

Gulf-Atlantic Coastal Flats/Rolling Plains Wetlands

General Information

573. Accuracy assessment and validation of classified satellite imagery of Texas coastal wetlands.

Hinson, J. M.; German, C. D.; and Pulich, W.
Marine Technology Society Journal 28(2): 4-9. (1994)
NAL Call #: GC1.M3; ISSN: 0025-3324.

Notes: Conference: Third Thematic Conference on Remote Sensing for Marine and Coastal Environments

Descriptors: wetlands/ coastal zone/ satellite sensing/ mapping/ classification systems/ vegetation cover/ classification/ remote sensing/ satellite technology/ Landsat/ satellite technology/ USA, Texas, Galveston Bay/ coastal zone/ satellite sensing/ classification systems/ vegetation cover

Abstract: Two methods of determining wetlands and landcover classification accuracy for Landsat thematic mapper (TM) imagery are presented and evaluated. A partial Landsat TM scene of the upper Texas coast (Galveston Bay) was classified according to the NOAA CoastWatch-Change Analysis Program landcover classification scheme. Thirteen major wetland, upland and open water landcover types were identified using a series of supervised and unsupervised classification procedures. The classification accuracy was estimated using two accuracy assessment methods: ground truthing 407 sites located with Global Positioning System (GPS) and direct overlay of wetland categories with comparable United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) data. Comparisons of the accuracy assessment estimates found that the ground truthing method consistently produced higher accuracy estimates than that of the direct overlay method. It was concluded that ancillary data as a means of accuracy assessment for classified imagery as an alternative to ground truthing should be used with caution.

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574. Analysis of landscape patterns in coastal wetlands of Galveston Bay, Texas (USA).

Liu, Amy J. and Cameron, Guy N.
Landscape Ecology 16(7): 581-595. (2001)

NAL Call #: QH541.15.L35 L36; ISSN: 0921-2973

Descriptors: GIS: geographic information system, computer method/ perimeter area method: field method/ coastal wetlands: spatial pattern/ fractal dimension/ landscape ecology: historical change

Abstract: High productivity and accessibility have made coastal wetlands attractive sites for human settlements. This study analyzed the patterns of wetland landscapes in Galveston Bay, Texas, USA. The first objective of the study was to describe the relationships between the fractal dimension of wetland boundaries and those factors which affect the wetland landscapes (e.g., land use, type of vegetation, size, location, and level of human disturbance). The second objective was to construct a historical database to contrast wetland areas which had experienced different levels of disturbance between 1956 and 1989. The fractal dimension, a measure of how much of the geographical space is filled by boundaries, was measured by the perimeter-area method. The fractal dimension of wetlands was significantly affected by land use, type of vegetation, size, and level of anthropogenic disturbance. In addition,

increasing the size of buffers around roads did not significantly affect the fractal dimension of wetlands. Landscape indices, such as fractal dimension, dominance, and diversity, were used to characterize spatial heterogeneity in the historical database. Lake Stephenson, an area of low anthropogenic disturbance, experienced no changes in wetland composition and abundance over time. Anahuac, an area of medium disturbance, experienced changes in both wetland composition and abundance. Texas City, an area of high disturbance, experienced a change in wetland composition. These differences can be associated with the type and level of disturbance present; however, more evidence is needed to determine whether certain landscape patterns have stable, intrinsic properties which allow persistence in the face of disturbance. These results will be informative to resource managers determining how wetlands can be managed as natural resources and nature reserves.

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575. Analytical method of determining wetland hydrology.

Palalay, S. and Geter, F.

In: Drainage and water table control Proceedings of Sixth International Drainage Symposium. (Held 13 Dec 1992-15 Dec 1992 at Nashville, Tennessee.)

St. Joseph, Michigan, USA: American Society of Agricultural Engineers; pp. 345-352; 1992.

Descriptors: wetlands/ water management/ rain/ temperature/ hydrology/ drainage/ spacing/ meteorology/ models/ hydrogenic soils

Abstract: The water management simulation model, DRAINMOD, was used to quantify the presence of wetland hydrology on a strip of ground between two parallel drains. It was concluded that on a Fallsington (hydric) soil subjected to the 1958-1973 rainfall and temperature at Wilmington Airport, Delaware, USA, there would be wetland hydrology if 1.2 m deep drains were spaced no closer than 97.5 m. The results of the simulation was also used to identify easily measurable climatic variables that were significant in affecting the highest 7-day average water table. Regression analyses were done on several variables and some predictive equations were derived. The analyses showed that the 14-day rainfall (7-days after and 7-day before the rise of the highest 7-day average water table) had the greatest impact. Rainfall of a prior period up to three months also had some effect and the coefficient of determination was slightly improved by including the prior 3-month rainfall as a second variable.

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576. Assessment of saltwater intrusion impact on gas exchange behavior of Louisiana Gulf Coast wetland species.

Pezeshki, S. R.; DeLaune, R. D.; and Patrick, W. H.
Wetlands Ecology and Management 1(1): 21-30. (1989)

Descriptors: wetlands/ gas exchange/ plants/ reviews/ aquatic plants/ salinity effects/ salt wedges/ literature reviews/ USA, Louisiana/ saline water/ salt wedges/ literature reviews/ plants/ reviews/ environmental effects/ physiology, biochemistry, biophysics

Abstract: A review of gas exchange responses of wetland plants to salinity is presented for several species representative of different wetland habitats extending along water level and salinity gradients in the Louisiana Gulf Coast, U.S.A. The information was synthesized from earlier plant physiological response studies. Vegetation examined represent a broad range of sensitivity to salt, including brackish marsh, freshwater marsh, and bottomland tree species. Changes in stomatal conductance and carbon assimilation rates are common responses of wetland plants to short-term and long-term exposure to salinity. The combination of anaerobiosis and salinity apparently causes substantial reductions in stomatal conductance and carbon assimilation. Exposure to salt concentrations greater than 170 mol/m³ (10 ppt) caused leaf death in plants representing freshwater habitats.

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577. Benthic macroinvertebrates of small Florida pondcypress swamps and the influence of dry periods.

