. We attribute the between-river difference in herbivory to higher availability of willow, greater beaver density, and lower availability of young Fremont cottonwood (Populus deltoids subsp. Wislizenii; an alternative food source) on the Green River. Flow regulation increased willow availability to beaver by promoting the formation of island patches that are continuously adjacent to water and feature a perimeter with a relatively high proportion of willow interfacing with water.

1375. **Benthic macroinvertebrate fauna in small streams used by cattle in the Blue Ridge Mountains, Virginia.**
Braccia, Amy and Voshell, J. Reese
Northeastern Naturalist 13(2): 269-286. (2006)
NAL Call #: QH105.M2M36; ISSN: 1092-6194
Descriptors: commercial activities/ conservation measures/ freshwater habitat/ lotic water/ land zones/ Macroinvertebrata: farming and agriculture/ benthic fauna/ small montane streams/ cattle/ habitat management/ Virginia/ Blue Ridge Mountains/ invertebrates
Abstract: Cattle production is a common land use, and the adverse effects of cattle grazing on stream habitat and

macroinvertebrates has been well documented. The purpose of our study was to provide a list of taxa that can be expected to occur in small streams impacted by cattle in the southern Blue Ridge Mountains and to demonstrate how taxon-specific natural history information can be used to gain insight about benthic habitat condition. We identified 97 benthic macro invertebrate taxa from five cattle-impacted streams that differed in cattle grazing intensity. Our findings suggest that some macroinvertebrate taxa can sustain low levels of cattle grazing and that sedimentation is a major stressor to the macroinvertebrate fauna.

1376. **Bioassessment of the Green River Basin using fish: The effects of land use and hydrology on community composition.**
Lewis, B. E. and Grubbs, S. A.
Southeastern Biology (2002)
Descriptors: Green River/ hydrology/ agriculture/ water quality/ water chemistry/ freshwater fish/ population structure/ Impact of forestry or agriculture/ freshwater fish
Abstract: Fish communities within the Green River Basin are affected by a number of land use and hydrological factors. We present results from qualitative sampling of 75 sites within the Green River Basin. Agricultural runoff, silt, and mining operations affect water quality throughout the basin and increase inter-drainage similarity. Important chemical and habitat factors affecting fish diversity and evenness include substrate embeddedness, habitat diversity and pH. Similarity between communities in areas of low perturbation is primarily affected by stream size and connectivity between sites. Sites in these drainages should exhibit a higher intra-drainage to inter-drainage similarity ratio than drainages with lower water quality.

1377. **Bioeconomic analysis of selected conservation practices on soil erosion and freshwater fisheries.**
Westra, J. V.; Zimmerman, J. K. H.; and Vondracek, B.
Journal of the American Water Resources Association 41(2): 309-322. (2005)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: agricultural drainage and pesticide transport model/ ADAPT/ best management practices/ BMPs/ economics/ fish/ ecosystems/ mathematical models/ runoff/ farmers/ land management/ wildlife habitat/ soils/ agricultural catchment/ fishery management/ nonpoint source pollution/ soil erosion/ suspended sediments/ riparia
Abstract: Farmers can generate environmental benefits (improved water quality and fisheries and wildlife habitat), but they may not be able to quantify them. Furthermore, farmers may reduce their incomes from managing lands to produce these positive externalities but receive little monetary compensation in return. This study simulated the relationship between agricultural practices, water quality, fish responses to suspended sediment and farm income within two small watersheds, one of a cool water stream and one of a warm water stream. Using the Agricultural Drainage and Pesticide Transport (ADAPT) model, this study related best management practices (BMPs) to calculated instream suspended sediment concentrations by estimating sediment delivery, runoff, base flow, and streambank erosion to quantify the effects of suspended sediment exposure on fish communities. By implementing selected BMPs in each watershed, annual net farm income declined $18,000 to $28,000 (1 to 3 percent) from previous levels. "Lethal" fish events from suspended sediments in the cool water watershed decreased by 60 percent as conservation tillage and riparian buffers increased. Despite reducing suspended sediments by 25 percent, BMPs in the warm water watershed did not reduce the negative response of the fisheries. Differences in responses (physical and biological) between watersheds highlight potential gains in economic efficiency by targeting BMPs or by offering performance based "green payments."

1378. **Biological effects of fine sediment in the lotic environment.**
Wood, Paul J. and Armitage, Patrick D.
Environmental Management 21(2): 203-217. (1997)
NAL Call #: HC79.E5E5; ISSN: 0364-152X
Descriptors: biological effects/ conservation/ deposition/ fine sediment/ habitat quality/ lotic environment/ river sedimentation/ soil science/ transport/ fish/ invertebrate/ Invertebrata/ Pisces/ animals/ chordates/ nonhuman vertebrates/ vertebrates
Abstract: Although sedimentation is a naturally occurring phenomenon in rivers, land-use changes have resulted in an increase in anthropogenically induced fine sediment deposition. Poorly managed agricultural practices, mineral extraction, and construction can result in an increase in suspended solids and sedimentation in rivers and streams, leading to a decline in habitat quality. The nature and origins of fine sediments in the lotic environment are reviewed in relation to channel and nonchannel sources and the impact of human activity. Fine sediment transport and deposition are outlined in relation to variations in streamflow and particle size characteristics. A holistic approach to the problems associated with fine sediment is outlined to aid in the identification of sediment sources, transport, and deposition processes in the river catchment. The multiple causes and deleterious impacts associated with fine sediments on riverine habitats, primary producers, macroinvertebrates, and fisheries are identified and reviewed to provide river managers with a guide to source material. The restoration of rivers with fine sediment problems are discussed in relation to a holistic management framework to aid in the planning and undertaking of mitigation measures within both the river channel and surrounding catchment area.

1379. **Biological response of aquatic communities to streambank fencing in selected streams impacted by agricultural grazing.**
Argent, D. G. and Lenig, A.
In: Proceedings of the 2005 Watershed Management Conference: Managing Watersheds for Human and Natural Impacts: Engineering, Ecological, and Economic Challenges. Williamsburg, VA; pp. 967-978; 2005.
Descriptors: grazing/ livestock/ streams/ streambanks/ fencing/ aquatic habitat/ aquatic life
Abstract: Streams impacted by agricultural grazing experience compromised functioning because of physical degradation and various pollutants (e.g., nitrates and fecal coliforms). The objective of this study was to determine if stream functioning could be significantly improved with the removal of livestock from the adjacent corridor. In 1999,

four grazed pastures that contained meadow streams received streambank fencing through the Partners for Fish and Wildlife Program (treatment sites). These streams exhibited unstable streambanks and elevated nitrate and fecal coliform levels as a direct result of cattle impacts on the stream. Concurrent with streambank fencing, we established monitoring stations that were 100-m long within each stream. In addition, several control streams were monitored that had (a) no history of grazing and no fencing (control streams) or (b) a history of grazing and no fencing (control farms). At each station seasonal collections were made for benthic macroinvertebrates and fishes; and various water chemistry parameters (TKN, nitrates, ammonia, phosphates, fecal coliforms, and turbidity). Over the course of this study, nitrates have remained reasonably constant during the spring season and declined significantly during the summer and fall seasons; TKN, and phosphorus have not changed appreciably during the spring collection periods at treatment sites, but were slightly elevated during the summer sampling period. Turbidity has declined significantly during the spring sampling period, but remains elevated during the summer and fall periods. Fecal coliform concentrations continue to be quite high in treatment farm streams, but fluctuate, seasonally. Treatment sites contain a good diversity and abundance of macroinvertebrates and fish that are comparable to those found in control streams. Our findings to date suggest that streams impacted by agricultural grazing may require appreciable periods of time to experience improved stream functioning.

1380. **Can biological assessments discriminate among types of stress? A case study from the Eastern Corn Belt Plains ecoregion.**
Norton, S. B.; Cormier, S. M.; Smith, M.; and Jones, R. C.
Environmental Toxicology and Chemistry 19 (4, Part 2): 1113-1119. (2000)
NAL Call #: QH545.A1E58
Descriptors: agricultural ecosystem/ aquatic organisms/ assessments/ benthic fauna/ benthos/ biochemical oxygen demand/ bioindicators/ case studies/ community structure/ ecology/ ecosystem disturbance/ environmental impact/ environmental monitoring/ environmental stress/ freshwater fish/ macroinvertebrates/ midges/ models/ multivariate analysis/ nutrient concentrations/ pollution effects/ pollution indicators/ regional analysis/ regional planning/ risk assessment/ streams/ zoobenthos/ Pisces/ Zea mays/ Ohio
Abstract: We investigated the feasibility of using the structure of fish and benthic macroinvertebrate communities to distinguish among major types of stressors (e.g., siltation, nutrient enrichment, and stream structural degradation) using spatially and temporally matched data on stressors and responses. The 19 stressor variables addressed stream chemistry and in-stream habitat and included biological oxygen demand (BOD), total suspended solids, nitrogen, phosphorus, and components of the Qualitative Habitat Evaluation Index. The 42 response variables addressed fish and invertebrate community structure and included many of the component metrics of the Index of Biological Integrity and the Invertebrate Community Index as well as variables specifically calculated for this project. All data were collected between 1988 and 1994 by the Ohio Environmental Protection Agency in the Eastern Corn Belt Plains ecoregion. Prior to analysis, variables were transformed to near normality, and variables significantly correlated with drainage area were fit to regression models and the resulting residuals used in the analyses. Multivariate analyses included factor and discriminant analysis. The first six stressor factors explained 69% of the variation. Discriminant functions formed using the response variables significantly separated site clusters classified into high, medium, and low categories along stressor gradients. Both fish and macroinvertebrate variables were important in distinguishing site categories. For example, percentage Tanytarsini midges and percentage Glyptotendipes were important in distinguishing sites having high and low BOD. Percentage darters was associated with sites having high scores for stream corridor structure and low concentrations of inorganic nutrients, and percentage roundbodied suckers was associated with sites having low BOD and low concentrations of zinc and lead. These results indicate that diagnostic models may be developed that will be useful for site-specific and regional assessments.

1381. **Can warmwater streams be rehabilitated using watershed-scale standard erosion control measures alone.**
Shields, F. Douglas; Knight, Scott S.; and Cooper, Charles M.
Environmental Management 40(1): 62-79. (July 2007)
NAL Call #: HC79.E5E5
Descriptors: fish/ monitoring/ river restoration/ restoration assessment/ ecosystem rehabilitation/ instream structures/ channel incision
Abstract: Degradation of warmwater streams in agricultural landscapes is a pervasive problem, and reports of restoration effectiveness based on monitoring data are rare. Described is the outcome of rehabilitation of two deeply incised, unstable sand-and-gravel-bed streams. Channel networks of both watersheds were treated using standard erosion control measures, and aquatic habitats within 1-km-long reaches of each stream were further treated by addition of instream structures and planting woody vegetation on banks (habitat rehabilitation). Fish and their habitats were sampled semiannually during 1-2 years before rehabilitation, 3-4 years after rehabilitation, and 10-11 years after rehabilitation. Reaches with only erosion control measures located upstream from the habitat measure reaches and in similar streams in adjacent watersheds were sampled concurrently. Sediment concentrations declined steeply throughout both watersheds, with means >=40% lower during the post-rehabilitation period than before. Physical effects of habitat rehabilitation were persistent through time, with pool habitat availability much higher in rehabilitated reaches than elsewhere.
This citation is from AGRICOLA.

1382. **Changes in fish assemblage structure of the Red River of the North.**
Aadland, Luther P.; Koel, Todd M.; Franzin, William G.; Stewart, Kenneth W.; and Nelson, Patrick
In: American Fisheries Society Symposium, 45; Bethesda, MD: American Fisheries Society, 2005. 293-321.
Notes: Symposium on Changes in Fish Community Structures in Large USA Rivers, Phoenix, AZ, USA; 1888569727 (ISBN); No. 45.

Descriptors: freshwater ecology: ecology, environmental sciences/ biogeography: population studies/ wildlife management: conservation/ reintroduction/ applied and field techniques/ agriculture/ assemblage structure/ channelization/ dam construction/ wetland drainage
Abstract: The Red River of the North basin (RRNB) has an area of about 287,000 square kilometers of the upper Midwestern United States and south-central Canada. The river forms the North Dakota-Minnesota boundary and flows into Lake Winnipeg, Manitoba, and then, via the Nelson River, into Hudson Bay. While the Red River main stem remains a sinuous stream similar to early descriptions, the river's watershed has been altered dramatically by intensive agriculture, wetland drainage, channelization of tributary streams, and dam construction. Early land surveys described a landscape largely covered by prairie and wetlands. However, thousands of kilometers of ditches have been excavated to drain wetlands for agriculture in the United States in the late 1800s to the 1920s, and continuing, in Canada, to the present. Over 500 dams have blocked access to critical spawning habitat in the basin starting in the late 1800s. Also, during the mid-1900s, many of the tributaries were channelized, causing the loss of several thousand stream kilometers. While much of RRNBs fish assemblage remains similar to earliest historical records, the loss of the lake sturgeon Acipenser fulvescens is a notable change resulting from habitat loss and fragmentation, and overfishing. Additional localized extirpations of channel catfish Ictalurus punctatus, several redhorse Moxostoma species, sauger Sander canadensis, and other migratory fishes have occurred upstream of dams on several tributaries. Presently, efforts are underway to restore migratory pathways through dam removal, conversion of dams to rapids, and construction of nature-like fishways. Concurrently, lake sturgeon is being reintroduced in the hope that restored access to historic spawning areas will allow reestablishment of the species. Proposed construction of new flood control dams may undermine these efforts.

1383. **Changes in fish assemblage structure upstream of impoundments within the upper Wabash River Basin, Indiana.**
Guenther, Cameron B. and Spacie, Anne
Transactions of the American Fisheries Society 135(3): 570-583. (2006)
NAL Call #: 414.9-Am3; ISSN: 0002-8487
Descriptors: commercial activities/ ecology/ freshwater habitat/ lotic water/ land zones/ Pisces: Industry/ Dams and impoundments/ distribution and trophic structure effects/ streams/ trophic structure/ Dams and impoundments effects/ community structure/ distribution within habitat/ stream/ distribution and trophic structure/ Indiana/ Upper Wabash River Basin/ Pisces/ chordates/ fish/ vertebrates
Abstract: The effects of dams and impoundments on downstream fish assemblages have been well documented, but changes in fish assemblages in upstream tributaries have received little attention. We compared changes in abundance and composition in fish assemblages in streams fragmented by impoundments with those found in nearby unfragmented streams by sampling fish, in-stream habitat, physicochemical factors, and drainage features in 22 agriculturally dominated streams during the summers of 2002 and 2003. Eleven sampling sites were tributaries upstream of impoundments, while 11 were tributaries of free-flowing rivers. We tested the hypothesis that fish assemblages upstream of impoundments would differ from those found in streams without impoundments. Using multiple regression and canonical correspondence analysis, we partitioned the variation in species distributions into that explained by in-stream habitat, reach-level factors, drainage features, and temporal variation. Spatial patterns of species distributions indicated significant upstream effects of impoundment, fragmentation being the single largest predictor of species distributions. Mean fluvial specialist richness was significantly greater in unfragmented (6 species/reach) than in fragmented streams (3 species/reach), whereas mean fluvial generalist richness was significantly greater in fragmented (12 species/reach) than unfragmented streams (8 species/reach). A shift in piscivore abundance and composition was also observed, with smallmouth bass Micropterus dolomieu and redfin pickerel Esox americanus replaced by largemouth bass M. salmoides and white bass Morone chrysops in the streams fragmented by impoundments. Additionally, greater total richness and piscivore abundance was observed in tributaries upstream of impoundments. Unfragmented streams showed a significantly lower total abundance of piscivores (7 fish/reach) than upstream tributaries of impoundments (14 fish/reach). The downstream presence of an impoundment led to significant homogenization of fish assemblages through a significant increase in generalist richness and abundance in fragmented streams and a shift in the abundance and type of piscivores.

1384. **Changes in fish assemblages in the tidal Hudson River, New York.**
Daniels, R. A.; Limburg, K. E.; Schmidt, R. E.; Strayer, D. L.; and Chambers, R. C.
American Fisheries Society Symposium 45: 471-503. (2005)
Descriptors: climatic changes/ commercial fishing/ deforestation/ domestic wastes/ dredging/ environmental impact/ estuaries/ freshwater fish/ harvesting/ introduced species/ rivers/ urbanization/ watersheds/ Microgadus tomcod/ Morone saxatilis/ Notropis hudsonius/ Osmerus mordax/ New Jersey/ Hudson R.
Abstract: The main channel of the Hudson River is a tidal estuary from its mouth in New York Harbor to Troy, New York, 247 km upstream. It drains about 35,000 km^2 and is an important navigational, commercial, and recreational system. Since the arrival of European settlers over 400 years ago, it has undergone numerous environmental changes. These changes have included channel maintenance by dredging, wholesale dumping of industrial and domestic wastes, scattered in-basin urbanization and shoreline development, deforestation of the watershed and an increase in agriculture, and water removal for commercial, industrial, and agricultural needs. In addition, the biota of the river has supported commercial and recreational harvesting, exotic species have become established, and habitats have become fragmented, replaced, changed in extent, or isolated. The tidal portion of the Hudson River is among the most-studied water bodies on Earth. We use data from surveys conducted in 1936, the 1970s, the 1980s, and the 1990s to examine changes in fish assemblages and from other sources dating back to

1842. The surveys are synoptic but use a variety of gears and techniques and were conducted by different researchers with different study goals. The scale of our assessment is necessarily coarse. Over 200 species of fish are reported from the drainage, including freshwater and diadromous species, estuarine forms, certain life history stages of primarily marine species, and marine strays. The tidal Hudson River fish assemblages have responded to the environmental changes of the last century in several ways. Several important native species appear to be in decline (e.g., rainbow smelt Osmerus mordax and Atlantic tomcod Microgadus tomcod), others, once in decline, have rebounded (e.g., striped bass Morone saxatilis), and populations of some species seem stable (e.g., spottail shiner Notropis hudsonius).

1385. **Channelization and livestock impacts on salmonid habitat and biomass in western Washington.**
Chapman, D. W. and Knudsen, E.
American Fisheries Society: Transactions 109(4): 357-363. (1980)
NAL Call #: 414.9-Am3; ISSN: 0002-8487
Descriptors: channelization/ grazing/ habitat alterations/ management/ research: rivers and streams/ riparian habitat/ fish/ ecology/ flowing waters/ rivers/ streams/ salmonids/ Washington/ Salmonidae

1386. **Comparative effects of sheep and cattle grazing on an anadromous fish stream in central Idaho.**
May, B. E. and Somes, W. L.
In: Proceedings of the Annual Conference of the Western Association of Fish and Wildlife Agencies. Las Vegas, Nevada; Vol. 62; pp. 490-500; 1982.
NAL Call #: SK351.W47
Descriptors: habitat alterations/ grazing/ management/ research: rivers and streams/ riparian habitat/ Idaho

1387. **A comparison of single-cell and multicell culverts for stream crossings.**
Wargo, R. S. and Weisman, R. N.
Journal of the American Water Resources Association 42(4): 989-995. (2006)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: aggradation/ backwater/ bankfull/ culverts/ erosion/ fish passage/ floodplain/ perching/ rivers/ streams/ scour/ sediment transport/ stream restoration
Abstract: Single-barrel culverts are a common means of roadway crossings for smaller streams. While this culvert design provides an economical solution for a crossing, the adverse effects of conveying the stream through a single opening can be far reaching. The single-barrel culvert is typically sized for a design storm much greater than the channel forming discharge. This oversizing causes an interruption of the normal flow patterns and sediment transport for the system. Shallow depths at low flow in the pipe and perching at the outlet can impede fish passage. Multicell culverts (where the main culvert at the channel invert is sized for bankfull discharge, and additional pipes are placed at the floodplain elevation to convey overbank flow up to the design discharge) have been recommended as a best management practice to minimize erosion and improve fish passage. This flume study scaled a prototype single-barrel culvert to both a single-cell model, and a multicell design to compare outlet scour and flow depths within the culvert. The results provide designers and planners with evidence of the benefits of multicell culverts to justify the higher cost of installation compared to single-barrel culverts.

1388. **A comparison of the areal extent of fish habitat gains and losses associated with selected compensation projects in Canada.**
Harper, D. J. and Quigley, J. T.
Fisheries 30(2): 18-25. (2005)
NAL Call #: SH1.F54; ISSN: 03632415
Descriptors: aquatic habitat/ fish/ no net loss/ performance/ policy tools/ Canada
Abstract: We conducted a review of studies that evaluated the effectiveness of fish habitat compensation projects in achieving the conservation goal of no net loss of productive capacity of fish habitat in Canada. Combined, the 103 compensation projects assessed in the 10 studies created and/or restored 493,205 m 2 of fish habitat to offset habitat impacts totalling 1,142,648 m^2. Most of the compensation projects assessed were a result of impacts to estuarine and riverine in-channel habitats. Forestry and urban development activities resulted in the greatest percentage of compensation projects. Overall, 64% of the projects were deemed to have achieved no net loss. Fifty percent of the projects had a compensation ratio (compensation area:impacted area) of less than 1:1. The small number of studies found in the literature suggests that performance evaluations are rarely conducted, limiting our ability to practice adaptive management. We advocate that a national monitoring program be developed through which the achievement of no net loss can be assessed on an ongoing basis.

1389. **Comparison of two methods of habitat rehabilitation for brown trout in a southeast Minnesota stream.**
Thorn, W. C. and Anderson, C. S.
Minnesota Department of Natural Resources(488)(2001).
Notes: Project Number: MN F-026-R/Study 689 [Unpublished Fish Report].
Descriptors: habitat management for fish/ trout, brown/ rehabilitation/ streams/ techniques/ cover/ shores and banks/ habitat changes/ size/ abundance/ standing crop/ Minnesota/ Salmo/ Salmonidae/ Salmo trutta
Abstract: Habitat rehabilitation with overhead bank cover and woody debris for brown trout under a no-kill regulation was evaluated in two reaches of Hay Creek.

1390. **Concentrations of faecal coliform bacteria in Prince Edward Island headwater streams: An interim report.**
Adams, J. D.
In: Effects of land use practices on fish, shellfish, and their habitats on Prince Edward Island., Canadian Manuscript Report of Fisheries and Aquatic Sciences 2408; Charlottetown, Prince Edward Island: Canadian Department of Fisheries and Oceans, 2002. 121-141.
Descriptors: agricultural pollution/ bacteria/ excretory

products/ organic wastes/ water pollution/ Canada, Prince Edward Island
Abstract: This project measured faecal coliform (FC) levels in headwater streams of Prince Edward Island in July-November 1998 and May-October 1999. Potential FC bacteria contributors at study sites included cattle, sheep, geese, and humans. Water and sediment (1998 only) samples were taken upstream and downstream of potential FC contributors. There was a significant positive correlation between wet-days and FC concentrations in water, suggesting that runoff or resuspension contributes to increased FC levels. All the cattle and sheep access sites showed a significant increase of FC downstream from the livestock. The site with a forested buffer zone which had cattle fenced out of the stream showed no difference in FC concentrations between upstream and downstream sampling points. The waterfowl site, consisting of a stream that runs through two ponds, provided evidence that high numbers of geese had a significant effect on FC concentrations. Results from this site also suggested that ponds can act as filters or buffers for FC concentrations. Water samples from the stream exiting the upper pond showed significantly lower FC concentrations than water samples taken upstream of the pond. Additional sites were sampled in the 1999 field season. The two 1999 cattle access sites showed significant increases in FC concentrations at downstream sampling sites, and the 1999 cattle fenced site showed no change in bacteria levels between upstream and downstream points. A site added in the 1999 field season provided a reference on what levels of FC to expect naturally since the stream occurred primarily in a forested area without other influences. Several upstream locations in which there was no agricultural or anthropogenic activity also showed low FC levels.

1391. **Conflicts between people and fish for water: Two British Columbia salmon and steelhead rearing streams in need of flows.**
Rosenau, M. and Angelo, M.
Vancouver, BC: Pacific Fisheries Resource Conservation Council, 2003.
http://www.fish.bc.ca/files/ConflictsPeopleFish_2003_0_Complete.pdf
Descriptors: environmental effects/ habitat/ habitat improvement/ legislation/ salmon fisheries/ water/ Oncorhynchus/ Canada, British Columbia/ Canada, British Columbia, Englishman R./ Canada, British Columbia, Nicola R./ Canada, British Columbia, Thompson R.
Abstract: The amount of water flowing in a stream during the spawning, incubation and early life stages of salmon and steelhead is crucial to their health and survival. The freshwater rearing phase for all species of salmon requires the maintenance of the quality and quantity of water in terms of temperature, nutrition and spatial requirements and these parameters are affected by flow. Low flows can impact on salmon and steelhead rearing by reducing habitat capacity and availability for young fish as well as stressing or killing adult and young fish through increased summer water temperatures. Lowered flows can interrupt the passage of adult and juvenile fish to spawning and rearing areas. The extraction of water from streams and lakes has undermined the production of salmon and steelhead in a number of high-profile British Columbia watersheds. Increasing human settlement throughout the past century has led to unprecedented demands for water for industrial, agricultural and domestic purposes. Indeed, it is the opinion of various fisheries professionals that the over-abstraction of water may have contributed to the decline of some southern-interior coho salmon stocks to the point that they have now been listed by the Committee on the Status of Endangered Wildlife in Canada. The withdrawal of water for an array of purposes has also adversely affected some east-coast Vancouver Island steelhead populations that were already in a crisis state.

1392. **Cost effectiveness of vegetative filter strips and instream half-logs for ecological restoration.**
Frimpong, E. A.; Lee, J. G.; and Sutton, T. M.
Journal of the American Water Resources Association 42(5): 1349-1361. (Oct. 2006)
NAL Call #: GB651.W315
Descriptors: ecological restoration/ cost effectiveness/ cost analysis/ streams/ riparian buffers/ riparian forests/ logs/ water pollution/ pollution control/ wildlife habitats/ agricultural watersheds/ watershed management/ Indiana/ pollution/ land resources/ forestry related
Abstract: This paper presents the results of cost effectiveness (CE) analysis of vegetative filter strips (VFS) and instream half-logs as tools for recovering scores on a fish Index of Biotic Integrity (IBI) in the upper Wabash River watershed (UW) in Indiana. Three assumptions were made about recovery time for IBI scores (5, 15, and 30 years) and social discount rates (1, 3, and 5 percent), which were tested for sensitivity of the estimated CE ratios. Effectiveness of VFS was estimated using fish IBIs and riparian forest cover from 49 first-order to fifth-order stream reaches. Half-log structures had been installed for approximately two years in the UW prior to the study and provided a basis for estimates of cost and maintenance. Cost effectiveness ratios for VFS decreased from $387 to $277 per 100 m for a 1 percent increase in IBI scores from first- to fifth-order streams with 3 percent discount and 30-year recovery. This cost weighted by proportion of stream orders was $360. The ratio decreased with decreasing time of recovery and discount rate. Based on installation costs and an assumption of equal recovery rates, half-logs were two-thirds to one-half as cost-effective as VFS. Half-logs would be a cost-effective supplement to VFS in low order streams if they can be proven to recover IBI scores faster than VFS do. This study provides baseline data and a framework for planning and determining the cost of stream restoration.
This citation is from AGRICOLA.

1393. **The development and historic use of habitat structures in channel restoration in the United States: The grand experiment in fisheries management.**
Thompson, D. M. and Stull, G. N.
Geographie Physique et Quaternaire 56(1): 45-60. (2002).
http://www.erudit.org/revue/gpq/2002/v56/n1/008604ar.pdf
Descriptors: channels/ fisheries/ fishery management/ habitats/ history
Abstract: The use of instream structures to modify aquatic habitat has a long history in the USA. Pioneering work by wealthy landowners in the Catskills region of New York produced a range of designs in the decades preceding the Great Depression in an effort to replenish fish populations

depleted from overfishing. The scientific evaluation of structures began in 1930. Within two years, a Michigan research team claimed improved fish populations. Cheap labour and government-sponsored conservation projects spearheaded by the Civilian Conservation Corps allowed the widespread adoption of the techniques in the 1930s, before adequate testing of the long-term impact of the devices. The start of World War II temporarily ended the government conservation efforts and prevented the continued evaluation of structures. During the 1940s, 1950s and 1960s, designs of instream structures remained essentially unchanged. Meanwhile, the small number of evaluations of the impact of the structures often were flawed. The continued use of early designs of instream structures helped instill a false belief that instream structures were proven to be a benefit to fish. Even modern use of instream structures continues to rely on the basic blueprints developed in the Catskills, despite documented problems with the use of these designs.

1394. **Do conservation practices and programs benefit the intended resource concern?**
Westra, J. V.; Zimmerman, J. K. H.; and Vondracek, B.
Agricultural and Resource Economics Review 33(1): 105-120. (2004)
NAL Call #: HD1773.A2N6; ISSN: 10682805
Descriptors: agricultural drainage and pesticide transport model (ADAPT)/ Conservation Reserve Program (CRP)/ Conservation Security Program (CSP)/ fisheries/ green payments/ water quality
Abstract: Many conservation programs under the 2002 Farm Act address resource concerns such as water quality and aquatic communities in streams. Analyzing two such programs, simulated changes in agricultural practices decreased field-edge sediment losses by 25-31 % in two geophysically distinct Minnesota watersheds. However, while in-stream sediment concentrations and lethal fisheries events decreased significantly in one watershed, there was no discernable improvement for the fisheries in the other, despite potentially spending over $100,000 annually in conservation payments. These results highlight the importance of performance-based conservation payments targeted to genuine resource concerns in watersheds and the value of integrated bioeconomic modeling of conservation programs.

1395. **Ecological responses to trout habitat rehabilitation in a northern Michigan stream.**
Rosi-Marshall, Emma J.; Moerke, Ashley H.; and Lamberti, Gary A.
Environmental Management (2006)
NAL Call #: HC79.E5E5 ; ISSN: 0364-152X
Descriptors: animals/ fisheries/ fishes [physiology]/ invertebrates [physiology]/ Michigan/ population dynamics/ [methods]/ ecosystem/ trout [physiology]
Abstract: Monitoring of stream restoration projects is often limited and success often focuses on a single taxon (e.g., salmonids), even though other aspects of stream structure and function may also respond to restoration activities. The Ottawa National Forest (ONF), Michigan, conducted a site-specific trout habitat improvement to enhance the trout fishery in Cook's Run, a 3rd-order stream that the ONF determined was negatively affected by past logging. Our objectives were to determine if the habitat improvement increased trout abundances and enhanced other ecological variables (overall habitat quality, organic matter retention, seston concentration, periphyton abundance, sediment organic matter content, and macroinvertebrate abundance and diversity) following rehabilitation. The addition of skybooms (underbank cover structures) and k-dams (pool-creating structures) increased the relative abundance of harvestable trout (>25 cm in total length) as intended but not overall trout abundances. Both rehabilitation techniques also increased maximum channel depth and organic matter retention, but only k-dams increased overall habitat quality. Neither approach significantly affected other ecological variables. The modest ecological response to this habitat improvement likely occurred because the system was not severely degraded beforehand, and thus small, local changes in habitat did not measurably affect most physical and ecological variables measured. However, increases in habitat volume and in organic matter retention may enhance stream biota in the long term.

1396. **Effect of animal grazing on water quality of nonpoint runoff in the Pacific Northwest.**
Saxton, K. E.; Elliott, L. F.; Papendick, R. I.; Jawson, M. D.; and Fortier, D. H.
Ada, Okla.: United States Environmental Protection Agency Research and Development, 1983. 7 p.
Notes: EPA 600/S2-83/071.
NAL Call #: TD223.7.E442 1983
Descriptors: Pacific Northwest/ freshwater environment/ impact of agriculture/ cattle/ grazing/ erosion/ sedimentation/ water quality/ management/ manure/ indicator bacteria/ freshwater environment/ impact of forestry or agriculture/ policy, management, education or information

1397. **The effect of forest type on benthic macroinvertebrate structure and ecological function in a pine plantation in the North Carolina Piedmont.**
Goodman, Keli J.; Hershey, Anne E.; and Fortino, Kenneth
Hydrobiologia 559: 305-318. (2006)
NAL Call #: 410 H992; ISSN: 0018-8158
Descriptors: ecology/ trophic structure/ freshwater habitat/ lotic water/ terrestrial habitat/ land zones/ Macroinvertebrata: food webs/ stream benthic community trophic function/ effect of forest type/ community structure/ stream benthic community/ stream/ benthic community structure and trophic function/ forest and woodland/ forest type effect on stream benthic community structure and trophic function/ North Carolina/ Tar Pamlico River Basin/ stream benthic community structure and trophic function/ invertebrates
Abstract: We examined the impact of small-scale commercial forestry on the structure and function of 6 headwater streams in the North Carolina Piedmont. During 2001-2003 terrestrial organic matter inputs, temperature, macroinvertebrate community composition and tolerance, leaf breakdown rate, and food web structure were quantified for 2 streams draining mature stands of managed loblolly pine, 2 streams draining mature hardwood forests, and 2 streams draining 3-year-old clear cuts, which had been replanted with loblolly pine. Streams in the clear-cuts and pine plantations were bordered by a 15 m hardwood

buffer. Despite differences in watershed land-use, there were no significant differences in the organic matter supply or temperature between streams draining different forest types. However, algal biomass was significantly higher in clear-cut sites than forested sites, and was also higher in hardwood sites than pine sites. Streams draining the clear-cut sites contained lower macroinvertebrate richness and diversity, and fewer intolerant species, than streams draining pine and hardwood stands. Despite the differences in macroinvertebrates community composition, there was no difference among forest types in leaf-pack breakdown rates. Analysis of Δ15N and Δ13C natural abundance of functional feeding group indicated that the shredders and predators collected from streams draining clear-cuts had a Δ15N value that was enriched relative to the macroinvertebrates of streams draining pine and hardwood forests. This difference in Δ15N signature appears to be the result of the incorporation of riparian grass species in the clear-cuts, which have a higher Δ15N, into the diet of shredders. Pine sites had similar food webs to natural hardwood sites. Our results suggest that clear-cutting changes both the trophic dynamics and macroinvertebrate composition of low-order Piedmont streams in North Carolina despite the presence of hardwood buffers. However, large differences were not found between older pine and hardwood stands, indicating rapid recovery following re-growth of forest vegetation, when hardwood buffer strips were present.

1398. **Effect of streambank fencing on herpetofauna in pasture stream zones.**
Homyack, J. D. and Giuliano, W. M.
Wildlife Society Bulletin 30(2): 361-369. (2002)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: riparian environments/ range management/ species richness/ abundance/ biomass/ herpetofauna/ ecosystem management/ ecosystem disturbance/ agriculture/ population density/ community composition/ species diversity/ riparian vegetation/ water quality/ animal populations/ man-induced effects/ stream banks/ ecology/ amphibians/ Regina septemvittata/ Thamnophis sirtalis/ Amphibia/ Reptilia/ queen snake/ common garter snake/ reptiles/ streambank fencing/ livestock grazing
Abstract: Grazing livestock in streams and associated riparian zones may negatively impact a variety of wildlife through direct disturbance and alteration of environmental conditions. To evaluate streambank fencing as a management tool, we measured the richness, abundance, and biomass of reptile and amphibian species on 10 grazed streams and associated riparian areas and 10 similar areas that were recently fenced (1-2 yrs) to exclude livestock, during spring and summer of 1998 and 1999. Effects of streambank fencing on vegetation, water quality, and macroinvertebrate populations also were examined because livestock grazing may indirectly impact communities of herpetofauna through their influence on these factors. We found no difference in species richness, abundance of all species combined, or biomass of herpetofauna between fenced and unfenced streams. However, northern queen snakes (Regina septemvittata) and eastern garter snakes (Thamnophis sirtalis) were more abundant on fenced than unfenced sites. Percent litter cover and vertical obstruction were higher on fenced sites, terrestrial macroinvertebrate biomass was greater on unfenced sites, and water-quality variables did not differ between site types. Although some species (e.g., birds) responded quickly (<4 yrs) to streambank fencing, it appeared that herpetofauna might require a longer recovery time (>4 yrs). The length of time since livestock were excluded, dispersal ability, reproductive potential, and distance to the nearest remnant population may be important factors in reptile and amphibian recovery in grazed stream and riparian zones.

1399. **The effect of variable-retention riparian buffer zones on water temperatures in small headwater streams in sub-boreal forest ecosystems of British Columbia.**
Macdonald, J. S.; MacIsaac, E. A.; and Herunter, H. E.
Canadian Journal of Forest Research 33(8): 1371-1382. (2003)
NAL Call #: SD13.C35; ISSN: 00455067.
Notes: doi: 10.1139/x03-015.
Descriptors: Harvesting/ Insect control/ thermal effects/ forest harvesting/ stream flow/ boreal forest/ buffer zone/ forest management/ harvesting/ riparian zone/ stream/ water temperature/ Canada
Abstract: Stream temperature impacts resulting from forest harvesting in riparian areas have been documented in a number of locations in North America. As part of the Stuart-Takla Fisheries-Forestry Interaction Project, we have investigated the influence of three variable-retention riparian harvesting prescriptions on temperatures in first-order streams in the interior sub-boreal forests of northern British Columbia. Prescriptions were designed to represent a range of possible harvesting options outlined by the Forest Practices Code of B.C., or associated best management practice guidelines. Five years after the completion of harvesting treatments, temperatures remained four to six degrees warmer, and diurnal temperature variation remained higher than in the control streams regardless of treatment. Initially, the high-retention treatment acted to mitigate the temperature effects of the harvesting, but 3 successive years of windthrow was antecedent to reduced canopy density and equivalent temperature impacts. We speculate that late autumn reversals in the impacts of forest harvesting also occur. Temperature impacts in this study remained within the tolerance limits of local biota. However, even modest temperature changes could alter insect production, egg incubation, fish rearing, migration timing, and susceptibility to disease, and the effects of large changes to daily temperature range are not well understood.

1400. **Effect of woody riparian patches in croplands on stream macroinvertebrates.**
Wooster, D. E. and DeBano, S. J.
Archiv fur Hydrobiologie 165(2): 241-268. (2006); ISSN: 00039136.
Notes: doi: 10.1127/0003-9136/2006/0165-0241.
Descriptors: agricultural landscapes/ aquatic macroinvertebrates/ patch size/ riparian buffers/ woody riparian vegetation
Abstract: Woody riparian vegetation plays important roles in stream ecosystems and its presence can have strong impacts on stream fauna. Agricultural practices have led to the removal and fragmentation of woody riparian vegetation

in many watersheds. It is unclear whether small, isolated patches of woody riparian vegetation continue to exert important influences on stream fauna. The impact of these types of patches and the influence of the size of the patches on stream macroinvertebrates was examined in a watershed in northeastern Oregon that is dominated by dryland wheat production. Half of the study reaches flowed through patches of woody riparian vegetation and half flowed through areas in which there was no woody vegetation and wheat fields were found within 3m of the stream. Stream reaches flowing through patches of woody riparian vegetation had higher taxa richness than those flowing through areas lacking woody vegetation. Size of woody patches, as measured by patch length, was positively correlated with shredder abundance, scraper abundance and diversity, and was also correlated with overall community composition as defined by ordination scores. An analysis of individual taxa revealed that patch length was positively associated with nine taxa that are known to be sensitive to human disturbances and negatively associated with one taxon which is considered tolerant of human disturbances. Patch length was also negatively associated with the proportion of sediment on the substrate and it appears that this environmental factor might drive the relationships between patch length and the abundance of the ten taxa. Woody riparian patch width was also examined as a measure of size. In contrast to length, patch width was not correlated with any metric of macroinvertebrate community structure. The results of this study also revealed that macroinvertebrate community structure was influenced by the drainage the study sites were found in. This was unexpected because the study was conducted in a small watershed and the sites within each drainage were specifically chosen to be similar in land use and geology. These results indicate that patch length may be as important, if not more important, than patch width in influencing stream ecosystems. However, the "buffer" literature generally considers only buffer width when examining the relationship between patch size and stream systems. This study highlights the need to consider patch length, as well as width, in studies examining the effect of patches of riparian vegetation on stream fauna, in the design of buffer projects, and in the monitoring of existing project effectiveness. © 2006 E. Schweizerbart'sche Verlagsbuchhandlung.

1401. **Effectiveness of best management practices in improving stream ecosystem quality.**
Yates, A. G.; Bailey, R. C.; and Schwindt, J. A.
Hydrobiologia 583(1): 331-344. (2007)
NAL Call #: 410 H992; ISSN: 00188158.
Notes: doi: 10.1007/s10750-007-0619-4.
Descriptors: micro-basin scale/ agriculture/ best management practices/ BMPs/ stream agroecosystems/ stream quality
Abstract: Implementation of best management practices (BMPs), such as improved manure storage, buffer strips, and grassed waterways, through government funded conservation programs is a common approach for mitigation of the impacts agricultural activities have on the surrounding environment. In this study, we tested the ability of these practices to meet the environmental goal of improved stream quality at a "micro-basin" scale in the Upper Thames River Watershed, southern Ontario, Canada. Micro-basins were first and second order basins, averaging 400 ha in area, representing gradients of land cover, geomorphology, and participation in conservation programs. At the outflow of each micro-basin the benthic macro-invertebrate community was sampled, water chemistry measurements completed, and habitat quality assessed. Results showed micro-basins with relatively high levels of BMP implementation consistently demonstrated improved stream ecosystem quality over the majority of micro-basins with low or no implementation. Streams in the Upper Thames River basin appeared to exhibit a threshold effect, where with several BMPs in the same basin an improvement in stream ecosystem quality is visible. In addition to the BMPs implemented through government funded conservation programs, the observed ecosystem improvements are probably due to increased environmental awareness and improved management by farmers. © 2007 Springer Science+Business Media B.V.

1402. **Effectiveness of forestry streamside management zones in the sand-clay hills of Mississippi: Early indications.**
Carroll, G. D.; Schoenholtz, S. H.; Young, B. W.; and Dibble, E. D.
Water, Air, and Soil Pollution: Focus 4(1): 275-296. (2004); ISSN: 15677230.
Notes: doi: 10.1023/B:WAFO.0000012813.94538.c8.
Descriptors: aquatic macroinvertebrates/ best management practices/ BMPs/ forest management/ logging/ stream habitat/ water quality
Abstract: During the past decade, compliance with initiatives to promote forestry best management practices (BMPs) has been monitored in most states of the southern U.S. and suggests an excellent level of acceptance throughout the region. However, effectiveness of these practices to protect water quality and aquatic habitat in streams that are potentially impacted by forest management activities has not been as thoroughly documented as the degree of compliance. The objective of this study was to determine effectiveness of streamside management zones (SMZs), a key element of BMPs designed for protection of water quality, aquatic habitat, and macroinvertebrate communities, in low-order streams within a region of north central Mississippi that is subjected to intensive forest management. Three SMZ treatments (undisturbed reference, clear-cut logging with an SMZ designated by forest managers, or clear-cut logging with no SMZ) were evaluated using a study with three replications of each treatment. Response metrics including water quality parameters, mineral soil exposure and net deposition/erosion within riparian zones, stream habitat indicators, and aquatic macroinvertebrate communities were comparable between streams receiving SMZs and undisturbed reference streams at all sampling intervals during the first year after treatment. Furthermore, significant elevation of streamwater temperature, decline in habitat stability rating, and increase in density of macroinvertebrates occurring in streams without an SMZ in comparison to reference streams provides additional evidence of SMZ effectiveness during the initial year after harvesting. © 2004 Kluwer Academic Publishers.

1403. **Effectiveness of habitat manipulation for wild salmonids in Wyoming streams.**
Binns, N. Allen
North American Journal of Fisheries Management 24(3): 911-921. (2004)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: conservation measures/ ecology/ population dynamics/ habitat/ freshwater habitat/ lotic water/ land zones/ Salmonidae: habitat management/ streams/ effectiveness of habitat manipulation/ biomass/ population density/ stream/ Wyoming/ Pisces, Actinopterygii, Salmoniformes/ chordates/ fish/ vertebrates
Abstract: Habitat manipulation is commonly used to enhance habitat and stocks of fluvial trout of the genera Oncorhynchus, Salmo, and Salvelinus, but questions have been raised about the effectiveness of such work. Consequently, I analyzed wild trout abundance, biomass, and habitat before and after habitat manipulations among 30 projects done by the Wyoming Game and Fish Department. Abundance and biomass of trout increased following habitat manipulation among most of the projects. Excessive angler harvest prevented an increase at three projects, and drought hindered fish response in a fourth stream. At a fifth project, the trout population decreased after intense cattle grazing degraded project structures. Instream structures proved durable. Only one project, which featured wire trash catchers in a fourth-order mountain stream, suffered failure of habitat manipulation devices. Cover for trout and residual pool depth significantly increased following projects, whereas eroding banks significantly decreased. Both timber and log check dams consistently produced good pools, but rock check dams did not. Mean per project cost statewide was US$39,230/mi. These results demonstrate that well-built, properly located, and properly maintained instream structures can provide better habitat and increase stocks of trout in carefully selected reaches, thus satisfying public and agency expectations for fishery improvement and gaining time to correct watershed problems.

1404. **Effectiveness of isolated pipeline crossing techniques to mitigate sediment impacts on brook trout streams.**
Reid, S. M.; Stoklosar, S.; Metikosh, S.; and Evans, J.
Water Quality Research Journal of Canada 37(2): 473-488. (2002); ISSN: 1201-3080
Descriptors: aquatic communities/ dams/ environmental impact/ geological sedimentation/ habitat destruction/ habitats/ pipelines/ pumps/ riparian vegetation/ sediment/ streams/ suspended solids/ fishes/ Salvelinus fontinalis/ trout
Abstract: Stream populations of brook trout (Salvelinus fontinalis) are sensitive to sediment-caused changes to habitat, i.e., increased embeddedness of bed material. The use of watercourse crossing techniques (dam and pump, and flume methods) that isolate the construction site by diverting flow around the crossing has often been promoted as a means of controlling the amount of sediment released, particularly for those watercourses with sensitive fish species or habitats. However, few case studies have evaluated the effectiveness of isolated crossing construction techniques to mitigate the effects of instream construction activities. We measured suspended sediment concentrations during six isolated pipeline crossings of brook trout streams in Minnesota (USA), Nova Scotia and Ontario (Canada). In addition, sediment deposition rates, riffle habitats and fish abundance were monitored upstream and downstream of four of the crossings. Results of monitoring studies indicated that isolated techniques can be very effective at: (i) minimizing increases to downstream suspended sediment concentrations during instream construction; and, (ii) preventing sediment-induced effects on habitat and fish abundance downstream of pipeline water crossings. For sensitive watercourses, isolated crossing techniques are an effective alternative to trenchless crossing techniques (e.g., horizontal directional drilling).

1405. **Effects of an agricultural drainwater bypass on fishes inhabiting the grassland water district and the lower San Joaquin River, California.**
Saiki, M. K.; Martin, V. A.; Schwarzbach, S. E.; and May, T. W.
North American Journal of Fisheries Management 21(3): 624-635. (2001)
NAL Call #: SH219.N66; ISSN: 1548-8675
Descriptors: grassland water district/ Lower San Joaquin River map/ California/ agricultural drainwater bypass/ freshwater fish/ community structure/ abundance/ selenium concentration/ environmental factors/ abiotic factors/ water quality/ forestry/ physiology, biology, biochemistry/ ecology and conservation
Abstract: The Grassland Bypass Project, which began operation in September 1996, was conceived as a means of diverting brackish selenium-contaminated agricultural drainwater away from canals and sloughs needed for transporting irrigation water to wetlands within the Grassland Water District (the Grasslands), Merced County, California. The seleniferous drainwater is now routed into the San Luis Drain for conveyance to North Mud Slough and eventual disposal in the San Joaquin River. The purpose of this study was to determine the extent to which the Grassland Bypass Project has affected fishes in sloughs and other surface waters within and downstream from the Grasslands. During September-October 1997, 9,795 fish representing 25 species were captured at 13 sampling sites. Although several species exhibited restricted spatial distributions, association analysis and cluster analysis failed to identify more than one fish species assemblage inhabiting the various sites. However, seleniferous drainwater from the San Luis Drain has influenced selenium concentrations in whole fish within North Mud Slough and the San Joaquin River. The highest concentrations of selenium (12-23 µg/g, dry weight basis) were measured in green sunfish Lepomis cyanellus from the San Luis Drain where seleniferous drainwater is most concentrated, whereas the second highest concentrations occurred in green sunfish (7.6-17 µg/g) and bluegills Lepomis macrochirus (14-18 µg/g) from North Mud Slough immediately downstream from the drain. Although there was some variation, fish in the San Joaquin River generally contained higher body burdens of selenium when captured immediately below the mouth of North Mud Slough (3.1-4.9 µg/g for green sunfish, 3.7-5.0 µg/g for bluegills) than when captured upstream from the mouth (0.67-3.3 µg/g for green sunfish, 0.59-3.7 µg/g for bluegills). Waterborne selenium

was the single most important predictor of selenium concentrations in green sunfish and bluegills, as judged by results from multiple-regression analyses. Among bluegills, water temperature also contributed to the prediction of selenium body burdens.

1406. **Effects of conservation practices on aquatic habitats and fauna.**
Knight, Scott S. and Boyer, Kathryn L.
In: Fish and Wildlife Response to Farm Bill Conservation Practices; Bethesda, MD: The Wildlife Society, 2007. 19 pp.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfb7.pdf
Descriptors: aquatic environment/ surface water/ aquatic habitat/ conservation practices/ terrestrial habitat/ wildlife species/ watershed management/ wildlife management
Abstract: This paper examines the effects of NRCS-defined conservation practices used as conservation measures for aquatic species and their habitats. A major goal of both state and federal agricultural and environmental agencies in the United States is sustainable management of watersheds where agriculture is a dominant land use. Because watershed processes and conditions directly and indirectly affect soil, water, air, plants, animals, and humans, USDA NRCS encourages a watershed approach to management of agricultural operations in the United States. This requires a suite of approaches or practices that address natural resource concerns in uplands and stream corridors. Land clearing, leveling, draining, tilling, fertilizing, and harvesting together create prolonged perturbations manifested in the ecological and physical conditions of streams and rivers. Regardless of the cause of a problem in a watershed, its effect on aquatic habitats and their biological communities is dramatic. Physical damage due to channelization, erosion, sedimentation, and altered hydrological regimes coupled with ecological damage due to excessive nutrients, pesticide contamination, and riparian clearing cumulatively diminish the quality of aquatic habitats and threaten their biological communities. In general, the primary goals for farmers and ranchers in agricultural watersheds are (a) control of non-point source pollutants such as nutrients, sediments, and pesticides, (b) adequate water supplies for crop and animal production, and (c) stream/river channel stability. As indicators of watershed conditions, aquatic species and their habitats play a pivotal role in how we manage watersheds, with the ultimate goal of sustaining water quality and ecological integrity. Conservation planning identifies resource concerns within watersheds and what practices should be implemented to address them. If such practices are applied according to USDA standards, habitats will benefit as will the species that inhabit them.

1407. **Effects of gravel augmentation on macroinvertebrate assemblages in a regulated California river.**
Merz, J. E. and Chan, L. K.
River Research and Applications 21(1): 61-74. (2005)
NAL Call #: TC530.R43 ; ISSN: 15351459.
Notes: doi: 10.1002/rra.819.
Descriptors: biomass/ gravel/ macroinvertebrates/ physical habitat/ river enhancement/ salmon/ spawning/ species diversity/ biomass/ gravel bed stream/ macroinvertebrate/ salmonid/ spawning/ species diversity/ California/ Mokelumne River/ Oncorhynchus mykiss/ Salmonidae
Abstract: Enhancement projects within anadromous salmonid rivers of California have increased in recent years. Much of this work is intended as mitigation in regulated streams where salmon and steelhead spawning habitat is inaccessible or degraded due to dams, water diversions and channelization. Little research has been done to assess the benefits of spawning habitat enhancement to stream organisms other than salmon. We monitored benthic macroinvertebrates at seven spawning gravel augmentation sites in the lower Mokelumne River, a regulated stream in the Central Valley of California. Placement of cleaned floodplain gravel decreased depths and increased stream velocities. Benthic organisms colonized new gravels quickly, equalling densities and biomass of unenhanced spawning sites within 4 weeks. Macroinvertebrate species richness equalled that of unenhanced sites within 4 weeks and diversity within 2 weeks. Standing crop, as indicated by densities and dry biomass, was significantly higher in enhancement sites after 12 weeks than in unenhanced sites and remained so over the following 10 weeks. Although mobile collector/browsers initially dominated new gravels, sedentary collectors were the most common feeding category after 4 weeks, similar to unenhanced sites. These data suggest that cleaned gravels from adjacent floodplain materials, used to enhance salmonid spawning sites, are quickly incorporated into the stream ecosystem, benefiting benthic macroinvertebrate densities and dry biomass.

1408. **Effects of grazing management on streambanks.**
Bohn, C. C. and Buckhouse, J. C.
Transactions of the North American Wildlife and Natural Resource Conference 51: 265-271. (1986)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: Cervus/ livestock/ Odocoileus hemionus/ runoff/ stocking rate/ streams/ wildlife management/ Oregon
This citation is from AGRICOLA.

1409. **Effects of habitat disturbance on stream salamanders: Implications for buffer zones and watershed management.**
Willson J. D. and Dorcas M. E.
Conservation Biology 17(3): 763-771. (June 2003)
NAL Call #: QH75.A1C5
Descriptors: salamanders/ riparian buffers/ North Carolina/ habitat management
Abstract: With human populations increasing worldwide, habitat destruction and degradation are among the greatest threats facing wildlife. To minimize the impacts of development on aquatic habitats, numerous conservation measures have been implemented, including the use of riparian buffer zones along streams and rivers. We examined the effectiveness of current buffer-zone systems for management of small watersheds in conserving stream-dwelling salamander populations in 10 small streams (draining <40.5 ha) in the western Piedmont of North Carolina. We captured salamanders by means of funnel traps and systematic dipnetting and used a geographic information system to calculate the percentage of disturbed habitat within the watershed of each stream and within 10.7-, 30.5-, and 61.0 -m buffer zones around each stream, upstream from our sampling locations. Although the relative

abundance of salamanders was strongly inversely proportional to the percentage of disturbed habitat in the entire watersheds (R^2 = 0.71 for Desmognathus fuscus and 0.48 for Eurycea cirrigera), we found little to no correlation between the relative abundance of salamanders and the percentage of disturbed habitat present within buffer zones (R^2 = 0.06-0.27 for D. fuscus and 0.01-0.07 for E. cirrigera). Thus, conservation efforts aimed at preserving salamander populations in headwater streams must consider land use throughout entire watersheds, rather than just preserving small riparian buffer zones.

1410. **Effects of livestock grazing exclosure on aquatic macroinvertebrates in a montane stream New Mexico.**
Rinne, J. N.
Great Basin Naturalist 48(2): 146-153. (1988)
NAL Call #: 410 G79; ISSN: 0017-3614
Descriptors: mammal/ biomass/ habitat/ watershed/ population density/ chi square
Abstract: Aquatic macroinvertebrate populations inhabiting reaches of a stream within areas excluded from livestock grazing for a decade were markedly different from those in grazed areas when density, biomass, biotic condition indices, and mean chi square indices of the two populations were compared. Increased densities and biomasses of more tolerant forms of macroinvertebrates were observed in grazed reaches. Because pretreatment data were not available, differences in macroinvertebrate populations and relative tolerances of taxa in grazed and ungrazed areas could be as easily attributed to linear changes in stream habitat as to removal of domestic livestock. Results of this study have implications for the design of futur research on the effects of livestock grazing on stream environments and biota: (1) baseline/pretreatment information is prerequisite, and (2) the study should take a watershed (ecosystem) approach.
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1411. **Effects of local land use on physical habitat, benthic macroinvertebrates, and fish in the Whitewater River, Minnesota, USA.**
Nerbonne, B. A. and Vondracek, B.
Environmental Management 28(1): 87-99. (2001)
NAL Call #: HC79.E5E5; ISSN: 0364152X.
Notes: doi: 10.1007/s002670010209.
Descriptors: aquatic insects/ BMPs/ fish/ grass buffers/ physical habitat/ riparian areas/ stream theory/ wooded buffers/ farms/ rivers/ sedimentation/ watersheds/ soil losses/ land use/ benthic environment/ best management practices/ land use/ macroinvertebrates/ land use/ ecosystem/ fishes/ fresh water/ invertebrates/ United States
Abstract: Best management practices (BMPs) have been developed to address soil loss and the resulting sedimentation of streams, but information is lacking regarding their benefits to stream biota. We compared instream physical habitat and invertebrate and fish assemblages from farms with BMP to those from farms with conventional agricultural practices within the Whitewater River watershed of southeastern Minnesota, USA, in 1996 and 1997. Invertebrate assemblages were assessed using the US EPA's rapid bioassessment protocol (RBP), and fish assemblages were assessed with two indices of biotic integrity (BIs). Sites were classified by upland land use (BMP or conventional practices) and riparian management (grass, grazed, or wooded buffer). Physical habitat characteristics differed across buffer types, but not upland land use, using an analysis of covariance, with buffer width and stream as covariates. Percent fines and embeddedness were negatively correlated with buffer width. Stream sites along grass buffers generally had significantly lower percent fines, embeddedness, and exposed streambank soil, but higher percent cover and overhanging vegetation when compared with sites that had grazed or wooded buffers. RBP and IBI scores were not significantly different across upland land use or riparian buffer type but did show several correlations with instream physical habitat variables. RBP and IBI scores were both negatively correlated with percent fines and embeddedness and positively correlated with width-to-depth ratio. The lack of difference in RBP or IBI scores across buffer types suggests that biotic indicators may not respond to local changes, that other factors not measured may be important, or that greater improvements in watershed condition are necessary for changes in biota to be apparent. Grass buffers may be a viable alternative for riparian management, especially if sedimentation and stream-bank stability are primary concerns.
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1412. **Effects of riparian area management on stream habitat and fish communities in central and southwest Wisconsin.**
Stephens, T. J. University of Wisconsin, Stevens Point, 2001.
Notes: Degree: M.S.
Descriptors: vegetation/ plant succession/ grasses/ shrubs/ statistics/ temperature, environment/ size/ cover/ Wisconsin
Abstract: Objectives were to: (1) evaluate how differences in riparian vegetation (well-managed grazing, ungrazed grass, early successional-shrub vegetation, and late successional-wooded vegetation) affect stream habitat and fish community characteristics among stream reaches; and (2) assess stream habitat quality and fish community characteristics among streams with different thermal regimes in two ecoregions of Wisconsin.
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1413. **Effects of sedimentation and turbidity on lotic food webs: A concise review for natural resource managers.**
Henley, W. F.; Patterson, M. A.; Neves, R. J.; and Lemly, A. D.
Reviews in Fisheries Science 8(2): 125-139. (2000); ISSN: 1064-1262
Descriptors: sediment load/ nephelometers/ trophic levels/ environmental impact/ ecosystem disturbance/ water quality control/ population dynamics/ food chains/ turbidity/ environment management/ zooplankton/ sedimentation/ mollusks/ fish/ insects/ watersheds/ suspended sediments/ monitoring/ streams/ habitat community studies/ mechanical and natural changes/ erosion and sedimentation
Abstract: Sedimentation and turbidity are significant contributors to declines in populations of North American aquatic organisms. Impacts to lotic fauna may be expressed through pervasive alterations in local food chains beginning at the primary trophic level. Decreases in primary production are associated with increases in sedimentation and turbidity and produce negative cascading effects through depleted food availability to

zooplankton, insects, freshwater mollusks, and fish. Direct effects at each trophic level are mortality, reduced physiological function, and avoidance; however, decreases in available food at trophic levels also result in depressed rates of growth, reproduction, and recruitment. Impacts of turbidity to aquatic organisms often seem inconsistent among watersheds and experiments, but this apparent difference is actually due to the lack of correlation between suspended sediment concentrations (mg/L) and units of measure (Nephelometric Turbidity Units, NTU). The use of NTU as a surrogate measurement of suspended sediment to predict biotic effects within watersheds is dubious. Similar NTU measurements from different watersheds may be correlated with different concentrations of suspended sediment. For monitoring the effects of turbidity within local watersheds, we recommend that the correlation between suspended sediment and NTUs be examined over a range of discharge recordings, and that this be used as a baseline to examine local effects. We recommend that riparian buffer strips and livestock fencing be used to reduce sediment input to streams.

1414. **Effects of silviculture using best management practices on stream macroinvertebrate communities in three ecoregions of Arkansas, USA.**
McCord, S. B.; Grippo, R. S.; and Eagle, D. M.
Water, Air and Soil Pollution 184(1-4): 299-311. (2007)
NAL Call #: TD172.W36; ISSN: 00496979.
Notes: doi: 10.1007/s11270-007-9417-x.
Descriptors: BACI study design/ Euclidean distance/ functional feeding groups/ logging/ best management practices/ BMPs/ streams/ macroinvertebrate communities
Abstract: We examined aquatic macroinvertebrate assemblages in six Arkansas low-order streams across three ecoregions. Samples were taken at locations above and below silviculture sites using Best Management Practices (BMPs) and were compared in winter and spring for 1 year prior to logging and 2 years after treatments. Implementation at all sites scored between 89 and 100% in compliance assessments using state BMP guidelines. Deficiencies were generally limited to engineering controls designed to prevent soil erosion; however, no clear evidence of sedimentation was observed in any of the study streams. Water quality variables were similar between sites upstream and downstream of the harvests in all survey periods. Analysis of variance did not indicate reduced taxonomic richness that could clearly be attributed to silviculture operations, but did reveal several significant differences in relative abundance variables that could be associated with negative impacts, primarily at a single site. Euclidean distance indicated that macroinvertebrate assemblage similarity between reference and treatment stations decreased after treatments at two additional study sites. At most sites, however, there was not an assemblage shift from organisms using coarse particulate organic matter as the primary food source to those using fine particulate organic matter downstream of the harvests. Our results indicated that BMPs were moderately to strongly effective in protecting water quality and biological integrity in five of the six study streams. © 2007 Springer Science+Business Media B.V.

1415. **Effects of streambank fencing of pasture land on benthic macroinvertebrates and the quality of surface water and shallow ground water in the Big Spring Run Basin of Mill Creek Watershed, Lancaster County, Pennsylvania, 1993-2001.**
Galeone, D. G.; Brightbill, R. A.; Low, D. J.; and O'Brien, D. L. U.S. Geological Survey; United States Geological Survey Scientific Investigations Report no. 2006-5141, 2006. 197 pp.
http://pubs.usgs.gov/sir/2006/5141/pdf/sir2006-5141.pdf
Descriptors: channels/ ground water/ groundwater/ groundwater basins inland water environment/ pastures/ river basins/ stream pollution/ streams/ surface water/ surface-groundwater relations/ vegetation/ watersheds/ zoobenthos/ Iowa, Big Spring/ Pennsylvania, Lancaster Cty.
Abstract: Streambank fencing along stream channels in pastured areas and the exclusion of pasture animals from the channel are best- management practices designed to reduce nutrient and suspended- sediment yields from drainage basins. Establishment of vegetation in the fenced area helps to stabilize streambanks and provides better habitat for wildlife in and near the stream. This study documented the effectiveness of a 5- to 12-foot-wide buffer strip on the quality of surface water and near-stream ground water in a 1.42- mi(sup 2) treatment basin in Lancaster County, Pa. Two miles of stream were fenced in the basin in 1997 following a 3- to 4- year pre-treatment period of monitoring surface- and ground-water variables in the treatment and control basins. Changes in surface- and ground-water quality were monitored for about 4 years after fence installation.

1416. **Effects of watershed best management practices on habitat and fish in Wisconsin streams.**
Wang, L.; Lyons, J.; and Kanehl, P.
Journal of the American Water Resources Association 38(3): 663-680. (2002)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: aquatic ecosystems/ BMP evaluation/ fish/ nonpoint source pollution/ physical habitat/ watershed management/ ecosystems/ low temperature effects/ marine biology/ stream flow/ best management practices/ BMPs/ habitat conditions/ habitat management/ water temperature/ United States/ Cottidae/ Salmo trutta/ Salmonidae
Abstract: We evaluated the effectiveness of watershed-scale implementations of best-management practices (BMPs) for improving habitat and fish attributes in two coldwater stream systems in Wisconsin. We sampled physical habitat, water temperature, and fish communities in multiple paired treatment and reference streams before and after upland (barnyard runoff controls, manure storage, contour plowing, reduced tillage) and riparian (stream bank fencing, sloping, limited rip-rapping) BMP installation in the treatment subwatersheds. In Spring Creek, BMPs significantly improved overall stream habitat quality, bank stability, instream cover for fish, abundance of cool- and coldwater fishes, and abundance of all fishes. Improvements were most pronounced at sites with riparian BMPs. Water temperatures were consistently cold enough to support coldwater fishes such as trout (Salmonidae) and sculpins (Cottidae) even before BMP installation. We observed the first-time occurrence of naturally reproduced brown trout (Salmo trutta) in Spring Creek, indicating that

the stream condition had been improved to be able to partially sustain a trout population. In Eagle Creek and its tributary Joos Creek, limited riparian BMPs led to localized gains in overall habitat quality, bank stability, and water depth. However, because few upland BMPs were installed in the subwatershed there were no improvements in water temperature or the quality of the fish community. Temperatures remained marginal for coldwater fish throughout the study. Our results demonstrate that riparian BMPs can improve habitat conditions in Wisconsin streams, but cannot restore coldwater fish communities if there is insufficient upland BMP implementation. Our approach of studying multiple paired treatment and reference streams before and after BMP implementation proved effective in detecting the response of stream ecosystems to watershed management activities.

1417. **Endangered species and irrigated agriculture: Water resource competition in western river systems.**
Moore, Michael R.; Mulville, Aimee.; Weinberg, Marca; and United States. Dept. of Agriculture.
Economic Research Service.
Washington, D.C.: U.S. Dept. of Agriculture, Economic Research Service; iv, 20 p.: ill., maps; Series: Agriculture information bulletin no. 720 (An Economic Research Service report). (1995).
Notes: Cover title. Distributed to depository libraries in microfiche. Shipping list no.: 97-0500-M. "November 1995" Includes bibliographical references (p. 18-19).
SUDOCS: A 1.75:720.
NAL Call #: Fiche S 133 A 1.75:720
Descriptors: Endangered species---West---United States/ Water resources development---West---United States/ Irrigation farming---West---United States
This citation is from AGRICOLA.

1418. **Estimation of smolt-to-adult return percentages for Snake River Basin anadromous salmonids, 1990-1997.**
Sandford, B. P. and Smith, S. G.
Journal of Agricultural, Biological, and Environmental Statistics 7(2): 243-263. (2002)
NAL Call #: S566.55.J68; ISSN: 10857117.
Notes: doi: 10.1198/10857110260141274.
Descriptors: bootstrap/ fish passage/ fish transportation/ passive-integrated-transponder tag/ stratified tag-recapture
Abstract: From numbers of juvenile salmonids (smolts) tagged between 1990 and 1997 with passive-integrated-transponder (PIT) tags and detections at downstream hydropower projects on the lower Snake and Columbia Rivers, we applied and adapted stratified tagrecapture methods to estimate the number of PIT-tagged smolts that experienced each possible detection history through the dams. Using adult detection records upon return after 1-3 years of ocean residence, we estimated smolt-to-adult return (SAR) percentages for fish in detection-history categories that included downstream barge transport, migration in-river following detection, and migration in-river with no detection. We used bootstrap methods to estimate 95% confidence intervals for estimated SARs and ratios of SARs for selected detection-history categories. In general, though small numbers of returning adults and statistical uncertainty at various stages of the estimation procedure led to fairly imprecise SAR estimates, some general trends were evident. Adult return percentages for spring/summer yearling chinook salmon and steelhead were highest for fish transported from Lower Granite and Little Goose Dams but only slightly higher than for nondetected fish. Passage routes of nondetected fish (through spill and turbines) may represent optimal passage conditions. Once a juvenile fish is entrained in a bypass system at a "collector dam," transporting the fish maximizes the probability of its eventual return as an adult. © 2002 American Statistical Association and the International Biometric Society.

1419. **An evaluation of instream and riparian restoration techniques applied to the Spafford Creek drainage in Otisco Valley, NY.**
Connerton, M.; Schwartz, C.; and Hamilton, C.
American Fisheries Society Annual Meeting 133: 153. (2003).
Notes: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.
Descriptors: conservation/ channel flow/ creek drainages: habitat/ ditching/ farming practices/ flooding/ habitat improvement/ over grazing/ restoration techniques: instream, riparian/ stream bank stability/ vegetation changes

1420. **Evaluation of restoration efforts on the 1996 upper Adams River sockeye salmon run.**
Hume, J. M.; Morton, K. F.; Lofthouse, D.; MacKinlay, D.; Shortreed, K. S.; Grout, J.; and Volk, E.
Canadian Technical Report of Fisheries and Aquatic Sciences 2466: i-vi, 1-57. (2003); ISSN: 0706-6457
Descriptors: behavior/ ecology/ population dynamics/ population structure/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Oncorhynchus nerka: conservation measures/ migration/ age class distribution/ recruitment/ river/ British Columbia/ Upper Adams River/ migratory stock restoration efforts evaluation/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: The Upper Adams River has an estimated 1.25 million m^2 of spawning grounds and Adams Lake has the potential to produce 26 million sockeye salmon (Oncorhynchus nerka) smolts but blockages, including a splash dam on the Adams River (1907 to 1922) and a slide at Hells Gate on the Fraser River in 1913 resulted in the total elimination of the Upper Adams River sockeye salmon stock. In light of the previous abundant run and the unused capacity of the system, a long term effort has been made to rebuild the sockeye run to the Upper Adams River. This included egg and fry transplants from 1949 to 1984 resulting in increasing run sizes every four years (most Adams sockeye mature at age-4) until 1988 (7,000). In 1992 the run was considerably smaller (3,000) and a renewed effort was made to enhance the offspring of the 1992 brood year. Reduced exploitation rates (19%) in 1996 resulted in 25,000 sockeye spawners. Fish culture and fry release programs in 1992 and 1996 used native stock from both the Upper Adams River and nearby Momich River system, releasing fry into the river and after net pen rearing, into the north end of Adams Lake. In 1997, 1.3 million fry were released into the river and lake. In addition to the fry release project, the lake was fertilized in 1997 to promote

the lake growth and subsequent survival of sockeye in the lake and marine environments. An average of 3 mg P/m^2/wk and 48 mg N/m^2/wk were added to the lake from May to September, using a "front end" loading regime where the nutrients were added at a higher rate in June than in September. We applied two agricultural fertilizers by boat, ammonium nitrate (28-0-0) and ammonium polyphosphate (10-34-0). Particulate C and P were higher in the fertilized year and the year following than in a reference year 1986. Chlorophyll concentrations were highest in 1997 but macrozooplankton showed no significant difference between years. Our analysis, based on known sockeye escapements, length frequency analysis, and the levels of marine Sr in the otolith cores of juvenile O. nerka, determined that reference year samples were virtually all from lake resident kokanee, making between year size comparisons of trawl caught fall fry invalid. However, migrating smolts from the 1996 brood year were 1 g larger (3.6 g) than smolts from the 1992 brood year, which is expected to result in increase marine survival. Comparisons of adult returns to the Upper Adams River from the 1980 cycle brood years with co-migrating stocks to other nearby rivers, indicates increased abundance due to restoration efforts, although the sample size is insufficient for statistically significant comparisons.

1421. **Experimental enrichment of two oligotrophic rivers in south coastal British Columbia.**
Wilson, G. A.; Ashley, K. I.; Land, R. W.; and Slaney, P. A.
In: American Fisheries Society Symposium: Nutrients in Salmonid Ecosystems - Sustaining Production and Biodiversity.; Vol. 34.; pp. 149-162; 2003.
Descriptors: agriculture/ anadromous species/ biodiversity/ biomass/ coastal zone/ escapement/ fertilizers/ fishery limnology/ fishery management/ forest industry/ freshwater fish/ habitat improvement (chemical)/ man-induced effects/ nitrogen/ nutrients (mineral)/ overfishing/ phosphorus/ population density/ population dynamics/ population structure/ restoration/ river discharge/ rivers/ salmon fisheries/ Oncorhynchus mykiss/ Salmonidae/ Canada, British Columbia, Adam R./ Canada, British Columbia, Big Silver Creek
Abstract: Big Silver Creek and the Adam River are oligotrophic (conductivity< 45 µ Omega /cm; TDP <2-5 µg/L; NO_{2+3} -N < 45 µg/L), mid-sized coastal rivers in southwestern British Columbia. They were treated with inorganic P (phosphorus) and N (nitrogen) to examine the feasibility of low-level inorganic fertilization as a method of increasing resident fish populations in rivers subject to habitat loss by historical logging practices. Both rivers have low numbers and sizes of resident salmonids (<20/ha, >20 cm fork length), despite extensive suitable habitat. Water temperatures in summer average 12 degree C and 14 degree C with summer discharge averaging 12 and 4 m^3/S in Big Silver Creek and the Adam River, respectively. In 1992-1997, physical, chemical, and biological assessments took place from May to September in three reaches of each river. Liquid agricultural fertilizer was added to the lower reaches) of each river from June to September of 1994-1997, while upstream reaches were monitored as controls. Fertilizer addition methods evolved from dripping through a hose and valve system, to a more dependable preprogrammable injection system, with the merits of each system discussed. In each river, chlorophyll-a accrual and benthic invertebrate biomass and density increased, on average, two to four-fold in the fertilized reaches. There was an average four-fold increase in rainbow trout abundance in each river following four summers of fertilization, with a large increase in mountain whitefish Prosopium williamsoni (Big Silver Creek) and a smaller increase in brown trout Salmo trutta (Adam River). The experimental treatments confirmed that low-level fertilization augmented productivity, resulting in a significant response of resident trout in two oligotrophic streams. The technique can be applied to aquatic systems with reduced fish populations resulting from habitat loss, overfishing, or to anadromous populations caught in the negative feedback loop of decreasing escapement and associated losses of marine-derived nutrients.

1422. **Experimental nutrient addition to the Keogh River and application to the Salmon River in coastal British Columbia.**
Slaney, P. A.; Ward, B. R.; and Wightman, J. C.
In: American Fisheries Society Symposium: Nutrients in Salmonid Ecosystems - Sustaining Production and Biodiversity.; Vol. 34.; 111-126; 2003.
Descriptors: agriculture/ aquatic insects/ carcasses/ chlorophylls/ colonization/ fertilizers/ fishery limnology/ fishery management/ forest industry/ freshwater fish/ fry/ habitat improvement (chemical)/ man-induced effects/ nutrients (mineral)/ phosphorus/ phytoplankton/ population density/ population structure/ primary production/ restoration/ river fisheries/ rivers/ salmon fisheries/ smolts/ species diversity/ trophic structure/ zoobenthos/ Oncorhynchus kisutch/ Oncorhynchus mykiss/ Canada, British Columbia, Salmon R./ Canada, British Columbia, Vancouver I., Keogh R.
Abstract: Oligotrophic streams are ubiquitous throughout coastal British Columbia, and thereby, significant nutrient influx can be provided externally via salmon carcasses. At the Keogh River on northern Vancouver Island, experimental nutrient addition was conducted from 1983 to 1986 to examine if potential increases in trophic productivity may augment growth and production of salmonid smolts. Subsequently, an applied treatment was conducted over the past decade at the infertile Salmon River to offset intensive logging impacts and to accelerate colonization of steelhead trout Oncorhynchus mykiss of headwater reaches above a hydroelectric diversion. The two rivers were treated with agricultural (dry, later liquid) fertilizers, while upstream control reaches were untreated. At Keogh, inorganic P and N were introduced to produce target soluble phosphorus concentrations of 10-15 mg per L, and N loadings of 50-100 mg per L over the four years of nutrient addition. Average peak algal biomass as chlorophyll a increased 5-10-fold in response to nutrient addition. Geometric mean weights of steelhead trout and coho salmon O. kisutch fry within several treated reaches were 1.4-2.0-fold higher than the control, and mean weights of steelhead part were 30-130% greater in the three treated reaches. Average steelhead smolt yield in three brood years increased 62% (peak, 2.5-fold in 1987) over prefertilization years; yet there was no increase in average smolt size because mean smolt age was reduced by about one year. There were corresponding increases in returning adults and reported catches by steelhead anglers at the

Keogh River, compared with trends at an adjacent river fishery. The response of coho smolts to nutrient addition was less marked, or a suggested 21% increase in numbers ($P < 0.1$) with no change in size, although results were moderated by production of coho smolts from several untreated tributaries and small lakes. At the upper Salmon River, where nutrient targets were reduced to one-third that of the Keogh, nutrient addition was associated with 3-7-fold higher benthic insect density in treated reaches than controls, and 2-3-fold greater mean weights and biomass of steelhead and rainbow trout in treated index sites than upstream, unfertilized sites. Over the decade, estimated numbers of steelhead part and smolt migrants at the Salmon River diversion increased from about 1,500 to 8,000. The results at the Salmon River confirmed those of the Keogh and indicated that lower-level nutrient addition can produce a similar positive trophic response.

1423. **Experimental provision of large woody debris in streams as a trout management technique.**
Lehane, B. M.; Giller, P. S.; O'Halloran, J.; Smith, C.; and Murphy, J.
Aquatic Conservation: Marine and Freshwater Ecosystems 12(3): 289-311. (May 2002-June 2002)
Descriptors: aquatic Environment/ deforestation/ detritus/ ecology/ ecosystem management/ environment management/ fisheries/ fluvial features/ freshwater fish/ habitat/ management/ rivers/ streams/ trout/ wood/ Salmo trutta/ Eire, Munster, Cork, Douglas R.
Abstract: 1. The natural stock of large woody debris (LWD) in the afforested Douglas River (Fermoy, Co. Cork) is very low relative to old-growth forests, which seems to arise from deficiency both of supply and retention. Woody debris is important to the ecology and physical structure of forest streams, so its abundance is relevant to aquatic conservation and the maintenance and size of salmonid fish stocks. 2. The physical characteristics and fish stocks of 16 contiguous segments of two 200 m stream reaches were surveyed in spring 1998 prior to the installation of 12 partially spanning debris structures on four of the segments. This study investigated the effect of debris structures on the heterogeneity of flow and substratum, and the distribution of brown trout (Salmo trutta), and assessed the potential use of woody debris manipulation as a tool in the management of forest streams. 3. Surveys of stream habitat conditions over a 2 year period following the installation of woody debris showed a change in stream architecture. This created more suitable habitat for trout through development of additional pools in which beds of fine sediment developed, and constraining the main current, increasing the amount of eddies and slack water areas. 4. There were significant increases in trout density and biomass in the debris segments relative to control segments without debris dams 1 and 2 years after debris addition, although trout condition was not modified by the addition of LWD. These results suggest that the addition of woody debris offers a positive and practical management technique for enhancing fish in plantation forest streams.

1424. **Factors related to amphibian occurrence and abundance in headwater streams draining second-growth Douglas-fir forests in southwestern Washington.**
Wilkins, R. Neal and Peterson, N. Phil
Forest Ecology and Management 139(1/3): 79-91. (2000)
NAL Call #: SD1.F73; ISSN: 0378-1127
Descriptors: Ascaphus truei/ Dicamptodon/ Dicamptodon copei/ Dicamptodon tenebrosus/ Plethodon/ Plethodon dunni/ Plethodon vandykei/ Plethodon vehiculum/ Rhyacotriton kezeri/ amphibians and reptiles/ habits-behavior/ distribution/ Douglas fir/ ecosystems/ forests, coniferous/ habitat use/ rivers/ status/ wildlife-habitat relationships/ Columbia torrent salamander/ giant salamander/ tailed frog/ Pacific giant salamander/ Cope's giant salamander/ woodland salamander/ western red-backed salamander/ Dunn's salamander/ Van Dyke's salamander/ Pseudotsuga spp./
Washington, southwestern area
Abstract: Forested headwaters of the US Pacific Northwest are an important habitat resource for a varied amphibian fauna. Factors related to occupancy and relative abundance for many of these species are poorly known, adding uncertainty to conservation decisions in managed forestlands. We sampled occurrence and abundance of amphibians in 40 perennial headwater streams traversing 50-65-year-old second-growth forests in the coast range of southwestern Washington. Streams were divided among basalt (n=18) and marine sediment (n=22) lithologies. Our samples resulted in collections of 1141 amphibians of six taxa--three stream-breeders and three woodland salamanders. Stream breeding taxa included larval and neotenic giant salamanders (Dicamptodon spp.), Columbia torrent salamanders (Rhyacotriton kezeri) and larval tailed frogs (Ascaphus truei). Pacific giant salamanders (D. tenebrosus) and/or Cope's giant salamanders (D. copei) occupied 95% of sampled streams, accounting for 57% of total amphibians collected. Streams traversing basalt lithology had almost twice the giant salamander abundance of marine sediment streams. Adjusting for lithology, giant salamanders increased in abundance with increasing pool frequencies in combination with increasing large woody debris (LWD) accumulations in adjacent riparian areas, and decreased with increasing accumulations of large (>60 cm diameter) woody debris in the channel. Torrent salamanders occupied 53% of sampled streams. The likelihood of habitat occupancy by torrent salamanders increased as channel gradient increased and basin area decreased. When adjusted for basin area, torrent salamander abundance increased as the proportion of the active channel with flowing water decreased, and at more northerly aspects. Larval tailed frogs larva were found in 13% of sampled streams, exclusively occupying basalt streams at elevations >300 m. At least one of the three species of woodland salamanders (Plethodon spp.) occupied habitats adjacent to 93% of sampled streams. Western red-backed salamanders (P. vehiculum) were most ubiquitous, occupying habitats adjacent to 85% of sampled streams. Dunn's salamanders (P. dunni) occupied habitats adjacent to 58% of sampled streams, likelihood of occurrence increasing with increasing gradient of the steepest sideslope. Van Dyke's salamanders (P. vandykei) occupied habitats adjacent to three streams, all of which traversed basalt lithologies on north facing slopes. Our results suggest that habitat quality for headwater

amphibians in this region is strongly influenced by landform characteristics, including basin lithology. These associations provide managers an opportunity to improve headwater amphibian conservation strategies by prioritizing stream segments with respect to their likely amphibian fauna.

1425. **Fencing to control livestock grazing on riparian habitats along streams: Is it a viable alternative?**
Platts, W. S. and Wagstaff, F. J.
North American Journal of Fisheries Management 4(3): 266-272. (1984)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: habitat alterations/ management/ research: rivers and streams/ riparian habitat

1426. **Fish and grazing relationships in southwestern national forests.**
Rinne, John N.
Developments in Animal and Veterinary Sciences 30: 329-371. (2000); ISSN: 0167-5168.
Notes: Literature review; Livestock Management in the American Southwest: Ecology, Society, and Economics.
Descriptors: commercial activities/ ecology/ land and freshwater zones/ Pisces: farming and agriculture/ fauna/ conservation measures/ livestock grazing/ freshwater habitat/ United States, southwestern region/ chordates/ fish/ vertebrates

1427. **Fish assemblage response to recent mitigation of a channelized warmwater stream.**
Raborn, S. W. and Schramm, H. L.
River Research and Applications 19(4): 289-301. (2002)
NAL Call #: TC530.R43 .
Notes: doi:10.1002/rra.704.
Descriptors: Mississippi/ Luxapallila Creek/ environment management/ rivers/ habitat/ habitat restoration/ freshwater fish/ ecology/ freshwater environment/ freshwater fish
Abstract: Various designs of low-head dams are used to rehabilitate streams or forestall upstream channel incision after channelization. We report on the efficacy of using notched sills and grade control structures (GCS) to restore the fish assemblage in Luxapallila Creek, Mississippi. We tested the null hypotheses that habitat variables and species richness, evenness, and assemblage structure would not differ among: (1) a channelized segment with no modifications, (2) a channelized segment mitigated by the installation of sills and GCS, (3) a segment upstream of the installations and undergoing channel incision, and (4) an unaltered segment. Although habitat variables changed, neither species richness, evenness, nor fish assemblage structure differed between mitigated and channelized segments with both exhibiting less richness and different assemblage structures than the unaltered segment. Lack of differences in species richness between the incised and unaltered segments suggest that the GCS may have halted the negative effects of upstream channel incision before species were extirpated. Conspicuous habitat differences between the altered (channelized and mitigated) and unaltered segments were lack of backwaters and riparian vegetation in the altered segments. Our results suggest a more comprehensive rehabilitation strategy is required in Luxapallila Creek.

1428. **Fish communities and their associations with environmental variables, lower San Joaquin River drainage, California.**
Brown, Larry R.
Environmental Biology of Fishes 57(3): 251-269. (2000); ISSN: 0378-1909
Descriptors: pollution assessment control and management/ bioassessment/ assessment method/ multivariate analysis/ statistical method/ index of biotic integrity/ agricultural development/ cost benefit balance/ ecotoxicology/ environmental variables/ habitat quality/ human disturbances/ resource management/ species distribution/ specific conductance/ water depth/ water quality
Abstract: Twenty sites in the lower San Joaquin River drainage, California, were sampled from 1993 to 1995 to characterize fish communities and their associations with measures of water quality and habitat quality. The feasibility of developing an Index of Biotic Integrity was assessed by evaluating four fish community metrics, including percentages of native fish, omnivorous fish, fish intolerant of environmental degradation, and fish with external anomalies. Of the thirty-one taxa of fish captured during the study, only 10 taxa were native to the drainage. Multivariate analyses of percentage data identified four site groups characterized by different groups of species. The distributions of fish species were related to specific conductance, gradient, and mean depth; however, specific conductance acted as a surrogate variable for a large group of correlated variables. Two of the fish community metrics - percentage of introduced fish and percentage of intolerant fish - appeared to be responsive to environment quality but the responses of the other two metrics - percentage of omnivorous fish and percentage of fish with anomalies - were less direct. The conclusion of the study is that fish communities are responsive to environmental conditions, including conditions associated with human-caused disturbances, particularly agriculture and water development. The results suggest that changes in water management and water quality could result in changes in species distributions. Balancing the costs and benefits of such changes poses a considerable challenge to resource managers.

1429. **Fish communities of the Sacramento River Basin: Implications for conservation of native fishes in the Central Valley, California.**
May, J. T. and Brown, L. R.
Environmental Biology of Fishes 63(4): 373-388. (2002); ISSN: 03781909.
Notes: doi: 10.1023/A:1014964318485.
Descriptors: environmental gradients/ flow regulation/ index of biotic integrity/ introduced species/ metrics/ multivariate analysis/ native species/ water-quality/ community structure/ conservation/ environmental gradient/ ichthyofauna/ river basin/ United States/ Pisces

Abstract: The associations of resident fish communities with environmental variables and stream condition were evaluated at representative sites within the Sacramento River Basin, California between 1996 and 1998 using multivariate ordination techniques and by calculating six fish community metrics. In addition, the results of the current study were compared with recent studies in the San Joaquin River drainage to provide a wider perspective of the condition of resident fish communities in the Central Valley of California as a whole. Within the Sacramento drainage, species distributions were correlated with elevational and substrate size gradients; however, the elevation of a sampling site was correlated with a suite of water-quality and habitat variables that are indicative of land use effects on physiochemical stream parameters. Four fish community metrics - percentage of native fish, percentage of intolerant fish, number of tolerant species, and percentage of fish with external anomalies - were responsive to environmental quality. Comparisons between the current study and recent studies in the San Joaquin River drainage suggested that differences in water-management practices may have significant effects on native species fish community structure. Additionally, the results of the current study suggest that index of biotic integrity-type indices can be developed for the Sacramento River Basin and possibly the entire Central Valley, California. The protection of native fish communities in the Central Valley and other arid environments continues to be a conflict between human needs for water resources and the requirements of aquatic ecosystems; preservation of these ecosystems will require innovative management strategies.

1430. **Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes.**
Freeman, M. C.; Bowen, Z. H.; Bovee, K. D.; and Irwin, E. R.
Ecological Applications 11(1): 179-190. (2001)
NAL Call #: QH540.E23; ISSN: 10510761
Descriptors: flow regulation/ habitat stability/ hydrologic alteration/ instream habitat/ juvenile fish/ PHABSIM/ riverine fishes/ southeastern U.S. river/ Tallapoosa River/ abundance/ community response/ ecological impact/ flow regulation/ habitat availability/ ichthyofauna/ United States
Abstract: Conserving biological resources native to large river systems increasingly depends on how flow-regulated segments of these rivers are managed. Improving management will require a better understanding of linkages between river biota and temporal variability of flow and instream habitat. However, few studies have quantified responses of native fish populations to multiyear (>2 yr) patterns of hydrologic or habitat variability in flow-regulated systems. To provide these data, we quantified young-of-year (YOY) fish abundance during four years in relation to hydrologic and habitat variability in two segments of the Tallapoosa River in the southeastern United States. One segment had an unregulated flow regime, whereas the other was flow-regulated by a peak-load generating hydropower dam. We sampled fishes annually and explored how continuously recorded flow data and physical habitat simulation models (PHABSIM) for spring (April-June) and summer (July-August) preceding each sample explained fish abundances. Patterns of YOY abundance in relation to habitat availability (median area) and habitat persistence (longest period with habitat area continuously above the long-term median area) differed between unregulated and flow-regulated sites. At the unregulated site, YOY abundances were most frequently correlated with availability of shallow-slow habitat in summer (10 species) and persistence of shallow-slow and shallow-fast habitat in spring (nine species). Additionally, abundances were negatively correlated with 1-h maximum flow in summer (five species). At the flow-regulated site, YOY abundances were more frequently correlated with persistence of shallow-water habitats (four species in spring; six species in summer) than with habitat availability or magnitude of flow extremes. The associations of YOY with habitat persistence at the flow-regulated site corresponded to the effects of flow regulation on habitat patterns. Flow regulation reduced median flows during spring and summer, which resulted in median availability of shallow-water habitats comparable to the unregulated site. However, habitat persistence was severely reduced by flow fluctuations resulting from pulsed water releases for peak-load power generation. Habitat persistence, comparable to levels in the unregulated site, only occurred during summer when low rainfall or other factors occasionally curtailed power generation. As a consequence, summer-spawning species numerically dominated the fish assemblage at the flow-regulated site; five of six spring-spawning species occurring at both study sites were significantly less abundant at the flow-regulated site. Persistence of native fishes in flow-regulated systems depends, in part, on the seasonal occurrence of stable habitat conditions that facilitate reproduction and YOY survival.

1431. **Flows for floodplain forests: A successful riparian restoration.**
Rood, S. B.; Gourley, C. R.; Ammon, E. M.; Heki, L. G.; Klotz, J. R.; Morrison, M. L.; Mosley, D.; Scoppettone, G. G.; Swanson, S.; and Wagner, P. L.
Bioscience 53(7): 647-656. (2003)
NAL Call #: 500 Am322A; ISSN: 00063568
Descriptors: birds/ cottonwoods/ ecosystem restoration/ River regulation/ Chasmistes cujus/ Populus fremontii/ Salix exigua
Abstract: Throughout the 20th century, the Truckee River that flows from Lake Tahoe into the Nevada desert was progressively dammed and dewatered, which led to the collapse of its aquatic and riparian ecosystems. The federal designation of the endemic cui-ui sucker (Chasmistes cujus) as endangered prompted a restoration program in the 1980s aimed at increasing spring flows to permit fish spawning. These flows did promote cui-ui reproduction, as well as an unanticipated benefit, the extensive seedling recruitment of Fremont cottonwood (Populus fremontii) and sandbar willow (Salix exigua). Recruitment was scattered in 1983 but extensive in 1987, when the hydrograph satisfied the riparian recruitment box model that had been developed for other rivers. That model was subsequently applied to develop flow prescriptions that were implemented from 1995 through 2000 and enabled further seedling establishment. The woodland recovery produced broad ecosystem benefits, as evidenced by the return by 1998 of 10 of 19 riparian bird species whose populations had been locally extirpated or had declined severely between 1868 and 1980. The dramatic partial recovery along this severely

degraded desert river offers promise that the use of instream flow regulation can promote ecosystem restoration along other dammed rivers worldwide.

1432. **Geomorphological processes in meandering and straight reaches of an agricultural stream in east central Illinois: Relations to aquatic habitat.**
Frothingham, K. M.
Urbana-Champaign, IL: University of Illinois at Urbana-Champaign, 2001.
Descriptors: agriculture/ fishery data/ fluvial morphology/ geomorphology/ habitat/ man-induced effects/ meandering/ population dynamics/ rivers/ sedimentation/ soil erosion/ stream flow/ Illinois
Abstract: In environments dominated by human activity, such as the agricultural Midwest, stream channel geomorphology is influenced strongly by anthropogenic factors. Past research has shown that human-induced channel modifications, including stream channelization, affects both the abiotic and biotic components of a stream. However, connections between changes in geomorphological form and function and ecological conditions in agricultural streams are still poorly understood. The objectives of this research are threefold: (1) determine characteristic patterns of three- dimensional (3-D) fluid motion in planform-scale stream reaches with different channel morphologies; (2) develop an objective method of classifying geomorphic features (e.g., pools and riffles) based on stream morphology; and (3) identify planform- and bar-element scale linkages between geomorphological variability and ecological conditions. Geomorphological and fisheries data were collected in the headwaters of the Embarras River where channel maintenance for agricultural drainage has produced a straight channelized reach adjacent to a highly sinuous unmodified reach. Geomorphological data were collected between 1997 and 2000. Planform scale fish sampling was conducted approximately monthly from July 1997 to August 1998 to provide information on community structure in the highly sinuous and straight reaches. Bar element scale fisheries data were collected in an extended meandering reach during July and August 1999. Results indicate that the highly sinuous reach has greater geomorphological variability, both over time and over space, than the straight reach. Bed morphology within the highly sinuous reach is characterized by multiple pool-riffle sequences with all of the pools located along the outer bank of the curved stream channel. Flow through the highly sinuous reach is fully three-dimensional and has a well-developed spatial pattern of helical motion. In contrast, bed morphology within the straight reach is relatively uniform and flow moves predominantly in the downstream. The highly sinuous reach has higher rates of channel erosion than the straight reach and the pattern of erosion in the highly sinuous reach generally conforms to zones of maximum near-bank velocity and areas of pronounced helical motion. The highly sinuous reach also contains more and larger individual fish than the straight reach, suggesting that increased geomorphological complexity at the planform-scale results in increased fish abundance and total biomass. at the bar-element scale, fish abundance in pools and riffles is the same; however, species composition is different. A larger percentage of fish classified as pool specialists are found in pools while more riffle specialists are found in riffles. These results indicate that both pools and riffles are critical stream habitat structures needed to support a diverse aquatic community in human-modified streams.

1433. **Grazing effects on stream habitat and fishes: Research design considerations.**
Rinne, J. N.
North American Journal of Fisheries Management 8(2): 240-247. (1988)
NAL Call #: SH219.N66; ISSN: 0275-5947
Descriptors: grazing/ river banks/ erosion control/ vegetation cover/ habitat improvement (biological)/ fishery management/ research programs/ environmental impact/ environmental conditions/ population levels/ Salmonidae/ population levels/ New Mexico, Vacas R./ vegetation cover/ habitat improvement (biological)
Abstract: A 4-year study of a montane stream from which cattle grazing had been excluded for 10 years indicated that stream bank vegetation and stability were markedly improved and that stream substrate fines were somewhat reduced, but it indicated that fish populations were unaffected. Shortcomings of this case history study are common to past similarly designed studies of grazing effects on fishes and their habitats. Three major deficiencies in research design are (1) lack of pretreatment data, (2) improper consideration of fishery management principles, and (3) linear positioning of treatments along a stream. Future research on riparian grazing effects must address these factors in addition to designs of long-term (10+ years) ecosystem (watershed) studies.

1434. **Grazing management influences on two brook trout streams in Wyoming.**
Hubert, W. A.; Lanka, R. P.; Wesche, T. A.; and Stabler, F.
In: Riparian ecosystems and their management: Reconciling conflicting uses, General Technical Report-RM 120/ Johnson, R. Roy ; Ziebell, Charles D.; Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H.; Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, 1985.
pp. 290-294.
Notes: Conference held April 16-18, 1985 in Tuscon, Ariz.
NAL Call #: aSD11.A42
Descriptors: riparian environments/ grazing/ environment management/ environmental impact/ habitat/ abundance/ Salvelinus fontinalis/ Wyoming/ cattle grazing
Abstract: Brook trout (Salvelinus fontinalis) abundance and instream habitat characteristics were evaluated in two rangeland streams. Heavily grazed and lightly grazed reaches of two streams with different grazing management were compared. Relationships between stream morphology, riparian zone characteristics, and trout abundance were observed.

1435. **Habitat and fish responses to multiple agricultural best management practices in a warm water stream.**
Wang, L.; Lyons, J.; and Kanehl, P.
Journal of the American Water Resources Association 42(4): 1047-1062. (2006)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: agricultural land use/ best management practices/ BMPs/ fish/ nonpoint source pollution/ riparian buffers/ warm water stream/ watershed management/ aquatic habitat
Abstract: Thirteen years of annual habitat and fish sampling were used to evaluate the response of a small warm water stream in eastern Wisconsin to agricultural best management practices (BMPs). Stream physical habitat and fish communities were sampled in multiple reference and treatment stations before, during, and after upland and riparian BMP implementation in the Otter Creek subwatershed of the Sheboygan River watershed. Habitat and fish community measures varied substantially among years, and varied more at stations that had low habitat diversity, reinforcing the notion that the detection of stream responses to BMP implementation requires long term sampling. Best management practices increased substrate size; reduced sediment depth, embeddedness, and bank erosion; and improved overall habitat quality at stations where a natural vegetative buffer existed or streambank fencing was installed as a riparian BMP. There were lesser improvements at locations where only upland BMPs were implemented. Despite the habitat changes, we could not detect significant improvements in fish communities. It is speculated that the species needed to improve the fish community, mainly pollution intolerant species, suckers (Castomidae), and darters (Percidae), had been largely eliminated from the Sheboygan River watershed by broadscale agricultural nonpoint source pollution and could not colonize Otter Creek, even though habitat conditions may have been suitable.

1436. **Habitat associations of age-0 cutthroat trout in a spring stream improved for adult salmonids.**
Hubert, W. A. and Joyce, M. P.
Journal of Freshwater Ecology 20(2): 277-286. (2005)
NAL Call #: QH541.5.F7J68; ISSN: 02705060
Descriptors: habitat management/ habitat use/ juvenile/ salmonid/ vegetation cover/ Amadina fasciata/ Aves/ Galliformes/ Oncorhynchus/ Oncorhynchus clarki/ Salmonidae/ Serpentes
Abstract: Native cutthroat trout (Oncorhynchus clarki) in the Snake River watershed use streams formed by large springs for spawning and nursery habitat. Several spring streams have been modified to enhance abundance of adult salmonids, but the habitat associations of age-0 cutthroat trout in these systems are undescribed. We assessed the frequency of collection of age-0 cutthroat trout in riffles, riffle margins, pool margins, and backwaters from late June to the middle of August 2000 in a spring stream with such modifications. The proportion of sites in which age-0 cutthroat trout were collected increased up to the middle of July and then decreased. We found substantially lower frequencies of collection of age-0 cutthroat trout in riffles compared to the three stream-margin habitat types. Age-0 cutthroat trout appeared to select shallow, low-velocity, stream-margin habitat with cover that provided protection from piscivorous adult salmonids and avian predators. Our observations suggest that modification of spring streams for production of cutthroat trout should include efforts to manage stream margins so they provide cover in the form of aquatic macrophytes or overhanging vegetation for age-0 fish.

1437. **Habitat associations with upland stream fish assemblages in Bankhead National Forest, Alabama.**
Powers, S. L.; Jones, G. L.; Redinger, P.; and Mayden, R. L.
Southeastern Naturalist 2(1): 85-92. (2003)
NAL Call #: IPSP11706; ISSN: 1528-7092.
Descriptors: abiotic factors/ community structure/ species composition/ large woody debris (LWD)/ regression analysis/ habitats/ fish assemblages/ Sipsey Fork River/ Bankhead National Forest/ environmental factors/ habitat association/ ecology/ checklist/ freshwater fish/ Alabama
Abstract: Fishes and habitat were sampled at nine sites in the Sipsey Fork River drainage in Bankhead National Forest, Alabama. Stream width, depth, current velocity, substrate type, bank height and amount of large woody debris (LWD) were measured at each site to test for association of these habitat variables with upland stream fish assemblages. Regression of habitat variables onto species richness indicated that only bank height was significantly associated with species richness in our study area. The lack of habitat associations with species richness seemingly contradicts findings by several previous investigators working in lowland streams. The availability of large substrate and both deep and shallow habitats at all sites may have reduced the observed association of these variables and LWD with stream fish assemblages. Stream width and current velocity, though not significant, did show strong positive correlations with species richness. The significant association between high banks and species richness may reflect a more intact riparian zone due to inaccessibility of streams in gorges.

1438. **Habitat, land use, and fish assemblage relationships in Iowa streams: Preliminary assessment in an agricultural landscape.**
Heitke, Jeremiah D.; Pierce, Clay L.; Gelwicks, Gregory T.; Simmons, Gregory A.; and Siegwarth, Gary L.
In: American Fisheries Society Symposium, 48; Bethesda, MD: American Fisheries Society, 2006. 287-303.
Notes: Symposium on Influences of Landscape on Stream Habitat and Biological Communities, Madison, WI, USA; August 25 -26, 2004; 188856976X (ISBN); No. 48.
Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ biotic integrity index/ land use/ physical habitat
Abstract: Iowa leads the nation in percentage of land area converted to cropland, with a resulting negative impact on streams. We examined physical habitat, land use, and fish assemblage data from 37 second- to sixth-order stream sites, representing 7 of the 10 ecoregions within Iowa. Physical habitat conditions varied widely among sites, with sand dominating substrate composition. A nonmetric multidimensional scaling ordination of physical habitat variables suggested a pattern of among-site similarities defined by a stream size axis, an axis contrasting sites dominated by either woody or rocky fish cover, and an axis

characterizing degree of riparian canopy coverage. Blunmose minnow Pimephales notatus and sand shiner Notropis stramineus were the most abundant fish species, followed by green sunfish Lepomis cyanellus and common carp Cyprinus carpio. These four species were collected in more than 80% of the sites. Fish species richness at sites averaged 22, ranging from 6 to 38, and fish index of biotic integrity (IBI) at sites averaged 47 (fair), ranging from 21 (poor) to 96 (excellent). Species richness and IBI were highest at sites characterized by rocky fish cover and relatively coarse substrates. Values for several physical habitat and land use variables were significantly different between sites with IBI: 30 (fair) and sites with IBI ≥ 50 (good). We found a general pattern of IBI, species richness, total fish abundance, and width-to-depth ratio decreasing from the northeast to the southwest ecoregions, and percentage of unvegetated banks and bank slope increasing from northeast to southwest. Stable and vegetated banks, wide stream channels with coarse substrates, and rocky fish cover were associated with high biotic condition; while unvegetated and eroding banks, and deep channels with predominantly fine substrates were associated with lower biotic condition. Land use was calculated at three spatial scales: catchment, network riparian buffer, and local riparian buffer. We found few relationships of fish assemblages with land use, potentially due to sampling design and the pervasiveness of agriculture across Iowa. There is substantial variation among physical habitat, land use, and fish assemblage conditions across Iowa, due to a combination of geology, climate, zoogeography, and human alteration.

1439. **Habitat rehabilitation for inland fisheries: Global review of effectiveness and guidance for rehabilitation of freshwater ecosystems.**
Roni, P.; Hanson, K.; Beechie, T.; Pess, G.; Pollock, M.; and Bartley, D. M.
FAO-Fisheries-Technical-Paper 484, 2005. 116 pp.
Notes: Literature review; ISSN: 0429-9345.
http://www.fao.org/docrep/008/a0039e/a0039e00.htm
Descriptors: aquatic environment/ cost benefit analysis/ dams/ development projects/ fisheries/ floodplains/ floods/ freshwater ecology/ freshwater fishes/ habitat destruction/ habitats/ hydraulic structures/ monitoring/ nature conservation/ planning/ rehabilitation/ riparian vegetation/ rivers/ streams/ watersheds/ fishes
Abstract: This bulletin discusses the key steps to consider when designing monitoring and evaluation of habitat rehabilitation activities for inland fisheries at various scales. Three areas lacking in most rehabilitation projects are demonstrated: (i) adequate assessment of historic conditions, impaired ecosystem processes and factors limiting biotic production; (ii) understanding upstream or watershed-scale factors that may influence effectiveness of reach or localized rehabilitation; and (iii) well-designed and well-funded monitoring and evaluation. These are the same factors that consistently limit the ability of published studies to determine the success of a given technique at improving habitat conditions or fisheries resources. Finally, this review suggests that many habitat rehabilitation techniques show promise, but most have not received adequate planning, monitoring or cost-benefit analysis.

1440. **Habitat restoration, landowner outreach, and enhancement of Russian River coho populations in northern California.**
Olin, P. G.; Coey, B.; Acomb, D.; Moore, J.; Nossaman, S.; Thompson, L.; Wilson, B.; and Lewis, D.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 59; 2003.
Descriptors: wildlife management: conservation/ agricultural expansion/ captive broodstock program/ dam construction/ enhancement program/ gravel mining/ habitat restoration/ landowner outreach/ stream habitat

1441. **Habitat selection by juvenile coho salmon in response to food and woody debris manipulations in suburban and rural stream sections.**
Giannico, G. R.
Canadian Journal of Fisheries and Aquatic Science 57(9): 1804-1813. (2000)
NAL Call #: 442.9 C16J
Descriptors: agricultural runoff/ food availability/ geographical distribution/ habitat/ habitat improvement (physical)/ man-induced effects/ sheltered habitats/ urbanization/ Oncorhynchus kisutch/ Canada, British Columbia, Vedder-Chilliwack R.
Abstract: This study explored the effects of food and woody debris manipulations on the summer distribution of juvenile coho salmon (Oncorhynchus kisutch) in small suburban streams. To examine fish responses to these factors, three different experiments were carried out in modified sections of two streams. The results showed that the distribution of juvenile coho salmon in a stream section was primarily controlled by the availability and distribution of food among pools and by the presence and density of woody debris. Food, however, played a dominant role because the foraging quality of a pool not only affected the density of fish in it but also the response of those fish towards instream debris. In food-rich stream sections, low proportions of juvenile coho salmon occupied pools with dense woody debris in the spring, which changed towards late summer. In contrast, in food-poor reaches, high proportions of fish were found in pools with abundant debris in the spring. Pools that combined abundant food with sparse woody debris were the most favoured by the fish. It is important that salmonid habitat enhancement projects consider that open foraging areas interspersed with woody debris characterize the type of summer habitat that juvenile coho salmon prefer.

1442. **Habitat use, movements, and survival of American black duck, Anas rubripes, and mallard, A. platyrhynchos, broods in agricultural landscapes of southern Quebec.**
Maisonneuve, C.; Desrosiers, A.; and McNicoll, R.
Canadian Field Naturalist 114(2): 201-210. (2000)
NAL Call #: 410.9 Ot8; ISSN: 00083550
Descriptors: agricultural landscapes/ American black duck/ Anas platyrhynchos/ Anas rubripes/ brood survival/ habitat/ mallard/ movements/ Quebec/ habitat use/ movement/ survival/ waterfowl/ Canada/ Anas rubripes
Abstract: American Black Duck and Mallard females were equipped with radiotransmitters in order to identify habitats used during brood-rearing, to quantify brood movements

and to assess survival. The majority (96%) of the 134 brood sightings were made on waterways: 59% on streams, 19% in ditches, and 19% on mill ponds created on these streams. Mean proportions of sightings per brood were greater on streams (64%) and ditches (31%) for Black Ducks (64%), whereas for Mallards these were greater on streams (43%) and mill ponds (37%). Broods of both species made extensive movements, mainly along waterways. Overland movements and maximum distances from the nest were greater for Black Ducks than for Mallards. Daily survival rates (DSR) of broods of both species were similar. DSRs were lower for Class I broods (0.921) than for Class II broods (0.988). The probability of broods of both species surviving to 30 days was relatively similar (95% CI for Black Duck: 0.134-0.206, 95% CI for Mallard: 0.186-0.232). Results of this study indicate a lack of adequate brood-rearing marsh habitat in the agricultural landscapes of southern Quebec where extensive drainage work has been carried out.

1443. **Herpetofaunal and vegetational characterization of a thermally-impacted stream at the beginning of restoration.**
Bowers, C. F.; Hanlin, H. G.; Guynn, D. C.; McLendon, J. P.; and Davis, J. R.
Ecological Engineering 15(Suppl. 1)(2000)
NAL Call #: TD1.E26; ISSN: 09258574.
Notes: doi: 10.1016/S0925-8574(99)00076-2.
Descriptors: amphibians/ floodplain restoration/ herpetofauna/ reptiles/ riparian width/ species diversity/ community response/ restoration ecology/ riparian zone/ thermal pollution/ United States/ Amphibia/ Reptilia/ Riparia
Abstract: Pen Branch, a third order stream on the Savannah River Site (SRS), located near Aiken, SC, USA, received thermal effluents from the cooling system of a nuclear production reactor from 1954 to 1988. The thermal-effluent and increased flow destroyed vegetation in the stream corridor (i.e. impacted portion of the floodplain), and subsequent erosion created a braided stream system with a greatly expanded delta. Restoration of the area began with planting of bottomland hardwood species in 1993. Occurrence of amphibians and reptiles was monitored by daily sampling from I January 1995 through 30 September 1996 to characterize the course of the restoration. Vegetation was sampled in the summer of 1996 to characterize the habitats in the unimpacted riparian zone and the impacted stream corridor. A total of 12 580 individuals representing 72 species of herpetofauna were captured. There were no significant differences in relative abundance or diversity of herpetofauna in unplanted versus planted zones within the impacted corridor 3 years after planting. Likewise, there were no significant differences in abundance or diversity of herpetofauna in the upper and lower corridor areas, which differed in sire preparation before planting, or in riparian zones of different widths. However, species diversity of amphibians and reptiles in the unimpacted riparian zone was significantly higher than on vegetated islands located between stream braids within the impacted floodplain corridor. There were also significantly more species and individuals within the riparian zone than in the corridor, and the species assemblage within the riparian zone differed from that of the corridor. Woody vegetation within the unimpacted riparian zone was significantly higher in basal area than on islands within the corridor.

1444. **Historical changes in fish distribution and abundance in the Platte River in Nebraska.**
Peters, E. J. and Schainost, S.
In: American Fisheries Society Symposium, 45; Bethesda, MD: Amer Fisheries Soc, 2005. 239-248.
Notes: Symposium on Changes in Fish Community Structures in Large USA Rivers, Phoenix, AZ, USA; 1888569727 (ISBN); No. 45.
Descriptors: freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ biogeography: population studies/ wildlife management: conservation/ irrigation/ applied and field techniques/ mining/ applied and field techniques/ pollution/ historical distribution/ historical abundance
Abstract: From its headwaters in the Rocky Mountains, the Platte River drains 230,362 km(2) in Colorado, Wyoming, and Nebraska. The Platte River is formed by the confluence of the North Platte and South Platte near the city of North Platte, Nebraska, and receives additional flow from the Loup and Elkhorn rivers that drain the Sand Hills region of Nebraska. Water diversions for mining and irrigation began in the 1840s in Colorado and Wyoming, and irrigation diversions in Nebraska began in the 1850s. Construction of dams for control of river flows commenced on the North Platte River in Wyoming in 1904. Additional dams and diversions in the North Platte, South Platte, and Platte rivers have extensively modified natural flow patterns and caused interruptions of flows. Pollution, from mining, industrial, municipal, and agricultural sources, and introductions of 24 normative species have also taken their toll. Fishes of the basin were little studied before changes in land use, pollution, and introduction of exotic species began. The current fish fauna totals approximately 100 species from 20 families. Native species richness declines westward, but some species find refugia in western headwaters streams. Declines in 26 native species has led to their being listing as species of concern by one or more basin states.

1445. **Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales.**
Freeman, M. C.; Pringle, C. M.; and Jackson, C. R.
Journal of the American Water Resources Association 43(1): 5-14. (2007)
NAL Call #: GB651.W315; ISSN: 1093474X.
Notes: doi: 10.1111/j.1752-1688.2007.00002.x.
Descriptors: aquatic ecology/ biodiversity/ ecosystem function/ environmental impacts/ hydrologic connectivity/ rivers/ streams
Abstract: Cumulatively, headwater streams contribute to maintaining hydrologic connectivity and ecosystem integrity at regional scales. Hydrologic connectivity is the water-mediated transport of matter, energy and organisms within or between elements of the hydrologic cycle. Headwater streams compose over two-thirds of total stream length in a typical river drainage and directly connect the upland and

riparian landscape to the rest of the stream ecosystem. Altering headwater streams, e.g., by channelization, diversion through pipes, impoundment and burial, modifies fluxes between uplands and downstream river segments and eliminates distinctive habitats. The large-scale ecological effects of altering headwaters are amplified by land uses that alter runoff and nutrient loads to streams, and by widespread dam construction on larger rivers (which frequently leaves free-flowing upstream portions of river systems essential to sustaining aquatic biodiversity). We discuss three examples of large-scale consequences of cumulative headwater alteration. Downstream eutrophication and coastal hypoxia result, in part, from agricultural practices that alter headwaters and wetlands while increasing nutrient runoff. Extensive headwater alteration is also expected to lower secondary productivity of river systems by reducing stream-system length and trophic subsidies to downstream river segments, affecting aquatic communities and terrestrial wildlife that utilize aquatic resources. Reduced viability of freshwater biota may occur with cumulative headwater alteration, including for species that occupy a range of stream sizes but for which headwater streams diversify the network of interconnected populations or enhance survival for particular life stages. Developing a more predictive understanding of ecological patterns that may emerge on regional scales as a result of headwater alterations will require studies focused on components and pathways that connect headwaters to river, coastal and terrestrial ecosystems. Linkages between headwaters and downstream ecosystems cannot be discounted when addressing large-scale issues such as hypoxia in the Gulf of Mexico and global losses of biodiversity. © 2007 American Water Resources Association.

1446. **Impact of cattle on two isolated fish populations in Pahranagat Valley, Nevada.**
Taylor, Frances R.; Gillman, Leah A.; and Pedretti, John W.
Great Basin Naturalist 49(4): 491-495. (1989)
NAL Call #: 410 G79; ISSN: 0017-3614
Descriptors: habitat alterations/ grazing/ management/ research/ nitrogen/ pollution/ rivers and streams/ Nevada/ Nevada: Ash Springs/ Nevada: Brownie Spring/ Cichlasoma/ Cichlidae/ Cyprinidae/ Gambusia/ Poecilia/ Poeciliidae/ Rhinichthys/ Cichlasoma nigrofasciatum/ Crenichthys baileyi baileyi/ Gambusia affinis/ Poecilia mexicana/ Rhinichthys osculus
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1447. **Impact of deferred rotation grazing on stream characteristics in central Nevada: A case study.**
Myers, T. J. and Swanson, S.
North American Journal of Fisheries Management 15(2): 428-439. (1995)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: land use/ ranching/ watersheds/ fluvial morphology/ habitat improvement/ grazing/ range management/ Nevada/ range management/ ranching/ fluvial morphology/ habitat improvement
Abstract: Three central Nevada streams were selected to study the watershed-scale effects on stream morphology and bank stability of deferred rotation cattle grazing, complete rest from grazing, and the presence of road crossings. The streams had gravel substrates, and their entrenchments, width: depth ratios, sinuosities and gradients were moderate. Based on statistical analysis of 1980 stream survey results, geologic basin features, and the occurrence of similar flooding, we concluded that the three streams had similar conditions at the start of the grazing treatment. Since 1980, deferred rotation grazing allowed much improvement of aquatic and riparian habitats but the improvement was limited by the presence of roads, which apparently added sediment to the streams. Complete rest from grazing without the presence of roads allowed the most improvement. Of the variables measured in the 1980 survey, streambank soil stability, type and amount of vegetation cover, and quality of pools improved most in all three streams. The best values for channel and water width: depth ratios, channel entrenchment, bank angle, bank undercut, and bank depth were measured on the stream managed with complete rest. Deferred rotation grazing in the absence of roads produced the second best values. The ratio of channel width to base flow water width was significantly higher on bare ground transects. Shrub and tree cover increased significantly more on the rested than on the grazed watersheds. These results should help managers select aquatic habitat and stream morphology objectives for grazing management.
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1448. **Impact of environmental factors on fish distribution assessed in rangeland streams.**
Thompson, L. C.; Forero, L.; Sado, Y.; and Tate, K. W.
California Agriculture 60(4): 200-206. (2006);
ISSN: 0008-0845
Descriptors: environmental factors/ habitats/ rangelands/ spatial distribution/ streams/ watersheds/ wildlife management/ fishes
Abstract: We sampled fish in pools located on tributaries of Cow Creek in the northern Sacramento Valley, and related fish distribution and habitat use to environmental factors across the 2003 agricultural growing season. This rangeland watershed experiences extensive livestock use, and many landowners divert stream water for pasture irrigation. Our goal was to provide landowners and managers with current baseline information about the conditions in which fish were found. Our results provide a basis for the development and comparison of irrigation best management practices that may improve conditions for native fish in rangeland streams.
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1449. **Impact of livestock grazing activities on stream insect communities and the riverine environment.**
Strand, M. and Merritt, R. W.
American Entomologist 45(1): 13-30. (1999)
NAL Call #: QL461.A52; ISSN: 1046-2821
Descriptors: grazing/ community composition/ riparian environments/ aquatic insects/ environment management/ ecosystem disturbance/ insecta/ insects
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1450. **Impacts of the Columbia River hydroelectric system on main-stem habitats of fall chinook salmon.**
Dauble, D. D.; Hanrahan, T. P.; Geist, D. R.; and Parsley, M. J.
North American Journal of Fisheries Management 23(3): 641-659. (2003)
NAL Call #: SH219.N66 ; ISSN: 02755947
Descriptors: ecological impact/ habitat restoration/ hydroelectric power plant/ salmonid/ spawning/ United States/ Oncorhynchus tshawytscha
Abstract: Salmonid habitats in main-stem reaches of the Columbia and Snake rivers have changed dramatically during the past 60 years because of hydroelectric development and operation. Only about 13% and 58% of riverine habitats in the Columbia and Snake rivers, respectively, remain. Most riverine habitat is found in the upper Snake River; however, it is upstream of Hells Canyon Dam and not accessible to anadromous salmonids. We determined that approximately 661 and 805 km of the Columbia and Snake rivers, respectively, were once used by fall chinook salmon Oncorhynchus tshawytscha for spawning. Fall chinook salmon currently use only about 85 km of the main-stem Columbia River and 163 km of the main-stem Snake River for spawning. We used a geomorphic model to identify three river reaches downstream of present migration barriers with high potential for restoration of riverine processes: the Columbia River upstream of John Day Dam, the Columbia-Snake-Yakima River confluence, and the lower Snake River upstream of Little Goose Dam. Our analysis substantiated the assertion that historic spawning areas for fall chinook salmon occurred primarily within wide alluvial floodplains, which were once common in the mainstem Columbia and Snake rivers. These areas possessed more unconsolidated sediment and more bars and islands and had lower water surface slopes than did less extensively used areas. Because flows in the main stem are now highly regulated, the predevelopment alluvial river ecosystem is not expected to be restored simply by operational modification of one or more dams. Establishing more normative flow regimes - specifically, sustained peak flows for scouring - is essential to restoring the functional characteristics of existing, altered habitats. Restoring production of fall chinook salmon to any of these reaches also requires that population genetics and viability of potential seed populations (i.e., from tributaries, tailrace spawning areas, and hatcheries) be considered.

1451. **In search of effective scales for stream management: Does agroecoregion, watershed, or their intersection best explain the variance in stream macroinvertebrate communities?**
Dovciak, A. L. and Perry, J. A.
Environmental Management 30(3): 365-377. (2002)
NAL Call #: HC79.E5E5; ISSN: 0364152X.
Notes: doi: 10.1007/s00267-002-2529-6.
Descriptors: agriculture/ ecoregion/ landscape/ macroinvertebrates/ stream/ watershed/ geology/ soils/ water quality/ watersheds/ stream management/ environmental impact/ classification/ community structure/ macroinvertebrate/ river management/ stream/ resource management/ river ecosystem/ stream (river)/ ecosystem/ environmental protection/ invertebrate/ United States/ conservation of natural resources/ ecosystem/ invertebrates
Abstract: Our lack of understanding of relationships between stream biotic communities and surrounding landscape conditions makes it difficult to determine the spatial scale at which management practices are best assessed. We investigated these relationships in the Minnesota River Basin, which is divided into major watersheds and agroecoregions which are based on soil type, geologic parent material, landscape slope steepness, and climatic factors affecting crop productivity. We collected macroinvertebrate and stream habitat data from 68 tributaries among three major watersheds and two agroecoregions. We tested the effectiveness of the two landscape classification systems (i.e., watershed, agroecoregion) in explaining variance in habitat and macroinvertebrate metrics, and analyzed the relative influence on macroinvertebrates of local habitat versus regional characteristics. Macroinvertebrate community composition was most strongly influenced by local habitat; the variance in habitat conditions was best explained at the scale of intersection of major watershed and agroecoregion (i.e., stream habitat conditions were most homogeneous within the physical regions of intersection of these two landscape classification systems). Our results are consistent with findings of other authors that most variation in macroinvertebrate community data from large agricultural catchments is attributable to local physical conditions. Our results are the first to test the hypothesis and demonstrate that the scale of intersection best explains these variances. The results suggest that management practices adjusted for both watershed and ecoregion characteristics, with the goal of improving physical habitat characteristics of local streams, may lead to better basin-wide water quality conditions and stream biological integrity.

1452. **The inadequacy of the fish-bearing criterion for stream management.**
Cummins, Kenneth W. and Wilzbach, Margaret A.
Aquatic Sciences 67(4): 486-491. (2005); ISSN: 1015-1621
Descriptors: commercial activities/ conservation measures/ freshwater habitat/ lotic water/ land zones/ Salmonidae: forestry/ timber harvest/ habitat management/ stream management/ fish bearing criterion/ juveniles/ intermittent streams/ headwater streams/ United States/ Pisces, Actinopterygii, Salmoniformes/ chordates/ fish/ vertebrates
Abstract: Dependence on the fish-bearing and non-fish-bearing designation in determining the regulation of stream management is questioned. The importance of intermittent, ephemeral, and very small first order channels as suppliers of invertebrates and detritus to permanently flowing, receiving streams that support juvenile salmonids warrant their protection during timber harvest. Small gravel bed roads serve many of the same functions as the small intermittent and ephemeral headwater channels. Therefore, many could be managed like small stream channels and eligible for exclusion from road decommissioning actions. Among the invertebrates inhabiting headwater streams, many have specific adaptations to low and seasonal flows. Given these considerations, it is clear that criteria other than the presence or absence of juvenile salmonids need to be considered in managing forested watersheds.

1453. **Influence of forest and rangeland management on anadromous fish habitat in western North America: Effects of livestock grazing.**
Platts, W. S. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station; General Technical Report PNW-124, 1981. 25 p.
Notes: ISSN 0368-6224.
NAL Call #: aSD11.A46
Descriptors: North America/ grazing lands/ rangeland management/ forestry management/ fish populations
This citation is from AGRICOLA.

1454. **Influence of habitat, water quality, and land use on macro-invertebrate and fish assemblages of a southeastern coastal plain watershed, USA.**
Sawyer, J. A.; Stewart, P. M.; Mullen, M. M.; Simon, T. P.; and Bennett, H. H.
Aquatic Ecosystem Health and Management 7(1): 85-99. (2004); ISSN: 14634988.
Notes: doi: 10.1080/14634980490281353.
Descriptors: instream habitat/ land use/ multivariate/ Invertebrata/ Pisum sativum
Abstract: Most states in the U.S. are currently developing methods for assessing the integrity of aquatic habitats through the development of regional biocriteria. While multimetric indices have been used to show community composition, pollution tolerance, species diversity, and trophic structure with a combined index, the specific environmental factors that drive biological communities may be better explained through the use of multivariate statistical techniques. Macroinvertebrate and fish assemblages were sampled along with water quality, landuse and qualitative and quantitative habitat assessments from forty-nine sites throughout the Choctawhatchee-Pea, a southeastern U.S. watershed. Multivariate statistical analyses of habitat, water quality, and land-use data were used to determine the relationship between environmental variables and the dependent biological variables, macroinvertebrate and fish community structure. Sampling of biological and environmental data showed that there was a great deal of homogeneity within the watershed, which complicated the task of identifying environmental influences on biological assemblages. Macro-invertebrate and fish assemblages of the Choctawhatchee-Pea watershed were similar in their response to environmental conditions with water chemistry having the greatest relationship to macro-invertebrate and fish community structure followed by instream habitat and land use.
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1455. **Influence of instream and landscape-level factors on the distribution of Topeka shiners Notropis topeka in Kansas streams.**
Schrank, S. J.; Guy, C. S.; Whiles, M. R.; and Brock, B. L.
Copeia (2): 413-421. (2001); ISSN: 00458511
Descriptors: abundance/ population decline/ spatial distribution/ stream/ United States/ Micropterus salmoides/ Notropis topeka
Abstract: The Topeka shiner Notropis topeka has declined in abundance throughout its historical range in the central U.S. As a result, this minnow was listed as federally endangered in 1999. The objective of our study was to quantitatively assess instream physical, chemical, and biological parameters and landscape-level factors influencing the distribution (i.e., extant or extirpated) of Topeka shiners. We sampled 26 streams in the Flint Hills region of Kansas: 12 sites where Topeka shiners are extant; and 14 sites where they are extirpated. Multivariate analysis of variance was used to test whether variables were different between extant and extirpated sites. Mean catch per effort of largemouth bass in stream pools was higher at extirpated sites, and species diversity by trophic guild and richness in stream pools were higher at extirpated sites. Stepwise logistic regression was used to develop a model to predict whether Topeka shiners were extant or extirpated. Number of small impoundments per watershed area, catch per effort of largemouth bass Micropterus salmoides in pools, and length of pool were the only significant variables in the logistic model. Our model correctly classified 83% of extant sites and 85% of extirpated sites. In a landscape-level analysis of 111 streams, only number of small impoundments per watershed area was significant in the logistic model. These results provide predictive tools to assess instream and landscape-level characteristics for habitat management and possible reintroduction of Topeka shiners in Kansas Flint Hills streams.
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1456. **Influence of intensive rotational grazing on bank erosion, fish habitat quality, and fish communities in southwestern Wisconsin trout streams.**
Lyons, J.; Weigel, B. M.; Paine, L. K.; and Undersander, D. J.
Journal of Soil and Water Conservation 55(3): 271-276. (2000)
NAL Call #: 56.8 J822 ; ISSN: 0022-4561
Descriptors: rotational grazing/ stream erosion/ streams/ habitats/ water quality/ Oncorhynchus mykiss/ depth/ sediments/ width/ Wisconsin
This citation is from AGRICOLA.

1457. **Influence of stream characteristics and grazing intensity on stream temperatures in eastern Oregon.**
Maloney, S. B.; Tiedemann, A. R.; Higgins, D. A.; Quigley, T. M.; and Marx, D. B.
Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture; General Technical Report-PNW 459, 1999. 19 p.
http://www.fs.fed.us/pnw/pubs/gtr_459.pdf
Descriptors: forested watersheds/ grazing management strategies/ grazing intensity/ fisheries/ fish habitat/ chinook salmon/ steelhead trout/ cutthroat trout/ Dolly Varden trout
Abstract: Stream temperatures were measured during summer months, 1978 to 1984, at 12 forested watersheds near John Day, Oregon, to determine temperature characteristics and assess effects of three range management strategies of increasing intensity. Maximum temperatures in streams of the 12 watersheds ranged from 12.5 to 27.8 oC. Maximum stream temperatures on four watersheds exceeded 24 oC, the recommended short-term maximum for rainbow trout (Oncorhynchus mykiss) and chinook salmon (O. tshawytscha). Streams with greater than 75 percent stream shade maintained acceptable stream temperatures for rainbow trout and chinook salmon. Lowest temperatures were observed in streams from ungrazed watersheds. Although highest temperatures were

observed in the most intensively managed watersheds (2.8 hectares per animal unit month), the effect of range management strategy was not definitive. It was confounded by watershed characteristics and about 100 years of grazing use prior to initiation of this study.
This citation is from Treesearch.

1458. **Influences of upland and riparian land use patterns on stream biotic integrity.**
Snyder, C. D.; Young, J. A.; Villella, R.; and Lemarie, D. P.
Landscape Ecology 18(7): 647-664. (2003)
NAL Call #: QH541.15.L35 L36; ISSN: 0921-2973
Descriptors: commercial activities/ reproduction/ ecology/ habitat utilization/ abiotic factors/ land zones/ Pisces: Urban land use patterns/ streams/ farming and agriculture/ agricultural activity/ reproduction/ agricultural and urban land use patterns/ trophic structure/ community structure/ habitat preference/ West Virginia/ Opequon Creek Watershed/ ecology and reproduction/ Pisces/ chordates/ fish/ vertebrates
Abstract: We explored land use, fish assemblage structure, and stream habitat associations in 20 catchments in Opequon Creek watershed, West Virginia. The purpose was to determine the relative importance of urban and agriculture land use on stream biotic integrity, and to evaluate the spatial scale (i.e., whole-catchment vs riparian buffer) at which land use effects were most pronounced. We found that index of biological integrity (IBI) scores were strongly associated with extent of urban land use in individual catchments. Sites that received ratings of poor or very poor based on IBI scores had >7% of urban land use in their respective catchments. Habitat correlations suggested that urban land use disrupted flow regime, reduced water quality, and altered stream channels. In contrast, we found no meaningful relationship between agricultural land use and IBI at either whole-catchment or riparian scales despite strong correlations between percent agriculture and several important stream habitat measures, including nitrate concentrations, proportion of fine sediments in riffles, and the abundance of fish cover. We also found that variation in gradient (channel slope) influenced responses of fish assemblages to land use. Urban land use was more disruptive to biological integrity in catchments with steeper channel slopes. Based on comparisons of our results in the topographically diverse Opequon Creek watershed with results from watersheds in flatter terrains, we hypothesize that the potential for riparian forests to mitigate effects of deleterious land uses in upland portions of the watershed is inversely related to gradient.

1459. **Innovative static self-cleaning screen protects fish and removes debris at irrigation diversions.**
Strong, J. J. and Weir, R. K.
In: Challenges Facing Irrigation and Drainage in the New Millennium: Proceedings of the U.S. Committee on Irrigation and Drainage. Fort Collins, CO; 427-436; 2000.
Descriptors: irrigation/ rivers/ water management/ fish/ environmental impact
Abstract: Recent concerns in the USA about the environmental effects of river diversion structures for irrigation systems has prompted the development of new structures that prevent fish (both migratory and non-migratory) from entering irrigation canals where they would otherwise be lost. The diversion structure for the Flathead Irrigation Project, in a remote location of Montana, USA was developed to be reliable, cost-effective, maintenance-free and not to require electric supply. A suitable screening system was developed utilizing linear array of concave screen panels, installed along the crest of small dams or diversion structures. As the water flows over the screen, a portion flows through to the irrigation system and the remainder flows across the screen surface carrying aquatic life safely downstream.

1460. **Instream investigations in the Beaver Creek watershed in west Tennessee, 1991-95.**
Byl, T. D. and Carney, K. A.
Denver, CO: USGS Branch of Information Services; U.S. Geological Survey Water-Resources Investigations Report 96-4186, 1996. 34 pp.
Descriptors: agricultural practices/ agricultural runoff/ best management practices/ BMPs/ herbicides/ interagency cooperation/ nonpoint pollution sources/ path of pollutants/ pollution monitoring/ riparian vegetation/ rivers/ stream pollution/ suspended sediments/ Tennessee/ Beaver Creek/ water pollution control/ water quality control/ watersheds/ wetlands
Abstract: The U.S. Geological Survey (USGS), in cooperation with the Tennessee Department of Agriculture, began a long-term scientific investigation in 1989 to evaluate the effect of agricultural activities on water quality and the effectiveness of agricultural best management practices in the Beaver Creek watershed, West Tennessee. In 1993 as a part of this study, the USGS, in cooperation with the Natural Resources Conservation Service, Shelby County Soil Conservation District, and the Tennessee Soybean Promotion Board, began an evaluation of the physical, chemical, biological and hydrological factors that affect water quality in streams and wetlands, and instream resource-management systems to treat agricultural nonpoint-source runoff and improve water quality. The purpose of this report is to present the results of three studies of stream and wetland investigations and a study on the transport of aldicarb from an agricultural field in the Beaver Creek watershed. A natural bottomland hardwood wetland and an artificially constructed wetland were evaluated as instream resource-management systems. These two studies showed that wetlands are an effective way to improve the quality of agricultural nonpoint-source runoff. The wetlands reduced concentrations and loads of suspended sediments, nutrients, and pesticides in the streams. A third paper documents the influence of riparian vegetation on the biological structure and water quality of a small stream draining an agricultural field. A comparison of the upper reach lined with herbaceous plants and the lower reach with mature woody vegetation showed a more stable biological community structure and water-quality characteristics in the woody reach than in the herbaceous reach. The water-quality characteristics monitored were pH, temperature, dissolved oxygen, and specific conductance. The herbaceous reach had a greater diversity and abundance of organisms during spring and early summer, but the abundance dropped by approximately 85 percent during late summer. A fourth study describes the transport of aldicarb and its metabolites-aldicarb sulfoxide and aldicarb sulfone-in runoff at a small stream draining a cotton field. During 1991 to 1995, aldicarb and its metabolites were detected in runoff events. The highest

concentrations occurred when aldicarb was applied to the field just hours before a rain storm. Aldicarb was not detectable in runoff a few weeks after application. The metabolites of aldicarb were detectable for 76 days after application. These studies demonstrate streambank vegetation and wetlands have a significant influence on stream water quality. The importance of weather conditions to herbicide application and runoff also is evident. This information can be used by resource managers to sustain and improve our Nation's streams for future generations.

1461. **An integrated appraoch to stream restoration on the Upper Little Colorado River, Arizona.**
Valencia, Ruth A.; Wirtanen, Mark; and Moody, Tom
Ecological Society of America Annual Meeting, Proceedings 87: 286-287(2002)
NAL Call #: QH540.E365.
Notes: Meeting abstract; 87th Annual Meeting of the Ecological Society of America and the 14th Annual International Conference of the Society for Ecological Restoration, Tucson, Arizona, USA; August 04-09, 2002.
Descriptors: conservation/ terrestrial ecology: ecology, environmental sciences/ Upper Little Colorado River Watershed Partnership/ erosion/ grazing/ integrated restoration approach/ multiple land ownership/ native riparian vegetation/ riparian corridors/ riparian restoration/ sedimentation/ stream restoration/ water supply/ wildlife habitat

1462. **Integrating stream bioassessment and landscape ecology as a tool for land use planning.**
Bailey, Robert C.; Reynoldson, Trefor B.; Yates, Adam G.; Bailey, John; and Linke, Simon
Freshwater Biology 52(5): 908-917. (2007);
ISSN: 0046-5070
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ Canada/ Macroinvertebrata: habitat management/ land use planning/ stream bioassessment/ landscape ecology/ land use planning/ community structure/ benthos/ environmental indicators/ streams/ benthic communities/ British Columbia/ Fraser River Basin/ invertebrates
Abstract: 1. Bioassessment has evolved significantly from a method of deciding whether an ecosystem exposed to stressors should 'pass' or 'fail' (or how badly it fails). Society wants some notion of what has caused any observed degradation of ecosystems, and what management strategies might improve degraded ecosystems. Managers also want to predict what negative or positive effects different land use strategies will have on the component ecosystems of a landscape, including lakes and streams. 2. Here we illustrate an approach to providing these tools to managers with data from a bioassessment study of streams in the Fraser River Basin of British Columbia, Canada. 3. Landscape scale descriptors of both the natural (e.g. catchment size, surficial geology) and stressor (e.g. hard rock mines, forest harvest) environment of each site were used to define the natural and stressor environments of each of the 242 stream sites. 4. We classified 206 reference (relatively unexposed to human activity) sites using their benthic macroinvertebrate community composition, and then discriminated among the faunally defined groups with landscape scale descriptors of the natural environment of the sites. 5. This discriminant function model allowed us to predict which group each of the test sites would be in if it were in reference condition, and then measure the relationship between the amount of human activity and the biota in each of these groups. 6. These relationships were turned into projections of what will happen to a stream ecosystem's biota if the stressor environment is either improved or degraded. These projection models form the basis of evidence-based land use planning that takes into account the health of freshwater ecosystems.

1463. **Integrating the stream and its valley: Land use change, aquatic habitat, and fish assemblages (North Carolina).**
Scott, M. C.
Athens, GA: University of Georgia, 2001.
Descriptors: fishery management/ interspecific relationships/ multiple use of resources/ resource management/ rivers/ watersheds/ North Carolina
Abstract: Streams integrate landscape processes across multiple spatial and temporal scales. Human activities have extensively altered landscapes in North America, with serious consequences for aquatic ecosystems. I investigated land use in southern Appalachian watersheds to identify proximate effects on stream habitat and ultimate effects on fish assemblage structure and organization. I examined how catchment land use type, extent, spatial pattern, and history affect physical and chemical characteristics of streams, and how instream factors (i.e., habitat) influence distribution and abundance of stream fishes. Field data were used to test predicted relationships and to construct empirical models of relationships among landscape and stream variables. Forest cover accounted for the most variation in nearly all models, supporting predictions of nutrient enrichment, thermal pollution, and sedimentation caused by landscape disturbance. Physicochemical models fit better when landscape predictors were catchment-wide rather than localized, indicating cumulative impacts. Four faunal associations were identified across the landscape. Three classes were dominated by endemic Appalachian highland fishes, forming a continuous gradient in assemblage structure from smaller, cooler, higher-elevation streams to larger, warmer, lower- elevation streams. A fourth association was characterized by non-endemic fishes where habitats were affected by nutrients and sediment in association with forest cover loss in streamside buffers and high density of buildings and roads. Endemic, small-bodied (low fecundity), cool- water trophic specialists that depend on coarse substrate for spawning declined where stream habitats were modified. They were supplanted by cosmopolitan, large- bodied (long-lived, high-fecundity), warmwater trophic generalists that do not require rocky substrates for successful spawning. Streams draining urbanizing catchments, or those that had been severely disturbed in the past, had lower ratios of endemic to widespread taxa even though riparian buffers were largely forested, suggesting legacy effects from past catchment disturbance. Replacement of unique locally-adapted taxa with widespread generalized species has been termed biological homogenization, and may severely affect regional and continental biodiversity, particularly in regions with rich

endemic faunas such as the Southeast. Research identifying functional responses to cumulative effects of landscape change is needed to promote proactive conservation at the watershed scale, management that is critical to maintaining the integrity of aquatic habitat and biodiverse communities.

1464. **Invertebrate biodiversity in agricultural and urban headwater streams: Implications for conservation and management.**
Moore, A. A. and Palmer, M. A.
Ecological Applications 15: 1169-1177. (Aug. 2005)
NAL Call #: QH540.E23
Descriptors: aquatic invertebrates/ biodiversity/ species diversity/ aquatic habitat/ land use/ streams/ agricultural watersheds/ urban areas/ riparian buffers/ best management practices/ BMPs/ water pollution/ aquatic insects/ Maryland/ pollution
This citation is from AGRICOLA.

1465. **Invertebrate community and stream substrate responses to woody debris removal from an ice storm-impacted stream system, NY USA.**
Warren, Dana R. and Kraft, Clifford E.
Hydrobiologia 568: 477-488. (2006)
NAL Call #: 410 H992; ISSN: 0018-8158
Descriptors: ecology/ population dynamics/ freshwater habitat/ lotic water/ abiotic factors/ physical factors/ land zones/ Macroinvertebrata: community structure/ habitat substrate/ community responses/ woody debris removal/ ice storm impacted streams/ population density/ distribution within habitat/ physical factors/ climate and weather/ New York/ Adirondack Mountains/ Rocky Branch Watershed/ invertebrates
Abstract: We assessed the influence of ice-storm-derived debris dams on aquatic macroinvertebrates and stream substrates in a high-gradient watershed in the eastern Adirondack Mountains of New York State. Using a modification of electrofishing techniques, invertebrates were collected once before (June 2000) and once after (June 2001) wood removal from the downstream reach in each of six pairs of reaches (second and third-order streams). Stream substrates were also mapped in 2000 and 2001 to evaluate shifts in dominant substrates within a reach following wood removal. The following metrics were used to compare the invertebrate communities before and after wood removal: genera similarity, Shannon-Weiner equitability, taxa richness, dominant taxon, percent dominance and functional feeding group relative abundance. The changes in removal reaches were evaluated relative to changes in upstream reference reaches using a Before-After Control-Impact (BACI) design and analysis. Stream substrates did not change significantly in response to wood removal, although a trend toward coarser substrates was observed following removal. Following wood removal, the relative proportion of grazers increased upstream and downstream from removed dams in all streams; however, comparisons of other metrics indicated no significant response to removal. Invertebrate responses to wood removal were lower than expected, perhaps due to the presence of abundant boulder-formed pools in this high gradient system.

1466. **Landscape and local influences on the biotic integrity of fish communities in Ohio headwater streams.**
McCollum, Donna S.
Oxford, OH: Miami University, 2004.
Descriptors: abiotic factors/ anthropogenic factors/ biodiversity/ catchment area/ community composition/ ecosystem disturbance/ environmental protection/ geomorphology/ prediction/ primary production/ riparian environments/ river basin management/ species diversity/ watersheds/ Ohio
Abstract: Stream ecosystems are holistic systems that incorporate disturbances and abiotic influences at many spatial and temporal scales. This view supports a three-tiered model of variables that determine biotic integrity in streams, with causes and effects flowing from large-scale to fine-scale processes. Tier One characteristics include variables important at the scale of geomorphological processes and land use over entire watersheds. These variables largely determine Tier Two factors, abiotic conditions in a stream reach. Tier Two variables, in turn, largely structure the Tier Three variables, the stream's biotic communities. Through field studies and GIS analysis, relationships among these three tiers of variables were examined in this research to explore the question of how agriculture exerts its influence on stream fishes. This study investigated 27 streams, in two ecoregions and the transition area, or ecotone, between them, in south-central Ohio. The study design allowed questions to be asked concerning the relative influence of geomorphology and land use in varied landscapes, as well as relative impacts of watershed versus riparian land use. The region also contained relatively equal proportions of three types of agriculture (hay, row crops, and pasture) allowing the study to address the question of which land use might be most harmful to stream fish. This study supported the importance of row crop agriculture, finding it to be the most degrading type of agriculture for stream fish, but also found pasture to be an important causal factor in stream community degradation. This study also supported the importance of riparian buffers, finding riparian agriculture to be more degrading than agriculture over the entire watershed. A more interesting finding is the suggestion that a minor amount of nutrient enrichment from agricultural land use may benefit streams that are naturally oligotrophic. A possible mechanism could be increased primary production, which increases macroinvertebrate density, and provides a larger food base for fishes. This study also reports the possible existence of a biodiversity hotspot in the transitional region between the two ecoregions. Some evidence exists that greater habitat heterogeneity increases species richness, suggesting a possible cause for higher biodiversity in this ecotonal region. Since habitat heterogeneity over whole streams was not measured in this study, both the existence and mechanism of such a hotspot needs more study. A final conclusion is that geomorphology and agricultural land use may be equally important in structuring stream conditions, and thus, biological stream communities. This study illustrates the difficulties associated with overlapping causes and effects in complex systems such as streams and their catchments. Several variables in the study reported here required examination at multiple scales and with multiple statistical techniques in order to understand relationships that varied across different regions. The effects of a particular agricultural

variable were not always equal in the diverse landscapes of southern Ohio. Lotic ecologists must examine a variety of ecoregions, and incorporate a variety of scales with a variety of analytic tools, if predictive stream ecology is to become a reality.

1467. **Landscape characteristics, land use, and coho salmon (Oncorhynchus kisutch) abundance, Snohomish River, Wash., U.S.A.**
Pess, George R.; Montgomery, David R.; Steel, E. Ashley; Bilby, Robert E.; Feist, Blake E.; and Greenberg, Harvey M.
Canadian Journal of Fisheries and Aquatic Science 59(4): 613-623. (2002)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: freshwater ecology: ecology, environmental sciences/ human ecology: anthropology/ population studies/ wildlife management: conservation/ abundance/ habitat/ land use/ landscape characteristics/ population density/ population restoration
Abstract: We used temporally consistent patterns in the spatial distribution of returning adult coho salmon (Oncorhynchus kisutch) to explore relationships between salmon abundance, landscape characteristics, and land use patterns in the Snohomish River watershed, Wash. The proportion of total adult coho salmon abundance supported by a specific stream reach was consistent among years, even though interannual adult coho salmon abundance varied substantially. Wetland occurrence, local geology, stream gradient, and land use were significantly correlated with adult coho salmon abundance. Median adult coho salmon densities in forest-dominated areas were 1.5-3.5 times the densities in rural, urban, and agricultural areas. Relationships between these habitat characteristics and adult coho salmon abundance were consistent over time. Spatially explicit statistical models that included these habitat variables explained almost half of the variation in the annual distribution of adult coho salmon. Our analysis indicates that such models can be used to identify and prioritize freshwater areas for protection and restoration.

1468. **Landscape influences on stream ecosystems: Implications for restoration and management.**
Moerke, Ashley Heather
Notre Dame, IN: University of Notre Dame, 2004.
Descriptors: anthropogenic factors/ biodiversity/ community composition/ conservation/ environmental factors/ environmental impact/ habitat/ habitat improvement/ land use/ resource management/ restoration/ river basins/ sedimentation/ water quality/ watersheds/
Indiana, South Bend, Juday Creek
Abstract: The structure and function of streams and rivers worldwide continue to be degraded by human activities including land-use change. To reverse this trend, basic ecological research is needed to evaluate environmental factors influencing streams at multiple spatial scales and to restore streams that are impaired by these factors. Three integrated studies were conducted-a landscape assessment, statewide restoration survey, and restoration case study-to strengthen the scientific framework of stream restoration. A comparative study of 22 Michigan streams elucidated relationships among multiple environmental factors, spatial scales, and stream response variables in a mixed land-use river basin. Water quality was influenced primarily by regional factors, whereas stream habitat and fishes were influenced by both local and regional factors. Overall, anthropogenic factors (e.g., land use) explained the most variation in stream conditions. Forested streams had the least degraded water quality, habitat, and fish communities whereas agricultural streams lacking buffers were the most degraded. Urban streams and agricultural streams with buffers generally were intermediate in response. A statewide survey of reach-scale stream restorations assessed the nature and extent of restoration in Indiana. The survey identified commonalities across all restorations assessed, including the type of restoration, project goals, and structures installed. In general, stream relocation was the most common type of restoration. However, project evaluation was uncommon and most monitoring was not appropriate for evaluating the goals of the restoration. A long-term assessment of an Indiana stream restoration (Juday Creek) provided additional insights into improvements for future restoration and monitoring designs. Biological responses to the restoration varied with time, taxon, and endpoint measured, which emphasizes that monitoring efforts should incorporate long-term assessments of a suite of biological and physical parameters. Additionally, continued sedimentation from upstream threatened the long-term persistence of habitat and biological integrity, which suggests that restorations should target the scale (e.g., watershed) at which the degradation occurs. This integrated approach identified factors and spatial scales controlling midwestern streams, common restoration approaches used, and the effectiveness of those approaches. This information will help resource managers determine the most appropriate scales and approaches to manage and restore midwestern streams.

1469. **Landscape models to understand steelhead (Oncorhynchus mykiss) distribution and help prioritize barrier removals in the Willamette Basin, Oregon, USA.**
Steel, E. Ashley; Feist, Blake E.; Jensen, David W.; Pess, George R.; Sheer, Mindi B.; Brauner, Jody B.; and Bilby, Robert E.
Canadian Journal of Fisheries and Aquatic Science 61(6): 999-1011. (2004)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: conservation measures/ reproduction/ reproductive behavior/ behavior/ ecology/ population dynamics/ land zones/ Oncorhynchus mykiss: habitat management/ stream barrier removal/ prioritization using landscape models of redd distribution and density/ breeding site/ redds/ migration/ population density/ distribution within habitat/ prediction using landscape models/ implications for prioritizing stream barrier removal/ animal constructions/ Oregon/ Willamette River Basin/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: We use linear mixed models to predict winter steelhead (Oncorhynchus mykiss) redd density from geology, land use, and climate variables in the Willamette River basin, Oregon. Landscape variables included in the set of best models were alluvium, hillslope 6%, landslide-derived geology, young (40 years) forest, shrub vegetation, agricultural land use, and mafic volcanic geology. Our approach enables us to model the temporal correlation between annual redd counts at the same site while extracting patterns of relative redd density across sites that

are consistent even among years with varying strengths of steelhead returns. We use our model to predict redd density (redds per kilometre) upstream of 111 probable migration barriers as well as the 95% confidence interval around the redd density prediction and the total number of potential redds behind each barrier. Using a metric that incorporates uncertainty, we identified high-priority barriers that might have been overlooked using only stream length or mean predicted fish benefit and we clearly differentiated between otherwise similar barriers. We show that landscape features can be used to describe and predict the distribution of winter steelhead redds and that these models can be used immediately to improve decision-making for anadromous salmonids.

1470. **Large wood addition for aquatic habitat rehabilitation in an incised, sand-bed stream, Little Topashaw Creek, Mississippi.**
Shields, F. D.; Knight, S. S.; and Stofleth, J. M.
River Research and Applications 22(7): 803-817. (2006)
NAL Call #: TC530.R43 ; ISSN: 1535-1459
Descriptors: aquatic communities/ aquatic environment/ dead wood/ environmental degradation/ erosion/ erosion control/ habitats/ rehabilitation/ species richness/ stream flow/ streams/ willows/ fishes/ Salix
Abstract: Large wood (LW) is a key component of stream habitats, and degraded streams often contain little wood relative to less-impacted ones. Habitat rehabilitation and erosion control techniques that emphasize addition of natural wood in the form of individual elements or structures are increasingly popular. However, the efficacy of wood addition, especially in physically unstable, warmwater systems is not well established. The effects of habitat rehabilitation of Little Topashaw Creek, a sinuous, sand-bed stream draining 37 km^2 in northwest Mississippi are described herein. The rehabilitation project consisted of placing 72 LW structures along eroding concave banks of a 2-km reach and planting 4000 willow cuttings in sandbars opposite or adjacent to the LW structures. Response was measured by monitoring flow, channel geometry, physical aquatic habitat and fish populations in treated and untreated reaches for 2 years before and 4 years after rehabilitation. Initially, LW structures reduced high flow velocities at concave bank toes. Progressive failure of the LW structures and renewed erosion began during the second year after rehabilitation, with only 64% of the structures and about 10% of the willow plantings surviving for 3 years. Accordingly, long-term changes in physical habitat attributable to rehabilitation were limited to an increase in LW density. Fish biomass increased in the treated reach, and species richness approximately doubled in all reaches after rehabilitation, suggesting the occurrence of some sort of stressful event prior to our study. Fish community composition shifted toward one typical of a lightly degraded reference site, but similar shifts occurred in the untreated reaches downstream, which had relatively high levels of naturally occurring LW. Large wood is a key component of sand-bed stream ecosystems, but LW addition for rehabilitation should be limited to sites with more stable beds and conditions that foster rapid woody plant colonization of sediment deposits.

1471. **Large woody debris and its influence on macroinvertebrate assemblages in southeastern coastal plain streams, USA.**
Bhattarai, S. and Mullen, M. W.
Southeastern Biology 53(2): 215-216. (2006);
ISSN: 1533-8436
Descriptors: freshwater streams/ stream ecology/ woody debris/ macroinvertebrates/ macroinvertebrate abundance/ Choctawhatchee River/ habitat structures/ habitat complexities/ rivers/ lakes/ freshwater environments/ Alabama
Abstract: Large woody debris (LWD) has important structural and functional roles in streams, but there is little research to support this view in the southeastern coastal plains. This study surveyed 35 stream reaches in the Choctawhatchee River watershed of southeastern Alabama. These reaches were broadly classified into three distinct categories: urban, forested and mixed. Large woody debris characteristics and functions were quantified. Pool, sediment characteristics, and drainage areas of each reach were measured along with assessment of macroinvertebrate assemblages. Statistical analyses of LWD, pool, sediment, drainage and macroinvertebrate data were used to examine the relationship among LWD characteristics and functions, pool, drainage and sediment characteristics, and biological variables. There were significant differences in LWD number and volume among the three site categories. These differences apparently resulted in a higher frequency of pools, sediment storage sites and woody debris storage sites, and more ecologically important, heterogeneous habitat in forested streams that contained higher number and volume of LWD. Large woody debris positively influenced macroinvertebrate assemblages and partially abated the negative effect of fine sediment on macroinvertebrates, as indicated by significant positive correlations among LWD, pools and biological variables and an apparent increase in the complexity of in-stream habitat.

1472. **Large woody debris and land management in California's hardwood-dominated watersheds.**
Opperman, J. J.
Environmental Management 35(3): 266-277. (2005)
NAL Call #: HC79.E5E5 ; ISSN: 0364152X.
Notes: doi: 10.1007/s00267-004-0068-z.
Descriptors: debris jams/ large woody debris/ Mediterranean-climate streams/ private land/ steelhead/ debris/ forestry/ hardwoods/ land use/ surveys/ debris-jam frequency/ hardwood-dominated watersheds/ land management/ large woody debris (LWD)/ watersheds/ watershed management/ wood debris/ conservation of natural resources/ environment design/ rivers/ water supply/ forestry/ hardwoods/ land use/ surveys/ water sheds/ Coniferophyta/ Oncorhynchus mykiss/ Salmonidae
Abstract: Although large woody debris (LWD) has been studied extensively in conifer-dominated watersheds, relatively little is known about LWD in hardwood-dominated watersheds. Field surveys of 32 hardwood-dominated stream reaches in northern coastal California revealed that levels of LWD varied with land ownership and that living trees strongly influenced debris jam formation. Almost half of the channel-spanning debris jams, which stored the most wood and were most likely to form a pool, were formed behind a key piece that was still living. These living key

pieces might provide greater longevity and stability than would otherwise be expected from hardwood LWD. Compared to streams on private land, streams on public land had significantly greater LWD loading and debris-jam frequency. Land management practices that remove wood from streams might be contributing to the degradation of salmonid habitat in California's hardwood-dominated watersheds. © 2005 Springer Science+Business Media, Inc.

1473. **Least-desired index for assessing the effectiveness of grass riparian filter strips in improving water quality in an agricultural region.**
Kosnicki, Ely and Sites, Robert W.
Environmental Entomology 36(4): 713-724. (2007)
NAL Call #: QL461.E532; ISSN: 0046-225X
Descriptors: methods and techniques/ conservation/ agronomy: agriculture/ freshwater ecology: ecology, environmental sciences/ least desired index/ LDI, laboratory techniques/ grass riparian filter strip/ grfs, field equipment/ water quality/ stream/ sedimentation/ biotic integrity
Abstract: Unprotected streams within the agricultural Midwest region of the United States are subject to sedimentation, nutrification, and agricultural chemicals. Grass riparian filter strips (GRFSs) have been implemented as a best management practice to minimize sedimentation and associated materials that are harmful to aquatic ecosystems; however, few studies have examined the benthic community response to CRFS installation. This study introduces a least-desired index (LDI) multimetric approach of evaluating benthic communities in response to GRFS installation. LDI was determined in a reciprocal fashion to that of a benthic macroinvertebrate index of biotic integrity (B-IRI). When reference conditions are not available for the use of B-IBI, anti-reference sites, representing least-desired conditions, can be used in constructing an LDI. A B-IBI and LDI were constructed in the Claypan Till Plains Subsection of Missouri and comparatively used to evaluate two test sites where tall fescue GRFS were installed. Five metrics were used to develop the B-IBI and six for the LDI. The LDI tended to be more conservative at evaluation in comparison to the B-IBI. Paired t-tests showed that LDI and B-IBI were significantly different at scoring test sites. The LDI assessed both test sites as showing no response to GRFS installation, whereas the B-IBI suggested moderate improvement. The LDI was considered to be a better index for evaluation because the streams used to develop the B-IRI were not suitable reference sites. An argument for the use of chironomid based rnetrics in low gradient agricultural streams is presented.

1474. **Literature review on the effects of rip-rap on fish and fish habitat with habitat management implications.**
Quigley, J. T. and Harper, D. J.
Canadian Manuscript Report of Fisheries and Aquatic Sciences 2701: 1-76, X-XI. (2004); ISSN: 0706-6473.
Notes: Literature review.
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Pisces: habitat management/ streambank protection with rip rap/ impact on populations/ impact of streambank protection with rip rap/ community structure/ population dynamics/ stream/ British Columbia/ Pisces/ chordates/ fish/ vertebrates
Abstract: This study provides habitat management staff in the Pacific Region of Fisheries and Oceans Canada (DFO) with the most recent information on the range of potential effects of rip-rap on fish and fish habitat in order to improve decision making and regional consistency. The effects of rip-rap on fish and fish habitat were investigated through a literature review and an evaluation of over 20 years of environmental impact monitoring data in British Columbia. At a local scale, positive and negative effects of rip-rap on fish and fish habitat were found. Positive effects tended to occur with applications of rip-rap in degraded systems that had excessive erosion problems, particularly where it was combined with other habitat management strategies. Negative effects of rip-rap applications were related to the loss of natural habitat, as vegetated natural banks almost universally provided superior habitat than rip-rapped sites. In fact, our study suggested that sites with only 14% of their site length vegetated provided higher habitat value than rip-rapped sites. Watershed scale effects include restricted lateral channel migration, decreased natural sediment deposition, reduced recruitment of gravel and large woody debris, hydrological changes (such as reduced ability to attenuate flood peaks) and reduced heterogeneity of habitat. These effects are largely negative and potentially cumulative in nature. The effects from rip-rap should not be considered solely on a site specific basis. Impacts to landscape-level ecological and hydrological processes should be considered during the assessment of proposed rip-rap projects. Short term management recommendations: 1. DFO should be precautionary in the use of rip-rap, and only consider it as an option in degraded systems that are devoid of riparian vegetation and subject to excessive erosion. 2. DFO should encourage the use of alternative streambank stabilization methods, such as bio-engineering approaches (Adams 2003; MELP 2000), that may provide a greater value to fish habitat. 3. The application of rip-rap at vegetated sites will likely result in a loss of productive capacity and should be Authorized pursuant to Section 3 5(2) of the Fisheries Act provided the impacts from the proposed development cannot be fully mitigated. 4. If rip-rap is the only viable alternative for streambank protection, and is to be applied at a scale large enough to potentially affect river processes, DFO should require a hydrological assessment. The impact assessment should consider landscape-level ecological and hydrological processes, and downstream cumulative impacts to the watershed. For Authorized rip-rap streambank protection projects, DFO should require compensation, including additional techniques other than simply re-vegetating the site. Consideration should be given to off-channel habitat development to compensate for the loss of potential for natural off-channel habitat development. Rigorous monitoring and maintenance programs should be implemented to ensure compensation success. Long-term management recommendations: 6. Dialogue with other levels of government and industry groups responsible for linear development (pipelines, railway, highways, etc.) should be initiated and maintained to develop strategies for protection of watersheds from excessive application of rip-rap as a bank protection technique. 7. Long term plans for river migration corridors should be developed. These plans should incorporate flood control solutions as alternatives to channelization.

Examples include setback dykes at anticipated problem areas, stepped levees, greenbelts, meander zones, riparian conservation easements, subdivision regulations, building codes and zoning ordinances. A pro-active approach to planning can increase the range of solutions available, and avoid dealing with projects on an emergency basis where potential solutions can be limited. 8. A coordinated education and awareness initiative should be undertaken targeting all private and industrial landowners and stakeholders within and adjacent to river migration corridors. The value of natural riparian vegetation in terms of both stream bank protection and fish habitat should be promoted to reduce unnecessary riparian removal and subsequent activities that result in an overall hardening of stream banks within a watershed without due consideration of its overall impact. 9. The effectiveness of alternate bio-engineering approaches to streambank protection should be quantified using a scientific monitoring and assessment program. 10. Long term field research should be conducted to fill the information gap on cumulative watershed level impacts resulting from extensive rip-rapping.

1475. **Livestock grazing.**
Platts W. S. and Meehan W. R.
In: Influences of forest and rangeland management on salmonid fishes and their habitats.
Bethesda: American Fisheries Society, 1991; pp. 389-423.
NAL Call #: SH167.S17I53 1991
Descriptors: grazing/ livestock/ rangeland management/ forestry management/ fish populations/ salmonid/ fish ecology

1476. **Livestock grazing effects on southwestern streams: A complex research problem.**
Rinne, J. N.
In: Riparian ecosystems and their management: Reconciling conflicting uses, General Technical Report-RM 120/ Johnson, R. Roy ; Ziebell, Charles D.; Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H.; Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, 1985. pp. 295-299.
Notes: Conference held April 16-18, 1985 in Tuscon, Ariz.
NAL Call #: aSD11.A42
Descriptors: livestock/ habitats/ fish/ grazing/ riparian buffers/ streams/ New Mexico
This citation is from AGRICOLA.

1477. **Livestock grazing, golden trout, and streams in the Golden Trout Wilderness, California: Impacts and management implications.**
Knapp, R. A. and Matthews, K. R.
North American Journal of Fisheries Management 16(4): 805-820. (1996)
NAL Call #: SH219.N66; ISSN: 0275-5947
Descriptors: freshwater fish/ population density/ water quality/ land use/ California/ canopy shading/ livestock/ grazing/ trout/ ecological effects/ resources management/ freshwater fish/ fluvial morphology/ plant populations/ vegetation cover/ fishery management/ predators/ Oncorhynchus aguabonita/ degradation/ physical properties/ environmental effects
Abstract: Impacts of livestock grazing on California golden trout Oncorhynchus mykiss aguabonita and their habitat were studied inside and outside of livestock exclosures in the Golden Trout Wilderness, California. In two consecutive years, the majority of stream physical characteristics showed large differences between grazed and ungrazed areas, and the directions of these differences were consistent with the recovery of exclosed streams and riparian areas from impacts caused by livestock grazing. Ungrazed areas consistently had greater canopy shading, stream depths, and bank-full heights and smaller stream widths than grazed areas. California golden trout were very abundant in the study sites; their densities and biomasses were among the highest ever recorded for stream-dwelling trout in the western United States. California golden trout density and biomass per unit area were significantly higher in ungrazed than in grazed areas in three of four comparisons. Differences between grazed and ungrazed areas were less consistent when density and biomass were calculated on the basis of stream length. Our results suggest that current levels of livestock grazing are degrading the stream and riparian components of the study meadows to the detriment of golden trout populations.

1478. **Livestock grazing management impacts on stream water quality: A review.**
Agouridis, C. T.; Workman, S. R.; Warner, R. C.; and Jennings, G. D.
Journal of the American Water Resources Association 41(3): 591-606. (2005)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: agriculture/ environmental impacts/ nonpoint source pollution/ sustainability/ water quality/ stream flow/ best management practices/ BMPs/ climatic regions/ livestock grazing management/ stream water quality/ agricultural runoff/ animals/ hydraulics/ rivers
Abstract: Controlling agricultural nonpoint source pollution from livestock grazing is a necessary step to improving the water quality of the nation's streams. The goal of enhanced stream water quality will most likely result from the implementation of an integrated system of best management practices (BMPs) linked with stream hydraulic and geomorphic characteristics. However, a grazing BMP system is often developed with the concept that BMPs will function independently from interactions among controls, climatic regions, and the multifaceted functions exhibited by streams. This paper examines the peer reviewed literature pertaining to grazing BMPs commonly implemented in the southern humid region of the United States to ascertain effects of BMPs on stream water quality. Results indicate that the most extensive BMP research efforts occurred in the western and midwestern U.S. While numerous studies documented the negative impacts of grazing on stream health, few actually examined the success of BMPs for mitigating these effects. Even fewer studies provided the necessary information to enable the reader to determine the efficacy of a comprehensive systems approach integrating multiple BMPs with pre-BMP and post-BMP geomorphic conditions. Perhaps grazing BMP research should begin incorporating geomorphic information about the streams with the goal of achieving sustainable stream water quality.

1479. **Livestock grazing relationships with fisheries.**
Burton, T. A. and Kozel, S. J.
In: Proceedings of a symposium on sustaining rangeland ecosystems. Eastern Oregon State College, La Grande, Oregon. Edge, W. D. and Olsen-Edge, S. L. (eds.); Vol. Special Report 953.
Corvallis, Ore.: Oregon State University Extension Service; pp. 140-145; 1996.
NAL Call #: 100 Or3M no.953
Descriptors: forest ecology/ forest management/ water quality/ grassland management/ riparian forests/ riparian vegetation/ grasslands/ riparian grasslands/ management/ environmental degradation/ erosion/ grazing/ grazing intensity/ fisheries/ vegetation types
Abstract: The importance of appropriate management of riparian grasslands for maintaining the quality of aquatic habitats is emphasized. Recent estimates for W. USA have indicated that 66% of Bureau of Land Management riparian areas are not functioning properly or are functioning at risk and that 22% of US Forest Service riparian areas are not meeting forest plant objectives for proper condition. Grazing management may have a major effect on aquatic ecosystems. In the Bear Valley Basin, Idaho, use of early-season low intensity grazing by cattle reversed the downward trend in stream bank stability and substrate sedimentation, increasing the survival of the endangered chinook salmon (Oncorhynchus tshawytscha).

1480. **Livestock influences on riparian zones and fish habitat: Literature classification.**
Larsen, R. E.; Krueger, W. C.; George, M. R.; Barrington, M. R.; Buckhouse, J. C.; and Johnson, D. E.
Journal of Range Management 51(6): 661-664. (1998)
NAL Call #: 60.18 J82 ; ISSN: 0022-409X.
Notes: Literature review.
Descriptors: classification/ grazing/ riparian vegetation/ habitats/ field experimentation/ experimental design/ streams/ riparian grasslands
Abstract: A key was used to classify articles about livestock influences on riparian zones and fish habitat into 3 classes: papers that contained original data, those that were commentary, and reports about methodology such as classification systems, policies, and monitoring criteria. Four hundred and twenty-eight of the total articles were directly related to grazing impacts on riparian zones and fish habitat. Only 89 of these grazing impact articles were classified as experimental, where treatments were replicated and results were statistically valid. This analysis revealed several limitations of riparian grazing studies that included: (1) inadequate description of grazing management practices or treatments, (2) weak study designs, and (3) lack of pre-treatment data.

1481. **The long-term effectiveness of fish habitat restoration practices: Lawrence Creek, Wisconsin.**
Champoux, O.; Biron, P. M.; and Roy, A. G.
Annals of the Association of American Geographers 93(1): 42-54. (Mar. 2003)
Descriptors: animal morphology/ aquatic habitat/ bank erosion/ channel flow/ channel morphology/ deterioration/ environmental impact/ feeding behavior/ fish management/ fluvial morphology/ freshwater fish/ geomorphology/ grazing/ habitat/ habitat improvement/ moraines/ pools/ rehabilitation/ rivers/ stream discharge/ trout/ Salmonidae/ Wisconsin
Abstract: Although many streams in North America have been rehabilitated to improve the habitat of salmonids, little is known about the long-term impacts of such practices on salmonid habitats and on river dynamics. The success of these improvement schemes is often assessed a short time after the work is completed and is usually based on changes in the targeted biological populations. This article examines the long-term effects of bank-cover deflectors on the physical fish habitat and on the channel morphology. The study was conducted on Lawrence Creek, a small stream in Wisconsin, where trout habitat had been affected negatively by intense cattle grazing. Data on the physical habitat and on channel morphology were collected on a 600-m-long reach in 1963 (immediately prior to the rehabilitation work), in 1966, and in 1999. In the upstream section, the channel flows through a moraine deposit where bed material is coarser than the material of the outwash plain found in the downstream portion of the reach. Results indicate that fish habitat in 1999 was better than in 1963 but has deteriorated substantially since 1966. Pool area increased from 267 m^2 to 625 m^2 between 1963 and 1966, but has decreased to 488 m^2 since then. Most of this deterioration, however, is concentrated in the morainic section. In the outwash plain, the deflectors are still in good condition, and the area occupied by pools has remained constant since 1966. In the morainic section, most structures are no longer efficient and the channel is unstable due to high bed-shear stress values, which entrain bed and bank erosion. Effective long-term rehabilitation schemes should therefore carefully consider the varying sensitivity of river reaches due to different geomorphic contexts.

1482. **Macroinvertebrate assemblage change in a small eastern Oregon stream following disturbance by grazing cattle.**
Reed, T.
Journal of Freshwater Ecology 18(2): 315-320. (2003)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060
Descriptors: zoobenthos/ macrofauna/ grazing/ sampling/ ecosystem disturbance/ aquatic insects/ community composition/ population structure/ rivers/ biotic factors/ herbivores/ Chironomidae/ Ephemeroptera/ Oregon/ cattle/ midges/ mayflies
Abstract: Badger Creek (Ochoco National Forest, Oregon) was sampled before and after cattle arrived and on July 31 in a reach of stream where cattle were present and a reach where they were not. Index values and ordination of these samples indicates that seasonality and local conditions are important drivers in macroinvertebrate community composition. In both a three month survey and the single date sampling, disturbance by grazing cattle was correlated with more Chironomidae larvae and fewer mayflies, indicating that cattle create an environment conducive to the macroinvertebrate assemblage compositions found in low oxygen, organically enriched systems.

1483. **Macroinvertebrate communities in agriculturally impacted southern Illinois streams: Patterns with riparian vegetation, water quality, and in-stream habitat quality.**
Stone, Mandy L.; Whiles, Matt R.; Webber, Jeremy A.; Williard, Karl W.; and Reeve, John D.
Journal of Environmental Quality 34(3): 907-917. (May 2005)
NAL Call #: QH540.J6
Descriptors: agriculture/ aquatic habitat/ aquatic insects/ biomass/ copepods/ dominant species/ drainage ditches/ environmental quality/ forests/ habitat preferences/ harbors/ headwaters/ macroinvertebrates/ mollusks/ oligochaetes/ organic matter/ orthophosphates/ pollution monitoring/ population density/ riparian land/ riparian vegetation/ rivers/ silt/ streams/ structure/ substrates/ vegetation/ water quality/ water chemistry/ water quality/ zoobenthos/ Chironomidae/ Copepoda/ Mollusca/ Physella/ Sphaerium/ Illinois
Abstract: Relationships between riparian land cover, in-stream habitat, water chemistry, and macroinvertebrates were examined in headwater streams draining an agricultural region of Illinois. Macroinvertebrates and organic matter were collected monthly for one year from three intensively monitored streams with a gradient of riparian forest cover (6, 22, and 31% of riparian area). Bioassessments and physical habitat analyses were also performed in these three streams and 12 other nearby headwater streams. The intensively monitored site with the least riparian forest cover had significantly greater percent silt substrates than the sites with medium and high forest cover, and significantly higher very fine organics in substrates than the medium and high forested sites. Macroinvertebrates were abundant in all streams, but communities reflected degraded conditions; noninsect groups, mostly oligochaetes and copepods, dominated density and oligochaetes and mollusks, mostly Sphaerium and Physella, dominated biomass. Of insects, dipterans, mostly Chironomidae, dominated density and dipterans and coleopterans were important contributors to biomass. Collector-gatherers dominated functional structure in all three intensively monitored sites, indicating that functional structure metrics may not be appropriate for assessing these systems. The intensively monitored site with lowest riparian forest cover had significantly greater macroinvertebrate density and biomass, but lowest insect density and biomass. Density and biomass of active collector-filterers (mostly Sphaerium) decreased with increasing riparian forest. Hilsenhoff scores from all 15 sites were significantly correlated with in-stream habitat scores, percent riparian forest, and orthophosphate concentrations, and multiple regression indicated that in-stream habitat was the primary factor influencing biotic integrity. Our results show that these "drainage ditches" harbor abundant macroinvertebrates that are typical of degraded conditions, but that they can reflect gradients of conditions in and around these streams.

1484. **Macroinvertebrate community responses to selection logging in riparian and upland areas of headwater catchments in a northern hardwood forest.**
Kreutzweiser, D. P.; Capell, S. S.; and Good, K. P.
Journal of the North American Benthological Society 24(1): 208-222. (2005)
NAL Call #: QL141.F7; ISSN: 08873593.
Notes: doi: 10.1899/0887-3593(2005)024 <0208:MCRTSL>2.0.CO;2.
Descriptors: northern hardwood forests/ selection logging/ stream insect communities/ community structure/ ecological impact/ macroinvertebrate/ riparian forest/ selective logging/ stream/ Insecta/ Riparia
Abstract: Aquatic insect communities were examined in 2 streams at different selection logging intensities in headwater catchments of a northern hardwood forest. Insect communities of these streams were compared to those of a nearby reference stream (no harvesting) over a 2-y pre- and 3-y post-logging period. The experimental catchments were logged by a mechanical harvester and cable skidders, one at a low-intensity (29% basal area removal) and the other at a moderate-intensity (42% basal area removal) harvesting rate. There were no riparian reserves or buffer zones, but logging was conducted in compliance with a riparian code of practice (3-m setback from stream edges) and other best management practices. Changes in community structure, community metrics, or relative abundance of discriminatory taxa attributable to logging impacts were not detected at the low-intensity site. Some deviations from reference and pre-logging trends in community structure, multivariate dispersion, and population levels of discriminatory taxa were detected at the moderate-intensity site after the logging. These deviations were mainly driven by small, but usually significant, increases in abundance of 5 gatherer taxa. The increases in abundance of gatherer taxa appeared to be a response to a significant increase (~2.5x) in streambed deposition of fine particulate organic material at that site. However, the shifts in community structure and changes in abundance of these taxa at the moderate-intensity site were not larger than some natural changes in abundance among other taxa at the reference site over the 5-y study. The increases in abundance of some taxa at the moderate-intensity site may indicate a logging impact, but the changes were small and there were no indications of reciprocal declines among other taxa. It appears that selection logging at up to 42% basal area removal in compliance with the riparian code of practice and other good management practices largely mitigated harmful alterations to stream habitat and insect communities in these northern hardwood forest catchments. © 2005 by The North American Benthological Society.

1485. **Macroinvertebrate community structure and function associated with large wood in low gradient streams.**
Johnson, Lucinda B.; Breneman, Dan H.; and Richards, Carl
River Research and Applications 19(3): 199-218. (2003)
NAL Call #: TC530.R43
Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ Invertebrata, Animalia/ macroinvertebrate (Invertebrata): common, clinger, sprawler, swimmer/ Michigan/ Minnesota/

agricultural regions/ behavior/ channel flow/ community function/ community structure/ dominant substrate composition/ feeding characteristics/ forested stream ecosystems/ habitat types/ large woody debris/ local diversity/ low gradient streams/ multiple habitat qualitative sampling approach/ regional patterns/ trophic characteristics/ wood abundance/ wood distribution
Abstract: Large woody debris (wood) plays a number of important roles in forested stream ecosystems. Wood in streams provides habitat and flow refugia for fish and invertebrates, and is a site of biofilm production that serves as food for grazing organisms. Logs added to streams are rapidly colonized by invertebrates, and this habitat alteration is accompanied by changes in community composition and functional processes. A multiple habitat, qualitative sampling approach was employed to evaluate macroinvertebrate communities associated with wood habitats in 71 stream reaches in central Michigan and southeastern Minnesota, two agricultural regions in the midwestern United States. Macroinvertebrate taxa were classified with respect to behaviour (e.g. sprawler, clinger, swimmer), as well as trophic/feeding characteristics. These traits were used to examine community structure as a function of wood abundance and distribution. Although wood is not abundant in these streams and logs are generally small in size, wood is a very important habitat in both Michigan and Minnesota: 86% and 95% of the total taxa encountered at Michigan and Minnesota study sites, respectively, were found in wood habitats. Differences in regional patterns in the distribution of taxa across habitats were observed between Michigan and Minnesota. These are believed to result from differences in the number of habitat types available, and the dominant substrate composition. Local invertebrate diversity increased in Michigan, but not Minnesota, with the presence of wood habitats in streams. The presence of wood at a site increased the average taxa richness by 15 and 10 taxa in Michigan and Minnesota, respectively. Macroinvertebrate behavioural attributes and functional traits associated with wood habitats suggest that community traits may vary due to both local difference in flow and the location of wood in the channel.
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1486. **Macroinvertebrate response to logging in coastal headwater streams of Washington, U.S.A.**
Haggerty, S. M.; Batzer, D. P.; and Jackson, C. R.
Canadian Journal of Fisheries and Aquatic Science 61(4): 529-537. (2004)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: commercial activities/ ecology/ population dynamics/ freshwater habitat/ lotic water/ abiotic factors/ land zones/ Macroinvertebrata: forestry/ logging/ community responses/ biomass/ logging effects/ community structure/ population density/ stream/ coastal headwater streams/ community responses to logging/ physical factors/ sediment composition and accretion rates/ Washington/ coastal mountain ranges/ invertebrates
Abstract: We examined the effects of logging on macroinvertebrate assemblages in first-order streams of four coniferous watersheds in Washington's Coastal Mountain ranges. Each watershed contained three to four first-order streams that were placed into one of three treatment types: clear-cut logging, operational buffer-strip (2.5-21 m) logging, or uncut reference streams. Prelogging baseline data on macroinvertebrate assemblages, channel morphology, sediment composition, sediment accretion rates, and water temperatures were collected from each stream in summer 1998. Logging operations were conducted the next winter and spring. Streams were resampled in summer 1999, within 1 year of logging, and summer 2000, 1+ years after logging. Preexisting treatment differences did not exist in 1998, indicating that postharvest treatment differences could be attributed to logging operations. In 1999, densities of macroinvertebrate collectors, densities and biomass of macroinvertebrate shredders, and accretion rates of organic sediments were greater in clear-cut and buffered streams than uncut references. These differences diminished by 2000. An increase in collecting and shredding macroinvertebrate is not a typical response to logging and may reflect the fact that logged streams became buried under slash, increasing detrital food supplies for these organisms. The narrow buffers used for this study did not prevent macroinvertebrate community changes associated with logging.
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1487. **Management alternatives to enhance water quality and ecological function of channelized streams and drainage canals.**
Evans, R. O.; Bass, K. L.; Burchell, M. R.; Hinson, R. D.; Johnson, R.; and Doxey, M.
Journal of Soil and Water Conservation 62(4): 308-320. (July 2007-Aug. 2007)
NAL Call #: 56.8 J822
Descriptors: constructed wetlands/ floodplains/ drainage channels/ stream channels/ drainage water/ water management/ watershed hydrology/ water quality/ plant communities/ macroinvertebrates/ wildlife habitats/ ecological function/ best management practices/ BMPs/ North Carolina/ irrigation and drainage/ wildlife conservation
This citation is from AGRICOLA.

1488. **Managing the Columbia River: Instream flows, water withdrawals, and salmon survival.**
National Research Council, Water Science and Technology Board
Washington, DC: National Academy Press; 268 p. pp. (2004).
http://www.nap.edu/catalog.php?record_id=10962
Descriptors: anadromous species/ commercial fishing/ dams/ ecological effects/ environment management/ habitats/ hydrological regime/ instream flow/ man-induced effects/ nature conservation/ population dynamics/ rare species/ regulated rivers/ river basins/ river flow/ rivers/ salmon/ selective withdrawal/ stream flow/ survival/ water budget/ United States/ Columbia R.
Abstract: For thousands of years, North America's Columbia River salmon runs were the most abundant on Earth. The salmon evolved in a setting of many long- and short-term environmental changes and disruptions. With the introduction of an industrial-based economy to the region in the late nineteenth century, the scale and rate of environmental variability in the basin changed. The creation of impoundments on the Columbia River and its tributaries, dam operations, commercial fishing, logging, diversions for irrigated agriculture, and human population growth have altered the Columbia's presettlement flow regime and have reduced the quality of salmon habitat across the river basin.

There have been attendant declines--including some extinctions--in the populations of all resident salmon species. Many of these salmon are currently listed as threatened and endangered pursuant to the federal Endangered Species Act. Annual salmon and steelhead returns to the Columbia River estuary are estimated to have been as high as 16 million fish per year during the late 1800s. The returns have dwindled over time, dropping to near 1 million fish per year in the 1990s. These numbers rebounded in the late 1990s and early 2000s, largely because that time frame coincided with a period of favorable ocean condition for salmon. The majority of returns today consist of hatchery-reared fish.

1489. **Minimum habitat requirements for establishing translocated cutthroat trout populations.**
Harig, Amy L. and Fausch, Kurt D.
Ecological Applications 12(2): 535-551. (2002)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ abiotic factors/ land and freshwater zones/ Oncorhynchus clarki (Salmonidae): release and relocation programmes/ translocation/ minimum habitat requirements/ establishing populations/ habitat utilization/ streams/ abiotic factors/ Colorado/ New Mexico/ establishing translocated populations/ Salmonidae/ Salmoniformes, Actinopterygii, Pisces/ chordates/ fish/ vertebrates
Abstract: Translocation is an important management strategy in conservation programs for endangered or threatened species, including native cutthroat trout (Oncorhynchus clarki) in the western United States. Most subspecies of cutthroat trout have declined to <5% of their historical range, and both historical and translocated populations now persist in small isolated fragments of habitat. Success rates for translocations of fishes are generally <50%, and habitat quality or quantity are frequently cited as the cause of failure. Therefore, we conducted field surveys of stream-scale habitat and measured basin-scale habitat using a Geographic Information System for 27 streams where two subspecies of cutthroat trout were translocated in Colorado and New Mexico, to identify specific habitat attributes that contribute to the success of translocations. We used polytomous logistic regression to develop models that predict three categories of cutthroat trout translocation success (high, low, absent) from habitat attributes at two spatial scales. Models based on stream-scale habitat attributes indicated that cold summer water temperature, narrow stream width, and lack of deep pools limited translocations of cutthroat trout. Cold summer temperatures are known to delay spawning and prolong egg incubation, which reduces the growth of fry and likely limits their overwinter survival. Furthermore, small streams with few deep pools may lack the space necessary to permit overwinter survival of a sufficient number of individuals to sustain a population. Models based on basin-scale habitat were not as effective as stream-scale habitat models for distinguishing among translocation sites with high, low, or absent population status but indicated that a minimum watershed area of 14.7 km^2 was useful as a coarse filter for separating sites with high numbers of cutthroat trout from those with low or absent status. Watersheds larger than this are expected to encompass low-elevation habitat that provides warmer summer temperatures and to have relatively wide stream channels of sufficient length to provide an adequate number of deep pools. These results indicate that the appropriate scale of habitat measurement for predicting cutthroat trout translocation success in fragmented watersheds is at the patch rather than landscape scale, which is similar to results for other salmonids and vertebrate taxa in general.

1490. **Monitor and protect Wigwam River bull trout for Koocanusa Reservoir: Skookumchuck Creek juvenile bull trout and fish habitat monitoring program.**
Cope, R. S.
Portland, OR: Bonneville Power Administration; BPA Report DOE/BP 00005672-8, 2004. i-vii, 1-40.
Notes: 2002-2003 annual report, project no. 200000400; Related report: DOE/BP-00005672-5.
http://pisces.bpa.gov/release/documents/documentviewer.aspx?pub=R00005672-8.pdf
Descriptors: conservation/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Pisces: conservation measures/ habitat monitoring program/ annual research report/ stream/ British Columbia/ Skookumchuck Creek/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: The Skookumchuck Creek juvenile bull trout (Salvelinus confluentus) and fish habitat monitoring program is a co-operative initiative of the British Columbia Ministry of Water, Land, and Air Protection and Bonneville Power Administration. The objective was to develop a better understanding of juvenile bull trout and Westslope cutthroat trout recruitment and the ongoing hydrologic and morphologic processes, especially as they relate to spawning and rearing habitat quality. This report provides a summary of results obtained to date. In 2003, several minor modifications were made to the three Skookumchuck Creek index sites permanently established in 2002. Sites one and three were extended by 210 m and 100 m, respectively, and the bankfull height was lowered slightly for all three index sites. These changes resulted in a better fit among index sites between observed bankfull indicators, bankfull cross-sectional area, estimated bankfull discharge and estimated water velocity. However, the 2003 bankfull discharge estimates generated from the estimated cross-sectional area and "roughness" or mannings n were lower than return frequency estimates. This discrepancy was most likely due to a combination of; 1) the actual return frequency was lower than 1.5, and 2) bankfull elevation was under-estimated slightly. A fourth index site was permanently established in Sandown Creek in 2003. This site was added to represent juvenile rearing habitat, within a sub-basin that supports a major proportion of the current forest harvesting activity. Bull trout represented 49.6% of the juvenile catch in 2003. Although the percentage of the total catch was lower for bull trout in 2003, the total catch of bull trout fry was notably higher and this resulted in higher mean annual density estimates across all index sites. This was especially true for site three, where densities were significantly higher in 2003 (16.4 fish/100 m^2). Higher densities were attributed to improved survival based on the significantly larger size of fry in 2003, and the comparatively warm and dry winter and spring of 2002-2003. The decrease in catch composition of bull trout in 2003 was due to a corresponding increase in Westslope cutthroat trout

catch. Westslope cutthroat trout fry were captured exclusively in sites two and three (the bull trout spawning reaches). The capture of cutthroat trout fry in 2003 but not in 2002 was thought to represent an earlier date of emergence due to warmer water temperatures. Juveniles were captured in all sample sites, however, Sandown Creek captures represented 76.7% of all juvenile captures. The corresponding juvenile Westslope cutthroat trout density (4.62 fish/100 m^2) was the highest recorded in the bull trout and fish habitat monitoring program. In 2003, snorkel surveys were conducted on mainstem kookumchuck Creek index sites to target deep, mid-channel habitat that was not effectively sampled using existing electrofishing techniques. Sub-adult and adult Westslope cutthroat trout dominated this habitat. Densities were 3.1 and 3.2 fish/100 lineal m for sites one and three, respectively, while site two densities were 8.6 fish/100 lineal m. The very high densities of adult cutthroat trout within site two were attributed to habitat quality and in particular, the abundance of deep pool habitat. The range of morphological stream types for the mainstem Skookumchuck Creek encompass the stable and resilient spectrum (C3(1), C3). In general, Skookumchuck Creek can be characterized by stability and habitat heterogeneity. These reaches, with their high sinuosity, frequent deep pools, and high quality spawning and rearing habitat contain high densities of bull trout and Westslope cutthroat trout. Sandown Creek, in contrast, appears to be undergoing a successional evolution from an F4 stream type to a C4 stream type to accommodate changes or alterations to sediment supply. Disturbance indicators suggest increased sediment supply resulted in channel aggradation and infilling. The previously over-widened bed of the F4 stream type is now the elevation of the new floodplain for the C4 stream type, which gradually incises through the aggraded streambed. Although disturbed, Sandown Creek maintains high habitat value and the high juvenile Westslope cutthroat trout densities can be attributed to the high frequency of large woody debris (LWD) and associated LWD cover in pools. When compared to other bull trout and Westslope cutthroat trout systems, a strong case can be made that the Skookumchuck Creek bull trout and Westslope cutthroat trout represent a significant and stable population. The upper Skookumchuck Creek watershed remains relatively pristine, and maintains high water quality and high habitat capability. After eighty years of forest development and public access within the Skookumchuck Creek watershed, conservative forest harvesting levels that preserved the riparian ecosystem, and angling regulations designed to limit harvest, appear to have been successful in preventing habitat degradation or over-exploitation of the fishery.
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1491. **Monitoring the effectiveness of restoration works on walleye spawning beds and of the best management practices on a small dairy operation in eastern Ontario.**
Lavictoire, M.
In: 49th Annual Conference on Great Lakes Research: The Changing Environment of the Great Lakes. Windsor, Ontario; 2006.
Descriptors: best management practices/ BMPs/ density/ freshwater fish/ habitat improvement/ larvae/ monitoring/ nature conservation/ pollution monitoring/ rehabilitation/ restoration/ river basin management/ sampling/ spawning/ zoobenthos/ walleye/ British Isles, England, Cornwall/ Canada, Ontario, Raisin R./ North America, Great Lakes
Abstract: Although many groups are implementing restoration activities, relatively few are monitoring the effects of these works. Work is being conducted in eastern Ontario to assess the success of restoration activities. Walleye spawning bed rehabilitation was completed on the Raisin River and Hoople Creek. Monitoring of egg densities was completed between 1985 and 2003 on Raisin, and in 1985 and 2004 on Hoople. Larvae densities were compared between the two watercourses in 2005. The results showed a decrease in the egg densities on the Raisin and an increase on Hoople. The number of walleye larvae captured on Hoople was higher than that on the Raisin. This suggests that while rehabilitation on Hoople has been successful, the Raisin spawning beds remain impaired. The effectiveness of best management practices (BMPs) of cattle operations is currently being monitored on a tributary to the Beaudette River, Cornwall. Background data was gathered at 6 stations during summer/fall of 2005. This data included benthic macroinvertebrate and fish communities sampling, water quality, channel morphology and riparian characteristics. The BMPs were implemented in the fall/winter of 2005. Sampling of the six stations will continue for an additional 3 years to monitor the success of the rehabilitation projects.
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1492. **Natural wood recruitment versus stream habitat restoration: Habitat and wild trout responses in streams of the White Mountain National Forest.**
Prout, M. W. and Milot, G.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 155; 2003.
Descriptors: conservation/ biomass/ boulders/ channel aggradation/ channel scouring/ natural wood recruitment/ second growth forests/ species abundance/ stream habitat restoration/ stream morphology/ upland stream: habitat/ valley streams: habitat
© Thomson Reuters Scientific

1493. **The Newfoundland Small Stream Buffer Study Phase 1: Impacts of current forest harvesting practices on stream habitat and biota.**
Decker, R. C.; Scruton, D. A.; Meade, J. D.; Clarke, K. D.; and Cole, L. J.
Canadian Technical Report of Fisheries and Aquatic Sciences(2449): i-ix, 1-64. (2003); ISSN: 0706-6457
Descriptors: forestry/ freshwater ecology: ecology, environmental sciences/ wildlife management: conservation/ forest harvesting/ applied and field techniques/ Department of fisheries and Oceans, Canada/ Newfoundland small Stream Buffer Study, Phase 1/ community composition/ habitat characteristics/ sedimentation rate/ stream/ temperature
Abstract: The Newfoundland Small Stream Buffer Study Phase 1 was initiated and carried out by the Department of Fisheries and Oceans, Canada on the island of Newfoundland. Similar research was conducted in New Brunswick and British Columbia. The objective was to study the impacts of forest harvesting on salmonids and their habitat. Twelve stream reaches from 3 different watersheds subjected to forest harvesting were sampled during the summer of 2000. Salmonids studied were brook trout

(Salvelinus fontinalis) and Atlantic salmon (Salmo salar). Other variables measured during this study included sedimentation rates, temperature regime, benthic invertebrate community composition, riparian buffer composition, stream habitat characteristics, and large woody debris. These results were then analyzed and related to the different forestry treatments. These treatments included a control stream (no cuffing), treatment 1 stream reach (recent cutting, 20 m riparian buffer) and treatment 2 and treatment 3 (older cut areas, less than 20 m riparian buffer). In the control and treatment 1 reaches results from the sediment sampling, benthic invertebrate sampling, and temperature data were mixed. In one watershed forest harvesting did significantly increase the amount of sediment entering the treatment 1 reach while the other 2 watersheds did not yield any significant increase in sedimentation after cutting. Benthic invertebrates were significantly less abundant in treatment 1 reaches than in control stream reaches. Treatment 1 reach was significantly warmer than the control in one watershed while there was no significant difference in another watershed. Brook trout in treatment 1 reaches were larger than brook trout in control reaches while in treatment 2 and treatment 3 streams they were significantly smaller than those in control and treatment 1 stream reaches. Atlantic salmon size relationships were opposite to brook trout; the smallest salmon inhabiting control streams and the largest in streams impacted by older harvest events (treatment 3).

1494. **No-till improves stream ecosystem quality.**
Yates, A. G.; Bailey, R. C.; and Schwindt, J. A.
Journal of Soil and Water Conservation 61(1): 14-19. (2006)
NAL Call #: 56.8 J822
Descriptors: mu-basin/ benthic macroinvertebrates/ habitat/ no-till/ southern Ontario/ stream quality/ tillage systems/ water quality
Abstract: No-till cropping systems have become very common in North America over the past two decades. The effects of no-till on stream quality, however, have not been studied at watershed scales. We measured habitat and stream water quality and sampled the benthic macroinvertebrate community in 32 small (100 to 1400 ha, 247 to 3,460 ac) subwatersheds that exhibited a gradient of the proportion of land under no-till cropping systems to determine relationships between the use of no-till and stream quality. Increased use of no-till systems resulted in improvements in habitat and water quality and the benthic macroinvertebrate community. Based on these results we concluded that increased use of no-till cropping systems by farmers has a positive effect on the quality of streams in agroecosytems.

1495. **On debris flows, river networks, and the spatial structure of channel morphology.**
Bigelow, P. E.; Benda, L. E.; Miller, D. J.; and Burnett, K. M.
Forest Science 53(2): 220-238. (Apr. 2007)
NAL Call #: 99.8 F7632
Descriptors: streams/ stream channels/ landforms/ water erosion/ fish/ habitats/ spatial data/ dead wood/ landslides/ alluvium/ rivers/ classification/ sediment deposition/ watershed hydrology/ forested watersheds/ sediments/ drainage basins/ Oregon/ debris fans/ fish bearing streams/ stream classification/ debris deposition/ habitat typing/ natural resources, environment, general ecology, and wildlife conservation/ water resources and management/ pollution/ soil conservation/ forestry related
Abstract: We evaluated the morphological effects of debris flows from headwater streams in larger, fish-bearing channels of the central Oregon Coast Range, including their influence on fans, wood recruitment, and channel morphology. Continuous channel surveys (6.4 km) were conducted in third- through fifth-order streams (drainage area < 10 km^2 and slope <7%) where debris fan effects at confluences were most evident. This basin size contains the majority of channels (67%) in the central Coast Range with gradients that are used by coho salmon (Oncorhynchus kisutch Walbaum). The close spacing between headwater tributaries susceptible to debris flows (118 m average) resulted in long continuous sections of fish-bearing streams that were bordered by debris fans (103 m average) and debris fans impinging on 54% of the total channel length surveyed. Debris flows also supplied the majority of wood (58% of pieces) to the surveyed fish-bearing channels. The highest values of large wood, boulders, and channel gradients were associated with debris fans at confluences with headwater tributaries, while deeper sediment deposits were often associated with fans but also extended up and downstream from fans. The spacing and network pattern of debris flow-prone headwater tributaries influenced the spatial structure of channel morphology and aquatic habitats leading to a high degree of physical heterogeneity and patchiness in channel environments. Our study contributes to a growing emphasis on the role of tributary confluences in structuring channel morphology and aquatic habitats in mountain drainage basins and argues for including a confluence component to stream classification and habitat typing schemes.
This citation is from AGRICOLA.

1496. **Pesticides in stream sediment and aquatic biota: Distribution, trends, and governing factors.**
Nowell, L. H.; Capel, P. D.; and Dileanis, P. D.
Boca Raton, Florida: Lewis Publishers; 1001 p. (1999).
Notes: Includes bibliographical references (p. 867-946) and index.
NAL Call #: TD427.P35N68 1999; ISBN: 1566704693 .
Descriptors: Pesticides---Environmental aspects---United States/ Organochlorine compounds---Environmental aspects---United States/ Water---pollution---United States/ Contaminated sediments---United States/ Aquatic organisms, Effect of water pollution on---United States
This citation is from AGRICOLA.

1497. **PHABSIM analysis of a straight trapezoidal reach and a highly sinuous reach in a low-order agricultural stream in the Midwest.**
Tompkins, M. R. and Herricks, E.
Hydroecologie appliquee 14(1): 175-192. (2004)
Descriptors: channels/ fish/ fluvial morphology/ freshwater fish/ geomorphology/ habitat/ restoration/ river fisheries/ rivers/ simulation/ stream flow/ Pisces/
Unites States, Midwest
Abstract: The PHABSIM model (Physical HABitat SIMulation Model) was applied to adjacent straight trapezoidal and highly sinuous reaches in a third order agricultural drainage stream in East-Central Illinois. A 30 year flow record was used to generate weighted usable

area (WUA) estimates for six warmwater fish species for each reach. Supplementing PHABSIM analysis, detailed surveys provided planametric maps of each reach, and regular fish sampling both supported the selection of species modeled with PHABSIM and provided data for PHABSIM evaluation. Analysis of the 30-year WUA estimates supported the development of metrics for fish community analysis, and the analysis of selected fish species populations in each reach. Six monthly fish collections in each reach provided a basis for and a detailed description of the fish communities in each reach. Metrics developed for four of the six species modeled were positively related to the relative differences in numbers of fish present between the two reaches.

1498. **Physico-chemical and biological responses of streams to restoration of riparian pastures.**
Walsh, M. C.
University Park, PA: Penn State, 2002.
Notes: Degree: M.S.; Wildlife Coop. Unit Report
Descriptors: bottom characteristics/ disturbance/ fishes, freshwater/ grazing/ habitat changes invertebrates/ nitrogen/ population density erosion/ riparian habitat/ sedimentation/ shores and banks fences/ stream improvement/ streams/ temperature, environment phosphorus/ trout, brown/ water flow/ water, chemical properties/ water, physical properties/ Pennsylvania/ Centre County
Abstract: Objective was to quantify the effects of streambank fencing and stabilization in central Pennsylvania. Stream responses were measured across a spectrum of variables. Fish communities, macroinvertebrate communities, stream temperatures, channel morphology, substrate composition, and water quality were evaluated and compared to pre- restoration conditions. Study area was located within the Spring Creek watershed, which included three study basins: Spring Creek, Cedar Creek and Slab Cabin Run.

1499. **Potential trout population response to reduced riparian buffer widths in north Georgia.**
Jones, Krista L.; Poole, Geoffrey C.; Meyer, Judy L.; Bumback, William R.; and Kramer, Elizabeth A.
In: Proceedings of the 2005 Georgia Water Resources Conference. Athens, GA.; 2005.
Notes: Meeting abstract.
http://cms.ce.gatech.edu/gwri/uploads/proceedings/2005/JonesKristaL_GAWR2005_Abstract.pdf
Descriptors: aquatic habitat/ deforestation/ environmental effects/ fish populations/ freshwater fish/ population dynamics/ riparian land/ river basins/ streams/ trout/ water temperature/ Oncorhynchus mykiss/ Salmo trutta/ Georgia
Abstract: The Georgia State Legislature reduced the width of mandatory-forested riparian buffers along the State's trout streams from 100 ft to 50 ft in 2000. This research evaluated the potential response of trout populations to this reduction in buffer width by: 1) quantifying the relationships between riparian forest conditions, in-stream habitat, and young-of-the-year rainbow and brown trout (Oncorhynchus mykiss and Salmo trutta); 2) applying these quantified relationships at the stream segment and stream network scales to determine the efficacy of 50-ft buffers for protecting in-stream habitat; 3) examining existing forest conditions along the stream network; and 4) assessing the existing thermal alteration of trout streams. Stream temperatures were consistently and negatively related to percent riparian forest cover and elevation; in this study landscape, riparian forest cover overwhelms the influence of basin forest cover in determining stream temperature. Fine sediment in riffles was negatively related to percent riparian forest cover and maximum reach velocity. Biomass of young-of-the-year trout (< 150 mm in total length) was negatively related to stream temperature, riffle embeddedness, and maximum reach depth. When these relationships were applied at the stream segment scale, we found that reducing forested buffers from 100 ft to 50 ft would increase stream temperatures by 1.6 to 2.3 degree C, depending on summer weather conditions, and increase riffle embeddedness scores by 4.2 points across a range of maximum stream velocity. As a consequence of these seemingly small increases in stream temperature and riffle embeddedness, the biomass of young-of-the-year trout would be reduced by 81% to 88%, depending on elevation and summer weather conditions. Within the trout stream network, 63% of stream segments are likely to support reproducing trout populations with the presence of a 100-ft buffer; this percentage drops to 9% with a 50-ft buffer. These quantitative analyses at both the stream segment and trout stream network scales imply that a 50-ft buffer is not effective at maintaining the in-stream conditions necessary for self-sustaining trout populations. Due to existing disturbance of riparian forests, substantial alteration of the thermal conditions of trout streams has occurred along the trout stream network in North Georgia. Further deforestation of riparian areas will increase the warming of trout streams. The ability of Georgia's mountain streams to maintain self-sustaining trout populations is reduced because of the warmer stream temperatures and increased fine sediment delivery associated with a reduction in riparian buffer width to 50 ft.

1500. **Practices for livestock grazing and aquatic habitat protection on western rangelands.**
May, B. E. and Davis, B.
In: Proceedings of the Wildlife-Livestock Relationships Symposium. Coeur D'alene, Idaho. Peek, James M. and Dalke, P. D. (eds.)
Moscow, Idaho: Forest, Wildlife and Range Experiment Station, University of Idaho; pp. 271-278; 1982.
NAL Call #: SF84.84.W5 1981
Descriptors: wildlife/ livestock/ grazing/ aquatic habitat/ rangelands

1501. **A preliminary review of NOAA's community-based dam removal and fish passage projects.**
Lenhart, C. F.
Coastal Management 31(1): 79-98. (2003);
ISSN: 08920753
Descriptors: anadromous fish/ dam removal/ fish passage/ habitat restoration/ dams/ ecosystems/ environmental protection/ fisheries/ river basin projects/ stream ecosystem/ coastal zones/ dam/ fish/ fishpass structure/ habitat restoration/ river management/ Oncorhynchus
Abstract: Dams and other stream blockages prevent anadromous fish from accessing large areas of key habitat. The NOAA Community-Based Restoration Program (CRP) supports habitat restoration projects, including 53 dam

removal and fish passage projects from 1996 to 2002. This article provides a preliminary review of the biological benefits provided by the first 18 CRP dam removal and fish passage projects supported between 1996 and 1999. These 18 projects improved access to over 160 km of river habitat for many anadromous fish species, especially river herring (Alosa spp.) on the east coast and salmonids (Oncorhynchus spp.) on the west coast. While fish ladders provide targeted fish species access to key habitat areas, dam removal can improve the health of entire stream ecosystems and provide fish passage to fish species unable to utilize ladders. The CRP complements existing federal regulatory programs by providing a cooperative process at the local level that can restore habitats efficiently and effectively while encouraging long-term stewardship.

1502. **Preliminary study of the effects of headwater riparian reserves with upslope thinning on stream habitats and amphibians in western Oregon.**
Olson, Deanna H. and Rugger, Cynthia
Forest Science 53(2): 331-342. (2007)
NAL Call #: 99.8 F7632; ISSN: 0015-749X
Descriptors: commercial activities/ ecology/ population dynamics/ terrestrial habitat/ land zones/ Amphibia: forestry/ upslope thinning and headwater riparian reserves/ effect on riparian community structure and population density/ community structure/ forest stream riparian habitat/ effect of forestry practices/ population density/ forest and woodland/ stream riparian habitat/ effect of forestry practices on community structure and population density/ riparian habitat/ forest streams/ Oregon/ United States, western region/ forestry practices effect on riparian community structure and population density/ Amphibia/ amphibians/ chordates/ vertebrates
Abstract: We conducted a preliminary examination of the responses of stream amphibians and instream habitat conditions to alternative riparian buffer zones with forest thinning upslope. Pre and posttreatment surveys were carried out on 68 headwater stream reaches (including 23 unthinned reference reaches) at 11 sites in western Oregon. Streams were in managed conifer stands, 40 to 80 years old, where the thinning treatment reduced stands from 600 trees per hectare (tph) to 200 tph. Treatments consisted of four widths of riparian buffers approximately 6, 15, 70, and 145 m on each side of streams. Over three study years, 3,131 individuals of 13 species were detected. For the more common instream and bank species analyzed, capture rates persisted posttreatment with no negative treatment effect from thinning with any of the buffer widths. More animals were detected after thinning in treatment reaches compared to reference reaches for rough-skinned newts (Taricha granulosa Skilton) occurring on stream banks, and for instream coastal giant salamanders (Dicamptodon tenebrosus Baird and Girard). Treatment effects on instream habitat parameters were not detected. Interannual variation was evident for western red-backed salamanders (Plethodon vehiculum Cooper), and several habitat conditions including pool-riffle ratio, stream spatial intermittency, stream width, and down wood. Overall, riparian buffers with moderate upslope thinning (200 tph) seemed to have retained the aquatic vertebrate community along channels among sites in the first 2 years posttreatment; however, several limitations of the study reduce the inference of the findings, and these preliminary results are best interpreted as hypotheses for further investigation.

1503. **Production from wood duck nest boxes as a proportion of the harvest in Massachusetts.**
Heusmann, H. W.
Wildlife Society Bulletin 28(4): 1046-1049. (2000)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: Aix sponsa/ harvest/ Massachusetts/ nest box/ population/ wood duck/ habitat management/ nest/ productivity/ waterfowl/ Aix sponsa
Abstract: Many state wildlife agencies participate in habitat management practices to increase waterfowl populations, including the use of nest boxes. Measuring the result of such a program is often difficult. One way to assess the success is to measure production against harvest. The Massachusetts Division of Fisheries and Wildlife maintains more than 1,700 wood duck (Aix sponsa) nest boxes located throughout the state. More than half the boxes were used by wood ducks in 1998. I calculated that 4,300 wood ducks were fledged from state boxes compared to a state harvest of 5,500 wood ducks. When non-state boxes are considered, wood duck nest boxes in Massachusetts may produce as many wood ducks as are harvested in the state, or more. Large-scale nest box programs in appropriate areas can contribute substantially to fall populations.

1504. **Quantifying expected ecological response to natural resource legislation: A case study of riparian buffers, aquatic habitat, and trout populations.**
Jones, Krista L.; Poole, Geoffrey C.; Meyer, Judy L.; Bumback, William; and Kramer, Elizabeth A.
Ecology and Society 11(2): Unpaginated. (2006).
http://www.ecologyandsociety.org/vol11/iss2/art15/
Descriptors: commercial activities/ ecology/ population dynamics/ freshwater habitat/ lotic water/ land zones/ Salmoninae: forestry/ logging of riparian buffer zones/ 15-meter river buffer/ prediction/ biomass/ abundance/ model/ biomass/ population size/ river/ Georgia/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: Regulations governing the management of streamside vegetation (riparian buffers) lie at a nexus between environmental, social, and land development interests, and can yield especially contentious debates among stakeholders. In 2001, the State Legislature of Georgia, USA, took up this debate; the Legislature reduced the minimum width of mandatory-forested riparian buffers along designated trout streams from≃30 m (100 ft) to≃15 m (50 ft), and commissioned this study to assess the expected response of existing trout populations. Because our research was designed to provide rigorous and accessible data for informing this management debate, this research may serve as a general template for other studies designed to inform regulatory and management decisions. We established and quantified relationships among riparian forests, aquatic habitat (stream temperature and riffle embeddedness), and trout reproductive success (biomass of young trout). We used these relationships to determine the expected impacts of the buffer width reduction on aquatic habitat and trout reproductive success at the

stream segment and stream network scales, and assessed associated uncertainty. When compared with stream segments having 30-m wide buffers, our analysis indicated that individual stream segments with 15-m wide buffers have: 1) higher peak temperatures (average peak stream temperatures during the warmest week of the year increase by ≃2.0 ± 0.3°C, depending on summertime climate conditions); and 2) more fine sediments (fines in riffle habitats increase by approximately 25% of the observed inter-study-site range). The data show that trout populations will respond markedly to these habitat changes. Linear regression models and an associated Monte Carlo uncertainty assessment document an expected 87% reduction in young trout biomass, with a 95% confidence interval ranging from a 66% reduction to a 97% reduction. A landscape assessment showed that 63% of Georgia's 2nd- to 5th-order trout stream segments could maintain stream temperatures likely (>50% probability) to support young trout in streams bordered by 30-m wide forested riparian buffers. Less than 9% of those streams (only those at the highest elevations) would maintain such temperatures with 15-m wide riparian buffers. As young trout are indicative of trout reproductive success, our results portend substantial reductions or elimination of trout populations in northern Georgia streams where vegetated riparian buffer widths are reduced to 15 m.

1505. **Rangeland grazing as a source of steroid hormones to surface waters.**
Kolodziej, E. P. and Sedlak, D. L.
Environmental Science and Technology 41(10): 3514-3520. (2007); ISSN: 0013936X.
Notes: doi: 10.1021/es063050y.
Descriptors: androgen/ estrogen/ gestagen/ water/ water pollutant/ androgens/ estrogens/ progestins/ water/ water pollutants, chemical
Abstract: Cattle and other livestock excrete endogenous steroid hormones, including estrogens, androgens, and progestins; therefore, allowing grazing livestock direct access to surface waters can result in the release of steroids in agricultural watersheds. Elevated concentrations of steroids are problematic because low concentrations of certain steroids can affect fish reproduction. To assess the occurrence and transport of steroids arising from grazing cattle, gas chromatography-tandem mass spectrometry (GC/MS/MS) was used to quantify a suite of estrogens, androgens, and progestins in small creeks impacted by rangeland grazing. Steroids were detected in 86% of samples from rangeland creeks where cattle had direct access to the water, with concentrations as high as 44 ng/L observed shortly after rain events at the beginning of the winter wet season. Estrogens were present at concentrations above the predicted no-effect concentrations for fish in 10-20% of the samples, and androstenedione was detected at concentrations higher than response thresholds for pheromonal communication in fish. The results suggest that, in certain cases, measures such as stream fencing in rangeland areas to limit direct discharge of animal wastes to surface waters or better manure management practices might be merited to protect ecosystem health.

1506. **Reach- and catchment-scale determinants of the distribution of freshwater mussels (Bivalvia: Unionidae) in south-eastern Michigan, U.S.A.**
Mcrae, S. E.; Allan, J. D.; and Burch, J. B.
Freshwater Biology 49(2): 127-142. (2004); ISSN: 00465070
Descriptors: catchment/ freshwater mussels/ habitat/ land-use/ Unionidae/ agricultural catchment/ bivalve/ channel morphology/ freshwater environment/ relative abundance/ spatial distribution/ species richness/ streamflow/ water quality/ Michigan/ Raisin River/ Bivalvia/ Unionidae
Abstract: 1. We investigated the diversity and distribution of freshwater mussels at 40 sites in an agricultural catchment, the River Raisin in south-eastern Michigan, to relate mussel assemblages and individual taxa to reach and catchment-scale variables. Unionids were surveyed by timed searches in 100-m reaches, and in-stream and riparian habitat were quantified as well as flow, water chemistry and channel morphology. Land use/cover and surficial geology were determined for site subcatchments and riparian buffers. 2. Some 21 mussel species were found overall; richness ranged from 0 to 12 living species per site. From the upper to middle to lower catchment, the number of individuals, number of species, Shannon-Weaver diversity and relative abundance of intolerant unionids all declined significantly. 3. Four groupings based on overall mussel diversity and abundance were significantly related to reach-scale habitat variables. The richest mussel assemblages were associated with sites with higher overall habitat quality, greater flow stability, less fine substratum, and lower specific conductance. 4. Stepwise multiple regressions revealed that the distribution and abundance of the total mussel assemblage, as well as the most common species, could be predicted from a combination of reach- and catchment-scale variables (R^2 = 0.63 for total mussels, R^2 = 0.51-0.86 for individual species). 5. Flow stability, substratum composition and overall reach habitat quality were the most commonly identified reach-scale variables, and measures of surficial geology were the most effective catchment-scale variables. The spatial pattern of geology is likely to be responsible for the diversity gradient from the upper to the lower catchment. 6. Prior studies, attempting to explain mussel distributions from local habitat features alone, have found relatively weak relationships. By employing a combination of reach- and catchment-scale habitat variables, this study was able to account for a substantial amount of the spatial variability in mussel distributions.

1507. **Reach-scale effects of riparian forest cover on urban stream ecosystems.**
Roy, Allison H.; Faust, Christina L.; Freeman, Mary C.; and Meyer, Judith L.
Canadian Journal of Fisheries and Aquatic Science 62(10): 2312-2329. (Oct. 2005)
NAL Call #: 442.9 C16J
Descriptors: aquatic habitat/ biomass/ forest canopy/ catchment areas/ chlorophyll a/ density/ ecosystems/ fisheries/ foods/ hardwood/ invertebrates/ macroinvertebrates/ particle size/ protection/ salamanders/ standing crops/ streams/ water column/ Campostoma oligolepis/ Caudata/ Georgia
Abstract: We compared habitat and biota between paired open and forested reaches within five small streams (basin

area 10-20 km^2) in suburban catchments (9%- 49% urban land cover) in the Piedmont of Georgia, USA. Stream reaches with open canopies were narrower than forested reaches (4.1 versus 5.0 m, respectively). There were no differences in habitat diversity (variation in velocity, depth, or bed particle size) between open and forested reaches. However, absence of local forest cover corresponded to decreased large wood and increased algal chlorophyll a standing crop biomass. These differences in basal food resources translated into higher densities of fishes in open (9.0 individuals $\cdot m^{-2}$) versus forested (4.9 individuals $\cdot m^{-2}$) reaches, primarily attributed to higher densities of the herbivore Campostoma oligolepis. Densities of terrestrial invertebrate inputs were higher in open reaches; however, trends suggested higher biomass of terrestrial inputs in forested reaches and a corresponding higher density of terrestrial prey consumed by water column feeding fishes. Reach-scale biotic integrity (macroinvertebrates, salamanders, and fishes) was largely unaffected by differences in canopy cover. In urbanizing areas where catchment land cover drives habitat and biotic quality, management practices that rely exclusively on forested riparian areas for stream protection are unlikely to be effective at maintaining ecosystem integrity.

1508. **Recovery of prairie fish assemblages at the transition from channelized to nonchannelized: Implications for conservation of natural channels.**
Vokoun, Jason C. and Rabeni, Charles F.
Natural Areas Journal 23(4): 349-355. (2003)
NAL Call #: QH76.N37; ISSN: 0885-8608
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ Pisces: disturbance by man/ stream channelization/ habitat management/ community structure/ Missouri/ Central Dissected Till Plains/ Pisces/ chordates/ fish/ vertebrates
Abstract: Fish assemblages were systematically sampled along the transition from channelized to unchannelized reaches in seven streams in northern Missouri, USA. Streams ranged in size from 4th to 8th order and were located in the Central Dissected Till Plains including the Grand, Chariton, Salt, and Fabius watersheds. Maximum species richness was reached 3-5 km downstream from the end of channelization. A limited core group of 10 species was present at most of the sites (channelized and unchannelized locations), and a diverse group of 45 species was present at relatively few sites (rarely channelized locations). The core group consisted largely of tolerant, omnivorous species and contained no top carnivores. The 45-species diverse group included a greater proportion of intolerant, benthic invertivorous, lithophilous, and carnivorous species. The effect of channelization extended well into unchannelized reaches and should be considered by conservation planners.

1509. **A reference-based framework for evaluating the ecological condition of stream networks in small watersheds.**
Rheinhardt, Richard D.; Brinson, Mark M.; Christian, Robert R.; Miller, Kevin H.; and Meyer, Greg F.
Wetlands 27(3): 524-542. (2007)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: assessment/ coastal plain/ restoration/ functions/ indicators/ riparian/ reference framework/ North Carolina
Abstract: Nine field indicators were identified for evaluating the hydrologic, biogeochemical, and/or habitat functioning of stream channels, riparian zones, or both. We ranked condition from "relatively unaltered" to "severely altered" for each of the identified indicators based on the range of conditions actually encountered among reference sites in the Coastal Plain of North Carolina, USA. The rankings provided a framework for developing a narrative used for scoring condition of the indicators at the scale of a reach (100-m-long x 60-m-wide segment). Reach condition was then derived by aggregating indicator scores, which were weighted by the number of functions with which each indicator was affiliated. Watershed-scale assessments were conducted by sampling randomly chosen first- to fourthorder reaches within stream networks at the density of approximately one 100-m reach per 1.0 km^2 of watershed drainage area. We used the association between indicators and hydrologic, biogeochemical, and habitat functions to obtain aggregated, weighted scores for channel and riparian zone condition. We used both aggregated network scores and mean indicator scores to compare condition among stream networks. At a reach scale, scores of indicators suggest strategies for restoration. At the watershed scale, aggregate scores showed differences among stream networks that could be used to prioritize restoration efforts and monitor change over time.

1510. **Regeneration of native trees and wetlands: Results of an unplanned, twenty year experiment in the Colorado River Delta, Mexico.**
Nagler, P. L. and Glenn, E. P.
2007 AGU Joint Assembly Proceedings (2007).
Notes: Invited poster presentation; Presented at 2007 AGU Joint Assembly on 22-25 May 2007 in Acapulco, Mexico.
Descriptors: wetlands/ habitat restoration/ cottonwood/ willow/ avian habitat
Abstract: Historically, cottonwood and willow trees were common on the Lower Colorado River, although quantitative estimates of their former abundance are not available. During the past hundred years, dams and flow regulation have altered the riparian habitat to favor dominance by exotic saltcedar and other salt- tolerant shrubs over the floodplain. It is widely assumed that, once established, saltcedar competitively excludes native trees, and that removal of saltcedar will be necessary as part of restoration programs. We studied the regeneration of cottonwood and willow trees in the presence of saltcedar in the delta of the Colorado River in Mexico from 1992 to 2002 in response to flood releases from the U.S. Flood releases of 50 cms to 750 cms in El Nino years of 1993, 1997-1998 and 2000 each germinated cohorts of trees amidst saltcedar stands and in bare soil scoured by the floods. During their establishment year, these trees rooted into the shallow aquifer under the river channel, and became dominant age classes of trees in subsequent years. Low-volume administrative spills (water ordered by irrigators but not used) provided a nearly perennial run of water in the river in non-flood years. The large and small flows created a rich avian habitat, containing backwaters, marsh areas, and a multi-stored canopy of native trees, saltcedar and

other shrubs. Bird density and diversity in this river stretch are higher than has been reported anywhere else on the Lower Colorado River. The acreage of cottonwood and willow trees in the delta might be as high today as was reported in a 1904 timber survey before the era of dams and agriculture. The main threats to the ecosystem are fires, many deliberately set, timber harvesting, and vegetation clearing projects. Although surface flows are needed to wash salts from the riverbanks, germinate seeds, and enhance avian habitat, the main water source for the trees is the regional aquifer maintained by irrigation of the surrounding agricultural fields in the valley. In this agro-ecosystem, riparian and wetland habitats benefit greatly from agricultural inefficiencies and the vagaries of climate related to El Nino cycles.

1511. **Relation between fish communities and riparian zone conditions at two spatial scales.**
Lee, K. E.; Goldstein, R. M.; and Hanson, P. E.
Journal of the American Water Resources Association 37(6): 1465-1474. (Dec. 2001)
NAL Call #: GB651.W315
Descriptors: abiotic factors/ agricultural watersheds/ agriculture/ catchment areas/ community composition/ comparison studies/ ecological effects/ ecology/ ecosystems/ environment management/ fish populations/ freshwater fish/ habitat improvement/ population structure/ riparian vegetation/ riparian environments/ riparian zone/ river basins/ spatial distribution/ species diversity/ species diversity/ streams/ streams (in natural channels)/ vegetation cover/ water management/ water quality (natural waters)/ watershed management/ watersheds/ Minnesota/ Minnesota River
Abstract: The relation of fish community composition to riparian cover at two spatial scales was compared at 18 streams in the agricultural Minnesota River Basin. The two spatial scales were: (1) local riparian zone (a 200 meter wide buffer extending 2 to 3 kilometers upstream of the sampling reach); and (2) the upstream riparian zone (a 200 m wide buffer on the mainstem and all perennial tributaries upstream of the sampling reach). Analysis of variance indicated that streams with wooded-local riparian zones had greater fish species richness (means = 20 and 15, respectively) and Index of Biotic Integrity (IBI) scores (means = 40 and 26, respectively) than streams with open-local riparian zones. Streams with wooded-upstream riparian zones tended (were not statistically significant) to have greater numbers of species (means = 19 and 15, respectively) and IBI scores (means = 33 and 28, respectively) than streams with open-upstream riparian zones. There was no significant interaction between the riparian zone conditions at the two scales. This study suggests that maintenance of wooded riparian cover along streams could be effective in maintaining or improving fish community composition in streams draining heavily agricultural areas.

1512. **Relation of desert pupfish abundance to selected environmental variables in natural and manmade habitats in the Salton Sea Basin.**
Martin, B. A. and Saiki, M. K.
Environmental Biology of Fishes 73(1): 97-107. (2005)
Descriptors: abundance/ community composition/ dissolved oxygen/ drainage water/ ecological distribution/ environmental effects/ environmental factors/ grain size/ habitat/ introduced species/ man-induced effects/ nature conservation/ predators/ rare species/ salinity effects/ sediment texture/ water quality/ Cyprinodon latifasciatus/ Cyprinodon macularius/ Salton Sea/ California
Abstract: The relation between abundance of desert pupfish, Cyprinodon macularius, and selected biological and physicochemical variables in natural and manmade habitats within the Salton Sea Basin were assessed. Field sampling in a natural tributary, Salt Creek, and three agricultural drains captured eight species including pupfish (1.1% of the total catch), the only native species encountered. According to Bray-Curtis resemblance functions, fish species assemblages differed mostly between Salt Creek and the drains (i.e., the three drains had relatively similar species assemblages). Pupfish numbers and environmental variables varied among sites and sample periods. Canonical correlation showed that pupfish abundance was positively correlated with abundance of western mosquitofish, Gambusia affinis, and negatively correlated with abundance of porthole livebearers, Poeciliopsis gracilis, tilapias (Sarotherodon mossambica and Tilapia zillii), longjaw mudsuckers, Gillichthys mirabilis, and mollies (Poecilia latipinna and Poecilia mexicana). In addition, pupfish abundance was positively correlated with cover, pH, and salinity, and negatively correlated with sediment factor (a measure of sediment grain size) and dissolved oxygen. Pupfish abundance was generally highest in habitats where water quality extremes (especially high pH and salinity, and low dissolved oxygen) seemingly limited the occurrence of nonnative fishes. This study also documented evidence of predation by mudsuckers on pupfish. These findings support the contention of many resource managers that pupfish populations are adversely influenced by ecological interactions with nonnative fishes.

1513. **Relation of instream habitat and physical conditions to fish communities of agricultural streams in the northern Midwest.**
Talmage, Philip J.; Perry, James A.; and Goldstein, Robert M.
North American Journal of Fisheries Management 22(3): 825-833. (2002)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ abiotic factors/ land zones/ Pisces: habitat management/ stream restoration/ instream habitat and physical conditions/ importance/ Minnesota and North Dakota/ community structure/ instream habitat and physical influences/ stream/ agricultural streams/ environmental influences/ physical factors/ community structure correlations/ Minnesota/ Minnesota River basin and Red River/ North Dakota/ Red River/ Pisces/ chordates/ fish/ vertebrates
Abstract: Fish, instream habitat, and physical stream conditions were surveyed in 29 agricultural streams in the

Red River of the North basin during summer 1994 and the Minnesota River basin during summer 1997. Our goal was to determine which instream habitat and physical conditions should be considered for stream restoration. Principle components analysis identified six axes that explained 79% of the total variability in instream habitat and physical conditions. Percent run, percent boulder, percent woody debris, percent overhanging vegetation, percent sand, and frequency of erosion were the variables best associated with these axes. Multiple linear regression analysis of the instream habitat and physical conditions explained 14-50% of the variability in fish community composition. Managers of agricultural warmwater streams in the northern Midwest should emphasize these six instream habitat and physical conditions, and the factors that influence them, during stream restoration.

1514. **Relation of riparian buffer strips to in-stream habitat, macroinvertebrates and fish in a small Iowa stream.**
Isenhart, Thomas M.
Journal of the Iowa Academy of Science 113(1-2): 49-55. (2006)
NAL Call #: Q11.J68; ISSN: 0896-8381
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ Macroinvertebrata/ Pisces: habitat management/ riparian buffer strips/ stream community structure effects/ community structure/ effect of riparian buffer strips/ stream/ Iowa/ Bear Creek/ Pisces/ chordates/ fish/ invertebrates/ vertebrates
Abstract: Macroinvertebrate and fish habitat is often degraded as a result of agriculture. Riparian buffer strips are commonly used to counteract the negative effects of agriculture in headwater streams. We assessed the relation of multi-aged riparian buffer strips to in-stream habitat, macroinvertebrate and fish assemblages in an Iowa stream. In-stream habitat, macroinvertebrates, and fish were sampled from two buffered sites and two unbuffered sites, with the greatest substrate, water depth, and velocity heterogeneity occurring in buffered sites. The highest macroinvertebrate richness (11) as well as fish species richness (14), diversity (1.99) and IBI score (37) were found in the site buffered the longest. Habitat heterogeneity and fish community richness and diversity were greater in buffered sites than unbuffered sites making them possible indicators with which short-term stream recovery can be measured.

1515. **Relations between biotic integrity and physical habitat in the Embarras River Basin, Illinois.**
Holtrop, A. M. and Fischer, R. U.
Journal of Freshwater Ecology 17(3): 475-483. (2002)
NAL Call #: QH541.5.F7J68; ISSN: 02705060
Descriptors: habitat quality/ index method/ species richness/ stream/ water quality/ habitat quality/ organismal community/ river basin/ United States
Abstract: This study investigated the relationship between a habitat quality index and stream fish assessment indices used to evaluate stream quality in an agricultural setting. Fish data and stream habitat quality data were collected from 13 sampling localities within the Embarras River basin. Habitat quality was measured using a stream habitat assessment procedure, a qualitative index comprised of 15 metrics. Stream quality was determined by fish species richness and an index of biotic integrity (IBI). Multiple regression analysis identified pool quality, bank vegetation, and width-to-depth ratio as the best estimators of IBI. These variables were used in creating a model for predicting IBI. This model demonstrates the potential for predicting the biotic integrity of a stream fish community from commonly collected, and often readily available, habitat data. Thus, models which use habitat information may be an important management tool which will allow for the rapid prediction of the biotic integrity of a stream, and thus permit intensive management practices to be focused on critical sites within a stream basin.

1516. **Relationship between landuse and stream conditions in the Karsted Upper Green River watershed of Kentucky.**
Meier, Ouida W.; Meier, Albert J.; and Grubbs, Scott
Ecological Society of America Annual Meeting, Proceedings 88 (2003)
NAL Call #: QH540.E365.
Notes: 88th Annual Meeting of the Ecological Society of America held jointly with the International Society for Ecological Modeling - North American Chapter, Savannah, Georgia, USA; August 03-08, 2003.
Descriptors: biodiversity/ conservation/ freshwater ecology: ecology, environmental sciences/ geographic information system/ GIS, applied and field techniques/ Conservation Reserve Enhancement Program [CREP]/ USDA/ aquatic ecosystems/ aquatic faunal community/ cropland/ habitat parameters/ karsted upper watershed/ land use/ pasture/ riparian buffers/ river basin/ stream conditions/ total suspended solids/ turbidity/ waste contamination/ water quality

1517. **Relationship of riparian buffer type to water temperature in the driftless area ecoregion of Minnesota.**
Blann, Kristen; Nerbonne, Julia Frost; and Vondracek, Bruce
North American Journal of Fisheries Management 22(2): 441-451. (2002)
NAL Call #: SH219.N66; ISSN: 0275-5947
Descriptors: conservation measures/ habitat/ freshwater habitat/ lotic water/ abiotic factors/ physical factors/ land zones/ Salvelinus fontinalis: habitat management/ riparian buffer type management/ water temperature relations/ reintroduction implications/ release and relocation programs/ reintroduction/ stream/ temperature/ Minnesota/ Goodhue County/ Wells Creek/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: We used the U.S. Fish and Wildlife Service's Stream Network Temperature Model to examine the role of riparian buffer type in mediating summer water temperatures for the reintroduction of brook trout Salvelinus fontinalis into Wells Creek, a tributary to the Mississippi River located in southeastern Minnesota. Stream temperatures measured from 23 July to 3 September 1997 were used to calibrate the model, evaluate existing temperatures, generate simulations for different shade conditions and channel morphologies, and generate simulations for "average" and "warm" summers (we define

a warm summer as one that is 2.8°C above the 30-year mean). The simulations indicated that successional buffers (grasses and forbs) provided as much shade as wooded buffers in streams with a width less than 2.5 m. With a low width:depth ratio, the successional buffer vegetation mediated mean temperature as well as the wooded buffer when discharge was held constant. At a discharge characteristic of our study reach, the mean temperature would be about the same along a successional buffer as in a wooded buffer if the wooded vegetation also led to widening of the stream channel. However, wooded buffers had a significantly higher percentage of shade than grazed or successional buffers. In general, temperatures in an average year decreased along the wooded reaches and increased slightly along the successional and grazed buffer areas. The differences in measured weekly mean maximum temperatures may be as great as 2.5°C across riparian buffer types. Maximum temperatures across all riparian types would be higher during warmer than average years, even with 50% shade along the stream. Shade provided by successional and woody vegetation may serve to moderate maximum temperatures and may be sufficient for the reintroduction of brook trout if other conditions improve.

1518. **Relationship of wooded riparian zones and runoff potential to fish community composition in agricultural systems.**
Stauffer, J. C.; Goldstein, R. M.; and Newman, R. M.
Canadian Journal of Fisheries and Aquatic Science 57: 307-316. (2000)
NAL Call #: 442.9 C16J.
http://article.pubs.nrccnrc.gc.ca/RPAS/RPViewDoc?_handler_=HandleInitialGet&calyLang=eng&journal=cjfas&volume=57&articleFile=f99-197.pdf
Descriptors: fish community composition/ forested buffers/ riparian zones/ biodiversity/ agricultural runoff
Abstract: The relationship of fish community composition to riparian cover and runoff potential was investigated in 20 streams in the agricultural Minnesota River Basin during the summer of 1997. Analysis of variance indicated significant differences in fish community composition due to both riparian cover (wooded versus open) and runoff potential (high or low). Streams with wooded riparian zones had higher index of biological integrity (IBI) scores, species richness, diversity, and percentages of benthic insectivores and herbivores than streams with open riparian zones. Streams with low runoff potential had higher IBI scores and species richness than streams with high runoff potential. The riparian cover and runoff potential interaction was marginally significant with respect to IBI scores and species richness, suggesting a weak interaction between the two factors. Although both factors were important, riparian cover influenced fish community composition more than runoff potential in these streams, indicating that local factors (close to the stream) dominated landscape- or basin-level factors. [Authors]

1519. **Relationships between land use and stream ecosystems: A multistream assessment in southwestern Michigan.**
Moerke, A. H. and Lamberti, G. A.
In: American Fisheries Society Symposium: Landscape Influences on Stream Habitats and Biological Assemblages.; Vol. 48.; 323-338; 2006.
Descriptors: agricultural runoff/ aquatic habitat/ assessments/ catchment area/ ecosystems/ fish populations/ freshwater fish/ geographical distribution/ land use/ land use/ population density/ riparian land/ stream pollution/ streams/ urbanization/ water quality/ water quality/ Pisces/ Michigan, Kalamazoo
Abstract: Ecologists recognize that surrounding land use can influence the structure and function of aquatic ecosystems, but few studies have explicitly examined the relative effects of different types of land use on stream ecosystems. We quantified the relationships between different land uses (forested, urban, agricultural with or without riparian buffers) and stream physicochemical variables and resident fish assemblages in 21 southwestern Michigan streams. These streams were located within a single basin (Kalamazoo River) and ecoregion to minimize differences in natural landscape conditions. Streams responded to a gradient of land use, with forested streams having the least degraded water quality, physical habitat, and fish assemblages, and agricultural streams lacking buffers being the most degraded. Urban and agricultural streams with buffers displayed characteristics intermediate to forested and agricultural streams lacking buffers. In general, habitat complexity and water quality declined across this land-use gradient from forested to agricultural streams, whereas fish density, richness, and dominance by tolerant species increased along the land-use gradient. Although urban streams had lower percentages of altered land use (i.e., <40% urban) in their catchments compared to agricultural streams (i.e., >50% agriculture), both land uses appeared to have similar detrimental effects on streams suggesting higher per unit area impacts of urbanization on streams. The presence of forested riparian buffers along agricultural streams increased the complexity of instream habitat, but resulted in few benefits to fish assemblages, suggesting that stream water quality in altered landscapes may be constraining fish assemblages more than physical habitat.

1520. **The residence time of large woody debris in the Queets River, Washington, USA.**
Hyatt, Timothy L. and Naiman, Robert J.
Ecological Applications 11(1): 191-202. (2001)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: conservation measures/ ecology/ habitat utilization/ habitat/ freshwater habitat/ lotic water/ land and freshwater zones/ Salmonidae: habitat management/ instream large woody debris/ residence time significance/ habitat preference/ habitat suitability/ river/ Washington/ Olympic Mountains/ Queets River/ residence time/ habitat enhancement effects/ Salmonidae/ Salmoniformes, Actinopterygii, Pisces/ chordates/ fish/ vertebrates
Abstract: Instream large woody debris (LWD) provides several critical functions in riverine ecosystems, including sediment and nutrient retention, salmonid habitat enhancement, and stable colonization sites for incipient floodplain vegetation. In this study, the size and species

composition of LWD in the Queets River, Washington, USA, were examined and compared with the size and species composition of forest trees from which they originated, in order to determine a depletion rate for LWD in the active channel. Increment cores from instream LWD were crossdated against cores from riparian conifers to estimate the year each LWD piece was recruited to the river channel. Debris pieces that were decayed or otherwise incompetent to provide cores were dated using standard 14C techniques. Hardwood species (Alnus rubra, Populus trichocarpa, and Acer macrophyllum) were better represented among riparian forests than among instream LWD, and conifers (Picea sitchensis, Tsuga heterophylla, Pseudotsuga menziesii, and Thuja plicata) were better represented among LWD than in the adjacent riparian forest, suggesting that hardwoods were depleted from the channel faster than conifers. The depletion rate of coniferous LWD from the channel followed an exponential decay curve in which 80% of LWD pieces were <50 yr old, although some pieces have remained for up to 1400 yr. Although most wood is depleted from the channel within 50 yr, some wood is apparently buried in the floodplain and exhumed centuries later by lateral channel migration. The calculated depletion constant of 0.030 is equivalent to a half-life of ≃20 yr, meaning that virtually all of the wood will have disappeared within 50 yr. This rapid depletion suggests that harvesting large conifers from the riparian zones of large streams could have adverse impacts within three to five decades.

1521. **Response of fish communities to cropland density and natural environmental setting in the Eastern Highland Rim Ecoregion of the lower Tennessee River Basin, Alabama and Tennessee, 1999.**
Powell, Jeffrey R. U. S. Geological Survey; Water Resources Investigations report: WRI 02-4268, 2003. 48 p.
http://pubs.usgs.gov/wri/wri024268/pdf/wri024268.pdf
Descriptors: agriculture/ Alabama/ bacteria/ Chordata/ coliform bacteria/ dissolved materials/ dissolved oxygen/ drainage basins/ Eastern Highland Rim Ecoregion/ ecology/ environmental effects/ land cover/ land use/ nutrients/ oxygen/ pH/ Pisces/ principal components analysis/ species diversity/ statistical analysis/ streams/ surface water/ Tennessee/ Tennessee River/ United States/ USGS/ Vertebrata/ water quality

1522. **Response of leaf retention to in-stream restoration: A measure of stream processes in assessing habitat management success.**
Huusko, A.; Maki, Petays A.; Vehanen, T; and Kotamaa, J
Proceedings, American Fisheries Society Annual Meeting 133: 331-332. (2003).
Notes: Conference: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.
Descriptors: forestry/ freshwater ecology: ecology, environmental sciences/ wildlife management: conservation/ community diversity/ ecosystem productivity/ fish production/ habitat management success/ habitat responses/ headwater streams/ in stream restoration/ leaf retention/ log drives/ physical habitat structure/ rapids sections/ restoration projects/ restoration success/ stream channel structure/ stream enhancement/ stream processes

1523. **Response of unionid mussels to dam removal in Koshkonong Creek, Wisconsin (USA).**
Sethi, S. A.; Selle, A. R.; Doyle, M. W.; Stanley, E. H.; and Kitchel, H. E.
Hydrobiologia 525: 157-165. (2004)
NAL Call #: 410 H992; ISSN: 0018-8158
Descriptors: dams/ mortality/ population density/ removal/ reservoirs/ sand/ sediment/ silt/ mussels
Abstract: Dam removal is a potentially powerful tool for restoring riverine habitats and communities. However, the effectiveness of this tool is unknown because published data on the effects of dam removal on in-stream biota are lacking. We investigated the effects of a small dam removal on unionid mussels in Koshkonong Creek, Wisconsin (USA). Removal of the dam led to mortality both within the former impoundment and in downstream reaches. Within the former reservoir, mortality rates were extremely high (95%) due to desiccation and exposure. Mussel densities in a bed 0.5 km downstream from the dam declined from 3.80 ± 0.56 mussels m^{-2} in fall 2000 immediately after dam removal to 2.60 ± 0.48 mussels m^{-2} by summer 2003. One rare species, Quadrula pustulosa, was lost from community. Mortality of mussels buried in deposited silt was also observed at a site 1.7 km below the dam. Silt and sand increased from 16.8 and 1.1% of total area sampled in fall 2000 to 30.4 and 15.9%, respectively, in summer 2003. Total suspended sediment concentrations in the water column were always higher downstream from the reservoir than upstream, suggesting that transport and deposition of reservoir sediments likely contributed to downstream mussel mortality. Thus, while benefits of the dam removal included fish passage and restoration of lotic habitats in the former millpond, these changes were brought about at some cost to the local mussel community. Pre-removal assessments of potential ecological impacts of dam removal and appropriate mitigation efforts should be included in the dam removal process to reduce short-term negative ecological effects of this restoration action.

1524. **Responses of organic matter and macroinvertebrates to placements of boulder clusters in a small stream of southwestern British Columbia, Canada.**
Negishi, Junjiro N. and Richardson, John S.
Canadian Journal of Fisheries and Aquatic Science 60(3): 247-258. (2003)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ North America/ Canada/ Macroinvertebrata: habitat management/ Boulder cluster placement/ effect on organic matter retention and community structure/ community structure/ effect of boulder cluster placement/ stream/ British Columbia/ Coast Range Mountains/ Spring Creek/ invertebrates
Abstract: Diversity and productivity of stream food webs are related to habitat heterogeneity and efficiency of energy retention. We tested the hypothesis that experimental boulder placements in a second-order stream would increase diversity and abundance of macroinvertebrates by restoring detrital retention and habitat heterogeneity. Two relatively natural, upstream, reference reaches and a downstream treatment reach with a relatively straight channel and less woody debris were studied for 3 months before and 1.2 years after the placement of six boulder

clusters in the treatment reach. Mean velocity and its coefficient of variation increased in the treatment reach (140 and 115%, respectively), whereas the reference reaches remained relatively unchanged after the placements. Enhanced particulate organic matter storage (550%) was accompanied by increased total macroinvertebrate abundance (280%) in the treatment reach, converging with those of the reference reaches almost 1 year after the treatment. Detritivorous taxa numerically dominated the macroinvertebrate community, the total densities of which were best predicted by the fine fraction of organic matter biomass at microhabitat scale. However, the effect of boulder clusters on taxonomic richness was negligible. Our findings suggest that boulder clusters can be used at least as a short-term means to restore macroinvertebrate productivity in detritus-based stream systems.

1525. **Responses of stream breeding amphibians to riparian buffers in headwater streams: Ameliorating the effects of regeneration harvest.**
Pollett, Kathleen L.
Northwestern Naturalist 84(2): 111. (2003)
NAL Call #: QL671.M8; ISSN: 1051-1733
Descriptors: streams/ breeding/ amphibians/ riparian buffers/ Northwest Forest Plan/ Pacific Northwest/ Washington
Abstract: Anthropogenic disturbance resulting from natural resource extraction is a major component of the Pacific Northwest landscape. The implementation of the Northwest Forest Plan in 1994 mandated increased riparian buffers on streams, including non-fishbearing streams on federal lands. In addition, Washington State has recently begun requiring buffers adjacent to non-fishbearing streams on state and private lands. These buffers can be as narrow as 50 ft. The effectiveness of buffers this size is largely untested on perennial non-fishbearing streams. In this study the effectiveness of small buffers was assessed by sampling streams for amphibians and collecting information on abiotic variables. A total of 40 streams between Mount St Helens and the Columbia River Gorge (T6N R3E to T2N R8E) were sampled. Twelve of these streams were buffered (width = 12 to 20 m, tree age 35 to 50), ten were unbuffered (no trees more than 10 y old left in the riparian zone), ten were in forests 35 to 50 y old, and eight were surrounded by unmanaged stands. Preliminary results suggest that these narrow buffers have higher abundances of Rhyacotriton cascadae than unbuffered streams, whereas abiotic variables and abundances of Dicamptodon spp. were similar. Ascaphus trueii was not found in sufficient abundance to include in the analysis. Differences in R. cascade abundance between unmanaged streams and those in the three management treatments appear to be more substantial than between buffered and unbuffered streams.

1526. **Restoration of degraded riverine/riparian habitat in the Great Basin and Snake River regions.**
Platts, W. S. and Jensen, S. E.
In: Wetland Creation and Restoration: The Status of the Science. Covelo, Calif.: Island Press, 1990; pp. 367-404.
Notes: ISBN: 1559630450.
NAL Call #: QH541.5.M3W462
Descriptors: habitat restoration/ riparian land/ stream restoration/ water resources management/ wetland restoration/ environmental impact/ planting management/ riparian waters/ soil-water-plant relationships/ water resources development/ watershed management/ wildlife habitats
Abstract: Riverine/riparian habitat (RRH) includes interdependent aquatic (riverine) and streamside (riparian) resources that are valuable for fish and wildlife habitat, flood storage and desynchronization, nutrient cycling and water quality, recreation, and heritage values. RRH includes resources both wetter and drier than stipulated for wetlands. Whereas the ' natural or achievable state ' of a riparian habitat may be wetland, the ' existing state ' may be non-wetland because of natural or anthropogenically-induced changes in the hydrologic character of RRH. There are many different types of RRH, each with distinctive structure, function, and values. Restoration commonly requires: planning to identify preliminary goals and a general approach; baseline assessments and inventories; designs from which the feasibility of accomplishing goals can be assessed; evaluation to assure compliance with designs; and monitoring of variables important to goals and objectives. The goals, approach, and design of restoration projects must be tailored to each type of RRH. Some general elements important to restoration of degraded RRH are: establishment of hydrologic conditions compatible with project goals; efficient handling of soil and substrates in construction; selection and propagation of plants suited to the site and project goals; evaluation of features to enhance habitat for target species; maintenance and control of impacts; and scheduling construction to reflect site constraints and goals.

1527. **A review of aquatic impact associated with turbidity.**
Edwards, C. J.
In: Technical workshop on sediments: Proceedings. Corvallis, Oregon
Washington, D.C.: Terrene Institute; pp. 109-112; 1993.
NAL Call #: QE571.T42 1992
Descriptors: erosion/ sediment/ turbidity/ logging/ logging effects/ aquatic organisms
This citation is from AGRICOLA.

1528. **A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds.**
Roni, P.; Beechie, T. J.; Bilby, R. E.; Leonetti, F. E.; Pollock, M. M.; and Pess, G. R.
North American Journal of Fisheries Management 22(1): 1-20. (2002)
NAL Call #: SH219.N66; ISSN: 0275-5947.
Notes: Literature review.
Descriptors: aquatic animals/ habitats/ marine environment/ marine fishes/ streams/ water conservation/

water resources/ watershed management/ watersheds/ fishes/ Pacific Northwest/ United States/ vertebrates/ Chordata/ animals
Abstract: Millions of dollars are spent annually on watershed restoration and stream habitat improvement in the Pacific Northwest States of the USA in an effort to increase fish population. It is generally accepted that watershed restoration should focus on restoring natural processes that create and maintain habitat rather than manipulating instream habitats. However, most process-based restoration is site- specific, that is, conducted on a short stream reach. To synthesize site-specific techniques into a process-based watershed restoration strategy, we reviewed the effectiveness of various restoration techniques at improving fish habitat and developed a hierarchical strategy for prioritizing them. The hierarchical strategy we present is based on three elements: (1) principles of watershed processes; (2) protecting existing high-quality habitats; and (3) current knowledge of the effectiveness of specific techniques. Initially, efforts should focus on protecting areas with intact processes and high-quality habitat. Following a watershed assessment, we recommend that restoration focus on reconnecting isolated high-quality fish habitats, such as instream or off-channel habitats made inaccessible by culverts or other artificial obstructions. Once the connectivity of habitats within a basin has been restored, efforts should focus on restoring hydrologic, geologic (sediment delivery and routing), and riparian processes through road decommissioning and maintenance, exclusion of livestock, and restoration of riparian areas. Instream habitat enhancement (e.g., additions of wood, boulders, or nutrients) should be employed after restoring natural processes or where short-term improvements in habitat are needed (e.g., habitat for endangered species). Finally, existing research and monitoring is inadequate for all the techniques we reviewed, and additional, comprehensive physical and biological evaluations of most watershed restoration methods are needed.

1529. **A review of trout management in southeast Minnesota streams.**
Thorn, W. C.; Anderson, C. S.; Lorenzen, W. E.; Hendrickson, D. L.; and Wagner, J. W.
North American Journal of Fisheries Management 17(4): 860-872. (1997)
NAL Call #: SH219.N66; ISSN: 0275-5947
Descriptors: fishery management/ sport fishing/ man-induced effects/ habitats/ trout/ fish management/ fishing/ stream biota/ watershed management/ Salvelinus fontinalis/ Salmo trutta/ Minnesota/ historical account/ sport fishing/ management/ watershed protection
Abstract: Agricultural development after 1850 in southeast Minnesota degraded instream habitat, and by 1900, the native brook trout Salvelinus fontinalis was extirpated from most streams. By the 1940s, after 60-70 years of stocking, the exotic brown trout Salmo trutta was the most common trout, but abundance was low and limited by lack of reproductive habitat. Soil conservation practices of the 1930s and 1940s and watershed management under Public Law (PL) 566 in the 1950s and 1960s reduced flooding, erosion, and sedimentation and increased infiltration and base flow. By the 1970s, brown trout reproduction was common, but abundance was still low. Fisheries managers of the Minnesota Department of Natural Resources assumed that adult habitat limited abundance, so they improved instream habitat in streams with public access, which increased brown trout abundance in some streams. Experimental management since 1975 has shown that the lack of adult habitat did limit trout abundance. This management regime has also enabled the quantification of habitat quality and has developed a decision key for brown trout management. When land management has degraded stream habitat, land treatments, acquisition of riparian corridors, and instream management are necessary to rehabilitate habitat and provide recreational fisheries.

1530. **Riparian deforestation, stream narrowing, and loss of stream ecosystem services.**
Sweeney, B. W.; Bott, T. L.; Jackson, J. K.; Kaplan, L. A.; Newbold, J. D.; Standley, L. J.; Hession, W. C.; and Horwitz, R. J.
Proceedings of the National Academy of Sciences 101(39): 14132-14137. (2004)
NAL Call #: 500 M762; ISSN: 00278424.
Notes: doi: 10.1073/pnas.0405895101.
Descriptors: deforestation/ riparian ecosystem/ conservation of natural resources/ ecosystem/ fresh water/ water movements/ riparia
Abstract: A study of 16 streams in eastern North America shows that riparian deforestation causes channel narrowing, which reduces the total amount of stream habitat and ecosystem per unit channel length and compromises in-stream processing of pollutants. Wide forest reaches had more macroinvertebrates, total ecosystem processing of organic matter, and nitrogen uptake per unit channel length than contiguous narrow deforested reaches. Stream narrowing nullified any potential advantages of deforestation regarding abundance of fish, quality of dissolved organic matter, and pesticide degradation. These findings show that forested stream channels have a wider and more natural configuration, which significantly affects the total in-stream amount and activity of the ecosystem, including the processing of pollutants. The results reinforce both current policy of the United States that endorses riparian forest buffers as best management practice and federal and state programs that subsidize riparian reforestation for stream restoration and water quality. Not only do forest buffers prevent nonpoint source pollutants from entering small streams, they also enhance the in-stream processing of both nonpoint and point source pollutants, thereby reducing their impact on downstream rivers and estuaries.

1531. **Riparian fencing, grazing, and trout habitat preference on Summit Creek, Idaho.**
Keller, C. R. and Burnham, K. P.
North American Journal of Fisheries Management 2(1): 53-59. (1982)
NAL Call #: SH219.N66; ISSN: 0275-5947
Descriptors: grazing/ control/ abundance/ land use/ watersheds/ body size/ habitat selection/ electric fishing/ salmonidae/ Salvelinus fontinalis/ effects on/ riparian environments/ fencing/ electric fishing/ Salmo gairdneri/ Idaho, Summit Creek
Abstract: In 1975, 3.2 km of Summit Creek, Idaho were fenced by the Bureau of Land Management to exclude

livestock from the riparian area. Six stream sections were electrofished in 1979 to determine differences in trout abundance, size, and growth between grazed and ungrazed stream sections. Electrofishing station were paired by habitat type. There were more trout in ungrazed sections than in grazed sections in all three habitat types sampled. With one exception, there were more catachablesized (200 mm long or longer) rainbow trout (Salmo gairdneri) and brook trout (Salvelinus fontinalis) in the ungrazed area than in the grazed area. There was also evidence that the average size of the fish was less in grazed sections. Fish population data were not collected prior to fencing; therefore it cannot be firmly concluded that the trout population increased within the livestock enclosure as a result of fencing the riparian area. However, the combined results of previous trout habitat improvements documented for Summit Creek, as a result of the fencing, and this study support the conclusion that trout prefer stream areas in ungrazed habitat over grazed habitat.

1532. **Riparian forestry management and adult stream insects.**
Briers, R. A. and Gee, J. H. R.
Hydrology and Earth System Sciences 8(3): 545-549. (2004); ISSN: 10275606
Descriptors: life history/ microclimate/ plantation/ riparian vegetation/ aquatic ecosystem/ forest management/ habitat structure/ insect/ microclimate/ riparian vegetation/ upland region/ Hexapoda/ Insecta/ Riparia
Abstract: The impacts of coniferous plantation forestry on the biology of upland streams in the UK are firmly established. Whilst benthic communities have been well studied, very little research has considered the impacts of riparian forestry management on adult stream insects, yet the essentially terrestrial adult (reproductive) phase may be important in determining the abundance and distribution of larval stages. Riparian vegetation has a potentially strong impact on survival and success of adult stages through alteration of microclimate, habitat structure and potential food sources, in addition to effects carried over from larval stages. Here, current riparian management strategies are analysed in the light of available information on the ecology of adult stream insects. On the whole, management practices appear to favour adult stream insects, although an increase in tree cover in riparian areas could be beneficial, by providing more favourable microclimatic conditions for adults. This conclusion is drawn based on rather limited information, and the need for further research into the effects of riparian forestry management on adult stream insects is highlighted. © EGU.

1533. **A riparian wildlife habitat evaluation scheme developed using GIS.**
Iverson, Louis R.; Szafoni, Diane L.; Baum, Sharon E.; and Cook, Elizabeth A.
Environmental Management 28(5): 639-654. (2001)
NAL Call #: HC79.E5E5; ISSN: 0364-152X.
http://www.springerlink.com/content/02helrpgau6xlfx2/fulltext.pdf
Descriptors: wildlife/ ecosystems/ riparian habitat/ rivers/ techniques/ GIS/ succession/ management/ habitat surveys/ habitat management/ landscape ecology/ wildlife habitat/ spatial analysis/ landscape ecology/ riparian habitat/ growth and development/ ecosystem/ fresh water/ conservation of natural resources [methods]/ environmental monitoring [methods]/ agriculture/ animals/ data collection/ environment/ forestry/ geography/ geology/ information systems/ models, biological/ Poaceae/ population dynamics/ urban population/ habitat evaluation/ waters/ Illinois
Abstract: To evaluate riparian habitat for wildlife, the authors used a geographic information system (GIS) that prioritized individual streams (for acquisition or management) by habitat ranking. They demonstrate this methodology for the Vermillion River basin in east-central Illinois, USA. Three data sets were used to evaluate land cover encompassing 300 m on either side of the streams: (1) the US Geological Survey's land use and land cover information (LUDA), (2) land cover manually digitized from the National High Altitude Photography (NHAP) program, and (3) Landsat Thematic Mapper (TM) data classified into land cover. Each of 30 tributaries in the study area was ranked for habitat according to the data contained in each data set, and results were compared. Habitat ranking schemes were devised and analysis performed for three species guilds: forest, grassland, and mixed succession species. TM and NHAP each differentiated habitat scores (for forest, grassland, and mixed successional guilds) among tributaries in a similar and suitable way, while LUDA was not suitable, due to the coarse resolution of the data. Overall, it was shown that the methodology is suitable to rank streams based on riparian habitat quality. Even though more work is needed to test and verify the method, the project has shown the potential for such techniques to assist in evaluating, tracking, and improving the management of riparian wildlife resources. The method can easily be applied over large areas such as states if TM-based land cover and stream data are available.

1534. **Riverine landscapes: Biodiversity patterns, disturbance regimes, and aquatic conservation.**
Ward, J. V.
Biological Conservation 83(3): 269-278. (1998)
NAL Call #: S900.B5; ISSN: 0006-3207
Descriptors: aquatic conservation/ bank stabilization/ biodiversity patterns/ channelization/ disturbance regimes/ environmental gradient/ environmental heterogeneity/ flow regulation/ groundwater aquifers/ multiple interactive pathways/ riparian/ floodplain systems/ riverine landscapes/ upstream-downstream linkage
Abstract: The term riverine landscape implies a holistic geomorphic perspective of the extensive interconnected series of biotopes and environmental gradients that, with their biotic communities, constitute fluvial systems. Natural disturbance regimes maintain multiple interactive pathways (connectivity) across the riverine landscape. Disturbance and environmental gradients, acting in concert, result in a positive feedback between connectivity and spatio-temporal heterogeneity that leads to the broadscale patterns and processes responsible for high levels of biodiversity. Anthropogenic impacts such as flow regulation, channelization, and bank stabilization, by (1) disrupting natural disturbance regimes, (2) truncating environmental gradients, and (3) severing interactive pathways, eliminate upstream-downstream linkages and isolate river channels from riparian/floodplain systems and contiguous groundwater aquifers. These alterations interfere with

successional trajectories, habitat diversification, migratory pathways and other processes, thereby reducing biodiversity. Ecosystem management is necessary to maintain or restore biodiversity at a landscape scale. To be effective, conservation efforts should be based on a solid conceptual foundation and a holistic understanding of natural river ecosystems. Such background knowledge is necessary to re-establish environmental gradients, to reconnect interactive pathways, and to reconstitute some semblance of the natural dynamics responsible for high levels of biodiversity. The challenge for the future lies in protecting the ecological integrity and biodiversity of aquatic systems in the face of increasing pressures on our freshwater resources. This will require integrating sound scientific principles with management perspectives that recognize floodplains and groundwaters as integral components of rivers and that are based on sustaining, rather than suppressing, environmental heterogeneity.

1535. **The riverscape: A strategic perspective for restoring wild riverine fish populations.**
Li, H. W.; Fausch, K. D.; Torgersen, C.E.; and Baxter, C. V.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 201; 2003.
Descriptors: freshwater ecology: ecology, environmental sciences/ cattle exclusion/ applied and field techniques/ flood pulse concept/ hyporheic corridor concept/ process domain concept/ river continuum concept/ serial continuity concept/ channel morphology/ conservation strategies/ fish movements/ geomorphology/ habitat management/ lentic systems/ population recovery/ riparian vegetation/ riverine environments/ riverscapes/ spatial scaling/ standing crops/ stream restoration/ stream riparian interactions/ temporal scaling/ trophic ecology/ wetlands: habitat

1536. **Salmon recovery in the Pacific Northwest: A summary of agricultural and other economic effects.**
Aillery, Marcel P.
Washington, D.C.: U.S. Dept. of Agriculture, Economic Research Service, 1994. 10 p.
Notes: Caption title. "July 1994." Includes bibliographical references (p. 9).
NAL Call #: 1 Ag84Ab no.699
Descriptors: Salmon fisheries---Columbia River---Watershed/ Rare fishes---Columbia River---Watershed/ Wildlife conservation---Columbia River---Watershed
This citation is from AGRICOLA.

1537. **A science-based approach for identifying temperature-sensitive streams for rainbow trout.**
Nelitz, Marc A.; MacIsaac, Erland A.; and Peterman, Randall M.
North American Journal of Fisheries Management 27(2): 405-424. (2007)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: commercial activities/ conservation measures/ techniques/ freshwater habitat/ lotic water/ abiotic factors/ physical factors/ land zones/ North America/ Canada/ Oncorhynchus mykiss: forestry/ impact on stream temperature/ analysis technique and conservation relationships/ habitat management/ stream habitat management/ identification of temperature sensitive streams/ forestry impact relationships/ ecological techniques/ temperature sensitive stream habitat identification/ forestry impact and conservation relationships/ stream/ forestry impact and conservation relations/ temperature/ British Columbia/ Upper Fraser and Skeena Rivers/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: To regulate human-induced changes to fish habitat, resource managers commonly set standards based on maximum allowable changes. For example, new legislation in British Columbia (BC), Canada, calls for restrictions on harvesting of trees and related activities near temperature-sensitive streams. However, methods for designating such streams are still evolving. Our objective was to help develop such methods by (1) improving understanding of the temperature-dependent responses of fish and (2) devising improved methods for estimating the effects of forestry-related activities on stream temperature as well as the chance of exceeding upper temperature limits. Using previously published models, we found that for rainbow trout Oncorhynchus mykiss particular increases in stream temperature led to different effects on juvenile growth rate, egg survival rate, and resistance to mortality from diseases. In a separate analysis, to evaluate the chance that cumulative forestry activities will increase stream temperature by various amounts, we compiled Summer temperature data for 104 streams in central BC that reflected different watershed features, contrasting summer climates, and various levels of land use. A classification and regression tree analysis of a summer maximum weekly average temperature (MWAT) index grouped streams into six categories as a function of watershed size, watershed elevation, and air temperature. We then analyzed the remaining unexplained variation among stream temperature indices using Bayesian regression. We found high probabilities that increases in road density and the density of road crossings of streams within watersheds are associated with increases in residual temperature. For instance, a Bayesian regression indicated a 6-in-10 chance that the MWAT in our study area will increase by 1.25°C for a road density of 2 km/km^2 of watershed area and by 3.25°C for a road density of 4 km/km^2. These analyses illustrate some possible ways to help designate temperature-sensitive streams.

1538. **Seasonal movements, habitat use, aggregation, exploitation, and entrainment of saugers in the Lower Yellowstone River: An empirical assessment of factors affecting population recovery.**
Jaeger, Matthew E.; Zale, Alexander V.; McMahon, Thomas E.; and Schmitz, Brad J.
North American Journal of Fisheries Management 25(4): 1550-1568. (2005)
NAL Call #: SH219.N66 ; ISSN: 0275-5947
Descriptors: commercial activities/ behavior/ social behavior/ ecology/ land zones/ Sander canadensis: farming and agriculture/ irrigation canals/ leisure and sport/ angling/ aggregating behavior/ population dynamics/ population recovery dynamics/ influencing factors/ empirical assessment/ river/ distribution within habitat/ seasonal distribution and movements/ habitat utilization/ Montana/ Yellowstone River/ Huntley Diversion/ Pisces, Actinopterygii, Perciformes, Percidae/ chordates/ fish/ vertebrates

Abstract: Migratory barriers, habitat loss, entrainment in irrigation canals, and overexploitation, especially at times of aggregation, have been suggested to explain the failure of Yellowstone River saugers Sander canadensis to return to historical abundances after a late-1980s decline that was attributed to drought. These factors are thought to affect saugers throughout their range and migratory large-river fishes in general. We characterized the seasonal movement patterns, habitat use, and aggregation of saugers and estimated movement, exploitation, and irrigation canal entrainment rates to test these hypotheses. Saugers aggregated near spawning areas in spring and subsequently dispersed 5-350 km to upstream home locations, where they remained for the rest of the year. Upstream movement was not overtly restricted by low-head diversion dams. During the spawning period, terrace and bluff pools, which are unique geomorphic units associated with bedrock and boulder substrate, were positively selected, while all other habitat types were avoided. Tributary spawning was rare. After moving to home locations, saugers used most habitat types in proportion to their availability but selected reaches in specific geologic types that allowed formation of deep, long pools. Exploitation occurred primarily in early spring and late autumn. was low annually (18.6%), and was not related to aggregation. Annual survival was high (70.4%). Entrainment in one irrigation diversion accounted for more than half of all nonfishing mortality. Therefore, habitat loss and overexploitation probably did not prevent sauger recovery, as the absence of migratory barriers allowed adult saugers unrestricted access to widely separated and diverse habitats and did not induce artificial aggregation. In other systems, population declines attributed to overexploitation during periods of aggregation may therefore have been caused fundamentally by migration barriers that created artificial aggregations.

1539. **Setting an effective TMDL: Sediment loading and effects of suspended sediment on fish.**
Vondracek, B.; Zimmerman, J. K. H.; and Westra, J. V.
Journal of the American Water Resources Association 39(5): 1005-1015. (Oct. 2003)
NAL Call #: GB651.W315
Descriptors: agricultural watersheds/ catchment areas/ ecological effects/ fish/ freshwater fish/ lethal effects/ loading/ model studies/ mortality/ mortality causes/ pollution control/ pollution effects/ resuspended sediments/ sediment load/ sediment pollution/ sediments/ streams/ sublethal effects/ suspended load/ suspended sediments/ suspended particulate matter/ threshold levels/ threshold limits/ toxicity tests/ turbidimetry/ turbidity/ water pollution effects/ water quality standards/ water resources/ watersheds/ Salmo trutta/ Minnesota/ Chippewa River/ Wells Creek
Abstract: The Agricultural Drainage and Pesticide Transport model was used to examine the relationship between fish and suspended sediment in the context of a proposed total maximum daily load (TMDL) in two agricultural watersheds in Minnesota. During a 50-year simulation, Wells Creek, a third-order cold water stream, had an estimated 1,164 events (i.e., one or more consecutive days of estimated sediment loading) and the Chippewa River, a fourth-order warm water stream, had 906 events of measurable suspended sediment. Sublethal thresholds were exceeded for 970 events and lethal levels for 194 events for brown trout in Wells Creek, whereas adult nonsalmonids would have experienced sublethal levels for 923 events and lethal levels for 241 events. Sublethal levels were exceeded for 756 events and lethal thresholds were exceeded for 150 events in the Chippewa River. Nonsalmonids would have experienced 15 events of mortality between 0 and 20 percent in Wells Creek. In the Chippewa River, there were 35 events of mortality between 0 and 20 percent and one event in which mortality could have exceeded 20 percent. The Minnesota Pollution Control Agency has proposed listing stream reaches as being impaired for turbidity at 25 NTU, which is approximately 46 mg suspended sediment/l. We estimated that 46 mg/l would be exceeded approximately 30 days in a year (d/yr) in both systems. A TMDL of 46 mg SS/l may be too high to ensure that stream fishes are not negatively affected by suspended sediment. We recommend that an indicator incorporating the duration of exposure be applied.

1540. **Southern two-lined salamanders in urbanizing watersheds.**
Miller, Jennifer E.; Hess, George R.; and Moorman, Christopher E.
Urban Ecosystems 10(1): 73-85. (2007)
NAL Call #: QH541.5.C6 U73; ISSN: 1083-8155
Descriptors: conservation measures/ ecology/ population dynamics/ habitat/ freshwater habitat/ lotic water/ land zones/ Eurycea cirrigera: disturbance by man/ stream habitats in urbanizing watersheds/ habitat management/ population size/ stream/ urbanizing watersheds/ North Carolina/ Wake County/ Amphibia, Lissamphibia, Caudata, Plethodontidae/ amphibians/ chordates/ vertebrates
Abstract: Forested riparian buffers are an increasingly common method of mitigating the negative effects of impervious surface cover on water quality and wildlife habitat. We sampled larval southern two-lined salamanders (Eurycea cirrigera) in 43 streams, representing the range of impervious surface cover and forested riparian buffer width across Wake County, NC, USA. Larval abundance decreased with increasing impervious surface cover in the upstream catchment, but was not affected by buffer width. This is likely a result of an incomplete buffer system and culverts or other breaches along streams. Larval abundance increased with detritus cover in the stream to a threshold and then decreased as detritus continued to increase. As percent pebble substrate in the stream increased, especially in perennial streams, larval salamander abundance also increased. We suspect salamanders were unable to migrate with the water column during dry periods in intermittent streams with sedimented interstices below the surface, resulting in low abundances. A combination of increased peak flows and sedimentation, reduced base flow, and chemical changes likely reduces the abundance of salamanders in urban and suburban streams. We suggest creation of catchment-wide, unbreached buffers to maintain the integrity of stream habitats in urbanizing watersheds.

1541. **Spatial variation in fish species richness of the upper Mississippi River system.**
Koel, T. M.
Transactions of the American Fisheries Society 133(4): 984-1003. (2004)
NAL Call #: 414.9-Am3; ISSN: 00028487
Descriptors: wildlife management/ habitat restoration/ aquatic habitat quality/ aquatic habitat/ isolated habitats/ watershed management
Abstract: Important natural environmental gradients, including the connectivity of off-channel aquatic habitats to the main-stem river, have been lost in many reaches of the upper Mississippi River system, and an understanding of the consequences of this isolation is lacking in regard to native fish communities. The objectives of this study were to describe patterns of fish species richness, evenness, and diversity among representative habitats and river reaches and to examine the relationship between fish species richness and habitat diversity. Each year (1994-1999) fish communities of main-channel borders (MCB), side channel borders (SCB), and contiguous backwater shorelines (BWS) were sampled using boat-mounted electrofishing, mini-fyke-nets, fyke nets, hoop nets, and seines at a standardized number of sites. A total of 0.65 million fish were collected, representing 106 species from upper Mississippi River Pools 4, 8, 13, and 26; the open (unimpounded) river reach; and the La Grange Reach of the Illinois River. Within pools, species richness based on rarefaction differed significantly among habitats and was highest in BWS and lowest in MCB ($P < 0.0001$). At the reach scale, Pools 4, 8, and 13 consistently had the highest species richness and Pool 26, the open-river reach, and the La Grange Reach were significantly lower ($P < 0.0001$). Species evenness and diversity indices showed similar trends. The relationship between native fish species richness and habitat diversity was highly significant ($r^2 = 0.85$; $P = 0.0091$). These results support efforts aimed at the conservation and enhancement of connected side channels and backwaters. Although constrained by dams, pools with high native species richness could serve as a relative reference. The remnants of natural riverine dynamics that remain in these reaches should be preserved and enhanced; conditions could be used to guide restoration activities in more degraded reaches.

1542. **Spatially explicit estimates of erosion-risk indices and variable riparian buffer widths in watersheds.**
Wissmar, R. C.; Beer, W. N.; and Timm, R. K.
Aquatic Sciences 66(4): 446-455. (2004); ISSN: 10151621.
Notes: doi: 10.1007/s00027-004-0714-9.
Descriptors: catchments/ erosive soils/ landscape/ protection/ riparian vegetation/ spatial/ streams/ environmental disturbance/ erosion/ habitat restoration/ land cover/ riparian vegetation/ watershed/ Washington/ riparia
Abstract: Strategies for protecting and restoring riparian and stream ecosystems commonly encounter uncertainties about natural processes and management practices that contribute to environmental disturbances. Improvements in management plans require landscape approaches that account for the explicit spatial distribution and variability of different land cover types that can contribute to unstable conditions. We use a spatially explicit procedure to determine erosion-risk indices and variable riparian buffer widths in watersheds. The indices are based on land cover types that can contribute to erosion either alone or collectively. Land cover information (e.g., unstable soils, immature forest stands, roads, critical slope for land failure and rain-on-snow areas) was used to estimate erosion-risk indices. Erosion-risk indices increase with greater co-occurrences of contributing land covers. The procedure was used to identify erosion-prone areas in tributary watersheds of the Beckler-Rapid River drainage (260 km^2), in the State of Washington, USA. A regression analysis of the relationship between mean sediment inputs to streams and erosion-risk indices of sixteen different watersheds indicated that erosion-risk indices explained 65% of the variation associated with sediment inputs to channels. Landscape maps of erosion-risk categories, based on ranges of erosion-risk indices, allowed spatially explicit definitions of stream reach lengths susceptible to different levels of erosion. Low to high-risk categories, and reach lengths vulnerable to erosion, also permitted the identification of the distribution of channels requiring protection by variable riparian buffers widths. The applicability of the procedure to other landscapes was demonstrated by estimating erosion risk-indices and variable riparian buffer widths for watersheds in the upper Cedar River drainage near Seattle, Washington. This approach allows watershed managers to use existing records and published information to address environmental problems within highly variable landscapes.

1543. **The stability of Piasa Creek fish assemblage.**
Kerfoot, J. R. and Schaefer, J. F.
Transactions of the Illinois State Academy of Science 95 (Supplement): 152. (2002)
NAL Call #: 500 IL6; ISSN: 0019-2252.
Notes: Meeting abstract; 94th Annual Meeting of the Illinois State Academy of Science held April 19-20, 2002 in Edwardsville, IL.
Descriptors: freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ agriculture/ anthropogenic effects/ biological communities/ drainage practices/ fish assemblages: stability/ land use/ species abundance
Abstract: A survey of fishes of Piasa Creek, in Jersey, Madison and Macoupin counties, west central Illinois, was conducted in 1967 by Thomerson (1969). This survey consisted of 31 sites and 41 collections over 1 year. No stream fish assemblage at any one place can remain stable forever because biological communities are dynamic and fluctuating. Extensive agriculture practices have arisen over the last few decades along Piasa Creek, and this study will address what impact this has had on the assemblage over time. A second survey of the fish assemblage was conducted in the summer/fall of 2001. Collections were made at 25 of the original 31 sites. The changes in fish assemblages are important because they can help to detect any anthropogenic effects on the river system, and also many concepts in ecology rely on the ideas that populations achieve stability or that aquatic communities operate in a regular and predictable fashion. Also, in taking an inventory of the abundance of indicator species can help detect changes in the overall system. Data sets like ours that

detail changes in assemblages over periods of decades are rare. My hypothesis is that due to anthropogenic changes to the drainage and land use practices changes in assemblage have occurred.

1544. **The status of Atlantic salmon (Salmo salar): Populations and habitats.**
Boisclair, Daniel
Canadian Journal of Fisheries and Aquatic Science 61(12): 2267-2410. (2004)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: ecology/ habitat/ land zones/ North America/ Canada/ Salmo salar/ ecology/ habitat/ aquatic habitat/ Quebec/ Pisces, Actinopterygii, Salmoniformes, Salmonidae/ chordates/ fish/ vertebrates
Abstract: The important decline of Atlantic salmon (Salmo salar) across its range during the past three decades, despite numerous management and conservation programmes, is an alarming index of the vulnerability of this species. The following series of papers was produced to summarize current knowledge on specific interactions between biotic and abiotic variables that may contribute to determine the survival of Atlantic salmon. Evaluation of the challenges encountered in spawning grounds (siltation, oxygenation), nursery habitats (substrate, trophic interactions), overwintering habitats (flow conditions, winter feeding opportunities), and coastal and oceanic environments (water temperature, predators, parasites) suggest that all habitats required by Atlantic salmon and all processes that occur in each habitat represent a critical link that allows this species to persist. Management practices employed during artificial fish selection, incubation, and stocking also affect the success of restoration efforts. Because limiting factors may change in time and because our ability to intervene in specific habitats may be minimal, the only strategy within our reach may be to continue gathering information about processes that determine the fragility of Atlantic salmon and, in the light of our findings, to implement scientifically sound actions where and when possible.

1545. **Strategies for ecological restoration of the middle Rio Grande in New Mexico and recovery of the endangered Rio Grande silvery minnow.**
Cowley, David E.
Reviews in Fisheries Science 14(1-2): 169-186. (2006); ISSN: 1064-1262
Descriptors: biogeography: population studies/ biodiversity/ wildlife management: conservation/ biodiversity/ aquatic ecosystem/ habitat restoration
Abstract: Issues relevant to management of and land aquatic ecosystems include: (1) a poor understanding of the extent and linkages of an aquatic ecosystem, (2) human population growth coupled with a highly variable water supply, (3) hydrologic modifications of rivers associated with dams, levees, canalizations, and diversions, (4) impairment of water quality, (5) alteration of vegetative communities of catchments and riparian zones, (6) introduction of invasive non-native species, and (7) imperiled native species. All of these issues occur in the Middle Rio Grande of New Mexico and the first six in combination have been responsible for the imperilment of its native aquatic biota. Pie extinction of two fish species, extirpation of 13 others, and endangerment of the Rio Grande silvery minnow, a pelagic-spawning species with an enormous potential for recolonization of habitats, has been caused by a century of river and landscape modifications. Erosion from heavily grazed grasslands coupled with appropriation of surface flows for irrigation, both associated with human population expansion in New Mexico, led to increased sediment deposition in the Middle Rio Grande. Sediment deposition exacerbated problems due to flooding and droughts, which led to a series of political and technological actions that progressively extirpated most of the large-bodied native fishes and all but one of the pelagic-spawning minnows. Restoration of the Middle Rio Grande and recovery of the endangered silvery minnow will require many changes in the way humans use the river and its floodplain. If those changes occur they should consider the Rio Grande within a landscape context that includes strategies for humans to live in regions without damaging fragile lands and their aquatic ecosystems.

1546. **Stream characteristics and nonpoint pollution impacts on aquatic communities in the Lake Latonka watershed, Mercer County, Pennsylvania.**
Brenner, Fred J.; Barber, Rebecca N.; and Walent, Jason S.
Journal of the Pennsylvania Academy of Science 79(2-3): 65-71. (2005)
NAL Call #: Q11.J682; ISSN: 1044-6753
Descriptors: ecology/ habitat/ freshwater habitat/ lotic water/ pollution/ abiotic factors/ land zones/ Macroinvertebrata/ Pisces: community structure/ water quality and habitat characteristics relationship/ stream/ pollution/ water quality/ community structure relationship/ chemical factors/ pollutants/ Pennsylvania/ Mercer County/ Lake Latonka/ Pisces/ chordates/ fish/ invertebrates/ vertebrates
Abstract: The composition of macroinvertebrate and fish communities were compared with water quality and habitat characteristics at two locations above and below Lake Latonka, Mercer County, Pennsylvania and for two tributaries to Coolspring Creek that discharge directly into the lake. Streams within the watershed have received drainage from surrounding farms and septic discharges since the lake was constructed in the early 1960's. Coliform bacteria, nutrient and suspended solids concentrations in streams were inversely correlated with the size and characteristics of both macroinvertebrate and fish communities, but stream habitat characteristics were positively correlated with these aquatic communities. For the streams with the Lake Latonka Development, stream habitat appears to be more important than water quality in determining the size and characteristics of macroinvertebrate and fish communities. The size and species composition of both the macroinvertebrate and fish communities were similar in Coolspring Creek above and below the lake suggesting that the dam did not have an adverse impact on the aquatic communities below the structure.

1547. **Stream corridor restoration: Principles, processes, and practices.**
Federal Interagency Stream Restoration Working Group.
USDA, Natural Resources Conservation Service, 1998.
Notes: Cooperative effort among fifteen Federal agencies and partners to produce a common reference on stream corridor restoration./ Shipping list no.: 99-0011-S./ "National engineering handbook (NEH), part 653"--Transmittal sheet./ "October 1998."/ "August 26, 1998"--Transmittal sheet./ Includes bibliographical references and index.
http://www.nrcs.usda.gov/technical/stream_restoration/PDFFILES/ALL-SCRH-08-01.pdf
Descriptors: stream restoration/ habitat management/ biological communities/ agroecosystems/ environmental impact

1548. **Stream corridor restoration research: A long and winding road.**
Shields, F. D.; Cooper, C. M.; Knight, S. S.; and Moore, M. T.
Ecological Engineering 20(5): 441-454. (2003)
NAL Call #: TD1.E26; ISSN: 0925-8574
Descriptors: fishes/ habitats/ agriculture/ stream corridors/ drainage ditches/ groundwater/ rivers/ lakes/ ecology/ engineering/ civil engineering
Abstract: Stream corridor restoration research and practice is presented as an example of the application of ecology and engineering to solve a class of environmental problems. Interest and public investment in stream corridor restoration has increased sharply in developed nations over the last two decades, as evidenced by the volume of technical and refereed literature. However, real progress at the regional and national scale depends on successful research outcomes. Research addressing problems associated with stream corridor ecosystem restoration is beset by numerous problems. First, terms referring to restoration are loosely defined. Secondly, stream ecosystems are not amenable to rigorous experimental design because they are governed by a host of independent variables that are heterogeneous in time and space, they are not scalable, and their response times are often too long for human attention spans. These problems lead to poorly controlled or uncontrolled experiments with outcomes that are not reproducible. Extension of results to other sites or regions is uncertain. Social factors further complicate research and practice - riparian landowners may or may not cooperate with the experiment, and application of findings normally occurs through a process of suboptimal compromise. Economic issues, namely assigning costs for present and future ecosystem services that provide off-site benefits, further impede progress. Clearly, the situation calls for a hybrid approach between the rigor of the ecologist and the judgment and pragmatism of the engineer. This hybrid approach can be used to develop creative, low-cost approaches to address key factors limiting recovery.

1549. **Stream geomorphology and fish community structure in channelized and meandering reaches of an agricultural stream.**
Frothingham, Kelly M.; Rhoads, Bruce L.; and Herricks, Edwin E.
Water Science and Application 4: 105-117. (2001).
http://www.buffalostate.edu/geography/documents/frothingham%20et%20al%202001.pdf
Descriptors: Actinopterygii/ agriculture/ bedforms/ biodiversity/ biota/ Champaign County, Illinois/ channel geometry/ channelization/ Chordata/ communities/ conservation/ controls/ cross sections/ Cypriniformes/ drainage/ ecology/ ecosystems/ Embarras River/ erosion/ fluvial features/ fluvial sedimentation/ geomorphology/ habitat/ human activity/ Illinois/ meanders/ Osteichthyes/ Pisces/ reclamation/ seasonal variations/ sedimentation/ sediments/ spatial variations/ streams/ Teleostei/ United States/ Vertebrata/ waterways

1550. **Stream geomorphology, bank vegetation, and three-dimensional habitat hydraulics for fish in midwestern agricultural streams.**
Rhoads, Bruce L.; Schwartz, John S.; and Porter, Stacey
Water Resources Research 39(8): 2-13. (Aug. 2003).
Notes: ePaper no.: 1218.
Descriptors: agriculture/ bedforms/ biota/ Champaign County, Illinois/ channels/ drainage basins/ elevation/ Embarras River/ geomorphology/ hydrology/ Illinois/ Madden Creek/ Midwest/ Piatt County, Illinois/ river banks/ runoff/ Sangamon River/ streamflow/ streams/ United States/ vegetation/ Vermilion River/ watersheds

1551. **Stream habitat and fisheries response to livestock grazing and instream improvement structures, Big Creek, Utah.**
Platts, W. S. and Nelson, R. L.
Journal of Soil and Water Conservation 40(4): 374-379. (1985)
NAL Call #: 56.8 J822 ; ISSN: 0022-4561
Descriptors: environmental degradation/ fisheries/ grazing/ habitat destruction/ livestock/ rangelands/ streams/ Utah
This citation is from AGRICOLA.

1552. **Stream habitat restoration using large woody debris in the Green Mountain National Forest, Vermont.**
Roy, S. R.; McKinley, D.; and Nislow, K. H.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations. Quebec, PQ, Canada; Vol. 133.; 155; 2003.
Notes: Poster summary # SP-19-09.
Descriptors: conservation/ Hankin Reeves Survey/ applied and field techniques: electrofishing/ forest resource management plans/ channel morphology/ geomorphology/ habitat management/ large woody debris [LWD]/ natural wood regimes/ restoration projects: implementation, monitoring, planning/ upland streams: habitat
Abstract: The effects of stream restoration on aquatic ecosystems.

1553. **Stream restoration practices in the southeastern United States.**
Sudduth, Elizabeth B.; Meyer, Judy L.; and Bernhardt, Emily S.
Restoration Ecology 15(3): 573-583. (2007)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: channel reconfiguration/ evaluation/ in-stream habitat improvement/ monitoring/ riparian management/ United States, southeastern region/ stream restoration/ water quality management/ United States
Abstract: We collected information on 860 stream restoration projects in four states in the southeastern United States-Georgia, Kentucky, North Carolina, and South Carolina-to gain a better understanding of the practice of stream restoration in this area of high aquatic biodiversity and rapid metropolitan expansion. This was completed as a part of the National River Restoration Science Synthesis, with the larger goal of understanding the state of the science of stream restoration. Stream restoration project density, goals, and monitoring rates varied by state, although southeastern monitoring rates were higher than in other parts of the country. North Carolina had the most projects in the Southeast, of which 36% were monitored. In-depth phone interviews with project managers from a random subsample of projects provided insights into the process of stream restoration. Land availability was the most common basis for site prioritization, and 49% of projects involved mitigation. Although 51% of projects were associated with a watershed assessment, only 30% of projects were done as part of a larger plan for the watershed. Projects were monitored using physical (77% of monitored projects), chemical (36%), and biological (86%) variables, although many projects were planned and ultimately evaluated based on public opinion. Our results suggest that stream restoration in the southeastern United States is at an exciting point where better incorporation of a watershed perspective into planning and establishment and evaluation of stated, measurable success criteria for every project could lead to more effective projects.

1554. **Stream restoration using new dam technology.**
Griffin, G. B.
Land and Water 45(1): 12-16. (Jan. 2001-Feb. 2001)
NAL Call #: HD101.L36
Descriptors: aquatic habitat/ cattle/ dams/ environmental quality/ environmental restoration/ grazing/ habitat/ livestock/ morphology/ streams/ technology/ trout/ water management/ water quality/ North Carolina, Chaney Creek
Abstract: Silver Springs Ranch contains about twelve miles of spring creeks, each with multiple underground water sources issuing all along its bed. One of these is Chaney Creek, a main tributary of Silver Creek, a world-renowned trout-fishing stream. Cattle had been grazing on this ranch for over a hundred years and had seriously damaged Chaney Creek. Its banks had been broken down and the creek itself gradually widened. When ranch owner Tom O'Gara first saw Chaney Creek, its banks were bare dirt in many places, and the creek was as much as 80 feet wide, with an average depth of 3 to 4 inches. He was interested in restoring Chaney Creek, and began by removing livestock grazing from this part of the ranch. The cattle have been out for four years, and there has already been noticeable improvement. Nature would, over time, finish restoring Chaney Creek; however, Tom decided not to wait, but instead to give nature a helping hand by restoring segments of the stream back to what was more likely its original channel width and meandering course. Focus would be on fish (specifically, trout) habitat and related aquatic life.

1555. **Stream vertebrates in managed headwater streams: Habitat associations of assemblages and species.**
Olson, Deanna H.; Weaver, George W.; Ellenburg, Loretta L.; Hansen, Bruce; and Thompson, Rebecca
Northwestern Naturalist 81(2): 84-85. (2000)
NAL Call #: QL671.M8; ISSN: 1051-1733
Descriptors: Ascaphus truei/ Dicamptodon tenebrosus/ Plethodon dunni/ Rhyacotriton cascadae/ Rhyacotriton variegatus/ Taricha granulosa/ amphibians and reptiles/ habits-behavior/ distribution/ ecosystems/ forestry practices/ habitat management/ habitat surveys/ habitat use/ management/ microhabitat/ modeling/ riparian habitat/ rivers/ socio-economic studies/ techniques/ wildlife/ wildlife-habitat relationships/ Pacific giant salamander/ Cascades salamander/ southern Olympic/ salamanders/ tailed frog/ Dunn's salamander/ roughskin newt/ Oregon, Western
Abstract: A greater understanding of the ecology of headwater stream vertebrates in managed forest stands is needed for the refinement of forestry practices that manage for multiple resources, including species, habitats and socio-economic values. Pretreatment sampling for our Riparian Buffer Study in western Oregon has revealed distinct amphibian and fish assemblages corresponding to instream habitat gradients in headwaters. Habitat and faunal data were collected across 13 study basins and >140 headwater stream reaches; over 4,000 animals of 15 taxa have been sampled. Canonical correlations were calculated separately for instream species-assemblages, instream and bank fauna, and bank amphibians. Results identified several distinct species-assemblages, each with ranked habitat correlates. Assemblage patterns were more related to hydrological, topographic, and geomorphic habitat attributes (e.g. channel flow type and size, gradient) than fine scale microhabitat features (e.g. downed wood, substrate size). Generalized linear models (Poisson and logistic regression) of individual species-habitat relations were generated for seven taxa (trout spp., cottid spp., Dicamptodon tenebrosus, Rhyacotriton variegatus, R. cascadae, Plethodon dunni, Ascaphus truei, and Taricha granulosa). Results correspond to assemblage-associations. Our study shows the relatively restricted use of the uppermost nonfish-bearing stream channel by a unique amphibian assemblage dominated by torrent salamander species, currently a species of concern in the region. Our Riparian Buffer Study treatments are designed to advance the development of management approaches that have a high likelihood of persistnce of such sensitive species within managed wetlands.

1556. **Streambank restoration effectiveness: Lessons learned from a comparative study.**
Cooperman, M. S.; Hinch, S. G.; Bennett, S.; Branton, M. A.; Galbraith, R. V.; Quigley, J. T.; and Heise, B. A.
Fisheries 32(6): 278-291. (June 2007)
NAL Call #: SH1.F54
Descriptors: banks/ channels/ erosion/ evaluation/ experimental design/ grading/ habitat improvement/ habitats/ monitoring/ nature conservation/ riparian zone/ river banks/ salmon/ shrubs/ streams/ zoobenthos/ Canada, British Columbia
Abstract: Post-treatment effectiveness monitoring should be an integral part of stream restoration efforts, but it is often neglected due to lack of funds or insufficient project planning. Here we report results of an effectiveness evaluation of a streambank restoration program for salmon streams in the southern interior of British Columbia. Restoration involved treating eroding riverbanks with bank grading, riparian plantings, and installation of rock toes, rock-wood current deflectors, and livestock exclusion fencing. Absence of pre-treatment site characterization data necessitated comparing post treatment conditions at treated sites to conditions at untreated eroding control sites. We measured in-channel and riparian conditions plus invertebrate abundance and biomass at 16 sites treated between 1997 and 2002 and 11 nearby control sites. Treatment and control sites did not substantively differ in their habitat condition or aquatic macroinvertebrate abundances, although treated sites tended to have more shrubs along the outside bank, higher inside banks, and narrower wetted widths. Absence of statistical differences between treatment and control sites might be due to low statistical power, as >50 sites per group would need to be sampled for power to reach 0.8 at the effect sizes observed. Site specific channel gradient, a variable unaffected by restoration actions, was correlated with many of the variables we measured to characterize habitat condition, thereby confounding our ability to determine the magnitude of change relating to treatment efforts. Our results demonstrate the weaknesses of relying on a post-treatment, between-group comparison experimental design for restoration effectiveness monitoring. We suggest collection of pre-treatment data should be an essential part of the restoration process so more appropriate "before-after" experimental designs can be applied.

1557. **Summer and fall microhabitat utilization of juvenile bull trout and cutthroat trout in a wilderness stream, Idaho.**
Spangler, R. E. and Scarnecchia, D. L.
Hydrobiologia 452: 145-154. (2001)
NAL Call #: 410 H992; ISSN: 00188158.
Notes: doi: 10.1023/A:1011988313707.
Descriptors: char/ fish ecology/ Oncorhynchus clarki/ Salvelinus confluentus/ trout/ ocean habitats/ stream flow/ microhabitat/ marine biology/ habitat use/ juvenile/ microhabitat/ salmonid/ United States
Abstract: Microhabitat use and availability were evaluated and compared between different size classes of juvenile resident bull trout (Salvelinus confluentus) and cutthroat trout (Oncorhynchus clarki) in a small wilderness stream within the South Fork Clearwater River basin, Idaho. The objective was to determine if utilization of measured habitat characteristics changed from summer to late fall. Sampling of fish was conducted with night snorkeling. During the summer, smaller juvenile bull trout (<66 mm) total length (TL) were associated with shallow stream margins over coarse substrates. In the fall, they moved to significantly deeper, lower velocity water, and closer to cover ($p<0.05$), but maintained their association with coarse substrates. During the summer, larger juvenile bull trout and larger juvenile cutthroat trout (66-130 mm TL) occupied significantly deeper water than smaller juvenile bull trout ($p<0.05$). Generally, larger juvenile bull trout were found closer to the bottom and in lower velocity water than larger juvenile cutthroat trout ($p<0.05$). In the fall, larger juvenile bull trout and larger juvenile cutthroat trout were associated with significantly deeper, lower velocity water located closer to cover than in summer ($p<0.05$). However, cutthroat trout occupied slightly deeper water over finer substrates than bull trout. Deep water with low velocities evidently provide important rearing areas for large bull trout and large cutthroat trout in the fall. Land management practices that maintain such environments will benefit these species.

1558. **Surface water quality: Calibration of paired basins prior to streambank fencing of pasture land.**
Galeone, D. G.
Journal of Environmental Quality 28(6): 1853-1863. (1999)
NAL Call #: QH540.J6; ISSN: 0047-2425
Descriptors: catchment hydrology/ fencing/ pastures/ water quality/ communities/ equations/ manures/ nutrients/ pretreatment/ revegetation/ sediment/ streams/ trampling/ yields/ geological sedimentation/ losses from soil
Abstract: Streambank fencing is a best management practice that is targeted to reduce suspended sediment and nutrient inputs to streams by reducing direct inputs from animals, eliminating streambank trampling, and promoting streambank revegetation. A paired basin study was conducted in two small adjacent basins in Pennsylvania, USA, to determine the water quality effects of streambank fencing. This article documents the 3-yr calibration period between control and treatment basins prior to fence installation. Approx.70% of land adjacent to streambanks in the study area is used as pasture. Nutrient quantities applied as manure, benthic-macroinvertebrate communities, and the physical habitat of each stream were similar in both basins. Total N, P, and suspended sediment yields measured at the outlet of each basin averaged ~56, 2.8, and 2650 kg/ha on an annual basis. For both basins, ~90% of the total N yield was attributable to dissolved NO3-N and ~90% of the total N yield occurred during nonstormflow; conversely, ~90% of the total P yield was attributable to stormflow and 60 to 65% of the total P yield was suspended. Regression equations developed between both basins for low flow and stormflow samples for nutrients, suspended sediment, and discharge indicated a significant relation for most constituents. Pretreatment relation between basins for low flow and stormflow samples would need to change by 6 and 14% for total N concentrations and 24 and 9% for total P concentrations in order for streambank fencing to significantly affect water quality in the treatment basin.

1559. **Survey of livestock influences on stream and riparian ecosystems in the western United States.**
Belsky, A. J.; Matzke, A.; and Uselman, S.
Journal of Soil and Water Conservation 54(1): 419-431. (1999)
NAL Call #: 56.8 J822; ISSN: 0022-4561.
http://www.landsinfo.org/ecosystem_defense/Science_Documents/Belsky_et_al_1999.pdf
Descriptors: livestock/ water quality/ riparian land/ streams/ grazing/ environmental effects/ channel morphology/ arid lands/ riparian environments/ arid environments/ agricultural pollution/ agricultural runoff/ environmental impact/ water pollution/ river banks/ natural channels/ ecology/ arid regions/ United States, western region
Abstract: This paper summarizes the major effects of livestock grazing on stream and riparian ecosystems in the arid West. The study focused primarily on results from peer-reviewed, experimental studies, and secondarily on comparative studies of grazed versus naturally or historically protected areas. Results were summarized in tabular form. Livestock grazing was found to negatively affect water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, instream and streambank vegetation, and aquatic and riparian wildlife. No positive environmental impacts were found. Livestock also were found to cause negative impacts at the landscape and regional levels. Although it is sometimes difficult to draw generalizations from the many studies, due in part to differences in methodology and environmental variability among study sites, most recent scientific studies document that livestock grazing continues to be detrimental to stream and riparian ecosystems in the West.

1560. **Targeting conservation efforts in the presence of threshold effects and ecosystem linkages.**
Wu, J. and Skelton-Groth, K.
Ecological Economics 42(1-2): 313-331. (2002)
NAL Call #: QH540.E26; ISSN: 09218009.
Notes: doi: 10.1016/S0921-8009(02)00104-0.
Descriptors: conservation policy/ correlated benefits/ fund allocation/ salmon restoration/ targeting criteria/ threshold effects/ nature conservation/ restoration ecology/ riparian zone/ salmonid/ targeting/ United States
Abstract: The prevailing federal policy of targeting conservation programs on the basis of physical criteria tends to ignore the threshold effect of conservation efforts and the correlation between alternative environmental benefits. In this article, we examine the extent to which conservation funds will be misallocated when threshold effects and correlated benefits are ignored. We show that targeting conservation efforts based on physical criteria or political equity concerns may actually lead to the lowest possible benefits to society from conservation expenditure. Ignoring correlated benefits may lead not only to misallocation of conservation funds among watersheds, but also to incorrect resources (e.g. land, streams) being targeted for conservation. The empirical analysis focuses on riparian habitat investments for salmon restoration in the Pacific Northwest. We show that a large portion of conservation benefits would be lost when threshold effects and correlated benefits are ignored, and argue that funds should be allocated so that the total value of environmental benefits is maximized, not the total amount of resources protected.

1561. **Temporal and spatial assessment of water quality, physical habitat, and benthic communities in an impaired agricultural stream in California's San Joaquin Valley.**
Hall, Lenwood W. and Killen, William D.
Journal of Environmental Science and Health: Part A 40(5): 959-989. (2005); ISSN: 1093-4529
Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ water quality/ environmental degradation/ benthic community/ physical habitat
Abstract: The goal of this study was to characterize and discuss the relationships among water quality, physical habitat, and benthic community data collected annually over a three-year period (2000-2002) in an impaired agricultural stream (Orestimba Creek) in California's San Joaquin River watershed. Conductivity, pH, and turbidity were the most important water quality conditions influencing the various benthic metrics. Significantly higher flow conditions and lower dissolved oxygen values were reported in Orestimba Creek in 2001; increased turbidity conditions were reported in 2002. Channel alteration, riparian buffer, sediment deposition, and channel flow were the most important physical habitat metrics influencing the various benthic metrics. Higher total physical habitat scores were reported in 2001 when compared with 2002. The most dominant benthic taxa collected during all three years of sampling were oligochaetes and chironomids. Oligochaetes are found in stressful environments while chironomids can be either sensitive or tolerant to environmental stressors depending on the species. Populations of both daphnids and the exotic clam Corbicula were reported to increase over time. Both of these taxa are generally tolerant to most types of environmental degradation. The exception is that daphnids are highly sensitive to organophosphate insecticides. The % filterers increased over time, which suggests an increase in environmental disturbance. The % collectors decreased from 2000 to 2002, which suggests an improvement in environmental conditions. The presence of similar to 100 taxa in Orestimba Creek during each of the three years of sampling implies that benthic communities in this stream are fairly diverse, considering their ephemeral environment, but without a clear definition of benthic community expectations based on established reference conditions it is unknown if this water body is actually impaired.

1562. **Toward efficient riparian restoration: Integrating economic, physical, and biological models.**
Watanabe, Michio; Adams, Richard M.; Wu, JunJie; Bolte, John P.; Cox, Matt M.; Johnson, Sherri L.; Liss, William J.; Boggess, William G.; and Ebersole, Joseph L.
Journal of Environmental Management 75(2): 93-104. (2005)
NAL Call #: HC75.E5J6 ; ISSN: 0301-4797
Descriptors: conservation measures/ habitat/ freshwater habitat/ lotic water/ land zones/ comprehensive zoology:

habitat management/ habitat restoration/ stream riparian habitat/ analysis of models/ stream/ riparian habitat restoration/ Oregon/ Grand Ronde basin/ stream riparian habitat restoration
Abstract: This paper integrates economic, biological, and physical models to explore the efficient combination and spatial allocation of conservation efforts to protect water quality and increase salmonid populations in the Grande Ronde basin, Oregon. We focus on the effects of shade on water temperatures and the subsequent impacts on endangered juvenile salmonid populations. The integrated modeling system consists of a physical model that links riparian conditions and hydrological characteristics to water temperature; a biological model that links water temperature and riparian conditions to salmonid abundance, and an economic model that incorporates both physical and biological models to estimate minimum cost allocations of conservation efforts. Our findings indicate that conservation alternatives such as passive and active riparian restoration, the width of riparian restoration zones, and the types of vegetation used in restoration activities should be selected based on the spatial distribution of riparian characteristics in the basin. The relative effectiveness of passive and active restoration plays an important role in determining the efficient allocations of conservation efforts. The time frame considered in the restoration efforts and the magnitude of desired temperature reductions also affect the efficient combinations of restoration activities. If the objective of conservation efforts is to maximize fish populations, then fishery benefits should be directly targeted. Targeting other criterion such as water temperatures would result in different allocations of conservation efforts, and therefore are not generally efficient.

1563. **Trout habitat, abundance, and fishing opportunities in fenced vs unfenced riparian habitat along Sheep Creek, Colorado.**
Stuber, R. J.
In: Riparian ecosystems and their management: Reconciling conflicting uses, General Technical Report-RM 120/ Johnson, R. Roy ; Ziebell, Charles D.; Patton, David R.; Ffolliott, Peter F.; and Hamre, R. H.; Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, 1985. pp. 310-314.
Notes: Conference held April 16-18, 1985 in Tuscon, Ariz.
NAL Call #: aSD11.A42
Descriptors: riparian environments/ livestock/ river banks/ grazing/ abundance/ Salmo/ standing stock/ Colorado, Sheep Creek/ livestock
Abstract: Fencing was used to protect 40 hectares of riparian stream habitat along 2.5 km of Sheep Creek, Colorado, from adverse impacts due to heavy streamside recreation use and cattle grazing. Fish habitat within the fenced area was narrower, deeper, had less streambank alteration, and better streamside vegetation than comparable unfenced sections. Estimated trout standing crop was twice as great, and proportional stock density (PSD) was higher than in unfenced sections. There was a higher proportion of nongame fish present in unfenced sections. Projected fishing opportunities within the fenced sections were double those estimated for a comparable length of unfenced habitat along the same stream.

1564. **Undamming rivers: A review of the ecological impacts of dam removal.**
Bednarek, A. T.
Environmental Management 27(6): 803-814. (2001)
NAL Call #: HC79.E5E5; ISSN: 0364-152X
Descriptors: dams/ rivers/ environmental restoration/ river engineering/ restoration/ fluvial morphology/ habitat/ sediment transport/ ecosystem resilience/ environmental impact/ migratory species/ stream flow rate/ cost benefit analysis/ biota/ regulated rivers/ environmental quality/ sediment load/ streamflow/ alteration of flow/ Pisces/ fish passage/ dam removal/ reclamation/ protective measures and control/ environmental action/ ecological impact of water development
Abstract: Dam removal continues to garner attention as a potential river restoration tool. The increasing possibility of dam removal through the FERC relicensing process, as well as through federal and state agency actions, makes a critical examination of the ecological benefits and costs essential. This paper reviews the possible ecological impacts of dam removal using various case studies. Restoration of an unregulated flow regime has resulted in increased biotic diversity through the enhancement of preferred spawning grounds or other habitat. By returning riverine conditions and sediment transport to formerly impounded areas, riffle/pool sequences, gravel, and cobble have reappeared, along with increases in biotic diversity. Fish passage has been another benefit of dam removal. However, the disappearance of the reservoir may also affect certain publicly desirable fisheries. Short-term ecological impacts of dam removal include an increased sediment load that may cause suffocation and abrasion to various biota and habitats. However, several recorded dam removals have suggested that the increased sediment load caused by removal should be a short-term effect. Preremoval studies for contaminated sediment may be effective at controlling toxic release problems. Although monitoring and dam removal studies are limited, a continued examination of the possible ecological impacts is important for quantifying the resistance and resilience of aquatic ecosystems. Dam removal, although controversial, is an important alternative for river restoration.

1565. **Urbanization effects on stream fish assemblages in Maryland, USA.**
Morgan, R. P. and Cushman, S. F.
Journal of the North American Benthological Society 24(3): 643-655. (2005)
NAL Call #: QL141.F7; ISSN: 08873593.
Notes: doi: 10.1899/0887-3593(2005)024\[0643:UEOSFA\]2.0.CO;2.
Descriptors: fish assemblages/ Maryland/ MBSS/ urbanization/ ichthyofauna/ index of biotic integrity/ stream/ urbanization/ Maryland
Abstract: We examined patterns in Maryland fish assemblages in 1st- through 3rd-order nontidal streams along an urbanization gradient in the Eastern Piedmont

(EP) and Coastal Plain (CP) physiographic ecoregions of Maryland, USA, using 1995 to 1997 and 2000 to 2002 data from the Maryland Biological Site Survey (MBSS). Major urbanization and other historical stressors occur in both ecoregions, and there is potential for further stress over the next 25 y as urbanization increases. We assigned each MBSS site (n = 544 streams) to a class of urbanization based on land cover within its upsite catchment. We compared observed fish abundance and species richness to the probable (expected) assemblages within each ecoregion, and also assessed the accuracy of the Maryland fish index of biotic integrity (FIBI) to indicate catchment urbanization. Relationships between urbanization and fish assemblages and FIBI varied between the 2 ecoregions. Assemblages in EP streams exhibited stronger relationships with urbanization than those in CP streams, particularly when urban land cover was >25% of the catchment. Across all EP stream orders (1st, 2nd, and 3rd), high urbanization was associated with low fish abundance and richness, low FIBI, and few intolerant fish species, resulting in assemblages dominated by tolerant species. Conservation practices minimizing urbanization effects on fish assemblages may be inadequate to protect sensitive fish species because of the invasiveness of urban development and stressors related to the urban stream syndrome. © 2005 by The North American Benthological Society.

1566. **Using historical biological data to evaluate status and trends in the Big Darby Creek Watershed (Ohio, USA).**
Schubauer Berigan, M. K.; Smith, M.; Hopkins, J.; and Cormier, S. M.
Environmental Toxicology and Chemistry 19(4,pt.2): 1097-1105. (2000)
NAL Call #: QH545.A1E58; ISSN: 0730-7268 [ETOCDK].
Notes: In the Special Issue: Ecosystem Vulnerability. Paper presented at the American Society for Testing and Materials-U.S. Environmental Protection Agency-Society of Environmental Toxicology and Chemistry Symposium, August 17-20, 1998, Seattle, Washington. Includes references.
Descriptors: watersheds/ watershed management/ biological indicators/ trends/ Ohio
Abstract: Assessment of watershed ecological status and trends is challenging for managers who lack randomly or consistently sampled data, or monitoring programs developed from a watershed perspective. This study investigated analytical approaches for assessment of status and trends using data collected by the Ohio Environmental Protection Agency as part of state requirements for reporting stream quality and managing discharge permits. Fish and benthic macroinvertebrate metrics collected during three time periods (1979-1981, 1986-1989, 1990-1993) were analyzed for the mainstem of Big Darby Creek, a high-quality warm-water stream in central Ohio, USA. Analysis of variance of transformed metrics showed significant differences among time periods for six fish metrics. In addition, significant positive linear trends were observed for four metrics plus the index of biotic integrity score, and negative linear trends for two fish metrics. An analysis of a subset of sites paired by location and sampled over the three periods reflected findings using all available data for the mainstem. In particular, mean estimates were very similar between the reduced and full data sets, whereas standard error estimates were much greater in the reduced subset. Analysis of serial autocorrelation patterns among the fish metrics over the three time periods suggests changes in the nature of stressors over time. A comparison within the most recent time period showed significantly better condition for Big Darby mainstem than for Hellbranch Run (the easternmost subwatershed), after adjusting for watershed size. The consistency of paired and nonrandomized results suggested that either type of data might be judiciously used for this watershed assessment. Results indicated that overall biological condition of the mainstem of the Big Darby Creek watershed has significantly improved since the early 1980s.
This citation is from AGRICOLA.

1567. **Using stream bioassessment protocols to monitor impacts of a confined swine operation.**
Jack, J.; Kelley, R. H.; and Stiles, D.
Journal of the American Water Resources Association 42(3): 747-753. (2006)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: best management practices/ BMPs/ bioindicators/ confined animal feeding operations/ CAFOs/ macroinvertebrates/ nonpoint source pollution/ water quality
Abstract: The processing of waste from confined animal feeding operations (CAFOs) presents a major environmental challenge. Treatment of waste and subsequent land application is a common best management practice (BMP) for these operations in Kentucky, USA, but there are few data assessing the effect of runoff from such operations on aquatic communities. The authors sampled a stream bordering a CAFO with a land application program to determine if runoff from the fertilized fields was adversely affecting stream communities. Water chemistry, periphyton, and macroinvertebrate samples from riffle habitats downstream of the CAFO were compared to samples collected from an upstream site and a control stream in 1999 and 2000. Riffle communities downstream of the fertilized fields had higher chlorophyll a levels than other sites, but there were no significant differences in macroinvertebrate numbers or in biometrics such as taxa richness among the sites. The BMP in place at this site may be effective in reducing this CAFO's impact on the stream; however, similar assessments at other CAFO sites should be done to assess their impacts. Functional measures such as nutrient retention and litter decomposition of streams impacted by CAFOs should also be investigated to ensure that these operations are not adversely affecting stream communities.

1568. **Using stream bioassessment to monitor best management practice effectiveness.**
Vowell, J. L.
Forest Ecology and Management 143(1-3): 237-244. (2001)
NAL Call #: SD1.F73; ISSN: 03781127.
Notes: doi: 10.1016/S0378-1127(00)00521-1.
Descriptors: benthic macroinvertebrates/ best management practices/ bioassessment/ BMP effectiveness/ logging/ nonpoint source pollution/ aquatic ecosystems/ environmental management/ assessment method/ streams/ United States

Abstract: A best management practices (BMPs)effectiveness study was conducted to evaluate Florida's BMPs for protecting aquatic ecosystems during intensive forestry operations. Sites were selected in major ecoregions of the state and each site was associated with a stream adjacent to intensive silviculture treatments. A stream bioassessment was conducted at each site before silviculture treatments, to determine a pre-treatment stream condition index (SCI). Sampling for the bioassessment was conducted at points along each stream, above and below the treatment area, to establish reference and test conditions. Silviculture treatments of clearcut harvesting, intensive mechanical site preparation and machine planting were then completed, during which all applicable BMPs were adhered to. One year after the first bioassessment and following the treatments, the sites were re-sampled at the same points. No significant difference in the SCI was observed between the reference and test portions of the streams that could be attributed to the treatments using BMPs. Hence, the results of the study support the hypothesis that proper application of BMPs provides protection to adjacent stream ecosystems.

1569. **Using stream macroinvertebrates to compare riparian land use practices on cattle farms in southwestern Wisconsin.**
Weigel, B. M.; Lyons, J.; Paine, L. K.; Dodson, S. I.; and Undersander, D. J.
Journal of Freshwater Ecology 15(1): 93-106. (2000)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060
Descriptors: benthos/ riparian environments/ land use/ agriculture/ sedimentation/ environmental effects/ Invertebrata/ Wisconsin
Abstract: Vegetative riparian buffer strips are typically used to curb stream degradation due to cattle grazing, but intensive rotational grazing has shown promise as an alternative best management practice. The authors compared aquatic macroinvertebrate assemblages among stream segments within continuously grazed pastures, intensive rotationally grazed pastures, undisturbed grassy vegetative buffer strips, and undisturbed woody vegetative buffer strips. Macroinvertebrate and stream sedimentation data were collected from four streams in each land use category in two consecutive years. In an attempt to account for inherent watershed variability among streams, watershed condition was represented with a sample collected upstream of each treatment reach. Watershed condition tended to have greater influence on macroinvertebrate measures than local riparian land use. However, local riparian land use influences were apparent if watershed condition was statistically accounted for with analysis of covariance. Stream reaches with intensive rotational grazing tended to have macroinvertebrate assemblage characteristics intermediate of the buffer and continuously grazed reaches. Although we detected some differences in macroinvertebrate assemblages that apparently reflected very local land use, our results suggest the macroinvertebrates were mostly responding to large-scale watershed influences.

1570. **Utility of biological monitoring for detection of timber harvest effects on streams and evaluation of best management practices: A review.**
Fortino, K.; Hershey, A. E.; and Goodman, K. J.
Journal of the North American Benthological Society 23(3): 634-646. (2004)
NAL Call #: QL141.F7; ISSN: 08873593.
Notes: doi: 10.1899/0887-3593(2004)023 <0634:UOBMFD>2.0.CO;2.
Descriptors: biological monitoring/ multimetric/ predictive modeling/ timber harvest/ biomonitoring/ community structure/ management practices/ stream/ timber harvesting
Abstract: Best Management Practice (BMP) guidelines have been developed to reduce the negative impacts of timber harvest on streams. BMPs are widely implemented, but the effectiveness of timber harvest BMPs has not been evaluated using modern biological monitoring techniques. Most current biological monitoring is based on 1 of 2 main approaches: multimetric monitoring or predictive modeling. These approaches differ considerably, and their respective merits and failings have been debated extensively in the literature. Our review evaluated the ability of these biological monitoring approaches to detect timber harvest effects and to assess the effectiveness of BMPs. Both techniques detect impairment via changes in macroinvertebrate community structure, despite their differences in approach. Most of the negative effects of timber harvest result in changes in the macroinvertebrate community, so we have concluded that both techniques should be effective for the evaluation of timber harvest and BMPs.

1571. **Warmwater stream bank protection and fish habitat: A comparative study.**
Shields, F. D.; Knight, S. S.; and Cooper, C. M.
Environmental Management 26(3): 317-328. (2000)
NAL Call #: HC79.E5E5 ; ISSN: 0364152X.
Notes: doi: 10.1007/s002670010089.
Descriptors: fish/ habitat/ stream bank protection/ stream restoration/ streambank erosion/ bank protection/ biomass/ cost benefit analysis/ ocean habitats/ stream bank protection/ environmental protection/ conservation planning/ fish/ habitat restoration/ river management/ cost/ environmental management/ environmental protection/ fish/ marine environment/ nonhuman/ United States/
Abstract: Fishes and their habitats were sampled in Harland Creek, Mississippi, for 3 years to compare the relative value of three types of bank treatment in an incised, warm-water stream. Semiannual samples were collected from 10 reaches: 3 reaches protected by each of the three types of protection (longitudinal stone toe, stone spurs, and dormant willow posts) and an unprotected, slowly eroding bend. Protection of concave banks of bends had no measurable effect on the habitat quality of downstream riffles. Although bends and adjacent downstream riffles were faunistically similar at the species level, catostomids and centrarchids were more dominant in pools and smaller cyprinids more dominant in riffles. Reaches with willow posts were slightly deeper than the others, most likely because of geomorphic factors rather than bank treatment. Mean water surface widths in reaches stabilized with stone spurs were 40% to 90% greater than for other treatments, and current velocities were greatest in reaches with stone toe. Patterns of fish abundance and species diversity did

not differ significantly among treatments. However, principal components analysis indicated that the fish species distribution associated with the untreated reference site was distinct. Reaches stabilized with stone spurs supported significantly higher densities of large fish and higher levels of fish biomass per unit channel length than reaches with other bank treatments, generally confirming previous research in the region. Initial costs for spurs were comparable to those for stone toe and about three times greater than for willow posts.

1572. **Water quality in relation to watershed management in the lower San Gabriel River, southern California.**
Haj Manouchehri, Daneh
Fullerton, CA: California State University, Fullerton, 2004.
Notes: Degree: MS; Advisor: Laton, William Richard
Descriptors: watershed management/ water quality/ San Gabriel River/ California
Abstract: Currently water quality is one of the most critical concerns throughout the world. the lower reaches of the San Gabriel River Watershed, located in Los Angeles and Orange Counties lie in a semi-arid climate with a dense population. the purpose of this research was to identify the impaired reaches of the river with the type and level of impairment below the Whittier Narrows Dam. the levels of impairment were compared with federal, state and local surface water quality standards. the survey results indicated that the lower reaches of San Gabriel River were significantly impaired by metals (4 mg/l of arsenic), total coliform (240000/100ml) and nutrients (5 mg/l of nitrite). the major sources of the impairments are local industrial land use, intensive residential areas and agricultural runoff, respectively. the level of impairment at several stations reached readings too high to support the existing and intermittent designated beneficial uses of the river. Most of the dams and canalization of the basin were in response to the catastrophic floods of 1938. However, since it has been urbanized, people are demanding that the river be a resource for recreation and wildlife not only a gutter for urban runoff and flood flows. the study concludes that attaining the river water quality standards for beneficial uses will significantly enhance the value of the watershed.
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1573. **Water quality in Wyoming: The Sage Creek Project.**
Shirley, M. D.
Rangelands 25(3): 32-35. (2003)
NAL Call #: SF85.A1R32; ISSN: 0190-0528
Descriptors: benthos/ development projects/ erosion/ geological sedimentation/ geology/ grazing systems/ monitoring/ plant communities/ riparian vegetation/ streams/ vegetation/ water quality/ watersheds
Abstract: The geology and soils, erosion and sedimentation, and vegetation of the Sage Creek Basin in Wyoming, USA, were examined to assess the water quality of the stream. Sage Creek has been one of Wyoming's impaired stream, thus a Sage Creek Project was developed. The important aspects of the project were the implementation of a planned grazing system in the majority of the watershed and modifications to road crossings. A monitoring system has been established to collect additional baseline data and track the effectiveness of the best management practice implementation. The monitoring programme includes: chemical water quality and benthic macroinvertebrate sampling, channel cross-sections, riparian photo-points, green-line transects, and upland biological transects.
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1574. **Watershed improvement using prescribed burns as a way to restore aquatic habitat for native fish.**
Gori, David and Backer, Dana
In: Connecting mountain islands and desert seas: biodiversity and management of the Madrean Archipelago II., Proceedings RMRS 36/ Gottfried, Gerald J.; Gebow, Brooke S.; Eskew, Lane G.; and Edminster, Carleton B.; Ogden, UT: Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 403-406. http://www.fs.fed.us/rm/pubs/rmrs_p036/rmrs_p036_403_406.pdf
Descriptors: conservation measures/ land zones/ North America/ Pisces: habitat management/ aquatic habitat restoration/ native species/ fire management/ grassland watersheds/ freshwater habitat/ United States, southwestern region/ Pisces/ chordates/ fish/ vertebrates
Abstract: The Nature Conservancy and Bureau of Land Management are testing a model that prescribed burns can be used to increase perennial grass cover, reduce shrubs in desert grassland, and improve watershed condition and aquatic habitat. Results of a prescribed burn in the Hot Springs Creek watershed on Muleshoe Ranch CMA demonstrated the predicted vegetation changes and watershed improvement. Since 1991, instream cover, aquatic habitat depth, and native fish density have increased in Hot Springs Creek. Our results suggest that prescribed fire is an important tool for managing grassland watersheds and restoring aquatic habitat.
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1575. **Winter habitat of selected stream fishes and potential impacts from land-use activity.**
Cunjak, R. A.
In: Workshop on the science and management for habitat conservation and restoration strategies (HabCARES) in the Great Lakes. Kempenfelt, Ontario, Canada.
Kelso, J. R. (eds.)
Ottawa, Ontario, Canada: National Research Council of Canada; pp. 267-282; 1996.
Notes: Also published as: Canadian journal of fisheries and aquatic sciences/ Journal canadien des sciences halieutiques et aquatiques [Can. J. Fish. Aquat. Sci./J. Can. Sci. Halieut. Aquat.] 53 (supplement 1); ISSN: 0706-652X .
Descriptors: habitat/ habitat selection/ winter/ environmental impact/ land use/ metabolism/ habitat improvement/ rivers/ Salmonidae/ Canada/ conservation, wildlife management and recreation
Abstract: This paper reviews the habitat characteristics and the behaviour of selected stream fishes during winter in temperate-boreal ecosystems. Emphasis is placed on the salmonid fishes upon which most winter research has been directed. As space is the primary factor regulating stream fish populations in winter, aspects of winter habitat are considered at various spatial scales from microhabitat to stream reach to river basin. Choice of winter habitat is governed by the need to minimize energy expenditure, with the main criterion being protection from adverse physicochemical conditions. The distance moved to

wintering habitats, and the continued activity by many fishes during the winter, need to be considered when making management decisions regarding fish habitat. How habitat is affected by land-use activity in stream catchments is discussed with reference to impacts from water withdrawal, varying discharge regimes, and erosion or sedimentation. Even stream enhancement practices can deleteriously affect stream habitat if project managers are unaware of winter habitat requirements and stream conditions. Maintenance of habitat complexity, at least at the scale of stream sub-basin, is recommended to ensure the diversity of winter habitats for fish communities.

Lentic Habitats (Estuaries, Lakes, Ponds, Wetlands)

1576. **Achieving restoration success: Myths in bottomland hardwood forests.**
Stanturf, J. A.; Schoenholtz, S. H.; Schweitzer, C. J.; and Shepard, J. P.
Restoration Ecology 9(2): 189-200. (2001)
NAL Call #: QH541.15.R45R515; ISSN: 10612971.
Notes: doi: 10.1046/j.1526-100X.2001.009002189.x.
Descriptors: afforestation/ functions/ Wetlands Reserve Program/ afforestation/ ecosystem function/ floodplain forest/ restoration ecology/ United States
Abstract: Restoration of bottomland hardwood forests is the subject of considerable interest in the southern United States, but restoration success is elusive. Techniques for establishing bottomland tree species are well developed, yet problems have occurred in operational programs. Current plans for restoration on public and private land suggest that as many as 200,000 hectares could be restored in the Lower Mississippi Alluvial Valley alone. The ideal of ecological restoration is to reestablish a completely functioning ecosystem. Although some argue that afforestation is incomplete restoration, it is a necessary and costly first step but not an easy task. The 1992 Wetlands Reserve Program in Mississippi, which failed on 90% of the area, illustrates the difficulty of broadly applying our knowledge of afforestation. In our view, the focus for ecological restoration should be to restore functions, rather than specifying some ambiguous natural state based on reference stands or pre-settlement forest conditions. We view restoration as one element in a continuum model of sustainable forest management, allowing us to prescribe restoration goals that incorporate land-owner objectives. Enforcing the discipline of explicit terms of predicted values of functions, causal mechanisms and temproal response trajectories, will hasten the development of meaningful criteria for restoration success. We present our observations about current efforts to restore bottomland hardwoods as nine myths, or statements of dubious origin, and at best partial truth.

1577. **Addressing wetland issues: The Kansas NRCS approach.**
Soffran, L. M. and McDowell, J. L.
In: Proceedings of the 2004 Self-Sustaining Solutions for Streams, Wetlands, and Watersheds Conference. D'Ambrosio J.L. (eds.)
St Paul, MN; pp. 215-220 ; 2004.
Notes: Sponsors: American Society of Agricultural Engineers, ASAE; Ohio State University; Ohio Department of Natural Resources; EPA Great Lakes Grants Program; National Fish and Wildlife Foundation; U.S. Enviromental Protection Agency.; ISBN: 1892769441
Descriptors: HGM/ hydrogeomorphic/ minimal effects/ mitigation/ wetland functions/ wetlands/ agriculture/ biodiversity/ geomorphology/ water levels
Abstract: Frequently a wetland in Kansas has been manipulated to improve farming operations or provide a reliable water source for livestock. When a wetland has been converted in violation of wetland provisions, restoration or enhancement of the remaining wetland is the primary approach used to regain the lost wetland acreage and functional capacity units. In Kansas, the Natural Resources Conservation Service (NRCS) has adopted the Hydrogeomorphic (HGM) Model procedure for assessing wetland functions and values. Four interim HGM models are being used for minimal effects determinations and for mitigations of converted wetlands. The Playa Depression Model is used in the High Plains Playa region of Kansas. A Depression Model is being applied to non-riverine type depressions in the remainder of the state east of the playa region boundary. A Slope Model is used for hillside seeps, and a Riverine Model applies to wooded and herbaceous riverine settings. Structures are frequently constructed as a component of wetland restoration and creation, and land entered into the Wetland Reserve Program or Conservation Reserve Program. The structural design may include a dike or other type of water impoundment structure. A water level control structure may be included in the design when the objective is shallow water wetlands for wildlife.

1578. **Agricultural chemicals and prairie pothole wetlands: Meeting the needs of the resource and the farmer - U.S. perspective.**
Grue, C. E.; Tome, M. W.; Messmer, T. A.; Henry, D. B.; Swanson, G. A.; and DeWeese, L. R.
Transactions of the North American Wildlife and Natural Resource Conference 54: 43-58. (1989)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: agricultural activity/ prairie wetland ecosystems/ ecology/ agrichemicals/ semiaquatic habitat/ grassland/ chemical pollution/ United States, north central region/ wetland conservation

1579. **Agricultural ponds support amphibian populations.**
Knutson, Melinda G.; Richardson, William B.; Reineke, David M.; Gray, Brian R.; Parmelee, Jeffrey R.; and Weick, Shawn E.
Ecological Applications 14(3): 669-684. (2004)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: wetlands/ Ambystoma tigrinum/ Caudata/ agricultural ponds/ agriculture/ communities/ conservation/

ecosystems/ freshwater ecology/ habitat management/ habitat use/ Minnesota, Houston County/ Minnesota, Winona County/ land zones/ Minnesota/ nitrogen/ phosphorus/ ponds/ productivity/ reproduction/ reproductive success/ species diversity/ wildlife/ tiger salamander

Abstract: In some agricultural regions, natural wetlands are scarce, and constructed agricultural ponds may represent important alternative breeding habitats for amphibians. Properly managed, these agricultural ponds may effectively increase the total amount of breeding habitat and help to sustain populations. We studied small, constructed agricultural ponds in southeastern Minnesota to assess their value as amphibian breeding sites. Our study examined habitat factors associated with amphibian reproduction at two spatial scales: the pond and the landscape surrounding the pond. We found that small agricultural ponds in southeastern Minnesota provided breeding habitat for at least 10 species of amphibians. Species richness and multispecies reproductive success were more closely associated with characteristics of the pond (water quality, vegetation, and predators) compared with characteristics of the surrounding landscape, but individual species were associated with both pond and landscape variables. Ponds surrounded by row crops had similar species richness and reproductive success compared with natural wetlands and ponds surrounded by non-grazed pasture. Ponds used for watering livestock had elevated concentrations of phosphorus, higher turbidity, and a trend toward reduced amphibian reproductive success. Species richness was highest in small ponds, ponds with lower total nitrogen concentrations, tiger salamanders (Ambystoma tigrinum) present, and lacking fish. Multispecies reproductive success was best in ponds with lower total nitrogen concentrations, less emergent vegetation, and lacking fish. Habitat factors associated with higher reproductive success varied among individual species. We conclude that small, constructed farm ponds, properly managed, may help sustain amphibian populations in landscapes where natural wetland habitat is rare. We recommend management actions such as limiting livestock access to the pond to improve water quality, reducing nitrogen input, and avoiding the introduction of fish.

1580. **Agricultural production and wetland habitat quality in a coastal prairie ecosystem: Simulated effects of alternative resource policies on land-use decisions.**
Musacchio, L. R. and Grant, W. E.
Ecological Modelling 150(1-2): 23-43. (2002)
NAL Call #: QH541.15.M3E25; ISSN: 03043800.
Notes: doi: 10.1016/S0304-3800(01)00459-8.
Descriptors: ecosystem management/ land use/ migratory waterfowl/ natural resource policy/ systems modeling/ wildlife habitat/ agricultural ecosystem/ ecological modeling/ ecosystem management/ land use/ waterfowl/ wetland/ United States/ Anas/ Anatidae/ Anser/ Anser caerulescens caerulescens/ Anser sp./ Bos taurus/ Oryza sativa

Abstract: We describe an integrated systems model of the coastal prairie ecosystem in Texas, USA to simulate the effect of alternative federal resource policy scenarios (crop subsidies) for rice (Oryza sativa) on land-use decisions of farmers and the subsequent impact on lesser snow goose (Anser caerulescens caerulescens) habitat. We evaluate the ability of the model to predict shifts in land use, agricultural production, economic viability of farms, and the resulting wetland habitat quality for geese, in view of the uncertainty concerning representation of farmers' land-use decision making processes (management styles). We then simulate shifts in land use, rice and cattle production, farm profitability, and level of wetland habitat use by geese that might result from three alternative federal resource policy scenarios and three alternative farmers' management styles. We found changes in land-use allocation, rice and cattle production, and farm profitability resulting from the policy scenarios affected habitat use by geese. Policy financial incentives, market price for rice, level of rice production, and farm size were important factors that affected wetland habitat use by geese. The management styles of farmers affected the quality of wetland habitat when policy scenarios required rice to be grown with conventional production methods. In this case, farmers, particularly those who were concerned about maintaining farming as a way of life, continued rice production and maintained wetland habitat for geese even when crop subsidies decreased over time. The public benefited from the decision making of these farmers because the important indirect use value (wildlife habitat and water quality) and existence value (biodiversity and cultural history) of rice agriculture was maintained as an agroecosystem.

1581. **Agricultural wetland management for conservation goals: Invertebrates in California ricelands.**
O'Malley, Rachel Emerson
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 857-885.
Notes: ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Invertebrata/ farming and agriculture/ agricultural wetlands management for conservation/ conservation measures/ agricultural wetlands conservation goals/ habitat management/ agricultural wetlands/ cultivated land habitat/ California/ agricultural wetlands conservation value and management

1582. **Agricultural wetlands and waterbirds: A review.**
Czech, H. A. and Parsons, K. C.
Waterbirds 25(2 [supplement]): 56-65. (2002)
NAL Call #: QL671; ISSN: 1524-4695.
Notes: Literature review. Managing Wetlands for Waterbirds: Integrated Approaches.
Descriptors: agricultural ecosystem/ wetlands/ habitat changes/ habitat utilization/ aquatic birds/ habitat/ agriculture/ breeding sites/ foraging behavior/ rice fields/ Aves/ ecology/ community studies/ conservation, wildlife management and recreation

Abstract: Waterbird use of agricultural wetlands has increased as natural wetlands continue to decline worldwide. Little information exists on waterbird use of wetland crops such as taro, hasu, and wild rice. Several reports exist on waterbird use of cranberry bog systems. Information exists on waterbird use of rice fields, especially by herons and egrets. Rice fields encompass over 1.5 million km^2 of land and are found on all continents except

Antarctica. Rice fields are seasonally flooded for cultivation and to decoy waterfowl, and drawn down for sowing and harvest. A wide variety of waterbirds including wading birds, shorebirds, waterfowl, marshbirds, and seabirds utilize rice fields for foraging and to a lesser extent as breeding sites. In some areas, especially Asia, waterbirds have come to rely upon rice fields as foraging sites. However, few reports exist on waterbird use of rice ecosystems outside of the Mediterranean Region. Species that are commonly found utilizing agricultural wetlands during the breeding season, migration, and as wintering grounds are listed. General trends and threats to waterbirds utilizing agricultural wetlands, including habitat destruction and degradation, contaminant exposure, and prey fluctuations are presented.

1583. **Agriculture and wildlife: Ecological implications of subsurface irrigation drainage.**
Lemly, A. Dennis
Journal of Arid Environments 28(2): 85-94. (1994)
NAL Call #: QH541.5.D4J6; ISSN: 0140-1963.
Notes: Literature review.
Descriptors: farming and agriculture/ subsurface irrigation drainage/ wetland fauna/ semiaquatic habitat/ chemical pollution/ agricultural irrigation/ wetlands/ United States, western region

1584. **Agronomy implications of waterfowl management in Mississippi ricefields.**
Manley, S. W.; Kaminski, R. M.; Reinecke, K. J.; and Gerard, P. D.
Wildlife Society Bulletin 33(3): 981-992. (2005)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2005)33[981:AIOWMI]2.0.CO;2.
Descriptors: agronomic benefits/ habitat management/ Mississippi Alluvial Valley/ Oryza sativa/ red rice/ rice/ straw disposal/ wetlands/ winter flooding/ winter weeds/ agronomy/ environmental economics/ rice/ waterfowl/ wildlife management/ Mississippi/ Anatidae/ Oryza rufipogon/ Oryza sativa/ Poaceae
Abstract: Ricefields are important foraging habitat for waterfowl and other waterbirds in several North American wintering areas, including the Mississippi Alluvial Valley (MAV). Rice growers are likely to adopt management practices that provide habitat for waterfowl if agronomic benefits also occur. Therefore, we conducted a replicated field experiment during autumn through spring 1995-1997 to study effects of postharvest field treatment and winter-water management on agronomic variables including biomass of residual rice straw, cool-season grasses and forbs (i.e., winter weeds), and viability of red rice (oryza sativa var.). The treatment combination of postharvest disking and flooding until early March reduced straw 68%, from 9,938 kg/ha after harvest to 3,209 kg/ha in spring. Treatment combinations that included flooding until early March were most effective in suppressing winter weeds and decreased their biomass in spring by 83% when compared to the average of other treatment combinations. Effects of treatment combinations on spring viability of red rice differed between winters, but no significant effects were found within winters. Autumn disking followed by flooding until early March reduced rice straw and suppressed winter weeds the most, but with additional costs. To obtain the most agronomic benefits, we recommend that rice growers forgo autumn disking and flood fields until early March, which will provide moderate straw reduction, good weed suppression, and predicted savings of $22.24-62.93/ha (U.S.) ($9.00-25.47/ac). Maintenance of floods on ricefields until early March also benefits waterfowl and other waterbirds by providing foraging habitat throughout winter.

1585. **Altering succession and improving habitat at created wetlands in Wyoming.**
Mckinstry, Mark Calvert. University of Wyoming, 2004.
Notes: Degree: PhD; Advisor: Anderson, Stanley H.
Descriptors: wetlands/ succession/ Wyoming/ waterfowl/ habitat use/ aquatic vegetation/ plant biomass/ habitat improvement
Abstract: In northeast Wyoming over 1,500 wetlands have been created through bentonite mining. These wetlands ranged in age from one to over 50 years old and represent one of the largest wetland creation projects in the world. They also served as a large experiment in self designing ecosystems. I found that waterfowl used wetlands in this region that (1) are located within complexes of >5 within 1 km, (2) have variable depths to accommodate various feeding strategies, and (3) have abundant submersed and emergent vegetation. I evaluated 48 wetlands in three age classes to determine aquatic plant succession. These wetlands were dominated by wind-dispersed emergents and generally have low species richness and plant biomass. During the reclamation process no attempt was made to introduce aquatic plants into these wetlands, most of which were isolated from other wetlands and sources of propagules by 50 km or more. I designed several experiments using greenhouse microcosms and field trials to identify plants that could be propagated at these wetlands using bentonite substrates or bentonite mixed with native topsoil. Plant species for experimental trials were selected based on their adaptations to the high salinity, ph, and alkalinity common among these wetlands. Generally, all plants (10 species of both submersed and emergent plants) had higher growth weights and survival in microcosms with the topsoil or topsoil and bentonite mixed soil, suggesting that reclamation should include the addition of topsoil into these wetlands. Several plants did well under various treatments and in field trials, including some that are of high value to wildlife (Potamogeton pectinatus, Vallisneria americana, Scirpus validus, Scirpus maritimus, Eleocharis palustris). I also evaluated the use of salvaged-wetland soil in six newly-created wetlands as a technique to introduce propagules of native aquatic plants. The use of salvaged-wetland soil increased (1) the number of plant species present at a wetland over time (richness), (2) the total vegetation coverage in a treated wetland over time, and (3) the total plant biomass in a treated wetland. I recommend that future reclamation include the use of topsoil and salvaged-wetland soil to improve aquatic plant growth as well as plantings of select wetland species to improve plant diversity and biomass at these wetlands.

1586. **Alternative uses of wetlands other than conventional farming in Iowa, Kansas, Missouri, and Nebraska.**
Leventhal, E.
Washington, DC: Environmental Protection Agency; EPA/171/R-92/006, 1992.
Descriptors: wetlands/ land use/ agriculture/ economic analysis/ sociological aspects/ environmental impact/ ecosystem disturbance/ United States/ conservation, wildlife management and recreation
Abstract: Conversion of wetlands in Iowa, Kansas, Missouri, and Nebraska into agricultural dry lands in the past several decades has occurred as a means to obtain profit from what landowners would otherwise consider unprofitable land. The activity has resulted in substantial losses of wetlands valued for their unique ability to mitigate flood and storm damage, control erosion, discharge and recharge groundwater, improve water quality, and support a wide diversity of fish, wildlife, and vegetation. Utilizing fish, wildlife, and vegetation from wetlands for profit is a way for wetland owners to recognize the value their wetlands add to their property. Landowners then have an incentive to preserve rather than convert their wetlands. [Sponsored by Environmental Protection Agency, Kansas City, KS. Region VII.]

1587. **Amphibian colonization and use of ponds created for trial mitigation of wetland loss.**
Pechmann, J. H. K.; Estes, R. A.; Scott, D. E.; and Gibbons, J. W.
Wetlands 21(1): 93-111. (2001)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: amphibians/ migration/ wetland creation/ habitat creation/ mitigation/ ponds
Abstract: Created ponds were built as an experiment in mitigating the loss of a wetland to construction. We monitored amphibian breeding population sizes and juvenile recruitment at these created ponds for 8.5 years and compared the populations to those observed at the original wetland, Sun Bay (≤ 600 m from the created ponds), and at an undisturbed reference wetland, Rainbow Bay. Some amphibians continued breeding migrations to Sun Bay even after it was filled with soil. Few of the anuran colonists of the created ponds had been previously captured at Sun Bay, but many of the salamander colonists had been collected. The created ponds became permanent, whereas Sun Bay and Rainbow Bay were temporary ponds. Juveniles of two salamander species and 10 species of frogs and toads metamorphosed and emigrated from the created ponds during the study. By the final years of the study, the community structure of adult and juvenile amphibians differed among the three created ponds, as well as between these ponds and the prior amphibian community at the filled wetland and the contemporaneous community at the reference wetland. Mean size at metamorphosis was smaller at the created ponds than at the reference site for two species of frogs, whereas the opposite was true for two salamanders. We conclude that the created ponds provided partial mitigation for the loss of the natural amphibian breeding habitat. Differences between the created ponds and the natural wetlands were likely related to differences in their hydrologic regimes, size, substrates, vegetation, and surrounding terrestrial habitats and to the limited availability of colonists of some species.

1588. **Amphibian occurrence and aquatic invaders in a changing landscape: Implications for wetland mitigation in the Willamette Valley, Oregon, USA.**
Pearl, Christopher A.; Adams, Michael J.; Leuthold, Niels; and Bury, R. Bruce
Wetlands 25(1): 76-88. (2005)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetland mitigation/ breeding occurrence/ landscape characteristics
Abstract: Despite concern about the conservation status of amphibians in western North America, few field studies have documented occurrence patterns of amphibians relative to potential stressors. We surveyed wetland fauna in Oregon's Willamette Valley and used an information theoretic approach (AIC) to rank the associations between native amphibian breeding occurrence and wetland characteristics, non-native aquatic predators, and landscape characteristics in a mixed urban-agricultural landscape. Best predictors varied among the five native amphibians and were generally consistent with life history differences. Pacific tree frog (Pseudacris regilla) and long-toed salamander (Ambystoma macrodactylum) occurrence was best predicted by the absence of non-native fish. Northern red-legged frog (Rana a. aurora) and northwestern salamander (Ambystoma gracile) were most strongly related to wetland vegetative characteristics. The occurrence of rough-skinned newts (Taricha granulosa), a migratory species that makes extensive use of terrestrial habitats, was best predicted by greater forest cover within 1 km. The absence of non-native fish was a strong predictor of occurrence for four of the five native species. In contrast, amphibians were not strongly related to native fish presence. We found little evidence supporting negative effects of the presence of breeding populations of bullfrog (Rana catesbeiana) on any native species. Only the two Ambystoma salamanders were associated with wetland permanence. Northwestern salamanders (which usually have a multi-year larval stage) were associated with permanent waters, while long-toed salamanders were associated with temporary wetlands. Although all the species make some use of upland habitats, only one (rough-skinned newt) was strongly associated with surrounding landscape conditions. Instead, our analysis suggests that within-wetland characteristics best predict amphibian occurrence in this region. We recommend that wetland preservation and mitigation efforts concentrate on sites lacking non-native fish for the conservation of native amphibians in the Willamette Valley and other western lowlands.

1589. **Amphibian occurrence and wetland characteristics in the Puget Sound Basin.**
Richter, Klaus O. and Azous, Amanda L.
Wetlands 15(3): 305-312. (1995)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: breeding habitat/ hydrology/ land use/ predation/ vegetation class

Abstract: We studied the pattern of amphibian distributions within 19 wetlands of the Puget Sound Basin in King County, Washington State from 1988 through 1991. Amphibian richness was compared to wetland size, vegetation classes, presence of bullfrog and fish predators, hydrologic characteristics of water flow, fluctuation, and permanence, and land use. Low velocity flow and low fluctuation were correlated with high species richness. Seasonal persistence of water was unrelated to species richness. Wetland size, distance to other wetlands favorable for breeding, fish and bullfrog predators, and the number of vegetation classes found at a wetland were unrelated to total number of species. Increasing mean water-level fluctuation and percent watershed urbanization were correlated with low species richness. Small and structurally simple wetlands often have high value amphibian habitat, and traditional reliance on wetland size and broad vegetation classes without site-specific studies should be avoided when assessing habitat value for amphibians.

1590. **An analysis of economic incentives in wetlands policies addressing biodiversity.**
Fernandez, L.
Science of the Total Environment (1-3): 107-122. (1999)
NAL Call #: RA565.S365; ISSN: 0048-9697.
Notes: Special issue: Managing for biodiversity for the protection of nature; doi: 10.1016/S0048-9697(99)00311-3.
Descriptors: wetlands/ biodiversity/ policies/ restoration/ environmental protection/ economic analysis/ environmental economics/ legislation/ nature conservation/ environmental restoration/ simulation/ California/ resources management/ wildlife habitat/ costs/ evaluation process
Abstract: This paper offers an economic analysis of economic incentives within the Habitat Conservation Plan and Wetlands Mitigation Bank policies. Both policies are relatively new policies for protection and restoration of ecosystems such as wetlands that support biodiversity. The components of the policies such as the measures of success, conversion of biological units into economic units, and timing of the actions by policymakers and landowners influence the incentives to carry out protection and restoration. A stochastic optimal control model is developed which incorporates ecological uncertainty of wetlands restoration. The model helps in examining the decisions of how much to invest in a wetlands mitigation bank or habitat conservation plan. The model is calibrated with data from California bioeconomic parameters. Numerical simulation of the model provides a sensitivity analysis of how model parameters of restoration costs, stochastic biological growth, discount rate, and the market value of credits affect the trajectory of investment and the optimal stopping state of wetlands quality when the investment ends. The analysis reveals that more restoration will occur when there is a reduction in restoration costs, an increase in biological uncertainty or an increase in the value of wetlands credits. Continued restoration is harder to justify at a higher discount rate and cost.

1591. **Analysis of wetland trends and management alternatives for Georgia.**
Woolf, S. W. and Kundell, J. E.
Atlanta: Environmental Resources Center, Georgia Institute of Technology; Report No. Erc 01-85, 1985. 154 p.
Descriptors: wetlands/ coastal marshes/ Georgia/ land use/ salt marshes/ alternative planning/ drainage/ erosion/ estuaries/ flood control/ forest management/ marshes/ soils/ urban runoff/ vegetation/ water management/ waterfowl
Abstract: Georgia is experiencing ' Sunbelt ' population growth and expansions in agricultural and forestry production resulting in increased pressure to convert wetlands to other uses. An analysis was undertaken of data generated by the Fish & Wildlife Service 's National Wetland Inventory, Georgia Department of Natural Resource 's Landsat Land use study, and Soil Conservation Service 's National Resources Inventory. Wetland acreage, distribution, types, and trends were identified for Georgia. A review of case law and statutory law was conducted and wetland management activities of federal, state, and local governments were determined. Alternative management strategies were identified for Georgia. (Woolf-U. GA)

1592. **Anthropogenic correlates of species richness in southeastern Ontario wetlands.**
Findlay, C. S. and Houlahan, J.
Conservation Biology 11(4): 1000-1009. (Aug. 1997)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: wetlands/ plant populations/ community composition/ man-induced effects/ anthropogenic factors/ species diversity/ plants/ roads/ forestry/ Vertebrata/ Canada, Ontario/ species richness/ forest practices/ vertebrates/ conservation/ mechanical and natural changes/ water and plants
Abstract: We examined the relationship between the richness of four different wetland taxa (birds, mammals, herptiles, and plants) in 30 southeastern Ontario, Canada wetlands and two anthropogenic factors: road construction and forest removal/conversion on adjacent lands. Data were obtained from two sources: road densities and forest cover from 1:50,000 Government of Canada topographic maps and species lists and wetland areas from Ontario Ministry of Natural Resources wetland evaluation reports. Multiple regression analysis was used to model the relationships between species richness and wetland area, road density, and forest cover. Our results show a strong positive relationship between wetland area and species richness for all taxa. The species richness of all taxa except mammals was negatively correlated with the density of paved roads on lands up to 2 km from the wetland. Furthermore, both herptile and mammal species richness showed a strong positive correlation with the proportion of forest cover on lands within 2 km. These results provide evidence that at the landscape level, road construction and forest removal on adjacent lands pose significant risks to wetland biodiversity. Furthermore, they suggest that most existing wetland policies, which focus almost exclusively on activities within the wetland itself and/or a narrow buffer zone around the wetland perimeter, are unlikely to provide adequate protection for wetland biodiversity.

1593. **Anthropogenic effects on the biodiversity of riparian wetlands of a northern temperate landscape.**
Mensing, D. M.; Galatowitsch, S. M.; and Tester, J. R.
Journal of Environmental Management 53(4): 349-377. (1998)
NAL Call #: HC75.E5J6; ISSN: 0301-4797
Descriptors: wetlands/ assessment/ land use/ fish/ aquatic invertebrates/ riparian vegetation/ effects/ biodiversity/ landscape/ land resources/ resource conservation/ resource management/ riparian forests/ biological indicators/ human activity/ forestry practices/ birds/ Amphibia/ Minnesota/ disturbance/ vertebrates/ Chordata/ animals
Abstract: The present study explores the relationships between riparian wetland communities and anthropogenic disturbances, including urban, forestry and cultivated land. Small stream riparian wetlands in central Minnesota, USA, provided an opportunity to detect these relationships because land use within the region is heterogeneous, resulting in disturbance gradients at the scales of stream reach and landscape. The research tested 2 hypotheses: organismal groups (wet meadow vegetation, shrub carr vegetation, aquatic macro-invertebrates, amphibians, fish and birds) respond differently to various types of anthropogenic disturbance; and the observed biological responses are dependent on the spatial scale of the disturbance. It was shown that birds were the best indicators of landscape condition within the near vicinity of small stream riparian wetlands, and fish community composition corresponded to broader landscape land use patterns. It is suggested that the type of anthropogenic disturbance and the spatial scale at which the disturbance occurs will have variable consequences to different organismal groups. If the effectiveness of the proposed indicators is verified, then managers can strategically monitor the biota and accurately interpret the results. The strength and interpretability of bird and fish relationships to land use of riparian wetlands suggest that indicator and criteria development are warranted.

1594. **Anuran call surveys on small wetlands in Prince Edward Island, Canada restored by dredging of sediments.**
Stevens, C. E.; Diamond, A. W.; and Gabor Shane, T. S.
Wetlands 22(1): 90-99. (2002)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: anuran call survey/ marsh monitoring program/ NAWMP/ small wetlands/ wetland restoration/ abundance estimation/ amphibians/ habitat restoration/ species occurrence/ wetland/ Canada/ Bufo americanus/ Pseudacris crucifer/ Rana clamitans/ Rana pipiens/ Rana sylvatica
Abstract: In 1990, the North American Waterfowl Management Plan (NAWMP) implemented a small-wetland restoration program in Prince Edward Island (PEI), Canada. Wetlands were restored by means of dredging accumulated sediment and organic debris to create open water and emulate pre-disturbance conditions. Three call surveys were conducted in the spring and summer of 1998 and 1999 to estimate abundance and occurrence of spring peepers (Pseudacris crucifer), wood frogs (Rana sylvatica), northern leopard frogs (Rana pipiens). American toads (Bufo americanus), and green frogs (Rana clamitans) on restored and reference wetlands. Numbers of species calling and abundance indices of northern leopard frogs, green frogs, and spring peepers were significantly higher on restored versus reference wetlands. The number of species calling in restored wetlands was positively correlated with proximity to freshwater rivers; in refernce wetlands, the number was positively associated with proximity with forested perimeters and area of open water. Occurrence of calling green frogs in restored wetlands was positively correlated with percent cattail and, in reference wetlands, with proximity to other wetlands. Our results suggest that small wetland restoration projects may be a good conservation tool for anurans. We recommend further research on reproductive success and on local population trends in restored wetlands to determine if restoration is beneficial for anurans on PEI.

1595. **Aquatic invertebrate and plant responses following mechanical manipulations of moist-soil habitat.**
Gray, M. J.; Kaminski, R. M.; Weerakkody, G.; Leopold, B. D.; and Jensen, K. C.
Wildlife Society Bulletin 27(3): 770-779. (1999)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: aquatic invertebrates/ hydrophytes/ Mississippi/ moist-soil management/ waterfowl habitat/ wetland management
Abstract: Managers mow, disk, and till moist-soil habitats to set back succession and increase interspersion of emergent vegetation and water for migrant and wintering waterbirds. We evaluated effects of autumn applications of these manipulations on aquatic invertebrates and moist-soil plants during 2 subsequent winters and growing seasons, respectively, at Noxubee National Wildlife Refuge, Mississippi. Greatest seed mass was in tilled and disked plots in 1993 ($P \leq 0.008$) and in tilled plots in 1994 ($P \leq 0.008$). Plant species diversity generally was greatest in tilled plots in both years ($P \leq 0.05$). Mowed and control plots produced greatest aquatic invertebrate mass in winter 1992-93 ($P \leq 0.025$) and diversity in both winters ($P \leq 0.01$). Invertebrate mass and plant standing crop generally did not differ among treatments in winter 1993-94 and both years, respectively. We recommend autumn tilling in small moist-soil habitats to increase plant species diversity and seed yield. For large-scale management, disking may be more practical than tilling and would likely yield similar plant responses. We recommend autumn mowing if moist-soil habitats exist in early seral stages and contain desirable seed-producing plants that are robust and do not readily topple following flooding to create open water areas for waterbirds.

1596. **Aquatic invertebrate responses to timber harvest in a bottomland hardwood wetland of South Carolina.**
Batzer, D. P.; George, B. M.; and Braccia, A.
Forest Science 51(4): 284-291. (2005)
NAL Call #: 99.8 F7632; ISSN: 0015-749X
Descriptors: wetlands/ lowland forests/ hardwood forests/ logging/ clearcutting/ Aedes/ Culicidae/ community structure/ indicator species/ environmental impact/ South Carolina
This citation is from AGRICOLA.

1597. **Aquatic macroinvertebrate assemblages in mitigated and natural wetlands.**
Balcombe, C. K.; Anderson, J. T.; Fortney, R. H.; and Kordek, W. S.
Hydrobiologia 541(1): 175-188. (2005)
NAL Call #: 410 H992; ISSN: 00188158.
Notes: doi: 10.1007/s10750-004-5706-1.
Descriptors: invertebrates/ macroinvertebrates/ mitigation wetland/ wetland construction/ wetlands/ wildlife/ biodiversity/ biomass/ composition/ ecosystems/ ocean habitats/ quality assurance/ wetlands/ human disturbances/ macroinvertebrates/ mitigation/ quality habitat/ lakes/ macroinvertebrate/ species richness/ wetland/ West Virginia/ Annelida/ Anura/ Invertebrata/ Isopoda/ Oligochaeta (Metazoa)/ Physidae/ Planorbidae
Abstract: Many wetlands have been constructed in West Virginia as mitigation for a variety of human disturbances, but no comprehensive evaluation on their success has been conducted. Macroinvertebrates are extremely valuable components of functioning wetland ecosystems. As such, benthic and water column invertebrate communities were chosen as surrogates for wetland function in the evaluation of 11 mitigation and 4 reference wetlands in West Virginia. Mitigation wetlands ranged in age from 4 to 21 years old. Overall familial richness, diversity, density and biomass were similar between mitigation and reference wetlands ($p > 0.05$). Within open water habitats, total benthic invertebrate density was higher in reference wetlands, but mass of common taxa from water column samples was higher in mitigation wetlands ($p < 0.05$) Planorbidae density from benthic samples in emergent habitats was higher in reference than mitigated wetlands. Benthic Oligochaeta density was higher across open water habitats in mitigation wetlands. All other benthic taxa were similar between wetland types. Among the most common water column orders, Isopoda density was higher in reference wetlands, but Physidae density was higher in mitigation wetlands. Within mitigation wetlands, emergent areas contained higher richness and diversity than open areas. These data indicate that mitigation and reference wetlands generally support similar invertebrate assemblages, especially among benthic populations. The few observed differences are likely attributable to differences in vegetative community composition and structure. Mitigation wetlands currently support abundant and productive invertebrate communities, and as such, provide quality habitat for wetland dependent wildlife species, especially waterbirds and anurans. © Springer 2005.

1598. **Aquatic macroinvertebrate diversity of playa wetlands: The role of landscape and island biogeographic characteristics.**
Hall, D. L.; Willig, M. R.; Moorhead, D. L.; Sites, R. W.; Fish, E. B.; and Mollhagen, T. R.
Wetlands 24(1): 77-91. (2004)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ macrofauna/ species diversity/ biogeography/ community composition/ ecology/ fauna/ biodiversity/ aquatic organisms/ life history/ regression analysis/ Texas/ Texas, Southern High Plains/ landscape ecology/ island biogeography
Abstract: Wetland habitats continue to be lost at a unsettling rate, especially freshwater emergent wetlands that are isolated geographically. These are the predominant wetlands found in arid and semi-arid environments, where they serve as foci of regional biodiversity. This is especially true of the playa wetlands of the Southern High Plains of Texas, USA. The factors that determine and maintain biotic diversity in these wetlands are understood poorly. Consequently, this study examined the effect of island biogeographic and landscape features on the diversity of aquatic macroinvertebrates in playa wetlands. Macroinvertebrates were collected from playas three times during the spring and summer of 1994 and categorized as resident or transient taxa based on life history strategies. Diversity was estimated using taxonomic richness (richness) and Fisher's log-series alpha (alpha). Surrounding land-use practices influenced resident richness, whereas playa surface area affected resident and transient richness, as well as resident alpha . However, relationships differed among sampling dates. Regression analyses suggested that transient richness and alpha were influenced more by insular characteristics than by landscape features. The converse was true for resident richness and alpha . Therefore, both insular and landscape characteristics affected the diversity of macroinvertebrates in playa wetlands, but impacts were dependent on life-history strategy and time since inundation (i.e., sampling date). Consequently, conservation and management efforts targeting macroinvertebrates in playa wetlands will need to focus on the wetlands and characteristics of adjacent watershed features.

1599. **Assessing conservation trade-offs: Identifying the effects of flooding rice fields for waterbirds on non-target bird species.**
Elphick, C. S.
Biological Conservation 117(1): 105-110. (2004)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/S0006-3207(03)00264-7.
Descriptors: agriculture/ California, Central Valley/ landbird/ passerines/ raptors/ arable land/ avifauna/ conservation management/ ecological impact/ flooding/ nontarget organism/ trade-off/ waterfowl
Abstract: I examined how winter flooding of post-harvest rice fields - a management practice used to benefit waterbirds - affects field use by other birds. In addition to waterbirds previously studied, I recorded 56 bird species in rice fields. Of these, five were more abundant in flooded fields, ten were more abundant in unflooded fields, no difference was detected for 19, and the remainder were too rare to draw any conclusions. Species that were more common in unflooded fields were all carnivorous or granivorous in winter, whereas species that were more common in flooded fields were mostly insectivores commonly associated with aquatic habitats. The net effects of the responses by individual species were fewer raptor species in flooded fields, but no difference in the species richness of other landbirds. Winter flooding potentially has negative effects for some birds, but has no discernible effects on most species studied and may benefit some passerines.

1600. **Assessing drought-related ecological risk in the Florida Everglades.**
Smith, S. M.; Gawlik, D. E.; Rutchey, K.; Crozier, G. E.; and Gray, S.
Journal of Environmental Management 68(4): 355-366. (2003)
NAL Call #: HC75.E5J6 ; ISSN: 03014797.
Notes: doi: 10.1016/S0301-4797(03)00102-6.
Descriptors: drought/ Everglades/ fire/ risk assessment/ wading birds/ drought/ environmental management/ environmental stress/ wader/ water management/ drought stress/ environmental impact assessment/ risk assessment/ birds/ ecosystem/ models, theoretical/ natural disasters/ water supply/ United States
Abstract: In the winter-spring of 2001, South Florida experienced one of the worst droughts in its recorded history. Out of a myriad of ecological concerns identified during this time, the potential for catastrophic peat fire and negative impacts to wading bird reproduction emerged as critical issues. Water managers attempted to strike a balance between the environment and protection of water supplies for agriculture and urban interests. It became evident, however, that a broad-scale, integrated way to portray and prioritise ecological stress was lacking in the Florida Everglades, despite this being considered a necessary tool for addressing issues of environmental protectioh. In order to provide a framework for evaluating various water management operations using real-time information, we developed GIS-based indices of peat-fire risk and wading bird habitat suitability. These indices, based on real physical, chemical, and biological data, describe two ecological conditions that help define the physical and biological integrity of the Everglades. In addition to providing continuous, updated assessments throughout the drought period, we incorporated predictive models of water levels to evaluate how various water management alternatives might exacerbate or alleviate ecological stress during this time.

1601. **Assessing salt marsh harvest mouse movements during high tides, San Pablo Bay, California.**
Hulst, Miriam D.; Hall, Linnea S.; Morrison, Michael L.; and Bias, Michael L.
Transactions of the Western Section of the Wildlife Society 37: 88-91. (2001)
NAL Call #: SK351.W523; ISSN: 0893-214X
Descriptors: conservation measures/ ecology/ distribution within habitat/ brackish habitat/ abiotic factors/ physical factors/ land and freshwater zones/ Reithrodontomys raviventris (Muridae): habitat management/ salt marsh levee/ diked areas/ restoration/ zonation/ winter high tides/ water movements/ California/ Sonoma County/ San Pablo Bay National Wildlife Refuge/ Muridae/ Rodentia, Mammalia/ chordates/ mammals/ vertebrates

1602. **Avian and amphibian use of fenced and unfenced stock ponds in northeastern Oregon forests.**
Bull, E. L.; Deal, J. W.; and Hohmann, J. E. USDA Forest Service Rocky Mountain Research Station; PNW-RP-539, 2001. 9 p.
NAL Call #: A99.9 F7625Uni no. 539
http://www.treesearch.fs.fed.us/pubs/2964
Descriptors: amphibians/ birds/ livestock grazing/ northeastern Oregon/ stock ponds
Abstract: The abundance of birds and amphibian larvae was compared between fenced and unfenced stock ponds in 1993 to determine if fencing improved the habitat for these species in northeastern Oregon. Stock ponds that were fenced had significantly higher densities of bird species, guilds, and taxonomic groups than stock ponds that were unfenced. No differences in the relative abundance of larvae of Pacific treefrogs (Pseudacris regilla) or long-toed salamanders (Ambystoma macrodactylum) were found between fenced and unfenced ponds. Fencing at least a portion of stock ponds in forested areas provides habitat for a greater diversity and abundance of birds.

1603. **Avian communities in forested riparian wetlands of southern Michigan, USA.**
Inman, Rainy L.; Prince, Harold H.; and Hayes, Daniel B.
Wetlands 22(4): 647-660. (2002)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: biodiversity/ biogeography: population studies/ modeling/ mathematical and computer techniques/ avian community/ breeding status/ floodplain/ forested riparian wetlands/ plant species dominance/ plant species richness/ plant species structure/ species composition/ vegetation composition/ vegetation structure/ wetlands ecology
Abstract: Descriptive studies are an important first step in developing assessment models for regional wetland subclasses. Objectives of this study were to gather benchmark information on the composition and structure of vegetation from minimally impacted riparian forested wetland sites in Michigan, USA, and to determine if species composition of the breeding bird community and relative densities of individual species varied among riparian and adjacent upland forest zones. Plant species richness, dominance, and structure differed greatly between floodplain wetlands and uplands and were similar among zones within floodplain forests. Of 54 breeding bird species recorded through point count surveys (1998-99), 39 were observed in both floodplain and upland forests, while 11 were found only in floodplains and 4 solely in the uplands. Detectable patterns of avian density across riparian and upland forest zones were evident for 31 breeding species. Most species preferred areas closest to the river over other zones, although a few species were more prevalent within interior floodplains or uplands as compared to riverside forests. Forested riparian wetlands in this region act as essential breeding habitats for many avian species not often found in upland areas and are especially important for obligate riparian species and rare or declining breeding birds observed within our sites. These results are consistent with many studies across North America, where riparian forests have been found to support disproportionately large numbers of breeding bird species as compared to more xeric forests and other upland habitats.

1604. **Avian communities of created and natural wetlands: Bottomland forests in Virginia.**
Snell Rood, Emilie C. and Cristol, Daniel A.
Condor 105(2): 303-315. (May 2003)
NAL Call #: QL671.C6; ISSN: 0010-5422
Descriptors: Aves/ habitat management/ created vs. natural forest wetland communities/ community structure/ semiaquatic habitat/ forest and woodland/ created vs. natural forest wetlands/ Virginia/ Chowan River Basin/ community structure in created vs. natural forest wetlands/ conservation significance
Abstract: The federal government requires those who destroy wetlands to preserve, restore, or create new ones with the goal of no net loss of wetlands. In the summer of 2000, we tested whether forested wetlands created an average of 8 years earlier had developed avian communities similar to natural wetlands of the same age in southeastern Virginia. We compared six created wetlands to five natural (reference) wetlands that had undergone ecological succession after clearcutting. We also created a trajectory of expected avian community development by comparing 20 reference wetlands, logged 1-25 years earlier, to mature forested wetlands that had not been logged for 50 years or more. Created wetlands had significantly lower avian richness and diversity, and a different community composition, than reference wetlands. These differences were likely due to the fact that created wetlands supported low numbers of the expected passerine species. In addition, natural wetlands supported species of higher conservation concern, as measured by Neotropical migratory status, trophic level, habitat specificity, and wetland dependency. The trajectory of avian community development indicated that the created wetlands were developmentally behind reference wetlands or were following a different developmental trajectory altogether. We hypothesize that the differences between created and reference forested wetlands were due to unnatural patterns of hydrology or retarded vegetation development on created wetlands. It should not be assumed that created forested wetlands can provide full ecosystem replacement for natural forested wetlands.