Leslie, A. J.; Crisman, T. L.; Prenger, J. P.; and Ewel, K. C. *Wetlands* 17(4): 447-455. (1997)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: drawdown/ forested wetland/ macroinvertebrates/ pondcypress swamps

Abstract: Benthic macroinvertebrate communities were sampled bimonthly from December 1993 to April 1995 in three small pondcypress swamps. Eighty-five taxa were collected, with Chironomidae, Dytiscidae, and Hydrophilidae contributing large numbers of genera. Annual mean density was 4,229 individuals/m², and monthly densities for individual ponds ranged from 950 to 11,623 individuals/m². Three genera, Crangonyx (Amphipoda), Polypedilum, and Chironomus (Chironomidae), accounted for 70% of the total density. High levels of temporal and inter-pond variability were documented. Taxon richness and total density of communities sampled during drawdown were similar to those of wet months. The large number of taxa unique to the dry period contributed substantially to overall taxon richness. The benthic macroinvertebrate communities of these systems seem to be adapted to unpredictable drawdown.

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578. Carbon dioxide exchange in a high marsh on the Texas Gulf Coast: Effects of freshwater availability.

Heinsch, F. A.; Heilman, J. L.; McInnes, K. J.; Cobos, D. R.; Zuberer, D. A.; and Roelke, D. L.

Agricultural and Forest Meteorology 125(1-2): 159-172. (2004)

NAL Call #: 340.8 AG8; ISSN: 0168-1923

Descriptors: relaxed eddy accumulation: applied and field techniques/ carbon dioxide exchange/ channelization/ drought/ dryland ecosystem/ ecosystem respiration/ evaporation/ flooding/ freshwater inflow/ gas exchange/ gross ecosystem production/ marsh/ net ecosystem exchange/ rainfall/ sediment salinity/ standing water/ water availability/ wetland ecosystem

Abstract: The supply of water to the Nueces River Delta near Corpus Christi, Texas is limited by dams and channelization of the river which restrict freshwater inflow. The upper end (high marsh) of the delta frequently dries up during the summer. The marsh consists of slightly elevated islands containing emergent halophytes, and shallow ponds interconnected by narrow channels. Carbon dioxide

exchange in the marsh was measured by relaxed eddy accumulation (REA) during two periods, one in 1997 that included two floods from the river followed by an extended period of drying and disappearance of standing water, and the other in 1998 that was in the midst of a drought with no standing water present. The marsh was a net CO₂ sink during periods of high water availability and low sediment salinity, and a net source when water availability was low and salinity was high. During the 1997 period, net ecosystem exchange (NEE) and gross ecosystem production (GEP) ranged from -7.3 g CO₂ m⁻² per day (net gain of CO₂) and 12.3 g CO₂ m⁻² per day, respectively, after flooding to +8.7 g CO₂ m⁻² per day (net loss of CO₂) and 0.4 g CO₂ m⁻² per day, respectively, when sediments were dry. NEE and GEP averaged 0.5 and 7.7 g CO₂ m⁻² per day, respectively, during this period. Standing water, and water in pores restricted gas exchange between sediment and the atmosphere so that ecosystem respiration (R) increased as the marsh dried, with R ranging from 1.2 to 15.6 g CO₂ m⁻² per day and averaging 8.2 g CO₂ m⁻² per day. During the 1998 drought, NEE, GEP, and R averaged 5.8, 3.3, and 9.19 CO₂ m⁻² per day, respectively. A 27 turn rain during this period produced a 14-fold increase in GEP and a 75% reduction in R that lasted for 2 days. In 1997, NEE and its components were all significantly correlated at the 0.05 level with water availability as estimated by the cumulative difference between rainfall and evaporation, while in 1998, only NEE and GEP were significantly correlated with water availability. Results of this study indicate that the marsh NEE behaved more like that of a dryland ecosystem than a wetland because of limited freshwater inflow. Copyright 2004 Elsevier B.V. All rights reserved.
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579. Carolina bay wetlands: Unique habitats of the southeastern United States.

Sharitz, R. R.

Wetlands 23(3): 550-562. (2003)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ species richness/ biological diversity/ conservation/ habitats/ groundwater/ evapotranspiration/ species diversity/ hydrology/ coastal plains/ amphibians/ rainfall/ agriculture/ aquatic environment/ drainage/ life cycles/ ecosystems/ water level/ community composition/ mapping/ nature conservation/ environmental protection/ freshwater organisms/ Amphibia/ USA North Carolina/ USA, South Carolina/ amphibians

Abstract: Carolina bays, depression wetlands of the southeastern United States Coastal Plain, are 'islands' of high species richness within the upland landscape and are the major breeding habitat for numerous amphibians. The 2001 Supreme Court decision that removes isolated wetlands from protection under the Clean Water Act has potential for great losses of these wetland ecosystems. Most Carolina bays are not naturally connected with stream drainages or other water bodies, and their hydrology is driven primarily by rainfall and evapotranspiration. Their potential interaction with shallow ground water is not well-understood. Water levels in these wetlands may vary seasonally and across years from inundated to dry, and organisms inhabiting Carolina bays must be adapted to fluctuating and often unpredictable hydrologic conditions. The ecological importance of these wetlands as habitats for species that require an aquatic environment for a part of

their life cycle has been well-documented. Many Carolina bays have been drained and converted to agriculture or other uses, and many of the smaller bays have been poorly inventoried and mapped. If these wetlands are not protected in the future, a major source of biological diversity in the southeastern United States will be lost.

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580. Changes in benthic algal attributes during salt marsh restoration.

Zheng, L.; Stevenson, R. J.; and Craft, C.