1605. **Avian response to nutrient enrichment in an oligotrophic wetland, the Florida Everglades.**
Crozier, Gaea E. and Gawlik, Dale E.
Condor 104(3): 631-642. (Aug. 2002)
NAL Call #: QL671.C6; ISSN: 0010-5422
Descriptors: Aves/ community structure/ wetland community response to nutrient enrichment/ semiaquatic habitat/ oligotrophic wetland/ fertilizer and pesticide pollution/ fertilizers and pesticides/ phosphates/ Florida/ North Everglades/ community response to nutrient enrichment
Abstract: We studied the effects of nutrient enrichment on the bird community in an oligotrophic wetland, the Florida Everglades. Among the non-wading birds surveyed in 1996 and 1997, Boat-tailed Grackles (Quiscalus major) and Common Moorhens (Gallinula chloropus) were consistently more abundant in enriched sites, whereas Common Yellowthroats (Geothlypis trichas) were consistently more abundant in unenriched sites. The abundance of Red-winged Blackbird (Agelaius phoeniceus) was not significantly different between enriched and unenriched sites. Among wading birds, Wood Storks (Mycteria americana) and Great Egrets (Ardea alba) were significantly more abundant in enriched than unenriched areas in a dry year, 1991. Great Egrets and all wading species combined were significantly more abundant in enriched than unenriched areas in the wet year, 1995. Great Blue Herons (Ardea herodias) and White Ibises (Eudocimus albus) did not differ in abundance between enriched and unenriched areas in the dry or wet year. A significant interaction between water depth and nutrient status in the wet year indicated that wading bird abundance increased with water depth only in nutrient-enriched areas presumably because the enriched areas had greater food availability than unenriched areas at the same water depth. Bird abundance appeared to increase in nutrient-enriched areas; however, this increase was accompanied by a shift in species composition typically found in the unenriched Everglades and was a fundamental change in the Everglades' distinctive structure.

1606. **Avian response to vegetative pattern in playa wetlands during winter.**
Smith, L. M.; Haukos, D. A.; and Prather, R. M.
Wildlife Society Bulletin 32(2): 474-480. (2004)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: Hemi-marsh/ Playas/ Southern High Plains/ waterfowl/ wetlands/ Calcarius mccownii
Abstract: Breeding-bird communities inhabiting northern prairie wetlands have been shown to have higher densities and diversities in wetlands with a well-interspersed 50:50 vegetative cover:water ratio than in those wetlands with a higher or lower proportion of cover. Potential reasons for such a response include increased food or visual isolation and spacing of breeding birds. We manipulated coverwater ratios (75:25, 50:50, 25:75) in Southern Great Plains playas and examined avian response (i.e., species richness, non-waterfowl bird density, and waterfowl density) to these patterns in winter. We found the highest species richness and generally the highest waterfowl densities in the 50:50 cover:water treatment. Because the amount of vegetative food was similar among treatments and waterfowl inhabiting playas during winter are forming pair bonds, it is most likely that the optimal edge and visual isolation provided in the 50:50 cover:water treatment contributed to its high use and richness. Nonwaterfowl bird density was not different among the treatments. Many nonwaterfowl birds using playas in winter, such as McCown's longspur (Calcarius mccownii), occur as nonbreeding feeding flocks, are not forming pair bonds, and likely are not responding to particular cover:water treatments. Playa wetland biologists should create a well-interspersed 50:50 cover:water ratio to optimize waterfowl use and avian species richness.

1607. **Avian use of natural and created salt marsh in Texas, USA.**
Darnell, Traci M. and Smith, Elizabeth H.
Waterbirds 27(3): 355-361. (2004)
NAL Call #: QL671; ISSN: 1524-4695
Descriptors: Aransas National Wildlife Refuge/ artificial salt marsh island/ intertidal area/ natural salt marsh island
Abstract: Bird use of three created salt marsh islands, constructed from dredged material near the Aransas National Wildlife Refuge, Texas, USA, was compared with that of natural marsh to provide feedback prior to additional

marsh construction. Habitat associations of four bird groups (shorebirds, perching birds, wading birds, and gulls and terns) were similar in all sites, but relative contributions of each group to total avian abundance differed. Differences in site-use by birds were largely explained by differences in ratios of available habitat types, which were products of their geomorphic designs. Created marsh designs differed substantially from the natural marsh, where the unvegetated exposed-substrate and shallow-water habitats preferred by waterbirds were prominent features. The oldest created site (four years old) differed most from the natural marsh. Intertidal areas in the site were almost completely overgrown by vegetation, resulting in dominance of the avian assemblage by perching birds (especially grackles, Quiscalus spp.) rather than waterbirds. In the newer created sites (two years old), where vegetation had not completely overgrown the intertidal areas, avian assemblages were more typical of the natural marsh. However, vegetation cover was expanding in these sites, causing a reduction in waterbird habitat area. Efforts to ensure availability of unvegetated habitat in created sites will improve their structural similarity to natural marsh in the study area, and will likely increase their functional similarity for avian species.

1608. **Avifauna associated with ephemeral ponds on the Cumberland Plateau, Tennessee.**
Scheffers, B. R.; Harris, J. B. C.; and Haskell, D. G.
Journal of Field Ornithology 77(2): 178-183. (2006)
NAL Call #: 413.8 B534; ISSN: 02738570.
Notes: doi: 10.1111/j.1557-9263.2006.00039.x.
Descriptors: aerial invertebrates/ avian diversity/ hardwood forest/ point count/ vernal pool/ wetland
Abstract: Although ephemeral ponds act as small hotspots of plant, invertebrate, and salamander diversity, the importance of such ponds for birds has been little studied. We hypothesized that ephemeral ponds on the Cumberland Plateau in Tennessee would support a greater abundance, richness, and diversity of birds than the surrounding hardwood forests. In 2004, we recorded all birds seen or heard in 10 min within 50-m radius circles at 25 ephemeral ponds. We repeated the counts at control sites located 150 m from each pond in the surrounding forest. To quantify potential food availability, we captured aerial invertebrates using sweep nets at four points around a subsample of eight ephemeral ponds and at an equal number of control sites. We found significantly greater bird abundance, richness, and species diversity at ephemeral ponds than at control sites, and that pond area was not associated with either bird abundance or richness. Bird community composition at pond and control sites was similar. Aerial invertebrates were significantly more abundant at ephemeral ponds than at adjacent forest sites, providing one possible explanation for greater bird abundance at ephemeral ponds. ©2006 Association of Field Ornithologists.

1609. **Avifauna of agricultural wetlands on three farms in eastern South Dakota.**
Kirschenmann, Thomas R.; Hubbard, Daniel E.; and Rickerl, Diane H.
South Dakota Academy of Science: Proceedings 79: 183. (2000)
NAL Call #: 500 SO82; ISSN: 0096-378X
Descriptors: birds/ communities/ ecosystems/ farmland/ status/ wetlands/ lowlands/ Aves/ numerical studies
Abstract: In this study, the authors evaluated the avian use of wetlands on three farms each using a different agricultural management system: a conventional system (CON), an organic system (ORG), and transitional no-till system (TNT). Waterfowl pair abundance varied for individual species on individual wetland classes (temporary, seasonal, and semipermanent water regimes) both between systems and between years in 1993 and 1994. Total waterfowl pair abundance was generally higher in temporary wetlands on the ORG and/or TNT farming systems depending on year; however, it was higher in seasonal and semipermanent wetlands on the CON farming system. Species richness was typically higher on the ORG system for individual wetland classes when all wetland classes were combined. Abundance of non-waterfowl breeding birds, both individual species and total birds was typically higher on the ORG and/or TNT farming systems. The authors conclude that they could not detect any consistent trends in avian use between systems. Due to the inherent variation between the wetland numbers, sizes and habitat conditions among the farms, the influence of the type of systems, if any, were observed.

1610. **The avifauna of an agricultural wetland complex in the western Gulf Coastal Plain of Louisiana, USA.**
Musumeche, Michael J.; Huner, Jay V.; Mikuska, Tibor; Richard, Gregory; and Leonard, Billy
Proceedings of the Louisiana Academy of Sciences 64: 22-37. (2002); ISSN: 0096-9192
Descriptors: conservation measures/ ecology/ man-made habitat/ land zones/ Aves: habitat management/ seasonal abundance relationships/ checklists/ seasonal checklist/ population dynamics/ seasonal abundance/ semiaquatic habitat/ agricultural wetland/ species survey and seasonal abundance/ cultivated land habitat/ Louisiana/ St. Landry Parish/ birds/ chordates/ vertebrates

1611. **The avifauna of constructed treatment wetlands in south Florida used for Everglades restoration.**
Chimney, Michael J. and Gawlik, Dale E.
Florida Field Naturalist 35(1): 9-21. (2007); ISSN: 0738-999X
Descriptors: habitat/ land zones/ semiaquatic habitat/ stormwater treatment wetlands/ annotated checklists/ community structure/ man-made habitat/ Florida/ Aves/ birds/ chordates/ vertebrates
Abstract: Constructed treatment wetlands invariably create wildlife habitat (Kadlec and Knight 1996, U.S. Environmental Protection Agency 1999, Knight et al. 2001). Habitat improvement can be dramatic, especially when these systems are built on degraded areas such as farm fields (Hickman 1994). The South Florida Water Management District (SF-WMD) and the U.S. Army Corps of Engineers have built a complex of large treatment

wetlands, known as Stormwater Treatment Areas (STAs), on reclaimed farmland in south Florida as part of a multi-billion dollar effort by State and Federal governments to protect and restore the Everglades (Chimney and Goforth 2001, Sklar et al. 2005, SFWMD 2006). Current plans call for the STAs to encompass more than 17,000 ha. These wetlands were designed to treat and reduce high phosphorus concentrations in stormwater runoff from the Everglades Agricultural Area (EAA) before this water enters the northern portion of the remaining Everglades, the Water Conservation Areas (WCAs) (Fig. 1). The STAs have attracted a high abundance and diversity of wildlife species, including many birds. This paper presents a checklist of the avifauna found in two of the STAs and compares STA bird community composition and species richness with regional and other treatment wetlands.

1612. **Balancing wildlife needs and nitrate removal in constructed wetlands: The case of the Irvine ranch water district's San Joaquin Wildlife Sanctuary.**
Fleming Singer, Maia S. and Horne, Alexander J.
Ecological Engineering 26(2): 147-166. (2006)
NAL Call #: TD1.E26; ISSN: 0925-8574
Descriptors: conservation measures/ ecology/ habitat utilization/ habitat/ land zones/ Aves: disturbance by man/ wetland construction for nitrate removal vs wildlife requirements/ habitat management/ community structure/ habitat preference/ semiaquatic habitat/ California/ Irvine/ San Joaquin Wildlife Sanctuary/ Aves/ birds/ chordates/ vertebrates
Abstract: The San Joaquin Wildlife Sanctuary (SJWS), Irvine, CA, is a 32 ha series of shallow ponds created to maximize nitrate removal rates while maintaining 90% open water and episodically exposed shoreline for avian habitat. Design elements created non-ideal denitrification conditions by diminishing an organic carbon source (emergent vegetation) and increasing sediment exposure to oxygen. SJWS aqueous nitrogen and avian data (1999-2002) were analyzed to discern whether design and operating conditions allowed for simultaneous nitrate removal and diverse, abundant avian habitat. Average TIN removal efficiency was 80% while average TN removal efficiency was 60%; the difference reflects Org-N production in the marsh. Based on Chl-a measurements, roughly 40% of Org-N produced in the system was present as algae. The highest annual nitrate removal rates occurred April-May (350-500 $mg/m^2/d$) and September-October (250-425 $mg/m^2/d$). First order rate constants ranged 30.7-47.5 m year-1. Seasonal plantings of barnyard grass (Echinocloa crus-galli) were intended to serve as a carbon amendment for denitrification, however, there was no difference in nitrate removal between amended and non-amended conditions, likely because data averaging obscured a small, localized enhancement signal. Average avian species richness was high, ranging between 65 and 76 species month-1, while average relative abundance was mid-range, at 65-83 birds ha-1 month-1. Birds observed included common and rare species. © 2005 Elsevier B.V. All rights reserved.

1613. **Behavior of migrant shorebirds in playas of the Southern High Plains, Texas.**
Davis, Craig A. and Smith, Loren M.
Condor 100(2): 266-276. (1998)
NAL Call #: QL671.C6; ISSN: 0010-5422
Descriptors: activity budget/ fall/ feeding/ playas/ sleeping/ spring/ shorebirds/ Southern High Plains/ Texas
Abstract: Playas in the Southern High Plains (SHP) are important for migrant shorebirds, but the functional role of playas to migrant shorebirds is not clearly understood. We conducted diurnal time-activity budgets on American Avocets (Recurvirostra americana), Long-billed Dowitchers (Limnodromus scolopaceus), Least Sandpipers (Calidris minutilla), and Western Sandpipers (C. mauri) in spring and fall 1993 and 1994 in 69 play as on the SHP of Texas. During both seasons, Least and Western Sandpipers spent 70-80% of their time feeding. Long-billed Dowitchers spent 77% of their time feeding in spring, but spent more time sleeping and less feeding in fall. American Avocets spent 41-50% of their time feeding and 34-40% of their time sleeping during each season. All four species spent minimal time engaged in locomotion, body maintenance, alert, and aggressive behaviors. American Avocets and Long-billed Dowitchers fed most during the midday and late periods and slept most during the early period. Least Sandpipers fed most during the early period, whereas feeding activities of Western Sandpipers remained 70-80% throughout the day. Each of these species use different behavioral strategies in response to such factors as migration distances, energetic needs, differential predation, nocturnal foraging, and diet. Playas appear to serve as important intermediate stopover sites for shorebirds during migration.

1614. **Benthic invertebrates at foraging locations of nine waterbird species in managed wetlands of the northern San Joaquin Valley, California.**
Safran, R. J.; Isola, C. R.; Colwell, M. A.; and Williams, O. E.
Wetlands 17(3): 407-415. (1997)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ San Joaquin Valley/ invertebrates/ forages/ water depth/ site selection/ water birds/ benthic fauna/ midges/ aquatic habitat/ oligochaetes/ ecology/ zoobenthos/ aquatic birds/ habitat selection/ food availability/ Invertebrata/ California
Abstract: The ecologies of waterbirds are closely tied to the distribution and abundance of food resources. For many species of waterfowl and shorebirds, benthic invertebrates (especially Chironomidae) are an important dietary component that influences habitat selection. Consequently, we sampled benthic invertebrates and measured water depth at foraging locations of nine waterbird species and paired random sites in the Grasslands of the northern San Joaquin Valley, California, USA from January to April 1994 and 1995. Our resulting habitat-selection models indicate significant differences in benthic invertebrate densities or biomasses at foraging and random locations for three of nine species and significant differences in water depths between foraging and random locations for four of nine species. Additionally, we observed significant interspecific differences in water depths at foraging locations - shorebirds used shallow habitats (<10 cm), whereas most waterfowl species foraged in deep water (>20 cm).

Waterfowl foraged over a wider range of water depths than shorebirds, indicating greater behavioral flexibility in habitat use. Our results indicate that selection of foraging habitat by smaller bodied waterbirds, including dowitchers, dunlin, western sandpiper, and least sandpiper is strongly influenced by water depth, which mediates the availability of benthic invertebrates. Additionally, foraging site selection of more mobile taxa that are able to forage in a wide range of water depths, including northern shoveler and American green-winged teal, is influenced by invertebrate biomass. The broad range of water depths used by waterfowl and the relatively restricted depths used by shorebirds indicate that water depth can be manipulated to benefit a multitude of waterbird species.
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1615. **Best management practices and drought combine to silence the Illinois chorus frog in Arkansas.**
Trauth, Joy B.; Trauth, Stanley E.; and Johnson, Ronald L.
Wildlife Society Bulletin 34(2): 514-518. (June 2006)
NAL Call #: SK357.A1W5.
Notes: Commentary.
Descriptors: amphibiotic species/ droughts/ environmental protection/ habitat/ life span/ nature conservation/ rare species/ recruitment/ reproduction/ vulnerability/ wetlands/ wildlife
Abstract: A primary threat to amphibians in North America is the loss of wetland areas used for reproduction, especially small, temporary, and isolated wetlands. The Illinois chorus frog (Pseudacris streckeri illinoensis) is particularly vulnerable and exists today in a highly fragmented distribution limited to a few isolated populations in Arkansas, Illinois, and Missouri. Precision land-leveling combined with seasonal drought conditions has resulted in a significant population decline and range contraction for this species in Arkansas. Distributional surveys conducted from 1987 through 2004 indicate a 61% range contraction from a maximum of 59 km^2 to a current range of approximately 23 km^2. Additionally, there has been a lack of recruitment the past 2 years for a species that typically possesses a 2–3-year lifespan. Because the Clean Water Act will only protect isolated vernal pools if the continued existence of a threatened or endangered species is jeopardized, the future of this subspecies of chorus frog in Arkansas is both tenuous and problematic. In the absence of immediate protection and habitat modification through the reintroduction of depressions, we argue extirpation of this species in Arkansas may be imminent. The increasing use of precision land-leveling may have implications for other amphibian species worldwide.
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1616. **Best management practices to enable the coexistence of agriculture and the Everglades environment.**
Izuno, F. T.; Rice, R. W.; and Capone, L. T.
HortScience 34(1): 27-33. (1999)
NAL Call #: SB1.H6; ISSN: 0018-5345
Descriptors: agriculture/ swamps/ ecosystems/ crop management/ environmental protection/ geographical variation/ drainage/ habitats/ farms/ pumps/ fertilizers/ low input agriculture/ Florida
This citation is from AGRICOLA.

1617. **Biological diversity of created forested wetlands in comparison to reference forested wetlands in the Bay watershed.**
Perry, M. C.; Osenton, P. C.; and Stoll, C. S.
In: Proceedings of the conference: Conservation of biological diversity: A key to the restoration of the Chesapeake Bay ecosystem and beyond. Therres, G. D. (eds.); pp. 261-268; 2001.
Descriptors: wetlands/ ecosystems/ forests/ amphibiotic species/ aquatic reptiles/ aquatic birds/ aquatic mammals/ population structure/ species diversity/ biodiversity/ dominant species/ nature conservation/ habitat improvement/ comparative studies/ watersheds/ Anura/ Scaphiopus holbrookii/ Peromyscus leucopus/ Microtus pennsylvanicus/ Plethodon cinereus/ Rana sylvatica/ Hemidactylium scutatum/ Maryland/ eastern spadefoot toad/ habitat community studies/ conservation, wildlife management and recreation
Abstract: Amphibians, reptiles, birds, and mammals were surveyed at six created forested wetlands in central Maryland and at six adjacent reference forested wetlands during 1993-1996 to determine comparative biological diversity of these habitats. Amphibians and reptiles were caught in pitfall and funnel traps associated with 15.4-m (50-ft) drift fences. Birds were surveyed with a complete count while walking through each area. Mammals were surveyed by capture in live traps. More species and total individuals of amphibians were caught on the reference wetlands than on the created wetlands. The red-backed salamander (Plethodon cinereus), the four-toed salamander (Hemidactylium scutatum), the eastern spadefoot (Scaphiopus holbrooki), and the wood frog (Rana sylvatica) were captured on the reference wetlands, but not on the created sites. The wood frog was captured at all reference sites and may represent the best amphibian species to characterize a forested wetland. Reptiles were not caught in sufficient numbers to warrant comparisons. Ninety-two bird species were recorded on created sites and 55 bird species on the reference sites. Bird species on the created sites represented those typically found in nonforested habitats. Mammal species were similar on both sites, but overall the reference sites had three times the number caught on created sites. The meadow vole (Microtus pennsylvanicus) was the dominant species captured on created sites, and the white-footed mouse (Peromyscus leucopus) was the dominant species on reference sites, with little habitat overlap for these two species. Although species richness and total number of animals were high for created forested wetlands, these survey results show major differences from species expected for a forested wetland. The created forested wetlands appear to provide good habitat for wildlife, but are probably not providing the full functions and values of the forested wetlands that they were constructed to replace.
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1618. **Biological responses to wetland restoration: Implications for wildlife habitat development through the Wetlands Reserve Program.**
Rewa, C.
In: A comprehensive review of Farm Bill contributions to wildlife conservation, 1985-2000/ Heard, L. P; Hohman, W. L.; Halloum, D. J.; and Wildlife Habitat Management Institute (U.S.); Series: Technical Report USDA-NRCS-WHMI.

Madison, MS: U.S. Department of Agriculture, 2000; pp. 95-116.
NAL Call #: aS604.6 C66 2000
Descriptors: Wetlands Reserve Program/ wetlands/ riparian areas/ wildlife habitats/ California/ Mississippi

1619. **Bird community patterns of spring-seasonal and semi-permanent wetlands in the Sacramento Valley, California.**
Harris, P. Dawn
Corvallis, Oregon: Oregon State University, 2001.
Descriptors: seasonal wetlands/ restoration/ birds/ California/ community patterns/ Sacramento Valley

1620. **Bird-habitat relationships in a Texas estuarine marsh during summer.**
Weller, M. W.
Wetlands 14(4): 293-300. (1994)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: birds/ habitats/ estuarine environment/ marshes/ flooding/ species diversity/ wildlife management/ salt marshes/ plant populations/ rainfall/ habitat utilization/ summer/ habitat selection/ environment management/ marine birds/ ecological zonation/ Texas/ Aves/ San Bernard National Wildlife Refuge
Abstract: Birds were surveyed during summer 1985 in five adjacent saline vegetation zones and during summers 1986 and 1991 in 6 adjacent vegetation zones on the San Bernard National Wildlife Refuge on the upper Texas Coast. Although 66 bird species were recorded, numbers and species varied among years, and only 17 were nesting species. A few bird species used all vegetation types at some time, but most were limited by vegetation structure or water presence. Olney's three-square bulrush (Scirpus olneyi), saltgrass (Distichlis spicata), and mudflats were especially favored feeding and resting areas in response to periodic flooding and had the greatest frequency of use as well as species richness. Reduced rainfall and water depths during 1986 were reflected in a change toward birds favoring drier conditions. Heavy rainfall in 1991 decreased diversity but increased usage and favored freshwater and swimming birds. Although tidally influenced wetlands often are considered uniform, dynamic water and salinity regimes observed along this coast must be considered in the design of any management or conservation program.
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1621. **Birds in North American Great Lakes coastal wet meadows: Is landscape context important?**
Riffell, S. K.; Keas, B. E.; and Burton, T. M.
Landscape Ecology 18(2): 95-111. (2003)
NAL Call #: QH541.15.L35 L36; ISSN: 09212973.
Notes: doi: 10.1023/A:1024411218155.
Descriptors: birds/ Great Lakes coastal wetlands/ landscape context/ Michigan/ principal component analysis/ regression analysis/ wet meadows/ wetland conservation and management/ abundance/ avifauna/ conservation status/ landscape/ patch use/ species richness/ wetland management
Abstract: Landscape context can influence species richness, abundance, or probability of patch-use by birds. Little is known, however, about the effects of landscape context on birds in wetland-dominated landscapes. This lack of knowledge is alarming because many wetlands are threatened by development and other human impacts, while serving critical functions as migratory, breeding and foraging habitat. To address this lack of knowledge, we censused birds in North American Great Lakes coastal wet meadows located along the northern Lake Huron shoreline in Michigan (USA) during 1997 and 1998. Using a suite of multivariate techniques, we first accounted for effects of area and within-patch habitat characteristics before testing for effects of landscape context. Most bird variables were significantly related to landscape context, and two major patterns were apparent. First, avian species richness, abundance, and probability of patch-use by some species were higher for wet meadows located in complex contexts (adjacent to many patch types) compared to simpler contexts (adjacent to only one patch type). Second, these variables were higher for wet meadows located in wetland contexts compared to contexts that were terrestrial and road-impacted, dominated by open water habitats, or dominated by forested wetland habitats. Conservation plans for wetlands have focused on saving large wetlands and creating the vegetative habitat structure required by birds, but they should go further and explicitly consider the landscape context of wetlands as well. Specifically, wetlands located in complex and/or wetland contexts should have a higher conservation value than similar wetlands located in simpler, more terrestrial contexts.
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1622. **Black duck pair and brood abundance before and after wetland stabilisation.**
Seymour, N. R.; Thabane, L.; and Lane, M.
Wildfowl 53: 119-125. (2002)
NAL Call #: SK351.W575; ISSN: 09546324
Descriptors: distribution/ ducks/ habitat/ wildlife management/ abundance/ habitat management/ stabilization/ waterfowl/ wetlands
Abstract: Changes in the abundance of Black Duck pairs and broods in four manipulated wetlands and 52 reference wetlands were compared. There was an increase in the number of pairs and broods at manipulated sites following manipulation, while unstabilised sites experienced a decline in bird numbers during the same period. However, there were no significant differences in brood sizes or hatching success either at manipulated or reference sites. The results have implications for current management practices regarding stabilisation processes as a means to increase species abundance.
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1623. **Black tern colonization of a restored prairie wetland in northwestern Minnesota.**
Delehanty, David J. and Svedarsky, W. Daniel
Prairie Naturalist 25(3): 213-218. (1993)
NAL Call #: QH540.P7; ISSN: 0091-0376
Descriptors: wetlands/ birds/ behavior/ colonization/ ecosystems/ nests-nesting/ prairies
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1624. **Bottomland hardwood forest management for black bears in Louisiana.**
Weaver, K. M.; Tabberer, D. K.; Moore, L. U.; Chandler, G. A.; Posey, J. C.; and Pelton, M. R.
In: Proceedings of the 44th Annual Conference Southeastern Association of Fish and Wildlife Agencies. Richmond, Va.; Vol. 44: Southeastern Association of Fish

and Wildlife Agencies; pp. 342-350; 1990.
NAL Call #: SK1.S6
Descriptors: telemetry/ forest practices/ techniques/ Louisiana/ Northeast Region
Abstract: Recommendations were outlined for bear habitat management based on a review of the literature and preliminary evidence from ongoing studies that were developed in concert with the Tensas River National Wildlife Refuge Forest Habitat Management Plan.

1625. **Bottomland hardwoods of the Mississippi Alluvial Valley: Characteristics and management of natural function, structure, and composition.**
Hamel, Paul B. and Foti, Thomas L.
Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station; GTR-SRS-042, 2001. 109 p.
NAL Call #: aSD143.G46 no. 42
http://www.srs.fs.usda.gov/pubs/2474
Descriptors: bottomland hardwoods/ forest history/ mammals/ Mississippi Alluvial Valley/ old growth/ songbirds/ wetland restoration
Abstract: A symposium entitled "Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition" convened on October 28, 1995, as part of the Natural Areas Conference, October 25-28, 1995, In Fayetteville, AR. The symposium's goal was to provide information that managers need to begin restoring the composition, structure, and function of off rest ecosystems in the Mississippi Alluvial Valley. Included in the proceedings from that symposium are 8 of 13 presentations. These peer-reviewed contributions address historical conditions of forests in the Mississippi Alluvial Valley (two papers), historical changes that are reflected in today's forests (one paper), the effect of historic and prehistoric rainfall patterns (one paper), forest fauna in the region (two papers), the effect of herbivory on forest vegetation (one paper), and management of bottomland hardwood forests for multiple outputs (one paper). A ninth paper, concerning characteristics of old-growth forests, is a posthumous submission authored by Dr. James T. Tanner; and the tenth paper was published in another venue. The intended audience of these proceedings includes managers of private, State, and Federal lands, as well as land management planners from a range of jurisdictions.

1626. **Breeding bird communities of recently restored and natural prairie potholes.**
Delphey, P. J. and Dinsmore, J. J.
Wetlands 13(3): 200-206. (1993)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ droughts/ aquatic birds/ reclamation/ community composition/ comparative studies/ environmental restoration/ Aves/ Iowa/ natural wetlands/ environmental restoration/ aquatic birds/ reclamation/ comparative studies
Abstract: We compared the breeding bird communities of natural and recently restored prairie potholes in northern Iowa in 1989 and 1990. Species richness of breeding birds was higher ($P < 0.05$) at natural wetlands, although duck pair counts and species richness were not significantly different between wetland types ($P > 0.1$). Common yellowthroat (Geothlypis trichas), red-winged blackbird (Agelaius phoeniceus), marsh wren (Cistothorus palustris), and swamp sparrow (Melospiza georgiana) were each more abundant at natural than at restored wetlands during at least one year ($P < 0.05$). Brown-headed cowbirds (Molothrus ater) parasitized a significantly greater proportion of red-winged blackbird nests at natural than at restored wetlands. Incomplete development of typical vegetation structure evidently depresses bird species richness at recently restored prairie potholes. Drought the year before and during the first year of our study undoubtedly affected our results. Similar studies should be conducted during periods of relatively high precipitation to complement our results.

1627. **Breeding ducks and their habitats in the High Plains of Texas.**
Ray, James D.; Sullivan, Brian D.; and Miller, Harvey W.
Southwestern Naturalist 48(2): 241-248. (2003)
NAL Call #: 409.6 So8 ; ISSN: 0038-4909
Descriptors: roadside survey: applied and field techniques/ central flyway/ breeding areas/ impoundments: habitat/ occupancy rates/ playa lakes: habitat/ ponds: habitat/ species density
Abstract: The High Plains of Texas is one of the southernmost nontraditional breeding areas for many duck species in North America. Because of a paucity of information on breeding ducks there, we conducted roadside surveys of breeding ducks and their habitats during May and June from 1988 through 1992. Breeding pairs of 15 species were observed on 6 types of ponds (natural and man-made wetlands containing surface water). Mallard (Anas platyrhynchos) density ranged from 9.1 to 23.1 pairs/100 km^2, and density for all species combined ranged from 14.8 to 46.7 pairs/100 km^2 (all years and survey periods included). Occupancy rates were highest on playa lakes and impoundments, though all pond types had occupancy rates exceeding 26% (all surveys and years). Duck pairs per occupied pond were highest on playa lakes (>7 and >4 on May and June surveys, respectively), followed by impoundments (> 5 and > 2) and entrenched draws (>2 and >3). Although the density of breeding pairs in the High Plains of Texas (47 pairs/100 km^2) is generally lower than in prominent nesting areas (e.g., >200 in the San Luis Valley. CO; >600 in central Montana; >2,000 in California; >4,000 in the Prairie Pothole Region), information reported here further confirms the use of the Playa Lakes Region by breeding ducks and illustrates its importance as a major habitat area for waterfowl in the Central Flyway.

1628. **Breeding ecology and nesting habitat associations of five marsh bird species in western New York.**
Lor, Socheata and Malecki, Richard A.
Waterbirds 29(4): 427-436. (Dec. 2006)
NAL Call #: QL671
Descriptors: birds/ wildlife habitat/ breeding/ nesting/ marshes/ New York
Abstract: Nesting habitats and nest success of five species of marsh birds were studied during 1997 and 1998 at the Iroquois National Wildlife Refuge (NWR) and the adjacent Oak Orchard and Tonawanda State Wildlife Management Areas (WMA) located in western New York. Nest searches

located 18 American Bittern (Botaurus lentiginosus), 117 Least Bittern (Ixobrychus exilis), 189 Pied-billed Grebe (Podilymbus podiceps), 23 Sora (Porzana carolina), and 72 Virginia Rail (Rallus limicola) nests. Average nest densities in 1998, our best nest searching year, ranged from 0.01/ha for Soras (N = 8) to 0.28/ha for Pied-billed Grebes (N = 160). Mayfield nest success estimates for Least Bittern were 80% (N = 16) in 1997 and 46% (N = 37) in 1998. Nest success estimates were 72% (N = 55) for Pied-billed Grebe, 43% (N = 6) for Sora, and 38% (N = 20) for Virginia Rail. Nests of all five species were located in 70% emergent vegetation with a mean water depth of 24-56 cm and an average vegetation height that ranged from 69-133 cm. Logistic regression models were developed for each species using habitat variables at nest and random site locations. Each model was ranked with Akaike's Information Criterion for small sample size (AICc). In general, our best models indicated that increased emergent vegetation and horizontal cover with shallow water depths improved the odds of encountering marsh bird nests in the wetlands of western New York. We suggest that managing wetlands as a complex, at different stages of succession, would best benefit marsh bird species.

1629. **Breeding season bird use of restored wetlands in eastern Maryland.**
Muir Hotaling, N. E.; Kuenzel, W. J.; and Douglass, L. W.
Southeastern Naturalist 1(3): 233-252. (2002)
NAL Call #: IPSP11706; ISSN: 15287092
Descriptors: Aves/ Maryland/ breeding/ surveys/ wetland restoration/ birds/ habitat selection
Abstract: We evaluated breeding season (May-July) bird species richness, abundance, and diversity in 21 restored wetlands and several associated habitats (woodlots, cultivated and uncultivated fields, and hedgerows) on Maryland's Eastern Shore over two years. Ninety-seven bird species were encountered over all habitats, while 72 of these species were found in wetlands. Of those birds found in wetlands, 35 species (49%) were wetland dependent and 13 species (18%) were breeding. Wetland-dependent, shorebird, and total species richness and bird abundance were lowest in fields and highest in restored wetlands. Total avian abundance and species richness in woodlots were similar to values in restored wetlands, but species composition differed. The density of individuals and of species was highest in hedgerows and restored wetlands. Bird abundance, species richness, and diversity were higher in restored wetlands in the second year of the study. Richness showed no regression relationship ($p > 0.05$) with either site age or cover-to-water ratio. Restored emergent marshes in eastern Maryland provide habitat for wetland birds, but benefits must be weighed against the loss of bird use in habitats converted into a wetland.

1630. **Breeding-season survival of mallard females in the Prairie Pothole Region of Canada.**
Devries, J. H.; Citta, J. J.; Lindberg, M. S.; Howerter, D. W.; and Anderson, M. G.
Journal of Wildlife Management 67(3): 551-563. (2003)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: abdominal implants/ Alberta/ Anas platyrhynchos/ known fate models/ mallard/ Manitoba/ NAWMP/ Prairie Pothole Region/ predation/ radiotelemetry/ Saskatchewan/ survival probability/ breeding season/ female/ habitat restoration/ radiotelemetry/ survival/ waterfowl/ wetland/ Canada/ Anas platyrhynchos
Abstract: As part of the Prairie Habitat Joint Venture (PHJV) Habitat Assessment Project, we radiomarked and tracked daily 2,249 female mallard ducks (Anas platyrhynchos) in the Prairie Pothole Region (PPR) of Canada. We conducted our study at 19 different 54- to 78-km^2 sites for 1 year per site from 1993 to 1998. We estimated female survival probability during the 90-day period following arrival on the breeding area and employed information-theoretic approaches to select among competing models that described factors affecting survival probability. We investigated the relationship between female survival and 3 periods of the nesting season, female age (yearling vs. older), upland habitat treatments, longitude, and habitat variables. Our model estimates of female survival probability ranged between 0.62 (SE = 0.028) and 0.84 (SE = 0.018) and averaged 0.76 (SE = 0.004) for the 90-day period. The best approximating model indicated that female survival was (1) lowest when most females were nesting, and (2) depended on longitude and percent wetland habitat such that survival was lowest at western sites with low wetland densities. Management efforts to reduce wetland loss, especially in western regions of the Canadian PPR, may positively influence female survival. Upland habitat restorations designed to improve nest survival may not have a concurrent impact on female survival unless a significant portion of the nesting population is affected.

1631. **Breeding waterbird wetland habitat availability and response to water-level management in Saint John River floodplain wetlands, New Brunswick.**
Connor, K. J. and Gabor, S.
Hydrobiologia 567(1): 169-181. (2006)
NAL Call #: 410 H992; ISSN: 00188158.
Notes: doi: 10.1007/s10750-006-0051-1.
Descriptors: brood-rearing habitat/ floodplain/ waterbird/ waterfowl/ wetland
Abstract: Wetland management by the Eastern Habitat Joint Venture (EHJV) has focused primarily on water level control to increase the amount of available brood-rearing habitat for waterfowl along the Saint John River floodplain in New Brunswick. Impounded wetlands make up approximately 13% of the Saint John River Floodplain complex. Study objectives included an evaluation of waterfowl brood, and wetland obligate bird use of impoundments and seasonally flooded wetlands within the Saint John River floodplain. Historical water level data and a GIS wetlands inventory were used to estimate the duration of flooding on seasonally flooded wetland habitats, and the distribution and relative amount of brood-rearing habitat throughout the breeding period by region. Aerial brood surveys and call response surveys were used to estimate the relative abundance of waterfowl broods and breeding wetland obligate birds respectively. The overall density of waterfowl broods was greater on impoundments than on seasonally flooded wetlands during both years of study but varied by site. Mean species richness of wetland obligate birds was significantly greater on impoundments than on seasonally flooded wetland habitat. Generally, use of seasonally flooded wetlands by wetland obligate birds during late summer declined while the use of

impoundments increased. Current habitat management for waterfowl appears to be compatible with habitat requirements of wetland obligate birds by increasing the availability of interspersed open water and emergent vegetation throughout the breeding season. A watershed-based analysis of wetland habitat suggests future wetland management should focus on enhancing current impoundments within the Saint John River floodplain. Resources must be secured for maintenance and water level manipulation within existing managed wetlands rather than the construction of additional impoundments. Further evaluation of the distribution of wetland habitat types in the province is essential to identifying focus areas for waterbird conservation throughout NB. © Springer 2006.

1632. **Carbon, plant, and temperature control of nitrate removal from wetland mesocosms.**
David, Mark B.; Gentry, Lowell E.; Smith, Karen M.; and Kovacic, David A.
Transactions of the Illinois State Academy of Science 90 (3-4): 103-112. (1997)
NAL Call #: 500 IL6; ISSN: 0019-2252
Descriptors: biochemistry and molecular biophysics/ conservation/ pollution assessment control and management/ wildlife management: conservation/ agricultural non point source pollution/ bioprocess engineering/ carbon availability/ constructed wetlands/ nitrate/ pollution/ temperature/ tile drainage waters
Abstract: Constructed wetlands have been developed to remove agricultural non-point source pollution from tile drainage waters in the Midwest, but their effectiveness and function are not known. This study investigated the interaction of C availability and temperature on NO_{-3}- removal from water columns in a constructed wetland. Experimental mesocosms (20.32 cm diameter PVC pipes) were buried upright to a depth of 15 cm into wetland sediments to enclose a 7.5 L water column (23 cm depth). Six mesocosms were placed in areas with bare soil and six were placed in areas supporting reed canary grass (Phalaris arundinacea). Treatments were either NO_{-3}- additions (10 mg NO_{-3}-N L^{-1} increase in concentration in water column) or NO_{-3}- Plus glucose additions (10 mg NO_{-3}--N L^{-1} and 50 mg C L^{-1} increases in water column) to the mesocosms during April and June. In April, (11- 12 degree C water temperature) over a 7 day time span, NO_{-3} cntdot concentrations in the overlying water decreased approximately 50% in non-grass treatments, with or without glucose additions. All or nearly all of the NO_{-3}- was removed from the grass mesocosms in April, and glucose additions did not increase the removal rate. In June (27 degree C water temperature) NO_{-3}- concentrations decreased to zero for all treatments in 48 hours or less. Presence of grass did not affect the rate of NO_{-3}- decrease; however, glucose additions increased the rate to < 24 hours. When calculated on a mass basis in the NO-3 only mesocosms, removal of NO_{-3}- was 0.25 and 0.42 g NO_{-3}—N m^{-2} d^{-1} in the April non-grass and grass treatments, respectively, and 1.6 and 1.4 g NO_{-3}--N m^{-2} d^{-1} in the June corresponding treatments. Calculated Q_{-10} values of NO_{-3}- removal per day for non-grass and grass treatments were 3.3 and 2.2, respectively. Depending on amounts and seasonal timing of inputs of NO_{-3}- to the wetlands, mesocosm results suggest that large amounts of NO-3- can be removed from the overlying water by a combination of sediment and plant mechanisms.

1633. **Carrying capacity and diel use of managed playa wetlands by nonbreeding waterbirds.**
Anderson, J. T. and Smith, L. M.
Wildlife Society Bulletin 27(2): 281-291. (1999)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: wetlands/ management/ habitat utilization/ carrying capacity/ flooding/ ecosystem management/ migratory species/ playas/ activity patterns/ nighttime/ daytime/ diurnal variations/ aquatic birds/ nature conservation/ Southern High Plains/ waterfowl/ monitoring/ habitats/ species diversity/ soil management/ seeds/ invertebrates/ Aves/ Texas/ New Mexico/ birds/ winter/ moist-soil management practices
Abstract: Playa wetlands on the Southern High Plains of Texas and New Mexico provide essential wintering habitat for migratory waterbirds. Moist-soil management practices have been implemented in playas, yet no variations on the timing of management have been attempted. In addition, previous evaluation of wetland management has considered only diurnal use by waterfowl and has not considered invertebrates. We compared waterbird diversity, waterfowl abundance, and waterfowl carrying capacity based on seeds and invertebrates among playas varying in flooding date (September vs. November) and management regimes (moist-soil managed vs. unmanaged) during nocturnal and diurnal periods during the winters of 1994-1995 and 1995-1996. Waterbird species richness and diversity were greater in November flooded, moistsoil managed than in September flooded, managed; September flooded, unmanaged; and November flooded, unmanaged playas. Waterfowl were more abundant in November flooded, moist-soil managed playas than in the other treatments, and counts were 10.5 times higher during nocturnal than diurnal counts. Evaluation of moist-soil management using diurnal counts only showed no waterfowl-use benefit. Carrying capacity, based on seed biomass, was greater in managed than in unmanaged playas. Potential use days, using invertebrate abundance, was higher in playas flooded in September than in November. Moist-soil management of playas is effective in increasing waterbird diversity and waterfowl abundance. If the main purpose is to evaluate effectiveness of wetland management for waterfowl, then monitoring of nocturnal and diurnal use is essential.

1634. **Carrying capacity of wetland habitats used by breeding greater snow geese.**
Masse, H.; Rochefort, L.; and Gauthier, G.
Journal of Wildlife Management 65(2): 271-281. (Apr. 2001)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wetlands/ carrying capacity/ grazing/ wildlife management/ Canada, Nunavut/ population number/ breeding sites/ herbivores/ food availability/ ecosystem management/ environment management/ Chen caerulescens atlantica/ Canada, Nunavut, Bylot I./ greater snow goose/ management/ population dynamics/ conservation, wildlife management and recreation

Abstract: Because geese can damage their arctic breeding habitats through overgrazing, there is debate about limiting the rapid growth of the greater snow goose (Chen caerulescens atlantica) population and setting a population goal. To answer these questions, we assessed the nutritional carrying capacity of freshwater wetland habitats for breeding greater snow geese at the Bylot Island colony, Nunavut, Canada. Specifically, we (1) mapped the different types of wetlands on the island; (2) estimated net aboveground primary production of these habitats; (3) compared total food availability with predicted total food requirements of the current population; and (4) validated our predictions of plant biomass consumed by comparing them to the intensity of goose grazing measured. Freshwater wetlands represented 173 ± 6 km^2 or 11% of the total area of the south plain of Bylot Island. Streams and wet polygons were the most important habitats in terms of availability of suitable forage plants for geese. The average net aboveground primary production ranged from 21.0 ± 4.6 along lakes to 46.0 ± 9.8 g/m^2 in polygon channels. We estimated the total food supply available for geese in wetlands at 2,625 ± 461 tons in 1997 but only 1,247 ± 473 tons in 1996, a year of low plant production. We predicted a summer food requirement for goslings at 8.1 ± 0.6 kg/bird, for breeding adults at 7.9 ± 2.3, and for nonbreeding adults at 4.7 ± 1.5, and we predicted the total summer food requirements of the goose population at 1,201 ± 160 tons. The predicted amount of biomass removed (32 ± 7%) agreed well with the actual amount of biomass removed measured in mid-August (39 ± 11%) in 1997, but not in 1996 (67 ± 27% vs 26 ± 17%, respectively), possibly because the goose population was lower that year due to poor breeding success. In 1997, the goose population was at 46 ± 10% of the theoretical short-term carrying capacity (341,000 geese) of the wetlands of Bylot Island. We recommend keeping the goose population below this theoretical carrying capacity.

1635. **Cattail distribution and abundance in North Dakota.**
Ralston, S. T.; Linz, G. M.; Bleier, W. J.; and Homan, H. J.
Journal of Aquatic Plant Management 45: 21-24. (Jan. 2007).
http://skralston.com/Scott/Downloads/Ralston%20JAPM21-24.pdf
Descriptors: wildlife habitat/ cattails/ habitat management/ North Dakota
Abstract: Wetlands in the Prairie Pothole Region (PPR) of North Dakota provide important habitats for a plethora of invertebrate and vertebrate animals. Since 1991, glyphosate-based (N-phosphonomethyl-glycine) herbicides have been used to manage dense cattail (Typha spp. L.) stands on 29,522 ha of wetlands in the PPR to disperse blackbird roosts. Limited information exists on the abundance and distribution of this important habitat. We took aerial photographs and used geospatial analysis tools to identify wetland basins and cattail coverage on randomly selected sample sites within the PPR. We found that average wetland density and size were 13 wetlands/km 2 and 1.1 ha, respectively. Average wetland size was 1.1 ha; whereas, wetlands with cattails averaged 2.4 ha. Cattail was most commonly found in palustrine systems, semi-permanent wetlands, and wetlands with surface water throughout the growing season. Our data showed that current cattail management activities annually impact <1% of the total wetland acreage. The affects of these management actions on wildlife populations, however, are largely unknown.
This citation is from AGRICOLA.

1636. **Cattle grazing mediates climate change impacts on ephemeral wetlands.**
Pyke, Christopher R. and Marty, Jaymee
Conservation Biology 19(5): 1619-1625. (2005)
NAL Call #: QH75.A1C5; ISSN: 0888-8892
Descriptors: climatic changes/ grazing/ feeding behavior/ amphibiotic species/ environmental impact/ wetlands/ resource management/ vulnerability/ rare species/ hydrology/ environmental effects/ precipitation/ reproduction/ conservation/ temperature effects/ Ambystoma californiense/ Caudata/ California/ California tiger salamander
Abstract: Climate change impacts depend in large part on land-management decisions; interactions between global changes and local resource management, however, rarely have been quantified. We used a combination of experimental manipulations and simulation modeling to investigate the effects of interactions between cattle grazing and regional climate change on vernal pool communities. Data from a grazing exclosure study indicated that 3 years after the removal of grazing, ungrazed vernal pools dried an average of 50 days per year earlier than grazed control pools. Modeling showed that regional climate change could also alter vernal pool hydrology. Increased temperatures and winter precipitation were predicted to increase periods of inundation. We evaluated the ecological implications of interactions between grazing and climate change for branchiopods and the California tiger salamander (Ambystoma californiense) at four sites spanning a latitudinal climate gradient. Grazing played an important role in maintaining the suitability of vernal pool hydrological conditions for fairy shrimp and salamander reproduction. The ecological importance of the interaction varied nonlinearly across the region. Our results show that grazing can confound hydrologic changes driven by climate change and play a critical role in maintaining the hydrologic suitability of vernal pools for endangered aquatic invertebrates and amphibians. These observations suggest an important limitation of impact assessments of climate change based on experiments in unmanaged ecosystems. The biophysical impacts of land management may be critical for understanding the vulnerability of ecological systems to climate change.

1637. **Changes in piping plover nesting habitat availability at Great Plains alkaline wetlands, 1938-1997.**
Root, Brian G. and Ryan, Mark R.
Wetlands 24(4): 766-776. (2004)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: alkaline wetland/ fire frequency/ flooding impact/ ground water hydrology/ livestock grazing intensity/ long term recovery/ nesting habitat availability/ surface water level/ total beach habitat/ vegetation encroachment
Abstract: Alkaline wetland beaches provide crucial habitat for breeding piping plovers (Charadrius melodus) in the northern Great Plains of the United States and Canada. Vegetation encroachment has been identified as a potential

threat that decreases alkaline beach habitat availability, but the long-term status of these breeding habitats has not been evaluated. We measured vegetation changes at two North Dakota alkaline wetland complexes from 1938 to 1997. Total beach habitat, including lower beaches that were impacted by flooding, varied substantially among years based on changes in surface-water levels. Quantities of upper-beach habitats, which were not affected by inundation, were negatively correlated with precipitation amounts during the previous five-year periods. We measured declines in upper-beach habitat averaging 0.89 ha/yr and 0.20ha/yr at our two wetland complexes from 1938 to 1997, suggesting that long-term changes in factors other than precipitation (e.g., ground-water hydrology, livestock grazing intensity, or fire frequency) may be negatively affecting beach availability. Vegetation reduction may be critical to long-term recovery of threatened piping plovers in the Great Plains.

1638. **Changes in species diversity in peatlands drained for forestry.**
Vasander, Harri; Laiho, Raija; and Laine, Jukka
In: Northern forested wetlands: Ecology and management/ Trettin, Carl C.; Jurgensen, Martin F.; Grigal, David F.; and Gale, Margaret R.
Boca Raton, Fla.: CRC Press, Inc., 1997; pp. 109-119.
Notes: ISBN: 1566701775. Meeting paper: International Symposium on the Ecology and Management of Northern Forested Wetland, Traverse City, Michigan, USA; Cochrane, Ontario, Canada; August 24-31, 1994.
Descriptors: biodiversity/ forestry/ freshwater ecology: ecology, environmental sciences/ northern forested wetland/ peatland drainage/ species diversity

1639. **Changes in vernal pool edaphic settings through mitigation at the project and landscape scale.**
Wacker, M. and Kelly, N. M.
Wetlands Ecology and Management 12(3): 165-178. (2004)
NAL Call #: QH541.5.M3 W472; ISSN: 09234861
Descriptors: California/ HGM/ mitigation/ regulation/ vernal pools/ wetlands
Abstract: Vernal pool mitigation is a highly controversial process that has been frequently criticized for its inability to adequately replicate the ecosystem functions of the original intact wetlands. We analyzed past mitigation practices in two rapidly growing counties in California's Great Central Valley to determine if mitigation procedures are re-arranging the vernal pool landscape by substituting more common or less ecologically significant pool types (as defined by soil type and geomorphology) for rarer or ecologically richer pool types. Results indicate that most development projects impacting vernal pools conduct at least a portion of their mitigation requirements at a site with similar edaphic settings. However, when examined at a landscape-scale across all development projects, the more common edaphic settings such as Northern Hardpan and Low Terrace pools are increasing while more rare types such as Northern Claypan and Volcanic Mudflow pools are decreasing. Results also show that Drainageway pools, a less-specialized pool type with generally lower species richness, are becoming more common through mitigation. These results are confirmed by an analysis of landscape diversity, which showed that overall landscape diversity was lower at mitigation sites than at project sites. Despite these results, the ecological significance of vernal pool mitigation practices remains unclear for several reasons. The lack of maps showing exact locations of vernal pools at project sites make it difficult to precisely determine vernal pool acreage and distribution among edaphic settings. Additionally, more research is needed to determine precise relationships between edaphic settings and species distributions and the effects of mitigation area management practices on species distribution and persistence.

1640. **Chironomidae (Diptera) and vegetation in a created wetland and implications for sampling.**
Streever, W. J.; Evans, D. L.; Keenan, C. M.; and Crisman, T. L.
Wetlands 15(3): 285-289. (1995)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ sampling/ vegetation patterns/ artificial wetlands/ ecosystems/ vegetation cover/ habitat improvement (physical)/ habitat improvement (biological)/ ecological associations/ invertebrates/ habitats/ Diptera/ Chironomidae/ Florida/ artificial wetlands/ vegetation cover/ habitat improvement (physical)/ habitat improvement (biological)/ ecological associations/ invertebrates/ habitats/ vegetation patterns/ Diptera/ Chironomidae
Abstract: Although invertebrate communities are used in the evaluation of created freshwater wetlands, spatial patterns of invertebrate community structure are frequently ignored. Invertebrate distributions are generally associated with plant community distribution in natural aquatic ecosystems. In this study, 180 core samples were collected to examine associations between chironomoid (Diptera) genera and emergent vegetation communities in a single created freshwater herbaceous wetland in central Florida. Three of the five common genera were significantly more abundant ($p < 0.05$, Wilcoxon Rank Sum Test) in areas with greater than 50% cover by emergent vegetation than in open water, but no differences were found between areas dominated by Pontederia cordata and areas dominated by mixed emergent vegetation. Samples from an area of open water and an area with over 80% cover by P. cordata showed significant differences in abundances of all common chironomid genera ($P < 0.05$, Wilcoxon Rank Sum Test). Results suggest that sampling designs for studies comparing benthic invertebrate communities from natural and created wetlands should consider the possible associations between vegetation and invertebrate communities.

1641. **Coastal wetlands of the Upper Great Lakes: Distribution of invertebrate communities in response to environmental variation.**
Gathman, Joseph P.; Burton, Thomas M.; and Armitage, Brian J.
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 949-994.
Notes: ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Invertebrata/ community structure/ population density/ coastal wetland fauna/ distribution within habitat/

semiaquatic habitat/ wetland communities/ environmental variables/ abiotic factors/ coastal wetlands/ water movements/ Great Lakes/ North America

1642. **Collaborative planning for wetlands and wildlife: Issues and examples.**
Porter, Douglas R. and Salvesen, David.
Washington, DC: Island Press; 293 p. (1995)
NAL Call #: QH76.C65 1995; ISBN: 1559632879.
Descriptors: Wetland conservation---United States---Planning
This citation is from AGRICOLA.

1643. **Colonization of herpetofauna to a created wetland.**
Toure, T'shaka A. and Middendorf, George A.
Bulletin of the Maryland Herpetological Society 38(4): 99-117. (2002)
NAL Call #: QL640.M3; ISSN: 0025-4231
Descriptors: behavior/ terrestrial ecology: ecology, environmental sciences/ dipnetting/ applied and field techniques: drift fence array/ applied and field techniques: frog cell/ applied and field techniques: funnel trapping/ applied and field techniques: pitfall trapping/ applied and field techniques/ clay substrates/ colonization/ conservation biology/ created wetlands: habitat/ flooded areas/ forests: habitat/ hydroperiods/ species diversity/ terraced sites/ vegetation density/ waterbodies
Abstract: The colonization by amphibians and reptiles of a newly created wetland was investigated at a site along Sands Road in Davidsonville, Anne Arundel County, MD. This 52-hectare artificial wetland was constructed in a gradient design that resulted in four distinct terraced sites that temporarily retain rainwater. This palustrine wetland site, surrounded by an emergent, young, shrub-scrub, forested area, is characterized by the appearance of shallow temporarily flooded areas over a clay substrate that remains wet even during the driest periods of the year with a groundwater depth less than 1.5 m. The adjacent natural forest bordering the Patuxent River served as a natural indicator of amphibian and reptile activity and a source for site colonization. The created wetland site was monitored over two field seasons (March through September 1995-96) using linear transects, frog calls, drift fence arrays, pitfall and funnel traps, and dipnets. Sampling, conducted for 54 days revealed a total of twenty-eight species (16 amphibians and 12 reptiles). The colonization of this created wetland compared favorably in diversity to adjacent, natural forest. Factors best explaining differences in herpetofaunal activity, across the different sites within the created wetland, were density of vegetation surrounding the waterbody and hydroperiod.

1644. **Colonization of restored wetlands by amphibians in Minnesota.**
Lehtinen, Richard M. and Galatowitsch, Susan M.
American Midland Naturalist 145(2): 388-396. (2001)
NAL Call #: 410 M58; ISSN: 0003-0031
Descriptors: aquatic vegetation cover/ colonization/ habitat suitability/ restored wetlands/ water chemistry
Abstract: Twelve wetlands (7 recently restored; 5 reference) in central and southern Minnesota were monitored during the 1998 breeding season to assess colonization of recently restored wetlands by amphibians, compare the amphibian fauna to that of reference wetlands and identify important factors influencing the probability of colonization. Eight amphibian species rapidly colonized recently restored wetlands and established breeding populations. Reference wetlands were inhabited by twelve species, including four not found in restored wetlands (Ambystoma laterale, Notophthalmus viridescens, Pseudacris crucifer and Rana clamitans). Most local habitat variables, such as water chemistry or aquatic vegetation cover, were not influential in determining species richness patterns in recently restored wetlands. Size and spatial isolation of restored wetlands, however, were important predictors of species richness. Habitat suitability also influenced the probability of colonization for some species. The results of this study indicate that restored wetlands are valuable habitat for at least a subset of the amphibian fauna of this region and that wetland size, isolation and habitat suitability all influence colonization success.

1645. **Comparing ecological functions of natural and created wetlands for shorebirds in Texas.**
Brusati, Elizabeth D.; DuBowy, Paul J.; and Lacher, Thomas E.
Waterbirds 24(3): 371-380. (2001)
NAL Call #: QL671; ISSN: 1524-4695
Descriptors: fecal analysis: analytical method/ fixed point observations: survey method/ inshore transects: survey method/ offshore transects: survey method/ chick provisioning/ diet/ estuaries: habitat/ food resource partitioning/ foraging ecology/ habitat choice/ habitat differences/ intercolony differences/ piscivory/ prey choice/ satellite imagery/ sea surface temperature/ stable isotope ratios/ water masses: delineation
Abstract: We compared shorebird behavior, abundance and prey availability between natural and created wetlands along the Gulf of Mexico, Texas, USA. Locations included Aransas National Wildlife Refuge, the Nueces River Delta, and Mustang Island. Few significant differences existed in invertebrate density or biomass between sites; greater differences were found seasonally than between natural and created sites. Non-metric multidimensional scaling of avian abundance separated Mustang Island from Nueces Delta. Cluster analysis of behavior of Black-bellied Plover (Pluvialis squatarola), Long-billed Curlew (Numenius americanus), "peeps" (Calidris minutilla, C. pusilla), and Willet (Catoptrophorus semipalmatus), showed no clear differences in their behavior on natural and created sites. Mustang Island sites were more similar to each other than to Nueces Delta. All created sites had natural hydrology and tidal circulation, which appear to facilitate invertebrate and avian recruitment.

1646. **Comparison of avian communities on restored and natural wetlands in North and South Dakota.**
Ratti, J. T.; Rocklage, A. M.; Giudice, J. H.; Garton, E. O.; and Golner, D. P.
Journal of Wildlife Management 65(4): 676-684. (2001)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: avian community/ birds/ habitat/ North Dakota/ South Dakota/ waterfowl/ wetland restoration/ avifauna/ habitat restoration/ habitat use/ waterfowl/ wetland/ United States

Abstract: We compared avian use of 39 restored and 39 natural wetlands in North and South Dakota during spring and summer of 1997 and 1998. Wetlands were widely distributed, but restored- and natural-wetland pairs were from the same geographic locale and had similar characteristics, including wetland size. We conducted paired comparisons between restored and natural wetlands for wetland-bird density, waterfowl-breeding pairs, and wetland-avian abundance, species richness, and diversity. We also compared abundance, species richness, and diversity of birds on upland areas adjacent to wetlands. Canada goose (avian scientific names in Appendix A), mallard, redhead, and ruddy duck had higher densities on restored wetlands. We failed to detect differences in overall avian abundance, species richness, or diversity, between restored and natural wetlands. We conclude that restored wetlands in the Prairie Pothole Region supported similar avian communities with equal or higher abundances than those of natural wetlands.

1647. **A comparison of natural and created depressional wetlands in central Oklahoma using metrics from indices of biological integrity.**
Hartzell, Dena; Bidwell, Joseph R.; and Davis, Craig A.
Wetlands 27(4): 794-805. (Dec. 2007)
NAL Call #: QH75.A1W47
Descriptors: Aves/ constructed wetlands/ depressional wetlands/ IBI/ macroinvertebrates/ natural wetlands/ seasonal differences/ vegetation
Abstract: Created wetlands and water bodies that have wetland characteristics (old farm ponds) appear to provide many of the habitat attributes of natural systems. To compare the biological and physical characteristics of natural and created wetlands, we evaluated water chemistry and a suite of metrics associated with the plant, macroinvertebrate, and avian assemblages at 12 natural and six created systems in central Oklahoma. The natural wetlands had significantly shallower depths and higher turbidity levels than the created wetlands. Of 43 metrics across the three biotic assemblages, seven were significantly different between the two wetland types. The proportions of hemipteran insects from the family Corixidae and insectivorous bird species were both greater in natural than created wetlands. The proportion of perennial plant species, the proportion of invertebrates in the shredder feeding guild, the number of Ephemeroptera, Trichoptera, Sphaeridae, and dragonfly (ETSD) taxa, the proportion of individuals in the dominant bird taxa, and the proportion of avian edge species were all greater in created wetlands than in natural wetlands. The community similarity (based on Jaccard's similarity index) in the two wetland types was 38% for plants, 56% for macroinvertebrates, and 65% for birds. For some individual metrics, assemblage members had similar attributes (e.g., proportion of omnivorous taxa) although the specific taxa often differed between natural and created wetlands. These differences may influence the performance of certain assessment methods when they are applied to created wetlands.

1648. **Comparison of wetland structure and function on grazed and ungrazed salt marshes.**
Reader, Judy and Craft, Christopher
Journal of the Elisha Mitchell Scientific Society 115(4): 236-249. (1999)
NAL Call #: 500 EL4; ISSN: 0013-6220
Descriptors: estuarine ecology: ecology, environmental sciences/ backmarsh elevation/ benthic community/ biomass: aboveground, belowground/ carbon: nitrogen ratio/ grazing effects/ herbivory/ nitrogen:phosphorus ratio/ primary productivity/ salinity/ salt marshes/ soil development/ species composition/ species density/ streamside elevation/ tidal inundation/ wetlands: function, structure
Abstract: Macrophyte productivity, soil development, and benthic invertebrate communities were compared on grazed and ungrazed salt marshes to examine the effects of grazing by feral ponies on wetland structure and function. The marshes had similar geomorphology (embayment), elevation (streamside and backmarsh), tidal inundation (1 m), salinity (25-35 ppt), soil type (Carteret series), and plant species composition (Spartina alterniflora Loisel) but differed with respect to the presence or absence of ponies. Over a two year period, above and belowground (0-30 cm depth) biomass were significantly lower in the grazed marsh (aboveground = 196-400 g/m^2, belowground = 828-1049 g/m^2) than the ungrazed marsh (aboveground = 588-671 g/m^2; belowground = 4,921-6,730 g/m^2). Reduction in Spartina biomass at the grazed marsh resulted in less soil organic carbon, nitrogen, and phosphorus than at the ungrazed marsh. There was no difference in C:N ratios at the two marshes, but N:P ratios were higher in the ungrazed marsh (9:1-19:1) than the grazed marsh (6:1-11:1), suggesting that more N is available for marsh organisms at the ungrazed site. Total benthic infauna density did not differ between the grazed (31,265 organisms/m^2) and ungrazed (45,511 organisms/m^2) marshes. However, the density of subsurface deposit feeders was significantly lower in the grazed marsh (10,370 organisms/m^2) than in the ungrazed marsh (16,877 organisms/m^2), perhaps as a result of lower soil organic matter and reduced food availability. Our findings suggested that herbivory by feral ponies co-ops primary productivity that would otherwise enter the detritus based salt marsh food web. This hypothesis should be tested using manipulative studies (e.g. exclosures) that exclude the ponies from areas of the marsh.

1649. **Composition of breeding bird communities in Gulf Coast Chenier Plain marshes: Effects of winter burning.**
Gabrey, S. W. and Afton, A. D.
Southeastern Naturalist 3(1): 173-185. (2004)
NAL Call #: IPSP11706; ISSN: 15287092
Descriptors: breeding birds/ waterfowl/ prescribed burning/ marshes/ winter burns/ Agelaius/ Agelaius phoeniceus/ Ammodramus maritimus/ Anatidae/ Aves/ Emberizinae/ Icteridae/ Quiscalus major/ Spartina patens
Abstract: Marsh managers along the Gulf Coast Chenier Plain frequently use winter burns to alter marsh vegetation and improve habitat quality for wintering waterfowl. However, effects of these burns on marsh avifauna are not well documented. We recorded abundances of breeding bird species and vegetation structure in burned and

unburned control marshes during one breeding season before (1996) and two breeding seasons after (1997, 1998) experimental winter burns. We used non-metric multidimensional scaling analysis to assess the extent and direction of changes in bird community compositions of burned and unburned control marshes and to investigate the influence of vegetation structure on bird community composition. Overall, we found that Seaside Sparrows (Emberizidae: Ammodramus maritimus [Wilson]) and Red-winged Blackbirds and Boat-tailed Grackles (Icteridae: Agelaius phoeniceus [L.] and Quiscalus major Vieillot, respectively) comprised > 85% of observed birds. In burned marshes during the first breeding season following experimental burns (1997), icterid abundance increased while Seaside Sparrow abundance decreased relative to pre-burn (1996) conditions. This pattern was reversed during the second breeding season post-burn. No obvious patterns of change in avian abundance were detected in unburned control marshes over the 3-year period. Qualitative changes in breeding bird community composition were related to effects of winter burning on percent cover of dead vegetation and Spartina patens (Aiton) Muhl.

1650. **Consequences of habitat loss and fragmentation for wetland amphibian assemblages.**
Lehtinen, R. M.; Galatowitsch, S. M.; and Tester, J. R.
Wetlands 19(1): 1-12. (1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ habitat changes/ conservation/ habitats/ amphibians/ land use/ marshes/ geographical information systems/ species extinction/ ecosystem disturbance/ nature conservation/ Amphibia/ Minnesota/ amphibians/ habitat fragmentation
Abstract: Landscape-level variables operating at multiple spatial scales likely influence wetland amphibian assemblages but have not been investigated in detail. We examined the significance of habitat loss and fragmentation, as well as selected within-wetland conditions, affecting amphibian assemblages in twenty-one glacial marshes. Wetlands were located within urban and agricultural regions of central and southwestern Minnesota, USA and were distributed across two ecoregions: tallgrass prairie and northern hardwood forest. We surveyed amphibian assemblages and used a geographic information system to quantify land-use variables at three scales: 500, 1000, and 2500 m. Ten species of amphibians were detected, the most abundant being Rana pipiens, Ambystoma tigrinum, and Bufo americanus. Amphibian species richness was lower with greater wetland isolation and road density at all spatial scales in both ecoregions. Amphibian species richness also had a negative relationship with the proportion of urban land-use at all spatial scales in the hardwood forest ecoregion, and species richness was greater in wetlands with fish and Ambystoma tigrinum. These biotic relationships are less consistent and more difficult to interpret than are land-use relationships. The data presented here suggest that decreases in landscape connectivity via fragmentation and habitat loss can affect amphibian assemblages, and reversing those landscape changes should be an important part of a regional conservation strategy.

1651. **Consequences of prairie wetland drainage for crustacean biodiversity and metapopulations.**
Jenkins, D. G.; Grissom, S.; and Miller, K.
Conservation Biology 17(1): 158-167. (Feb. 2003)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: wetlands/ prairies/ drainage/ biological diversity/ metapopulations/ historical ecology/ temporary ponds/ community composition/ freshwater crustaceans/ species diversity/ historical account/ long-term records/ genetics/ population genetics/ species extinction/ man-induced effects/ land use/ agriculture/ Crustacea/ Illinois/ conservation/ mechanical and natural changes
Abstract: Much of Illinois was once wet prairie, dotted with ancient (ca. 10,000-year-old) ephemeral wetlands. Most wetland habitat (85%) was converted to agriculture over a span of about 100 years (ca. 1850-1950). The consequences of this severe habitat fragmentation on wetland communities and metapopulations are unknown. We studied crustacean communities (weekly stovepipe samples throughout hydroperiods) for 3 years in a set of extant ephemeral wetlands in Illinois. We generated species-sites curves by rarefaction and extrapolated those curves to conservatively estimate that 83-85 crustacean species may have inhabited approximately 4 million ephemeral wetlands that once existed in Illinois; 8-9 crustacean species were driven to extinction in Illinois during drainage; and 75-76 crustacean species are extant in the few remaining ephemeral wetlands of Illinois. We also conducted cellular automata simulations to examine the potential effects of habitat fragmentation on the genetic structure of extant crustacean metapopulation. Simulations indicated that conversion of the former wet prairie to agriculture may have reduced crustacean metapopulations to isolated populations that are more vulnerable to future habitat loss. Despite severe habitat fragmentation, curvilinear species-sites relationships suggest that the greatest extinction rates have yet to occur for ephemeral wetland crustaceans. However, selection for limited dispersal during habitat fragmentation may contribute to extinction debt for extant species. Conservation programs can preserve much of the historical biodiversity of ephemeral wetlands, but future wetland biodiversity will depend heavily on the success of those efforts. The consequences of historical wetland loss and the importance of wetland conservation efforts to agriculture in the United States should be instructive for other regions.

1652. **Conservation compliance and wetlands conservation provisions of the omnibus farm acts of 1985, 1990 and 1996.**
Brady, S. J.
In: A comprehensive review of Farm Bill contributions to wildlife conservation, 1985-2000/ Heard, L. P; Hohman, W. L.; Halloum, D. J.; and Wildlife Habitat Management Institute (U.S.); Series: Technical Report USDA/NRCS/WHMI. Madison, MS: U.S. Department of Agriculture, 2000; pp. 5-17.
NAL Call #: aS604.6 C66 2000
Descriptors: conservation compliance/ Conservation Reserve Program/ Wetlands Reserve Program/ Farm Bill/ laws and regulations/ wildlife habitats

1653. **Conservation implications of flooding rice fields on winter waterbird communities.**
Elphick, C. S. and Oring, L. W.
Agriculture, Ecosystems and Environment 94(1): 17-29. (Jan. 2003)
NAL Call #: S601.A34
Descriptors: California/ shorebird/ waterfowl/ wading birds/ agricultural wetland/ rice farming/ conservation value/ habitat management
Abstract: The effects of flooding harvested rice fields on waterbird communities were studied during winter. Variation in the number of waterbird species, overall densities of all waterbirds, wading birds, waterfowl, and shorebirds, and a measure of conservation value that weighted species according to their relative abundance and population trends were examined. Each variable was tested for differences among: (a) flooded and unflooded fields; (b) flooded fields that received different rice straw manipulations; and (c) fields with different water depths. Flooded fields were used by waterbirds more than unflooded fields according to most criteria, although wading bird densities did not differ between flooded and unflooded fields. In terms of conservation value, flooded fields contributed considerably more to waterbird conservation than unflooded fields. The number of waterbird species, total waterbird density, and the density of wading birds differed significantly among straw management treatments, though in different ways. Water depth significantly affected all measures, but in all cases most of the variation went unexplained. Bird densities were explained best by asymptotic relationships, with shorebird densities greatest in shallow water and waterfowl and wading bird densities greatest in deeper conditions. Waterbird richness and conservation value both were greatest at depths of 10-15cm. Intentionally flooding fields during winter significantly affected numerous aspects of the waterbird community. The method of flooding also influenced the waterbird community, although these effects often were small.
This citation is from AGRICOLA.

1654. **Conservation of aquatic insects: Worldwide crisis or localized threats.**
Polhemus, D. A.
American Zoologist 33(6): 588-598. (1993)
NAL Call #: 410 Am3; ISSN: 0003-1569 [AMZOAF].
Notes: Literature review.Paper presented at the Symposium, "The Crisis in Invertebrate Conservation," Annual Meeting of the American Society of Zoologists and the Canadian Society of Zoologists, December 27-30, 1992, Vancouver, British Columbia. Includes references.
Descriptors: aquatic insects/ nature conservation/ endangered species/ species diversity/ legislation/ biodiversity/ Ambrysus amargosus
This citation is from AGRICOLA.

1655. **Constructed ponds as mitigated habitat for wood frogs (Rana sylvatica) and spotted salamanders (Ambystoma maculatum).**
Good, C. D.; Pauley, T. K.; and Keyser, P.
Southeastern Biology 53(2): 225. (2006); ISSN: 1533-8436
Descriptors: amphibia/ wood frog/ spotted salamander/ ponds/ conservation actions/ habitat suitabilities/ breeding/ freshwater environments/ amphibia/ Aeschnidae/ Rana sylvatica/ Ambystoma maculatum
Abstract: Amphibian monitoring is important for successful conservation practices in timbered forests. Three ponds were constructed in 3 forested areas on MeadWestvaco's Wildlife and Ecosystem Research Forest in Randolph County, WV. To determine habitat suitability for breeding and larval amphibians, studies were conducted in 6 ponds during 2004, and all 9 in 2005. Drift fence methods with paired funnel traps (16 per pond) were used for amphibian captures. Species of focus included Rana sylvatica and Ambystoma maculatum because they are known to be philopatric thus providing data on the continued use of these ponds as breeding sites. During both years, trapped amphibians were measured and given 1 pond specific mark with viable implant elastomer. In 2005, juveniles were given individual tags. Breeding R. sylvatica (n = 15) were captured in early spring 2005. No breeding R. sylvatica were captured in 2004. In 2005, juvenile captures (n = 146) increased from 2004 (n = 30). No A. maculatum were captured. Phenological differences between ponds, possibly due to elevation or hydrology, will be presented. Adult R. sylvatica increased pond use, while larval success in ponds remains to be seen. Tadpoles did not successfully metamorphose from 2 ponds in 2005. Clear-cut treatments surrounding the ponds will be applied in 2006 and results will be compared to these baseline data.
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1656. **Constructed wetlands for wastewater treatment and wildlife habitat: 17 case studies.**
United States Environmental Protection Agency.
Washington, DC: U.S. Environmental Protection Agency; EPA832-R93-005, 1993. 174 p.
Notes: EP 1.2:W 53/7 (SuDocs).
NAL Call #: TD756.5.C65--1993
Descriptors: Constructed wetlands---United States---Case studies/ Sewage---Purification---Biological treatment---United States---Case studies/ Habitat---Ecology---Modification---United States---Case studies
This citation is from AGRICOLA.

1657. **Constructing freshwater wetlands to replace impacted natural wetlands: A subtropical perspective.**
Streever, W. J.; Kiefer, J. H.; and Crisman, T. L.
In: Tropical Limnology/ Timotius, K. H. and Goeltenboth, F.; Vol. 3, 1995; pp. 127-135.
Notes: Special issue: Tropical rivers, wetlands and special topics; Conference: International Conference on Tropical Limnology in Commemoration of the 65th Anniversary of The Ruttner-Thienemann Limnological Sunda Expedition, Salatiga (Indonesia), 4-8 Jul 1994; ISBN: 979-8792-01-3.
Descriptors: wetlands/ nature conservation/ fishery management/ agricultural runoff/ water quality control/ Florida/ mining/ phosphates/ conservation, wildlife management and recreation
Abstract: Numerous tropical nations are interested in wetland conservation, but as economies and populations continue to grow wetland losses will continue to accrue. In the U.S.A. legislation encourages the construction of wetlands as mitigation for unavoidable wetland loss. Construction of over 4000 ha of freshwater wetlands in Florida's phosphate mining district (latitude 28 N, longitude 82 W) provides a subtropical perspective on the potential of wetland construction in the tropics. Extensive field data from industry reports and from government-supported

research indicate that vegetation, fish, meiofauna, and benthic invertebrate communities of some constructed wetlands are similar to those of nearby natural wetlands. In this paper, six "principles of wetland construction" are presented to summarize and synthesize experience gained through the construction of wetlands in central Florida: 1. The potential benefits offered by construction of wetlands should only be considered when loss of natural wetlands is unavoidable. 2. Clear and realistic goals should be formulated for each wetland construction project. 3. Establishment of the appropriate hydrology should be a primary concern in wetland construction. 4. Establishment and maintenance of vegetation involve both active and passive strategies. 5. Because wetland construction technology is still in a developmental stage, all projects should be carefully monitored. 6. If monitoring reveals major faults with a constructed system, remedial measures should be taken Future wetland construction projects in the tropics may benefit from wetland constructior experience in Florida's subtropics.

1658. **Created and restored marshes in the Lower Fraser River, British Columbia: Summary of their functioning as fish habitat.**
Levings, C. D. and Nishimura, D. J.
Water Quality Research Journal of Canada 32(3): 599-618. (1997); ISSN: 1201-3080
Descriptors: Canada, British Columbia, Fraser River/ marshes/ aquatic habitat/ estuaries/ invertebrates/ smolt/ salmon/ aquatic plants/ artificial wetlands/ rehabilitation/ comparison studies/ environmental restoration/ Oncorhynchus
Abstract: Ecological comparisons of transplanted, natural (reference) and disrupted (unvegetated) marsh sites on the Fraser River estuary, British Columbia, were conducted between 1991 and 1994. The study examined vegetative biomass and cover, invertebrate abundance, fish abundance, fish residency, fish food, and submergence time for the three habitats. Standing crop biomass at three transplant sites was within the range of values for reference sites, but was much lower at an unstable site where sediment slumping had occurred. The percent cover of Lyngbyei's sedge (Carex lyngbyei) in eight transplant sites was <50% of that observed in adjacent reference sites when data were averaged over the study area; rushes (Juncus spp.) were more abundant in transplant sites. In all study reaches, abundance of invertebrates at transplant and reference sites was significantly higher than at disrupted sites. In several instances, invertebrate abundance at transplant sites was greater than at reference sites. No significant difference (p>0.05) was observed among marsh sites when chum salmon (Oncorhynchus keta) and chinook salmon (O. tschawytscha) fry abundance were compared. However, chinook and sockeye smolt catches were significantly different (p<0.05) among marsh sites and were usually higher at disrupted sites. In nine sites in the North Arm and Deas Slough area chum fry residency was examined. At one transplant site (DE1) marked chum fry were caught up to 48 h after release. No fry were caught 1 h after release at a transplant site (DI1) and a disrupted site (DE4). At the remaining sites, fry were caught up to 1 and 3 h after release. At all sites, over 80% of the total number of food organisms examined in chum fry stomachs were harpacticoid copepods. Mean submergence time for reference marshes ranged from 33.2 to 50.7%, but for transplanted sites the value ranged from 26.4 to 60.1%. Our study shows that numerous factors need to be examined in determining if restored marshes will function as natural habitats. The development of a standardized set of reference criteria would assist in evaluating whether or not transplanted marshes are functioning as designed.

1659. **Creation and restoration of riparian habitat in southwestern arid and semi-arid regions.**
Johnson, R. R.; Mills, G. S.; and Carothers, S. W.
In: Wetland Creation and Restoration: The Status of the Science. Covelo, Calif.: Island Press, 1990; pp. 351-366.
Notes: ISBN: 1559630450.
NAL Call #: QH541.5.M3W462
Descriptors: artificial wetlands/ habitat restoration/ riparian land/ water resources management/ wetland restoration/ arid lands/ planting management/ research priorities/ riparian vegetation/ riparian waters/ soil-water-plant relationships/ vegetation establishment/ water resources development
Abstract: Though the literature on characteristics, values, and functions of riparian habitats in the arid and semiarid southwestern region of the United States is fairly extensive, few papers that pertain to its creation or restoration are available. Because these projects are so recent, evaluations of successes and failures are based on short-term results; long-term survival and growth rates are as yet unknown. In most cases, creation and restoration projects have involved the planting of vegetation and not the creation of conditions suitable for the natural regeneration of riparian habitats. Important considerations for riparian creation or restoration projects in the Southwest include: depth to water table; soil salinity and texture; amount and frequency of irrigation; effects of rising and dropping water tables on planted trees; protection from vandalism, off-road vehicles, and livestock; monitoring of growth rates as well as survival; and project design flexible enough to allow for major modifications. Because the creation and restoration of riparian habitats in the Southwest is new and mostly experimental, more information is needed for virtually every aspect of revegetation. Two major questions that need to be answered are whether planted trees survive for more than a few years and reach expected sizes, and what ranges of planting parameters are most cost-effective. Specific information needs include the identification of: the most suitable watering regimes; suitable soil conditions for various tree species; long- term survival and growth rates; and effects of variable water levels on planted trees.

1660. **Decline of duck nest success revisited: Relationships with predators and wetlands in dynamic prairie environments.**
Drever, M. C.; Wins-Purdy, A.; Nudds, T. D.; and Clark, R. G.
Auk 121(2): 497-508. (2004)
NAL Call #: 413.8 AU4 ; ISSN: 00048038
Descriptors: Anas acuta/ Anas clypeata/ Anas discors/ Anas platyrhynchos/ Anas strepera
Abstract: Covariation among factors that may affect nest success of dabbling ducks in the Prairie Pothole Region of North America (e.g. productivity of upland and wetland

habitat related to climate variation, and duck and predator densities) often confounds efforts to interpret the effect of any individual factor. A comparison of nest success of dabbling ducks at sites with and without predator management provided an opportunity to separate the effect of predation pressure from other factors because predator management has occurred over a range of climatic conditions. We updated an existing study on temporal trends of nest success for prairie ducks in the Prairie Pothole Region of North America by compiling recent estimates of nest success for five species of dabbling ducks (Mallard [Anas platyhrynchos], Northern Pintail [A. acuta], Northern Shoveler [A. clypeata], Blue-winged Teal [A. discors], and Gadwall [A. strepera]). In addition, we compared trends of nest success at unmanaged sites and sites where nest predators were excluded or removed. We used pond density calculated from annual surveys for breeding waterfowl as an index of upland and wetland productivity and a correlate of predator and duck density. At unmanaged sites, the best approximating local regression model suggested that, rather than having undergone a monotonic decline, average nest success has fluctuated through time, although those changes do not appear to be associated with changes in pond density. At sites where predators were excluded, nest success did not vary with time but varied positively with pond density in the previous year, although that effect was tempered by high pond density in the year of observation. At sites where predators were removed but could emigrate back into study plots, nest success varied widely over time and we found no evidence of an effect of pond density. We show that nest success of dabbling ducks is higher under predator management than at sites without predator management, and that this relationship varies with climatic conditions, possibly related to complex interactions within and among duck species, their predators, and their prey.

1661. **Design and management of edge-of-field water control structures for ecological benefits.**
Shields, F. D.; Smiley, P. C.; and Cooper, C. M.
Journal of Soil and Water Conservation 57(3): 151-157. (2002)
NAL Call #: 56.8 J822 ; ISSN: 00224561
Descriptors: amphibians/ birds/ ecological impairment/ erosion control/ fish/ gully/ mammals/ reptiles/ riparian zone/ species diversity/ ecological impact/ erosion control/ gully erosion/ riparian zone/ soil water/ United States
Abstract: Stream channel incision often triggers formation of tributary gullies. These gullies erode and extend into fields, generating sediments that pollute downstream waters and degrade aquatic habitats. Standard practice for gully treatment involves damming using an earthen embankment with drainage provided by an L-shaped metal pipe. To date, thousands of these structures, also known as drop pipes, have been constructed in riparian zones adjacent to agricultural areas, but environmental criteria have played no role in design. Sixteen drop pipe sites (defined as the region of temporary or permanent impoundment created by the structure) in northwestern Mississippi were sampled for fish, amphibians, reptiles, birds, and mammals; and physical habitat characteristics were assessed by sampling vegetation and surveying site topography. Speciose sites (those yielding 65 to 82 vertebrate species) were relatively large [≥0.09 ha (.22 ac)], with a significant pool area. Depauperate sites (only 11 to 20 species captured) were smaller, with no pool area and little woody vegetation. Considerable environmental benefits could be realized by slightly modified design and management of drop pipe structures. Results of this study suggest habitat benefits are minimal for sites smaller than 0.1 ha (0.2 ac), for sites lacking woody vegetation, and for sites that do not have at least 20% of their area below the inlet weir elevation.

1662. **Designing wetlands for amphibians: The importance of predatory fish and shallow littoral zones in structuring of amphibian communities.**
Porej, D. and Hetherington, T. E.
Wetlands Ecology and Management 13(4): 445-455. (2005)
NAL Call #: QH541.5.M3 W472; ISSN: 09234861.
Notes: doi: 10.1007/s11273-004-0522-y.
Descriptors: Ambystoma/ American bullfrog/ amphibian community/ colonization/ green frog/ habitat restoration/ leopard frog/ Ohio/ predation/ small-mouthed salamander/ wetland mitigation/ community structure/ habitat restoration/ littoral environment/ species diversity/ wetlands/ United States/ Ambystoma maculatum/ Ambystoma opacum/ Ambystoma texanum/ Amphibia/ Amphiuma means/ Anura/ Felidae/ Notophthalmus viridescens/ Panthera pardus/ Rana catesbeiana/ Rana clamitans/ Rana sylvatica/ Salamandridae
Abstract: Under section 401 and section 404 of the Clean Water Act, permission to degrade existing natural wetlands in the USA may be conditional on restoring or creating 'replacement' wetlands. Success of wetland mitigation efforts in adequately replacing lost wildlife habitats depends on our good understanding of key ecological attributes that affect the structure of wetland faunal communities. We examined the effects of the presence of predatory fish, shallow vegetated littoral zone, emergent vegetation cover, wetland age and size on amphibian diversity in 42 replacement wetlands located in the Ohio's North Central Tillplain ecoregion. We recorded 13 species of pond-breeding amphibians, and the average local species richness ([α-richness) was 4.2 ± 1.7 species per site (range 1-7). There is strong evidence for the positive association between amphibian species richness and presence of a shallow littoral zone, and the negative association with presence of predatory fish. There was no evidence for the association between species richness and age, size, amount of forest cover within 200 m, nor the amount of emergent vegetation cover at the study sites. It is estimated that local species richness in wetlands with shallows was 1.76 species higher on average than in wetlands without shallows (95% CI from 0.75 to 2.76). The presence of predatory fish was associated with an average reduction in species richness by an estimated 1.21 species (95% CI from 0.29 to 2.11). Replacement wetlands were placed in areas with little or no existing forest cover, and amphibian species associated with forested wetlands were either rare (eastern newt, spotted salamander) or not present at all (marbled salamander, wood frog). In addition, we surveyed all replacement wetlands constructed under section 401 in Ohio since 1990, and found that predatory fish were present in 52.4% of the sites and that shallows were absent

from 42.7% of the sites. Our results indicate that current wetland replacement practices could have a negative effect on the amphibian diversity within our region. © Springer 2005.

1663. **Designing wetlands for wildlife.**
Abney, C. D.
In: Proceedings of the 2001 Wetlands Engineering and River Restoration Conference. Hayes D. F. and Hayes D. F. (eds.)
Reno, NV; pp. 447-452; 2001. ISBN: 0784405816
Descriptors: biodiversity/ ecosystems/ hydrology/ nutrition/ recharging (underground waters)/ sedimentation/ vegetation/ water treatment/ natural system processes/ wildlife/ wetlands
Abstract: The designing of wetlands for specific wildlife species was discussed. The study focused on freshwater wetland requirements for migratory waterbirds in order to provide specific examples of habitat design. Questions regarding food production, shelter, reproduction, and predation must be addressed, as well as the hydrological dynamics that are present in natural systems that normally support the targeted wildlife and how these play a role in species survival. Once life cycle needs are assessed, wetlands can be strategically designed and managed to simulate natural conditions and thereby optimize habitat value.

1664. **Developing an invertebrate index of biological integrity for wetlands.**
Helgen, Judy
In: Methods for evaluating wetland condition; Washington, D.C: U.S. Environmental Protection Agency, Office of Water, 2002.
Notes: Original title: Developing an invertebrate index of biological integrity for wetlands (#9); Title from web page. "March 2002." "EPA-822-R-02-019." Description based on content viewed April 10, 2003. "Prepared jointly by U.S. Environmental Protection Agency, Health and Ecological Criteria Division (Office of Science and Technology) and Wetlands Division (Office of Wetlands, Oceans, and Watersheds)".
NAL Call #: QH541.5.M3H46 2002
http://www.epa.gov/waterscience/criteria/wetlands/9Invertebrate.pdf
Descriptors: Wetlands---United States/ Aquatic invertebrates---Environmental aspects---United States
This citation is from AGRICOLA.

1665. **Development of community metrics to evaluate recovery of Minnesota wetlands.**
Galatowitsch, S. M.; Whited, D. C.; and Tester, J. R.
Journal of Aquatic Ecosystem Stress and Recovery 6(3): 217-234. (1998)
NAL Call #: QH541.5.W3 J68; ISSN: 1386-1980.
Notes: Special Issue: Recovery in Aquatic Ecosystems.
Descriptors: wetlands/ environmental monitoring/ indicator species/ methodology/ land use/ restoration/ ecosystems/ long-term changes/ community composition/ land management/ bioindicators/ surface water/ birds/ populations/ Minnesota/ land restoration/ pollution monitoring and detection/ protective measures and control/ watershed protection/ environmental action
Abstract: Monitoring wetland recovery requires assessment tools that efficiently and reliably discern ecosystem changes in response to changes in land use. The biological indicator approach pioneered for rivers and streams that uses changes in species assemblages to interpret degradation levels may be a promising monitoring approach for wetlands. We explored how well metrics based on species assemblages related to land use patterns for eight kinds of wetlands in Minnesota. We evaluated land use on site and within 500 m, 1000 m, 2500 m and 5000 m of riverine, littoral, and depressional wetlands (n = 116) in three ecoregions. Proportion of agriculture, urban, grassland, forest, and water were correlated with metrics developed from plant, bird, fish, invertebrate, and amphibian community data collected from field surveys. We found 79 metrics that relate to land use, including five that may be useful for many wetlands: proportion of wetland birds, wetland bird richness, proportion of insectivorous birds, importance of Carex, importance of invasive perennials. Since very few metrics were significant for even one-half of the wetland types surveyed, our data suggest that monitoring recovery in wetlands with community indicators will likely require different metrics, depending on type and ecoregion. In addition, wetlands within extensively degraded ecoregions may be most problematic for indicator development because biotic degradation is historic and severe.

1666. **Diet of mallards wintering in greentree reservoirs in southeastern Arkansas.**
Dabbert, C. B. and Martin, T. E.
Journal of Field Ornithology 71(3): 423-428. (2000)
NAL Call #: 413.8 B534; ISSN: 02738570.
http://www.bioone.org/archive/0273-8570/71/3/pdf/i0273-8570-71-3-423.pdf
Descriptors: wetlands/ waterfowl/ ducks/ mallards/ greentree reservoirs/ flooding/ wildlife habitat
Abstract: Loss of wetlands to agriculture and development negatively impacts waterfowl. Greentree reservoirs are forested tracts that are purposefully flooded to increase hunting opportunities for sportsman and to provide shelter for waterfowl such as Mallards (Anas platyrhynchos). These human-made wetlands can also make natural foods such as acorns and invertebrates available to Mallards. Food habits analysis conducted in 1959 indicated acorns composed 24% of the volume of diets of Mallards collected from a variety of habitats including agricultural fields, naturally flooded bottomland forests, and greentree reservoirs in Arkansas. However, changes that may have occurred in food use by Mallards in bottomland hardwood habitats in Arkansas since last examined are unclear. We examined foods used by Mallards in greentree reservoirs from November 1990 to February 1991 in southeastern Arkansas. Seventeen species of plants and 21 families/orders of animals occurred in the diet of Mallards. Mallards consumed 65% plant matter, primarily seeds of narrowleaf foresteria (Foresteria angustifolia), Nuttall oak (Quercus nuttallii), Pennsylvania smartweed (Polygonum pensylvanicum), and rice (Oryza sativa). Invertebrate taxa, constituting 6% or more of the sample by both volume and mass, included the orders Coleoptera, Diptera, and

Isopoda. Diets of Mallards present in greentree reservoirs in our study indicate Mallards still use natural foods, though agricultural seeds were in close proximity to natural foods.

1667. **Dipteran standing stock biomass and effects of aquatic bird predation at a constructed wetland.**
Ashley, M. C.; Robinson, J. A.; Oring, L. W.; and Vinyard, G. A.
Wetlands 20(1): 84-90. (2000)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: American avocet/ aquatic birds/ Chironomid/ Diptera/ predation/ Wilson's phalarope/ constructed wetland/ population density/ predator-prey interaction/ zoobenthos/ United States/ Anas cyanoptera/ Phalaropus tricolor/ Recurvirostra americana
Abstract: We studied the relationship between benthic invertebrates and aquatic birds at a newly constructed wetland using an avian exclosure experiment combined with counts of aquatic bird use. We measured the standing stock biomass of benthic dipterans both inside and outside exclosures. Chironomidae was the most abundant dipteran family present. Maximum chironomid standing stock biomass per pond ranged from 3.62 to 27.82 g/m^2 and was comparable to that found in a number of natural systems. We monitored the abundance of ten aquatic birds species. Abundances of three aquatic bird species [American avocet (Recurvirostra americana), Wilson's phalarope (Phalaropus tricolor), and cinnamon teal (Anas cyanoptera)] were significantly correlated with chironomid and total dipteran densities. Our experiment, however, found no significant effect of predation on invertebrate densities.

1668. **Distribution of adult Odonata among localized wetlands in east-central Mississippi.**
Bried, Jason T. and Ervin, Gary N.
Southeastern Naturalist 4(4): 731-744. (2005)
NAL Call #: IPSP11706 ; ISSN: 1528-7092
Descriptors: species composition/ species richness/ habitat preference/ man made wetland site/ natural bottomland forest/ beta diversity index/ proportion coefficient
Abstract: We measured species richness and composition of adult Odonata and inferred habitat preferences among man-made wetland sites and surrounding tracts of natural bottomland forest. Cumulative species richness and composition were described by proportion coefficients and beta diversity indices. The three man-made sites provided open space resources, and more species were observed in each than in the floodplain forest. Twenty-nine of 42 species documented over a four-month period were observed in only one or two of the four wetlands studied. Large differences in species assemblages between the immediately adjacent ditch and marsh sites were the best evidence for high habitat affinity because distance and structural barriers to movement were absent. Such compositional asymmetry may reflect differential vegetative and reproductive suitability of the habitats. Results suggest that the open-canopy wetlands supported higher diversity of adult Odonata, and that distinct odonate assemblages were found among different habitat types in this floodplain wetland complex.

1669. **Does facilitation of faunal recruitment benefit ecosystem restoration? An experimental study of invertebrate assemblages in wetland mesocosms.**
Brady, V. J.; Cardinale, B. J.; Gathman, J. P.; and Burton, T. M.
Restoration Ecology 10(4): 617-626. (Dec. 2002)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: wetlands/ community structure/ aquatic ecosystems/ conservation/ zoobenthos/ macrofauna/ environment management/ nature conservation/ restoration/ transplantation/ stocking (organisms)/ biotic factors/ recruitment/ community composition/ colonization/ aquatic insects/ freshwater molluscs/ mesocosms/ comparative studies/ Chironomidae/ Gastropoda/ Invertebrata/ midges/ poor colonizers/ vegetation/ sediment plugs/ gastropods/ slugs/ snails/ aquatic entomology/ insects/ conservation, wildlife management and recreation
Abstract: We used wetland mesocosms (1) to experimentally assess whether inoculating a restored wetland site with vegetation/sediment plugs from a natural wetland would alter the development of invertebrate communities relative to unaided controls and (2) to determine if stocking of a poor invertebrate colonizer could further modify community development beyond that due to simple inoculation. After filling mesocosms with soil from a drained and cultivated former wetland and restoring comparable hydrology, mesocosms were randomly assigned to one of three treatments: control (a reference for unaided community development), inoculated (received three vegetation/sediment cores from a natural wetland), and stocked + inoculated (received three cores and were stocked with a poorly dispersing invertebrate group-gastropods). All mesocosms were placed 100 m from a natural wetland and allowed to colonize for 82 days. Facilitation of invertebrate colonization led to communities in inoculated and stocked + inoculated treatments that contrasted strongly with those in the unaided control treatment. Control mesocosms had the highest taxa richness but the lowest diversity due to high densities and dominance of Tanytarsini (Diptera: Chironomidae). Community structure in inoculated and stocked + inoculated mesocosms was more similar to that of a nearby natural wetland, with abundance more evenly distributed among taxa, leading to diversity that was higher than in the control treatment. Inoculated and stocked + inoculated communities were dominated by non-aerial invertebrates, whereas control mesocosms were dominated by aerial invertebrates. These results suggest that facilitation of invertebrate recruitment does indeed alter invertebrate community development and that facilitation may lead to a more natural community structure in less time under conditions simulating wetland restoration.

1670. **Duck nest success in the Prairie Pothole Region.**
Klett, A. T.; Shaffer, T. L.; and Johnson, D. H.
Journal of Wildlife Management 52(3): 431-440. (1988)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: breeding success/ breeding/ colonies/ nests/ population dynamics/ nature conservation/ aquatic birds/ Anas/ Minnesota/ North Dakota/ South Dakota/ aquatic birds
Abstract: The authors estimated nest success of mallard (Anas platyrhynchos), gadwall (A. strepera), blue-winged teal (A. discors), northern shoveler (A. clypeata), and

northern pintail (A. acuta) for 5 regions in North Dakota, South Dakota, and Minnesota, for 1-3 periods between 1986 and 1984, and for 8 habitat classes. Nest success rates ranged from < 5 to 36% among regions, periods, and species. Rates were lowest in western Minnesota (MNW) and eastern North Dakota (NDE), intermediate in central North Dakota (NDC) and eastern South Dakota (SDE), and highest in central South Dakota (SDC). In regions with comparable data, no consistent trend in nest success was apparent from early to late periods. Gadwalls and blue-winged teal nested more successfully than mallards and pintails; the relative success of shovelers varied regionally.

1671. **Duwamish River Coastal America restoration and reference sites: Results from 1997 monitoring studies.**
Cordell, J. R.; Tear, L. M.; Jensen, K.; and Higgins, H. A.
Seattle, WA: Fisheries Research Institute; FRI-UW-9903, 1999.
Notes: Other numbers: Technical report. School of Aquatic and Fishery Science, Fisheries Research Institute, Washington University [Rep. Fish. Res. Inst. Wash. Univ.]. No. 9903.
Descriptors: wetlands/ habitat improvement/ water resources/ riprap/ restoration/ brackishwater environment/ man-induced effects/ tidal currents/ riparian vegetation/ fishery sciences/ environmental protection/ coastal zone/ fishery management/ coastal inlets/ anthropogenic factors/ Oncorhynchus/ Carex lyngbyei/ Scirpus maritima/ Washington/ Seattle/ Duwamish Waterway/ habitat community
Abstract: In this report, we present the results of 1997 biological monitoring at three wetland restoration sites in the Duwamish River estuary, Seattle, Washington. Restoration at these sites was originally facilitated by the federal Coastal America program and was carried out by a partnership of the City of Seattle, U.S. Fish & Wildlife Service, the U.S. Army Corps of Engineers, and the U.S. Environmental Protection Agency. Two of these sites are in the middle portion of the Duwamish Waterway, in a region dominated by tidal influence and mixed fresh- and marine water. The first of these sites consists of the General Service Administration (GSA) site located adjacent to the Federal Center South, which is a long, narrow intertidal strip running parallel to the east bank of the Duwamish Waterway adjacent/to the Seattle District Corps of Engineers. Restoration at this site included removal of rock riprap and a large overwater wharf structure to allow natural colonization by existing wetland plants, construction of a sediment "bench" at 0.0-m elevation to promote use by juvenile salmon (Oncorhynchus spp.), and planting of upland riparian vegetation. The second site is at Terminal 105 (T-105); this site originally consisted of a vacated street end and a large pipe that drained a small degraded wetland area. Restoration included removal of debris and replacement of the pipe with an estuarine channel that restored tidal flow to the area. The third Coastal America restoration site is at the upper Turning Basin at the head of the Duwamish Waterway. This site/comprises an upland riparian buffer planted with native vegetation and a small regraded upper intertidal basin planted with fringing native sedge, Carex lyngbyei, and rush, Scirpus maritima.

1672. **Ecological characteristics of a natural wetland receiving secondary effluent.**
Martin, J. R.; Clarke, R. A.; and Knight, R. L.
Water Science and Technology (2001); ISSN: 0273-1223
Descriptors: animals/ fishes/ invertebrates/ plants/ population dynamics/ trees/ ecosystem/ environmental monitoring/ waste disposal, fluid [methods]
Abstract: The Boot wetland treatment system is a 115-acre, hydrologically altered cypress-gum wetland in Polk County, Florida. The Poinciana Wastewater Treatment Plant No. 3 has discharged secondary effluent to the bermed Boot wetland since August 1984. Before that time this natural wetland had been affected adversely by forestry, drainage, and surrounding development which contributed to dying trees and a groundcover of invasive upland plants. In accordance with the Florida Department of Environmental Protection's Wetlands Application Rule (Chapter 62-611, F.A.C.), a routine biological and water quality monitoring program has been in effect since October 1990. Components of the biological monitoring program include surveys of canopy and subcanopy, herbaceous and shrub groundcover species, benthic macroinvertebrates, fish, and nuisance mosquitoes. Effluent addition to the Boot wetland has resulted in continuous wetland inundation with atypical water depth of 2.5 to 3.0 feet for the past 15 years. Dominance and density of trees has steadily increased, upland invader species were eliminated, and stable plant, fish, and invertebrate communities were established. The long term biological data from this treatment wetland is compared to data from other natural treatment wetlands and a control wetland.

1673. **Ecology and conservation biology of the Colorado River Delta, Mexico.**
Glenn, E. P.; Zamora-Arroyo, F.; Nagler, P. L.; Briggs, M.; Shaw, W.; and Flessa, K.
Journal of Arid Environments 49(1): 5-15. (2001)
NAL Call #: QH541.5.D4J6; ISSN: 01401963.
Notes: doi: 10.1006/jare.2001.0832.
Descriptors: biosphere reserve/ Colorado River/ Delta/ desert river/ El Nino/ estuary/ riparian/ wetland/ conservation/ delta/ endangered species/ migratory species/ revegetation/ water flow/ Mexico/ Anas/ Anatidae/ Anser/ Aves/ Empidonax traillii/ Rallus/ Rallus longirostris yumanensis/ Riparia/ Salix/ Typha/ Yuma
Abstract: The Colorado River Delta in Mexico has been partially revegetated following 20 years of water flows from the United States. Lake Powell, the last major impoundment built on the river, filled in 1981. Since then, flood flows in the main channel of the river have occurred in El Nino cycles, and have returned native trees and other vegetation to the riparian corridor. This vegetation provides a migration route for endangered southwestern willow flycatchers (Empidonax traillii) and other migratory birds moving from Mexico to the United States for summer nesting. Agricultural drain water from the Wellton-Mohawk Irrigation District conveyed to the delta since 1977 has created Cienega de Santa Clara, a 4200-ha Typha domengensis marsh containing the largest remaining population of the endangered Yuma clapper rail (Rallus longirostris yumanensis), plus numerous species of migratory and resident waterfowl. Populations in the marine

part of the delta have been severely affected by the lack of river flow, but some species have responded positively to renewed flows. Currently, there are 170,000 ha of natural areas in the lower delta in Mexico, containing riparian, wetland and intertidal habitats. Much of this land as well as the adjacent marine zone is protected in the Biosphere Reserve of the Upper Gulf of California and Colorado River Delta. Natural resource managers, scientists and non-governmental environmental groups in Mexico and the United States are exploring conservation measures that can provide water and protection for these areas for the future. © 2001 Academic Press.

1674. **Ecology and management of migrant shorebirds in the Playa Lakes Region of Texas.**
Davis, Craig A. and Smith, Loren M.
Wildlife Monographs(140): 1-45. (1998)
NAL Call #: 410 W64; ISSN: 0084-0173
Descriptors: body size/ diet/ feeding ecology/ habitat selection/ migration/ sex differences/ stopover site
Abstract: During spring and fall migration, shorebirds rely on stopover areas to replenish energy reserves and fulfill nutrient requirements. Most studies of stopover areas have focused on wetlands in the Northern Great Plains; little attention has been given to wetlands in the Southern Great Plains, especially the Playa Lakes Region (PLR). Our objectives were to determine migrant-shorebird species compositions, abundances, migration chronologies, use of habitats, and feeding ecologies in the PLR during spring and fall migration. More than 130 playa wetlands were surveyed for shorebirds in a 34,000-km^2 area of western Texas. We selected American avocet (Recurvirostra americana), long-billed dowitcher (Limnodromus scolopaceus), least sandpiper (Calidris minutilla), and western sandpiper (C. mauri) as a subset of all shorebirds present to examine feeding ecologies; these 4 species were common species during both migration periods and represent a wide range of body sizes and guilds. We also evaluated the influence of sex on the feeding ecologies of the 4 species. Thirty shorebird species used playa wetlands during spring and fall, 1993-94. The most abundant species during spring were American avocet, long-billed dowitcher, and Wilson's phalarope (Phalaropus tricolor), whereas the most abundant species during fall were American avocet, long-billed dowitcher, long-billed curlew (Numenius americanus), stilt sandpiper (Calidris himantopus), and lesser yellowlegs (Tringa flavipes). Migration chronologies of each species were distinct in spring with peak abundances occurring over 2-4 weeks and were protracted in fall with peak abundances occurring over 5-8 weeks. In general, most shorebird species selected playas that contained sparse vegetation (<25% vegetation cover), adequate amounts of mudflat (10-15%) and shallow (<4 cm depth) water (10-20%) habitats, and higher invertebrate populations. Invertebrates were the most important component in the diets of American avocets, long-billed dowitchers, least sandpipers, and western sandpipers, and diets varied little between males and females. In the spring, all 4 species consumed mostly chironomids, whereas in the fall, all 4 consumed a wider variety of invertebrates. important invertebrate foods during the fall included chironomids, hydrophilids, leeches, planorbids, corixids, conchostracans, and hydracarinas. The 4 species also consumed more plant material (predominantly seeds) in the fall than in the spring. Differences in spring and fall diets of the 4 shorebird species were attributed to seasonal differences in invertebrate abundances and diversities; invertebrate abundances and diversities were higher in the fall than in the spring. Shorebird diets were compared with availabilities of foods within and across individual playas. For most foods, overall selection patterns (i.e., selection across playas) were different from selection patterns within individual playas. In general, all 4 species exhibited a wide range of selection patterns for invertebrates as availability of invertebrates changed, suggesting that the 4 species used an opportunistic foraging strategy. Shorebird foraging appeared to decrease invertebrate populations in spring, but not in fall. Management of playas in the PLR should focus on creating and maintaining sparse vegetation cover, and adequate mudflat (at least 10-15%) and shallow water (at least 10-20%) habitats. Because invertebrates are important foods of migrant shorebirds, management also should focus on enhancing invertebrate populations in playas. Gradual drawdowns of playas with deep water and flooding of dry playas should be used to provide available habitat for shorebirds throughout migration. Mowing and shallow disking can be used to create preferred habitat conditions and provide a detrital food base to enhance invertebrate populations. Managers that can manage only a few playas should consider managing playas during periods of maximum shorebird diversity in the PLR. During spring, maximum shorebird diversity occurred in late April and early May, whereas during fall, maximum shorebird diversity occurred in late August.

1675. **Ecology of insect communities in nontidal wetlands.**
Batzer, D. P. and Wissinger, S. A.
Annual Review of Entomology 41: 75-100. (1996)
NAL Call #: 421 An72; ISSN: 0066-4170 [ARENAA].
Notes: Literature review.
Descriptors: wetlands/ insects/ community ecology/ habitats/ interactions/ colonization/ nature conservation/ insect communities/ freshwater ecology
This citation is from AGRICOLA.

1676. **Effect of forest management practices on southern forested wetland productivity.**
Conner, W. H.
Wetlands 14(1): 27-40. (1994)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: bobwhite quail/ wetlands/ forest industry/ biological production/ hydrology/ flooding/ resource management/ water levels/ environmental effects/ logging/ forest management/ water level/ drainage/
United States, Southeast
Abstract: In the interest of increasing productivity of forested wetlands for timber production and/or wildlife value, management schemes that deal mainly with water-level control have been developed. The three forest types in the southeastern U.S. most commonly affected are cypress/tupelo forests, bottomland hardwood forests, and wet pine sites (including pocosins). In forested wetlands, hydrology is the most important factor influencing productivity. In bottomland and cypress/tupelo forests, water-level control can have mixed results. Alterations in natural hydrologic patterns leading to increased flooding or drainage can cause decreased growth rates or even death

of the forest. Bottomland hardwoods respond favorably in the short term to water-level management, but the long-term response is currently under study. In wet pine sites, timber volume can be increased significantly by water-level management, but the impact upon other ecological functions is less understood. It is difficult to adequately describe productivity relations in wetland forests because of the great diversity in habitat types and the lack of data on how structure and function might be affected by forestry operations. There is a definite need for more long-term, regional studies involving multidisciplinary efforts.

1677. **Effect of watershed land use and lake age on zooplankton species richness.**
Dodson, Stanley I.; Everhart, William R.; Jandl, Andrew K.; and Krauskopf, Sara J.
Hydrobiologia 579: 393-399. (2007)
NAL Call #: 410 H992; ISSN: 0018-8158
Descriptors: ecology/ community structure/ habitat/ freshwater habitat/ lentic water/ land zones/ comprehensive zoology: watershed land use/ shallow lake species diversity effect/ species diversity/ effect of watershed land use/ lake/ Wisconsin/ shallow lake species diversity
Abstract: Results of a field survey of southern Wisconsin shallow lakes suggested that watershed (catchment basin) land use has a significant and adverse effect on zooplankton species richness. Zooplankton communities in lakes with no riparian buffer zone, in agriculture-dominated watersheds, contained about half as many species as lakes in least-impact watersheds. In that study, the age of the lake was not taken into account. It is possible that agricultural lakes, often artificial, were so recently-constructed that they had not yet accumulated the equilibrium number of species characteristic of older lakes. In other words, it is possible that the interpretation of the results of the previous study is fatally flawed, if the results were an artifact of lake age, rather than an effect of land use. The major aim of this current study was to determine the ages of agricultural lakes and of lakes in least-impact watersheds, to test for an effect of lake age on zooplankton species richness, using the same sites from the previous study. We used an anova approach to test the null hypothesis that two factors, watershed land use and lake age, had no systematic effect on zooplankton species richness. We determined the age of 35 shallow lakes, using aerial photos, satellite images, and interviews of resource managers and land owners. We identified five artificial agricultural sites and five artificial sites in least-impact prairie watersheds. The artificial sites in this study ranged from 3 to 37 years in age, while natural lakes dated from the melting of the last glacier, about 9500 years ago. Our results suggest, that because artificial lake made up only about a third of the sites, and for the range of lake age and watershed land use, lake age did not have a significant effect on zooplankton species richness, while land use had a highly significant adverse effect. These results pose a larger question for future research. Namely, how quickly do newly-constructed lakes attain the equilibrium number of species seen in the previous study, and what is the quantitative relationship between lake age and zooplankton richness?

1678. **The effects of a fall prescribed burn on Hemileuca eglanterina Boisduval (Saturniidae).**
Severns, Paul M.
Journal of the Lepidopterists' Society 57(2): 137-143. (2003); ISSN: 0024-0966
Descriptors: conservation measures/ reproduction/ reproductive behavior/ ecology/ terrestrial habitat/ abiotic factors/ physical factors/ land zones/ Hemileuca eglanterina: habitat management/ autumn prescribed burning/ impacts on population dynamics/ conservation implications/ wet prairie grassland/ breeding site/ oviposition sites/ egg laying/ population dynamics/ egg mass and larval abundances/ effects of autumn prescribed burning/ prairie/ grassland/ wet prairie/ fire/ autumn prescribed burn/ Oregon/ Willamette Valley/ Insecta, Lepidoptera, Glossata, Heteroneura, Bombycoidea, Saturniidae/ arthropods/ insects/ invertebrates/ lepidopterans
Abstract: Autumn prescribed burning is often used to manage a rare wet prairie plant community endemic to the Willamette Valley in western Oregon, USA. A local race of day flying Saturniid moth, Hemileuca eglanterina, was used to investigate the effects of a prescribed burn on adult, larval, and egg mass abundance contrasted with an adjacent unburned area. Adult male moths were not more frequently encountered in the burned habitat but female H. eglanterina laid more than twice as many egg masses in the burned compared to the unburned habitat in the burn year. Furthermore, females laid significantly more egg masses on the burn edge in the burn year ($p<0.001$), suggesting that H. eglanterina chose to oviposit on burned host plants over unburned host plants. Egg masses laid before the prescribed burn did not survive the fall fire, demonstrating that the management practice is catastrophic for the immature population. Although fire can substantially reduce immature Lepidoptera populations, some species living in ecosystems that had a frequent historic fire return interval may benefit from the ecological release caused by a prescribed burn. Fires consuming entire habitat parcels of fragmented ecosystems may lead to population bottlenecks and an increased frequency of inbreeding. Conservative prescribed burning practices with unburned refugia may be the most effective way to manage for the conservation of rare grassland plant communities and their insect fauna.

1679. **The effects of adjacent land use on wetland species richness and community composition.**
Houlahan, J. E.; Keddy, P. A.; Makkay, K.; and Findlay, C. S.
Wetlands 26(1): 79-96. (2006)
NAL Call #: QH75.A1W47; ISSN: 02775212.
Notes: doi: 10.1672/0277-5212(2006)26 [79:TEOALU]2.0.CO;2.
Descriptors: dispersal/ eutrophication/ exotics/ fertilizer/ forest cover/ functional groups/ land use/ plant diversity/ scale/ species-area/ streams/ wetlands
Abstract: Wetlands provide important ecosystem functions and values, such as wildlife habitat, water filtration and flood protection. Wetland plant communities play a fundamental role in maintaining these functions but are thought to be increasingly threatened by human modifications of the landscape, such as deforestation and road construction. Here, we examine the quantitative

relationships between two dependent variables (plant species richness, community composition) and a set of independent variables describing land use (e.g., forest cover, road density, and building density). As independent variables, we further include wetland characteristics that may be related to landuse practices (e.g., area and nutrient status). Wetland size is the most important predictor of both total plant species richness and the species richness within most functional groups. In addition, landscape properties, such as forest cover, presence of streams and nutrient status of water and sediment are significant predictors of plant species richness. Adjacent land use 250-300 m from the wetland affects plant diversity. Differences in the land-use-diversity relationship among different plant functional groups suggest that adjacent land use affects wetland plant communities in two important ways. First, it alters the abundance and distribution of propagules in adjoining habitats. Second, it alters the number of dispersal routes. Our results suggest that current management practices are inadequate and that regulation of adjacent land use is a critical component of wetland conservation. © 2006, The Society of Wetland Scientists.

1680. **The effects of bird use on nutrient removal in a constructed wastewater-treatment wetland.**
Andersen, D. C.; Sartoris, J. J.; Thullen, J. S. ; and Reusch, P. G.
Wetlands 23(2): 423-435. (2003)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: blackbirds/ California/ constructed wetland/ nitrogen/ nutrient removal/ phosphorus/ Schoenoplectus californicus/ Schoenoplectus acutus/ wastewater treatment/ waterfowl/ constructed wetland/ nitrogen/ phosphorus/ avifauna/ constructed wetland/ feces/ habitat use/ nitrogen/ nutrient enrichment/ phosphorus/ water treatment/ United States/ Agelaius phoeniceus
Abstract: A 9.9-ha constructed wetland designed to reduce nitrogen in municipal wastewater following conventional secondary treatment began operating in southern California's San Jacinto Valley in September 1994. The wetland incorporated zones of bulrush (Schoenoplectus acutus and S. californicus) for effluent treatment, plus areas of 1.8-m deep open water and other features to benefit wintering waterfowl. A one-year long program to monitor bird use and evaluate their contribution to loadings of nitrogen and phosphorus was initiated seven months later and a second, four-month long period of monitoring was initiated after a 20-month hiatus. Daily bird use peaked at nearly 12,000 individuals during the second period. Estimates of maximum daily nitrogen and phosphorus input by birds were 139 g N ha^{-1} day^{-1} and 56 g P ha^{-1} day^{-1}. Following a reconfiguration of the wetland that increased the area of open water, a third year-long period of monitoring was initiated in September 2000. Estimated maximum daily loading attributable to birds during this period reached 312 g N ha^{-1} day^{-1} and 124 g P ha^{-1} day-$^{1.}$ These levels represent only 2.6% and 7.0%, respectively, of the mean daily loads of N and P in inflow water from the wastewater-treatment plant. Wintering waterfowl contributed the most to nutrient loading, but the numerically dominant species was the colonial Red-winged Blackbird (Agelaius phoeniceus). The wetland's nutrient-removal efficiency was negatively correlated to bird loading. However, the greatest bird loading occurred during November to March, when winter conditions would reduce microbial nutrient-removal processes and plant uptake in the wetland. Multiple regression analysis indicated that variation in nutrient removal efficiency over a one-year period was best explained by wetland water temperature (R^2 = 0.21) and that little additional insight was gained by adding bird loading and inflow nutrient load data (R^2 = 0.22). This case study supports the concept that a constructed wetland can be designed both to reduce nutrients in municipal wastewater and to provide habitat for wetland birds.

1681. **Effects of cattle grazing on diversity in ephemeral wetlands.**
Marty, Jaymee T.
Conservation Biology 19(5): 1626-1632. (2005)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: species diversity/ grazing/ feeding behavior/ introduced species/ ranching/ endemic species/ wetlands/ life cycle/ nature conservation/ biodiversity/ rare species/ environmental impact/ aquatic plants/ species richness/ conservation/ Central Valley/ California
Abstract: Cattle are usually thought of as a threat to biodiversity. In regions threatened by exotic species invasion and lacking native wild grazers, however, cattle may produce the type of disturbance that helps maintain diverse communities. Across 72 vernal pools, I examined the effect of different grazing treatments (ungrazed, continuously grazed, wet-season grazed and dry-season grazed) on vernal-pool plant and aquatic faunal diversity in the Central Valley of California. After 3 years of treatment, ungrazed pools had 88% higher cover of exotic annual grasses and 47% lower relative cover of native species than pools grazed at historical levels (continuously grazed). Species richness of native plants declined by 25% and aquatic invertebrate richness was 28% lower in the ungrazed compared with the continuously grazed treatments. Release from grazing reduced pool inundation period by 50 to 80%, making it difficult for some vernal-pool endemic species to complete their life cycle. My results show that one should not assume livestock and ranching operations are necessarily damaging to native communities. In my central California study site, grazing helped maintain native plant and aquatic diversity in vernal pools.

1682. **Effects of climate change and land use on duck abundance in Canadian prairie-parklands.**
Bethke, Raymond W. and Nudds, Thomas D.
Ecological Applications 5(3): 588-600. (1995)
NAL Call #: QH540.E23 ; ISSN: 1051-0761
Descriptors: climatology: environmental sciences/ mathematical biology: computational biology/ models and simulations: computational biology/ systematics and taxonomy/ wildlife management: conservation/ agriculture/ drought/ habitat/ mathematical model/ precipitation/ survey
Abstract: Recent declines in the number of breeding ducks in the Canadian prairie-parklands have been hypothesized to be due to loss of habitat to agriculture However, prairie-parkland also has experienced wetland loss to drought as well as to agriculture. If habitat restoration is to be implemented and monitored successfully, it is important to separate the effects of anthropogenic changes to the

landscape on duck populations from those caused by changes in climate. We used data from annual air-ground surveys and from precipitation records to develop relationships between indices of abundance of each of 10 species of ducks and indices of wetland conditions during 1955-1974. We used these relationships to predict annual abundance of each species during 1975-1989. We compared predicted and observed abundances over the period 1975-1989 to distinguish declines in duck abundance greater than those accounted for by drought alone and to determine the magnitude and location of real "deficits" in duck abundance. Average annual deficits within Canadian prairie-parkland over the period 1975-1989 were estimated at 1.2 times 10-6 birds for both Mallard (Anas platyrhynchos) and Northern Pintail (A. acuta), 480 000 for Blue-winged Teal (A. discors), 190 000 for American Wigeon (A. americana), 175 000 for Northern Shoveler (A. clypeata), 50 000 for Gadwall (A. strepera), 10 000 for Green-winged Teal (A. crecca), 40 000 for Canvasback (Aythya valisineria), 25 000 for Lesser Scaup (A. affinis), and 5000 for Redhead (A. americana). Overall, the effect of agricultural expansion in the cast on prime waterfowl habitat since 1951 appears to have been negligible. There, as much as 90% had been already lost prior to 1951. In the west, however, where prime waterfowl habitat was still relatively abundant in 1951, agricultural development has encroached substantially. The relationship between the lost area of the best breeding habitats and the size of population deficits for Mallards and Northern Pintails in the entire Canadian prairie-parkland region was significant for both species ($P < 0.0027$ and $P < 0.0001$, respectively). Consequently, habitat restoration programs located where the highest quality waterfowl habitat and the lowest quality agricultural lands overlap most should have the greatest potential to affect recovery of breeding duck populations in the Canadian prairie-parklands.

1683. **Effects of foraging waterfowl in winter flooded rice fields on weed stress and residue decomposition.**
Van Groenigen, J. W.; Burns, E. G.; Eadie, J. M. ; Horwath, W. R.; and Van Kessel, C.
Agriculture, Ecosystems and Environment 95(1): 289-296. (2003)
NAL Call #: S601.A34; ISSN: 01678809.
Notes: doi: 10.1016/S0167-8809(02)00097-X.
Descriptors: conservation/ rice sustainability/ waterfowl foraging/ waterfowl habitat/ weed management/ biological control/ foraging behavior/ plant residue/ rice/ waterfowl/ weed control/ United States
Abstract: This study quantifies the agronomic benefits of foraging waterfowl in winter flooded rice fields in the Sacramento Valley of California (US). Fifteen winter flooded rice fields along a 105 km long transect, each with five pairs of waterfowl exclosures and control plots were used to measure residue decomposition in spring, and weed biomass and grain yield at harvest. Experimental exclusion of waterfowl resulted in a significant increase in remaining residue from 1014 to 1233 kg ha^{-1} across the transect. At seven sites with high waterfowl activity, remaining residue increased from 836 to 1549 kg ha^{-1} when waterfowl were excluded from the plot. Grassy weed biomass increased from 44 to 91 kg ha^{-1} over the whole transect in absence of waterfowl. At seven sites with high waterfowl activity the grassy weed biomass more than doubled in the absence of waterfowl from 89 to 204 kg ha^{-1}. No significant yield effect could be detected. Winter flooding rice fields resulted in mutual benefits for waterfowl and agriculture that could be of particular significance in organic farming systems.

1684. **Effects of forest harvesting on bufflehead and common loon foraging behavior.**
Pierre, Johanna P.; Boss, Shelly M.; and Paszkowski, Cynthia A.
Ornithological Science 4(2): 161-168. (2005); ISSN: 1347-0558
Descriptors: commercial activities/ nutrition/ diet/ prey/ feeding behavior/ locomotion/ swimming/ ecology/ community structure/ population dynamics/ predators/ freshwater habitat/ lentic water/ abiotic factors/ land zones/ North America/ Canada/ Bucephala albeola/ Gavia immer: forestry/ piscean prey/ food availability/ foraging/ foraging behavior related to forest harvesting/ boreal lakes/ aquatic diving/ lake/ physical factors/ Alberta/ north/ Pisces/ birds/ chordates/ fish/ vertebrates
Abstract: We compared foraging behavior of Bufflehead (Bucephala albeola Linnaeus) and Common Loon (Gavia immer Brunnich) on eight lakes in harvested and unharvested boreal mixedwood forest in northern Alberta, Canada. For one summer before (1996) and two Summers after (1997, 1998) forest harvesting around three of the eight lakes, we recorded the duration of Bufflehead and Common Loon dives. After logging, forested buffer strips 100m-wide separated cut-blocks from lakes ('harvested lakes'). 'Unharvested lakes' were surrounded by ≥450m of undisturbed forest throughout the study. There were no detectable differences in dive duration between harvested and unharvested lakes for Bufflehead or Common Loon. Correlations between environmental variables (water clarity, fish biomass, depth) and the duration of Common Loon dives were not significant. However, the duration of Bufflehead dives differed between lakes, unrelated to forest harvesting. The duration of Bufflehead dives was negatively correlated with water clarity but was not significantly cot-related with fish biomass. While our study shows that the foraging behavior of Buffleheads was affected by lake conditions, the utility of aquatic birds as indicators of the effects of forestry on western boreal lakes remains unproven.

1685. **Effects of glyphosate herbicide on cattails, invertebrates, and waterfowl in South Dakota wetlands.**
Solberg, K. L. and Higgins, K. F.
Wildlife Society Bulletin 21(3): 299-307. (1993)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: wetlands/ glyphosate/ Typha/ waterfowl/ population density/ nontarget organisms/ aquatic invertebrates/ adverse effects/ South Dakota
This citation is from AGRICOLA.

1686. **Effects of habitat manipulation on reproductive success of individual largemouth bass in an Ozark reservoir.**
Hunt, J. and Annett, C. A.
North American Journal of Fisheries Management 22(4): 1201-1208. (2002)
NAL Call #: SH219.N66 ; ISSN: 02755947.

Notes: doi: 10.1577/1548-8675(2002)022 <1201:EOHMOR>2.0.CO;2.
Descriptors: coarse woody debris/ fish/ habitat management/ reproductive success/ spawning ground/ United States/ Micropterus/ Micropterus salmoides/ Perciformes
Abstract: Centrarchids prefer nesting near patches of physical structure, and both simple and complex supplemental structure enhance the reproduction of black basses Micropterus spp. in systems where naturally occurring structure is lacking. Supplemental structure may not be helpful in systems that contain plentiful physical structure, and nests located near supplemental structure may not be as successful as nests located near naturally occurring structure. We monitored nests of largemouth bass M. salmoides in areas with and without supplemental logs in a small Arkansas reservoir containing abundant natural structure to assess how spawning individuals responded to habitat manipulation on two spatial scales, microhabitat and mesohabitat. We compared the use of natural versus supplemental logs, mating success, hatching success, nesting success, nest density, and nearest-neighbor distances in manipulated and unmanipulated mesohabitats. Nesting males used supplemental logs more often than we expected based on their use of naturally occurring logs (67% versus 25.4%, respectively). Mating, hatching, and nesting success were equally high for broods located near supplemental logs and naturally occurring structure. Manipulated and unmanipulated mesohabitat produced equal nest densities and nearest-neighbor distances. We conclude that supplemental logs were a useful management tool in Lake Wedington and provided high-quality microhabitat for spawning. We recommend that managers consider installing log structures where natural structure is sparse or floaters are abundant. Supplemental logs should be installed in a configuration mimicking the natural spacing of nests to accommodate the parental behavior of black basses.

1687. **Effects of management practices on wetland birds.**
Johnson, D. H. and Dechant Shaffer, J. A.: Northern Prairie Wildlife Research Center, U.S. Geological Survey. (2001).
Notes: See also http://www.npwrc.usgs.gov/resource/literatr/grasbird/index.htm (Effects of management practices on grassland birds).
http://www.npwrc.usgs.gov/resource/literatr/wetbird/index.htm
Descriptors: ecological requirements/ dispersion/ wetland habitat/ brood-egg/ habitat management/ management/ North America
Abstract: These reports are a series of literature syntheses on North American wetland birds. The need for these reports was identified by the Prairie Pothole Joint Venture (PPJV), a part of the North American Waterfowl Management Plan. The PPJV recently adopted a new goal, to stabilize or increase populations of declining grassland- and wetland-associated wildlife species in the Prairie Pothole Region. To further that objective, it is essential to understand the habitat needs of birds other than waterfowl, and how management practices affect their habitats. The focus of these reports is on management of breeding habitat, particularly in the northern Great Plains. Resource contains 15 species accounts.

1688. **Effects of pesticides on soil and water microflora and mesofauna in wetland ricefields: A summary of current knowledge and extrapolation to temperate environments.**
Roger, P. A.; Simpson, I.; Oficial, R.; Ardales, S.; and Jimenez, R.
Australian Journal of Experimental Agriculture 34(7): 1057-1068. (1994)
NAL Call #: 23 Au792; ISSN: 0816-1089.
Notes: Literature review.
Descriptors: wetlands/ pesticides/ rice/ temperate zone/ invertebrates/ fertilizers/ agricultural practices/ microorganisms/ data collections/ rice fields/ pollution effects/ agricultural pollution/ Invertebrata/ biodiversity
Abstract: This review summarises information on the behaviour of pesticides and their impacts on microorganisms and non-target invertebrates that was collected in, or is applicable to, temperate wetland ricefields. An extensive bibliographic survey shows that current knowledge is fragmentary and partly outdated. Pesticides applied on soil at recommended levels rarely had a detrimental effect on microbial populations or their activities. They had more effect on invertebrate populations, inducing the blooming of individual species of floodwater zooplankton and reducing populations of aquatic oligochaetes in soil. Available information raises concerns regarding the long-term effects of pesticides on (i) microorganisms, primary producers, and invertebrates of importance to soil fertility, (ii) predators of rice pests and vectors, and (iii) microbial metabolism of pesticides.

1689. **Effects of prescribed fall burning on a wetland plant community, with implications for management of plants and herbivores.**
McWilliams, S. R.; Sloat, T.; Toft, C. A.; and Hatch, D.
Western North American Naturalist 67(2): 299-317. (2007)
NAL Call #: QH1.G7; ISSN: 15270904
Descriptors: adaptive management/ CANOCO/ correspondence analysis/ fire/ geese/ prescribed burning/ wetland plant community
Abstract: An important contemporary challenge for adaptive resource management is assessing both the direct and indirect effects of management activities by designing appropriate monitoring programs and sound analysis methods. Here we evaluate the effects of prescribed fall burning on a wetland plant community that is managed primarily for spring-migrating geese. During late fall in 2 consecutive years, we burned vegetation in 4 replicate blocks (2.3 ha each) that traversed a natural moisture and associated vegetation gradient. We used ordination, gradient analysis, and contingency table analysis to evaluate how annual changes in relative abundance of plants were affected by burning as well as other important ecological factors. Burning increased species diversity of plants, especially in the 2 wetter vegetation zones, but had no effect on species richness or on the proportion of native plant species. Wetland plant species responded to prescribed burning independently, and their response often differed by vegetation zone and with annual variation in

flooding. Burning enhanced the abundance of native foxtail barley (Hordeum jubatum) and reduced the abundance of introduced swamp timothy (Crypsis shoenoides). Saltgrass (Distichlis spicata), a native plant species, was usually less abundant following burning, although the level of response was different for each of the 3 vegetation zones. Two other introduced plant species, quackgrass (Elytrigia repens) and reed canarygrass (Phalaris arundinaceae), were less abundant after fall burning, especially when spring flooding was more extensive. Wild geese using the experimental blocks for feeding clearly preferred burned sites, suggesting that fall burning can enhance wetland use by geese during spring. Given that simple manipulations such as burning and flooding of a wetland system may often produce complex results, we suggest that on-going management schemes be regularly evaluated with field experiments such as those conducted in this study.

1690. **Effects of riparian timber management on amphibians in Maine.**
Perkins, Dustin W. and Hunter, Malcolm L.
Journal of Wildlife Management 70(3): 657-670. (2006)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Caudata/ Salientia/ Ambystoma maculatum/ American toad/ Bufo americanus/ eastern red-backed salamander/ Plethodon cinereus/ Rana sylvatica/ spotted salamander/ wood frog/ wildlife-human relationships/ commercial enterprises/ communities/ disturbances/ habitat use/ forestry practices/ habitat alterations/ wetlands/ ecosystems/ headwater stream/ land zones/ Maine/ riparian habitat/ riparian timber harvesting/ riparian timber management/ rivers/ temperate forest/ wildlife management/ amphibians/ buffers/ first-order stream/ forest management/ headwater streams/ partial harvests/ riparian zones/ stream salamanders/ vegetation/ waters/ forest/ silviculture
Abstract: Riparian areas are one of the most complex, diverse, and dynamic environments in forested ecosystems. In areas managed for timber riparian areas are often protected with unharvested forested buffers, but it is unclear whether these buffers are adequate to maintain the floral and faunal diversity of riparian areas. Amphibians are sensitive to forest management, have high diversity in riparian areas, and are among the most abundant vertebrates in temperate forests; therefore, they are excellent candidates to use in a study of the effects of riparian timber management. We conducted a field experiment with 15 headwater streams in western Maine, USA, randomly assigned to 5 silvicultural treatments. We examined Amphibian abundance for 1 year prior to and 2 years following treatment We also undertook a retrospective study on 12 headwater streams representing 3 treatments where harvests had occurred 4-10 years earlier. We used pitfall traps with drift fences and cover-controlled, active-searches to sample terrestrial and stream Amphibians. Wood frogs (Rana sylvatica), eastern red-backed salamanders (Plethodon cinereus), and spotted salamanders (Ambystoma maculatum) were sensitive to timber harvesting along headwater streams. American toads (Bufo americanus) were either unaffected or increased in abundance postharvest. Buffers ranging in width from 11 to 35 m appeared to partially mitigate the effects of timber harvest because abundances were generally higher within the buffer than in the adjacent clearcut for wood frogs, American toads, and to a lesser extent red-backed salamanders. Partial harvests adjacent to headwater streams had the least effect on the riparian Amphibian community and should be considered for harvests along headwater streams when managing at the stream scale. Our results show that managers can conduct riparian timber harvesting in a manner that allows a diverse suite of Amphibian species to persist in the first years after harvest. It is plausible that these same practices may also mitigate the effects of timber harvesting on other forest species. Long-term effects of riparian timber harvesting on Amphibians and other forest species population persistence and viability is a logical next step.

1691. **Effects of sediment load on emergence of aquatic invertebrates and plants from wetland soil egg and seed banks.**
Gleason, R. A.; Euliss, N. H.; Hubbard, D. E.; and Duffy, W. G.
Wetlands 23(1): 26-34. (2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: agricultural impacts/ egg banks/ hydrophytes/ prairie potholes/ resting eggs/ sedimentation/ seed banks/ siltation/ tillage/ wetland condition/ wetland degradation
Abstract: Intensive agricultural activities near prairie wetlands may result in excessive sediment loads, which may bury seed and invertebrate egg banks that are important for maintenance and cycling of biotic communities during wet/dry cycles. We evaluated effects of sediment burial on emergence of plants and invertebrates from seed and invertebrate egg banks. Sediment-load experiments indicated that burial depths of 0.5 cm caused a 91.7% reduction in total seedling emergence and a 99.7% reduction in total invertebrate emergence. Results of our burial experiments corroborated prior research on seedling emergence. However, our study demonstrated that invertebrate emergence is also highly susceptible to the effects of burial. Our research suggests that sediment entering wetlands from agricultural erosion may also hamper successional changes throughout interannual climate cycles. Land-management strategies need to be implemented that will prevent erosion of cropland top soil from entering wetlands.

1692. **Effects of structural marsh management and salinity on sediments, hydrology, invertebrates, and waterbirds in marsh ponds during winter on the Gulf Coast Chenier Plain.**
Bolduc, Francois. Louisiana State University and Agricultural and Mechanical College, 2003.
Notes: Advisor: Afton, Alan D.
Descriptors: wetlands/ marshes/ structural marsh management/ waterbirds/ salinity/ wintering habitat/ Louisiana
Abstract: Compositions of wintering waterbird communities are dependent upon food accessibility (via water depth), biomasses and sizes of their invertebrate prey, which in turn are influenced by the hydrology and sediments of wetland habitats. The hydrology and sediments of marsh ponds on the Gulf Coast Chenier Plain probably are affected by structural marsh management (levees, water control structures and impoundments; SMM) and salinity; therefore, SMM and salinity ultimately may affect wintering

waterbird communities. Accordingly, I measured sediment and hydrologic variables, biomasses and sizes of common aquatic invertebrates, and densities of common wintering waterbird species in ponds of impounded freshwater (IF), impounded oligohaline (IO), impounded mesohaline (IM), and unimpounded mesohaline (UM) marshes during winters 1997-1998 to 1999-2000 on Rockefeller State Wildlife Refuge, near Grand Chenier, Louisiana. SMM affected sediment and hydrologic variables, which negatively affected biomasses of Nematoda and secondarily increased those of Ostracoda. However, few waterbird species possess the capacity to capture these small prey; consequently, I predicted that avian species that consume invertebrates would not be among those differentiating waterbird communities between ponds of IM and UM marshes. Comparisons of waterbird densities provided inconsistent results with this prediction because some shorebird and waterfowl species that feed heavily on invertebrates were those that primarily differentiated waterbird communities between ponds of IM and UM marshes. My comparison of IF, IO, and IM marsh ponds indicated that, except for salinity, they differed little in sediment and hydrologic variables. Accordingly, these marshes only differed in biomass of Oligochaeta; consequently, I predicted that avian species that consume invertebrates would not be among those differentiating waterbird communities among ponds of IF, IO, and IM marshes. Accordingly, their waterbird communities primarily differed in densities of waterbird species that feed on vegetation. In conclusion, some waterbird species exclusively used ponds of UM marshes rather than ponds of IM marshes, and most species had highest densities in IF marshes when water depth favored those that maximized their densities. Consequently, my results suggest that marsh managers should focus on the preservation of UM and IF marshes for the conservation of wintering waterbird populations on the Gulf Coast Chenier Plain.

1693. **Effects of structural marsh management and winter burning on plant and bird communities during summer in the Gulf Coast Chenier Plain.**
Gabrey, S. W.; Afton, A. D.; and Wilson, B. C.
Wildlife Society Bulletin 29(1): 218-231. (2001)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: wetlands/ watershed management/ prescribed burning/ coasts/ Louisiana/ Texas
This citation is from AGRICOLA.

1694. **Effects of the herbicide imazapyr on benthic macroinvertebrates in a logged pond cypress dome.**
Fowlkes, Mark D.; Michael, Jerry L.; Crisman, Thomas L.; and Prenger, Joseph P.
Environmental Toxicology and Chemistry 22(4): 900-907. (2003)
NAL Call #: QH545.A1E58; ISSN: 0730-7268.
http://www.srs.fs.usda.gov/pubs/5485
Descriptors: imazapyr/ herbicide/ macroinvertebrates/ chironomid deformity/ wetland
Abstract: Increased herbicide use in silviculture over the last several decades has led to concern over potential water contamination, which may affect biotic health. In the southeastern United States, pine Ratwoods are important for timber production and are often interspersed with cypress wetlands. Cypress domes are isolated, shallow basins that collect surficial waters from adjacent forested areas and therefore might be expected to contain pesticide from storm runoff. This study utilizes in situ microcosm experiments to assess the effects of a concentration gradient of the herbicide imazapyr (0.184, 1.84, and 18.4 mg/L, equivalent to 1, 10, and 100 times the expected environmental concentration from a normal application rate) on the nracroinvertebrate community of a logged pond cypress dome using changes in macroinvertebrate composition, chironomid biomass, and chironomid head-capsule deformities. The control core was not significantly different from the surrounding cypress dome for any parameter, suggesting that enclosure effects were likely of minimal importance in the final experimental results. The lack of statistical difference ($p < 0.05$) in macroinvertcbrate community composition, chironomid deformity rate, and chironomid biomass between treatments suggests that imazapyr did not affect the macroinvertebrate community at Ihe concentralions tested. Chironomid deformity rate ranged from 0.97% for imazapyr control to 4.96% for the 100X treatment, with chironomid biomass being 1.79 and 1.87 mg/L, respectively.
This citation is from Treesearch.

1695. **Effects of vegetation manipulation on breeding waterfowl in prairie wetlands: A literature review.**
Kantrud, H. A. Fish and Wildlife Service, U.S. Department of the Interior, 1986. Fish and Wildlife Technical Report.
Notes: Also available in USDA General Technical Report RM-194, Can Livestock Be Used as a Tool to Enhance Wildlife Habitat?, Reno, Nevada, 13 February 1990, edited by Severson, Kieth E., pp. 93-123.
Call no. aSD11.A42 no. 194.
http://www.npwrc.usgs.gov/resource/wetlands/vegmanip/index.htm#contents
Descriptors: waterfowl/ wetlands/ prairie/ ducks/ marshes
Abstract: Both dabbling and diving ducks and their broods prefer wetlands with openings in the marsh canopy. Decreased use is commonly associated with decreased habitat heterogeneity caused by tall, robust hydrophytes and other species adapted to form monotypes in the absence of disturbance. Reductions in height and density of tall, emergent hydrophytes by fire and grazing (unless very intensive) generally benefit breeding waterfowl. Such benefits are an increase in pair density, probably related to increased interspersion of cover and open water which decreases visibility among conspecific pairs, and improvements in their invertebrate food resources that result from increased habitat heterogeneity. Research needs are great because of the drastic changes that have accrued to prairie wetlands through fire suppression, cultivation, and other factors. -from Author

1696. **Effects of wastewater on wetland animal communities.**
Brennan, K. M.
In: Ecological Considerations in Wetlands Treatment of Municipal Wastewaters/ Godfrey, Paul J.
New York: Van Nostrand Reinhold, 1985; pp. 199-223.
Notes: Literature review; ISBN: 0442230095.
NAL Call #: QH545.S49E3

Descriptors: wetlands treatment/ wastewater treatment/ water pollution effects/ ecosystems/ wildlife/ environmental effects/ economic aspects/ artificial wetlands
Abstract: An inventory of known discharges of wastewater to wetlands in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin was performed. The results show that the use of natural wetlands for the discharge of treated wastewater is relatively common. However, the intentional inclusion of wetlands as part of the treatment process is rare. Both types of situations may become more attractive due to economic factors. Although the short-term benefits of the use of natural wetlands for the disposal or treatment of wastewater (cost-effectiveness, treatment efficiency, and convenience) appear promising, the long-term ability of these areas to treat wastewater is questionable. The construction of artificial wetlands for the treatment of wastewater would avoid any detrimental effects that might result from the use of natural wetlands and also could provide supplementary habitats for wetland wildlife and possibly reservoirs for rare species. Few animal-related studies have been performed at the small number of artificial wetland sites presently in existence; thus, the information base is too small and too short-term for any conclusions to be drawn.

1697. **Effects of wetland creation on breeding season bird use in boreal eastern Ontario.**
Locky, D. A.; Davies, J. C.; and Warner, B. G.
Canadian Field Naturalist 119(1): 64-75. (2005)
NAL Call #: 410.9 Ot8 ; ISSN: 00083550
Descriptors: boreal/ breeding birds/ constructed wetland/ marsh/ Ontario/ rare birds/ upland birds/ wetland birds
Abstract: Wetland construction has been an effective means of mitigating wetland habitat losses due to agricultural and other activities. However, the type, variety, and age of the habitats created are often critical components in the success of the wetland when the aim is to enhance the bird community. Hilliardton Marsh was constructed as a series of cells between 1993 and 1997 in boreal eastern Ontario to provide waterfowl habitat. We determined habitat change and monitored breeding-season bird use before construction and one year after the last cell was constructed. Wetland construction resulted in dramatic changes to the vegetation and bird communities. The area was transformed into a variety of wetland habitats, but primarily marsh, one of the rarest wetland types in boreal Ontario. Survey stations with moderate habitat change exhibited the greatest change in bird species richness. Total species richness increased 55% from 56 to 87 species, with obligate wetland birds increasing from 3 to 26 species. Rare birds increased from 11 to 27 species, with most as obligate or facultative wetland birds, but also Peregrine Falcon (Falco peregrinus). Bird abundance, as measured by the number of stations where a species was observed, increased significantly for obligate wetland birds. There were no significant losses of species from any bird group, as adjacent upland habitat was preserved. This short-term study has shown that construction of new wetland habitat in boreal eastern Ontario, especially marsh, can significantly increase the numbers of breeding-season birds, including rare species. However, long-term monitoring is required to ensure sustained success of wetland construction projects for birds.

1698. **Effects of winter marsh burning on abundance and nesting activity of Louisiana seaside sparrows in the Gulf Coast Chenier Plain.**
Gabrey, S. W. and Afton, A. D.
Wilson Bulletin 112(3): 365-372. (2000)
NAL Call #: 413.8 W692; ISSN: 00435643
Descriptors: abundance/ ecological impact/ habitat management/ marsh/ nesting/ passerines/ prescribed burning/ United States/ Ammodramus maritimus/ Gulf Coast Chenier Plain
Abstract: Louisiana Seaside Sparrows (Ammodramus maritimus fisheri) breed and winter exclusively in brackish and saline marshes along the northern Gulf of Mexico. Many Gulf Coast marshes, particularly in the Chenier Plain of southwestern Louisiana and southeastern Texas, are burned intentionally in fall or winter as part of waterfowl management programs. Fire reportedly has negatively affected two Seaside Sparrow subspecies (A. m. nigrescens and A. m. mirabilis) in Florida, but there is no published information regarding effects of fire on A. m. fisheri. We compared abundance of territorial male Louisiana Seaside Sparrows, number of nesting activity indicators, and vegetation structure in paired burned and unburned plots in Chenier Plain marshes in southwestern Louisiana during the 1996 breeding season (April-July) before experimental winter burns (January 1997) and again during two breeding seasons post-burn (1997-1998). We found that abundance of male sparrows decreased in burned plots during the first breeding season post-burn, but was higher than that of unburned plots during the second breeding season post-burn. Indicators of nesting activity showed a similar but non-significant pattern in response to burning. Sparrow abundance and nesting activity seemingly are linked to dead vegetation cover, which was lower in burned plots during the first breeding season post-burn, but did not differ from that in unburned plots during the second breeding season post-burn. We recommend that marsh management plans in the Gulf Coast Chenier Plain integrate waterfowl and Seaside Sparrow management by maintaining a mosaic of burned and unburned marshes and allowing vegetation to recover for at least two growing seasons before reburning a marsh.

1699. **Endangered species management requires a new look at the benefit of fire: The Cape Sable seaside sparrow in the Everglades ecosystem.**
La Puma, David A.; Lockwood, Julie L.; and Davis, Michelle J.
Biological Conservation 136(3): 398-407. (2007)
NAL Call #: S900.B5; ISSN: 0006-3207
Descriptors: conservation measures/ reproduction/ ecology/ population dynamics/ terrestrial habitat/ abiotic factors/ physical factors/ land zones/ Ammodramus maritimus mirabilis/ habitat management/ reproductive productivity/ nesting success/ population density/ grassland/ prairie habitat/ fire/ Florida/ Everglades National Park/ Aves/ Passeriformes/ Emberizidae/ birds/ chordates/ vertebrates
Abstract: Although disturbance processes play important roles in maintaining habitat heterogeneity, the potential effects of such processes on rare or endangered species is virtually unknown and difficult to test. We use an unplanned fire, which burned half of a long-term study plot, as a natural experiment to test the effects of fire on the federally

endangered Cape Sable seaside sparrow in Everglades National Park. By implementing a before-after-control impact study design we determine the mechanistic link between fire and demography of this endangered sparrow. Our results show that while the sparrow tolerates fire, neither sparrow density nor nesting success are enhanced by fire, which runs contrary to the current paradigm in which sparrows are expected to benefit and therefore require fire for persistence. Our results caution against the assumption that occupancy of disturbance-prone habitat automatically suggests dependence on disturbance. Land managers must prevent large and frequent fires from burning occupied sparrow habitat to best manage for the species. Moreover, it is imperative that more studies focus on the effects of disturbance processes on rare and endangered species in order to prevent further loss of biodiversity. © 2006 Elsevier Ltd. All rights reserved.
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1700. **Enhanced prairie wetland effects on surface water quality in Crowfoot Creek, Alberta.**
Ontkean, G. R.; Chanasyk, D. S.; Riemersma, S.; Bennett, D. R.; and Brunen, J. M.
Water Quality Research Journal of Canada 38(2): 335-359. (2003); ISSN: 1201-3080
Descriptors: wetlands/ water quality/ surface water/ habitat/ aquatic birds/ watersheds/ nutrient concentrations/ fecal coliforms/ surface water/ water quality (natural waters)/ catchment areas/ nutrients/ bacteria (faecal)/ birds (waterfowl)/ monitoring/ fate of pollutants/ prairies/ data collections/ spatial distribution/ temporal distribution/ suspended solids/ bacteria/ Canada, Alberta, Crowfoot Creek
Abstract: A three-year study was conducted to examine the effects of a prairie wetland enhanced for waterfowl habitat on surface water quality in the Crowfoot Creek watershed in southern Alberta, Canada. Monitoring was carried out at the Hilton wetland from mid-March to the end of October in 1997 to 1999 at two inflow sites and one outflow site. Data were collected on flow, total phosphorus (TP), total nitrogen (TN), total suspended solids (TSS), and fecal coliform (FC) bacteria. Nutrient concentrations were highest in the spring, and decreased during the remainder of the monitoring period each year. Nutrient concentrations did not change significantly within the wetland due to the form of nutrient, reduced retention times for nutrient uptake, and the addition of nutrients to the water through sediment release and decomposition of organic matter. The wetland acted as both a source and a sink for nutrients, depending on flow volumes. TSS concentrations decreased significantly from inflow to outflow, indicating sedimentation occurred in the wetland. FC bacteria levels were lowest in the spring and increased during the post-spring runoff (PSRO) period. FC bacteria counts decreased significantly within the wetland throughout the entire year. The Hilton wetland was effective in reducing the amounts of TSS and FC bacteria exported from the wetland; however, there was no significant change in nutrient status.
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1701. **Estimated extent of geographically isolated wetlands in selected areas of the United States.**
Tiner, R. W.
Wetlands 23(3): 636-652. (2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: coastal plains/ geographical distribution/ geographical information systems/ grasslands/ habitats/ hydrological data/ meadows/ nature conservation/ prairies/ regulations/ watersheds/ wetlands
Abstract: In preparing a major report on geographically isolated wetlands, the US Fish and Wildlife Service (FWS) initiated a study of the extent of these wetlands across the country. The FWS used geographical information system (GIS) technology to analyse existing digital data (e.g., National Wetlands Inventory data and US Geological Survey hydrologic data) to predict the extent of isolated wetlands in 72 study areas. Study sites included areas where specific types of isolated wetlands (e.g., prairie pothole marshes, playas, Nebraska's rainwater basin marshes and meadows, terminal basins, sinkhole wetlands, Carolina bays, and West Coast vernal pools) were known to occur, as well as areas from other physiographic regions. In total, these sites represented a broad cross-section of America's landscape. Although intended to show examples of the extent of isolated wetlands across the country, the study was not designed to generate statistically significant estimates of isolated wetlands for the nation. As expected, the extent of isolated wetlands was quite variable. The study found that isolated wetlands constituted a significant proportion of the wetland resource in arid and semiarid to subhumid regions and in karst topography. Eight study areas had more than half of their wetland area designated as isolated, while 24 other areas had 20-50% of their wetland area in this category. For most sites, isolated wetlands represented a greater percent of the total number of wetlands than the percent of wetland area. This was largely attributed to difference in wetland size, with most non-isolated wetlands being larger than the isolated wetlands. Forty-three sites had more than 50% of their total number of wetlands designated as isolated. The estimates of isolated wetlands presented in this study cannot be readily translated to wetlands that have lost Clean Water Act "protection" based on a recent U.S. Supreme Court ruling for several reasons, including the lack of written guidance on interpreting the Court's decision for identifying jurisdictional wetlands. The results of this GIS analysis present one perspective on the extent of geographically isolated wetlands in the country and represent a starting point for more detailed assessments.
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1702. **Estuarine wetland restoration: A dike breach project in the Snohomish River Estuary, Marysville, WA.**
Soden, John M.
Ecological Society of America Annual Meeting, Proceedings 87: 271. (2002)
NAL Call #: QH540.E365.
Notes: Meeting abstract; 87th Annual Meeting of the Ecological Society of America and the 14th Annual International Conference of the Society for Ecological Restoration, Tucson, Arizona, USA; August 04-09, 2002.
Descriptors: estuarine ecology: ecology, environmental sciences/ wildlife management: conservation/ estuarine wetland restoration/ management method/ dike breach

project/ fish use trends/ intertidal zone elevations/ natural vegetation/ reclaimed wet pasture/ salinity/ site drainage/ tidal flow restoration/ water quality/ water temperature/ wildlife

1703. **Eutrophication and restoration of Lake Apopka, USA.**
Gu, Binhe
Hupo Kexue 17(1): 1-8(2005); ISSN: 1003-5427
Descriptors: freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ sediment/ water quality/ eutrophication/ drainage basin/ habitat restoration/ agricultural development/ paleolimnology/ food web structure
Abstract: This paper provides a literature review on eutrophication and restoration of Lake Apopka, a large, shallow and subtropical take in Florida, USA. Prior to 1947, Lake Apopka was a clear-water, submerged macrophyte-dominated system with a famous recreation fishery. Hydrologic alteration of the drainage basin and large-scale agricultural development of floodplain has resulted in catastrophic changes in Lake Apopka ecosystem. These changes include excessive phosphorus loading to the lake, massive die-off of the submerged macrophytes and virtual disappearance of the large-mouth bass population. Nowadays, Lake Apopka is a hypereutrophic system dominated by picophytoplankton and rough fish gizzard shad. Approximately 90% of the lake bottom is covered by a layer of 50 cm thick, unconsolidated, flocculent organic materials largely originated from water column production. Measures of Lake Apopka restoration include (I) reduction of external phosphorus loading, (2) removal of phosphorus and other suspended solids from the lake by filtration through the marsh flow-way and by mass removal of gizzard shad, (3) improvement of food-web structure by removing gizzard shad, (4) restoration of habitat through shoreline plantation and (5) increases in water level fluctuation. Major research covers a variety of topics including analysis of past water quality conditions, estimates of external and internal phosphorus loading. setting water quality goal, sediment characterization, resuspension, nutrient inventory and fluxes, paleolimnological evidences for eutrophication, primary productivity, phytoplankton community structure, and limiting nutrients. Recent debates on eutrophication mechanisms and restoration strategies are also presented.

1704. **Evaluating acute toxicity of methyl parathion application in constructed wetland mesocosms.**
Milam, C. D.; Bouldin, J. L.; Farris, J. L.; Schulz, R.; Moore, M. T.; Bennett, E. R.; Cooper, C. M.; and Smith, S.
Environmental Toxicology 19(5): 471-479. (Oct. 2004)
NAL Call #: RA1221.T69; ISSN: 1520-4081
Descriptors: Ceriodaphnia (Cladocera)/ Hyalella azteca (Amphipoda)/ Chironomus tentans (Chironomidae)/ Pimephales promelas (Cyprinidae)/ pollutants/ survival/ semiaquatic habitat/ fertilizer and pesticide pollution/ toxic effects/ fertilizers and pesticides/ methyl parathion/ Mississippi/ Oxford, Miss./ toxic effects of methyl parathion/ constructed wetland mesocosms
Abstract: Wetland ecosystems have reduced ambient levels of various organic and metallic compounds, although their effectiveness on agricultural pesticides is not well documented. Five stations within each of two 10 X 50 m constructed wetlands (two vegetated, two nonvegetated) were selected to measure the fate and effects of methyl parathion (MeP). Following a simulated storm event (0.64 cm of rainfall), aqueous, sediment, and plant samples were collected and analyzed spatially (5, 10, 20, and 40 m from the inlet) and temporally (after 3-10 days) for MeP concentrations and for the impact of those concentrations on the aquatic fauna. Aqueous toxicity to fish decreased spatially and temporally in the vegetated mesocosm. Pimephales promelas survival was significantly reduced, to 68%, at the 10-m station of the nonvegetated wetlands (3 h postapplication), with pesticide concentrations averaging 9.6 μ g MeP/L. Ceriodaphnia in both the vegetated and nonvegetated wetlands was sensitive (i.e., a significant acute response to MeP occurred) to pesticide concentrations through 10 days postapplication. Mean MeP concentrations in water ranged from 0.5 to 15.4 μ g/L and from 0.1 to 27.0 μ g/L in the vegetated and nonvegetated wetlands, respectively. Hyalella azteca aqueous tests resulted in significant mortality in the 5-m vegetated segment 10 days after exposure to MeP (2.2 μ g/L. Solid-phase (10-day) sediment toxicity tests showed no significant reduction in Chironomus tentans survival or growth, except for the sediments sampled 3 h postapplication in the nonvegetated wetland (65% survival). Thereafter, midge survival averaged >87% in sediments sampled from both wetlands. These data suggest that wetlands play a significant role in mitigating the effect of MeP exposure in sensitive aquatic biota. © 2004 Wiley Periodicals, Inc.

1705. **Evaluating perturbations and developing restoration strategies for inland wetlands in the Great Lakes Basin.**
Detenbeck, N. E.; Galatowitsch, S. M.; Atkinson, J.; and Ball, H.
Wetlands 19(4): 789-820. (1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212.
Notes: Conference: Temperate Wetlands Restoration Workshop, Barrie, ON (Canada), 27 Nov-1 Dec 1995.
Descriptors: wetlands/ land reclamation/ land management/ hydrology/ water quality/ vegetation/ exotic species/ sedimentation/ disturbance/ environmental restoration/ nature conservation/ ecosystem disturbance/ eutrophication/ land use/ land restoration/ land/ water quality (natural waters)/ land restoration/ North America, Great Lakes
Abstract: Wetland coverage and type distributions vary systematically by ecoregion across the Great Lakes Basin. Land use and subsequent changes in wetland type distributions also vary among ecoregions. Incidence of wetland disturbance varies significantly within ecoregions but tends to increase from north to south with intensity of land use. Although the nature of disturbance activities varies by predominant land-use type, mechanisms of impact and potential response endpoints appear to be similar across agricultural and urban areas. Based on the proportion of associated disturbance activities and proportion response endpoints affected, the highest ranking mechanisms of impact are sedimentation/turbidity, retention time, eutrophication, and changes in hydrologic timing. Disturbance activities here are defined as events that cause wetland structure or function to vary outside of a normal

range, while stressors represent the individual internal or external agents (causes) that act singly or in combination to impair one or more wetland functions. Responses most likely associated with disturbance activities based on shared mechanisms of impact are 1) shifts in plant species composition, 2) reduction in wildlife production, 3) decreased local or regional biodiversity, 4) reduction in fish and/or other secondary production, 5) increased flood peaks/frequency, 6) increased aboveground production, 7) decreased water quality downstream, and 8) loss of aquatic plant species with high light compensation points. General strategies and goals for wetland restoration can be derived at the ecoregion scale using information on current and historic wetland extent and type distributions and the distribution of special-concern species dependent on specific wetland types or mosaics of habitat types. Restoration of flood-control and water-quality improvement functions will require estimates of wetland coverage relative to total land area or specific land uses (e.g., deforestation, urbanization) at the watershed scale. The high incidence of disturbance activities in the more developed southern ecoregions of both Canada and the U.S. is reflected in the loss of species across all wetland types. The species data here suggest that an effective regional strategy must include restoration of a diversity of wetland types, including the rarer wetland types (wet meadows, fens), as well as forested swamps, which were extensive historically. The prevalence of anthropogenic stresses and openwater habitats likely contributes to the concentration of exotic species in inland wetlands of the southern Great Lakes ecoregions. Vegetation removal and site disturbance are the best- documented causes for plant invasions, and encroachment activities are common in marshes and ponds of the southern ecoregions.

1706. **Evaluating salt marsh restoration in Delaware Bay: Analysis of fish response at former salt hay farms.**
Able, Kenneth W.; Nemerson, David M.; and Grothues, Thomas M.
Estuaries 27(1): 58-69. (2004)
NAL Call #: GC96.E79; ISSN: 0160-8347
Descriptors: conservation measures/ life cycle and development/ development/ Growth/ ecology/ population dynamics/ habitat/ brackish habitat/ marine zones/ Atlantic Ocean/ Micropogonias undulatus: growth rate/ salt marsh restoration effects/ North Atlantic/ Pisces, Actinopterygii, Perciformes, Sciaenidae/ chordates/ fish/ vertebrates
Abstract: In a continuing effort to monitor the fish response to marsh restoration (resumed tidal flow, creation of creeks), we compared qualitative and quantitative data on species richness, abundance, assemblage structure and growth between pre-restoration and post-restoration conditions at two former salt hay farms relative to a reference marsh in the mesohaline portion of Delaware Bay. The most extensive comparison, during April-November 1998, sampled fish populations in large marsh creeks with otter trawls and in small marsh creeks with weirs. Species richness and abundance increased dramatically after restoration. Subsequent comparisons indicated that fish size, assemblage structure, and growth of one of the dominant species, Micropogonias undulatus, was similar between reference and restored marshes 1 and 2 yr post-restoration. Total fish abundance and abundance of the dominant species was greater, often by an order of magnitude, in one of the older restored sites (2 yr post-restoration), while the other restored site (1 yr post-restoration) had values similar to the reference marsh. The success of the restoration at the time of this study suggests that return of the tidal flow and increased marsh area and edge in intertidal and subtidal creeks relative to the former salt hay farms contributed to the quick response of resident and transient young-of-the-year fishes.

1707. **Evaluating salt marsh restoration in Delaware Bay: The response of blue crabs, Callinectes sapidus, at former salt hay farms.**
Jivoff, Paul R. and Able, Kenneth W.
Estuaries 26(3): 709-719. (2003)
NAL Call #: GC96.E79; ISSN: 0160-8347
Descriptors: conservation measures/ ecology/ population dynamics/ habitat/ brackish habitat/ marine zones/ Atlantic Ocean/ North Atlantic/ Callinectes sapidus: habitat management/ salt marsh restoration/ population density/ population structure/ environmental indicators/ population level response based evaluation of salt marsh restoration/ salt marsh/ northwest Atlantic/ New Jersey/ Delaware Bay/ Crustacea, Malacostraca, Eumalacostraca, Eucarida, Decapoda, Reptantia, Brachyura/ arthropods/ crustaceans/ invertebrates
Abstract: Marshes are important habitats for various life history stages of many fish and invertebrates. Much effort has been directed at restoring marshes, yet it is not clear how fish and invertebrates have responded to marsh restoration. The blue crab, Callinectes sapidus, uses marsh habitats during much of its benthic life. We investigated the response of blue crabs to marsh restoration by comparing crab abundance (catch per unit effort), mean size and size frequency distribution, sex ratio, and molt stages of crabs in recently restored marshes that were former salt hay farms to that of adjacent reference marshes with similar physical characteristics in the mesohaline portion of Delaware Bay. Field sampling occurred monthly (April-November) in 1997 and 1998 using replicate daytime otter trawls in large marsh creeks and weirs in smaller intertidal marsh creeks. Blue crabs were either equal or more abundant, the incidence of molting was in most months similar, and population sex ratios were indistinguishable in restored and reference marshes, suggesting that the restored areas attract crabs and support their growth. Site location had a greater effect on the sex ratio of crabs such that marshes closer to the mouth of the bay contained a higher percentage of adult female crabs. In each annual growing season (April July), the monthly increase in crab size and, in some months (June July), the incidence of molting at the restored sites was greater than the reference sites, suggesting that the restored sites may provide areas for enhanced growth of crabs. These results suggest that blue crabs have responded positively to restoration of former salt hay farms in the mesohaline portion of Delaware Bay.

1708. **Evaluation of farmed playa wetlands as avian habitat using survey data and two rapid assessment techniques.**
Rivers, J. W. and Cable, T. T.
Transactions of the Kansas Academy of Science 106(3): 155-165. (2003)
NAL Call #: 500 K13T; ISSN: 0022-8443

Descriptors: wetlands/ playas/ agriculture/ aquatic birds/ biological surveys/ sampling/ habitat/ Kansas
Abstract: Playa wetlands contribute to the biological diversity of the southern Great Plains, yet many are modified by current farming practices. We surveyed 12 farmed playa wetlands from 1998-99 to (1) document seasonal avian use of these habitats and (2) assess the performance of two rapid assessment techniques, the Habitat Assessment Technique and the Wetland Evaluation Technique. Thirty-six bird species were observed on farmed playa wetlands, 42% of which are dependent on wetland habitats. In contrast, only 5 species were observed on upland reference sites in 1999, and none were dependent on wetlands. Collectively, both rapid assessment techniques rated farmed playa wetlands as poor habitats because of the physical characteristics of study sites. Based on field observations and published work, we conclude that farmed playa wetlands provide habitat for many avian species and the rapid assessment techniques examined are unsuitable for assessing playa wetlands as avian habitat in Kansas.

1709. **Evaluation of nekton use and habitat characteristics of restored Louisiana marsh.**
Bush Thom, Christina S.; La Peyre, Megan K.; and Nyman, J. Andrew
Ecological Engineering 23(2): 63-75. (2004)
NAL Call #: TD1.E26; ISSN: 0925-8574
Descriptors: conservation measures/ ecology/ habitat/ brackish habitat/ land zones/ marine zones/ Atlantic Ocean/ North Atlantic/ Crustacea/ Pisces: habitat management/ marsh terracing/ coconut matting restoration techniques/ nekton community structure/ habitat quality/ managed vs unmanaged marsh/ community structure/ nekton assemblage composition/ environmental indicators/ salt marsh/ Sabine National Wildlife Refuge/ Gulf of Mexico/ arthropods/ chordates/ crustaceans/ fish/ invertebrates/ vertebrates

1710. **Evaluation of partners for fish and wildlife wetland restoration efforts in the Saginaw Bay watershed (Michigan).**
Thompson, Katherine Ford. Michigan State University, 2004.
Notes: Advisor: Millenbah, Kelly F.; Degree: MS
Descriptors: wetland restoration/ fish/ wildlife/ ecological analysis/ Saginaw Bay/ Michigan
Abstract: Since 1987, the U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program has provided technical assistance to private landowners to voluntarily restore wetlands on their property. However, monitoring and evaluation of these projects has been limited. to determine the success of past Partner's wetland restoration projects in the Saginaw Bay watershed of Michigan, both broad and intensive-level evaluations were conducted that compared restored and natural reference wetlands. Furthermore, through landowner surveys, the relationship of landowner perception and experience to the broad and intensive ecological evaluations was explored. Ecological evaluation revealed water depth and percent open water were greater ($P < 0.05$) on restored than reference sites. Conversely, percent total vegetation cover was less ($P < 0.05$) on restored than reference sites. Restored and reference sites supported similar mean avian species richness and avian diversity, however, restored sites supported higher ($P < 0.05$) densities of wetland dependent birds. Although water depth and land cover characteristics on restored sites did not approximate conditions on reference sites, avian response to these areas suggests that restored sites are able to support avian use similar or better than natural wetlands. Overall, landowner surveys had lower ($P = 0.02$) estimates of percent total cover than broad evaluations. However, percent open water was not different among the three evaluation techniques. Landowner surveys, broad and intensive evaluation techniques can all be used to effectively monitor and evaluate restored wetlands on private lands.

1711. **An evaluation of vegetation and wildlife communities in mitigation and natural wetlands of West Virginia.**
Balcombe, Collins K.
Morgantown, W. Va.: West Virginia University, 2003.
Notes: Thesis submitted to the Davis College of Agriculture, Forestry, and Consumer Sciences at West Virginia University in partial fulfillment of the requirements for the degree of Master of Science in Wildlife and Fisheries Resource Management
http://www.forestry.caf.wvu.edu/jAnderson/Balcombe_c_thesis.pdf
Descriptors: wetland mitigation/ wetland restoration/ wetland management/ mitigation wetland/ constructed wetland/ reference wetland

1712. **An evaluation of vernal pool creation projects in New England: Project documentation from 1991-2000.**
Lichko, L. E. and Calhoun, A. J. K.
Environmental Management 32(1): 141-151. (2003)
NAL Call #: HC79.E5E5 ; ISSN: 0364-152X
Descriptors: environment-ecology/ vernal pool/ wetland creation/ compensatory mitigation/ wetland monitoring/ reference wetlands/ New England/ metapopulation dynamics/ amphibian conservation/ temporary wetlands/ self design/ mitigation/ landscape/ declines/ biodiversity/ populations/ hydroperiod
Abstract: Vernal pools are vulnerable to loss through development and agricultural and forestry practices owing to their isolation from open water bodies and their small size. Some vernal pool-dependent species are already listed in New England as Endangered, Threatened, or Species of Special Concern. Vernal pool creation is becoming more common in compensatory mitigation as open water ponds, in general, may be easier to create than wooded wetlands. However, research on vernal pool creation is limited, A recent National Research Council study (2001) cites vernal pools as "challenging to recreate." We reviewed documentation on 15 vernal pool creation projects in New England that were required by federal regulatory action. Our purpose was to determine whether vernal pool creation for compensatory mitigation in New England replaced key vernal pool functions by assessing project goals and documentation (including mitigation plans, pool design criteria, monitoring protocols, and performance standards). Our results indicate that creation attempts often fail to replicate lost pool functions. Pool design specifications are often based on conjecture rather than on reference wetlands or created pools that function

successfully. Project monitoring lacks consistency and reliability, and record keeping by regulatory agencies is inadequate. Strengthening of protection of isolated wetlands in general, and standardization across all aspects of vernal pool creation, is needed to ensure success and to promote conservation of the long-term landscape functions of vernal pools.

1713. **Extent and distribution of waterfowl habitat managed on private lands in the Mississippi Alluvial Valley.**
Uihlein, W. B.
Mississippi State, MS: Mississippi State University, 2000.
Notes: Thesis (Ph.D.)
Descriptors: Mississippi Delta/ rice/ private lands/ winter/ agriculture/ habitat management/ surveys

1714. **Factors affecting condition of northern pintails wintering in the Southern High Plains.**
Smith, Loren M. and Sheeley, Douglas G.
Journal of Wildlife Management 57(1): 62-71. (1993)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: body weight/ carcass composition/ climate/ diet/ energetic cost/ fat/ gizzard mass/ lipid/ nutrient reserve/ paired male/ population ecology/ protein/ reproduction/ sex difference/ survival/ wetland management
Abstract: Because nutrient reserves affect survival and subsequent reproduction, it is necessary to examine factors affecting nutrient reserves to understand the population ecology of northern pintails (Anas acuta). Thus, we examined variation in carcass composition and organ mass of northern pintails wintering on the Southern High Plains (SHP) of Texas (USA) with respect to time (month, year; which varied in wetland availability), age, sex, and pair status. Carcass mass for males, and fat-gizzard mass, and percent fat were higher ($P < 0.05$) in 1985-86 (wet year) than 1985 (normal year) for males and females. This was attributed to precipitation that was 70% above normal in 1985-86, and resulted in increased availability of wetlands. Adult and immature birds did not differ ($P > 0.10$) with the exception of ash mass. Males were heavier ($P < 0.001$), had heavier ($P < 0.001$) organs (gizzard and liver), and had more ($P < 0.001$) protein and ash than females. Females had a higher ($P < 0.001$) percentage of fat than males. Fat and protein decreased from November to December in both years. In the normal year, fat did not vary ($P > 0.05$) from January to March. A decline ($P < 0.05$) in fat in February of the wet year may have been an endogenous response to reduce energetic costs. Changes in gizzard mass over time probably reflected dietary changes during winter. Paired males had greater ($P < 0.01$) lipid levels than unpaired birds in the wet year but not in the normal year. We could not make this comparison for females because ther were so few unpaired females. Management in the SHP should focus on improving playa wetlands in winter because pintail body condition can be improved by increased wetland availability, and improved condition has been associated with increased survival and reproduction.

1715. **Fall water requirements for seasonal diked wetlands at Lower Klamath National Wildlife Refuge.**
Mayer, T. D. and Thomasson, R.
Wetlands 24(1): 92-103. (Mar. 2004)
NAL Call #: QH75.A1W47
Descriptors: seasonal wetlands/ autumn/ hydrology/ water management/ flooded conditions/ saturated conditions/ surface water level/ groundwater/ volume/ water quantity/ soil water/ wetland soils/ water balance/ measurement/ models/ refuge habitats/ California/ water resources and management/ natural resources, environment, general ecology, and wildlife conservation/ soil chemistry and physics
This citation is from AGRICOLA.

1716. **The Farm Bill and duck production in the Prairie Pothole Region: Increasing the benefits.**
Reynolds, R. E.; Shaffer, T. L.; Loesch, C. R.; and Cox, R. R.
Wildlife Society Bulletin 34(4): 963-974. (2006)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2006)34[963:TFBADP]2.0.CO;2.
Descriptors: Conservation Reserve Program/ duck/ Farm Bill/ Prairie Pothole Region/ Swampbuster/ United States Department of Agriculture
Abstract: The Food Security Act of 1985 contained provisions that affected wildlife conservation nationwide. Two provisions that most benefited waterfowl populations in the Prairie Pothole Region (PPR) were the Conservation Reserve Program (CRP) and "Swampbuster" (wetland conservation). Permanent cover established under the CRP provides attractive nesting habitat for upland-nesting ducks that is more secure than other major habitats. Swampbuster has prevented drainage of wetlands vital to breeding duck pairs. In 2007 many CRP contracts will expire. Deliberations will begin in late 2006 regarding the next Farm Bill. The United States Department of Agriculture needs sound biological information and scientific analyses to help establish wildlife priorities in the Farm Bill. We used data from breeding duck population and wetland habitat surveys to develop models for 5 species of upland-nesting ducks and applied these models to >2.6 million wetlands in a digital database for the PPR in North and South Dakota, USA. We used geographic information systems techniques to identify locations in the PPR where CRP cover would be accessible to the greatest number of nesting hens. We then summarized distribution of current CRP contracts relative to distribution of upland-breeding ducks. We also used our models to predict change in the breeding duck population (landscape carrying capacity) that might occur if certain wetlands were exempt from the Swampbuster provision. Our analyses showed that 75% of CRP contracts as of July 2005 were in areas accessible to high or medium numbers of breeding ducks and 25% were in areas of low populations. We suggest a method to prioritize CRP extensions and reenrollment of current contracts or target new contracts to maintain or increase duck production. Additionally, our models suggested that if the Swampbuster provision were removed from future Farm Bills and protected wetland were drained, this area of the PPR could experience a 37% decline in the waterfowl populations we studied.

1717. **Fate of wetlands associated with the central Nebraska irrigation canal system.**
Ekstein, J. D. and Hygnstrom, S. E.
Great Plains Research 6(1): 41-60. (1996)
NAL Call #: QH104.5.G73 G755; ISSN: 1052-5165
Descriptors: wetlands/ irrigation districts/ canals/ aerial photography/ environmental effects/ water table rise/ flooding/ wildlife management/ nature conservation/ environmental impact/ Nebraska/ nature conservation/ environmental impact/ irrigation districts/ water table rise/ wildlife management
Abstract: Changes in wetlands in the vicinity of the Phelps and E65 canals operated by Central Nebraska Public Power and Irrigation District in Southcentral Nebraska were examined using aerial photographs taken on seven occasions from 1938 to 1981. According to previous research, nearly 90% of the original wetlands within the surrounding Rainwater Basin were destroyed or altered by draining and filling between 1900 and 1980. Within a zone extending 10 kilometers on each side of the Phelps and E65 canals, however, we observed an increase in the number and total area of wetlands, which we hypothesize to have been caused by an elevated groundwater table. Of additional importance for wildlife management, there was a notable decrease in wetlands temporarily flooded for 2 months or less, and a notable increase in wetlands seasonally flooded for 3 to 5 months each year. These changes were most conspicuous after 1969.

1718. **Fish and wildlife benefits associated with wetland establishment practices.**
Rewa, Charles A.
In: Fish and Wildlife Response to Farm Bill Conservation Practices; Bethesda, MD: The Wildlife Society, 2007. 12 pp.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfb6.pdf
Descriptors: aquatic habitat/ conservation practices/ wetland conservation/ wetland management/ terrestrial habitat/ wildlife species/ wildlife management
Abstract: This paper summarizes the findings of studies conducted to document fish and wildlife response to these practices. The majority of published studies describe bird response to wetland restoration, with most reporting bird communities in restored wetlands to be similar to those of natural reference wetlands. Studies also indicate that invertebrates and amphibians generally respond quickly to and colonize newly established wetland habitats. Key factors reported as correlated with wildlife species richness include wetland size, availability of nearby wetlands habitats, diversity of water depths and vegetation, wetland age, and maintenance and management activity. Key knowledge gaps in our understanding of fish and wildlife response to wetland establishment practices are identified, including the need for studies on biota other than birds and long-term monitoring of wetland condition and wildlife response over time.

1719. **Fish assemblage composition in constructed and natural tidal marshes of San Diego Bay: Relative influence of channel morphology and restoration history.**
Williams, G. D. and Zedler, J. B.
Estuaries 22(3A): 702-716. (Sept. 1999)
NAL Call #: GC96.E79; ISSN: 0160-8347
Descriptors: wetlands/ tides/ environmental restoration/ habitat utilization/ California/ San Diego Bay/ tidal marshes/ morphology/ rehabilitation/ channel morphology/ species composition/ aquatic habitat/ population density/ killifish/ multivariate analysis/ monitoring/ biological sampling/ physical properties/ environment management/ river engineering/ ecosystem disturbance/ environmental impact/ community composition/ fluvial morphology/ environmental factors/ Pisces/ Fundulus parvipinnis/ California killifish/ reclamation/ water quality control/ mechanical and natural changes/ multi-disciplinary studies/ environmental effects/ erosion and sedimentation
Abstract: This study evaluated the use by fish of restored tidal wetlands and identified links between fish species composition and habitat characteristics. We compared the attributes of natural and constructed channel habitats in Sweetwater Marsh National Wildlife Refuge, San Diego Bay, California, by using fish monitoring data to explore the relationships between channel environmental characteristics and fish species composition. Fishes were sampled annually for 8 yr (1989-1996) at eight sampling sites, four in constructed marshes and four in natural marshes, using beach seines and blocking nets. We also measured channel habitat characteristics, including channel hydrology (stream order), width and maximum depth, bank slope, water quality (DO, temperature, salinity), and sediment composition. Fish colonization was rapid in constructed channels, and there was no obvious relationship between channel age and species richness or density. Total richness and total density did not differ significantly between constructed and natural channels, although California killifish (Fundulus parvipinnis) were found in significantly higher densities in constructed channels. Multivariate analyses showed fish assemblage composition was related to channel habitat characteristics, suggesting a channel's physical properties were more important in determining fish use than its restoration status. This relationship highlights the importance of designing restoration projects with natural hydrologic features and choosing proper assessment criteria in order to avoid misleading interpretations of constructed channel success. We recommend that future projects be designed to mimic natural marsh hydrogeomorphology and diversity more closely, the assessment process utilize better estimates of fish habitat function (e.g., individual and community-based species trends, residence time, feeding, growth) and reference site choice, and experimental research be further incorporated into the restoration process.

1720. **Fish recruitment to a constructed wetland.**
Langston, M. A. and Kent, D. M.
Journal of Freshwater Ecology 12(1): 123-129. (1997)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060
Descriptors: Florida/ artificial wetlands/ fish populations/ seasonal variations/ fish establishment/ biological sampling/ Pisces/ fish recruitment/ environmental restoration/ artificial wetlands
Abstract: A 31.6 ha isolated, constructed wetland in east central Florida was sampled for fish over a two year period using a fyke net and minnow traps. A rich and abundant fish community rapidly developed. Cumulatively, 848 fish of 14 species were collected. Variation in abundance was observed, and reflects seasonal conditions. Gambusia affinis, Fundulus chrysotus, and Lepomis gulosis were the most abundant species. This fish community was similar to

natural fish communities of the region. Fish may have been introduced to the study wetland by irrigation, transport on terrestrial or volant fauna, or a combination of the two modes.

1721. **The fishery value of salt marsh restoration projects.**
Rozas, Lawrence P.; Caldwell, Philip; and Minello, Thomas J.
Journal of Coastal Research (Special Issue 40): 37-50. (Winter 2005); ISSN: 0749-0208
Descriptors: conservation measures/ ecology/ habitat/ brackish habitat/ marine zones/ Atlantic Ocean/ North Atlantic/ Callinectes sapidus/ Farfantepenaeus aztecus/ Litopenaeus setiferus: habitat management/ salt marsh restoration projects/ evaluation of value for enhancing fishery species populations/ biomass/ population dynamics/ salt marsh/ Gulf of Mexico/ Texas/ Galveston Bay/ Crustacea, Malacostraca, Eumalacostraca, Eucarida, Decapoda, Natantia/ arthropods/ Crustaceans/ invertebrates
Abstract: We assessed the benefits of different wetland restoration techniques for fishery resources by comparing habitat complexity, fishery support, and construction costs among five salt marsh restoration projects in Galveston Bay, Texas. The restoration projects included marsh terracing at Galveston Island State Park (GISPT) and Pierce Marsh Preserve (PMPT), mound construction at Jumbile Cove (JC), and marsh island construction north of Galveston Island along Interstate Highway 45 at 1-45 East Marsh (145EM) and 1-45 West Marsh (145WM). The projects were located in shallow estuarine waters and used bottom sediments or upland soils to construct intertidal areas that were planted with smooth cordgrass Spartina alterniflora. We used a Geographic Information System (GIS) and high-resolution aerial photography to classify areas into land (marsh vegetation) and water and applied fishery density models to assess fishery support. These models were developed to describe fine-scale distribution patterns for brown shrimp Farfantepenaeus aztecus, white shrimp Litopenaeus setiferus, and blue crab Callinectes, sapidus across shallow estuarine habitat types (emergent marsh and shallow open water) of the Galveston Bay estuary. Restoration sites ranged in size from 6.9 ha (145EM) to 68.2 ha (GISPT). Construction costs ranged from $362,250 (GISPT) to $74,200 (145EM). Costs standardized to 1 ha for comparison among projects were $40,608 (145WM), $11,875 (JC), 685 (145EM), $8,771 (PMPT), and $5,310 (GISPT). The 145WM project contained the greatest percentage of marsh vegetation (68%), whereas the two terracing projects had the smallest percentage (PMPT = 18%, GISPT = 19%). More of the constructed marsh in the terracing projects, however, was vegetated marsh edge (located within 1 m of the marsh shoreline) than in other projects (PMPT = 29%, GISPT 25%, 145EM - 20%, JC = 11%, 145WM - 9%), and this habitat type supports the greatest densities of fishery species. Based on our modeling analysis, overall fishery support was greatest for the two 1-45 projects, followed by the PMPT terracing project. Estimates of standing crop (number of animals) standardized to 1 ha ranged between 22,246-30,863 for brown shrimp, 21,773-33,139 for white shrimp, and 17,240-24,927 for blue crab. The two terracing projects and 145EM had higher fishery-benefit: cost ratios (ratio of standardized net fishery value to standardized project cost) than the other projects. Although marsh terraces composed of small cells supported the highest nekton populations, terraces constructed of medium cells were more cost-effective than terraces composed of either small or large cells. Based on our modeling results, all five restored sites supported relatively high populations of fishery species compared to prerestoration conditions. However, restoration sites did not support populations equivalent to a reference marsh system. Restoration projects should maximize the area of marsh vegetation and create a high degree of water-marsh interspersion to provide the most benefit for fishery species.

1722. **Floral and faunal colonization of restored wetlands in west-central Minnesota and northeastern South Dakota.**
Sewell, R. S. and Higgins, K. F.
In: Proceedings of the Fourteenth Annual Conference on Wetlands Restoration and Creation/ Webb, F. J. Plant City, Fl.: Hillsborough Community Coll, 1991; pp. 108-133.
Notes: Conference: 18. Annu. Conf. on Wetlands Restoration and Creation, Plant City, FL (USA), 16-17 May 1991.
Descriptors: wetlands/ biological surveys/ community composition/ land reclamation/ aquatic animals/ freshwater fish/ aquatic plants/ aquatic birds/ Minnesota/ South Dakota
Abstract: The objective of this study was to determine trends in species abundance and richness of waterfowl, aquatic macroinvertebrates, fishes and hydrophytes in restored wetlands of differing ages since restoration. One hundred fifty-six restored seasonal and semi-permanent basins of 12 different ages were surveyed in 3 counties of northeast South Dakota and 6 counties of west-central Minnesota, USA. A large diversity of flora and fauna colonized wetlands as early as one year after restoration. Twelve species of waterfowl were observed in all age classes of the restored basins. Thirty-one taxa of macroinvertebrates occurred in restored basins, 12 of which were in age class 1 basins. Four fish species inhibited restored basins of all ages. An average of over 16 taxa of aquatic hydrophytes had coverage values of greater than or equal to 5% of the total wetland area in restored basins. This study demonstrated that wetland managers can expect extensive floral and faunal colonization of prairie wetlands even in the first year after restoration.

1723. **Functional assessment of five wetlands constructed to mitigate wetland loss in Ohio, USA.**
Wilson, R. F. and Mitsch, W. J.
Wetlands 16(4): 436-451. (1996)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ habitat improvement/ man-induced effects/ nature conservation/ evaluation/ hydrology/ marshes/ environmental restoration/ Ohio/ evaluation/ depression wetlands/ environmental restoration/ habitat improvement/ man-induced effects/ nature conservation
Abstract: Five replacement wetlands in Ohio, USA, were investigated to determine their ecological and legal success. Hydrology, soils, vegetation, wildlife, and water quality of each wetland determined their functional success. The progress of the wetlands was also compared to their

legal requirements. Four of the five wetlands (80%) were in compliance with legal requirements and the same four wetlands demonstrated medium to high ecosystem success. For the four wetlands, a replacement ratio of 1.4:1 was achieved for area, and depressional wetlands were generally replaced with depressional wetlands.

1724. **Functional equivalency between rice fields and seminatural wetland habitats.**
Elphick, Chris S.
Conservation Biology 14(1): 181-191. (2000)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: multivariate analysis: analytical method/ anthropogenic habitat/ behavior/ feeding efficiency/ food abundance/ foraging performance/ functional equivalency/ predation threat/ rice fields/ seminatural wetland habitat/ time allocation
Abstract: Evaluating the potential for anthropogenic habitats to act as surrogates for the natural habitats they replace is a key issue in conservation biology. In California, flooded rice fields are used by numerous aquatic birds during winter. If this habitat functions similarly to more natural wetlands, increased flooding may help replace the extensive wetlands that occurred in the region prior to agricultural development. I tested whether food abundance, perceived predation threat, foraging performance, and the way in which birds allocate their time to different behaviors differed between flooded rice fields and seminatural wetlands for several species of aquatic bird. When appropriate, I also compared flooded and unflooded fields. Invertebrate densities did not differ among habitats. Seminatural wetlands had less rice grain but more seeds from other plants than the two rice habitats. The frequency with which predators passed over a feeding area was lower in flooded fields than in unflooded fields or seminatural wetlands. Most differences in feeding performance and time allocation among habitats were small and statistically insignificant. For some species, feeding efficiency was greater in seminatural wetlands than in flooded fields. Increasing attack rates and the amount of time spent feeding when in flooded fields, however, may allow birds to compensate for reduced efficiency. Multivariate analyses showed that group size, predation threat, time of day, date, and water depth often were associated with behaviors, but that these variables rarely accounted for habitat differences. Flooded fields apparently provide equivalent foraging habitat to seminatural wetlands and, because of reduced predation threat, may be a safer habitat for waterbirds. Thus, if managed appropriately, one of the world's dominant forms of agriculture can provide valuable waterbird habitat.

1725. **Functional variability of habitats within the Sacramento-San Joaquin Delta: Restoration implications.**
Lucas, Lisa V.; Cloern, James E.; Thompson, Janet K.; and Monsen, Nancy E.
Ecological Applications 12(5): 1528-1547. (2002)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lotic water/ land zones/ comprehensive zoology: habitat management/ habitat restoration/ restoration outcomes prediction/ delta habitat comparison implications/ ecological energetics/ habitat restoration outcomes prediction/ river/ California/ Sacramento-San Joaquin Delta
Abstract: We have now entered an era of large-scale attempts to restore ecological functions and biological communities in impaired ecosystems. Our knowledge base of complex ecosystems and interrelated functions is limited, so the outcomes of specific restoration actions are highly uncertain. One approach for exploring that uncertainty and anticipating the range of possible restoration outcomes is comparative study of existing habitats similar to future habitats slated for construction. Here we compare two examples of one habitat type targeted for restoration in the Sacramento-San Joaquin River Delta. We compare one critical ecological function provided by these shallow tidal habitats -- production and distribution of phytoplankton biomass as the food supply to pelagic consumers. We measured spatial and short-term temporal variability of phytoplankton biomass and growth rate and quantified the hydrodynamic and biological processes governing that variability. Results show that the production and distribution of phytoplankton biomass can be highly variable within and between nearby habitats of the same type, due to variations in phytoplankton sources, sinks, and transport. Therefore, superficially similar, geographically proximate habitats can function very differently, and that functional variability introduces large uncertainties into the restoration process. Comparative study of existing habitats is one way ecosystem science can elucidate and potentially minimize restoration uncertainties, by identifying processes shaping habitat functionality, including those that can be controlled in the restoration design.

1726. **Grass buffers for playas in agricultural landscapes: An annotated bibliography.**
Melcher, C. P. and Skagen, S. K. U.S. Geological Survey; U.S. Geological Survey Open File Report no. 2005-1220, 2005. 56 pp.
http://www.fort.usgs.gov/products/publications/21485/21485.pdf
Descriptors: conservation/ ecology/ filters/ grasses/ grasslands/ playas/ sediment contamination/ wetlands/ Colorado/ Kansas/ Southern High Plains/ Texas
Abstract: This bibliography and associated literature synthesis (Melcher and Skagen, 2005) was developed for the Playa Lakes Joint Venture (PLJV). The PLJV sought compilation and annotation of the literature on grass buffers for protecting playas from runoff containing sediments, nutrients, pesticides, and other contaminants. In addition, PLJV sought information regarding the extent to which buffers may attenuate the precipitation runoff needed to fill playas, and avian use of buffers. We emphasize grass buffers, but we also provide information on other buffer types. There are a number of relatively synonymous terms that describe grass buffers for wetlands. They include: buffer strip, vegetated filter strip (VFS), grass buffer, grass filter, grass hedge, and grassed waterway (GW), among others (see McKague and others, 1996). Although some of these terms represent slightly different designs, placements, and/or purposes, they all perform similar functions. In this document, we use buffer and VFS more or less interchangeably; other types are specified by name (e.g., grass hedges). Our bibliography is by no means exhaustive, as the body of literature potentially relevant to

playas and wetland buffers is vast. Thus, we attempted to include and annotate at least 13 papers by numerous researchers heavily involved in buffer research and modeling. We also included single papers by other researchers to increase the spectrum of regional focus, watershed/wetland conditions, research approaches, researcher expertise, and the time over which buffer theories/practices have evolved. We found virtually no literature specific to buffers for playas (confirmed by D.A. Haukos, oral. commun., 2005); thus, we conducted interviews with playa scientists to glean information on possible buffer design and management specifically for playas. We did, however, find a significant body of literature on the results of controlled experiments designed to test buffer effectiveness, an important first step towards validating buffer effectiveness in real-world situations. Of the literature on playa ecology, flora, and wildlife, we found that most focuses on playa basins and wetlands rather than the surrounding uplands and grasslands; furthermore, most of the empirical work on playa ecology has taken place in the Southern High Plains (SHP; i.e., Texas and Okalahoma panhandles, southeastern Colorado, and southwestern Kansas) because many wetlands in other portions of the PLJV region (Fig. 1) were only recently recognized as playas. Finally, we found few papers on avian use of buffers; therefore, we focused on those that report on avian use of Conservation Reserve Program (CRP) fields or lands enrolled in similar programs.

1727. **Grazing management strategies for Lahontan cutthroat trout stream habitats.**
Coffin, P. D.
In: Proceedings of a symposium on sustaining rangeland ecosystems.Eastern Oregon State College, La Grande, Oregon. Edge, W. D. and Olsen-Edge, S. L. (eds.);
Vol. Special Report 953.
Corvallis, Ore.: Oregon State University Extension Service; pp. 150-152; 1996.
NAL Call #: 100 Or3M no.953
Descriptors: grassland management/ grazing systems/ damage/ grasslands/ riparian grasslands/ grazing/ management/ plant height/ grazing intensity/ nature conservation/ soil conservation
Abstract: Recommended grazing management practices for the maintenance of the Lahontan cutthroat trout in Nevada, California and Oregon included maximum allowable use of 20% of the annual growth of woody species and 30% of the annual growth of other key riparian species; >6 inches grazing height left at the end of the season; limiting streambank damage to 10%; introducing grazing rest periods preferably annually; limiting livestock access to the stream; and monitoring of hot season grazing use.

1728. **Guiding principles for constructed treatment wetlands: Providing for water quality and wildlife habitat.**
Interagency Workgroup on Constructed Wetlands (U.S.)
Washington, DC: U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds. (2001).
Notes: Rev. 06/26/2001, Original document published in 2000; Title from web page. Developed by Interagency Workgroup on Constructed Wetlands. "October 2000" Description based on content viewed April 11, 2002. "EPA-843-B-00-003"
NAL Call #: TD756.5.G85 2000.
http://www.epa.gov/owow/wetlands/pdf/constructed.pdf
Descriptors: Constructed wetlands---United States/ Water quality---United States/ Water quality management---United States/ Wetland ecology---United States
Abstract: This User's Guide provides: guiding principles for planning, siting, design, construction, operation, maintenance, and monitoring of constructed treatment wetlands; information on current [Environmental Protection] Agency policies, permits, regulations, and resources; and answers to common questions.
This citation is from AGRICOLA.

1729. **Habitat and landscape associations of breeding birds in native and restored grasslands.**
Fletcher, R. J. and Koford, R. R.
Journal of Wildlife Management 66(4): 1011-1022. (2002)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: bird density/ edge effects/ grassland birds/ habitat relationships/ Iowa/ landscape fragmentation/ Prairie Pothole Region/ restoration/ tallgrass prairie/ avifauna/ grassland/ habitat restoration/ species diversity/ United States/ Ammodramus savannature/ Passerculus sandwichensis
Abstract: In the midwestern United States, less than 1% of the original tallgrass prairie ecosystem remains. State and federal agencies have responded to this habitat loss with programs and land acquisition that have increased the amount of grassland on the landscape by restoring grassland from other land-use practices. We assessed the effects of habitat restoration and the relative contribution of local habitat and landscape factors on breeding grassland birds in northern Iowa. During the 1999 and 2000 breeding seasons, we surveyed grassland birds in 10 tallgrass prairies and 10 restored grasslands that contained a wide diversity of habitat and landscape conditions. Densities of common bird species were similar between habitat types, except for grasshopper sparrows (Ammodramus savannarum) and savannah sparrows (Passerculus sandwichensis), which were 4 and 9 times more dense in restored grasslands, respectively. Species richness of breeding birds was similar between habitat types. Habitat structure was different in prairies and restored grasslands; restored grasslands had 7% less total vegetation cover and 3% more bare ground. A nested, multiscale analysis indicated that habitat structure explained some variation in species richness and bird density of all common species, yet addition of landscape structure improved models for species richness and for density of 4 of 8 species considered, explaining an additional 10-29% of the variation. Edge-density metrics were the most common variables entering into landscape models; most species had lower densities in landscapes with high edge density. Our results indicate that restored grassland habitats contain bird communities generally similar to those in native prairie habitats in northern Iowa, suggesting that restored grasslands may provide similar habitat suitability for most grassland birds. In addition, both local habitat and landscape factors can be important for managing breeding grassland birds.

1730. **Habitat contribution and waterbird use of Wetland Reserve Program sites in the Cache River watershed, Illinois.**
Hicks, Brianne M.
Carbondale, Illinois: Southern Illinois University, 2003.
Descriptors: wetlands/ birds/ wildlife habitat/ Illinois/ Wetlands Reserve Program

1731. **Habitat selection and habitat use by the bog turtle (Clemmys muhlenbergii) in Maryland.**
Morrow, J. L.; Howard, J. H.; Smith, S. A.; and Poppel, D. K.
Journal of Herpetology 35(4): 545-552. (2001)
NAL Call #: QL640.J6; ISSN: 00221511
Descriptors: Clemmys muhlenbergii/ Lonicera japonica/ Maryland/ turtles/ habitat selection
Abstract: Habitat selection of 50 bog turtles (Clemmys muhlenbergii) was studied at two sites in Harford County, Maryland, from April 1996 to August 1997. These sites differ in size, amount of grazing, and stage of vegetative succession. In addition, one of the sites was studied intensively 20 years ago. Turtle movements were monitored using radiotelemetry: Individuals were located twice a week during the active season and once a month during hibernation to assess habitat selection and seasonal changes in habitat use: Vegetative, soil, and water characteristics were recorded in 0.25-m^2 quadrat placed at turtle locations and stratified random locations throughout the study areas. Turtles selected sedges and rushes and other low-lying herbaceous plants. They avoided some woody plants (alders, grapes, and berries) and an exotic plant (Japanese honeysuckle, Lonicera japonica) that may gradually eliminate typical wetland vegetation and produce a closed canopy. Management practices, such as moderate animal grazing and winter burns, will help retard plant succession and provide more open habitat.
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1732. **Habitat use and movement of the mummichog (Fundulus heteroclitus) in a restored salt marsh.**
Teo, S. L. and Able, K. W.
Estuaries 26(3): 720-730. (2003)
NAL Call #: GC96.E79; ISSN: 0160-8347
Descriptors: animal behavior/ habitat selection/ habitats/ movement/ nature conservation/ population density/ salt marshes/ Fundulus heteroclitus
Abstract: The mummichog, Fundulus heteroclitus, is one of the most abundant macrofaunal components of salt marsh ecosystems along the east coast of the USA. During April-November 1998, we determined the habitat use and movement patterns of young-of-the-year (YOY) and adult mummichogs in a restored marsh, formerly a salt hay farm, and an adjacent creek in order to expand our understanding of the ecology of the species and evaluate the success of the restoration. Four major fish habitat types (large first-order natural creek, second-order created creek, linear drainage ditch, and marsh surface) were identified within the study site. Patterns of relative abundance and mark and recapture using coded wire tags were used to determine the habitat use, tidal movements, home range, and site fidelity of the species within these habitat types. A total of 14 784 fishes, ranging from 20-100 mm SL, were captured with wire mesh traps and tagged, and 1521 (10.3%) fishes were recaptured. A variety of gears were used to attempt to recapture fish across all habitat types, including wire mesh traps, push nets, and otter trawls. Based on abundance and recaptures of tagged fish, the YOY and adults primarily used the shallow subtidal and intertidal areas of the created creek, the intertidal drainage ditches, and the marsh surface of the restored marsh but not the larger, first-order natural creek. At low tide, large numbers were found in the subtidal areas of the created creek; these then moved onto the marsh surface on the flooding tide. Elevation, and thus hydroperiod, appeared to influence the microscale use of the marsh surface. We estimated the home range of adults and large YOY (20-100 mm SL) to be 15 ha at high tide, which was much larger than previously quantified. There was strong site fidelity to the created creek at low tide. The habitat use and movement patterns of the mummichog appeared similar to that reported for natural marshes. Coupled with the results of other studies on the feeding, growth, and production of this species in this restored marsh, the species appeared to have responded well to the restoration.
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1733. **Habitat use by mallards during spring migration through central Iowa USA.**
Lagrange, T. G. and Dinsmore, J. J.
Journal of Wildlife Management 53(4): 1076-1081. (1989)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Anas platyrhynchos/ high energy seed/ food/ nighttime cover/ sheetwater wetland
Abstract: We studied the use of 455 seasonally flooded farmed basins (sheetwater wetlands) and 16 small emergent wetlands by migratory mallards (Anas platyrhynchos) in central Iowa during spring 1983-84. During daytime, sheetwater wetlands provided 19,530 mallard use days compared with 103 on the few remaining emergent wetlands. Mallards used larger (> 2 ha) versus smaller sheetwater wetlands, moist-soil or corn-vegetated wetlands more than emergent wetlands or soybean-vegetated wetlands, untilled wetlands more than conservation-tiller or plowed sheetwater wetlands, and sheetwater wetlands located farther from disturbance. Mallards used sheetwater wetlands during all daylight hours, but flew ≤ 13 km to roost on larger emergent wetlands. A diversity of habitats appears necesary for spring migratory mallards: sheetwater wetlands provide food and high-energy seeds and emergent wetlands provide nighttime cover.
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1734. **Habitat use by nonbreeding wood ducks in the Coastal Plain and Rice Prairie Region of Texas.**
Anderson, James T. and Tacha, Thomas C.
Southwestern Naturalist 47(3): 486-489. (2002)
NAL Call #: 409.6 So8 ; ISSN: 0038-4909
Descriptors: aquatic habitat/ forested wetlands/ habitat types/ habitat use
© Thomson Reuters Scientific

1735. **Hepatic retinoids of bullfrogs in relation to agricultural pesticides.**
Boily, M. H.; Berube, V. E.; Spear, P. A.; DeBlois, C.; and Dassylva, N.
Environmental Toxicology and Chemistry 24(5): 1099-1106. (2005)
NAL Call #: QH545.A1E58; ISSN: 07307268

Descriptors: amphibians/ pesticides/ Rana catesbeiana/ Retinol/ Retinyl ester/ agriculture/ ecosystems/ pesticides/ agricultural activity/ amphibians/ bullfrogs/ biodiversity/ agricultural chemical/ pesticide/ retinoid/ agricultural practices/ frog/ pesticide/ physiological response/ pollution effect/ agriculture/ biocides/ Canada/ North America/ Quebec [Canada]/ Amphibia

Abstract: Agricultural pesticides often have been cited as a factor affecting indigenous amphibian populations, but possible effects of pesticides and other factors associated with agricultural practices are understood poorly. Adult bullfrogs (Rana catesbeiana) were collected within the Yamaska River basin (Quebec, Canada) in subwatersheds representing low, medium, and high agricultural activities and 53 pesticides were analyzed in surface water. More pesticides were detected in subwatersheds associated with high agricultural activities like Rivière Noire and Rivière à la Barbue and pesticide concentrations were higher compared to the other study sites. Female and male body weights differed between sites. In the case of males, body weight was significantly less at Rivière à la Barbue. Liver retinol stores were decreased significantly in male bullfrogs from Rivière Noire, although total retinyl esters concentrations varied between sites having the highest concentration at Yamaska-Nord where the agricultural activity was considered low. The ratio of hepatic retinyl palmitate to retinol tended to be higher for male bullfrogs from Rivière Noire and Rivière à la Barbue. These results suggest that factors associated with intensive agricultural practices may affect the body weight and retinoid stores in male bullfrogs living in these agroecosystems. © 2005 SETAC.

1736. **Historic and comparative perspectives on rehabilitation of marshes as habitat for fish in the Lower Great Lakes Basin.**
Whillans, T. H.
Canadian Journal of Fisheries and Aquatic Science 53(Supplement 1): 58-66. (1996)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: marshes/ environmental restoration/ ecosystem analysis/ historical account/ sedimentation/ ecosystems/ fish/ aquatic habitat/ Canada, Ontario

Abstract: Retrospective and comparative assessments of fish habitat have been used to guide rehabilitation in Cootes Paradise, a marsh at Hamilton, Ont., on Lake Ontario. The marsh was severely altered by human and natural stresses, including high water levels, influx of fine eroded sediments, and channelization. Recovery has been limited by a different but overlapping set of stresses, including the continued influx of fine eroded sediments, resuspension of sediments, exotic fish, and increased fetch. Assessment has involved the use of "accumulator-," "residue-," and "replica"-type retrospective evidence and the comparison of Cootes Paradise with other reference marshes. The emergent narrative science (a synthesis of science in historical and environmental context that serves as a partially testable hypothesis), verified and adjusted by small scale experiments, has identified the need to re-introduce vegetation, reduce fetch, exclude common carp (Cyprinus carpio), anchor the marsh sediments, and reduce the influx of land use derived fine sediments. Narrative science uses the "ecological memory" of the marsh for historical information on ecological degradation and in the form of the remnant natural resilience upon which ecological rehabilitation could build. The narrative science provides the basis for adaptive management and the monitoring that it requires.

1737. **Historical wetlands in Oregon's Willamette Valley: Implications for restoration of winter waterbird habitat.**
Taft, O. W. and Haig, S. M.
Wetlands 23(1): 51-64. (2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ environmental restoration/ overwintering/ historical ecology/ valleys/ habitats/ waterfowl/ agriculture/ river basins/ habitat improvement/ ecosystem management/ restoration/ anthropogenic factors/ biological surveys/ river valleys/ aquatic birds/ Aves/ Cygnus buccinator/ Chen caerulescens/ Grus canadensis/ Numenius americanus/ Oregon, Willamette Valley/ birds/ trumpeter swan/ snow goose/ sandhill crane/ long-billed curlew/ Anser caerulescens/ Olor buccinator

Abstract: Before agricultural expansion in the 19th century, river valleys of North America supported expanses of wetland habitat. In restoring these landscapes, it is important to understand their historical condition and biological function. Synthesizing historical primary accounts (from explorers, travelers, settlers, and farmers) with contemporary knowledge of these wetland systems, we developed a profile of the wetlands and their use by nonbreeding waterbirds (e.g., waterfowl, wading birds, and shorebirds) within the Willamette Valley, Oregon, ca. 1840. We found evidence for three types of wetlands used by non-breeding waterbirds in fall, winter, and spring: emergent wetlands, riverine wetlands, and wetland prairie. The most extensive wetland type was wetland prairie, which functioned as fall/winter habitat for waterbirds, but only while native Kalapuyans managed the region with fire. Since the mid-1800s, four species, in particular, have decreased their use of the Willamette Valley: trumpeter swan (Cygnus buccinator), snow goose (Chen caerulescens), sandhill crane (Grus canadensis), and long-billed curlew (Numenius americanus). Information suggests that ca. 1840, waterbirds and their habitats were more abundant in the Willamette Valley than today. Restoration of the Willamette Valley landscape is warranted, and today's agricultural wetlands-former wetland prairie-hold highest restoration potential.

1738. **Home ranges, movements, and habitat selection of Oregon spotted frogs (Rana pretiosa).**
Watson, James W.; McAllister, Kelly R.; and Pierce, D. John
Journal of Herpetology 37(2): 292-300. (June 2003)
NAL Call #: QL640.J6; ISSN: 0022-1511
Descriptors: Rana pretiosa (Ranidae)/ home range/ home range use/ distribution within habitat/ movement patterns/ habitat selection/ home-range use relationships/ habitat utilization/ range use/ habitat preference/ semiaquatic habitat/ wetland upland pasture mosaic/ grassland/ Washington/ Thurston County/ Dempsey Creek/ habitat selection/ home range use and movement patterns/ upland pasture wetland mosaic

Abstract: From 1997-1999 we studied one of four known populations of Oregon Spotted Frogs (Rana pretiosa) in Washington State to investigate patterns of range use, movements, and habitat selection. Sixty telemetered frogs occupied a range that was a mosaic of wetlands (15.6 ha) and upland pasture (13.2 ha) grazed by dairy cows. Mean (± SE) home-range size for four frogs was 2.2 ± 1.0 ha. Patterns of spatial use, determined from 654 telemetry locations, were closely related to season and changing surface water conditions. During the breeding season (February to May), frogs occupied >=-50% of the area they used the entire year, and oviposited in shallow pools (depth = 16.9 ± 0.6 cm) on the margins of an ephemeral creek. In the dry season (June to August), frogs moved down stream to deeper, permanent pools (depth = 23.6 ± 1.0 cm), significantly reduced their movements, and occupied the smallest ranges of any season. During the wet season (September to January), frogs moved back up stream and reoccupied the breeding range. During the coldest weather, frogs buried themselves at the base of dense vegetation in shallow water under ice (depth = 17.4 ± 0.8 cm). Frogs avoided dry uplands. Frogs selected sedge (Carex obnupta, and Carex utriculata)/rush (Juncos effuses) habitat during breeding and hardhack (Spiraea douglasii) cover during the dry season that shaded and maintained remnant pools. Frogs preferred microhabitats with 50-75% water surface exposure based on comparisons between telemetry locations and nearby locations that were randomly selected. Aquatic requirements necessary to complete the life cycle of Oregon Spotted Frogs in this population include (1) stable, shallow water areas for egg and tadpole survival in the breeding season, (2) deep, moderately vegetated pools for adult and juvenile survival in the dry season, and (3) shallow water levels over emergent vegetation for protecting all age classes during cold weather in the wet season.

1739. **Hydrologic aspects of marsh ponds during winter on the Gulf Coast Chenier Plain, USA: Effects of structural marsh management.**
Bolduc, F. and Afton, A. D.
Marine Ecology Progress Series 266: 35-42. (2004); ISSN: 01718630
Descriptors: coastal wetlands/ Gulf of Mexico/ Ponds/ wintering waterbirds/ avifauna/ coastal wetland/ dissolved oxygen/ ecological impact/ habitat management/ hydrology/ impoundment/ salinity/ water depth/ water temperature/ zoobenthos/ Gulf Coastal Plain/ Louisiana
Abstract: The hydrology of marsh ponds influences aquatic invertebrate and waterbird communities. Hydrologic variables in marsh ponds of the Gulf Coast Chenier Plain are potentially affected by structural marsh management (SMM: levees, water control structures and impoundments) that has been implemented since the 1950s. Assuming that SMM restricts tidal flows and drainage of rainwater, we predicted that SMM would increase water depth, and concomitantly decrease salinity and transparency in impounded marsh ponds. We also predicted that SMM would increase seasonal variability in water depth in impounded marsh ponds because of the potential incapacity of water control structures to cope with large flooding events. In addition, we predicted that SMM would decrease spatial variability in water depth. Finally, we predicted that ponds of impounded freshwater (IF), oligohaline (IO), and mesohaline (IM) marshes would be similar in water depth, temperature, dissolved oxygen (O2), and transparency. Using a priori multivariate analysis of variance (MANOVA) contrast, we tested these predictions by comparing hydrologic variables within ponds of impounded and unimpounded marshes during winters 1997-1998 to 1999-2000 on Rockefeller State Wildlife Refuge, near Grand Chenier, Louisiana. Specifically, we compared hydrologic variables (1) between IM and unimpounded mesohaline marsh ponds (UM); and (2) among IF, IO, and IM marshes ponds. As predicted, water depth was higher and salinity and O2 were lower in IM than in UM marsh ponds. However, temperature and transparency did not differ between IM and UM marsh ponds. Water depth varied more among months in IM marsh ponds than within those of UM marshes, and variances among and within ponds were lower in IM than UM marshes. Finally, all hydrologic variables, except salinity, were similar among IF, IO, and IM marsh ponds. Hydrologic changes within marsh ponds due to SMM should (1) promote benthic invertebrate taxa that tolerate low levels of O2 and salinity; (2) deter waterbird species that cannot cope with increased water levels; and (3) reduce waterbird species diversity by decreasing spatial variability in water depth among and within marsh ponds.

1740. **The impact of agriculture on temporary wetland amphibians in Florida.**
Babbitt, Kimberly J.; Baber, Matthew J.; and Tanner, George W.
In: Amphibians and reptiles: Status and conservation in Florida/ Meshaka, W. E. and Babbitt, K. J.
Malabar, FL: Krieger Publishing Co., 2005; pp. 48-55.
Notes: 1575242516 (ISBN).
Descriptors: agriculture/ biogeography: population studies/ wildlife management: conservation/ species richness/ habitat/ urbanization/ anthropogenic disturbance/ temporary wetland/ agricultural disturbance/ upland landscape

1741. **Impact of hydropattern disturbance on crayfish population dynamics in the seasonal wetlands of Everglades National Park, USA.**
Acosta, C. A. and Perry, S. A.
Aquatic Conservation: Marine and Freshwater Ecosystems 11(1): 45-57. (2001); ISSN: 10527613.
Notes: doi: 10.1002/aqc.426.
Descriptors: crayfish/ Everglades/ hydroperiod/ wetland restoration/ environmental stress/ hydroperiod/ population dynamics/ wetlands/ United States/ Procambarus alleni
Abstract: 1. The natural hydropattern in the seasonally-flooded marl prairie wetlands of Everglades National Park has been severely disrupted by human water control activities, seriously impacting higher trophic organisms, e.g. wading birds, that depend on these wetlands. Less is known about the impacts on key aquatic fauna, such as crayfish Procambarus alleni, or how these populations might respond to proposed habitat restoration strategies.
2. Under severe environmental stress, populations of burrowing crayfish are predicted to have skewed size structure, low reproductive success, low survival, and widespread dispersal. As predicted for populations in stressed habitats, crayfish density was low, small dispersing adults were dominant, juvenile abundance was

low, and survival was low in habitats where the hydroperiod (duration of flooding) was short and groundwater level was lowest. 3. Crayfish dispersed during flooding, but during the drydown, they burrowed rather than sought deeper water. This dispersal strategy may be adaptive for surviving in seasonal wetlands, but this had severe consequences on survival in disturbed habitats with shortened hydroperiods. Survival in burrows during the dry season was high in the longer-hydroperiod habitats but was zero in the short-hydroperiod habitat where the groundwater level fell more than 1 m. 4. Long-hydroperiod marl prairie may function as sources, whereas short-hydroperiod habitats act as population sinks. Our study suggests that the threshold conditions for preventing mass mortality of crayfish in these wetlands are hydroperiods > 7 months and groundwater levels < 0.5 m below the surface during the dry season. 5. Historical (pre-drainage) hydroperiods appear to be restricted to the longest hydroperiod areas of the marl prairie. This indicates that much of the marl prairie wetlands now function as population sinks for crayfish and other invertebrates. The historical hydropatterns need to be re-established throughout the marl prairie wetlands to achieve the restoration goal of increasing productivity in the aquatic faunal community. © 2001 John Wiley & Sons, Ltd.

1742. **The impact of waterfowl foraging on the decomposition of rice straw: Mutual benefits for rice growers and waterfowl.**
Bird, J. A.; Pettygrove, G. S.; and Eadie, J. M.
Journal of Applied Ecology 37(5): 728-741. (2000)
NAL Call #: 410 J828; ISSN: 0021-8901
Descriptors: agriculture/ ducks/ nitrogen/ straw disposal/ wetland management/ winter habitat
Abstract: 1. Recent legislation in California, USA, has restricted traditional open-field burning of rice straw residues, leading farmers to adopt alternative methods of straw disposal such as post-harvest flooding of rice fields. These changes may benefit wildlife because winter-flooded fallow rice fields provide foraging habitat to migratory waterfowl. In turn, the foraging activity of waterfowl may help to increase rice straw decomposition, providing a reciprocal benefit to farmers. We examined the effects of waterfowl foraging activity on straw decomposition and nitrogen mineralization following rice harvest in a fallow flooded soil. 2. Experimental plots (25 m^2) were established on a silty clay soil and were subjected to two post-harvest treatments: wet-rolled or untilled. Mallard ducks Arias platyrhynchos were placed in one-half of the experimental plots, following a splitplot design, for a 3-week period, at a density equivalent to 33 birds ha-1 over a season of 180 days to approximate regional abundance data. 3. Waterfowl foraging activity increased residual surface straw decomposition by 78% in untilled plots and 18% in wet-rolled plots compared with the respective unforaged plots. Average straw diameter in foraged plots was reduced to one-third that of unforaged plots. 4. Waterfowl foraging and field tillage reduced nitrogen (N) concentrations in the surface straw residue remaining at the end of the winter fallow period. Below-ground organic residue was not affected by waterfowl foraging, indicating that ducks did not incorporate the straw. There were no apparent additions of carbon (C) or N to the soil as a result of waterfowl activity. 5. We conclude that waterfowl foraging can substantially increase straw decomposition in flooded, fallow, rice fields. Accordingly, rice producers should consider agronomic practices that attract waterfowl, such as winter flooding, to maximize the decomposition of rice straw residue. At the upper end of regionally observed waterfowl densities (at or near 33 birds ha-1 season-1) waterfowl foraging activity may alleviate the need for autumn tillage. Shallow flooded rice fields will also provide important winter habitat to migratory waterfowl, aiding wetland management and conservation efforts in the Central Valley of California. 6. These results provide an example of how a mutually beneficial solution can be achieved that provides needed waterbird habitat while concomitantly alleviating an agricultural problem.

1743. **Impacts of center pivot irrigation systems on birds in prairie wetlands.**
Peterson, T. L. and Cooper, J. A.
Journal of Wildlife Management 51(1): 238-247. (1987)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wetlands/ center pivot irrigation/ birds/ nesting/ Minnesota
This citation is from AGRICOLA.

1744. **Impacts of changing irrigation practices on waterfowl habitat use in the southern San Joaquin Valley, California.**
Barnum, D. A. and Euliss, N. H.
California Fish and Game 77(1): 10-21. (1991)
NAL Call #: 410 C12; ISSN: 0008-1078
Descriptors: agricultural runoff/ California/ diurnal variation/ ducks/ irrigation/ Kern National Wildlife Refuge/ population dynamics/ seasonal variation/ ecological effects/ environmental impact/ irrigation effects/ irrigation practices/ San Joaquin Valley/ waterfowl/ habitat use/ hydrology/ water management/ mallards/ northern pintails/ cinnamon teal/ green-winged teal/ northern shovelers/ ruddy ducks
Abstract: Diurnal aerial census data were used to examine habitat use patterns of ducks wintering in the southern San Joaquin Valley, California from 1980-87. Densities (birds/ha) for the northern pintail (Anas acuta), mallard (A. platyrhynchos), green-winged teal (A. crecca), cinnamon teal (A. cyanoptera), shoveler (A. clypeata), ruddy duck (Oxyura jamaicensis), and total ducks, in each of five habitats, were determined--nocturnal habitat use by ducks may be very different than diurnal use and would therefore yield different densities. Low densities were observed for most species on evaporation ponds, hunting clubs and miscellaneous wetlands. Most hunting clubs were small, isolated parcels of wetland with food production limited by cost and availability of irrigation water. The low densities observed on these wetlands suggests that they were not heavily used by wintering ducks. However, hunting clubs provided habitat important for attracting ducks away from contaminated evaporation ponds in September and again in late winter (January-February). Evaporation ponds were not heavily used by ducks, but the large area provided by evaporation ponds may affect use of these habitats in the future. Density for all species, except the ruddy duck, was highest on preirrigated croplands or Kern National Wildlife Refuge (Kern NWR). Ducks such as mallard and teal that use densely vegetated wetlands were probably attracted to the diversity of vegetative cover on Kern NWR. Other species, such as pintail, make use of Kern NWR's managed areas for diurnal feeding and resting. Preirrigated

croplands had the highest density of pintail. The value of these shallow-flooded wetlands with their available waste grains may be similar to that of rice fields in the Sacramento Valley. Moreover, preirrigated fields provided large expanses of open water for diurnal resting locations important to pintail for predator detection.

1745. **Impacts of forest harvest on small ponds and amphibians.**
Wind, Elke
Northwestern Naturalist 87(2): 193. (2006)
NAL Call #: QL671.M8; ISSN: 1051-1733.
Notes: Conference: 2006 Annual Meetings of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society, held jointly at Evergreen State College, Washington, March 27-April 1, 2006.
Descriptors: forests/ amphibians/ Canada/ British Columbia/ riparian buffers/ variable retention harvesting/ ponds
Abstract: Studies have shown that forest harvesting can reduce the abundance of amphibians in terrestrial environments, but few studies have investigated impacts on lentic aquatic habitats. Most amphibian species in the Pacific Northwest live in forests and breed in standing water, often laying their eggs in small, seasonal ponds that offer protection from predation. However, in British Columbia small ponds are not afforded protection under the Forest and Range Practices Act and the effects of forest harvesting on these habitats and he importance of riparian buffers are unknown. In 2002, I began a study with Weyerhaeuser's British Columbia Coastal Group to investigate whether amphibians and small ponds were useful indicators to evaluate the effectiveness of variable retention (VR) harvesting methods at maintaining biodiversity. Weyerhaeuser's VR harvesting methods often result in the retention of tree patches around small ponds, so I initiated a pre- and post-harvest buffer experiment at three forested sites slated for harvest in 2004 to 2005. Results to date suggest that immediately after harvesting, small ponds on southeastern Vancouver Island have longer hydroperiods compared to pre-harvest conditions and that amphibians continue to breed in these habitats, with some species appearing to be attracted to the reduced canopy cover conditions. However, the survival rate of larvae in cutover areas may be reduced based on the detection rate of larvae and metamorphs in harvested versus unharvested areas. As a result, creative retention solutions may be necessary to maintain adequate cover and microclimate conditions for amphibians within harvested landscapes.

1746. **Impacts of marsh management on coastal-marsh bird habitats.**
Mitchell, L. R.; Gabrey, S.; Marra, P. P.; and Erwin, R. M.
Studies in Avian Biology 32: 155-175. (2006)
NAL Call #: QL671.S8.
Notes: 01979922 (ISSN); 0943610702 (ISBN).
Descriptors: disturbance/ impoundment/ marsh endemic/ marsh management/ mosquito control/ open-marsh water management/ prescribed fire/ structural marsh management
Abstract: The effects of habitat-management practices in coastal marshes have been poorly evaluated. We summarize the extant literature concerning whether these manipulations achieve their goals and the effects of these manipulations on target (i.e., waterfowl and waterfowl food plants) and non-target organisms (particularly coastal-marsh endemics). Although we focus on the effects of marsh management on birds, we also summarize the scant literature concerning the impacts of marsh manipulations on wildlife such as small mammals and invertebrates. We address three common forms of anthropogenic marsh disturbance: prescribed fire, structural marsh management, and open-marsh water management. We also address marsh perturbations by native and introduced vertebrates.

1747. **Impacts of water development on aquatic macroinvertebrates, amphibians, and plants in wetlands of a semi-arid landscape.**
Euliss, Ned H. and Mushet, David M.
Aquatic Ecosystem Health and Management 7(1): 73-84. (2004); ISSN: 1463-4988
Descriptors: ecology/ habitat/ land zones/ Amphibia/ Macroinvertebrata: disturbance by man/ wetlands excavation/ impact on communities/ semi arid landscape/ community structure/ impact of water development/ semiaquatic habitat/ wetlands/ water development impact on communities/ North Dakota/ Little Missouri National Grassland/ water development impact on wetland communities/ amphibians/ chordates/ invertebrates/ vertebrates
Abstract: We compared the macroinvertebrate and amphibian communities of 12 excavated and 12 natural wetlands in western North Dakota, USA, to assess the effects of artificially lengthened hydroperiods on the biotic communities of wetlands in this semi-arid region. Excavated wetlands were much deeper and captured greater volumes of water than natural wetlands. Most excavated wetlands maintained water throughout the study period (May to October 1999), whereas most of the natural wetlands were dry by June. Excavated wetlands were largely unvegetated or contained submergent and deep-marsh plant species. The natural wetlands had two well-defined vegetative zones populated by plant species typical of wet meadows and shallow marshes. Excavated wetlands had a richer aquatic macroinvertebrate community that included several predatory taxa not found in natural wetlands. Taxa adapted to the short hydroperiods of seasonal wetlands were largely absent from excavated wetlands. The amphibian community of natural and excavated wetlands included the boreal chorus frog (Pseudacris maculata), northern leopard frog (Rana pipiens), plains spadefoot (Scaphiopus bombifrons), Woodhouse's toad (Bufo woodhousii woodhousii), and tiger salamander (Ambystoma tigrinum). The plains spadefoot occurred only in natural wetlands while tiger salamanders occurred in all 12 excavated wetlands and only one natural wetland. Boreal chorus frogs and northern leopard frogs were present in both wetland types; however, they successfully reproduced only in wetlands lacking tiger salamanders. Artificially extending the hydroperiod of wetlands by excavation has greatly influenced the composition of native biotic communities adapted to the naturally short hydroperiods of wetlands in this semi-arid region. The compositional change of the biotic communities can be related to hydrological changes and biotic interactions, especially predation related to excavation.

1748. **Implications of climate change on marsh bird conservation in Lower Great Lakes coastal wetlands.**
Ingram, J. W.; Meyer, S. W.; and Holmes, K.
Annual Conference on Great Lakes Research 49 (2006)
Descriptors: aquatic plants/ birds/ climate change scenarios/ climate models/ coastal geomorphology/ community composition/ conservation/ ecological distribution/ geomorphology/ water levels/ marshes/ prediction/ species diversity/ water levels/ wetlands/ wetlands vegetation/ Aves/ North America, Great Lakes/ Ontario L./ Erie L./ Pennsylvania, Erie
Abstract: Water level cycles are critical drivers governing coastal wetland distribution, ecological diversity and functioning within the Laurentian Great Lakes. Projections from 2050 climate change scenarios suggest a decline in Great Lakes water levels which may affect the diversity and distribution of current wetland plant and wildlife communities. Wetland vegetation and bird community predictive models were used to estimate impacts on community structure due to reductions in mean annual water levels for Lakes Ontario and Erie. Shoreline alteration and coastal geomorphology will strongly affect the ability of current wetland communities to respond and persist under declining water level scenarios. Existing wetland conservation projects and future Great Lakes coastal wetland conservation programs need to consider climate change scenarios to ensure that actions taken in the next 10 years remain good conservation decisions into the future.

1749. **The importance of beaver to wetland habitats and waterfowl in Wyoming.**
McKinstry, M. C.; Caffrey, P.; and Anderson, S. H.
Journal of the American Water Resources Association 37(6): 1571-1577. (2001)
NAL Call #: GB651.W315; ISSN: 1093474X
Descriptors: beavers/ Castor canadensis/ waterfowl/ wetlands/ Wyoming/ biodiversity/ drainage/ land use/ managers/ plants (botany)/ ponding/ wetland habitats/ wetlands/ keystone species/ restoration ecology/ riparian zones/ rodents
Abstract: Beaver (Castor canadensis) are habitat-modifying keystone species, and their activities broadly influence many other plants and animals. Beaver are especially important to waterfowl in the western U.S. where riparian and wetland habitats comprise less than 2 percent of the landscape yet provide habitat for greater than 80 percent of wildlife species. Wyoming is currently ranked sixth of the 50 states in the size of its breeding waterfowl population, and beaver ponds may play a significant role in providing habitat for these birds. The objectives of this research were to: (1) identify streams in Wyoming where beaver are currently present, extirpated, or used to manage riparian habitat; (2) identify areas where beaver could be relocated to create wetlands and improve riparian habitat; (3) compare wetland surface areas between areas that have beaver with those that did not; and (4) compare waterfowl numbers in areas with and without beaver. Using a survey of 125 land managers in Wyoming, we found that beaver have been removed from 23 percent (6,497 km) of the streams for which managers had direct knowledge (28,297 km). The same managers estimated that there are over 3,500 km of streams where beaver could improve habitat conditions. The riparian width in streams with beaver ponds averaged 33.9 m (95 percent CI = 25.1-42.7 m) in contrast to 10.5 m (CI = 8.6-12.4 m) in streams without beaver. During waterfowl surveys we counted 7.5 ducks/km (CI = 0.9-14.4 ducks/km) of stream in areas with beaver ponds and only 0.1 ducks/km (no CIs calculated) of stream in similar areas without beaver present. Beginning in 1994, we restored beaver to 14 streams throughout Wyoming in an effort to create wetlands and improve riparian habitat. Waterfowl have been quick to respond to these important habitats. We feel that beaver restoration and management can be used to improve habitat in drainages where conflicts with other land uses are minimal.

1750. **Importance of grasslands in waterfowl conservation in the Prairie Pothole Region.**
Thoroughgood, P.; Edwards, C.; Guyn, K.; and Devries, J.
Canadian Journal of Plant Science 87(3): 529. (2007)
NAL Call #: 450 C16; ISSN: 0008-4220.
Notes: Conference: Annual Conference of the Canadian Society of Agronomy/Canadian Society for Horticultural Science/Canadian Society of Animal Science, Halifax, CANADA; August 01 -04, 2006.
Descriptors: nutrition/ wildlife management: conservation/ animal care/ wildlife habitat/ economic reality/ bird breeding/ perennial forage/ prairie grassland/ beef producers/ large scale forage conservation
Abstract: Prairie grasslands are a vital component of Canada's natural capital and provide numerous ecological goods and services; including wildlife habitat. Beef producers are the primary stewards of these grasslands and have an important role in wildlife conservation. Research conducted by Ducks Unlimited Canada has shown that perennial forage, including hay, tame pasture and native rangeland, provides attractive and productive habitat for upland nesting waterfowl. The Prairie Pothole Region (PPR) supports about 52% of the continental duck population, thus changes in perennial forage acreage in the PPR significantly impacts breeding waterfowl populations in North America. In this presentation, DUC provides an explanation of the importance of perennial forage crops to breeding waterfowl. It demonstrates that Government and market forces that change the economic reality of beef production can have a direct impact on waterfowl and other wildlife. We will examine programs such as Agriculture and Agri-Food Canada's Permanent Cover Program and, more recently, Greencover Canada, to demonstrate the benefits that large-scale forage conversion has on PPR waterfowl productivity.

1751. **The importance of local and regional factors in predicting effective conservation: Planning strategies for wetland bird communities in agricultural and urban landscapes.**
Whited, Diane; Galatowitsch, Susan; Tester, John R.; Schik, Karen; Lehtinen, Rick; and Husveth, Jason
Landscape and Urban Planning 49(1-2): 49-65. (2000)
NAL Call #: QH75.A1L32; ISSN: 0169-2046
Descriptors: wildlife management: conservation/ agricultural landscapes/ conservation effectiveness: local factors, regional factors/ urban landscapes/ wetland communities

Abstract: Wetland assessment techniques have generally focused on rapid evaluations of local and site impacts; however, wetland biodiversity is often influenced both by adjacent and regional land use. Forty wetlands were studied in the Red River Valley (RRV), Southwest Prairie (SWP), and the Northern Hardwood Forest (NHF) ecoregions of Minnesota, USA, to assess the strength of association between local and landscape condition and avian community composition. We examined the relationship between bird assemblages and local and landscape factors (connectedness, isolation, road density, and site impacts). Landscape variables were calculated for three spatial scales at 500 m (79 ha), 1000 m (314 ha), and 2500 m (1963 ha). Connectedness and road density are important measures for predicting bird assemblages in both agricultural ecoregions (SWP and RRV). Connectedness and its relationship with wetland bird assemblages were most pronounced at the larger scale (2500 m), where the largest remnant patches can be discerned. In contrast, road effects on bird assemblages were most pronounced at the smallest scale (500 m). Wetland isolation corresponded to bird community patterns as well, but only in one ecoregion (SWP). In the urbanizing ecoregion (NHF), species richness was considerably lower than elsewhere but community patterns did not correspond to landscape variables. The focus of wetland conservation planning needs to shift from the site scale to the landscape scale to ensure that connection with the regional wetland pattern is accounted for, therefore, affording the best opportunity to successfully maintain wetland avian diversity.

1752. **The importance of playa wetlands to biodiversity of the Southern High Plains.**
Haukos, David A. and Smith, Loren M.
Landscape and Urban Planning 28(1): 83-98. (Feb. 1994)
NAL Call #: QH75.A1L32; ISSN: 0169-2046
Descriptors: comprehensive zoology/ farming and agriculture/ threats to playa wetland habitats/ habitat management/ conservation/ New Mexico/ Texas/ species diversity/ playa wetlands/ semiaquatic habitat/ prairie biodiversity/ grasslands/ prairie/ chemical pollution/ Southern High Plains

1753. **The importance of winter floods to mallards in the Mississippi Alluvial Valley.**
Heitmeyer, M. E.
Journal of Wildlife Management 70(1): 101-110. (2006)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: Anas platyrhynchos/ body composition/ bottomland hardwood wetlands/ carrying capacity/ floods/ food habits/ mallard/ Mississippi Alluvial Valley/ prebasic molt/ time budgets
Abstract: Winter flooding of bottomland hardwood (BLH) floodplains in the Mississippi Alluvial Valley (MAV) causes dynamic availability of resources to wintering mallards (Anas platyrhynchos). The effect of changing resource availability on mallard body condition and timing of life-cycle events are important considerations for waterfowl habitat conservation planning in the MAV. During a study of mallards wintering in the Mingo Basin of southeastern Missouri, USA, I collected data on population size, habitat use, behavior, food habits, body composition, and chronology of the prebasic molt during 2 major flood events in 1982. I also analyzed winter (Dec-Feb) hydrological data for 14 rivers in the MAV from 1939-1940 to 1998-1999 to provide a perspective on variation of winter flooding in this ecosystem. Winter floods in the Mingo Basin precipitated ecological events that benefited mallards. During floods, mallards redistributed to shallowly flooded (<50cm) live forest dominated by red oaks (Quercus spp.), increased daily foraging time by up to 8×, consumed 170-222 g dry weight of food/day, increased consumption of animal matter by up to 14×, gained fresh body and lipid mass, and initiated the prebasic molt. Winter flooding of major rivers in the MAV during 1939-1940 to 1998-1999 was highly variable among locations and years. An average of 6.7 ± 2.1 (±SE) and 5.1 ± 1.9 of 17 river gage stations were flooded >5 and >10 days/winter, respectively. Mallards increased daily food consumption by 33-39% over daily existence energy (DEE) levels during floods. These data suggest that previous estimates of foraging carrying capacity in MAV habitats (and other wintering and migration areas where significant fat deposition occurs) using only DEE-based daily food consumption estimates may be overestimated. Consequently, habitat and acre goals set by North American Waterfowl Management Plan Joint Ventures for these areas may be greatly underestimated. The evolutionary adaptations of mallards seem influenced by timing, duration, and extent of winter flooding in the MAV. Efforts to protect the integrity of MAV rivers, associated floodplain habitats, and their winter flow and flooding regimes are critical for sustaining local, regional, and continental mallard populations.

1754. **Improving the cost-effectiveness of ecosystem management: An application to waterfowl production.**
Rashford, B. S. and Adams, R. M.
American Journal of Agricultural Economics 89(3): 755-768. (2007); ISSN: 00029092.
Notes: doi: 10.1111/j.1467-8276.2007.00984.x.
Descriptors: cost minimization/ simulation/ waterfowl/ wildlife management
Abstract: Species conservation is an important global policy issue. The design of cost-effective species conservation programs requires resource managers to choose from a suite of conservation activities and sites. This article determines cost-effective conservation strategies for waterfowl using a bioeconomic modeling framework, which is developed using a biological simulation model for waterfowl and regression analysis. The model accounts for (a) a broad range of land-use and direct wildlife conservation activities, (b) the effect of landscape heterogeneity, and (c) interactions between conservation activities. Results indicate that accounting for the three factors listed above can improve the cost-effectiveness of waterfowl conservation on agricultural land. © 2007 American Agricultural Economics Association.

1755. **Indicators of wetland condition for the Prairie Pothole Region of the United States.**
Guntenspergen, G. R.; Peterson, S. A.; Leibowitz, S. G.; and Cowardin, L. M.
Environmental Monitoring and Assessment 78(3): 229-252. (2002)
NAL Call #: TD194.E5; ISSN: 0167-6369
Descriptors: birds/ ecosystems/ prairies/ wetlands/

grasslands/ farmland/ upland habitat/ wildlife-habitat relationships/ habitat management/ habitat surveys/ monitoring/ remote sensing/
United States, north central region
Abstract: The authors describe a study designed to evaluate the performance of wetland condition indicators of the Prairie Pothole Region (PPR) of the north central United States. Basin and landscape scale indicators were tested in 1992 and 1993 to determine their ability to discriminate between the influences of grassland dominated and cropland dominated landscapes in the PPR. Paired plots were selected from each of the major regions of the PPR. Among the landscape scale indicators tested, those most capable of distinguishing between the two landscapes were: 1) frequency of drained wetland basins, 2) total length of drainage ditch per plot, 3) amount of exposed soil in the upland subject to erosion, 4) indices of change in area of wetland covered by water, and 5) number of breeding duck pairs. Basin scale indicators including soil phosphorus concentrations and invertebrate taxa richness showed some promise; however, plant species richness was the only statistically significant basin scale indicator distinguishing grassland dominated from cropland dominated landscapes. Although this study found a number of promising candidate indicators, one of the authors' conclusions is that basin scale indicators present a number of implementation problems, including: skill level requirements, site access denials, and recession of site access by landowners. Alternatively, they suggest that the use of landscape indicators based on remote sensing can be an effective means of assessing wetland integrity.

1756. **Indirect effects of feral horses on estuarine communities.**
Levin, P. S.; Ellis, J.; Petrik, R.; and Hay, M. E.
Conservation Biology 16(5): 1364-1371. (2002)
NAL Call #: QH75.A1C5; ISSN: 08888892.
Notes: doi: 10.1046/j.1523-1739.2002.01167.x.
Descriptors: biodiversity/ estuarine ecosystem/ feral organism/ saltmarsh/ ungulate/ Animalia/ Aves/ Decapoda (Crustacea)/ Equidae/ Equus caballus/ Pisces/ Spartina/ Ungulata
Abstract: Livestock have grazed on salt marshes for centuries and have dramatic effects on marsh vegetation. Most studies examining the effects of livestock on salt marshes have focused on the effects on plants rather than on salt marsh fauna or ecological processes. However, grazers such as feral horses may have strong indirect effects on communities by altering the habitat, making it more or less suitable for species that potentially occur there. We evaluated the indirect effects of grazing by feral horses on estuarine animals that use salt marshes and adjacent subtidal communities. Surveys revealed that horse-grazed marshes had less vegetation, a higher diversity of foraging birds, higher densities of crabs, and a lower density and species richness of fishes than marshes not grazed by horses. In addition, fish density was reduced in subtidal habitats adjacent to grazed marshes. Experiments manipulating marsh vegetation indicated that the potential for predation on fishes in ungrazed marshes was higher than in grazed marshes. Results of additional experiments in which fishes were enclosed with or without artificial Spartina suggested that the removal of shelter provided by marsh vegetation results in behavioral shifts by fishes that make them more susceptible to predation. Although large herbivores are naturally absent from extant salt marsh ecosystems, such large herbivores were common members of Pleistocene communities. Using modern horses as surrogates for extinct ungulates, we hypothesize that large herbivores could have had strong indirect effects on Pleistocene estuarine habitats. We argue that both the modern introduction of ungulates to salt marshes, and the prehistoric elimination of large herbivores affected estuarine biodiversity.

1757. **Infaunal assemblages on constructed intertidal mudflats at Jonesport, Maine (USA).**
Ray, G. L.
Marine Pollution Bulletin 40(12): 1186-1200. (2000); ISSN: 0025326X.
Notes: doi: 10.1016/S0025-326X(00)00083-7.
Descriptors: benthos/ community structure/ dredged material/ habitat construction/ Maine/ mudflat/ biomass/ constructed wetland/ species diversity/ species richness/ benthic environment/ biodiversity/ biomass/ dredging/ ecology/ environmental protection/ sediment/ United States/ Ovis aries
Abstract: Dredged materials have been used to construct two mudflats near Jonesport, Maine (USA). A flat at Sheep Island was constructed in 1989 and along with an adjacent reference area (REF) has been monitored for infaunal assemblage development and sediment texture since 1990. The second site, Beals Island, an example of a much older constructed flat (CF), has been monitored since 1991. Infaunal taxa richness, total numerical abundance, species composition, and diversity values were similar between the Sheep Island natural and constructed sites within two years of construction. At Beals Island, taxa richness and other diversity measures were similar between sites, however, abundance and total biomass values were lower at the constructed site. Although total biomass was also lower at the Sheep Island CF than its REF, biomass values at both constructed sites (Sheep Island and Beals Island) were within the range of values previously reported for natural flats.

1758. **Influence of agriculture on aquatic invertebrate communities of temporary wetlands in the Prairie Pothole Region of North Dakota, USA.**
Euliss, N. H. and Mushet, D. M.
Wetlands 19(3): 578-583. (1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ land use/ agriculture/ prairies/ cultivated lands/ agricultural practices/ invertebrates/ environmental impact/ aquatic communities/ temporary ponds/ cladocera/ Invertebrata/ North Dakota/ Prairie Pothole Region/ water fleas
Abstract: We evaluated the influence of intensive agriculture on invertebrate communities of temporary wetlands as indicated by aquatic invertebrate resting eggs, shells, and cases remaining after wetlands dried. To facilitate the comparison, we sampled 19 wetlands within cropland areas and 19 wetlands within grassland areas. We found resting eggs, shells, and cases of significantly more taxa and greater numbers of cladoceran resting eggs (ephippia), planorbid and physid snail shells, and ostracod shells in wetlands within grasslands than in croplands. We

also successfully incubated greater numbers of cladocerans and ostracods from soil samples collected from grassland sites. We were unable to detect differences in the viability of cladoceran ephippia between grassland and cropland wetlands, but our sample size was small due to an absence of ephippia in most cropland wetlands sampled; 74% of the cropland wetlands were devoid of cladoceran ephippia whereas ephippia were well represented in nearly all of our grassland sites. Our results corroborate findings of other investigators that prairie pothole wetlands have been negatively impacted by human activities. Our study demonstrates that aquatic invertebrates of temporary wetlands have been negatively impacted by intensive agriculture and suggests that future studies need to assess the influence of agricultural practices on wetland-dependant wildlife.

1759. **Influence of cattle grazing and pasture land use on macroinvertebrate communities in freshwater wetlands.**
Steinman, A. D.; Conklin, J.; Bohlen, P. J.; and Uzarski, D. G.
Wetlands 23(4): 877-889. (2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: community structure/ species richness/ nutrient concentrations/ water column/ wetlands/ freshwater environments/ grazing/ stocking rates/ land use/ pasture/ pastures/ invertebrates/ nutrients/ cattle/ livestock/ environmental effects/ ostracods/ macroinvertebrates/ midges/ bioindicators/ eutrophication/ aquatic insects/ freshwater crustaceans/ zoobenthos/ population structure/ community composition/ species diversity/ biotic factors/ dominant species/ aquatic plants/ stocking density/ stocks/ agriculture/ indicator species/ pollution indicators/ Invertebrata/ Culicidae/ Juncus effusus/ Polygonum/ Panicum hemitomon/ Florida/ cattle/ cattle stocking/ mosquitoes
Abstract: Responses of wetland abiotic variables and aquatic invertebrate community structure to cattle stocking density, pasture type, and dominant vegetation were evaluated in subtropical pastures. Cattle were stocked at four treatment levels on improved (fertilized) and semi-native (unfertilized) pastures in south-central Florida, USA. Improved pasture wetlands were dominated either by Panicum hemitomon (maidencane) or by a mixture of Polygonum spp. (smartweed) and Juncus effusus; semi-native pasture wetlands were dominated mainly by maidencane. Cattle stocking density had few significant effects on water-column nutrient concentration or invertebrate community structure. However, water-column nutrient concentrations were significantly greater in the wetlands on improved pastures compared to semi-native pastures. Invertebrate richness and diversity were greater in wetlands on semi-native pastures than on improved pastures, despite lower nutrient concentrations in the former. Overall, the cattle stocking treatment had little impact on invertebrate community structure in these systems relative to prior pasture land use. However, vegetation type influenced invertebrate communities and explained some of the differences between pasture types. Semi-native (lower nutrient) wetland pastures dominated by maidencane had significantly greater invertebrate richness and diversity than improved (higher nutrient) wetland pastures dominated by mixed vegetation but showed no difference when compared to improved wetland pastures dominated by maidencane. Chironomids were the dominant invertebrate in wetlands of both pasture types. Correspondence analysis revealed that ostracods and Culicidae larvae might be useful as bioindicators of subtropical wetlands that are experiencing cultural eutrophication.

1760. **Influence of flood waters on survival, reproduction, and habitat use of white-tailed deer in the Florida Everglades.**
MacDonald-Beyers, K. and Labisky, R. F.
Wetlands 25: 659-666. (Sept. 2005)
NAL Call #: QH75.A1W47
Descriptors: Odocoileus virginianus/ wildlife/ wildlife habitats/ floods/ hydrology/ wetlands/ ecosystem management/ anthropogenic activities/ water flow/ ecological restoration/ surface water level/ depth/ population ecology/ population dynamics/ Florida/ Everglades/ aquatic biology and ecology animals/ animal ecology and behavior/ water resources and management/ natural resources, environment, general ecology, and wildlife conservation/ meteorology and climatology
This citation is from AGRICOLA.

1761. **Influence of grazing systems on waterfowl production.**
Hertel, D. and Barker, W. T.
Proceedings of the North Dakota Academy of Science 41(79): 6. (1987)
NAL Call #: 500 N813; ISSN: 0096-9214
Descriptors: cattle/ waterfowl/ grazing/ range management/ wildlife management/ North Dakota
This citation is from AGRICOLA.

1762. **Influence of land use on postmetamorphic body size of playa lake amphibians.**
Gray, M. J. and Smith, L. M.
Journal of Wildlife Management 69(2): 515-524. (2005)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wetlands/ body size/ grasslands/ reproduction/ conspecifics/ rainfall/ drift/ land use/ amphibiotic species/ hydrology/ playas/ habitat improvement/ growth rate/ Spea multiplicata/ Bufo cognatus/ Ambystoma tigrinum mavortium/ Southern High Plains/ Great Plains toad/ barred tiger salamander
Abstract: Agricultural land use may indirectly affect the body size of amphibians by altering the hydroperiods of nearby wetlands and influencing amphibian densities-both factors which can limit the larval and postmetamorphic growth rates of amphibians. We measured postmetamorphic body size for 4 species (Spea multiplicata, S. bombifrons, Bufo cognatus, Ambystoma tigrinum mavortium) and 3 age classes (metamorph, subadult, adult) of amphibians captured at playa wetlands surrounded by one of 2 general land-use types (cultivation, grassland) in the Southern High Plains. Sixteen playas (4 per land-use type in 1999 and 2000) were partially enclosed with drift fence and pitfall traps, and mass and snout-vent length (SVL) were measured from a subsample of captured individuals. Mass and SVL were 10-148% greater for amphibians captured at grassland wetlands than at cropland wetlands for most species and age classes. Mass and SVL also were 3-124% greater in 1999 than in

2000 for most species and age classes. We attribute differences in body size between land-use types to differences in the hydroperiods of the associated wetlands, and potentially to variation in the density of terrestrial conspecifics and aquatic predators. We attribute differences in body size between years to differences in rainfall. Body size is positively related to the probability of survival, reproduction, and evolutionary fitness in amphibians. Thus, if cultivation of landscapes surrounding wetlands negatively influences postmetamorphic body size of amphibians, restoration of native grasslands surrounding playa wetlands may help prevent local amphibian declines.

1763. **Influence of wetland age on bird use of restored wetlands in Iowa.**
Vanrees-Siewert, K. L. and Dinsmore, J. J.
Wetlands 16(4): 577-582. (1996)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ habitat improvement/ reclamation/ aquatic birds/ breeding sites/ evaluation/ species diversity/ environmental restoration/ habitat utilization/ environmental quality/ birds/ habitats/ waterfowl/ Iowa/ evaluation/ breeding sites/ Aves
Abstract: A goal of wetland restoration is to provide habitat for breeding populations of waterfowl and other bird species. To meet this goal, it is important to determine how birds respond to restored wetlands and which factors influence their use of restored wetlands. We examined the relationship between bird species richness and years since restoration at restored prairie wetlands in Iowa. We detected 42 bird species in restored wetlands, 15 of which were breeding species. The mean number of breeding bird species was significantly greater in older restored wetlands (4.3 species in 1-year-old wetlands, 7.2 species in 4-year-old wetlands, $P = 0.005$). The mean number of all bird species, waterfowl species, and breeding waterfowl species did not change with wetland age. Total and breeding bird species richness increased with percent cover of emergent vegetation. Waterfowl species richness and breeding waterfowl species richness were influenced more by wetland area than vegetation characteristics, whereas total species richness and breeding bird species richness were influenced more by vegetation characteristics. If the goal of restoration is simply to provide a breeding site for waterfowl, our data suggest that this can be done in a few years. However, we favor longterm restorations. Such restorations are more likely to have a more diverse bird community that more closely resembles those found in natural wetlands.

1764. **Influences of riparian logging on plants and invertebrates in small, depressional wetlands of Georgia, USA.**
Batzer, D. P. Jackson, C. R. ; and Mosner, M.
Hydrobiologia 441(1-3): 123-132. (2000)
NAL Call #: 410 H992; ISSN: 0018-8158
Descriptors: wetlands/ logging/ plants/ Georgia/ pine trees/ invertebrates/ ecological effects/ water temperature/ biomass/ vegetation/ hydrogen ion concentration/ ecosystem disturbance/ man-induced effects/ forest industry/ aquatic plants/ long-term changes/ environmental conditions/ biota/ ecosystem management/ riparian environments/ population-environment relations/ human impact/ forestry/ aquatic organisms/ environmental impact/ environmental changes/ ecology/ daphnia/ Oligochaeta/ Invertebrata/ pinus/ plantae/ pine/ oligochaetes/ angleworms/ earthworms/ pines
Abstract: We studied 12 small, seasonally flooded, depressional wetlands on the Atlantic Coastal Plain of Georgia, U.S.A. Each wetland was embedded in stands of managed plantation pine. The pine trees surrounding each wetland had been harvested and replanted beginning in 1997 (2 sites), 1995 (2 sites), 1993 (1 site), 1988 (2 sites), 1984 (2 sites) or 1975 (3 sites). Regressions of various environmental variables with harvest histories indicated that those wetlands surrounded by smaller trees had greater light levels, water temperatures, pH, herbaceous plant cover and biomass, terrestrial invertebrate diversities and numbers, and water flea numbers, and lower water electrical conductivities and aquatic oligochaete numbers than those wetlands surrounded by more mature trees. Detected variations in hydroperiod, water depth, dissolved oxygen levels, sediment inputs, macrophyte diversity, periphyton biomass and densities of most aquatic invertebrates were not clearly correlated with past histories of peripheral tree harvest. This study suggests that harvesting trees around small wetlands initiates physical and ecological changes within the embedded habitats and that changes can persist for up to 15 years.

1765. **Initial response of fishes to marsh restoration at a former salt hay farm bordering Delaware Bay.**
Able, K. W.; Nemerson, D. M.; Light, P. R.; and Bush, R. O.
In: Concepts and controversies in tidal marsh ecology/ Weinstein, Michael P. and Kreeger, Daniel A.
Dordrecht: Kluwer Academic Publishers, 2000; pp. 749-773.
Descriptors: conservation measures/ biometrics/ ecology/ population dynamics/ habitat/ brackish habitat/ marine zones/ Atlantic Ocean/ North Atlantic/ Pisces: habitat management/ habitat restoration/ size/ community structure/ population size/ salt marsh restoration effects/ salt marsh/ restoration/ initial responses/ North West Atlantic/ New Jersey/ Delaware Bay/ Initial responses to salt marsh restoration/ Pisces/ chordates/ fish/ vertebrates
Abstract: The success of salt marsh restoration, especially as it relates to the structural and functional role of fish populations, is poorly defined. In order to evaluate the effectiveness of the restoration of a former salt hay farm toward a functional marsh, we monitored the fish response to the restoration (resumed tidal flow, creation of creeks) from September 1996 to November 1997 and compared that to the prerestoration condition. During the post-restoration period we compared fish species richness, abundance, composition and size during the spring, summer and fall between the restored site and an adjacent reference marsh with similar physical characteristics (temperature, salinity, dissolved oxygen, depth, distance from the bay). Fish populations, primarily young-of-the-year, were characterized at both sites by monthly sampling with replicate (4 tows per site, 2 sites in each of two creeks) daytime otter trawls (4.9 m, 6 mm cod end mesh, n=375 two-minute tows) in large marsh creeks and with weirs (2.0 m×1.5 m×1.5 m, with 5.0 m×1.5 m wings, 6.0 mm mesh, n=48) in smaller intertidal marsh creeks (2 sites in the restored marsh, 4 sites in reference marshes). Based on these observations, fish abundance was greater in the

restored creeks while species richness, species composition, and average size of fishes were similar to the reference site. An analysis of fish assemblages at the same sites indicated that the reference and restored marshes were similar for large and small marsh creeks. Where differences occurred it was often the result of greater abundances of selected species at the restored marsh. Also, during this period the standing stock at the restored marsh may have exceeded that for the reference marsh. Thus, it appears that the fish responded quickly to the restoration.

1766. **Integrated management of waterbird habitats at impounded wetlands in Delaware Bay, U.S.A.**
Parsons, K. C.
Waterbirds 25(SPECIAL PUBL.2): 25-41. (2002)
NAL Call #: QL671; ISSN: 07386028
Descriptors: Delaware Bay/ drawdown/ impoundments/ waterbirds/ wetland management/ drawdown/ habitat management/ impoundment/ integrated approach/ waterfowl/ wetland/ United States
Abstract: Most streams in the upper Delaware Bay U.S.A. drainage have been impounded either historically or at present to accommodate a variety of wetland management objectives. Long-term impoundment has resulted in loss of wetland function and biodiversity. Nevertheless, extensive wetlands in Salem County, New Jersey and New Castle County, Delaware provide habitat for many important waterbirds, including breeding wading birds, migratory shorebirds, and waterfowl. Public and private agencies in both states have initiated wetland restoration programs to improve habitat values for multiple waterbird groups. I conducted wetland studies in nine streams to examine patterns of waterbird use to 1) identify water level management practices that promote waterbird utilization, and 2) develop guidelines for resource managers to meet integrated wetland management objectives. A total of 62 species (32,100 individuals) of wading birds, waterfowl, shorebirds, seabirds, marshbirds, and raptors was recorded April-July, 1993-1996 and 2000 during weekly observations. Most waterbird groups were more abundant at impounded sites than at tidal sites in streams. In addition, the use of streams within the region varied for all waterbird groups indicating that some streams were highly utilized while at others, relatively few waterbirds were present. Water level management regime was an important factor in determining waterbird use. Wading birds were most abundant at wetlands undergoing a mid-season drawdown at which time many locally-breeding species were meeting adult and nestling food requirements. Waterfowl were more abundant at wetlands with relatively high water levels in early spring compared to levels later in the season, which coincided with duck migration. Migratory shorebirds were most abundant on wetlands with relatively low water levels during May. Results 1) confirm the need for variably-managed wetland mosaics which provide habitat at a variety of water levels and 2) identify the importance of timing of drawdown in meeting the foraging needs of multiple waterbird groups.

1767. **Integrated management of waterbirds: Beyond the conventional.**
Erwin, R. M.
Waterbirds 25(Special Publ.2): 5-12. (2002)
NAL Call #: QL671; ISSN: 07386028
Descriptors: impoundments/ landscape scale/ refuges/ shorebirds/ wading birds/ waterfowl/ wetland and waterbird management/ conservation management/ habitat management/ integrated approach/ waterfowl/ wetland
Abstract: Integrated waterbird management over the past few decades has implicitly referred to methods for managing wetlands that usually attempt to enhance habitat for taxonomic groups such as shorebirds and wading birds, in addition to waterfowl, the traditional focus group. Here I describe five elements of integration in management: taxonomic, spatial, temporal, population and habitat, and multiple-use management objectives. Spatial integration simply expands the scale of management concern. Rather than emphasizing management on a very limited number of impoundments or wetlands in small refuges or wildlife management areas, the vision is beginning to shift to connectivity within larger landscapes on the order of many square kilometers as telemetry data on daily and seasonal movements for many species become available. Temporal integration refers to the potential for either simultaneous management for waterbirds and commercial "crops" (e.g., crayfish and rice) or for temporally-staggered management such as row crop production in spring-summer growing seasons and waterbird management on fallow fields in the non-growing (winter) season. Integrating population dynamics with habitats has become a major research focus over the past decade. Identifying which wetlands are "sources" or "sinks" for specific populations provides managers with critical information about effective management. Further, the applications of spatially explicit population models place heavy demands on researchers to identify use patterns for breeding and dispersing individuals by age, sex, and reproductive class. Population viability analysis models require much the same information. Finally, multiple-use management integration refers to trying to optimize the uses of wetlands, when only one (perhaps secondary) use may include waterbird management. Depending upon the ownership and primary land use of a particular parcel of land containing wetlands and/or water bodies, managing for waterbirds may be an "easy sell" (e.g., public natural resource lands) or a very contentious one, where wetlands are created for industrial, aquaculture or urban uses. In the latter case, careful planning and implementation require broad stakeholder participation and education.

1768. **Integrating shorebird habitat needs with water management efforts at the Laguna Atascosa National Wildlife Refuge, Texas.**
Fernandez, Marie Kathryn
Kingsville, TX: Texas A&M University - Kingsville, 2000.
Notes: Degree: MS; Advisor: Smith, Steven A.
Descriptors: wetlands/ shorebirds/ winter/ habitat management/ migration/ water level/ seasons/ lowland/ habitat use/ Laguna Atascosa National Wildlife Refuge/ Texas

Abstract: The lower Laguna Madre area and adjacent wetlands, including those found at the Laguna Atascosa National Wildlife Refuge in coastal southern Texas, provide important wintering and spring stopover habitat for migratory shorebirds. During winter-spring of 1996 and 1997, shorebird migration chronology and habitat use were studied on a 2,024 ha impoundment system at the Laguna Atascosa National Wildlife Refuge. The purpose of this study was to provide recommendations for shorebird management during winter and spring in conjunction with current management practices for waterfowl. Twenty-six species of shorebirds were documented in the first winter-spring field season and eighteen species in the second field season. The most abundant shorebird group was the semipalmated/western sandpiper Calidris pusilla/ C. mauri. Wintering shorebirds and early migrants were present at the initiation of the study period each year. Peak migration of shorebirds (based on numbers) appears to fall between mid-March and the end of April. Great variability occurs from year to year due to fluctuating water conditions. Shorebirds foraged primarily on wet mud or in shallow water and did not use vegetated areas to a great extent. Shorebird presence was directly related to water level. High water levels resulted in inaccessibility of prey to many foraging shorebirds or water depths too deep to be utilized by shorebirds. Dry mudflats were not used by most shorebirds, with the exception of long-billed curlew Numenius americanus, willet Catoptrophorus semipalmatus and plovers Pluvialis sp. and Charadrius spp.).

1769. **Interactive effects of animal disturbance and elevation on vegetation of a tidal freshwater marsh.**
Baldwin, A. H. and Pendleton, F. N.
Estuaries 26(4 A): 905-915. (2003)
NAL Call #: GC96.E79; ISSN: 01608347
Descriptors: community composition/ disturbance/ elevation/ saltmarsh/ vegetation structure/ United States/ Bidens laevis/ Zizania aquatica
Abstract: We studied interactions between animal disturbance (geese, carp, and muskrat) and elevation in a field experiment in tidal freshwater marshes of the Patuxent River, Maryland, United States. Vegetation changes were recorded in fenced and unfenced plots in high and low marsh community types for 2 yr using measurements of areal cover and within-plot frequency (which were averaged to create a dominance index), Leaf Area Index (LAI), and aboveground biomass. We related light environment to differences in vegetation using below-canopy measurements of Photosynthetically Active Radiation (PAR). In the low marsh, total cover of all species, cover of annual species, biomass, and LAI were significantly higher in plots fenced to exclude animals (exclosures) than in unfenced plots (fenced/unfenced total cover = 76/40%, annual cover = 45/10%, biomass = 936/352 g m-2, LAI = 3.3/1.4). PAR was significantly lower in fenced than unfenced plots (fenced/unfenced = 115/442 μ mol s-l m -2). Despite the strong effect of fencing on biomass, species richness per plot (i.e., the number of species per plot, or species density) was not affected significantly by fencing in the low marsh. Most of the observed differences in cover, biomass, LAI, and PAR were due to variation in the abundance of the herbaceous annual species Bidens laevis (dominance index fenced/unfenced = 45/10%) and Zizania aquatica (30/12%). In the high marsh community, fencing had only minor effects on plant community composition and did not significantly affect species richness, cover, biomass, PAR, or LAI. Our results show that animals can dramatically affect low marsh vegetation, primarily via physical disturbance or herbivory of shallowly rooted seedlings of annual species.

1770. **Interspecific differences in habitat use of shorebirds and waterfowl foraging in managed wetlands of California's San Joaquin Valley.**
Isola, C. R.; Colwell, M. A.; Taft, O. W.; and Safran, R. J.
Waterbirds 23(2): 196-203. (2000)
NAL Call #: QL671; ISSN: 1524-4695
Descriptors: bottom topography/ foraging/ habitat use/ interspecific differences/ managed wetlands/ water depth
Abstract: A common wetland management objective is to provide habitat for a diverse assemblage of species, which requires data on interspecific differences in habitat use. Consequently, we studied habitat use by ten water-bird taxa (four dabbling ducks and six shorebirds) foraging in managed, seasonal wetlands in the northern San Joaquin Valley, California during late winter and early spring of 1994 and 1995. A MANOVA analysis detected strong interspecific differences in habitat use, with water depth explaining 86% of differences among taxa in a discriminant function analysis. ANOVA identified four groups based on similarities in use of water depth: 1) small shore-birds (<5 cm): 2) large shorebirds (5-11 cm); 3) teal (10-15 cm); and large dabbling ducks (>20 cm). Among these groups, variation in water depth at foraging locations increased with size, suggesting that water depth constrained foraging by shorebirds and teal more than larger waterfowl. In California's Central Valley, where large numbers of shorebirds and waterfowl winter, our findings suggest that managers can provide habitat for shorebirds and water-fowl by reducing the average depth to which habitats are flooded, especially during winter when deep-water habitat is abundant. Within a wetland complex or an individual wetland, this prescription will yield greatest diversity of water depth, and, hence, bird use in wetlands characterized by variable bottom topography.

1771. **Invertebrate assemblages and trace element bioaccumulation associated with constructed wetlands.**
Nelson, S. M.; Roline, R. A.; Thullen, J. S.; Sartoris, J. J.; and Boutwell, J. E.
Wetlands 20(2): 406-415. (June 2000)
NAL Call #: QH75.A1W47
Descriptors: dissolved oxygen/ bioaccumulation/ community structure/ trace elements/ artificial wetlands/ invertebrates/ wetlands/ wastewater treatment/ heavy metals/ aluminum/ arsenic/ selenium/ aluminium/ plant populations/ vegetation cover/ aquatic plants/ community composition/ animals (invertebrates)/ Invertebrata/ Potamogeton/ Scirpus
Abstract: Invertebrate assemblages were studied in eight monoculture wetland mesocosms constructed for wastewater treatment. Low concentrationsof dissolved oxygen (D.O.) were measured in bulrush mesocosms while higher concentrations of D.O. were measured in open watermesocosms containing submerged pondweeds. Invertebrate taxarichness was positively related to D.O.

concentrations that were,in turn, related to vegetation communities. Reference wetland sites contained a variety of plant species along with extensive open water areas. Invertebrate taxa richness was greater at reference sites than in any wastewater mesocosm. Invertebrate samples from the wastewater mesocosms and reference sites were analyzed for five trace elements. While the concentrations of aluminum, arsenic, mercury, and silver were below values harmful to wildlife, the concentrations of selenium reached levels of moderate concern on one occasion. Data from this study suggest that selenium bioaccumulation by invertebrates may be related tothe type of vegetation community or detrital habitat type.Wetlands designed for invertebrate production for waterfowl should take into account the potential for low D.O. concentrations and trace element bioaccumulation associated with vegetation community types.

1772. **Invertebrate egg banks of restored, natural, and drained wetlands in the Prairie Pothole Region of the United States.**
Gleason, R. A.; Euliss, N. H.; Hubbard, D. E.; and Duffy, W. G.
Wetlands 24(3): 562-572. (2004)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ prairies/ abundance/ drainage/ eggs/ succession/ recruitment/ man-induced effects/ anthropogenic factors/ embryonic development/ habitat improvement/ aquatic insects/ seasonal variations/ restoration/ water levels/ dispersion/ statistical analysis/ community composition/ population dynamics/ species diversity/ invertebrates/ banks/ history/ cultivation/ maintenance/ seeds/ indicators/ drawdown/ Invertebrata/ United States/ Canada/ Saskatchewan/ Prairie Pothole Region
Abstract: Analogous to 'seed banks,' 'egg banks' are important for seasonal succession and maintenance of invertebrate species diversity throughout wet and dry cycles in the prairie pothole region. Further, recruitment of invertebrates from relic egg banks in the sediments and dispersal of eggs into wetlands is believed to be important for reestablishment of invertebrates in recently restored wetlands. Alhough tens-of-thousands of wetlands have been restored in the prairie pothole region of the United States, studies have not been conducted to evaluate the recovery of invertebrate egg banks in restored wetlands. We used taxon richness and abundance as indicators of potential egg bank recovery and compared these parameters in restored wetlands to those of non-drained and drained wetlands with a history of cultivation and also to reference wetlands with no history of cultivation. We found few significant differences among wetland categories within three physiographic regions (Glaciated Plains, Missouri Coteau, and Prairie Coteau). Most statistical comparisons indicated that restored wetlands had invertebrate egg banks similar to reference, non-drained, and drained wetlands. The one exception was drained seasonal wetlands in the Glaciated Plains, which had significantly lower taxon richness and invertebrate abundance than the other wetland categories. Trends did suggest that invertebrate egg bank taxon richness and abundance are increasing in restored seasonal wetlands relative to their drained analogues, whereas a similar trend was not observed for restored semi-permanent wetlands. Although recovery was not related to years since restoration, comparisons of restored wetlands with reference wetlands suggest that recovery potential may be inversely related to the extent of wetland drainage and intensive agriculture that varies spatially in the prairie pothole region. Our research suggests that periodic drawdowns of semi-permanent restored wetlands may be needed to promote production and development of invertebrate egg banks. Inoculation of restored wetlands may also be needed in areas where extensive wetland drainage has resulted in fewer wetland habitats to provide sources of passively dispersed eggs to newly restored wetlands.

1773. **Invertebrate response to moist-soil management of playa wetlands.**
Anderson, J. T. and Smith, L. M.
Ecological Applications 10(2): 550-558. (2000)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: invertebrates/ migratory birds/ moist-soil management/ Playas/ wetlands/ biomass/ density/ invertebrate/ species diversity/ wetland management/ United States
Abstract: Moist-soil management is a wetland management technique commonly used to increase seed production for migratory birds. However, the responses of invertebrates to moist-soil management have seldom been investigated even though their availability may be as important as seeds to foraging waterbirds. We studied the effects of moist-soil management and initial fall flooding date (September vs. November) on invertebrate density, biomass, and diversity in 12 playa wetlands on the Southern High Plains, USA, during the winters of 1994-1995 and 1995-1996. Invertebrates were sampled using a combination of benthic core, epiphytic, and water-column samplers. Total invertebrate density and biomass were higher in playas that were moist-soil managed and that had longer hydroperiods (four rather than two months) than in playas that were not managed or that had shorter hydro-periods. Most invertebrate taxa (75%) were more abundant in moist-soil managed wetlands than in unmanaged wetlands. Invertebrate familial richness and diversity were greater in moist-soil managed playas than in unmanaged playas, but initial flooding date had little effect on invertebrate diversity. Planorbidae snails were the most abundant invertebrate taxon. A combination of moist-soil management and early fall (September) water application is an effective tool to increase invertebrate density, biomass, and diversity in playas for migratory birds.

1774. **Invertebrates associated with woody debris in a southeastern U.S. forested floodplain wetland.**
Braccia, Amy and Batzer, Darold P.
Wetlands 21(1): 18-31. (Mar. 2001)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: Invertebrata/ biomass/ community structure/ habitat utilization/ woody debris/ forested wetlands/ semiaquatic habitat/ forest and woodland/ South Carolina/ Coosawhatchie River Floodplain/ surveys
Abstract: Woody debris is an ecologically important resource in upland forests and stream ecosystems. Although much is known about invertebrate-woody debris interactions in forests and streams, little information exists

for forested wetlands. In this study, invertebrates associated with woody debris in a Southeastern U. S. forested floodplain are described and factors that shape community structure are examined. Woody debris samples were collected during two wet (March 1998 and 1999) and one dry period (August 1998) from a bottomland hardwood wetland along the Coosawhatchie River, South Carolina, USA. During wet period collections, both submersed and floating woody debris were collected. Invertebrate richness, density, and arthropod standing-stock biomass were compared among sampling periods (wet and dry), between floating and submersed wood, and among woody debris decay classes. Most invertebrate richness and arthropod biomass was associated with wood collected during wet periods. However, the non-aquatic rather than aquatic arthropods were the most significant component of the overall community structure. Floating woody debris was a "hot spot" for invertebrate richness and arthropod biomass. Increased invertebrate richness was also associated with well-decayed wood. Invertebrates were classified based on temporal use of woody debris and included perennial residents, seasonal colonizers, and seasonal refugees. Overall findings suggest that woody debris is an important resource for invertebrates, and wood-associated invertebrates (especially non-aquatics) need to be considered when studying the diversity and function of forested wetlands.

1775. **Invited paper: Principles for management of aquatic-breeding amphibians.**
Semlitsch, Raymond D.
Journal of Wildlife Management 64(3): 615-631. (2000)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wildlife management: conservation/ population studies/ connectivity/ dispersal/ ecological disturbance/ ecosystem management/ habitat fragmentation/ habitat loss/ hydrologic cycle/ population dynamics/ recolonization/ wetlands
Abstract: Coordinated efforts by ecologists and natural resource managers are necessary to balance the conservation of biological diversity with the potential for sustained economic development. Because some amphibians have suffered world-wide declines during the last 20 years, it is important to consider biologically based management strategies that will preserve local and regional populations. This paper provides a brief overview of potential threats to local and regional populations, the state of knowledge on population and landscape processes, and the critical elements needed for an effective management plan for amphibians. Local population dynamics and ecological connectivity of amphibian metapopulations must be considered in effective management plans. There are 3 critical factors to consider in a management plan (1) the number or density of individuals dispersing from individual wetlands, (2) the diversity of wetlands with regard to hydroperiod, and (3) the probability of dispersal among adjacent wetlands or the rescue and recolonization of local populations. Wetlands losses reduce the total number of sites where pond-breeding amphibians can reproduce and recruit juveniles into the breeding population. Loss of small, temporary wetlands (<4.0 ha) may be especially harmful to amphibians because of their abundance and high species diversity. Alteration of wetlands, particularly hydrologic cycles, can severely impair completion of larval metamorphosis through either early pond drying (if hydroperiod is shortened) or through increased predation (if hydroperiod is lengthened or connections made with fish-infested lakes, rivers, or canals). Wetland loss also increases the distance between neighboring wetlands that is critical to metapopulation source-sink processes. Reduction in wetland density reduces the probability that populations will be rescued from extinction by nearby source populations. Local populations cannot be considered independent of source-sink processes that connect wetlands at the landscape or regional level. Further, the fragmentation of natural habitats from timber harvesting, agriculture, roads, drainage canals, or urban development impedes or prevents dispersal and decreases the probability of wetland recolonization. If our goal is to maintain or enhance present levels of amphibian diversity, then resource managers must incorporate critical elements into plans that protect population and landscape processes thereby maintaining viable populations and communities of amphibians.

1776. **Iowa's wetlands present and future with a focus on prairie potholes.**
Bishop, R. A.; Joens, J.; and Zohrer, J.
Journal of the Iowa Academy of Science 105(3): 89-93. (1998)
NAL Call #: Q11.J68; ISSN: 0896-8381
Descriptors: pothole habitat/ prairie marsh/ riparian floodplain/ uplands/ wetland restoration/ wildlife habitat
Abstract: The vast prairie marsh-pothole complex that historically covered approximately 7.6 millions acres in Iowa was reduced to less than 30,000 acres by 1980 when it was estimated that only 5,000 acres of prairie marsh and pothole habitat remained in private ownership. A bleak outlook for the future of wetlands was presented by Bishop (1981)." This outlook changed with the development of the North American Waterfowl Management Plan and the passage of two important pieces of legislation: the North American Wetlands Conservation Act and the Food Security Act of 1985. Protection of existing wetlands was afforded through the Swampbuster provision of the Food Security Act. The North American Wetlands Conservation Act and the Wetland Reserve Program offered through the Food Security Act provided needed funding for the protection and restoration of wetlands in Iowa. Since 1988, the Iowa Department of Natural Resources, the U.S. Fish and Wildlife Service, and various county conservation boards together with Pheasants Forever, Ducks Unlimited, and the Iowa Natural Heritage Foundation have purchased over 10,000 ha (25,000 ac) of wetlands and uplands in the Prairie Pothole Region of Iowa and restored over 24,240 ha (6,600 ac) of public and private wetlands. The United States Department of Agriculture, Natural Resources Conservation Service has enrolled approximately 24,240 ha (60,600 ac) of riparian floodplains and potholes into the Wetland Reserve Program and Emergency Wetland Reserve Program, affording them protection through permanent easements. Public support of wetland legislation will ensure that funding continues to be available to protect and restore Iowa's prairie wetlands.

1777. **Isotopic evidence for changes in residue decomposition and N-cycling in winter flooded rice fields by foraging waterfowl.**
Diepen, L. T. A. van; Groenigen, J. W. van; and Kessel, C. van
Agriculture, Ecosystems and Environment 102(1): 41-47. (2004)
NAL Call #: S601.A34; ISSN: 0167-8809
Descriptors: wetlands/ animal behavior/ crop residues/ cycling/ decomposition/ flooding/ foraging/ isotope fractionation/ nitrogen/ rice/ rice straw/ straw/ waterfowl/ wild birds
Abstract: Winter flooded rice fields can serve as substitute habitat for migratory waterfowl. Not much is known about the effects of the foraging waterfowl on nutrient cycling in rice production systems. This study quantifies the effect of foraging waterfowl on decomposition of rice residue and N-cycling in a winter flooded rice field in the Sacramento Valley, California. Along two transects in a field, pairs of control plots and exclosure plots, which excluded waterfowl, were set up. The original straw residue within the inner 2 m^2 of the 3 m x 3 m plots was replaced by ^{15}N labelled straw residue. The labelled residue was subsequently followed into the light fraction and mineral fraction of the soil through the winter flooding period. Foraging waterfowl increased the loss of ^{15}N from the residue from 83 to 89%, but did not affect the mass decomposition and loss of total N of the residue. No significant effect of the waterfowl was seen in the recovery of the residue N in the total soil N pool and in the light fraction, although there was a low recovery of residue N within these pools in the control treatments. The recovery of residue N in the NH_4 ± N pool after winter flooding was significantly lower in the presence of waterfowl. The increased loss of residue N and lower recovery of residue N in the presence of waterfowl may indicate that the rate of N-cycling was increased. A better understanding of the N-cycle in winter flooded rice fields in the presence of waterfowl is needed to assess the potential benefits of winter flooding for the rice farmers.

1778. **Juvenile sciaenid fishes respond favorably to Delaware Bay marsh restoration.**
Nemerson, David M. and Able, Kenneth W.
Ecological Engineering 25(3): 260-274. (2005)
NAL Call #: TD1.E26; ISSN: 0925-8574.
Notes: In 2 volumes.
Descriptors: conservation measures/ biometrics/ whole animal physiology/ nutrition/ diet/ ecology/ population dynamics/ brackish habitat/ marine zones/ Atlantic Ocean/ Cynoscion regalis/ Leiostomus xanthurus/ Micropogonias undulatus: habitat management/ salt marsh restoration/ size/ length/ weight/ physiological condition/ condition factor/ prey/ feeding rate/ stomach fullness/ population density/ salt marsh/ abundance/ prey type/ stomach fullness and condition/ natural vs restored sites/ man-made habitat/ restored salt marsh/ North Atlantic/ New Jersey/ Delaware Bay/ Pisces, Actinopterygii, Perciformes, Sciaenidae/ chordates/ fish/ vertebrates
Abstract: Former salt hay farms in Delaware Bay have been the site of extensive restorations aimed at restoring tidal flow to the sites, encouraging Spartina alterniflora (smooth cordgrass) recolonization and creating high-quality juvenile fish habitat. We assessed the 234 ha Dennis Township restoration site as habitat for juvenile Cynoscion regalis (weakfish), Leiostomus xanthurus (spot) and Micropogonias undulatus (Atlantic croaker) by comparing abundance, prey types consumed, stomach fullness and condition factor at the restored site and at a nearby reference marsh, Moores Beach. The three sciaenid species were equally or more abundant at the restored marsh. Measures of feeding were generally equal or higher at the restored site and stomach fullness was equal to or significantly higher at the restored marsh compared with the reference marsh. Fish condition, as measured by predicted weight-at-length, was generally at least equal between the sites and was occasionally higher at the restored site. At both sites, a seasonal pattern typical of mid-Atlantic estuaries of recruitment, ontogenetic change in food habits and emigration of transient fishes was apparent. Three years following restoration, the Dennis Township site provided equivalent to enhanced conditions for feeding and growth for large numbers of juvenile sciaenid fish, compared to a nearby reference site.

1779. **Land use, water chemistry, aquatic vegetation and zooplankton community structure of shallow lakes.**
Dodson, Stanley I.; Lillie, Richard A.; and Will Wolf, Susan
Ecological Applications 15(4): 1191-1198. (2005)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: ecology/ habitat/ freshwater habitat/ lentic water/ abiotic factors/ land zones/ comprehensive zoology: disturbance by man/ land use effect on shallow lake community structure/ community structure/ influencing factors/ lake/ shallow lakes/ chemical factors/ water chemistry/ effect on community structure/ Wisconsin/ shallow lake community structure
Abstract: Landscape-lake interactions, including anthropogenic effects in modern human-dominated landscapes, are essential elements of our understanding of aquatic community ecology. This study links land use (six categories) to the aquatic environment (30 water chemistry, lake morphology, and vegetation variables) and to zooplankton community richness (32 common taxa) and composition in 73 small and shallow lakes of southeastern Wisconsin, USA. The sites differed most according to two environmental variables (principal components analysis (PCA) ordination): the presence/absence of riparian vegetation and the water source (whether ground or atmospheric). Shallow lakes in different land use categories (reference, urban, and agricultural) differed significantly in terms of the two major environmental variables, especially presence of riparian and aquatic vegetation. Reference sites were characterized by the most vegetation and the highest zooplankton richness. Agricultural sites with wide riparian vegetative buffer strips (>30 m) had significantly more zooplankton taxa than agricultural lakes with narrow buffer strips. A non-metric multidimensional scaling (NMS) ordination of zooplankton community composition suggested a single community among land use categories, with some variation related to vegetation and the water source. The first NMS axis was correlated with PCAI axis (vegetation) and with zooplankton taxon richness, and the second axis was correlated with PCA2 (water source). The third axis was not strongly correlated with any of the measured environmental factors, suggesting that an unmeasured factor related to disturbance was also important in determining taxon composition. Our analysis

supports the hypothesis that zooplankton community structure (taxon richness and composition) is indirectly associated with land use, via the effect of land use on vegetation and the hydrological continuum.

1780. **Landowner satisfaction with the Wetlands Reserve Program in Wisconsin.**
Forshay, K. J.; Morzaria-Luna, H. N.; Hale, B.; and Predick, K.
Environmental Management 36(2): 248-257. (2005)
NAL Call #: HC79.E5E5 ; ISSN: 0364152X.
Notes: doi: 10.1007/s00267-004-0093-y.
Descriptors: conservation easement/ federal program/ invasive species/ monitoring/ restoration/ wetland/ biodiversity/ costs/ data reduction/ environmental impact/ plants (botany)/ restoration/ ecological monitoring/ landowners/ restoration sites/ Wetlands Reserve Program (WRP)/ ecology/ landowner/ monitoring/ restoration ecology/ ecosystem restoration/ program development/ wetland/ conservation of natural resources/ consumer participation/ fresh water/ personal satisfaction/ Wisconsin/ Cervidae
Abstract: We evaluated ecological monitoring data and landowner perceptions to the federally funded Wetlands Reserve Program (WRP) in a three-county region in Wisconsin. We surveyed landowner satisfaction, involvement, participation, and use of the WRP restoration sites. We found that landowners are satisfied with the overall program (mean, 3.6 ± 0.2 [SE], on a scale of 1-5, with 5 being completely satisfied). WRP restorations significantly increased the area of wetland within the sites surveyed, the increase was primarily of fresh meadow (736.32 ha after restoration). Satisfaction is related to landowner participation during restoration and to the economic incentives provided by the WRP, Landowner satisfaction and the number of plant communities after restoration are unrelated to each other or to restoration and easement costs per hectare. Survey participants recommended some changes to the WRP, including a reduction in the tax rate of land enrolled in the WRP, approval for permanent deer stands, and increased communication with WRP officials during the restoration. Monitoring information collected for WRP restoration sites does not allow assessment of whether WRP sites are functionally equivalent to natural sites. We suggest that the WRP require a more rigorous monitoring program, including guidelines for invasive species control. Managers should also encourage collaborations with external researchers and consider restorations within an experimental framework.

1781. **A landscape approach to conserving wetland bird habitat in the Prairie Pothole Region of eastern South Dakota.**
Naugle, David E.; Johnson, Rex R.; Estey, Michael E.; and Higgins, Kenneth F.
Wetlands 21(1): 1-17. (2001)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: conservation measures/ terrestrial habitat/ land and freshwater zones/ Aves/ habitat management/ semiaquatic habitat/ grasslands/ prairie wetlands/ South Dakota/ Prairie Pothole Region/ landscape survey/ birds/ chordates/ vertebrates
Abstract: Resource managers confronted with preserving ecosystems for prairie wetland birds in fragmented landscapes require landscape studies that direct conservation efforts over broad geographic regions. We investigated the role of local and landscape factors affecting habitat suitability by integrating remotely sensed wetland and land-cover data with wetland bird habitat models. We linked habitat models with locations of easement and fee-title wetlands to evaluate spatial location and extent of protected, suitable habitat. We also simulated impacts of the loss of small wetlands on suitability of larger wetlands for mobile species that use multiple wetlands. Lastly, we evaluated the efficacy of waterfowl habitat programs in preserving suitable habitat for nongame wetland bird species to recommend strategies for maximizing regional landscape connectivity. Regional databases constructed for this study indicate that easement and fee-title tracts encompass 13.9% (1.2 million ha) of land area and protect 19.8% of the wetlands in eastern South Dakota, USA. Proportion of protected wetlands is highest for semi-permanent (32.3%), intermediate for seasonal (25.6%), and lowest for temporary wetlands (15.8%). A stratified, two-stage cluster sample was used to randomly select 834 semi-permanent and seasonal wetlands that were surveyed for birds in 1995 and 1996. Logistic analyses indicate that habitat suitability for some species (e.g., Virginia rail, pied-billed grebe) is related to local vegetation conditions within wetlands, while suitability for others (e.g., northern pintail, black tern) is related to landscape structure at larger scales. As a result, unfragmented prairie wetland landscapes (i.e., areas with wetland complexes embedded within upland grasslands) provide habitat for more species than isolated wetlands in tillage fields. Models developed from survey wetlands were used to classify habitat suitability for all semi-permanent and seasonal wetlands in eastern South Dakota. Small wetlands are critical components of the surrounding landscape that influence habitat suitability of larger wetlands. Models used to reclassify suitability of larger remaining wetlands after small wetlands (<0.5 ha) were removed indicate that species most vulnerable to loss of small wetlands are vagile species that exploit resources over broad spatial scales. Number of wetlands suitable for northern pintails, a mobile species that uses multiple wetlands within a season, decreased 20.7% when wetlands <0.5 ha were removed. Historic paradigms dictating waterfowl habitat protection efforts also have conserved habitat for nongame bird species. Modern paradigms that acknowledge the importance of small shallow wetlands to breeding waterfowl have shifted the focus of protection towards preserving habitat for species that occupy more abundant seasonal wetlands. Cessation of protection efforts would result in further fragmentation of regional wetland landscapes. We recommend that wetlands be acquired not only to consolidate suitable habitat within protected core areas but also to ensure that core areas coalesce to preserve connectivity among regional wetland landscapes.

1782. **Landscape-based spatially explicit species index models for Everglades restoration.**
Curnutt, J. L.; Comiskey, J.; Nott, M. P.; and Gross, L. J.
Ecological Applications 10(6): 1849-1860. (2000)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: wetlands/ models/ landscape/ environmental restoration/ Florida/ ecosystem management/ nature conservation/ habitat improvement/ hydrology/ water management/ Everglades/ modeling, mathematics, computer applications/ protective measures and control/ reclamation
Abstract: As part of the effort to restore the similar to 10,000-km^2 Everglades drainage in southern Florida, USA, we developed spatially explicit species index (SESI) models of a number of species and species groups. In this paper we describe the methodology and results of three such models: those for the Cape Sable Seaside Sparrow and the Snail Kite, and the species group model of long-legged wading birds. SESI models are designed to produce relative comparisons of one management alternative to a base scenario or to another alternative. The model outputs do not provide an exact quantitative prediction of future biotic group responses, but rather, when applying the same input data and different hydrologic plans, the models provide the best available means to compare the relative response of the biotic groups. We compared four alternative hydrologic management scenarios to a base scenario (i.e., predicted conditions assuming that current water management practices continue). We ranked the results of the comparisons for each set of models. No one scenario was beneficial to all species; however, they provide a uniform assessment, based on the best available observational information, of relative species responses to alternative water-management plans. As such, these models were used extensively in the restoration planning.

1783. **Landscape characteristics influence pond occupancy by frogs after accounting for detectability.**
Mazerolle, M. J.; Desrochers, A.; and Rochefort, L.
Ecological Applications 15(3): 824-834. (2005)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: amphibians/ detection/ field surveys/ habitat disturbance/ landscape/ logistic regression/ New Brunswick, Canada/ patch/ peatland/ Rana clamitans/ site-occupancy model/ agricultural land/ frog/ habitat structure/ patchiness/ population distribution/ species occurrence/ North America/ Amphibia/ Anura
Abstract: Many investigators have hypothesized that landscape attributes such as the amount and proximity of habitat are important for amphibian spatial patterns. This has produced a number of studies focusing on the effects of landscape characteristics on amphibian patterns of occurrence in patches or ponds, most of which conclude that the landscape is important. We identified two concerns associated with these studies: one deals with their applicability to other landscape types, as most have been conducted in agricultural landscapes; the other highlights the need to account for the probability of detection. We tested the hypothesis that landscape characteristics influence spatial patterns of amphibian occurrence at ponds after accounting for the probability of detection in little-studied peatland landscapes undergoing peat mining. We also illustrated the costs of not accounting for the probability of detection by comparing our results to conventional logistic regression analyses. Results indicate that frog occurrence increased with the percent cover of ponds within 100, 250, and 1000 m, as well as the amount of forest cover within 1000 m. However, forest cover at 250 m had a negative influence on frog presence at ponds. Not accounting for the probability of detection resulted in underestimating the influence of most variables on frog occurrence, whereas a few were overestimated. Regardless, we show that conventional logistic regression can lead to different conclusions than analyses accounting for detectability. Our study is consistent with the hypothesis that landscape characteristics are important in determining the spatial patterns of frog occurrence at ponds. We strongly recommend estimating the probability of detection in field surveys, as this will increase the quality and conservation potential of models derived from such data.

1784. **Landscape context mediates influence of local food abundance on wetland use by wintering shorebirds in an agricultural valley.**
Taft, O. W. and Haig, S. M.
Biological Conservation 128(3): 298-307. (2006)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/j.biocon.2005.09.036.
Descriptors: benthic invertebrates/ dunlin/ Calidris alpina/ killdeer/ Charadrius vociferus/ wetland conservation/ wetland landscape planning/ food availability/ habitat conservation/ habitat use/ landscape ecology/ wader/ wetlands/ Oregon/ Willamette Valley/ Aves/ Invertebrata
Abstract: While it is widely understood that local abundance of benthic invertebrates can greatly influence the distribution and abundance of wetland birds, no studies have examined if wetland landscape context can mediate this relationship. We studied the influence of wetland food abundance and landscape context on use of agricultural wetlands by wintering dunlin (Calidris alpina) and killdeer (Charadrius vociferus) in the Willamette Valley of Oregon, USA, over two winters (1999-2000, 2000-2001) of differing rainfall and subsequent habitat distribution. We monitored bird use (frequency of occurrence and abundance) at a sample of wetlands differing in local food abundance (density and biomass) and landscape context [adjacent shorebird habitat (defined as ha of wet habitat with less than 50% vegetative cover and within a 2-km radius) and nearest neighbor distance]. We evaluated predictive models for bird use using linear regression and the Cp criterion to select the most parsimonious model. During the dry winter (2000-2001), dunlin exhibited greater use of sites with higher invertebrate density and biomass but also with more adjacent shorebird habitat and closest to a wetland neighbor. However, neither landscape context nor food abundance were important predictors of dunlin use during the wet winter (1999-2000). Use of sites by killdeer was unrelated to either local food abundance or landscape context measures during both winters. Our findings contribute to a growing recognition of the importance of landscape structure to wetland birds and highlight a number of implications for the spatial planning and enhancement of wetlands using a landscape approach.

1785. **Landscape ecological planning process for wetland, waterfowl, and farmland conservation.**
Musacchio, L. R. and Coulson, R. N.
Landscape and Urban Planning 56(3-4): 125-147. (Oct. 2001)
NAL Call #: QH75.A1L32; ISSN: 0169-2046
Descriptors: wetlands/ landscape/ habitat/ geographic information systems/ agricultural land/ rice fields/ land use/ grants/ policies/ regional planning/ rice field aquaculture/ nature conservation/ overwintering/ plant culture/ conservation/ waterfowl/ ecological effects/ farms/ geographical information systems/ rice/ anatidae/ Chen caerulescens caerulescens/ Oryza sativa/ Texas/ ducks/ lesser snow goose/ Anser caerulescens caerulescens/ rice/ planning/ development/ law, policy, economics and social sciences/ plant culture/ conservation, wildlife management and recreation/ ecological impact of water development
Abstract: A landscape ecological planning process (LEP process) is described that addresses the issues of rice production and wetland habitat conservation on privately owned rice farms in Texas. The LEP process was used to evaluate proposed land-use management plans based on alternative policies for the next US Farm Bill, which would be in effect from 2003 to 2009. A system simulation model, geographic information systems (GIS) model based on expert knowledge, as well as expert opinion, were used to evaluate uncertainty about the effects of these plans and policies on different types of farms and the quality of winter habitat of lesser snow geese. The models simulated shifts in land-use, rice and cattle production, farm profitability, and use of habitat by geese. Simulation results suggested that the level of federal subsidies for all policies influenced the continuation of rice production from 2003 to 2009. In addition, the size of the farm influenced whether rice production continued until 2009. The smaller farms were more sensitive to decreases in federal subsidies than larger farms because smaller farms received less income from goose hunting leases. Winter habitat for lesser snow geese was reduced in terms of patch size and nearest neighbor distance when rice production was discontinued by 2009 for all policies. Agricultural policy experts, who were familiar with the study sites, selected the modified version of the conservation policy as the example that would most benefit farmers and geese. The experts emphasized that their policy would offer far mers more flexibility to manage their farms, to diversify their incomes, and to be good land stewards.

1786. **Local and landscape-level influences on wetland bird communities of the Prairie Pothole Region of Iowa, USA.**
Fairbairn, S. E. and Dinsmore, J. J.
Wetlands 21(1): 41-47. (2001)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ landscape/ community composition/ prairies/ birds/ habitats/ wildlife management/ aquatic birds/ population structure/ habitat selection/ population density/ ecosystem management/ Aves/ Iowa/ Iowa/ birds
Abstract: Bird species richness and individual species densities were measured in wetland complexes in 1998. These values were then related to habitat variables within the complexes and to area of wetland habitat in the surrounding landscape. The percentage of wetland area within a complex that was covered with emergent vegetation and the total area of wetland habitat in the 3 km surrounding each complex were significant predictors of species richness. A perimeter-to-area ratio was the most frequently selected variable for inclusion in species-density models, being selected for 8 of 15 models. Five species' densities were related to the percentage of the wetland area that was covered by emergent vegetation, and 4 densities were related to the area covered by weak-stemmed wet-meadow vegetation. Densities of 5 species, as well as the overall species richness, were associated with a measure of the amount of wetland habitat within a 3-km buffer surrounding the wetland complexes. This indicates that the presence and abundance of some wetland bird species may be influenced by the amount of wetland habitat nearby. Thus, programs that encourage restoration of tracts of land that contain multiple wetland basins should be emphasized to maximize benefits to the wetland bird community.

1787. **Long-term impacts of forest road crossings of wetlands in Pennsylvania.**
Miller, R. L.; DeWalle, D. R.; Brooks, R. P.; and Finley, J. C.
Northern Journal of Applied Forestry 14(3): 109-116. (1997)
NAL Call #: SD143.N6; ISSN: 0742-6348
Descriptors: wetlands/ forests/ roads/ surveys/ habitats/ waterways/ vegetation/ land ownership/ landforms/ rivers/ width/ Pennsylvania
Abstract: A survey was conducted of 70 forest road crossings of wetlands in Pennsylvania to describe the characteristics of these crossings and to evaluate the long-term impacts of the crossings on habitat quality, channel stability, vegetation, wetland width and channel sediment embeddedness above and below the crossings. Sampling was stratified into five physiographic provinces and three land ownership types. Difficulty was encountered in identifying sites for the survey especially in the glaciated northwest region and on private and industry lands. The majority of samples obtained were from unglaciated provinces and public lands. Wetlands identified were primarily linear riparian wetlands associated with first- and second-order channels. Crossings encountered were largely gravel-covered culverts used to provide access to adjacent management areas. Only 35 of 814 comparisons of mean environmental conditions above and below the wetland crossings were found to be significant. Significant differences that did occur suggested that stream bed fine sediment levels were higher, basal area lower, and herbaceous cover higher in the immediate vicinity of some crossings simply due to the presence of the road and fill banks.
This citation is from AGRICOLA.

1788. **Long term monitoring of grass shrimp Palaemonetes spp. population metrics at sites with agricultural runoff influences.**
Leight, A. K.; Scott, G. I.; Fulton, M. H.; and Daugomah, J. W.
Integrative and Comparative Biology 45(1): 143-150. (2005); ISSN: 15407063
Descriptors: Decapoda (Crustacea)/ Palaemonetes/ grass shrimp/ integrated pest management/ shrimp/ aquatic invertebrates

Abstract: Rising concern over pesticide usage near estuarine systems and evidence of physical and physiological impacts on estuarine organisms have strengthened the need to better identify the ecological effects of nonpoint source runoff. Grass shrimp, Palaemonetes spp., are ecologically important and abundant marsh inhabitants that may be impacted by anthropogenic contamination. Populations of grass shrimp were sampled monthly, over a period of ten years, at four sites in South Carolina with varying upland land use characteristics. Spatial and temporal trends in grass shrimp densities were noted over time and between sites. Agricultural and golf course land usage corresponded with decreased grass shrimp population levels, overall shrimp size, and percentage of gravid females. Conservation methods, such as the use of best management practices (BMPs) and integrated pesticide management (IPM) at agricultural fields, corresponded with increased grass shrimp population density.

1789. **Long-term response of northern pintails to changes in wetlands and agriculture in the Canadian Prairie Pothole Region.**
Podruzny, Kevin M.; DeVries, James H.; Armstrong, Llwellyn M.; and Rotella, Jay J.
Journal of Wildlife Management 66(4): 993-1010. (2002)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: commercial activities/ ecology/ population dynamics/ land and freshwater zones/ North America/ Anas acuta (Anatidae): farming and agriculture/ population size/ semiaquatic habitat/ Canada/ Canadian Prairie Pothole Region/ long term response to changes in wetlands and agriculture/ Anatidae/ Anseriformes/ Aves/ birds/ chordates/ vertebrates
Abstract: From 1955 through the late 1970s, northern pintail (Anas acuta) populations closely tracked the abundance of spring ponds. Declines in numbers of both northern pintails (hereafter, pintails) and ponds were evident during years of drought. However, since the early 1980s, the strength of the relationship between pintails and ponds has weakened greatly. Agricultural expansion on primary breeding grounds has been implicated as the cause of sustained pintail declines, but previous studies investigated pintail response only at large geographic scales (e.g., prairie-wide, stratum level). Potentially important effects of localized or multiscale changes in wetlands and agriculture on pintails are not well understood. Using data from the Canadian Prairie Pothole Region for 1961 to 1996, we investigated spatial and temporal covariation of pintail numbers with environmental factors (pond numbers and wetness indices) and agriculture at various scales. Models best supported by the data indicated that pintails responded positively to winter precipitation but with important regional variation and positively to pond numbers in some locations (southwestern Saskatchewan and southern Alberta). Results also indicated that pintail settling was better explained (increases in R^2 values of 0.05-0.06) using information about specific agricultural practices than about overall increases in farmed area. At a prairie-wide scale, we detected a negative association between settling and increased cropland area. At regional scales, settling was positively associated to various degrees with area in fallow (i.e., summerfallow - land tilled but not planted to crop in a given year). Both associations were strengthened with higher winter precipitation. Because cropland stubble is used readily as a nesting habitat by pintails and spring tillage of fields not used for summerfallow destroys nests, a shift from summerfallow to continuous cropping in the Prairie Pothole Region of Canada may have reduced the reproductive capacity of pintails in important breeding areas. In regions with characteristics that historically have attracted pintails to settle, we encourage land managers to promote agricultural practices that minimize use of spring tillage, convert cropland to perennial forages and pasture, and protect and restore wetland and upland habitat.

1790. **Macroinvertebrate abundance, water chemistry, and wetland characteristics affect use of wetlands by avian species in Maine.**
Longcore, J. R.; McAuley, D. G.; Pendelton, G. W.; Bennatti, C. R.; Mingo, T. M.; and Stromborg, K. L.
Hydrobiologia 567(1): 143-167. (2006)
NAL Call #: 410 H992; ISSN: 00188158.
Notes: doi: 10.1007/s10750-006-0055-x.
Descriptors: acidity/ avian species/ beavers/ Castor canadensis/ macroinvertebrates/ water chemistry/ waterfowl broods/ wetland characteristics/ wetland use
Abstract: Our objective was to determine use by avian species (e.g., piscivores, marsh birds, waterfowl, selected passerines) of 29 wetlands in areas with low (<200 μ eq l^{-1}) acid-neutralizing capacity (ANC) in southeastern Maine. We documented bird, pair, and brood use during 1982-1984 and in 1982 we sampled 10 wetlands with a sweep net to collect invertebrates. We related mean numbers of invertebrates per wetland to water chemistry, basin characteristics, and avian use of different wetland types. Shallow, beaver (Castor canadensis)-created wetlands with the highest phosphorus levels and abundant and varied macrophyte assemblages supported greater densities of macroinvertebrates and numbers of duck broods (88.3% of all broods) in contrast to deep, glacial type wetlands with sparse vegetation and lower invertebrate densities that supported fewer broods (11.7%). Low pH may have affected some acid-intolerant invertebrate taxa (i.e., Ephemeroptera), but high mean numbers of Insecta per wetland were recorded from wetlands with a pH of 5.51. Other Classes and Orders of invertebrates were more abundant on wetlands with pH > 5.51. All years combined use of wetlands by broods was greater on wetlands with pH ≤ 5.51 (77.4%) in contract to wetlands with pH > 5.51 that supported 21.8% of the broods. High mean brood density was associated with mean number of Insecta per wetland. For lentic wetlands created by beaver, those habitats contained vegetative structure and nutrients necessary to provide cover to support invertebrate populations that are prey of omnivore and insectivore species. The fishless status of a few wetlands may have affected use by some waterfowl species and obligate piscivores.

1791. **Macroinvertebrate assemblage response to highway crossings in forested wetlands: Implications for biological assessment.**
King, R. S.; Nunnery, K. T.; and Richardson, C. J.
Wetlands Ecology and Management 8(4): 243-256. (2000)
NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861
Descriptors: wildlife management: conservation/ terrestrial

ecology: ecology, environmental sciences/ biological assessment/ assessment method/ ordination tests/ statistical method/ perturbation tests/ statistical method/ Clean Water Act/ biological integrity/ biological monitoring/ bottomland forested wetlands: habitat/ chemical integrity/ community structure/ grazing/ habitat complexity/ habitat patchiness/ herbaceous detrital resources/ highway crossings/ metrics/ physical integrity/ swamps: habitat/ taxon richness: areal, numerical

Abstract: Despite the mandate of the Clean Water Act to protect the physical, chemical, and biological integrity of the USA's wetlands, the use of biota to assess wetland condition has not been well explored. During June, 1996, we evaluated the response of macroinvertebrate assemblages to fill-culvert highway crossings in two bottomland forested wetlands in North Carolina. Our objective was to apply biological assessment methods and metrics that have been effectively used in streams to explore their applicability in forested wetlands. We found significant changes in several metrics as a function of distance from the highway crossings. Areal and numerical taxon richness increased within at least 40 m of highway when compared to control locations. Percent dominant taxon values were lowest within 10 m of the highway. Percent herbivores also increased significantly within at least 40 m of the highway, reflecting the lower % crown closure and associated shift in primary production from trees to herbaceous macrophytes and algae. The North Carolina Biotic Index, a metric of tolerance, did not reflect assemblage changes near the highway. Ordination and permutation tests revealed that assemblage composition was significantly different from controls at 10 and 40 m distances from the highway crossings. In particular, algal grazers such as the mayflies Caenis sp. and Callibaetis sp. responded positively and the damselflies Ischnura spp. and the fingernail clams Sphaerium spp. responded negatively to the crossings. Favorable algal and herbaceous detrital resources, greater patchiness and habitat complexity, and overall high tolerance to natural stressors probably contributed to the increase in taxon richness near the highway. However, significant deviation from control locations indicated the highway was a source of perturbation. Our findings illustrate the potential utility of macroinvertebrate assemblages for wetland assessment, but suggest the importance of defining the reference condition as well as the need for development of metrics for specific classes of wetlands.

1792. **Macroinvertebrate response to cattail management at Cheyenne Bottoms, Kansas, USA.**
Kostecke, R. M.; Smith, L. M.; and Hands, H. M.
Wetlands 25(3): 758-763. (2005)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: recruitment/ biomass/ wetlands/ head/ hydrology/ food/ basins/ typha/ chironomidae

Abstract: Cheyenne Bottoms, Kansas, USA has been designated by the Ramsar convention as a Wetland of International Importance. However, since that 1988 designation, cattail (Typha spp.) has become the dominant plant within the basin, and migratory bird use has decreased. We examined the effects of different cattail-management treatments (burned, disked, and grazed by 5 and 20 head of cattle) on macroinvertebrates used as food resources by migratory birds. We found few differences in diversity, biomass, or density of macroinvertebrates among treatments. When differences existed, diversity, biomass, and density were greater within the control or more heavily vegetated treatments (e.g., burned) than within less vegetated treatments (e.g., disked). Macroinvertebrate densities, particularly Chironomidae, ranged from 154 to 681/m^2; however, they were up to seven times lower than historic densities and well below the 5000/m^2 that has been suggested for supporting large numbers (0.5 million) of migratory waterbirds. Thus, Cheyenne Bottoms' capacity to support migratory waterbirds may currently be reduced due to low macroinvertebrate densities in areas where cattail has invaded, as well as in areas where cattail has been managed. Research and management should be targeted at restoring the hydrology and dependent biotic communities that support migratory birds.

1793. **Macroinvertebrate response to marsh management strategies in Utah.**
Huener, J. D. and Kadlec, J. A.
Wetlands 12(2): 72-78. (1992)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wildlife management/ marshes/ water levels/ macrofauna/ ecosystem management/ population density/ Invertebrata/ Utah

Abstract: The authors examined the response of aquatic macroinvertebrates to three marsh management strategies. The three management practices compared were conventional full pool management, full pool management with carp (Cyprinus carpio) control, and contour furrowing (also with carp control). Significant differences in standing crops (both numbers and biomass) of invertebrates were observed among the three management strategies. The contour furrowed area had the highest standing crops of water column invertebrates, followed by the carp-controlled full pool area, while the conventionally managed area had the lowest standing crops. In the benthos, the two full pool areas (with and without carp) had higher standing crops than the contour furrowed area. Significant differences were noted in seasonal abundance, with all management practices having lowest densities of invertebrates in April and May. Implications for management include indications of the negative impacts of carp and winter drawdowns on invertebrates in managed marshes.

1794. **Macroinvertebrate responses to wetland restoration in northern New York.**
Brown, S. C.; Smith, K.; and Batzer, D.
Environmental Entomology 26(5): 1016-1024. (Oct. 1997)
NAL Call #: QL461.E532; ISSN: 0046-225X
Descriptors: wetlands/ environmental restoration/ New York/ macrofauna/ man-induced effects/ environmental impact/ environment management/ habitat improvement/ colonization/ community composition/ aquatic insects/ Insecta/ soil transplantation/ aquatic entomology/ reclamation/ mechanical and natural changes/ habitat community studies

Abstract: Wetlands are being restored throughout the United States in an effort to replace habitat functions lost following drainage. We studied the macroinvertebrate communities that developed in wetlands restored by the U.S. Fish and Wildlife Service and compared them to those occurring at natural wetlands in the same area. During the

3 yr of the study, most taxa found at the natural sites could also be found in similar numbers at the restored sites. Insects with aerial dispersal capability rapidly colonized the restored habitats, but some less mobile forms (noninsects and some hemipterans) either colonized more slowly or not at all. We analyzed the effects of experimental techniques for site preparation that were applied before restoration of hydrology to determine if they influenced macroinvertebrate recolonization. Transplantation of remnant wetland soil, which resulted in faster and more prolific plant growth, significantly increased overall macroinvertebrate numbers, and significantly increased the abundance of 10 specific taxonomic groups. The use of this technique, along with possible inoculation of some less mobile taxa, could improve efforts to reestablish natural macroinvertebrate communities to newly restored wetland habitats.

1795. **Management of rice fields for wetlands, water, and rice production.**
Andrews, Elizabeth S. and Williams, Philip B.
In: National Conference on Hydraulic Engineering. San Francisco, Calif.
New York: American Society of Civil Engineers; pp. 1161-1166; 1993.
NAL Call #: TC5.H824 1993; ISBN: 0872629201
Descriptors: wetlands/ waterfowl/ aquatic habitat/ rice production/ California/ Sacramento Valley
Abstract: The feasibility of managing a portion of the Sacramento Valley's rice fields as wetlands for waterfowl use, storage, and aid in rice straw decomposition was evaluated. Approximately 95% of the area's original wetlands have been lost, and populations of resident and migratory waterfowl have declined as a result of this and other pressures on the ecosystem. The analysis showed that there was significant potential to manage rice acreages in the Sacramento Valley for winter wetlands for the benefit of farmers, waterfowl, and downstream water uses, though constraints to such operation are numerous.

1796. **Managing agricultural wetlands for waterbirds in the coastal regions of Louisiana, USA.**
Huner, J. V.; Jeske, C. W.; and Norling, W.
Waterbirds 25(Special Publication 2): 66-78. (2003)
NAL Call #: QL671; ISSN: 1524-4695
Descriptors: agricultural wetlands/ artificial freshwater habitat/ coastal wetlands/ crawfish management/ crawfish ponds/ freshwater habitat/ gulf coastal plain/ land conservation programs/ migration/ riparian habitat
Abstract: Rice and/or crawfish are cultivated in over 225,000 ha of shallow earthen impoundments within 160 km of the Gulf of Mexico along the coast of Louisiana. The region includes both the Gulf Coastal Plain and Prairie and the Lower Mississippi River Valley. Annual loss of 4,475 ha of coastal wetlands in Louisiana due to subsidence, erosion, and rising sea level has significantly reduced desirable freshwater habitat in the region. The suite of resident, migrant, breeding, and wintering waterbirds depending on this region includes grebes, pelicans, cormorants, anhingas, wading birds, waterfowl, coots, rails, gallinules, shorebirds, gulls, terns, and kingfishers. These taxa utilize the artificial freshwater wetland habitat provided by the agricultural wetlands. Numerous other birds utilize riparian areas associated with these artificial wetlands. Crawfish ponds are especially valuable cool season habitat for predaceous waterbirds because they provide shallow water systems rich in invertebrate and small vertebrate prey during the period from mid-autumn through mid-spring when most rice fields are drained. Because most crawfish ponds are not drained until late spring or early summer, predictable, food-rich, shallow water waterbird habitat is available throughout the region when rice fields are being cultivated for rice production. Incorporation of crawfish management into government-sponsored land conservation programs should encourage land owners to sustain standing water habitat outside of program mandated fill/drain requirements. Farmers could adjust the times when their impoundments are filled or drained to maximize benefits to many species, especially migrating shorebirds.

1797. **Marsh impoundments for the management of wildlife and plants in Louisiana.**
Chabreck, R. H. and Junkin, G. M.
In: Marsh management in coastal Louisiana: Effects and issues.Baton Rouge, LA. Duffy, W. G. and Clark, D. (eds.): Fish and Wildlife Service, U.S. Department of the Interior; pp. 112-119; 1989.
NAL Call #: QH540.U562 no. 89(22)
Descriptors: marshes/ wetlands/ wildlife/ Louisiana/ wildlife habitats
Abstract: Marsh impoundments are widely used in coastal regions for improving wildlife habitats, aquaculture, water storage for agricultural irrigation and industrial uses, flooding of marshes for mosquito control, and maintenance of favorable water depths for navigation. Impoundments used to improve wildlife habitat can be categorized into 4 types by water depth and salinity regimes: permanently flooded with freshwater, manipulated freshwater, permanently flooded with brackish water, and manipulated brackish water. In certain areas, e.g. SE Louisiana, impoundment use is limited because of the fluid nature of the subsoil. -from Authors

1798. **Marsh terracing as a wetland restoration tool for creating fishery habitat.**
Rozas, L. P. and Minello, T. J.
Wetlands 21(3): 327-341. (Sept. 2001)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ intertidal environment/ habitat improvement/ marshes/ restoration/ fishery resources/ nekton/ marine crustaceans/ biomass/ population density/ terraces/ environmental restoration/ fisheries/ geological terraces/ crustaceans/ fetch/ biological sampling/ habitats/ mullet/ menhaden/ trout/ intertidal areas/ Litopenaeus setiferus/ Palaemonetes pugio/ Callinectes sapidus/ Farfantepenaeus aztecus/ Brevoortia patronus/ Mugil cephalus/ Cynoscion nebulosus/ Louisiana/ northern white shrimp/ white shrimp/ daggerblade grass shrimp/ blue crab/ gulf menhaden/ striped mullet/ spotted seatrout/ restoration/ protective measures and control/ conservation and environmental protection/ reclamation
Abstract: Terracing is a relatively new wetland-restoration technique used to convert shallow subtidal bottom to marsh. This method uses existing bottom sediments to form terraces or ridges at marsh elevation. A terrace field is constructed by arranging these ridges in some pattern that maximizes intertidal edge and minimizes fetch between

ridges; the intertidal area is planted with marsh vegetation. We examined the habitat value of terracing for fishery species at Sabine National Wildlife Refuge, Louisiana (USA) in spring and fall 1999 by quantifying and comparing nekton densities in a 9-yr-old terrace field and nearby reference area using a 1-m^2 drop sampler. Decapod crustaceans were more abundant than fishes, composing 62% and 95% of all organisms we collected in spring and fall, respectively. White shrimp Litopenaeus setiferus, dagger-blade grass shrimp Palaemonetes pugio, blue crab Callinectes sapidus, and brown shrimp Farfantepenaeus aztecus accounted for 94% of all crustaceans, whereas 60% of all fishes were gulf menhaden Brevoortia patronus. Mean densities of white shrimp (fall), daggerblade grass shrimp, blue crab, and brown shrimp (spring) were significantly greater in terrace marsh than on non-vegetated bottom in the reference pond. Densities of most nekton on non-vegetated bottom were similar in the terrace field and the reference pond, but gulf menhaden and white shrimp had higher densities at terrace pond sites and brown shrimp (spring) were more abundant at reference pond sites. The pattern for biomass was similar to that for density in that the mean biomass of most species was significantly greater at terrace marsh sites than reference pond sites and similar at terrace and reference pond sites. Terrace marsh, however, was not functionally equivalent to natural marsh, as mean densities of daggerblade grass shrimp (fall), brown shrimp (spring), and blue crab and mean biomass of white shrimp (fall), striped mullet Mugil cephalus (spring), and spotted seatrout Cynoscion nebulosus (fall) were greater at reference marsh sites than terrace marsh sites. Using these density and biomass patterns and the percentage of marsh and pond area in the terrace field, we concluded that terrace fields support higher standing crops of most fishery species compared with shallow marsh ponds of similar size. Future restoration projects could include design changes to increase the proportion of marsh in a terrace field and enhance the habitat value of marsh terraces for fishery species.

1799. **Microhabitat association of Blanding's turtles in natural and constructed wetlands in southeastern New York.**
Hartwig, T. S. and Kiviat, E.
Journal of Wildlife Management 71(2): 576-582. (Apr. 2007)
NAL Call #: 410 J827
Descriptors: wildlife management/ wild animals/ turtles/ constructed wetlands/ wildlife habitats/ Emydidae/ wetlands/ habitat conservation/ radio frequency identification/ vegetation cover/ Cephalanthus occidentalis/ water temperature/ spring/ summer/ foraging/ submerged aquatic plants/ endangered species/ habitat destruction/ population size/ New York/ Emydoidea blandingii
Abstract: We studied Blanding's turtle (Emydoidea blandingii) microhabitat in natural wetlands and wetlands constructed for the turtles in Dutchess County, New York, USA. Investigation of these topics can provide information on ways to increase the extent of Blanding's turtle habitat, improve its quality, and assure that conservation or restoration managers do not overlook key habitat characteristics. Microhabitat was determined by radiotracking individuals to their exact locations and recording habitat variables. Blanding's turtles were associated with shallow water depths ($\bar{x}$ = 30 cm), muck substrates, and areas of abundant vegetation (total cover $\bar{x}$ = 87%). Buttonbush (Cephalanthus occidentalis) had the greatest mean total cover (29%). In the constructed wetlands, Blanding's turtles were associated with significantly less cover and warmer water than in the natural wetlands. Blanding's turtles appeared to be using the constructed wetlands to bask and forage in the spring and early summer but moved to deeper wetlands in late summer when the constructed wetlands dried up or became too warm. For Blanding's turtles, new habitat should contain abundant emergent vegetation (including buttonbush in Dutchess County and other areas where the turtles are known to use buttonbush swamps), basking areas, muck, floating plant material, and submerged aquatic vegetation. Blanding's turtle's use of constructed wetlands highlights the value of a complex of connected wetland habitats in providing for the varied needs of the turtle.
This citation is from AGRICOLA.

1800. **Migrant shorebird predation on benthic invertebrates along the Illinois River, Illinois.**
Hamer, G. L.; Heske, E. J.; Brawn, J. D.; and Brown, P. W.
Wilson Journal of Ornithology 118(2): 152-163. (2006)
NAL Call #: QL671.W55 ; ISSN: 15594491.
http://www.bioone.org/archive/1559-4491/118/2/pdf/i1559-4491-118-2-152.pdf
Descriptors: shorebirds/ wetlands/ invertebrates/ predation/ wildlife habitat/ Illinois
Abstract: We evaluated the effect of shorebird predation on invertebrates at a wetland complex along the Illinois River, west-central Illinois, during spring migration. Using a new exclosure experiment design adapted to the shifting nature of foraging microhabitat of interior wetlands, we found that shorebird predation did not significantly deplete total invertebrate density or total biomass in open (no exclosure) versus exclosure treatments. Chironomids and oligochaetes were the most common invertebrates occurring in substrate samples. The density of oligochaetes was lower in open treatments, though the degree of difference varied both spatially and temporally. Shorebird density was positively correlated with the amount of invertebrate biomass removed from the substrate during the late-May sampling period. Our results suggest that shorebirds use an opportunistic foraging strategy and consume the most abundant invertebrate prey. The dynamic hydrology at our study site likely played a role in preventing invertebrate depletion by continually exposing new foraging areas and prey.

1801. **Migratory bird responses to grazing.**
Wetlands Reserve Program Grasslands Workgroup Natural Resources Conservation Service, U.S. Department of Agriculture, 2005.
ftp://ftpfc.sc.egov.usda.gov/NHQ/ecs/Wild/WRPgrassland.pdf
Descriptors: grazing/ birds/ environmental impact/ wetlands/ Wetlands Reserve Program/ grasslands

1802. **Mine-drainage treatment wetland as habitat for herptofaunal wildlife.**
Lacki, M. J.; Hummer, J. W.; and Webster, H. J.
Environmental Management 16(4): 513-520. (1992)
NAL Call #: HC79.E5E5 ; ISSN: 0364-152X
Descriptors: constructed wetlands/ wildlife habitat/ herptofauna/ amphibians/ reptiles
Abstract: Land reclamation techniques that incorporate habitat features for herptofaunal wildlife have received little attention. We assessed the suitability of a wetland, constructed for the treatment of mine-water drainage, for supporting herptofaunal wildlife from 1988 through 1990 using diurnal and nocturnal surveys. Natural wetlands within the surrounding watershed were also monitored for comparison. The treatment wetland supported the greatest abundance and species richness of herptofauna among the sites surveyed. Abundance was a function of the frog density, particularly green frogs (Rana clamitans) and pickerel frogs (R. palustris), while species richness was due to the number of snake species found. The rich mix of snake species present at the treatment wetland was believed due to a combination of an abundant frog prey base and an amply supply of den sites in rock debris left behind from earlier surface-mining activities. Nocturnal surveys of breeding male frogs demonstrated highest breeding activity at the treatment wetland, particularly for spring peepers (Hyla crucifer). Whole-body assays of green frog and bullfrog (R. catesbeiana) tissues showed no differences among sites in uptake of iron, aluminum, and zinc; manganese levels in samples from the treatment wetland were significantly lower than those from natural wetlands. These results suggest that wetlands established for water quality improvement can provide habitat for reptiles and amphibians, with the species composition dependent on the construction design, the proximity to source populations, and the degree of acidity and heavy-metal concentrations in drainage waters.

1803. **Modeling habitat change in salt marshes after tidal restoration.**
Boumans, R. M.; Burdick, D. M.; and Dionne, M.
Restoration Ecology 10(3): 543-555. (Sept. 2002)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: hydrology/ salt marshes/ human impact/ tides/ topography/ coastal zone management/ restoration/ man-induced effects/ plant populations/ vegetation cover/ tidal effects/ tidal currents/ United States, New England/ reclamation/ conservation, wildlife management and recreation/ ecosystems and energetics
Abstract: Salt marshes continue to degrade in the United States due to indirect human impacts arising from tidal restrictions. Roads or berms with inadequate provision for tidal flow hinder ecosystem functions and interfere with self-maintenance of habitat, because interactions among vegetation, soil, and hydrology within tidally restricted marshes prevent them from responding to sea level rise. Prediction of the tidal range that is expected after restoration relative to the current geomorphology is crucial for successful restoration of salt marsh habitat. Both insufficient (due to restriction) and excessive (due to subsidence and sea level rise) tidal flooding can lead to loss of salt marshes. We developed and applied the Marsh Response to Hydrological Modifications model as a predictive tool to forecast the success of management scenarios for restoring full tides to previously restricted areas. We present an overview of a computer simulation tool that evaluates potential culvert installations with output of expected tidal ranges, water discharges, and flood potentials. For three New England tidal marshes we show species distributions of plants for tidally restricted and nonrestricted areas. Elevation ranges of species are used for short-term (<5 years) predictions of changes to salt marsh habitat after tidal restoration. In addition, elevation changes of the marsh substrate measured at these sites are extrapolated to predict long-term (>5 years) changes in marsh geomorphology under restored tidal regimes. The resultant tidal regime should be designed to provide habitat requirements for salt marsh plants. At sites with substantial elevation losses a balance must be struck that stimulates elevation increases by improving sediment fluxes into marshes while establishing flooding regimes appropriate to sustain the desired plants.

1804. **Modelling self-design of the aquatic community in a newly created freshwater wetland.**
Metzker, K. D. and Mitsch, W. J.
Ecological Modelling 100(1-3): 61-86. (1997)
NAL Call #: QH541.15.M3E25; ISSN: 0304-3800
Descriptors: wetlands/ marshes/ freshwater fish/ community composition/ ecological succession/ climax community/ fish/ evolution/ fish populations/ community development/ Ohio/ Pisces/ models/ community structure
Abstract: A dynamic simulation model was constructed to predict the natural development of a fish community in a recently constructed, freshwater marsh in the midwestern USA, and to determine which forces are significant in shaping the self-design trajectory of the fish community. The model allowed immigration of five species of fishes from a nearby river into the constructed wetland system and allowed them to interact with each other as well as with the other biotic components of the wetland. Imported fishes included Micropterus salmoides, Lepomis macrochirus, Lepomis cyanellus, Cyprinus carpio and Ameirus natalis. These species were chosen because each is common in the nearby river and because each possesses physiological characteristics allowing survival in typical marsh conditions. Each species population was divided into three distinct ontogenetic stages and were graduated into the next ontogenetic stage as the normal consequence of growth. Modelled interactions included intra and interspecific competition; predation; feeding; reproduction; fish effects on system abiotic components (e.g., bioturbation) and mortality. The fish community underwent several major changes in structure during the first 4 years of its simulated existence, before establishing a stable structure. Under environmental conditions prevailing in the system, the fish community always evolved toward a stable state with a high-biomass population dominated by Cyprinus carpio and a smaller population of Ameirus natalis. If the effects of suboptimal environmental conditions were removed, then the system always evolved toward a low-biomass state consisting entirely of Micropterus salmoides. The role of chance was also tested and resulted in significant short term modifications to the community structure; however, these changes decreased in magnitude and were insufficient to prevent attainment of either of the two alternate steady states. These results indicate that the fish community in wetlands has a strong self-design trajectory,

tending toward almost complete dominance by Cyprinus carpio unless typical wetland environmental conditions were significantly ameliorated.

1805. **Monitoring the hydrology of Canadian prairie wetlands to detect the effects of climate change and land use changes.**
Conly, F. M. and van der Kamp, G.
Environmental Monitoring and Assessment 67(1-2): 195-215. (2001)
NAL Call #: TD194.E5; ISSN: 01676369.
Notes: doi: 10.1023/A:1006486607040.
Descriptors: climate change/ land use/ monitoring/ prairie pothole wetlands/ prairie wetland/ wetland hydrology/ agriculture/ climate change/ ecology/ hydrology/ wetlands/ sloughs/ environmental engineering/ climate change/ environmental monitoring/ hydrological response/ land use change/ wetland/ environmental monitoring/ climate/ conservation of natural resources/ ecosystem/ water movements/ Canada/ Anas/ Anas sp./ Anatidae
Abstract: There are millions of small isolated wetlands in the semi-arid Canadian prairies. These 'sloughs' are refuges for wildlife in an area that is otherwise intensively used for agriculture. They are particularly important as waterfowl habitat, with more than half of all North American ducks nesting in prairie sloughs. The water levels and ecology of the wetlands are sensitive to atmospheric change and to changes of agricultural practices in the surrounding fields. Monitoring of the hydrological conditions of the wetlands across the region is vital for detecting long-term trends and for studying the processes that control the water balance of the wetlands. Such monitoring therefore requires extensive regional-scale data complemented by intensive measurements at a few locations. At present, wetlands are being enumerated across the region once each year and year-round monitoring is being carried out at a few locations. The regional-scale data can be statistically related to regional climate data, but such analyses cast little light on the hydrological processes and have limited predictive value when climate and land use are changing. The intensive monitoring network has provided important insights but it now needs to be expanded and revised to meet new questions concerning the effects of climate change and land use.

1806. **Muskrat abundance, distribution, and herbivory within cattail-dominated coastal wetlands: Effects of water level manipulation.**
Toner, J. A.; Farrell, J. M.; and Leopold, D. J.
In: Global threats to large lakes: Managing in an environment of instability and unpredictability. Chicago, IL International Lake Environment Committee (eds.); pp. 48; 2003.
Notes: 46th Conference on Great Lakes Research and 10th World Lake Conference.
Descriptors: aquatic plants/ cattails/ marshes/ muskrats/ quantitative distribution/ shallow water/ vegetation/ water control/ water level fluctuations/ water management/ water levels/ wetlands/ Ondatra zibethicus/ Typha/ Canada, Quebec, St. Lawrence R.
Abstract: Water level management of aquatic ecosystems has cumulative, long-term impacts on wetland communities. Stabilization of St. Lawrence River (SLR) water levels is proposed to have created dense cattail (Typha spp.) stands where diverse shallow water marsh communities historically existed. Cattail expansion and dominance may also be related to important herbivore populations, such as the muskrat (Ondatra zibethicus). We hypothesize that current SLR water level regulations limit muskrat abundance, distribution, and subsequent herbivory effects within cattail-dominated marshes. To test this hypothesis, we evaluated muskrat populations in wetlands where water levels are raised by water control structures (managed) and wetlands where the International Joint Commission (IJC) regulates water levels. Muskrat house locations were recorded with a GPS during winter censuses in 2001 and 2002. Cattail consumption estimates were developed with data from vegetation surveys and house counts. Results indicate that muskrat abundance, distribution, and herbivory effects are limited by IJC water level regulations. Managed wetlands have greater muskrat house densities than IJC regulated wetlands (p=0.0201). Current regulations may contribute to the dominance of cattail and reduction of fish and waterfowl habitat in SLR wetlands.

1807. **Natural flatwoods marshes and created freshwater marshes of Florida: Factors influencing aquatic invertebrate distribution and comparisons between natural and created marsh communities.**
Evans, David L.; Streever, William J.; and Crisman, Thomas L.
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 81-104.
Notes: ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Invertebrata/ community structure/ natural flatwoods marshes/ population density/ natural flatwoods marshes community/ influencing factors/ comparison with created freshwater marshes/ marsh/ Florida/ natural flatwoods marshes community structure/ influencing factors and comparison with created freshwater marshes

1808. **Nest sites of ducks in grazed mixed-grass prairie in North Dakota.**
Duebbert, H. F.; Lokemoen, J. T.; and Sharp, D. E.
Prairie Naturalist 18(2): 99-108. (1986)
NAL Call #: QH540.P7; ISSN: 0091-0376
Descriptors: Symphoricarpos occidentalis/ Anas platyrhynchos/ Anas strepera/ Rosa woodsii/ Anas discors/ Anas clypeata/ Stipa viridula/ Agropyron smithii/ habitat use/ nesting success/ seasonal wetland/ grazing pressure management
Abstract: Habitat use and nesting success of seven species of dabbling ducks were evaluated in five vegetative associations within grazed mixed-grass prairie in central North Dakota. During 1976-80, 548 nests were found on 412 ha of grazed prairie for an annual average density of 27 nests/100 ha. Numbers of nests found ranged from 1/100 ha in 1977 (a drought year) to 58/100 ha in 1979 (a very wet year), reflecting the variability that may be expected in a dynamic prairie wetland environment. Nesting success ranged from an average of 23% in the western snowberry (Symphoricarpos occidentalis) association to 34% in the mixed-grass association. Forty-two percent of

the mallard (Anas platyrhynchos) nests and 35% of the gadwall (A. strepera) nests were in patches of western snowberry and/or Wood's rose (Rosa woodsii) that made up 2% of the available cover. Numbers of nests of blue-winged teal (A. discors) and northern shoveler (A. clypeata) were highest in cool-season grasses, especially green needlegrass (Stipa viridula) and western wheatgrass (Agropyron smithii). Height/density (HD) of residual cover decreased exponentially with increased grazing pressure. Use of grazed prairie by blue-winged teal was maximized when the HD of residual cover was 0.5 dm or higher, as could be maintained under light grazing. Results of this study indicated that properly grazed mixed-grass prairie can provide adequate nesting habitat for dabbling ducks. We recommend that preservation and sound ecological management be focused on large tracts of mixed-grass prairie with complexes of seasonal and semipermanent wetlands.

1809. **Nesting and foraging behavior of red-winged blackbirds in stormwater wetlands.**
Sparling, D. W.; Eisemann, J.; and Kuenzel, W.
Urban Ecosystems 10(1): 1-15. (2007)
NAL Call #: QH541.5.C6 U73; ISSN: 10838155.
Notes: doi: 10.1007/s11252-006-0009-0.
Descriptors: birds/ blackbirds/ suburban/ urban/ wildlife
Abstract: Stormwater wetlands are a common part of urban and suburban landscapes. These constructed wetlands provide first-order treatment of effluent from roads, parking lots, lawns and other surfaces. They also provide habitat for wetland-associated birds. Thus, there is a concern that birds may be attracted to potentially toxic habitats. This study assesses nesting success and forging behavior of Red-winged Blackbirds (Agelaius phoeniceus) in retention stormwater wetlands based on drainage type. Drainage categories included residential, commercial, and highway sites. Commercial sites had the lowest nesting success and the lowest diversity of invertebrate foods. Mean nest success values for all three types of wetlands, especially for highway drainages, were comparable to published values from natural wetlands. Over two years of study highway ponds collectively served as source populations whereas residential and commercial sites were population sinks in one year and sources in the other. Red-wings using highway sites had the highest foraging efficiency as determined by the frequency and duration of forays. Residential sites had the greatest human disturbance and generally had intermediate-quality habitat and nesting success. We conclude that while stormwater wetlands collect run off and accompanying pollutants, they can still be valuable habitats for nesting birds in urban and suburban areas. We recommend a few management strategies that can increase avian use of these habitats.

1810. **Nongame bird use of restored wetlands in Manitowoc County, Wisconsin.**
Guggisberg, A. C. Wisconsin Department of Natural Resources, 1996. 60 p.
Descriptors: land ownership/ questionnaire/ statistics/ surveys/ vegetation
Abstract: Nongame wildlife use and vegetation were monitored on 143 restored wetlands in Manitowoc County. Included is a supplement, entitled "Wisconsin's Coastal Lake Michigan Wetland Restoration Research Program: Getting Started & Data Sheets and Instructions."

1811. **Odonates as biological indicators of grazing effects on Canadian prairie wetlands.**
Foote, Alee and Hornung, Christine L. Rice
Ecological Entomology 30(3): 273-283. (2005)
NAL Call #: QL461.E4; ISSN: 0307-6946
Descriptors: wetlands/ grazing/ vegetation/ prairies/ abundance/ indicator species/ reproductive effort/ water quality/ biodiversity/ agriculture/ aquatic insects/ emergent vegetation/ lentic environment/ ecosystem disturbance/ Scirpus acutus/ Zygoptera/ Odonata/ Canada, Alberta/ damselflies/ dragonflies
Abstract: 1. Aquatic macro-invertebrates have frequently been used as biological indicators in lotic environments but much less commonly so in lentic habitats. Dragonflies and damselflies (Order Odonata) satisfy most selection criteria for lentic bioindicators of grazing impacts. 2. Intensive cattle grazing affects most of the Canadian prairie pothole region but the effects of grazing on wetlands are poorly understood. 3. Here the vegetation structure and invertebrate community composition of 27 prairie potholes in Alberta, Canada were studied and compared. Wetlands were evenly divided into three treatments of different grazing regimes. 4. Removal of emergent vegetation by cattle grazing decreased odonate abundance and reproductive effort. Shorter Scirpus acutus stems resulted in significantly fewer damselflies (Suborder Zygoptera) and lower reproductive efforts. 5. Overall odonate diversity was affected by the height of key plant species, highlighting the importance of the vegetation structure of both emergent vegetation for breeding and adjacent upland vegetation for nocturnal roosts. Wetland vegetation structure was more important than vegetation composition to the life history of odonates. 6. Wetland water quality parameters of nitrogen, phosphorus, total dissolved solids (TDS), and chlorophyll-a concentration did not change due to the presence of grazing cattle at wetlands so water quality influences were rejected as mechanisms of change. 7. Larval odonate diversity and abundance was positively correlated with overall aquatic macro-invertebrate diversity and abundance, hence it was concluded that the larval odonate community can be an accurate bioindicator of intactness and diversity of overall aquatic macro-invertebrate communities in Canadian prairie wetlands.

1812. **Organochlorine pesticides and polychlorinated biphenyls in sediment and fish from wetlands in the north central United States.**
Martin, D. B. and Hartman, W. A.
Journal of the Association of Official Analytical Chemists 68(4): 12-17. (1985)
NAL Call #: 381 As7; ISSN: 0004-5756
Descriptors: biomagnification/ polychlorinated biphenyls/ organochlorines/ animals/ chromatography, gas/ fishes [metabolism]/ insecticides/ soil pollutants/ water pollutants, chemical/ United States, north central region
Abstract: Sediment samples collected in 1980-1982 from riverine and pothole wetlands at 17 locations in the north central United States were analyzed for organochlorine pesticides, certain of their metabolites, and polychlorinated

biphenyls (PCBs). Concentrations were above minimum detection levels (5 ng/g of organochlorines and 20 ng/g of PCBs) in less than 4% of the samples taken. Fish samples taken at 9 of these 17 locations, and analyzed for the same compounds, showed a higher frequency of detectable contaminants. The most common compound found in fish was DDE, which was found in 51% of the samples at levels up to 512 ng/g. alpha-BHC was present at concentrations of 5 to 27 ng/g in 36% of the fish samples, and DDD was found at levels of 5 to 60 ng/g in 14%. Four other compounds, DDT, dieldrin, PCB, and trans-nonachlor, were detected in fish at relatively low concentrations in less than 10% of the samples. This survey, thus, indicated little contamination by organochlorine pesticides or PCBs in the wetland habitats of this region.

1813. **Organochlorine residues in ducks on playa lakes of the Texas panhandle and eastern New Mexico USA.**
Flickinger E. L. and Krynitsky A. J.
Journal of Wildlife Diseases 23(1): 165-168. (1987)
NAL Call #: 41.9 W64B; ISSN: 0090-3558
Descriptors: DDT/ heptachlor/ insecticide/ nontarget organism

1814. **An overview of major wetland functions and values.**
Sather, J. H.; Smith, R. D.; and Western Energy and Land Use Team (Sept. 1984).
Notes: Microfiche item number: 611-R-1; Other number: SFA 29 (4).
Descriptors: wetlands/ management/ research/ ecology/ freshwater environment/ food chains/ nutrients/ trophic interactions/ habitats/ fishery/ aquatic birds/ sociological aspects/ economics/ hydrology/ water quality/ ecology and conservation/ aquaculture, aquariology and water use

1815. **Parasitism and ecology of wetlands: A review.**
Thomas, F.; Cezilly, F.; De Meeues, T.; Crivelli, A.; and Renaud, F.
Estuaries 20(3): 646-654. (1997)
NAL Call #: GC96.E79; ISSN: 0160-8347.
Notes: Literature review.
Descriptors: wetlands/ ecosystems/ ecology/ coastal waters/ parasites/ predation/ conservation/ estuaries/ nature conservation/ species interactions: parasites and diseases/ ecology/ community studies
Abstract: Recent advances in ecology have suggested that parasites, through the spectrum of their effects, could act as key species in ecosystems. Wetlands are productive ecosystems within which parasitism is diversified. There already exists evidence for direct and indirect effects of parasites on their host species. The influence of parasites on the population ecology of hosts includes survival, castration, sexual selection, predation, and spatial distribution. Parasites can also affect the evolution of host biological diversity (i.e., genetic structure and interspecific competition) and trophic interactions between prey and predators. The key role parasites might play in the ecology of coastal waters and wetlands should be considered in conservation programs applied to such ecosystems.

1816. **Passing of northern pike and common carp through experimental barriers designed for use in wetland restoration.**
French, J. R. P.; Wilcox, D. A.; and Nichols, S. J.
Wetlands 19(4): 883-888. (Dec. 1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212.
Notes: Conference: Temperate Wetlands Restoration Workshop, Barrie, ON (Canada), 27 Nov-1 Dec 1995.
Descriptors: wetlands/ fish passages/ coasts/ land reclamation/ fish management/ carp/ fish populations/ environmental restoration/ fishways/ restoration/ ecosystem management/ population control/ body size/ freshwater fish/ Cyprinus carpio/ Esox lucius/ Ohio/ Erie L./ Metzger Marsh/ common carp/ northern pike/ European carp/ fisheries engineering/ reclamation/ conservation/ wildlife management
Abstract: Restoration plans for Metzger Marsh, a coastal wetland on the south shore of western Lake Erie, incorporated a fish-control system designed to restrict access to the wetland by large common carp (Cyprinus carpio). Ingress fish passageways in the structure contain slots into which experimental grates of varying size and shape can be placed to selectively allow entry and transfer of other large fish species while minimizing the number of common carp to be handled. We tested different sizes and shapes of grates in experimental tanks in the laboratory to determine the best design for testing in the field. We also tested northern pike (Esox lucius) because lack of access to wetland spawning habitat has greatly reduced their populations in western Lake Erie. Based on our results, vertical bar grates were chosen for installation because common carp were able to pass through circular grates smaller than body height by compressing their soft abdomens; they passed through rectangular grates on the diagonal. Vertical bar grates with 5-cm spacing that were installed across much of the control structure should limit access of common carp larger than 34 cm total length (TL) and northern pike larger than 70 cm. Vertical bar grates selected for initial field trials in the fish passageway had spacings of 5.8 and 6.6 cm, which increased access by common carp to 40 and 47 cm TL and by northern pike to 76 and 81 cm, respectively. The percentage of potential common carp biomass (fish seeking entry) that must be handled in lift baskets in the passageway increased from 0.9 to 4.8 to 15.4 with each increase in spacing between bars. Further increases in spacing would greatly increase the number of common carp that would have to be handled. The results of field testing should be useful in designing selective fish-control systems for other wetland restoration sites adjacent to large water bodies.

1817. **Past and future impacts of wetland regulations on playa ecology in the southern Great Plains.**
Haukos, D. A. and Smith, L. M.
Wetlands 23(3): 577-589. (2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ legislation/ environmental regulations/ conservation/ education/ government regulations/ government policy/ playas/ regulations/ solid wastes/ feedlot runoff/ excavation/ aquifers/ watersheds/ groundwater recharge/ municipal wastewater/ urban planning/ degradation/ surface drainage/ nature conservation/ Southern Great Plains/ Texas/ New Mexico/ playas

Abstract: Playa wetlands provide functions critical to the existence of life on the High Plains portion of the Great Plains, including surface drainage, aquifer recharge, and wildlife habitat. These small, circular, isolated depressional wetlands with closed watersheds have a dynamic, unpredictable hydroperiod, which is essential to the maintenance of biodiversity. Most numerous in the Southern High Plains of northwestern Texas and eastern New Mexico, playas have been impacted by sedimentation, pit excavation, road construction, industrial and municipal wastewater, feedlot runoff, urban development, overgrazing, and deliberate filling. Despite being declared, as a wetland class, jurisdictional 'waters of the United States' since 1977, regulations and laws for conservation of wetland functions have seldom been applied to playas. The January 2001 Supreme Court decision, Solid Waste Agency of Northern Cook County (SWANCC) v. United States Army of Corps of Engineers, likely eliminated federal regulation of impacts covered by the Clean Water Act in all but a few playas. Although still subject to the Federal 'Swampbuster' provision enacted by the 1985 Food Security Act, extended natural dry periods allows for frequent cultivation and other activities in playas without incurring violation, contributing to the continued degradation of playa functions. None of the states with significant numbers of playas have regulations for the conservation of playa functions. Suggestions for the successful future conservation of playas and their associated functions include (1) increased promotion and implementation of existing federal and state conservation programs specifically for playas; (2) proposed state regulations for playa conservation; (3) recognition of agricultural impacts on wetland determinations; (4) creation of Wetland Management Districts to preserve intact, functioning playas; and (5) increased public education on the value of playas.

1818. **Patterns and dynamics of shorebird use of California's Central Valley.**
David Shuford, W.; Page, G. W.; and Kjelmyr, J. E.
Condor 100(2): 227-244. (1998)
NAL Call #: QL671.C6; ISSN: 0021-8901
Descriptors: wetlands/ conservation/ distribution/ habitat use/ Pacific Flyway/ ricelands/ seasonal abundance
Abstract: Surveys of California's Central Valley between 1992-1995 document it as one of the most important regions in western North America to migratory and wintering shorebirds. Populations averaged 134,000 individuals in August, 211,000 in November, 303,000 in January, and 335,000 in April. Of 33 species, the 10 or 11 that averaged over 1,000 individuals each season accounted for 99% of total numbers. Managed wetlands, agricultural fields (especially rice), and agricultural evaporation ponds held the most shorebirds. Species varied their seasonal, geographic, and habitat use of the Central Valley, primarily in response to changes in water availability from rainfall or management practices and latitudinal variation in habitat availability mediated, in part, by climate. In the record rainfall year of 1994-1995, shorebird numbers increased 74% between November and January, primarily from coast-to-interior movements of the Dunlin (Calidris alpina) and Long-billed Dowitcher (Limnodromus scolopaceus) and local habitat shifts of Killdeer (Charadrius vociferus). Although the Valley's shorebirds face threats from poor or toxic water quality, changing agricultural practices, and habitat loss to urbanization, they should benefit from current efforts to increase flooding of rice fields and to secure a stable high quality water supply for wetlands. Development of a sound conservation strategy is crucial for the preservation of shorebird populations in the Central Valley, as this agriculturally-dominated landscape is among the most altered in North America and remains vulnerable to strong economic and population growth pressures that may impact shorebird habitats in the future.

1819. **Physical, chemical, and biological data for detailed study of irrigation drainage in the middle Green River Basin, Utah, 1988-89, with selected data for 1982-87.**
Peltz, L. A. and Waddell, B.
Denver, Colo.: U.S. Geological Survey; Open-File Report 91-530, 1991. 213 p.
Descriptors: wetlands/ water quality/ water pollution sources/ nonpoint pollution sources/ Utah/ selenium/ irrigation/ drainage water/ sediments/ plants/ waterfowl/ fish/ invertebrates/ water measurement/ data collections/ irrigation
Abstract: Physical, chemical, and biological data were collected in the middle Green River basin, eastern Utah, between 1988 and 1989, as part of a detailed study of the effects of irrigation drainage on wetlands areas. Data-collection efforts were concentrated in the Stewart Lake Waterfowl Management Area near Jensen, and Ouray National Wildlife Refuge near Ouray. Data also were collected from Ashley Creek near Vernal, Pelican Lake near Ouray, and in Pariette Wetlands near Myton. A limited quantity of data collected during earlier studies (1982-87), funded by the U.S. Fish and Wildlife Service, also is included. This report contains data needed to assess the effects of selenium and other potentially toxic contaminants on streams and wetlands. Data consist of concentrations of trace elements and common elements in samples of water, sediments, plants, waterfowl, birds, fish, and invertebrates. Other data presented in the report are groundwater levels, surface water discharges, radiochemical constituents in water, analyses of organochlorine compounds in biota, and morphometric measurements of biota. (USGS)

1820. **Phytoplankton primary production and photosynthetic parameters in reservoirs along a gradient of watershed land use.**
Knoll, Lesley B.; Vanni, Michael J.; and Renwick, William H.
Limnology and Oceanography 48(2): 608-617. (2003); ISSN: 0024-3590
Descriptors: freshwater ecology/ chlorophyll/ nonvolatile suspended solids/ multiple regression/ agriculture/ cropland area/ dam outflows/ irradiance/ land use gradients/ light attenuation/ light limitation/ light saturation/ photosynthetic parameters/ primary production/ reservoirs/ stream inflows/ water depth/ watersheds
Abstract: We investigated how watershed land use (a gradient of agricultural vs. forested land) relates to phytoplankton primary production (PPr) and photosynthetic parameters in 12 reservoirs in Ohio and examined spatial variation in these parameters. Shallow sites near stream inflows had higher light attenuation, total phosphorus (TP), chlorophyll, nonvolatile suspended solids (NVSS), light-

saturated photosynthesis (PmB), and volumetric PPr than deeper sites near dam outflows, but areal PPr and the initial slope of the photosynthesis-irradiance curve (alphaB) were not significantly different between sites. Mean mixed layer irradiance and the severity of light limitation did not differ between sites because shallower depths compensated for higher light attenuation at inflow sites. Watershed land use (percent agriculture) was only weakly (but significantly) related to mean annual PPr, TP, and chlorophyll, but there was a well-defined upper limit to the effect of land use on all three of these parameters. Multiple regression showed that inclusion of additional watershed factors (the ratio of watershed land area to reservoir volume and the ratio of cropland area to number of livestock) greatly increased the variance explained compared to land use alone. TP and chlorophyll were highly correlated with each other and with PPr. Comparison of our TP-chlorophyll, TP-PPr, and chlorophyll-PPr regressions with those of other studies suggests that reservoirs have lower PPr per unit TP than natural lakes, probably because of lower light intensity and higher concentrations of nonalgal P in reservoirs.

1821. **Plant and animal community responses to restored Iowa wetlands.**
LaGrange, Theodore G. and Dinsmore, James J.
Prairie Naturalist 21(1): 39-48. (1989)
NAL Call #: QH540.P7; ISSN: 0091-0376
Descriptors: wetlands/ communities/ ecosystems/ habitat management/ habitat surveys/ management/ plants/ wildlife/ Iowa

1822. **Plant community composition and biomass in Gulf Coast Chenier Plain marshes: Responses to winter burning and structural marsh management.**
Gabrey, S. W. and Afton, A. D.
Environmental Management 27(2): 281-293. (2001)
NAL Call #: HC79.E5E5; ISSN: 0364152X.
Notes: doi: 10.1007/s002670010149.
Descriptors: burning/ coastal marshes/ Gulf Coast Chenier Plain/ Louisiana/ marsh process/ plant biomass/ plant community/ productivity/ structural marsh management/ biomass/ coastal zones/ plants (botany)/ productivity/ wetlands/ nutrient cycles/ environmental impact/ biomass/ community composition/ habitat management/ marsh/ plant community/ prescribed burning/ primary production/ environmental management/ conservation of natural resources/ fires/ United States/ Anatidae
Abstract: Many marshes in the Gulf Coast Chenier Plain, USA, are managed through a combination of fall or winter burning and structural marsh management (i.e., levees and water control structures; hereafter SMM). The goals of winter burning and SMM include improvement of waterfowl and furbearer habitat, maintenance of historic isohaline lines, and creation and maintenance of emergent wetlands. Although management practices are intended to influence the plant community, effects of these practices on primary productivity have not been investigated. Marsh processes, such as vertical accretion and nutrient cycles, which depend on primary productivity may be affected directly or indirectly by winter burning or SMM. We compared Chenier Plain plant community characteristics (species composition and above- and belowground biomass) in experimentally burned and unburned control plots within impounded and unimpounded marshes at 7 months (1996), 19 months (1997), and 31 months (1998) after burning. Burning and SMM did not affect number of plant species or species composition in our experiment. For all three years combined, burned plots had higher live above-ground biomass than did unburned plots. Total above-ground and dead above-ground biomasses were reduced in burned plots for two and three years, respectively, compared to those in unburned control plots. During all three years, belowground biomass was lower in impounded than in unimpounded marshes but did not differ between burn treatments. Our results clearly indicate that current marsh management practices influence marsh primary productivity and may impact other marsh processes, such as vertical accretion, that are dependent on organic matter accumulation and decay.

1823. **Plant composition and erosion potential of a grazed wetland in the Salmon River subbasin, Idaho.**
Hopfensperger, K. N.; Wu, J. Q.; and Gill, R. A.
Western North American Naturalist 66(3): 354-364. (2006)
NAL Call #: QH1.G7; ISSN: 1527-0904
Descriptors: botanical composition/ erosion/ forbs/ geographical information systems/ grassland management/ grasslands/ grazing/ introduced species/ livestock/ meadows/ riparian grasslands/ shrubs/ spatial variation/ species diversity/ species richness/ stand structure/ Universal Soil Loss Equation/ water erosion/ watersheds/ wetlands/ grasses/ Poaceae
Abstract: Wetlands are dynamic habitats with many unique, important functions including filtering sediments and providing diverse habitats for fish and wildlife. Wetlands in the western United States are particularly important because they offer habitat for a number of protected runs of endangered fish species. Historically, livestock grazing has altered wetland and riparian area form and function by facilitating exotic species invasions, altering spatial heterogeneity of vegetation, and increasing erosion. In this study, we examined the vegetation structure and erosion potential in a wetland meadow exposed to unregulated grazing along Deer Creek in the Salmon River subbasin, Idaho, USA. We characterized the vegetation composition and structure within the study area and attempted to assess potential erosion conditions using the Revised Universal Soil Loss Equation (RUSLE) with geographical information system, an empirical approach developed by the U.S. Department of Agriculture-Agricultural Research Service. Historically, the riparian vegetation in the study region was dominated by graminoids and forbs. The current wetland meadow is dominated by forbs blended with few sedges and grasses that are all listed as wetland indicators by the USFWS. The Salmon River subbasin also includes subalpine meadow, broadleaf riparian vegetation and shrub-dominated riparian vegetation. We found no significant spatial variability in species richness and noted a moderate number of exotic species in the total plant composition. Plant cover was higher near slightly entrenched banks, indicating that uncontrolled livestock were primarily occupying gently sloped streambanks and the interior of the meadow. Based on current vegetation composition and RUSLE results, uncontrolled grazing may be negatively impacting the study

area. If uncontrolled grazing were excluded or carefully managed in the wetland meadows of the upper portion of the Deer Creek watershed, a reduction in excess sediments to Deer Creek may occur.

1824. **Plant succession and greentree reservoir management: Implications for management and restoration of bottomland hardwood wetlands.**
King, Sammy L. and Allen, James A.
Wetlands 16(4): 503-511. (1996)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: plants/ Plantae/ plants/ bottomland hardwood wetlands/ conservation/ greentree reservoir management/ plant succession/ vegetation establishment/ wetlands management/ wetlands restoration
Abstract: Bottomland hardwood forests are distributed along rivers and streams throughout the central and eastern United States, with the greatest concentration in the Southeast. Past and projected losses of bottomland hardwoods and degradation of remaining stands suggest that habitat management and/or restoration strategies that target multiple species and multiple uses will be necessary to maintain, enhance, and restore flora and fauna within bottomland hardwood wetlands. A greentree reservoir is a current management strategy that entails manipulating water regimes to provide habitat for wintering waterfowl. We conducted a literature review and synthesis to determine the potential impacts of greentree reservoir management on plant succession within bottomland hardwood wetlands. Greentree reservoirs can impact vegetation establishment through several processes. Despite shortcomings of greentree reservoirs, designs similar to them could be very beneficial in restoring bottomland hardwood plant and animal communities from degraded forests provided water-level control and maintenance are substantially improved. Emulation of natural hydrologic regimes, including natural variability, could produce diverse bottomland hardwood plant communities and provide habitat for a variety of wildlife species.

1825. **Playas of the Southern High Plains: The macroinvertebrate fauna.**
Hall, Dianne L.; Sites, Robert W.; Fish, Ernest B.; Mollhagen, Tony R.; Moorhead, Daryl L.; and Willig, Michael R.
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 635-665.
Notes: ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Macroinvertebrata/ habitat management/ playa lakes overview/ food webs/ community structure/ playa lakes/ emigration/ immigration/ playa lakes fauna overview/ habitat colonization/ playa lakes colonization patterns/ temporary water/ Southern Great Plains/ playa lakes community ecology and conservation

1826. **Postbreeding movements of American avocets and implications for wetland connectivity in the western Great Basin.**
Plissner, J. H.; Haig, S. M.; and Oring, L. W.
Auk 117(2): 290-298. (2000)
NAL Call #: 413.8 AU4 ; ISSN: 00048038
Descriptors: connectivity/ dispersal/ patchiness/ shorebird/ wetland management/ United States/ Recurvirostra americana
Abstract: Wetlands in the western Great Basin of the United States are patchily distributed and undergo extensive seasonal and annual variation in water levels. The American Avocet (Recurvirostra americana) is one of many shorebird species that use these wetlands as breeding and migratory stopover sites and must adjust to variable conditions. We used radio telemetry to determine postbreeding, premigratory movement patterns of avocets throughout the region. In 1996 and 1997, 185 breeding adults were captured and fitted with radio transmitters at five breeding areas in Oregon, California, and Nevada. Regular aerial and ground surveys were conducted at the five main study areas from June through September, or until all avocets had left a site. Other wetlands in the western Great Basin also were surveyed by aircraft for the presence of radio-marked birds. Fifty-six percent of radio-marked avocets were still detected in the region at least eight weeks after capture. Each of these individuals was detected at an average of 2.1 lakes (range 0 to 6), with 74% found at more than one lake system. Forty radio-marked individuals moved at least 200 km between wetlands prior to migration, most of which dispersed northward. Male and female patterns did not differ significantly. Overall, movements may be associated with a prebasic molt, exploitation of a superabundant food source in northern lakes, and reconnaissance for future breeding efforts or staging sites. These results also demonstrate wide-ranging patterns of dispersal in this species and suggest a need for the consideration of large-scale habitat connectivity issues in establishing conservation strategies for shorebirds in the western Great Basin.

1827. **Potential impact of selected agricultural chemical contaminants on a northern prairie wetland: A microcosm evaluation.**
Johnson, B. T.
Environmental Toxicology and Chemistry 5(5): 473-485. (1986)
NAL Call #: QH545.A1E58; ISSN: 0730-7268
Descriptors: wetlands/ water pollution effects/ wildlife habitats/ limnology/ agricultural chemicals/ prairies/ pesticides/ microcosms/ toxicity/ sediments/ plants/ invertebrates/ algae/ macrophytes/ growth/ productivity
Abstract: An aquatic, multicomponent microcosm simulating a northern prairie wetland was used to asses the potential effects of six extensively used agricultural pesticides. 16 3-liter aquatic microcosms were treated with three concentrations of each of the pesticides carbofuran, fonofos, phorate, atrazine, treflan and triallate. The microcosm units were incubated for 30 d in an environmental chamber, with a 16-h light:8-h dark cycle, maintained at 20 C. The laboratory protocol was designed as an initial, rapid, economical screening test to determine

the effect, but not the fate, of chemical contaminants in terms of toxicity, impaired productivity and community biochemical functions. Static acute toxicity tests with Daphnia magna and Chironomus riparius suggested that carbofuran, fonofos, phorate and triallate were very toxic to aquatic invertebrates. For D. magna the 48-h EC50 values were 48, 15, 19 and 57 microgram(µg)/L, respectively. Invertebrates viability tests indicated rapid changes in the toxicological persistence of these pesticides after microcosm interaction. Populations of D. magna were established in the 10 µg/L test concentration of carbofuran, phorate, triallate and fonofos at 1, 1, 14 and 28 d, respectively. Preexposure of the wetland sediments to either triallate or fonofos did not appear to change the relative toxicological persistence of each compound in the water column. Changes in pH, alkalinity, conductivity, dissolved oxygen, total nitrogen and total phosphorus were also observed with different pesticide treatments. Atrazine significantly reduced gross primary productivity and inhibited algal and macrophytic growth. The respiratory electron transfer system, phosphatase activity, oxygen consumption and mineralization of dissolved organic carbon were not significantly impacted by any of these pesticides in hydrosoils. However, the impact of atrazine, fonofos and triallate on invertebrates and plants in the microcosm - both key elements in wetland productivity - would suggest that caution be used in application of these pesticides in or near wetland habitats.

1828. **Potential impacts of agricultural chemicals on waterfowl and other wildlife inhabiting prairie wetlands: An evaluation of research needs and approaches.**
Grue, C. E.; DeWeese, L. R.; Mineau, P.; Swanson, G. A.; Foster, J. R.; Arnold, P. M.; Huckins, J. N.; Sheehan, P. J.; Marshall, W. K.; and Ludden, A. P.
Transactions of the North American Wildlife and Natural Resource Conference 51: 357-383. (1986)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: pesticide residues/ fertilizers/ pollution/ research/ toxicity/ waterfowl/ wildlife/ United States, Midwest/ Canada
This citation is from AGRICOLA.

1829. **Predicted distribution and characteristics of wetlands used by mallard pairs in five Great Lakes states.**
Yerkes, T.; Paige, R.; MacLeod, R.; Armstrong, L.; Soulliere, G.; and Gatti, R.
American Midland Naturalist 157(2): 356-364. (2007)
NAL Call #: 410 M58; ISSN: 0003-0031
Descriptors: animal behavior/ distribution/ habitat selection/ habitats/ models/ wetlands/ wildlife conservation/ Anas platyrhynchos/ birds
Abstract: Understanding the relationship between wetland types and waterfowl distribution in the Great Lakes States of Wisconsin, Michigan, Illinois, Indiana and Ohio is complicated because basin specific waterfowl survey data do not exist. We used data from breeding waterfowl surveys in Michigan and Wisconsin during 1993 to 2002 and digital wetland data within buffered transect routes to develop a predictive model of mallard distribution within the 5 Great Lake States. The most parsimonious model based on AICc was used to map predictive distributions of breeding mallards. Based on the positive influence of palustrine emergent, palustrine unknown and palustrine unconsolidated shore and the negative influence of palustrine forested wetlands, the highest densities of breeding mallards were predicted in southeastern Wisconsin and southeastern Michigan. Additionally, we flew helicopter surveys in spring of 2003 to characterize wetland basins used by mallard pairs. Individual pairs were observed most often on small palustrine emergent and palustrine forested wetlands. The resulting models and maps can be used by a variety of agencies to plan conservation and management actions for mallards breeding in the Great Lakes States.

1830. **Principles for management of aquatic-breeding amphibians.**
Semlitsch, R. D.
Journal of Wildlife Management 64(3): 615-631. (2000)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wildlife management/ conservation/ population dynamics/ wetlands/ ecosystem management/ breeding sites/ hydrology/ nature conservation/ land use/ Amphibia/ amphibians/ species diversity/ conservation/ habitat community studies/ conservation, wildlife management and recreation
Abstract: Coordinated efforts by ecologists and natural resource managers are necessary to balance the conservation of biological diversity with the potential for sustained economic development. Because some amphibians have suffered world-wide declines during the last 20 years, it is important to consider biologically based management strategies that will preserve local and regional populations. This paper provides a brief overview of potential threats to local and regional populations, the state of knowledge on population and landscape processes, and the critical elements needed for an effective management plan for amphibians. Local population dynamics and ecological connectivity of amphibian metapopulations must be considered in effective management plans. There are 3 critical factors to consider in a management plan (1) the number or density of individuals dispersing from individual wetlands, (2) the diversity of wetlands with regard to hydroperiod, and (3) the probability of dispersal among adjacent wetlands or the rescue and recolonization of local populations. Wetland losses reduce the total number of sites where pond-breeding amphibians can reproduce and recruit juveniles into the breeding population. Loss of small, temporary wetlands (<4.0 ha) may be especially harmful to amphibians because of their abundance and high species diversity. Alteration of wetlands, particularly hydrologic cycles, can severely impair completion of larval metamorphosis through either early pond drying (if hydroperiod is shortened) or through increased predation (if hydroperiod is lengthened or connections made with fish-infested lakes, rivers, or canals). Wetland loss also increases the distance between neighboring wetlands that is critical to metapopulation source-sink processes. Reduction in wetland density reduces the probablity that populations will be rescued from extinction by nearby source populations. Local populations cannot be considered independent of source-sink processes that connect wetlands at the landscape or regional level. Further the fragmentation of natural habitats from timber harvesting, agriculture, roads, drainage canals, or urban development impedes or prevents dispersal and decreases

the probability of wetland recolonization. If our goal is to maintain or enhance present levels of amphibian diversity, then resource managers must incorporate critical elements into plans that protect population and landscape processes thereby maintaining viable populations and communities of amphibians.