Wetlands 24(2): 309-323. (June 2004)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ marshes/ sediments/ environmental restoration/ salt marshes/ algae/ biomass/ species composition/ habitat improvement/ community composition/ chronostratigraphy/ species diversity/ primary production/ Periphyton/ age determination/ regional variations/ seasonal variations/ restoration/ organic matter/ epiphytes/ sediment chemistry/ sediment samples/ nutrients/ diatoms/ accumulation/ *Spartina*/ indicators/ phosphorus/ nitrogen/ Bacillariophyceae/ *Spartina alterniflora*/ USA, North Carolina/ reclamation/ habitat community studies/ conservation, wildlife management and recreation/ water and plants

Abstract: To assess attributes of algal assemblages as indicators of salt marsh restoration, we chose eight pairs of salt marshes in North Carolina, USA, each pair with one restored marsh (from 1 to 28 years old) and a nearby existing salt marsh. Algae on both *Spartina alterniflora* and sediments (sediment algae) were collected in each marsh during spring and summer 1998 for assaying algal biomass (dry mass (DM), ash free dry mass (AFDM), chl a content, algal biovolume), algal species composition and diversity, and gross primary production. An attribute restoration ratio was calculated by dividing attribute values from each restored marsh by values from a paired reference marsh. Controlling for regional variation in reference marshes substantially increased precision in relations between attributes and the increase in age of restored marshes. The organic matter restoration ratio of sediments increased with age of restored marshes in both spring and summer. The algal biomass restoration ratios of epiphytes, calculated with algal biovolume and chl a, increased with restored marsh age in summer but not during spring. Biomass of sediment algae was not related to marsh age. The species diversity of sediment algae in summer showed an asymptotic relationship with sediment nutrient concentration. The similarity of diatom species composition between paired restored and reference sites increased with age of restored marshes during spring and summer. Primary production by epiphytic and sediment algae in summer showed site-specific changes and did not change consistently with marsh age. Algal biomass, algal diversity, and diatom species composition during summer were positively correlated with sediment nitrogen and phosphorus concentration. We concluded that other structural and functional development of restored wetlands, especially nutrient storage in sediments, regulates algal species composition and algal biomass accumulation, which can be used to evaluate salt marsh restoration.

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581. Chesapeake wetlands: The vital link between the watershed and the bay.

Chesapeake Bay Program

Annapolis, Md.: United States Fish and Wildlife Service; EPA 903-R-97-002, 1997.

NAL Call #: QH76.5.A123C542 1997

Descriptors: wetlands---Chesapeake Bay/ watershed (Md. and Va.)/ wetland conservation---Chesapeake Bay/ watershed (Md. and Va.)

This citation is from AGRICOLA.

582. 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/ USA, 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 chironomid (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.

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583. Citronelle ponds: Little-known wetlands of the central Gulf Coastal Plain, USA.

Folkerts, George W.

Natural Areas Journal 17(1): 6-16. (1997)

NAL Call #: QH76.N37; ISSN: 0885-8608

Descriptors: kaolinite/ kaolinite dissolution/ pond cypress/ swamp tupelo/ water fluctuation/ freshwater ecology/ habitat/ forested depression wetland/ dominant species/ citronelle ponds/ conservation/ crustaceans (Crustacea Unspecified)/ insects (Insecta Unspecified)/ Crustacea (Crustacea Unspecified)/ Insecta (Insecta Unspecified)/ *Nyssa biflora* (Nyssaceae)/ *Taxodium ascendens* (Coniferopsida)/ angiosperms/ animals/ arthropods/ crustaceans/ dicots/ gymnosperms/ invertebrates/ plants/ spermatophytes/ vascular plants/ Central Gulf coastal plain

Abstract: Citronelle ponds are forested depression wetlands occurring on relatively flat uneroded surfaces of the Citronelle Formation along the Gulf coast of the United States from Mississippi to the central Florida Panhandle. The depressions seem to have formed by the dissolution of kaolinite in the substrate and associated loss of volume. Most are temporarily flooded, typically from early winter to late spring. Soils are usually of the Grady series. Few depressions have connections with surface or subsurface drainage. Nearly all Citronelle ponds were forested in their primeval state, characteristically supporting pondcypress (*Taxodium ascendens* Brogn.) and swamp tupelo (*Nyssa biflora* (Walt.) Sarg.) as dominants. The fauna consists of species that can tolerate water fluctuation and frequent drying and includes a large diversity of crustaceans and insects. Fishes are seldom present. Most of the ponds are isolated amid lands used for agriculture and forestry. Few remain in anything resembling a natural state. Action to preserve representative Citronelle ponds is urgently needed.

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584. Common reed *Phragmites australis*: Control and effects upon biodiversity in freshwater nontidal wetlands.

Ailstock, M. Stephen.; Norman, C. Michael.; and Bushmann, Paul J.

Restoration Ecology 9(1): 49-59. (Mar. 2001)

NAL Call #: QH541.15.R45R515; ISSN: 1061-2971

Descriptors: Macroinvertebrata/ disturbance by man/ vegetation control/ effects on community structure/ community structure/ effects of vegetation control measures/ semiaquatic habitat/ fertilizers and pesticides/ herbicide/ fire/ burning for vegetation control/ effect on community structure/ Maryland/ Chesapeake Bay/ non tidal wetlands/ effect of vegetation control measures

Abstract: *Phragmites australis* (common reed) has expanded in many wetland habitats. Its ability to exclude other plant species has led to both control and eradication programs. This study examined two control methods-herbicide application or a herbicide-burning combination-for their efficacy and ability to restore plant biodiversity in nontidal wetlands. Two *Phragmites*-dominated sites received the herbicide glyphosate. One of these sites was burned following herbicide application. Plant and soil macroinvertebrate abundance and diversity were evaluated pre-treatment and every year for four years post-treatment using belt transects. The growth of *Phragmites* propagules-seeds, rhizomes, and rooted shoots-was examined in the greenhouse and under bare, burned, or vegetated soil conditions. Both control programs greatly reduced *Phragmites* abundance and increased plant biodiversity. Plant re-growth was quicker on the herbicide-burn site, with presumably a more rapid return to wetland function. Re-growth at both sites depended upon a pre-existing, diverse soil seed bank. There were no directed changes in soil macroinvertebrate abundance or diversity and they appeared unaffected by changes in the plant community. *Phragmites* seeds survived only on bare soils, while buried rhizomes survived under all soil conditions. This suggests natural seeding of disturbed soils and inadvertent human planting of rhizomes as likely avenues for *Phragmites* colonization. Herbicide control, with or without burning, can reduce *Phragmites* abundance and increase plant

biodiversity temporarily. These changes do not necessarily lead to a more diverse animal community. Moreover, unless *Phragmites* is eradicated and further human disturbance is prohibited, it will likely eventually re-establish dominance.
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585. A comparison of factors controlling sedimentation rates and wetland loss in fluvial-deltaic systems, Texas Gulf Coast.

White, W. A.; Morton, R. A.; and Holmes, C. W.