1831. **Progress in wetland restoration ecology.**
Zedler, Joy B.
Trends in Ecology and Evolution 15(10): 402-407. (2000)
NAL Call #: QH540.T742 ; ISSN: 0169-5347
Descriptors: biodiversity/ disturbance regimes/ habitat types/ invasive species/ landscape setting/ seed banks/ soil properties/ spatial scales/ temporal/ topography/ water preservation/ wetland restoration ecology

1832. **Protection of habitat for rare wetland fauna during timber harvesting in Massachusetts (USA).**
Kittredge, D. B.
Natural Areas Journal 16(4): 310-317. (1996)
NAL Call #: QH76.N37; ISSN: 0885-8608
Descriptors: wetlands/ conservation/ rare species/ environmental protection/ trees/ harvesting/ nature conservation/ aquatic organisms/ ecosystem disturbance/ environmental impact/ forestry/ environmental effects/ forest industry/ Massachusetts/ harvesting/ forest industry/ trees/ forestry/ rare species/ nature conservation/ aquatic organisms/ ecosystem disturbance/ environmental impact/ environmental effects
Abstract: The practice of harvesting timber is commonly thought of as conflicting with the protection of rare species habitat. In Massachusetts, over 5 years and more than 3,300 harvesting operations, rare wetland faunal habitat was involved 5.3% of the time (175 occurrences). The Massachusetts Natural Heritage and Endangered Species Program reviewed all proposed harvesting that involved habitat for rare wetland species and determined that operations would cause "no impact" in 58.9% of the cases, "possible impact" in 40% of the cases, and "definite impact" in 1.1% of the cases. Rare fauna whose habitat was most frequently involved were wood turtle (Clemmys insculpta), spotted turtle (Clemmys guttata), and spring salamander (Gyrinophilus porphyriticus). The Natural Heritage and Endangered Species Program recommended mitigating measures such as timing of the harvest, buffers around water bodies, improved stream crossing techniques, and other practices. In most circumstances, these were incorporated into the forest cutting plan and were made a requirement of the operation. When they were not required, the regulating agency had determined that the recommendations did not apply to the specific circumstances on the ground. In general, habitat of rare wetland faunal species is not impacted by timber harvesting in Massachusetts, and likewise, harvesting is not seriously impacted by habitat protection. Regulation of harvesting, an atlas of rare species habitats, and good communication result in protection of habitat that is compatible with harvesting.

1833. **Rapid response of macroinvertebrates to drainage management of shallow connected lakes.**
Van De Meutter, Frank; Stoks, Robby; and De Meester, Luc
Journal of Applied Ecology 43(1): 51-60. (2006)
NAL Call #: 410 J828; ISSN: 0021-8901
Descriptors: methods and techniques/ conservation/ terrestrial ecology: ecology, environmental sciences/ biodiversity/ lake restoration/ applied and field techniques/ drainage management/ applied and field techniques/ lake drainage/ applied and field techniques/ lake recolonization/ applied and field techniques/ species richness/ species diversity/ abiotic conditions/ shallow connected lake
Abstract: 1. Shallow lakes throughout the world are subject to drainage, either for fish harvesting or lake restoration. Lake drainage of fish lakes is known to improve macrophyte and zooplankton diversity, but the effect on the macroinvertebrate community is poorly known.2. In the present study, we investigated temporal trends in the macroinvertebrate community following drainage of six shallow connected lakes. Diversity increased for all macroinvertebrates (family level). Recolonization of the lakes occurred within the first year after the drainage and was supplemented with a set of species that were previously rare or did not occur in the lakes. Changes in the abiotic conditions of the lakes were small and transient, except for the decline in fish. The rapid recolonization by the species occurring before drainage is attributed to the high connectivity of our system. The appearance of supplementary species may relate to lowered fish predation, suggesting that fish were a dominant factor in shaping the communities.4. Synthesis and applications. Lake drainage has a positive effect on the diversity and richness of macroinvertebrates in shallow connected lakes. This positive effect may be due to a decline in fish predation following lake drainage in combination with a high rate of recolonization among others via connections to non-drained lakes. Lake drainage, therefore, is probably the most cost-effective lake restoration tool in shallow connected lakes. Other restoration tools may be preferable in isolated lakes where recolonization is constrained.

1834. **Reforestation of frequently flooded agricultural fields: A compendium of results from research conducted at the Lake George Wetland and Wildlife Restoration Project, Mississippi.**
Williams, H. M.; Craft, M. H.; and Young, G. L.
Vicksburg, MS.: Army Engineer Waterways Experiment Station; WES/TR/WRP-RE-18, 1997.
Notes: NTIS accession number: ADA3311321.
Descriptors: wetlands/ flood plains/ agriculture/ land use/ reclamation/ ecosystem management/ environment management/ plant populations/ vegetation cover/ habitat/ Mississippi, George L./ bottomland hardwood reforestation/ habitat community studies/ conservation, wildlife management and recreation
Abstract: The objective of the Lake George Bottomland Hardwood Wildlife and Wetland Restoration Project is to restore functioning bottomland hardwood wetland habitat by reforesting 3,600 ha of agricultural fields located in the Mississippi Delta. The Lake George Project provided an opportunity to conduct applied research on several bottomland hardwood reforestation topics. University and

Federal agency scientists conducted studies on matching tree species to the site, selecting plant stock type, selecting when to plant, and monitoring early habitat development following planting.

1835. **A regional assessment of salt marsh restoration and monitoring in the Gulf of Maine.**
Konisky, R. A.; Burdick, D. M.; Dionne, M.; and Neckles, H. A.
Restoration Ecology 14(4): 516-525. (2006)
NAL Call #: QH541.15.R45R515; ISSN: 10612971.
Notes: doi: 10.1111/j.1526-100X.2006.00163.x.
Descriptors: estuary/ monitoring protocol/ regional assessment/ salt marsh/ tidal restoration
Abstract: We compiled salt marsh monitoring datasets from 36 complete or imminent restoration projects in the Gulf of Maine to assess regional monitoring and restoration practices. Data were organized by functional indicators and restoration project types (culvert replacement, excavation works, or ditch plugging) then pooled to generate mean values for indicators before restoration, after restoration, and at reference sites. Monitoring data were checked against the regional standards of a voluntary protocol for the Gulf of Maine. Data inventories showed that vegetation and salinity indicators were most frequently collected (89 and 78% of sites, respectively), whereas nekton, bird, and hydrologic measures were collected at only about half of the sites. Reference conditions were monitored at 72% of sites. Indicators were analyzed to see if project sites were degraded relative to reference areas and to detect ecological responses to restoration activities. Results showed that compared to reference areas, prerestoration sites had smaller tidal ranges, reduced salinity levels, greater cover of brackish plants species, and lower cover of halophyte plants. Following restoration, physical factors rebounded rapidly with increased flood and salinity levels after about one year, especially for culvert projects. Biological responses were less definitive and occurred over longer time frames. Plant communities trended toward recovered halophytes and reduced brackish species at 3+ years following restoration. Nekton and avian indicators were indistinguishable among reference, impacted, and restored areas. The protocol was successful in demonstrating restoration response for the region, but results were limited by regional inconsistencies in field practices and relatively few multiyear datasets. To improve future assessment capabilities, we encourage greater adherence to the standard protocol throughout the Gulf of Maine salt marsh restoration community. © 2006 Society for Ecological Restoration International.

1836. **Regional patterns of wading bird productivity in northeastern U.S. estuaries.**
Parsons, K. C.; Schmidt, S. R.; and Matz, A. C.
Waterbirds 24(3): 323-330. (2001)
NAL Call #: QL671; ISSN: 07386028
Descriptors: estuaries/ northeastern United States/ predation/ productivity/ wading birds/ estuarine ecosystem/ mortality/ predation/ reproductive success/ wader/ United States/ Bubulcus ibis/ Egretta thula/ Nycticorax nycticorax/ Plegadis falcinellus
Abstract: We investigated wading bird productivity in four estuaries from Delaware Bay to Boston Harbor in northeastern U.S.A. over the period 1986-1998. To document and characterize reproductive performance of numerically dominant species for use in wildlife and habitat management planning, we recorded 1) number of eggs laid, 2) percent of eggs hatched, 3) percent of hatchlings surviving 10-15 days post-hatch, 4) number of nestlings produced, and 5) factors of offspring mortality in nests of Black-crowned Night Heron (Nycticorax nycticorax), Snowy Egret (Egretta thula), Cattle Egret (Bubulcus ibis), and Glossy Ibis (Plegadis falcinellus). We randomly selected 30-50 nests of each species (as available) for study at colonies in Delaware Bay (1993-1998), New York Harbor (1986-1994), Cape Cod (1990-94), and Boston Harbor (1993-94). In addition, we recorded abundance of nesting wading birds and avian predators in most years of study. Colony size ranged from 120-8,300 nests. Clutch size of all species was greater at northern-most sites. Loss of eggs varied between estuaries for all species except Glossy Ibis. Hatching success ranged from 75-88% and differed between estuaries for Black-crowned Night Heron and Glossy Ibis. Hatchling survival ranged from 16-87% and was lowest in Delaware Bay for all species. Nestling production was lowest in Delaware Bay for all species. In general, predation was high in Delaware Bay and egg inviability was high in Boston Harbor. Predation of nestlings was greatest in Delaware Bay for Cattle Egret, but there were no differences between estuaries for other species. Proportions of avian predators to nesting herons did not explain high predation rates in Delaware Bay. Received 18 April 2001, accepted 21 June 2001.

1837. **Regional wetlands planning: A case study of coastal wetlands planning in the San Francisco Bay area and southern California.**
Denisoff, C. and Movassaghi, M.
In: Taking a Look at California's Ocean Resources: An Agenda for the Future. San Deigo, California. Magoon, O. R.; Converse, H.; Baird, B.; and Miller-Henson, M. (eds.); Vol. 2. Reston, Va.: American Society of Civil Engineers; pp. 1028-1037; 1998.
Notes: Case studies; Conference: California and the World Ocean '97.
Descriptors: wetlands/ marine resources/ resource management/ coastal zone management/ environment management/ regional planning/ salt marshes/ San Francisco Bay/ land reclamation/ land management/ agriculture/ estimating/ coasts/ coastal zone/ San Francisco County/ conservation, wildlife management and recreation/ coastal zone management/ conservation and environmental protection/ techniques of planning/ environmental action/ legal/ governmental
Abstract: Historically, wetland habitats were often seen only as a breeding ground for disease-carrying mosquitoes. From approximately the mid-18th century through the middle of the 20th century, the vast majority of wetlands in the United States were drained and converted into agricultural land through policies of the federal and state governments for what were the considered more "productive" uses. For example, the Federal Swamp Land Acts - National Swamp and Overflowed Land Act- of the 1800's gave 65 million acres of wetlands to 15 states, including California, for reclamation. In 1866, the California Legislature Commissioned the Board of Swamp and

Overflowed Land to manage these properties. In turn, by 1870, the majority of wetlands had been transferred to private ownership. Between 1850 and 1920, about 70 percent of California's wetlands were destroyed, largely by levee and drainage projects. These projects where in some cases subsidized to aid private developers in reclaiming swamplands for agricultural purposes, helping to make California the leading agricultural state in the Nation by 1887 (CA Department of Water Resources 1993). Estimates of wetlands that historically existed in California range from 3 to 5 million acres. The current estimate of wetland acreage in California is approximately 454,000 acres; this represents an 85 to 90 percent reduction, the greatest percentage loss in the nation.

1838. **Relationship of breeding bird density and diversity to habitat variables in forested wetlands.**
Swift, B. L.; Larson, J. S.; and DeGraaf, R. M.
Wilson Bulletin 96(1): 48-59. (1984)
NAL Call #: 413.8 W692; ISSN: 0043-5643
Descriptors: Aves/ community structure/ breeding/ forest-wetland-habitat relationships/ semiaquatic habitat/ forested wetlands/ breeding community/ Massachusetts/ Connecticut Valley/ population density/ wildlife habitat/ species diversity

1839. **Relationships between wintering waterbirds and invertebrates, sediments and hydrology of coastal marsh ponds.**
Bolduc, F. and Afton, A. D.
Waterbirds 27(3): 333-341. (2004)
NAL Call #: QL671; ISSN: 15244695
Descriptors: coastal wetlands/ Gulf of Mexico/ hydrology/ invertebrates/ sediments/ shorebirds/ wading birds/ waterfowl/ habitat management/ hydrology/ invertebrate/ population density/ sediment/ wader/ Louisiana/ North America/ Rockefeller State Wildlife Refuge/ United States/ Anas/ Anas clypeata/ Anas crecca/ Anatidae/ Anser/ Aves/ Invertebrata
Abstract: We studied relationships among sediment variables (carbon content, C:N, hardness, oxygen penetration, silt-clay fraction), hydrologic variables (dissolved oxygen, salinity, temperature, transparency, water depth), sizes and biomass of common invertebrate classes, and densities of 15 common waterbird species in ponds of impounded freshwater, oligohaline, mesohaline, and unimpounded mesohaline marshes during winters 1997-98 to 1999-2000 on Rockefeller State Wildlife Refuge, Louisiana, USA. Canonical correspondence analysis and forward selection was used to analyze the above variables. Water depth and oxygen penetration were the variables that best segregated habitat characteristics that resulted in maximum densities of common waterbird species. Most common waterbird species were associated with specific marsh types, except Green-winged Teal (Anas crecca) and Northern Shoveler (Anas clypeata). We concluded that hydrologic manipulation of marsh ponds is the best way to manage habitats for these birds, if the hydrology can be controlled adequately.

1840. **Remarkable amphibian biomass and abundance in an isolated wetland: Implications for wetland conservation.**
Gibbons, J. Whitfield; Winne, Christopher T.; Scott, David E.; Willson, John D.; Glaudas, Xavier; Andrews, Kimberly M.; Todd, Brian D.; Fedewa, Luke A.; Wilkinson, Lucas; Tsaliagos, Ria N.; Harper, Steven J.; Greene, Judith L.; Tuberville, Tracey D.; Metts, Brian S.; Dorcas, Michael E.; Nestor, John P.; Young, Cameron A.; Akre, Tom; Reed, Robert N.; Buhlmann, Kurt A.; Norman, Jason; Croshaw, Dean A.; Hagen, Cris; and Rothermel, Betsie B.
Conservation Biology 20(5): 1457-1465. (2006)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: Rana sphenocephala/ southern leopard frog/ amphibian decline/ biodiversity/ drought/ land use/ wetland recovery/ biomass/ ecosystem/ amphibia [physiology]/ conservation of natural resources [methods]/ animals/ fresh water/ population density/ population dynamics/ South Carolina
Abstract: Despite the continuing loss of wetland habitats and associated declines in amphibian populations, attempts to translate wetland losses into measurable losses to ecosystems have been lacking. We estimated the potential productivity from the amphibian community that would be compromised by the loss of a single isolated wetland that has been protected from most industrial, agricultural, and urban impacts for the past 54 years. We used a continuous drift fence at Ellenton Bay, a 10-ha freshwater wetland on the Savannah River Site, near Aiken, South Carolina (U.S.A.), to sample all amphibians for 1 year following a prolonged drought. Despite intensive agricultural use of the land surrounding Ellenton Bay prior to 1951, we documented 24 species and remarkably high numbers and biomass of juvenile amphibians (>360,000 individuals; >1,400 kg) produced during one breeding season. Anurans (17 species) were more abundant than salamanders (7 species), comprising 96.4% of individual captures. Most (95.9%) of the amphibian biomass came from 232095 individuals of a single species of anuran (southern leopard frog[Rana sphenocephala]). Our results revealed the resilience of an amphibian community to natural stressors and historical habitat alteration and the potential magnitude of biomass and energy transfer from isolated wetlands to surrounding terrestrial habitat. We attributed the postdrought success of amphibians to a combination of adult longevity (often >5 years), a reduction in predator abundance, and an abundance of larval food resources. Likewise, the increase of forest cover around Ellenton Bay from <20% in 1951 to >60% in 2001 probably contributed to the long-term persistence of amphibians at this site. Our findings provide an optimistic counterpoint to the issue of the global decline of biological diversity by demonstrating that conservation efforts can mitigate historical habitat degradation.

1841. **Research and policy issues regarding coastal wetland impoundments: Lessons learned in South Carolina.**
Devoe, M. R. and Baughman, D. S.
In: Marsh management in coastal Louisiana: Effects and issues.Baton Rouge, LA. Duffy, W. G. and Clark, D. (eds.): Fish and Wildlife Service, U.S. Department of the Interior; pp. 98-106; 1989.

NAL Call #: QH540.U562 no.89(22)
Descriptors: waterfowl/ habitats/ marshes/ Louisiana/ wetlands/ impoundment/ rice production
Abstract: More than 140 000 acres along South Carolina's coastal rivers and tidal creeks were impounded for rice production during the early 1800's; 70 000 of the State's 504 000 acres of contiguous wetlands remain impounded today. Because of heightened awareness of the inherent productivity of these systems for waterfowl habitat and aquaculture, a number of property owners have submitted permit applications to State and Federal regulatory agencies to re-impound formerly impounded areas. These applications have generated a number of questions, regarding the ecology, management, and public policy of coastal impoundments, and wetlands in general. Opinions concerning the effects impoundments have on wetland processes have differed between wildlife and marine biologists. This dichotomy is especially evident within several of the 13 agencies which play a role in the decision-making process. Additionally, inconsistent decision-making has contributed to the dilemma, politics and economics play an extremely important role in the process. These and other issues have underscored the need for credible and focused research data and information on one hand and a fair, consistent, and unbiased regulatory framework on the other. -from Authors

1842. **Residual organochlorine pesticides in soils and fish from wetland restoration areas in central Florida, USA.**
Marburger, J. E.; Johnson, W. E.; Gross, T. S.; Douglas, D. R.; and Di, J.
Wetlands 22(4): 705-711. (Dec. 2002)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ soil contamination/ organochlorine compounds/ pesticides/ aquatic organisms/ Chlordane/ DDT/ Dieldrin/ tissues/ soil/ contamination/ pesticides (organochlorine)/ Florida/ rehabilitation/ water pollution/ fate of pollutants/ sediment contamination/ spatial distribution/ bioaccumulation/ fish populations/ animal tissues/ data collections/ sediment pollution/ DDE/ geographical distribution/ restoration/ pollution dispersion/ Pisces/ Ameiurus nebulosus/ Micropterus salmoides/ Pomoxis nigromaculatus/ fish/ black crappie/ largemouth bass/ brown bullhead/ freshwater pollution/ environmental impact/ sources and fate of pollution/ effects on organisms/ water pollution: monitoring, control and remediation
Abstract: Four wetland restoration sites in the Emeralda Marsh Conservation Area located in central Florida, USA were flooded between 1992 and 1994. Florida Fish and Wildlife Conservation Commission stocked largemouth bass in the flooded areas from 1992 to 1996. In 1996, organochlorine pesticides (OCPs) were measured in flooded soils and in black crappie, brown bullhead catfish, and largemouth bass from the four sites. Areas 5 and 7 had the highest concentrations of total residual OCPs in the flooded soils, including dieldrin (385 ± 241 µg/kg), sum of DDT, DDD, and DDE (7,173 ± 1,710 µg/kg), and toxaphene (39,444 ± 11,284 µg/kg). Sum of chlordane residuals was highest in area 5 (1,766 ± 1,037 µg/kg). ANOVA indicated significant differences in location and fish muscle tissue concentrations for chlordane residuals, DDT residuals, and dieldrin. Fish from areas 5 and 7 had the greatest concentrations of chlordane residuals, DDT residuals, and dieldrin, which corresponded to the higher soil concentrations in these two areas. OCPs in muscle tissue were below the U.S. Food and Drug Administration action limits for human consumption. For three-year-old bass collected from Area 5, mean concentrations of chlordane residuals, DDT residuals, and dieldrin were 15-17 times higher in ovary tissue and 76-80 times higher in fat tissue compared with muscle tissue. Mean toxaphene levels in bass ovary and fat tissues were 9 and 39 times higher, respectively, than in muscle tissues. Tissue OCP concentrations were consistent with site OCPs, regardless of fish species.

1843. **Response of a terrestrial mollusc community to an autumn prescribed burn in a rare wetland prairie of western Oregon, USA.**
Severns, Paul M.
Journal of Molluscan Studies 71(Part 2): 181-187. (2005)
NAL Call #: QL401; ISSN: 0260-1230
Descriptors: prescribed burning: applied and field techniques/ grasslands/ wetland prairie
Abstract: Conservation and management of grasslands may involve the use of prescribed fire to reinstate a historical disturbance regime recently suppressed by humans. I used traps to describe the terrestrial mollusc community in a rare wetland prairie ecosystem of western Oregon, USA over a 3-year period in an adjacent burned and unburned wetland prairie parcel beginning 1 year following an autumn prescribed fire. Species richness was lower throughout the burned area for the duration of the study period and mollusc abundance was lower in the first postburn year, but steadily increased over time, surpassing the adjacent burned area by the third postburn year. According to Multi-response Permutation Procedure, the mollusc community in the adjacent burned area differed significantly from the unburned prairie each year since the burn, suggesting that fire history may structure the wetland prairie mollusc community. Indicator species analysis identified that Deroceras reticulatum and Monadenia fidelis were indicator species for unburned wetland prairie, while Catinella rhederi and Vertigo modesta were indicator species for burned habitat at the study site. Since fire appears to decrease wetland prairie mollusc diversity and abundance, prescribed burns should be conducted in accordance with refuges, to provide a source population for colonizing molluscs and for other animals with unknown responses to fire.

1844. **Response of amphibians to restoration of a southern Appalachian wetland: A long-term analysis of community dynamics.**
Petranka, J. W.; Kennedy, C. A.; and Murray, S. S.
Wetlands 23(4): 1030-1042. (Dec. 2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ environmental restoration/ community structure/ species diversity/ amphibians/ monitoring/ frogs/ dynamics/ salamanders/ ecosystems/ restoration/ colonization/ community composition/ environmental impact/ breeding seasons/ Ambystoma maculatum/ Rana sylvatica/ Notophthalmus viridescens/ Anura/ North Carolina/ spotted salamander/ wood frog/ reclamation/ effects of pollution/ conservation, wildlife

management and recreation/ water pollution: monitoring, control and remediation
Abstract: Although amphibians are increasingly being used to assess ecosystem function of compensatory wetlands, there are almost no long-term studies of responses to ecological restoration. Consequently, much uncertainty exists about the appropriate timeframes and best criteria for evaluating responses to wetland restoration. We studied aspects of pond colonization and long-term community dynamics in ponds created at a mitigation site in western North Carolina. We examined whether landscape variables influenced the initial colonization of 22 constructed ponds and conducted a long-term study of changes in species richness and community composition in ten constructed and ten reference ponds over seven breeding seasons. During the first year of pond filling, species richness and the number of egg masses of the wood frog (Rana sylvatica) and spotted salamander (Ambystoma maculatum) were positively correlated with pond size, depth, and hydroperiod but independent of distance to the nearest forest, paved road, or source pond. The ten constructed ponds in the long-term study first filled in 1996 and were larger, deeper, warmer, more oxygen-rich, and of longer seasonal hydroperiod than reference ponds. Seven species bred in the constructed ponds during the first year of filling, and species richness reached equilibrium within two years of initial pond filling. Most species colonized constructed ponds rapidly, but frequency of use by eastern newts (Notophthalmus viridescens) increased slowly over five years. Constructed ponds supported significantly more species than reference ponds, and the annual turnover rate of breeding populations was approximately 25% for both pond types. Our data suggest that post-restoration monitoring for 2-3 years may be sufficient to characterize species and communities that will utilize ponds for the first decade or so after pond creation.

1845. **Response of amphibians to restoration of a southern Appalachian wetland: Perturbations confound post-restoration assessment.**
Petranka, J. W.; Murray, S. S.; and Kennedy, C. A.
Wetlands 23(2): 278-290. (June 2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ environmental restoration/ monitoring/ demography/ pathogens/ amphibians/ population dynamics/ eggs/ ponds/ land management/ restoration/ amphibiotic species/ larvae/ environmental monitoring/ droughts/ environmental impact/ reproduction/ mortality causes/ recruitment/ hatching/ breeding seasons/ animal physiology/ life cycle/ sexual selection/ metamorphosis/ governments/ Rana sylvatica/ Ambystoma maculatum/ Ranavirus/ Anura/ North Carolina/ wood frog/ spotted salamander/ reclamation/ water quality control/ habitat community studies/ conservation, wildlife management and recreation/ water pollution: monitoring, control and remediation
Abstract: Although regulatory agencies in the USA typically require 3-5 yr of post-restoration monitoring of biotic responses to wetland mitigation, many researchers have argued that longer time frames are needed to assess population responses adequately. We conducted an 8-yr study to examine the demographic responses of the wood frog (Rana sylvatica) and spotted salamander (Ambystoma maculatum) to wetland creation at a mitigation bank in western North Carolina. Our primary goals were to compare juvenile output in ten reference and ten constructed ponds and to assess the overall change in breeding population size in response to site restoration. We used annual censuses of egg masses to assess changes in breeding population size and used estimates of larval population size at hatching and the initiation of metamorphosis to assess embryonic and larval survival. Adults of both species bred in most constructed ponds within a few months after filling in 1996. Estimated juvenile production from 1996 to 2002 did not differ significantly between pond types for either species. The percentage of both constructed and reference ponds that produced juveniles decreased markedly from 1996 to 1998 and remained low through 2002. The decrease in juvenile output was mostly associated with reduced larval survival rather than increased embryonic mortality across years. Drought and outbreaks of a pathogen (Ranavirus) were the primary causes of low juvenile production from 1998 to 2002. The overall breeding population of R. sylvatica increased markedly in 1999-2000 following a large recruitment of juveniles from constructed ponds in 1996-1997. With the onset of drought and ranaviral infections, the population declined to levels in 2002 that were at or below 1995 pre-restoration numbers. Despite site perturbations, the breeding population of A. maculatum remained relatively stable from 1995 to 2002, a phenomenon that may reflect selection for delayed reproduction and iteroparity in this species. Although we have monitored R. sylvatica and A. maculatum for seven breeding seasons after the creation of seasonal wetlands, we are still uncertain that site restoration will achieve the goal of increasing breeding populations above pre-restoration levels. Because amphibians have significant population lags and are sensitive to site perturbations, monitoring that exceeds five years may be required to assess demographic responses to site restoration adequately.

1846. **Response of breeding birds to shearing and burning in wetland brush ecosystems.**
Hanowski, J. M.; Christian, D. P.; and Nelson, M. C.
Wetlands 19(3): 584-593. (1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ wild birds/ population density/ prescribed burning/ cutting/ Minnesota
This citation is from AGRICOLA.

1847. **Response of invertebrates to glyphosate-induced habitat alterations in wetlands.**
Linz, G. M.; Bleier, W. J.; Overland, J. D.; and Homan, H. J.
Wetlands 19(1): 220-227. (1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ habitat availability/ herbicides/ abundance/ plant populations/ plant control/ freshwater crustaceans/ aquatic plants/ aquatic insects/ community composition/ cattails/ habitats/ invertebrates/ weed control/ Typha/ Chaoboridae/ Chironomidae/ Corixidae/ Ostracoda/ Oligochaeta/ Cladocera/ Hydracarina/ North Dakota/ glyphosate/ copepods/ ostracods/ angleworms/ earthworms/ oligochaetes/ water fleas/ water boatman/ midges/ phantom midges/ Invertebrata/ Copepoda
Abstract: Wetlands in the Prairie Pothole Region of eastern North Dakota, USA are often overgrown with cattails (Typha spp), providing habitat for crop-depredating

blackbirds and impeding use by waterfowl. One and two years post-treatment (1992 and 1993), we assessed the response of invertebrates to a catastrophic reduction in cattail coverage caused by glyphosate, a herbicide applied to about 14,000 ha of North Dakota's wetlands since 1991. Numbers of Crustacea, Hydracarina, Oligochaeta, Copepoda, Ostracoda, and Cladocera were similar between treated and reference wetlands ($P > 0.10$), while abundance of Gastropoda was greater in the treated wetlands ($P = 0.10$). Insect abundance was greater in treated wetlands ($P < 0.01$), with activity traps yielding highest numbers in July. Corixidae and Chironomidae were more abundant in treated wetlands ($P < 0.10$), whereas Chaoboridae was consistently more plentiful in the reference wetlands ($P = 0.05$). Our results suggest that populations of some aquatic invertebrates may be enhanced by a reduction in cattail coverage with glyphosate-based herbicide.

1848. **Response of macroinvertebrates and small fish to nutrient enrichment in the northern Everglades.**
Rader, Russell B. and Richardson, Curtis J.
Wetlands 14(2): 134-146. (June 1994)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: Invertebrata/ pisces/ farming and agriculture/ agricultural runoff effects on wetland community/ trophic structure/ community structure/ population density/ effects of nutrient enrichment/ semiaquatic habitat/ wetland/ chemical factors/ nutrient enrichment effects on wetland community/ Florida/ Everglades, North/ nutrient enrichments effects on community

1849. **Response of waterbirds to number of wetlands in the Prairie Pothole Region of North Dakota, USA.**
Niemuth, N. D. and Solberg, J. W.
Waterbirds 26(2): 233-238. (2003)
NAL Call #: QL671; ISSN: 07386028
Descriptors: American bittern/ American coot/ black tern/ Breeding Bird Survey/ North Dakota/ pied-billed grebe/ population dynamics/ Prairie Pothole Region/ Sora/ temporal variation/ wetland/ birds/ habitat availability/ spatial variation/ species occurrence/ wildlife management/ United States/ Anas acuta/ Botaurus lentiginosus/ Chlidonias niger/ Fulica americana/ Podilymbus podiceps
Abstract: We examined the relationship between number of wetlands and occurrence of five waterbird and one waterfowl species in the Prairie Pothole Region of North Dakota, USA, from 1980-2000. Data from 13 Breeding Bird Survey routes provided an index to regional density and distribution of Pied-billed Grebe (Podilymbus podiceps), Black Tern (Chlidonias niger), American Bittern (Botaurus lentiginosus), Northern Pintail (Anas acuta), Sora (Porzana carolina), and American Coot (Fulica americano), while 69 segments from annual Waterfowl Breeding Ground Population and Habitat Surveys provided air index to regional wetland availability. Numbers of wetlands and birds varied among years, and density and distribution of all six species showed a strong positive correlation with number of wetlands. Correlations were weaker when the number of wetlands was lagged one year, suggesting that waterbird distributions shift in response to water availability rather than respond locally. Spatial and temporal variation of waterbird habitat and numbers should be considered in monitoring and management of waterbirds in the Prairie Pothole Region.

1850. **Responses of amphibians to restoration of a southern Appalachian wetland: Perturbations confound post-restoration assessment.**
Petranka, J. W.; Murray, S. S.; and Kennedy, C. A.
Wetlands 23(2): 278-290. (2003)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: amphibians/ created ponds/ drought/ mitigation banks/ North Carolina/ Ranavirus/ disturbance/ drought stress/ population size/ reproduction/ restoration ecology/ wetlands/ United States/ Ambystoma maculatum/ Rana sylvatica
Abstract: Although regulatory agencies in the USA typically require 3-5 yr of post-restoration monitoring of biotic responses to wetland mitigation, many researchers have argued that longer time frames are needed to assess population responses adequately. We conducted an 8-yr study to examine the demographic responses of the wood frog (Rana sylvatica) and spotted salamander (Ambystoma maculatum) to wetland creation at a mitigation bank in western North Carolina. Our primary goals were to compare juvenile output in ten reference and ten constructed ponds and to assess the overall change in breeding population size in response to site restoration. We used annual censuses of egg masses to assess changes in breeding population size and used estimates of larval population size at hatching and the initiation of metamorphosis to assess embryonic and larval survival. Adults of both species bred in most constructed ponds within a few months after filling in 1996. Estimated juvenile production from 1996 to 2002 did not differ significantly between pond types for either species. The percentage of both constructed and reference ponds that produced juveniles decreased markedly from 1996 to 1998 and remained low through 2002. The decrease in juvenile output was mostly associated with reduced larval survival rather than increased embryonic mortality across years. Drought and outbreaks of a pathogen (Ranavirus) were the primary causes of low juvenile production from 1998 to 2002. The overall breeding population of R. sylvatica increased markedly in 1999-2000 following a large recruitment of juveniles from constructed ponds in 1996-1997. With the onset of drought and ranaviral infections, the population declined to levels in 2002 that were at or below 1995 pre-restoration numbers. Despite site perturbations, the breeding population of A. maculatum remained relatively stable from 1995 to 2002, a phenomenon that may reflect selection for delayed reproduction and iteroparity in this species. Although we have monitored R. sylvatica and A. maculatum for seven breeding seasons after the creation of seasonal wetlands, we are still uncertain that site restoration will achieve the goal of increasing breeding populations above pre-restoration levels. Because amphibians have significant population lags and are sensitive to site perturbations, monitoring that exceeds five years may be required to assess demographic responses to site restoration adequately.

1851. **Restoration of a south Florida forested wetland.**
Weller, J. D.
Ecological Engineering 4(2): 143-151. (1995)
NAL Call #: TD1.E26; ISSN: 0925-8574.
Notes: Special issue: Restoration and Creation of Wetlands.
Descriptors: wetlands/ environmental restoration/ forests/ land use/ drainage/ ecosystem disturbance/ ecosystem management/ nature conservation/ swamps/ hydrology/ surface water/ groundwater recharge/ groundwater/ habitat improvement/ vegetation cover/ water control/ Florida/ water control
Abstract: A rewatering project conducted at Fern Forest Nature Center in Pompano Beach, Florida, USA, has rejuvenated and restored an area of south Florida forested wetland to its pre-drainage condition in three years. Through the removal of undesirable vegetation such as Brazilian pepper (Schinus terebinthifolius) and the re-introduction of water, the following have been accomplished: increase in surfacewater duration time; elevation of groundwater by 70 to 84 cm; rejuvenation of a depressed forested wetland, a deciduous hardwood swamp, and an emergent wetland; and enhancement of a wading bird habitat, a cypress dome, and 3.2 km of shallow stream bed (1.5 m deep or less). These accomplishments have assured the survival of the park's 34 rare and endangered fern species and encouraged the natural return of 16 wetland bird species, 8 fish species, 6 species of turtles, 6 species of snakes, 5 snails, 2 frog species, and even the American alligator (Alligator mississippiensis).

1852. **The restoration of Union Grove Lake, Iowa.**
Bachmann, R. W. and Hoyman, T. A.
Lake and Reservoir Management 9(2): 53-54. (1994)
Descriptors: agricultural runoff/ cropland/ dissolved oxygen/ dredging/ eutrophication/ habitat improvement/ lake reclamation/ lake restoration/ land use/ sedimentation rates/ sediments/ silt load/ water pollution sources/ watersheds
Abstract: Union Grove Lake is a 105 acre impoundment with about 90% of its watershed in cropland. A US EPA funded Clean Lakes diagnostic/feasibility study in 1983 found that siltation was a major problem that threatened to diminish the recreational usage of the lake. Other problems included winter fish kills due to loss of dissolved oxygen under winter ice cover, poor water transparency, high summer algal levels, and occasional problems with aquatic macrophytes. A lake restoration project was carried out in the period from 1984 through 1992. The lake was dredged to remove 275,000 cubic yards of sediment, shorelines were protected with rip rap, a sediment-retention dike was constructed on the arm with the main tributary, and an artificial aeration system was installed in the deepest part of the lake to maintain winter dissolved oxygen levels. A cooperative program was carried out in the watershed to intensify soil conservation activities. This included increased use of conservation tillage, construction of terraces, grassed waterways, and water and sediment retention basins. The Soil Conservation Service reported that by 1993 nearly 100% of the watershed was in SCS approved soil conservation practices. A post restoration study found that the dredging had increased the lake volume by 14% and thus increased the life of the lake, but it is too early to evaluate the effectiveness of the soil conservation work in slowing down the rate of sedimentation in the lake. It was recommended that the lake be remapped in 10 years to measure the post restoration sedimentation rates. The sedimentation dike was found to provide a barrier to mixing between the upper arm and the main portion of the lake and may help to keep particulate matter from moving from the tributary out into the main part of the lake. The aeration of the lake in the winter has eliminated the winter oxygen loss and there are no more fish kills. This has enhanced the fisheries management program. There was no evidence that the restoration project has changed water quality in the lake as measured by water transparency, concentrations of plant nutrients, and concentrations of algal chlorophylls.

1853. **Restored wetlands as management tools for wetland-dependent birds.**
Dick, Thomas M.
Pennsylvania Birds 7(1): 4-6. (1993); ISSN: 0898-8501
Descriptors: wetlands/ birds/ communities/ ecosystems/ habitat management/ management/ restoration/ wildlife

1854. **Restoring fish populations in a heavily managed ecosystem: The San Francisco Bay-Delta and its watershed.**
Luoma, S.; Brown, R.; Taylor, K.; and Bernstein, B.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003; Vol. 133.; pp. 244; 2003.
Descriptors: freshwater ecology: ecology, environmental sciences/ population studies/ wildlife management: conservation/ CALFED Bay Delta Program/ agriculture/ dams/ ecosystem processes/ escapement/ fish population restoration/ heavily managed ecosystem/ natural variability/ population level processes/ urbanization/ water diversions/ watershed

1855. **Restoring wetland habitats with cows and other livestock: A prescribed grazing program to conserve bog turtle habitat in New Jersey.**
Tesauro, J.
Conservation Biology in Practice 2(2): 26-30. (2001); ISSN: 1526-4629.
http://www.conbio.org/CIP/article22wet.cfm
Descriptors: Bos taurus/ reptiles/ cattle/ wetland/ habitat management/ agriculture/ New Jersey

1856. **Restoring wetlands in the Orange Creek Basin: An innovative state/federal partnership approach.**
Moore, Rosalind A.
Ecological Society of America Annual Meeting, Proceedings 87: 394. (2002)
NAL Call #: QH540.E365.
Notes: Poster session; Conference: 87th Annual Meeting of the Ecological Society of America and the 14th Annual International Conference of the Society for Ecological Restoration, Tucson, Arizona, USA; August 04-09, 2002.
Descriptors: freshwater ecology: ecology, environmental sciences/ wildlife management: conservation/ St. Johns River Water Management District/ U.S. Department of

Agriculture/ NRCS/ USDA/ Natural Resources Conservation Service/ grazing/ hunting/ hydrology/ innovative state/ federal partnership/ land use/ nutrient load/ public recreation/ vegetation reestablishment/ wetland restoration/ wetlands condition/ wildlife habitat enhancement/ Florida
Abstract: Florida's St. Johns River Water Management District (SJRWMD) and the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) are conducting a four-year project to restore wetlands in the Orange Creek Basin, a tributary of the St. Johns River in north central Florida. The 3,400 acre parcel containing 1,500 acres of wetlands was purchased by the SJRWMD, and a 30-year easement purchased under NRCS' Wetlands Reserve Program. Funding for restoration work is shared between the SJRWMD and NRCS. Prior to restoration, the property was drained and used for muck farming, timber production and pasture. Major goals of the project are to restore the hydrologic connection of the wetlands to the Orange Creek floodplain, reduce nutrient loading into the creek, and enhance waterfowl and wading bird populations. In the year following hydrologic restoration, good wetland conditions developed despite the continuation of a multi-year drought. Wetland vegetation has reestablished and several shallow islands have been created to enhance wading bird habitat. Upland restoration continues through prescribed fire and range management. The site is open to the public for passive recreation and for occasional hunting during winter. Ongoing challenges include control of tropical soda apple (Solanum viarum), an invasive exotic, and management of adjacent uplands for cattle grazing. Monitoring and adaptive management techniques are enlisted to meet project goals. The project is a good example of an innovative agency partnership and multi-objective planning.
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1857. **A review of basin morphology and pool hydrology of isolated ponded wetlands: Implications for seasonal forest pools of the northeastern United States.**
Brooks, Robert T.
Wetlands Ecology and Management 13: 335-348. (2005)
NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861.
http://www.treesearch.fs.fed.us/pubs/21526
Descriptors: amphibians/ aquatic invertebrates/ hydrology/ hydroperiod/ seasonal forest pools/ woodland vernal pools
Abstract: Seasonal forest pools (SFPs) are geographically- and hydrologically- isolated ponded wetlands, in that they are topographically isolated from other surface waters. SFPs occur commonly throughout the temperate forests of the eastern United States and adjacent Canada. SFPs are ephemeral in occurrence, typically drying annually. The regular drying of SFPs excludes fish from these habitats, and as a result, they are the preferred breeding habitat of some amphibians, notably ambystomid ('mole') salamanders and wood frogs (Rana sylvatica Le Conte). The pools also support a rich and diverse invertebrate fauna. The duration of the wet phase, or hydroperiod of SFPs, has been repeatedly shown to be the dominant influence on the composition and fitness of the faunal community of the pools. Despite the importance of SFP hydrology, it is a poorly studied subject. This paper reviews the limited state-of-knowledge of seasonal forest pool hydrology and associated basin morphology. The review discusses findings from studies of other isolated ponded wetlands that could be applicable to our understanding of the hydrology of SFPs.
This citation is from Treesearch.

1858. **A review of early literature on forested wetlands in the United States.**
Lugo, A. E. (1984).
Notes: Literature review.
Descriptors: wetlands/ forests/ ecology/ forested/ habitat community studies/ freshwater habitats/ United States
Abstract: A review of the literature dealing with freshwater-forested wetlands reveals three phases prior to 1970: early descriptions, formal descriptive accounts, and ecological descriptions. Each of these phases is reviewed with the objective of presenting the points of view of early students of forested wetlands and focusing on the generalizations that emerged from those studies. Specific topics of discussion are species composition and diversity, vegetation structure and physiognomy, response to flooding, succession, site factors and wetland classification, wildlife, and uses and values.
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1859. **Review of the effects of non-point nutrient loading on coastal ecosystems.**
Gabric, A. J. and Bell, P. R. F.
Australian Journal of Marine and Freshwater Research 44(2): 261-283. (1993); ISSN: 0067-1940.
Notes: Literature review.
Descriptors: pollution effects/ nutrients (mineral)/ coastal waters/ eutrophication/ ecosystem management/ runoff/ erosion/ land use/ coastal zone management/ man-induced effects/ human factors/ coastal water/ nutrients/ nonpoint pollution/ non point pollution/ ecosystems and energetics/ effects on organisms/ pollution environment/ coastal zone management/ pollution effects/ marine pollution
Abstract: In many coastal regions (e.g. parts of the North Sea, northern Adriatic Sea, Baltic Sea, Great Barrier Reef lagoon, wider Caribbean, coastal areas of the USA) there is large-scale, and in some cases chronic, eutrophication. In some regions, the link between eutrophication and the destruction of an ecosystem is obvious, with excessive algal growth and water-column anoxia. In other cases, particularly in more fragile ecosystems such as coral-reef and seagrass areas, the links are not so obvious, yet the impacts of eutrophication in such regions can be devastating. Eutrophication can have more insidious effects such as contributing directly to the mortality of fish, marine mammals and sea birds and indirectly to disease or death in humans owing to the accumulation of biotoxins in seafoods. Increased development and changes in land-use patterns in the coastal zone have increased the loading of diffuse or non-point nutrients. In areas subject to runoff and soil erosion, most of the nutrient load is transported in particulate form. In such cases, the loads of nutrients discharged from cropping lands are typically an order of magnitude greater than those discharged from pristine forested areas. Nutrient export from pasture lands, whether these are fertilized or not, is also significantly greater than that from pristine areas, and in many cases the total loads from such areas are far higher than those from intensively farmed areas. A reduction in nutrient discharges to coastal waters will require careful land-use planning. The importance of the particulate fraction in the nutrient load

necessitates effective control of soil erosion. The hydrological and nutrient linkage between terrestrial and marine ecosystems must be emphasized. Collective management of hinterland and coastal-zone resources could initiate remediation of a serious and growing problem.

1860. **Rice fields as temporary wetlands: A review.**
Lawler, S. P.
Israel Journal of Zoology 47(4): 513-528. (2001);
ISSN: 0021-2210
Descriptors: wetlands/ agricultural land/ Oryza sativa/ rice/ wetlands/ aquatic entomology
Abstract: Rice fields are temporary wetlands that harbor many of the same species that breed in natural temporary ponds. Therefore the rice agroecosystem has the potential to help sustain the regional biodiversity of many invertebrates and vertebrates. Like natural areas of wetlands, rice cultivation provides a habitat mosaic of temporary and more permanent waters. Because of their low floral diversity and because their species composition will rarely overlap completely with that of natural ponds, rice fields are not substitutes for natural temporary ponds. However, they are important in sustaining populations of several species, including wading birds and frogs. Farming methods vary widely, and different practices can alter the suitability of rice fields as habitats. Farmers use water management, pesticides, and sometimes fish to control crop pests and mosquitoes, and other taxa may be affected as well. Farmers may irrigate rice intermittently to control pests, and intermittent habitat holds fewer species than areas that are flooded for longer periods. Broad-spectrum pesticides may harm invertebrates and other wildlife, and may even cause pest resurgences if they have greater effects on predator populations than on the pests. Fish often decrease the abundance of invertebrate predators, but fish farming in rice fields often discourages the use of harmful pesticides. Because farming practices can affect the conservation value of rice fields, ecologists are encouraged to work with farmers and study the role of rice fields in the population dynamics of temporary pond species, and how changing farming methods alter this role.

1861. **The role of submersed aquatic vegetation as habitat for fish in Minnesota lakes, including the implications of non-native plant invasions and their management.**
Valley, Ray D.; Cross, Timothy K.; and Radomski, Paul
Minnesota Department of Natural Resources Section of Fisheries Special Publication 160: 1-25. (2004);
ISSN: 0193-1245.
http://wfs.sdstate.edu/wfsdept/Pond%20Web%20Page/Subm%20veg%20MN%20DRN%20Valley%20report.pdf
Descriptors: conservation measures/ ecology/ habitat/ freshwater habitat/ lentic water/ land zones/ Pisces: habitat management/ aquatic plant management/ implications of role as habitat in lakes/ habitat utilization/ role of submersed aquatic vegetation in lakes/ exotic plant invasions and management implications/ Lake/ role of submersed aquatic vegetation as habitat/ exotic plant invasion and management implications/ Minnesota/ habitat role of submerged aquatic vegetation in lakes/ plant invasions and management implications/ Pisces/ chordates/ fish/ vertebrates
Abstract: This review updates the Division of Fish and Wildlife's understanding of the role of submersed aquatic vegetation (SAV) in providing fish habitat in Minnesota lakes. Below, are several generalizations and recommended approaches for aquatic plant management. 1. Many fish, such as sunfish, largemouth bass, northern pike, and muskellunge, depend on SAV for food and shelter. Nongame fish such as darters, minnows, and killifishes depend primarily on nearshore emergent and submersed vegetation 2. The presence of SAV tends to promote higher water clarity. 3. Black bullhead and common carp often dominate turbid lakes with little to no SAV. Carp are an invasive non-native species that contributes to the loss of native SAV by dislodging rooted plants and resuspending sediments. 4. Generally, conditions for game fish deteriorate when the percentage of a basin that is covered with SAV falls below 10% or exceeds 60%. This range does not consider basin morphometry (i.e., shallow versus deep) which ultimately controls how much vegetation naturally grows within a lake. 5. Studies show native plants provide higher quality habitat for desirable fish than invasive non-native plants such as curly-leaf pondweed or Eurasian watermilfoil. However, these non-native plants provide better habitat than little or no SAV. 6. Minnesota lakes infested with curly-leaf pondweed or Eurasian watermilfoil have not seen large declines in game fish populations. 7. Lake productivity and initial plant conditions appear to greatly affect selective wholelake herbicide's (such as fluridone) effect on fish habitat. Whole-lake studies in infested, moderately-productive (mesotrophic) Michigan lakes with abundant native plants, showed neutral to positive effects of fluridone on fish habitat. 2 8. Fluridone applications in infested productive (eutrophic) Minnesota lakes with low cover of native SAV can have dramatic negative effects on SAV habitats, water clarity, and fish communities. 9. Aquatic plant management policies should reflect a precautionary approach where it is understood that any alteration to SAV will invariably have some effect on a lake's fish community. Therefore, policies should ostensibly be conservative with the intent to minimize habitat degradation. 10. Limiting the cumulative amount of SAV removal may be the most prudent approach towards precautionary management. However, thresholds should be dependent on lake type. The current 15% rule (maximum treatment area within the 15 foot depth zone) for chemicals and 50% rule for mechanical harvesting may be reasonable for some lakes (e.g., small eutrophic lakes); stricter thresholds may be needed for others (e.g., soft water lakes, large or deep lakes). 11. Overall, whole-lake aquatic plant treatment is risky. Significant biological risks associated with large-scale manipulations include excessive removal of fish habitat and thus decline of fish populations, loss of sensitive plant species, declines in water clarity and potential long-term cumulative effects of multiple treatments, since eradication of non-native plant species is highly unlikely. 12. Vegetated, nearshore habitat is critical for fish recruitment. Any removal should be viewed as habitat loss, and efforts should be made to minimize this loss. It follows that 100 feet of removal is worse than 50 feet of removal even if the removal is of a non-native species. 13. Mechanical harvesting may be the best alternative for managing nuisance surface growth of vegetation. Although this requires perpetual maintenance, harvested boat lanes through surface-growing vegetation represents a positive

benefit for recreational access and fish habitat (harvested strips of SAV increases edge and may benefit game species).

1862. **The role of the Wetland Reserve Program in conservation efforts in the Mississippi River Alluvial Valley.**
King, S. L.; Twedt, D. J.; and Wilson, R. R.
Wildlife Society Bulletin 34(4): 914-920. (2006)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648 (2006)34 [914:TROTWR] 2.0.CO;2.
Descriptors: Black bear/ conservation/ migratory birds/ Mississippi Alluvial Valley/ restoration/ Ursus americanus luteolus/ Wetlands Reserve Program/ Wetlands
Abstract: The Mississippi River Alluvial Valley includes the floodplain of the Mississippi River from Cairo, Illinois, USA, to the Gulf of Mexico. Originally this region supported about 10 million ha of bottomland hardwood forests, but only about 2.8 million ha remain today. Furthermore, most of the remaining bottomland forest is highly fragmented with altered hydrologic processes. During the 1990s landscape-scale conservation planning efforts were initiated for migratory birds and the threatened Louisiana black bear (Ursus americanus luteolus). These plans call for large-scale reforestation and restoration efforts in the region, particularly on private lands. In 1990 the Food, Agriculture, Conservation and Trade Act authorized the Wetlands Reserve Program (WRP). The WRP is a voluntary program administered by the United States Department of Agriculture that provides eligible landowners with financial incentives to restore wetlands and retire marginal farmlands from agricultural production. As of 30 September 2005, over 275,700 ha have been enrolled in the program in the Mississippi River Alluvial Valley, with the greatest concentration in Louisiana, Arkansas, and Mississippi, USA. Hydrologic restoration is common on most sites, with open-water wetlands, such as moist-soil units and sloughs, constituting up to 30% of a given tract. Over 33,200 ha of open-water wetlands have been created, potentially providing over 115,000,000 duck-use days. Twenty-three of 87 forest-bird conservation areas have met or exceed core habitat goals for migratory songbirds and another 24 have met minimum area requirements. The WRP played an integral role in the fulfillment of these goals. Although some landscape goals have been attained, the young age of the program and forest stands, and the lack of monitoring, has limited evaluations of the program's impact on wildlife populations.

1863. **The role of wildlife science in wetland ecosystem restoration: Lessons from the Everglades.**
Gawlik, D. E.
Ecological Engineering 26(1): 70-83. (2006)
NAL Call #: TD1.E26; ISSN: 09258574.
Notes: doi: 10.1016/j.ecoleng.2005.09.008.
Descriptors: conceptual model/ ecosystem restoration/ Everglades/ indicator/ monitoring/ performance measure/ wading birds/ wildlife/ biodiversity/ ecology/ ecosystems/ environmental protection/ monitoring/ wetlands/ biodiversity/ ecology/ ecosystems/ environmental protection/ monitoring/ restoration/ wetlands/ bioindicator/ monitoring/ restoration ecology/ wetland/ Aves
Abstract: There has been little discussion of how and when to integrate wildlife science into ecological restoration projects. The recent emergence of wetland ecosystem restoration offers an opportunity to use wildlife science to increase the probability of a project being successful. This paper traces the evolution of wetland ecosystem restoration in North America and proposes three roles for wildlife science in wetland ecosystem restoration: (1) contribute to conceptual ecosystem models, (2) develop quantitative performance measures and restoration targets that track the progress of restoration, and (3) achieve social feasibility by sustaining long-term public support for a project. The extensive knowledge base for many species of wildlife makes them especially useful for contributing to conceptual ecosystem models. Wildlife species are often the subject of long-term monitoring and research because they have commercial value, are conspicuous, or have aesthetic appeal. Wildlife parameters can be good performance measures for large-scale restoration projects because some species integrate information over large spatial scales and are long-lived. Parameters associated with threatened or endangered wildlife species should get special consideration as performance measures because the information will meet multiple needs rather than just those of the conceptual ecosystem model. Finally, wetland ecosystem restoration projects need to sustain funding over decades to ensure the restored system is self-sustaining. Wildlife are a valued resource that can help achieve the social feasibility of a project by providing a way to communicate complex science in terms that society understands and values.

1864. **Salt toxicosis in ruddy ducks that winter on an agricultural evaporation basin in California.**
Gordus, A. G.; Shivaprasad, H. L.; and Swift, P. K.
Journal of Wildlife Diseases 38(1): 124-131. (2002)
NAL Call #: 41.9 W64B; ISSN: 0090-3558
Descriptors: brain sodium/ evaporation ponds/ hypersaline water/ Oxyura jamaicensis/ ruddy duck/ salt encrustation/ salt toxicosis
Abstract: Agricultural evaporation basins are used as a means to dispose of highly saline underground-tile-drainage water in the San Joaquin Valley (California, USA). The hypersaline water conditions encourage high aquatic invertebrate production, primarily brine shrimp (Artemia franciscana), which attract birds to those sites. Cool winter temperatures (<4 C) and hypersaline water conditions (>70,000 µ mhos/cm) resulted in feather salt encrustation and salt toxicosis in ruddy ducks (Oxyura jamaicensis). During December 1998 and January 1999, approximately 200 dead and sick ruddy ducks were collected from an evaporation basin and five healthy control ruddy ducks were collected from a freshwater wetland. Brains contained ≥1,890 ppm sodium (wet tissue mass) in seven dead birds and contained ≤1.150 ppm sodium in the control birds. Liver arsenic, lead, and mercury concentrations were <1 ppm in all birds examined. Manganese, molybdenum, and copper liver concentrations did not differ significantly (P > 0.05) between the two groups of ducks. The dead ducks had significantly higher liver selenium, cadmium, iron, and zinc than the controls, but the concentrations were not sufficient to cause toxicity. Significant gross and microscopic lesions in most of the dead birds included conjunctivitis, lens opacity and cataract formation, vascular

congestion in various organs most notably in the meninges of the brain, and myocardial and skeletal muscle degeneration.

1865. **Scale-dependent habitat use in three species of prairie wetland birds.**
Naugle, D. E.; Higgins, K. F.; Nusser, S. M.; and Johnson, W. C.
Landscape Ecology 14(3): 267-276. (1999)
NAL Call #: QH541.15.L35 L36; ISSN: 0921-2973
Descriptors: wetlands/ habitat utilization/ nesting behavior/ foraging behavior/ aquatic birds/ Podilymbus podiceps/ Xanthocephalus xanthocephalus/ Chlidonias niger/ South Dakota/ yellow-headed blackbird/ black tern/ prairie wetlands
Abstract: We evaluated the influence of scale on habitat use for three wetland-obligate bird species with divergent life history characteristics and possible scale-dependent criteria for nesting and foraging in South Dakota, USA. A stratified, two-stage cluster sample was used to randomly select survey wetlands within strata defined by region, wetland density, and wetland surface area. We used 18-m (0.1 ha) fixed radius circular-plots to survey birds in 412 semipermanent wetlands during the summers of 1995 and 1996. Variation in habitat use by pied-billed grebes (Podilymbus podiceps) and yellow-headed blackbirds (Xanthocephalus xanthocephalus), two sedentary species that rarely exploit resources outside the vicinity of nest wetlands, was explained solely by within-patch variation. Yellow-headed blackbirds were a cosmopolitan species that commonly nested in small wetlands, whereas pied-billed grebes were an area-sensitive species that used larger wetlands regardless of landscape pattern. Area requirements for black terns (Chlidonias niger), a vagile species that typically forages up to 4 km away from the nest wetland, fluctuated in response to landscape structure. Black tern area requirements were small (6.5 ha) in heterogeneous landscapes compared to those in homogeneous landscapes (15.4 - 32.6 ha). Low wetland density landscapes composed of small wetlands, where few nesting wetlands occurred and potential food sources were spread over large distances, were not widely used by black terns. Landscape-level measurements related to black tern occurrence extended past relationships between wetlands into the surrounding matrix. Black terns were more likely to occur in landscapes where grasslands had not been tilled for agricultural production. Our findings represent empirical evidence that characteristics of entire landscapes, rather than individual patches, must be quantified to assess habitat suitability for wide-ranging species that use resources over large areas.

1866. **Seasonal and semipermanent wetlands of California: Invertebrate community ecology and responses to management methods.**
de Szalay, Ferenc A.; Euliss, Ned H.; and Batzer, Darold P.
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 829-855.
Notes: ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Invertebrata/ habitat management/ seasonal and semipermanent wetlands management effect on fauna/ ecology/ semiaquatic habitat/ seasonal and semipermanent wetlands/ community ecology and management/ California

1867. **Seasonal dynamics of aquatic fauna and habitat parameters in a perched upper Missouri River Wetland.**
Fisher, S. J. and Willis, D. W.
Wetlands 20(3): 470-478. (2000)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: Missouri River/ native fishes/ perched wetland/ zooplankton production/ community dynamics/ ichthyofauna/ seasonality/ wetland/ zooplankton/ United States/ Ameiurus melas/ Bosmina
Abstract: The Missouri River floodplain historically contained numerous wetlands; however, alterations to the corridor have resulted in the loss of flood-pulse processes. The annual contributions of small wetlands (<15 ha) perched on the Missouri River floodplain have not been viewed as important; however, consequences of draining or filling perched wetlands in the upper Missouri River basin remain unclear. The objective of this study was to survey aquatic fauna and basic habitat characteristics in a small perched wetland before, during, and after a connection period within a naturally functioning section of the Missouri River. Fishes, macroinvertebrates, zooplankton, and habitat parameters were sampled during May, July, and September 1997. No significant differences ($P > 0.05$; $F < 4.2$; df = 2,9) in densities or catch-per-unit-effort among sample periods were detected for macroinvertebrates. Copepoda nauplii, calanoid Copepoda, and Bosmina spp. densities showed significant changes ($P < 0.03$; $F > 6.1$; df = 2,9) and collectively surpassed 3,200 organisms/L. These densities exceeded other regional means by as much as 900%. Twenty-four fish species were documented in the wetland; however, the black bullhead, Ameiurus melas Rafinesque, dominated the fish community. Wetland depth and surface area increased during the connection period and inundated terrestrial grasses and woody debris. Decay of submerged organic matter, combined with the lack of rooted macrophytes, loss of algal productivity to flushing, and higher turbidity, may have all contributed to reduced summer dissolved oxygen levels. Avian feeding activity suggested that fishes were using the upper water column when nearly anoxic lower water column conditions existed. Although the wetland habitat may be harsh, presence of juvenile fishes and dense zooplankton populations establishes the potential importance of these water bodies to the Missouri River ecosystem.

1868. **Seasonal dynamics of bird assemblages in a Texas estuarine wetland.**
Weller, Milton W.
Journal of Field Ornithology 65(3): 388-401. (1994)
NAL Call #: 413.8 B534; ISSN: 0273-8570
Descriptors: management strategy/ species richness/ Texas/ birds/ bird diversity/ estuarine ecosystems/ wetlands/ bird populations
Abstract: Bird species richness and seasonality were sampled in diverse habitats of an estuarine wetland complex of San Bernard National Wildlife Refuge on the mid-Texas coast. Observations made between 1985 and 1991 included all months, and form a composite annual

view; 121 species were recorded, with 54 taxa identified in 1 mo. Only 23 species occurred regularly over a series of months, and their patterns of wetland use varied markedly by species and season. The wetland complex served different functions for different species, but most used the area for migration stops and wintering. Eleven species were considered breeders in the brackish marsh, but another 33 species probably nested in nearby freshwater wetlands, coastal islands or in shrubs or small trees, and fed or rested in the marsh. Such coastal areas are used by birds year-round and, in addition to protection, need management strategies to ensure habitat diversity and normal water regimes which will maintain natural bird diversity and serve all species for different life stages.

1869. **Sedimentation of Prairie Pothole wetlands: The need for integrated research by agricultural and wildlife interests.**
Gleason, R. A. and Euliss, N. H.
In: Water for Agriculture and Wildlife and the Environment: Win-Win Opportunities -- Proceedings from the USCID Wetlands Seminar.Bismarck, North Dakota.) Schaack, J.; Anderson, S. S.; U.S. Committee on Irrigation and Drainage; and U.S. Bureau of Reclamation (eds.)
Denver, Colo.: U.S. Committee on Irrigation and Drainage; pp. 107-114; 1997.
NAL Call #: GB624.U83 1996
Descriptors: Conservation Reserve Program/ regional conservation programs/ Prairie Pothole Region
Abstract: Examined the influences of sedimentation on wildlife values in wetlands within the Prairie Pothole Region.

1870. **Selenium in agricultural drainage: Essential nutrient or toxic threat?**
Moore, S. B.
Journal of Irrigation and Drainage Engineering 115(1): 21-28. (1989)
NAL Call #: 290.9 Am3ps (IR); ISSN: 0733-9437
Descriptors: agricultural drainage/ wildlife habitat/ selenium/ Kesterson Reservoir/ California
Abstract: The essential nutrient selenium is believed responsible for numerous deformities, reproductive failures, and deaths of migratory birds at Kesterson Reservoir in California's San Joaquin Valley. Wildlife problems at the reservoir appeared only a few years after the area began receiving selenium-laden subsurface drainage water from less than 42,000 acre (17,000 ha) or irrigated agricultural land on the west side of the valley. Although substantially reduced in acreage from their historic extent, the valleys's wetland habitats continue to satisfy the wintering and migratory needs of substantial populations of Pacific Flyway migratory birds. Remnant anadromous fish populations struggle to survive the inadequate flows and low water quality of the valley's riverine habitats. It is estimated that in order to sustain intensively managed, irrigated agriculture and associated high levels of crop production, more than 1,000,000 acre (405,000 ha) of land on the west side of the valley must eventually be drained. Unless extraordinary measures are taken, the potential is great for contaminated agricultural drainage to further harm fish and wildlife resources of the San Joaquin Valley.

1871. **Selenium in wetlands and waterfowl foods at Kesterson Reservoir California, USA 1984.**
Schuler C. A.; Anthony R. G.; and Ohlendorf H. M.
Archives of Environmental Contamination and Toxicology 19(6): 845-853. (1990)
NAL Call #: TD172.A7; ISSN: 0090-4341
Descriptors: plants/ aquatic insects/ agrichemicals/ water pollution/ environmental surveillance/ bioaccumulation/ health hazard/ toxicity
Abstract: Kesterson Reservoir (Kesterson) received subsurface agricultural drainwater containing high levels of salts and selenium from farmland in the San Joaquin Valley of California. The accumulation of selenium in wetlands and waterfowl foods at Kesterson was investigated during May, August, and December of 1984. High concentrations of selenium were found in water, sediments, terrestrial and aquatic vegetation, and aquatic insects. Mean selenium concentrations in aquatic plants and insects ranged from 1.5 to 170 . µ.g/g dry weight and were about 11 to 290 times those found at a nearby reference site. Concentrations in some waterfowl food plants and insects at Kesterson were up to 64 times those reported to be a health hazard to birds. Selenium concentrations were more seasonally variable in aquatic plants than in aquatic insects. Few differences in selenium accumulation were found among ponds. Deposition of selenium in plant parts was not uniform; rhizomes contained higher concentrations than seeds and leaves were intermediate. Most biota bioaccumulated maximum selenium concentrations that were 1,000 to nearly 5,00 times the concentration in the water.

1872. **Shorebird breeding biology in wetlands of the Playa Lakes, Texas, USA.**
Conway, W. C.; Smith, L. M.; and Ray, J. D.
Waterbirds 28(2): 129-138. (2005)
NAL Call #: QL671; ISSN: 15244695
Descriptors: American avocet/ black-necked stilt/ breeding biology/ killdeer/ playas/ saline lakes/ snowy plover/ clutch size/ conservation planning/ habitat management/ hatching/ predation/ reproductive biology/ reproductive success/ waders/ wetlands/ playa lakes/ Texas/ Anatidae/ Charadrius alexandrinus/ Charadrius vociferous/ Charadrius vociferus/ Himantopus mexicanus/ Recurvirostra americana
Abstract: Wetlands in the Playa Lakes Region of Texas are important habitats for North American wintering waterfowl and migrant shorebirds. However, shorebird breeding biology has been overlooked in characterizing the region's ecological importance. In 1998 and 1999, American Avocet (Recurvirostra americana), Black-necked Stilt (Himantopus mexicanus), Killdeer (Charadrius vociferous), and Snowy Plover (C. alexandrinus) breeding ecology were studied in playas, saline lakes, and riparian wetlands in the Playa Lakes Region of Texas. Chronology of nest initiation, clutch sizes, and hatching success for 298 Snowy Plover, 111 American Avocet, 43 Killdeer, and 26 Black-necked Stilt clutches were measured. All four species nested in saline lakes, American Avocet and Killdeer also nested in playas, and Snowy Plover nested on riparian wetlands. American Avocet had higher hatching success in 1999 (52%) than 1998 (8%), because of more suitable hydrological conditions and lower predation. Hatching success was

higher in 1998 than 1999 for Killdeer (1998, 63%; 1999, 21%) and Snowy Plover (1998, 47%; 1999, 33%) due to failures caused by flooding and hail in 1999. In other regions, clutch predation limits shorebird productivity, but hatching success in the Playa Lakes Region appears to be limited by unpredictable precipitation patterns and wetland hydroperiod. As such, breeding shorebird conservation and management should focus upon maintaining wetland hydrological integrity.

1873. **Shorebird habitat use and nest-site selection in the Playa Lakes Region.**
Conway, Warren C.; Smith, Loren M.; and Ray, James D.
Journal of Wildlife Management 69(1): 174-184. (2005)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: freshwater ecology: ecology, environmental sciences/ conservation/ biogeography: population studies/ anthropogenic stress/ nest site selection/ hydroperiod/ riparian wetland/ saline lake/ playas/ created wetland/ brood rearing habitat
Abstract: Wetlands in the Playa Lakes Region (PLR) provide important habitats for wintering waterfowl, cranes, and both migrant and breeding shorebirds. Playa Lakes Region wetlands experience naturally fluctuating hydroperiods but are exposed to anthropogenic stresses, which are exacerbated during summer and may influence PLR wetland occupancy and selection by breeding shorebirds. We examined wetland-scale habitat use and nest-site selection of the 4 dominant shorebirds (American avocets [Recurvirostra americana], black-necked stilts [Himantopus mexicanus], killdeer [Charadrius vociferus], snowy plovers [C. alexandrinus]) nesting in playas, saline lakes, and in both created and riparian wetlands in the PLR of Texas, USA. All 4 species nested in saline lakes. Only avocets and killdeer nested in playas, and snowy plovers nested in riparian wetlands. No nests were found in created wetlands. Wetland habitat changed ($P < 0.001$) during the breeding season, while water habitats generally decreased. Used (i.e., shorebirds found nesting) Wetlands had more ($P < 0.05$) mudflats than non-used (i.e., shorebirds not found nesting) wetlands, which had more ($P < 0.05$) dry habitats. Used and non-used wetlands had similar ($P > 0.05$) amounts of water habitats. Nests were located close to vegetation on bare dry ground and dry ground with vegetation. Because water is ephemeral in PLR wetlands, shorebirds must select - in a somewhat predictive manner upon arrival - wetlands with suitable nest-site and brood-rearing habitat. Although surface water is necessary for nesting, its presence is not adequate for delineating suitable PLR wetland habitat for breeding shorebirds. Our findings that created wetlands cannot compensate for regional wetland losses in habitat or function highlights the need for conservation of natural PLR wetlands.

1874. **Shorebird use of managed wetlands in the Mississippi Alluvial Valley.**
Twedt, D. J.; Nelms, C. O.; Rettig, V. E.; and Aycock, S. R.
American Midland Naturalist 140(1): 140-152. (1998)
NAL Call #: 410 M58; ISSN: 0003-0031
Descriptors: wetlands/ habitat utilization/ agricultural land/ wildlife management/ aquatic birds/ artificial substrata/ population density/ migratory species/ ecosystem management/ birds/ land management/ environmental protection/ habitats/ Aves/ Charadrius vociferus/ Gallinago gallinago/ Mississippi R./ United States/ birds/ killdeer/ common snipe
Abstract: We assessed shorebird use of artificial wetlands within the Mississippi Alluvial Valley during the winters of 1991-1992 and 1992-1993 and during the autumn of 1994. On agricultural fields managed to provide habitat for waterfowl from November to March, mean shorebird density was 58.6 birds/100 ha, but shorebird densities were greater on soybean fields than on rice or moist-soil fields. Killdeer (Charadrius vociferus) and common snipe (Gallinago gallinago) were common throughout winter, but shorebird abundance and species richness along survey routes increased from November through April. During the late summer and autumn, wetlands on public lands in the Mississippi Alluvial Valley are managed by the U.S. Fish and Wildlife Service specifically to provide foraging habitat for shorebirds. From August through October 1994, we observed 14,564 individual shorebirds of 22 species using these anthropogenic wetlands. Mean shorebird density on wetlands managed by flooding previously dry, disked fields was 695 birds/100 ha, whereas mean density on wetlands managed by drawing down water reservoirs was 1224 birds/100 ha. We recommend increased shallow-water flooding of agricultural fields, particularly soybean fields, during winter to provide habitat for wintering and early spring migrant shorebirds. More importantly, we recommend continued water management on public wetlands from July through October, preferably by drawing down water reservoirs, to provide foraging habitat for southward migrating shorebirds.

1875. **Short-term response of wetland birds to prescribed burning in Rainwater Basin wetlands.**
Brennan, E. K.; Smith, L. M.; Haukos, D. A.; and Lagrange, T. G.
Wetlands 25(3): 667-674. (2005)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ burning/ species richness/ abundance/ migration/ recruitment/ basins/ introduced species/ incineration/ birds/ species diversity/ forest fires/ litter/ Aves/ Nebraska/ birds
Abstract: Prescribed burning is often used in wetlands to remove plant litter, decrease woody or invasive species, and increase use by wetland birds. However, little is known about the within-season, short-term response of wetland birds to prescribed burning, especially during spring migration. We surveyed use of 19 burned and 19 unburned (reference) wetlands by migratory birds in the Rainwater Basin region of Nebraska, USA during three spring migrations, 2002-2004. We calculated the change in avian abundance and species richness, as well as generating the Soerenson's similarity index for burned and reference wetlands in the weeks immediately before and after burning. We compared Soerenson's index values and percent change in abundance and species richness between burned and reference wetlands using an analysis of covariance with week and wetland area as covariates to account for migration chronology and differences in the area of experimental units. Following removal of effects due to wetland area and week, burning had no effect on the percent change in avian abundance and species richness. Soerenson's index also did not differ between burned and reference wetlands. Prescribed burning did not improve use

of wetlands by migratory birds in the short term. Understanding the immediate and long-term effects of prescribed burning on migratory avian abundance, species richness, and community composition is imperative for management decisions.

1876. **Spatial modeling of wetland condition in the U.S. Prairie Pothole Region.**
Royle, J. A.; Koneff, M. D.; and Reynolds, R. E.
Biometrics 58(2): 270-279. (2002); ISSN: 0006-341X
Descriptors: grasslands/ habitats/ mapping/ prairies/ remote sensing/ spatial variation/ statistical analysis/ waterfowl/ wetlands/ wildlife conservation/ birds
Abstract: We propose a spatial modelling framework for wetland data produced from a remote-sensing-based waterfowl habitat survey conducted in the U.S. Prairie Pothole Region (PPR) of Montana and North Dakota. The data produced from this survey consist of the area containing water on many thousands of wetland basins (i.e., prairie potholes). We propose a two-state model containing wet and dry states. This model provides a concise description of wet probability, i.e., the probability that a basin contains water, and the amount of water contained in wet basins. The two model components are spatially linked through a common latent effect, which is assumed to be spatially correlated. Model fitting and prediction is carried out using Markov chain Monte Carlo methods. The model primarily facilitates mapping of habitat conditions, which is useful in varied monitoring and assessment capacities. More importantly, the predictive capability of the model provides a rigorous statistical framework for directing management and conservation activities by enabling characterization of habitat structure at any point on the landscape.

1877. **Spatial scale and abundance patterns of large fish communities in freshwater marshes of the Florida Everglades.**
Chick, J. H.; Ruetz, C. R.; and Trexler, J. C.
Wetlands 24(3): 652-664. (2004)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: abundance patterns/ Everglades/ hydroperiod/ large fish communities/ spatial scale
Abstract: Anthropogenic habitat alterations and water-management practices have imposed an artificial spatial scale onto the once contiguous freshwater marshes of the Florida Everglades. To gain insight into how these changes may affect biotic communities, we examined whether variation in the abundance and community structure of large fishes (SL > 8 cm) in Everglades marshes varied more at regional or intra-regional scales, and whether this variation was related to hydroperiod, water depth, floating mat volume, and vegetation density. From October 1997 to October 2002, we used an airboat electrofisher to sample large fishes at sites within three regions of the Everglades. Each of these regions is subject to unique water-management schedules. Dry-down events (water depth < 10 cm) occurred at several sites during spring in 1999, 2000, 2001, and 2002. The 2001 dry-down event was the most severe and widespread. Abundance of several fishes decreased significantly through time, and the number of days post-dry-down covaried significantly with abundance for several species. Processes operating at the regional scale appear to play important roles in regulating large fishes. The most pronounced patterns in abundance and community structure occurred at the regional scale, and the effect size for region was greater than the effect size for sites nested within region for abundance of all species combined, all predators combined, and each of the seven most abundant species. Non-metric multi-dimensional scaling revealed distinct groupings of sites corresponding to the three regions. We also found significant variation in community structure through time that correlated with the number of days post-dry-down. Our results suggest that hydroperiod and water management at the regional scale influence large fish communities of Everglades marshes.

1878. **Spatial use by wintering greater white-fronted geese relative to a decade of habitat change in California's Central Valley.**
Ackerman, J. T.; Takekawa, J. Y.; Orthmeyer, D. L.; Fleskes, J. P.; Yee, J. L.; and Kruse, K. L.
Journal of Wildlife Management 70(4): 965-976. (2006)
NAL Call #: 410 J827; ISSN: 0022541X.
Notes: doi: 10.2193/0022-541X(2006)70[965:SUBWGW]2.0.CO;2.
Descriptors: agriculture/ Anser albifrons/ California/ Central Valley Joint Venture/ flooded rice/ greater white-fronted geese/ habitat use/ landscape change/ radiotelemetry/ wetland management
Abstract: We investigated the effect of recent habitat changes in California's Central Valley on wintering Pacific greater white-fronted geese (Anser albifrons frontalis) by comparing roost-to-feed distances, distributions, population range sizes, and habitat use during 1987-1990 and 1998-2000. These habitat changes included wetland restoration and agricultural land enhancement due to the 1990 implementation of the Central Valley Joint Venture, increased land area used for rice (Oryza sativa) production, and the practice of flooding, rather than burning, rice straw residues for decomposition because of burning restrictions enacted in 1991. Using radiotelemetry, we tracked 192 female geese and recorded 4,516 locations. Geese traveled shorter distances between roosting and feeding sites during 1998-2000 (24.2 ± 2.2 km) than during 1987-1990 (32.5 ± 3.4 km); distance traveled tended to decline throughout winter during both decades and varied among watershed basins. Population range size was smaller during 1998-2000 (3,367 km^2) than during 1987-1990 (5,145 km^2), despite a 2.2-fold increase in the size of the Pacific Flyway population of white-fronted geese during the same time period. The population range size also tended to increase throughout winter during both decades. Feeding and roosting distributions of geese also differed between decades; geese shifted into basins that had the greatest increases in the amount of area in rice production (i.e., American Basin) and out of other basins (i.e., Delta Basin). The use of rice habitat for roosting (1987-1990: 40%, 1998-2000: 54%) and feeding (1987-1990: 57%, 1998-2000: 72%) increased between decades, whereas use of wetlands declined for roosting (1987-1990: 36%, 1998-2000: 31%) and feeding (1987-1990: 22%, 1998-2000: 12%). Within postharvested rice habitats, geese roosted and fed primarily in burned rice fields during 1987-1990 (roost: 43%, feed: 34%), whereas they used flooded rice fields during 1998-2000 (roost: 78%, feed: 64%). Our

results suggest that white-fronted geese have altered their spatial use of California's Central Valley during the past decade in response to changing agricultural practices and the implementation of the Central Valley Joint Venture.

1879. **Spring distribution of ring-necked pheasants (Phasianus colchicus) following cattail reduction with glyphosate herbicide.**
Homan, H. J.; Linz, G. M.; Carlson, R. C.; and Bleier, W. J.
Wildlife Research 30(2): 159-166. (2003); ISSN: 10353712.
Notes: doi: 10.1071/WR01003.
Descriptors: bird/ glyphosate/ habitat use/ weed control/ wetland/ United States/ Helianthus annuus/ Phasianus colchicus/ Typha
Abstract: To reduce blackbird (leteridae) damage to field crops in the north-central United States, dense stands of cattail (Typha spp.) are thinned with glyphosate herbicide. The stands become unusable as roosting and loafing sites, which helps to protect susceptible crops nearby, particularly sunflower (Helianthus annus). Landscape-level impacts of cattail management on non-target avian species have not been studied. We measured use of upland breeding territories by male ring-necked pheasants (Phasianus colchicus) following cattail reduction in wetlands used by pheasants for overwintering. In August 1992, glyphosate was applied to all wetlands with ≥70% cattail coverage in four 23-km^2 study blocks in south-eastern North Dakota. Four other blocks were used for controls. Habitat use was inferred from territorial crowing counts. No treatment effect or treatment*year interaction (all $P \geq 0.05$) was evident during 2 years of post-treatment observations. Although the herbicide eradicated large contiguous stands of cattail that pheasants had used for winter cover, surface water levels rose in 1993, which created additional cattail growth in untreated wetlands within the blocks. The additional cattail may have lessened the effect of the herbicide treatments. During drier periods, when cattail growth slows, cattail reduction could affect use of upland breeding sites. We recommend more research to assess the effects of glyphosate during drier periods.

1880. **Status of lesser snow geese and Ross's geese wintering in the Interior Highlands of Mexico.**
Drewien, R. C.; Terrazas, A. L.; Taylor, J. P.; Barraza, J. M. O.; and Shea, R. E.
Wildlife Society Bulletin 31(2): 417-432. (2003)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: Chen c. caerulescens/ Chen rossii/ Chihuahua/ distribution/ Durango/ interior highlands/ lesser snow geese/ Mexico/ Ross's geese/ status/ winter populations/ conservation status/ habitat use/ population estimation/ spatial distribution/ waterfowl
Abstract: During winters 1998 and 1999 we surveyed, by air or ground, 145 wetland areas in 8 states of the Mexican Interior Highlands for lesser snow geese (Chen caerulescens caerulescens) and Ross's geese (C. rossii; hereafter both species are jointly referred to as light geese). Only limited data were available on abundance, distribution, habitat use, and species composition of light geese flocks wintering in the Mexican Interior Highlands. We surveyed wetlands from the northern border of Chihuahua southward >1,400 km into the states of Jalisco and Michoacan. During ground surveys we visually sampled geese to assess species, color phase, and age composition (n=60,967). In 1998, drought in the northern Highlands left many natural wetlands dry or nearly dry; wetland water levels farther south were generally low. In 1999 water levels improved in the northern Highlands but drought prevailed in the southern Highlands. During 1998 and 1999 we recorded 229,288 and 310,204 light geese, respectively, at 58 wetlands in 5 states. Combining our counts with the midwinter inventories in the United States provided estimates of 465,653 and 447,729 light geese wintering in the western Central Flyway during 1998 and 1999, respectively, or 76-83% higher than the previous peak estimate in winter 1993. Most light geese (95%) were in the northern states of Chihuahua and Durango. Species ratios, weighted by flock size, showed 78.5% and 81.2% snow geese (1.3-1.5% blue phase) and 21.5% and 18.8% Ross's geese during winters 1998 and 1999, respectively. Population estimates by species included 180,100 and 252,000 snow geese and 49,200 and 58,200 Ross's geese for the 2 winters, respectively. Ross's geese were most abundant in Chihuahua, and their proportion in flocks declined southward. We observed higher proportions of Ross's geese and blue-phase snow geese than were reported in this region during the 1980s. Primary foraging sites for light geese were corn, oats, and sorghum fields. We observed little waterfowl hunting, and opportunities to increase harvest of light geese, if desired in the future, appear limited due to restrictive hunting regulations, especially for foreigners. Changing land uses and crop patterns could adversely affect the future quality and quantity of some winter habitats for light geese and other migratory birds in Mexico. Only combined counts in Mexico and the United States can reliably assess the population status of western Central Flyway light geese; 15 surveys during 1969-99 showed that an average of 60.6% of the population wintered in Mexico.

1881. **Strategies for biodiversity protection.**
Bean, Michael J.
In: Precious heritage: The status of biodiversity in the United States/ Stein, Bruce A.; Kutner, Lynn S.; and Adams, Jonathan S.
New York: Oxford, 2000; pp. 255-273.
Descriptors: Wetlands Reserve Program/ biodiversity protection/ conservation interests/ conservation land acquisition/ land trusts/ land use/ water use/ wildlife refuges/ animals/ plants/ animal (Animalia)/ plant (Plantae)

1882. **Straw and winter flooding benefit mosquitoes and other insects in a rice agroecosystem.**
Lawler, S. P. and Dritz, D. A.
Ecological Applications 15(6): 2052-2059. (2005)
NAL Call #: QH540.E23; ISSN: 10510761
Descriptors: aquatic insects/ bottom-up effects/ Culex tarsalis/ detritus/ macroinvertebrates/ paddy/ rice/ wetland/ agricultural ecosystem/ flooding/ food web/ mosquito/ paddy field/ algae/ Culex tarsalis/ Hexapoda/ Insecta
Abstract: Rice fields are widespread agroecosystems that provide wetland habitat for many species, including pests like mosquitoes and beneficial insects. They can be used as models to understand how basal resources affect food web dynamics in seasonal wetlands. Rice field management may also influence adjacent communities by

affecting mosquitoes, wildlife, and air quality. Rice straw incorporation and winter flooding have become common methods used to prepare seedbeds, largely replacing burning of straw. These methods could affect aquatic insects, including mosquitoes, because they increase nutrient availability during the growing season. We studied 16 fields where straw was either burned or incorporated into soil after the previous growing season; these treatments were crossed with either winter flooding or no winter flooding. Algae, mosquitoes, other herbivorous insects and predatory insects all responded positively to one or both treatments that increased nutrients (straw incorporation and winter flooding). While the overall increase in insect production could benefit wildlife, mosquito abatement personnel may need to monitor unburned fields more closely. The issue of mosquito production adds to the complexity of agricultural and environmental concerns bearing on rice field management. Straw incorporation and winter flooding reduce particulate pollutants caused by burning, reduce fertilizer needs, and increase densities of beneficial insects. However, these techniques may increase mosquitoes, methane production, and fungal diseases of rice. Further improvement of straw management practices could minimize these problems.

1883. **Succession of macroinvertebrates in playas of the Southern High Plains, USA.**
Moorhead, D. L.; Hall, D. L.; and Willig, M. R.
Journal of the North American Benthological Society 17(4): 430-442. (1998)
NAL Call #: QL141.F7; ISSN: 0887-3593
Descriptors: wetlands/ trophic structure/ community composition/ species diversity/ temporal variations/ predators/ filter feeders/ detritus feeders/ ecological succession/ colonization/ temporary ponds/ playas/ succession/ macrofauna/ species richness/ trophic levels/ trophic level/ macroinvertebrates/ sampling/ aquatic insects/ Ostracoda/ Branchiopoda/ Notonectidae/ Hydrophilidae/ Invertebrata/ ostracods/ branchiopods/ water scavenger beetles/ freshwater crustaceans/ backswimmers/ Texas
Abstract: Playas are seasonal wetlands that constitute the principal surface-water features of the semiarid, Southern High Plains, USA. They are shallow pools that usually persist for 2-4 mo following inundation by spring rains. The development of macroinvertebrate assemblages in 10 playas located in West Texas was examined during the summer of 1994. Playas were sampled 3 times at approximately monthly intervals, beginning shortly after initial inundation in early May. All playas were dry within 90 d. Species richness and diversity (Fisher's log-series alpha) increased significantly over time ($p < 0.05$). Thirteen of the 16 species representing at least 1% of collected individuals, showed significant differences in abundances over time ($p < 0.05$). Some taxa increased in abundance (especially insects), whereas others decreased (most crustaceans). Trophic structure of assemblages also changed over time, with a significant reduction in the abundances of detrivores ($p < 0.05$) and filter-feeders ($p < 0.05$) occurring concurrently with an increase in the abundance of predators ($p < 0.05$). The composition of macroinvertebrate assemblages became more similar among playas over time (Ochai's index, $p < 0.05$), and changes in composition within individual playas tended to decrease with time ($p < 0.05$). These results suggest a rapid development of macroinvertebrate assemblages in playas, begining with early dominance of crustacean detritivores and filter-feeders (e.g., phyllopods and ostracods), followed by later dominance of herbivorous and predaceous insects (e.g., hydrophilids and notonectids). Increases in species richness, diversity, and similarity in assemblage composition among playas over time are consistent with a pattern of progressive colonization by a finite set of species capable of exploiting these ephemeral habitats.

1884. **Summer distribution, abundance, and habitat use of black-necked stilts and American avocets in California's Central Valley.**
Shuford, W. David; Humphrey, Joan M.; Hansen, Robert B.; Page, Gary W.; Stenzel, Lynne E.; and Hickey, Catherine M.
Western Birds 38(1): 11-28. (2007)
NAL Call #: QL684.C2; ISSN: 0160-1121
Descriptors: Charadriiformes/ Recurvirostridae/ Himantopus mexicanus/ Recurvirostra americana/ California/ Central Valley/ distribution/ habitat use/ status/ wetlands/ ecosystems/ shallow water habitats/ summer distribution/ land zones/ population ecology
Abstract: Little is known about breeding shorebirds in California's Central Valley on which conservation actions could be based. In summer 2003, we surveyed shallow-water habitats throughout that region for Black-necked Stilts (Himantopus mexicanus) and American Avocets (Recurvirostra americana). Survey methods included ground counts, aerial surveys, and sampling of Sacramento Valley rice fields. We estimated about 30,000 Black-necked Stilts and 10,700 American Avocets in the Central Valley, exclusive of Suisun Marsh. The proportion of stilts and avocets, respectedly, within four subregions were Sacramento Valley 74% and 37%. delta 1% and 1%. San Joaquin basin 2% and 7%, and Tulare basin 23% and 56%. The ratio of stilts to avocets was 5.6:1 in the Sacramento Valley, 1.1:1 in the San Joaquin Val-ley. The Sacramento Valley held 64% of all stilts and avocets, the Tulare basin 32%. the San Joaquin basin 3%, and the delta 1%. Key habitats were rice fields (73%). managed wetlands (10%), and sewage ponds (6%) for stilts, and rice (35%). managed wetlands (32%), agricultural evaporation ponds (14%), sewage ponds (9%), and agricultural canals (6%) for avocets. Rice held 98% of all stilts and 93% of all avocets in the Sacramento Valley. The Tulare basin had five habitats that held >10% of its total for at least one of the species and was the only region where agricultural evaporation ponds, agricultural canals and ditches, and water-storage facilities supported large numbers of shorebirds. Overall, >80% of all stilts and avocets in the Central Valley were found in environments created for agriculture, water management, or industry. where they may be exposed to toxins. Their reliance on these artificial environments is risky, as future changes to serve human economies may reduce the value of such habitats to wildlife. Thus there is a need to restore and enhance high-quality wetlands in the Central Valley to counter historic losses and potential future loss of other shallow-water habitats of uncertain reliability and quality.

1885. **Targeting ecosystem features for conservation: Standing crops in the Florida Everglades.**
Turner, Andrew M.; Trexler, Joel C.; Jordan, C. Frank; Slack, Sarah J.; Geddes, Pamela; Chick, John H.; and Loftus, William F.
Conservation Biology 13(4): 898-911. (1999)
NAL Call #: QH75.A1C5; ISSN: 0888-8892
Descriptors: ecology/ community structure/ habitat/ pollution/ land and freshwater zones/ Invertebrata/ Pisces: biomass/ species diversity/ low biodiversity/ semiaquatic habitat/ oligotrophic wetland biomass/ biodiversity/ conservation aspects/ oligotrophic wetlands/ Florida/ Everglades/ biomass and biodiversity/ conservation significance/ chordates/ fish/ invertebrates/ vertebrates
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1886. **Temporal overlap of nesting duck and aquatic invertebrate abundances in the Grasslands Ecological Area, California, USA.**
de Szalay, F. A.; Carroll, L. C.; Beam, J. A.; and Resh, V. H.
Wetlands 23(4): 739-749. (2003)
NAL Call #: QH75.A1W47; ISSN: 02775212
Descriptors: Anas cyanoptera/ Anas platyrhynchos/ Anas strepera/ California/ Crustaceans/ insects/ invertebrates/ nesting waterfowl/ snails/ wetlands/ abundance/ food availability/ invertebrate/ predator-prey interaction/ temporal variation/ waterfowl/ wetland/ California/ North America/ San Joaquin Valley/ United States/ Amphipoda/ Anas cyanoptera/ Anas platyrhynchos/ Anas strepera/ Cladocera/ Coleoptera/ Corixidae/ Dytiscidae/ Gastropoda/ Heteroptera/ Hydrophiidae/ Ostracoda
Abstract: Aquatic invertebrates are essential components of duckling diets, but little is known about temporal changes of invertebrate populations in different types of brood habitats. In spring and summer 1996 and 1997, we conducted searches for duck nests in upland fields in the Grasslands Ecological Area in California's Central Valley to determine timing of nest initiation and hatching. We also sampled aquatic invertebrate populations in adjacent permanent wetlands, semi-permanent borrow areas within seasonal wetlands that were drawn down in spring, and reverse-cycle wetlands (i.e., wetlands flooded from spring to summer) to estimate invertebrate food resources available to ducklings. Abundances of many invertebrates important in duckling diets (Gastropoda, Cladocera, Ostracoda, Amphipoda, Corixidae, Dytiscidae, Hydrophilidae) were greater in borrow areas and reverse-cycle wetlands than in permanent wetlands. Peak macroinvertebrate densities in borrow areas occurred immediately after adjacent wetlands are drawn down in March-April. Peak densities in reverse-cycle wetlands and permanent wetlands occur in May. Although total numbers of microinvertebrates (<1 mm size) and macroinvertebrates (≥1 mm size) in all wetlands decreased after May, most mallard (Anas platyrhynchos) and cinnamon teal (A. cyanoptera) eggs hatched in May. Therefore, these ducklings hatch when abundant invertebrate food resources were most available in reverse-cycle wetlands. In contrast, most gadwall (A. strepera) eggs hatched in June after invertebrate numbers started to decrease. In areas where hydrology is controlled, managing for reverse-cycle wetlands may be a useful strategy to provide abundant invertebrate food resources during the waterfowl breeding season. © 2003, The Society of Wetland Scientists.
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1887. **Temporarily flooded wetlands of Missouri: Invertebrate ecology and management.**
Magee, Patrick A.; Reid, Frederic A.; and Fredrickson, Leigh H.
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 691-710.
Notes: ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Invertebrata/ habitat management/ ecology/ temporarily flooded wetlands/ semiaquatic habitat/ flooding/ Missouri/ temporarily flooded wetlands ecology and management
© Thomson Reuters Scientific

1888. **Temporary forest pools: Can we see the water for the trees?**
Williams, D. D.
Wetlands Ecology and Management 13(3): 213-233. (2005)
NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861
Descriptors: aquatic communities/ forestry practices/ forests/ nature conservation/ ponds/ riparian vegetation/ survival/ water resources/ wetlands
Abstract: Temporary waters, in general, are fascinating habitats in which to study the properties of species adapted to living in highly variable environments. Species display a remarkable array of strategies for dealing with the periodic loss of their primary medium that sets them apart from the inhabitants of permanent water bodies. Survival of individuals typically depends on exceptional physiological tolerance or effective migrational abilities, and communities have their own, distinctive hallmarks. This paper will broadly overview the biology of temporary ponds, but will emphasize those in temperate forests. In particular, links will be sought between aquatic community properties, the nature of the riparian vegetation, and forestry practices. Quite apart from their inherent biological interest, temporary waters are now in the limelight both from a conservation perspective, as these habitats come more into conflict with human activities, and a health-control perspective, as breeding habitats for vectors of arboviruses. Traditionally, many temporary waters, be they pools, streams or wetlands, have been considered to be 'wasted' areas of land, potentially convertible to agriculture/silviculture once drained. In reality, they are natural features of the global landscape representing distinct and unique habitats for many species - some that are found nowhere else, others that reach their maximum abundance there. To be effective, conservation measures must preserve the full, hydroseral range of wetland types.
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1889. **Testing the efficacy of harvest buffers on the invertebrate communities in seasonal forest wetlands.**
Hanson, Mark A.; Church, James O.; Miller, Anthony T.; Palik, Brian J.; and Butler, Malcolm G.
Minnesota Department of Natural Resources Summaries of Wildlife Research Findings 2004: 164-179. (2005)
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ land zones/ Invertebrata: forestry/ timber harvesting/ community structure effects/ habitat management/ timber harvesting buffer zones/ community structure/ timber harvesting and buffer zones effects/ semiaquatic habitat/ seasonal forest wetlands/ forest and woodland/ Minnesota, North central/ invertebrates
Abstract: We assessed community-level responses of aquatic invertebrates in small, seasonal forest wetlands to evaluate potential influences of timber harvest and harvest buffers in adjacent uplands. Data gathered during the first 4 years following clear-cut timber harvest (2001-2004) indicated that tree removal produced discernable shifts in aquatic invertebrate communities in adjacent seasonal wetlands. Retention of harvest buffers appeared to partially mitigate against these influences, but benefits of buffers may be limited by windthrow or other factors. Additional site-level research is needed to clarify relationships between physical and ecological characteristics of seasonal wetlands and adjacent silviculture activities, and to better document efficacy and longevity of harvest buffers.

1890. **Threats to imperiled freshwater fauna.**
Richter, B. D.; Braun, D. P.; Mendelson, M. A.; and Master, L. L.
Conservation Biology 11(5): 1081-1093. (Oct. 1997)
NAL Call #: QH75.A1C5; ISSN: 0888-8892
Descriptors: population decline/ freshwater environments/ aquatic animals/ conservation/ environmental stress/ anthropogenic factors/ pollution effects/ eutrophication/ sediment load/ river engineering/ agricultural pollution/ introduced species/ freshwater fish/ aquatic insects/ freshwater molluscs/ freshwater crustaceans/ Amphibiotic species/ ecosystem disturbance/ nature conservation/ Inland water environment/ regulated rivers/ sedimentation/ exotic species/ hydrological regime/ mussels/ fish/ dams/ United States/ conservation/ ecological impact/ water development
Abstract: Threats to imperiled freshwater fauna in the U.S. were assessed through an experts survey addressing anthropogenic stressors and their sources. Specifically, causes of historic declines and current limits to recovery were identified for 135 imperiled freshwater species of fishes, crayfishes, dragonflies and damselflies, mussels, and amphibians. The survey was designed to identify threats with sufficient specificity to inform resource managers and regulators faced with translating information about predominant biological threats into specific, responsive actions. The findings point to altered sediment loads and nutrient inputs from agricultural nonpoint pollution; interference from exotic species; and altered hydrologic regimes associated with impoundment operations as the three leading threats nationwide, accompanied by many lesser but still significant threats. Variations in threats among regions and among taxa were also evident. Eastern species are most commonly affected by altered sediment loads from agricultural activities, whereas exotic species, habitat removal/damage, and altered hydrologic regimes predominate in the West. Altered sediment loading from agricultural activities and exotic species are dominant problems for both eastern mussels and fishes. However, eastern fishes also appear to be suffering from municipal nonpoint pollution (nutrients and sediments), whereas eastern mussels appear to be more severely affected by altered nutrient impacts from hydroelectric impoundments and agricultural runoff. Our findings suggest that control of nonpoint source pollution associated with agriculture activities should be a very high priority for agricultural producers and governmental support programs. Additionally, the large number of hydropower dams in the U.S. subject to federal re-licensing in coming years suggests a significant opportunity to restore natural hydrologic regimes in the affected rivers.

1891. **Threats to waterbirds and wetlands: Implications for conservation, inventory and research.**
O'Connell, Mark
Wildfowl 51: 1-15. (2000)
NAL Call #: SK351.W575; ISSN: 0954-6324
Descriptors: waterbirds (Aves)/ animals/ birds/ chordates/ nonhuman vertebrates/ vertebrates/ biodiversity/ conservation/ demographic changes/ economic changes/ human activity/ social changes/ wetlands: habitat
Abstract: The world has undergone major social, economic and demographic changes in the last two centuries. Predictions suggest that during the next 100 years, even greater changes will occur and this will put increasing pressure on wetlands and their biodiversity. This paper examines the changes that have occurred, and the nature of threats facing waterbirds and wetlands as a result of human activities. The need for specific areas of research is identified, particularly in relation to detecting and measuring change and the need to provide solution-oriented research to underpin conservation action.

1892. **A tidal habitat restoration success story: The Union Slough Restoration Project.**
Houghton, J. P. and Uhlig, L.
2003 Georgia Basin/Puget Sound Resarch Conference Proceedings (Feb. 2004).
Notes: Publisher: Puget Sound Action Team, Olympia, WA. http://www.psat.wa.gov/Publications/03_proceedings/PAPERS/ORAL/6a_hough.pdf
Descriptors: agriculture/ anadromous species/ benthos/ coast defences/ estuarine dynamics/ flooding/ habitat/ habitat improvement/ marshes/ restoration/ seining/ zoobenthos/ Cancer magister/ Oncorhynchus kisutch/ Oncorhynchus tshawytscha/ Salmonidae/ INE, Canada, British Columbia, Georgia Basin/ INE, Washington, Everett/ INE, Washington, Puget Sound/ INE, Washington, Snohomish Estuary, Union Slough
Abstract: In February 2001, dikes were breached to restore tidal circulation to a ± 20-acre, former agricultural parcel along Union Slough in the lower Snohomish Estuary, near Everett, Washington. Before dike breaching, an internal dike was constructed to protect Interstate 5 (I-5) and the site was graded to provide desired elevations for brackish marsh development. Finally, we excavated a deep dendritic channel that would allow maximum accessibility by juvenile salmonids and possibly Dungeness crab. Substantial

numbers of small invertebrates and fish were observed using and feeding in the site as early as the April following dike breaching. Summer and fall seining demonstrated use by six species of juvenile anadromous salmonids, with chinook and coho juveniles remaining in the site through November 2001. Benthic productivity appears to be high and a variety of shorebirds and waterfowl have been observed. Marsh vegetation has rapidly colonized elevations between about +7 and +11 feet mean lower low water, covering over 3 acres of the site by late summer 2002. Several pieces of large woody debris were recruited to shorelines within the site during winter 2001 - 2002 flooding, and most have remained. This and several other sites in the Snohomish Estuary clearly demonstrate that breaching dikes to restore tidal action is a relatively certain and often low-cost means of providing real and immediate increases in habitat function.

1893. **Toxicity assessment of water from lakes anad wetlands receiving irrigation drain water.**
Dickerson, K. K.; Hubert, W. A.; and Bergman, H. L.
Environmental Toxicology and Chemistry 15(7): 1097-1101. (1996)
NAL Call #: QH545.A1E58; ISSN: 0730-7268
Descriptors: wetlands/ drainage water/ irrigation water/ contaminants/ toxicity/ Ceriodaphnia dubia/ Pimephales promelas/ mortality/ water quality/ lakes/ water pollution/ Colorado/ Wyoming/ Montana
Abstract: A method for reconnaissance-level assessments of the potential toxicity of water in lakes and wetlands that receive irrigation drain water is needed. We evaluated a model that predicts toxicity to aquatic organisms due to major ionic composition as a primary means of assessing water quality. The model was used in conjunction with acute toxicity tests and trace element analyses. Mortality of Ceriodaphnia dubia and fathead minnows (Pimephales promelas) observed in acute toxicity tests was compared to mortality predicted by the model. The method was applied at 22 lakes and wetlands on federally administered lands in Colorado, Montana, Utah, and Wyoming Fourteen of 22 locations had water that was not toxic to test organisms. Six locations had undiluted water that was toxic to C. dubia due to major ionic composition, and two locations had undiluted water that showed toxic effects caused by factors other than elevated levels of major ions. The model for C. dubia seemed to be sufficiently accurate for future application using our approach to assess lakes and wetlands receiving irrigation drain water.
This citation is from AGRICOLA.

1894. **Tracking wetland restoration: Do mitigation sites follow desired trajectories?**
Zedler, J. B. and Callaway, J. C.
Restoration Ecology 7(1): 69-73. (Mar. 1999)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: wetlands/ environmental restoration/ environment management/ California/ San Diego Bay/ rehabilitation/ ecosystems/ damage/ monitoring/ wildlife habitats/ model studies/ alternative planning/ nature conservation/ environmental assessment/ trajectories/ Sweetwater Marsh National Wildlife Refuge/ reclamation/ water quality control/ conservation, wildlife management and recreation/ environmental engineering
Abstract: Hypothetical models in the scientific literature suggest that ecosystem restoration and creation sites follow a smooth path of development (called a trajectory), rapidly matching natural reference sites (the target). Multi-million-dollar mitigation agreements have been based on the expectation that damages to habitat will be compensated within 5-10 years, and monitoring periods have been set accordingly. Our San Diego Bay study site, the Sweetwater Marsh National Wildlife Refuge, has one of the longest and most detailed records of habitat development at a mitigation site: data on soil organic matter, soil nitrogen, plant growth, and plant canopies for up to 10 years from a 12-year-old site. High interannual variation and lack of directional changes indicate little chance that targets will be reached in the near future. Other papers perpetuate the trajectory model, despite data that corroborate our findings. After reviewing "trajectory models" and presenting our comprehensive data for the first time, we suggest alternative management and mitigation policies.

1895. **Trophic structure and avian communities across a salinity gradient in evaporation ponds of the San Francisco Bay Estuary.**
Takekawa, J. Y.; Miles, A. K.; Schoellhamer, D. H.; Athearn, N. D.; Saiki, M. K.; Duffy, W. D.; Kleinschmidt, S.; Shellenbarger, G. G.; and Jannusch, C. A.
Hydrobiologia 567(1): 307-327. (2006)
NAL Call #: 410 H992; ISSN: 00188158.
Notes: doi: 10.1007/s10750-006-0061-z.
Descriptors: salt evaporation ponds/ salt ponds/ San Francisco Bay/ waterbirds
Abstract: Commercial salt evaporation ponds comprise a large proportion of baylands adjacent to the San Francisco Bay, a highly urbanized estuary. In the past two centuries, more than 79% of the historic tidal wetlands in this estuary have been lost. Resource management agencies have acquired more than 10 000 ha of commercial salt ponds with plans to undertake one of the largest wetland restoration projects in North America. However, these plans have created debate about the ecological importance of salt ponds for migratory bird communities in western North America. Salt ponds are unique mesohaline (5-18 g l-1) to hyperhaline (> 40 g l-1) wetlands, but little is known of their ecological structure or value. Thus, we studied decommissioned salt ponds in the North Bay of the San Francisco Bay estuary from January 1999 through November 2001. We measured water quality parameters (salinity, DO, pH, temperature), nutrient concentrations, primary productivity, zooplankton, macroinvertebrates, fish, and birds across a range of salinities from 24 to 264 g l-1. Our studies documented how unique limnological characteristics of salt ponds were related to nutrient levels, primary productivity rates, invertebrate biomass and taxa richness, prey fish, and avian predator numbers. Salt ponds were shown to have unique trophic and physical attributes that supported large numbers of migratory birds. Therefore, managers should carefully weigh the benefits of increasing habitat for native tidal marsh species with the costs of losing these unique hypersaline systems.

1896. **Use of restored small wetlands by breeding waterfowl in Prince Edward Island, Canada.**
Stevens, C. E.; Gabor, T. S.; and Diamond, A. W.
Restoration Ecology 11(1): 3-12. (2003)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: wetlands/ environmental restoration/ breeding/ restoration/ environment management/ aquatic birds/ abundance/ plant populations/ environmental factors/ nature conservation/ Anas crecca carolinensis/ Anas rubripes/ Typha/ Canada, Prince Edward Island/ green-winged teal/ American black duck/ ring-necked ducks/ gadwell
Abstract: Since 1990 under the Eastern Habitat Joint Venture over 100 small wetlands have been restored in Prince Edward Island, Canada. Wetlands were restored by means of dredging accumulated sediment from erosion to emulate pre-disturbance conditions (i.e., open water and extended hydroperiod). In 1998 and 1999 we compared waterfowl pair and brood use on 22 restored and 24 reference wetlands. More pairs and broods of Ring-necked Ducks, Gadwall, Green-winged Teal, and American Black Ducks used restored versus reference wetlands. In restored wetlands waterfowl pair density and species richness were positively correlated with wetland/cattail area, percent cattail cover, and close proximity to freshwater rivers. In addition, a waterfowl reproductive index was positively correlated with percent cattail cover. Green-winged Teal pair occurrence in restored wetlands was positively correlated with greater amounts of open water and water depths. American Black Duck pairs occurred on most (86%) restored wetlands. Restored small wetlands likely served as stopover points for American Black Duck broods during overland or stream movements, whereas they likely served as a final brood-rearing destination for Green-winged Teal broods. We suggest that wetland restoration is a good management tool for increasing populations of Green-winged Teal and American Black Ducks in Prince Edward Island.
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1897. **Use of temporary wetlands by anurans in a hydrologically modified landscape.**
Babbitt, Kimberly J. and Tanner, George W.
Wetlands 20(2): 313-322. (2000)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: freshwater ecology: ecology, environmental sciences/ breeding activity/ breeding sites/ cattle ranch/ dynamic habitats/ habitat use/ hydrologically modified landscape/ localized flooding/ meteorological conditions/ species abundance/ species composition/ temporary wetlands/ water table/ wetland hydrology/ wetland size
Abstract: We examined larval anuran assemblages at 12 temporary wetlands occurring on the MacArthur Agro-Ecology Research Center (MAERC) in southcentral Florida. MAERC is an active cattle ranch, and the wetlands on the site are heavily influenced by an extensive series of ditches that drain the landscape. Ditching has resulted in a change from a historically extensive marsh system to a series of isolated wetlands surrounded by upland habitats. Because a majority of anurans in Florida breed exclusively or facultatively in wetlands whose drying regime excludes fish, we were interested in determining the value of these modified wetlands as breeding sites. We examined the effect of wetland size and hydrology on anuran use, and compared breeding activity across three summers that varied greatly in rainfall pattern. We sampled tadpoles from May 93 to August 93 and from May 94 to September 95. A total of 3678 tadpoles from 11 species was collected. Rana utricularia was the most abundant species and the only species found in every wetland. Species richness was related positively to wetland size ($r = 0.65$, $p = 0.023$) but not hydroperiod ($r = 0.03$, $p = 0.93$). Tadpole abundance was not related to wetland size ($r = 0.35$, $p = 0.29$) nor hydroperiod ($r = 0.40$, $p = 0.22$). Annual variation in rainfall resulted in significant changes in species composition. A drought during 1993 resulted in no breeding. A high water table in the spring of 1995 resulted in localized flooding in early summer on part of the ranch. Wetlands in these areas were exposed to spillover of water from ditches containing fishes. Wetlands so impacted showed significant changes in species composition from the previous year (x2 = 1008, $p < 0.0001$), whereas wetlands that were not impacted did not differ in composition. The wetlands at MAERC provide dynamic habitats that offer varying breeding opportunities that are highly dependent on meteorological conditions.
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1898. **Use of wetlands by spring-migrant shorebirds in agricultural landscapes of North Dakota's Drift Prairie.**
Niemuth, N. D.; Estey, M. E.; Reynolds, R. E.; Loesch, C. R.; and Meeks, W. A.
Wetlands 26(1): 30-39. (2006)
NAL Call #: QH75.A1W47; ISSN: 02775212.
Notes: doi: 10.1672/0277-5212(2006)26[30:UOWBSS]2.0.CO;2.
Descriptors: Farm Bill/ landscape ecology/ migration chronology/ Prairie Pothole Region/ wetland complex
Abstract: Small, isolated wetlands in the Prairie Pothole Region of North America may be of critical importance to migrating shorebirds but are at high risk of drainage for agricultural production. We evaluated shorebird use of 1,181 temporary and seasonal wetlands within agricultural fields in the Drift Prairie physiographic region of North Dakota, USA over a 10-week period in spring of 2001. A total of 4,050 shorebirds of 25 species was observed on sampled wetlands. Shorebirds selected temporary wetlands that had water present during multiple visits, little emergent vegetation, large perimeters, and other wetlands in the surrounding landscape. Shorebirds were less likely to use wetlands showing evidence of drainage. Observed use of wetland basins suggests that small wetlands in the Prairie Pothole Region host millions of migrant shorebirds each spring. Continued existence of many of these wetlands may be threatened by a recent U.S. Supreme Court ruling that removed federal protection from certain isolated wetlands. Our results show the importance of current wetland protection provisions such as "Swampbuster" and other conservation practices of the United States Department of Agriculture Farm Program. © 2006, The Society of Wetland Scientists.
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1899. **Using species-habitat models to target conservation: A case study with breeding mallards.**
Newbold, S. and Eadie, J. M.
Ecological Applications 14(5): 1384-1393. (2004)
NAL Call #: QH540.E23; ISSN: 10510761
Descriptors: Anas platyrhynchos/ count regression/ edge effects/ GIS/ habitat selection/ mallards/ optimization/ reserve site selection/ species-habitat models/ systematic

conservation/ wetlands/ conservation management/ conservation planning/ decision making/ ecological modeling/ habitat restoration/ habitat use/ waterfowl/ California/ Central Valley/ Anas/ Anas platyrhynchos/ Anatidae/ Anser

Abstract: To make effective conservation decisions, managers must understand the ecology of species targeted for conservation and be able to apply that knowledge in decision-making. Most conservation research to date has focused on the first of these requirements, but lately ecologists and others have begun to address more systematically the decision-making component of conservation. In this paper, we develop an explicit model of species-habitat relations and incorporate it into an optimization framework for prioritizing sites for management. We then present a case study that applies these concepts to choosing sites for wetlands restoration to benefit breeding Mallards (Anas platyrhynchos) in the Central Valley of California, USA. First, a model of habitat selection by Mallards was estimated using count regression techniques. Our results indicate that breeding Mallard abundances depend not only on the amount of each land use type present, but also on the interspersion of particular land use types in the vicinity of each survey location. We then used the estimated parameters in an optimization model to predict the differences in the expected total Mallard abundance under three generalized strategies for wetlands restoration. Our results suggest that using the spatial habitat preferences of Mallards to target restoration can lead to a greater-than-proportional increase in Mallard abundances: a simulated 50% increase in the total area of wetlands resulted in a nearly 80% increase in the total abundance of breeding Mallards. In contrast, simulated strategies for choosing restoration sites that did not account for the spatial habitat preferences of Mallards resulted in 13-33% increases in total abundance. Accounting for the spatial arrangement of preferred habitats when setting restoration priorities can enhance conservation effectiveness considerably.

1900. **The value of agricultural wetlands as invertebrate resources for wintering shorebirds.**
Taft, O. W. and Haig, S. M.
Agriculture, Ecosystems and Environment 110(3-4): 249-256. (2005)
NAL Call #: S601.A34; ISSN: 0167-8809
Descriptors: invertebrate abundance/ dunlin/ killdeer/ oligochaetes/ wetland landscape/ wintering waterbirds

Abstract: Agricultural landscapes have received little recognition for the food resources they provide to wintering waterbirds. In the Willamette Valley of Oregon, modest yet significant populations of wintering shorebirds (Charadriiformes) regularly use hundreds of dispersed wetlands on agricultural lands. Benthic invertebrates are a critical resource for the survival of overwintering shorebirds, yet the abundance of invertebrate resources in agricultural wetlands such as these has not been quantified. To evaluate the importance of agricultural wetlands to a population of wintering shorebirds, the density, biomass, and general community composition of invertebrates available to birds were quantified at a sample of Willamette Valley sites during a wet (1999-2000) and a dry winter (2000-2001). Invertebrate densities ranged among wetlands from 173 to 1925 (mean +/- S.E.: 936 +/- 106) individuals/m^2 in the wet winter, and from 214 to 3484 (1028 +/- 155) individuals/m^2 in the dry winter. Total invertebrate estimated biomass among wetlands ranged from 35 to 652 (mean +/- S.E.: 364 +/- 35) mg/m^2 in the wet winter, and from 85 to 1405 (437 +/- 62) mg/m^2 in the dry winter. These estimates for food abundance were comparable to that observed in some other important freshwater wintering regions in North America.
This citation is from AGRICOLA.

1901. **Variation in size and location of wading bird colonies in the Upper St. Johns River Basin, Florida, USA.**
Bryan, J. C.; Miller, S. J.; Yates, C. S.; and Minno, M.
Waterbirds 26(2): 239-251. (2003)
NAL Call #: QL671; ISSN: 07386028
Descriptors: borrow pits/ Upper St. Johns River/ wading bird colonies/ wetland restoration/ aerial survey/ habitat restoration/ nest site/ wader/ United States/ Bubulcus ibis/ Mycteria americana

Abstract: Wading bird nesting colonies were surveyed in the Upper St. Johns River Basin, east central Florida, USA in 1993-1995 and 1998-2000 using aerial survey methods. A total of 62 colony locations were found over six years, with a maximum of 35 sites active in each of two years. Borrow pits and managed impoundments were the most important nesting locations based on size and persistence. Most of these sites were in or adjacent to the Upper St. Johns River Basin Project, a wetland restoration protect. Higher numbers of nests were counted during nesting seasons preceded by above average rainfall than during seasons characterized by drought. Cattle Egrets (Bubulcus ibis) were the most common nesting species in all years, however, the proportion of the total nests that were Cattle Egrets decreased over the study period. Wood Storks (Mycteria americana), a federally endangered species, nested in increasing numbers within three borrow pits adjacent to the Upper St. Johns River Basin Project. This study reveals the importance of borrow pits, most of which are on private land where sites are unprotected, to wading bird nesting in east central Florida.

1902. **Vegetation, invertebrate, and wildlife community rankings and habitat analysis of mitigation wetlands in West Virginia.**
Balcombe, C. K.; Anderson, J. T.; Fortney, R. H.; and Kordek, W. S.
Wetlands Ecology and Management 13(5): 517-530. (2005)
NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861
Descriptors: created wetland/ man-made wetland/ mitigation wetland/ reference wetland/ restored wetland/ wetland management/ wetland mitigation

Abstract: Numerous efforts have been made in West Virginia to construct and restore compensatory wetlands as mitigation for natural wetlands destroyed through highway development, timbering, mining, and other human activities. Because such little effort has been made to evaluate these wetlands, there is a need to evaluate the success of these systems. The objective of this study was to determine if mitigation wetlands in West Virginia were adequately supporting ecological communities relative to naturally occurring reference wetlands and to attribute specific characteristics in wetland habitat with trends in wildlife abundance across wetlands. Specifically, avian and anuran communities, as well as habitat quality for eight wetland-dependent wildlife species were evaluated. To supplement this evaluation, vegetation and invertebrate communities also were assessed. Wetland ranks were assigned based on several parameters including richness, abundance, diversity, density, and biomass, depending on which taxa was being analyzed. Mitigation wetlands consistently scored better ranks than reference wetlands across all communities analyzed. Canonical correspondence analysis revealed no correlations between environmental variables and community data. However, trends relating wetland habitat characteristics to community structure were observed. These data stress the need to maintain specific habitat characteristics in mitigated wetlands that are compatible with wildlife colonization and proliferation. © Springer 2005.

1903. **Vegetation similarity and avifaunal food value of restored and natural marshes in northern New York.**
Brown, Stephen C.
Restoration Ecology 7(1): 56-68. (1999)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: natural restored marsh comparisons: avifaunal food value, vegetation/ restoration ecology
Abstract: Measuring the success of wetland restoration efforts requires an assessment of the wetland plant community as it changes following restoration. But analyses of restored wetlands often include plant community data from only one time period. We studied the development of plant communities at 13 restored marshes in northern New York for 4 years, including 1 year prior to restoration and 3 years afterwards. Restored wetlands ranged in size from 0.23 to 1.70 ha. Four reference wetlands of similar basin morphology, soil type, and size (0.29-0.48 ha) that occurred naturally in the same area were studied as comparisons. Dike construction to restore hydrology disturbed the existing vegetation in some parts of the restored sites, and vegetation was monitored in both disturbed and undisturbed areas. Undisturbed areas within the restored sites, which were dominated by upland field grasses before restoration, developed wetland plant communities with lower wetland index values but comparable numbers of wetland plant species than the reference wetlands, and they lagged behind the reference sites in terms of total wetland plant cover. There were significantly more plant species valuable as food sources for wetland birds, and a significantly higher percent cover of these species, at the undisturbed areas of the restored sites than at the reference wetlands. Areas of the restored sites that were disturbed by dike construction, however, often developed dense, monospecific cattail stands. In general, the plant communities at restored sites became increasingly similar to those at the reference wetlands over time, but higher numbers of herbaceous plants developed at the restored sites, including food plants for waterfowl, rails, and songbirds. Differences in shrub cover will probably lessen as natural recolonization increases shrub cover at the restored sites. Natural recolonization appears to be an effective technique for restoring wetlands on abandoned agricultural fields with established plant cover, but it is less successful in areas where soil has been exposed by construction activity.

1904. **Vertebrate use of habitats created by installation of field-scale erosion control structures.**
Cooper, C. M.; Smiley, P. C.; Wigginton, J. D.; Knight, S. S.; and Kallies, K. W.
Journal of Freshwater Ecology 12(2): 199-207. (June 1997)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060
Descriptors: Vertebrata/ farming and agriculture/ agricultural field runoff control by drop pipe installation/ community structure/ habitat utilization/ semiaquatic habitat/ wetland habitats created by drop pipe installation in field/ community structures and habitat use survey/ Mississippi/ Panola County/ agriculture field runoff control by drop pipe installation/ created wetland habitats use and community structures

1905. **Vertebrate use of nontidal wetlands on Galveston Island, Texas, USA.**
Mueller A. J.
Texas Journal of Science 37(2-3): 215-226. (1985)
NAL Call #: 470 T31; ISSN: 0040-4403
Descriptors: amphibians/ reptiles/ birds/ emergent aquatic vegetation/ rainfall/ evaporation/ salinity/ barrier islands
Abstract: The nontidal wetlands of Galveston Island, Texas, depend on local rainfall for freshwater, and many dry out during summer. Evaporation and inundation by storm tides cause salinities to rise; they decline when heavy rains flush out the saltwater. Aquatic emergents are the dominant vegetation. Nontidal marshes provide important habitat for many kinds of wildlife, especially birds. In a comparison of two wetlands, one natural and the other man-made, the natural area received equal or greater use by all aquatic bird groups except the black-crowned night heron (Nycticorax nycticorax) and American coot (Fulica americana). Nontidal wetlands are the only available habitat on Galveston Island for many amphibians and reptiles.

1906. **Volunteers monitor bird use of wetland restoration on public lands in central Florida.**
Marburger, J. E.
Ecological Restoration 20(3): 164-172. (2002); ISSN: 1543-4079
Descriptors: Aves/ Florida/ seabirds/ waterfowl/ restoration/ wetlands/ surface water level/ hydrology/ habitat conservation/ ecological restoration
Abstract: In the Emeralda Marsh Connection Area (FL), the purpose of the volunteers' work was to evaluate certain related species to see if they responded to environmental changes brought on by the restoration, particularly alterations in water levels.

1907. **Waste rice for waterfowl in the Mississippi Alluvial Valley.**
Stafford, J. D.; Kaminski, R. M.; Reinecke, K. J.; and Manley, S. W.
Journal of Wildlife Management 70(1): 61-69. (2006)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: carrying capacity/ conservation planning/ estimation/ food resources/ foraging/ Mississippi Alluvial Valley/ rice/ sampling/ waterfowl
Abstract: Flooded rice fields are important foraging habitats for waterfowl in the lower Mississippi Alluvial Valley (MAV). Waste rice previously was abundant in late autumn (140-492 kg/ha), but early planting and harvest dates in recent

years may have increased losses of waste rice during autumn before waterfowl arrive. Research in Mississippi rice fields revealed waste-rice abundance decreased 79-99% during autumns 1995-1996 (Manley et al. 2004). To determine if this trend existed throughout the MAV, we used multistage sampling (MSS) to estimate waste-rice abundance during September-December 2000-2002. Averaged over years, mean abundance of waste rice decreased 71% between harvest ($\bar{x}$ = 271.0 kg/ha, CV=13% n = 3 years) and late autumn ($\bar{x}$ = 78.4 kg/ha, CV= 15% n = 3). Among 15 models formulated to explain variation in rice abundance among fields and across years, the best model indicated abundance of waste rice in late autumn differed between harvester types (i.e., conventional > stripper header) and was positively related to initial waste-rice abundance after harvest. Because abundance of waste rice in late autumn was less than previous estimates in all 3 years, we concluded that waterfowl conservationists have overestimated carrying capacity of rice fields for wintering waterfowl by 52-83% and recommend 325 duck-use days/ha (DUDs) as a revised estimate. We suggest monitoring advances in rice harvest dates to determine when new surveys are warranted and recommend increased management of moist-soil wetlands to compensate for decreased rice abundance.

1908. **Water quality and macroinvertebrate assemblages in three types of seasonally inundated limesink wetlands in southwest Georgia.**
Battle, J. and Golladay, S. W.
Journal of Freshwater Ecology 16(2): 189-208. (2001)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060
Descriptors: wetlands/ macrofauna/ zoobenthos/ water quality/ community composition/ species diversity/ ecology/ invertebrates/ aquatic life/ Georgia
Abstract: In southwest Georgia there are three types of shallow, seasonally inundated limesink wetlands based on soil characteristics and vegetation-grass-sedge marshes, cypress savannas, and cypress-gum swamps. We sampled wetlands of the three types from February 1997 through June 1998 during early, mid, and late hydroperiod in 1997. The wetlands had similar water chemistry soon after inundation. Over rime, water in swamps generally had higher levels of dissolved organic carbon, NH_4 -N, NO_3 -N, and PO_4 -P, was more darkly stained, and had lower temperatures than in other wetland types. We collected 121 macroinvertebrate taxa, with 40 taxa occurring in >10% of the samples. Marshes had higher macroinvertebrate numbers and taxa richness than other wetland types. Early in the hydroperiod, macroinvertebrate assemblages were composed of taxa that overwintered in wetlands. Later, predators were abundant in the marshes, and detritivore numbers declined in swamps. Our findings suggest that water quality is influenced by interactions of vegetation, soils, and time since inundation. We believe that macroinvertebrate assemblages differed among the wetland types due mainly to vegetation. Macroinvertebrates in marshes probably have a wider variety of food sources (i.e., algae) and greater habitat structure available, whereas in swamps macroinvertebrates have more stressful conditions (i.e., low dissolved oxygen) caused by processing of large detrital inputs.

1909. **Waterbird communities and associated wetlands of the Colorado River Delta, Mexico.**
Hinojosa Huerta, Osvel; Destefano, Stephen; Carrillo Guerrero, Yamilett; Shaw, William W.; and Valdes Casillas, Carlos
Studies in Avian Biology (27): 52-60. (2004)
NAL Call #: QL671.S8; ISSN: 0197-9922
Descriptors: biodiversity/ biogeography: population studies/ marine ecology: ecology, environmental sciences/ agricultural drain/ flood control measures/ guild composition/ species abundance/ species richness/ waterbird communities/ wetland habitat/ wetland management program
Abstract: Despite extensive losses of wetlands caused by water diversions upstream, the Colorado River Delta in northwestern Mexico remains an important wetland system in the Sonoran Desert. The purpose of our study was to describe waterbird communities across a variety of wetland habitat types and zones that exist in the Delta. We measured species richness and abundance of waterbirds from September 1999 to August 2000. We observed a total of 11,918 individuals of 71 species at sites within seven wetland areas. The waterbird communities differed with respect to guild composition and species abundances among the wetland zones. Wetlands along the eastern portion of the Delta (Cienega and Indio), which are supported by agricultural drains and managed under conservation initiatives, exhibited the highest species richness in our summer and winter censuses, and highest abundance in summer. Shorebirds were the dominant guild in the summer period, while waterfowl were dominant during winter. Breeding marshbirds were also abundant, with the Yuma Clapper Rail (Rallus longirostris yumanensis) being most notable. Wetlands along the western Delta (Hardy and Cucapa) were also supported by agricultural drains, but were not managed specifically for wildlife. The Double-crested Cormorant (Phalacrocorax auritus) and American Coot (Fulica americana) were dominant during winter, while long-legged waders (Ardeidae) were dominant in summer. The composition of waterbird communities along the mainstem of the Colorado River was similar to that of wetlands along the western portion of the Delta. The shallow and ephemeral Laguna Salada, along the western boundary of the Delta, exhibited the highest waterbird abundance among our winter censuses when it was flooded in 2000. The results of our study suggest that even minimal levels of instream flows would lead to habitat improvements for waterbirds in the Delta floodplain. A bi-national wetland management program for the Delta should consider the impacts of flood control measures and diversions for agricultural and urban uses to the health of wetland habitats on both sides of the international border.

1910. **Waterbird communities in managed wetlands of varying water depth.**
Colwell, M. A. and Taft, O. W.
Waterbirds 23(1): 45-55. (2000)
NAL Call #: QL671; ISSN: 0738-6028
Descriptors: wetlands/ habitat selection/ community composition/ species diversity/ aquatic birds/ water depth/ environment management/ ecosystem management/ ecological distribution/ habitat utilization/ winter/ California/ Aves/ San Joaquin Valley/ birds/ behavior/ management/

Abstract: Published accounts of interspecific differences in habitat use by waterbirds predict that shallow wetlands should accommodate more species and greater numbers of waterbirds than deep wetlands. We evaluated this hypothesis by examining relationships between winter (January/February) waterbird use (presence/absence, density and number of species) and average depth, variation in depth and size of 25 wetlands in the northern San Joaquin Valley, California. Bird densities correlated consistently with depth. Likelihood of use increased in shallow wetlands for all nine wading birds (shorebirds and ibis); densities of three dabbling duck species and Black-necked Stilt (Himantopus mexicanus) also increased in shallow wetlands, whereas use and densities of two diving birds increased in deep wetlands. We observed no statistically significant relationship between depth and densities of two other waterbird species. The number of species of waterbird, dabbling duck, and wading bird increased in shallow wetlands, whereas the number of species of diving bird increased in deep wetlands. Wetland size and topographic variation inconsistently predicted waterbird densities, but both characteristics correlated positively with number of species. Our results provide general support for shallow flooding of wetlands to provide habitat for more species. We conclude that managers seeking to provide foraging habitat for a diverse community of wintering waterbirds should flood wetlands to average depths of 10-20 cm, where topography can provide a range of depths attractive to a large number of species. However, this prescription is region-specific and influenced by the great diversity and abundance of waterfowl and shorebirds wintering in California's Central Valley.

1911. **Waterbird communities in rice fields subjected to different post-harvest treatments.**
Day, John H. and Colwell, Mark A.
Colonial Waterbirds 21(2): 185-197. (1998);
ISSN: 0738-6028
Descriptors: community composition/ post harvest treatments/ rice fields/ habitat/ species richness/ wetland management
Abstract: In California's Sacramento Valley, the potential value of rice fields as habitat for waterbirds may vary with harvest method, postharvest treatment of rice straw (chopped, burned, plowed), and extent of flooding. Recent changes in rice harvesting methods (i.e., use of stripper-headers) and a legislative mandate to decrease burning of rice straw after harvest may alter habitat availability and use. Thus, we investigated species richness and community composition of nonbreeding waterbirds during October-March 1993-94 and 1994-95 in rice fields of the northern Sacramento Valley. Most (85-91% of land area) rice was conventionally harvested (i.e., cutter bar), and the remainder was stripped. Rice straw was left untreated in more than half of fields (52% in 1994 and 54% in 1995), especially in stripped fields (56-70%). In fields where farmers treated straw, the most common management methods were plowing (15-21%), burning (19-24%), and chopping (3-5%). Fields became increasingly wet from October through March as seasonal precipitation accumulated and farmers flooded fields to facilitate straw decomposition and provide habitat for ducks. Species richness of waterbirds was greater ($P < 0.002$) in conventionally-harvested fields than in stripped fields; within harvest methods, species richness was consistently greater ($P < 0.01$) in flooded than non-flooded fields. By contrast, species richness did not differ among straw treatments ($P > 0.23$). Species richness in stripped fields probably was low because foraging opportunities were limited by tall dense straw, decreased grain density, and infrequent flooding. We recommend that land managers wishing to provide habitat for a diverse waterbird community harvest rice using conventional methods and flood fields shallowly.

1912. **Waterbird foods in winter-managed ricefields in Mississippi.**
Manley, S. W.; Kaminski, R. M.; Reinecke, K. J.; and Gerard, P. D.
Journal of Wildlife Management 68(1): 74-83. (2004)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: foraging carrying capacity/ Mississippi Alluvial Valley/ Oryza saliva/ private-lands management/ rice/ shorebirds/ waterfowl/ agricultural land/ carrying capacity/ feeding ground/ rice/ waterfowl/ wildlife management/ winter/ Mississippi
Abstract: Ricefields are important foraging habitats for waterfowl and other waterbirds in primary North American wintering regions. We conducted a large-scale experiment to test effects of post-harvest ricefield treatment, winter water management, and temporal factors on availabilities of rice, moist-soil plant seeds, aquatic invertebrates, and green forage in the Mississippi Alluvial Valley (MAV), Mississippi, USA, fall-winter 1995-1997. Our results revealed that a large decrease in rice grain occurred between harvest and early winter (79-99%), which, if generally true throughout the MAV, would have critical implications on foraging carrying capacity of ricefields for migrating and wintering waterbirds. During the remainder of winter, food resources generally were similar among treatment combinations. An exception was biomass of aquatic invertebrates, which demonstrated potential to increase by late winter in ricefields that remained flooded. We offer revised calculations of foraging carrying capacity for waterfowl in MAV ricefields and recommend continuing research and management designed to increase availability of residual rice and aquatic invertebrates in winter.

1913. **Waterbird responses to experimental drawdown: Implications for the multispecies management of wetland mosaics.**
Taft, O. W.; Colwell, M. A.; Isola, C. R.; and Safran, R. J.
Journal of Applied Ecology 39(6): 987-1001. (2002)
NAL Call #: 410 J828; ISSN: 00218901.
Notes: doi: 10.1046/j.1365-2664.2002.00763.x.
Descriptors: diving waterbirds/ habitat use/ moist-soil management/ non-breeding season/ shorebirds/ water depth/ waterfowl/ abundance/ avifauna/ human activity/ species richness/ wetland management/ United States/ Anas/ Anas sp./ Anatidae/ Anser
Abstract: 1. The loss and human modification of wetlands world-wide underscores the importance of efficient management. For wetlands that provide habitats for non-breeding waterbirds, such management often aims to support a rich and abundant waterbird community. 2. Among the world's many seasonal, moist-soil managed wetlands, annual winter flooding is followed by spring

drawdown to encourage germination of waterfowl food plants. Recommendations on how best to maintain flooded wetlands for multiple species are mostly theoretical, and drawdown management typically focuses on spring for migrating shorebirds. The benefits and drawbacks of shallow-water management in winter have not been examined, especially where sizeable populations of wintering shorebirds and waterfowl occur together. 3. We considered The Grasslands Ecological Area in California's Central Valley, USA, as a model wetland complex in which to assess optimal winter flood-depth for multi-species use. We also examined the relative benefits for each waterbird group (e.g. shorebirds and waterfowl) of drawdowns conducted in winter and spring. We experimentally dewatered wetlands of measured topography in the winter and spring of 1994-95, documenting changes in waterbird species richness and abundance associated with daily changes in habitat diversity and availability. 4. Results indicated limited regional availability of shallow-water habitat across the landscape in winter but not spring, as use by shorebirds and teal increased on drawndown wetlands in winter only. Use by deeper-water dabbling ducks and diving waterbirds declined during the later stages of drawdown in both seasons, but not until use by shorebirds and teal had peaked. The maximum diversity and abundance of waterbirds occurred at average depths of 10-20 cm on wetlands with topographic gradients of 30-40 cm. 5. This study has important implications for the winter management of seasonal wetland complexes, especially moist-soil systems where managers provide habitat for different waterbird groups (from shorebirds to diving waterbirds) simultaneously. In general, where topography is variable (e.g. a difference of 30-40 cm between the deepest and shallowest zones), wetlands flooded to average depths of 15-20 cm should accommodate the greatest richness and abundance of waterbirds.

1914. **Waterbird responses to hydrological management of Wetlands Reserve Program habitats in New York.**
Kaminski, M. R.; Baldassarre, G. A.; and Pearse, A. T.
Wildlife Society Bulletin 34(4): 921-926. (2006)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2006)34[921:WRTHMO]2.0.CO;2.
Descriptors: moist-soil management/ New York/ restoration/ waterbird/ waterfowl/ wetland management/ Wetlands Reserve Program
Abstract: The Wetlands Reserve Program (WRP) has restored nearly 600,000 ha of wetlands in the United States since inception of the program in 1996. However, no research has evaluated postrestoration management of WRP wetlands in relation to waterfowl and waterbird use. Therefore, we conducted an experiment to compare waterfowl and waterbird abundance and diversity between hydrologically managed (i.e., spring-summer drawdown for vegetation regeneration) and nonmanaged WRP wetlands in central New York, USA, in 2004. We surveyed waterfowl and other waterbirds on 5 managed and 5 nonmanaged wetlands over 3 10-week periods (i.e., spring: 7 Mar-15 May; summer: 16 May-24 Jul; autumn: 25 Jul-30 Sep). We detected a total of 36 taxa of these birds across the 3 periods and both types of wetlands but observed 1.4-2.3 times more taxa on managed than on nonmanaged wetlands among periods. Additionally, we recorded 0.8-13.2 times greater relative abundances (n birds/ha of wetland) of waterfowl and other waterbirds on managed than on nonmanaged wetlands during spring through autumn. We recommend regular postrestoration hydrological management of WRP wetlands to regenerate moist-soil and other emergent plants and promote waterfowl and waterbird use of these restored habitats.

1915. **Waterbird use of bayland wetlands in the San Francisco Bay Estuary: Movements of long-billed dowitchers during the winter.**
Takekawa, J. Y.; Warnock, N.; Martinelli, G. M.; Miles, A. K.; and Tsao, D. C.
Waterbirds 25 (Special Publ.2): 93-105. (2002)
NAL Call #: QL671; ISSN: 07386028
Descriptors: Limnodromus scolopaceus/ long-billed dowitcher/ radio telemetry/ San Francisco Bay/ wintering ecology/ biotelemetry/ estuarine ecosystem/ habitat use/ movement/ overwintering/ restoration ecology/ waterfowl/ wetland/ United States/ Calidris alpina/ Calidris mauri/ Himantopus mexicanus/ Limnodromus scolopaceus
Abstract: The San Francisco Bay estuary is a migration and wintering area for more than 1.5 million waterbirds on the west coast of North America. Because the estuary is located in a metropolitan area, development and diking of baylands (the region between the edge of the bay and the historical high tide line) have greatly altered the wetland landscape. Recently, conservation interests have promoted restoration of diked baylands to tidal salt marshes for the benefit of endangered native species. However, effects of tidal marsh conversion on the existing community of waterbirds in the baylands are largely unknown, especially in muted tidal marshes with restricted inflows and in artificial salt evaporation ponds where high waterbird densities are found. The first radio-marking study of the Long-billed Dowitcher (Limnodromus scolopaceus) was conducted in November-December 2000 to examine their use of baylands. We captured 32 birds by rocket netting in a muted tidal marsh on the North Bay and radio-marked them with 1.2 g transmitters affixed with glue. Individuals were tracked for an average of 20.3 d (±8.5 SD) and obtained 217 high tide and 195 low tide locations. Movements between tides ($\bar{x}$ = 1.29 ± 1.48 SD km) and home range sizes ($\bar{x}$ = 17.7 ± 16.0 SD km^2) were highly variable. Long-billed Dowitchers preferred open habitats such as muted tidal marshes during the high tide, but the majority (78.5%) also remained in these wetlands during low tide rather than feeding at nearby mud flats. Their avoidance of mud flats contrasted sharply with Western Sandpipers (Calidris mauri) but was similar to Black-necked Stilts (Himantopus mexicanus). Seven Long-billed Dowitchers flew 110 km inland to Central Valley wetlands in mid-December, a regional movement documented earlier for Dunlin (Calidris alpina) wintering on the coast. However, unlike Dunlin, their movements were not in response to rainfall but may have been in response to a low pressure front or possibly predictable flooding of fields in the Central Valley. Although the estuary is a major wintering area supporting large numbers of waterbirds, some birds such as Long-billed Dowitchers move inland to freshwater wetlands in the Central Valley.

1916. **Waterfowl use of forested wetlands of the southern United States: An overview.**
Fredrickson, L. H. and Heitmeyer, M. E.
In: Waterfowl in winter/ Weller, M. W.
Minneapolis: University of Minnesota Press, 1988
pp. 307-323.
NAL Call #: QL696.A52W38
Descriptors: Anatidae/ wildlife management/ habitat exploitation/ semiaquatic habitat/ forest/ wetland/ United States, southern region/ wetland forests/ habitat exploitation and wildlife management

1917. **Waterfowl use of managed and unmanaged beaver ponds in south-central Ontario.**
Gabor, T. Shane; Murkin, Henry R.; and Ingram, Joel W.
Northeast Wildlife 57: 45-57. (2002)
Descriptors: conservation measures/ nutrition/ diet/ prey/ ecology/ population dynamics/ predators/ habitat/ freshwater habitat/ lentic water/ land zones/ North America/ Canada/ Aix sponsa/ Anas platyrhynchos/ Lophodytes cucullatus: habitat management/ prey/ Invertebrata/ piscean prey/ Cyprinidae/ food availability/ population density/ habitat utilization/ food resource availability relationship/ beaver ponds/ Ontario/ Pisces, Actinopterygii, Cypriniformes/ birds/ chordates/ fish/ invertebrates/ vertebrates
Abstract: We studied waterfowl habitat use and resource availability on beaver (Castor canadensis) ponds in south-central Ontario. We studied 6 types of natural beaver ponds (aquatic bed, emergent, forested, scrub-shrub, unvegetated, seasonally flooded) and 1 managed beaver pond (dewatered for >1 year to rejuvenate vegetation communities and then re-flooded). Waterfowl use was determined from helicopter surveys for breeding pairs and elevated platforms for broods. Invertebrate and minnow abundance and biomass were determined using sweep net samples. Mallard (Anas platyrhynchos) pair densities were higher ($P = 0.001$) on emergent (0.16 ± 0.02 SE) and scrub-shrub (0.20 ± 0.03) wetlands than on seasonally flooded (0.08 ± 0.02) ponds. Wood duck (Aix sponsa) pair densities were higher ($P = 0.0001$) on forested (0.20 ± 0.04), emergent (0.14 ± 0.03) and unvegetated (0.23 ± 0.06) wetlands than on seasonally flooded ponds (0.01 ± 0.01). Hooded merganser (Lophodytes cucullatus) pair densities were higher ($P = 0.0001$) on forested (0.10 ± 0.02) and unvegetated (0.07 ± 0.01) ponds than on scrub-shrub (0.01 ± 0.01) and seasonally flooded (0) wetlands. Differences in brood densities were not detected between wetland classes for mallard/black duck ($P = 0.08$), wood ducks ($P = 0.17$) and all species combined ($P = 0.44$). Hooded merganser brood densities were higher ($P = 0.02$) on forested (0.66 ± 0.22) and unvegetated (0.59 ± 0.23) wetlands than on emergent (0) wetlands. In June, total invertebrate biomass was higher ($P = 0.008$) in emergent (0.72 ± 0.32), forested (0.78 ± 0.30), scrub-shrub (0.75 ± 0.24), and managed wetlands (0.70 ± 0.17) than in unvegetated ponds (0.08 ± 0.05). In July, total invertebrate biomass was higher ($P = 0.009$) in emergent (1.23 ± 0.38) and managed (0.99 ± 0.22) wetlands than in unvegetated ponds (0.07 ± 0.03). Managed wetlands had similar productivity to natural vegetated wetlands and therefore intensive water level management to increase waterfowl productivity has limited potential. Waterfowl use in the region is primarily affected by wetland availability. Beaver abundance and distribution determine wetland availability and therefore, programs, partnerships, and policy initiatives that consider both forestry and beaver management will positively impact waterfowl in Canada's forested regions.

1918. **Weak correspondence between macroinvertebrate assemblages and land use in Prairie Pothole Region wetlands, USA.**
Tangen, B. A.; Butler, M. G.; and Ell, M. J.
Wetlands 23(1): 104-115. (2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ macrofauna/ land use/ agricultural land/ aquatic communities/ aquatic insects/ community composition/ species diversity/ biotic factors/ trophic relationships/ freshwater fish/ environmental impact/ ecosystem disturbance/ agriculture/ environment management/ invertebrates/ fish/ population dynamics/ aquatic habitat/ Invertebrata/ pisces/ North Dakota/ Prairie Pothole Region
Abstract: To evaluate the potential development of a macroinvertebrate Index of Biotic Integrity (IBI) for Prairie Pothole Region wetlands, we sampled the aquatic macroinvertebrate and fish communities in 24 semipermanent wetlands located throughout Central North Dakota. Wetland basins were selected to encompass a range of surrounding land-use, ranging from 100% grassland to 100% cropland. We used redundancy analysis (RDA) to identify the influences of fish, and temporal and spatial variation on the macroinvertebrate community. We also used RDA to look for relationships between wetland macroinvertebrate communities and land-use. Seventeen potential invertebrate metrics were tested by graphical analyses. We identified a strong influence on the macroinvertebrate community due to the presence of fish. A number of invertebrate taxa decreased in abundance as the summer progressed, and there was noticeable variation in the invertebrate community among individual wetlands of the region. However, we detected no strong relationships between the varying degrees of agricultural land-use in the wetland catchments and the invertebrate community. Consequently, we were unable to identify any effective IBI metrics indicative of land-use disturbance. Lack of correspondence between land-use and macroinvertebrates in this habitat is most likely due to a high degree of natural disturbance (e.g., presence of fish, temporal changes) and a low diversity community of resilient taxa in Prairie Pothole Region wetlands.

1919. **Wetland and aquatic habitats.**
Mathias, M. E. and Moyle, P.
Agriculture, Ecosystems and Environment 42(1-2): 165-176. (1992)
NAL Call #: S601.A34; ISSN: 0167-8809.
Notes: Special issue: Integrating conservation biol. & agric. production.
Descriptors: wetlands/ riparian environments/ dispersal/ agricultural practices/ biological diversity/ species diversity/ ecosystem management/ environmental impact/ agriculture/ dispersion/ man-induced effects/ man-induced effects/ dispersal/ agricultural practices/ biological diversity/ mechanical and natural changes
Abstract: Riparian wetland areas often represent critical corridors for animal and plant dispersion in wildland

watersheds and downstream river systems. It is essential that integrated management of riparian wetland areas be developed to reverse the loss of biological diversity. Agricultural and urban uses, and related water developments, have led to a marked decline of stream-side wetland habitats. Six major ways are discussed in which conventional agriculture alters wetlands and aquatic habitats: wetland drainage, water diversions, stream channelization, bank stabilization, grazing, and the release of agricultural pollutants. This article discusses these practices and suggests ways biological diversity can be protected, or even enhanced. In addition, aquaculture is discussed as a new force which affects the diversity of aquatic organisms. Aquaculture methods range in intensity of management from low to high. Management for biological diversity as well as for food production should be encouraged.

1920. **Wetland and riparian birds of West Virginia: Status, future research and guidelines for constructed wetlands.**
Edinger, Bruce
West Virginia Academy of Science. Proceedings 72(1): 4-5. (2000); ISSN: 0096-4263
Descriptors: agricultural practices/ biological indicators/ birds/ communities/ ecosystems/ habitat alterations/ habitat islands/ riparian habitat/ rivers/ trophic relationships/ urbanization/ wetland draining/ wetlands/ wildlife-habitat relationships/ West Virginia
Abstract: Birds, along with amphibians, are excellent vertebrate indicators of wetland functioning and values. Wetland birds, often specialist predators high on the food web, indicate an intact trophic pyramid. They are also sensitive to vegetation type and other landscape parameters. The absence or rarity of wetland birds can indicate problems with wetland quantity or quality. To determine the status of West Virginia's wetland birds, a review of existing records (Hall, 1983; Buckelew and Hall, 1994; lists assembled by bird clubs and state and federal agencies, etc.) and of conservation and management sources (journal articles, Partners in Flight Abstracts of The Nature Conservancy, Birds of North America, etc.) was conducted. Also, from 1996 through 1999, plot censuses of six natural and created wetland habitats in north-central West Virginia and similar studies in riparian communities along five rivers, allowed up to date (if local) data on wetland bird densities. This study provides an overview of the general status of wetland bird communities, important wetland habitat characteristics, long-term population changes, problematic wetland species, recommendations for future wetland bird research, and recommendations for constructed wetlands. West Virginia wetland communities are riverine, lacustrine (reservoirs and lakes), and palustrine (wet meadow, emergent, shrub-scrub, forested, and beaver pond) systems, and the bird community varied from one wetland type to another. For example, isolated and ephemeral beaver ponds, support a high diversity of secondary cavity nesters (high quantity of snags) and black ducks (possibly lessened competition with ma1lards who threaten hybridization and genetic swamping). Wetlands lacking a shrub layer, either naturally or because a constructed wetland was in an early stage of succession, lacked species such as Empidonax flycatchers. In sum, West Virginia's wetland bird species were sensitive to surrounding habitat, type of wetland vegetation, proportion and depth of open water, and availability of mud margin. Threats to wetland-dependent birds in West Virginia continue to be habitat fragmentation, loss, and degradation. Quantified, long-term studies of breeding and non-breeding bird usage of some of West Virginia's larger wetlands are needed to adequately assess population trends. Breeding Bird Survey studies poorly monitor wetland species. At the same time, given the high diversity of migratory wetland birds found in some West Virginia wetlands, additional research is needed into the value of these wetlands, despite their sma11 size, as stopover sites for migratory species. Ecotonal and seasonal use of wetlands by "non-wetland" bird species is a third area needing attention. In the same way red-shouldered hawks have territories that allow feeding in forested wetlands, but are also found in other habitats, several other species of birds may be found to have "habitat mosaic" needs that include wetlands. Finally, since constructed wetlands are a growing part of the wetland mix in West Virginia, mitigation wetlands can be improved as wetland bird habitat if they are sufficiently large, hydrologically joined to rivers, allowed to undergo wetland succession to develop shrub-scrub and organic soils, and surrounded by plant communities complementary to the needs of wetland bird species.

1921. **Wetland birds: Habitat resources and conservation implications.**
Weller, Milton W.
Cambridge, UK : Cambridge University Press; xv, 271 p., [26] p. of plates : ill., map. (1999).
Notes: Contents note: Introduction -- Wetlands: what, where, and why -- Major groups of birds that use wetlands -- Water and other resource influences -- Foods, feeding tactics, strategies, and guilds -- Bird mobility and wetland predictability -- Other behavioral and physical influences on wetland living -- Spatial and structural patterns -- Habitat dynamics: water, plant succession, and time -- Population consequences of wetland abundance and quality -- How birds influence wetlands -- Conservation implications -- Measures of bird habitat use and quality -- Current status and some conservation problems -- Conservation and management strategies -- Outlook.
NAL Call #: QL698.95.W45 1999; ISBN: 0521633265.
Descriptors: Water birds---Ecology/ Wetland animals---Ecology/ Birds, Protection of
This citation is from AGRICOLA.

1922. **Wetland conservation and Ducks Unlimited: Real world approaches to multispecies management.**
Tori, Gildo M.; McLeod, Scott; McKnight, Keith; Moorman, Thomas; and Reid, Frederic A.
Waterbirds 25 (Special Publication 2): 115-121. (2002)
NAL Call #: QL671; ISSN: 1524-4695
Descriptors: biodiversity/ freshwater ecology: ecology, environmental sciences/ terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ multispecies management/ applied and field techniques/ Ducks Unlimited/ biodiversity/ coastal wetlands/ development: agricultural, industrial, urban/ habitat degradation/ habitat loss/ hydrological modification/ integrated habitat based landscape management/ land conversion/ palustrine wetlands/ riverine wetlands/ sustainable ecosystems/ wetland conservation/ wetland

management/ wetland restoration/ wetland associated uplands/ wildlife diversity
Abstract: Conversion and loss of coastal, riverine, and palustrine wetlands to agricultural, urban, and industrial developments have had significant impacts on waterbirds. Degradation of wetlands and associated upland habitats, and associated impacts on several duck and rail species are well documented. Wetland restoration and management are essential for wildlife diversity because of the magnitude of wetland destruction and hydrological modification that has occurred in most of the United States. Half of threatened and endangered species rely upon wetlands for some portion of their life cycle, underscoring the importance of wetlands to all wildlife. Ducks Unlimited, during its 65-year history of conservation programs, has restored, protected, and enhanced nearly 4.05 million hectares of wetlands and associated uplands in North America. Despite the accomplishments of Ducks Unlimited and its private, state, provincial and federal partners, the perception remains that our efforts benefit only waterfowl. However, wildlife inventories on Ducks Unlimited projects indicate benefits to more than 900 species. Herein, we promote an integrated, habitat-based landscape approach to wetland restoration and management, rather than individual species management, to achieve biodiversity and sustainable ecosystem objectives. We discuss the development of wetland restoration and management strategies for quality wetland complexes needed for waterbirds during their annual life cycles. Further, we underscore the importance of wetland management by our state, federal and private land partners to manage wetland complexes to provide high quality habitat for a wide array of wetland wildlife.

1923. **Wetland management for shorebirds and other species: Experiences on the Canadian prairies.**
Dickson, H. Loney and McKeating, Gerald
Transactions of the North American Wildlife and Natural Resource Conference 58: 370-377. (1993)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: Aves/ habitat management/ semiaquatic habitat/ wetlands management/ multispecies approach/ Canada/ Alberta/ Manitoba/ Saskatchewan/ multispecies approach to wetland management/

1924. **Wetland restoration in the Prairie Pothole Region of North America: A literature review.**
Knutsen, G. A. and Euliss, N. H. U.S. Geological Survey; USGS/BRD/BSR 2001-0006, 2001. 54 p.
Notes: Literature review; U.S. Geological Survey, Biological Resources Division, Biological Science Report 2001-0006.
Descriptors: amphibians/ birds/ fishes, freshwater/ floods/ habitat management for wildlife/ land reclamation/ land use/ mammals/ prairie/ rehabilitation/ reptiles/ seeds/ vegetation/ water catchments/ water, chemical properties/ water, physical properties invertebrates/ wetlands/ wetland restoration/ prairie potholes/ Prairie Pothole Region
Abstract: In this report, prairie pothole region (PPR) literature is categorized into five general sections: wildlife, vegetation, invertebrates, fish, and physical and chemical characteristics of restored wetlands. Each of the five sections includes a summary of research and is divided into two parts: an overview of research and findings, and regional case studies. It is noted that there is a scarcity of research in the western and northern portions of the PPR most studies having been conducted in Iowa, Minnesota, or South Dakota.

1925. **Wetland restoration thresholds: Can a degradation transition be reversed with increased effort?**
Lindig-Cisneros, R.; Desmond, J.; Boyer, K. E.; and Zedler, J. B.
Ecological Applications 13(1): 193-205. (2003)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: alternative-state theory/ cordgrass/ fertilization effects/ irreversible transition/ management actions/ nitrogen addition/ restoration outcome, evaluating/ restoration threshold/ Spartina foliosa/ statistical design/ wetland restoration, coastal/ coastal wetland/ degradation/ restoration ecology/ wetland management/ Spartina foliosa
Abstract: Previous attempts to reverse the degradation of a coastal wetland and restore nesting habitat for an endangered bird showed that adding nitrogen could temporarily increase the height of Spartina foliosa, but not produce self-sustaining tall canopies. We asked if increased effort (up to five years of N fertilization) would shift canopy attributes across the hypothesized threshold. Thirty plots were treated with 0-5 yr of urea addition, and all were followed for 5 yr. Canopies were robust while urea was being added, but Spartina reverted to short stature soon after fertilization ended, supporting R. J. Hobbs and D. A. Norton's concept of an irreversible transition. However, specific outcomes depended on thechoice of response variable (six comparisons), the choice of reference data (initial conditions, same-year data, and pooled data), and the choice of statistical design (repeated measures vs. complete design), indicating the need to assess experiments thoroughly before making strong recommendations for management.

1926. **Wetland use by non-breeding ducks in coastal Texas, USA.**
Anderson, James T.; Muehl, George T.; Tacha, Thomas C.; and Lobpries, David S.
Wildfowl 51: 191-214. (2000)
NAL Call #: SK351.W575; ISSN: 0954-6324
Descriptors: aquatic vegetation/ habitat use/ management priorities/ population density/ wetland types
Abstract: Wetland use by nonbreeding ducks in coastal Texas in the areas between Galveston Bay and the Rio Grande were studied, September 1991 to March 1993, to determine the most important wetland types based on density. Twenty-five species of ducks were observed using wetlands on a stratified (based on dominant land use) random sample of 64.75 ha (one-quarter section) plots. Ranks of density for all ducks, as a group, were highest in lacustrine littoral emergent nonpersistent wetlands. Anatini density ranks were greatest in wetlands with scrub-shrub vegetation, but individual species' ranks varied. Dendrocygnini and Aythyini density ranks were highest in lacustrine littoral wetlands, particularly those with aquatic-bed vegetation. Ducks depend on a wide array of wetland types (including 48 of 82 available subclasses), and management should provide complexes of wetlands. Management should concentrate on protecting, enhancing,

and/or creating 15 of 1,201 wetland types occurring in the coastal plains of Texas that were prioritized for management actions. These wetlands were predominantly aquatic-bed, scrub-shrub, and unconsolidated substrate types.

1927. **Wetland use, settling patterns, and recruitment in mallards.**
Krapu, G. L.; Greenwood, R. J.; Dwyer, C. P.; Kraft, K. M.; and Cowardin, L. M.
Journal of Wildlife Management 61(3): 736-746. (1997)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wetlands/ habitat selection/ aquatic birds/ ecosystem disturbance/ ponds/ population dynamics/ ducks/ populations/ wildlife management/ waterfowl/ habitats/ habitat utilization/ recruitment/ breeding sites/ Anas platyrhynchos/ mallard/ Minnesota/ North Dakota/ breeding pairs
Abstract: The correlation between number of May ponds in the Prairie Pothole Region (PPR) of North America and size of the continental mallard (Anas platyrhynchos) breeding population the following spring weakened from the 1950s to the 1980s, suggesting possible changes in suitability of prairie ponds for meeting reproductive needs. We studied wetland use and preferences of radioequipped female mallards by reproductive stage (1988-90) in eastern North Dakota and westcentral Minnesota and evaluated effect of land use on pair distribution in eastern North Dakota (1987-91). May pond density varied among years and study areas, with changes in number of temporary and seasonal ponds accounting for 93% of variation in total ponds. During all reproductive stages, semipermanent basins were used most by females, but temporary and seasonal ponds were preferred during prenesting and egg production. Accounting for number of relocations, number of ponds used varied by year, by reproductive stage and with pond density during egg production. Numbers of breeding mallard pairs in stratum 46 in eastern North Dakota increased as May ponds increased from 1963 to 1985, but 33,659 fewer breeding pairs on average were present in 1971-85 than in 1963-70. Number of breeding pairs declined relative to May ponds from the 1960s to the 1980s, probably because fewer pairs settle in temporary and seasonal ponds as the percent of landscape in cropland increases. Waterfowl managers in the PPR should target efforts to increase duck production on landscapes where non-cropped temporarily and seasonally flooded wetland habitats are plentiful, thereby increasing cost effectiveness of management actions taken to increase nest success rate.

1928. **Wetlands Reserve Program.**
Hussey, S. L.
Fisheries 19(8): 42-43. (1994)
NAL Call #: SH1.F54; ISSN: 0363-2415
Descriptors: wetlands/ fishery resources/ agriculture/ nature conservation/ legislation/ resources management/ environmental protection/ fisheries/ habitats/ wildlife conservation/ Wetlands Reserve Program/ stock assessment and management/ law/ policy/ economics/ social sciences/ conservation/ wildlife management/ recreation/ water law and institutions/ environmental action/ United States
Abstract: Historically, one of the greatest threats to wetlands has been drainage for agricultural purposes. One-fourth of U.S. Cropland, more than 100 million acres, was obtained by clearing and draining wetlands. This loss of wetland functions and terrestrial ecosystems. Three-fourths of the nation's fish production depends on wetlands. A wetlands protection program with tremendous potential is the Wetlands Reserve Program, authorized by the food, Agriculture, Conservation and Trade Act of 1990. While not commonly associated with fisheries, this program offers significant opportunities to improve fisheries habitats. The Wetlands Reserve Program was established for the voluntary restoration and protection of wetland by landowners through permanent or 30-year easements on up to 1 million acres of wetlands previously modified for agricultural production. The program is designed to take marginal cropland out of production, providing landowners with the opportunity to benefit by maintaining wetlands. Riparian areas are also eligible for enrollment in the program. The prospect of habitat for fish and wildlife is one national priority factor in determining eligibility for enrollment.

1929. **Wildlife habitat on grazed or ungrazed small pond shorelines in south Texas.**
Whyte, R. J. and Cain, B. W.
Journal of Range Management 34(1): 64-68. (1981)
NAL Call #: 60.18 J82; ISSN: 0022-409X.
http://jrm.library.arizona.edu/Volume34/Number1/azu_jrm_v34_n1_64_68_m.pdf
Descriptors: grazing/ littoral zone/ vegetation/ ponds/ community composition/ vegetation cover/ Aves/ Texas/ effects on/ environmental effects/ vegetation cover
Abstract: Three man-made ponds constructed in 1956 and fenced to exclude cattle from the shoreline were selected to study the effects of cattle on shoreline vegetation. These ponds were partially opened in 1977 to allow grazing on one-half of the shoreline. In most areas the foliar cover and vegetation height were reduced by cattle pressure. The stable Longtom Community and the Knotgrass-Smartweed Community were more affected by cattle pressure than the Transition Community which changed as the water level rose or dropped. The seasonal Aquatic Community was least affected by cattle pressure and thus maintained good stands of waterfowl food plants. Carefully planned grazing which allows key rest and grazing periods will control the impact of grazing on the shoreline vegetation.

1930. **Wildlife responses to wetland restoration and creation: An annotated bibliography.**
Rewa, C.
In: A comprehensive review of Farm Bill contributions to wildlife conservation, 1985-2000/ Heard, L. P; Hohman, W. L.; Halloum, D. J.; and Wildlife Habitat Management Institute (U.S.); Series: Technical Report USDA/NRCS/WHMI. Madison, MS: USDA, NRCS, Wildlife Habitat Management Institute, 2000; pp. 135-150.
NAL Call #: aS604.6 C66 2000
Descriptors: wetlands/ constructed wetlands/ water quality/ wildlife habitats

1931. **Wildlife use of mitigation and reference wetlands in West Virginia.**
Balcombe, C. K.; Anderson, J. T.; Fortney, R. H.; and Kordek, W. S.
Ecological Engineering 25(1): 85-99. (2005)
NAL Call #: TD1.E26; ISSN: 09258574.
Notes: doi: 10.1016/j.ecoleng.2005.03.003.
Descriptors: anurans/ birds/ frogs/ habitat use/ mitigation/ mitigation success/ mitigation wetland/ West Virginia/ wetland-dependent species/ biodiversity/ ecosystems/ Anuran densities/ mitigation/ reference wetlands/ wildlife/ abundance/ amphibians/ birds/ habitat use/ species diversity/ species richness/ wetland/ West Virginia/ Anatidae/ Anura/ Aves
Abstract: We evaluated avian and anuran communities in 11 mitigation and four reference wetlands throughout West Virginia, USA. Avian species richness ($P = 0.711$), diversity ($P = 0.314$), and abundance ($P = 0.856$) (expressed as mean ± S.E. per ha) were similar between mitigation (richness: 11.3 ± 0.40; diversity: 3.1 ± 0.53; abundance: 27.1 ± 2.2) and reference (richness: 11.2 ± 0.62; diversity: 2.8 ± 0.47; abundance: 28.5 ± 4.9) wetlands. Waterbird ($P = 0.013$) and waterfowl ($P = 0.013$) abundance were higher in mitigation (waterbird: 5.1 ± 1.5; waterfowl: 4.4 ± 1.4) than reference (waterbird: 0.44 ± 0.23; waterfowl: 0.24 ± 0.21) wetlands. Anuran (frogs and toads) species richness ($P = 0.023$), Wisconsin index (WI) calling values ($P < 0.001$), and abundance ($P < 0.001$) (expressed as mean ± S.E. per survey point) were higher in mitigation (richness: 2.01 ± 0.09; WI: 0.52 ± 0.03; abundance: 4.75 ± 0.66) than reference (richness: 1.47 ± 0.14; WI: 0.40 ± 0.17; abundance: 4.69 ± 1.18) wetlands. Evidence suggests that avian and anuran densities in mitigation wetlands are similar or in some cases higher than in natural (reference) wetlands.

1932. **Winter aggregations, Dehnel Effect, and habitat relations in the Suisun shrew Sorex ornatus sinuosus.**
Hays, Warren S. and Lidicker, William Z.
Acta Theriologica 45(4): 433-442. (2000)
NAL Call #: 410 AC88; ISSN: 0001-7051
Descriptors: conservation measures/ biometrics/ behavior/ social behavior/ ecology/ habitat utilization/ habitat/ brackish habitat/ land and freshwater zones/ Sorex ornatus sinuosus (Soricidae): habitat management/ weight/ body mass/ aggregating behavior/ social organization/ distribution within habitat/ habitat preference/ salt marsh/ tidal marsh habitat/ California/ Solano County/ Suisun Bay/ Rush Ranch/ winter aggregations/ Dehnel Effect/ habitat relations/ Soricidae/ Insectivora, Mammalia/ chordates/ mammals/ vertebrates
Abstract: A live-trapping study on Suisun shrews Sorex ornatus sinuosus Grinnell, 1913, an endangered subspecies, was performed during the non-breeding season along the edge of a tidal marsh in California. During the winter, these shrews lived in distinct social aggregations composed of a single adult male, several adult females, and subadults. These groups remained stable even when the adult male died. As the breeding season approached, these groups were invaded by numerous adult males resulting in a nearly complete change in group membership. At the end of the breeding season, adult body mass declined by 30 to 40% (Dehnel Effect). Shrews reached high densities along the marsh/grassland ecotone, but the precise locations of social groups seemed unrelated to the presence of particular plant species or to the amphipod food supply. Subadult males wintered mostly outside of social groups in the marsh below high tide level. Conservation efforts need to focus on preserving the tidal marsh ecotone without promoting contact with the upland subspecies.

1933. **Winter management of Californian rice fields for waterbirds.**
Elphick, C. S. and Oring, L. W.
Journal of Applied Ecology 35(1): 95-108. (1998)
NAL Call #: 410 J828; ISSN: 0021-8901
Descriptors: wetlands/ water management/ rice/ crop residues/ legislation/ burning/ waste management/ stubble/ wild birds/ nature conservation/ flooding/ submergence/ incorporation/ water/ depth/ land use/ decomposition
Abstract: Recent legislation designed to reduce air pollution has restricted Californian rice-farmers from burning rice stubble after harvest. Intentional flooding of fields during winter to speed straw decomposition is becoming increasingly common as growers seek alternatives to burning residual straw. The potential for flooded fields to act as a surrogate for destroyed wetland habitat may be an additional benefit in a region that hosts a large proportion of North America's wintering water birds. The degree to which water birds use flooded fields and whether the method of flooding affects their use was investigated. Intentionally flooded rice fields received significantly greater use by 24 of 31 species studied. Only great blue herons Ardea herodias and sandhill cranes Grus canadensis were significantly more common in unflooded fields. Geese densities did not differ between flooded and unflooded fields. There were no differences in the densities of most bird species in flooded fields that received different straw manipulations to improve decomposition rates. Exceptions included several small shore birds which occurred at highest densities in fields where straw was incorporated into the soil. For 14 species, it was tested whether preferred depths, suggested in the literature, received disproportionately higher use. Most of these species were more likely to be encountered within the suggested depth ranges. Depth, however, was a poor predictor of bird density. Depths of 15-20 cm resulted in frequent use by the greatest number of species. It is concluded that flooding rice fields increased suitable habitat for most, but not all, species studied. Different straw manipulation methods had little effect on most species. Water depth, however, was important in determining species occurrence. During the first half of the winter, water depths were greater than the median depths used by most species.

1934. **Wintering shorebird assemblages and behavior in restored tidal wetlands in southern California.**
Armitage, A. R.; Jensen, S. M.; Yoon, J. E.; and Ambrose, R. F.
Restoration Ecology 15(1): 139-148. (2007)
NAL Call #: QH541.15.R45R515; ISSN: 10612971.
Notes: doi: 10.1111/j.1526-100X.2006.00198.x.
Descriptors: behavior/ diversity/ habitat heterogeneity/ landscape matrix/ mudflats/ restoration/ shorebirds
Abstract: Habitat restoration can partially compensate for

the extensive loss of coastal wetlands, but creation of functional habitat and assessment of restoration success remain challenging tasks. To evaluate wintering shorebird use of restored coastal wetlands, we quantified shorebird assemblages and behavior of selected focal species at five restored sites and paired reference sites in Mugu Lagoon, southern California, United States. The Shannon-Wiener index of species diversity (for all birds in order Charadriiformes) was higher in the restored than in the reference portion of three of the five sites, higher in the reference portion of a fourth site, and similar between reference and restored areas of the fifth site. Species diversity was lower in sites closer to man-made structures. The four most abundant species groups across the five sites were selected for detailed analysis of site use and behavior: Willets (Catoptrophorus semipalmatus), Marbled Godwits (Limosa fedoa), Dowitchers (Limnodromus spp.), and Sandpipers (Calidris spp.) (Western, Least, and Dunlin). Each focal species group exhibited distinct site preferences, and densities in restored sites were often as high or higher than in reference sites. Willets and Dowitchers preferred habitats with more extensive tidal flats, a characteristic of restored sites. Godwits and Sandpipers preferred heterogeneous habitats with a mix of water and tidal flats. Most birds were engaged in feeding activities during the ebb tides surveyed, and there were no apparent differences in behavior between reference and restored sites. Though not all restored sites were used equally by all species, the creation of multiple restored sites with varied habitat characteristics attracted a diverse assemblage of shorebirds and may have contributed to the integrity of the regional wetland landscape. © 2007 Society for Ecological Restoration International.

1935. **Zooplankton, benthic macroinvertebrate, and fish responses to drought and hydrologic restoration of a pondcypress ecosystem in Tate's Hell Swamp, Florida.**
Roberts, C. R. University of Florida, 2000.
Notes: Thesis (M.S.). Includes bibliographical references (leaves 182-202).
Descriptors: Freshwater zooplankton---Ecology---Florida/ Aquatic invertebrates---Ecology---Florida/ Fishes---Ecology---Florida/ Wetland restoration---Florida
This citation is from AGRICOLA.

1936. **Zooplankton communities of restored depressional wetlands in Wisconsin, USA.**
Dodson, S. I. and Lillie, R. A.
Wetlands 21(2): 292-300. (2001)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ watersheds/ zooplankton/ waterfowl/ agriculture/ sexual reproduction/ taxonomy/ daphnia/ ecosystems/ eutrophication/ turbidity/ surface water/ environment management/ community structure/ environmental restoration/ species richness/ agricultural land/ plankton/ ecosystem disturbance/ nutrient enrichment/ restoration/ evaluation/ community composition/ species diversity/ Cladocera/ Copepoda/ Wisconsin/ restoration/ water fleas/ copepods
Abstract: Wisconsin has lost approximately 2 million hectares of wetland since statehood (1848). Through the combined efforts of state and federal agencies and private groups focused primarily on wetland restoration for waterfowl habitat management or compensatory mitigation, a fairly substantial gain in wetland area has been achieved. Much of the wetland restoration effort in Wisconsin has occurred on formerly agricultural lands. However, due to the nature of the past disturbance and possible residual effects not corrected by simply returning surface waters to these lands, there is some question regarding the resultant wetland quality or biological integrity. In an effort aimed at developing tools to measure wetland gains in terms of quality or ecological integrity, the Wisconsin Department of Natural Resources (WDNR) initiated a study of biological communities on restored wetlands in Wisconsin. In this paper, we report on the community of microcrustaceans and arthropods that can be collected with a plankton net in open water in wetlands. We examined zooplankton community structure in restored wetlands in terms of richness, taxonomic representation, and Daphnia sexual reproduction and related these metrics to attributes on wetlands representing least-disturbed conditions and agriculturally impacted wetlands. We sampled 56 palustrine wetlands distributed across Wisconsin. These wetland sites were categorized as agricultural, least-impacted, and restored (recently withdrawn from agricultural usage). The wetlands were reasonably homogeneous in many ways, so that taxon richness was not correlated with basin origin, presence of adjacent roads, presence or absence of fish, water chemistry, or the size of the open water. We identified a total of 40 taxa. Taxon richness was significantly lower in agricultural sites (average of 3.88 taxa per site) compared to that of least-impacted sites (7.29 taxa) and restored sites (7.21 taxa). Taxon richness of restored sites was significantly correlated with time since restoration. The data indicate that taxon richness changes from a value typical of agricultural sites to the average richness of least-impacted sites in about 6.4 years. The total taxon list for 8 agricultural sites (14 taxa) was significantly smaller than the average value for randomly chosen sets of 8 least-impacted sites (20.4 taxa). Agricultural and least-impacted sites tended to have the same common taxa. Many taxa of chydorid cladocerans and cyclopoid copepods that were rare in least-impacted sites did not occur in the agricultural sites, nor did fairy shrimp occur in agricultural sites. Daphnia populations only produced males in least-impacted and restored sites. Further research is needed to identify the mechanism(s) responsible for the reduced species richness and lack of sexual reproduction in agricultural wetland sites. Likely factors include eutrophication, turbidity, or chemical contamination. We conclude that restoration of wetland watersheds works. Withdrawal of the watershed from agricultural usage is followed by an increase in taxon richness, and the sites resembled least-impacted sites in about 6-7 years.

Mixed Habitats

1937. **Abundance and habitat associations of birds wintering in the Platte River Valley, Nebraska.**
Davis, C. A.
Great Plains Research 11(2): 233-248. (2001)
NAL Call #: QH104.5.G73 G755; ISSN: 10525165
Descriptors: grassland birds/ habitat association/ Nebraska/ Platte River Valley/ shrubland birds/ wintering birds/ woodland birds/ avifauna/ community composition/ habitat use/ overwintering/ relative abundance/ United States/ Agelaius phoeniceus/ Eremophila alpestris/ Junco hyemalis/ Parus atricapillus/ Spizella arborea/ Sturnella neglecta
Abstract: The abundance and habitat associations of overwintering birds in Platte River Valley of central Nebraska may influence their long-term survival. I observed a total of 51 species over a three-year period in shrub-grassland, forest, grassland, and cropland habitats during the winter. Grassland habitats had the lowest abundance of wintering birds, while abundances in shrub-grassland, forest, and cropland habitats were higher and similar. Species richness was highest in forests ($\bar{x}$ = 2.97 species) and lowest in grasslands ($\bar{x}$ = 0.73 species) and croplands ($\bar{x}$ = 0.57 species). Overall, horned larks (Eremophila alpestris), American tree sparrows (Spizella arborea), black-capped chickadees (Parus atricapillus), dark-eyed juncos (Junco hyemalis), western meadowlarks (Sturnella neglecta), and red-winged blackbirds (Agelaius phoeniceus) were the most abundant wintering birds in the Platte River Valley. American tree sparrows (34%) accounted for most of the birds in shrub-grasslands, while black-capped chickadees (18%), dark-eyed juncos (11%), and American tree sparrows (10%) accounted for most of the birds in forests. Grasslands were dominated by American tree sparrows (39%) and western meadowlarks (27%), and croplands were dominated by horned larks (43%), red-winged blackbirds (25%), and western meadowlarks (16%). The winter bird community in the Platte River Valley is dominated by woodland-associated species. Many of the woodland-associated species that overwinter in the Platte River Valley have likely benefited from the development of woodlands in the region.

1938. **Abundance patterns of landbirds in restored and remnant riparian forests on the Sacramento River, California, and U.S.A.**
Gardali, Thomas; Holmes, Aaron L.; Small, Stacy L.; Nur, Nadav; Geupel, Geoffrey R.; and Golet, Gregory H.
Restoration Ecology 14(3): 391-403. (2006)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: conservation measures/ ecology/ population dynamics/ terrestrial habitat/ land zones/ Aves: habitat management/ riparian forests restoration/ abundance patterns/ population size/ forest and woodland/ restored and remnant riparian forests/ riparian habitat/ California/ Sacramento River/ Aves/ birds/ chordates/ vertebrates
Abstract: Riparian vegetation along the Sacramento River-California's largest river-has been almost entirely lost, and several wildlife species have been extirpated or have declined as a result. Large-scale restoration efforts are focusing on revegetating the land with native plants. To evaluate restoration success, we conducted surveys of landbirds on revegetated and remnant riparian plots from 1993 to 2003. Our objectives were to estimate population trends of landbirds, compare abundance patterns over time between revegetated and remnant riparian forests, and evaluate abundance in relation to restoration age. Of the 20 species examined, 11 were increasing, 1 was decreasing (Lazuli Bunting (Passerina amoena)), and 8 showed no trend. The negative trend for Lazuli Bunting is consistent with information on poor reproductive success and with Breeding Bird Survey results. There was no apparent guild association common to species with increasing trends. Nine species were increasing on revegetated and remnant plots, four were increasing on revegetated plots only, three were increasing on remnant plots only, the Lazuli Bunting was decreasing on both, and three species were stable on both. Although many species were increasing at a faster rate on revegetated plots, their abundance did not reach that of the remnant plots. For revegetated plots, "year since planting" was a strong predictor of abundance trends for 13 species: positive for 12, negative for 1. Our study shows that restoration activities along the Sacramento River are successfully providing habitat for a diverse community of landbirds and that results from bird monitoring provide a meaningful way to evaluate restoration success.

1939. **Addressing global warming and biodiversity through forest restoration and coastal wetlands creation.**
Williams, J. R.
Science of the Total Environment 240(1-3): 1-9. (Oct. 1999)
NAL Call #: RA565.S365; ISSN: 0048-9697.
Notes: Special issue: Managing for biodiversity for the protection of nature.
Descriptors: wetlands/ habitat improvement/ climatic changes/ biodiversity/ environment management/ global warming/ forests/ environmental restoration/ biological diversity/ greenhouse gases/ soil erosion/ wood wastes/ compost/ research programs/ Louisiana/ Mississippi River Valley/ research priorities/ habitats/ erosion control/ protective measures and control/ environmental action/ air pollution
Abstract: The Climate Challenge is a partnership between the Department of Energy and the electric utility industry to reduce, avoid, and sequester greenhouse gases. A portion of the initiative, the sequestration of greenhouse gases, is the focus of this presentation. Over 4 million acres of bottomland hardwood forests were cleared for agriculture in the Mississippi River Valley in the 1970s. Reestablishing these forests would improve depleted wildlife habitats, serve as wildlife corridors, increase biodiversity, and decrease soil erosion. Also, Louisiana is losing coastal wetlands at a rate of approximately 25 square miles/year. This coastal erosion is due to a number of factors and many efforts are currently underway to address the matter. One such effort is the use of material generated in the dredging of navigational canals; however, this material is low in nutrient value, making the regeneration of marsh grasses more difficult. In addition, bottomland hardwood forests and coastal wetland grasses are excellent `carbon

sinks' because they take carbon dioxide out of the atmosphere and store it in living plant tissue. Entergy Services, Inc. is an electric utility with a service territory that comprises portions of both the Lower Mississippi River Valley and the Gulf of Mexico coastline. This provides an opportunity to positively address both habitat losses noted above while at the same time addressing global warming, forest fragmentation, and biodiversity. Entergy, through its affiliation with the UtiliTree Carbon Company, is participating in projects that will investigate the feasibility of using bottomland hardwood reforestation on cleared marginal farmlands now managed by the Louisiana Department of Wildlife and Fisheries and the US Fish and Wildlife Service. Entergy has also begun a research project with the Environmental Protection Agency and the state of Louisiana. The research is a compost demonstration project that will utilize wood waste generated through our tree-trimming program as a compost material that will be mixed with low nutrient dredge material to create new coastal wetlands. Taken together, Entergy's initiatives will be able to address global warming through carbon sequestration, restore fragmented forest habitats, reduce coastal erosion and improve the quality of a vital coastal aquatic nursery habitat. Efforts will be made to manage the created habitats for biodiversity. Pulling all these ideas together creates an effect in which the whole is greater than the sum of the parts. In such a synergy of ideas, there are no losers and the winners are both industry participants and the environment.

1940. **Agricultural conservation: Status of programs that provide financial incentives.**
General Accounting Office
Washington, DC: GAO; 60 p. (1995).
Notes: Report No.: GAO/RCED-95-169.
http://www.gao.gov/archive/1995/rc95169.pdf
Descriptors: economics/ land use/ agriculture/ conservation/ federal programs/ economic analysis/ sociological aspects/ soil conservation/ erosion control/ environmental protection/ pollution control/ habitat improvement/ farms/ water pollution control/ wildlife conservation/ environmental action/ protective measures and control/ watershed protection/ United States
Abstract: The Agriculture Department (USDA) administers 17 programs that provide financial incentives to farmers and ranchers who use conservation measures. Under 10 of the programs, USDA, through direct payments or low-cost loans, helps defray the cost of implementing conservation practices. Under the other seven programs, USDA purchases easements or rents land in order to retire it from agricultural production. The incentive-based conservation programs are intended to encourage voluntary efforts to reduce soil erosion, lessen water pollution, enhance fish and wildlife habitat, and address other conservation concerns. This report provides information on these incentive-based programs since fiscal year 1992, including information on their budgets and levels of activity and on the primary purposes of the conservation measures taken under the programs. GAO also identifies potential options for consolidating them.

1941. **Agricultural land use patterns of native ungulates in south-eastern Montana.**
Selting, J. P. and Irby, L. R.
Journal of Range Management 50(4): 338-345. (July 1997)
NAL Call #: 60.18 J82 ; ISSN: 0022-409X [JRMGAQ]
Descriptors: Odocoileus hemionus/ odocoileus virginianus/ antilocapra americana/ wild animals/ habitat selection/ population density/ patterns/ seasonal variation/ agricultural land/ Montana/ Conservation Reserve Program lands
Abstract: Mule deer (Odocoileus hemionus), white-tailed deer (Odocolieus virginianus), and pronghorn antelope (Antilocapra americana) use of 6 agricultural land use categories in southeastern Montana were monitored to identify use patterns at specific sites. Alfalfa (Medicago sativa L.), bottom rangeland, Conservation Reserve Program (CRP) lands, upland rangeland, wheat (Triticum aestivum L.) stubble, and growing wheat were observed during dawn, day, dusk, and night hours over a period of 12 months. Mule deer densities on alfalfa peaked in fall and again in spring. The CRP lands were selected in all seasons. Rangeland sites were most heavily used in winter and summer. White-tailed deer used CRP lands in all seasons except fall. Alfalfa was selected in fall, spring, and summer. Antelope densities on alfalfa were highest in spring and fall, while growing wheat fields were used most in spring. Antelope in the northern study area selected CRP land in all seasons except fall. Densities of animals and patterns of use observed during this study would be unlikely to produce significant impacts on forage or crops at most of our study sites.
This citation is from AGRICOLA.

1942. **Agricultural landscapes: Can they support healthy bird populations as well as farm products?**
Peterjohn, B. G.
Auk 120(1): 14-19. (2003)
NAL Call #: 413.8 AU4; ISSN: 00048038
Descriptors: agricultural ecosystem/ avifauna/ nature conservation

1943. **Agriculture and wildlife: More than peacefully coexistent.**
Johnson, Phyllis E.
Agricultural Research 51(10): 2. (2003)
NAL Call #: 1.98 Ag84 ; ISSN: 0002-161X.
http://www.ars.usda.gov/is/AR/archive/oct03/form1003.htm
Descriptors: agricultural practices/ birds/ census-survey methods/ ecosystem management/ habitat management/ insecticides/ livestock/ pesticides/ pollution/ plants/ public relations/ study methods/ wildlife/ Secale cereale/ Triticum spp./ Maryland
Abstract: This article has notes about the relationship between agriculture and wildlife. The Henry A. Wallace Beltsville Agricultural Research Center (BARC) is home to diverse native wildlife. The 'Green Wedge'- the 30,000 plus acre natural area, which is shared with the U.S. Department of the Interior's Patuxent Research Refuge harbors a native gene pool of worldwide significance. The Agricultural Research Center Insect Biocontrol Laboratory contributes to sustainable agricultural systems by developing naturally derived pest control agents, decreasing the amounts of synthetic insecticides used, reducing undesirable effects of synthetic pesticides, and delaying development of resistance to environmentally friendly insect control

measures. Ten years ago, a sustainable agriculture program was started, and ARS research results were used to grow corn, soybean, wheat, rye, and other crops to feed livestock. BARC scientists are doing agricultural research, and Patuxent scientists are doing wildlife research, and they work together quite nicely in these research projects. There are BARC scientists who both on and off duty promote environmental causes like speaking to the public, participating in Earth Day festivities, or working with agriculture farmer groups. These employees participate on their own in national bird surveys that document the birds of BARC and surrounding lands and contribute to scientific understanding of birds and their migrations. The native flora and fauna at BARC contain the heritage of the farm. Natural biocontrol agents from this gene pool can help further reduce pesticide and fertilizer use on all farms.

1944. **The agroecology of carabid beetles.**
Holland, J. M.
Andover, UK: Intercept; 356 p. (2002)
Descriptors: agricultural land/ animal ecology/ biological control agents/ biological indicators/ crop husbandry/ cultivation/ diets/ habitats/ pest control/ predators/ predatory insects/ seed predation/ spatial distribution/ species diversity/ survival/ weeds/ Carabidae/ insects
Abstract: This book, divided into 11 chapters, provides an extensive overview of the recent literature on the ecology and behaviour of carabid beetles inhabiting agricultural land, their role in pest control and in the diet of farmland wildlife, along with a summary of their value as bioindicators. Emphasis is also given on carabid survival, their spatial distribution in agricultural landscapes, their use in agroecosystems and in weed seed predation, carabid assemblage organization and species composition, and the impact of cultivation and crop husbandry practices and of non-crop habitat management on carabid beetles.

1945. **Agroforestry and wildlife management go together on small farms.**
Core, J.
Agricultural Research 52: 18-19. (Dec. 2004)
NAL Call #: 1.98 Ag84
Descriptors: agroforestry/ wildlife management/ small farms/ wildlife habitats/ forest wildlife relations/ lowland forests/ silvicultural practices/ Quercus/ frogs/ Ranidae/ toads/ Bufonidae/ songbirds/ birds of prey/ bats/ Chiroptera/ rabbits/ Leporidae/ water birds/ cover crops/ Missouri/ root production method/ soil cultivation and cropping systems/ natural resources, environment, general ecology, and wildlife conservation/ forestry production artificial regeneration
This citation is from AGRICOLA.

1946. **Agroforestry and wildlife: Opportunities and alternatives.**
Allen, A. W.
In: Agroforestry and sustainable systems symposium proceedings.
Fort Collins, Colo.: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; pp. 67-73; 1995.
Notes: Literature review; Meeting held August 7-10, 1994, Fort Collins, Colorado. Includes references.
NAL Call #: aSD11.A42 no.261
Descriptors: wildlife/ agroforestry/ ecosystems/ farm management/ land use/ land use planning/ habitats/ fragmentation/ fauna
This citation is from AGRICOLA.

1947. **American black duck and mallard breeding distribution and habitat relationships along a forest-agriculture gradient in southern Quebec.**
Maisonneuve, C.; Belanger, L.; Bordage, D.; Jobin, B.; Grenier, M.; Beaulieu, J.; Gabor, S.; and Filion, B.
Journal of Wildlife Management 70(2): 450-459. (2006)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: aerial survey/ agricultural landscape/ American black duck/ Anas platyrhynchos/ Anas rubripes/ breeding/ habitat model/ mallard/ southern Quebec
Abstract: Although the American black duck (Anas rubripes) has been designated a priority species in eastern North America, no systematic survey has been done in the agricultural lowlands of southern Quebec, where the species is suspected to be relatively abundant and cohabits with the mallard (Anas platyrhynchos), often considered as a competing species. During the spring of 1998 and 1999, we surveyed breeding waterfowl in 343 4-km^2 plots distributed in the lowlands of the St. Lawrence Valley and Lac-Saint-Jean, Canada, and in agricultural areas of Abitibi-Temiscamingue, Canada. American black duck densities were higher in dairy farm and forested landscapes (>39 indicated breeding pairs [IBPs]/100 km^2) than in cropland landscapes (8 IBPs/100 km^2). Mallard densities were similar across all landscape types (30-43 IBPs/100 km^2). Habitat modeling using data derived from satellite imagery indicated that the presence of black ducks decreased with increasing areas of corn, ploughed fields, and deciduous forests, whereas it was favored in areas where topography was undulating with slopes of 10-15%. The same parameters had the opposite effect on mallard presence. The odds of black ducks being present were doubled where mallards were present, indicating that both species seem to be attracted to areas supporting adequate habitats, which contradicts the hypothesis of competition between these 2 species to explain for recent declines in the black duck population. Results of our habitat analyses support the hypothesis that habitat changes may be a primary factor leading to these declines. Dairy farm landscapes are of great importance for black ducks, and the conversion of this type of landscape toward a cropland landscape represents a threat to an important portion of the population of this species.

1948. **Amphibian responses to helicopter harvesting in forested floodplains of low order, blackwater streams.**
Clawson, R. G.; Lockaby, B. G.; and Jones, R. H.
Forest Ecology and Management 90(2-3): 225-235. (1997)
NAL Call #: SD1.F73; ISSN: 0378-1127
Descriptors: commercial activities/ ecology/ terrestrial habitat/ land and freshwater zones/ Amphibia: forestry/ helicopter harvesting effects on communities/ community structure/ population dynamics/ responses to helicopter timber harvesting/ semiaquatic habitat/ forest and woodland/ floodplain forested wetlands/ community

responses to timber harvest/ Alabama/ community responses to helicopter timber harvesting/ forested wetlands/ Amphibia/ amphibians/ chordates/ vertebrates

1949. **The amphibians and reptiles of the Kissimmee River. II. Patterns of abundance and occurrence in hammocks and pastures.**
Donnelly, Maureen A.; Baber, Matthew J.; and Farrell, Christopher J.
Herpetological Natural History 8(2): 171-179. (2001); ISSN: 1069-1928
Descriptors: terrestrial habitat/ land zones/ Amphibia/ Reptilia: terrestrial habitat/ Hammocks/ abundance and occurrence/ grassland/ pasture/ Florida/ Kissimmee River/ pasture habitats/ Amphibia/ amphibians/ chordates/ reptiles/ vertebrates
Abstract: We sampled amphibians and reptiles in two habitats in the Kissimmee River basin using drift fence arrays from March 1997-September 1998. Oak-cabbage palm hammocks and pastures were sampled as part of a more inclusive study of the amphibians and reptiles of the Kissimmee Basin. Hammocks mark the limits of the floodplain, and pastures replaced floodplain vegetation when the river was channelized. Twenty-one species were captured during the study (ten frogs, four lizards, six snakes, and one turtle). An additional species, Gopherus polyphemus, was observed near arrays but not captured in traps. Species richness differed between habitats and among sites. Twelve of the 21 species were captured only in oak-cabbage palm hammock, nine species were collected in both habitats, and no species was unique to the pasture habitat. Three species, Gastrophryne carolinensis, Rana sphenocephala, and Scincella lateralis were captured in all five sites. The greatest number of species were trapped in Hammock C and the lowest number of species were trapped in Pasture C. Patterns of species accumulation differed among sites but were difficult to interpret because of flooding associated with the 1997-98 El Niiio Southern Oscillation Event. We found a significant difference in amphibian and reptile abundance among months but no significant difference in abundance between habitats. The abundance of amphibians and reptiles was not associated with variation in rainfall.

1950. **Animal and habitat relationships in the South Platte Basin with emphasis on threatened and endangered species.**
Fitzgerald, J. P.
In: Endangered Species Management: Planning Our Future, Proceedings of the 6th Annual 1996 South Platte Forum. Greeley, Colorado. Graf, D. and Williams, D. J. (eds.) Fort Collins, CO: Colorado Water Resources Research Institute, Colorado State University; pp. 8; 1995.
Descriptors: United States/ Colorado/ South Platte River Basin/ wildlife habitats/ river basins/ animal populations/ priorities/ wildlife management/ preservation/ spatial distribution/ species diversity/ water development impacts
Abstract: A minimum of 353 species of terrestrial vertebrates reside in or make important seasonal use of habitats in the South Platte River Basin in Colorado. The list includes 252 birds, 69 mammals, 22 reptiles, and 10 amphibians. When species are tied to habitat requisites, the most critical habitats in priority of management needs/preservation are: 1. Grassland/Prairie; 2. Plains Riparian/Wetlands; 3. Middle to High Elevation Forests. In a management context the two most critical habitat types present the most serious problems. Most of the eastern plains is in private ownership with few incentives available to landowners for protection/habitat management. Habitat is becoming fragmented with less than one-third still in prairie. Water allocation and use patterns as well as human population growth patterns are increasing pressures on remaining plains landscapes, especially at the foothills/plains interface in the basin. Agricultural patterns including increasing use of the Conservation Reserve Program will also likely effect distributional patterns of wildlife, perhaps to the detriment of some species.

1951. **Application of logistic regression analysis of proportional hazard modelling for investigating relationships between habitat and population dynamics of bobwhite quail.**
Call, E. M. University of Missouri-Columbia, 2002.
Notes: Wildlife Coop. Unit Report, Thesis
Descriptors: Colinus virginianus/ colinus/ Phasianidae/ Colinus virginianus/ bobwhite/ cover/ cultivated farmland/ grassland/ habitat/ habitat management for wildlife/ modeling/ nests and nesting/ population dynamics/ productivity/ reproduction/ statistics/ survival
Abstract: Objectives were to quantify bobwhite quail survival and reproductive success, and to identify the major habitat factors influencing bobwhite survival and reproductive success. Study was conducted on Reform, Prairie Fork, and Whetstone Creek Conservation Areas.

1952. **Applied disequilibriums: Riparian habitat management for wildlife.**
Boyce, M. S. and Payne, N. F.
In: Ecosystem management: Applications for sustainable forest and wildlife resources/ Boyce, M. S. and Haney, A. New Haven, Conn.: Yale University Press, 1997; pp. 133-146.
Notes: ISBN: 0-300-06902-2; Conference: Based on a symposium on ecosystem management held at the University of Wisconsin-Stevens Point, 3-5 March, 1994.
Descriptors: forests/ resource management/ riparian forests/ riparian vegetation/ wildlife conservation/ North America
Abstract: The role of riparian zone management is reviewed in the context of ecosystem management, with particular reference to wildlife species in North America. It is concluded that management to maintain or restore disturbance regimes is fundamental to ecosystem management in riparian areas.

1953. **Area requirements of grassland birds: A regional perspective.**
Johnson, D. H. and Igl, L. D.
Auk 118(1): 24-34. (2001)
NAL Call #: 413.8 AU4 ; ISSN: 00048038
Descriptors: avifauna/ density/ grassland/ patch size/ prairie/ species occurrence/ United States/ Agelaius phoeniceus/ Ammodramus bairdii/ Ammodramus leconteii/ Ammodramus savannarum/ Circus cyaneus/ Cistothorus

platensis/ Dolichonyx oryzivorus/ Geothlypis trichas/ Molothrus ater/ Passerculus sandwichensis/ Spizella pallida/ Sturnella neglecta/ Tyrannus tyrannus/ Zenaida macroura
Abstract: Area requirements of grassland birds have not been studied except in tallgrass prairie. We studied the relation between both species-occurrence and density and patch size by conducting 699 fixed-radius point counts of 15 bird species on 303 restored grassland areas in nine counties in four northern Great Plains states. Northern Harrier (Circus cyaneus), Sedge Wren (Cistothorus platensis), Clay-colored Sparrow (Spizella pallida), Grasshopper Sparrow (Ammodramus savannarum), Baird's Sparrow (Ammodramus bairdii), Le Conte's Sparrow (Ammodramus leconteii), and Bobolink (Dolichonyx oryzivorus) were shown to favor larger grassland patches in one or more counties. Evidence of area sensitivity was weak or ambivalent for Eastern Kingbird (Tyrannus tyrannus), Common Yellowthroat (Geothlypis trichas), Savannah Sparrow (Passerculus sandwichensis), and Western Meadowlark (Sturnella neglecta). Red-winged Blackbirds (Agelaius phoeniceus) preferred larger patches in some counties, and smaller patches in others. Mourning Doves (Zenaida macroura) and Brown- headed Cowbirds (Molothrus ater) tended to favor smaller grassland patches. Three species showed greater area sensitivity in counties where each species was more common. Five species demonstrated some spatial pattern of area sensitivity, either north to south or east to west. This study demonstrates the importance of replication in space; results from one area may not apply to others because of differences in study design, analytical methods, location relative to range of the species, and surrounding landscapes.

1954. **Assessing effects of alternative agricultural practices on wildlife habitat in Iowa, USA.**
Santelmann, M.; Freemark, K.; Sifneos, J.; and White, D.
Agriculture, Ecosystems and Environment 113(1-4): 243-253. (2006)
NAL Call #: S601.A34; ISSN: 01678809.
Notes: doi: 10.1016/j.agee.2005.09.015.
Descriptors: butterflies/ future scenarios/ Iowa watersheds/ landscape change/ wildlife habitat
Abstract: A habitat-change model was used to compare past, present, and future land cover and management practices to assess potential impacts of alternative agricultural practices on wildlife in two agricultural watersheds, Walnut Creek and Buck Creek, in central Iowa, USA. This approach required a habitat map for each scenario based on soil type and land cover, a list of resident species, and an estimate of the suitability of each of 26 habitat classes for every species. Impact on wildlife was calculated from median percent change in habitat area relative to the present. Habitat classes with the highest species richness for native vertebrates were ungrazed riparian forest, upland forest and wet prairie. Differences in habitat composition and configuration were evident among maps of the watersheds for the past, present, and three alternative future scenarios (Production, Water Quality, and Biodiversity). The Production scenario ranked lowest in providing habitat for all native taxa. For most taxa, changes in wildlife habitat due to land use changes in the Biodiversity, Water Quality, and Past scenarios were similar, resulting in greater habitat than either the present landscape or the Production scenario. For native birds, amphibians, mammals, and rare species in both watersheds, the Biodiversity scenario ranked highest in providing habitat, and the Water Quality scenario was similar to or slightly below the Biodiversity scenario. The Water Quality scenario was similar to or slightly better than the Biodiversity scenario for reptiles and butterflies in both watersheds, and both ranked higher than the Production scenario for these taxa.

1955. **Assessing effects of timber harvest on riparian zone features and functions for aquatic and wildlife habitat.**
Taratoot, Mark
Research Triangle Park, N.C.: National Council of the Paper Industry for Air and Stream Improvement;
Series: Technical bulletin 775. (1999)
NAL Call #: TD899.P3N34-no.775
Descriptors: logging/ riparian forests/ water pollution/ wildlife habitat/ aquatic habitat/ riparian zones
This citation is from AGRICOLA.

1956. **Assessing landowner activities related to birds across rural-to-urban landscapes.**
Lepczyk, C. A.; Mertig, A. G.; and Liu, J.
Environmental Management 33(1): 110-125. (2004)
NAL Call #: HC79.E5E5; ISSN: 0364152X
Descriptors: avian ecology/ Breeding Bird Survey/ human dimensions/ human-dominated landscapes/ private land/ social survey/ wildlife management/ fertilizers/ ocean habitats/ plants (botany)/ rural areas/ depredation/ habitat fragmentation/ avifauna/ landowner/ birds/ landscape/ wildlife conservation/ natural resources conservation/ ownership/ Midwest, United States
Abstract: Fluctuations of bird abundances in the Midwest region of the United States have been attributed to such factors as landscape change, habitat fragmentation, depredation, and supplemental feeding. However, no attempt has been made to estimate the collective role of landowner activities that may influence birds across a landscape. To investigate how landowners might influence birds when the majority (> 90%) of land is privately owned, we surveyed all 1694 private domestic landowners living on three breeding bird survey routes (~120 km) that represent a continuum of rural-to-urban landscapes in Southeastern Michigan from October through December 2000. Our survey was designed to investigate (1) the proportion of landowners involved in bird feeding, providing bird houses, planting or maintaining vegetation for birds, gardening, landscaping, applying fertilizer, and applying pesticides or herbicides; (2) whether differences existed between urban, suburban, and rural landowner activities; and (3) whether landowners that carried out a given activity were sociodemographically different from those who did not. Of the 968 respondents (58.5% response rate), 912 (94%) carried out at least one of the activities on their land and the average landowner carried out 3.7 activities. A total of 65.6% fed birds, 45.7% provided bird houses, 54.6% planted or maintained vegetation for birds, 72.7% gardened, 72.3% landscaped, 49.3% applied fertilizer, and 25.2% applied pesticides or herbicides. Significant differences existed between the landscapes, with rural landowners having more bird houses and applying pesticides or herbicides in greater frequency. Similarly,

urban landowners had a greater density of bird feeders and houses, but planted or maintained vegetation in the lowest frequency. Participation in activities varied by demographic factors, such as age, gender, and occupation. Scaling each activity to all landowners, including nonrespondents, across all landscapes indicates that between 14% and 82% of landowners may be engaged in a particular activity, with application of pesticides or herbicides having the least potential involvement (13.9%-55.4%) and gardening having the greatest potential involvement (40.1%-81.6%). Taken collectively, our results indicate that landowners are both intentionally and unintentionally engaged in a wide range of activities that are likely to influence bird populations.

1957. **Assessing the potential impacts of alternative landscape designs on amphibian population dynamics.**
Rustigian, H. L.; Santelmann, M. V.; and Schumaker, N. H.
Landscape Ecology 18(1): 65-81. (2003)
NAL Call #: QH541.15.L35 L36; ISSN: 09212973.
Notes: doi: 10.1023/A:1022936613275.
Descriptors: agriculture/ amphibians/ future scenarios/ Iowa/ landscape change/ population dynamics/ spatially explicit population model/ conservation planning/ ecological impact/ individual-based model/ land use change/ landscape ecology/ population dynamics/ United States
Abstract: An individual-based, spatially explicit population model was used to predict the consequences of future land-use alternatives for populations of four amphibian species in two central Iowa (Midwest USA) agricultural watersheds. The model included both breeding and upland habitat and incorporated effects of climatic variation and demographic stochasticity. Data requirements of the model include life history characteristics, dispersal behavior, habitat affinities, as well as land use and landcover in geographic information systems databases. Future scenarios were ranked according to change in breeder abundance, saturation, and distribution, compared to baseline conditions. Sensitivity of simulation results to changes in model parameters was also examined. Simulated results suggest that while all four species modeled are likely to persist under present and future scenario conditions, two may be more at risk from future landscape change. Although the study species are all widespread generalists regarded as having a low conservation priority, they depend on wetlands and ponds, increasingly endangered habitats in agricultural landscapes. Broader conservation strategies in the region would ensure that these currently common organisms do not become the endangered species of the future.

1958. **An assessment of natural cavity abundance, nest box use, and management recommendations for birds on the Ohio River Islands National Wildlife Refuge, West Virginia.**
Sacilotto, Karen A. West Virginia University, 2003.
Notes: Advisor: Anderson, James T.; Thesis/ Dissertation
Descriptors: birds/ nesting boxes/ erosion/ evaluation/ islands/ habitat management/ habitat restoration/ Ohio River Islands National Wildlife Refuge/ Ohio
Abstract: Aquatic habitats connected with Ohio River islands and their back channels (areas where commercial traffic is prohibited) provide quality habitats for bottomland hardwood wildlife. The back channel side ($\bar{x}$ = 19.93 cavities/50-m radius plot, SE = 2.48) contained more cavities than the navigational channel side ($\bar{x}$ = 11.58 cavities/50-m radius plot, SE = 1.73) (P P = 0.007) was lower on the back channel side, while bird diversity (P = 0.025) was higher on the back channel side in 2001. House wrens (Troglodytes aedon) (F = 12.91, P F = 4.82, P = 0.033), and bird species building moss nests (F = 5.59, P = 0.023) appear to select nest sites based on total area of nest boxes visible. Management should concentrate on restoration of bottomland hardwoods and protection against erosion of the islands.

1959. **Attributes of golden-winged warbler territories in a mountain wetland.**
Rossell, C. Reed; Patch, Steven C.; and Wilds, Stephanie P.
Wildlife Society Bulletin 31(4): 1099-1104. (2003)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: Parulidae/ Passeriformes/ Vermivora chrysoptera/ Fringillidae/ behavior/ conservation/ conservation status/ forest habitat/ forested wetlands/ geographic information system/ Graham County/ Tulula Creek/ ecosystems/ habitat characteristics/ habitat composition/ habitat types/ habitat use/ land zones/ montane habitat/ mountain wetland/ mountain wetlands/ North Carolina/ population decline/ wetlands/ shrub habitat/ spatial distribution/ successional habitat/ terrestrial ecology/ territorial defense/ home range-territory/ territory characteristics/ U.S. Fish and Wildlife Service/ GIS/ neotropical migrant/ United States, southeastern region/ territory/ early succession/ golden-winged warbler/ Appalachian Mountains
Abstract: The golden-winged warbler (Vermivora chrysoptera) is currently under status assessment for federal listing by the United States Fish and Wildlife Service because of its continual decline in the southern Appalachians and the northeastern United States. To date, no studies have examined the spatial distribution of habitat characteristics of golden-winged warbler territories. We describe the habitat attributes of golden-winged warbler territories (n=10) in a mountain wetland in North Carolina using a Geographic Information System (GIS). We compared proportions of 4 habitat types (open, shrub, forest, water), length of edge between forest and each habitat type, and total length of edge between all habitat types among territories, 10-m zones around territories, and the study area. Habitat composition among territories was diverse and included a wide range of areas covered by each habitat type. Territories and the 10-m zones contained less forest (P= 0.02, P= 0.037) and more total edge (P= 0.006, P= 0.002) than the study area. The 10-m zones also contained more edge between forest and open habitat than the territories (P= 0.014). All other attributes were similar between territories, 10-m zones, and the study area. These results suggest that golden-winged warblers select territories based on their degree of patchiness and structural complexity. Territory boundaries also probably extend farther than is typically delineated by song perches, with peripheral areas likely providing important edge attributes for nesting. Management guidelines for golden-

winged warblers should include maintaining a diverse mosaic of successional habitat types, with particular attention to providing herbaceous openings.

1960. **Avian abundance and diversity in CRP, crop fields, pastures, and restored and native grasslands during winter.**
Morris, Kelly
Passenger Pigeon 62(3/4): 217-224. (2000);
ISSN: 0031-2703
Descriptors: birds/ crops/ conservation/ species diversity/ hibernation/ snow/ grass prairies/ meadows/ agricultural conservation programs
Abstract: I compared grassland bird use of land set aside by the Conservation Reserve Program (CRP), crop fields, pastures, and restored and native prairies during winter in southern Wisconsin. Species diversity was highest in crop fields, followed by restored prairie, CP2 (CRP fields planted to native grasses), native prairie remnants, and pastures. Avian abundance (number of individuals seen per hour of observation) was highest in pastures, followed by restored prairie, CP2, crop fields and native prairie. No birds were observed in CP1 fields (CRP fields planted to introduced grasses and legumes). Avian abundance in crop fields and native prairie was higher during periods of incomplete snow cover than during periods with 100% snow cover, while the reverse was true for restored prairie and CP2 sites. The variety of habitats used by grassland birds during winter should be taken into account when management plans are being developed for these species.

1961. **Avian communities on utility rights-of-ways and other managed shrublands in the northeastern United States.**
Confer, J. L. and Pascoe, S. M.
Forest Ecology and Management 185(1-2): 193-205. (2003)
NAL Call #: SD1.F73; ISSN: 03781127
Descriptors: habitat selection/ nesting success/ rights-of-way/ shrubland birds/ shrubland management/ succession/ biodiversity/ herbicides/ reforestation/ vegetation/ shrublands/ forestry/ avifauna/ community structure/ conservation management/ cutting/ habitat management/ herbicide/ prescribed burning/ right of way/ shrubland/ United States/ Molothrus ater
Abstract: We studied bird density and nesting success on utility rights-of-way (ROW) managed primarily by selective herbicide application in New York, Massachusetts and Maine. For comparison, we also estimated bird density in ROW managed by cutting in New Hampshire and New York and in shrublands managed by fire in the Finger Lakes National Forest (FLNF), New York. On herbicide-managed ROW, we detected a mean of 14.3 individuals and 12.2 species per point count, including many species of early-succession habitat that are declining throughout northeastern United States. Nesting success in forested landscapes of New York, Maine, and Massachusetts was 55% on the ROW, 69% in forests within 20 m of the ROW, and 63% in forests more than 20 m from the ROW. Brown-headed cowbirds (Molothrus ater) parasitized 5.3% of the nests and reduced host recruitment by even less. This suggests that ROW in forested areas support high production of shrubland birds and do not exert a measurably harmful effect on forest-nesting birds. Selective herbicide application on ROW sustained shrubland vegetation and supported high densities and high nesting success. Mechanical cutting lowered the structural diversity of vegetation the following spring and was associated with fewer individual birds and species. Cool burns in early spring produced a high structural diversity of herbs, shrubs and trees and supported a high density of birds and bird species. Long-term maintenance of shrublands by burning will require Supplemental cutting to remove saplings. As reforestation continues to reduce shrubland habitat, probably below pre-colonial levels, active management for early-succession habitat will be necessary to sustain current population levels of numerous species.

1962. **Avian community response to pine-grassland restoration.**
Wood, D. R.; Wes Burger, L.; Bowman, J. L.; and Hardy, C. L.
Wildlife Society Bulletin 32(3): 819-828. (2004)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2004)032[0819:ACRTPR]2.0.CO;2.
Descriptors: landscape/ midstory removal/ Mississippi/ Picoides borealis/ pine-grassland restoration/ prescribed fire/ red-cockaded woodpecker/ songbirds/ avifauna/ community structure/ coniferous forest/ grassland/ habitat management/ habitat structure/ restoration ecology/ Homochitto National Forest/ Mississippi/ Aimophila/ Aimophila aestivalis/ Aves/ Galliformes/ Icteria virens/ Passeri/ Passeridae/ Picidae/ Picoides/ Picoides borealis/ Vireo/ Vireo olivaceus/ Vireonidae
Abstract: Habitat management for an endangered species may affect nontarget communities. We examined avian community response to pine-grassland restoration for red-cockaded woodpeckers (Picoides borealis) and traditional United States Forest Service pine sawtimber management at Homochitto National Forest, Mississippi from 1994-1996. Thirteen species were more abundant in pine-grassland restoration stands, whereas 5 species were more abundant in traditionally managed pine sawtimber stands. Mature restored pine-grassland stands had greater avian species richness, total bird abundance, and avian conservation value than traditionally managed pine sawtimber stands. We used logistic regression models in an exploratory analysis to predict occurrence of selected species using stand- and landscape-scale habitat characteristics. Probability of red-eyed vireo (Vireo olivaceus) occurrence increased with increasing hardwood canopy cover, and probability of yellow-breasted chat (Icteria virens) occurrence increased with increasing grass ground cover. Species richness, total avian abundance, and occurrence of red-eyed vireos and Bachman's sparrows (Aimophila aestivalis) increased with increasing values of Shannon's Habitat Diversity Index. Pine-grassland restoration for red-cockaded woodpeckers created vegetation composition and structure at the stand and landscape scales that may benefit numerous avian species of regional conservation concern.

1963. **Avian community structure associated with woodland habitats in fragmented and unfragmented landscapes in western South Dakota.**
Kelsey, K. W. South Dakota State Univeristy, 2001.
Notes: Project no. SD W-107-R/Study No. 1011; Wildlife Coop. Unit Report - Thesis
http://wfs.sdstate.edu/wfsdept/Publications/Theses/Kelsey,%20Kyle%20W.%20MS-2001.pdf
Descriptors: abundance/ birds/ grassland/ habitat/ habitat management/ population density/ population dynamics/ prairie/ species diversity/ transect survey/ vegetation/ wildlife-habitat relationships/ woodland climax/ South Dakota
Abstract: Purpose was to conduct an intial inventory of prairie woodlands, native and planted, in non-fragmented and fragmented landscapes in the mixed-grass prairie region of western South Dakota. Objectives were to: (1) determine if patch size, vegetation metrics, and landscape characteristics had any effects on avian community structure (species composition, richness, abundance, and density); and (2) evaluate if exist in bird assemblages between planted and native woodlands. The question of whether planted woodlands create habitat for woodland birds of management concern despite their degrading affects on grassland bird habitat is addressed.

1964. **Avian population trends within the evolving agricultural landscape of eastern and central United States.**
Murphy, M. T.
Auk 120(1): 20-34. (Jan. 2003)
NAL Call #: 413.8 AU4; ISSN: 0004-8038
Descriptors: Conservation Reserve Program/ migratory birds/ CRP fields/ nesting success/ breeding birds/ North America/ habitat/ grassland/ abundance/ songbirds
Abstract: State-level Breeding Bird Survey (1980-1998) and U.S. Department of Agriculture statistics were used to test the hypothesis that changes in agricultural land use within the eastern and central U.S. have driven population trends of grassland and shrub habitat birds over the past two decades. The degree to which population trends differed between grassland and shrub habitats was evaluated with respect to migratory and nesting behavior. Grassland birds declined significantly between 1980 and 1999, but, on average, shrub habitat species did not. Grassland-breeding, long-distance migrants exhibited the strongest negative trends. Most species (78%; n = 63) exhibited at least one significant association between population trends and changes in agricultural land use, and in most, land use "explained" 25-30% of the variation in population trends among states. Changes in the farmland landscape accounted for more of the interstate variability of population trends of short-distance migrants than of both long- distance migrants and residents, and that variability was greater in grassland than shrub species. Declines in the area of rangeland and cover crops were followed by population declines and increases, respectively, by many species. Increases of land in the Conservation Reserve Program had negative associations with population trends of some shrub species. The results indicate that grassland birds have declined strongly over the past two decades, and that regardless of migratory behavior or nesting habits, avian population trends are linked strongly to changes in agricultural land use within North America.

1965. **Beaver (Castor canadensis) in heavily browsed environments.**
Baker, Bruce W.
Lutra 46(2): 173-181. (2003); ISSN: 0024-7634
Descriptors: Castoridae/ Rodentia/ Cervidae/ Artiodactyla/ Castor canadensis/ Cervus elaphus/ Cervus canadensis/ biogeography/ animal interactions/ interspecies relationships/ intraspecies relationships/ heavily browsed environment/ Castor canadensis/ Cervus elaphus/ Colorado/ Douglas Creek and Rocky Mountain National Park/ food supply/ foods-feeding/ interspecies relationships/ Salix/ diets/ habitat use/ land zones/ nutrition/ American beaver/ wapiti/ food/ vegetation/ damage [forest]/ overuse/ habitat change/ den/ ecosystem
Abstract: Beaver (Castor canadensis) populations have declined or failed to recover in heavily browsed environments. I suggest that intense browsing by livestock or ungulates can disrupt beaver-willow (Salix spp.) mutualisms that likely evolved under relatively low herbivory in a more predator-rich environment, and that this interaction may explain beaver and willow declines. Field experiments in Rocky Mountain National Park, Colorado, USA, found the interaction of beaver and elk (Cervus elaphus) herbivory suppressed compensatory growth in willow. Intense elk browsing of simulated beaver-cut willow produced plants which were small and hedged with a high percentage of dead stems, whereas protected plants were large and highly branched with a low percentage of dead stems. Evaluation of a winter food cache showed beaver had selected woody stems with a lower percentage of leaders browsed by elk. A lack of willow stems suitable as winter beaver food may cause beaver populations to decline, creating a negative feedback mechanism for beaver and willow. In contrast, if browsing by livestock or ungulates can be controlled, and beaver can disperse from a nearby source population, then beaver may build dams in marginal habitat which will benefit willow and cause a positive riparian response that restores proper function to degraded habitat. In a shrub-steppe riparian ecosystem of northwestern Colorado, USA, rest from overgrazing of livestock released herbaceous vegetation initiating restoration of a beaver-willow community. Thus, competition from livestock or ungulates can cause beaver and willow to decline and can prevent their restoration in heavily browsed riparian environments, but beaver and willow populations can recover under proper grazing management.

1966. **Biodiversity and ecological value of conservation lands in agricultural landscapes of southern Ontario, Canada.**
Milne, R. J. and Bennett, L. P.
Landscape Ecology 22(5): 657-670. (2007)
NAL Call #: QH541.15.L35 L36; ISSN: 09212973.
Notes: doi: 10.1007/s10980-006-9063-5.
Descriptors: anuran/ avian/ biodiversity/ connectivity/ ecological value/ integrated assessment/ multifunctional/ patch size/ rarity/ sub-watershed

Abstract: In eastern North America, large forest patches have been the primary target of biodiversity conservation. This conservation strategy ignores land units that combine to form the complex emergent rural landscapes typical of this region. In addition, many studies have focussed on one wildlife group at a single spatial scale. In this paper, studies of avian and anuran populations at regional and landscape scales have been integrated to assess the ecological value of agricultural mosaics in southern Ontario on the basis of the maintenance of faunal biodiversity. Field surveys of avian and anuran populations were conducted between 2001 and 2004 at the watershed and sub-watershed levels. The ecological values of land units were based on a combination of several components including species richness, species of conservation concern (rarity), abundance, and landscape parameters (patch size and connectivity). It was determined that habitats such as thicket swamps, coniferous plantations and cultural savannas can play an important role in the overall biodiversity and ecological value of the agricultural landscape. Thicket swamps at the edge of agricultural fields or roads provided excellent breeding habitat for anurans. Coniferous plantations and cultural savannas attracted many birds of conservation concern. In many cases, the land units that provided high ecological value for birds did not score well for frogs. Higher scores for avian and anuran populations were recorded along the Niagara Escarpment and other protected areas as expected. However, some private land areas scored high, some spatially connected to the protected areas and therefore providing an opportunity for private land owners to enter into a management arrangement with the local agencies. © 2007 Springer Science+Business Media, Inc.

1967. **Biodiversity of agricultural land: Habitats, species and hotspots.**
Usher, M. B.
In: Biodiversity and conservation in agriculture proceedings of an international symposium. Stakis Brighton Metropole Hotel, UK.
Farnham, UK: British Crop Protection Council; pp. 1-14; 1997.
Notes: Literature review.
NAL Call #: SB599.B73-no.69; ISBN: 190139669X
Descriptors: agricultural land/ biodiversity/ species diversity/ genetic diversity/ community ecology/ landscape ecology/ habitats
This citation is from AGRICOLA.

1968. **Biodiversity of southeastern Minnesota forested streams: Relationships between trout habitat improvement practices, riparian communities and Louisiana waterthrushes.**
Stucker, J. H. University of Minnesota, 2000.
Notes: Degree: M.S.
Descriptors: wildlife-habitat relationships/ interspecies relationships/ habitat management/ policies and programs/ ecology/ nests and nesting/ reproduction/ statistics/ habitat changes/ Minnesota/ Winona County/ Wabasha County/ Fillmore County/ Houston County/ Olmsted County
Abstract: Thesis is divided into the following chapters: (1) Louisiana Waterthrush (Seiurus motacilla) Ecology in Southeastern Minnesota; (2) Trout Habitat Improvement Projects and Avian Communities of Southeastern Minnesota; (3) Trout Habitat Improvement Projects, Macroinvertebrate Communities and Riparian Physical Habitats of Southeastern Minnesota; and (4) Conservation and Management Implications for Riparian Forests: Trout Habitat Improvement and Louisiana Waterthrushes,

1969. **Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles.**
Semlitsch, Raymond D. and Bodie, J. Russell
Conservation Biology 17(5): 1219-1228. (2003)
NAL Call #: QH75.A1C5; ISSN: 0888-8892
Descriptors: conservation measures/ behavior/ ecology/ terrestrial habitat/ Amphibia/ Reptilia: habitat management/ buffer zones/ wetland habitat/ biological criteria/ migration/ terrestrial migration distances/ distribution within habitat/ habitat utilization/ semiaquatic habitat/ wetlands/ biological criteria/ riparian habitat/ amphibians/ chordates/ reptiles/ vertebrates
Abstract: Terrestrial habitats surrounding wetlands are critical to the management of natural resources. Although the protection of water resources from human activities such as agriculture, silviculture, and urban development is obvious, it is also apparent that terrestrial areas surrounding wetlands are core habitats for many semiaquatic species that depend on mesic ecotones to complete their life cycle. For purposes of conservation and management, it is important to define core habitats used by local breeding populations surrounding wetlands. Our objective was to provide an estimate of the biologically relevant size of core habitats surrounding wetlands for amphibians and reptiles. We summarize data from the literature on the use of terrestrial habitats by amphibians and reptiles associated with wetlands (19 frog and 13 salamander species representing 1363 individuals; 5 snake and 28 turtle species representing more than 2245 individuals). Core terrestrial habitat ranged from 159 to 290 m for amphibians and from 127 to 289 m for reptiles from the edge of the aquatic site. Data from these studies also indicated the importance of terrestrial habitats for feeding, overwintering, and nesting, and, thus, the biological interdependence between aquatic and terrestrial habitats that is essential for the persistence of populations. The minimum and maximum values for core habitats, depending on the level of protection needed, can be used to set biologically meaningful buffers for wetland and riparian habitats. These results indicate that large areas of terrestrial habitat surrounding wetlands are critical for maintaining biodiversity.

1970. **Biological effects of agriculturally derived surface water pollutants on aquatic systems: A review.**
Cooper, C. M.
Journal of Environmental Quality 22(3): 402-408. (July 1993-Sept. 1993)
NAL Call #: QH540.J6; ISSN: 0047-2425 [JEVQAA].
Notes: Paper presented at the USDA-ARS Beltsville Agricultural Research Center Symposium XVII, "Agricultural Water Quality Priorities, A Team Approach to Conserving Natural Resources," May 4-8, 1992, Beltsville, MD. Includes references.

Descriptors: aquatic environment/ surface water/ water quality/ sediment/ nutrients/ organic wastes/ pesticides/ heavy metals/ pollution/ agriculture

Abstract: Environmental manipulations and other human activities are major causes of stress on natural ecosystems. Of the many sources of surface water pollutants, agricultural activities have been identified as major contributors to environmental stress, which affects all ecosystem components. In water, agricultural contaminants are most noticeable when they produce immediate, dramatic toxic effects on aquatic life although more subtle, sublethal chronic effects may be just as damaging over long periods. Aquatic systems have the ability to recover from contaminant damage if not seriously overloaded with irreversible pollutants. Thus, contaminant loading level is as important as type of pollutant. Although suspended sediment represents the largest volume of aquatic contaminant, pesticides, nutrients, and organic enrichment are also major stressors of aquatic life. Stream corridor habitat traps and processes contaminants. Loss of buffering habitat, including riparian zones, accelerates effects of pollutants and should be considered when assessing damage to aquatic life. Protection of habitat is the single most effective means of conserving biological diversity. Current available management practices and promising new technology are providing solutions to many contaminant-related problems in aquatic systems.

This citation is from AGRICOLA.

1971. **Biophysical and ecological interactions in a temperate tree-based intercropping system.**

Thevathasan, N. V.; Gordon, A. M.; Simpson, J. A.; Reynolds, P. E.; Price, G.; and Zhang, P.

Journal of Crop Improvement 12(1-2): 339-363. (2004); ISSN: 15427528.

Notes: doi: 10.1300/J411v12n01_04.

Descriptors: agroecosystems/ agroforestry/ biodiversity/ biophysical interactions/ carbon sequestration/ sustainable agriculture/ Acer/ Aves/ Fraxinus/ Glycine max/ Hordeum vulgare subsp. vulgare/ Juglans/ Mammalia/ Pheretima sieboldi/ Picea/ Populus/ Quercus/ Thuja/ Triticum aestivum/ Zea mays

Abstract: Tree-based intercropping is considered an excellent farming system and can contribute much to our understanding of sustainable agriculture practices. Our current research goals are to address and quantify the numerous biophysical interactions that occur at the tree-crop interface in order to enhance our understanding of the ecology of tree-based intercropping (a form of agroforestry). In 1987, the University of Guelph established a large field experiment on 30 ha of prime agricultural land in Wellington county southern Ontario, Canada to investigate various aspects of intercropping trees with agricultural crops. A variety of spacing, crop compatibility and tree growth, and survival experiments were initiated at that time, utilizing 10 tree species within the genera Picea, Thuja, Pinus, Juglans, Quercus, Fraxinus, Acer, and Populus. Two between row-spacings (12.5 m or 15 m) and two within row-spacings (3 m, or 6 m) were utilized in conjunction with all possible combinations of three agricultural crops (soybean, corn, and either winter wheat or barley). Investigations over the last decade have documented several complementary biophysical interactions. Nitrogen (N) transfer from fall-shed leaves to adjacent crops with enhanced soil nitrification as the proposed mechanism was estimated to be 5 kg N ha-1. Soil organic carbon (C) adjacent to tree rows has increased by over 1%, largely as a result of tree litterfall inputs and fine root turnover. It is estimated that intercropping has reduced nitrate loading to adjacent waterways by 50%, a hypothesized function of deep percolate interception by tree roots. We have also noticed increased bird diversity and usage within the intercropped area as compared to mono-cropped adjacent agricultural areas, and have recorded increases in small mammal populations. Earthworm distribution and abundance was also found to be higher closer to the tree rows when compared to earthworm numbers in the crop alleys. We speculate that these are indicative of major changes in the flow of energy within the trophic structure identified with intercropping systems. In light of climate change mitigation processes, C sequestration and NO2 reduction potentials in tree-based intercropping systems were studied and compared to conventional agricultural systems. The results suggest that sequestration of C was 5 times more in the former system than in the latter. Competitive interactions between trees and crops for nutrients, moisture and light were also studied. The tangible benefits that are derived from properly designed and managed tree-based intercropping systems place this land management option above conventional agriculture in terms of long-term productivity and sustainability.

1972. **Bird communities of prairie uplands and wetlands in relation to farming practices in Saskatchewan.**

Shutler, D.; Mullie, A.; and Clark, R. G.

Conservation Biology 14(5): 1441-1451. (2000)

NAL Call #: QH75.A1C5; ISSN: 08888892.

Notes: doi: 10.1046/j.1523-1739.2000.98246.x.

Descriptors: avifauna/ community composition/ farming system/ prairie/ wetland/ Canada/ Aves

Abstract: Modern farm practices can vary in their emphasis on tillage versus chemicals to control weeds, and researchers know little about which emphasis has greater ecological benefits. We compared avifaunas of uplands and wetlands in four treatments: conventional farms, conservation farms (contrasting those that minimized frequency of tillage [minimum tillage] with those that eliminated chemical inputs [organic]), and restored or natural (wild) sites in Saskatchewan, Canada. Of 37 different upland bird species encountered during surveys, one made greater use of farms, four made greater use of wild sites, and the remaining species showed no preference. When all upland species were combined, higher relative abundance occurred on wild than on farm sites, and on minimum tillage than on conventional farms. Wild upland sites also had more species than did conventional farms. Of 79 different species encountered during surveys of wetlands and their margins, most had similar encounter probabilities among treatments, although seven were more common on either organic farms or wild sites. Higher relative abundances were documented in wetland habitat of wild sites and organic farms than of minimum tillage or conventional farms. Wetlands of wild sites had more species than did minimum tillage or conventional farms. Overall, in terms of both avifaunal density and diversity, small treatment effects could be ascribed to differences between conventional and

conservation farms, whereas larger effects were due to differences between farms and wild sites. Wetlands were heavily used by birds in all treatments, suggesting high conservation priority regardless of context.

1973. **Bird observations in five agricultural field types of the Everglades agricultural area in summer and fall.**
Pearlstine, Elise V.; Mazzotti, Frank J.; Rice, Kenneth G.; and Liner, Anna
Florida Field Naturalist 32(3): 75-84. (2004);
ISSN: 0738-999X
Descriptors: biodiversity/ biogeography: population studies/ terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ restoration planning/ applied and field techniques/ cane field/ fallow field/ sod field
Abstract: The Everglades Agricultural Area (EAA) is a 280,000 ha segment of former Everglades that was drained early in this century and converted to agricultural cultivation. It is near natural Everglades habitat; however, the wildlife of this area remains relatively unknown. We surveyed 18 sites in five agricultural field types for bird presence and abundance from mid-June to December 1999. We compared these EAA sites with four sites at the adjacent Arthur R. Marshall Loxahatchee National Wildlife Refuge (LNWR) and tallied 4,005 individuals and 72 species within the 9 sites. Flooded habitats such as rice and fallow flooded fields contained a larger numbers of birds and higher species diversity than terrestrial habitats (cane, sod, fallow fields) within the EAA. However, each field type supports a unique assemblage of species and contributes to overall avian diversity of the area. We recommend that flooded habitats be expanded within the EAA, especially on idle lands. There is a need for further study and the inclusion of wildlife in agricultural and restoration planning in the area.

1974. **Birds on organic and conventional farms in Ontario: Partitioning effects of habitat and practices on species composition and abundance.**
Freemark, K. E. and Kirk, D. A.
Biological Conservation 101(3): 337-350. (2001)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/S0006-3207(01)00079-9.
Descriptors: bird population declines/ Canada/ canonical correspondence analysis/ farmland birds/ habitat and practices/ Ontario/ organic farms/ variation partitioning/ abundance/ avifauna/ conservation management/ intensive agriculture/ population decline/ species richness/ Aves/ Galliformes
Abstract: Population declines of farmland birds over recent decades in Europe, Canada and the USA have been attributed to more intensive agricultural management. We counted birds during the 1990 breeding season on 72 field sites in southern Ontario, Canada, paired between 10 organic and 10 conventional farms for local habitat to enhance our ability to detect effects of agricultural practices. Of 68 species recorded, 58 were on organic sites, 59 on conventional. Species richness and total abundance were significantly greater on organic than conventional sites based on log-linear regression.Of 43 species analyzed with log-linear regression, eight (18.6%) were significantly ($P < 0.05$) more abundant on organic than conventional sites and four (9.3%) approached significance ($0.05 < P < 0.10$). Eight of these 12 species had negative population trends for 1967-1998 Breeding Bird Surveys (BBS) in this region. Two of the 43 species analyzed (4.7%) were significantly more abundant on conventional than organic sites and three (7.0%) approached significance. Two of these five species had negative BBS population trends. A canonical correspondence analysis (CCA) of 13 practices and 13 habitat variables explained 44% of total variation (TV) accounted for in a detrended correspondence analysis of bird species composition and abundance. Practices contributed 23.7% of TV, habitat 26%; habitat and practices shared 5.7% with each other and 12% with farm ownership (i.e. clustering of field sites within farms). CCA ordinations indicated considerable mixing of organic and conventional sites across a gradient from sites with many birds species associated with greater habitat heterogeneity and more pasture, winter grain, farmstead and other non-crop habitats (hedgerow, woodland) to sites with few bird species associated with larger fields, more rowcrop and spring grain, more passes and tilling, and use of herbicides and chemical fertilizers. Our results re-emphasize the importance of non-crop habitats, more permanent crop cover, and less intensive management practices to the conservation of avian biodiversity on farmland. [Canadian Crown Copyright]

1975. **Bobwhite quail myths.**
White, Bill
Missouri Conservationist 65(8)(2004); ISSN: 0026-6515.
http://mdc.mo.gov/conmag/2004/08/10.htm
Descriptors: Colinus virginianus/ agricultural practices/ birds/ fences/ habitat alterations/ habitat management/ habitat use/ landowners/ management/ population ecology/ predators/ restoration/ wildlife/ northern bobwhite quail/ Missouri
Abstract: This article has notes about the myths related to quails declining number. One of the common beliefs is that predators are eating all the quail. The main reason behind this, though, is a lack of proper habitat. A survey of landowners at a quail field day showed that 60 percent of the participants were managing their land for quail. Those same 60 percent were seeing more quail on their property. Wooded fence lines and draws not only crowd out quail friendly shrubs and weeds, but they also provide an advantage for quail predators. A Mississippi study found that quail near trees were most susceptible to avian predators like great horned owls and Cooper's hawks. The invasion of trees into quail habitat also has provided additional food sources and dens to such predators as raccoons, skunks. A study shows that quail numbers triple when habitat is managed in a quail-friendly manner. Wooded fence lines and draws can be restored for quail by dropping the trees with a chainsaw. Stumps of undesirable trees should be treated to prevent resprouting. Valuable lumber and wildlife food trees should remain uncut. If brome or fescue is present under these trees, those grasses should be eliminated. The long-term increases in wild turkey and deer populations are not the cause for the decline in quail. They do, though, indicate the reason for the decline.

1976. **Breeding bird population changes in the Gila River Bird Area.**
Shook, R. S.
NMOS Bulletin 32(2): 49-50. (2004).
Notes: Published by New Mexico Ornithological Society.
Descriptors: forests/ riparian habitat/ birds/ breeding/ Aves/ fencing/ cattle
Abstract: The Gila River Bird Area, approximately 48 km west of Silver City, Grant Co., New Mexico, was established in 1970 by the Forest Service in order to preserve and restore prime riparian habitat. From 1995 through 1999, eight wetlands were constructed for stream bank stabilization and to create habitat for the endangered (Southwestern) Willow Flycatcher (Empidonax trailii extimus). Fencing was also constructed to manage cattle access. Beginning in 1996 periodic avian strip censuses have been conducted to measure changes in avian population numbers. Using linear regression analysis, I compared the average number of detections per km per breeding season for the years 1997 through 2003, for 21 breeding species chosen to represent diversity in both taxonomic and habitat preference. The species chosen were: Mallard (Anas platyrhynchos) Common Black-Hawk (Buteogallus anthracinus), Wild Turkey (Meleagris gallopavo), Killdeer (Charadrius vociferus), Yellow-billed Cuckoo (Coccyzus americanus), Northern Flicker (Colaptes auratus), Western Wood-Pewee (Contopus sordidulus), Southwestern) Willow Flycatcher, Black Phoebe (Sayornis nigricans), Brown-crested Flycatcher (Myiarchus tyrannulus), Bell's Vireo (Vireo bellii), Lucy's Warbler, Yellow Warbler (Dendroica petechia), Common Yellowthroat (Geothlypis trichas), Yellow-breasted Chat (Icteria virens), Summer Tanager (Piranga rubra), Northern Cardinal (Cardinalis cardinalis), Red-winged Blackbird (Agelaius phoeniceus), Hooded Oriole (Icterus cucullatus), Bullock's Oriole (Icterus bullockii), and Lesser Goldfinch (Carduelis psaltria). Results indicate significant increases in populations of Western Wood Pewees, Brown-crested Flycatchers, Bell's Vireos, Yellow-breasted Chats, and Northern Cardinals. The first two species are forest birds while the remainder prefers dense underbrush. Significant declines occurred in populations of Killdeer and Red-winged Blackbirds owing to decreases in their preferred habitat.

1977. **Breeding bird response to riparian forest management: 9 years post-harvest.**
Hanowski, JoAnn; Danz, Nick; and Lind, Jim
Forest Ecology and Management 241(1-3): 272-277. (2007)
NAL Call #: SD1.F73; ISSN: 0378-1127
Descriptors: commercial activities/ terrestrial habitat/ land zones/ Aves: forestry/ riparian forest managment/ breeding species response/ forest and woodland/ Minnesota/ Pokegama Lake tributary streams/ breeding species/ response to riparian forest management/ Aves/ birds/ chordates/ vertebrates
Abstract: We previously examined the 3-year response of breeding bird communities to timber harvest in riparian areas using two harvest techniques (full tree harvest (GPL) and cut-to-length (CTL)) along first- to third-order streams in northern Minnesota, USA. We revisited the same 12 sites 9 years post-harvest and compared community composition, total abundance, species richness, and the abundance of bird guilds on harvest plots randomly assigned to four treatments (three plots per treatment). Analyses revealed a significant response of the bird community to timber harvest in the riparian area. Nine years post-harvest, bird communities in the uncut riparian buffers were statistically indistinguishable from control bird communities. Differences in bird communities between CTL and GPL treatments detected 3 years post-harvest in buffers were no longer evident after 9 years. Breeding bird community composition in harvested buffers became more similar to uncut and control buffer communities in species composition. All treatment buffers continued to have more species and individuals than control buffers; these bird species had affinities for early-successional forests. No differences among forest interior species or ground-nesting birds were evident between treatments 9 years post-harvest. © 2007 Elsevier B.V. All rights reserved.

1978. **Breeding pond selection and movement patterns by eastern spadefoot toads (Scaphiopus holbrookii) in relation to weather and edaphic conditions.**
Greenberg, Cathryn H. and Tanner, George W.
Journal of Herpetology 38(4): 569-577. (2004)
NAL Call #: QL640.J6; ISSN: 0022-1511
Descriptors: Anura/ Lissamphibia/ Pelobatidae/ Aristida stricta/ eastern spadefoot/ longleaf pine/ Pinus palustris/ Scaphiopus holbrookii/ breeding pond selection/ breeding pond selection/ wildlife movement patterns/ breeding grounds/ climate/ weather/ environmental factors/ habitat use/ Florida, Marion County/ Florida, Putnam County/ Ocala National Forest/ land zones/ North America/ reproduction/ breeding/ Aristida stricta/ Pinus spp./ wiregrass
Abstract: Eastern Spadefoot Toads (Scaphiopus holbrookii) require fish-free, isolated, ephemeral ponds for breeding but otherwise inhabit surrounding uplands, commonly xeric longleaf pine (Pinus palustris) and wiregrass (Aristida beyrichiana) ecosystem. Fire suppression in the Florida sandhills has the potential to alter upland and pond suitability through increased hardwood densities and resultant higher transpiration. In this paper, we explore breeding and metamorphic emigration movements in relation to weather, hydrological conditions of ponds, and surrounding upland matrices. We use nine years of data from continuous monitoring with drift fences and pitfall traps at eight ephemeral ponds in two upland matrices: regularly burned, savanna-like sandhills (N = 4), and hardwood-invaded sandhills (N = 4). Neither adult nor metamorph captures differed between ponds within the two upland matrices, suggesting that they are tolerant of upland heterogeneity created by fire frequency. Explosive breeding occurred during nine periods and in all seasons; adults were captured rarely otherwise. At the landscape-level, an interaction between rainfall and maximum change in barometric pressure were the top significant predictors of explosive breeding. At the pond-level, rainfall and the change in pond depth during the month prior to breeding were the top significant predictors of adult captures. Metamorphic emigrations occurred following transformation and usually were complete within a week regardless of rainfall levels. Movement by adults and metamorphs was directional, but mean directions of adult emigrations and immigrations did not always correspond. Our results suggest that spadefoot toads are highly

adapted to breeding conditions and upland habitat heterogeneity created by weather patterns and fire frequency in Florida sandhills.

1979. **Buffered wetlands in agricultural landscapes in the Prairie Pothole Region: Environmental, agronomic, and economic evaluations.**
Rickerl, D. H.; Janssen, L. L.; and Woodland, R.
Journal of Soil and Water Conservation 55(2): 220-225. (2000)
NAL Call #: 56.8 J822; ISSN: 00224561
Descriptors: agriculture/ crop budgets/ farming systems/ Prairie Pothole Region/ regulations/ wetland buffer strips/ Wetlands Reserve Program/ wetlands/ agronomy/ buffering/ cropping practice/ nutrient cycling/ wetland/ United States
Abstract: A farm site with four seasonal wetlands was chosen in Lake County, S.D. to examine agronomic, environmental, and economic performance of cropped fields with buffered and non buffered wetlands. Buffers were established in blocks around two of the wetlands in 1995. In 1997 and 1998, soil/water/plants were analyzed for nutrient content in the buffered and non buffered wetlands. Results showed that the wetland buffer vegetation effectively removed nutrients, thus reducing nutrient content in wetland soils and vegetation, and cycling captured nutrients through hay and forage crops. Long term budgets were developed for combinations of five wetland management scenarios and three crop farming systems. Net returns from buffered wetland fields were generally lower than net returns from maximum crop production. Net returns were greatest for the Wetland Reserve Program (WRP) or Conservation Reserve Program (CRP) scenarios, regardless of farming system. The results suggest that enrolling wetlands in WRP or CRP has both economic and environmental benefits.

1980. **Burrowing owl nest success and burrow longevity in north central Oregon.**
Holmes, Aaron L.; Green, Gregory A.; Morgan, Russell L.; and Livezey, Kent B.
Western North American Naturalist 63(2): 244-250. (2003)
NAL Call #: QH1.G7; ISSN: 1527-0904
Descriptors: Taxidea taxus/ Mustelidae/ Carnivora/ Athene cunicularia/ Strigiformes/ Strigidae/ Speotyto cunicularia/ behavior/ terrestrial ecology/ burrow destruction/ burrow longevity/ burrow reuse/ migratory population/ nest success/ athene cunicularia/ predation/ foods-feeding/ burrows/ farming and agriculture/ productivity/ habitat management/ livestock trampling of burrows/ predators/ mammals/ minimization of burrow trampling by livestock/ Morrow County/ mortality/ natural soil erosion/ nesting success/ Oregon/ environmental factors/ Taxidea taxus/ habitat use/ wildlife-human relationships/ commercial enterprises/ conservation/ wildlife management/ diets/ disturbances/ land zones/ nutrition/ population ecology/ reproduction/ den/ fertility-recruitment/ habitat/ nest/ philopatry/ badger/ burrowing owl
Abstract: We studied nest success, burrow longevity, and rates of burrow reuse for a migratory population of Burrowing Owl (Athene cunicularia) in north central Oregon from 1995 to 1997. Nest success varied annually from 50% to 67%. Principal causes of nest failure were desertion (26%) and depredation by badgers (Taxidea taxus; 13%). Reuse of available nest and satellite burrows in subsequent years was 87% in 1996 and 57% in 1997. Reuse was highest at burrows in sandy soils, which may indicate that nest-site availability is a limiting factor in sandier soil types. Trampling by livestock resulted in the loss of 24% of all burrows between one season and the next, and natural erosion resulted in closure of 17%. Both causes of burrow failure occurred more frequently in soils with a sand component due to their friable nature. We recommend that habitat used by livestock be evaluated for use by Burrowing Owls, that occupied areas be managed to minimize destruction of burrows by livestock, and that predator-control efforts be revised to exclude mortality of badgers.

1981. **Calhoun Point Habitat Rehabilitation and Enhancement Project.**
Miller, D.
In: Proceedings of the 2001 Wetlands Engineering and River Restoration Conference. Hayes D.F. and Hayes D.F. (eds.) Reno, NV; pp. 733-739; 2001. ISBN: 0784405816
Descriptors: agriculture/ dams/ dredging/ floods/ forestry/ project management/ rivers/ sediments/ bottomland forest/ habitat rehabilitation/ biodiversity
Abstract: The U.S. Army Corps of Engineers Environmental Management Program (EMP) is a program for enhancing wildlife habitat in the upper Mississippi River system. In recognition of the benefit of balanced management of the multiple functions that the river performs, the program is funded by the same legislation that provides for improvements to navigation. Calhoun Point, at the confluence of the Illinois and Mississippi Rivers, is a key area within the program; containing abundant bottomland forest, open water, emergent wetlands, and scattered agricultural fields. The current project includes berms to protect the 2,100-acre site from frequent, sediment-laden floods, and to provide a means to perch water on the interior to increase waterfowl habitation. The project also includes stop log structures, sluice gates, and pump sites to move water into, out of, and between the many lakes and sloughs inside the protected area. There is also a dredging component to provide fisheries and reverse some of the siltation that has occurred. The project is currently under design with construction scheduled to begin in early summer 2001. When construction has been completed the area will be managed by the Illinois Department of Natural Resources. This paper describes the design of the project, including information about design criteria, problems that were encountered and their solutions, engineering tools, and coordination among the consultant, the Department of Natural Resources, and the Corps of Engineers.

1982. **Can cows and fish co-exist?**
Fitch, L. and Adams, B. W.
Canadian Journal of Plant Science 78(2): 191-198. (1998)
NAL Call #: 450 C16; ISSN: 0008-4220
Descriptors: agriculture/ grazing management/ riparian ecosystem
Abstract: Our paper provides an ecological perspective on the interrelationship between livestock grazing and riparian areas through a review of topical literature, We also describe the Alberta Riparian Habitat Management Project (also known as "Cows and Fish"), and draw upon our experience to provide a perspective on future riparian management actions. Those actions should begin with an understanding that prairie landscapes evolved with herbivores, in a grazing regime timed and controlled by season and climatic fluctuations where grazing by native grazers was followed by variable rest periods. Prevailing range management principles represent an attempt to imitate the natural system and describe ecologically based grazing systems. Traditionally, range management guidelines have focused on grazing practices and impacts in upland, terrestrial rangelands, with a lack of attention devoted to riparian areas. Three decades of riparian investigation have quantified the effect unmanaged livestock grazing can have on range productivity and watershed function. We contend that suitable grazing strategies for riparian areas will be developed first by understanding the function of riparian systems and then by applying range management principles to develop riparian grazing strategies. A key step towards determining the fit of livestock grazing is an understanding of the formation of riparian systems and their ecological function. We describe riparian structure, function and process to provide linkages between livestock grazing, riparian vegetation health and stream channel dynamics. We summarize the effects of unmanaged livestock grazing on riparian habitats and fish and wildlife populations. The general conclusion is that unmanaged grazing results in overuse and degradation of riparian areas. The literature provides several options for the development of riparian grazing strategies. We provide an overview of strategies suitable for riparian areas in Southern Alberta which should maintain ecological function and sustained use.

1983. **Cerulean warbler abundance and occurrence relative to large-scale edge and habitat characteristics.**
Wood, Petra Bohall; Bosworth, Scott B.; and Dettmers, Randy
Condor 108(1): 154-165. (2006)
NAL Call #: QL671.C6; ISSN: 0010-5422
Descriptors: human ecology: anthropology/ terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ species abundance/ forest fragmentation/ species occurrence/ edge effect/ mountaintop mining/ reclaimed mine landscape
Abstract: We examined Cerulean Warbler (Dendroica cerulea) abundance and occurrence in southwestern West Virginia, where the coal-mining technique of mountaintop removal mining-valley fill converts large contiguous tracts of deciduous forest to forest patches surrounded by early successional habitats. Our study objectives were to quantify abundance and occurrence of Cerulean Warblers relative to (1) distance from the edge of extensive reclaimed grasslands and (2) habitat structure and landscape characteristics. Cerulean Warbler abundance increased with distance from the edge and edge effects extended 340 m into the forest. Percent occurrence did not vary with distance from mine edge, suggesting a degree of tolerance to the extensive edge occurring at the interface of forest and reclaimed lands. Abundance and occurrence were greater on ridges and midslopes than in bottomlands; consequently, disturbances such as mountaintop mining in which ridges are removed may have a greater impact on populations compared to other sources of fragmentation where ridges are not disturbed. Models based on the information-theoretic approach indicated that Cerulean Warblers were more likely to be present in productive sites on northwest to southeast facing slopes, upper slope positions (midslope to ridgetop), and forests with low sapling density. Cerulean Warbler abundance was positively associated with more productive sites, higher snag density, large blocks of mature deciduous forest, and low amounts of edge in the landscape. In addition to outright loss of forested habitat, mountaintop mining-valley fill alters the spatial configuration of forested habitats, creating edge and area effects that negatively affect Cerulean Warbler abundance and occurrence in the reclaimed mine landscape.

1984. **The challenge of conservation in agriculture and the role of entomologists.**
Van Hook, T.
Florida Entomologist 77(1): 42-73. (Mar. 1994)
NAL Call #: 420 F662; ISSN: 0015-4040 [FETMAC].
Notes: Literature review; Symposium: Insect Behavioral Ecology--'93. Includes references.
Descriptors: arthropods/ conservation/ sustainability/ landscape ecology/ environmental education/ legislation/ biodiversity/ endangered species act
This citation is from AGRICOLA.

1985. **Changes in avian species composition following surface mining and reclamation along a riparian forest corridor in southern Indiana.**
Lacki, M. J.; Fitzgerald, J. L.; and Hummer, J. W.
Wetlands Ecology and Management 12(5): 447-457. (2004)
NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ zoogeography/ land zones/ Aves: industry/ surface mining/ impacts on riparian forest corridor community dynamics and distribution/ habitat management/ surface mining habitat reclaimation/ community structure/ species composition changes/ riparian forest corridor/ impacts of surface mining and reclaimation/ distribution within habitat/ riparian forest corridors role/ riparian habitat/ riparian forest corridors/ community dynamics and distribution/ dispersal/ Indiana/ Warrick County/ Pigeon Creek watershed/ riparian forest corridor community ecology and distribution/ Aves/ birds/ chordates/ vertebrates
Abstract: Data on the response of bird communities to surface mining and habitat modification are limited, with virtually no data examining the effects of mining on bird communities in and along riparian forest corridors. Bird community composition was examined using line transects from 1994 to 2000 at eight sites within and along a riparian forest corridor in southwestern Indiana that was impacted by an adjacent surface mining operation. Three habitats

were sampled: closed canopy, riparian forest with no open water; fragmented canopy, riparian forest with flood plain oxbows; and reclaimed mined land with constructed ponds. Despite shifts in species composition, overall bird species richness, measured as the mean number of bird species recorded/transect route, did not differ among habitats and remained unchanged across years. More species were recorded solely on mined land than in either closed forest or forested oxbow habitats. Mined land provided stopover habitat for shorebirds and waterfowl not recorded in other habitats, and supported an assemblage of grassland-associated bird species weakly represented in the area prior to mining. A variety of wood warblers and other migrants were recorded in the forest corridor throughout the survey period, suggesting that, although surface mining reduced the width of the forest corridor, the corridor was still important habitat for movement of forest-dependent birds and non-resident bird species in migration. We suggest that surface mining and reclamation practices can be implemented near riparian forest and still provide for a diverse assemblage of bird species. These data indicate that even narrow (0.4 km wide) riparian corridors are potentially valuable in a landscape context as stopover habitats and routes of dispersal and movement of forest-dependent and migratory bird species.

1986. **Changes in bird abundance in eastern North America: Urban sprawl and global footprint?**
Valiela, I. and Martinetto, P.
Bioscience 57(4): 360-370. (2007)
NAL Call #: 500 Am322A; ISSN: 00063568.
Notes: doi: 10.1641/B570410.
Descriptors: habitat losses/ loss of birds
Abstract: The abundance of birds recorded in the North American Breeding Bird Survey decreased by up to 18 percent between 1966 and 2005. The abundance of US and Canadian resident species decreased by 30 percent, and that of migrants within the United States and Canada decreased by 19 percent. By contrast, Neotropical migrants increased by up to 20 percent. Land-cover changes in northern latitudes therefore seem more consequential for bird populations than those occurring in Neotropical habitats. Lower abundances were most marked for resident breeding birds that used open, edge, and wetland habitats, the environments most affected by human disturbances-particularly urban sprawl-in northern latitudes. The abundance of resident and migrant forest-dwelling birds increased (although trends va ried from species to species), with the increases seeming to follow the 20th-century expansion of forest area in northern latitudes, rather than the loss of Neotropical forests. The geographic footprint of changes in bird abundance linked to habitat changes in North America may thus be extending southward, with negative effects on birds that use open habitats and positive effects on forest birds. © 2007 American Institute of Biological Sciences.

1987. **Changes in land use in eastern Kansas, 1984-2000.**
Applegate, Roger D.; Flock, Brian E.; and Finck, Elmer J.
Transactions of the Kansas Academy of Science 106(3-4): 192-197. (2003)
NAL Call #: 500 K13T; ISSN: 0022-8443
Descriptors: biodiversity/ conservation/ terrestrial ecology: ecology, environmental sciences/ LANDSAT thematic mapper images/ brushland/ cropland/ grassland/ habitat availability/ habitat modification/ lakes/ land use change/ landscape ecology/ open water/ population declines/ rural landscape/ urbanization/ watershed ponds/ woodland
Abstract: Populations of ring-necked pheasant (Phasianus colchicus), northern bobwhite (Colinus virginianus), cottontails (Sylvilagus sp.), greater prairie-chicken (Tympanuchus cupido), and black-tailed jackrabbit (Lepus californicus), have been declining in eastern Kansas for 40+ years. During the same timeframe populations of wild turkey (Melagris gallopavo) and tree squirrels (Sciurus sp.) have increased. We measured change in land use based on Landsat Thematic Mapper images for spring, summer, and fall of 1984, 1992, and 2000. Open water (lakes, watershed ponds) and woodland increased 17% and 23% respectively during the 16 year period. Cropland declined 6% during the 16-year period. Grassland increased <1% due to CRP, and urbanization permanently removed 26% of all other land uses in the study area. Loss of open land habitat due to increases in woodland, open water, and urbanization has modified habitat for brushland and grassland species such as ring-necked pheasant, northern bobwhite, cottontails, greater prairie-chicken, and black-tailed jackrabbit. At the same time, the increase in woodland area along with increases in timber volume have created additional habitats for wild turkey and squirrels.

1988. **Changes to wildlife habitat on agricultural land in Canada, 1981-2001.**
Javorek, S. K.; Antonowitsch, R.; Callaghan, C.; Grant, M.; and Weins, T.
Canadian Journal of Soil Science 87(2 Spec. Iss.): 225-233. (2007)
NAL Call #: 56.8 C162 ; ISSN: 00084271
Descriptors: agroecosystems/ biodiversity/ Indicators/ land use change/ wildlife habitat
Abstract: Agricultural land in Canada comprises cultivated land, hayland and grazing land with associated riparian areas, wetlands, woodlands, and natural grasslands. Although these agro-ecosystems support many species of Canada's native fauna, agricultural land use is dynamic, and changes in agricultural practices can have important implications for biodiversity. We report on Agriculture and Agri-Food Canada's National Agri-environmental Health Analysis and Reporting Program's assessment of wildlife habitat on farmland in Canada. Habitat use matrices were developed for 493 species of birds, mammals, reptiles and amphibians associated with farmland habitat in Canada. We derived patterns of land use from Statistics Canada's Census of Agriculture data and applied them at the soil landscape polygon scale. We developed a proportionally weighted Habitat Capacity index to relate habitat use and land use. A 5% decrease in Habitat Capacity occurred on Canada's agricultural land from 1981 to 2001, associated with an expansion in cropland and a decline in pasture. A regional pattern of small decline in Habitat Capacity is

evident in the Prairie Provinces, where dramatic declines in the use of summerfallow had a positive impact on Habitat Capacity. In eastern Canada, greater decreases in Habitat Capacity occurred, associated with an increase in agricultural intensification. Policies and programs designed to sustain biodiversity should not be developed independently of socioeconomic factors or policies favouring agricultural intensification. We recommend a holistic approach to making policy decisions relevant to environmental and economic sustainability in the Canadian agricultural landscape.

1989. **Climate change and biodiversity conservation in Great Plains agroecosystems.**
Guo, QinFeng
Global Environmental Change 10(4): 289-298. (2000); ISSN: 0959-3780
Descriptors: climatic change/ habitats/ agricultural land/ landscape/ biodiversity/ land use/ ecosystems/ research/ wildlife conservation/ resource management
Abstract: Global change and habitat fragmentation are considered with regard to the unique features of the agroecosystems in the Great Plains. In this region, croplands occupy the majority of the landscape, forming mosaics with linear riparian zones and shelterbelts. These three elements play different roles in the maintenance of biodiversity, and their continued effectiveness under a changing climate is critical to maintaining a healthy and productive agricultural ecosystem. This article evaluates current research and discusses future directions. The goal is to provide a scientific base for future conservation biology and wildlife management.

1990. **Clustering and compactness in reserve site selection: An extension of the biodiversity management area selection model.**
Fischer, D. T. and Church, R. L.
Forest Science 49(4): 555-565. (2003)
NAL Call #: 99.8 F7632; ISSN: 0015749X
Descriptors: Integer programming/ optimization/ reserve design/ site selection/ biodiversity/ ecosystems/ mathematical models/ planning/ biodiversity management/ forestry
Abstract: Over the last 15yr, a n umber of formal mathematical models and heuristics have been developed for the purpose of selecting sites for biodiversity conservation. One of these models, the Biodiversity Management Area Selection (BMAS) model (Church et al. 1996a), places a major emphasis on protecting at least a certain area for each biodiversity element. Viewed spatially, solutions from this model tend to be a combination of isolated planning units and, sometimes, small clusters. One method to identify solutions with potentially less fragmentation is to add an objective to minimize the outside perimeter of selected areas. Outside perimeter only counts those edges of a planning unit that are not shared in common with another selected planning unit in a cluster, and, therefore, compact clustering is encouraged. This article presents a new math programming model that incorporates this perimeter objective into the BMAS model. We present an application using data from the USDA Forest Service-funded Sierra Nevada Ecosystem Project (Davis et al. 1996) and show that the model can be solved optimally by off-the-shelf software. Our tests indicate that the model can produce dramatic reductions in perimeter of the reserve system (increasing clustering and compactness) at the expense of relatively small decreases in performance against area and suitability measures.

1991. **Coastal fisheries enhancement through U.S. Department of Agriculture programs.**
Menzel, B. W.
In: American Fisheries Society Annual Meeting of the Worldwide Decline of Wild Fish Populations, Quebec, PQ, Canada; August 10-14, 2003.; Vol. 133.; pp. 60; 2003.
Descriptors: wildlife management: conservation/ Natural Resources Conservation Service/ U. S. Department of Agriculture/ aquatic habitat quality/ aquatic habitat/ coastal fisheries enhancement/ fisheries resources/ watershed management

1992. **Colony choice in cliff swallows: Effects of heterogeneity in foraging habitat.**
Brown, C. R.; Sas, C. M.; and Brown, M. B.
Auk 119(2): 446-460. (2002)
NAL Call #: 413.8 AU4 ; ISSN: 00048038
Descriptors: bird/ colony/ food availability/ foraging behavior/ habitat/ heterogeneity/ nesting/ United States/ Petrochelidon pyrrhonota
Abstract: One potential determinant of colony size in birds is the local availability of food near a nesting site. Insectivorous Cliff Swallows (Petrochelidon pyrrhonota) in southwestern Nebraska nest in colonies ranging from 2 to over 3,000 nests, but they feed on so many kinds of insects that direct sampling of food resources is impractical. Instead, we investigated the degree to which swallow colony size was correlated with the extent of different habitat types, land use diversity, and plant species diversity in the colony's foraging range, and used those parameters as indices of potential variation among sites in food availability. Amount of flowing and standing water in the foraging range was a significant predictor of mean colony size across years at a site, with larger colonies associated with more water. The same result held for most years when analyzed separately. The extent of flowing water in the foraging range also was a significant predictor of the frequency with which a site was occupied across years. In addition, univariate tests suggested that the amount of cultivated cropland in the foraging range varied inversely with colony size. Land use diversity, as measured by Simpson's index, increased significantly with colony size, and all of the sites with perennially very large colonies (mean colony size >1,000 nests) were associated with foraging ranges of relatively high land use diversity. Repeatability of colony size across years differed significantly from zero across all sites, but repeatabilities were significantly lower (colony sizes less similar between years) for sites situated in low-diversity habitats and for sites used less often. There was no strong effect of plant species diversity within the foraging range on either colony size at a site or likelihood of site use. We conclude that land use diversity per se (and possibly the extent of water near a site) might influence insect distribution and constrain formation of the larger colonies to certain sites. These findings emphasize that colony choice in Cliff Swallows is complex, reflecting both the socially mediated costs and

benefits of group size that vary among individuals and the effects of habitat heterogeneity that may influence food availability at some sites.

1993. **Comparative demography of burrowing owls in agricultural and urban landscapes in southeastern Washington.**
Conway, Courtney J.; Garcia, Victoria; Smith, Matthew D.; Ellis, Lisa A.; and Whitney, Joyce L.
Journal of Field Ornithology 77(3): 280-290. (2006)
NAL Call #: 413.8 B534; ISSN: 0273-8570
Descriptors: Strigidae/ Strigiformes/ Athene cunicularia/ burrowing owl/ Speotyto cunicularia/ annula fecundity/ biogeography/ clutch size/ conservation/ wildlife management/ farmland/ ecosystems/ habitat use/ habitat management/ land zones/ artificial structures/ nesting success/ population ecology/ reproduction/ productivity/ urban habitat/ Washington/ agriculture/ Athene cunicularia/ fecundity/ land use/ natal recruitment/ reproductive success/ shrub-steppe/ density/ brood-egg/ fertility-recruitment/ philopatry/ habitat/ settlement
Abstract: Anecdotal evidence suggests that Burrowing Owls have declined in the state of Washington. We examined the status of these owls in agricultural and urban habitats to better understand the underlying causes of these declines. Nest density was higher in the area dominated by agriculture (0.67 nests/km(2)) than in the urban area (0.28 nests/km(2)), and re-use of nest burrows was more common in the agricultural area. We found no difference in mean clutch size between the two areas, but nesting success was higher in the agricultural area. The mean number of fledglings per nesting attempt was higher in the agricultural area (2.02 vs. 1.47), but we found no difference between the two areas in the mean number of fledglings per successful nest (3.2 vs. 3.1). Both natal recruitment (4% vs. 8%) and annual return rate of adults (30% vs. 39%) were lower in the agricultural area than in the urban area, suggesting that the owl population in the agricultural area may not be stable and may be a "sink" population. Due to high burrow fidelity from year to year, and the tendency of some owls in Washington to overwinter, we recommend that legal protection of nest burrows be extended to the nonbreeding season.

1994. **Comparison of chlorpyrifos fate and effects in outdoor aquatic micro- and mesocosms of various scale and construction.**
Leeuwangh, P.
In: Freshwater Field Tests for Hazard Assessment of Chemicals/ Hill, I. R.; Heimbach, F.; Leeuwangh, P.; and Mattiessen, P. Boca Raton, FL: Lewis Publishers, 1994; pp. 217-248.
Notes: Literature review; Conference: European Workshop on Freshwater Field Tests, Potsdam (Germany), 25-26 Jun 1992; ISBN: 0-87371-940-9.
Descriptors: pesticides/ fate/ pollution effects/ experimental research/ freshwater ecology/ aquatic communities/ fate of pollutants/ aquatic environment/ insecticides/ taxonomy/ water pollution effects/ chlorpyrifos/ aquatic environments/ chlorpyrifos/ effects on organisms/ effects of pollution/ freshwater pollution
Abstract: Various micro- and mesocosms simulating the natural environment have been used to study the fate and effects of the insecticide chlorpyrifos. Literature was reviewed to observe the influence of scale, test design and meteorological conditions on the fate and effects of chlorpyrifos. The disappearance of chlorpyrifos from water is consistent in all studies, despite variation in system dimensions (9 to 450 m^3) and in physico-chemical and biological properties. In most studies however, the product has no effect on the physico-chemical characteristics of the water. It is possible that intermesocosm variability, especially that due to the macrophyte biomass at the time of application of the pesticide, obscures subtle effects. The primary effects of chlorpyrifos were consistent in all studies, even though wide differences were apparent in the composition of the main taxonomic groups at the time of application of the pesticide. Indirect effects of chlorpyrifos in micro- and mesocosms are much more variable, in both direction and magnitude. In some, but not all studies, phytoplankton, periphyton, rotifers, oligochaetes, some mollusc taxa and the isopod Asellus have shown a tendency to increase in biomass or abundance. Reductions in chlorpyrifos-sensitive invertebrate forage species resulted in transient reduced growth of endemic larval fathead minnows. The complexity of natural ecosystems and the lack of qualitative and quantitative a priori information on trophic structure can make prediction of indirect effects very difficult. In the reviewed literature there were no indications of direct or indirect effects on macrophytes, Coelenterata or Arachnida. No mention was made of other taxa.

1995. **A comparison of raptor densities and habitat use in Kansas cropland and rangeland ecosystems.**
Williams, C. K.; Applegate, R. D.; Lutz, R. S.; and Rusch, D. H.
Journal of Raptor Research 34(3): 203-209. (2000)
NAL Call #: QL696.F3J682; ISSN: 08921016
Descriptors: American kestrel/ Buteo jamaicensis/ Circus cyaneus/ Cover type selection/ cropland/ density/ Falco sparverius/ line transect/ northern harrier/ rangeland/ red-tailed hawk/ arable land/ habitat selection/ population density/ rangeland/ raptors/ species diversity/ United States
Abstract: We counted raptors on line transects along roads to assess densities, species diversity, and habitat selection of winter raptors between cropland and rangeland habitats in eastern Kansas. We conducted counts every 2 wk between September-March 1994-98. Species diversity indices did not differ between the two habitats (P = 0.15). We calculated density estimates and cover type selection for Red-tailed Hawks (Buteo jamaicensis), Northern Harriers (Circus cyaneus), and American Kestrels (Falco sparverius). Red-tailed Hawks and Northern Harrier densities were higher in cropland, while kestrel densities did not differ between the two habitats. All three species across both habitats had a general preference for idleland habitat. We believe three factors could explain the higher raptor densities in cropland: increased prey abundance, increased visibility of prey associated with harvested agriculture fields, and/or a higher relative amount of preferred hunting habitat.

1996. **A comprehensive review of Farm Bill contributions to wildlife conservation, 1985-2000.**
Heard, L. P.; Hohman, W. L.; Halloum, D. J.; and Wildlife Habitat Management Institute (U.S.)
Madison, MS: USDA, NRCS, 2000.
Notes: "Technical Report, USDA/NRCS/WHMI-2000." "December 2000." Includes bibliographical references.
NAL Call #: aS604.6 C66 2000
Descriptors: Agricultural law and legislation---United States/ Agricultural conservation---Government policy---United States/ Wildlife habitat improvement---United States/ Wetland agriculture
Abstract: Contents: Conservation compliance and wetlands conservation provisions of the Omnibus Farm Acts of 1985, 1990, and 1996/ Stephen J. Brady; Grassland bird use of Conservation Reserve Program fields in the Great Plains/ Douglas H. Johnson; Waterfowl responses to the Conservation Reserve Program in the Northern Great Plains/ Ronald E. Reynolds; Impact of the Conservation Reserve Program on wildlife conservation in the Midwest/ Mark R. Ryan; Wildlife responses to the Conservation Reserve Program in the Southeast/ Wes Burger; The value of buffer habitats for birds in agricultural landscapes/ Louis B. Best; Biological responses to wetland restoration: Implications for wildlife habitat development through the Wetlands Reserve Program/ Charlie Rewa; Wildlife Habitat Incentives Program: A summary of accomplishments, 1998-1999/ Ed Hackett; Environmental Quality Incentives Program: Program summary and potential for wildlife benefits/ Anthony Esser, Robert T. Molleur, Paige Buck, Charlie Rewa; Wildlife responses to wetland restoration and creation: An annotated bibliography/ Charlie Rewa; An annotated bibliography for wildlife responses to the Conservation Reserve Program/ Arthur W. Allen
This citation is from AGRICOLA.

1997. **Conservation in America: State government incentives for habitat conservation.**
Defenders of Wildlife
Defenders of Wildlife 1 (2002).
http://www.biodiversitypartners.org/pubs/CinAReport/Conservation_in_America.pdf
Descriptors: census-survey methods/ conservation/ conservation education/ conservation programs/ Conservation Reserve Program/ ecosystem management/ endangered-threatened species/ funding/ game farms/ habitat alterations/ habitat management/ land acquisition/ land use/ land, private/ land, public/ landowners/ laws-law enforcement/ management/ monitoring/ planning/ population ecology/ preservation/ protection/ public relations/ restoration/ socio-economic studies/ species diversity/ wildlife/ incentives
Abstract: The major cause for the extinction of various species is habitat destruction, which needs to be controlled in order to preserve the wildlife heritage of a country. The authors discuss the efforts taken by the federal and state governments to encourage private landowners in conserving the wildlife heritage. There are many political and public objections to the purchase of private land by the government and hence alternate conservation approaches for preserving the diminishing habitats in privately owned lands need to be carried out by the government. The approaches adopted were based on the incentives given to the landowners for maintaining a healthy habitat. The incentives include direct payments, education/technical assistance, legal/statutory mechanisms, market institutions, property rights tools, recognition programs, administrative streamlining, and tax relief. A detailed description of these incentives by state governments along with examples of successful programs, summarization of the information collected from 50 states about 400 incentives and programs and results of the research with the incentive type, number of programs, and people involved in it, are listed in this article. Accounts of the amount of land affected by the conservation programs and various methods that need to be adopted by states to further improve their efforts to conserve private lands have been suggested here. Questionnaires, maps, tables, and charts that reveal the data collected from the survey are presented. It was concluded that the incentives for habitat conservation on private land need a strong support by funding, field studies, data collection, and coordinated planning.
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1998. **Conservation of disturbance-dependent birds in eastern North America.**
Hunter, W. C.; Buehler, D. A.; Canterbury, R. A.; Confer, J. L.; and Hamel, P. B.
Wildlife Society Bulletin 29(2): 440-445. (2001)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: birds/ disturbance/ early succession/ fire/ grasslands/ prairies/ savanna/ shrub-scrub/ avifauna/ population decline/ species conservation/ North America
Abstract: Populations of most bird species associated with grassland, shrub-scrub habitats, and disturbed areas in forested habitats (hereafter all referred to as disturbance-dependent species) have declined steeply. However, a widespread perception exists that disturbance-dependent species are merely returning to population levels likely found by the first European explorers and settlers. The fact that many disturbance-dependent bird species and subspecies are now extinct, globally rare, threatened, or endangered challenges that perception and raises the question of balance between conservation efforts for birds dependent upon disturbances and birds more closely associated with mature forests. An overall understanding of the status and trends for these disturbance-dependent species requires reconstruction of at least thousands of years of Native American land use followed by 500 years of post-European settlement. Interpretations herein on how to manage for these disturbance-dependent species should support efforts to conserve all landbirds in eastern North America.
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1999. **Conservation of priority birds in sagebrush ecosystems.**
Rich, T. D.; Wisdom, M. J.; and Saab, V. A.
In: Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, General Technical Report-PSW 191/ Ralph, C. J. and Rich, T. D.; Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 589-606.
Notes: Volume 2; ISSN: 0196-2094; Conference held 2002 March 20-24 in Asilomar, California.
http://www.fs.fed.us/psw/publications/documents/psw_gtr191/Asilomar/pdfs/589-606.pdf
Descriptors: Artemisia, Columbia Plateau/ conservation plans/ Great Basin/ greater sage-grouse/ landbirds/

Partners in Flight/ population trends/ public land/ sagebrush
Abstract: Sagebrush ecosystems occupy over 62,000,000 ha of the western US. However, they have been degraded or completely eliminated by agricultural conversion, overgrazing by domestic livestock, invasion of exotic plants, expansion of pinyon and juniper woodlands, uncharacteristic wildfires, and fragmentation. This habitat loss has led to an increasing number of special status species, including 630 plant and animal species of conservation concern. In this paper, we focus on the 22 taxa of sagebrush associated birds that are priorities in Partners in Flight Bird Conservation Plans. These range from sagebrush obligates--Greater Sage-grouse (Centrocercus urophasianus), Gunnison Sage-grouse (C. minimus), Sage Thrasher (Oreoscoptes montanus), Sage Sparrow (Amphispiza belli), Brewer's Sparrow (Spizella breweri)--to grassland associates such as Short-eared Owl (Asio flammeus) and Vesper Sparrow (Pooecetes gramineus). Partners in Flight has identified five of these species for the continental Watch List--Swainson's hawk (Buteo swainsoni), both sage-grouse, the Short-eared Owl, and Brewer's Sparrow--which places them among the highest priority species for conservation action in North America. We also examine the extent to which sage grouse may serve as classic umbrella species for shrubsteppe avifauna. These species tended to occur together--83 pairwise correlations of relative abundance were significant (8.55 expected). Factor analysis of these data showed that species formed groups based on habitat associations much as expected, although sage-grouse aligned more closely with the Vesper Sparrow than expected. Population trends for three major physiographic strata that encompass sagebrush ecosystems--the Columbia Plateau, Wyoming Basin, and Basin and Range--showed the Columbia Plateau to have many more declining population trends. Habitat associations for declining species included both sagebrush and grassland types. Historic (1850) and current population sizes were estimated for 12 priority taxa in the Interior Columbia Basin based on predicted areas of historic and current source habitat. Estimated current population sizes are, not surprisingly, drastically reduced from historic numbers. The Western Meadowlark (Sturnella neglecta) showed the least percent reduction and Grasshopper Sparrow the most. For six species that had significant or near significant declines in the Columbia Plateau since 1966 and for which we had historic and current habitat estimates, the estimated historical declines were all remarkably similar to recent trends. Trends and management activities on public lands in Idaho, Oregon, and Washington that may be contributing to disproportionate declines in priority birds include an increase in the area burned annually by wildfire, an increase in the biomass of grazing cattle, and continued fencing and water development that spread negative impacts over an ever greater portion of the landscape. We suggest that conservation of sage-grouse populations in reasonable numbers well distributed across their historical ranges also will provide substantial benefits for many, or even most, other bird species that cooccur with these grouse. Given that more than 57 percent of this habitat is in public ownership and that concern for the future of sage-grouse continues to build, we have all the information and opportunity we need to take action. Indeed, if we cannot successfully conserve sage-grouse and the sagebrush ecosystem in the US given our theory, our knowledge, and our large blocks of public land, then one wonders how we can succeed for other species elsewhere.

2000. **The Conservation Reserve Enhancement Program.**
Allen, Arthur W.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 115-132.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ Conservation Reserve Enhancement Program/ landscape scale
Abstract: The Conservation Reserve Enhancement Program (CREP) reflects advancement in U.S. Department of Agriculture agricultural policy by addressing agriculturally related conservation on a multi-farm, landscape scale and establishing funding support and partnerships with state and non-governmental organizations. Underway in 25 states, with more being planned, the CREP addresses environmental issues on the farmed landscape with implications for environmental quality potentially reaching thousands of miles away from where program conservation practices are established. Most CREPs have been initiated only within the last 4 years. Monitoring programs to evaluate CREP performance have been established, but because of time needed to establish vegetative covers, growing participation in the programs over time, and the complexities of landscape-level analysis, quantifiable results are limited. Environmental data related to CREP eff ects on water quality and wildlife habitats are being collected for future assessments and refinement of the program. By addressing state-identified priorities, landowner needs, and social issues, the CREP offers substantial promise to fully integrate economically viable agricultural production and effective conservation.

2001. **The Conservation Reserve Program and duck production in the U.S. Prairie Pothole Region.**
Reynolds, Ronald E.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 33-40.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: ducks/ Conservation Reserve Program (CRP)/ conservation assessment/ Prairie Pothole Region/ nest success/ mallard/ Anas platyrhynchos/ Gadwall/ Anas strepera/ blue-winged teal/ Anas discors/ northern shoveler/ Anas clypeata/ northern pintail/ Anas aguta/ waterfowl production areas/ wetlands habitats/ wetlands conservation/ Great Plains/ North Dakota/ South Dakota
Abstract: The paper presents a summary the success of the CRP in the Prarie Pothole Region. The Prairie Pothole Region (PPR) of North America has historically been considered the most important area of the continent for many species of waterfowl, particularly upland nesting ducks. CRP cover in the PPR has resulted in significantly increased productivity of ducks from the most important duck breeding area in North America. Ducks produced in

the PPR migrate to virtually every state, province, and territory in North America, Mexico, and several countries in South America. Waterfowl hunters and observers nationwide have been the beneficiaries of the CRP. In order to maintain duck production levels in the PPR, at least 5 million acres (2 million ha) of CRP will need to be targeted toward areas of moderate to high duck density. To maximize duck production and meet other regional migratory bird and upland bird population goals, a total of 8 million acres (3.2 million ha) of CRP cover is recommended (Wildlife Management Institute, 2001). Finally, Swampbuster provisions of the Farm Bill must be continued to protect wetlands habitat critical to breeding waterfowl and broods. Waterfowl enthusiasts nationwide will be looking forward to continuing the benefits of these landmark conservation initiatives.

2002. **The Conservation Reserve Program in the Southeast: Issues affecting wildlife habitat value.**
Burger, L. Wes
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 63-92.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: Conservation Reserve Program/ USDA/ Farm Bill/ wildlife conservation/ wildlife habitat/ fish/ United States, Southeast/ cover crops/ forests
Abstract: Provision of wildlife habitat is one of the statuary objectives of the Conservation Preserve Program (CRP); however, the realized wildlife habitat benefits vary regionally in relation to specific cover crop, age, and management regimes. As of February 2005, 1,324,066 ha were enrolled in the CRP in 12 southeastern states. Approximately 57% of southeastern CRP was in 1 of 3 tree cover practices (CP3 new pine, CP3a new hardwood, or CP11 existing trees); 19% as CP10 existing grass (much of which was reenrolled CP1); 4% as CP1 cool-season grass; 3% in CP2 native warm season grasses; and 12% in continuous-signup buffer practices. Targeted conservation practices resulted in enrollment of 75,014 ha of longleaf pine within the longleaf practice and 2,850 ha of hardwoods in the continuous bottomland hardwood practice. Plant communities on CRP fields are not static, but change over time. In the southeastern United States, natural succession progresses rapidly because of fertile soils, long growing seasons, and substantial rainfall. As such, the specific wildlife species that occur on CRP stands will vary over the life of the contract. Wildlife populations at a given point in time will be a function of conservation practice, age of the stand, establishment methods, and mid-contract management regimes. Provision and maintenance of wildlife habitat on CRP fields in the South requires active management. Planned disturbance (disking or fire) should be incorporated into the conservation plan of operation for all grass plantings in the Southeast. Exotic forage grasses may need to be eradicated to accrue substantive wildlife benefits. Tree plantings also require active management. Most pine CP11 plantings are now 15-17 years old and are characterized by closed canopies with dense litter accumulation and little herbaceous ground cover. Th inning, selective herbicide, and prescribed fi re would enhance the habitat value of these stands. The CRP has had substantial impact on land use and landscape composition in the Southeast. However, the wildlife habitat value of fields enrolled in the CRP in the Southeast has been diminished by selection of cover practices with short duration or minimal habitat value (i.e., CP1, CP1 reenrolled as CP10, CP3, CP11). Proactive management of extant CRP acreage and selective enrollment of high-value cover practices (e.g. longleaf pine) will be required to achieve the types of wildlife habitat benefits associated with the CRP in other regions.

2003. **The Conservation Security Program: A new conservation program that rewards historic land stewards who have applied and managed effective conservation systems.**
Henry, Hank
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 193-198.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ Conservation Security Program/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ land stewardship
Abstract: The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and rangeland, as well as forested land that is an incidental part of an agriculture operation. In the first signup, CSP was offered in 18 watersheds located in 22 states. In 2005, the program is available in all 50 states, the Caribbean, and the Pacific Basin. The program provides equitable access to benefits to all producers, regardless of size of operation, crops produced, or geographic location.

2004. **Conserving nature, but to what end? Conservation policies and the unanticipated ecologies they support.**
Carolan, M. S.
Organization and Environment 19(2): 153-170. (2006); ISSN: 10860266.
Notes: doi: 10.1177/1086026606288061.
Descriptors: contemporary evolution/ environmental management/ future of environmental sociology/ gene banks/ seed banks/ sustainable fishing/ trophy hunting
Abstract: The author examines various cases of conservation policies in practice, and the implication of those practices in terms of the ecologies they support, showing, in the end, that the "nature" being preserved is not always the one intended. In doing this, insights are also gleaned to inform how we should do environmental sociology, and what lies in environmental sociology's future if we work toward this end. The author argues that environmental sociology needs to become more environmental: to be willing to understand sociobiophysical relationships in all their complexity, even in those cases that require a well-grounded understanding of ecosystem processes. Thus, although retaining focus on the historical subject, which shapes conceptions of and ultimately practices toward ecology, we must also begin to view this subject as also an ecological object. The implications of

such an analytic move, in terms of what it means for environmental sociology's future, are then discussed.

2005. **Continuous Conservation Reserve Program: Factors influencing the value of agricultural buffers to wildlife conservation.**
Clark, William R. and Reeder, Kathleen F.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 93-114.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ agricultural buffers/ wildlife/ fish/ Continuous Conservation Reserve Program
Abstract: The Continuous Conservation Reserve Program (CCRP) principally consists of linear buffer conservation practices designed to remove highly erodible land from production and to improve water quality. The extent of projects differentiates CCRP from the general signup CRP, which focuses on whole-field enrollments. Small sizes and high edge to area ratios have the potential to limit the usefulness of these practices for wildlife. Careful planning and management are keys to gaining the desired wildlife benefits from these plantings, particularly with regard to the role of buffers in the landscape. Evidence that the practices enrolled in the CCRP are used by wildlife is mounting, although studies are still most heavily focused on the avian community. Further study on reproductive success and survival is needed on all species of wildlife using these plantings to determine how the CCRP can best serve wildlife habitat functions.

2006. **Core terrestrial habitat for conservation of local populations of salamanders and wood frogs in agricultural landscapes.**
Porej, D.; Micacchion, M.; and Hetherington, T. E.
Biological Conservation 120(3): 399-409. (2004)
NAL Call #: S900.B5; ISSN: 0006-3207
Descriptors: wetlands/ Akaike information criterion/ fish/ glaciated plateau/ habitat preservation/ marbled salamanders/ predation/ red spotted newts/ smallmouth salamanders/ spotted salamanders/ tiger salamanders/ till plains/ wood frogs/ amphibia/ conservation/ Ohio/ Notophthalmus viridescens viridescens/ Rana sylvatica/ Ambystoma tigrinum/ Ambystoma maculatum/ Ambystoma jeffersonianum
Abstract: Pond-breeding amphibians require aquatic and terrestrial habitats to complete their lifecycles, and preservation of both habitats is necessary for maintaining local populations. Current wetland regulations focus primarily on aquatic habitats, and criteria to define critical upland habitats and regulations to protect them are often ambiguous or lacking. We examined the association between the presence of seven pond-breeding amphibian species and the landscape composition surrounding 54 wetlands located within the Till Plains and the Glaciated Plateau ecoregions of Ohio, USA. We quantified landscape composition within 200 m of the wetland ("core terrestrial zone") and the area extending from 200 m to 1 km from the wetland ("broader landscape context zone"). We constructed binary logistic regression models for each species, and evaluated them using Akaike Information Criterion. Presence of spotted salamanders (Ambystoma maculatum), Jefferson's salamander complex (A. jeffersonianum) and smallmouth salamanders (A. texanum) was positively associated with the amount of forest within the core zone. Presence of wood frogs (Rana sylvatica) was positively associated with the amount of forest within the core zone and the amount of forest within the broader landscape context zone. Presence of tiger salamanders (A. tigrinum tigrinum) was negatively associated with the cumulative length of paved roads within 1 km of the site, and presence of red-spotted newts (Notophthalmus v. viridescens) was negatively associated with the average linear distance to the five nearest wetlands. Overall salamander diversity was positively associated with the amount of forest within the core zone, and negatively associated with the presence of predatory fish and cumulative length of paved roads within 1 km of the site. Our results confirm the strong association between the structure of surrounding upland areas and amphibian diversity at breeding ponds, and stress the importance of preserving core terrestrial habitat around wetlands for maintaining amphibian diversity.

2007. **Critical elements for biologically based recovery plans of aquatic-breeding amphibians.**
Semlitsch, Raymond D.
Conservation Biology 16(3): 619-629. (2002)*NAL Call #:* QH75.A1C5 ; ISSN: 0888-8892 *Descriptors:* aquatic life/ amphibians/ ecosystems/ habitat management/ breeding/ habitat restoration/ habitat use
Abstract: The global loss of biodiversity and the increasing number of threatened or endangered species have focused attention on conservation and species-recovery strategies. Because current evidence indicates that some amphibians are experiencing population declines, range constrictions, or extinctions, and federal and state agencies have listed many species as threatened or endangered, it is essential to develop sound principles upon which to base recovery plans for different ecosystems, amphibian communities, or species if we are to balance the conservation of amphibian diversity with economic development and a growing human population. I present a framework of biologically based principles that can be used for current species conservation efforts. My goal is to provide the critical elements needed to develop biologically based recovery plans for aquatic-breeding amphibians in any region. This paper is organized in three parts: (1) an overview of critical local population and landscape processes required to maintain amphibian species and threats, (2) the critical elements associated with successful recovery plans, and (3) considerations for measuring success and long-term habitat management. Clearly, we need more basic data on life-history requirements, special adaptations, habitat use, dispersal behavior, and population biology, especially factors influencing long-term persistence for many species. Nevertheless, because some species are in urgent need of conservation action, we cannot afford to wait for additional data; the most important critical elements required to initiate effective recovery efforts for amphibians are known. I hope my discussion will help managers understand the importance of incorporating local population and metapopulation factors into their recovery and restoration plans. I also hope managers begin to think about ultimate

recovery and restoration strategies that consider connectivity among populations across regions and state boundaries.

2008. **The culture of fire in the Southeast.**
Palmer, W. E.; Robertson, K. M.; and Masters, R. E.
Transactions of the North American Wildlife and Natural Resource Conference 69: 354-368. (2004)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: forest/ fire/ habitat management/ Red Hills region/ Florida/ Georgia
Abstract: The paper reiterates the ecological importance of frequent fire for management practices and maintenance of upland systems in the South, presenting the Red Hills experience where fire use has remained the dominant land management practice. Obstacles to conducting prescribed fires are summarized. [from paper]

2009. **Deer herbivory as an ecological constraint to restoration of degraded riparian corridors.**
Opperman, Jeff J. and Merenlender, Adina M.
Restoration Ecology 8(1): 41-47. (2000)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: conservation measures/ nutrition/ diet/ ecology/ terrestrial habitat/ land and freshwater zones/ Ungulata (Mammalia): habitat management/ food plants/ feeding behavior/ grazing/ riparian woodlands/ corridor restoration/ forest and woodland/ California/ Mendocino County/ Mammalia/ chordates/ mammals/ vertebrates
Abstract: Ungulate herbivory can impact riparian vegetation in several ways, such as by reducing vigor or reproductive output of mature plants, and through increased mortality of seedlings and saplings. Much work has focused on the effects of livestock grazing within riparian corridors, while few studies have addressed the influence of native ungulate herbivory on riparian vegetation. This study investigated the effect of deer herbivory on riparian regeneration along three streams with degraded riparian corridors in Mendocino County, California. We utilized existing stream restoration efforts by private landowners and natural resource agencies to compare six deer exclosures with six upstream control plots. Livestock were excluded from both exclosure and control plots. Three of the deer exclosures had been in place for 15 years, one for 6 years, and two for 4 years. The abundance and size distribution of woody riparian plant species such as Salix exigua, S. laevigata, S. lasiolepis, Alnus rhombifolia, and Fraxinus latifolia were quantified for each exclosure and control plot. The mean density of saplings in deer exclosures was $0.49 \pm 0.15/m^2$, while the mean density of saplings in control plots was $0.05 \pm 0.02/m^2$. Within exclosures, 35% of saplings were less than 1 m and 65% were greater than 1 m; within control plots, 97% of saplings were less than 1 m in height. The fact that little regeneration had occurred in control plots suggests that deer herbivory can substantially reduce the rate of recovery of woody riparian species within degraded riparian corridors. Exclusionary fencing has demonstrated promising results for riparian restoration in a region with intense deer herbivory.

2010. **Demographic limitations of the ability of habitat restoration to rescue declining populations.**
Schrott, G. R.; With, K. A.; and King, A. W.
Conservation Biology 19(4): 1181-1193. (2005)
NAL Call #: QH75.A1C5 ; ISSN: 08888892.
Notes: doi: 10.1111/j.1523-1739.2005.00205.x.
Descriptors: demographic models/ extinction risk/ habitat fragmentation/ habitat loss/ migratory birds/ neutral landscape models/ habitat fragmentation/ habitat restoration/ migratory population/ population decline/ Aves/ Passeri
Abstract: Habitat restoration is often recommended in conservation without first evaluating whether populations are in fact habitat limited and thus whether declining populations can be stabilized or recovered through habitat restoration. We used a spatially structured demographic model coupled with a dynamic neutral landscape model to evaluate whether habitat restoration could rescue populations of several generic migratory songbirds that differed in their sensitivity to habitat fragmentation (i.e., severity of edge effects on nesting success). Simulating a best-case scenario, landscapes were instantly restored to 100% habitat before, at, or after habitat loss exceeded the species' vulnerability threshold. The vulnerability threshold is a measure of extinction risk, in which the change in population growth rate ($\Delta\lambda$) scaled to the rate of habitat loss (Δh) falls below -1% ($\Delta\lambda/\Delta h \leq -0.01$). Habitat restoration was most effective for species with low-to-moderate edge sensitivities and in landscapes that had not previously experienced extensive fragmentation. To stabilize populations of species that were highly edge sensitive or any species in heavily fragmented landscapes, restoration needed to be initiated long before the vulnerability threshold was reached. In practice, habitat restoration is generally not initiated until a population is at risk of extinction, but our model results demonstrate that some populations cannot be recovered at this point through habitat restoration alone. At this stage, habitat loss and fragmentation have seriously eroded the species' demographic potential such that halting population declines is limited more by demographic factors than the amount of available habitat. Evidence that populations decline in response to habitat loss is thus not sufficient to conclude that habitat restoration will be sufficient to rescue declining populations. ©2005 Society for Conservation Biology.

2011. **Desert water harvesting to benefit wildlife: A simple, cheap, and durable sub-surface water harvester for remote locations.**
Rice, W. E.
Environmental Monitoring and Assessment 99(1-3): 251-257. (2004)
NAL Call #: TD194.E5; ISSN: 01676369.
Notes: doi: 10.1007/s10661-004-4030-6.
Descriptors: appropriate technology/ micro-catchment/ water conservation/ water harvester (guzzler)/ crops/ harvesters/ irrigation/ pipe/ polyvinyl chlorides/ precipitation (meteorology)/ desert water harvesting/ drinking trough/ drip irrigation/ mean annual precipitation (MAP)/ surface waters/ appropriate technology/ arid environment/ water management/ water supply/ wildlife management/ water availability/ water management/ farm crops/ harvesting/ irrigation/ piping/ polyvinyl chloride/ precipitation/ storage tanks/ Idaho/ Animalia/ Artemisia tridentata/ Aves

Abstract: A sub-surface desert water harvester was constructed in the sagebrush steppe habitat of south-central Idaho, U.S.A. The desert water harvester utilizes a buried micro-catchment and three buried storage tanks to augment water for wildlife during the dry season. In this region, mean annual precipitation (MAP) ranges between about 150-250 mm (6”-10”), 70% of which falls during the cold season, November to May. Mid-summer through early autumn, June through October, is the dry portion of the year. During this period, the sub-surface water harvester provides supplemental water for wildlife for 30-90 days, depending upon the precipitation that year. The desert water harvester is constructed with commonly available, "over the counter" materials. The micro-catchment is made of a square-shaped, 20 mL. "PERMALON" polyethylene pond liner (approximately 22.9 m × 22.9 m = 523 m^2) buried at a depth of about 60 cm. A PVC pipe connects the harvester with two storage tanks and a drinking trough. The total capacity of the water harvester is about 4777 L (1262 U.S. gallons) which includes three underground storage tanks, a trough and pipes. The drinking trough is refined with an access ramp for birds and small animals. The technology is simple, cheap, and durable and can be adapted to other uses, e.g. drip irrigation, short-term water for small livestock, poultry farming etc. The desert water harvester can be used to concentrate and collect water from precipitation and run-off in semi-arid and arid regions. Water harvested in such a relatively small area will not impact the ground water table but it should help to grow small areas of crops or vegetables to aid villagers in self-sufficiency.

2012. **Designs for protecting amphibians in managed headwater forests in the U.S. Pacific Northwest.**
Olson, Deanna H.; Rugger, Cynthia; and Rundio, David
Northwestern Naturalist 87(2): 181. (2006)
NAL Call #: QL671.M8; ISSN: 1051-1733.
Notes: 2006 Annual Meetings of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society, held jointly at Evergreen State College, Washington, March 27-April 1, 2006.
Descriptors: Abies spp./ Douglas fir/ forests/ treatment/ thinning/ amphibians/ habitat/ Pacific Northwest
Abstract: Headwaters comprise the majority of US Pacific Northwest forest landscapes, and harbor a diversity of endemic species. Thinning of young managed stands is being used on federal lands for wood production, fuels reduction to reduce risk of severe fire, and accelerated development of late-successional forest conditions. Thinning with headwater-stream riparian buffers and upslope-leave islands holds promise for species retention. Specifically, our research examines the effects on instream, bank-dwelling, and upslope amphibians of four riparian buffer widths (6, 15, 70, and 145 m on each side of streams) and three sizes of upslope leave islands (0.1, 0.2, and 0.4 ha circular patches) within a thinned forest matrix (50 to 80 y), which reduced Douglas- fir stands from about 600 trees ha (tph) to 200 tph. Instream amphibians were not affected by joint buffers and upslope thinning in years first and second post-treatment, while some effects were seen on bank and thinned upslope salamander species abundances. Larger leave islands retained habitats and fauna. We are tracking stream species' responses through year five post-thinning and propose to follow the study through a second entry of thinning, reducing stands to about 80 tph.

2013. **Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90.**
Hoffman, R. J.
Denver, Colo.: U.S. Geol. Survey, Earth Science Information Center, 1994. USGS Water-Resources Investigations Report.
NAL Call #: GB701.W375 no.92-4024C
Descriptors: wetlands/ wildlife habitats/ water quality/ irrigation effects/ public health/ contamination/ toxicity/ heavy metals/ agricultural hydrology/ aquatic life/ bioaccumulation/ water pollution effects/ Nevada/ Stillwater Wildlife Management Area
Abstract: This report presents a summary of the detailed scientific study of Stillwater Wildlife Management Area and other nearby wetlands in west-central Nevada during 1987-90. The work was funded by the National Irrigation Water Quality Program of the U.S. Department of the Interior with the overall objectives of determining (1) the extent, magnitude, and effects of selected water-quality constituents associated with irrigation drainage on fish, wildlife, and human health, and (2) the sources and exposure pathways that cause contamination where adverse effects are documented. Much of the information in this report was summarized from two previously published interpretive reports that were completed to fulfill study objectives. Where applicable, data for the study area from other published sources also were utilized. The results of these studies indicate that the aquatic biota in natural wetlands of the Carson Desert are adversely affected by hydrological and geochemical sources and processes in the Newlands Irrigation Project area. Reactions between water and naturally occurring minerals in the shallow alluvial aquifer increase concentrations of potentially toxic constituents in ground water that eventually enters the wetlands. Once in the wetlands, these constituents are further concentrated by evaporation and transpiration. Water from some agricultural drains that enter Stillwater WMA was acutely toxic to aquatic organisms. The drains in the agricultural areas, which eventually discharge to the wetlands, were also implicated as sites of uptake of selenium and mercury by aquatic organisms.

2014. **Detailed study of irrigation drainage in and near wildlife management areas, west-central Nevada, 1987-90 - Part B: Effect on biota in Stillwater and Fernley Wildlife Management Areas, and other nearby wetlands.**
Hallock, R. J. and Hallock, L. L.
Denver, Colo.: U.S. Geological Survey; Water Resources Investigation Report: 92-4024B, 1993.
Descriptors: wetlands/ water pollution effects/ toxicity/ selenium/ dissolved solids/ water quality/ waterfowl/ water control/ wildlife/ irrigation/ drainage/ pollution effects/ Nevada/ Stillwater

Abstract: A water-quality reconnaissance study during 1986-87 found high concentrations of several potentially toxic elements in water, bottom sediment, and biota in and near Stillwater Wildlife Management Area (WMA). This study prompted the U.S. Department of the Interior to initiate a more detailed study to determine the hydrogeochemical processes that control water quality in the Stillwater WMA, and other nearby wetlands, and the resulting effects on biota, especially migratory birds. Present wetland size is about 10% of historical size; the dissolved-solids load in the water in these now-isolated wetlands has increased only moderately, but the dissolved-solids concentration has increased more than seven-fold. Wetland vegetation has diminished and species composition in flow water has shifted to predominant salt-tolerant species in many areas. Decreased vegetative cover for nesting is implicated in declining waterfowl production. Decreases in numbers or virtual absence of several wildlife species are attributed to degraded water quality. Results of toxicity tests indicate that water in some drains and wetland areas is acutely toxic to some fish and invertebrates. Toxicity is attributed to the combined presence of arsenic, boron, lithium, and molybdenum. Biological pathways are involved in the transport of mercury and selenium from agricultural drains to wetlands. Hatch success of both artificially incubated and field-reared duck eggs was greater than/= 90 percent; no teratogenesis was observed. Mercury in muscle tissue of waterfowl harvested from Carson Lake in October 1987 exceeded the human health criterion six-fold.

2015. **Detailed study of selenium and selected elements in water, bottom sediment, and biota associated with irrigation drainage in the middle Green River Basin, Utah, 1988-90.**
Stephens, D. W.; Waddell, B.; Peltz, A.; and Miller, J. B.
Denver, Colo.: U.S. Geological Survey; Water-Resources Investigations Report 92-4084, 1992. 164 p.
Descriptors: wetlands/ bioaccumulation/ drainage water/ selenium/ water pollution effects/ water pollution sources/ ducks/ irrigation/ water birds/ waterfowl/ wildlife habitats
Abstract: Studies completed at Stewart Lake Waterfowl Management Area, lower Ashley Creek, Ouray National Wildlife Refuge, and Pariette Wetlands, Utah identified several areas where selenium was adversely affecting water quality and creating a hazard to wildlife. The source of contamination at Stewart Lake is drainwater and shallow groundwater from soils derived from Mancos Shale. Median concentrations of selenium in all drainwater discharged to Stewart Lake exceeded the State standard of 5 microg/L established for wildlife protection. Selenium concentrations i all biological tissues sampled at Stewart Lake Waterfowl Management Area were large compared to concentrations in biota from most other sites in the middle Green River basin. Selenium concentrations in Ashley Creek upstream of the City of Vernal generally were less than 1 microg/L but 12 miles downstream averaged 73 microg/L. The source of the contamination was believed to be from inflows of shallow groundwater and surface water originating as seepage from a sewage-lagoon system that flows through Mancos Shale and mobilizes selenium. Waterfowl from the area contained selenium concentrations as large as 27.2 microg/g in muscle tissue, and an eared grebe egg contained 71 microg/g. Selenium contamination of ponds at Ouray National Wildlife Refuge was limited to a small area on the western part of the refuge and was apparently due to seepage of shallow groundwater into waterfowl ponds. Geometric mean concentrations of selenium in plants, invertebrates, bird eggs, and fish from the North and South Roadside Ponds were larger than concentrations known to cause reproductive failure in mallards. (USGS)

2016. **The development of bottomland forest restoration in the lower Mississippi River Alluvial Valley.**
Hayes, R. J.
Ecological Restoration 22: 170-182. (Sept. 2004)
Descriptors: lowland forests/ ecological restoration/ reforestation/ land use/ wetlands/ hardwood/ trees/ forest habitats/ forest policy/ history/ planting/ forest ecology/ forest wildlife relations/ forest management/ silvicultural practices/ Mississippi River/ United States, southeastern region/ plant ecology/ aquatic biology and ecology general/ animal ecology and behavior/ forest management/ land resources
This citation is from AGRICOLA.

2017. **Directing spatial patterns of recruitment during an experimental urban woodland reclamation.**
Robinson, G. R. and Handel, S. N.
Ecological Applications 10(1): 174-188. (2000)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: clonal growth/ dispersal/ experimental reclamation/ nucleation/ safe sites/ seed sources/ spatial pattern/ surrounding landscape/ habitat restoration/ nucleation/ recruitment/ restoration ecology/ seed dispersal/ spatial analysis/ woodland/ United States
Abstract: Studies of biological invasions indicate that natural recruitment of new species can occur as a 'nucleation' phenomenon, in which scattered colonization foci spread and coalesce. Ecological reclamation of damaged lands might make use of this potential for enhanced natural dispersal, by inoculating sites with multiple small plantings to attract animal dispersers and other mutualists from nearby remnants of natural habitat. We conducted an experimental test of this proposition. On a 6-ha section of an abandoned municipal landfill in the New Jersey Meadowlands, we installed 16 clusters of 21 trees and shrubs in an array of fenced plots. Clusters contained seven native species known to: (1) attract bird dispersers to introduce propagules from remnants of off-site habitat; (2) contribute propagules by virtue of high reproductive output and clonal growth; and (3) accelerate woodland succession on open, degraded habitats. Average plant size was varied, with half the plots receiving larger trees and shrubs, to test whether woody plant size would enhance any attractive function. An additional eight empty plots were studied to estimate background rates of recruitment and to test for a fencing effect. Site preparation included the addition of 90 cm of fresh substrate, including organic matter, and a cover crop of annual grasses. Recruitment of woody plants inside and surrounding the experimental plots was examined for five years, and results were compared on the basis of treatment and recruitment mode (avian, wind, or clonal dispersal). Woody plant recruitment into experimental plots was rapid and substantial, primarily via dispersal from natural sources. Plots with larger plants attracted significantly more recruits

at the outset, but this difference diminished over time. Fall seed rain samples yielded a mean estimate of 426 seeds/m^2 within plots. However, size distributions of recruiting woody species increasingly shifted toward larger individuals each year. Experimental manipulations that opened seed beds for woody plant recruitment had short-lived effects, indicating a narrow window of opportunity for establishment. Spread of the planted species themselves was generally weak, although clonal growth contributed substantially to spread on the margins of plots. Most recruitment outside experimental plots was from external sources. A strong proximity component was found for bird-dispersed recruits, which were highly clustered near planted plots, with the highest densities near source populations on the site margin. Wind-dispersed trees and shrubs, by contrast, were not associated with planted plots and were concentrated near one corner of the site. Discounting plot interiors, total recruitment density for the site after 5 yr was ~800 woody stems/ha, 36% via avian dispersal, 10% via clonal spread, and the remainder via wind-borne propagules. New recruits represented 26 woody plant species, all but four from external sources, and only five common species contributed more than a few recruits. We conclude that techniques for manipulating natural seed dispersal hold promise for ecological restoration, provided that background populations are available to supply colonists.

2018. **Distinctiveness, use, and value of Midwestern oak savannas and woodlands as avian habitats.**
Grundel, Ralph and Pavlovic, Noel B.
Auk 124(3): 969-985. (2007)
NAL Call #: 413.8 AU4 ; ISSN: 0004-8038
Descriptors: terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ forest habitat/ migration/ woodland/ vegetation gradient/ oak savanna
Abstract: Oak savannas and woodlands historically covered millions of hectares in the midwestern United States but are rare today. We evaluated the ecological distinctiveness and conservation value of savannas and woodlands by examining bird distributions across a fire-maintained woody-vegetation gradient in northwest Indiana encompassing five habitats-open habitats with low canopy cover, savannas, woodlands, scrublands, and forests-during migration, breeding, and overwintering. Savannas and woodlands were significantly different in overall bird species composition from open and forest habitats but were often intermediate between open and forest in guild densities. Few bird species were consistently and highly concentrated in savannas or woodlands, and the Red-headed Woodpecker (Melanerpes erythrocephalus) was the only species significantly more abundant in savannas and woodlands than in open, scrub, and forest habitats. Fire frequency over a 15-year interval was a significant predictor of bird community composition and was positively related to species diversity, spring transient migrant density, and density of the most threatened species. Each habitat type had characteristics potentially important for avian conservation. Scrub had the highest density of transient migrants, which suggests it plays an important role as migration stopover habitat. More species were significantly concentrated in open or forest habitats than in the other habitats. Lack of species concentration and intermediate community composition suggested that birds experienced savannas and woodlands more as ecotones than as habitats distinct from forests or grasslands. However, this intermediate character can benefit conservation, as evidenced by savannas and woodlands having the highest density of the most threatened species along this woody-vegetation gradient.

2019. **Distribution and composition of mammalian predators along the Snake River in southwestern Idaho.**
Zoellick, B. W.; Ulmschnelder, H. M.; and Stanley, A. W.
Northwest Science 79(4): 265-272. (2005)
NAL Call #: 470 N81; ISSN: 0029344X
Descriptors: mammals/ birds/ predators/ nesting/ habitat management/ reduced river flows
Abstract: In 1990-1992, we studied the distribution and composition of a mammalian predator community to assess its potential to impact ground-nesting waterfowl and songbirds on Snake River islands in Deer Flat National Wildlife Refuge in southwestern Idaho. We used scent-station and track-plot surveys to examine visits of mammalian predators to riparian areas on the mainland and to 30 Refuge islands on a 64-km reach of the river. Coyotes, mink, red foxes, raccoons, and striped skunks were widely distributed. Visitation rates of mammalian predators that frequently visited scent stations (coyotes, red foxes, striped skunks, and feral cats) did not differ among upper, middle, and lower segments of the study reach. Tracks of river otters were primarily observed on the upper two-thirds of the study reach that had less agricultural development. Badgers, bobcats, and mountain lions were infrequently detected. Refuge islands provided relatively mammalian predator-free habitat for nesting birds as visitation rates of terrestrial predators to scent stations and track plots in riparian areas on the mainland were generally 2-4 times those on islands at river flows of 184.1 m3/s. Reducing Snake River flows has the potential to increase visits to islands of four terrestrial carnivores (coyotes, raccoons, red foxes, and striped skunks) that were widely distributed on the mainland and important predators of nesting waterfowl. Because mammalian predators were widely distributed, management actions to prevent or reduce predator visits would need widespread application to result in more than localized increases in waterfowl production on Refuge islands.

2020. **Distribution of bats in fragmented wetland forests of southeast Missouri.**
Warwick, Adam; Fredrickson, Leigh H.; and Heitmeyer, Mickey
Bat Research News 42(4): 187. (2001)
NAL Call #: QL737.C5 B328; ISSN: 0005-6227
Descriptors: bottomland hardwood forests/ bats/ Mississippi Alluvial Valley/ remnant forests/ habitat management
Abstract: Bottomland Hardwood wetlands in the Mississippi Alluvial Valley (MAV) were gradually converted to row crops beginning in the mid-1800's. Among states with wetland forests in the MAV, Missouri has the most severe losses and modifications with about 40,000 ha of the original one million ha remaining as small patches of remnant forests in nine southeastern countries. Little is known about remnant

wildlife populations within this highly fragmented landscape and foremost among these taxa is the order Chiroptera. Bats play an important role in bottomland forests as prey for snakes, hawks, owls, skunks, and opossums. Furthermore, bats serve agriculture by controlling common crop pests. We report on the abundance and species richness of bats in three landscapes of varying amounts of forest cover. We also report on the distribution of bats among natural forest remnants, and sites with agroforestry, buffer strips, and windbreaks. The first field season of 5500 net hours and 200 detector hours has revealed that landscapes with medium forest cover are used the most by bat species, with the highest abundance and species richness occurring in buffer strips and natural forest patches. Species of concern such as Myotis sodalis and M. grisescens have been documented on some study sites. In addition, male little brown bats M. lucifugus have been encountered in multiple forest patches, implicating bottomland hardwood forests as important summer habitat. These results are essential to develop landscape-level predictions of bat abundance and species richness in relation to forest cover and habitat type in disrupted floodplain systems.

2021. **Diversity of neotropical migratory landbird species assemblages in forest fragments and man-made vegetation in Los Tuxtlas, Mexico.**
Estrada, A. and Coates-Estrada, R.
Biodiversity and Conservation 14(7): 1719-1734. (2005)
NAL Call #: QH75.A1B562; ISSN: 09603115.
Notes: doi: 10.1007/s10531-004-0696-x.
Descriptors: agricultural habitats/ avian diversity/ forest fragmentation/ Los Tuxtlas/ Mexico/ neotropical migrant birds/ forest/ habitat fragmentation/ migratory species/ species diversity/ Veracruz/ Aves/ Capsicum frutescens/ citrus/ Pimenta dioica/ Theobroma cacao/ Zea mays
Abstract: We investigated the presence of Neotropical migratory landbirds in a 90-km^2 landscape in the region of Los Tuxtlas, Veracruz, Mexico. Using the fixed-radius count point procedure, migratory landbirds were surveyed in 21 forest fragments and in four replicates of shaded (coffee, cacao and mixed) and unshaded (citrus and allspice) plantations, live fences, non-arboreal crops (corn and jalapeno chili pepper) and pastures. The surveys resulted in the count of 4732 birds representing 72 species. While forest fragments accounted for 65% of the total species count, 73% of the birds were counted in the arboreal man-made habitats. Pastures contributed to 10% of the species and to 1% of the individuals counted. Live fences were particularly rich in individuals, accounting for 28% of the birds counted. Rarefaction analysis showed that forest fragments were the sites richest in species, followed by shaded and unshaded plantations and by live fences. Pastures were the habitats poorest in species, followed by non-arboreal crops. Species richness of Neotropical migratory landbirds was associated to vertical and horizontal diversity of vegetation in the habitats investigated. Shaded and unshaded plantations as well as live fences were more similar to forest fragments in species assemblages than non-arboreal crops and pastures. We discuss the conservation value of arboreal agricultural habitat and of live fences in conjunction with forest fragments as temporary habitats for Neotropical migratory landbirds that stop over or winter in Los Tuxtlas. © Springer 2005.

2022. **Does mallard clutch size vary with landscape composition?**
Ball, I. J.; Artmann, M. J.; and Hoekman, S. T.
Wilson Bulletin 114(3): 404-406. (2002)
NAL Call #: 413.8 W692; ISSN: 00435643
Descriptors: arable land/ clutch size/ grassland/ landscape structure/ waterfowl/ United States/ Anas platyrhynchos
Abstract: We studied Mallards (Arias platyrhynchos) nesting in artificial nesting structures in northeastern North Dakota and compared clutch size between landscapes where proportion of cropland was either high (mean = 68.9%, cropland landscapes) or low (mean = 30.2%, grassland landscapes). Mallard clutch size was significantly related to nest initiation date and landscape composition. Mean clutch size, controlled for nest initiation date, was 1.24 ± 0.33 SE eggs smaller on cropland landscapes than on grassland landscapes. Generality of this pattern across space, time, and type of nesting sites is unknown, as is causation. Demographic importance of variation in clutch size may be influenced by covariation with other demographic variables, such as nest success and abundance of breeding pairs, which also are negatively correlated with landscape proportion of cropland. We suggest that researchers examine relationships between clutch size and landscape composition in both structure-nesting and ground-nesting Mallards, in other geographic areas, and in other duck species.

2023. **Dry creek long-term watershed study: The effects of harvesting in streamside management zones and adjacent uplands of riparian corridors on avian communities in the coastal plain of Georgia.**
Grooms, Merideth P.; Lanham, J. Drew; and Wigley, T. Bently
In: Proceedings of the 13th Biennial Southern Silvicultural Research Conference, General Technical Report-SRS 92/ Connor, Kristina F.; Asheville, NC: Southern Research Station, Forest Service, U.S. Department of Agriculture, 2006. pp. 21-25.
http://www.treesearch.fs.fed.us/pubs/23305
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ land zones/ Aves: forestry/ riparian corridor tree harvesting/ community structure/ habitat management/ riparian corridors/ tree harvesting/ forest and woodland/ Georgia/ Southlands Forest/ birds/ chordates/ vertebrates
Abstract: We evaluated the effects of Best Management Practices (BMPs) harvesting on avian communities associated with headwater streams in the Georgia Coastal Plain. Two watersheds served as references, with no timber harvesting, and two treatment watersheds were clearcut with retention of Streamside Management Zones (SMZs) according to Georgia BMPs for forestry. Bird communities were surveyed in each watershed before and after harvest by variable-distance transect surveys. The bird community surveyed in each watershed was divided into foraging, nesting, and disturbance guilds. A Partners In Flight (PIF) composite score-based index was used to calculate the

conservation value (CV) of those communities. Among variables measured, disturbance guilds showed the most apparent response to harvesting. This response, considered in the context of the CV index response, indicated that there was some changeover from high priority disturbance-sensitive species to moderate/high priority disturbance-tolerant species resulting from harvesting. We recommend the use of PIF scores and associated CV indexes along with other bird community variables in investigations of the value of SMZs for songbirds.

2024. **Ecological approaches to reduce predation on ground-nesting gamebirds and their nests.**
Jimenez, J. E. and Conover, M. R.
Wildlife Society Bulletin 29(1): 62-69. (2001)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: avian recruitment/ ducks/ ground-nesting birds/ integrated pest management/ predation/ predator-prey interactions/ wildlife damage management/ anthropogenic effect/ gamebird/ management practices/ predation/ predation risk
Abstract: In human-modified environments, high predation rates on ground-nesting birds and their eggs can be a serious problem. We reviewed the literature to determine the effectiveness of ecological approaches to improve recruitment of ground-nesting birds. Ecological approaches reduce predation rates by modifying natural interactions among predators, prey, and their habitats. These approaches include modification of the predator community, associational defense, use of alternative prey, and habitat or landscape manipulation. These techniques can be applied successfully only under limited conditions and for a specific array of species. Because of this, no management practice is uniformly better than another to increase avian recruitment; different techniques are complementary rather than exclusive. Managers need to select the best technique(s) based on the predator community, local topography, size of the area, the avian species in need of protection, and economics.

2025. **Ecological restoration on Area C of the James K. Herbert Wetland Prairie Preserve, Tulare County.**
Kamansky, Bobby; Herbert, James K.; Hansen, Robert B.; and Combs, Carole K.
Grasslands 14(4): 1, 8-10. (2004); ISSN: 1540-6857
Descriptors: biogeography: population studies/ terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ Sequoia Riverlands Trust/ wildlife conservation board/ floodplain management/ grassland vegetation/ habitat restoration/ seasonal wetlands/ vegetation management/ water quality/ wildlife enhancement/ wildlife habitat

2026. **Ecological restoration on Area C of the James K. Herbert Wetland Prairie Preserve, Tulare County, Part II: Three-year Project Report.**
Kamansky, Bobby; Hansen, Robert B.; and Combs, Carole K.
Grasslands 16(2): 6-9. (2004); ISSN: 1540-6857.
http://www.cnga.org/library/journal/pdfs/GrasslandsSpring06.pdf
Descriptors: biogeography: population studies/ terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ Sequoia Riverlands Trust/ wildlife conservation board/ floodplain management/ grassland vegetation/ habitat restoration/ seasonal wetlands/ vegetation management/ water quality/ wildlife enhancement/ wildlife habitat

2027. **Ecology and management of scrub-shrub birds in New England: A comprehensive review.**
Schlossberg, S. and King, D. I., 2007. 120 pp.
Notes: Submitted to the USDA Natural Resources Conservation Service, Resource Inventory and Assessment Divisions.
ftp://ftp- fc.sc.egov.usda.gov /NHQ/nri/ceap/schlossbergkingreport.pdf
Descriptors: scrub-shrub habitats/ New England/ breeding birds/ early successional habitats/ habitat management/ wildlife management
Abstract: Scrub-shrub habitats in New England contain a diverse and varied breeding bird community. For instance, a shrubby power line corridor may hold Chestnut-Sided Warblers and Eastern Towhees. Clearcuts in coniferous forests may harbor White-throated Sparrows and Magnolia Warblers, and shrubby wetlands may have breeding Wilson’s Snipe and Yellow Warblers. Some shrubland birds, like Golden-winged Warbler and Mourning Warbler, nest only in early successional habitats and are rarely found in forests. Others, such as Northern Cardinal or Carolina Wren will breed in closed forests with a shrubby understory. To manage this diverse assemblage of birds and their habitats, it is important to know just what species would actually benefit from the creation of scrub-shrub habitat and which would not. Here, we develop a list of core species breeding in New England shrublands. This list serves as a basis for the literature review and management recommendations that follow. The scope of this review is the six states of New England -- Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine. As mentioned above, the scrub-shrub bird community varies substantially across this region, and we will emphasize these differences throughout this report.

2028. **Economic evaluation of on-farm conservation practices in the Great Lakes region of North America.**
Stonehouse, D. P.
Environmetrics 10(4): 505-520. (1999); ISSN: 1180-4009.
Notes: Conference: Environmental Statistics: Proceedings of the Conference on Environmetrics, Innsbruck (Austria), 4-8 Aug 1997.
Descriptors: soil conservation/ farms/ cost benefit analysis/ benefits/ economic aspects/ water quality/ agricultural practices/ degradation/ wildlife habitats/ social aspects/ agriculture/ nature conservation/ costs/ riparian vegetation/ pollution control/ soil erosion/ water quality control/ environmental protection/ socioeconomics/ North America/ Great Lakes/ environmental action
Abstract: Agriculture has long been regarded as a major contributor to wildlife habitat despoliation, soil degradation, and downstream watercourse pollution. It would be possible to largely eliminate natural resource degeneration through judicious application of on-farm conservation practices. Farmers have little economic incentive to conserve because, according to previous research, most conservation techniques have been demonstrated to be

unprofitable. The empirical research into three alternative types of conservation practices for this study confirms that two (conservation crops and riparian buffer strips) provide for net costs to farmers, and that the third (conservation soil tillage) is not profitable under all circumstances. At the same time, the research shows that two out of the three sets of practices, namely riparian buffer strips and conservation tillage, can be economically beneficial to society as a whole. This raises the question of whether and to what extent society, as economic gainers, should offer compensation to farmers as economic losers. This study furthermore establishes that not all conservation practices that result in reduced soil erosion will lead to decreased sediment and phosphorus loadings into watercourses; that not all reduced sediment and phosphorus loadings lead to improved water quality; and that, even where an improvement to water quality in chemical, physical, biological and aesthetic terms can be obtained, the costs to society of achieving improvement may exceed the economic benefits. Such outcomes can readily promote disagreements between environmentalists and ecologists on the one hand and socio-economists on the other.

2029. **Economic value of big game habitat production from natural and prescribed fire.**
Gonzalez-Caban, Armando; Loomis, John B.; Griffin, Dana; Wu, Elen; McCollum, Daniel; McKeever, Jane; and Freeman, Diane Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; Research Paper-PSW 249, 2003. 38 p.
Notes: Pacific Southwest Research Station
Research Paper 249.
http://www.treesearch.fs.fed.us/pubs/6907
Descriptors: contingent valuation/ deer hunting benefits/ fire economics/ prescribed burning costs/ travel cost method/ willingness-to-pay
Abstract: A macro time-series model and a micro GIS model were used to estimate a production function relating deer harvest response to prescribed fire, holding constant other environmental variables. The macro time-series model showed a marginal increase in deer harvested of 33 for an increase of 1,100 acres of prescribed burn. The marginal deer increase for the micro GIS model was 16. An additional 3,710 acres of prescribed burn would produce an additional eight deer harvested regardless of the model. For an additional 3,700 acres more of prescribed burn the marginal increase in deer harvested is four and five deer respectively for the macro time-series and micro GIS models. Using the Travel Cost Method the change in consumer surplus or net willingness-to-pay was $257 per additional deer harvested due to the additional trips in response to increasing deer harvest. The consumer surplus estimate using the Contingent Valuation Method was $222. Depending on the production function model used the initial deer hunting benefit response to a prescribed burning of 1,100 acres ranges from $3,840 to $7,920. An additional increase of 3,710 acres of prescribed burning would produce benefits of $1,920 regardless of the model used. An extra 3,700 acres more would produce only between $960 and $1,200 depending on the model. When compared to the cost of conducting the prescribed burning, the benefits derived from an increase in deer harvest represent no more than 3.4 percent of the total costs of the first 1,100 acres.
This citation is from Treesearch.

2030. **Edge- and area-sensitivity of shrubland birds.**
Rodewald, A. D. and Vitz, A. C.
Journal of Wildlife Management 69(2): 681-688. (2005)
NAL Call #: 410 J827; ISSN: 0022541X.
Notes: doi: 10.2193/0022-541X(2005)069
[0681:EAAOSB]2.0.CO;2.
Descriptors: area sensitivity/ birds/ clearcut/ early-successional forest/ edge/ forest management/ shrubland/ avifauna/ forest edge/ habitat management/ habitat use/ patch size/ sensitivity analysis/ shrubland/ North America/ Ohio/ United States/ Arthropoda/ Aves/ Dendroica discolor/ Icteria virens/ Passerina cyanea/ Spizella pusilla/ Vermivora pinus
Abstract: Populations of shrubland birds in eastern North America have consistently declined since the 1960s, but conservation is hampered by an inadequate understanding of the area requirements of most species. We examined the sensitivity of shrubland specialists to (a) the area of shrub stands and (b) proximity to mature-forest edges, and we evaluated whether habitat characteristics, food resources, or productivity of bird populations could have caused the relationships we identified. In 2002-2003, we used constant-effort mist-netting on 6 small (4-8 ha) and 6 large (13-16 ha) regenerating clearcuts that were 4-6 years post-harvest in southern Ohio, USA. We placed 3 nets at 20, 50, and 80 m from the mature-forest edge (n = 9 nets per site), and we sampled vegetation, fruit, and arthropods at each net. Seven of 8 shrubland specialists, particularly blue-winged warbler, prairie warbler, yellow-breasted chat, indigo bunting, and field sparrow, avoided mature-forest edges, with twice as many birds caught 80 m from edges compared to 20 m. Abundances of most species, especially yellow-breasted chats, were positively correlated with area, though the combined area effect was not statistically significant. We found no evidence of reduced avian productivity in small stands. Neither area nor edge was associated with habitat characteristics, fruit abundance, or arthropod biomass. Our results suggest shrubland birds avoid habitat edges. Thus, small or narrow cuts may not provide optimal habitat for this suite of declining species, and managers should consider options to minimize edge and provide larger patches of shrubland habitats in landscape-scale planning efforts.

2031. **Effect of anthropogenic disturbance and landscape structure on body size, demographics, and chaotic dynamics of Southern High Plains amphibians.**
Gray, Matthew James. Texas Tech University, 2002.
Notes: Advisor: Smith, Loren M.
Descriptors: amphibians/ wetlands/ playas/ prairies/ meadows/ precipitation/ rain/ habitat restoration/ body-size/ lowlands
Abstract: Amphibian populations are declining globally. Anthropogenic disturbance of landscapes surrounding wetlands may affect fitness, demographics, and dynamics of amphibian populations. Spatial positioning and relative connectedness of wetlands also may influence population demographics. Thus, I examined the effect of anthropogenic landscape use (cultivation vs. grassland)

and structure on postmetamorphic body size (a fitness correlate), demographics, and dynamics of amphibians at 16 playa wetlands on the Southern High Plains (SHP) of Texas during 1999 and 2000. Amphibian populations were monitored using drift fence and pitfall traps, landscape structure was quantified using spatial analysis software, and dynamics were assessed using difference equations. Postmetamorphic body size of all amphibian species and age classes generally was greater at grassland than cropland playas, and in 1999 (i.e., a wetter year) than 2000. Abundance of New Mexico and plains spadefoots (Spea multiplicata and S. bombions) generally was greater at cropland than grassland playas, and greater for barred tiger salamanders (Ambystoma tigrinum mavortium) in 1999 than 2000. Mean daily abundance of amphibians also was positively related to landscape structure indices representing geometric complexity and spatial positioning of wetlands. In general, as landscapes became more complex (e.g., numbers of edges increased) and inter-playa distance decreased, mean daily abundance of amphibians increased. Additional demographic analyses indicated that temporal niche partitioning existed in SHP amphibian populations; however, no differences existed between landuses. Lastly, biological chaos in the amphibian assemblage existed at 1 of 8 cropland and 7 of 8 grassland playas. A stochastic density-dependent Ricker function predicted chaotic dynamics most accurately. Anthropogenic disturbance surrounding wetlands affects body size, demographics, and dynamics of SHP amphibians. Spatial positioning of wetlands and landscape complexity may be as or more important than general landuse in affecting amphibian demographics. Annual differences in body size and abundance suggest rainfall may be important in influencing amphibian populations. Although spadefoot abundance was positively influenced by anthropogenic disturbance, I recommend retention and restoration of grasslands surrounding playa wetlands because landscape cultivation decreased body size and altered amphibian demographics and dynamics from an undisturbed state. These results have important implications in conservation biology, landscape ecology, and basic ecological and mathematical theory.

2032. **The effect of supplemental prey and prescribed fire on success of artificial nests.**
Jones, D. D.; Conner, M. L.; Warren, R. J.; and Ware, G. O.
Journal of Wildlife Management 66(4): 1112-1117. (2002)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: alternative prey/ artificial nest/ compensatory predation/ Georgia/ nest predation/ nest success/ predation management/ prescribed fire/ supplemental prey/ artificial nest/ nest predation/ nesting success/ prescribed burning
Abstract: Nest predation hinders recruitment of avian species and may be affected by availability of alternative prey and amount of nesting cover. Therefore, we evaluated effects of food abundance (i.e., supplemental prey) and time since prescribed fire on nest success of artificial ground nests. We monitored the fate of 759 artificial ground nests from June to July 2000. No interaction (P = 0.74) occurred between fire and supplemental prey treatments. Nest success in prey-supplemented plots (37.6%) did not differ (P = 0.70) from control plots (44.9%), and nest success in burned plots (41.8%) did not differ (P = 0.86) from nonburned plots (40.7%). Motion-sensitive cameras placed on feeders revealed that mesomammals accounted for >80% of visits to feeders, indicating that supplemental prey was detected and consumed by mesomammals. Nest predators differed as a function of food abundance, with combined avian and small-mammal predation being greater in prey-supplemented (46.5%) than in control (25.9%) plots. Nest predators also differed as a function of prescribed fire. Avian predation of nests was greater in burned (13.7%) than nonburned (9.9%) plots, whereas small-mammal predation was greater in non-burned (30.9%) than in burned (15.1%) plots. Altering food and cover to manage nest success may result in compensatory predation. Further work to quantify the extent of compensatory predation is needed to fully understand trade-offs of various practices for managing nest predation.

2033. **The effect of woodland proximity and wetland characteristics on larval anuran assemblages in an agricultural landscape.**
Babbitt, K. J.; Baber, M. J.; and Brandt, L. A.
Canadian Journal of Zoology 84(4): 510-519. (2006)
NAL Call #: 470 C16D; ISSN: 0008-4301
Descriptors: conservation measures/ nutrition/ diet/ prey/ ecology/ predators/ terrestrial habitat/ man-made habitat/ abiotic factors/ chemical factors/ physical factors/ land zones/ Anura: habitat management/ community structure/ piscean predators/ Gambusia holbrooki and Jordanella floridae/ Effect on community structure/ agricultural landscape/ semiaquatic habitat/ wetlands habitat characteristics/ agriculture landscape/ forest and woodland/ hardwood hammock patches/ proximity to wetland/ cultivated land habitat/ External pH/ depth/ water depth/ Florida/ Highlands County/ Pisces, Actinopterygii, Cyprinodontiformes, Cyprinodontidae/ amphibians/ chordates/ fish/ vertebrates
Abstract: Changes to landscapes for agricultural activities often result in reduction and fragmentation of forested habitat. Land conversion for cattle ranching in south-central Florida has resulted in increases in pasture land interspersed with remnant patches of hardwood hammock. To examine the importance of these hammocks to anurans, we sampled 78 seasonally inundated wetlands to examine the relative importance of proximity of hardwood hammock patches (>20 ha) and wetland characteristics and used generalized linear models to determine which factors had a significant effect on larval anuran species richness or abundance. Species richness was significantly influenced by pH, conductivity, and water depth. Proximity to hammock did not influence species richness; however, assemblage composition differed between wetlands near hammocks and wetlands surrounded by pasture. Barking treefrogs (Hyla gratiosa LeConte, 1856), pine woods treefrogs (Hyla femoralis Bose in Daudin, 1800), and oak toads (Bufo quercicus Holbrook, 1840) bred only in wetlands within 20, 50, and 200 m of hammocks, respectively. Factors influencing tadpole abundances were species-specific. Retention of seasonally inundated wetlands proximal to large hammocks on ranchlands can provide important habitat for supporting a diverse assemblage of anurans

2034. **Effectiveness of biodiversity indicators varies with extent, grain, and region.**
Hess, G. R.; Bartel, R. A.; Leidner, A. K.; Rosenfeld, K. M.; Rubino, M. J.; Snider, S. B.; and Ricketts, T. H.
Biological Conservation 132(4): 448-457. (2006)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/j.biocon.2006.04.037.
Descriptors: biodiversity hotspots/ extent/ grain/ indicator taxa/ scale
Abstract: The use of indicator taxa for conservation planning is common, despite inconsistent evidence regarding their effectiveness. These inconsistencies may be the result of differences among species and taxonomic groups studied, geographic location, or scale of analysis. The scale of analysis can be defined by grain and extent, which are often confounded. Grain is the size of each observational unit and extent is the size of the entire study area. Using species occurrence records compiled by NatureServe from survey data, range maps, and expert opinion, we examined correlations in species richness between each of seven taxa (amphibians, birds, butterflies, freshwater fish, mammals, freshwater mussels, and reptiles) and total richness of the remaining six taxa at varying grains and extents in two regions of the US (Mid-Atlantic and Pacific Northwest). We examined four different spatial units of interest: hexagon (~649 km^2), subecoregion (3800-34,000 km^2), ecoregion (8300-79,000 km^2), and geographic region (315,000-426,000 km^2). We analyzed the correlations with varying extent of analysis (grain held constant at the hexagon) and varying grain (extent held constant at the region). The strength of correlation among taxa was context dependent, varying widely with grain, extent, region, and taxon. This suggests that (1) taxon, grain, extent, and study location explain, in part, inconsistent results of previous studies; (2) planning based on indicator relationships developed at other grains or extents should be undertaken cautiously; and (3) planning based on indicator relationships developed in other geographic locations is risky, even if planning occurs at an equivalent grain and extent.

2035. **The effects of a vegetational corridor on the abundance and dispersal of insect biodiversity within a northern California organic vineyard.**
Nicholls, C. I.; Parrella, M.; and Altieri, M. A.
Landscape Ecology 16(2): 133-146. (2001)
NAL Call #: QH541.15.L35 L36; ISSN: 09212973.
Notes: doi: 10.1023/A:1011128222867.
Descriptors: biological control/ landscape ecology/ leafhoppers/ thrips/ vineyards/ biodiversity/ density gradient centrifugation/ egg/ environmental economics/ habitat/ parasitism/ predation/ riparian zone/ species abundance/ United States/ abundance/ dispersal/ habitat corridor/ insect/ landscape ecology/ spatial distribution
Abstract: During 1996 and 1997, two adjacent 2.5 has organic vineyard blocks (A and B) were monitored to assess the distributional and abundance patterns of the Western grape leafhopper Erythroneura elegantula Osborn (Homoptera: Cicadellidae) and its parasitoid Anagrus epos Girault (Hymenoptera: Mymaridae), Western flower thrips Frankliniella occidentalis (Pergande) and generalist predators. The main difference between blocks was that block A was cut across by a corridor composed of 65 flowering plant species which was connected to the surrounding riparian habitat, whereas block B had no plant corridor. In both years, leafhopper adults and nymphs and thrips tended to be more numerous in the middle rows of block A and less abundant in border rows close to the forest and corridor where predators were more abundant. The complex of predators circulating through the corridor moved to the adjacent vine rows and exerted a regulatory impact on herbivores present in such rows. In block B all insects were evenly distributed over the field, no obvious density gradient was detected from the edges into the center of the field. Although it is suspected that A. epos depended on food resources of the corridor, it did not display a gradient from this rich flowering area into the middle of the field. Likewise no differences in rates of egg parasitism of leafhoppers could be detected in vines near the corridor or in the vineyard center. The presence of riparian habitats enhanced predator colonization and abundance on adjacent vineyards, although this influence was limited by the distance to which natural enemies dispersed into the vineyard. However, the corridor amplified this influence by enhancing timely circulation and dispersal movement of predators into the center of the field.

2036. **The effects of adjacent land use on wetland amphibian species richness and community.**
Houlahan, J. E. and Findlay, C. S.
Canadian Journal of Fisheries and Aquatic Science 60(9): 1078-1094. (2003)
NAL Call #: 442.9 C16J; ISSN: 0706-652X
Descriptors: wetlands/ aquatic animals/ forests/ habitats/ land use/ marshes/ nature conservation/ nitrogen/ plant communities/ polluted water/ population density/ roads/ roots/ species richness/ vegetation types/ water pollution/ water quality/ animal communities
Abstract: Habitat destruction and fragmentation have been identified as possible causes of large-scale amphibian declines. Here, we examine the effects of adjacent land use and water quality on wetland amphibian species richness, abundance, and community composition in 74 Ontario wetlands. Species richness was positively correlated with wetland area, forest cover, and the amount of wetlands on adjacent lands and negatively correlated with road density and nitrogen levels. The land-use effects peak at 2000-3000 m. Amphibian abundance was positively correlated with forest cover, distance to wetlands >20 ha, and amount of marsh habitat and negatively correlated with road density. The effects of adjacent land use were strongest at around 200 m. Land-use and water quality effects varied widely across species, although most species are positively correlated with forest cover and amount of wetlands on adjacent lands and negatively correlated with road density and water quality. These results suggest that the effects of adjacent land use on amphibian communities can extend over comparatively large distances. As such, effective wetland conservation will not be achieved merely through the creation of narrow buffer zones between wetlands and intensive land uses, but rather will require maintaining a heterogeneous regional landscape containing relatively large areas of natural forest and wetlands.

2037. **Effects of agricultural cultivation on demographics of Southern High Plains amphibians.**
Gray, Matthew J.; Smith, Loren M.; and Brenes, Roberto
Conservation Biology 18(5): 1368-1377. (Oct. 2004)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: Amphibia/ farming and agriculture/ agricultural cultivation/ population responses/ community structure/ population density/ agricultural cultivation effects/ semiaquatic habitat/ Texas/ Southern High Plains/ population responses to agricultural cultivation/ playa wetlands
Abstract: Anthropogenic disturbance of landscapes surrounding wetlands is considered a factor in local and global amphibian declines. Few data exist on the effects of agricultural cultivation of wetland watersheds on amphibians, and results from previous studies are contradictory. Our objective was to test the effects of general anthropogenic land use (cultivation vs. grassland) on the demographics of seven species and three age classes of amphibians in the Southern High Plains of Texas. We partially enclosed 16 playa wetlands (4 per land use per year) with drift fences and pitfall traps and monitored relative daily abundance and diversity from 16 May to 17 October 1999 and 19 April to 18 August 2000. In general, relative abundance (i.e., average daily capture) of New Mexico and plains spadefoots (Spea multiplicata, S. bombifrons) was greater at cropland than grassland playas; the abundance of other species and diversity of the amphibian assemblage was not affected by land use. Also, abundance generally was greater in 1999 than 2000 for metamorph spadefoots and barred tiger salamanders (Ambystoma tigrinum mavortium). Differences in spadefoot abundance between land-use types may have been related to low species-specific vagility, resulting in increased nestedness within disturbed landscapes and reduced abundance of a potential keystone intraguild predator in cropland playas. The yearly difference in amphibian abundance was likely related to annual precipitation, which influenced wetland hydroperiod. Agricultural cultivation surrounding wetlands is associated with the increased abundance of some amphibian species, but other demographic and fitness parameters-such as temporal demographics, body size, and diet diversity-may be negatively affected.

2038. **Effects of agriculture on raptors in the western USA: An overview.**
Young, L. S.
In: Proceedings of the Western Raptor Management Symposium and Workshop.Boise, Idaho, USA.)
Pendleton, B. G. (eds.) Washington, D.C.: National Wildlife Federation;
pp. 209-218; 1989.
Notes: ISSN: 1044-4971; Institute for Wildlife Research, National Wildlife Federation, Scientific and Technical Series No. 12; xi + 317p.
Descriptors: prey density/ foraging/ environmental disturbances/ habitat preservation/ enhancement/ conservation programs/ education/ Farm Bill/ animals/ birds/ chordates/ nonhuman vertebrates/ vertebrates/ Conservation Resource management/ Agronomy

2039. **Effects of anthropogenic fragmentation and livestock grazing on western riparian bird communities.**
Tewksbury, Joshua J.; Black, Anne E.; Nur, Nadav; Saab, Victoria A.; Logan, Brian D.; and Dobkin, David S.
Studies in Avian Biology 25: 158-202 . (2002)
NAL Call #: QL671.S8; ISSN: 0197-9922
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ land zones/ Aves/ habitat fragmentation/ livestock grazing/ riparian communities/ farming and agriculture/ habitat management/ riparian habitats/ community structure/ United States, western/ birds/ chordates/ vertebrates
Abstract: Deciduous vegetation along streams and rivers provides breeding habitat to more bird species than any other plant community in the West, yet many riparian areas are heavily grazed by cattle and surrounded by increasingly developed landscapes. The combination of cattle grazing and landscape alteration (habitat loss and fragmentation) are thought to be critical factors affecting the richness and composition of breeding bird communities. Here, we examine the influence of land use and cattle grazing on deciduous riparian bird communities across seven riparian systems in five western states: Montana, Idaho, Nevada, Oregon and California. These riparian systems are embedded in landscapes ranging from nearly pristine to almost completely agricultural. We conducted landscape analysis at two spatial scales: local landscapes (all land within 500 m of each survey location) and regional landscapes (all land within 5 km of each survey location). Despite the large differences among riparian systems, we found a number of consistent effects of landscape change and grazing. Of the 87 species with at least 15 detections on two or more rivers, 44 species were less common in grazed sites, in heavily settled or agricultural landscapes, or in areas with little deciduous riparian habitat. The Veery (Catharus fuscescens), Song Sparrow (Melospiza melodia), Red-naped Sapsucker (Sphyrapicus nuchalis), Fox Sparrow (Passerella iliaca), and American Redstart (Setophaga ruticilla) were all less common under at least three of these conditions. In contrast, 33 species were significantly more common in one or more of these conditions. Sites surrounded by greater deciduous habitat had higher overall avian abundance and 22 species had significantly higher individual abundances in areas with more deciduous habitat. Yet, areas with more agriculture at the regional scale also had higher total avian abundance, due in large part to greater abundance of European Starling (Sturnus vulgaris), American Robin (Turdus migratorius), Brown-headed Cowbird (Molothrus ater), and Black-billed Magpie (Pica pica), all species that use both agricultural and riparian areas. Grazing effects varied considerably among riparian systems, but avian abundance and richness were significantly lower at grazed survey locations. Fifteen species were significantly less abundant in grazed sites while only five species were more abundant therein. Management should focus on (1) preserving and enlarging deciduous habitats, (2) reducing cattle grazing in deciduous habitats, and (3) protecting the few relatively pristine landscapes surrounding large deciduous riparian areas in the West.

2040. **Effects of clearcutting and natural regeneration on breeding bird communities of a baldcypress-tupelo wetland in South Carolina.**
Mitchell, Laura J.; Lancia, Richard A.; Lea, Russ; and Gauthreaux, Sidney A.
In: Proceedings of an International Symposium: Wetlands and River Corridor Management. Charleston, South Carolina. Kusler, Jon A. and Daly, Sally (eds.)
Berne, N.Y.: Association of Wetland Managers; pp. 155-161; 520 p.; 1989.
NAL Call #: QH541.5.M3P75 1989
Descriptors: wetlands/ lowland forests/ clearcutting/ silvicultural practices/ environmental impact/ birds

2041. **Effects of cropland conservation practices on fish and wildlife habitat.**
Brady, Stephen J.
In: Fish and Wildlife Response to Farm Bill Conservation Practices, Technical Review 07-1; Bethesda, MD: The Wildlife Society, 2007. pp. 9-23.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfb2.pdf
Descriptors: aquatic habitat/ conservation practices/ terrestrial habitat/ wildlife species/ wildlife management
Abstract: A literature review of commonly applied cropland soil and water conservation practices and their impact on fish and wildlife habitat is presented. Agriculture has had the most extensive effect on wildlife habitat of any human-induced factor in the United States. Any practice that improves runoff water quality and/or reduces sediment delivery will have beneficial effects to aquatic ecosystems. Many soil and water conservation practices have additional benefits to wildlife when applied in a habitat-friendly manner, but may have little or no benefit when applied otherwise. Wildlife and agriculture can coexist if land is managed to conserve sufficient biological integrity in the form of plant communities and habitat elements compatible with the surrounding landscape.

2042. **Effects of fire and agricultural practices on neotropical ant communities.**
Castano-Meneses, G. and Palacios-Vargas, J. G.
Biodiversity and Conservation 12(9): 1913-1919. (2003)
NAL Call #: QH75.A1B562; ISSN: 09603115.
Notes: doi: 10.1023/A:1024120600816.
Descriptors: Chamela/ succession/ tropical deciduous forest/ agricultural practices/ ants/ community structure/ ecological impact/ prescribed burning/ species diversity/ Mexico/ Formicidae/ Hymenoptera
Abstract: Fire is extensively used in agricultural management in Mexico. There is little information on the effects of those practices on the abundance and diversity of animals that live within these forest soils. We studied the effect of slashing, burning and land use in a tropical deciduous forest on ant communities in the State of Jalisco, Mexico. The original vegetation (tropical deciduous forest) was modified into a corn field. Sampling was carried out in five stages: before slashing, after slashing, after burning, after seeding and after harvest. We found that very severe fires greatly reduced ant diversity. The most important effect of fire was the reduction of ant density, and the change of species composition and trophic guilds. These changes are relevant in the recycling process of energy in the ecosystem.

2043. **Effects of forest regeneration on songbird movements in a managed forest landscape of Alberta, Canada.**
Robichaud, Isabelle; Villard, Marc Andre; and Machtans, Craig S.
Landscape Ecology 17(3): 247-262. (2002)
NAL Call #: QH541.15.L35 L36; ISSN: 0921-2973
Descriptors: ecology/ terrestrial habitat/ land and freshwater zones/ Canada/ Oscines (Passeriformes): distribution within habitat/ habitat utilization/ forest and woodland/ riparian habitat/ Alberta/ Calling Lake area/ riparian buffer/ corridor/ forest regeneration/ Passeriformes/ Aves/ birds/ chordates/ vertebrates
Abstract: Recent studies have shown that barrier effects exist even in relatively vagile species such as forest songbirds. The objectives of this study were to determine whether a 560 x 100 m riparian buffer strip of mature forest was used as a movement corridor by forest songbirds and, if so, to what extent corridor effects persisted as woody vegetation regenerated in the adjacent clearcut. Over a 4-yr period, juvenile movement rates decreased in the riparian buffer strip and increased in the regenerating clearcut. Adult movement rates increased in the riparian buffer strip in the first year after logging, then gradually decreased, while still increasing in the regenerating clearcut. However, both juvenile and adult movement rates were higher in the buffer strip than in an undisturbed control site. Results suggest that most adults we captured held territories in the vicinity of the net lanes, and that most of the juveniles captured were dispersing away from their natal territory. Four years after harvest, juvenile movement rates were higher in the regenerating clearcut than in the riparian buffer strip, but several species had not yet been captured or detected in the regeneration. Our results suggest that the use of the riparian buffer strip as a movement corridor decreased with forest regeneration for both adults and juveniles. However, the buffer strip still acted as a movement corridor for the following species: Philadelphia and Red-eyed Vireos, Red-breasted Nuthatch, and Ovenbird.

2044. **The effects of grazing by Tule elk and cattle on the vegetation dynamics and spider community of coastal salt marshes.**
Traut, Bibit H.
In: 87th Annual Meeting of the Ecological Society of America and the 14th Annual International Conference of the Society for Ecological Restoration. Tucson, Arizona August 04-09, 2002; 2002 .
Notes: Meeting abstract.
http://abstracts.co.allenpress.com/pweb/esa2002/document/14803
Descriptors: estuarine ecology: ecology, environmental sciences/ wildlife management: conservation/ agricultural open space/ coastal salt marshes/ community structure/ fenced enclosures/ grazing effects/ marsh upland ecotone/ multiple use/ plant biomass/ plant cover/ species richness/ spider diversity/ threatened habitat impacts/ vegetation dynamics/ vegetation richness/ vegetation structure/ wildland areas

Abstract: Salt marshes in the Point Reyes National Seashore (PRNS) are maintained both as wildland areas and agricultural open space. Yet, the impacts of this multiple use is not well understood, and there is concern that grazing the ecotone between the marsh and upland, the high salt marsh, may negatively impact this threatened habitat. The goal of this study was to determine if excluding cattle and Tule elk would result in increased vegetation complexity (structure and richness) and subsequently affect the spider community. Fenced exclosures were erected in the summer of 1999 at Home Bay (PRNS) and White Gulch (PRNS) to assess impacts of grazing by cattle and Tule elk, respectively. Within each marsh, a 20m x 5m mainplot of the high marsh was selected. Within each mainplot, 10 subplots (2m x 2m) were randomly selected, with 5 randomly established as exclosures and the others 5 left unfenced as controls. After two years, spider diversity and plant biomass, cover and height were measured within the inner 1m x 1m area. Both Tule elk and cattle grazing reduced plant biomass and height and led to increased bareground. Plant richness was not significantly different between cattle grazed and ungrazed plots, but individuals of plant species were more evenly distributed in the exclosures. Whereas in those plots grazed by Tule elk, species richness did increase in exclosures, but without a shift in individual species distributions. I had expected to see a response by the spider community to changes in vegetation structure, but there were no significant differences in spider diversity in any of the grazed or ungrazed plots. These results indicate that trophic generalists in a transition zone, the high salt marsh, may be responding to other factors than vegetation structure alone. Furthermore, grazing in the high salt marsh ecotone shifts plant community structure.

2045. **Effects of herbaceous competition control on wildlife habitat quality in piedmont pine plantations.**
Keyser, P. D.; Ford, V. L.; and Guynn, D. C.
Southern Journal of Applied Forestry 27(1): 55-60. (2003)
NAL Call #: SD1.S63; ISSN: 01484419
Descriptors: forage/ habitat/ herbaceous control/ herbicide/ pine management/ wildlife/ seed/ vegetation/ plants (botany)/ plantations/ plants/ seedlings
Abstract: Wildlife biologists have become increasingly concerned about the effects of herbaceous competition control in pine plantations on wildlife habitats. Data from a study designed to test the effectiveness of herbaceous weed control with different site preparation methods were re-analyzed to assess effects on various measures of wildlife habitat quality. Three rates of Oust® (0, 2, and 4 oz/ac) were applied in mid-April the first year to planted loblolly pine seedlings at seven locations (each a complete randomized block design) in the Virginia Piedmont. Site preparation methods used were pile only (two locations), burn only, chop and burn, pile and disk, and Velpar® and burn (two locations). Results were re-analyzed to assess effects of these methods on total herbaceous vegetation coverage, forage coverage, the ratio offorage/cover, species richness, and species diversity. Although total herbaceous coverage and species richness declined in the first year after application on many locations, vegetation rebounded in the second and/or third year. Few significant differences were observed in forage coverage, the ratio offorage to cover, or species diversity. By the third year, few differences remained among treatment levels. Mechanical site preparation appeared to have less impact on all measures than chemical site preparation. South. J. Appl. For. 27(1):55-60.

2046. **Effects of land use management on biotic integrity: An investigation of bird communities.**
Glennon, M. J. and Porter, W. F.
Biological Conservation 126(4): 499-511. (2005)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/j.biocon.2005.06.029.
Descriptors: community/ guild/ human impact gradient/ index of biotic integrity/ land use management/ anthropogenic effect/ community dynamics/ index of biotic integrity/ land management/ land use/ Adirondack Park/ New York [United States]/ Aves
Abstract: We examined the response of bird communities to a gradient of human impact in the Adirondack Park of northern New York State by testing the relationship of land use management types to an Index of Biotic Integrity (IBI) across the Adirondack landscape. We created the IBI by placing birds into 12 different guild categories and scoring study blocks according to relative representation of specialist versus generalist guild types. We investigated three questions relating to the effects of land use management on biotic integrity in the Adirondacks: (1) are there differences in biological integrity among the major land use types; (2) if so, what characteristics of these land use types are associated with high integrity bird communities; and, (3) to what degree is land management regulation effective in maintaining biological integrity in the Adirondack Park? We found significant differences in total, functional, compositional, and structural integrity on five land use types ranging from hamlet to wilderness. In all cases, integrity was lowest in hamlet areas and increased along the gradient to its highest level in wilderness areas. Biotic integrity showed strong groupings of the five land use classes. We found that bird community integrity was strongly related to roadlessness and that birds primarily responded to the distinction between developed and undeveloped land types. In contrast to roads and human development, forest management impacts in the Adirondacks do not appear to be of a high enough intensity to have significant negative impacts on breeding bird community integrity. Clustering of development is a means by which integrity may be safeguarded for the long term in the Adirondack Park.

2047. **Effects of land use on nongame wetland birds in western South Dakota stock ponds, U.S.A.**
May, Shawn M.; Naugle, David E.; and Higgins, Kenneth F.
Waterbirds 25(Special Publication 2): 51-55. (2002)
NAL Call #: QL671; ISSN: 1524-4695
Descriptors: LANDSAT TM imagery data/ National wetlands Inventory maps/ cattle grazing/ cropland landscapes/ grasslands/ habitat use/ land use change/ landscape types/ nesting habitat/ prairie landscapes/ stock ponds/ tillage agriculture/ vegetation cover/ wetlands
Abstract: Tillage agriculture is expanding into western prairie landscapes without knowledge of the effects of land use change on habitats used by nongame wetland birds. In 1999-2000, we surveyed 196 stock ponds within grassland (>95% grass) and cropland (>75% tillage) landscapes to

evaluate effects of land use on nongame wetland bird densities in western South Dakota. Land use and wetlands were delineated from Landsat TM imagery and National Wetlands Inventory maps. Sixteen nongame wetland bird species used stock ponds in western South Dakota, of which nine species were obligate wetland-nesting species. Although densities of seven nongame obligate wetland bird species were similar between landscape types, abundance of Wilson's Phalarope (Phalaropus tricolor) was greater in grassland study areas where cattle grazing limited growth of thick-stemmed emergent vegetation and reduced overall vegetative cover in stock ponds. In contrast, the Red-winged Blackbird (Agelaius phoeniceus) and Yellow-headed Blackbird (Xanthocephalus xanthocephalus) were more abundant in cropland landscapes where stock ponds provide abundant over-water nesting habitat (e.g., cattail). If grasslands continue to be converted to cropland, Wilson's Phalarope numbers will likely decrease as blackbird densities increase in stock ponds dominated by monotypic stands of cattail. To circumvent such changes, we recommend that resource managers conserve large tracts of grassland through aggressive easement programs in landscapes at highest risk of agricultural tillage.

2048. **Effects of livestock grazing on small mammals at a desert cienaga.**
Hayward, Bruce; Heske, Edward J.; and Painter, Charles W.
Journal of Wildlife Management 61(1): 123-129. (1997)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: conservation/ desert cienaga/ livestock grazing/ population abundance/ resource base/ small/ trophic level interaction
Abstract: Livestock in arid regions often concentrate their grazing in riparian areas, and this activity can have strong effects on native vegetation and wildlife. Small mammals at a desert wetland (cienaga) in southwestern New Mexico were more abundant on 2 1-ha plots from which livestock were excluded over a 10-year period than on 2 similar grazed plots ($P = 0.025$). However, species of small mammals differed in the direction and degree of their responses to livestock exclusion. Differences in mean abundance between grazed versus ungrazed plots could not be demonstrated for any species of small mammal individually because of strong annual variation in abundance and low statistical power of tests. However, the cumulative effect was that small mammals were 50% more abundant on plots from which livestock were excluded. Because small mammals provide an important resource base for many animals at higher trophic levels, even a few livestock exclosures of moderate size could benefit a variety of species of wildlife in desert wetlands.

2049. **Effects of pesticides and other organic pollutants in the aquatic environment on immunity of fish: A review.**
Dunier, M. and Siwicki, A. K.
Fish and Shellfish Immunology 3(6): 423-438. (1993); ISSN: 1050-4648.
Notes: Literature review.
Descriptors: pesticides/ organic compounds/ immunology/ disease resistance/ fish culture/ pollutants/ immunity/ effects on/ aquatic environment/ Pisces/ aquatic environments/ organic/ Fish culture/ effects on organisms freshwater pollution
Abstract: In the present paper the effects of various pollutants from industry or agriculture on the fish immune system are reviewed. The major xenobiotics involved as immunomodulators are pesticides (insecticides, herbicides, fungicides) and other organic pollutants such as polynuclear aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB) and tributyltin (TBT). Immunotoxicology in mammals has become a very active discipline, but there remains a scarcity of information concerning fish immunotoxicology. This review gathers the data available on the effects of certain pollutants in the aquatic environment on the humoral and cellular immunity of fish.

2050. **The effects of postfire salvage logging on aquatic ecosystems in the American west.**
Karr, James R.; Rhodes, Jonathan J.; Minshall, G. Wayne; Hauer, F. Richard; Beschta, Robert L.; Frissell, Christopher A.; and Perry, David A.
Bioscience 54(11): 1029-1033. (2004)
NAL Call #: 500 Am322A; ISSN: 0006-3568
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ land zones/ comprehensive zoology: forestry/ watersheds/ habitat protection/ habitat management/ aquatic ecosystems/ ecology/ postfire salvage logging/ forest and woodland/ United States, western region
Abstract: Recent changes in the forest policies, regulations, and laws affecting public lands encourage postfire salvage logging, an activity that all too often delays or prevents recovery. In contrast, the 10 recommendations proposed here can improve the condition of watersheds and aquatic ecosystems.

2051. **Effects of prairie and barrens management on butterfly faunal composition.**
Swengel, Ann B. and Swengel, Scott R.
Biodiversity and Conservation 10(10): 1757-1785. (2001)
NAL Call #: QH75.A1B562; ISSN: 0960-3115
Descriptors: conservation measures/ ecology/ terrestrial habitat/ land and freshwater zones/ Papilionoidea: habitat management/ community structure/ forest and woodland/ pine oak barrens/ grassland/ prairie/ United States/ prairie management/ barrens management/ faunal composition/ Papilionoidea/ Heteroneura, Glossata, Lepidoptera, Insecta/ arthropods/ insects/ invertebrates/ lepidopterans
Abstract: During 1990-1997, we recorded 122,138 adult butterflies in transect surveys at 125 pine-oak barrens in northern Wisconsin and 106 tallgrass prairies in six midwestern states grouped into three prairie subregions. Before analysis, we classified the butterflies into three ecological subgroups: specialist of native herbaceous vegetation, grassland (widely occurring in native and degraded herbaceous vegetation), and generalist. We analyzed this dataset both by ecological subgroups and as total butterflies, and by relative density and species richness, to investigate how these different ways of ordinating the same dataset might affect the results. In multiple linear regressions, density and richness of total butterflies and the subgroups related significantly to many non-management factors. In comparisons of more vs. less recent burning, all significant results for most recent burning

were negative. No significant negative relationships were attributed to the longest period since burning. In comparisons of burning vs. idling, all significant results in prairie favored idling, but in barrens favored burning. In comparisons of burning vs. mechanical cutting, all significant results in prairie favored cutting, but no significant differences occurred in barrens. In regressions including all management types, rotational burning (alone or combined with cutting) was significantly positive most often for generalists and never for specialists. Increasing years since last management was always negative in barrens and the southern prairie subregion but always positive in the two northern prairie subregions. Significant management patterns occurred more often in prairie than barrens, which were less fragmented. Specialists were favored by grazing in one northern prairie subregion (but disfavored in the other), haying, single wildfire (testable in barrens only), and increasing years since last treatment in one northern prairie subregion (but disfavored in barrens). Within subregion and subgroup, significant management results for density and richness never conflicted, but density had more significant results than richness. In no instances were the signs opposite when total butterflies and/or any subgroup(s) significantly related to the same management factor in the same type of regression. But what was significant for one sample was often not for another. Thus, management favorable for specialists and total butterflies did not conflict, but the subgroups had varying degrees of sensitivity, rather than opposite responses. Since the specialist (and total) butterflies did not consistently favor one management type over another among subregions, caution should be used in preserve management, to avoid overreliance on one management type over others.

2052. **Effects of prescribed burning on amphibian diversity in a southeastern U.S. National Forest.**
Schurbon, J. M. and Fauth, J. E.
Conservation Biology 17(5): 1338-1349. (2003)
NAL Call #: QH75.A1C5; ISSN: 08888892
Descriptors: abundance/ amphibians/ prescribed burning/ species diversity/ United States/ forest
Abstract: Fire alters the abundance and diversity of many species, but its effects on amphibians are poorly known. We tested whether prescribed burning affected amphibian abundance and diversity within the Francis Marion National Forest, South Carolina, by monitoring assemblages at 15 temporary ponds with five different burn histories: 0, 1, 3, 5, and 12 years after burns. We also monitored terrestrial and aquatic environmental variables likely to influence amphibian diversity, such as leaf-litter depth, pond water chemistry, and distance to neighboring ponds. Fire had significant negative effects. Immediate effects (burning during the study) explained 12.8% and 10.8% of the variation in anuran and amphibian abundance, respectively, whereas short-term effects explained 31.8% and 24.6% of variation in amphibian species richness and evenness, respectively. Species richness increased and evenness decreased with time since burn, primarily because salamanders were rarely encountered at sites burned within 2 years. These sites had the shallowest leaf litter and highest soil temperature variances. Environmental factors unrelated to burning also significantly influenced amphibian diversity. Water chemistry explained 31.1% of variation in species richness, 32.2% of evenness, and >25% of anuran, salamander, and total amphibian abundances. Salamanders were most sensitive to water chemistry factors, particularly pH. Our results suggest that decreasing the frequency of prescribed burns from the current 2-3 years to 3-7 years will better maintain diverse amphibian and plant assemblages. Substituting growing-season burns for the current practice of winter and spring burns would avoid repeatedly interrupting amphibian breeding and would maintain the desired longleaf pine community. 1339.

2053. **Effects of prescribed fire, extended harvest, movement, and habitat management on eastern cottontail (Sylvilagus floridanus) survival.**
Walker, John Matthew. Mississippi State University, 2004.
Notes: Degree: MS; Advisors: Leopold, Bruce D. and Burger, L. Wes
Descriptors: Sylvilagus floridanus/ prescribed fire/ habitat management/ breeding/ kernel ranges/ extended harvest
Abstract: For a sample of 351 radio-collared cottontails (Sylvilagus floridanus) monitored on Black Prairie Wildlife Management Area (BPWMA), 1997-2003, I examined prescribed fire, extended harvest, movement, and habitat management effects on survival. Breeding and non-breeding season survival increased during the study, concomitantly with increased management intensity. Hourly movement rates did not substantively influence survival. I generated each cottontail's home range kernel to evaluate prescribed burning effects on survival. for both 50% and 95% kernel ranges, percentage of the range burned did not affect cottontail survival. Survival of cottontails in treatment units subjected to October-february harvest (0.36, SE = 0.08) did not differ substantially from those subjected to October-january harvest (0.43 SE = 0.09). Although the direction of the effect supported increased additivity, the magnitude did not provide significant evidence for this, and I concluded that late season harvest did not affect significantly cottontail survival.