Geomorphology 44(1-2): 47-66. (2002)

NAL Call #: GB400; ISSN: 0169-555X

Descriptors: wetlands/ marshes/ deltas/ spatial distribution/ submergence/ water level fluctuations/ sedimentation rates/ erosion/ model studies/ comparison studies/ USA, Texas, Trinity R./ USA, Texas, Lavaca R./ USA, Texas, Navidad R./ USA, Texas, Nueces R.

Abstract: Submergence of coastal marshes in areas where rates of relative sea-level rise exceed rates of marsh sedimentation, or vertical accretion, is a global problem that requires detailed examination of the principal processes that establish, maintain, and degrade these biologically productive environments. Using a simple super(210)Pb-dating model, we measured sedimentation rates in cores from the Trinity, Lavaca-Navidad, and Nueces bayhead fluvial-deltaic systems in Texas where more than 2000 ha of wetlands have been lost since the 1950s. Long-term average rates of fluvial-deltaic aggradation decrease southwestward from 0.514 plus or minus 0.008 cm year super(-1) in the Trinity, 0.328 plus or minus 0.022 cm year super(-1) in the Lavaca-Navidad, to 0.262 plus or minus 0.034 cm year super(-1) in the Nueces. The relative magnitudes of sedimentation and wetland loss correlate with several parameters that define the differing fluvial-deltaic settings, including size of coastal drainage basin, average annual rainfall, suspended sediment load, thickness of Holocene mud in the valley fill, and rates of relative sea-level rise. There is some evidence that upstream reservoirs have reduced wetland sedimentation rates, which are now about one-half the local rates of relative sea-level rise. The extant conditions indicate that fluvial-deltaic marshes in these valleys will continue to be lost as a result of submergence and erosion.

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586. Comparison of nitrogen cycling in salt marsh zones related to sea-level rise.

Thomas, C. R. and Christian, R. R.

Marine Ecology Progress Series 221: 1-16. (2001)

NAL Call #: QH541.5.S3M32; ISSN: 0171-8630

Descriptors: nitrogen cycle/ salt marshes/ sea level/ modelling/ USA, Massachusetts, Cape Cod, Buzzard's Bay, Great Sippewissett Salt Marsh/ USA, Virginia, Phillips Creek Marsh/ USA, Georgia, Sapelo I./ literature reviews/ primary production/ nitrogen fixation/ denitrification/ mineralization/ tidal effects/ ecosystems and energetics

Abstract: Zones in salt marshes can be distinguished by different community and ecosystem properties. As marshes respond to changes in sea level, one might expect alterations in the relative proportions of these zones and, hence, alterations in overall functioning. We used ecological network analysis to assess potential changes in 1 ecosystem function, nitrogen cycling. We constructed nitrogen cycle networks of zones (creekbank, low marsh, and high marsh) for 3 salt marshes on the East Coast of the

USA; Great Sippewissett in Massachusetts, Upper Phillips Creek in Virginia, and Sapelo Island in Georgia. The same network structure was applied to all zones, largely using data derived from the literature on the 3 marshes. The factors used to analyze how nitrogen flowed through each zone included how nitrogen imported into the marsh was exported, how imports were related to primary productivity, and how much nitrogen was cycled within the system. Emphasis was placed on identifying patterns across zones that were consistent for all 3 marshes. When precipitation and tidal particulate nitrogen (PN) were the imports, export from active cycling via burial and denitrification significantly increased in importance moving across the marsh from the creekbank to the high marsh. Relative nitrogen cycling also significantly increased from creekbank to high marsh. As the area of the marsh zones decrease or increase in response to sea-level rise, nitrogen dynamics will change as a consequence. If the landscape slope is low allowing the marsh to migrate overland, the high marsh zone will increase in area. Nitrogen cycling as a percentage of total system throughput will increase per unit area averaged over the total marsh. If, however, the marsh stalls because of a steep slope at the upland margin, cycling will decrease on a per unit area basis. If the supply of sediment is great and the marsh progrades toward the sea, nitrogen cycling within the marsh may decrease. Therefore, as relative sea-level rises, the response of a salt marsh's nitrogen cycle will depend on the slope and sediment supply available to the marsh.

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587. Composition and aboveground productivity of three seasonally flooded depressional forested wetlands in coastal South Carolina.

Busbee, W. S.; Conner, W. H.; Allen, D. M.; and Lanham, J. D.

Southeastern Naturalist 2(3): 335-346. (Sept. 2003)

NAL Call #: IPSP11706; ISSN: 1528-7092

Descriptors: wetlands/ forests/ leaf litter/ community composition/ rare species/ primary production/ coastal zone/ ecosystem management/ nature conservation/ dominant species/ *Nyssa aquatica*/ *Nyssa sylvatica*/ *Taxodium distichum*/ USA, South Carolina/ depressional wetlands/ productivity/ conservation, wildlife management and recreation

Abstract: Depressional wetlands provide habitat for birds, mammals, reptiles, amphibians, invertebrates, and rare plant species. In order to protect, restore, and manage depressional wetlands, it is important to know more about the vegetative composition and productivity of these systems. The species composition and aboveground productivity of three seasonally flooded depressional forested wetlands were studied on the coastal plain of South Carolina from January 2000 to January 2001. The dominant tree species in the depressions were *Taxodium distichum* [L.] Rich., *Nyssa aquatica* L., and *Nyssa sylvatica* var. *biflora* [Walt.] Sarg. Annual diameter at breast height (dbh) growth was measured for all trees >10 cm dbh in five 20 x 25 m plots within each depression, and changes in dbh were used to estimate annual biomass and stem production. Aboveground net primary productivity (ANPP) was calculated for each wetland by summing stem and leaf litter production. There were no significant differences in

ANPP among sites, ranging from 564-774 grams/m²/yr. These ANPP values are similar to values reported for slowly flowing forested wetland systems of the southern United States.

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588. Composition and vulnerability of bottomland hardwood forests of the coastal plain province in the South Central USA.

McWilliams W. H. and Rosson J. F.

Forest Ecology and Management 33-34(1-4): 485-502. (1990)

NAL Call #: SD1.F73; ISSN: 0378-1127.

Notes: International Forested Wetlands Resource: Identification and Inventory Conference, Baton Rouge, Louisiana, USA, September 19-22, 1988.

Descriptors: species/ composition/ moist/ types/ cover/ vegetation

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589. A conceptual model of ecological interactions in the mangrove estuaries of the Florida Everglades.

Davis, Steven M.; Childers, Daniel L.; Lorenz, Jerome J.; Wanless, Harold R.; and Hopkins, Todd E.

Wetlands 25(4): 832-842. (2005)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: estuarine ecology/ environmental sciences/ models and simulations/ computational biology/ wildlife management/ conservation/ horticulture/ agriculture/ conceptual model/ mathematical and computer techniques/ salinity gradient/ precipitation pattern/ global climate change/ freshwater flow/ ecological interaction

Abstract: A brackish water ecotone of coastal bays and lakes, mangrove forests, salt marshes, tidal creeks, and upland hammocks separates Florida Bay, Biscayne Bay, and the Gulf of Mexico from the freshwater Everglades. The Everglades mangrove estuaries are characterized by salinity gradients that vary spatially with topography and vary seasonally and inter-annually with rainfall, tide, and freshwater flow from the Everglades. Because of their location at the lower end of the Everglades drainage basin, Everglades mangrove estuaries have been affected by upstream water management practices that have altered the freshwater heads and flows and that affect salinity gradients. Additionally, interannual variation in precipitation patterns, particularly those caused to El Nino events, control freshwater inputs and salinity dynamics in these estuaries. Two major external drivers on this system are water management activities and global climate change. These drivers lead to two major ecosystem stressors: reduced freshwater flow volume and duration, and sea-level rise. Major ecological attributes include mangrove forest production, soil accretion, and resilience; coastal lake submerged aquatic vegetation; resident mangrove fish populations; wood stork (*Mycteria americana*) and roseate spoonbill (*Platelea ajaja*) nesting colonies; and estuarine crocodilian populations. Causal linkages between stressors and attributes include coastal transgression, hydroperiods, salinity gradients, and the "white zone" freshwater/estuarine interface. The functional estuary and its ecological attributes, as influenced by sea level and freshwater flow, must be viewed as spatially dynamic, with a possible near-term balancing of transgression but ultimately a long-term continuation of inland movement. Regardless of the spatio-

temporal timing of this transgression, a salinity gradient supportive of ecologically functional Everglades mangrove estuaries will be required to maintain the integrity of the South Florida ecosystem.

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590. 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/ USA, 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 construction experience in Florida's subtropics.

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591. Contiguity and edge characteristics of wetlands in five coastal counties of North Carolina, USA.

Moorhead, K. K.

Wetlands 19(1): 276-282. (Mar. 1999)

NAL Call #: QH75.A1W47; *ISSN:* 0277-5212

Descriptors: wetlands/ nature conservation/ regional planning/ resource management/ classification systems/ forest industry/ vegetation cover/ plant populations/ geographical reference systems/ USA, North Carolina/ geographical information systems/ conservation/ classification/ forestry/ vegetation/ geographic information system/ habitat community studies/ conservation, wildlife management and recreation/ network design

Abstract: Wetland contiguity and edge were determined with a geographic information system (GIS) for five coastal counties in North Carolina, USA. The digital database was created from wetlands digitized from U.S. Fish and Wildlife Service National Wetlands Inventory maps. The GIS analysis was based on three classes of information: 1) all wetlands as one class; 2) wetlands separated by dominant vegetative community type (e.g., forest, shrub, or marsh); and 3) forest and shrub wetlands further separated by dominant vegetation (e.g., evergreen, deciduous, or mixed). The contiguity analysis supports the perception that the lower coastal plain counties are dominated by large contiguous wetlands. When wetlands were lumped into one class, the number of wetlands > 1,000 ha ranged from 2 to 7 and the area accounted for 77 to 96% of the total wetland area. Several of those sites were > 100,000 ha in size. When wetlands were separated into more specific classes, the number of sites < 10 ha ranged from 416 to 3,370, but the wetland area in this size class was < 5% of the total wetland area. The average size of evergreen forest and shrub wetlands was typically much greater than deciduous forest and shrub wetlands, a reflection of the configuration of large, block pocosin wetlands. Percent edge was also typically lower for the evergreen forest and shrub wetlands than for deciduous forest and shrub wetlands. The counties with the highest number of wetland sites in transition to other uses have the most land owned by private timber companies. Contiguity analysis of wetlands with GIS provides landscape-scale information for natural resource management issues such as preserve design, habitat fragmentation, rare species management, and species migration opportunities.

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592. Creation and restoration of coastal wetlands of the northeastern United States.

Shisler, J. K.

In: *Wetland Creation and Restoration: The Status of the Science.*

Covelo, Calif.: Island Press, 1990; pp. 143-170.

Notes: ISBN: 1559630450

NAL Call #: QH541.5.M3W462

Descriptors: artificial wetlands/ coastal zone management/ habitat restoration/ water resources management/ wetland restoration/ monitoring/ performance evaluation/ vegetation establishment/ water resources development/ watershed management

Abstract: The wetlands of the coastal zone of the northeast have been managed since the colonization of the United States. Restoration work associated with mitigation of impacts has been going on in the region for over twenty years. Despite this history, there has not been an extensive evaluation of these projects to determine their success and how they function. The mitigation process should be directed towards a management approach that is concerned with the total system instead of just the 'vegetated' wetland. Goals should be based upon a wetland system's requirements within a watershed or region. The use of adjacent wetlands as models is critical in this process. Monitoring the created or restored wetlands can provide an important database which can be used in planning future projects. Goals, clearly defined in the design process, will promote meaningful evaluations. (Author's abstract)

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593. Cypress domes in north Florida: Invertebrate ecology and response to human disturbance.

Leslie, Andrea J.; Prenger, Joseph P.; 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. 105-119.
Notes: ISBN: 0471292583
NAL Call #: QL365.4.A1158
Descriptors: Invertebrata/ disturbance by man/ human disturbance effects on pondcypress swamps communities/ community structure/ population density/ pondcypress swamps community/ swamp/ human disturbance effects/ Florida/ pondcypress swamps aquatic community/ response to human disturbance
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594. Denitrification and soil characteristics of wetlands created on two mine soils in east Texas, USA.