2054. **Effects of red-cockaded woodpecker management on bobwhite relative abundance.**
Chamberlain, Michael J. and Burger, L. Wes
Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 59: 10-16. (2005)
NAL Call #: SK1.S6; ISSN: 0276-7929
Descriptors: conservation measures/ ecology/ community structure/ population dynamics/ terrestrial habitat/ land zones/ Colinus virginianus: relative abundance/ population density/ endangered species habitat management effects on relative abundance of declining gamebird/ forest and woodland/ pine grassland communities/ grassland/ Mississippi/ Southwest/ Homochitto National Forest/ Aves, Galliformes, Phasianidae/ birds/ chordates/ vertebrates
Abstract: Loss of pine-grassland communities has contributed to declines in populations of northern bobwhites (Colinus virginianus; hereafter, bobwhite) and red-cockaded woodpeckers (Picoides borealis; RCW). However, evolving land management priorities on publicly-owned lands managed by the U.S. Forest Service (USFS) increasingly emphasize restoration of historic cover conditions and habitat for endangered species such as the RCW. These land use changes should benefit pine-grassland species, including bobwhite, but effects are not well understood. Therefore, we monitored abundance and distribution of

breeding bobwhites on the Homochitto National Forest of southwestern Mississippi during 1994-1999. We quantified abundance of breeding bobwhites using call counts in three landscapes that differed in extent of land under management for RCWs (low = 7.5%, intermediate = 46.7%, and high = 66.2%). Bobwhite abundance was closely tied to intensity of management. Landscapes with an intermediate and high proportion of stands dedicated to RCW management had relative abundance of bobwhite 46.9% and 232% greater than that observed in landscapes with a low extent of RCW management. RCW management likely enhances bobwhite habitat through maintenance of pine-grassland communities, and when applied to landscapes, has the potential to improve bobwhite populations locally and regionally.
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2055. **Effects of rest, season-long, and delayed grazing of wetlands and adjacent uplands on cattle and waterfowl use.**
Ruyle, G. B. University of California, Berkeley, 1980.
Notes: Thesis
Descriptors: habitat management/ grazing/ waterfowl/ wetlands
© NISC

2056. **Effects of Rodeo and Garlon 3A on nontarget wetland species in central Washington.**
Gardner, S. C. and Grue, C. E.
Environmental Toxicology and Chemistry 15(4): 441-451. (1996)
NAL Call #: QH545.A1E58; ISSN: 0730-7268
Descriptors: wetlands/ herbicides/ toxicity/ effects/ weeds/ weed control/ aquatic organisms/ aquatic weeds/ control/ chemical control/ glyphosate/ triclopyr/ nontarget effects/ aquatic invertebrates/ Lythrum salicaria/ Daphnia/ rainbow trout/ Lemna
Abstract: Purple loosestrife, Lythrum salicaria, is an invasive wetland perennial that became established in northeastern North America in the early 1800s. Despite its designation as a noxious weed, its distribution has continued to expand. Treatment with herbicides is the most widely used means of controlling purple loosestrife. This study examined the nontarget effects of two herbicides, Rodeo [glyphosate] and Garlon 3A [triclopyr amine], currently used or being considered for use in controlling purple loosestrife in Washington State, resp. Growth and/or survival of duckweed [Lemna spp.], Daphnia, and rainbow trout were monitored for at least 24 h following an application of each herbicide. Free-living water column and benthic invertebrates were monitored 24 h and 7 d post-spray using activity traps and sediment cores. Neither chemical was associated with significant decreases in survival or growth of the bioassay organisms, with the exception that growth of duckweed was reduced 48 h after exposure to Rodeo. Nor were significant decreases in the abundance of free-living aquatic invertebrates detected following the herbicide applications. Results suggest that neither herbicide, at the application rates used, poses a hazard to aquatic invertebrates in wetlands in central Washington. However, Rodeo, because it is a broad-spectrum herbicide, may pose a greater hazard to nontarget aquatic vegetation.
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2057. **Effects of sheep grazing on a riparian-stream environment.**
Platts, W. S. Intermountain Forest and Range Experiment Station, U.S. Department of Agriculture, 1981. 6 p. Research Note.
NAL Call #: A99.9 F764Un
Descriptors: grazing/ habitat alterations/ management/ research: rivers and streams/ riparian habitat
© NISC

2058. **Effects of streamside forest management on the composition and abundance of stream and riparian fauna of the Olympic peninsula.**
Raphael, Martin G.; Bisson, Peter A.; Jones, Lawrence L.; and Foster, Alex D.
In: Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Initiative workshop, General Technical Report-PNW 563/ Johnson, Adelaide C.; Haynes, Richard W.; and Monserud, Robert A.; Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture, 2002. pp. 27-40.
Notes: 0363-6224 (ISSN).
http://www.fs.fed.us/pnw/pubs/gtr563/gtr563a.pdf
Descriptors: commercial activities/ conservation measures/ ecology/ freshwater habitat/ lotic water/ terrestrial habitat/ land zones/ Vertebrata: forestry/ timber harvesting/ streamside forest management/ stream community/ riparian community/ habitat management/ riparian buffer zones/ streamside forest management regimes/ community structure/ stream fauna/ riparian fauna/ community composition/ forest and woodland/ community composition/ Washington/ Olympic Peninsula/ chordates/ vertebrates
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2059. **Effects of timber management on pond-breeding salamanders.**
Morris, Katrina M. and Maret, Timothy J.
Journal of Wildlife Management 71(4): 1034-1041. (2007)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Ambystomatidae/ Caudata/ Lissamphibia/ Ambystoma maculatum/ Ambystoma opacum/ forests/ ecosystems/ forestry practices/ habitat alterations/ habitat use/ Michaux State Forest/ oak-hickory forest/ Pennsylvania/ timber harvesting/ wildlife-human relationships/ commercial enterprises/ disturbances/ land zones
Abstract: Pond-breeding salamanders spend most of their lives in forested habitat surrounding the vernal pools where they breed. Timber harvesting has been demonstrated to have negative impacts on salamander populations due to changes in soil temperature, soil compaction, and general degradation of habitat. However, little is known about how long it takes for harvested forest habitat to once again become suitable for salamanders. Questions also remain as to whether salamanders will use an area that has been harvested in recent years if an older intact forest area is available. We used drift fences and pitfall traps to capture adult spotted salamanders (Ambystoma maculatum) and opacum) migrating to 3 vernal ponds during their breeding seasons. The study area contained tracts of forest that were marbled salamanders (A. opacum) migrating to 3 vernal ponds during their breeding seasons. The study area contained tracts of forest that werw clear-cut 11-12 years prior to the study. All 3 ponds were surrounded by areas of

clear-cut and intact forest and drift fences were placed in both habitat types. Similar numbers of spotted salamanders entered the ponds from clear-cut and intact forest areas. The number of marbled salamanders migrating to the ponds did not differ between areas of dear-cut and intact forest. These results suggest that clear-cut habitats may become suitable for adult pond-breeding salamanders after a relatively short regeneration period.

2060. **Enhanced avian diversity in Wisconsin pine barrens through aggregated timber harvest.**
Niemuth, Neal D. and Boyce, Mark S.
Transactions of the North American Wildlife and Natural Resource Conference 65: 184-199. (2000)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: commercial activities/ conservation measures/ terrestrial habitat/ land and freshwater zones/ Aves: forestry/ habitat management/ forest and woodland/ Wisconsin/ aggregated timber harvest/ species diversity/ birds/ chordates/ vertebrates

2061. **Enhancing riparian habitat for fish, wildlife, and timber in managed forests.**
Newton, Michael; Willis, Ruth; Walsh, Jennifer; Cole, Elizabeth; and Chan, Samuel
Weed Technology 10(2): 429-438. (1996)
NAL Call #: SB610.W39; ISSN: 0890-037X
Descriptors: conifer (Coniferopsida)/ fish/ Pisces/ animals/ chordates/ fish/ gymnosperms/ nonhuman vertebrates/ plants/ spermatophytes/ vascular plants/ vertebrates/ conservation/ forestry/ riparian habitat
Abstract: The productivity of riparian sites in managed forests can be focused to provide productive fish and wildlife habitat while yielding most of its productive capacity for other than amenity values. Establishment of habitat protection goals and measures of achievement permit flexible approaches for meeting them. Once the protection standards are set, intensive management of the woody cover is logically dependent on minimum disturbance methods, in general, for both vegetation management and harvest. Several currently registered chemical products and non-chemical methods are helpful and safe in achieving both yield and protection goals.

2062. **Environmental implications of excessive selenium: A review.**
Lemly, A. Dennis
Biomedical and Environmental Sciences 10(4): 415-435. (1997); ISSN: 0895-3988
Descriptors: selenium: trace metals/ agricultural irrigation/ fossil fuel waste disposal/ human activities/ land management/ public health/ water management
Abstract: Selenium is a naturally occurring trace element that is nutritionally required in small amounts but it can become toxic at concentrations only twice those required. The narrow margin between beneficial and harmful levels has important implications for human activities that increase the amount of selenium in the environment. Two of these activities, disposal of fossil fuel wastes and agricultural irrigation of arid, seleniferous soils, have poisoned fish and wildlife, and threatened public health at several locations in the United States. Research studies of these episodes have generated a data base that clearly illustrates the environmental hazard of excessive selenium, It is strongly bioaccumulated by aquatic organisms and even slight increases in waterborne concentrations can quickly result in toxic effects such as deformed embryos and reproductive failure in wildlife. The selenium data base has been very beneficial in developing hazard assessment procedures and establishing environmentally sound water quality criteria. The two faces of selenium, required nutrient and potent toxin, make it a particularly important trace element in the health of both animals and man. Because of this paradox, environmental selenium in relation to agriculture, fisheries, and wildlife will continue to raise important land and water-management issues for decades to come. If these issues are dealt with using prudence and the available environmental selenium data base, adverse impacts to natural resources and public health can be avoided.

2063. **Environmental Quality Incentives Program contributions to fish and wildlife conservation.**
Berkland, Mark W. and Rewa, Charles A.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 171-192.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ Environmental Quality Incentives Program
Abstract: The Environmental Quality Incentives Program (EQIP) is a voluntary program whereby the U.S. Department of Agriculture provides technical and financial assistance to active farmers and ranchers to address natural resource concerns such as soil conservation, water quality and quantity, nutrient management, and fish and wildlife habitat. The Natural Resources Conservation Service (NRCS) is working with these landowners to maximize the environmental benefi ts gained for the expenditures made in the program. Funding has expanded significantly under the 2002 Farm Bill, with the amount of annual funding authorized reaching $1.3 billion by fiscal year 2007. The EQIP has been used to implement a wide variety of practices that are considered beneficial to many species of fish and wildlife. The NRCS is also beginning to use EQIP to address the needs of declining and other at-risk fish and wildlife species. Few data are available that document fish and wildlife response to EQIP. Program implementation to date is summarized, and recent information on planning of practices with the potential to benefit fish and wildlife resources is examined.

2064. **Estimate of crappie entrainment through water discharge from a Nebraska irrigation reservoir.**
Fryda, Nicolas J.; Koupal, Keith D.; and Hoback, W. Wyatt
Journal of Freshwater Ecology 21(4): 693-697. (2006)
NAL Call #: QH541.5.F7J68; ISSN: 0270-5060
Descriptors: commercial activities/ ecology/ population dynamics/ freshwater habitat/ lentic water/ man-made habitat/ land zones/ Pomoxis: farming and agriculture/ Irrigation system/ mortality/ population density/ reservoir/ Irrigation reservoir/ entrainment estimate/ water supply system habitat/ Nebraska/ Sherman County/ Sherman

Reservoir/ Pisces, Actinopterygii, Perciformes, Centrarchidae/ chordates/ fish/ vertebrates
Abstract: From June to September in 2004 and 2005, we sampled twice per week from the irrigation canal below the dam to determine entrainment of crappies (Pomoxis spp.) from Sherman Reservoir, Sherman County, Nebraska. The estimated total loss from the reservoir was about 1.0 million crappies per year. During both years more crappies were released during nighttime than daytime hours and there was a positive relationship between water discharge and the number of crappies collected. Furthermore, increase in water discharge over 8 m3/S significantly increased the density of entrained crappies.

2065. **Estimating wildlife habitat trends on agricultural ecosystems in the United States.**
Brady, S. J. and Flather, C. H.
Proceedings from an Organization for Economic Co-operation and Development Expert Meeting:
156-167. (Nov. 2001).
Notes: ISBN: 9264199209; Conference: Agriculture and Biodiversity: Developing indicators for Policy Analysis held 5-8 November 2001 in Zurich, Switzerland.
Descriptors: agri-environmental indicators/ National Resources Inventory/ NRI/ wildlife habitat/ United States
Abstract: Recent trends (1992-1997) in wildlife habitat on agricultural and grazed ecosystems are reviewed using data from the 1997 National Resources Inventory. Land use changes, the losses and gains of wetlands, and reasons for wetland losses are described. Ecological indices describing spatial pattern and fragmentation of cropland and rangeland habitats are discussed, and geographically explicit summary statistics are presented for the United States. The effect of the Department of Agriculture's Conservation Reserve Program is described as an example of a multi-purpose habitat intervention scheme. Because land resource planners need estimates of habitat quantity and condition, the concept of wildlife habitat management as a secondary use of agricultural lands is reviewed. The uses and limitations of ecological indicators and habitat matrices, including statistical estimates of precision and the need to establish relationships between habitat-based indicators and direct measures of biodiversity, are also discussed.

2066. **Evaluating residual tree patches as stepping stones and short-term refugia for red-legged frogs.**
Chan-McLeod, Ann C. Allaye and Moy, Arnold
Journal of Wildlife Management 71(6): 1836-1844. (2007)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Anura/ Lissamphibia/ Ranidae/ Rana aurora/ British Columbia/ forests/ ecosystems/ forestry practices/ habitat alterations/ habitat management/ habitat use/ residual tree patch retention/ Vancouver Island/ wildlife-human relationships/ Canada/ commercial enterprises/ conservation/ wildlife management/ disturbances/ land zones
Abstract: Temperate pond-breeding amphibians are vulnerable to forest fragmentation because they must access upland terrestrial sites during the nonbreeding season but are prone to desiccation in hot, dry environments without canopy cover. Harvesting techniques that retain live trees in the cut block are advocated for sustaining forest biodiversity, but the effects of these practices on amphibians are unknown. We studied red-legged frogs (Rana aurora) in movement trials to assess: 1) how short-term use of residual trees was affected by tree patch size, streams, and neighborhood features 2) whether residual tree patches were used as stepping stones in negotiating cut blocks; 3) the effects of patch size and patch proximity in altering movement paths; and 4) the effects of retention level and patch size on interpatch distance. Residual tree patches were potentially valuable short-term refugia but their value was size dependent. Virtually all frogs released at the base of single trees or inside small tree clusters left within 72 hours, but the proportion leaving decreased curvilinearly with increasing patch size. Frogs were less likely to leave tree patches with a running stream or where neighborhood stream density was high. Residual tree patches did not systematically alter movement paths. Frogs intercepted residual tree patches mostly at random and had to be within 5-20 m of a tree patch before moving to it in greater proportions than expected by chance. However, amphibian movements were biased toward large (0.8 ha) patches and away from small (0.3 ha) patches 50 m away. Our results indicated that residual trees should not be retained singly but should be aggregated in groups between 0.8 ha and 1.5 ha, preferably in stream locations.

2067. **Evaluation of management practices and farming systems on Missouri wetland wildlife areas: A survey of agricultural cropping systems and wetland management practices on selected Missouri Department of Conservation wildlife areas.**
Graber, D. A. Missouri Dept. of Conservation, 1987. 20 p. Annual Report.
Descriptors: wetlands/ evaluation/ surveys/ cultivated farmland/ farms/ food crops/ habitat management/ questionnaire/ fertilization, soil and water/ water resources management/ plant control/ vegetation/ floods

2068. **Evaluation of management practices and farming systems on Missouri wetland wildlife areas: Determining the nutritional value of selected moist soil seeds and wetland agricultural crops.**
Graber, D. A. Missouri Dept. of Conservation, 1989. 13 p.
Descriptors: wetlands/ amino acids/ bioenergetics/ cultivated farmland/ evaluation/ farms/ floods/ food crops/ goose, Canada/ metabolism/ nutrients/ nutrition/ overwintering/ proteins/ seeds/ wildlife management areas/ Panicum spp./ Polygonum amphibium/ smartweed/ Sorghum vulgare/ Missouri
Abstract: Objectives were to determine: (1) by means of proximate analysis, amino acid assay and gross energy assay, the nutrient content of rowcrops and moist-soil plants (largeseed smartweed, milo, corn, wild millet, nodding smartweed, rice cutgrass, nodding foxtail, beggarticks, and soybean) regularly consumed by wintering Canada Geese in Missouri; (2) the true metabolizable energy of these rowcrops and plants for Canada geese; and (3) to what extent the gross energy of Canada goose foods varies when exposed to non-flooded and flooded conditions for 30, 60, 90 and 15 days between September 1987 and March 1988.

2069. **Evaluation of supplemental forages and prescribed burning for white-tailed deer in the Ozarks of Missouri.**
Jeffries, A. P.
Columbia, MO: University of Missouri-Columbia, 2000.
Notes: Degree: M.S.; Wildlife Coop. Unit Report
Descriptors: Odocoileus virginianus/ supplemental feeding/ habitat management/ disturbed habitat [fire]/ food supply/ fertilization, soil and water/ food crops seasons/ food elements/ harvests/ mast/ nutrients/ vegetation/ Missouri/ Ozark Plateau region/ Crawford County
Abstract: Thesis is divided into three chapter (study) topics: (1) An Evaluation of Supplemental Forages for White-tailed Deer in the Missouri Ozarks; (2) Effect of Prescribed Burning on Forage Production and Nutrients; and (3) Diet, Nutrition, and Body Characteristics of White-tailed Deer on Woodsvalley Farms, Missouri.

2070. **Exploring methods of selecting cropland for conservation.**
Feather, P.; Hellerstein, D.; and Hansen, L.
Agricultural Outlook (AO)(No. AO-254): 21-24. (1998)
NAL Call #: aHD1751.A422
Descriptors: agricultural land/ land use/ land management/ environmental protection/ evaluation/ land policy/ environmental policy/ methodology/ conservation/ recreation/ valuation/ economic analysis/ wildlife/ water quality/ erosion/ environmental impact/ attitudes/ hunting/ water recreation/ land diversion/ amenity and recreation areas/ outdoor recreation/ rural recreation/ visitors/ access/ United States/ wildlife viewing
Abstract: The way in which the environmental benefits index (EBI) operates with respect to selecting land for inclusion in the US Conservation Reserve Program (CRP) is detailed. The construction of the EBI relies on the judgements of natural resource experts and programme managers. The scoring system is based on selected factors: wildlife habitat, water quality, erodibility, retention of environmental benefits after contracts expire, air quality and conservation priority areas. An investigation into the value placed by the public on the enhanced recreational benefits which results from the CRP is presented. The analysis focuses on water based recreation, wildlife viewing and pheasant hunting.

2071. **Factors affecting songbird nest survival in riparian forests in a Midwestern agricultural landscape.**
Peak, Rebecca G.; Thompson, Frank R.; and Shaffer, Terry L.
Auk 121(3): 726-737. (2004)
NAL Call #: 413.8 AU4; ISSN: 0004-8038
Descriptors: reproduction/ reproductive productivity/ ecology/ population dynamics/ terrestrial habitat/ man-made habitat/ land zones/ Oscines: fledgeing success/ nest success/ influencing factors/ survival/ nest survival/ forest and woodland/ riparian forest/ riparian habitat/ cultivated land habitat/ agricultural landscape/ Missouri/ Scotland/ Knox and Clark counties/ Aves, Passeriformes/ birds/ chordates/ vertebrates
Abstract: We investigated factors affecting nest Success of songbirds in riparian forest and buffers in northeastern Missouri. We used an information-theoretic approach to determine support for hypotheses concerning effects of nest-site, habitat-patch, edge, and temporal factors on nest success of songbirds in three narrow (55-95 m) and three wide (400-530 m) riparian forests with adjacent grassland-shrub buffer strips and in three narrow and three wide riparian forests without adjacent grassland-shrub buffer strips. We predicted that temporal effects would have the most support and that habitat-patch and edge effects would have little support, because nest predation would be great across all sites in the highly fragmented, predominantly agricultural landscape. Interval nest success was 0.404, 0.227, 0.070, and 0.186, respectively, for Gray Catbird (Dumetella carolinensis), Northern Cardinal (Cardinalis cardinalis), Indigo Bunting (Passerina cyanea), and forest interior species pooled (Acadian Flycatcher (Empidonax virescens), Wood Thrush (Hylociclila mustelina), Ovenbird (Seiurus aurocapillus), and Kentucky Warbler (Oporornis formosus)). The effect of nest stage on nest success had the most support; daily nest success for Gray Catbird and Indigo Bunting were lowest in the laying stage. We found strong support for greater nest success of Gray Catbird in riparian forests with adjacent buffer strips than in riparian forests without adjacent buffer strips. Patch width also occurred in the most-supported model for Gray Catbird, but with very limited support. The null model received the most support for Northern Cardinal. Riparian forests provided breeding habitat for area-sensitive forest species and grassland-shrub nesting species. Buffer strips provided additional breeding habitat for grassland-shrub nesting Species. Interval nest success for Indigo Bunting and area-sensitive forest species pooled, however, fell well below the level that is likely necessary to balance juvenile and adult mortality, which suggests that when riparian forests are located within agricultural landscapes, the potential even for wide riparian forests with adjacent buffer strips to provide high-quality breeding habitat is severely diminished for some species.

2072. **Factors influencing soil invertebrate communities in riparian grasslands of the central Platte River floodplain.**
Davis, Craig A.; Austin, Jane E.; and Buhl, Deborah A.
Wetlands 26(2): 438-454. (2006)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: conservation measures/ ecology/ terrestrial habitat/ abiotic factors/ physical factors/ land zones/ invertebrata: habitat management/ river flow management/ effect on wet meadow soil community structure/ community structure/ wet meadow soil/ hydrology and topography effects/ conservation implications/ grassland/ wet meadows/ soil community structure/ soil habitat/ wet meadows community structure/ physical factors/ topography/ aridity/ water table depth/ climate and weather/ rain/ Nebraska/ Platte River Valley/ wet meadow soil community structure/ invertebrates
Abstract: In the Platte River Valley of central Nebraska, USA, riparian grasslands (also known as wet meadows) have been severely impacted by a reduction in river flows, causing lower ground-water levels and altered seasonal hydroperiods. The potential impacts of these hydrologic changes, as well as the environmental factors that influence wet meadow soil invertebrate communities, are not well understood. An understanding of the ecological processes that influence these invertebrate communities is crucial for maintaining and restoring wet meadows along the Platte

River. Our objectives were to describe the soil invertebrate community of wet meadows throughout the growing season and to examine the relative roles of abiotic factors in determining patterns in invertebrate community structure. We conducted the study in 12 wet meadows along the Platte River during 1999 and 2000. We identified 73 invertebrate taxa; 39 were considered soil inhabitants. Total biomass was primarily composed of earthworms, Scarabaeidae, Isopoda, and Elateridae, with earthworms and Scarabaeidae accounting for >82%. Differences in river flow and precipitation patterns influenced some soil invertebrates. Earthworms and Scarabaeidae declined dramatically from 1999 (wet year) to 2000 (dry year). The topographic gradient created by the ridge-swale complex affected several soil invertebrate taxa; Scarabaeidae, Diplopoda, and Lepidoptera biomasses were greatest on drier ridges, while Tipulidae and Isopoda biomasses were greatest in wetter sloughs. Responses of earthworm taxa to the topographic gradient were variable, but generally, greater biomasses occurred on ridges and mid-elevations. Water-table depth and soil moisture were the most important variables influencing wet meadow soil invertebrates. Because these communities are linked to the hydrologic processes of the Platte River, future alterations of wet meadow hydrology could shift the distribution patterns of many of these invertebrates and possibly eliminate more moisture-tolerant taxa. To maintain wet meadows and their biotic communities, flow management should focus on regaining as much as possible of the former hydrograph through properly timed flows that provide an adequate hydrologic regime for wet meadows. In addition, restoration of wet meadows will depend on restoring the natural topography of wet meadows.

2073. **Factors limiting mallard brood survival in prairie pothole landscapes.**
Krapu, G. L.; Pietz, P. J.; Brandt, D. A.; and Cox, R. R.
Journal of Wildlife Management 64(2): 553-561. (2000)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: survival/ prairies/ wildlife management/ mathematical models/ juveniles/ clutch/ population dynamics/ Anas platyrhynchos/ mallard/ prairie pothole landscapes
Abstract: In order to estimate mallard (Anas platyrhynchos) production from managed and unmanaged lands, waterfowl biologists need measurable predictors of brood survival. We evaluated effects of percent of seasonal basins holding water (WETSEAS), percent of upland landscape in perennial cover (PERNCOVER), rainfall (RAIN), daily minimum ambient temperature (TMIN), hatch date (HATCHDATE), brood age (BA; 0-7 or 8-30 days), age of brood females, and brood size on mallard brood survival in prairie pothole landscapes, and developed a predictive model using factors found to have significant effects. Sixteen of 56 radiomarked broods experienced total loss during 1,250 exposure days. Our final fitted model of brood survival contained only main effects of WETSEAS, HATCHDATE, and RAIN. Total brood loss during the first 30 days of exposure was 11.2 times more likely for broods hatched on areas with <17% WETSEAS than those on areas with >59% WETSEAS. Total brood loss was 5.2 times more likely during rainy conditions than during dry periods, and the hazard of total brood loss increased by 5% for each 1-day delay in hatching between 17 May and 12 August. High survival of mallard broods in landscapes where most seasonal basins contain water underscores the importance of maintaining seasonal wetlands as a major component of wetland complexes managed for mallard production. Because early hatched broods have higher survival, we also suggest that waterfowl managers focus their efforts on enhancing nest success of early laid clutches, especially in wet years.

2074. **The farm as natural habitat: Reconnecting food systems with ecosystems.**
Jackson, Dana L. and Jackson, Laura L.
Washington: Island Press; 296 p. (2002);
ISBN: 1559638478.
Descriptors: commercial activities/ conservation measures/ ecology/ man-made habitat/ comprehensive zoology: farming and agriculture/ habitat management/ agroecosystem management/ ecology/ agroecosystems/ cultivated land habitat/ farmland/ agricultural system ecosystem reconnection/ natural habitat potential

2075. **Farm Bill 2002: A discussion of the conservation aspects of the Farm Bill from a fisheries perspective.**
Thomas, D. L.; Pajak, P.; McGuire, B.; Williams, C.; Filipek, S.; and Hughes, R. M.
Fisheries 26(11): 36-38. (2001)
NAL Call #: SH1.F54; ISSN: 03632415
Descriptors: wildlife management/ Natural Resources Conservation Service/ U. S. Department of Agriculture/ aquatic habitat quality/ coastal fisheries enhancement/ fisheries resources/ watershed management
Abstract: During the spring of 2001, AFS asked members to work on an analysis of the new Farm Bill. David Thomas, chief of the Illinois Natural History Survey, volunteered to chair a committee and a fast-track schedule was established. The mission of the group was to prepare a document suitable for a column in Fisheries that briefly summarized the bill, the implications to fisheries, and perceived deficiencies. The group used as a starting point an earlier AFS document on "Aquatic Habitat Conservation, Recommendations for the 1995 Farm Bill" based on Pajak et al. 1994. A draft document was presented to the Fisheries Administrators Section at the AFS Annual Meeting in Phoenix, Arizona. Review comments were provided by AFS administrators as well as outside reviewers. This document represents a consensus of opinions from a broad cross-section of AFS members but is not a formal position paper of the Society.

2076. **Feeding habitats of spring-migrating blackbirds in east-central South Dakota.**
Sawin, Richard S.; Linz, George M.; Bleier, William J.; and Homan, H. Jeffrey
Prairie Naturalist 38(2): 73-84. (2006)
NAL Call #: QH540.P7; ISSN: 0091-0376
Descriptors: nutrition/ feeding behavior/ behavior/ social behavior/ aggregating behavior/ ecology/ habitat utilization/ land zones/ Icteridae: foraging/ flocking/ flock characteristics/ habitat preference/ South Dakota/ activity/ habitat use and behavior/ migratory staging area/ Aves, Passeriformes/ birds/ chordates/ vertebrates

Abstract: Between 27 March and 21 April 1998, we monitored blackbird (Icteridae) activity and habitat selection at a migratory staging area in east-central South Dakota. We used fixed-area observation points located within 201-km^2 circular plots centered on four wetland basins that were used as night roosts. Each roost was surveyed four times, with the surveys spread evenly throughout the blackbird migration. We recorded the number of blackbird flocks, flock size and composition, habitat used, and behavior (e.g., loafing and feeding). Fifty percent (n = 242) of the 482 flocks recorded in the quadrats was observed loafing ill trees of woodlots and shelterbelts. Feeding flocks preferred habitats classified as Corn (e.g., disked, plowed, and stubble corn fields) over two other foraging habitat categories (Cultivated and Grassland). A comparison of proportional availability of Cultivated habitat (soybean (Lathynts odoratus) and wheat (Triticum aestivium) stubble, inclusive) against proportional use by feeding flocks indicated that this habitat was avoided. Grassland habitat (hayfields, CRP, and pasture) was used according to its availability. Intensity of Grassland use depended on time of survey (AM and PM), with use greater during the PM survey. A two-factor model (habitat, time, and the interaction term) provided the best parsimonious fit of 15 a priori models tested with Akaike's information criterion (AICC). Selection of foraging habitats by blackbirds might reflect comparable strategies used by other early migrating granivores. This knowledge could help wildlife managers maximize the placement of corn field food plots for optimum benefit to wildlife species.

2077. **Female American black bear use of managed forest and agricultural lands in coastal North Carolina.**
Jones, Mark D. and Pelton, Michael R.
Ursus 14(2): 188-197. (2003)
NAL Call #: QL737.C27 I573; ISSN: 1537-6176
Descriptors: Ursus americanus/ abundance/ agriculture/ American black bear/ dispersion/ ecological requirements/ habitat/ home-range/ silviculture/ Glucine max/ Pinus spp./ Pinus taeda/ Triticum spp./ biotop/ home-range/ North Carolina
Abstract: American black bear use of intensively managed forestry and agricultural environments in the southeastern United States is poorly understood. During 1992-94, we radiomonitored female black bears (Ursus americanus) to determine home range and habitat use characteristics in two managed agroforestry environments in the North Carolina coastal plain. These areas represented opposite ends of the land-management spectrum. The Big Pocosin (BP) area was dominated by loblolly pine (Pinus taeda) plantations and human activity and development. The Gum Swamp (GS) area contained larger and more numerous remnants of unmanaged forests including bottomlands, mixed hardwoods, upland hardwoods, and pocosins. These unmanaged forests were interspersed with pine plantations and relatively low human activity. Home range and habitat analyses were conducted seasonally and annually using land use-land cover data in a geographic information system (GIS). Spring, summer, and fall home ranges of black bears were larger in the BP than the GS, and GS home ranges were among the smallest reported in the United States. Pocosins, clearcuts, and marshes were frequently preferred over managed pine plantations. Collared bears did not spend large amounts of time in agricultural areas, but evidence from a companion study suggests that bears depended heavily on crops for food obtained during short feeding forays. Changes in crop rotation patterns from corn, soybeans, and wheat to cotton may reduce agricultural food resources for bears. The continued loss of pocosins and marshes to human development may exacerbate the effects of reduced food crops. Black bears appear to benefit from early-succession habitats created by logging operations. We recommend the development of a coalition of state and federal wildlife agencies, the forest industry, and the agricultural community to discuss landscape effects on black bears in the Atlantic Coastal Plain and implement strategies to address future black bear habitat management in the region.

2078. **Field studies on pesticides and birds: Unexpected and unique relations.**
Blus, Lawrence J. and Henny, Charles J.
Ecological Applications 7(4): 1125-1132. (1997)
NAL Call #: QH540.E23 ; ISSN: 1051-0761
Descriptors: dicofol: pesticide/ famphur: pesticide/ pesticide/ DDE: pesticide/ DDT: pesticide/ bird (Aves)/ animals/ birds/ chordates/ nonhuman vertebrates/ vertebrates/ eggshell thickness/ population stability/ productivity/ reproductive success/ survival/ trophic level bioaccumulation
Abstract: We review the advantages and disadvantages of experimental and field studies for determining effects of pesticides on birds. Important problems or principles initially discovered in the field include effects of DDT (through its metabolite DDE) on eggshell thickness, reproductive success, and population stability; trophic-level bioaccumulation of the lipid-soluble organochlorine pesticides; indirect effects on productivity and survival through reductions in the food supply and cover by herbicides and insecticides; unexpected toxic effects and routes of exposure of organophosphorus compounds such as famphur and dimethoate; effects related to simultaneous application at full strength of several pesticides of different classes; and others. Also, potentially serious bird problems with dicofol, based on laboratory studies, later proved negligible in the field. In refining field tests of pesticides, the selection of a species or group of species to study is important, because exposure routes may vary greatly, and 10-fold interspecific differences in sensitivity to pesticides are relatively common. Although there are limitations with field investigations, particularly uncontrollable variables that must be addressed, the value of a well-designed field study far outweighs its shortcomings.

2079. **Fire and aquatic ecosystems of the western USA: Current knowledge and key questions.**
Bisson, P. A.; Rieman, B. E.; Luce, C.; Hessburg, P. F.; Lee, D. C.; Kershner, J. L.; Reeves, G. H.; and Gresswell, R. E.
Forest Ecology and Management 181: 213-229. (2003)
NAL Call #: SD1.F73; ISSN: 0378-1127.
http://www.treesearch.fs.fed.us/pubs/6025
Descriptors: forest/ fire/ habitat management/ waters/ ecosystem/ aquatic life/ ecological diversity
Abstract: Understanding of the effects of wildland fire and fire management on aquatic and riparian ecosystems is an

evolving field, with many questions still to be resolved. Limitations of current knowledge, and the certainty that fire management will continue, underscore the need to summarize available information. Integrating fire and fuels management with aquatic ecosystem conservation begins with recognizing that terrestrial and aquatic ecosystems are linked and dynamic, and that fire can play a critical role in maintaining aquatic ecological diversity. To protect aquatic ecosystems we argue that it will be important to: (1) accommodate fire-related and other ecological processes that maintain aquatic habitats and biodiversity, and not simply control fires or fuels; (2) prioritize projects according to risks and opportunities for fire control and the protection of aquatic ecosystems; and (3) develop new consistency in the management and regulatory process. Ultimately, all natural resource management is uncertain; the role of science is to apply experimental design and hypothesis testing to management applications that affect fire and aquatic ecosystems. Policymakers and the public will benefit from an expanded appreciation of fire ecology that enables them to implement watershed management projects as experiments with hypothesized outcomes, adequate controls, and replication.

2080. **Fire and beaver in the boreal forest-grassland transition off western Canada - A case study from Elk Island National Park, Canada.**
Hood, Glynnis A. and Bayley, Suzanne E.
Lutra 46(2): 235-241. (2003); ISSN: 0024-7634
Descriptors: Castoridae/ Rodentia/ Castor canadensis/ habitat use/ boreal forest-grassland transition area/ prescribed fire/ Alberta/ Elk Island National Park/ fires-burns/ habitat management/ lodge occupancy/ prescribed burning/ environmental factors/ Canada/ conservation/ wildlife management/ land zones
Abstract: Prescribed fire is used as a management tool in many areas throughout the world to restore vegetation communities, reduce fuel loading, and enhance wildlife habitats. However, the effect of prescribed fire on many wildlife species has not been well studied, especially on beavers (Castor canadensis). The purpose of our study was to examine whether prescribed fire influences beaver lodge occupancy in the aspen and mixed-wood habitats of Elk Island National Park, Alberta, Canada. In particular, we examined whether lodges in burned habitats experience lower occupancy levels than lodges in unburned habitats, whether the frequency of burns influences lodge abandonment, and whether the distance to suitable habitat potentially accessible from those lodges abandoned following a burn, influence beaver lodge occupancy. Since 1979, over 51% of Elk Island National Park (196 km^2) has been burned with the goal of restoring prairie plant communities. We found that fire negatively affected beaver lodge occupancy, an effect compounded with frequent burns. Though prescribed fire is considered an important landscape restoration process, the frequency of prescribed burning should be mitigated to ensure that flooding by beavers can continue as a key process that maintains wetlands on the landscape.

2081. **Fire and birds in the southwestern United States.**
Bock, C. E. and Block, W. M.
Studies in Avian Biology (30): 14-32. (2005)
NAL Call #: QL671.S8; ISSN: 01979922
Descriptors: birds/ chaparral/ desert/ fire/ grassland/ mixed-conifer/ pine-oak/ prescribed burning/ riparian/ savanna/ United States, southwestern region/ wildfire/ Aves/ Coniferophyta/ Juniperus/ Pinus edulis/ Pinus ponderosa/ Poaceae
Abstract: Fire is an important ecological force in many southwestern ecosystems, but frequencies, sizes, and intensities of fire have been altered historically by grazing, logging, exotic vegetation, and suppression. Prescribed burning should be applied widely, but under experimental conditions that facilitate studying its impacts on birds and other components of biodiversity. Exceptions are Sonoran, Mojave, and Chihuahuan desert scrub, and riparian woodlands, where the increased fuel loads caused by invasions of exotic grasses and trees have increased the frequency and intensity of wildfires that now are generally destructive to native vegetation. Fire once played a critical role in maintaining a balance between herbaceous and woody vegetation in desert grasslands, and in providing a short-term stimulus to forb and seed production. A 3-5 yr fire-return interval likely will sustain most desert grassland birds, but large areas should remain unburned to serve species dependent upon woody vegetation. Understory fire once maintained relatively open oak savanna, pinyon-juniper, pine-oak, ponderosa pine (Pinus ponderosa), and low elevation mixed-conifer forests and their bird assemblages, but current fuel conditions are more likely to result in stand-replacement fires outside the range of natural variation. Prescribed burning, thinning, and grazing management will be needed to return fire to its prehistoric role in these habitats. Fire also should be applied in high elevation mixed-conifer forests, especially to increase aspen stands that are important for many birds, but this will be an especially difficult challenge in an ecosystem where stand-replacement fires are natural events. Overall, surprisingly little is known about avian responses to southwestern fires, except as can be inferred from fire effects on vegetation. We call for cooperation between managers and researchers to replicate burns in appropriate habitats that will permit rigorous study of community and population-demographic responses of breeding, migrating, and wintering birds. This research is critical and urgent, given the present threat to many southwestern ecosystems from destructive wildfires, and the need to develop fire management strategies that not only reduce risk but also sustain bird populations and other components of southwestern biological diversity.

2082. **Fire and shade effects on ground cover structure in Kirtland's warbler habitat.**
Probst, J. R. and Donnerwright, D.
American Midland Naturalist 149(2): 320-334. (2003)
NAL Call #: 410 M58; ISSN: 00030031
Descriptors: fire/ habitat management/ passerines/ prescribed burning/ shading/ succession/ vegetation cover/ Arctostaphylos uva-ursai/ Comptonia peregrina/ Prunus pumila/ Vaccinium angustifolium
Abstract: Researchers and managers have suggested that a narrow range of ground-cover structure resulting from fire might be necessary for suitable Kirtland's warbler nesting

conditions. Yet, Kirtland's warblers have bred successfully in numerous unburned stands and there is little direct evidence to indicate that ground cover structure is a limiting factor for nest sites or habitat suitability within appropriate landform-ecosystems. We documented the range of percent cover for dominant ground-cover structural components in burned and unburned habitat (stand ages 7-23 y) occupied by Kirtland's warblers. The mean percent cover for the dominant ground-cover structural components was lichen/moss (12.1%), blueberry (Vaccinium angustifolium) (9.5%), bare ground and litter (5.6%), sedge/grass (5.2%), deadwood (4.3%), sand cherry (Prunus pumila) (3.3%), sweet fern (Comptonia peregrina) (2.3%), coarse grass (1.8%) and bearberry (Arctostaphylos uva-ursai) (1.2%). Burned sites had significantly more deadwood, sweet fern and lichen/moss cover, while unburned sites had significantly more bare ground and sedge/grass. We also investigated how fire, shade-history (i.e., pre-fire tree crown cover approximated by tree height and density) and succession influenced the percent cover of the dominant ground-cover structural components from 1 to 5-y after wildfire disturbance. The magnitude of differences in percent cover among shade-histories changed through time for the ground-cover components sand cherry, deadwood, grass/sedge and coarse grass. The percent cover of sweet fern, bearberry and bare ground was significantly different between some shade-histories. All dominant ground-cover components showed significant difference between at least one shade-history when compared to an unburned harvested reference stand. This suggests that more similarities exist among the three burned sites than between the burned sites and the unburned reference site. Our results suggest that fire, shade-history and succession influence ground-cover, but that various ground-cover components are affected differently by these factors. Because of the complex role disturbance history plays in maintaining ground-cover in Kirtland's warbler habitat, optimal management prescriptions are difficult to specify, especially when aspects of Kirtland's warbler ecology other than nest location are also considered. Although suitable ground cover structure can result without fire, maintaining prescribed fire is still desirable because this is a historically fire-regulated system. However, the range of ground-cover structures accepted by the Kirtland's Warbler and its resilience to disturbance suggests that suitable ground-cover for Kirtland's warbler could be maintained in some stands without burning after every timber harvest.

2083. **Fire ecology and bird populations in eastern deciduous forests.**
Artman, V. L.; Hutchinson, T. F.; and Brawn, J. D.
Studies in Avian Biology (30): 127-138. (2005)
NAL Call #: QL671.S8; ISSN: 01979922
Descriptors: eastern deciduous forest/ fire history/ fire suppression/ forest-interior birds/ maple/ oak/ prescribed fire/ savanna/ Acer/ Aves/ Quercus/ Sapindaceae
Abstract: Eastern deciduous forests are located across the central portion of eastern North America and provide habitat for a wide diversity of bird species. The occurrence of fire in the region has been associated with the presence of humans for over 10,000 yr. While pre-European fire regimes are poorly understood, fire is widely thought to have promoted and maintained large expanses of oak forest, woodland, and savanna documented in original land surveys. Forest composition is gradually shifting from fire-tolerant oaks (Quercus spp.) to other species (e.g., maples [Acer spp.]) and suppression of fire has been implicated as a primary cause. Prescribed fire has been used successfully to restore and maintain oak savannas and has been advocated to improve the sustainability of oak forests. Fire ecology research has addressed short-term effects of prescribed fire on habitat structure, breeding bird populations, and nesting productivity. In the short term, prescribed fire reduces habitat suitability for forest-interior birds that nest on the ground and in low shrubs but provides more favorable conditions for disturbance-dependent birds associated with savannas, woodlands, and early-successional forest. The use of prescribed burning requires tradeoffs in terms of management and conservation because some bird species benefit while others are negatively affected, depending on the degree to which fire changes habitat features. There is a critical need for long-term studies to better understand the effects of different fire regimes on bird populations in the eastern deciduous forest region.

2084. **Fire in North American wetland ecosystems and fire-wildlife relations: An annotated bibliography.**
Kirby, R. E.; Lewis, S. J.; and Sexson, T. N.
Washington, DC: U.S. Fish and Wildlife Service, 1988. 146 p. Biological Report.
NAL Call #: QH540.U562 no.88(1)
Descriptors: fire management/ wetlands/ wildlife/ North America
Abstract: Provides an annotated bibliography of 319 citations that provide specific research data, summaries of existing knowledge, or site-specific management advice for North America. To this bibliography is appended a supplemental bibliography of all articles cited in the US Fish & Wildlife Service publication series, Wildlife Review, years 1935 through the September 1987 issue (Number 206) that discussed any aspect of wildlife management and ecology related to fire management, fire behaviour, or fire effects in North America. The 942 citations in the supplemental bibliography are intended to provide a ready reference to the fire-wildlife literature that can be used to evaluate past, current or proposed use of fire in wildlife habitat management. -from Authors

2085. **Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update.**
Haufler, Jonathan B.; Galley Krista E. M.; Rooney William R.
Bethesda, MD: Wildlife Society; Technical Review 05-2, 2005. 205 pp.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish
Abstract: This publication updates the Heard et al. (2000) report, which summarized information concerning wildlife benefits derived from Farm Bill conservation programs. Since that initial report, the best researched and documented conservation program has been the Conservation Reserve Program, which is discussed in this volume.

2086. **Fish and wildlife benefits of the Wildlife Habitat Incentives Program.**
Gray, Randall L.; Benjamin, Sally L.; and Rewa, Charles A.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B.; Bethesda, MD: The Wildlife Society, 2005. pp. 155-169.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ Wildlife Habitat Incentives Program
Abstract: The Wildlife Habitat Incentives Program (WHIP) is a voluntary program that encourages the establishment and enhancement of a wide variety of fish and wildlife habitats of national, state, tribal, or local significance. Th rough voluntary agreements, the Natural Resources Conservation Service (NRCS) provides financial and technical assistance to participants who installed habitat restoration and management practices. Since 1998, nearly $150 million has been dedicated to the program and over 2.8 million acres involving over 18,000 contracts have been enrolled. A wide range of habitat-enhancement actions are cost-shared through the program, affecting hundreds of target and non-target species. While few quantitative data exist describing how fish and wildlife have responded to terrestrial and aquatic habitats enrolled in the program, the popularity of WHIP among participants and funding partners and anecdotal evidence imply that tangible benefits to target species are being realized. Additional studies are needed to better understand how WHIP projects affect local habitat use by and population response of target and non-target species.

2087. **Fish and Wildlife response to Farm Bill conservation practices.**
Boyer, Kathryn L.; Brady, Stephen J.; Burger, Loren W.; Clark, William R.; Franklin, Thomas M.; Ganguli, Amy C.; Haufler, Jonathan B.; Helinski, Ronald; Johnson, Douglas; Jones-Farrand, D. Todd; Knight, Scott S.; Manale, Andrew; Reeder, Kathleen F.; Rewa, Charles A.; and Ryan, Mark R.
Bethesda, MD: The Wildlife Society; Technical Review 07-1, 2007. 118 pp.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfball.pdf
Descriptors: aquatic habitat/ conservation practices/ conservation programs/ Farm Bill/ terrestrial habitat/ wildlife species/ wildlife management
Abstract: This document is the second of two literature reviews focused on fish and wildlife and the Farm Bill. It is a conservation practice-oriented companion to the Farm Bill conservation program-focused literature synthesis released in 2005 (Fish and Wildlife Benefits of Farm Bill Conservation Programs: 2000-2005 Update, The Wildlife Society Technical Review 05-2).

2088. **Fish and wildlife response to Farm Bill conservation practices: Executive summary.**
Haufler, Jonathan B.
In: Fish and Wildlife Response to Farm Bill Conservation Practices; Bethesda, MD: The Wildlife Society , 2007. 5 pp.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfb1.pdf
Descriptors: aquatic habitat/ conservation practices/ Farm Bill/ terrestrial habitat/ wildlife species/ wildlife management
Abstract: This summary describes the scope and purpose of the report Fish & Wildlife Response to Farm Bill Conservation Practices. This publication addresses conservation practices that can be used to provide fish and wildlife benefits through the Farm Bill. It does not specifically focus on investigations of actual Farm Bill funded projects, but rather summarizes investigations that have addressed various benefits or impacts to fish and wildlife resources associated with the primary practices utilized for fish and wildlife objectives within Farm Bill programs. The chapters in this volume do not attempt to provide a complete review of all literature pertaining to these practices, but rather to provide documentation of fish and wildlife responses reported in the literature.

2089. **Forest area and avian diversity in fragmented aspen woodland of North Dakota.**
Grant, T. A. and Berkey, G. B.
Wildlife Society Bulletin 27(4): 904-914. (2000)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: area requirements/ aspen woodland/ avian diversity/ grassland/ North Dakota/ avifauna/ community dynamics/ grassland/ habitat management/ vegetation cover/ woodland/ United States/ Populus
Abstract: Aspen (Populus spp.) woodland is increasing within native grasslands in north-central North Dakota, and this increase concerns land managers. We examined avian associations in aspen groves of various sizes on and near J. Clark Salyer National Wildlife Refuge in 1995-96 to predict how bird communities change as woody plant cover increases within a grassland-dominated landscape. Avian species richness increased as aspen grove size increased, particularly for bird species classified as forest interior, neotropical migrant, ground nesting, or insectivorous. Large (i.e., >100-ha) aspen groves provided suitable habitat for 12 area-sensitive species while also meeting the requirements of more ubiquitous habitat generalists. Conversely, small aspen groves did not support the number or diversity of avian species and were occupied by edge-associated species. None of 53 species recorded in the study were restricted to small aspen groves. We conclude that limiting the spread of aspen woodland into native grassland and eliminating small (i.e., <5-ha) aspen groves where feasible will not adversely impact woodland breeding bird communities. Many avian species occur with greater frequency in aspen woodlands than in eastern deciduous forest. Large woodlands contribute to local avian diversity and may provide habitat for forest species that have shown regional or continental population declines.

2090. **Forest change and stream fish habitat: Lessons from 'Olde' and New England.**
Nislow, K. H.
Journal of Fish Biology 67(Sb): 186-204. (Dec. 2005)
Descriptors: conservation/ deforestation/ ecosystem disturbance/ environmental impact/ environmental restoration/ fishery management/ forests/ freshwater fish/ habitat improvement/ identification keys/ land use/ landscape/ migrations/ reforestation/ socioeconomic aspects/ species diversity/ streams/ United States, New England
Abstract: The North Atlantic region has a long history of land use change that has influenced and will continue to

influence stream ecosystems and fisheries production. This paper explores and compares the potential consequences of changes in forest cover for fish production in upland, coldwater stream environments in New England, U.S.A. and the British Isles, two regions which share important similarities with respect to overall physical, biotic and socio-economic setting. Both regions were extensively deforested and essentially no extensive old-growth forest stands remain. In New England, recovering forests, consisting almost entirely of naturally-regenerated native species, now cover >60% of the landscape. Associated with this large-scale reforestation, open landscapes, common in the 19th and first half the 20th century, are currently rare and declining in this region. In the British Isles, forests still cover <20% of the landscape, and existing forests largely consist of exotic conifer plantations stocked at high stand densities and harvested at frequent rotations. While forest restoration and conservation is frequently recommended as a fisheries habitat conservation and restoration tool, consideration of the way in which forests affect essential aspects of fish habitat suggests that response of upland stream fish to landscape change is inherently complex. Under certain environmental settings and reforestation practices, conversion of open landscapes to young-mature forests can negatively impact fish production. Further, the effects of re-establishing old-growth forests are difficult to predict for the two regions (due to the current absence of such landscapes), and are likely to depend strongly on the extent to which critical ecosystem attributes (large-scale disturbances, fish migrations, keystone species, large woody debris recruitment) are allowed to be re-established. Understanding these context-dependencies is critical for predicting fish responses, and should help managers set realistic conservation, management and restoration goals. Management may best be served by promoting a diversity of land cover types in a way that emulates natural landscape and disturbance dynamics. This goal presents very different challenges in New England and the British Isles due to differences in current and predicted land use trajectories, along with differences in ecological context and public perception.

2091. **A functional analysis of streamside habitat use by southern Appalachian salamanders: Implications for riparian forest management.**
Petranka, James W. and Smith, Charles K.
Forest Ecology and Management 210(1-3): 443-454. (2005)
NAL Call #: SD1.F73; ISSN: 0378-1127
Descriptors: conservation measures/ ecology/ terrestrial habitat/ land zones/ Plethodontidae: habitat management/ habitat utilization/ functional analysis/ habitat management implications/ Tennessee/ riparian habitat/ North Carolina/ Southern Appalachians/ Amphibia, Lissamphibia, Caudata/ amphibians/ chordates/ vertebrates
Abstract: The appropriate management of streamside forests and use of riparian strips is poorly resolved for many systems because of a lack of understanding of the extent to which riparian forests function as environmental buffers for aquatic species versus core (essential) habitat for semi-aquatic and terrestrial species. We studied streamside forests in western North Carolina and eastern Tennessee, USA, to help delineate their functional value for plethodontid salamanders. We established 30 m x 40 m plots at 17 sites (823-1716 m in elevation) in unmanaged forests with closed canopies: Plots contained a portion of a seep or first-order stream along one edge and typically extended 36-38 m into the adjoining forest. We examined use of stream and streamside habitats based on captures during area-constrained searches of cover objects. We observed 6423 plethodontid salamanders belonging to 7 terrestrial-breeding and 12 aquatic-breeding species. Terrestrial-breeders (primarily Plethodon spp.) comprised 37% of terrestrial specimens and were more abundant at higher elevations. Aquatic-breeders (primarily Desmognathus spp.) increased their proportionate use of terrestrial habitat, but declined in overall abundance with elevation. Catches of aquatic-breeders were greatest within 8 m of aquatic habitats (49% of total terrestrial catch of aquatic-breeders), particularly at low elevation sites. The terrestrial zone provided core habitat for one terrestrial-breeder (D. wrighti) and six semi-aquatic species (Desmognathus spp., Gyrinophilus porphyriticus and Eurycea wilderae) that were broadly distributed throughout plots, and acted as an aquatic buffer for four highly aquatic species (Desmognathus spp.). The remaining species were terrestrial-breeders (Plethodon spp.) that were evenly distributed across plots, suggesting that riparian strips would function as important source populations for recolonization following timbering on adjoining land. Because of the vulnerability of plethodontid salamanders to edge effects, effective management of southern Appalachian streamside,habitats may require the addition of a terrestrial buffer to protect terrestrial core habitat that immediately adjoins streams and seeps. © 2005 Elsevier B.V. All rights reserved.

2092. **Geospatial analysis of changes in river-channel position and riparian vegetation of the lower Colorado River.**
Norman, Laura M.; Webb, Robert H.; Gass, Leila; Yanites, Brian; Howard, Keith A.; Pfeifer, E. D.; and Beard, L. Sue
Proceedings, The Geological Society of America Denver Annual Meeting (Nov. 2004).
Notes: Conference held November 7-10, 2004, Denver, CO; Poster no. 218-9.
http://gsa.confex.com/gsa/2004AM/finalprogram/abstract_79745.htm
Descriptors: aerial photography/ agriculture/ channelization/ climate change/ Colorado River/ Colorado River delta/ conservation/ ecosystems/ fluvial features/ future/ geomorphology/ habitat/ history/ human activity/ hydrology/ Lake Mead/ landform evolution/ landscapes/ Mexico/ models/ prediction/ processes/ remote sensing/ riparian environment/ sediments/ spatial data/ streamflow/ surface water/ variations/ vegetation

2093. **Grassland birds associated with agricultural riparian practices in southwestern Wisconsin.**
Renfrew, R. B. and Ribic, C. A.
Journal of Range Management 54(5): 546-552. (2001)
NAL Call #: 60.18 J82 ; ISSN: 0022-409X
Descriptors: grasslands/ population density/ riparian grasslands/ rotational grazing/ species richness
Abstract: Rotational grazing has been proposed as a Best Management Practice for minimizing runoff in Wisconsin agricultural riparian areas. The influence of this land

management practice on grassland birds has not been evaluated in relation to more traditional agricultural land management systems in Midwestern riparian areas. This study compared the grassland bird community in riparian areas in Wisconsin, USA that were rotationally grazed to 2 common land use practices along streams in Wisconsin: continuously grazed pastures and rowcrop fields with 10-m-wide ungrazed buffer strips located along the stream. We calculated total number of birds, the Berger-Parker Index of Dominance, and number of birds ha-1 for each site. Vegetation variables used were height-density, litter depth, and percent bare ground. Bird species richness, species dominance, and density did not differ among land use types. In contrast, grassland bird species of management concern (Savannah Sparrow (Passerculus sandwichensis), Eastern Meadowlark (Sturnella magna), and Bobolink (Dolichonyx oryzivorus)) were found on continuous and rotational pastures but very rarely or never occurred on buffer strips. Contrary to previous research, however, rotationally grazed pastures did not support more of these species than continuously grazed pastures. Bird density was related to vegetation structure, with higher densities found on sites with deeper litter. Within the pasture land use types, there were no consistent differences between species richness and density near the stream (<10 m) and away (>10 m).

2094. **The Grassland Reserve Program: New opportunities to benefit grassland wildlife.**
Wood, Floyd and Williams, Jim
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 147-154.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ Grassland Reserve Program/ grasslands/ grazing
Abstract: The Grassland Reserve Program (GRP) was established by the 2002 Farm Bill to provide assistance to landowners in conserving and enhancing ecological value of grasslands while maintaining their suitability for grazing and other compatible uses. In response to long-term declines in grassland acreage and their associated benefits, approximately 524,000 acres have been enrolled since fiscal year 2003 in a variety of long-term rental agreements and easements. The program has proven popular with landowners. Whereas wildlife benefits have likely accrued by protection, enhancement, and restoration of grasslands enrolled, little effort has been made to quantify wildlife response during the first 2 years of program operation. Additional studies are needed to document wildlife benefits achieved.

2095. **Habitat availability-preference relationships: Moose case study.**
Osko, Terrance James. University of Alberta (Canada), 2004.
Notes: Degree: PhD; Advisor: Hudson, Robert J.
Descriptors: habitat management/ moose/ habitat preference/ habitat use/ Canada
Abstract: Habitat management is driven by results from habitat selection studies that assume the habitats animals select impart fitness to their populations and are therefore required. Such assumptions are rarely tested yet often are accepted without question and generally applied, potentially leading to mismanagement of wildlife. General application also implies that observed animal preferences for habitats are assumed to be static. I used moose as a case study to investigate whether changing relative abundance of habitat classes can influence the habitat preferences of wildlife and examined how changes in relative habitat abundance might exert that influence. I tested the hypothesis that moose habitat preferences were fixed by comparing habitat use and preferences between 2 groups of moose from the same ecosystem, but which occupied areas differing in relative abundance of the same habitat classes. I used single and multiple linear regression to determine whether the observed preferences were descriptive of moose-habitat relationships that were unique for each group, or whether they were outcomes of a relationship that was common to both. I also assessed whether home range or site selection differed between the same 2 groups in response to physical features in their environment. Both habitat use and preference differed between the 2 moose groups, as did responses to environmental features, suggesting that habitat preferences were conditional upon availability. Regression results supported the hypothesis that contrasting preferences resulted from a common selection process, as well as the alternative, that moose in each group behaved according to unique selection processes. These opposing conclusions were reconciled by the possibility that unique relationships observed at specific places and times can be consolidated to describe comprehensive wildlife-habitat relationships (functional responses) that are responsive to habitat change. Wildlife managers must challenge past generalizations about wildlife-habitat relationships by applying habitat prescriptions as experiments to test hypotheses. Such testing of assumptions that drive habitat prescriptions can improve the act of habitat management as much as the prescriptions are intended to improve habitat. Future research should also seek mechanistic understanding of habitat selection through investigation of the trade-off decisions facing animals as habitat availability changes.

2096. **Habitat conservation for birds in the Mississippi headwaters/tallgrass prairie ecosystem.**
Koford, R. and Stallman, H.
Great Plains Research 12(1): 123-139. (2002)
NAL Call #: QH104.5.G73 G755; ISSN: 10525165
Descriptors: declining species/ grassland birds/ habitats/ restoration/ wetlands/ avifauna/ ecosystem management/ grassland/ habitat conservation/ wetland/ United States
Abstract: Land management agencies need to plan and prioritize their activities to best use limited resources. To implement ecosystem management, the US Fish and Wildlife Service has defined watershed-based planning units, such as the Mississippi Headwaters/Tallgrass Prairie Ecosystem. To identify important habitats for migratory birds in this ecosystem, we ranked habitats according to their importance for breeding birds of conservation concern, using rankings of the birds' conservation priority within this ecosystem. Grasslands and wetlands were the highest ranked habitats because 12 (46%) and 9 (25%), respectively, of the species breeding in these habitats had "Partners in Flight" scores greater than 19 (maximum 35).

Shrub-sapling stands and lake habitats ranked next, and forest habitats ranked lowest. The four highly ranked habitats are widespread in the Great Plains. These habitats can contribute to the conservation of a variety of high-priority bird species, if the habitats are restored and managed for birds.

2097. **Habitat fragmentation and the distribution of amphibians: Patch and landscape correlates in farmland.**
Kolozsvary, Mary B. and Swihart, Robert K.
Canadian Journal of Zoology 77(8): 1288-1299. (Aug. 1999)
NAL Call #: 470 C16D; ISSN: 0008-4301
Descriptors: Amphibia/ farming and agriculture/ agricultural fragmentation of forest and wetland/ ecological effects/ community structure/ distribution within habitat/ agriculturally fragmented forest and wetland habitats/ semiaquatic habitat/ agriculturally fragmented wetland ecology/ forest and woodland/ agriculturally fragmented forest ecology/ cultivated land habitat/ agriculturally fragmented forest and wetland/ ecology/ Indiana/ Tippecanoe and Warren Counties/ Indian Pine Natural Resources Area/ agriculturally fragmented forest and wetland habitat ecology

2098. **Habitat fragmentation effects on birds in grasslands and wetlands: A critique of our knowledge.**
Johnson, D. H.
Great Plains Research 11(2): 211-231. (2001)
NAL Call #: QH104.5.G73 G755; ISSN: 10525165
Descriptors: birds/ fragmentation/ grasslands/ habitat/ wetlands/ wildlife/ avifauna/ grassland/ habitat fragmentation/ habitat loss/ wetland/ Ammodramus henslowii/ Ammodramus savannarum/ Circus cyaneus/ Dolichonyx oryzivorus/ Passerculus sandwichensis
Abstract: Habitat fragmentation exacerbates the problem of habitat loss for grassland and wetland birds. Remaining patches of grasslands and wetlands may be too small, too isolated, and too influenced by edge effects to maintain viable populations of some breeding birds. Knowledge of the effects of fragmentation on bird populations is critically important for decisions about reserve design, grassland and wetland management, and implementation of cropland set-aside programs that benefit wildlife. In my review of research that has been conducted on habitat fragmentation, I found at least five common problems in the methodology used. The results of many studies are compromised by these problems: passive sampling (sampling larger areas in larger patches), confounding effects of habitat heterogeneity, consequences of inappropriate pooling of data from different species, artifacts associated with artificial nest data, and definition of actual habitat patches. As expected, some large-bodied birds with large territorial requirements, such as the northern harrier (Circus cyaneus), appear area sensitive. In addition, some small species of grassland birds favor patches of habitat far in excess of their territory size, including the Savannah (Passerculus sandwichensis), grasshopper (Ammodramus savannarum) and Henslow's (A. henslowii) sparrows, and the bobolink (Dolichonyx oryzivorus). Other species may be area sensitive as well, but the data are ambiguous. Area sensitivity among wetland birds remains unknown since virtually no studies have been based on solid methodologies. We need further research on grassland bird response to habitat that distinguishes supportable conclusions from those that may be artifactual.

2099. **A habitat network for terrestrial wildlife in the interior Columbia Basin.**
Wisdom, Michael J.; Wales, Barbara C.; Holthausen, Richard S.; Hann, Wendel J.; Hemstrom, Miles A.; and Rowland, Mary M.
Northwest Science 76(1): 1-14. (2002)
NAL Call #: 470 N81; ISSN: 0029-344X.
http://research.wsulibs.wsu.edu:8080/dspace/handle/2376/955
Descriptors: conservation measures/ terrestrial habitat/ land and freshwater zones/ Vertebrata: habitat management/ endangered taxa/ habitat-network mapping/ endangered status/ forest and woodland/ grassland/ scrub/ conservation/ United States/ Interior Columbia Basin/ endangered taxa/ chordates/ vertebrates
Abstract: Habitat managers need information about landscape conditions in relation to the composite requirements of species that deserve attention in conservation planning. Consequently, we characterized and mapped a broad-scale network of habitats for five suites of terrestrial vertebrates in the 58 million-ha Interior Columbia Basin (Basin). These five suites, referred to as Families, are composed of 44 species whose habitats have declined strongly from historical (circa 1850-1890) to current periods in the Basin, and thus are of conservation focus. Two of the five Families consist of species that depend on old forests. Species in another Family depend on early-seral forests. Species in the remaining Families depend on sagebrush-steppe or open canopy sagebrush and grasslands. For each Family, we characterized current habitat conditions at the scale of the watershed (mean size of 22 500 ha). Each watershed was classified as one of three conditions. Watersheds in Condition 1 contained habitats whose quality or abundance have changed little since the historical period. By contrast, watersheds in Condition 2 or 3 contained habitats that have changed from historical conditions, but in different ways. Watersheds in Condition 2 had habitats of high abundance but moderate resiliency and quality, whereas watersheds in Condition 3 contained habitats of low abundance or low resiliency and quality. The majority of watersheds (59-80%) were in Condition 3 for all five Families, whereas the lowest percentage (5-25%) of watersheds was in Condition 2 for four of five Families. Connectivity among watersheds for all Families appeared low in many parts of the Basin due to spatial gaps associated with areas of habitat extirpation. Our condition maps constitute a broad-scale network of habitats that could be useful for developing multi-species research hypotheses and management strategies for the Basin.

2100. **Habitat selection and use of edges by striped skunks in the Canadian prairies.**
Lariviere, S. and Messier, F.
Canadian Journal of Zoology 78(3): 366-372. (2000)
NAL Call #: 470 C16D; ISSN: 00084301
Descriptors: edge effect/ foraging behavior/ habitat selection/ habitat use/ home range/ mustelid/ Canada/ Mephitis mephitis

Abstract: During 1993-1994, we radio-tracked 21 female and 5 male striped skunks (Mephitis mephitis) in south-central Saskatchewan, Canada, to assess their patterns of habitat selection. Home ranges of both sexes contained more areas managed for nesting waterfowl and less woodland than the overall study area. When foraging within their home ranges, striped skunks used more wetland and woodland and less cropland relative to other habitat types (managed nesting areas, rights-of-way, farmsteads). Patterns of habitat selection by striped skunks were significantly but weakly correlated with abundance of insects and small mammals. Striped skunks selected undisturbed habitats where ground litter can accumulate, possibly because such habitats also harbor a greater abundance of prey. Our results support the restoration of grasslands for nesting waterfowl. Furthermore, the use of large habitat patches by striped skunks decreased away from edges, suggesting that large patches may serve as refuges for ground-nesting birds.

2101. **Habitat use and survival of northern bobwhite (Colinus virginianus) in cropland and rangeland ecosystems during the hunting season.**
Williams, Christopher K.; Scott Lutz, R.; Applegate, Roger D.; and Rusch, Donald H.
Canadian Journal of Zoology 78(9): 1562-1566. (2000)
NAL Call #: 470 C16D; ISSN: 0008-4301
Descriptors: ecology/ population dynamics/ man-made habitat/ land and freshwater zones/ Colinus virginianus (Phasianidae): survival/ winter/ habitat utilization/ winter cover/ cropland-rangeland comparisons/ terrestrial habitat/ rangeland/ cultivated land habitat/ Kansas/ Lyon County/ survival/ Phasianidae/ Galliformes, Aves/ birds/ chordates/ vertebrates

2102. **Habitat use by meso-predators in a corridor environment.**
Frey, S. N. and Conover, M. R.
Journal of Wildlife Management 70(4): 1111-1118. (2006)
NAL Call #: 410 J827; ISSN: 0022541X.
Notes: doi: 10.2193/0022-541X(2006)70 [1111:HUBMIA]2.0.CO;2.
Descriptors: corridors/ habitat use/ linear habitat/ predators/ raccoon/ red fox/ striped skunk/ waterfowl
Abstract: Red foxes (Vulpes vulpes), raccoons (Procyon lotor), and striped skunks (Mephitis mephitis) are found throughout the United States, wherever there is suitable denning habitat and food resources. Densities of these predators have increased throughout the Intermountain West as a consequence of human alterations in habitat. Within the Bear River Migratory Bird Refuge (hereafter, refuge), in northern Utah, USA, upland nesting habitat for ducks is limited to the levee banks and roadsides. Red foxes, raccoons, and striped skunks, which prey on upland nesting birds, are also abundant on the refuge. We studied red foxes, raccoons, and striped skunks' use of levees and the edges associated with them within a wetland environment. Red fox, raccoon, and striped skunk locations were negatively correlated with distance to the nearest dike (-0.78, -0.69, and -0.45, respectively). Animals incorporated more roads and/or levees into their home ranges than expected by chance ($\bar{x} = 2.6$; $Z < 0.001$); incorporation of levees was greater during the dispersal season than the rearing season ($P = 0.03$). Skunk home ranges (average size, 3.0 km^2) were oriented along roads and levees ($P = 0.03$), whereas raccoon (average size, 3.6 km^2) and fox home ranges (average size, 3.5 km^2) were not ($P = 0.93$, $P = 0.13$, respectively). Fox home ranges in the refuge were more oblong in shape than reported elsewhere ($P = 0.03$). However, home-range shapes of raccoons and striped skunks were similar to previous studies ($P = 0.84$, $P = 0.97$, respectively). The use of roads and levees within the refuge increases the possible travel distance and penetration of predators into wetland environments. This contributes to increased depredation of waterfowl nests and to decreased recruitment. Managers of similar areas might decrease depredation of waterfowl by disrupting the linear pattern of corridors, thereby decreasing the congestion of animal roads and levees. This would, then, decrease the encounter rates of predators and prey.

2103. **Habitat use, home ranges, and survival of swift foxes in a fragmented landscape: Conservation implications.**
Kamler, J. F.; Ballard, W. B.; Fish, E. B.; Lemons, P. R.; Mote, K.; and Perchellet, C. C.
Journal of Mammalogy 84(3): 989-995. (2003)
NAL Call #: 410 J823; ISSN: 0022-2372
Descriptors: animal sciences/ habitat use/ home range/ survival/ swift fox/ Texas/ Vulpes velox/ Joaquin kit foxes/ arid land foxes/ vulpes velox/ western Kansas/ North America/ mortality/ macrotis/ rates/ size
Abstract: Habitat loss might be one of the primary reasons for the decline of the swift fox (Vulpes velox) in the western Great Plains of North America. From 1998 to 2001, we monitored 42 swift foxes in a landscape interspersed with native short-grass prairies, nonnative grasslands enrolled in the Conservation Reserve Program, irrigated agricultural fields, and dryland agricultural fields. Survival estimates ranged from 0.52 to 0.66 for both adults and juveniles, and the primary causes of death were vehicle collisions (42% deaths) and coyote (Canis latrans) predation (33%). Annual home-range size was similar for males and females (10.8 and 10.5 km(2), respectively). Within the study area, swift foxes selected only short-grass prairies and had lower-than-expected use or complete avoidance of all other habitat types. Our results indicate swift foxes are more specialized in habitat selection than other North American canids; thus, protection of native short-grass prairies might be necessary for their long-term existence.

2104. **Headwater riparian forest-floor invertebrate communities associated with alternative forest management practices.**
Rykken, Jessica J.; Moldenke, Andrew R.; and Olson, Deanna H.
Ecological Applications 17(4): 1168-1183. (2007)
NAL Call #: QH540.E23; ISSN: 1051-0761
Descriptors: commercial activities/ ecology/ terrestrial habitat/ land zones/ Invertebrata: forestry/ alternative forest management practices/ forest floor communities/ headwater riparian zones/ community structure/ forest and woodland/ forest floor habitat/ riparian habitat/ headwater stream riparian zones/ Oregon/ Willamette National Forest/ invertebrates

Abstract: Headwater streams and their riparian zones are a common, yet poorly understood, component of Pacific Northwest, USA, landscapes. We describe the ecological importance of headwater stream riparian zones as habitat for forest-floor invertebrate communities and assess how alternative management strategies for riparian zones may impact these communities. We compared community composition of forest-floor invertebrates at increasing distances along trans-riparian (stream edge to upslope) transects in mature forests, clearcuts, and riparian buffers of ≃30-m width with upslope clearcuts. Invertebrates were collected using pitfall traps in five replicate blocks of three treatments each in the Willamette National Forest, Oregon, USA. We measured microclimate and microhabitat variables at pitfall locations. Despite strong elevation and block effects on community composition, community analyses revealed a distinct "riparian" invertebrate community within 1 m of the stream edge in mature forest treatments, which was strongly related to cool, humid microclimate conditions. Invertebrate community composition in buffer treatments was far more similar to that of mature forests than to clearcuts; a pattern mirrored by microclimate. These results suggest that, within our study sites, forest floor invertebrate distributions are strongly associated with microclimate and that riparian buffers of ≃30-m width do provide habitat for many riparian and forest species. Riparian reserves may serve as effective forest refugia and/or dispersal corridors for invertebrates and other taxa, and their incorporation into watershed management plans likely will contribute to meeting persistence and connectivity objectives.

2105. **Henslow's sparrow winter-survival estimates and response to prescribed burning.**
Thatcher, Benjamin S.; Krementz, David G.; and Woodrey, Mark S.
Journal of Wildlife Management 70(1): 198-206. (2006)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Emberizidae/ Passeriformes/ Ammodramus henslowii/ Fringillidae/ Laniidae/ Ammodramus henslowi/ Henslow's sparrow/ Lanius ludovicianus/ loggerhead shrike/ Mississippi sandhill crane/ environmental factors/ burn season/ coastal pine savanna/ coastal plain/ conservation/ wildlife management/ habitat use/ fires-burns/ forests/ ecosystems/ grasslands/ habitat management/ methods and techniques/ pine savanna/ population ecology/ prescribed burning/ radiotelemetry/ survival/ terrestrial ecology/ winter/ winter survival estimates/ wintering habitat/ habitat/ landscape management/ fire/ fertility/ recruitment/ Pinus spp./ Mississippi
Abstract: Wintering Henslow's sparrow (Ammodramus henslowii) populations rely on lands managed with prescribed burning, but the effects of various burn regimes on their overwinter survival are unknown. We studied wintering Henslow's sparrows in coastal pine savannas at the Mississippi Sandhill Crane National Wildlife Refuge, Jackson County, Mississippi, USA, during January and February 2001 and 2002. We used the known-fate modeling procedure in program MARK to evaluate the effects of bum age (1 or 2 growing seasons elapsed), burn season (growing, dormant), and calendar year on the survival rates of 83 radiomarked Henslow's sparrows. We found strong evidence that Henslow's sparrow survival rates differed by bum age (with higher survival in recently burned sites) and by year (with lower survival rates in 2001 likely because of drought conditions). We found some evidence that survival rates also differed by bum season (with higher survival in growing-season sites), although the effects of bum season were only apparent in recently burned sites. Avian predation was the suspected major cause of mortality (causing 6 of 14 deaths) with 1 confirmed loggerhead shrike (Lanius ludovicianus) depredation. Our results indicated that recently burned savannas provide high-quality wintering habitats and suggested that managers can improve conditions for wintering Henslow's sparrows by burning a large percentage of savannas each year.

2106. **Herbaceous filter strips in agroecosystems: Implications for ground beetle (Coleoptera: Carabidae) conservation and invertebrate weed seed predation.**
Menalled, Fabian D.; Lee, Jana C.; and Landis, Douglas A.
Great Lakes Entomologist 34(1): 77-91. (2002)
NAL Call #: QL461.M5; ISSN: 0090-0222
Descriptors: conservation measures/ nutrition/ diet/ ecology/ man-made habitat/ land zones/ Carabidae: habitat management/ community structure/ cultivated land habitat/ crop fields/ herbaceous filter strips/ effects on community structure/ Michigan/ Midland County/ Insecta, Coleoptera, Adephaga, Caraboidea/ arthropods/ beetles/ insects/ invertebrates
Abstract: A 9.3-ha crop field flanked by two filter strips was selected to: 1) assess carabid beetle activity-density and community composition and 2) assess post-dispersal weed seed predation by invertebrates in these habitats. Overall during 1997 and 1998, 12,937 carabid beetles comprising 58 species were collected. Greater species richness and activity-density was observed in filter strips than in the field. A multivariate ordination revealed that year of capture and habitat were important variables conditioning carabid beetle communities. While two omnivorous species known to eat weed seeds [Harpalus erraticus (Say), Anisodactylus sanctaecrucis (F.)] dominated the 1997 captures, two carnivorous [Pterostichus melanarius (Ill), Pterostichus permundus (Say)] were predominant in 1998. Two omnivorous species, Harpalus pensylvanicus (DeG) and H. erraticus, were primarily captured in filter strips. Weed seed removal was greater in filter strips than in the field. This study shows that habitat management represents a feasible approach to conserve beneficial organisms in farmlands.

2107. **Herpetofaunal response to gap and skidder-rut wetland creation in a southern bottomland hardwood forest.**
Cromer, Robert B.; Lanham, Joseph D.; and Hanlin, Hugh H.
Forest Science 48(2): 407-413. (May 2002)
NAL Call #: 99.8 F7632; ISSN: 0015-749X
Descriptors: Amphibia/ Reptilia/ forestry/ forest gaps/ skidder ruts/ wetland creation/ wetland conservation/ community response/ community structure/ forest and woodland/ bottomland hardwood forests/ man-made habitat/ skidder rut wetlands/ forest habitat/ community responses/ South Carolina/ Barnwell County/ Savannah River site

Abstract: We compared herpetofaunal communities in recently harvested gaps, skidder trails, and unharvested depressional wetlands to assess the effects of group-selection harvesting and skidder traffic on reptiles and amphibians in a southern bottomland hardwood forest. From January 1, 1997 to December 31, 1998 we captured 24,292 individuals representing 55 species of reptiles and amphibians at the Savannah River Site in Barnwell County, South Carolina. Forty-two species (n = 6,702 individuals) were captured in gaps, 43 species (n = 8,863 individuals) were captured along skid trails between gaps and 43 species (n = 8,727 individuals) were captured in bottomland depressions over the 2 yr period. Three vegetation variables and six environmental variables were correlated with herpetofaunal abundance. Salamander abundance, especially for species in the genus Ambystoma, was negatively associated with areas with less canopy cover and pronounced rutting (i.e., gaps and skidder trails). Alternatively, treefrog (Hylidae) abundance was positively associated with gap creation. Results from this study suggest that group selection harvests and skidder rutting may alter the herpetofaunal species composition in southern bottomland hardwoods by increasing habitat suitability for some species while diminishing it for others.

2108. **High offspring survival of the brown-headed cowbird in an invaded habitat.**
Winfree, R.
Animal Conservation 7(4): 445-453. (2004);
ISSN: 13679430.
Notes: doi: 10.1017/S1367943004001544.
Descriptors: brood parasitism/ habitat management/ host-parasite interaction/ passerines/ species conservation/ Aves/ Molothrus/ Molothrus ater
Abstract: The brood parasitic brown-headed cowbird (Molothrus ater) is considered an important threat to bird conservation in North America because it reduces the reproduction of its numerous host species. Prior to the colonisation of America by Europeans, the cowbird was largely confined to the North American prairie region, but it has since invaded forests and other habitats and is now one of the continent's most abundant breeding passerines. The objective of this study was to examine cowbird reproduction with different host communities to determine whether habitat-specific reproduction might contribute to the cowbird's population expansion. Cowbird offspring survival was estimated with hosts breeding in fragmented deciduous forest (a newly invaded habitat) and old fields (a habitat more similar to the cowbird's original range). Offspring survival was 1.8-3.1 times higher in forest compared to old fields and was high enough to cause the cowbird population to increase with most forest hosts. The results suggest that increased offspring survival in an invaded habitat facilitates cowbird population growth. Land management for extensive, continuous forests, which cowbirds are known to avoid, could help control the cowbird population and reduce parasitism levels for the >140 species of cowbird hosts.

2109. **Highly erodible land and Swampbuster provisions of the 2002 Farm Act.**
Brady, S. J.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 5-16.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ Swampbuster/ Conservation Reserve Program/ Wetlands Reserve Program
Abstract: The Farm Security and Rural Investment Act of 2002 continued provisions for the conservation of highly erodible land and wetlands that had been enacted by the omnibus farm acts of 1985, 1990, and 1996. The effects these provisions have on wildlife conservation are reviewed in light of recent data and reports published about those programs. Strong evidence supporting the conservation benefits of these programs includes the significant reduction in cropland soil-erosion rates of 1.3 billion tons per year and the significant reduction in wetland losses due to agriculture in recent periods. The latter is highlighted by net wetland gains on agricultural lands during the period 1997-2002. While these 2 provisions generally do not create wildlife habitat directly, they play a very substantial role in supporting the conservation gains made by other U.S. Department of Agriculture (USDA) conservation provisions. Additionally they provide strong motivation for producers to apply conservation systems on their highly erodible lands, to protect wetlands from conversion to cropland, and to apply for enrollment in the other USDA conservation programs, especially the Conservation Reserve and Wetlands Reserve programs.

2110. **Historical and present impacts of livestock grazing on fish and wildlife resources in western riparian habitats.**
Ohmart, Robert D.
In: Rangeland wildlife/ Krausman, Paul R.
Denver, Colo.: Society of Range Management, 1996; pp. 245-279.
Notes: Literature review.
NAL Call #: SK361.R36 1996
Descriptors: commercial activities/ terrestrial habitat/ land and freshwater zones/ comprehensive zoology: farming and agriculture/ riparian habitat/ livestock grazing/ biological effects/ North America/ biological effects of livestock grazing/ riparian habitats

2111. **The history, status and future needs of fish and wildlife management on private lands as related to USDA agricultural programs.**
Heard, L. Pete; Allen, Arthur W.; Best, Louis B.; Brady, Stephen J.; Burger, Wes; Esser, Anthony J.; Hackett, Ed; Helinski, Ronald R.; Hohman, William L.; Johnson, Douglas H.; Pederson, Roger L.; Reynolds, Ronald E.; Rewa, Charles; and Ryan, Mark R.
Transactions of the North American Wildlife and Natural Resource Conference 66: 54-67. (2001)
NAL Call #: 412.9 N814; ISSN: 0078-1355.

Notes: Meeting: Sixty-sixth North American Wildlife and Natural Resources Conference, Washington, DC, USA, March 16-20, 2001.
Descriptors: 1985 Food Security Act [Farm Bill]/ Conservation Reserve Program [CRP]/ Environmental Quality Incentive Program [EQIP]/ Wetlands Reserve Program [WRP]/ Wildlife Habitat Incentives Program [WHIP]/ agricultural programs/ compliance provisions/ highly erodable land/ land retirement programs/ private land management/ wildlife conservation/ wildlife management: future needs, history, status/ wildlife responses

2112. **How much habitat is enough? Guidelines for restoration and conservation of habitat in the Great Lakes.**
Bryan, G. K.
International Association for Great Lakes Research Conference 49: 24-25. (2006).
Notes: Location: South African Institute for Aquatic Biodiversity (SAIAB), Private Bag 1015, Grahamstown, 6140, South Africa.
Descriptors: Great Lakes/ habitats/ habitat management/ habitat rehabilitations/ restoration measures/ management strategies/ watershed management/ urbanization/ urban areas/ watersheds/ catchments/ rivers/ lakes/ policy/ management/ North America
Abstract: How Much Habitat is Enough? A Framework for Guiding Habitat Restoration in Great Lakes Areas of Concern provides 18 guidelines regarding the location, type, and quantity of forest, riparian, and wetland habitat needed to provide for minimum viable wildlife populations. Envisioned as a means to locate restoration projects within Canadian Areas of Concern it is now also widely used as a conservation planning tool and conservation biology primer. Over 40 Natural Heritage Strategies have adapted or adopted Framework guidelines. In 2006 the report 'Area Sensitive Forest Birds in Urban Areas' was released to address the restoration of forest habitat in urbanizing watersheds. The report identified and ranked forest bird 13 stressors, analyzed the loss of forest birds in the Greater Toronto AOC, and discussed mitigation measures. Mitigation measures for area sensitive forest birds in urban watersheds are limited; retaining adequate forest cover and adequate forest interior in much of the rapidly urbanizing lower Great Lakes basin may be seen as a greater priority in terms of songbirds. The report raises questions as to the foci of urban restoration efforts and how new development is planned.

2113. **Impact of a wetland development project on grassland birds in Hardin County, Ohio.**
Hoagstrom, Carl W.
Ohio Journal of Science 104(1): A17. (2004)
NAL Call #: 410 Oh3; ISSN: 0030-0950
Descriptors: grassland birds/ constructed wetlands/ ponds/ lowlands/ bird populations/ habitat restoration/ Ohio
Abstract: Ohio Northern University and the Ohio Department of Natural Resources are working together to establish a wetland complex three miles north of Roundhead, Ohio. In light of the concern for grassland bird populations, the impact of this development on the bird of the fields in which the wetlands were established is of interest. Eight walking surveys of the bird fauna were undertaken in May, June and July of 2002 and repeated in 2003. Diking, digging and seeding for the project were carried out in the spring, summer and fall of 2003. The impact of those disturbances on the grassland birds was explored by comparing the surveys of 2002 and 2003. Estimates of the number of singing males of each species for each year, with the estimate for 2002 given first, were - 15 and 13 Bobolink (Dolichonyx oryzivorus); ten and eight Eastern Meadowlarks (Sturnella magna); 12 and 14 Grasshopper Sparrows (Ammodramus savannarum); two and six Henslow's Sparrows (Ammodramus henslowii); two and two Vesper Sparrows (Pooecetes gramineus); and six and six Savannah Sparrows (Passerculus sandwichensis). Numbers were similar between the two years for each species. Two of the new ponds were dug and diked within the area occupied by the Bobolink colony with no meaningful difference between years. The wetland development activities appeared to have little effect on the bird populations.

2114. **Impact of crop harvest on small mammal populations in Brookings County, South Dakota.**
Pinkert, Melissa K.; Meerbeek, Jonathan R.; Scholten, George D.; and Jenks, Jonathan A.
Proceedings of the South Dakota Academy of Science 81: 39-45. (2002)
NAL Call #: 500 So82; ISSN: 0096-378X
Descriptors: commercial activities/ ecology/ population dynamics/ terrestrial habitat/ man-made habitat/ land zones/ Insectivora/ Rodentia: farming and agriculture/ crop harvesting/ population density/ crop harvesting effects/ distribution within habitat/ grassland/ cultivated land habitat/ agricultural habitats/ South Dakota/ Brookings County/ Mammalia/ chordates/ Insectivores/ mammals/ rodents/ vertebrates
Abstract: In the Midwest, agricultural cropland provides the majority of habitat available to small mammals. In some regions of the Midwest, cropland comprises as much as 70% of the landscape. Importance of these agricultural habitats to small mammals pre- and post-harvest is not well documented. The distribution of small mammals was studied in shelterbelt, grassland, and adjacent cropland habitats pre- and post-harvest in Brookings County, South Dakota from 20 September (before crop harvest) to 15 November 2001 (after crop harvest). Deer mice (Peromyscus maniculatus) (n=30) and white-footed mice (Peromyscus leucopus) (n= 29) were captured in relatively high numbers when compared to the other species: short-tailed shrews (Blarina brevicauda) (n=13), masked shrews (Sorex cinereus) (n=7), prairie voles (Microtus ochrogaster) (n=4), meadow voles (Microtus pennsylvanicus) (n=3), and northern grasshopper mice (Onychomys leucogaster) (n=2). Deer mice and white-footed mice were the only inhabitants of cropland. When compared to cropland, proportions of deer mice using the grassland and white-footed mice using the shelterbelt decreased after harvest. Competition among small mammals and predation risks from the short-tail shrew in grasslands and shelterbelts may force deer mice and white-footed mice into habitats such as cropland. Alternatively, the abundance of waste grain after harvest may explain the increased use of cropland. The prairie vole demonstrated a strong use of grassland, while the white-footed mouse used shelterbelt habitats. Cropland

habitats adjacent to shelterbelts and grasslands likely provide a relatively stable food source for small mammal populations.

2115. **Impact of riparian buffer guidelines on old growth in western boreal forests of Canada.**
Lee, P. and Barker, T.
Forestry 78: 263-278. (July 2005)
Descriptors: riparian buffers/ width/ old growth forests/ boreal forests/ forest management/ streams/ lakes/ fish/ simulation models/ guidelines/ riparian areas/ temporal variation/ spatial variation/ forest stands/ stand composition/ forest succession/ forest ecology/ wetland conservation/ wildlife habitats/ Canada/ buffer width/ riparian area management/ forest canopy types/ plant ecology/ water resources and management/ natural resources, environment, general ecology, and wildlife conservation/ forestry production general
This citation is from AGRICOLA.

2116. **Impacts of flooding regime modification on wildlife habitats of bottomland hardwood forests in the lower Mississippi Valley.**
Klimas, C. V.; Martin, C. O.; and Teaford, J. W.
Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station; Technical Report El-81-13, 981. 200 p.
Notes: Literature review.
Descriptors: flood plain management/ floods/ forests/ wildlife habitats/ hardwood/ aquatic animals/ logging/ land clearing/ Mississippi River
Abstract: This is a literature review concerning the impacts of flooding regime modification on bottomland hardwood forest wildlife habitats of the lower Mississippi Valley. The composition and structure of the bottomland forest are an important determinant of the quality and type of wildlife habitat available. These forest characteristics are largely influenced by the flooding regime. Overstory diversity and perennial understory diversity and productivity are lowest in near-permanently flooded habitats and increase in areas flooded less frequently and for shorter periods of time. Nonflooded areas are often, but not always, less diverse and productive than infrequently flooded areas. Tree growth, regional habitat diversity, and land clearance patterns may also be influenced by modifications to the hydrologic regime. Bottomland forests are considered productive wildlife habitat due to high soil fertility, abundant moisture, and the diversity and abundance of wildlife food and cover. Modifications in the magnitude, frequency, and duration of flooding are expected to bring about a wide variety of impacts on different species. Impacts of flooding regime modifications are discussed for mammals, birds, reptiles, and amphibians. Aquatic and semiaquatic species are generally adversely affected by flood reduction and are benefitted by normal flooding conditions. Species that are principally terrestrial may be severely impacted by major flooding events, but they may respond more to secondary influences such as land clearing and logging. Where known, both direct and indirect impacts of flooding regime modifications are discussed by species or species groups occurring in the study area.

2117. **Impacts of grazing on wetlands and riparian habitat: A review of our knowledge.**
Skovlin, J. M.; Platts, W. S.; Raleigh, R. F.; Carpenter, L. H.; Malechek, J. C.; and Rittenhouse, L. R.
In: Developing strategies for rangeland management/ National Research Council; Series: Westview special studies in agriculture science and policy.
Boulder, Colo.: Westview Press, 1984; pp. 1001-1166.
NAL Call #: SF85.3.D48
Descriptors: wetlands/ riparian habitats/ grazing/ North America/ rangelands
Abstract: In the context of western North America, discusses the effects of range livestock grazing on vegetation, watershed, and fish and wildlife. Grazing strategies to improve habitats are proposed for better decisions in allocating riparian zone uses.

2118. **Impacts of waste from concentrated animal feeding operations on water quality.**
Burkholder, J.; Libra, B.; Weyer, P.; Heathcote, S.; Kolpin, D.; Thorne, P. S.; and Wichman, M.
Environmental Health Perspectives 115(2): 308-312. (2007)
NAL Call #: RA565.A1E54; ISSN: 00916765.
Notes: doi: 10.1289/ehp.8839.
Descriptors: ecology/ human health/ poultry/ swine/ water contaminants/ wildlife
Abstract: Waste from agricultural livestock operations has been a long-standing concern with respect to contamination of water resources, particularly in terms of nutrient pollution. However, the recent growth of concentrated animal feeding operations (CAFOs) presents a greater risk to water quality because of both the increased volume of waste and to contaminants that may be present (e.g., antibiotics and other veterinary drugs) that may have both environmental and public health importance. Based on available data, generally accepted livestock waste management practices do not adequately or effectively protect water resources from contamination with excessive nutrients, microbial pathogens, and pharmaceuticals present in the waste. Impacts on surface water sources and wildlife have been documented in many agricultural areas in the United States. Potential impacts on human and environmental health from long-term inadvertent exposure to water contaminated with pharmaceuticals and other compounds are a growing public concern. This workgroup, which is part of the Conference on Environmental Health Impacts of Concentrated Animal Feeding Operations: Anticipating Hazards-Searching for Solutions, identified needs for rigorous ecosystem monitoring in the vicinity of CAFOs and for improved characterization of major toxicants affecting the environment and human health. Last, there is a need to promote and enforce best practices to minimize inputs of nutrients and toxicants from CAFOs into freshwater and marine ecosystems.

2119. **Implementing shorebird conservation on public lands.**
Ciuzio, Elizabeth; Morton, R. Mike; and Ranalli, Nicole
Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 59: 183-190. (2005)
NAL Call #: SK1.S6; ISSN: 0276-7929

Descriptors: conservation measures/ behavior/ man-made habitat/ land zones/ Charadrii: habitat management/ public lands conservation management for migratory species/ migration/ semiaquatic habitat/ cultivated land habitat/ Kentucky/ Aves, Charadriiformes/ birds/ chordates/ vertebrates
Abstract: Working toward fulfilling regional habitat objectives for migratory shore-birds, the Kentucky Department of Fish and Wildlife Resources (KDFWR) constructed moist soil units on three Wildlife Management Areas (WMA) to specifically be managed for stopover habitat. Units either were converted from agriculture land and fitted with water pumps or constructed at the base of a hill to collect rainwater. The most commonly observed shorebirds using these sites and other available habitat on the WMAs were killdeer (Charadrius vociferus), pectoral sandpiper (Calidris melanotos), and lesser yellowlegs (Tringa flavipes). Managing for shallow water habitat on public lands, particularly during fall migration and/or drought years, is key to ensuring that priority shorebirds arrive on the wintering or breeding grounds in good condition. Recommendations include considerations of spatial placement and topography of shorebird units, control of vegetation, and monitoring protocols.

2120. **Implications of food web interactions for restoration of Missouri Ozark glade habitats.**
Van Zandt, Peter A.; Collins, Eboni; Losos, Jonathan B.; and Chase, Jonathan M.
Restoration Ecology 13(2): 312-317. (2005)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: Sauria/ Aster oblongifolius/ eastern redcedar/ Echinacea paradoxa/ Juniperus virginiana/ northern fence lizard/ Rudbeckia missouriensis/ Sceloporus undulatus/ Schizachyrium scoparium/ terrestrial ecology/ field survey/ soil/ food web interaction/ glade habitat restoration/ brush pile/ sceloporus undulatus/ trophic cascade/ biomanipulation/ Cedrus spp.
Abstract: Ozark glades are gaps in forested areas that are dominated by grasses and forbs growing in rocky, nutrient-poor soil. Historically, these open, patchy habitats were maintained by natural and anthropogenic fire cycles that prohibited tree encroachment. However, because of decades of fire suppression, glades have become overgrown by fire-intolerant species such as Eastern red cedar (Juniperus virginiana). Current restoration practices include cutting down invasive cedars and burning brush piles, which represent habitat for Northern fence lizards (Sceloporus undulatus). Because Sceloporus actively consumes herbivores, we hypothesized that the presence of these lizards in and around brush piles might result in a trophic cascade, whereby damage on native plants is reduced. Field surveys across six Missouri glades indicated that lizard activity was minimal beyond 1 m from habitat structures. This activity pattern reduced grasshopper abundance by 75% and plant damage by over 66% on Echinacea paradoxa and Rudbeckia missouriensis near structures with lizards. A field transplant experiment demonstrated similar reductions in grasshopper abundance and damage on two other glade endemic species, Aster oblongifolius and Schizachyrium scoparium. These results demonstrate that future glade restoration efforts might benefit from considering top-down effects of predators in facilitating native plant establishment.

2121. **Importance of hydrologic and landscape heterogeneity for restoring bank swallow (Riparia riparia) colonies along the Sacramento River, California.**
Moffatt, K. C.; Crone, E. E.; Holl, K. D.; Schlorff, R. W.; and Garrison, B. A.
Restoration Ecology 13(2): 391-402. (2005)
NAL Call #: QH541.15.R45R515; ISSN: 10612971.
Notes: doi: 10.1111/j.1526-100X.2005.00049.x.
Descriptors: bank swallow/ landscape/ metapopulation/ restoration/ riparian/ endangered species/ heterogeneity/ human activity/ passerines/ restoration ecology/ California/ Sacramento River/ Riparia
Abstract: Human activities have degraded riparian systems in numerous ways, including homogenization of the floodplain landscape and minimization of extreme flows. We analyzed the effects of changes in these and other factors for extinction-colonization dynamics of a threatened Bank Swallow population along the upper Sacramento River, California, U.S.A. We monitored Bank Swallow distributions along a 160-km stretch of the river from 1986-1992 and 1996-2003 and tested whether site extinctions and colonizations corresponded with changes in maximum river discharge, surrounding land cover, estimated colony size, temperature, and precipitation. Colonization probabilities increased with maximum discharge. Extinction probabilities decreased with proximity to the nearest grassland, decreased with colony size, and increased with maximum discharge. To explore the implications for restoration, we incorporated the statistically estimated effects of distance to grassland and maximum discharge into simple metapopulation models. Under current conditions, the Bank Swallow metapopulation appears to be in continued decline, although stable or increasing numbers cannot be ruled out with the existing data. Maximum likelihood parameters from these regression models suggest that the Sacramento River metapopulation could be restored to 45 colonies through moderate amounts of grassland restoration, large increases in discharge, or direct restoration of nesting habitat by removing approximately 10% of existing bank protection (riprap) from suitable areas. Our results highlight the importance of grassland restoration, mixed benefits of restoring high spring discharge, and the importance of within-colony dynamics as areas for future research. © 2005 Society for Ecological Restoration International.

2122. **Importance of small isolated wetlands for herpetofaunal diversity in managed, young growth forests in the Coastal Plain of South Carolina.**
Russell, K. R.; Guynn, D. C.; and Hanlin, H. G.
Forest Ecology and Management 163(1-3): 43-59. (2002)
NAL Call #: SD1.F73; ISSN: 03781127.
Notes: doi: 10.1016/S0378-1127(01)00526-6.
Descriptors: amphibians/ forest management/ herpetofauna/ reptiles/ small isolated wetlands/ South Carolina coastal plain/ biodiversity/ ecology/ forestry/ hydrology/ management/ forest landscapes/ wetlands/

community composition/ forest management/ herpetofauna/ species diversity/ wetland/ United States/ Amphibia/ Coniferophyta/ Reptilia

Abstract: Freshwater wetlands support diverse and unique species assemblages, but the contribution of the smallest of these habitats to regional biodiversity continues to be underestimated, particularly within managed forests. We assessed and compared the richness, abundance, and diversity of herpetofauna at five small isolated wetlands (0.38-1.06 ha) imbedded within a commercial forest landscape in the South Carolina Coastal Plain. Continuous drift fences with pitfall traps that completely encircled the wetlands were used to sample entering and exiting herpetofauna. We also deployed coverboards to sample herpetofauna in the adjacent uplands. We captured 9186 individuals of 56 species (20 amphibians, 36 reptiles) from the five wetlands combined between 1996 and 1998. Although species richness and community composition were similar at the five sites, we found significant differences in herpetofaunal abundance and diversity among wetlands. These differences did not vary with wetland size but were related to environmental and habitat attributes of the surrounding upland stands. Amphibian abundance was positively correlated with basal area of upland conifers but negatively correlated with presence and size of hardwoods, relationships that appeared to be partially influenced by previous stand management. Amphibian diversity (H') increased with conifer diameter but decreased with increasing distance to nearest wetland. Reptile diversity was negatively correlated with upland canopy closure. Our data indicate that small isolated wetlands are focal points of herpetofaunal richness and abundance in managed coastal plain forests and contribute more to regional biodiversity than is implied by their small size or ephemeral hydrology. By incorporating small wetland values and functions into planning objectives, forest managers can significantly enhance the contribution of extensive young-growth forests to regional conservation of biodiversity.

2123. **Increasing and declining populations of northern bobwhites inhabit different types of landscapes.**
Veech, J. A.
Journal of Wildlife Management 70(4): 922-930. (2006)
NAL Call #: 410 J827; ISSN: 0022541X.
Notes: doi: 10.2193/0022-541X(2006)70[922:IADPON]2.0.CO;2.
Descriptors: Colinus virginianus/ cropland/ landscape composition/ National Resources Inventory/ North American Breeding Bird Survey/ northern bobwhites/ population/ urbanization

Abstract: Northern bobwhites (Colinus virginianus) have been declining in abundance throughout their range for several decades, and perhaps a century. Although wildlife biologists are well aware of this trend, most attempts to understand the declines have examined only a few local populations in a limited geographic area or have examined declines at a very large scale without reference to specific populations. Few studies use a standard protocol for examining trends in local populations throughout the entire natural range of bobwhites. I used the National Resources Inventory, a geographically extensive and intensive database on land cover and use, to characterize the composition and heterogeneity of landscapes inhabited by bobwhite populations that have been increasing (43 populations), decreasing (468), or become locally extinct (28). I tested bobwhite populations for overall positive or negative change, over the past 10 years or more, using data from the North American Breeding Bird Survey and a randomization test that controls for observer effects. Landscapes occupied by increasing and decreasing populations were, on average, different from one another in composition but not heterogeneity. As predicted, landscapes of decreasing populations tended to have a greater percentage of nonuseable land (e.g., urban and forestland) and a lesser percentage of useable land (e.g., cropland, pastures, and rangeland) as compared to landscapes where bobwhites actually increased. Moreover, landscapes where bobwhites had recently become extinct were different from those where bobwhites were only declining. In particular, a very large percentage of urban land characterized the landscapes of extinct populations. To some extent, landscapes of large (above average) and small (below average) populations also differed as predicted. The results do not point to a single universal explanation for bobwhite declines, but they do clearly show that declining populations inhabit local landscapes that, on average, are very different from those occupied by increasing populations. This knowledge may assist quail biologists and land managers to recognize the general type of landscape where the restoration of bobwhites may be most successful and where extant populations may be most threatened.

2124. **Indiana bats in the Midwest: The importance of hydric habitats.**
Carter, Timothy C.
Journal of Wildlife Management 70(5): 1185-1190. (2006)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: forestry/ wildlife management: conservation/ seasonal variation/ snag/ riparian forest/ maternity colony/ bottomland forest/ wetland forest/ day roosting/ foraging resources

Abstract: The endangered Indiana bat (Myotis sodalis) requires very specific habitats to provide necessary day-roosting and foraging resources during the spring and summer months throughout its distribution in the eastern United States. Maternity colonies of Indiana bats are almost always found under the exfoliating bark of dead or dying trees. Furthermore, they switch frequently among multiple roosts within large but still somewhat local areas. Therefore, habitats with large numbers of snags or decadent trees are needed to support Indiana bat maternity colonies. These habitats arise naturally and anthropogenically in a variety of ways. However, these conditions often are rare relative to other forest conditions. In the Midwest, such as southern and central Illinois, USA, maternity colonies are more commonly associated with bottomland, riparian, wetland, or other hydric forest types. It is unclear if this occurs because areas with large numbers of snags are more common in these habitats, if maternity colonies prefer these habitats for their foraging resources, or if decades of intensive agriculture have restricted colonies to these habitats. Because many large maternity colonies have been observed in hydric habitats of the Midwest, I hypothesize that these are preferred maternity habitats. Moreover, very few large maternity colonies have been located using upland forest habitats within the region.

Elsewhere, such as in the central and southern Appalachians, maternity colonies have been located in upland areas where bottomland habitats are less extensive. However, these colonies are usually characterized by small numbers of bats and ephemeral persistence. Future conservation efforts for the Indiana bat should focus on protecting and regenerating bottomland habitats along the major river systems of the midwestern United States. It is within these bottomland and riparian habitats that future large and long-term maternity colonies will be established.

2125. **Influence of agricultural landscape structure on a Southern High Plains, USA, amphibian assemblage.**
Gray, Matthew J.; Smith, Loren M.; and Leyva, Raquel I.
Landscape Ecology 19(7): 719-729. (2004)
NAL Call #: QH541.15.L35 L36; ISSN: 0921-2973
Descriptors: biogeography: population studies/ freshwater ecology: ecology, environmental sciences/ wildlife management: conservation/ agricultural landscape structure/ amphibian assemblage
Abstract: Landscape structure can influence demographics of spatially structured populations, particularly less vagile organisms such as amphibians. We examined the influence of agricultural landscape structure on community composition and relative abundance of the 4 most common amphibians in the Southern High Plains of central USA. Amphibian populations were monitored using pitfall traps and drift fence at 16 playa wetlands (8 playas/year) in 1999 and 2000. We quantified landscape structure surrounding each playa via estimating 13 spatial metrics that indexed playa isolation and inter-playa landscape complexity. Multivariate ordination and univariate correlations and regressions indicated that landscape structure was associated with community composition and relative abundance for 2 of the 4 amphibians. Spadefoots (Spea multiplicata, S. bombifrons) generally were positively associated with decreasing inter-playa distance and increasing inter-playa landscape complexity. Great Plains toads (Bufo cognatus) and barred tiger salamanders (Ambystoma tigrinum mavortium) usually were negatively associated with spadefoots but not influenced by landscape structure. Composition and relative abundance patterns were related to amphibian body size, which can influence species vagility and perception to landscape permeability. Spatial separation of these species in the multivariate ordination also may have been a consequence of differential competitive ability among species. These results suggest agricultural landscape structure may influence abundance and composition of spatially structured amphibian populations. This also is the first applied documentation that inter-patch landscape complexity can affect intra-patch community composition of amphibians as predicted by metapopulation theory. In the Southern High Plains, landscape complexity is positively associated with agricultural cultivation. Agricultural cultivation increases sedimentation, decreases hydroperiod, alters amphibian community dynamics, and negatively impacts postmetamorphic body size of amphibians in playa wetlands. Thus, conservation efforts should focus on preserving or restoring native landscape structure, hydroperiod, and connectivity among playas to maintain native amphibian populations and historic inter-playa movement.

2126. **Influence of deer, cattle grazing and timber harvest on plant species diversity in a longleaf pine bluestem ecosystem.**
Brockway, Dale G. and Lewis, Clifford E.
Forest Ecology and Management 175: 49-69. (2003)
NAL Call #: SD1.F73; ISSN: 0378-1127.
http://www.srs.fs.usda.gov/pubs/ja/ja_brockway024.pdf
Descriptors: cattle/ grazing/ longleaf pine/ Pinus palustris/ deer/ understory/ thinning/ clearcutting
Abstract: Despite a recent slowing in the negative historical trend, losses of naturally-regenerated longleaf pine forests currently continue, largely as a result of conversion to plantations of faster growing pine species. Comparing the impacts of type conversion with silvicultural approaches that maintain longleaf pine and ascertaining their interaction with the influence of other resource management practices, such as grazing, on plant species diversity are essential in discerning the effects of these activities on the long-term sustainability of these ecosystems. A flatwoods longleaf pine bluestem ecosystem, which naturally regenerated following timber harvest during the early 20th century, on the coastal plain of southern Alabama was thinned to a residual basal area of 17 m^2/ha or clearcut, windrowed and planted with slash pine (Pinus elliottii) seedlings in 1972 and then fenced in 1977 to differentially exclude grazing by deer and cattle. Neither grazing by deer alone nor deer in combination with cattle significantly altered vascular plant cover or species diversity; however, substantial differences were noted between the understory plant communities in the thinned forests and clearcut areas. Woody understory vegetation steadily increased through time, with woody plant cover in clearcuts (41%) dominated by the tree seedlings of Pinus elliottii and Quercus spp. being greater than that in thinned forests (31%) which were dominated by shrubs, principally Ilex glabra. While grass cover dominated by Schizachrium scoparium and Andropogon spp. remained stable (~81%), the foliar cover of all forbs declined through time (from 42 to 18%) as woody plant cover increased. Although the overall species richness and diversity declined and evenness increased through time, understory species richness and diversity were consistently higher in thinned forests than in artificially-regenerated clearcuts. Despite a modest short-term decline in this differential, indicating a partial recovery of the clearcut areas over time, the disparity in understory plant diversity between thinned forests and clearcuts persisted for at least a decade. Whether grazing includes domestic cattle or is limited to native ungulates, such as white-tailed deer, we recommend that longleaf pine forests not be clearcut and replaced by plantations of other pines, if the ecological diversity is to be conserved, high quality habitat is to be maintained and longleaf pine ecosystems are to be sustained.
This citation is from Treesearch.

2127. **Influence of financial incentive programs in sustaining wildlife values.**
Straka, T. J.; Kilgore, M. A.; Jacobson, M. G.; Greene, J. L.; and Daniels, S. E.
Human Dimensions of Wildlife 12(3): 197-199. (2007); ISSN: 10871209.
Notes: doi: 10.1080/10871200701323173.
Descriptors: economic incentives/ wildlife sustainablity/ habitat management/ policy

2128. **Influence of fire on Bachman's sparrow, an endemic North American songbird.**
Tucker, J. W.; Robinson, W. D.; and Grand, J. B.
Journal of Wildlife Management 68(4): 1114-1123. (2004)
NAL Call #: 410 J827; ISSN: 0022541X.
Notes: doi: 10.2193/0022-541X(2004)068 [1114:IOFOBS]2.0.CO;2.
Descriptors: Aimophila aestivalis/ Alabama/ Bachman's sparrow/ fire ecology/ Florida/ habitat management/ habitat restoration/ longleaf pine ecosystem/ Pinus palustris/ prescribed fire/ endemic species/ growing season/ habitat management/ habitat restoration/ passerines/ prescribed burning/ Alabama/ Blackwater River State Forest/ Conecuh National Forest/ Florida [United States]/ Aimophila/ Aimophila aestivalis/ Passeri/ Passeridae/ Pinus palustris
Abstract: Bachman's sparrow (Aimophila aestivalis), a near endemic songbird of the longleaf pine (Pinus palustris) ecosystem, is known to respond positively to prescribed fires. The influence of season (growing vs. dormant) and frequency (1 to ≥4 yr since burning) of fire on density of Bachman's sparrows, however, is poorly understood. We examined effects of fire on density of Bachman's sparrows in longleaf pine forests at the Conecuh National Forest, Alabama, and Blackwater River State Forest, Florida, USA. Density of Bachman's sparrows was greater the first 3 years after burning than ≥4 years after burning, and season of burning had little effect on the density of Bachman's sparrows. Percent coverage by grass had a greater influence on density of Bachman's sparrows than either season or frequency of burning. Percent canopy cover had a strong negative effect on coverage of grass but had a weaker effect on grass at stands burned frequently during the growing season. Growing-season fires (Apr-Sep) did not adversely affect density of Bachman's sparrows. Results from our study suggest that management and restoration of longleaf pine communities probably can be accomplished best by burning on a 2-3-year rotation during the growing season, when most fires historically occurred. Suppression of fire, or burning at intervals >4-5 years, will greatly reduce or eliminate habitat required by Bachman's sparrows.
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2129. **The influence of forest management on headwater stream amphibians at multiple spatial scales.**
Stoddard, Margo A. and Hayes, John P.
Ecological Applications 15(3): 811-823. (2005)
NAL Call #: QH540.E23 ; ISSN: 1051-0761
Descriptors: commercial activities/ conservation measures/ ecology/ habitat utilization/ freshwater habitat/ lotic water/ abiotic factors/ land zones/ Ascaphus truei/ Dicamptodon tenebrosus/ Rhyacotriton: forestry/ riparian buffers/ habitat management/ habitat preference/ forest management effects at multiple spatial scales/ stream/ headwater streams/ physical factors/ Oregon/ Oregon Coast range/ Amphibia, Lissamphibia, Anura, Leiopelmatidae/ amphibians/ chordates/ vertebrates
Abstract: Understanding how habitat structure at multiple spatial scales influences vertebrates can facilitate development of effective conservation strategies, but until recently most studies have focused on habitat relationships only at fine or intermediate scales. In particular, patterns of amphibian occurrence across broad spatial scales are not well studied, despite recent concerns over regional and global declines. We examined habitat relationships of larval and neotenic Pacific giant salamanders (Dicamptodon tenebrosus), larval and adult Pacific tailed frogs (Ascaphus truei) (hereafter "tailed frogs"), and torrent salamanders (Rhyacotriton spp.) at three spatial scales (2-m sample unit, intermediate, and drainage). In 1998 and 1999, we captured 1568 amphibians in 702 sample units in 16 randomly chosen drainages in the Oregon Coast Range. We examined species-habitat associations at each spatial scale using an information-theoretic approach of analysis to rank sets of logistic regression models developed a priori. At the 2-m sample unit scale, all groups were negatively associated with proportion of small substrate and positively associated with stream width or elevation. At the intermediate scale, Pacific giant salamanders, adult tailed frogs, and torrent salamanders were positively associated with presence of a 46-m band of forested habitat on each side of the stream, and larval tailed frogs were positively associated with. presence of forest > 105 years old. Aspect was important for Pacific giant salamanders and larval tailed frogs at the intermediate scale. At the drainage scale, all groups except torrent salamanders were positively associated with proportion of stream length having forested bands >46 m in width, but further analysis suggests narrower bands may provide adequate protection for some groups. Population- and community-level responses at broad spatial scales may be reflected in species-level responses at fine spatial scales, and our results suggest that geophysical and ecological characteristics, as well as measures of instream habitat, can be used together to prioritize conservation emphasis areas for stream amphibians in managed landscapes.
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2130. **Influence of habitat on distribution and abundance of the eastern woodrat in Kansas.**
Beckmann, Jon P.; Kaufman, Glennis A.; and Kaufman, Donald W.
Great Plains Research 11(2): 249-260. (2001)
NAL Call #: QH104.5.G73 G755; ISSN: 1052-5165
Descriptors: Neotoma floridana/ mammals/ distribution/ status/ habitat use/ behavior/ wildlife-habitat relationships/ ecosystems/ forests/ grasslands/ farmland/ nesting sites/ nests-nesting/ hedgerows/ riparian habitat/ density/ habitat alterations/ agricultural practices/ eastern woodrat/ Kansas: Smith County/ Kansas: Osborne County/ Kansas: Russell County
Abstract: Anthropogenic modification of native woodlands and grasslands in the Great Plains has altered the abundance and distribution of many species of mammals. To study habitat effects on the eastern woodrat (Neotoma floridana), the authors surveyed nests of the eastern woodrat in woodlands, grasslands, and croplands along 77 km of secondary roads in three counties in north-central Kansas. All nests were located in woodlands (<2% of habitat), although grasslands and croplands constituted 36% and 62% of habitat surveyed, respectively. In this survey, nests were associated positively with shelterbelts (3.6 nests per 100 m of road edge) but not with shrub patches (1.1 nests per 100 m of road edge) or riparian woodlands (0.3 nests per 100 m of road edge). Consequently, the authors specifically censused nests in an additional 12 riparian woodlands and 12 shelterbelts. Nests of eastern woodrats were less dense in riparian woodlands (9.4 nests/ha) than in shelterbelts (55.5 nests/ha). Density

of woodrat nests decreased as width of a wooded area increased. Further, nests per 100 m of length of woodland did not increase as the width of woodland increased. These patterns suggest that woodland edge, not woodland interior, is the primary factor in abundance of eastern woodrats in this region. Although the eastern woodrat has previously been considered a woodland species, the authors' results suggest that this assessment is incorrect. Their observations demonstrate that anthropogenic modification of the Great Plains, in the form of planted shelter belts and expanded riparian woodland, likely has increased the distribution and abundance of eastern woodrats, compared to the mid-1800s.

2131. **Influence of headwater site conditions and riparian buffers on terrestrial salamander response to forest thinning.**
Rundio, David E. and Olson, Deanna H.
Forest Science 53(2): 320-330. (2007)
NAL Call #: 99.8 F7632; ISSN: 0015-749X
Descriptors: commercial activities/ ecology/ population dynamics/ terrestrial habitat/ land zones/ Caudata: forestry/ thinning/ distribution and density impact and influencing factors/ population density/ forest/ impact of forestry thinning and influencing factors/ distribution within habitat/ forest and woodland/ forestry thinning impact on distribution and density and influencing factors/ Oregon/ Cascade Range and Coast Range/ Amphibia, Lissamphibia/ amphibians/ chordates/ vertebrates
Abstract: Although thinning of young, even-aged forests may accelerate the development of characteristics associated with mature forests, in the short term it may negatively affect some taxa, including terrestrial salamanders. Preexisting site: conditions, including down wood, and forest management measures, such as riparian buffers, may moderate these effects, but these relationships are poorly understood. To explore whether down wood and riparian buffer widths might influence short-term responses to thinning, we sampled salamanders using ground searches before and during the first 2 years after experimental thinning at two 45- to 65-year-old headwater forest sites in western Oregon that differed in down wood volume. Prethinning distributions of terrestrial salamanders overlapped one- and two-tree height riparian buffers, and except for red-backed salamanders, overlapped very little with narrower streamside or variable-width buffers. At the site where down wood volume was low, captures of ensatina (Ensatina eschscholtzii Gray) and western red-backed salamanders (Plethodon vehiculum Cooper) both declined by 40% in thinned areas. In contrast, captures of ensatina and Oregon slender salamanders (Batrachoseps wrighti Bishop) were not significantly affected by thinning at the site where down wood volume was high. Our results suggest that site conditions, such as down wood volume, and riparian buffers may influence the effect of thinning on terrestrial salamanders, and demonstrate the tight linkage among management of aquatic, riparian, and upslope resources in headwater forests.

2132. **Influence of land use and climate on wetland breeding birds in the Prairie Pothole Region of Canada.**
Forcey, G. M.; Linz, G. M.; Thogmartin, W. E.; and Bleier, W. J.
Canadian Journal of Zoology 85(3): 421-436. (Mar. 2007)
NAL Call #: 470 C16D
Descriptors: birds/ wetlands/ nesting/ breeding/ wildlife habitat/ Prairie Pothole Region/ Prairie Farm Rehabilitation Administration/ Canada
Abstract: Bird populations are influenced by a variety of factors at both small and large scales that range from the presence of suitable nesting habitat, predators, and food supplies to climate conditions and land-use patterns. We evaluated the influences of regional climate and land-use variables on wetland breeding birds in the Canada section of Bird Conservation Region 11 (CA-BCR11), the Prairie Potholes. We used bird abundance data from the North American Breeding Bird Survey, land-use data from the Prairie Farm Rehabilitation Administration, and weather data from the National Climatic Data and Information Archive to model effects of regional environmental variables on bird abundance. Models were constructed a priori using information from published habitat associations in the literature, and fitting was performed with WinBUGS using Markov chain Monte Carlo techniques. Both land-use and climate variables contributed to predicting bird abundance in CA-BCR11, although climate predictors contributed the most to improving model fit. Examination of regional effects of climate and land use on wetland birds in CA-BCR11 revealed relationships with environmental covariates that are often overlooked by small-scale habitat studies. Results from these studies can be used to improve conservation and management planning for regional populations of avifauna.
This citation is from AGRICOLA.

2133. **Influence of perennial upland cover on occupancy of nesting structures by mallards in northeastern North Dakota.**
Artmann, M. J.; Ball, I. J.; and Arnold, T. W.
Wildlife Society Bulletin 29(1): 232-238. (2001)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: Anas platyrhynchos/ mallards/ nesting structure/ North Dakota/ occupancy rates/ perennial cover/ artificial nest/ waterfowl/ wildlife management/ United States/ Anas platyrhynchos
Abstract: Artificial nesting structures are considered to be most attractive to nesting female mallards (Anas platyrhynchos) in areas where natural nesting cover is scarce, leading to the management recommendation to place structures in agricultural landscapes with little perennial upland cover. In 1997-1998, we compared occupancy rates of 260 nesting structures installed on 13 10.4-km^2 sites in northeastern North Dakota where amount of wetland habitat was comparable but amount of perennial upland cover was either high ($\bar{x}$=44.8%, grassland sites) or low ($\bar{x}$=8.0%, cropland sites). Contrary to expectation, occupancy rates were >4 times greater on grassland sites than on cropland sites (17.8 vs. 3.9%, P=0.003). The difference was largely a function of greater average mallard densities on grassland versus cropland sites (15.2 vs. 9.2 pairs/km^2, P≤0.002). When pair density was controlled for statistically, occupancy rates of structures did not differ between grassland and cropland sites (14.5 vs. 7.9%, P=0.22). We conclude that placing structures in areas with

high mallard density is the most effective way to maximize initial occupancy and that proportion of existing perennial upland cover in a landscape has little direct effect on structure occupancy.

2134. **The influence of salinity on the toxicity of various classes of chemicals to aquatic biota.**
Hall, L. W. and Anderson, R. D.
Critical Reviews in Toxicology 25(4): 281-346. (1995); ISSN: 1040-8444.
Notes: Literature review.
Descriptors: salinity/ toxicity/ aquatic environment/ organophosphorus pesticides/ heavy metals/ biota/ salinity effects/ lethal effects/ exposure tolerance/ pollution effects/ pesticides/ bioaccumulation/ food chains/ aquatic organisms/ effects of pollution/ toxicology and health/ effects on organisms/ environmental effects
Abstract: The objective of this study was to review all available aquatic toxicity literature regarding the effects of salinity on the toxicity of various classes of inorganic and organic chemicals. Toxicity data for studies in which toxicity was assessed at various salinities were organized by chemical classes and trophic groups. Seventy percent of the studies were conducted with either crustaceans or fish. The other 30% were with mollusks, annelids, zooplankton, bacteria, phytoplankton, or fungi. Results from 173 data entries showed that negative correlations (toxicity increasing with decreasing salinity) were reported most frequently (55%), followed by no correlations (27%) and positive correlations (18%). The toxicity of most metals such as cadmium, chromium, copper, mercury, nickel, and zinc was reported to increase with decreasing salinity. This finding is likely related to the greater bioavailability of the free metal ion (toxic form) at lower salinity conditions. There was generally no consistent trend for the toxicity of most organic chemicals with salinity. The one exception to this was reported with organophosphate insecticides, the toxicity of which appeared to increase with increasing salinity. Physiological characteristics of the various test species were important in determining the toxicity of the various classes of chemicals at a range of salinities. Results from various studies showed that euryhaline species were more resistant to toxic conditions at isosmotic salinities due to minimization of osmotic stress. Specific examples showed that fish were more resistant to toxic chemicals at middle salinities when compared with either lower or higher extremes. Life history and ecology of test species were important factors to consider when interpreting salinity/contaminant interaction data.

2135. **Information and farmers' attitudes about pesticides, water quality, and related environmental effects.**
Lichtenberg, E. and Zimmerman, R.
Agriculture, Ecosystems and Environment 3: 227-236. (1999)
NAL Call #: S601.A34; ISSN: 0167-8809.
Notes: doi: 10.1016/S0167-8809(99)00053-5.
Descriptors: United States, Mid-Atlantic states/ attitudes/ surveys/ agricultural chemicals/ pesticides/ environmental quality/ wildlife/ drinking water/ information systems/ farms/ agricultural pollution/ sociological aspects/ water quality/ environmental protection/ ecosystem disturbance/ agriculture/ agrochemicals/ perception/ public concern/ occupational safety/ environmental impact/ information exchange/ United States/ farmers' attitudes/ evaluation process/ behavior and fate characteristics/ environmental action
Abstract: This paper investigates the effects of information from different sources on farmers' attitudes regarding the effects of pesticides and other agricultural chemicals on environmental quality using a survey of 2700 farmers in three Mid-Atlantic States. Farmers' beliefs are similar to those of the general public on average, but are distributed more uniformly, suggesting that the farm community may be more polarized on environmental issues than the general public. Farmers regard first-hand sources of information such as direct field observation and pesticide labels as being the most important. Chemical dealers and extension rank next in importance. Farmers who attached greater importance to information from news media and extension expressed greater environmental concern. Farmers who found information from chemical dealers more important expressed greater concern about injury to wildlife and pesticides in drinking water but less concern about general environmental quality problems associated with agricultural chemicals.

2136. **Insect population responses to environmental stress and pollutants.**
Pimentel, David
Environmental Reviews 2(1): 1-15. (1994)
NAL Call #: GE140.E59
Descriptors: Insecta/ animals/ arthropods/ insects/ invertebrates/ air pollution/ biosphere/ chemicals/ ecosystem/ fertilizers/ pesticides/ soil pollution/ water pollution

2137. **Insects as indicators of land use in three ecoregions in the prairie pothole region.**
Anderson, D. J. and Vondracek, B.
Wetlands 19(3): 648-664. (1999)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ grasslands/ aquatic insects/ prairies/ biological indicators/ roads/ ecology/ diversity relationships/ arable land/ land use/ aquatic communities/ community ecology
Abstract: Populations of insects in the prairie pothole region of North Dakota, USA, were sampled to determine whether relationships existed between community- or taxon-level indicators and 11 land-use types. Insects were sampled with light traps at 126 wetland basins in 3 ecoregions. Sampling was conducted 3 times each year during the spring and early summer of 1995 and 1996. Sites were selected based on the proportion of cropland to grassland, hayland, and Conservation Reserve Program land surrounding wetland basins at 50 and 400 m radii. Other land-use types included in the analyses were woodland, roadways, and 5 wetland types: permanent, semi-permanent, seasonal, temporary, and riverine. In both years, taxa richness, abundance, and diversity were greater for the 2nd (June) and 3rd (July) sampling periods than for the 1st period (May), and indicators were greater in the Drift Plain and Red River Valley ecoregions than in the Missouri Coteau ecoregion. Several significant associations existed between insect indicators and land-use types; however,

rsuperscript 2 values were generally low. Much more of the variance in insect measures was explained by temperature, seasonal, and ecoregion effects. Several associations were significant within individual ecoregions (i.e., abundance of aquatic insects, Caenidae, Scarabaeidae, and Lepidoptera and number of Ephemeroptera families). However, no indicators were found in common for all 3 ecoregions. Several significant associations with land use were identified across all sites (i.e., all ecoregions combined). A small number of the significant relationships found across all sites were related to agricultural land use, and several indicated a negative relationship with grasslands. However, several positive relationships between the chosen insect indicators and riverine wetlands were observed across sites and in the Red River Valley ecoregion for both years and spatial scales (i.e., the abundance of Caenidae, Scarabaeidae, Ceratopogonidae, Hydropsychidae, and Hydroptilidae).

2138. **Integrating wildlife management and agriculture: Conserving biodiversity through long-term partnerships.**
Belding, R.; Giuliano, W. M.; Putnam, D.; and Taracido, J.
Proceedings of Conservation of Biological Diversity: A Key to the Restoration of the Chesapeake Bay Ecosystem and Beyond : 48-51. (2001)
Descriptors: agriculture/ bays/ biodiversity/ ecosystem management/ environment management/ environmental monitoring/ estuaries/ estuarine organisms/ freshwater organisms/ habitat improvement/ land use/ nature conservation/ pollution control/ pollution monitoring/ restoration/ rivers/ species diversity/ water quality control/ watersheds/ wetlands/ Chesapeake Bay/ Maryland, Susquehanna R./ Pennsylvania
Abstract: An association of conservation organizations and private landowners, working collectively under the title of Partners for Wildlife, is implementing an innovative conservation and management program designed to protect biodiversity in the Chesapeake Bay ecosystem and throughout Pennsylvania. This program uses three approaches to address biodiversity issues. First, we are implementing habitat enhancement programs on hundreds of farms in 15 counties, including 5 counties in the Susquehanna River watershed. These programs include (1) the establishment of native grasses in pastures and hay fields, (2) the restoration and protection of wetlands and streams in agricultural lands, and (3) the provision of edge manipulations on farm woodlots. These habitat enhancement techniques are designed to improve biodiversity by providing improved water quality and quantity, and greater floral structure and diversity, which has led to a greater abundance and diversity of fauna. Second, we are conducting extensive research and monitoring to quantify the impacts of our habitat enhancement on biodiversity and farm economics. And third, we are educating landowners on the benefits, not only to the environment, but also to themselves economically. Because these habitat management techniques benefit landowners, many farmers have begun implementing them on their own. This provides not only a long-term solution to decreased biodiversity but also to the declining agricultural community, a win-win situation.

2139. **Interaction of beaver and elk herbivory reduces standing crop of willow.**
Baker, Bruce W.; Ducharme, Heather C.; Mitchell, David C. S.; Stanley, Thomas R.; and Peinetti, H. Raul
Ecological Applications 15(1): 110-118. (2005)
NAL Call #: QH540.E23 ; ISSN: 1051-0761
Descriptors: Artiodactyla/ Castoridae/ Cervidae/ Rodentia/ Castor canadensis/ Cervus elaphus/ Colorado/ conservation/ wildlife management/ foods-feeding/ habitat management/ herbivory/ intense browsing/ interspecies relationships/ riparian habitat/ ecosystems/ Salix lasiandra/ willow-beaver restoration/ interspecies relationships/ intraspecies relationships/ diets/ habitat use/ land zones/ nutrition/ Salix spp.
Abstract: Populations of beaver and willow have not thrived in riparian environments that are heavily browsed by livestock or ungulates, such as elk. The interaction of beaver and elk herbivory may be an important mechanism underlying beaver and willow declines in this competitive environment. We conducted a field experiment that compared the standing crop of willow three years after simulated beaver cutting on paired plants with and without intense elk browsing (≃85% utilization rate). Simulated beaver cutting with intense elk browsing produced willow that was small (biomass and diameter) and short, with far fewer, but longer, shoots and a higher percentage of dead biomass. In contrast, simulated beaver cutting without elk browsing produced willow that was large, tall, and leafy, with many more, but shorter, shoots (highly branched) and a lower percentage of dead biomass. Total stem biomass after three years was 10 times greater on unbrowsed plants than on browsed plants. Unbrowsed plants recovered 84% of their pre-cut biomass after only two growing seasons, whereas browsed plants recovered only 6%. Thus, the interaction of beaver cutting and elk browsing strongly suppressed the standing crop of willow. We predict that a lack of willow suitable as winter food for beaver can cause beaver populations to decline, creating a feedback mechanism that reduces beaver and willow populations. Thus, intense herbivory by ungulates or livestock can disrupt beaver-willow mutualisms that naturally occur in less competitive environments.

2140. **Interactions between forests and fish in the Rocky Mountains of the USA.**
Fausch, K. D. and Young, M. K.
In: Fishes and forestry: Worldwide watershed interactions and management/ Northcote, T. G. and Hartman, G. F. Oxford: Blackwell Science, 2004.
Notes: ISBN: 0632058099.
Descriptors: commercial activities/ conservation measures/ ecology/ land zones/ Pisces: forestry/ habitat management/ forestry/ ecology/ forestry practices/ freshwater habitat/ United States/ Rocky Mountains/ chordates/ fish/ vertebrates
Abstract: This paper discusses the linkages among forest ecology, forestry practices and habitat for aquatic biota in the Rocky Mountains of the USA, emphasizing the role of anthropogenic and natural disturbances on large woody debris in forested streams due to its fundamental role in producing fish habitat. Also discussed are the other processes including sediment delivery and allochthonous input of terrestrial invertebrates that affect habitat and fish

abundance including recommended research and management planning at landscape scales to sustain native fishes.

2141. **Jarbidge Cooperative Elk Herd Carrying Capacity Study, 1999 Annual Report: Preliminary estimates of 1999 elk summer range carrying capacity.**
Beck, Jeffrey L. and Peek, James M.
Idaho Technical Bulletins(2001/03): 2001-2003. (2001).
http://www.blm.gov/id/st/en/info/publications/technical_bulletins/TB01-3.html
Descriptors: Cervus elaphus/ aerial surveys/ arrow grass/ aspen/ balsam poplar/ behavior/ biomass/ biometrics/ browsing/ carrying capacity/ Ceanothus/ census-survey methods/ conservation/ curlleaf cercocarpus/ ecosystems/ environmental factors/ feeding sites/ food habits studies/ food supply/ foods-feeding/ grazing/ habitat alterations/ habitat management/ habitat surveys/ habitat use/ Kentucky bluegrass/ livestock/ mammals/ mountain mahogany/ nutrients/ nutrition/ population ecology/ precipitation/ proteins/ sagebrush/ sampling/ season/ shrub grasslands/ snow/ snowberry/ study methods/ techniques/ telemetry/ transect surveys/ wildlife-habitat relationships/ wildlife-livestock relationships/ winter/ elk/ Poa pratensis/ Populus balsamifera/ Populus ssp./ Nevada: elko County
Abstract: The preliminary estimates of carrying capacity for elk (Cervus elaphus) in 1999, on the summer range within the Nevada Division of Wildlife Hunt Unit 072 in Elko County, is provided in this annual report. Elk summer habitat selection in the Jarbidge Mountains is closely associated with the woody communities of aspen and curlleaf mountain mahogany and some selections are also based on snowbrush ceanothus communities. The authors conducted a study to investigate elk nutritional relationships, examine dietary overlap among elk, livestock, and mule deer, and direct forage availability. A subset of 11 key forage species were selected. The authors analysed the diet of lactating cow elk and assessed their requirement for crude protein (CP) and digestible energy (DE). These requirements are more attainable through consumption of forbs and shrubs; grasses tend to provide lower levels. The dietary overlap between elk and other ungulates in summer and based on the key forage species has been highest between elk and mule deer. The two forage species, which occur in highest concentrations in the summer diets of these ungulates, are lupines and snowbrush. The calculation of the carrying capacity of elk was carried out for the amount of forage remaining in aspen and mahogany communities after seasonal livestock grazing was completed. A large portion of the standing crop is lost due to factors other than direct grazing such as trampling, fouling, and forage senescence. The healthy stands of trees and shrubs including aspen, mountain mahogany, and snowbrush will provide long-term support of viable elk and mule deer populations in the Jarbidge Mountains summer range. Throughout the summer these communities of plants provide browsing and grazing ungulates with high yields of nutritious forbs, graminoids, and shrubs.

2142. **Juvenile dispersal of Franklin's ground squirrel (Spermophilus franklinii) from a prairie "island".**
Martin, Jason M. and Heske, Edward J.
American Midland Naturalist 153(2): 444-449. (2005)
NAL Call #: 410 M58; ISSN: 0003-0031
Descriptors: ecology/ terrestrial habitat/ man-made habitat/ land zones/ Spermophilus franklinii: distribution within habitat/ juvenile dispersal from prairie island within agricultural landscape/ grassland/ cultivated land habitat/ Illinois/ Champaign County/ Urbana/ Mammalia, Rodentia, Sciuridae/ chordates/ mammals/ rodents/ vertebrates
Abstract: Franklin's ground squirrel (Spermophilus franklinii) is declining in the eastern portion of its range, and this decline is often attributed to habitat fragmentation. However, the ability of S. franklinii to disperse across an agricultural landscape is not known. During spring 2002 we live trapped a small, apparently isolated, population of Franklin's ground squirrels in a 12-ha tallgrass prairie restoration located south of Urbana, Champaign County, Illinois. This prairie "island" was surrounded primarily by row-crop agriculture. We radio-tracked 14 juvenile Franklin's ground squirrels (seven males and seven females) throughout dispersal to determine how far dispersers traveled, the timing of dispersal, if dispersal distance differed between sexes and if the agricultural matrix surrounding the study site was a barrier to movements. Males dispersed farther than females, but individuals of both sexes moved >=1 km from the study site. The farthest. movement recorded was by a male who traveled 3.6 km. Dispersal was age-dependent for both sexes, occurring at 9-11 wk of age. Agricultural fields did not seem to hinder movement, probably because dispersal occurred in late July and August before row crops were harvested. Open areas such as roadways, however, may be barriers for some individuals.

2143. **Land cover and bobwhite abundance on Oklahoma farms and ranches.**
Guthery, F. S.; Green, M. C.; Masters, R. E.; DeMaso, S. J.; Wilson, H. M.; and Steubing, F. B.
Journal of Wildlife Management 65(4): 838-849. (2001)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: call-counts/ Colinus virginianus/ land use/ landscape/ northern bobwhite/ Oklahoma/ gamebird/ habitat management/ land use/ landscape ecology/ population estimation/ United States/ Colinus virginianus
Abstract: To test prevailing paradigms of habitat management for northern bobwhites (Colinus virginianus), we analyzed relations between the abundance of these birds, land-cover classes, and landscape metrics on Oklahoma farms and ranches (200-ha areas; n = 78) during 1998-1999. Based on replicated call-count indices, bobwhites declined (-0.03 to -0.07 males/ha; 95% confidence level here and below) with the quantity of an area in mature woodland, and increased (0.02 to 0.05 males/ha) with the quantity of brushy prairie or early successional woodland. We observed highest populations in the absence of cropland agriculture. Bobwhites declined as Shannon diversity of cover types (-6.0 to -0.01 males/Shannon unit), patch richness (-0.08 to -0.02 males/patch), and the density of woody edge (-0.027 to -0.003 males/m/ha) increased. Bobwhites responded more strongly to the composition of land-cover classes on areas than to the configuration of these classes in areas. Our

results did not support the patchwork agriculture model of bobwhite abundance or the principle of edge. Results were consistent with a hypothesis that predicts bobwhite abundance is a nondecreasing function of usable space in time.

2144. **Land use and habitat gradients determine bird community diversity and abundance in suburban, rural and reserve landscapes of Minnesota, USA.**
Chapman, K. A. and Reich, P. B.
Biological Conservation 135(4): 543-557. (2007)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/j.biocon.2006.10.050.
Descriptors: bird community/ development/ diversity/ habitat gradient/ land use/ regional conservation
Abstract: Bird species' community responses to land use in the suburbanizing Twin Cities, Minnesota, USA, were contrasted among reserves, rural lands, and suburbs. For each land use type, bird composition, diversity, and abundance were recorded for 2 years in ≈99 plots in three sampling units (each ≈4500 ha). A habitat gradient defined by canopy structure (grasslands to savannas to forests) was influenced by land use, so [≈300 plots were used to characterize simultaneous variation in bird communities along land use and habitat gradients. At broad scales (aggregate of 33 plots covering ≈4500 ha) suburbs supported the lowest bird richness and diversity and rural landscapes the most, with reserves slightly below rural. Although reserves were like rural lands in diversity of bird communities, they supported more species of conservation concern, particularly of grasslands and savannas. Differences among land use types varied with habitat structure. Suburbs, rural lands, and reserves had similar forest bird communities, but differed in grassland and savanna bird communities. The extensive rural forests are important for the region's forest birds. Suburban grasslands and savannas had low shrub abundance, low native bird richness and high non-native bird richness and abundance. However, total bird richness and diversity were as high in suburban as in rural and reserve plots because high native richness in suburban forests and high non-native species richness in suburban grasslands and savannas compensated for lower native richness in suburban grasslands and savannas. Bird conservation here and in the Midwest USA should protect rural forests, expand grasslands and savannas in reserves, and improve habitat quality overall.

2145. **Landowner attitudes regarding wildlife management on private land in North Carolina.**
Daley, S. S.; Cobb, D. T.; Bromley, P. T.; and Sorenson, C. E.
Wildlife Society Bulletin 32(1): 209-219. (2004)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: attitudes/ behavior/ human dimensions/ landowner/ North Carolina/ private land/ telephone survey/ wildlife management/ attitudinal survey/ United States
Abstract: Early-successional habitats across the southeast United States have declined considerably in recent years amid rising human population growth and associated development. Recognizing the declining wildlife populations associated with early-successional habitats and the need for influence over habitat on private land, the North Carolina Wildlife Resources Commission established the Cooperative Upland Habitat Restoration and Enhancement (CURE) Program in August 2000. The program targets private landowners in 3 select regions of the state (Upper Coastal Plain I, Upper Coastal Plain II, and Western Piedmont). Survey research was conducted in the 3 CURE Program areas to 1) evaluate demographic and landownership attributes of private landowners and associated land-use characteristics, 2) assess regional differences in landowner attitudes and behavior toward wildlife management on private land, 3) identify landowner attributes related to regional differences in attitude or behavior, and 4) evaluate how regional differences will impact future CURE Program guidelines. Landowner attitudes toward wildlife in North Carolina are closely linked to property use and reliance on land for direct economic income (i.e., agricultural production). Landowners who depended on their property for earned annual income were less likely to consider the aesthetic or intrinsic value of wildlife on their land than those who did not rely on their land for income. For some landowners, financial incentives alone appeared sufficient to encourage participation in the CURE Program. Other landowners were less interested in financial rewards. For these landowners, alternative forms of encouragement, such as partnerships with agencies and organizations, might be more effective. Understanding variability in landowner attitudes and behavior toward wildlife habitat is critical to the success of private-land wildlife habitat management programs. In North Carolina the success of the CURE Program will depend on tailoring the program to fit regional differences in landowner values, attitudes, and behavior.

2146. **Landscape changes and ecological studies in agricultural regions, Quebec, Canada.**
Jobin, B.; Beaulieu, J.; Grenier, M.; Belanger, L.; Maisonneuve, C.; Bordage, D.; and Filion, B.
Landscape Ecology 18(6): 575-590. (2003)
NAL Call #: QH541.15.L35 L36; ISSN: 09212973.
Notes: doi: 10.1023/A:1026047625427.
Descriptors: agricultural landscapes/ conservation/ ecoregion/ landscape delineation/ NABCI/ Quebec/ wildlife habitat/ agricultural ecosystem/ conservation/ ecoregion/ land classification/ land use/ LANDSAT thematic mapper/ landscape ecology/ multivariate analysis/ remote sensing/ Canada/ North America
Abstract: Most landscape definitions in the western world are based on soil, climatic, or physiographic features and do not integrate humans as an integral part of the landscape. We present an approach where landscape types have been delineated in southern Que?bec, Canada based on current land use where anthropogenic and agricultural activities are concentrated as a practical application of the holistic approach in landscape definition. Landsat-TM satellite images were classified and the 27 habitat classes were regrouped into 5 general land cover classes (cash crop, dairy farming, forest, anthropogenic, wetlands) and overlaid onto soil landscape polygons to characterize natural boundary units. Cluster analyses were used to aggregate these polygons into seven agricultural types of landscape forming a gradient from urban and high-intensity cash crop farming activities to landscapes dominated by a mosaic of agriculture and forested areas. Multivariate analyses of raw data and of socio-economic

and farming practices variables were used to describe the defined types of landscape and these were projected over three established land classification systems of southern Quebec (Canadian ecoregions, North American Bird Conservation Initiative regions and Corn Heat Unit regions) to compare their similarity in terms of land cover and for planning of future ecological studies. Because agricultural landscapes are highly dynamic, they are bound to undergo changes in the near future. Our landscape delineation may serve as an experimental setup where landscape dynamics and wildlife populations and community structures could be monitored. Because the information we used to delineate and characterize agricultural landscape types is readily available in other countries, our approach could easily be adapted to similar data sources under and a wide variety of landscape types.

2147. **Landscape characteristics affecting habitat use and productivity of avifauna on stock ponds in western South Dakota.**
May, S. M. 2001.
Notes: Project Number: SD W-107-R/Study No. 1011; Wildlife Coop. Unit Report - Thesis
Descriptors: animals, non-game/ birds, marsh-dwellers/ broods and brooding/ habitat/ habitat management for wildlife/ ponds/ population density/ predators/ productivity/ statistics/ surveys/ utilization/ vegetation/ waterfowl/ wetlands/ wildlife-habitat relationships/ South Dakota, western region
Abstract: The effects of local- and landscape-level characteristics (specifically grassland fragmentation) on nongame wetland bird occurrence and density, and waterfowl pair and brood density and rates of productivity were evaluated in 1999 and 2000 in western South Dakota.

2148. **Landscape correlates along mourning dove call-count routes in Mississippi.**
Elmore, R. Dwayne; Vilella, Francisco J.; and Gerard, Patrick D.
Journal of Wildlife Management 71(2): 422-427. (2007)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: wildlife management: conservation/ landscape/ call count route
Abstract: Mourning dove (Zenaida macroura) call-count surveys in Mississippi, USA, suggest declining populations. We used available mourning dove call-count data to evaluate long-term mourning dove habitat relationships. Dove routes were located in the Mississippi Alluvial Valley, Deep Loess Province, Mid Coastal Plain, and Hilly Coastal Plain physiographic provinces of Mississippi. We also included routes in the Blackbelt Prairie region of Mississippi and Alabama, USA. We characterized landscape structure and composition within 1.64-km buffers around 10 selected mourning dove call-count routes during 3 time periods. Habitat classes included agriculture, forest, urban, regeneration stands, wetland, and woodlot. We used Akaike's Information Criterion to select the best candidate model. We selected a model containing percent agriculture and edge density that contained approximately 40% of the total variability in the data set. Percent agriculture was positively correlated with relative dove abundance. Interestingly, we found a negative relationship between edge density and dove abundance. Researchers should conduct future research on dove nesting patterns in Mississippi and threshold levels of edge necessary to maximize dove density. During the last 20 years, Mississippi lost more than 800,000 ha of cropland while forest cover represented largely by pine (Pinus taeda) plantations increased by more than 364,000 ha. Our results suggest observed localized declines in mourning dove abundance in Mississippi may be related to the documented conversion of agricultural lands to pine plantations.

2149. **A landscape ecology perspective for research, conservation, and management.**
Freemark, K. E.; Dunning, J. B.; Hejl, S. J.; and Probst, J. R.
In: Ecology and management of neotropical migratory birds: A synthesis and review of critical issues/ Martin, T. E. and Finch, D. M.
New York: Oxford University Press, 1995; pp. 381-427.
Notes: ISBN: 0-19-508452-7.
Descriptors: wild birds/ landscape ecology/ habitats/ forests/ wetlands/ riparian vegetation/ urban areas/ temperate zones/ neotropical region/ nature conservation/ wildlife management/ management/ wildlife conservation/ United States
Abstract: This paper highlights key concepts of landscape ecology important to the research, conservation and management of neotropical migratory birds. A review is given of empirical studies related to the landscape ecology of neotropical migratory birds in forests, farmland, wetlands, riparian habitats and urban habitats of temperate breeding areas in the USA, and to a more limited extent, on migration stopover areas and neotropical overwintering areas. Research, conservation and management implications for neotropical migratory birds arising from a landscape perspective are discussed.

2150. **Linkage between riparian buffer features and regeneration, benthic communities, and water temperature in headwater streams, western Oregon.**
Newton, Michael and Cole, Elizabeth C.
In: Productivity of Western forests: a forest products focus, General Technical Report-PNW 642; Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 81-101.
Descriptors: freshwater ecology: ecology, environmental sciences/ conservation/ forestry/ water temperature/ riparian forest/ headwater stream/ benthic community/ reforestation
Abstract: Riparian forests can be managed using a range of harvesting and regeneration methods to achieve multiple environmental and economic objectives. In this study, seven low-elevation second- or third-order streams were subjected to either patch clearcutting with no buffers or one-sided narrow buffers divided by uncut reaches. Of these streams, four were sites of intensive regeneration experiments, and the other three evaluated only the effect of harvest pattern on water temperature. Regeneration was successfully installed along four streams with intensive planting experiments in which three clearcuts on each spanned the stream for distances of 90 or 180 m. Regeneration cutting in these drainages included clearcutting to the water's edge in openings amounting to

25% of 1,500-m reaches. Planting tests evaluated three species: Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco var. menziesii), western hemlock (Tsuga heterophylla (Raf.) Sarg.), and western redcedar (Thuja plicata Donn). Douglas-fir was represented by two different stock types, bareroot plug+1 and 1+1 transplants on two sites and bareroot 1+1 and 2+0 seedlings on the other two sites. All regeneration efforts are on a path that will eventually result in conifer-dominated riparian zones, with degree of success influenced by choice of stock type, overtopping cover, animal damage and frost. Damage from deer (Odocoilius hemionus columbianus Rich.), elk (Cervus elaphus canadensis L.), beavers (Castor canadensis Kuhl.) and/or mountain beavers (Aplodontia rufa Raf.) occurred on all four stream systems. There were no patterns of beaver or mountain beaver damage among the stock types; browsing on hemlock was minor. Growth status of the plantations at age four was a function of overtopping vegetation where there is low risk of frost damage; freezing temperatures were limiting to seedling growth along one stream. All three of the primary tree regeneration species studied exhibited decreased growth with overtopping. As has been found on upland sites elsewhere, size of seedlings had a strong influence on their competitive ability in riparian zones.

2151. **Livestock effects on reproduction of the Columbia spotted frog.**
Bull, E. L. and Hayes, M. P.
Journal of Range Management 53(3): 291-294. (2000)
NAL Call #: 60.18 J82 ; ISSN: 0022-409X.
http://jrm.library.arizona.edu/Volume53/Number3/azu_jrm_v53_n3_291_294_m.pdf
Descriptors: Rana/ ponds/ ova/ grazing/ cattle/ aquatic plants/ surface area/ altitude/ depth/ fish/ habitats/ algae and seaweeds/ dissolved oxygen/ Oregon
This citation is from AGRICOLA.

2152. **Living on the edge: Field boundary habitats, biodiversity and agriculture.**
Clark, R. G.; Boutin, C.; Jobin, B.; Forsyth, D. J.; Shutler, D.; Leeson, J. Y.; Olfert, O.; and Thomas, A. G.
In: Field boundary habitats: Implications for weed, insect and disease management; Series: Topics in Canadian Weed Science 1. Sainte-Anne-de-Bellevue, Quebec: Canadian Weed Science Society, 2005; pp. 113-133.
Descriptors: biodiversity/ boundaries/ carbon sequestration/ erosion/ farming systems/ forage/ grazing/ habitats/ hay/ hedges/ insect pests/ landowners/ landscape ecology/ livestock/ nature conservation/ pesticides/ plant pests/ soil conservation/ surface water/ vertebrate pests/ weeds/ wetlands/ wildlife/ birds/ insects
Abstract: In many agricultural regions of Canada, the most common remnant natural areas are field boundaries, these habitats being linear features or narrow areas located beside cropland. Boundaries are often perceived to harbour noxious weeds, insects and birds that could potentially damage crops or interfere with crop production. Therefore, boundary habitat may be degraded by pesticides, fertilizers, tillage, wind and water exposure, excessive burning, haying and grazing. One conservation objective is to work with land owners to retain and protect existing boundaries, a goal that could be achieved more readily with evidence of benefits and practical ways of managing field margins. Direct services provided by boundary habitats include control of soil and water erosion, protection (e.g., from agro-chemicals) of surface water used by livestock and people, and provision of forage for livestock through grazing or haying. Boundaries serve as refugia for plants, insects or other animals that are either neutral or beneficial to agriculture. Native plants often are more common farther from field edges and in habitats abutting pastures and hayfields, whereas weeds are more abundant in boundaries adjacent to intensively managed agricultural fields, possibly as a result of competitive advantages or outright loss of native species created by disturbance and agrochemical use. Wildlife has been studied in several countries and under different agricultural settings, but survival and reproductive rates of animals occurring in boundaries are not well known. Relationships between boundary width, height and composition and wildlife value, carbon storage, and protection of surface waters are poorly quantified. Answers to these questions will help land owners, conservation agencies and policy-makers make better decisions about sustainable farm practices.

2153. **Long-term effects of rights-of-way maintenance via the wire-border zone method on bird nesting ecology.**
Yahner, R. H.; Ross, B. D.; Yahner, R. T.; Hutnik, R. J.; and Liscinsky, S. A.
Journal of Arboriculture 30(5): 288-293. (2004)
NAL Call #: SB436.J6; ISSN: 02785226
Descriptors: breeding birds/ handcutting/ herbicides/ nesting ecology/ vegetation/ avifauna/ ecological impact/ habitat management/ herbicide/ maintenance/ mowing/ nesting behavior/ right of way/ Allegheny Mountains/ Allegheny Plateau/ Appalachian Plateau/ Aves/ Pipilo/ Pipilo erythrophthalmus
Abstract: The long-term nesting ecology of birds was studied during 2002 and 2003 on the State Game Lands (SGL) 33 Research and Demonstration Area, which is located along a 230-kV transmission right-of-way (ROW) of FirstEnergy (Penelec) in the Allegheny Mountain Region, Centre County, Pennsylvania, U.S. The objectives of this study were to compare nest abundance, success, and placement (1) in handcut versus herbicide-treated study sites (units) and (2) in wire versus border zones. In addition, results from this study were compared to those obtained in a previous study conducted in 1991-1992 on the ROW to better understand the long-term effects of vegetation maintenance management on wildlife. Thirty-three and 26 nests of 10 bird species were noted in 2002 and 2003, respectively. The most frequently encountered nests in 1991-1992 and 2002-2003 were those of bird species adapted to early successional habitats, for example, eastern towhee (Pipilo erythrophthalmus), created by the wire-border zone method of vegetation maintenance on the ROW. Thirteen (39%) of 33 nests of all species combined fledged young in 2002 compared to 17 (65%) of 26 nests in 2003. Nesting success in 2003 on the SGL 33 ROW was typical of most studies of bird nesting success in a variety of habitats and was comparable to that recorded in 1991-1992. The low-volume basal unit was more important as nesting habitat than either handcut or mowing plus herbicide units, with nine species nesting in the low-volume basal unit versus only four species in each of the other two units. Thirty-five (59%) of the 59 nests on the

ROW were in wire zones, whereas 24 (41%) nests were in border zones. In conclusion, mowing plus herbicide treatment on a ROW may be the best application of the wire-border zone method in terms of resistance to seedling invasion of undesirable trees, cover-type development in the wire zone, and its value as wildlife habitat. Because early successional habitat is becoming less common in the eastern United States and because species dependent on these habitats are showing populations declines, the maintenance of a ROW via the wire-border zone method is extremely valuable to the long-term conservation of early successional bird species. © 2004 International Society of Arboriculture.

2154. **Long-term monitoring and evaluation of the Lower Red River Meadow Restoration Project, Idaho, U.S.A.**
Klein, L. R.; Clayton, S. R.; Alldredge, J. R.; and Goodwin, P.
Restoration Ecology 15(2): 223-239. (2007)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: channels/ ecosystems/ floodplains/ grasslands/ groundwater level/ habitats/ hydrodynamics/ meadows/ monitoring/ population density/ recovery/ riparian vegetation/ rivers/ slope/ species diversity/ streams/ water temperature/ wild birds/ birds/ Salmonidae
Abstract: Although public and financial support for stream restoration projects is increasing, long-term monitoring and reporting of project successes and failures are limited. We present the initial results of a long-term monitoring program for the Lower Red River Meadow Restoration Project in north-central Idaho, U.S.A. We evaluate a natural channel design's effectiveness in shifting a degraded stream ecosystem onto a path of ecological recovery. Field monitoring and hydrodynamic modelling are used to quantify post-restoration changes in 17 physical and biological performance indicators. Statistical and ecological significance are evaluated within a framework of clear objectives, expected responses (ecological hypotheses), and performance criteria (reference conditions) to assess post-restoration changes away from pre-restoration conditions. Compared to pre-restoration conditions, we observed ecosystem improvements in channel sinuosity, slope, depth, and water surface elevation; quantity, quality, and diversity of in-stream habitat and spawning substrate; and bird population numbers and diversity. Modelling documented the potential for enhanced river-floodplain connectivity. Failure to detect either statistically or ecologically significant change in groundwater depth, stream temperature, native riparian cover, and salmonid density is due to a combination of small sample sizes, high interannual variability, external influences, and the early stages of recovery. Unexpected decreases in native riparian cover led to implementation of adaptive management strategies. Challenges included those common to most project-level monitoring - isolating restoration effects in complex ecosystems, securing long-term funding, and implementing scientifically rigorous experimental designs. Continued monitoring and adaptive management that support the establishment of mature and dense riparian shrub communities are crucial to overall success of the project.

2155. **Mallard recruitment in the agricultural environment of North Dakota.**
Cowardin, L. M.; Gilmer, D. S.; and Shaiffer, C. W.
Wildlife Monographs 92: 1-37. (1985)
NAL Call #: 410 W64; ISSN: 0084-0173
Descriptors: Anas platyrhynchos (Anatidae)/ wildlife management/ population recruitment/ agricultural land/ nesting site/ agricultural habitat/ breeding season/ nest initiation curves/ reproductive productivity/ population dynamics/ recruitment/ habitat preference/ nesting/ agricultural environment/ semiaquatic habitat/ wetlands/ grassland/ cultivated land habitat/ agricultural population recruitment and management/ North Dakota/ agricultural habitat

2156. **Mammalian toxicology of organophosphorus pesticides.**
Sultatos, L. G.
Journal of Toxicology and Environmental Health 43(3): 271-289. (Nov. 1994)
NAL Call #: RA565.A1J6; ISSN: 0098-4108 [JTEHD6].
Notes: Literature review.
Descriptors: organophosphorus pesticides/ toxicity/ adverse effects/ acetylcholinesterase/ enzyme activity/ inhibition/ metabolism/ metabolites/ mammals/ toxicology/ carcinogenesis/ metabolic activation
This citation is from AGRICOLA.

2157. **Management of agricultural landscapes for the conservation of neotropical migratory birds.**
Koford, R. R. and Best, L. B.
In: Management of Midwestern landscapes for the conservation of neotropical migratory birds, General Technical Report-NC 781/ Thompson, F. R.; St. Paul, MN: North Central Forest Experiment Station, Forest Service, U.S. Department of Agriculture, 1996. pp. 86-88.
http://www.npwrc.usgs.gov/resource/habitat/landscap/index.htm
Descriptors: supporting science/ birds/ bird conservation/ landscape management
Abstract: Discussed management strategies for the management of avian habitat in agricultural landscapes.

2158. **Managing for enhancement of riparian and wetland areas of the western United States: An annotated bibliography.**
Koehler, D. A. and Thomas, A. E.
Ogden, UT: Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture; General Technical Report-RMRS 54, 2000. 369 p.
Notes: Rocky Mountain Research Station General Technical Report 54.
Descriptors: fisheries/ geomorphology/ grazing impacts/ hydrology/ riparian habitat/ riparian restoration/ riparian vegetation/ watersheds/ wetlands
Abstract: This annotated bibliography contains 1,905 citations from professional journals, symposia, workshops, proceedings, technical reports, and other sources. The intent of this compilation was to: (1) assemble, to the extent possible, all available and accessible publications relating to riparian management within a single source or document; (2) provide managers, field biologists, researchers, and others, a point of access for locating scientific literature relevent to their specific interest; and (3)

provide, under one cover, a comprehensive collection of annotated publications that could dessiminate basic information relative to the status of our knowledge.
This citation is from Treesearch.

2159. **A mesofilter conservation strategy to complement fine and coarse filters.**
Hunter, M. L.
Conservation Biology 19(4): 1025-1029. (2005)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: aquatic environment/ conservation/ ecosystems/ fires/ floods/ grasslands/ habitats/ hedges/ logs/ streams/ wetlands
Abstract: Setting aside entire ecosystems in reserves is an efficient way to maintain biodiversity because large numbers of species are protected, but ecosystem conservation constitutes a coarse filter that does not address some species. A complementary, fine-filter approach is also required to provide tailored management for some species (e.g., those subject to direct exploitation). Mesofilter conservation is another complementary approach that focuses on conserving critical elements of ecosystems that are important to many species, especially those likely to be overlooked by fine-filter approaches, such as invertebrates, fungi, and nonvascular plants. Critical elements include structures such as logs, snags, pools, springs, streams, reefs, and hedgerows, and processes such as fires and floods. Mesofilter conservation is particularly appropriate for seminatural ecosystems that are managed for both biodiversity and commodity production (e.g., forests managed for timber, grasslands managed for livestock forage, and aquatic ecosystems managed for fisheries) and is relevant to managing some agricultural and urban environments for biodiversity.

2160. **A meta-analysis of forest cover, edge effects, and artificial nest predation rates.**
Hartley, M. J. and Hunter, M. L.
Conservation Biology 12(2): 465-469. (1998)
NAL Call #: QH75.A1C5; ISSN: 0888-8892
Descriptors: forests/ predation/ edge effect/ Aves/ birds
Abstract: Landscape fragmentation has been among the most intensely studied topics in conservation biology for decades. The influence of habitat edge has often been investigated as an important feature in fragmented areas, especially with respect to bird nesting success, as evidenced by three recent reviews. Paton (1994) concluded that "current evidence, although equivocal, suggests that predation and parasitism rates are often significantly greater within 50 m of an edge." Andren (1995) examined edge (or patch size) effects in a review of 40 papers and concluded that "edge-related increase in predation seems to be most commonly found inside forests surrounded by farmland and was rarely found in forest mosaics." Major and Kendal (1996) showed that a preponderance of studies "demonstrated a positive correlation between predation rate and the degree of habitat fragmentation," but found "more variable results" regarding edge effects. We believe that none of these papers adequately addressed the issue of whether or not predation rates and edge effects differ between deforested versus forested landscapes. Thus, we decided to evaluate relationships between degree of forest cover in a landscape and (1) avian nest success rates and (2) the existence of elevated predation rates near habitat edges. We combined data from 13 previous studies in 33 U.S. landscapes to explore patterns of nest predation and landscape composition.

2161. **Model estimation of land-use effects on water levels of northern prairie wetlands.**
Voldseth, R. A.; Johnson, W. C.; Gilmanov, T.; Guntenspergen, G. R.; and Millett, B. V.
Ecological Applications 17(2): 527-540. (2007)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: grassland management/ grazing/ land use/ landscape condition/ Prairie Pothole Region/ prairie wetland/ waterfowl management/ wetland ecology/ wetland hydrology/ wetland modeling/ wetland water budget/ wetland water level
Abstract: Wetlands of the Prairie Pothole Region exist in a matrix of grassland dominated by intensive pastoral and cultivation agriculture. Recent conservation management has emphasized the conversion of cultivated farmland and degraded pastures to intact grassland to improve upland nesting habitat. The consequences of changes in land-use cover that alter watershed processes have not been evaluated relative to their effect on the water budgets and vegetation dynamics of associated wetlands. We simulated the effect of upland agricultural practices on the water budget and vegetation of a semipermanent prairie wetland by modifying a previously published mathematical model (WETSIM). Watershed cover/land-use practices were categorized as unmanaged grassland (native grass, smooth brome), managed grassland (moderately heavily grazed, prescribed burned), cultivated crops (row crop, small grain), and alfalfa hayland. Model simulations showed that differing rates of evapotranspiration and runoff associated with different upland plant-cover categories in the surrounding catchment produced differences in wetland water budgets and linked ecological dynamics. Wetland water levels were highest and vegetation the most dynamic under the managed-grassland simulations, while water levels were the lowest and vegetation the least dynamic under the unmanaged-grassland simulations. The modeling results suggest that unmanaged grassland, often planted for waterfowl nesting, may produce the least favorable wetland conditions for birds, especially in drier regions of the Prairie Pothole Region. These results stand as hypotheses that urgently need to be verified with empirical data. © 2007 by the Ecological Society of America.

2162. **Modeling annual mallard production in the prairie-parkland region.**
Miller, M. W.
Journal of Wildlife Management 64(2): 561-575. (2000)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: agriculture/ Anas platyrhynchos/ climate/ mallard/ modeling/ prairie-parkland region/ production/ survey/ temperature/ wetlands/ biological production/ environmental factor/ population modeling/ waterfowl/ wildlife management/ North America/ Anas platyrhynchos
Abstract: Biologists have proposed several environmental factors that might influence production of mallards (Anas platyrhynchos) nesting in the prairie-parkland region of the United States and Canada. These factors include precipitation, cold spring temperatures, wetland abundance, and upland breeding habitat. I used long-term historical

data sets of climate, wetland numbers, agricultural land use, and size of breeding mallard populations in multiple regression analyses to model annual indices of mallard production. Models were constructed at 2 scales: a continental scale that encompassed most of the mid-continental breeding range of mallards and a stratum-level scale that included 23 portions of that same breeding range. The production index at the continental scale was the estimated age ratio of mid-continental mallards in early fall; at the stratum scale my production index was the estimated number of broods of all duck species within an aerial survey stratum. Size of breeding mallard populations in May, and pond numbers in May and July, best modeled production at the continental scale. Variables that best modeled production at the stratum scale differed by region. Crop variables tended to appear more in models for western Canadian strata; pond variables predominated in models for United States strata; and spring temperature and pond variables dominated models for eastern Canadian strata. An index of cold spring temperatures appeared in 4 of 6 models for aspen parkland strata, and in only 1 of 11 models for strata dominated by prairie. Stratum-level models suggest that regional factors influencing mallard production are not evident at a larger scale. Testing these potential factors in a manipulative fashion would improve our understanding of mallard population dynamics, improving our ability to manage the mid-continental mallard population.

2163. **Modeling the ecological trap hypothesis: A habitat and demographic analysis for migrant songbirds.**
Donovan, T. M. and Thompson, F. R.
Ecological Applications 11(3): 871-882. (2001)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: ecological trap/ habitat quality/ landscape management/ neotropical migrant songbirds/ population demography/ population dynamics/ source-sink/ anthropogenic effect/ assessment method/ conservation management/ habitat quality/ population modeling/ songbirds/ source-sink dynamics
Abstract: Most species occupy both high- and low-quality habitats throughout their ranges. As habitats become modified through anthropogenic change, low-quality habitat may become a more dominant component of the landscape for some species. To conserve species, information on how to assess habitat quality and guidelines for maintaining or eliminating low-quality habitats are needed. We developed a source-sink population model that depicted the annual cycle of a generalized migratory songbird to address these questions. We determined how demographic factors, landscape composition (the percentage of high- and low-quality habitat), and habitat selection interacted to promote population persistence or extirpation. Demographic parameters, including adult and juvenile survival, nesting success (probability of a nest successfully fledging one or more young), number of nesting attempts, and number of young fledged per nest, interacted to affect population growth. In general, population growth was more sensitive to adult and juvenile survival than to fecundity. Nevertheless, within typically observed survival values, nest success was important in determining whether the population increased, decreased, or was stable. Moreover, the number of nest attempts by females and the number of young fledged per nesting attempt influenced population stability. This highlights the need to obtain more complete demographic data on species than simple nest success to assess habitat quality. When individuals selected high- and low-quality habitats in proportion to habitat availability, populations persisted as long as low-quality habitat did not make up >40% of the landscapes. However, when individuals preferred low-quality habitats over high-quality habitats, populations were extirpated in landscapes with >30% low-quality habitat because low-quality habitat functioned as an ecological trap, displacing individuals from high-quality to low-quality habitat. For long-term conservation, we emphasize the need for basic information on habitat selection and life-history characteristics of species throughout their range.

2164. **Modeling the impact of edge avoidance on avian nest densities in habitat fragments.**
Bollinger, E. K. and Switzer, P. V.
Ecological Applications 12(6): 1567-1575. (2002)
NAL Call #: QH540.E23 ; ISSN: 10510761
Descriptors: avian nest placement/ edge avoidance/ habitat fragmentation/ habitat interior/ habitat patch/ model/ nest density/ patch size/ avifauna/ density/ edge effect/ habitat fragmentation/ habitat selection/ nest site/ patch size
Abstract: In fragmented landscapes, many species of birds are absent from, or have reduced densities in, small habitat fragments. This pattern may result, at least in part, because birds avoid placing their nests near habitat edges where nest success often is low. We sought to clarify the role played by edge avoidance in producing these patch size effects. Using a numerical approach, we modeled nest densities in patches of different sizes and shapes both for species displaying edge avoidance (i.e., "edge-sensitive" species) and for those not displaying this characteristic (i.e., "edge-insensitive" species). Edge avoidance in our model was defined as a reduced probability of nest placement occurring near a habitat edge. Our model produced the expected result that edge avoidance reduced nest densities in patches of all sizes compared to densities of edge-insensitive species. Surprisingly, however, edge avoidance did not reduce nest densities in small patches relative to large patches, and nest densities actually increased exponentially as patch size decreased for edge-insensitive species. Also unexpected was the result that nests of edge-sensitive species were found in the edge habitat at frequencies only slightly below those expected based on edge area, whereas edge-insensitive species actually had higher than expected nest densities in edge habitat. However, in our model, edge-sensitive species displayed a greater reduction in nest densities near edges when their overall patch density was reduced by half, suggesting that edge avoidance is density dependent. Finally, both types of species showed marked increases in nest densities in linear habitat patches compared to square patches. These patterns were a direct result of our settlement rule that required a female's nest location to be a minimum distance from other nests. This study suggests that knowledge of the settlement rules used by female birds may be a key to accurately demonstrating the existence and assessing the potential consequences of edge avoidance. Detailed observations of marked females immediately following arrival at habitat patches, as well as a comparison of nest

densities, territory sizes, polygyny levels, and use of habitat off territory, would greatly help our understanding of this interesting and important phenomenon.

2165. **Modifying roadside vegetation management practices to reduce vehicular collisions with moose, Alces alces.**
Rea, Roy V.
Wildlife Biology 9(2): 81-91. (2003)
NAL Call #: SK351.W663; ISSN: 0909-6396
Descriptors: conservation measures/ nutrition/ feeding behavior/ ecology/ population dynamics/ man-made habitat/ Alces alces: disturbance by man/ vehicular collisions/ habitat management/ roadside vegetation management to reduce vehicular collisions/ foraging/ roadside habitat/ Mammalia, Artiodactyla, Cervidae/ chordates/ mammals/ ungulates/ vertebrates
Abstract: Vegetation management practices currently used within transportation corridors are primarily aimed at minimising encroaching shrub and tree growth in order to increase driver visibility and road safety. Such practices create prime foraging habitat for ungulates such as moose Alces alces by inhibiting forest succession and maintaining early seral shrub communities. Increased foraging activity within the corridor increases the likelihood of encounters between moose and motorists. Moose-related vehicular collisions are costly in terms of material damage claims and have significant negative impacts on public safety and moose populations in many parts of their range. Although several countermeasures have been developed in an attempt to reduce the frequency of these collisions, few have proven effective and even fewer have taken into consideration possible links between roadside vegetation management, the quality of browse regenerating from cut vegetation, and how moose use browse within the transportation corridor. To better understand these relationships, I reviewed the literature on ungulate-related vehicular collisions in combination with literature on plant response to mechanical damage. Many authors recognise the need to reduce the attractiveness of vegetation growing within transportation corridors. To date, diversionary feeding, forage repellents, establishment of unpalatable species and elimination of roadside brush have been used. Unfortunately, such techniques are only semi-effective or are not cost-efficient when applied across the landscape. It has long been recognised that the ability of plants to regenerate following mechanical damage is influenced by the timing of damage. Current research suggests that the quality of regenerating plant tissues for herbivores also depends on when plants are cut. Plants cut in the middle of the growing season produce regrowth that is high in nutritional value for at least two winters following brush-cutting as compared to plants cut at other times of the year, and uncut controls. Because roadside brush is generally cut during mid-summer, possible links between the quality of regenerated browse and increases in ungulate-related vehicular collisions during the autumn and winter should be elucidated. Based on this review, I recommend cutting brush early in the growing season and emphasize the need for collaborative long-term research to properly address this issue.

2166. **Monitoring restoration of riparian forests.**
Pollock, M. M.; Beechie, T. J.; Chan, S. S.; and Bigley, R.
In: Monitoring stream and watershed restoration/ Roni, P. Cambridge, MA: CABI Publishing, 2005; pp. 67-96.
Descriptors: benefits/ ecosystem management/ environment management/ environmental monitoring/ fish/ habitat improvement/ habitats/ hardwood/ monitoring/ productivity/ restoration/ riparian vegetation/ riparian vegetation/ streams/ watersheds/ North America
Abstract: Riparian forests are among the most biologically diverse portions of the terrestrial landscape and provide numerous benefits to instream habitat (Salo and Cundy 1987; Naiman et al. 1993; Nilsson et al. 1994; Pollock et al. 1998). Among these important benefits are the transport of large wood, fine organic material, nutrients, sediment, water, and thermal energy to the stream network, such that a natural aquatic environment is maintained. Alterations to riparian vegetation can alter or disrupt these watershed processes, which affect instream parameters such as stream productivity and the abundance of desirable fishes (Swanson and Lienkaemper 1978; Bisson et al. 1987; Lienkaemper and Swanson 1987). Riparian forest conditions largely determine instream conditions. Riparian areas also are a necessary habitat component for many wildlife species (Kondolf et al. 1987; Raedeke 1988). The loss of riparian habitat throughout much of North America and elsewhere is extensive, but the number of successful efforts to restore these systems is growing (Boldt et al. 1979; GAO 1988; Mutz 1989; BLM 1991; NRC 1992; Kattelman and Embury 1996; Wissmar and Beschta 1998). Riparian restoration describes a suite of restorative management techniques that can alter forest development in riparian areas for the purpose of improving instream and riparian habitat conditions (Oliver and Hinckley 1987; Berg 1990, 1995; Kohm and Franklin 1997).

2167. **Movement of forest birds across river and clearcut edges of varying riparian buffer strip widths.**
Shirley, S. M.
Forest Ecology and Management 223: 190-199. (Mar. 2006)
NAL Call #: SD1.F73
Descriptors: wild birds/ wildlife habitats/ forest habitats/ riparian forests/ riparian buffers/ habitat fragmentation/ British Columbia/ forest bird movements/ Vancouver Island animal ecology and behavior/ plant ecology/ aquatic biology and ecology general/ forestry related
This citation is from AGRICOLA.

2168. **Multi-scale landscape and seascape patterns associated with marbled murrelet nesting areas on the U.S. West Coast.**
Meyer, C. B.; Miller, S. L.; and Ralph, C. J.
Landscape Ecology 17(2): 95-115. (2002)
NAL Call #: QH541.15.L35 L36; ISSN: 09212973.
Notes: doi: 10.1023/A:1016574928706.
Descriptors: Brachyramphus marmoratus/ fidelity/ fragmentation/ landscape/ murrelet/ old-growth/ scale/ spatial/ temporal/ forest/ habitat fragmentation/ habitat management/ nestling/ seabird/ spatial distribution/ temporal distribution/ United States/ Aves

Abstract: Habitat for wide-ranging species should be addressed at multiple scales to fully understand factors that limit populations. The marbled murrelet (Brachyramphus marmoratus), a threatened seabird, forages on the ocean and nests inland in large trees. We developed statistical relationships between murrelet use (occupancy and abundance) and habitat variables quantified across many spatial scales (statewide to local) and two time periods in California and southern Oregon, USA. We also addressed (1) if old-growth forest fragmentation was negatively associated with murrelet use, and (2) if some nesting areas are more important than others due to their proximity to high quality marine habitat. Most landscapes used for nesting were restricted to low elevation areas with frequent fog. Birds were most abundant in unfragmented old-growth forests located within a matrix of mature second-growth forest. Murrelets were less likely to occupy old-growth habitat if it was isolated (> 5 km) from other nesting murrelets. We found a time lag in response to fragmentation, where at least a few years were required before birds abandoned fragmented forests. Compared to landscapes with little to no murrelet use, landscapes with many murrelets were closer to the ocean's bays, river mouths, sandy shores, submarine canyons, and marine waters with consistently high primary productivity. Within local landscapes (≤ 800 ha), inland factors limited bird abundance, but at the broadest landscape scale studied (3200 ha), proximity to marine habitat was most limiting. Management should focus on protecting or creating large, contiguous old-growth forest stands, especially in low-elevation areas near productive marine habitat.

2169. **The need to ground truth 30.5 m buffers: A case study of the boreal toad (Bufo boreas).**
Goates, Michael C.; Hatcha, Kent A.; and Eggett, Dennis L.
Biological Conservation 138(3-4): 474-483. (2007)
NAL Call #: S900.B5; ISSN: 0006-3207
Descriptors: forestry/ wildlife management: conservation/ conservation buffer/ ground truthing
Abstract: A buffer zone of 30.5 m is commonly used to protect species in riparian and wetland systems. This 30.5 m standard was developed to protect water quality, not biodiversity, and few studies have tested its effectiveness for protecting riparian and wetland species. We tested the standard implementation of 30.5 m buffers to determine if they protect critical habitat for semi-aquatic vertebrate species, using the boreal toad (Bufo boreas) as an example. Using radio telemetry of 84 toads in south-central Utah in 2003 and 2004, we found that the standard implementation of 30.5 m buffers did not protect all critical habitats for boreal toads. Managers should consider the following factors when establishing buffer zones: (1) Buffer requirements may vary by time of year. (2) A single year's observation may not be sufficient to establish adequate buffers. (3) Buffer requirements may differ by sex. Finally (4), sites should be ground truthed prior to determining buffer zones. Critically, we found that many small streams and seeps used by toads were outside of buffer zones due to low resolution of GIS mapping layers. After ground truthing and extending 30.5 m buffers around these habitats, the average percentage of all observations within 30.5 m buffers increased from 82.4% to 92.4%. Our data suggest that ground truthing may be the most important factor in establishing effective buffer zones.

2170. **Nest-site selection and success of mottled ducks on agricultural lands in southwest Louisiana.**
Durham, R. S. and Afton, A. D.
Wildlife Society Bulletin 31(2): 433-442. (2003)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: wetlands/ nesting behavior/ breeding success/ survival/ agricultural land/ habitat selection/ nesting/ breeding sites/ plant populations/ reproductive behavior/ population density/ grazing/ microhabitats/ environment management/ rice fields/ ecological distribution/ agriculture/ aquatic birds/ Anas fulvigula maculosa/ Oryza sativa/ Rubus trivialis/ Louisiana
Abstract: Listing of the mottled duck (Anas fulvigula maculosa) as a priority species in the Gulf Coast Joint Venture of the North American Waterfowl Management Plan, coupled with recent declines of rice (Oryza sativa) acreage, led us to investigate the nesting ecology of this species on agricultural lands in southwest Louisiana. We examined nest-site selection at macro- and microhabitat levels, nest success, causes of nest failures, and habitat features influencing nest success. We found that female mottled ducks preferred to nest in permanent pastures with knolls (53% of nests) and idle fields (22% of nests). Vegetation height was greater at nests than at random points within the same macrohabitat patch. Successful nests were associated with greater numbers of plant species, located farther from water, and associated with higher vegetation density values than were unsuccessful nests. We determined that mammalian predators caused most nest failures (77% of 52 unsuccessful nests). Our results suggest that nest success of mottled ducks on agricultural lands in southwest Louisiana could be improved by 1) locating large permanent pastures and idle fields near rice fields and other available wetlands, 2) managing plant communities in these upland areas to favor dense stands of perennial bunch grasses, tall composites, dewberry (Rubus trivialis), and other native grasses and forbs, and 3) managing cattle-stocking rates and the duration and timing of grazing to promote tall, dense stands of these plant taxa during the nesting season (March-June).

2171. **Neuroptera in agricultural ecosystems.**
Stelzl, M. and Devetak, D.
Agriculture, Ecosystems and Environment 74(1/3): 305-321. (June 1999)
NAL Call #: S601.A34; ISSN: 0167-8809 [AEENDO].
Notes: Literature review; Special issue: Invertebrate biodiversity as bioindicators of sustainable landscapes/ edited by M.G. Paoletti. Includes references.
Descriptors: neuroptera/ agricultural land/ ecosystems/ integrated pest management/ biological control/ agriculture/ habitats/ beneficial insects/ predation/ communities/ endangered species/ field crops/ orchards/ indicator species/ predators of insect pests
Abstract: Due to their well known environmental needs, Neuroptera serve as valuable indicator species for assessing the ecology of natural and semi-natural habitats.

In agricultural ecosystems some species of the families Chrysopidae, Hemerobiidae, and Coniopterygidae are known as beneficial predators of plant-sucking insect pests. Mass rearing and mass release of Chrysopids therefore, have become standard methods of biological pest control. The present paper summarizes information on biology and ecology of these three most important Neuropteran families, followed by a description of Neuropteran communities found in different natural and semi-natural ecosystems, with special reference to agroecosystems. Two separate sections deal with red lists of endangered species and integrated control programs. Literature lists are provided for those who want to study Neuroptera in more detail.
This citation is from AGRICOLA.

2172. **New opportunities for bird conservation research.**
Paul, Ellen and Cooper, Robert J.
In: Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, General Technical Report-PSW 191/ Ralph, C. J. and Rich, T. D.; Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 1008-1017.
Notes: 0196-2094 (ISSN).
Descriptors: conservation/ land zones/ Aves: conservation measures/ opportunities for conservation research/ North America/ Aves/ birds/ chordates/ vertebrates
Abstract: It is accepted and acknowledged that effective conservation requires a scientific basis, and it is accepted and acknowledged that scientific research benefits conservation. However, there has been little effort to bring together the resources of the research communities-both academic and government-based-with the conservation planning and implementation programs. Most scientific research is driven by either the investigator's own research interests or, on the government side, by the relatively short-term, relatively local management needs of natural resource managers. Also lacking is a comprehensive system to bring new or existing science to the conservation programs and resource managers. Developing a system to help planners and managers find and apply existing data is a critical need. And finally, there is a need to find funding for each of these components-setting the research agenda, conducting the research, and making it available to planners and managers. This session reviewed several promising opportunities to knit together ornithological research and bird conservation work.

2173. **Northern bobwhite population and habitat response to pine-grassland restoration.**
Cram, D. S.; Masters, R. E.; Guthery, F. S.; Engle, D. M.; and Montague, W. G.
Journal of Wildlife Management 66(4): 1031-1039. (2002)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Colinus virginianus/ Picidae/ bobwhite/ woodpeckers/ abundance/ dispersion/ ecological requirements/ silviculture/ habitat management/ Arkansas/ habitat restoration/ pine-grassland habitat

2174. **Odonata and wetland quality in southern Alberta, Canada: A preliminary study.**
Hornung, J. P. and Rice, C. L.
Odonatologica 32(2): 119-129. (2003); ISSN: 0375-0183
Descriptors: commercial activities/ conservation measures/ ecology/ land zones/ North America/ Canada/ Ischnura verticalis: Alberta/ Brooks/ Insecta, Odonata/ arthropods/ insects/ invertebrates
Abstract: The relationship between odon. and wetland quality was investigated in Brooks, from May until Sept. 1999. Sixteen study sites were each visited 7 times to survey adult dragonflies and aquatic macroinvertebrates, record environmental parameters, collect water samples, record vegetative characteristics, and assess beef cattle grazing influences. 25 odonate spp. were recorded, of which Ischnura verticalis is new to Alberta. A significant negative correlation was detected between cattle presence (measured as percent stems grazed surrounding the wetland) and odon. species richness ($p=0.022$; $r^2=0.322$), teneral species richness ($p=0.018$; $r^2=0.337$), and the Shannon-Weiner diversity indices ($p=0.060$; $r^2=0.230$) of the study sites. In addition, vegetation species richness and odon. species richness show a positive correlation ($p=0.066$; $r^2=0.221$). A logistic regression establishes that the absence of Coenagrion angulatum, Enallagma ebrium and Aeshna interrupta is associated with high cattle impacts, or low vegetation species richness. This study outlines the effect that cattle can have on wetland odon. species diversity and recommends that measures are taken to protect wetlands, while offering an incentive and reasonable cost/benefit ratio to both rangeland and wetland mangers.