Johns, D.; Williams, H.; Farrish, K.; and Wagner, S.
Wetlands 24(1): 57-67. (2004)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: soil properties/ denitrification/ artificial wetlands/ mine wastes/ lignite/ land reclamation/ mining/ sediment properties/ nitrogen cycle/ soil/ nitrates/ USA, Texas
Abstract: Recovery of wetland function is the primary goal of wetland creation. This study was undertaken to quantify denitrification and soil characteristics of wetlands created after lignite mine reclamation in east Texas, USA. Surface-soil denitrification rate and capacity were quantified using an acetylene (C₂H₂) inhibition/gas chromatography method in created wetlands of two age classes (4-8 years, and 10 years) on two mine soil types. Soil texture, pH, total-N, ammonium (NH₄⁺), nitrate (NO₃⁻), cation exchange capacity (CEC), total-P, and organic matter (OM) content were determined. Soil characteristics varied by soil type and by age. Denitrification rate ranged from less than 1 to 105 kg N ha⁻¹yr⁻¹, was highly variable, but did not differ among created wetlands. Denitrification rate was similar between natural and created wetlands. Denitrification capacity, denitrification rate when nitrate is in excess, ranged from 23 to 302 kg N ha⁻¹yr⁻¹ and varied by soil type. Denitrification appears to function as well in wetlands created on mine soil as in natural wetlands, but may be limited by soil characteristics.
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595. Denitrification enzyme activity of fringe salt marshes in New England (USA).

Wigand, C.; McKinney, R. A.; Chintala, M. M.; Charpentier, M. A.; and Groffman, P. M.
Journal of Environmental Quality 33(3): 1144-1151. (2004)
NAL Call #: QH540.J6; *ISSN:* 0047-2425
Descriptors: water pollution/ pollution control/ pollution load/ salt marshes/ watersheds/ wetland soils/ conservation buffers/ soil enzymes/ enzyme activity/ denitrification/ seasonal variation/ nitrogen/ phosphorus/ soil amendments/ Rhode Island
Abstract: Coastal salt marshes are a buffer between the uplands and adjacent coastal waters in New England (USA). With increasing N loads from developed watersheds, salt marshes could play an important role in the water quality maintenance of coastal waters. In this

study we examined seasonal relationships between denitrification enzyme activity (DEA) in salt marshes of Narragansett Bay, Rhode Island, and watershed N loadings, land use, and terrestrial hydric soils. In a manipulative experiment, the effect of nutrient enrichment on DEA was examined in a saltmeadow cordgrass [*Spartina patens* (Aiton) Muhl.] marsh. In the high marsh, DEA significantly ($p < 0.05$) increased with watershed N loadings and decreased with the percent of hydric soils in a 200-m terrestrial buffer. In the low marsh, we found no significant relationships between DEA and watershed N loadings, residential land development, or terrestrial hydric soils. In the manipulation experiment, we measured increased DEA in N-amended treatments, but no effect in the P-amended treatments. The positive relationships between N loading and high marsh DEA support the hypothesis that salt marshes may be important buffers between the terrestrial landscape and estuaries, preventing the movement of land-derived N into coastal waters. The negative relationships between marsh DEA and the percent of hydric soils in the adjacent watershed illustrate the importance of natural buffers within the terrestrial landscape. Denitrification enzyme activity appears to be a useful index for comparing relative N exposure and the potential denitrification activity of coastal salt marshes. This citation is from AGRICOLA.

596. Denitrification in a constructed wetland receiving agricultural runoff.

Poe, A. C.; Piehler, M. F.; Thompson, S. P.; and Paerl, H. W.
Wetlands 23(4): 817-826. (2003)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: artificial wetlands/ agricultural runoff/ denitrification/ nitrogen removal/ water quality control/ nutrient loading/ runoff/ water quality/ estuaries/ brackishwater pollution/ agricultural pollution/ pollution control/ restoration/ environment management/ nitrogen/ nutrients/ pollution load/ fluvial sediments/ sediments/ water pollution control/ surface water/ USA, North Carolina, Neuse R./ artificial wetlands
Abstract: Constructed wetlands are recognized as a means to improve water quality through nitrogen (N) removal. Water-quality concerns in the N-sensitive Neuse River Estuary, North Carolina, USA, have necessitated enactment of a 30% reduction in nitrogen (N) loading accompanied by an N loading cap. Open Grounds Farm (OGF) is an 18,220-ha row-crop farm located in the lower Neuse River Estuary. In 1999, a wetland was constructed to remove nutrients (N and Phosphorus), sediment, and pathogens in surface water draining from a 971-ha area of OGF. The wetland site is 5.1 ha of alternating segments of emergent marsh and open water. Nitrogen removal from the wetland via denitrification was measured monthly by analysis of dissolved nitrogen, oxygen, and argon in laboratory incubated sediment chambers using a Membrane Inlet Mass Spectrometer (MIMS). Nitrate concentration appeared to be the primary variable controlling denitrification rates. Spatial and temporal variability in rates of denitrification were investigated, including pre- and post- N loading events. Following rainfall, there was a 400% increase in denitrification rates in response to increased inorganic N loading. Nutrient loads entering and leaving the wetland were determined from nutrient analysis (twice monthly), intensive precipitation

event sampling, and continuous flow measurements at the entrance and exit of the wetland. Results indicated that the wetland received variable N loading (1-1,720 kg N per month) and had variable N removal via denitrification (8-81 kg N per month). Denitrification was an important mechanism for N removal.

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597. The design of ecological landscape models for Everglades restoration.

Sklar, F. H.; Fitz, H. C.; Wu, Y.; Van Zee, R.; and McVoy, C.

Ecological Economics 37(3): 379-401. (June 2001)

NAL Call #: QH540.E26; ISSN: 0921-8009.

Notes: Special Section: South Florida: The Reality of Change and The Prospects for Sustainability.

Descriptors: wetlands/ models/ environmental restoration/ landscape/ human impact/ hydrology/ USA, Florida, Everglades/ model studies/ ecology/ landscaping/ restoration/ phosphorus/ plant populations/ man-induced effects/ pollution effects/ ecosystem disturbance/ ecosystem management/ ecological distribution/ environment management/ environmental policy/ water management/ plant communities/ water quality/ mathematical models/ storm water/ trophic levels/ Typha/ Cladium/ USA, Florida, Everglades/ models/ modeling, mathematics, computer applications/ evaluation process/ protective measures and control/ land/ general environmental engineering/ reclamation

Abstract: Restoration of the Everglades is a multi-objective, multi-scale, multi-agency program that requires numerous computer models to test alternatives, understand ecosystem processes, and evaluate restoration performance. Landscape models used for Everglades restoration include hydrologic models, transition probability models, gradient models, distributional mosaic models, and individual-based models. As tools for restoration feasibility and as the backbone of the policies that will drive Everglades restoration for the next 20 years, it is critical that a wide audience evaluate the strengths and weaknesses of six landscape models. Simulations of historic hydropatterns and current hydropatterns, based mostly upon sheet-flow equations and canal-flow equations, respectively, have been the realm of the Natural Systems Model (NSM) and the South Florida Water Management Model (SFWMM). Despite a lack of biology in these two models, a comparison of their spatial output became the basis for the Comprehensive Everglades Restoration Plan (CERP) approved by the US Congress in October, 2000. SAWCAT, a transitional probability model, was based upon an analysis of the patchiness of cattail (*Typha*) and sawgrass (*Cladium*) cells in association with levees, water depth, and phosphorus. This statistical approach was used to predict the amount of sawgrass that would be converted to less desirable cattail, if phosphorus runoff patterns to the Everglades remained constant. The Everglades Water Quality Model (EWQM), a mass-balance gradient approach used to track phosphorus according to a simple net phosphorus removal coefficient, was used to design Storm Water Treatment Areas (STA) and to evaluate where and when phosphorus 'thresholds' would be exceeded under various hydrologic restoration plans. The Everglades landscape Model (ELM), a complex distributional mosaic model, used site-specific biogeochemical mechanisms and mass-balance to control energy and material flows, and to

predict changes in carbon and phosphorus structure of the soil, water, and plant communities as a result of modified water deliveries to the Everglades. The Across Trophic Level Spatial Simulation (ATLSS), also a distributional mosaic modeling approach, used individual-based rules of behavior to predict animal movement and abundance in relation to hydrologic restoration plans. When these landscape models are combined, they effectively contribute to water management and policy for Everglades restoration. To insure their effectiveness, an applied science strategy provides the framework for their integration into the restoration process.

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598. Differential recovery of a deepwater swamp forest across a gradient of disturbance intensity.

De Steven, D. and Sharitz, R. R.

Wetlands 17(4): 476-484. (Dec. 1997)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ USA, South Carolina, Savannah R./ deep-water habitats/ swamps/ cooling water/ vegetation establishment/ forests/ canopy/ substrates/ population density/ environmental impact/ water pollution/ thermal pollution/ ecosystem disturbance/ vegetation cover/ flood plains/ hydrology/ disturbance/ ecosystem recovery/ USA, South Carolina/ *Taxodium distichum*/ *Nyssa aquatica*/ USA, South Carolina, Savannah R./ Savannah River Site/ baldcypress/ water tupelo/ water and plants/ habitat community studies/ effects on organisms

Abstract: On the Savannah River Site, South Carolina, USA, large areas of floodplain swamp forest of baldcypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) were destroyed by the cumulative impacts of cooling-water discharges over a 35-year period of nuclear reactor operations. In one floodplain area, four years after thermal discharges ended, we analyzed the pattern of forest recovery across a disturbance gradient spanning from a site of chronic thermal impact and extensive sediment deposition to sites of intermittent thermal impact and little substrate change. Across this spatial gradient, we measured density and size structure of cypress and tupelo and assessed regeneration success in relation to density of surviving canopy trees and to substrate changes. Compared with undisturbed forest, canopy tree density was lower in all disturbed sites and decreased progressively with greater site disturbance. Density of tree regeneration decreased in parallel with declining canopy tree density; however, regeneration was particularly low in the site of chronic impact, where very few canopy trees had survived and where substrates had been modified by sedimentation. Size structures suggested that tree recruitment had occurred synchronously during a 5-year period of regional drought and minimal river flooding. Thus, cypress-tupelo recovery was influenced both by availability of seed sources and by site conditions, but floodplain hydrology also affected regeneration. The pattern of differential recovery across the disturbance gradient has allowed the use of natural regeneration potential in efforts to restore the pre-disturbance forest, and it also illustrates several key factors in wetlands design.

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599. Distribution and characterization of forested wetlands in the Carolinas and Virginia.

Brown, M. J.

Southern Journal of Applied Forestry 21(2): 64-70. (1997)
NAL Call #: SD1.S63; ISSN: 0148-4419

Descriptors: wetlands/ forests/ sampling/ classification/ estimating/ spatial distribution/ USA, Virginia/ USA, North Carolina/ USA, South Carolina/ water and plants/ evaluation, processing and publication

Abstract: Recent forest inventories of North Carolina, South Carolina, and Virginia, included sampling for hydric vegetation, hydric soils, and wetland hydrology. Forest samples that met all 3 of these criteria were classified as forested wetland. This study characterizes wetland forests by extent, owner, age, forest type, physiography, volume, growth, and removals, and evaluates its contribution to the timber supply. Wetland stands comprise 8.1 million ac, or 17% of the forests in the 3 States. They are over 90% privately owned, they vary widely by type and physiography, and they contribute 21% of all removals. Classification of wetland area based simply on broad management class and physiography will result in inaccurate estimates.

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600. 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.

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601. The distribution of benthic infauna of a Texas salt marsh in relation to the marsh edge.

Whaley, Shannon D. and Minello, Thomas J.