2175. **Optimizing landscape configuratlion to enhance habitat suitability for species with contrasting habitat requirements.**
Holzkaemper, Annelie; Lausch, Angela; and Seppelt, Ralf
Ecological Modelling 198(3-4): 277-292. (2006)
NAL Call #: QH541.15.M3E25; ISSN: 0304-3800
Descriptors: biogeography: population studies/ models and simulations: computational biology/ terrestrial ecology: ecology, environmental sciences/ wildlife management: conservation/ spatial optimization model/ mathematical and computer techniques/ land use change/ habitat suitability
Abstract: Heterogeneity of agricultural landscapes is supposed to be of significant importance for species diversity in agroecosystems. However, land use pattern changes may lead to an increase in suitable habitat for some species, but to habitat deterioration for other species with opposing habitat requirements. To investigate the effects of land use changes on different species' habitat suitabilities and to allow a trade off between management objectives, we applied a spatial optimization model. in this paper we present a new approach that integrates a neighbourhood dependent multi-species evaluation of land use patterns into an optimization framework for generating goal-driven scenarios. It is implemented using a genetic algorithm approach that aims at maximizing habitat suitability of three selected bird species (Middle-Spotted Woodpecker, Wood Lark, Red-Backed Shrike) by identifying optimum agricultural land use patterns. The evaluation of habitat suitability is based on landscape metrics calculated within the species' home ranges to incorporate the effects of species responses to landscape

pattern on a territorial scale. The main focus of this study is to explore the potential of this approach for conservation management on the basis of a case study. We investigate where habitat requirements oppose, where they coincide and how a landscape optimized simultaneously for all target species should be characterized. We found that all species would benefit from an increase of deciduous and coniferous forest, a decrease of cropland and grassland in the study area and more heterogeneous land use patterns (smaller patches, more diversity of land use types). Habitat requirements of Red-Backed Shrike contrast most to those of the other two species with respect to landscape composition and configuration.

2176. **Participant observations on environmental and social effects of the Conservation Reserve Program: Results of a national survey.**
Allen, Arthur W.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 199-205.
http://www.nrcs.usda.gov/TECHNICAL/nri/ceap/fwbenefit.html
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wildlife habitat/ Conservation Reserve Program/ program participants/ surveys
Abstract: A national survey of Conservation Reserve Program (CRP) contractees was completed to obtain information about environmental and social effects of the program on participants, farms, and communities. Over 75% of respondents believed CRP benefits to wildlife were important. Seventy three percent of respondents observed increased numbers of wildlife associated with CRP lands. A majority of respondents (82%) believed the amount of assistance furnished by the U.S. Department of Agriculture related to planning and maintaining wildlife habitat associated with CRP lands was appropriate. The majority of respondents reported CRP benefits, including increased quality of surface and ground waters, improved air quality, control of drifting snow, and elevated opportunities to hunt or simply observe wildlife as part of daily activities. Income stability, improved scenic quality of farms and landscapes, and potential increases in property values and future incomes also were seen as program benefits. Negative aspects, reported by less than 30% of respondents, included seeing the CRP as a source of weeds, fire hazard, and attracting unwanted requests for trespass.

2177. **Patch and landscape characteristics associated with the distribution of woodland amphibians in an agricultural fragmented landscape: An information-theoretic approach.**
Weyrauch, S. L. and Grubb, T. C.
Biological Conservation 115(3): 443-450. (2004)
NAL Call #: S900.B5; ISSN: 0006-3207
Descriptors: wetlands/ landscape/ patches/ habitat fragmentation/ agricultural ecosystems/ ecological distribution/ conservation/ man-induced effects/ land use/ agriculture/ patchiness/ forests/ habitat/ nature conservation/ amphibia/ Ohio/ amphibians
Abstract: In the Midwestern United States, agricultural landscapes with scattered patches of fragmented forest are common. To investigate the relationship between amphibian distributions and wetland, woodlot, and landscape characteristics, we studied the pond-breeding amphibians within a 15, 450-ha plot in rural north- central Ohio. We surveyed 25 woodlots and one area of continuous riparian forest for amphibians, and each surveyed woodland contained at least one temporary wetland. We used Akaike's Information Criterion (AIC) to evaluate the effectiveness of 13 a priori models in predicting total amphibian species richness, anuran richness, caudate richness, and the presence of individual species in woodlots. We identified 13 species of amphibians within the study plot, and every woodlot contained at least one amphibian species. The most important variable in predicting total amphibian and anuran species richness was hydroperiod. For caudates, woodlot edge-to-area ratio, hydroperiod, pH, and ammonia were important characteristics in predicting species richness. Woodlots within agricultural landscapes are important refuges for amphibians.

2178. **Patch characteristics and landscape context as predictors of species presence and abundance: A review.**
Mazerolle, M. J. and Villard, M. A.
Ecoscience 6(1): 117-124. (1999)
NAL Call #: QH540.E366; ISSN: 1195-6860.
Notes: Literature review.
Descriptors: ecosystems/ ecotypes/ variability/ correlation analysis/ species diversity/ abundance/ aquatic organisms/ Reptilia/ Amphibia/ Pisces/ Gastropoda/ Invertebrata/ Vertebrata
Abstract: Studies were reviewed which simultaneously considered landscape-scale and patch-scale effects in order to answer the following question: does the inclusion of landscape characteristics as explanatory variables increase the ability to predict species presence and abundance when local (i.e., habitat patch) conditions are known? The 61 studies selected cover a wide array of taxa, landscape types, and explanatory variables, but many (36%) focused on avain communities in forests fragmented by agriculture. Patch-scale variables had a significant effect on invertebrates, amphibians, reptiles, birds, and mammals in all landscape types. Landscape-scale characteristics also were significant predictors of species presence and abundance for vertebrates (fish, reptiles, amphibians, birds etc.,) but not for the majority of invertebrates (Gastropodaetc.,) in the studies reviewed. Results indicate that both patch and landscape characteristics should be included in models investigating the distribution and abundance of animals, at least for vertebrates. Results from this review suggest that the inclusion of landscape characteristics will enhance conservation strategies if the landscape scale is properly defined with respect to the taxon or taxa under investigation.

2179. **Perceptions of risk associated with use of farm chemicals: Implications for conservation initiatives.**
Tucker, M. and Napier, T. L.
Environmental Management 22(4): 575-587. (1998)
NAL Call #: HC79.E5E5; ISSN: 0364-152X
Descriptors: risk/ assessment/ groundwater/ food safety/ agricultural chemicals/ water quality/ food quality/ health/

environmental impact/ farmers' attitudes/ nontarget effects/ pesticides/ agricultural entomology/ Ohio/ corn belt
Abstract: Data were collected from 245 farmers within the Darby Creek hydrologic unit in central Ohio to assess perceptions of risk associated with use of farm chemicals. Farmers were asked to evaluate the level of risk associated with use of agricultural chemicals for water quality, food safety, food quality, health of applicator, health of farm animals, wildlife, beneficial plants, beneficial insects, and human health. Study findings revealed that respondents perceived use of farm chemicals posed little or no threat to any of the assessed items. A composite index was formulated from the responses to the nine items and was titled Perceived Risk. Variance in the Perceived Risk index was regressed against social learning variables. The findings revealed that approximately 32% of the variance was explained by the predictive variables included in the model. It was concluded that the theoretical perspective was somewhat useful for understanding perceptions held about agricultural chemical use at the farm level. The findings are discussed in the context of future conservation and educational-information programmes within the study region.

2180. **Pesticide toxicity endpoints in aquatic ecosystems.**
Simon, D.; Helliwell, S.; and Robards, K.
Journal of Aquatic Ecosystem Stress and Recovery 6(2): 159-177. (1998)
NAL Call #: QH541.5.W3 J68; ISSN: 1386-1980.
Notes: Literature review; doi: 10.1023/A:1009920227241.
Descriptors: pesticides/ pollution effects/ nutrients (mineral)/ plankton/ toxicity tests/ bioassays/ ecosystems/ nutrients/ numerical analysis/ fuzzy logic/ model studies/ aquatic environment/ toxicity testing/ multispecies testing/ methods and instruments/ effects of pollution/ toxicology and health
Abstract: To adequately protect aquatic ecosystems from impact by anthropogenic perturbations it is necessary to distinguish what is safe from what is not. This review examines approaches to this problem in relation to primary and secondary effects of pesticides. Understanding nutrient - plankton and plankton - plankton interrelationships on both spatial and temporal scales is important if secondary or indirect effects are to be assessed. Before defining or measuring a toxicity endpoint, consideration must be given to whether to use single species or multispecies tests. Each has its strengths and weaknesses and is reviewed. In single species testing, toxicity endpoints can be more clearly defined but extrapolation of effects to an ecosystem is more difficult than with multispecies testing and can often lead to incorrect conclusions. Interpretation of multispecies testing results are challenging and numerical analysis techniques including methods whose objectives are inference, classification and ordination are required. Conceptual and fuzzy logic modelling techniques promise a solution to the interpretation of multispecies tests.

2181. **Plant and small mammal diversity in orchard versus non-crop habitats.**
Sullivan, T. P. and Sullivan, D. S.
Agriculture, Ecosystems and Environment 116(3-4): 235-243. (2006)
NAL Call #: S601.A34; ISSN: 01678809.
Notes: doi: 10.1016/j.agee.2006.02.010.
Descriptors: agroecosystems/ biodiversity/ non-crop and orchard habitats/ small mammals/ species richness/ vegetation/ agricultural ecosystem/ agricultural land/ orchards/ riparian forest/ species richness/ vascular plant/ British Columbia/ Canada/ North America/ summerland/ Artemisia tridentata/ Malus x domestica/ Mammalia/ Tracheophyta
Abstract: This study was designed to determine the abundance and diversity of vascular plant and small mammal communities in a mosaic of orchard and non-crop habitats in an agricultural landscape. Study areas were located at Summerland, British Columbia, Canada where seven replicate habitats: old field, sagebrush, dwarf, and conventional apple orchards, ponderosa pine forest, hedgerow, and riparian were intensively sampled for vascular plant (1999) and small mammal communities (1999-2003). Total plant species sampled included 104 herbs, 26 shrubs, and 9 trees. Mean crown volume index of herbs was similar among sites. Hedgerow and riparian habitats had substantial shrub layers, and the conventional orchard, pine forest, and riparian habitats had the highest biomass of trees. Total mean species richness of plants was similar, but did range from 12.3 species in old field sites to 32.3 species in sage sites. Overall plant species diversity and structural diversity were highest in the sage, hedgerow, and riparian habitats. Total structural diversity was positively related to total species richness and species diversity of vegetation. Mean total abundance of small mammals ranged from 28.1 to 37.0 ha-1 across old field, sage, and riparian habitats compared with a range of 6.2-16.7 animals/ha in the other habitats. Old field and sage habitats generally had the highest levels of species richness and diversity of small mammals, although the other non-crop habitats were similar to these in some years. Structural diversity of vegetation appeared to be a reasonable indicator of biodiversity, at least for vascular plants and small mammals, and should be included in future assessments of diversity in agroecosystems.

2182. **Plant genotype affects long-term herbivore population dynamics and extinction: Conservation implications.**
McIntyre, P. J. and Whitham, T. G.
Ecology 84(2): 311-322. (2003)
NAL Call #: 410 Ec7; ISSN: 00129658
Descriptors: Aceria parapopuli/ arthropod galls/ cottonwoods/ Eriophyidae/ hybridization/ plant resistance/ plant-herbivore interactions/ population dynamics/ genotype/ herbivore/ hybridization/ plant-herbivore interaction/ population dynamics/ species conservation/ Acari/ Aceria/ Animalia/ Arthropoda/ Eriophyidae/ Populus angustifolia/ Populus berolinensis/ Populus fremontii
Abstract: Few studies have linked long-term herbivore population dynamics with plant genetics. In this study we present evidence that plant genotype and hybridization influence the population dynamics of the poplar bud gall mite, Aceria parapopuli. Using experimental transfers and a

five-year data set on mite abundance on two cottonwood species (Populus fremontii and P. angustifolia) and their naturally occurring hybrids, we demonstrated that hybrid trees exhibiting an F1 morphology were, on average, extremely susceptible to A. parapopuli. The susceptibility of these hybrids ranged several orders of magnitude and affected the population dynamics of A. parapopuli across the five years of study. Populations grew exponentially on susceptible hybrids in every year, eventually reaching a mean of ~140 galls per tree. In contrast, populations fluctuated around low densities (0.01-0.87 galls per tree) on their parental host species. Low gall densities on parental trees resulted in high annual extinction rates (mean = 62%) for mite populations on individual parental trees, in contrast to low annual extinction rates (mean = 7%) for mite populations on hybrid trees. We detected significant differences in gall population growth rates (intrinsic rate of increase, r) among hybrid genotypes across four years of study, ranging from r = 0 to r = 1.5, demonstrating that plant genotype influences a fundamental component of population dynamics. We argue that plant genotype should also impact metapopulation dynamics, because plant genotype affected the number of available colonists and directly affected mite extinction rates. If other arthropod species exhibit similar traits, these findings have important conservation implications. Because mite population growth and extinction are so closely tied to rare host genotypes, to conserve such species we must preserve rare host genotypes, which would represent a major challenge to current conservation practices that target species rather than genotypes.

2183. **Plasma retinoid profile in bullfrogs, Rana catesbeiana, in relation to agricultural intensity of sub-watersheds in the Yamaska River Drainage Basin, Quebec, Canada.**
Berube, V. E.; Boily, M. H.; DeBlois, C.; Dassylva, N.; and Spear, P. A.
Aquatic Toxicology 71(2): 109-120. (2005);
ISSN: 0166445X.
Notes: doi: 10.1016/j.aquatox.2004.10.018.
Descriptors: 13-cis-4-oxo-retinoic acid/ all-trans-retinol/ amphibians/ pesticides/ retinol/ agricultural practices/ frog/ pesticide residue/ plasma/ pollution effect/ population decline/ vitamin blood level/ Canada/ North America/ Quebec/ Yamaska River/ Amphibia/ Rana catesbeiana/ Vertebrata/ Zea mays
Abstract: Amphibian populations are decreasing globally and the causes are presently unclear. Retinoids have been extensively studied in other vertebrate classes where they are associated with pleiotropic effects such as susceptibility to disease (including cancer and parasitic infections), deformities and reproduction. To investigate the hypothesis that retinoid homeostasis is influenced by agricultural activities, blood samples were collected from adult bullfrogs, Rana catesbeiana, at each of six sub-watersheds chosen to represent a gradient of agricultural intensity within the Yamaska River drainage basin. Samples of surface water were collected at each of the study sites approximately 1 month after spraying and analyzed for 53 pesticides. Male body weight was significantly different ($p < 0.001$) between study sites with the smallest bullfrogs captured from the Riviere a la Barbue sub-watershed associated with high agricultural intensity. A significant linear regression ($p < 0.001$; $R2 = 0.176$) was obtained between plasma retinol and body weight. Plasma retinol concentrations were significantly different between study sites ($p < 0.001$) being lowest at both Riviere Noire and Riviere a la Barbue. More than 60% of the land area in these sub-watersheds is under intensive corn-soya cultivation and surface water contained the highest concentrations of the herbicides atrazine, deethyl-atrazine, simazine, metolachlor, dimethenamide, chlopyralide, dicamba and bentazone. Plasma 13-cis-4-oxo-retinoic acid was significantly different ($p < 0.001$) between sub-watersheds, however this effect was apparently unrelated to agricultural intensity. Plasma retinol was negatively correlated ($p = 0.026$; $r = -0.237$) with plasma 13-cis-4-oxo-retinoic acid. These results suggest that retinoid homeostasis in bullfrogs may be influenced by agricultural practices.

2184. **Postfledging survival and movement in dickcissels (Spiza americana): Implications for habitat management and conservation.**
Berkeley, L. I.; McCarty, J. P.; and Wolfenbarger, L.
Auk 124(2): 396-409. (2007)
NAL Call #: 413.8 AU4 ; ISSN: 00048038.
Notes: doi: 10.1642/0004-8038(2007)124[396:PSAMID]2.0.CO;2.
Descriptors: agriculture/ dickcissel/ fledgling stage/ grassland birds/ habitat use/ radiotelemetry/ Spiza americana/ survival analysis/ tallgrass prairie
Abstract: When land managers incorporate the habitat needs of grassland birds into their planning, they typically rely on management recommendations based on habitat use by adults during nesting. Habitat requirements for other critical life stages are seldom known and may differ from those of nesting adults. Using radiotelemetry, we examined survival and habitat use by juvenile Dickcissels (Spiza americana) during the postfledging period. In 2003 and 2004, we monitored 60 fledgling Dickcissels for ≤30 days after they left the nest. Mortality rates were highest during the first week after leaving the nest, and only 33% of the fledglings survived the first four weeks after leaving the nest. Estimated mean survival times were 16.9 ± 1.6 days after birds left the nest. In both years, fledgling survival was positively associated with dense vertical and horizontal structure of forbs at nests. Survival tended to be positively associated with vertical grass density on adult territories and negatively associated with patchily distributed forbs on adult territories. Fledgling habitat use was restricted to areas where Dickcissels nested and adjacent fields. Habitats used included corn and soybean fields, grasslands, and wetlands. Our results suggest that the fledgling period is a critical stage for Dickcissels and that fledglings require habitat similar to habitat used for nesting.

2185. **The potential of fruit trees to enhance converted habitats for migrating birds in southern Mexico.**
Foster, M. S.
Bird Conservation International 17(1): 45-61. (2007);
ISSN: 09592709.
Notes: doi: 10.1017/S0959270906000554.
http://www.pwrc.usgs.gov/prodabs/pubpdfs/6728_Foster.pdf

Descriptors: birds/ migration routes/ fruit trees/ habitat restoration/ forest shelterbelts/ Mexico
Abstract: Migration routes used by Nearctic migrant birds can cover great distances; they also differ among species, within species, and between years and seasons. As a result, migration routes for an entire migratory avifauna can encompass broad geographic areas, making it impossible to protect continuous stretches of habitat sufficient to connect the wintering and breeding grounds for most species. Consequently, ways to enhance habitats converted for human use (i.e. for pasture, crop cultivation, human settlement) as stopover sites for migrants are especially important. Shelterbelts around pastures and fields, if planted with species targeted to support migrant (and resident) bird species that naturally occupy mature forest habitats and that are at least partially frugivorous, could be a powerful enhancement tool for such species, if the birds will enter the converted areas to feed. I tested this approach for Nearctic migrant birds during the spring migration through an area in Chiapas, Mexico. Mature forest tree species whose fruits are eaten by birds were surveyed. Based on life form, crop size and fruit characteristics, I selected three tree species for study: Cymbopetalum mayanum (Annonaceae), Bursera simaruba (Burseraceae) and Trophis racemosa (Moraceae). I compared the use of fruits of these species by migrants and residents in forest with their use of the fruits of isolated individuals of the same species in pasture and cropland. All three plant species were useful for enhancing converted habitats for forest-occupying spring migrants, although species differed in the degree to which they entered disturbed areas to feed on the fruits. These tree species could probably enhance habitats for migrants at sites throughout the natural geographic ranges of the plants; in other geographic areas for other target bird groups, other tree species might be more appropriate. © BirdLife International 2007.

2186. **Practical realities of conjunctive management: The middle Rio Grande as an example.**
Dumars, C.
Technical Report: New Mexico Water Resources Research Institute 290: 119-122. (1995).
Notes: The Future of Albuquerque and Middle Rio Grande Basin: Proceedings of the 39th Annual New Mexico Water Conference, Albuquerque, NM (USA), 3-4 Nov 1994; New Mexico State University, New Mexico Water Resources Research Institute.
Descriptors: United States, New Mexico, Rio Grande River/ water rights/ management planning/ water resources/ water supply/ water management/ legal aspects/ riparian rights/ legal review/ conjunctive use/ river basin management/ regional planning/ multiple use of resources/ techniques of planning/ environmental action/ conservation, wildlife management and recreation

2187. **Predation and ring-necked pheasant population dynamics.**
Riley, T. Z. and Schulz, J. H.
Wildlife Society Bulletin 29(1): 33-38. (2001)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: wildlife management/ predation/ population dynamics/ recruitment/ Phasianus colchicus/ Ring necked pheasant/ management
Abstract: Because ring-necked pheasants (Phasianus colchicus) are an important wildlife resource in agricultural ecosystems, we reviewed the role of predators on pheasant population dynamics and suggest management options to ameliorate predation. Predator reduction programs have the potential to increase survival and recruitment, but these parameters decrease once predator control ceases. Extensive application of predator reductions may be ethically questionable, and habitat management directed at moderating the effects of predators at the landscape scale is expensive. An extensive distribution of cover during the nesting and brood-rearing periods can increase pheasant recruitment. Federal agricultural and conservation programs can be used to accomplish many of these landscape habitat improvements, but federal and state agencies must provide the technical assistance to deliver the program options to producers. New federal farm programs aimed at improving avian survival and recruitment must have an evaluation and monitoring component built in to determine their effectiveness.

2188. **Predation of artificial nests in a fragmented landscape in the tropical region of Los Tuxtlas, Mexico.**
Estrada, A.; Rivera, A.; and Coates-Estrada, R.
Biological Conservation 106(2): 199-209. (2002)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/S0006-3207(01)00246-4.
Descriptors: conservation/ edge effects/ forest fragmentation/ Los Tuxtlas/ Mexico/ neotropics/ nest predation/ artificial nest/ edge effect/ habitat fragmentation/ nest predation/ Mexico/ Aves/ Galliformes/ Mammalia
Abstract: Predation rates of artificial nests were investigated in a fragmented landscape in the lowlands of Los Tuxtlas in southern Mexico. Hen and plasticine eggs were used to assess predation pressure in four habitats: the interior of forest fragments, the forest-pasture edge, corridors of residual forest vegetation and linear strips of live fences across pastures. Three sites per habitat were used in three experimental trials. Hen and plasticine ground nests with three eggs each were alternated every 50 m along transects at each site. Predation rates on each type of nest were monitored for 9 days. Survey of potential avian and mammalian potential nest predators were conducted at each site prior to the experimental trails. Readings of amount of light illuminating the ground were taken by each nest at each site to assess exposure of nests. In general, average predation rates were significantly higher for both hen and plasticine nests in the forest-pasture edge and in the corridors than in the interior of the forest fragments. While birds and mammals were the principal predators on hen eggs in the forests, mammals were responsible for the majority (≥ 70%) of eggs damaged at the other habitats. Surveys of potential nest predators showed that avian and mammalian potential nest predators were significantly more common at the forest-pasture edges and at the other habitats than in the forests. Readings of light reaching the ground suggest that concealment of nests by the vegetation may play an important role in predation risk. Our results are corisistent with reports from other Neotropical rainforests indicating an increase of artificial nest predation pressures from forest interior to open habitats. Restoration of forest fragments, allowing the vegetation to grow along the forest-pasture edge and the planting of arboreal crops at the

forest-pasture edges may be measures that could increase cover and nest protection. © 2002 Published by Elsevier Science Ltd.

2189. **Predicting bird response to alternative management scenarios on a ranch in Campeche, Mexico.**
Wood, Paul A.; Dawson, Deanna K.; Sauer, John R.; and Wilson, Marcia H.
In: Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, General Technical Report-PSW 191/ Ralph, C. J. and Rich, T. D.; Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 101-106.
Notes: 0196-2094 (ISSN).
Descriptors: conservation measures/ ecology/ land zones/ North America/ Aves: disturbance by man/ impact of alternative management scenarios on wintering migrants and resident species/ habitat management/ population dynamics/ wintering migrants and resident species/ impact of alternative management scenarios/ Mexico/ Campeche/ Rancho Sandoval/ Aves/ birds/ chordates/ vertebrates
Abstract: We developed models to predict the potential response of wintering Neotropical migrant and resident bird species to alternative management scenarios, using data from point counts of birds along with habitat variables measured or estimated from remotely sensed data in a Geographic Information System. Expected numbers of occurrences at points were calculated for 100 species of birds, under current habitat conditions and under habitat conditions that would result from seven alternative management scenarios for Rancho Sandoval, a cattle ranch and private nature reserve in Campeche, Mexico. Most bird species of conservation concern would benefit from management scenarios that increase the amount of forest, but the highest priority resident species would not. To balance the somewhat conflicting habitat needs of these species andthe concerns of ranch managers, we recommend that forest area and connectivity be increased, and pastures be maintained but more efficiently managed to support cattle and the priority resident and migrant birds that require open habitats.

2190. **Proceedings of the 1998 Prairie Fish Habitat Management Workshop.**
Winnipeg, MB: Canadian Department of Fisheries and Oceans; Canadian Manuscript Report of Fisheries and Aquatic Sciences 2522, 2000. 164 pp.
Descriptors: Conferences/ environment management/ environmental impact/ habitat/ man-induced effects/ Canada, Alberta/ Canada, Manitoba/ Canada, Ontario/ Canada, Saskatchewan
Abstract: A Prairie Fish Habitat Management Workshop was held at Hecla Island, Manitoba on June 3-5, 1998. The workshop was sponsored by the Department of Fisheries and Oceans, Habitat Management Division (DFO-HM) with input and cooperation from the provinces of Alberta, Saskatchewan, Manitoba and Ontario. Separate breakout sessions dealing with 15 pre-selected topics were held involving 70 workshop participants. The workshop topics centered on key issues and activities with the potential to impact fishes and fish habitats in the four provinces. Participants (12-15 persons)in each breakout session produced recommendations addressing their assigned topic from a joint federal and provincial perspective. Topics for the workshop included: 1) wild rice 2) applying no net loss quantitatively 3) channelization 4) agricultural trends and impacts 5) road crossings 6) cumulative effects 7) instream flow needs 8) biodiversity 9) whole lake destruction 10) pipeline crossings 11) hydro peaking 12) gravel removal 13) timber harvesting impacts 14) regional scale projects 15) habitat transfer.

2191. **Progress towards understanding the structure, function, and ecological significance of small stream channels and their riparian zones.**
Moore, R. D. and Richardson, J. S.
Canadian Journal of Forest Research 33(8): 1349-1351. (2003)
NAL Call #: SD13.C35; ISSN: 00455067.
Notes: doi: 10.1139/x03-146.
Descriptors: ecosystems/ vegetation/ wildlife/ ecology/ community structure/ ecosystem function/ forest management/ riparian zone/ stream
Abstract: Incomplete knowledge of the ecological functions of small streams and their riparian zones, particularly their roles in larger watershed and landscape contexts, contributes to confusion and debate about the levels of riparian vegetation retention required along small streams for the purpose of protecting aquatic ecosystems, riparian wildlife, and water quality. As a consequence, there are marked differences in riparian forestry practices and management among jurisdictions throughout North America. To aid in resolving these issues, a symposium on small streams and their riparian zones was held at The University of British Columbia from 19 to 21 February 2002, which brought together scientists, managers, and practitioners and provided a forum for the presentation and discussion of emerging research results. This special issue includes a selection of papers presented at that symposium as well as one solicited paper.

2192. **Projecting the bird community response resulting from the adoption of shelterbelt agroforestry practices in eastern Nebraska.**
Pierce, R. A.; Farrand, D. T.; and Kurtz, W. B.
Agroforestry Systems 53(3): 333-350. (2001)
NAL Call #: SD387.M8A3; ISSN: 0167-4366
Descriptors: bird (Aves): community response, landscape variables/ tree (Spermatophyta)/ animals/ birds/ chordates/ nonhuman vertebrates/ plants/ spermatophytes/ vascular plants/ vertebrates/ agroforestry: shelterbelt plantings
Abstract: Evolving agricultural policies have influenced management practices within agroecosystems, impacting available habitats for many species of wildlife. Enhancing wildlife habitat has become an explicit objective of existing agricultural policy. Thus, there is renewed focus on field borders and the use of shelterbelt agroforestry systems to achieve conservation goals in the Midwest. Two Representative Farms - a 283-ha dryland and 510-ha irrigated farm were created in Saunders County, Nebraska. The Habitat Analysis and Modeling System (HAMS) was used to describe the composition and spatial pattern of the existing farms and surrounding landscape, as well as for the landscapes surrounding selected Breeding Bird Survey

(BBS) routes. Simulated land use changes resulting from the implementation of two shelterbelt scenarios, Agricultural and Wildlife, were incorporated on each Representative Farm and surrounding landscape. Landscape variables which influence breeding bird species richness and community composition as determined from BBS routes were measured on simulated farm landscapes. A more heterogeneous landscape results from implementing either scenario. The percent total woods was a significant determinant of bird species richness on the BBS routes and was important in influencing bird communities at the farm- and landscape-level. Other landscape metrics which influenced the bird community composition on BBS routes were woody edge percentages and edge density values. Policies promoting shelterbelts create edge habitats which ultimately favor birds within the Forest-edge/generalist guild while bird species in need of conservation such as grassland-field species would potentially be negatively affected.

2193. **A quiet crisis: What does the future hold for our wildlife?**
Madson, Chris
Wyoming Wildlife 65(9): 15-38. (2001); ISSN: 0043-9819
Descriptors: wildlife-livestock relationships/ wildlife-human relationships/ wildlife-habitat relationships/ wildlife/ wetland-wildlife relationships/ wetland draining/ tuberculosis/ transmission of disease/ supplemental feeding/ roads/ reserves/ refuges/ parks/ population ecology/ plague/ parasites/ diseases/ overwintering/ oil-gas development/ movements/ migration/ management/ mammals/ habitat management/ habitat alterations/ food supply/ fires-burns/ exotic species/ environmental factors/ drought/ corridors/ conservation/ chronic wasting disease/ buildings/ brucellosis/ birds/ behavior/ bacterial diseases/ Wyoming
Abstract: Several species of Wyoming wildlife came back from the brink of extinction when science and management were combined. But there are many new problems facing today's conservationists. The author presents a catalog of the problems faced by Wyoming wildlife and the emerging challenges that conservationists need to meet. Several species, including deer and pronghorns, survive on new shrubs rejuvenated by burns. Fire suppression and grazing by domestic herds have changed the shrub habitat. This affected the wildlife of the region. The prolonged drought of the region affected the reproductive success of many species. Balancing forage use and effective water storage can soften the effects of long term droughts. The occurrence of diseases like brucellosis, chronic wasting disease, and sylvatic plague is another crisis faced by Wyoming wildlife. By 1990, several new species were added to the federal listing of threatened and endangered species in Wyoming. These include Preble's meadow jumping mouse and the lynx. As federal government manages a majority of Wyoming land, habitat management becomes difficult. Loss of wetland habitat has affected Wyoming wildlife considerably. Studies found that wetland types are difficult to re-create as they require careful management of water levels. An increasing human population in Wyoming has increased the demand for outdoor recreation. Introduction of new technology, tools, and vehicles have impacted management issues, ethics, and the public image of recreation. Installation of new gas pipelines and development of natural gas fields adversely affect the habitat. The introduction of exotic plant and animal species is another area that requires attention by wildlife managers.

2194. **RCA III effects of sediment on the aquatic environment: Potential NRCS actions to improve aquatic habitat.**
Castro, Janine.; Reckendorf, Frank.; and United States. Natural Resources Conservation Service.
Washington, D.C.: U.S. Dept. of Agriculture, Natural Resources Conservation Service, 1995. Working paper (United States. Soil Conservation Service) No. 6.
Notes: Title from web page. "August 1995." Description based on content viewed May 3, 2002. Includes bibliographical references.
NAL Call #: aQH541.5.W3C37 1995
http://www.nrcs.usda.gov/TECHNICAL/NRI/pubs/wp06text.html
Descriptors: Aquatic ecology---Environmental aspects---United States/ Aquatic resources conservation---United States/ Soil erosion---United States/ Soil conservation---United States/ Sediment transport---United States/ Aquatic organisms, Effect of contaminated sediments on---United States
This citation is from AGRICOLA.

2195. **Red-shouldered hawk (Buteo lineatus) abundance and habitat in a reclaimed mine landscape.**
Balcerzak, Melissa J. and Wood, Petra Bohall
Journal of Raptor Research 37(3): 188-197. (2003)
NAL Call #: QL696.F3J682; ISSN: 0892-1016
Descriptors: conservation/ terrestrial ecology: ecology, environmental sciences/ standardized broadcast call technique/ applied and field techniques/ aerial photographs/ early successional grassland habitat/ forested habitat/ fragmented forest patches/ habitat characteristics/ habitat preferences/ habitat use/ landscape ecology/ landscape fragmentation/ late successional forest habitat/ microhabitat/ mid successional shrub/ pole habitat/ reclaimed mine landscape/ relative abundance
Abstract: Fragmentation of the landscape by large-scale mining may affect Red-shouldered Hawk (Buteo lineatus) populations by reducing the amount of forested habitat available in a landscape and by creating fragmented forest patches surrounded by reclaimed mine lands. We examined habitat characteristics and relative abundance of Red-shouldered Hawks in reclaimed mine landscapes within four treatments: early-successional grassland habitat, mid-successional shrub/pole habitat, late-successional fragmented forest habitat, and late-successional intact forest habitat. We quantified microhabitat characteristics within an 11.3-m-radius plot centered on 156 vegetation plots throughout the four treatments. We surveyed 48 stations on and adjacent to three mines for Red-shouldered Hawks using standardized broadcast call techniques during February 2000-January 2001 and measured landscape characteristics within 1000-m buffer zones centered on each station from digitized aerial photographs. Mean abundance of Red-shouldered Hawks was significantly higher in the intact forest (x=0.07 detections/point, SE=0.03) than the grassland (x=0.01, SE=0.01) treatment, but did not differ from the fragmented forest (x=0.03, SE=0.01) or shrub/pole (x=0.03, SE=0.01) treatments. Most microhabitat characteristics in both

fragmented and intact forest differed from shrub/pole and grasslands. Amount of wetland was the most important characteristic determining presence of Red-shouldered Hawks in a forest-dominated landscape. More wetlands in the landscape may provide abundant amphibians and reptiles, which are important in the diet of Red-shouldered Hawks.

2196. **Regional analysis of associations between avian guilds and habitat variables.**
Ross, Bradley D. and Yahner, Richard H.
Journal of the Pennsylvania Academy of Science 77(1): 7-14. (2003)
NAL Call #: Q11.J682; ISSN: 1044-6753
Descriptors: conservation measures/ nutrition/ feeding behavior/ ecology/ habitat utilization/ habitat/ land zones/ Aves: habitat management/ guilds and habitat associations/ regional analysis/ foraging/ community structure/ habitat preference/ habitat/ Pennsylvania/ Centre County/ Ridge and Valley Physiographic Province/ Aves/ birds/ chordates/ vertebrates
Abstract: We examined distributional patterns of avian guilds in relation to habitat data in the Ridge and Valley Physiographic Province, Centre County, Pennsylvania. County-wide avian data (migratory, habitat, and foraging guild classifications) were obtained from the Pennsylvania Breeding Bird Atlas (BBA), and habitat data (cover types, roadways, and streams) were derived from satellite imagery and the state transportation department. Based on linear-regression analyses, certain guild types were positively affected by extensive amounts of herbaceous grasslands (e.g., neotropical migrants) and herbaceous land (e.g., canopy-sallier foragers) and negatively affected by herbaceous cultivated lands (e.g., deciduous forest species) and developed lands (e.g., trunk-bark foragers). Neotropical migrats and canopy-sallier foragers were positively associated with wooded land/herbaceous grassland and wooded land/herbaceous land edges, respectively. However, deciduous and coniferous forest species were negatively associated with herbaceous land and developed land interfacing forest habitat, and trunk-bark foragers were negatively associated by greater amounts of deciduous wooded land/developed land edges. Differences in the abundance of nest predators and brood parasites may be among the reasons why regional species richness differs with various types of land uses or edges. Birds associated with forested habitats were positively correlated with the amount of forestland within BBA blocks; conversely, forest associates were negatively affected by edge habitat. Thus, professionals need to consider the amount and juxtaposition of different land uses as well as the extent and types of edge habitat when creating natural reserves and managing avian communities. Even minor increases in the amount of forest fragmentation and associated increase in edge can make habitat unsuitable for deciduous and coniferous forest species.

2197. **Regional diversity of temporary wetland carabid beetle communities: A matter of landscape features or cultivation intensity?**
Brose, Ulrich
Agriculture, Ecosystems and Environment 98(1-3): 163-167. (2003)
NAL Call #: S601.A34; ISSN: 0167-8809
Descriptors: agriculture/ biodiversity/ ecology: environmental sciences/ cultivation intensity/ habitat heterogeneity/ landscape ecology/ landscape features/ landscape structure/ macro ecology/ regional diversity/ species richness/ temporary wetland community
Abstract: The challenge of finding applicable indicators for sustainable agriculture requires evaluations at regional scales to lead to policy-relevant results. In this study, the regional diversity of temporary wetland carabid beetles was analysed for six landscapes of 10 km^2 each. The relative importance of landscape features and cultivation intensity for the regional diversity was compared. Total species richness was correlated with the mean soil-indices that were used as indicators of cultivation intensity. This is consistent with studies on local scales, which emphasise the importance of cultivation intensity for arthropod communities. The diversity of wetland and habitat-specific species correlated with the temporary wetlands mean duration of flooding and the density of temporary wetlands, but apart from this, there was no impact of landscape features on diversity. These results do not corroborate concepts of using indices of landscape structure as biodiversity indicators, but the importance of cultivation intensity cannot be too strongly emphasised.

2198. **The relationship between productivities of salmonids and forest stands in northern California watersheds.**
Frazey, Sharon L. and Wilzbach, Margaret A.
Western Journal of Applied Forestry 22(2): 73-80. (2007)
NAL Call #: SD388.W6; ISSN: 0885-6095
Descriptors: conservation measures/ biometrics/ ecology/ land zones/ Salmonidae: habitat management/ size/ body length/ biomass/ productivity/ forest stand productivity relationships/ management implications/ small watersheds/ California/ Pisces, Actinopterygii, Salmoniformes/ chordates/ fish/ vertebrates
Abstract: Productivities of resident salmonids and upland and riparian forests in 22 small watersheds of coastal northern California were estimated and compared to determine whether: 1) upland site productivity predicted riparian site productivity; 2) either upland or riparian site productivity predicted salmonid productivity; and 3) other parameters explained more of the variance in salmonid productivity. Upland and riparian site productivities were estimated using Site Index values for redwood (Sequoia sempervirens) and red alder (Alnus rubra), respectively. Salmonid productivity was indexed by back-calculated length at age 1 of the largest individuals sampled and by total biomass. Upland and riparian site indices were correlated, but neither factor contributed to the best approximating models of salmonid productivity. Total salmonid biomass was best described by a positive relationship with drainage area. Length of dominant fish was best described by a positive relationship with percentage of hardwoods within riparian areas, which may result from nutrient and/or litter subsidies provided by red

alder. The inability of forest productivity to predict salmon productivity may reflect insufficient variation in independent variables, limitations of the indices, and the operation of other factors affecting salmonid production. The lack of an apparent relationship between upland conifer and salmonid productivity suggests that management of land for timber productivity and component streams for salmonid production in these sites will require separate, albeit integrated, management strategies.

2199. **Relative abundance of bobwhites in relation to weather and land use.**
Lusk, J. J.; Guthery, F. S.; George, R. R.; Peterson, M. J.; and DeMaso, S. J.
Journal of Wildlife Management 66(4): 1040-1051. (2002)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: artificial neural network/ Colinus virginianus/ Index of abundance/ land-use variables/ northern bobwhite/ relative abundance/ Texas/ weather/ birds/ land use/ population dynamics/ relative abundance/ weather/ United States/ Colinus virginianus
Abstract: Weather and land use are important factors influencing the population dynamics of northern bobwhites (Colinus virginianus) in Texas and elsewhere. Using an artificial neural network, we studied the effects of these factors on an index of bobwhite abundance (hereafter, index) in 6 ecoregions in Texas. We used roadside-count data collected by the Texas Parks and Wildlife Department (TPWD) during 1978-1997. Weather variables were June, July, and August mean maximum temperatures, and winter (Dec-Feb), spring (Mar-May), summer (Jun-Aug), and fall (Sep-Nov) rainfall. We also included the proportion of county area in cultivation, the number of livestock per hectare of noncultivated land, and the previous year's bobwhite count in the analyses. The data were partitioned into training and validation data sets prior to analyses. The neural model explained 65% of the variation in the training data (n = 72) and 61% of the variation in the validation data (n = 17). The most important variables contributing to network predictions were July temperature, fall rainfall, cattle density, and the previous year's bobwhite count. State-level simulation results indicated that the bobwhite index decreased with increasing June temperature and livestock density. The bobwhite index increased with July and August temperature, fall rainfall, and the previous year's bobwhite count. Bobwhite abundance increased with the proportion of county area in cultivation up to approximately 20% cultivation and then declined. Winter, spring, and summer rainfall had little effect on the bobwhite index. Although many relationships appeared approximately linear or were decelerating, proportion of county area in cultivation and livestock density on noncultivated land showed strongly curvilinear responses. Therefore, cultivation up to approximately 20% of county area was beneficial, but the benefits disappeared as cultivation increased beyond this level. Further, at low livestock densities, between 0.15 and 0.40 head/ha, small increases in head/ha resulted in a decrease in the bobwhite index of 156.4%/head/ha. The results also indicated that a potential bias might exist in the survey protocol resulting in artificially inflated counts under some weather conditions.

2200. **Replacing sources with sinks: When do populations go down the drain?**
Keagy, Jason C.; Schreiber, Sebastian J.; and Cristol, Daniel A.
Restoration Ecology 13(3): 529-535. (2005)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: Icteridae/ Passeriformes/ Agelaius phoeniceus/ Fringillidae/ red-winged blackbirds/ Boulder County/ ecosystems/ conservation/ wildlife management/ grasslands/ habitat management/ habitat quality/ habitat restoration/ land zones/ models and simulations/ prairie/ converted hayfield/ marshes, salt/ source-sink model/ wetland mitigation/ restoration ecology/ source-sink dynamics/ wildlife populations/ habitat change/ wetlands/ mortality/ age/ loss of habitat/ reproduction/ Virginia/ Colorado
Abstract: We investigate the scenario in which some amount of higher quality habitat is destroyed and is then replaced by some undetermined amount of lower quality habitat. We examined how much low-quality habitat would need to be created to maintain the equilibrium population abundance in the entire geographic area. Using a source-sink model, we find that (1) the number of hectares of created habitat per hectare of destroyed habitat must equal the ratio of the high-quality habitat's productivity to the low-quality habitat's productivity, however, (2) if the created habitat is a sink, then there is a threshold fraction of destroyed high-quality habitat below which the initial population abundance cannot be maintained through the creation of habitat. We illustrate these results using data on red-winged blackbirds (Agelaius phoeniceus) in two different regions where high-quality habitat is being replaced by or converted into lower quality habitat.

2201. **Representation of landcover along breeding bird survey routes in the northern plains.**
Niemuth, N. D.; Dahl, A. L.; Estey, M. E.; and Loesch, C. R.
Journal of Wildlife Management 71(7): 2258-2265. (Sept. 2007)
NAL Call #: 410 J827
Descriptors: Breeding Bird Survey/ fragmentation/ grasslands/ landscape/ resolution/ roads/ wetlands
Abstract: The North American Breeding Bird Survey (BBS) is used extensively to make inferences about populations of many North American bird species and is increasingly being used for avian conservation planning. How well BBS routes represent the landscape is poorly known, even though accuracy of representation could significantly affect inferences made from BBS data. We used digital landcover data to examine how well landcover within 400-m buffers around BBS routes represented the surrounding landscape (the route neighborhood) for 52 routes in the Prairie Pothole Region of North Dakota and South Dakota. Differences in composition between landcover along BBS routes and the route neighborhood were not statistically significant for upland cover classes. The area of temporary and seasonal wetland basins was accurately represented by BBS routes in our study area, but the area of semipermanent and permanent wetland basins was significantly underrepresented along BBS routes. Number of wetland basins and upland patches was higher along routes. Area of urban, forest, and hay landcover classes was higher along routes, although differences were not statistically significant. Amount of bias in landcover representation was

negatively correlated with the proportion of each landcover type in the study area, but bias was not correlated with area of the route neighborhoods. Differences between landcover along BBS routes and the route neighborhood were primarily attributable to increased anthropogenic activity along roads and siting of roads away from relatively large, deep water bodies. Our results suggest that inferences made from BBS data in our study region are likely biased for species that are associated with deeper-water habitats or are strongly influenced by landscape fragmentation. Inferences made from BBS data for species associated with uplands or shallow wetlands are less likely to be biased because of differences in landcover composition.
This citation is from AGRICOLA.

2202. **Research on streamside issues through the wood compatibility initiative.**
Bolton, Susan and Berman, Cara
In: Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Initiative workshop, General Technical Report-PNW 563/ Johnson, Adelaide C.; Haynes, Richard W.; and Monserud, Robert A.; Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture, 2002. pp. 93-99.
Notes: 0363-6224 (ISSN); Literature review. http://www.fs.fed.us/pnw/pubs/gtr563/gtr563a.pdf
Descriptors: commercial activities/ conservation measures/ freshwater habitat/ lotic water/ terrestrial habitat/ land zones/ comprehensive zoology: forestry/ forestry regimes/ streamside resources/ wildlife management/ habitat management/ forest ecosystem management/ streams/ forest and woodland/ riparian forests/ riparian habitat
Abstract: Through the Wood Compatibility Initiative (WCI), the Center for Streamside Studies (now the Center for Water and Watershed Studies) at the University of Washington has undertaken a series of research efforts addressing production and protection of forest, fish, wildlife, and other aquatic and riparian resources. These efforts consist of micro-habitat and habitat-unit-scale mechanistic studies, trans-scale studies exploring hierarchical linkages of structure and function, as well as the development of a landscape classification model linking physical and biological processes across scales and integrating terrestrial and aquatic ecosystem components. Wood Compatibility Initiative funded projects have involved collaboration with scientists at the Pacific Northwest Research Station, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Weyerhaeuser Company, the City of Seattle, the Lummi Nation and others. The Center for Streamside Studies has addressed the role of large woody debris in streams, including stream input processes and hydraulic and biologic functions. Other studies have investigated freshwater habitat condition and its relation to salmonid productivity and the role of hyporheic flux in redd selection by salmonids. In collaboration with others, historic riparian stand condition, specifically canopy cover related to stream shading, has been investigated as well as the role of geomorphic variability in affecting stream temperatures. This paper summarizes the results from WCI studies initiated over the past four years.

2203. **Response of birds to fire in the American Southwest.**
Bock, Carl E. and Block, William M.
In: Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, General Technical Report-PSW 191/ Ralph, C. J. and Rich, T. D.; Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 1093-1099.
Notes: 0196-2094 (ISSN).
Descriptors: conservation measures/ ecology/ abiotic factors/ physical factors/ land zones/ Aves: habitat management/ prescribed burning/ community structure/ fire response/ United States, southwestern region/ birds/ chordates/ vertebrates
Abstract: Fire was a common prehistoric disturbance in most southwestern grasslands, oak savannas, and coniferous forests, but not in Sonoran and Mojave desertscrub, or in riparian ecosystems. Prescribed burning should be applied, but under experimental conditions that facilitate studying its impacts on birds and other components of biodiversity. Fire plays a critical role in maintaining a balance between desert grassland and Chihuahuan desertscrub, but unburned areas also are important for birds dependent upon woody vegetation and/or heavy grass cover. Understory fire probably once played a critical role in maintaining relatively open oak (Quercus spp.), pinyon-juniper (Pinus- Juniperus), and ponderosa pine (Pinus ponderosa) woodlands and their bird assemblages, while stand replacement fires sustained aspen groves (Populus tremuloides) at higher elevations. Carefully controlled prescribed burning, thinning, and grazing management will be needed to return fire to its prehistoric role in these habitats. There is an urgent need for cooperative effort between managers and researchers to implement replicated burns to quantify avian responses in appropriate habitats.

2204. **Response of reptile and amphibian communities to canopy gaps created by wind disturbance in the southern Appalachians.**
Greenberg, C. H.
Forest Ecology and Management 148(1-3): 135-144. (2001)
NAL Call #: SD1.F73; ISSN: 03781127.
Notes: doi: 10.1016/S0378-1127(00)00486-2.
Descriptors: coarse woody debris/ gaps/ natural disturbance and herpetofauna/ salamanders/ Southern Appalachian herpetofauna/ southern Appalachian reptiles/ biodiversity/ turbulence/ wind/ amphibian communities/ ecosystems/ canopy gap/ community response/ herpetofauna/ relative abundance/ species richness/ windthrow/ United States/ Amphibia/ Amphiuma means/ Anura/ Bufo americanus/ Caudata/ Reptilia/ Serpentes/ Squamata
Abstract: Reptile and amphibian communities were sampled in intact gaps created by wind disturbance, salvage-logged gaps, and closed canopy mature forest (controls). Sampling was conducted during June-October in 1997 and 1998 using drift fences with pitfall and funnel traps. Basal area of live trees, shade, leaf litter coverage, and litter depth was highest in controls and lowest in salvaged gaps. Percent cover, length, and diameter of coarse woody debris (CWD) were significantly greater in intact gaps than in salvaged gaps or controls. Coarse

woody debris was more decayed and had less bark in controls than gaps. The relative abundance of salamanders and American toads, and species richness and diversity of amphibians did not differ among treatments. In contrast, relative abundance of two lizard species and (marginally) snakes, and species richness and diversity of reptiles was higher in both gap treatments than in controls. Results suggest that higher light in gaps positively influenced reptile abundance, but CWD at the tested levels was not an important determinant of habitat quality. The presence of a partial canopy and other forest features in both gap treatments may have adequately retained the microclimatic conditions required by moisture-sensitive amphibians. Xeric study sites and an associated assemblage of species that are pre-adapted to relatively warm, dry conditions also might partially explain the absence of any significant response by amphibians. In the closed canopy forests of the southern Appalachians, I suggest that salamanders were historically dominant, whereas many reptile species occurred at low densities and depended upon infrequent natural disturbance to create ephemeral patches of suitable habitat. Further study is required to determine what parameters of disturbance influence reptile and amphibian communities, and how these effects might differ along a moisture gradient and among species.

2205. **Response of riparian avifauna to percentage and pattern of woody cover in an agricultural landscape.**
Perkins, M. W.; Johnson, R. J.; and Blankenship, E. E.
Wildlife Society Bulletin 31(3): 642-660. (2003)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: agriculture/ birds/ corridor/ fragmentation/ habitat/ landscape/ riparian/ woody cover/ agricultural ecosystem/ avifauna/ community structure/ conservation management/ forest cover/ riparian zone/ United States/ Contopus virens/ Icterus galbula/ Myiarchus crinitus/ Populus deltoides/ Vireo gilvus
Abstract: To better understand bird response to percentage and pattern of woody cover in agricultural areas, we recorded richness and abundance of breeding birds in 500-m transects along 18 wooded streams in southeastern Nebraska. Transects had differing amounts of woody cover in the surrounding landscape (~2-39%) out to distances of 500, 1,000, and 2,000 m. We grouped bird species as woodland (22 species) or edge (30 species) and analyzed results from the 1999 and 2000 breeding seasons using information theoretic methods. Richness of the woodland group increased with percentage of woody cover out to 500 m, but abundance did not change. In contrast, richness of the edge group was not affected by landscape variables, but abundance increased as percentage of woody cover decreased out to 1,000 m. Eight species increased in abundance and 5 decreased with increasing percentage of woody cover in the landscape out to distances of 500, 1,000, or 2,000 m. The great crested flycatcher (Myiarchus crinitus) was not present at sites with ≤14.7% woody cover in the surrounding landscape out to 500 m, and the eastern wood-pewee (Contopus virens), except for one site, was not present at sites with ≤24% woody cover out to 500 m. The Baltimore oriole (Icterus galbula) and warbling vireo (Vireo gilvus) apparently responded to the presence of large eastern cottonwood (Populus deltoides) trees. Management for a diverse avifauna in fragmented agricultural landscapes should include both local- and landscape-scale variables, including the amount and pattern of woody cover in the surrounding landscape.

2206. **Responses of elk and mule deer to cattle in summer.**
Coe, P. K.; Johnson, B. K.; Kern, J. W.; Findholt, S. L.; Kie, J. G.; and Wisdom, M. J.
Journal of Range Management 54(2): A51-A76. (2001)
NAL Call #: 60.18 J82 ; ISSN: 0022-409X.
Notes: "Special Electronic Section".
Descriptors: animal competition/ geographical information systems/ grazing/ pastures/ rangelands/ summer/ wild animals/ cattle/ Cervus elaphus/ Odocoileus hemionus/ Pinus ponderosa/ Pseudotsuga menziesii/ red deer
Abstract: Cattle graze seasonally on national forests in the western USA, and mule deer (Odocoileus hemionus) and/or elk (Cervus elaphus) are sympatric with cattle in most of these areas. But the effects of interspecific interactions in terms of both the resources selected and animal distributions across landscapes are poorly understood. At the USDA Forest Service Starkey Experimental Forest and Range (Starkey), located in northeast Oregon, USA, elk and mule deer were free ranging within a 78 km^2 study area enclosed by a 2.4 m high fence while cattle were moved among pastures in summer on a deferred-rotation schedule. Elk, mule deer, and cattle were located with an automated telemetry system from 1993-96 and locations were linked to a geographic information system of Starkey. Our objective was to examine responses of elk and mule deer to cattle at several spatial and temporal levels. We compared elk and mule deer distributions, use of plant communities, and resource selection functions in one cattle pasture (24 km^2) during early summer (cattle present in odd-numbered years) and late summer (cattle present in even-numbered years). Elk and deer differed in their spatial and temporal responses to presence of cattle. When cattle were present, the proportion of elk locations within the pasture decreased and use of the ponderosa pine/Douglas fir (Pinus ponderosa/Pseudotsuga menziesii) plant community within the pasture decreased in early summer and increased in late summer. The cattle resource selection function variable for early summer was not a predictor of elk distributions when cattle were present, but it was a predictor on years when cattle were absent. In late summer, the cattle resource selection function variable was a predictor of elk distributions regardless of presence of cattle. For mule deer distributions the cattle resource selection function variable was not a significant predictor in early summer (cattle present or absent), or in late summer when cattle were present, but it was a negative predictor of mule deer distributions when cattle were absent in late summer. Mule deer use increased or decreased in the opposite direction from elk use in 3 of 4 season/year combinations for both pasture and ponderosa pine/Douglas fir. Our results suggest that competition for forage could occur between elk and cattle in late summer and that species interactions may be stronger between elk and cattle than mule deer and cattle.

2207. **Responses of isolated wetland herpetofauna to upland forest management.**
Russell, Kevin R.; Hanlin, Hugh G.; Wigley, T. Bently; and Guynn, David C.
Journal of Wildlife Management 66(3): 603-617. (July 2002)
NAL Call #: 410 J827; ISSN: 0022-541X
Descriptors: Amphibia/ Reptilia/ forestry/ upland forest management/ isolated wetland taxa responses/ / habitat management/ community structure/ population dynamics/ wetland taxa/ upland forest management/ semiaquatic habitat/ isolated wetland/ South Carolina/ Marion County/ Woodbury Tract/ wetland taxa community
Abstract: Because many amphibians and reptiles associated with wetlands also use adjacent terrestrial habitats to complete their life cycles, it has been suggested that undisturbed upland areas are required to maintain populations of these species. To date, however, measured responses of wetland herpetofauna to upland silviculture include only retrospective comparisons or anecdotes without true spatial and temporal references. We used an experimental approach to measure responses of herpetofauna at isolated wetlands in the Coastal Plain of South Carolina, USA, to disturbance of adjacent loblolly pine (Pinus taeda) forests. We used drift fences with pitfall traps to sample herpetofauna at 5 wetland sites for 1 year before (1997) and 2 years after (1998-1999) the following treatments were applied to the upland stands surrounding each site: (1) reference (unharvested), (2) clearcutting, and (3) clearcutting followed by mechanical site preparation. Although silvicultural treatments significantly altered overstory and ground-cover characteristics of upland stands, we did not observe any treatment-related changes in the overall richness, abundance, or community similarity of amphibian and reptile communities at the wetlands. Turtles and snakes were less abundant adjacent to clearcut and site-prepared stands 6 months after treatment but not after 1.5 years, possibly in response to physical disturbance of nest sites and changes in ground cover. Fifteen of the 17 species of herpetofauna with ≥30 individual captures showed no effects of treatments. Bronze frogs (Rana clamitans) entered the wetlands in proportionally higher numbers from clearcuts and site-prepared stands 1.5 years after treatment, possibly in relation to increased standing water in treated stands. In contrast, site preparation appeared to reduce the abundance of black racers (Coluber constrictor) 6 months after treatment. In the short term at least, many species of isolated wetland herpetofauna in the southeastern Coastal Plain may tolerate some disturbance in adjacent upland stands. Responses of isolated wetland herpetofauna to upland silviculture and the need for adjacent forested buffers likely depend on the specific landscape context (e.g., natural disturbance regimes) in which the wetlands occur and composition of the resident herpetofaunal community.
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2208. **Restoration of aquatic ecosystems: Science, technology, and public policy.**
Committee on Restoration of Aquatic Ecosystems - Science, Technology and Public Policy and National Research Council Washington, DC: National Academy Press; 576 pp. (1992)
NAL Call #: QH541.5.W3N38 1992; ISBN: 0309092884.
http://fermat.nap.edu/catalog/1807.html
Descriptors: wetlands/ environmental restoration/ aquatic ecosystems/ rivers/ lakes/ environment management/ United States/ environmental management/ aquatic environments/ conservation, wildlife management and recreation/ environmental action/ basic approaches, concepts, and theory/ reclamation
Abstract: This volume examines the prospects for repairing the damage society has done to the USA's aquatic resources: lakes, rivers and streams, and wetlands. Restoration of Aquatic Ecosystems outlines a national strategy for aquatic restoration, with practical recommendations covering both the desired scope and scale of projects and needed government action. It features case studies of aquatic restoration activities throughout the country. With a wealth of data and commentary, the book examines key concepts and techniques used in restoration; common factors in successful restoration efforts; threats to the health of the nation's aquatic ecosystems; approaches to evaluation before, during, and after a restoration project; and the emerging specialties of restoration and landscape ecology--and how they will contribute to better integration of restoration efforts. Individual chapters provide an overview; a selective history of aquatic ecosystem management; planning and evaluating ecosystem restoration; lakes; rivers and streams; wetlands; integrated ecosystem restoration; and a national restoration strategy. An appendix discusses restoration case studies.
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2209. **Restoration, reconciliation, and reconnecting with nature nearby.**
Miller, James R.
Biological Conservation 127(3): 356-361. (2006)
NAL Call #: S900.B5; ISSN: 0006-3207.
Notes: doi:10.1016/j.biocon.2005.07.021.
Descriptors: reconciliation ecology/ habitat restoration/ birds/ Aves/ habitat management/ land use gradient/ biodiversity
Abstract: Biotic homogenization is in many ways a function of spatial and temporal scale. Another aspect of this phenomenon that perhaps receives somewhat less attention is related to "the scale of human experience", particularly in the way that people view homogenization. Here, I examine the relationship between scale and efforts to reverse the loss of native species using two case studies in the Midwestern U.S. Both of these are focused on the restoration of prairie, one in a rapidly urbanizing area and one in a rural context. At a large reserve in a rural area, it is possible to restore prairie at a scale that is sufficient to accommodate populations of grassland obligate birds. This is an unrealistic goal, however, for small reserves in the midst of suburban development and rapidly escalating land prices. Small reserves in this context may be suitable for taxa with smaller habitat requirements, but also have a vital role in reversing biotic homogenization by enabling people to experience nature directly. Not only does this improve their quality of life, but may also foster support for efforts to maintain biodiversity in more remote locations. Thus, the goals of conservation and ecological restoration at various points on the land-use gradient are somewhat different but complementary and inter-related. Conservation scientists have an obvious role in the restoration and management of large reserves, but they also have an important part to play in restoring and maintaining elements of biodiversity in cities and suburbs. (© 2006 Elsevier)
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2210. **Restoring Iowa's wildlife.**
Little, Terry W.
Iowa Conservationist 60(5): 22-31. (2001);
ISSN: 0021-0471
Descriptors: wildlife/ traps-trapping/ techniques/ stocking-transplanting/ restoration/ nets-netting/ management/ hunting and anti-hunting/ history/ habitat use/ ecosystem management/ conservation programs/ conservation/ captive animal care/ breeding/ DDT/ Iowa
Abstract: The author discusses the history of wildlife restoration in Iowa. The wildlife populations Iowa started declining 130 years ago. The Department of Natural Rresources started a restoration program for wild turkeys in the late 1970s. New cooperative programs by the National Wild Turkey Federation for wild turkey restoration were also begun. Nearly 75% of Iowa's remaining forestlands were filled with turkeys by 1980s. The turkeys were traded for prairie chickens. The prairie chickens on release in the wild, dispersed and moved from wintering areas to spring mating grounds. The USDA's Conservation Reserve Program planted cool-season grasses. Artificial mating grounds were created and the prairie chickens were released at dawn for breeding. This method proved successful and from 1987 to 1994 more than 549 prairie chickens were released. As the timber, which stands along field edges in Iowa was being destroyed, the ruffed-grouse population also declined. In 1979 an expanded effort was begun and turkeys and pheasants were traded for grouse. In a span of eight years, almost 1243 ruffed grouse were released in Iowa. Trapping pressures and habitat degradation had eliminated river otters from Iowa. Sixteen otters were flown in from Louisiana in 1985 and over 15 years 286 other otters were released at 19 sites. By 1964 the peregrine falcon had a small population due to the use of DDT. Young chicks from breeders having genetically wild breeding stock were used for restoration. The young were fed artificially. In 10 years, 100 falcons were released in urban locations. Trumpeter swans were severely threatened by hunting, egging, and wetland drainage. In 1993, the DNR began a recovery program. Swans obtained from zoos and flightless breeding pairs were established. One hundred swans were produced from these flightless pairs. Ospreys, bald eagle, bobcats, sandhill cranes were also restored. Fees received from hunters and anglers are funding the restoration and conservation efforts.

2211. **Restoring lepidopteran communities to oak savannas: Contrasting influences of habitat quantity and quality.**
Summerville, Keith S.; Steichen, Renae M.; and Lewis, Michelle N.
Restoration Ecology 13(1): 120-128. (2005)
NAL Call #: QH541.15.R45R515; ISSN: 1061-2971
Descriptors: conservation/ forestry/ tall grass prairie/ habitat disturbance/ savanna ecoregion
Abstract: Ecological restoration is deemed important for the long-term conservation of biodiversity, but ecologists still lack an understanding of how habitat availability and habitat quality in a restored system interact to determine species diversity. This problem seems particularly apparent in Tallgrass Prairie and savanna ecoregions, where restored management units represent the majority of extant habitat. In this study, we tested three principal hypotheses, each stating that the diversity of Lepidoptera would be greater in (1) patches of savanna habitat that were larger; (2) patches that were of higher habitat quality; and (3) patches that had greater connectivity to management units of similar physiognomy. Lepidoptera were sampled in 2003 from 13 unmanaged woodland remnants within Neal Smith National Wildlife Refuge, a 2,292-ha prairie and savanna reconstruction project. We also measured 11 environmental variables within each site to assess variation in habitat quantity and quality. Principal components analysis (PCA) was used to identify major gradients of environmental variation among the 13 sites. Our PCA differentiated among woodlands along three environmental gradients, defined by (1) stand size, shape, topography, and oak dominance; (2) degree of disturbance; and (3) isolation. Total lepidopteran species richness, however, was only predicted by variation in the first principal component. Species richness of Lepidoptera known to be oak specialists was significantly affected by variation along all three PCA gradients. Surprisingly, more isolated woodland remnants contained a greater richness of oak feeders. Our results suggest that approaches to restoring oak savannas should emphasize aspects of both habitat quantity and quality. Beyond making individual management units larger, priority sites for restoration should possess a low importance of trees that are indicative of past habitat disturbance (e.g., Honey locust, White mulberry) even if canopy closure is substantial. Connectivity among restored habitats may benefit savanna moth communities only when habitat linkages contain a flora similar in composition to focal patches.

2212. **Review of 15 years of research on ecotoxicology and remediation of land contaminated by agricultural drainage sediment rich in selenium.**
Wu, L.
Ecotoxicology and Environmental Safety 57(3): 257-269. (Mar. 2004)
NAL Call #: QH545.A1E29; ISSN: 0147-6513
Descriptors: wetlands/ selenium/ land reclamation/ bioaccumulation/ wildlife/ food chains/ grasslands/ vegetation/ soil remediation/ water reservoirs/ sediment pollution/ leaching/ ecotoxicology/ pollution effects/ pollution control/ microorganisms/ salinity effects/ agricultural pollution/ habitats/ reservoirs/ water birds/ methylation/ drainage water/ sediment contamination/ remediation/ contamination/ nesting/ rooted aquatic plants/ safety/ Gambusia affinis/ Kesterson Reservoir/ Central Valley/ California/ western mosquitofish/ land pollution/ ecosystems and energetics/ prevention and control/ effects of pollution/ water quality/ soil pollution: monitoring, control, remediation
Abstract: The consequences of elevated Se accumulation at the Kesterson Reservoir National Wildlife Refuge in the Central Valley of California created adverse effects on wildlife and led to extensive research on the behavior of Se in both the wetland and upland ecosystems. Selenium concentrations in water entering the Kesterson Reservoir averaged 300 $\mu g L^{-1}$. In pond waters 20-30% of the Se was selenate, while only 2% was selenite in the drainage water entering the reservoir. Submerged rooted aquatic plants fed on by water birds were found to contain 18-390 mg Se kg^{-1} dry weight. Mosquitofish collected from the San Luis Drain contained 332 mg Se kg^{-1}, and those collected from the ponds ranged from 339 to 380 mg kg^{-1}. Livers of water

birds had Se concentrations ranging from 19.9 to 127 mg kg^{-1}. The high concentrations of Se accumulation in the food chain of the wetland strongly suggest that Se bioaccumulation was the cause of death and deformity of embryos of the waterfowl nesting at the wetland habitat. In June 1986, the Kesterson Reservoir was closed to drain-water inputs, and the wetland was transformed to an upland grassland. New remedial plans were proposed. These new plans involved soil, water, and vegetation management to dissipate Se by bioaccumulation and volatilization through soil microorganisms and plants. The investigations of the potential transfer of Se from farm land into the crop and vegetables in the Central Valley indicated that plant tissue Se concentrations generally fall in a nonseleniferous category, except that the highest Se concentration of cotton was at a threshold where toxicity in animals could occur at a relatively low frequency. At the Kesterson upland grassland habitat, average total Se concentrations ranged from 500 to 8000 μg kg^{-1} and water-extractable Se ranged from 10 to 700 μg kg^{-1} in the top 15cm of soil and varied greatly, by a factor greater than 100, among soil samples. Uptake of Se by the plants was profoundly affected by the soil available Se concentration, soil moisture, pH, soil salinity, soil sulfate concentration, soil reoxidation condition, kind of plant species, and soil-management practices. The rate of soil Se dissipation at the Kesterson grassland system was from 1% (low methylation rate) to 5% (high methylation rate) Se inventory per year and it will take from 46 to 230 years to bring the soil Se down to a normal level, 4mg Se kg^{-1} soil. However, the Kesterson upland grassland habitat had Se bioaccumulation values less than 10% of those of the previous wetland. The potential food-chain contamination at the existing Kesterson grassland is much less problematic. No negative impact on wildlife has been reported for the upland habitat. Plants may contribute to the Se reoxidation process and be able to reduce the movement of Se in the soil. At the Kesterson grassland, the distribution of soil Se is extremely uneven; high levels of soil Se concentrated only in isolated spots. Therefore, leaching of soil Se is not at an area level. It is unlikely that problems of transport of Se from the Kesterson soil to the adjacent uncontaminated environment by leaching can occur.

2213. **A review of factors affecting productivity of bald eagles in the Great Lakes region: Implications for recovery.**
Bowerman, W. W.; Giesy, J. P.; Best, D. A.; and Kramer, V. J.
Environmental Health Perspectives 103(4 Supp.): 51-59. (1995)
NAL Call #: RA565.A1E54; ISSN: 0091-6765.
Notes: Conference: Work Session on Environmentally Induced Alterations in Development: A Focus on Wildlife, Racine, WI (USA), 10-12 Dec 1993; Source: Wildlife Development., 1995; Editors: Rolland, R. //Gilbertson, M. //Colborn, T.; Document number: NIH 95-218.
Descriptors: DDT/ reproduction/ Haliaeetus leucocephalus/ United States, Great Lakes/ pesticides (organochlorine)/ PCB/ TCDD/ PCB compounds/ birds/ mortality/ water pollution/ eggs/ environmental quality/ polychlorinated biphenyls/ aquatic birds/ freshwater pollution/ environmental impact/ toxicology and health/ pollution effects on organisms
Abstract: The bald eagle (Haliaeetus leucocephalus) population in North America declined greatly after World War II due primarily to the eggshell thinning effects of p,p'-DDE, a biodegradation product of DDT. After the banning of DDT in the United States and Canada during the early 1970s, the bald eagle population started to increase. However, this population recovery has not been uniform. Eagles nesting along the shorelines of the North American Great Lakes and rivers open to spawning runs of anadromous fishes from the Great Lakes still exhibit impaired reproduction. We have explored both ecological and toxicological factors that would limit reproduction of bald eagles in the Great Lakes region. Based on our studies, the most critical factors influencing eagle populations are concentrations of environmental toxicants. While there might be some continuing effects of DDE, total PCBs and most importantly 2,3,7,8-tetrachlordibenzo-p-dioxin equivalents (TCDD-EQ) in fishes from the Great Lakes and rivers open to spawning runs of anadromous fishes from the Great Lakes currently represent a significant hazard to bald eagles living along these shorelines or near these rivers and are most likely related to the impaired reproduction in bald eagles living there.

2214. **Riparian and woodlot landscape patterns and migration of neotropical migrants in riparian forests of eastern South Dakota.**
Swanson, David L.; Dean, Kurt L.; Carlisle, Heather A.; and Liknes, Eric T.
In: Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, General Technical Report-PSW 191/ Ralph, C. J. and Rich, T. D.; Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 541-549.
Notes: 0196-2094 (ISSN).
Descriptors: conservation measures/ ecology/ population dynamics/ terrestrial habitat/ land zones/ Aves: habitat management/ riparian corridor woodlands and farmstead woodlots for neotropical migrants/ community structure/ neotropical migrants in riparian corridor woodlands and farmstead woodlots/ population censuses/ forest and woodland/ riparian corridor woodlands and farmstead woodlots/ community structure of neotropical migrants/ riparian habitat/ South Dakota/ Missouri and Big Sioux rivers/ community structure of neotropical migrants in riparian corridor woodlands and farmstead woodlots/ Aves/ birds/ chordates/ vertebrates
Abstract: Woodland habitat types in the northern Great Plains compose only a very small fraction of the total land surface. These woodlands occur primarily as natural riparian forests or as scattered anthropogenic woodlots and shelterbelts. Natural riparian woodlands have been markedly reduced over the past century, but anthropogenic woodlands have increased during this same period. In this paper, we review and synthesize mist net and point count data from riparian corridor woodlands (Missouri and Big Sioux rivers) and farmstead woodlots in southeastern South Dakota to compare neotropical migrant abundance, species richness, diversity, and community similarity in these two habitats during spring and fall migrations. We hypothesized that the larger and more contiguous woodland area and greater vegetative diversity of riparian corridor woodlands relative to woodlots would attract higher numbers and more

species of neotropical migrants. Point count abundances were higher in woodlots than in riparian corridors in both spring and fall, whereas capture rates were similar in spring, but higher in Missouri River woodlands than at other sites in fall. Species richness and diversity were similar in riparian corridors and woodlots at both seasons. Community overlap between riparian corridors and woodlots was high in spring, but was lower in fall. In general, these data suggest that overall abundance and diversity of neotropical migrant communities are similar between riparian corridors and farmstead woodlots, despite some differences for individual species. In addition, recaptured migrants were capable of gaining mass during stopover in woodlots. Farmstead woodlots appear to effectively supplement natural riparian corridor woodlands as stopover sites for neotropical migrants. Thus, conservation of even small woodland parcels may benefit neotropical woodland migrants during migration.

2215. **Riparian buffers and thinning designs in western Oregon headwaters accomplish multiple resource objectives.**
Olson, Deanna H.; Chan, Samuel S.; and Thompson, Charles R.
In: Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Initiative workshop, General Technical Report-PNW 563/ Johnson, Adelaide C.; Haynes, Richard W.; and Monserud, Robert A.; Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture, 2002. pp. 81-91.
Notes: 0363-6224 (ISSN).
Descriptors: conservation measures/ freshwater habitat/ lotic water/ terrestrial habitat/ land zones/ comprehensive zoology: habitat management/ headwater riparian and upland forests/ riparian buffer/ thinning/ multiple resource management/ headwater streams/ forest density management/ buffer design/ forest and woodland/ riparian habitat/ Oregon/ United States, western region/ faunal responses to riparian buffers

2216. **Riparian buffers within a forest thinning context: Effects on stream amphibians and riparian microclimates in headwater drainages.**
Olson, Deanna H.; Chan, Samuel S.; Ellenburg, Loretta; and Rugger, Cynthia
Northwestern Naturalist 84(2): 109. (2003)
NAL Call #: QL671.M8; ISSN: 1051-1733
Descriptors: amphibians/ forest management/ thinning/ streams/ aquatic habitat/ habitat management/ microclimates/ temperature/ riparian buffers/ Oregon
Abstract: Management of forested headwaters varies from little consideration of aquatic-riparian resources to creation of subdrainage reserves. Such contrasting approaches have resulted in examination of key headwater resources and their responses to alternative forest management scenarios. In managed forests of headwater subdrainages in northwestern Oregon, we are examining the effects on amphibians and riparian microclimates of 4 no-entry riparian buffer widths (approximately 20, 50 to 75, 250, and 500 ft) in an upslope thinning context (80 trees per acre [tpa], thinned from a regenerated stand density of >300 tpa). Although the dominant species generally persisted in reaches within all four buffer widths in years one and two post-treatment, several trends are emerging including both increases and decreases in species' relative abundances. Riparian microclimate changes post-thinning included about a 2 degree air temperature increase and three to eight percent relative humidity decrease near the stream within the 50 to 75 ft riparian buffer, during the warmest times of the year. Use of multiple riparian buffer widths at project and stand scales may hedge uncertainty regarding sensitive species' responses to the joint effects of upslope and riparian forest management.

2217. **Riparian communities associated with Pacific Northwest headwater streams: Assemblages, processes, and uniqueness.**
Richardson, J. S.; Naiman, R. J.; Swanson, F. J.; and Hibbs, D. E.
Journal of the American Water Resources Association 41(4): 935-947. (Aug. 2005)
NAL Call #: GB651.W315.
Descriptors: riparian areas/ streams/ aquatic habitat/ wildlife/ riparian ecology
Abstract: Riparian areas of large streams provide important habitat to many species and control many instream processes - but is the same true for the margins of small streams? This review considers riparian areas alongside small streams in forested, mountainous areas of the Pacific Northwest and asks if there are fundamental ecological differences from larger streams and from other regions and if there are consequences for management from any differences. In the moist forests along many small streams of the Pacific Northwest, the contrast between the streamside and upslope forest is not as strong as that found in drier regions. Small streams typically lack floodplains, and the riparian area is often constrained by the hillslope. Nevertheless, riparian-associated organisms, some unique to headwater areas, are found along small streams. Disturbance of hillslopes and stream channels and microclimatic effects of streams on the riparian area provide great heterogeneity in processes and diversity of habitats. The tight coupling of the terrestrial riparian area with the aquatic system results from the closed canopy and high edge-to-area ratio for small streams. Riparian areas of the temperate, conifer dominated forests of the Pacific Northwest provide a unique environment. Forest management guidelines for small streams vary widely, and there has been little evaluation of the local or downstream consequences of forest practices along small streams.
This citation is from AGRICOLA.

2218. **Riparian corridors of eastern Oregon and Washington: Functions and sustainability along lowland-arid to mountain gradients.**
Wissmar, Robert C.
Aquatic Sciences 66(4): 373-387. (2004); ISSN: 1015-1621
Descriptors: conservation measures/ ecology/ freshwater habitat/ lotic water/ terrestrial habitat/ land zones/ comprehensive zoology: habitat management/ riparian and fluvial systems along altitude gradient/ riparian corridors and fluvial systems along altitude gradient/ conservation aspects/ river/ fluvial systems along altitude gradient/ ecological functions and stream/ riparian habitat/ riparian

corridors along altitude gradient/ Oregon, eastern region/ ecology of riparian corridors and fluvial systems along altitude gradient/ Washington

Abstract: Riparian corridors of eastern Oregon and Washington, like those in other regions, comprise small portions of river drainages but provide disproportionately important ecosystem functions. However, most riparian and fluvial (streams and rivers) systems have been greatly altered. Degraded ecosystems commonly reflect influences of land-uses (e. g., mining, logging, road construction, fire suppression, livestock grazing), hydro-developments (e. g., dams, irrigation, flood control) and other human actions. Some important consequences include: degradation and fragmentation of habitats, changes in riparian plant associations, isolated fish populations, and altered flow and sediment regimes. This synthesis paper evaluates some major environmental factors that can influence the sustainability of riparian corridors and fluvial systems along lowland-arid to mountain gradients within river drainages of eastern Oregon and Washington. Four tributary rivers of the Columbia River, the Grande Ronde and John Day Rivers in northeastern Oregon, and the Yakima and Methow Rivers on the eastside of the Cascade Mountains in Washington, provide perspectives on environmental conditions. Factors evaluated include: a) dominant riparian plant associations and distributions in relation to differences in precipitation and temperature regimes along elevation gradients; b) ecological and physiochemical functions of riparian and fluvial systems along elevation gradients; c) long-term historical and contemporary cumulative impacts of human actions; and d) management provisions that could restore and sustain ecosystem functions. Ecological functions of riparian and fluvial systems are viewed as being closely coupled because of their dependence on hydrological (surface and sub-surface) and sediment routing regimes. From a river landscape perspective, achieving greater connectivity can be a key objective for analyzing and integrating the management of riparian and fluvial ecosystems. Effective management should include ensuring the delineation of major limiting factors (e. g., erosion, water shortages and temperatures) and identification of streamside and channel networks that link critical habitats at multiple landscape scales (e. g., locations and spacing of refuge habitats for fish and wildlife). Management actions should encourage the connectivity of reaches and habitats and maintenance of riparian and fluvial functions so interactions can occur. Efforts should include renewal of natural flood and sediment routing regimes and the reestablishment of habitats adjacent to ecologically intact habitats.

2219. **Riparian livestock exclosure research in the western United States: A critique and some recommendations.**

Sarr, Daniel A.

Environmental Management 30(4): 516-526. (2002)

NAL Call #: HC79.E5E5; ISSN: 0364-152X.

Notes: Literature review.

Descriptors: commercial activities/ ecology/ terrestrial habitat/ man-made habitat/ land and freshwater zones/ comprehensive zoology: farming and agriculture/ habitat management/ population dynamics/ livestock exclosures/ freshwater habitat/ riparian habitat/ cultivated land habitat/ riparian farming areas/ United States, western region

Abstract: Over the last three decades, livestock exclosure research has emerged as a preferred method to evaluate the ecology of riparian ecosystems and their susceptibility to livestock impacts. This research has addressed the effects of livestock exclusion on many characteristics of riparian ecosystems, including vegetation, aquatic and terrestrial animals, and geomorphology. This paper reviews, critiques, and provides recommendations for the improvement of riparian livestock exclosure research. Exclosure-based research has left considerable scientific uncertainty due to popularization of relatively few studies, weak study designs, a poor understanding of the scales and mechanisms of ecosystem recovery, and selective, agenda-laden literature reviews advocating for or against public lands livestock grazing. Exclosures are often too small (<50 ha) and improperly placed to accurately measure the responses of aquatic organisms or geomorphic processes to livestock removal. Depending upon the site conditions when and where livestock exclosures are established, postexclusion dynamics may vary considerably. Systems can recover quickly and predictably with livestock removal (the "rubber band" model), fail to recover due to changes in system structure or function (the "Humpty Dumpty" model), or recover slowly and remain more sensitive to livestock impacts than they were before grazing was initiated (the "broken leg" model). Several initial ideas for strengthening the scientific basis for livestock exclosure research are presented: (1) incorporation of meta-analyses and critical reviews. (2) use of restoration ecology as a unifying conceptual framework; (3) development of long-term research programs; (4) improved exclosure placement/design; and (5) a stronger commitment to collection of pre-treatment data.

2220. **Risk assessment for conservation under ecological uncertainty: A case study with a stream-dwelling amphibian in managed forests.**

Sutherland, Glenn Douglas. University of British Columbia (Canada), 2002.

Notes: Degree: PhD; Advisor: Bunnell, Frederick L.

Descriptors: ecological uncertainty/ decision-making/ forest management/ habitat management/ amphibians/ tailed frog/ Ascaphus truei/ risk assessment

Abstract: Quantifying risks of forest and habitat management options are often limited by uncertainties in habitat associations, life history and population trends for resident species. Using the tailed frog Ascaphus truei , a headwater stream-dependent amphibian, I: (1) developed hierarchical models of habitat relationships across this species' range in British Columbia; (2) examined plausible life history responses to habitat change, and (3) investigated population persistence outcomes within and among streams to uncertain effects of forest harvesting and disturbance scenarios. To develop habitat association relationships I used classification and regression trees (CART) together with simple and partial Mantel tests. Variables describing biophysical setting at meso- and micro-scales had a greater influence on occurrence and abundance of larval frogs than did adjacent forest practices, possibly because most sampling sites were in disturbed watersheds. Underlying geology was a consistently important determinant of occurrence patterns, with fine-scale stream structure more important in determining

abundance. Using life stage-based population matrix models, I explored consequences of different life history strategies and ranges of habitat productivity and environmental variation on population persistence. Persistence is decreasingly sensitive to changes in growth rates, tadpole and adult survival, and fecundity. Populations also appear more sensitive to changes in survivorship of in-stream stages (eggs, hatchlings and tadpoles) than riparian stages (juveniles/adults). Clinal, elevational, and local reductions in habitat productivity (e.g., shorter growing seasons, reduced light penetration in mid-seral forests) appear as dominant factors mediating how local fluctuations in demographic rates determine risks of loss of small populations, even if environmental variation is relatively low. Using a spatially explicit metapopulation-landscape dynamics model, I explored six plausible hypotheses linking habitat alterations to population dynamics in response to forest harvesting and disturbances. Risks to populations from disturbance depend strongly on assumptions about age at first reproduction. Incremental effects of forest harvesting on risks were small compared with those already incurred through stochastic events (floods, debris flows, climatic variation) or state of the landscape. Once extirpated, population recovery through dispersal appears unlikely. However, key uncertainties about the impacts of harvesting and forest succession on demographic rates render evaluation of alternative riparian protection systems difficult with present knowledge.

2221. **Risk-based multiattribute decision-making in property and watershed management.**
Prato, T.
Natural Resource Modeling 12(3): 307-334. (1999);
ISSN: 0890-8575.
Notes: Literature review; Publisher: The Rocky Mountain Mathematics Consortium.
Descriptors: decision making/ government policies/ sustainable development/ resource management/ United States, Missouri/ risk/ watershed management/ farming/ agricultural watersheds/ river basin management/ regional planning/ environmental protection/ resource conservation/ models/ MADM/ best management practices/ BMPs/ sustainable use/ watershed protection/ conservation, wildlife management and recreation/ modeling, mathematics, computer applications/ policy and planning/ techniques of planning
Abstract: Determining best management systems for properties and evaluating their sustainability at the watershed scale are useful and important aspects of integrated watershed management. Multiattribute decision-making (MADM) is very useful for modeling the selection of best management systems for properties in a watershed. This paper reviews four MADM approaches including utility theory, surrogate worth tradeoff, free iterative search and stochastic dominance with respect to a function (SDWF). Emphasis is on determining how the first three methods could be used to determine the best (most preferred) combinations of attributes and associated management systems for a property. An application of the expected utility method with risk neutral preferences is presented in which farmer's preferences for five attributes are used to rank five farming systems for an agricultural watershed in Missouri. A framework is presented for assessing the sustainability of the best management systems for all properties in a watershed and the cost-effectiveness of policies for enhancing sustainable resource management at the watershed scale.

2222. **Riverine floodplain forests of the southeastern United States: Invertebrates in an aquatic-terrestrial ecotone.**
Smock, Leonard A.
In: Invertebrates in freshwater wetlands of North America: Ecology and management/ Batzer, Darold P.; Rader, Russell B.; and Wissinger, Scott A.
New York: John Wiley & Sons, 1999; pp. 137-165.
Notes: Literature review; ISBN: 0471292583.
NAL Call #: QL365.4.A1I58
Descriptors: Macroinvertebrata/ life cycle/ riverine flood plain forest/ fauna life history adaptations/ biomass/ productivity/ community structure/ population density/ distribution within habitat/ semiaquatic habitat/ flood plain habitat/ forest and woodland/ forested freshwater wetland/ flooding/ hydrologic cycle/ United States, Southeast

2223. **The role of disturbance in the ecology and conservation of birds.**
Brawn, J. D.; Robinson, S. K.; and Thompson, F. R.
Annual Review of Ecology and Systematics 32: 251-276. (2001); ISSN: 00664162.
Notes: doi: 10.1146/annurev.ecolsys.32.081501.114031.
Descriptors: fire/ flood pulse/ habitat selection/ silviculture/ successional habitats/ avifauna/ conservation management/ disturbance/ fire/ flooding/ habitat creation/ population decline/ North America/ Aves/ Vertebrata
Abstract: Natural ecological disturbance creates habitats that are used by diverse groups of birds. In North America, these habitats or ecosystems include grasslands or prairies, shrublands, savannas, early successional forests, and floodplains. Whereas the extent of all natural habitats has diminished significantly owing to outright loss from agriculture and development, the suppression of disturbance by agents such as fire and flooding has led to further losses. Accordingly, the abundances of many bird species adapted to disturbance-mediated habitats have declined as well. In North America, these declines have been more severe and common than those of species associated with less frequently disturbed habitats such as mature or closed-canopy forests. Field studies consistently reveal the direct role of disturbance and successional processes in structuring avian habitats and communities. Conservation strategies involving the management of disturbance through some combination of flooding, application of fire, or the expression of wildfire, and use of certain types of silviculture have the potential to diversify avian habitats at the local, landscape, and regional scale. Many aspects of the disturbance ecology of birds require further research. Important questions involve associations between the intensity and frequency of disturbance and the viability of bird populations, the scale of disturbance with respect to the spatial structure of populations, and the role of natural vs. anthropogenic disturbance. The effects of disturbance and ensuing successional processes on birds are potentially long-term, and comprehensive monitoring is essential.

2224. **The role of earthworms for assessment of sustainability and as bioindicators.**
Paoletti, M. G.
Agriculture, Ecosystems and Environment 74(1/3): 137-155. (June 1999)
NAL Call #: S601.A34; ISSN: 0167-8809 [AEENDO].
Notes: Literature review; Special issue: Invertebrate biodiversity as bioindicators of sustainable landscapes/ edited by M.G. Paoletti. Includes references.
Descriptors: earthworms/ indicator species/ sustainability/ evaluation/ monitoring/ environmental management/ environmental impact/ habitats/ agricultural land/ urban areas/ industrial sites/ species diversity/ biomass/ taxonomy/ identification/ soil pollution/ pesticides/ heavy metals/ genetic engineering/ crops/ stress/ orchards/ polluted soils
Abstract: Earthworms, which inhabit soils and litter layers in most landscapes, can offer an important tool to evaluate different environmental transformations and impacts. Agricultural landscapes, urban and industrialized habitats have some earthworms that represent interesting indicators to monitor different contaminations, to assess different farming practices and different landscape structures and transformations. Species number, abundance and biomass can give easily measurable elements. Ecological guilds can help in comparing different environments. Taxonomy is relatively well known, at least in temperate areas, where species identification is in general easily solved. CD-ROM based programs facilitate rapid identification of collected specimens. The substantial amount of research carried out on these invertebrates has made these soil organisms more promising for further improved and accurate work in assessing sustainability of different environments. In most cases earthworm biomass or abundance can offer a valuable tool to assess different environmental impacts such as tillage operations, soil pollution, different agricultural input, trampling, industrial plant pollution, etc. In rural environments different farming systems can be assessed using earthworm biomass and numbers.
This citation is from AGRICOLA.

2225. **The role of spiders as predators of insect pests with particular reference to orchards: A review.**
Bogya, S. and Mols, P. J.
Acta Phytopathologica et Entomologica Hungarica 31(1-2): 83-159. (1996); ISSN: 0238-1249
Descriptors: predator-prey interactions/ pesticides/ biological control/ Araneae/ Insecta/ agriculture/ applied entomology
Abstract: Spiders are well known predators of insects (including insect pests) but about there role as biological control agents in agroecosystems (particularly in orchards) little is known. In the last decade new information (especially of the behaviour of spiders in different agroecosystems) has become available and this increased expectations about spiders as beneficial organisms. Spiders are a very heterogeneous group of animals with different hunting tactics and therefore, they play a different ecological role. At family level these tactics are rather similar and one species of the group can be used as representative example for ecological studies for the whole family. On the other hand properties and behaviour found in different species of one family can be seen as characteristic for the whole family. A comprehensive review of spiders as natural enemies of pest species of different crops is given offering information about the expected prey spectrum per family. A qualitative evaluation of pest-spider relationships has been carried out for a whole range of agroecosystems and the results are transposed to spider groups inhabiting the orchard ecosystem. The effect of pesticides on spiders, both from laboratory and field experiments is discussed and it has been shown to be the most important factor influencing spider occurrence and abundance in the field. Thus the pest management system (conventional or IPM or ecological) determines to a great extent the role of spiders can play in controlling pest organisms. Only from a few species occurring in different ecosystems quantitative information of their searching and predatory potential is available resulting in functional response relationships to prey density. A list of methods for further quantitative evaluation of spider impact on pest in getting insight in predation processes is presented.
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2226. **Rural riparian restoration.**
Small, Stacy
PRBO Observer (119): 4-5. (2000)
Descriptors: agricultural crops/ agricultural practices/ birds/ communities/ ecosystems/ habitat management/ management/ orchards/ plantations/ plantings/ revegetation/ rice/ riparian habitat/ techniques/ wildlife/ California: Sacramento Valley
Abstract: Information is presented on the need for riparian habitat management for bird species in the Central Valley region of California.
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2227. **Salamander abundance and amphibian species richness in riparian buffer strips in the Oregon coast range.**
Vesely, David G. and McComb, William C.
Forest Science 48(2): 291-297. (2002)
NAL Call #: 99.8 F7632; ISSN: 0015-749X
Descriptors: commercial activities/ conservation measures/ ecology/ community structure/ terrestrial habitat/ land and freshwater zones/ Amphibia: forestry/ habitat management/ riparian buffer strips/ forestry technique/ species richness/ species diversity/ forest and woodland/ Oregon/ Oregon Coast Range/ species richness/ forestry management techniques/ evaluation/ Amphibia/ amphibians/ chordates/ vertebrates
Abstract: Logging and other forest practices are widely reported to be a threat to some amphibian populations in the Pacific Northwest. Riparian buffer strips are one conservation measure that may benefit amphibians in managed forests. However, few amphibian surveys have been conducted in buffer strips. We compared total salamander abundance, amphibian species richness, and sampling proportions for five species of salamanders between 17 managed stands and 12 unlogged, streamside forests in the Coast Range of western Oregon. We also identified relationships between buffer strip width and salamander population indices. Surveys conducted on 20 [x] 40 m plots demonstrated that torrent salamanders (Rhyacotriton spp.), clouded salamanders (Aneides ferreus), Dunn's salamanders (Plethodon dunni), western red-backed salamanders (Plethodon vehiculum), total salamander abundance, and amphibian species richness were sensitive to forest practices in riparian areas. We conclude that riparian buffer strips are a useful habitat

management strategy for several salamander species. However, buffer strip widths currently requiredby state forest practices regulations may not be adequate to prevent local declines in the diversity of amphibian communities.

2228. **Salmon Bay Natural Area pre-restoration monitoring 2004.**
Toft, J.; Cordell, J.; and Starkhouse, B. Washington University; Rep. Fish. Res. Inst. Wash. Univ. No. 0503, 2005.
Notes: Responsibility: School of Aquatic and Fishery Science, Fisheries Research Institute, Washington University.
http://www.fish.washington.edu/Research/Publications/pdfs/0503.pdf
Descriptors: baseline studies/ biological surveys/ coastal zone management/ habitat improvement/ monitoring/ shoreline restoration/ Puget Sound/ benthic invertebrates/ intertidal zone/ shoreline modifications/ overwater structure/ juvenile salmon/ Salmon Bay/ Chinook salmon/ riparian vegetation/ Washington
Abstract: The Salmon Bay Natural Area (SBNA) is a planned restoration project which will protect and enhance the last largely undeveloped, wooded shoreline on Seattle's Salmon Bay. This is an important location in the migration of endangered populations of juvenile Chinook salmon, since it is directly downstream from the Hiram M. Chittenden Locks. The overall objectives for restoring the shoreline habitat are to improve riparian and upland vegetation, remove the existing overwater structure and associated rip-rap, and enhance intertidal habitat in order to improve rearing opportunities for juvenile salmonids. Fieldwork was conducted during Spring and Summer 2004 at the overwater site and an adjacent reference site, sampling benthic invertebrates, terrestrial insects, fish (via snorkel surveys), and sediment grain size. The overwater site consisted of a recreational house with a deck and an attached floating dock, while the reference site was a stretch of adjacent beach. Two different tidal levels were included in the sampling design, pertaining to the high tidal elevation of the overwater structure at +8 Mean Lower Low Water (MLLW) and the low tidal elevation of the floating dock at +1 MLLW. All measurements of total invertebrate densities showed significantly higher numbers at the reference site as compared to the overwater site. This includes benthic macroinvertebrates, harpacticoid copepods, and terrestrial insects, all important juvenile salmonid prey items. The reference site also had a greater number of taxa with significantly higher densities. Taxa richness of benthic invertebrates was not limited by the overwater structure, as number of taxa were similar at the two sites and even greater at the low tidal elevation overwater structure site for benthic macroinvertebrates. Taxa richness of insects was much higher at the reference site.

2229. **Sampling on private property to evaluate population status and effects of land use practices on the gopher tortoise, Gopherus polyphemus.**
Hermann, S. M.; Guyer, C.; Hardin Waddle, J.; and Greg Nelms, M.
Biological Conservation 108(3): 289-298. (2002)
NAL Call #: S900.B5; ISSN: 00063207.
Notes: doi: 10.1016/S0006-3207(02)00123-4.
Descriptors: fire/ Gopherus/ land management/ private property/ status survey/ land management/ population size/ private land/ sampling/ species conservation/ United States/ Animalia/ Gopherus/ Gopherus polyphemus/ Polyphemus/ Testudinidae
Abstract: Although private properties are predicted to play an increasingly significant role in conservation, surveys of species of special concern are rare on these lands. We created a template for a multi-county survey of randomly selected sites and sampled for burrows of the gopher tortoise (Gopherus polyphemus) in south-central Georgia, USA. Current land use was strongly correlated with tortoise population condition. The highest densities of tortoise burrows were found on lands with open-canopied pine stands that were managed with prescribed fire, a practice associated with types of selection forestry and/or wildlife management. Agricultural sites and unburned areas provided poor habitat and pine plantations were only slightly better. Our estimates of tortoise population densities indicated that the current landscape supports less than 20% of the animals present before implementation of modern land use practices. In addition, our estimate for density of active burrows was approximately one third of that projected for the entire state range 20 years ago by Auffenberg and Franz [Auffenberg, W., Franz, R., 1982. The status and distribution of the gopher tortoise (Gopherus polyphemus). In: Bury, R. B. (Ed.), North American Tortoises: Conservation and Ecology (US Fish and Wildlife Service Wildlife Research Report 12). pp. 95-126]. However, some good sites for gopher tortoises remain in south Georgia and our data also suggested that extraordinary conservation actions may not be required if ways can be developed to retain traditional land management practices on private property.

2230. **Seasonal and habitat influences on avifauna of an agricultural impoundment in southwest Florida: Results of a five-year monitoring program.**
Main, Martin B. and Allen, Ginger M.
Florida Scientist 70(3): 219-240. (2007); ISSN: 0098-4590
Descriptors: ecology: environmental sciences/ climatology: environmental sciences/ biogeography: population studies/ wildlife management: conservation/ wildlife habitat/ species diversity/ avifauna/ seasonal influence/ habitat influence/ avian assemblage/ agricultural impoundment
Abstract: Agricultural impoundments represent potentially important habitat, but little information is available on the use of these areas by wildlife or how that use varies seasonally. We conducted weekly surveys during a 5-year period to document seasonal, annual, and habitat influences on the avian community of a 10.5-ha agricultural impoundment in southwest Florida. The impoundment included a mix of wetland and upland cover types typical of impoundments in the region. We recorded approximately 113 of the 229 potential native resident and migratory avifouna known to occur in the region, including 5 species of state or federally listed wading birds. Of the 85 species documented, 65% nested in southwest Florida, many of which were augmented by winter migrants. The avian assemblage was relatively evenly distributed and 5 of the 7 defined guilds were represented among the 8 most abundant species. Wetland cover types attracted the most species and birds, many of the most abundant of which

were species known to use wetlands with relatively dense vegetation. Seasonal effects associated with changing wetland conditions and migratory species were principal factors influencing changes in the bird community. Numbers of species and birds were inversely related to the rainy summer months and positively associated with improved foraging conditions created by seasonal changes in water level. Annual effects were less important but species and numbers of birds declined during the year of lowest annual rainfall Southwest Florida has thousands of hectares devoted to agricultural impoundments, the collective contribution of which may be extremely important for conservation of regional and migratory bird populations, yet almost nothing is known about the value of these habitats in working landscapes or how best to manage them for wildlife.

2231. **Seasonal variation in waterfowl nesting success and its relation to cover management in the Canadian prairies.**
Emery, R. B.; Howerter, D. W.; Armstrong, L. M.; Anderson, M. G.; Devries, J. H.; and Joynt, B. L.
Journal of Wildlife Management 69(3): 1181-1193. (2005)
NAL Call #: 410 J827; ISSN: 0022541X.
Notes: doi: 10.2193/0022-541X(2005)069[1181:SVIWNS]2.0.CO;2.
Descriptors: Cover management/ Initiation date/ mallard/ nesting success/ planted cover/ Prairie Pothole Region/ seasonal variation/ waterfowl/ habitat management/ nesting success/ seasonal variation/ vegetation cover/ waterfowl/ wildlife management/ Canada/ North America/ Anas/ Anas platyrhynchos/ Anatidae
Abstract: Early hatched waterfowl are more likely to enter the breeding population. Managers' primary tool to increase nesting success in the Prairie Pothole Region (PPR) of North America is managing upland vegetation for duck nesting cover. To determine whether managed covertypes affect early-season nesting success, we modeled seasonal variation in nesting success using >17,000 duck nests found in managed and unmanaged covertypes in prairie Canada from 1993 to 2000. Nesting success was higher in most managed covertypes than in unmanaged covertypes early in the nesting season. Planted cover appeared to be the best managed covertype for increasing early-season nesting success as it had high early-season nesting success, and was selected by nesting ducks in greater proportion than its availability; however, nesting success in planted cover declined later in the nesting season while nesting success in most unmanaged covertypes increased. Nevertheless, even with reduced nesting success late in the season, planted cover was more productive than surrounding unmanaged covertypes. Future waterfowl management efforts should focus on providing safe nesting cover early in the nesting season.

2232. **Selection of flooded agricultural fields and other landscapes by female northern pintails wintering in Tulare Basin, California.**
Fleskes, J. P.; Jarvis, R. L.; and Gilmer, D. S.
Wildlife Society Bulletin 31(3): 793-803. (2003)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: environment-ecology/ Anas acuta/ California/ habitat selection/ northern pintail/ San Joaquin Valley/ Tulare Basin/ San Joaquin Valley/ habitat use/ Sacramento Valley/ feeding ecology/ waterfowl/ ducks/ shorebirds/ movements/ wetlands
Abstract: Habitat selection and use are measures of relative importance of habitats to wildlife and necessary information for effective wildlife conservation. To measure the relative importance of flooded agricultural fields and other landscapes to northern pintails (Anas acuta) wintering in Tulare Basin (TB), California, we radiotagged female pintails during late August-early October, 1991-1993 in TB and other San Joaquin Valley areas and determined use and selection of these TB landscapes through March each year. Availability of landscape and field types in TB changed within and among years. Pintail use and selection (based upon use-to-availability log ratios) of landscape and field types differed among seasons, years, and diel periods. Fields flooded after harvest and before planting (i.e., pre-irrigated) were the most available, used, and selected landscape type before the hunting season (Prehunt). Safflower was the most available, used, and-except in 1993, when pre-irrigated fallow was available-selected pre-irrigated field type during Prehunt. Pre-irrigated barley-wheat received 19-22% of use before hunting season, but selection varied greatly among years and diel periods. During and after hunting season, managed marsh was the most available, used, and, along with floodwater areas, selected landscape type; pre-irrigated cotton and alfalfa were the least selected field types and accounted for less than or equal to13% of pintail use. Agricultural drainwater evaporation ponds, sewage treatment ponds, and reservoirs accounted for 42-48% of flooded landscape available but were little used and least selected. Exodus of pintails from TB coincided with drying of pre-irrigated fallow, safflower, and barley-wheat fields early in winter, indicating that preferred habitats were lacking in TB during late winter. Agriculture conservation programs could improve TB for pintails by increasing flooding of fallow and harvested safflower and grain fields. Conservation of remaining wetlands should concentrate on increasing the amount and productivity of marsh that is shallow-flooded as pre-irrigated grain fields dry. If pintails were provided with adequate preferred field and marsh habitats, including hunt-day sanctuaries, contaminant risks associated with exposure to drainwater evaporation ponds probably should remain low for these waterfowl even if their abundance in TB increased.

2233. **Setting restoration goals for disturbed Great Lakes island ecosystems: Policy considerations after you've got the data.**
Flaspohler, D. J. and Hurley, P. M.
In: 47th International Association for Great Lakes Research Conference; Vol. 2004.; pp. 44; 2004.
Notes: Location: South African Institute for Aquatic Biodiversity (SAIAB), (Formerly JLB Smith Institute of Ichthyology), Pvt Bag 1015, Grahamstown, 6140, South Africa.
Descriptors: anthropogenic alterations/ anthropogenic factors/ ecosystem approach/ ecosystem health/ forest habitat/ Great Lakes/ habitat management/ habitat restoration/ policy/ management/ forest environments/ conservation/ rivers/ lakes/ anthropogenic impact/ freshwater environments/ North America

Abstract: Restoration and maintenance of native forest biodiversity on Great Lakes islands requires an understanding of past ecosystem condition including measures of anthropogenic disturbance. To aid restoration and management of Sleeping Bear Dunes National Lakeshore (Michigan, USA we compared patterns of forest woody and herbaceous plant species composition on two islands in northern Lake Michigan, one with no history of white-tailed deer (South Manitou Island [SMI]), and the other with historically (but not currently) high densities of human-introduced deer (North Manitou Island [NMI]). We also compared current to pre-European forest conditions using 19th century survey data, and data collected in 2002. Current forest composition differs substantially from the historic condition. Also, recovery from a period of deer overabundance and excessive browse during the 1970s and early 1980s has progressed at a slow pace, if at all. For example, Canada yew is functionally extirpated, and forest herbs are either absent or far less abundant on NMI than SMI. We believe that active intervention will be necessary for the restoration of certain biodiversity elements. We discuss the conservation and policy issues related to our findings with a particular emphasis on the unique vulnerability of Great Lakes islands to ecological disturbance.

2234. **Short duration grazing and duck nesting: A case history.**
Evrard, J. O.; Wisconsin Department of Natural Resources; PUB-SS-745 2000, 2000.
Notes: Research Management Findings 45, published Oct 2000 by the Bureau of Integrated Science Services, Wisconsin Department of Natural Resources.
http://www.dnr.state.wi.us/org/es/science/publications/PUBL_RS_745_00.pdf
Descriptors: Bos taurus/ Anatinae/ ducks/ cattle/ habitat management/ prairie/ landscape management/ Wisconsin

2235. **Short-term effects of timber harvest on abundance, territory characteristics, and pairing success of ovenbirds in riparian buffer strips.**
Lambert, J. Daniel and Hannon, Susan J.
Auk 117(3): 687-698. (2000)
NAL Call #: 413.8 AU4; ISSN: 0004-8038
Descriptors: commercial activities/ reproduction/ reproductive behavior/ behavior/ ecology/ population dynamics/ terrestrial habitat/ land and freshwater zones/ Canada/ Seiurus aurocapillus (Parulidae): forestry/ timber harvesting/ abundance/ riparian forest/ pair formation/ pairing success/ territoriality/ territory characteristics/ population density/ forest and woodland/ riparian buffer strips/ riparian habitat/ forest buffer strips/ Alberta/ Parulidae/ Passeriformes, Aves/ birds/ chordates/ vertebrates

2236. **The shortgrass prairie.**
Gillihan, Scott W. and Carter, Michael F.
Birding 33(6): 546-551. (2001); ISSN: 0161-1836
Descriptors: adaptation/ agricultural practices/ birds/ conservation/ Conservation Reserve Program/ ecosystems/ grazing/ habitat alterations/ mammals/ neotropical migrants/ playas/ prairies/ riparian habitat/ semi-arid habitat/ wetlands/ wildlife-habitat relationships
Abstract: The shortgrass prairie is at the western edge of the North American grasslands, beginning just east of the Rocky Mountains. The birds living in this region and adapted to the semi-arid climate, include raptors that use cattle and bison bones for nest material, burrowing owls, and sparrows that sing in flight. The Rocky Mountains, which take moisture from Pacific storm-fronts, are responsible for the dry climate of the prairie. The topography, the diverse vegetation, and the climate present on the prairies are described in the article. Livestock and prairie dog grazing plays an important role in the mosaic nature of the prairie. The various habitat types present here are grasslands, lowland riparian areas, wetlands, sand sage prairie, and playa lakes. About 70% of the shortgrass prairie is privately owned, with the remainder being under the jurisdiction of the states and the federal government. The major conservation issues in the shortgrass prairie are habitat loss and habitat alteration. Due to lack of proper irrigation, most of the area is in grassland form only. The current focus of conservation is on the decline of Neotropical migrant bird species, which makes protecting grasslands the highest bird conservation priority. The conservation of shortgrass prairie is under the control of the North American Bird Conservation Initiative (NABCI). The details of the various organizations involved in the prairie conservation and their modes of functioning are discussed in the article.

2237. **Shrub regrowth, antiherbivore defenses, and nutritional value following fire.**
Schindler, J. R.; Fulbright, T. E; and Forbes, T. D. A.
Journal of Range Management 57(2): 178-186. (2004)
NAL Call #: 60.18 J82 ; ISSN: 0022-409X
Descriptors: chemical composition/ controlled burning/ crude protein/ defence/ fibre content/ grassland management/ grasslands/ mowing/ nutrient content/ nutritive value/ palatability/ plant composition/ plant height/ protein digestibility/ sprouts/ tannins/ Acacia rigidula/ Celtis pallida/ Odocoileus virginianus/ Prosopis glandulosa
Abstract: Prescribed fire is a commonly used as a follow-up procedure to mechanical top growth removal methods such as mowing and roller chopping, but the effects of fire on spinescence and tannin content of shrub sprouts produced after mechanical top growth removal are unknown. Following mowing, (1) height, spinescence, and tannin content in sprouts produced after burning; (2) nutrient and fibre contents in sprouts of the 3 study species; and (3) utilization of sprouts of each species in burned and unburned plots were determined in each of blackbrush acacia (Acacia rigidula), honey mesquite (Prosopis glandulosa), and spiny hackberry (Celtis pallida). The study was located in Rob and Bessie Welder Wildlife Refuge in Texas, USA. Averaged across sampling periods, burned blackbrush acacia and honey mesquite had 54% and 94%, respectively, shorter thorns than unburned plants. Burned and unburned spiny hackberry plants had similar thorn lengths. Averaged across species, sprouts of burned plants had similar tannin levels as unburned plants 6 and 12 weeks after burning. Sprouts of burned blackbrush acacia had higher levels of tannin than sprouts of unburned plants 34 weeks after burning. Leaf material from sprouts of burned spiny hackberry plants had higher crude protein and digestible protein than leaf material from unburned plants.

Blackbrush acacia sprouts in burned plots contained lower digestible dry matter and digestible energy than plants in unburned plots. Honey mesquite sprouts in burned plots contained higher digestible dry matter and digestible energy than plants in unburned plots. Burning appears to be a desirable follow-up treatment to mowing because it temporarily increases nutritional value of shrub sprouts, decreases physical defenses, and suppresses growth of shrub species that have low palatability to white-tailed deer.

2238. **Site accessibility and prioritization of nature reserves.**
Onal, H. and Yanprechaset, P.
Ecological Economics 60(4): 763-773. (2007)
NAL Call #: QH540.E26 ; ISSN: 09218009.
Notes: doi: 10.1016/j.ecolecon.2006.01.011.
Descriptors: Conservation reserve/ Integer programming/ site accessibility/ species representation
Abstract: Nature reserves not only protect habitat-stressed species but also provide recreation and welfare services to people. Therefore, site accessibility matters in reserve design. This study incorporates public accessibility, determined by urban populations and distances between urban areas and reserve sites, as an additional factor in conservation reserve design besides species representation and economic characteristics of individual sites. An optimization approach is introduced to determine a reserve network with maximum accessibility while satisfying specified representation targets under financial constraints. The paper also presents an empirical application of this approach to endangered/threatened birds in Illinois, USA, and analyzes the tradeoffs between ecological, economic, and social objectives of biological conservation. The results show that: i) the conventional minimal representation approach would result in a small reserve network, but this network would have poor accessibility; ii) public accessibility can be improved significantly by selecting alternative sites with the same amount of conservation budget; iii) further improvement in accessibility can be achieved by enlarging the network, but in this particular case the gains would be insignificant after the first few additional sites; and iv) a regionally integrated conservation plan, as opposed to decentralized conservation efforts, is beneficial for both species protection and social welfare.

2239. **Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: Broad-scale trends and management implications, Volume 1: Overview.**
Wisdom, M. J.; Holthausen, R. S.; Wales, B. C.; Hargis, C. D.; Saab, V. A.; Lee, D. C.; Hann, W. J.; Rich, T. D.; Rowland, M. M.; Murphy, W. J.; and Eames, M. R. Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture; General
Technical Report-PNW 485, 2000. 156 p.
Notes: 00929654 (ISSN).
Descriptors: cluster analysis/ conservation/ forest management/ habitat/ habitat condition/ habitat management/ habitat trend/ Interior Columbia Basin/ Interior Columbia Basin Ecosystem Management Project/ landscape analysis/ landscape ecology/ monitoring/ population viability/ rangeland management/ restoration/ sink environment/ source/ source environment/ source habitat/ source habitats/ spatial analysis/ species groups/ species of focus/ terrestrial vertebrates/ validation research/ viability/ wildlife/ wildlife-habitat relations/ conservation management/ ecosystem management/ habitat management/ habitat quality/ landscape ecology/ source-sink dynamics/ vertebrate/ United States
Abstract: We defined habitat requirements (source habitats) and assessed trends in these habitats for 91 species of terrestrial vertebrates on 58 million ha (145 million acres) of public and private lands within the interior Columbia basin (hereafter referred to as the basin). We also summarized knowledge about species-road relations for each species and mapped source habitats in relation to road densities for four species of terrestrial carnivores. Our assessment was conducted as part of the Interior Columbia Basin Ecosystem Management Project (ICBEMP), a multiresource, multidisciplinary effort by the USDA Forest Service (FS) and the USDI Bureau of Land Management (BLM) to develop an ecosystem-based strategy for managing FS and BLM lands within the basin. Our results indicated that habitats for species, groups, and families associated with old-forest structural stages, with native grasslands, or with native shrublands have undergone strong, widespread decline. Implications of these results for managing old-forest structural stages include consideration of (1) conservation of habitats in sub-basins and watersheds where decline in old forests has been strongest; (2) silvicultural manipulations of mid-seral forests to accelerate development of late-seral stages; and (3) long-term silvicultural manipulations and long-term accommodation of fire and other disturbance regimes in all forested structural stages to hasten development and improvement in the amount, quality, and distribution of old-forest stages. Implications of our results for managing rangelands include the potential to (1) conserve native grasslands and shrublands that have not undergone large-scale reduction in composition of native plants; (2) control or eradicate exotic plants on native grasslands and shrublands where invasion potential or spread of exotics is highest; and (3) restore native plant communities by using intensive range practices where potential for restoration is highest. Our analysis also indicated that >70 percent of the 91 species are affected negatively by one or more factors associated with roads. Moreover, maps of the abundance of source habitats in relation to classes of road density suggested that road-associated factors hypothetically may reduce the potential to support persistent populations of terrestrial carnivores in many subbasins. Management implications of our summarized road effects include the potential to mitigate a diverse set of negative factors associated with roads. Comprehensive mitigation of road-associated factors would require a substantial reduction in the density of existing roads as well as effective control of road access in relation to management of livestock, timber, recreation, hunting, trapping, mineral development, and other human activities. A major assumption of our work was that validation research will be conducted by agency scientists and other researchers to corroborate our findings. As a preliminary step in the process of validation, we found high agreement between trends in source habitats and prior trends in habitat outcomes that were estimated as part of the habitat outcome analysis for terrestrial species within the basin. Results of our assessment also were assumed to

lead to finer scale evaluations of habitats for some species, groups, or families as part of implementation procedures. Implementation procedures are necessary to relate our findings to local conditions; this would enable managers to effectively apply local conservation and restoration practices to support broad-scale conservation and restoration strategies that may evolve from our findings.

2240. **Southeastern Arizona Turkey Management Plan.**
Heffelfinger, J.; Wakeling, B.; MIllican, J.; Stone, S.; Skinner, T.; Fredlake, M.; and Adkins, M.
Phoenix, AZ: Arizona Game and Fish Department, 2000. 25 p.
Notes: Project Number: AZ W-053-M.
http://www.azgfd.gov/pdfs/h_f/management/SoutheasternArizonaWildTurke%20ManagementPlan.pdf
Descriptors: burning/ control/ cutting/ diet, artificial/ fertilization, soil and water/ fire/ grazing/ habitat management for wildlife/ harvests/ history/ mast/ planning, strategic/ planting/ population distribution/ predators/ seedlings/ stocking-transplanting/ surveys/ turkeys/ water/ wildlife management/ Arizona/ Huachuca Mountains
Abstract: The purpose of this plan is to provide guidance to agencies and organizations involved in the conservation and management of turkeys and their habitat. Strategies are listed for various management actions which are based on research or management experience. Insufficient information at this time precludes a more detailed implementation schedule with specific projects and funding needs. The information and strategies contained in this plan should help guide the development of such specific actions. Specific projects are already being planned and will be funded and implemented on an individual basis.

2241. **Species diversity, richness, and evenness of ground beetles in wheat fields and adjacent grasslands and riparian zones.**
French, B. Wade and Elliott, Norman C.
Southwestern Entomologist 26(4): 315-324. (2001); ISSN: 0147-1724
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ man-made habitat/ land and freshwater zones/ Carabidae: farming and agriculture/ habitat management/ community structure/ grassland/ grasslands adjacent to wheat fields/ riparian habitat/ riparian zones adjacent to wheat fields/ cultivated land habitat/ wheat fields/ Oklahoma/ Stillwater/ Carabidae/ Caraboidea, Adephaga, Coleoptera, Insecta/ arthropods/ coleopterans beetles/ insects/ invertebrates
Abstract: Natural habitats adjacent to or near agricultural fields harbor a variety of beneficial arthropods that assist in pest control. Ground beetles are polyphagous predators of various agricultural pests and often colonize cereal fields from adjacent habitats. Our objective was to measure the richness, diversity, and evenness of ground beetles in the interiors and boundaries of winter wheat fields and adjacent grasslands and riparian zones, and suggest strategies for managing carabid diversity and abundance in agricultural landscapes. We used pitfall traps to study ground beetles in winter wheat fields and in adjacent riparian zones and grasslands from 1993 through 1997 in north-central Oklahoma. During autumn, winter, and spring, species richness, evenness, and diversity were generally higher in the natural habitat interiors and the edges than in the interiors of wheat fields. We suggest adding grassy strips to wheat fields and extending the saum (zone of perennial herbs and grasses) adjacent to wooded riparian habitats to supplement numbers and diversity of ground beetles in the agricultural landscape.

2242. **Species richness and nesting success of neotropical migrants in natural and anthropogenic woodlands.**
Gentry, Dale J. and Swanson, David L.
South Dakota Academy of Science: Proceedings 80: 361. (2001)
NAL Call #: 500 SO82; ISSN: 0096-378X
Descriptors: woodlots/ nesting habitats/ Great Plains/ birds/ predation/ nesting success/ coastal habitat/ neotropical migrants/ rivers/ shelterbelts/ fragmented habitats
Abstract: Historic woodland nesting habitat for Neotropical migrant songbirds in the Northern Great Plains consists primarily of riparian habitat surrounding streams and rivers. These deciduous woodlands have become narrower as trees were cleared to make the land available for agriculture. Since then, new habitats for woodland nesting birds have arisen in the form of anthropogenic woodlots and shelterbelts. A decreased nesting success is associated with isolated and fragmented habitats due to increased rates of both nest predation by mammalian and avian predators, and brood parasitism by Brown-headed Cowbirds at forest edges. We compared nesting success in the two habitats to determine if Neotropical migrants are more successful nesting in reduced natural habitats or in anthropogenic woodlots. We also determined density and relative abundance of breeding birds with point counts four times during the summer. A total of 46 nests were found. Calculation of Mayfield nesting success on the nests in each habitat resulted in higher nesting success in the anthropogenic woodlands (0.543) than in the riparian areas (0.249) although we were not able to compare them statistically due to low sample size. Density and relative abundance were compared between habitats with an ANOVA and no significant differences were detected. These results represent only one field season, two more are planned before final results will be determined.

2243. **Spiders in decomposition food webs of agroecosystems: Theory and evidence.**
Wise, D. H.; Snyder, W. E.; Tuntibunpakul, P.; and Halaj, J.
Journal of Arachnology 27(1): 363-370. (1999)
NAL Call #: QL451.J6 ; ISSN: 0161-8202.
Notes: Literature review.
Descriptors: decomposition/ conservation tillage/ grazing/ mineralization/ nutrients/ pastures/ predation/ predators/ prey/ productivity/ subsidies/ tillage/ ecology/ Araneae/ arthropods/ Arachnida/ invertebrates/ animals
Abstract: The involvement of spiders in decomposition food webs has the potential to affect agricultural productivity through two quite different types of interactions (1) cascading, top-down effects of spider predation on rates of nutrient mineralization - spider- initiated trophic cascades in the detrital food web that could alter rates of decomposition and release of nutrients to plants, and (2) a bottom-up linkage, through spiders, between decomposition and grazing food webs - energy from the detrital web

contributing to elevated spider densities, which in turn might reduce pests and enhance net primary production. Scant experimental evidence exists to refute or support either hypothesis. The first set of interactions is most likely to be of significance in no-till and conservation tillage farming. In theory, spiders have the potential to enhance productivity by increasing rates of mineralization, but theory also predicts that spiders, by preying on important detritivores and fungivorus, depress rates of litter decomposition. Field experiments by Kajak et al. have uncovered such negative effects of spiders in mown pastures. Although this negative effect could reduce plant growth, the expected time lags in most types of crops suggest that the overall impact of spiders on plant production will be determined more by the interactions comprising the second hypothesis. However, the later hypothesis, that bottom-up control processes in the decomposition web affect crop productivity via energy subsidies to spiders and other generalist predators in the grazing web, remains conjecture without clear experimental confirmation. This hypothesis should be tested in agroecosystems in which detritus-based food webs can feasibly be manipulated.

2244. **Stop! Look! And listen!**
Clawson, Rick
Missouri Conservationist 64(3): 23-27. (2003);
ISSN: 0026-6515.
http://mdc.mo.gov/conmag/2003/03/50.htm
Descriptors: birds/ census-survey methods/ communities/ conservation/ ecosystems/ habitat alterations/ habitat management/ reserves/ refuges/ parks/ techniques/ wildlife-habitat relationships/ eastern meadowlark/ dickcissel/ gray catbird/ common yellowbird/ cardinal/ rufous-sided towhee/ yellow-billed cuckoo/ eastern wood-pewee/ blue-gray gnatcatcher/ summer tanager/ rose-breasted grosbeak/ great crested flycatcher/ Kentucky warbler/ bobwhite quai/ mourning dove/ Missouri
Abstract: Ever since the incorporation of Whetstone Creek Conservation Area, Missouri, in 1977, several conservation department managers have strived to alter the landscape using a variety of land management practices so as to attract a range of wildlife including songbirds. Recent practices include controlled burning, grazing, haying, and grain planting in the open lands, and timber cutting and thinning in the forestlands. These changes in habitat result in changes in the array and population of birds as diverse birds need diverse habitat for survival. The Breeding Bird Survey, conducted by driving on roads and recording the number of birds seen or heard, is an effective instrument to examine the changes. One such survey was done in June 2002. The population of grasshopper sparrows had declined as the required habitat of sparse grassland was missing. Despite the presence of dense tall grassland, a perfect environment for Henslow's sparrow, their numbers are expected to be only one or two. The past trends showed their absence despite a conducive environment. Contrary to the past figures the numbers of mourning doves have declined. The bobwhite quail figure has increased, confirming results of previous surveys. Red-winged blackbirds adapt to a variety of habitats and thus the change in the landscape has not reduced their numbers. The habitats of other birds like yellow-breasted chats, indigo buntings, and field sparrows have increased due to natural and deliberate insertion of fencerows and field borders. Although this form of survey has its limitations and thus should be used in conjunction with other measures, the results strengthened the belief that changes in habitat does influence the composition and number of birds.

2245. **Stream buffer effectiveness: Macroinvertebrate and salamander species as bioindicators of ecosystem stress, Coastal Plain, Georgia.**
Muenz, Tara K.; Golladay, Stephen W.; and Vellidis, George
Ecological Society of America Annual Meeting, Proceedings 87(2002)
NAL Call #: QH540.E365.
Notes: 87th Annual Meeting of the Ecological Society of America and the 14th Annual International Conference of the Society for Ecological Restoration, Tucson, Arizona, USA; August 04-09, 2002.
Descriptors: conservation/ freshwater ecology: ecology, environmental sciences/ best management practices/ BMPs/ agricultural impacts/ ecosystem stress/ ground water systems/ stream buffer/ water quality

2246. **Summary of national standards and guidelines for pesticides in water, bed sediment, and aquatic organisms and their application to water-quality assessments.**
Nowell, Lisa H.; Resek, Elizabeth A.; Geological Survey (U.S.); and United States. Environmental Protection Agency.
Sacramento, Calif.: U.S. Geological Survey; vi, 115 p.: ill.; Series: U.S. Geological Survey open-file report 94-44. (1994).
Notes: Open-File Report 94-44; Spine title: National standards and guidelines for pesticides in water, bed sediment, and aquatic organisms. Includes bibliographical references (p. 48-51).
NAL Call #: SB970.4.U6N69 1994
Descriptors: Pesticides---Government policy---United States/ Pesticides---Law and legislation---United States/ Pesticides---Environmental aspects---United States/ Water---United States---Pesticide content
This citation is from AGRICOLA.

2247. **A survey of research on riparian responses to silviculture.**
Cunningham, Patrick G.
In: Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Initiative workshop, General Technical Report PNW 563/ Johnson, Adelaide C.; Haynes, Richard W.; and Monserud, Robert A., eds.; Portland, OR: Pacific Northwest Research Station, Forest Service, U.S. Department of Agriculture, 2002. pp. 73-79.
http://www.fs.fed.us/pnw/pubs/gtr563/gtr563a.pdf
Descriptors: conservation/ forestry/ terrestrial ecology: ecology, environmental sciences/ riparian management/ applied and field techniques/ upslope forest stand management/ applied and field techniques/ aquatic conservation strategy/ Bureau of Land Management/ Northwest Forest Plan/ density management studies/ observational studies/ riparian processes/ riparian area processes/ riparian buffer studies/ riparian related questions/ silviculture: riparian responses/ upslope

management activities: riparian system impacts/ vegetation
Abstract: Some of the most critical issues that federal land managers and researchers are facing in the Pacific Northwest are centered around riparian processes and management, and how upslope management activities affect riparian systems. Researchers are developing a literature on riparian-related questions dominated by observational studies of riparian-area processes, vegetation, and wildlife species. Some experiments were conducted, and more are on the way. Issues that led to the development of the Northwest Forest Plan motivated many of these past and present studies. Very few of these studies, however, have examined the relation between upslope forest stand management and its effects on riparian ecosystems. The Bureau of Land Management density-management and riparian-buffer studies are among the few exceptions to this development. Some questions are emerging from this and other work that, when addressed, will help researchers and managers better understand the interactions between upslope forest management and riparian ecosystems.

2248. **Survey of state programs for habitat, hunting, and nongame management on private lands in the United States.**
Benson, D. E.
Wildlife Society Bulletin 29(1): 354-358. (2001)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: access/ fee-hunting/ habitat management/ hunting/ leasing/ nonconsumptive use/ nongame management/ stewardship/ wildlife enterprises/ habitat management/ private land/ wildlife management/ United States
Abstract: I conducted a study of state wildlife agency administrators to document access, leasing, and management programs of state wildlife agencies that assist hunted and nonhunted wildlife and recreation management on private lands. The study serves as a comparison with surveys about access and management programs on private lands that were conducted about 15 years earlier by other authors. Administrators (96%) believed that access to private land was important for their organizations' objectives. Access opportunities for hunting had decreased (45%) and leasing of lands for hunting had increased (69.4%) over the past 15 years. Demands for access to view wildlife on private lands were minor (66%). Habitat management on private lands that were leased either increased (39%), remained the same (39%), or was unknown (22%). Habitat management on lands that were not leased was believed to have increased (42%), stayed the same (42%), or was unknown (16%). The 4 most important management practices suggested for landowners who are considering wildlife, habitat, and hunting on their lands were habitat practices (69%), access and hunter management (12%), planning and enterprise management (11%), and animal population management (8%). More cooperation, empowerment of landowners, technical support, educational assistance, and funding were identified goals for public wildlife agencies and private landowners to effect proper management of all wildlife, habitats, and users on private lands.

2249. **Terrestrial movements of juvenile and adult tailed frogs in relation to timber harvest in coastal British Columbia.**
Wahbe, Tanya R.; Bunnell, Fred L.; and Bury, R. Bruce
Canadian Journal of Forest Research 34(12): 2455-2466. (2004)
NAL Call #: SD13.C35; ISSN: 0045-5067
Descriptors: Anura/ Leiopelmatidae/ Lissamphibia/ Ascaphus truei/ timber harvest/ clearcutting/ forestry practices/ wildlife habitat/ habitat use/ tailed frog/ Pacific Northwest/ North America
Abstract: Tailed frog (Ascaphus truei Stejneger) populations are at risk in much of the Pacific Northwest, and recolonization of sites may be slow postlogging. To examine the terrestrial movements of Ascaphus in clearcuts and old growth, we employed pitfall traps and drift-fence arrays installed along streams and 100 m into upland habitat. In the fall, we captured frogs farther from streams in old growth than in clearcuts, and more frogs were captured ≤ 25 m from streams in clearcuts. Stronger stream affinity in clearcuts was most evident with juvenile frogs, which exhibited more upstream movements than adults. Compared with inland sites where frogs remained close to streams (e.g., 12 m), frogs at our coastal sites were captured at greater distances from streams (≥100 m), having lower stream affinity than frogs at inland sites. Long-distance overland movements appear more likely where forested stands are present. Aggregations of Ascaphus at individual streams may not represent distinct populations and should not be managed as distinct units. Preserving groups of interconnected streams within watersheds instead of individual streams will improve the conservation status of Ascaphus. Population monitoring can ensure conservation measures promote long-term persistence.

2250. **Threatened and endangered species on U.S. Department of Defense lands in the arid west, USA.**
Tazik, D. J. and Martin, C. O.
Arid Land Research and Management 16(3): 259-276. (2002); ISSN: 15324982.
Notes: doi: 10.1080/153249802760284801.
Descriptors: desert wildlife/ land management/ military lands/ species conservation/ arid region/ endangered species/ habitat loss/ land management/ United States/ riparia
Abstract: Department of Defense (DOD) lands in the arid western United States provide important habitat for many threatened and endangered species (TES). We explore the status of these species and evaluate threats to their survival and recovery. Thirty-two military sites located in the Chihuahuan, Sonoran, Mojave, and Great Basin deserts collectively support 34 listed and candidate species and one delisted species. We assess the relationship between the status of these species and land degradation by categorizing species according to major habitat type and enumerating the major threats to their survival and recovery. Habitat loss and degradation due to increasing human activities throughout the region are the most significant factors is affecting these species. Urban and suburban development, agricultural conversion, and overgrazing are most important among Arid Grassland/Desert Scrub species, while hydrologic alternation is notable among Riparian and Aquatic species. Nonnative species impact TES through habitat modification,

as well as direct predation and competion. Specific conservation issues are discussed for selected species. While military disturbances have the potential to impact many of these species, poor watershed management practices of the past and the influx of humans are primarily responsible for the current status of TES and the ecosystems upon which they depend. Their continued survival and recovery requires coordinated conservation activities at the regional level.

2251. **Two species in one ecosystem: Management of northern bobwhite and red-cockaded woodpecker in the Red Hills.**
Engstrom R. T. and Palmer W. E.
In: Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference, General Technical Report-PSW 191/ Ralph, C. J. and Rich, T. D.; Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 2005. pp. 1151-1157.
Notes: Volume 2; Responsibility: Pacific Southwest Research Station; U.S. Forest Service General Technical Report series; ISSN: 0196-2094; Bird Conservation Implementation and Integration in the Americas: Third International Partners in Flight conference held 2002 March 20-24 in Asilomar, California.
http://www.fs.fed.us/psw/publications/documents/psw_gtr191/Asilomar/pdfs/1151-1157.pdf
Descriptors: Colinus virginianus/ bobwhite/ theory-model/ ecological requirements/ habitat/ forest/ habitat management/ landscape management/ Florida/ Georgia
Abstract: Sport hunting for Northern Bobwhites (Colinus virginianus) is the reason that approximately 300,000 acres of semi-wild lands still exist in the Red Hills region of north Florida and south Georgia. Use of fire for management and relatively large (400 to 4,000 ha), contiguous land ownerships permitted populations of bobwhite and Red-cockaded Woodpecker (Picoides borealis) to persist in the Red Hills as regional populations of these two species declined precipitously. Three factors play important roles in the habitat shared by these species: canopy cover, canopy tree species composition, and ground cover composition. These factors affect quality of fuel, which influences the occurrence of fire (ecological stability) and the costs of land management (economic stability). We used simple habitat models for these species to examine tradeoffs that optimize habitat conditions for each species. Maintaining conditions that enable healthy populations of both species to co-exist into the 21st century will require innovative management tools, including habitat restoration, and serious interest in conservation within the community of landowners.

2252. **Upland game species use of no-till corn sites harvested by steers in a pasture and agroforestry setting in east central Mississippi.**
Manning, Dawn Holland. Miss. State University, 2006.
Notes: Advisor: Boyd, Michael E.
Descriptors: game species/ no-tillage/ corn/ harvesting/ livestock/ pastures/ Mississippi/ mourning dove/ Zenaida macroura/ white-tailed deer/ Odocoileus virginianus/ eastern wild turkey/ Meleagris gallopavo silvestris/ northern bobwhite quail/ Colinus virginianus/ wildlife/ nutrition
Abstract: Due to vegetation conditions and waste grain availability, steers harvesting corn planted using no-till technology may attract numerous wildlife species. Using this technique in a pasture or agroforestry setting creates desirable open foraging habitat providing: grain, soft mast, and grass seeds available during and after steer harvesting. the objective was to evaluate the utilization of corn fields harvested by steers on Mourning Dove (Zenaida macroura), White-tailed Deer (Odocoileus virginianus), Eastern Wild Turkey (Meleagris gallopavo silvestris), and Northern Bobwhite Quail (Colinus virginianus) numbers. in Study I, 2 steer harvested sites (SHS) and 2 conventionally harvested sites (CHS) were monitored measuring Mourning dove use. Study II incorporated agroforestry techniques comparing: steer harvested plots (SHP), unmanaged pine plots (UPP), and thinned pine plots (TPP) contained on 2 different sites. Mourning dove numbers were significantly greater on SHS and SHP in both studies. No significant difference with respect to sites, but a significant difference with respect to treatments within sites was detected. Deer numbers were significantly greater on SHP. Steers grazing no-till corn attracted wildlife by creating desirable habitat, optimum foraging conditions, and a long-term food source (>6 months).

2253. **USDA conservation programs: A look at the record.**
Hansen, L. and Claassen, R.
Agricultural Outlook (AO) 284: 22-25. (2001)
NAL Call #: aHD1751.A422
Descriptors: agricultural sector/ conservation/ constraints/ environmental policy/ environmental protection/ erosion/ evaluation/ habitats/ soil conservation/ wetlands/ wildlife
Abstract: This paper reports on the findings of studies that examined the performance of USDA conservation programmes. These studies, in general, point to significant environmental benefits from soil conservation and wildlife restoration: soil erosion is down; wildlife habitat has improved; and wetlands are protected/restored. Remaining agri-environmental problems that have to be addressed are discussed.

2254. **Use of Maryland biological stream survey data to determine effects of agricultural riparian buffers on measures of biological stream health.**
Barker, Linda S.; Felton, Gary K.; and Russek Cohen, Estelle
Environmental Monitoring and Assessment 117(1-3): 1-19. (2006)
NAL Call #: TD194.E5; ISSN: 0167-6369
Descriptors: commercial activities/ conservation measures/ ecology/ freshwater habitat/ lotic water/ land zones/ comprehensive zoology: farming and agriculture/ agricultural riparian buffers/ Importance assessment/ use of stream ecology survey data/ habitat management/ community structure/ streams/ survey data use to assess importance of agricultural riparian buffers/ environmental indicators/ stream ecology/ stream/ ecology/ Maryland/ Coastal Plain and Piedmont regions
Abstract: This study was undertaken to determine the importance of riparian buffers to stream ecology in agricultural areas. The original Maryland Biological Stream Survey (MBSS) data set was partitioned to represent agricultural sites in Maryland's Coastal Plain and Piedmont regions. ANOVA, multiple linear regression (MLR), and

CART regression tree models were developed using riparian and site catchment landscape characteristics. MBSS data were both stratified by physiographic region and analyzed as a combined data set. All models indicated that land management at the site was not the controlling factor for fish IBIs (FIBI) at that site and, hence, using FIBI to evaluate site-scale factors would not be a prudent procedure. Measures of instream habitat and location in the stream network were the dominant explanatory factors for FIBI models. Both CART and MLR models indicated that forest buffers were influential on benthic IBIs (BIBI). Explanatory variables reflected instream conditions, adjacent landscape influence, and chemistry in the Coastal Plains sites, all of which are relatively site specific. However, for Piedmont sites, hydrologic factors were important, in addition to adjacent landscape influence, and chemistry. Both Coastal Plain and Piedmont CART models identified several hydrologic factors, emphasizing the dominant control of hydrology on the physical habitat index (PHI). Riparian buffers were a secondary influence on PHI in the Coastal Plain, but not in the Piedmont. Between 40% and 70% of the variation in FIBI, BIBI, and PHI was explained by the "easily obtainable" variables available from the MBSS data set. While these are empirical results specific to Maryland, the general findings are of use to other locations where the establishment of forest buffers is considered as an aquatic ecosystem restoration measure.

2255. **The use of riparian forest strips by small mammals in a boreal balsam fir forest.**
Darveau, Marcel; Labbe, Paul; Beauchesne, Patrick; Belanger, Louis; and Huot, Jean
Forest Ecology and Management 143(1-3): 95-104. (2001)
NAL Call #: SD1.F73; ISSN: 0378-1127
Descriptors: commercial activities/ conservation measures/ ecology/ terrestrial habitat/ land and freshwater zones/ Canada/ Mammalia: forestry/ riparian forest/ habitat management/ forestry practices/ habitat utilization/ forest and woodland/ riparian habitat/ habitat use/ Quebec/ Laurentian Mountains/ La Foret Montmorency/ Mammalia/ chordates/ mammals/ vertebrates
Abstract: Because riparian forest strips are perceived to buffer aquatic ecosystems from logging-related disturbance, they are usually not harvested. However, their value as refuges for terrestrial wildlife is unknown. We conducted two live-trapping experiments in the riparian zone adjacent to rivers in a boreal balsam fir (Abies balsamea) forest in Quebec. In the first experiment, we compared late summer use, during 4 separate years, of different width riparian strips (20, 40, 60 m, and control [>300 m wide]), and different stand thinning intensities (20 m intact and 20 m thinned of 1/3 of all trees) on resident small mammals. We found no differences in the densities of the most common species, Clethrionomys gapperi and Peromyscus maniculatus, among strip types or among years (P>0.05). We also tested for edge effects in large strips (60 m and controls). In controls, C. gapperi was less abundant in the first 20 m adjacent to the river (P=0.004) while P. maniculatus was more abundant (P=0.02) in that area. Neither species, however, showed an edge effect in the 60 m-strips (P>0.10). In the second experiment, we monitored small mammals over eight consecutive weeks in a 160 m [x] 170 m quadrat enclosing a 20 m-thinned forest strip and a clear-cut to investigate some aspects of the role of riparian strips at the landscape scale. During that time, Microtus pennsylvanicus, which was nearly absent from our study area in the previous years, invaded the clear-cuts and apparently confined C. gapperi and P. maniculatus to forest remnants such as 20 m-wide strips. A conclusion that emerges from this study and related studies on birds is that some species prefer larger strips or non-riparian habitats whereas others prefer narrow strips along riparian habitats. We recommend that managers ban the all-encompassing norms and manage for heterogeneity at different scales. Because our study was conducted at the stand scale and because it is not accompanied with an evaluation of the socio-economic aspects of riparian management, we cannot determine the proper mixture of strips in the landscape. However, our results could help managers to enhance the key-role of riparian ecosystems in maintaining regional biodiversity and contribute to the maintenance of local biodiversity by creating refuges for terrestrial wildlife.

2256. **Using adaptive management to meet conservation goals.**
Franklin, Thomas M.; Helinski, Ronald; and Manale, Andrew
In: Fish and Wildlife Response to Farm Bill Conservation Practices; Bethesda, MD: The Wildlife Society, 2007. 11 pp.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwfb8.pdf
Descriptors: aquatic habitat/ conservation practices/ terrestrial habitat/ wildlife species/ wildlife management
Abstract: This publication provides natural resource professionals with guidance on doing an effective job of managing natural resources. Their decision-making process should produce the kind of results desired by the public, elected officials, and their agencies' leadership. With billions of dollars spent each year on managing natural resources, accountability is more important than ever. Producing results is the key to success. Managers must have the necessary data to make enlightened decisions during program implementation -- not just at the conclusion of a program. Adaptive management is described as an adapt-and-learn methodology as it pertains to implementing Farm Bill conservation practices. Four regional case studies describe how adaptive management is being applied by practicing fish and wildlife managers. Indicators were identified to monitor and evaluate contributions to fish and wildlife habitat for each of the case studies. Data collected at each stage of the studies were used to make mid-course adjustments that enabled leadership to improve or enhance ongoing management actions.

2257. **Using an IBI to assess effectiveness of mitigation measures to replace loss of a wetland-stream ecosystem.**
Teels, B. M.; Mazanti, L. E.; and Rewa, C. A.
Wetlands 24(2): 375-384. (June 2004)
NAL Call #: QH75.A1W47
Descriptors: abundance/ aquatic habitat/ artificial wetlands/ baseline studies/ beavers/ biological surveys/ carnivores/ community composition/ construction/ dominant species/ ecosystem management/ ecosystems/ environmental monitoring/ fish populations/ habitats/ impoundments/ indigenous species/ lentic environment/ lotic environment/ man-induced effects/ monitoring/ natural resources/ reservoirs/ restoration/ species diversity/ standards/ streams/ surveys/ watersheds/ Etheostoma/ Virginia

Abstract: Approximately 7.3 hectares of wetlands, composed of six separate cells, were created to mitigate the loss of a 6-hectare, beaver-influenced, wetland-stream complex destroyed by the construction of a multi-purpose impoundment in the Cedar Run watershed in Fauquier County, Virginia, USA. The mitigation action physically replaced the lost wetlands and was judged successful in meeting planned objectives and regulatory requirements (which did not include standards for biota). A pre-project fish survey conducted in 1974 in the wetland-stream complex and three nearby streams provided a baseline condition from which to assess project impacts on fish, as determined from yearly surveys in the cells and the stream reach immediately upstream. In addition, fish communities were sampled at 157 stream locations within the northern Virginia Piedmont from 1997 to 1999 to establish a regional Index of Biotic Integrity (IBI) based on fish assemblages. A modification of that IBI was developed to assess the effectiveness of the mitigation based on 22 stream segments that were heavily influenced by beaver. Pre- and post-project conditions were assessed by gauging them against the wetland-stream complexes using this IBI. The IBI score for the mitigation area dropped from the pre-project 34 to 18 the first year after construction and ranged from 18 to 28 over the ten-year post-project monitoring period. A reduction in the number of native species was observed, and there was a dramatic shift in composition and relative abundance within key species groups. In general, the mitigation benefited species favoring lentic environments over those preferring lotic environments and had negative effects on trophic and habitat specialists and less tolerant species. Scores for the mitigation cells were lower than scores for the original wetlands for the following IBI metrics: number of darter species, number of minnow species, percent of the assemblage comprised of the single most dominant species, percent of tolerant individuals, percent of benthic invertivores, and percent of specialist carnivores minus tolerants. Upstream reach IBI scores also diminished over the same 10-year period, although more gradually. The IBI showed that, despite meeting all regulatory requirements, the mitigation failed to replace the original fish community in the wetland-stream complex and adversely impacted additional stream habitat. Using tools such as an IBI to monitor biological condition can help planners effectively mitigate unavoidable project impacts and avoid the unintended loss of important natural resources caused by compensatory mitigation actions.

2258. **Using economic and regulatory incentives to restore endangered species: Lessons learned from three new programs.**
Wilcove, D. S. and Lee, J.
Conservation Biology 18(3): 639-645. (2004)
NAL Call #: QH75.A1C5 ; ISSN: 08888892
Descriptors: conservation banking/ endangered species/ incentives/ private land/ safe harbor
Abstract: We studied three new incentive-based programs for restoring endangered species on private lands in the United States: safe harbor, Environmental Defense's Landowner Conservation Assistance Program, and conservation banking. For each program, we gathered data on the number of participating landowners, the number of species targeted for assistance, and the cumulative acreage of enrolled land. Measured in this way, both safe harbor and the Landowner Conservation Assistance Program have been remarkably successful Landowners are drawn to three aspects of these programs: (1) the removal of regulatory burdens associated with attracting endangered species to their property; (2) technical guidance on how to restore habitats for endangered species; and (3) cost-share assistance for habitat restoration. Technical guidance appears to be more important than either regulatory relief or financial assistance in securing the cooperation of some landowners. Assessing the success or failure of conservation banking proved more difficult, given the relatively small number of banks created to date and the lack of any centralized database on them. However, nearly half of the 47 endangered-species conservation banks we surveyed have sold credits, indicating some success in either acquiring or restoring essential habitats.

2259. **Using NatureServe information to assess conservation practice effects on at-risk species.**
Natural Resources Conservation Service Natural Resources Conservation Service, 2007. 5 pp.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/natureservesciencenote.pdf
Descriptors: conservation practices/ wildlife species/ geospatial models/ environmental impact/ aquatic species/ watersheds
Abstract: This publications provides a summary of the NatureServe pilot project to determine if existing datasets could be used to assess effects of conservation practices on at-risk species. Natural Heritage species-occurrence data and geospatial models for predicting species distribution hold promise for assessing the effects of conservation practices on at-risk species. Lack of comprehensive geospatial digital data on conservation practice application hinders quantification of practice effects on wildlife. If Missouri pilot project data can be shown to apply to practice-to-species relationships nationwide, 89 percent of conservation practices nationwide have positive, neutral, or mixed effects on most terrestrial wildlife and 79 percent have expected positive or neutral effects on most aquatic biota.

2260. **Using NatureServe information to assess Farm Bill practice effects on at-risk species and habitats.**
Comer, P.; Diamond, D.; Sowa, S.; Goodin, K.; Purcell, D.; Butler, D.; Cook, E.; Hamilton, C.; Hammerson, G.; Master, L.; Nigh, T.; Ormes, M.; True, D.; and White, B.
Arlington, VA: NatureServe, 2007. 94 p.
Notes: This study was funded by USDA Natural Resources Conservation Service under agreement # 68-3A75-5-146.
Descriptors: conservation practices/ environmental impact/ wildlife species/ wildlife habitat/ Farm Bill/ conservation impact
Abstract: NatureServe, in cooperation with USDA-NRCS, University of Missouri Resource Assessment Partnership (MoRAP) and Missouri Department of Conservation, completed a pilot research project to develop and evaluate methods for assessing benefits of conservation practices on at-risk wildlife species and habitats in Missouri. Our key objective was to utilize NatureServe data and other data sources to demonstrate processes that could both evaluate

the impacts of currently implemented conservation practices as well as help prioritize future Farm Bill program allocations.

2261. **The value of buffer zones for the conservation of biodiversity.**
Boatman, N. D.
In: Brighton Crop Protection Conference: Pests and Diseases, 1998: Proceedings of an International Conference. Brighton, UK; Vol. 3.
Farnham, UK: British Crop Protection Council; pp. 939-950; 1998.
Notes: Literature review.; ISBN: 0-901396-52-5
Descriptors: biodiversity/ availability/ agricultural land/ habitats/ nutrients/ pesticides/ pollution/ sediment/ aquatic environment/ environment/ agricultural entomology
Abstract: Buffer zones can give conservation benefits by reducing pollution of adjacent habitat, and by improving resource availability or habitat value within the buffer zone itself. The effect of pollution of aquatic and terrestrial non-crop habitats by sediments, nutrients and pesticides are reviewed, and the potential for additional benefits arising within buffer zones on farmland is considered, with particular reference to management prescriptions supported by the various Agri-Environment schemes.

2262. **The value of farm programs for providing winter cover and food for Minnesota pheasants.**
Haroldson, Kurt; Giudice, John; Kruege, Wendy; and Krueger, W.
In: Summaries of Wildlife Research Findings 2004/ Wingate, Paul J.; Kimmel, Richard O.; Lawrence, Jeffrey S.; and Lenarz, Mark S.
St. Paul, Minnesota: Department of Natural Resources Division of Fish and Wildlife, Wildlife Populations and Research Unit, 2004; pp. 21-30.
http://www.dnr.state.mn.us/publications/wildlife/research2004.html
Descriptors: Phasianus colchicus/ common pheasants/ ring-necked pheasants/ agriculture/ habitat/ abundance/ Minnesota/ winter habitat/ habitat management/ geographic information systems
Abstract: The purpose of this study is to determine how much winter habitat is needed to sustain local populations of ring-necked pheasants (Phasianus colchicus) over a range of winter conditions. We estimated relative abundance of pheasant populations on 36 study areas using roadside surveys. In addition, we estimated amounts of winter cover, winter food, and reproductive cover on each study area by cover mapping to a geographic information system (GIS). During 2003-2004, pheasant indices varied in association with weather and habitat. A preliminary evaluation indicated that mean pheasant indices were positively related to habitat abundance in most, but not all, regions. Future work will include continued pheasant surveys for at least three additional years, improved estimates of habitat abundance, and more complex analysis of the association between pheasant indices and habitat parameters. A final product of this project will be a GIS habitat model that managers can use to target habitat development efforts where they may yield the greatest increase in pheasant numbers.

2263. **Variation in ant populations with elevation, tree cover, and fire in a pinyon-juniper-dominated watershed.**
MontBlanc, E. M.; Chambers, J. C.; and Brussard, P. F.
Western North American Naturalist 67(4): 469-491. (2007)
NAL Call #: QH1.G7.
http://www.sagestep.org/educational_resources/bibliographies/articles/MontBlanketal2008.pdf
Descriptors: ants/ prescribed fire/ Great Basin/ ecosystem management/ altitude
Abstract: Climate change and fire suppression have facilitated expansion of pinyon-juniper woodlands into sagebrush-steppe ecosystems of the Great Basin, USA, resulting in a loss of biological diversity. To assess the effects of using prescribed fire in restoration efforts, ant abundance, species richness, and composition were examined pre- and post-burn along the elevation and tree cover gradients encompassed by a pinyon-juniper woodland in a central Nevada watershed. Ants were sampled using pitfall traps in 6 sites for the elevation study and in 2 sites for the tree cover study, representing paired burn and control sites in a randomized block design. Vegetation and ground cover variables were also sampled to determine how variation in ant populations was correlated with differences in vegetation and ground cover. Ant species richness remained unchanged for all treatments. Tree cover had no significant effect on ant populations. Significantly more ants were trapped after the burn treatment on burn plots. Variation in ant populations was not directly correlated with any of the vegetation or ground cover variables. According to ANOVA and multivariate analyses, elevation had the greatest effect on changes in ant communities, likely due to increased moisture availability. Our results suggest that management for conservation of sagebrush-steppe ecosystems in this and similar watersheds should include a range of elevations to ensure maximum ant species diversity.

2264. **Variation in terrestrial habitat use by four pool-breeding amphibian species.**
Regosin, J. V.; Windmiller, B. S.; Homan, R. N.; and Reed, J. M.
Journal of Wildlife Management 69(4): 1481-1493. (2005)
NAL Call #: 410 J827; ISSN: 0022541X
Descriptors: Ambystoma laterale/ Ambystoma maculatum/ buffer zone/ density/ migration distance/ Notophthalmus vindescens/ Rana sylvatica/ terrestrial ecology/ vernal pool
Abstract: We conducted a 2-year study of terrestrial habitat use by spotted salamanders (Ambystoma maculatum), blue-spotted salamanders (A. laterale), wood frogs (Rana sylvatica), and eastern newts (Notophthalmus viridescens) within blocks of forest enclosed by drift fencing and pitfall traps in the vicinity of a single breeding pond. Adult winter densities within forest habitat <100 m from the breeding pond were low for all species (range 0.1-1.9 individuals/ 100 m^2, n = 6 enclosures). During our 2-year study, at least 40% of wood frogs, 52% of blue-spotted salamanders, and 60% of spotted salamanders wintered >100 m from the breeding pond. Males tended to winter closer to the breeding pond than did females. Adult wood frogs and eastern newts were largely absent from upland forest adjacent to the breeding pond during spring and summer, but they entered these areas in significant numbers to winter. Analyses of net flow of amphibians resulting from fall movement suggest that summer and winter densities of

Ambystoma salamanders remained similar, while there were large increases in wood frog and eastern newt densities within terrestrial habitats near the breeding pond during fall. These results support a growing body of evidence that maintenance of suitable terrestrial habitat beyond 100 m from breeding pools is important for maintaining pool-breeding amphibian populations. Narrow protected buffer strips around breeding ponds might be even less effective than previously thought due to the disproportionate representation of males within these areas.

2265. **Vegetation management and ecosystem disturbance: Impact of glyphosate herbicide on plant and animal diversity in terrestrial systems.**
Sullivan, Thomas P. and Sullivan, Druscllia S.
Environmental Reviews 11(1): 37-59. (2003)
NAL Call #: GE140.E59; ISSN: 1181-8700
Descriptors: glyphosate herbicide: pesticide, soil pollutant, toxin/ Alces alces [moose] (Cervidae): bioindicator/ Capreolus capreolus (Cervidae): bioindicator, deer/ Lepus spp. [hare] (Leporidae): bioindicator/ Odocoileus spp. (Cervidae): bioindicator, deer/ plant (Plantae): bioindicator/ animals/ Artiodactyls/ chordates/ Lagomorphs/ mammals/ nonhuman mammals/ nonhuman vertebrates/ plants/ vertebrates/ agro ecosystem/ biodiversity/ crop production/ forest ecosystem/ species richness/ temperate climate/ terrestrial ecosystem/ vegetation management/ weed control

2266. **Viewpoint: Benefits and impacts of wildlife water developments.**
Rosenstock, S. S.; Ballard, W. B.; and DeVos, J. C.
Journal of Range Management 52(4): 302-311. (July 1999)
NAL Call #: 60.18 J82; ISSN: 0022-409X [JRMGAQ].
Notes: Literature review.
Descriptors: game birds/ water resources/ arid lands/ predators/ wildlife management/ Ovis canadensis/ Odocoileus virginianus/ Odocoileus hemionus/ Chiroptera/ Antilocapra americana/ wild birds/ desert rodents/ Lagomorpha/ adverse effects/ reptiles/ water quality/ cost benefit analysis/ duration/ experimental design/ Callipepla/ Zenaida
Abstract: Resource managers in the western United States have long assumed that water was a key limiting factor on wildlife populations in arid habitats. Beginning in the 1940s-1950s, state and federal resource management agencies initiated water development programs intended to benefit game species and other wildlife. At least 5,859 such developments have been built in 11 western states. Most state wildlife management agencies in the western United States have ongoing wildlife water development programs that vary greatly in extent. Ranchers and range managers also have developed water sources for livestock, many of which also are used by wildlife. Recently, critics have suggested that wildlife water developments have not yielded expected benefits, and may negatively impact wildlife by increasing predation, competition, and disease transmission. Based upon a comprehensive review of scientific literature, we conclude that wildlife water developments have likely benefitted many game and non-game species, but not all water development projects have yielded expected increases in animal distribution and abundance. Hypothesized negative impacts of water developments on wildlife are not supported by data and remain largely speculative. However, our understanding of both positive and negative effects of wildlife water developments is incomplete, because of design limitations of previous research. Long-term, experimental studies are needed to address unanswered questions concerning the efficacy and ecological effects of water developments. We also recommend that resource managers apply more rigorous planning criteria to new developments, and expand monitoring efforts associated with water development programs.
This citation is from AGRICOLA.

2267. **Water for wildlife: Improving access and reducing mortality for bats and other wildlife at livestock water developments.**
Taylor, Daniel A. R. and Tuttle, Stuart R.
Bat Research News 47(4): 152. (2006)
NAL Call #: QL737.C5 B328; ISSN: 0005-6227.
Notes: Papers presented at the 36th Annual North American Symposium on Bat Research, Wilmington, North Carolina, 18-21 October 2006.
Descriptors: Chiroptera/ terrestrial ecology/ bat mortality/ water shortages/ livestock water developments/ wildlife drinking water/ livestock troughs
Abstract: Livestock water developments are often one of the few water sources available to wildlife on arid western rangelands. Bats are especially vulnerable to water shortages, sometimes losing up to 50% of their body weight in evaporative water loss daily. Drinking rates of more than one bat/sec are not uncommon at livestock troughs. Without proper wildlife escape structures and maintenance, significant mortality to bats and other wildlife can occur at livestock troughs. Recent evidence suggests thousands of birds and mammals are drowned annually, including protected species. We evaluated more than 370 livestock troughs from several western states and conducted experiments on the effects of water development configuration and water level on bat access. Although wildlife escape structures are mandatory on most federal rangelands, they were present in <7 percent of the trough we inspected and >50 percent were obstructed by fencing or bracing. Bats required 3-6 times the number of approaches to successfully drink from troughs with obstructions. The ratio of successful to unsuccessful drinking attempts changed from 2:1 to 1:2 when water levels were lowered by 12" in smaller troughs. Fortunately, wildlife escape structures can be built and installed inexpensively and alternative fencing and bracing methods can facilitate bat access while still meeting livestock management objectives. To address these issues, BCI and the USDI-Natural Resources Conservation Service initiated the water for Wildlife Project to raise awareness among range and wildlife managers about the importance of livestock waters to bats and other wildlife, to evaluate existing conditions for wildlife at livestock waters, and to publish a comprehensive manual on developing wildlife-friendly livestock waters.

2268. **Water, water everywhere but not a place for fish: Tackling water and fish habitat management for productive fisheries in North America.**
Taylor, W. W.; Hughes, S. M.; and Mueller, K. B.
Transactions of the North American Wildlife and Natural Resource Conference 71: 131-149. (2006)
NAL Call #: 412.9 N814; ISSN: 0078-1355
Descriptors: natural resource management/ water management/ habitat conservation/ aquatic habitat/ wildlife habitats/ Wildlife Habitat Incentives Program/ natural resource policy/ water policy/ water resources/ fish/ fisheries/ North America/ habitat management/ National Fish Habitat Initiative
This citation is from AGRICOLA.

2269. **Waterbird communities and habitat relationships in coastal pastures of northern California.**
Colwell, M. A. and Dodd, S. L.
Conservation Biology 9(4): 827-834. (1995)
NAL Call #: QH75.A1C5 ; ISSN: 0888-8892
Descriptors: pastures/ habitats/ coastal areas/ plant height/ grazing/ wild birds/ waterfowl/ grasslands/ permanent grasslands/ wetlands/ nature conservation/ wild animals
Abstract: Waterbird (including geese) assemblages (diversity, composition, and species' densities) were examined in 20 pastures near Humboldt Bay, California, in relation to habitat characteristics (vegetation height, soil penetrability, water depth), abundance of invertebrates (worms and other invertebrates), and presence of livestock. From October 1991 to May 1992, 29 species and 10 776 birds were observed, most (78%) of which foraged. Nonrandom pasture use by birds resulted in a highly clumped spatial distribution. Habitat characteristics of pastures were correlated with this nonrandom pattern: waterbird diversity and densities of three sandpiper species and one gull species correlated negatively with vegetation height; densities of two plover species correlated negatively with soil penetrability; and waterfowl densities correlated positively with water depth. Species composition varied among pastures. Wading birds used pastures with tall vegetation, shorebirds and gulls frequented short-grass pastures, and waterfowl used flooded pastures. Both the presence of waterbirds and their densities increased in association with livestock. In coastal areas where much intertidal habitat has been reclaimed as pastureland, pastures offered valuable habitats to nonbreeding waterbirds. It is suggested that grazing in coastal pastures can be used to provide a mosaic of vegetation heights, which would yield greater waterbird diversity as well as higher densities of some species.

2270. **Wetland mitigation and amphibians: Preliminary observations at a southwestern Illinois bottomland hardwood forest restoration site.**
Mierzwa, Kenneth S.
Journal of the Iowa Academy of Science 107(3-4): 191-194. (2000)
NAL Call #: Q11.J68; ISSN: 0896-8381
Descriptors: conservation measures/ terrestrial habitat/ land and freshwater zones/ Amphibia: habitat management/ wetland mitigation/ forest habitat/ semiaquatic habitat/ wetland/ habitat mitigation/ forest and woodland/ hardwood forest/ Illinois/ Mid America Airport/ a chordates/ vertebrates

2271. **Wild bee species increase tomato production and respond differently to surrounding land use in northern California.**
Greenleaf, Sarah S. and Kremen, Claire
Biological Conservation 133(1): 81-87. (2006)
NAL Call #: S900.B5; ISSN: 0006-3207
Descriptors: commercial activities/ nutrition/ diet/ associations/ mutualism/ man-made habitat/ land zones/ Anthophora urbana/ Bombus vosnesenskii: pollination/ Solanum lycopersicum/ land use/ tomato production/ California/ Insecta, Hymenoptera, Apocrita, Aculeata, Apoidea, Apidae/ arthropods/ Hymenopterans/ insects/ invertebrates
Abstract: Pollination provided by bees enhances the production of many crops. However, the contribution of wild bees remains unmeasured for many crops, and the effects of anthropogenic change on many bee species are unstudied. We experimentally investigated how pollination by wild bees affects tomato production in northern California. We found that wild bees substantially increase the production of field-grown tomato, a crop generally considered self-pollinating. Surveys of the bee community on 14 organic fields that varied in proximity to natural habitat showed that the primary bee visitors, Anthophora urbana Cresson and Bombus vosnesenskii Radoszkowski, were affected differently by land management practices. B. vosnesenskii was found primarily on farms proximate to natural habitats, but neither proximity to natural habitat nor tomato floral abundance, temperature, or year explained variation in the visitation rates of A. urbana. Natural habitat appears to increase B. vosnesenskii populations and should be preserved near farms. Additional research is needed to determine how to maintain A. urbana. Species-specific differences in dependency on natural habitats underscore the importance of considering the natural histories of individual bee species when projecting population trends of pollinators and designing management plans for pollination services. Thus, to maintain an entire bee community, multiple approaches, including maintaining natural habitat, should be implemented. © 2006 Elsevier Ltd. All rights reserved

2272. **Wildfire, fuel reduction, and herpetofaunas across diverse landscape mosaics in northwestern forests.**
Bury, R. Bruce
Conservation Biology 18(4): 968-975. (2004)
NAL Call #: QH75.A1C5; ISSN: 0888-8892
Descriptors: commercial activities/ conservation measures/ ecology/ population dynamics/ freshwater habitat/ lotic water/ terrestrial habitat/ abiotic factors/ land zones/ forestry/ burning practices/ abundance/ habitat management/ population size/ streams/ forest fire/ forest and woodland/ United States, northwestern region/ Amphibia/ amphibians/ chordates/ reptiles/ vertebrates
Abstract: The herpetofauna (amphibians and reptiles) of northwestern forests (US.A.) is diverse, and many species are locally abundant. Most forest amphibians west of the Cascade Mountain crest are associated with cool,

cascading streams or coarse woody material on the forest floor, which are characteristics of mature forests. Extensive loss and fragmentation of habitat resulted from logging across approximately 50% of old-growth forests in northern California and approximately 80% of stands in Oregon and Washington. There is a complex landscape mosaic and overlap of northern and southern biotic elements in the Klamath-Siskiyou Region along the Oregon and California border creating a biodiversity hotspot. The region experiences many low-severity fires annually, punctuated by periodic major fires, including the Biscuit fire, the largest in North America in 2002. In the fire's northern portion, severe fire occurred on >50% of stands of young, managed trees but on only about 25-33% of old-growth stands. This suggests that the legacy of timber harvest may produce fire-prone stands. Calls for prescribed fire and thinning to reduce fuel loads will remove large amounts of coarse woody material from forests, which reduces cover for amphibians and alters nutrient inputs to streams. Our preliminary evidence suggests no negative effects of wildfire on terrestrial amphibians, but stream amphibians decrease following wildfire. Most reptiles are adapted to open terrain, so fire usually improves their habitat Today, the challenge is to maintain biodiversity in western forests in the face of intense political pressures designed to 'Prevent" catastrophic fires. We need a dedicated research effort to understanding how fire affects biota and to proactively investigate outcomes of fuel-reduction management on wildlife in western forests.

2273. **Wildlife and fish conservation through the Farm Bill.**
Gray, R. L. and Teels, B. M.
Wildlife Society Bulletin 34(4): 906-913. (2006)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2006)34[906:WAFCTT]2.0.CO;2.
Descriptors: conservation programs/ Conservation Reserve Program/ Conservation Security Program/ Environmental Quality Incentives Program/ Farm Bill/ Grassland Reserve Program/ Sodbuster/ Swampbuster/ Wetlands Reserve Program/ Wildlife Habitat Incentives Program
Abstract: Private lands constitute 70% of the land base in the United States and are important to the conservation of fish and wildlife. The last 4 Farm Bills established a variety of conservation programs that integrate fish and wildlife habitat as an important consideration in farm policy. These programs provide cost-sharing opportunities, technical assistance, and other financial incentives to restore or enhance habitats, and protect habitats through long-term or permanent conservation easements. The programs are providing landscape-scale habitat changes, resulting in increased populations of many species.

2274. **Wildlife benefits of the Wetlands Reserve Program.**
Rewa, Charles A.
In: Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update, Technical Review 05-2/ Haufler, Jonathan B., editor; Bethesda, MD: The Wildlife Society, 2005. pp. 133-146.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwbenefits8.pdf
Descriptors: conservation programs/ USDA/ Farm Bill/ wildlife conservation/ wetlands/ wildlife/ fish/ Wetlands Reserve Program/ NRCS/ conservation buffers/ wildlife habitat
Abstract: Since its initial authorization in 1990, more than 1.6 million acres of primarily drained or degraded wetlands on agricultural lands have been enrolled in the U.S. Department of Agriculture's (USDA) Wetlands Reserve Program (WRP). The Natural Resources Conservation Service (NRCS) and its partners are working with landowners to restore these lands to ecologically productive wetland and upland buffer habitats. Numerous studies have documented the value of restored and created wetlands to fish and wildlife resources. However, few objective studies have been completed that document fish and wildlife response to wetlands enrolled in and restored through WRP. Preliminary results of some studies underway indicate that wildlife use of WRP sites is comparable to or exceeds that of non-program restored wetland habitats. In addition, anecdotal reports on some WRP restored wetland complexes indicate that wildlife response has been greater than expected. Additional studies are needed to enable WRP program managers and participants to better understand how lands enrolled in the program aff ect local fish and wildlife use and the landscape factors that affect wildlife community dynamics and population trends influenced by the lands enrolled. Elements of USDA's Conservation Effects Assessment Project are intended to begin addressing this need.

2275. **Wildlife damage management research needs: Perceptions of scientists, wildlife managers, and stakeholders of the USDA/Wildlife Services program.**
Bruggers, Richard L.; Owens, Richard; and Hoffman, Thomas
International Biodeterioration and Biodegradation 49(2-3): 213-223. (2002)
NAL Call #: QH301.I54; ISSN: 0964-8305
Descriptors: bird (Aves): pest/ human (Hominidae)/ mammal (Mammalia): pest/ animals/ birds/ chordates/ humans/ mammals/ nonhuman mammals/ nonhuman vertebrates/ primates/ vertebrates/ USDA/ APHIS Wildlife Services Program/ administrative guidance/ agriculture/ aquaculture/ aviation/ invasive species/ legislative guidance/ livestock/ overabundant populations/ research needs assessment/ scientist perceptions/ stakeholder perceptions/ timber/ wildlife damage management research/ wildlife manager perceptions/ wildlife borne diseases/ wildlife-human conflicts
Abstract: This paper presents the results of a nationwide research needs assessment of the important wildlife-human conflict issues and associated research needs of the USDA/APHIS-Wildlife Services (WS) program and its stakeholders. Thirty-six WS State Directors, 23 WS/National Wildlife Research Center (NWRC) scientists and 6 members of the National Wildlife Services Advisory Committee (NWSAC) to the US Secretary of Agriculture responded to a request for participation. This paper compares these current research needs with previous regional and national research needs assessments for wildlife damage management in the United States. Important national problems identified included issues related to aviation, timber, agriculture, aquaculture, and livestock industries, as well as wildlife-borne diseases, invasive species, and overabundant wildlife populations.

This assessment provides useful input, along with legislative and administrative guidance, to NWRC for allocating resources to specific research projects that address the WS program's needs for knowledge and new methods.

2276. **Wildlife exposure to organophosphorus insecticides.**
Sanchez Hernandez, J. C.
Reviews of Environmental Contamination and Toxicology 172: 21-63. (2001)
NAL Call #: TX501.R48; ISSN: 0179-5953 [RCTOE4].
Notes: Literature review.
Descriptors: organophosphorus insecticides/ exposure/ cholinesterase/ markers/ monitoring/ wildlife/ nontarget organisms
This citation is from AGRICOLA.

2277. **Wildlife Habitat Incentives Program: A summary of accomplishments, 1998-1999.**
Hackett, E.
In: A comprehensive review of Farm Bill contributions to wildlife conservation, 1985-2000/ Heard, L. P; Hohman, W. L.; Halloum, D. J.; and Wildlife Habitat Management Institute (U.S.); Series: Technical Report USDA/NRCS/WHMI.
Madison, MS: USDA, NRCS, Wildlife Habitat Management Institute, 2000; pp. 117-124.
NAL Call #: aS604.6 C66 2000
Descriptors: Wildlife Habitat Incentives Program [WHIP]/ wildlife habitats/ wildlife management/ endangered species/ ecological restoration/ landowners/ Colinus virginianus/ Salmo salar/ conservation programs

2278. **Wildlife-habitat relationships in Oregon and Washington.**
Johnson, D. H. and O'Neil, T. A.
Corvallis, OR: Oregon State University Press. (2001)
Descriptors: vertebrates/ habitat/ habitat change/ habitat management/ vegetation/ landscape/ topography/ agriculture/ silviculture/ settlement/ Washington/ Oregon
Abstract: Book contains chapters on "Wildlife habitats: Descriptions, status, trends, and system dynamics," "Wildlife of Agriculture, Pastures, and Mixed Environs," "Wildlife of Riparian Habitats," "An Overview of Models and Their role in Wildlife Management," "Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management," among others.

2279. **Wildlife issues for the 2002 Farm Bill.**
Franklin, T. M. and Rowse, B. H.
Wildlife Society Bulletin 29(2): 731-733. (2001)
NAL Call #: SK357.A1W5; ISSN: 00917648
Descriptors: agriculture/ Conservation Reserve Program/ Conservation Securities Act/ Farm Bill/ wildlife conservation/ wildlife management

2280. **Wildlife use of water catchments in southwestern Arizona.**
O'Brien, C. S.; Waddell, R. B.; Rosenstock, S. S.; and Rabe, M. J.
Wildlife Society Bulletin 34(3): 582-591. (2006)
NAL Call #: SK357.A1W5; ISSN: 00917648.
Notes: doi: 10.2193/0091-7648(2006)34[582:WUOWCI]2.0.CO;2.
Descriptors: Arizona/ catchment/ habitat improvement/ Sonoran Desert/ video monitoring/ water development
Abstract: Construction of water developments has been used as a wildlife-habitat improvement technique in desert environments since the 1940s. Use of water developments by wildlife has been described in anecdotal observations, through water-hole counts, and with triggered still-cameras, but few studies have directly quantified wildlife use. We used video surveillance equipment to document wildlife use of 3 water catchments located in the Sonoran Desert, southwestern Arizona, USA, from June 2000 to November 2003. For each visitation, we recorded time of day, season of use, and activities engaged in, and we correlated visits with temperature and relative humidity. We logged 37,989 observation hours and documented 34 species using the water catchments. Most of the species recorded visited water catchments year-round with use peaking during June and July. The number of visits by nongame species (i.e., bats, raptors, mammalian predators, and rodents) exceeded the number of visits by game species (mule deer [Odocoileus hemionus], doves [Zenaida spp.], and Gambel's quail [Callipepia gambelii]). Visitation frequency for turkey vultures (Cathartes aura), owls, diurnal raptors, mule deer, coyotes (Canis latrans), and other mammalian predators increased with temperature. Most visits culminated in the animal drinking water. Other activities recorded were bathing, consumption of plant material and carrion, and intraspecies and interspecies interactions. We recorded 8 predation attempts: 4 by avian predators and 4 by bobcats (Lynx rufus). Although we documented that a number of species frequented water catchments, our observations do not prove need. However, we believe our observations do provide support for constructing water catchments that can accommodate a wide diversity of species.

2281. **Wildlife wins through the conservation seed program.**
Crane, J.
Forest Landowner 60(2): 46-49. (2001)
NAL Call #: SD144.A15F67; ISSN: 10879110
Descriptors: agriculture/ carbohydrates/ nutritional tonnages/ forestry/ agriculture/ animals/ forestry/ seeds/ wildlife
Abstract: The steps taken by hunters and outdoor enthusiasts to plant food plots and cover strips to benefit wildlife and to improve hunting is presented. The food plots planted in the correct places in a sufficient percentage of total land acerage results in greater wildlife numbers. These crops are shown to provide high amounts of carbohydrates necessary for wildlife to maintain energy and body heat during the winter months.

2282. **Winter bird communities in afforestation: Should we speed up or slow down ecological succession?**
Hamel, P. B.; Twedt, D. J.; Nuttle, T. J.; Woodson, C. A.; Broerman, F.; and Wahome, J. M.
In: Proceedings of a Conference on Sustainability of Wetlands and Water Resources: How Well Can Riverine Wetlands Continue to Support Society into the 21st Century?, General Technical Report-SRS 50/ Holland, Marjorie M.; Warren, Melvin L.; and Stanturf, John A.; Asheville, NC: Southern Research Station, Forest Service, U.S. Department of Agriculture Southern Research Station, Forest Service, U.S. Department of Agriculture, 2002. pp. 98-108.
http://www.srs.fs.usda.gov/pubs/gtr/gtr_srs050.pdf
Descriptors: afforestation/ agricultural land/ alluvial land/ habitats/ plant succession/ population density/ species richness/ wild birds/ wildlife management/ winter/ birds
Abstract: Recent assessments of afforestation on agricultural lands in the Mississippi Alluvial Valley imply the importance of quickly developing vertical forest structure to benefit wildlife. Examining this assumption, we find that mammals and birds occur through the full successional sere as targets of proactive management and control. Different species of animals thrive in structures available at different times during succession. Thus, forest managers' choices of strategies favor species' success differentially. Early successional species, particularly those avian communities occurring during winter, have heretofore been considered only in passing. However, because they occur in areas where herbaceous plants dominate vegetation structure, these communities include species otherwise rare or absent from the landscape. Extensive afforestation in the Mississippi Alluvial Valley provides ephemeral habitat for birds that winter in herbaceous areas. To provide habitat for winter birds, managers may wish to consider maintaining large tracts in herbaceous vegetation similar to that occurring 3 to 7 years after cessation of farming activities.
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2283. **Winter habitat use and survival of female ring-necked pheasants (Phasianus colchicus) in southeastern North Dakota.**
Homan, H. J.; Linz, G. M.; and Bleier, W. J.
American Midland Naturalist 143(2): 463-480. (2000)
NAL Call #: 410 M58; ISSN: 00030031
Descriptors: bird/ habitat use/ survival/ wetland/ United States/ Phasianus colchicus/ Typha
Abstract: From 1992 to 1995 we used radiotelemetry to monitor winter habitat selection and survival of female ring-necked pheasants (Phasianus colchicus) in southeastern North Dakota. We captured 100 birds at nine sites in six study blocks centered on cattail-dominated (Typha spp.) semipermanent wetlands. Pheasants showed nonrandom habitat use at two hierarchical scales. At the second-order scale (23-km^2 blocks) semipermanent wetlands were preferred during two winters in which habitat selection could be assessed (1992-1993 and 1994-1995). An additional second-order preference for grass-covered uplands was shown during the mild 1994-1995 winter. At the third-order scale (home-range) pheasants preferred the edges of wetlands in 1992-1993 and 1994-1995. The central portions of wetlands were preferred in 1992-1993 and used proportionately in 1994-1995. Seasonal wetlands were avoided at the third order scale during 1992-1993 and 1994-1995. The average winter survival rate was 0.41, with rates ranging from 0.04-0.86 and differing significantly among winters. Survival was lower during early winter and midwinter periods for birds weighing less than 1090 g and for birds captured in semipermanent wetlands under private ownership. A 1 C increase in the mean weekly maximum temperature decreased the probability of death by 0.06 and a 2.5 cm increase in new snow raised the probability of death by 0.08.
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2284. **Wintering raptor use of hybrid poplar plantations in northeastern Oregon.**
Moser, Brian W. and Hilpp, G. Keith
Journal of Raptor Research 37(4): 286-291. (2003)
NAL Call #: QL696.F3J682; ISSN: 0892-1016.
Notes: Translation by: Marquez, C.
Descriptors: conservation measures/ ecology/ man-made habitat/ land zones/ Falconiformes/ Nyctea scandiaca: habitat management/ habitat utilization/ winter use of tree plantations/ habitat management implications/ cultivated land and shrub steppe/ terrestrial habitat/ shrub steppe/ cultivated land habitat/ Oregon/ Columbia Basin/ Aves, Strigiformes, Strigidae/ birds/ chordates/ vertebrates
Abstract: We studied wintering raptor use of hybrid poplar (Populus spp.) plantations in comparison to surrounding cover types in the Columbia Basin of northeastern Oregon. Diurnal raptors were surveyed in shrub-steppe, poplar plantations, and irrigated croplands. Logistic regression analyses suggested that the three most common raptors, Red-tailed Hawks (Balm jamaicensis), American Kestrels (Falco sparverius), and Northern Harriers (Circus cyaneus) were associated with croplands, interiors of 1-yr-old plantations, and plantation edges. Shrub-steppe was also selected as a significant predictor of sites with American Kestrels. The best model for the Northern Harrier also included the interior of 2-yr-old plantations, but excluded croplands and edges of older plantations. Plantations and plantation edges appeared to be used by wintering raptors disproportionately to their availability. Our data suggest that maximizing plantation edges and managing for a variety of plantation ages within this landscape will likely provide suitable habitat for wintering raptors in this region.
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2285. **Wolf habitat analysis in Michigan: An example of the need for proactive land management for carnivore species.**
Gehring, Thomas M.; Potter, Bradly A.; and
Wildlife Society Bulletin 33(4): 1237-1244. (2005)
NAL Call #: SK357.A1W5; ISSN: 0091-7648
Descriptors: Canidae/ Carnivora/ Canis lupus/ Canis lupus/ gray wolf/ biogeography/ carnivore-human conflict/ conservation/ wildlife management/ habitat use/ habitat analysis/ colonization/ habitat management/ integrated management/ land zones/ livestock depredation/ Northern Lower Peninsula/ potential recolonization/ proactive land management/ recolonization/ roads/ gray wolf/ carnivores/ habitat evaluation/ Michigan
Abstract: Gray wolves (Canis lupus) likely will recolonize the northern Lower Peninsula of Michigan (NLP). As such, land managers would benefit from information on the amount, distribution, and quality of potential wolf habitat in this region. We estimated that 2,198-4,231 km(2) of favorable wolf habitat exist in the NLP, supporting an

estimated population of 40-105 wolves. Favorable habitat was fragmented by road networks and was predominantly located in the northeastern part of the state on private land. We discuss the management of wolves in the NLP as a case study of wolf recolonization in a landscape that has a relatively high road density and agricultural lands that likely will be sources of conflict with wolves. We provide a hierarchical model for consideration in proactively managing landscapes that already or likely will contain several carnivore species concomitant with human land use. We suggest that this case study and our hierarchical model offer insight into how proactive land management should occur for wolves and other carnivores in the northern Great Lakes Region and other human-altered landscapes.

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