Wetlands 22(4): 753-766. (2002)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: benthic infauna distribution/ coastal salt marsh/ elevation/ fishery production/ marsh edge relations/ nekton predator activity/ predation/ prey source/ sediment/ trophic link/ vegetated marsh surface shallow open water interface/ wetlands ecology

Abstract: Coastal salt marshes in the northern Gulf of Mexico are often highly fragmented, with a large amount of marsh edge, the interface between the vegetated marsh surface and shallow open water. Nekton predators, including many juvenile fishery species, aggregate near this marsh edge, and benthic infaunal populations are a primary source of prey for many of these predators. We examined the fine-scale (1-10 m) distributions of benthic infauna in relation to the edge of a Texas, USA salt marsh. Every six weeks for nearly a year, we sampled marsh sediments at five locations: on nonvegetated bottom 1 m from the marsh edge and on the vegetated marsh surface at 1, 3, 5, and 10 m from the edge. Surface-dwelling annelid worms and peracarid crustaceans were most abundant in low-elevation sediments near the marsh edge for most sampling periods. Because the marsh slope varied within the study area, we could distinguish between correlative relationships with elevation and distance from the marsh edge. Distributions of common surface-dwelling species were often unrelated to elevation but almost always negatively related to distance from the marsh edge. Abundances of near-surface direct deposit feeders and omnivores were related to both distance from edge and elevation. In contrast to surface dwellers, densities of abundant subsurface deposit feeders (mainly oligochaetes) were frequently greatest in sediments located away from the marsh edge. Surface and near-surface dwelling infauna are an important prey resource for nekton, including many juvenile fishery species that concentrate near the marsh edge. Populations of these infaunal prey fluctuated seasonally, with the greatest densities occurring during winter and early spring when predator abundances are generally low. Infaunal densities decreased dramatically near the marsh edge from the late spring through early fall, and this decrease coincides with historically high seasonal densities of nekton predators. Our data suggest that there is a strong trophic link between infauna and nekton near the marsh edge and that this relationship contributes to the high fishery productivity derived from Gulf Coast marshes.

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602. A dynamic nutrient budget of subsystem interactions in a salt marsh estuary.

Childers, D. L.; McKellar, H. N.; Dame, R. F.; Sklar, F. H.; and Blood, E. R.

Estuarine, Coastal and Shelf Science 36(2): 105-131. (1993)

NAL Call #: GB451.E72; ISSN: 0272-7714

Descriptors: wetlands/ estuarine chemistry/ salt marshes/ hydrodynamics/ nutrient cycles/ carbon/ nitrogen/ phosphorus/ estuarine dynamics/ tidal effects/ biogeochemical cycle/ estuaries/ nutrient dynamics/ USA, South Carolina, North Inlet Estuary/ USA, South Carolina/ nutrient dynamics/ estuarine chemistry/ carbon/ nitrogen/ phosphorus/ estuarine dynamics/ tidal effects/ biogeochemical cycle/ ecosystems and energetics/ ecology/ community studies/ organic compounds

Abstract: In tidal salt marsh estuaries, the different habitats of the ecosystem interact primarily through the tidal creek water column. These interactions include nutrient and materials exchanges with the salt marsh, oyster reefs, creek bottoms, and adjacent uplands. Nutrient budgets are often used to synthesize these kinds of subsystem exchange data, and are usually based on annual totals without accounting for nutrient variability at finer temporal

resolutions. In this paper, we present a dynamic budget of carbon (C), nitrogen (N), and phosphorus (P) for the North Inlet estuary, South Carolina that synthesizes subsystem flux data in a new way. We have developed a dynamic budget that uses a tidal hydrology model to generate daily areas of inundated intertidal habitat (i.e. vegetated marsh and oyster reef) from tidal heights calculated hourly and combines them with flux data to determine a net daily input to, or removal from, the water column. Daily surpluses or deficits of each nutrient were compared with daily rates of change in observed tidally-averaged nutrient concentrations. Particular emphasis was placed on evaluating budget output from the intertidal subsystems. We compared our total annual budgets to values from syntheses of two North Inlet flux studies.

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603. Ecological research for aquatic science and environmental restoration in South Florida.

Redfield, G. W.

Ecological Applications 10(4): 990-1005. (2000)

NAL Call #: QH540.E23; ISSN: 1051-0761

Descriptors: wetlands/ resource management/ aquatic sciences/ restoration/ research programs/ aquatic environment/ environmental restoration/ USA, Florida/ resources/ law, policy, economics and social sciences/ reclamation

Abstract: The theme of this feature--the land-water interface: science for a sustainable biosphere--provides a forum to highlight the relationship between science and resource management, using restoration of the Kissimmee-Okeechobee-Everglades (KOE) ecosystem of south Florida as a case study. This subtropical ecosystem encompasses 16 counties and 44,000 km², from the Kissimmee Chain of Lakes in central Florida to the shallow estuarine waters of Florida Bay, and is within the jurisdiction of the South Florida Water Management District. During the next two decades, the floodplain and channel of the Kissimmee River will be re-coupled into a meandering river system with riparian wetlands and a more natural hydrology. An evaluation program on this restoration has been designed using ecological concepts and will provide opportunities to corroborate river/floodplain theory and document the varied responses of biotic communities to hydrological restoration. The evaluation program will provide the information needed for adaptive management of the river/floodplain ecosystem. Scientists and engineers are testing an array of ecological hypotheses on Lake Okeechobee, a central feature of the KOE ecosystem, to reduce uncertainty in predicting responses to nutrient loading, lake stage variation, and exotic species invasion. Research on the lake has clarified the linkage between physical factors, nutrient levels and biotic variables, and the frequency of algal blooms. This information has been used to support decisions and plans for managing the lake and its watershed. Restoration of the Florida Everglades is grounded in a diverse suite of scientific projects that are contributing to wetland science, ecosystem modeling, and restoration ecology. Studies on the effects of nutrients on wetland ecosystem structure and function have provided information at several spatial scales which is being applied directly to management issues. Findings from research and monitoring have been crucial in supporting decisions on the completion of six large stormwater treatment areas in the Everglades Construction Project. At the southern edge of the ecosystem, Florida Bay

has been the focus of intensive research leading to changing paradigms on the relative effects of nutrients, turbidity, physical factors, and fresh water on the functions of this unique estuary. Scientific findings on the bay support the current direction of management actions to increase freshwater inputs from the southern Everglades, although much remains to be learned about this subtropical system.
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604. Ecosystem structure, nutrient dynamics, and hydrologic relationships in tree islands of the southern Everglades, Florida, USA.

Troxler Gann, T. G.; Childers, D. L.; and Rondeau, D. N. *Forest Ecology and Management* 214(1-3): 11-27. (2005)
NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: Chrysobalanus icaco/ Everglades/ forested wetlands/ hot spots/ nutrient-use efficiency/ sheet flow/ tree islands

Abstract: Tree islands are an important structural component of many graminoid-dominated wetlands because they increase ecological complexity in the landscape. Tree island area has been drastically reduced with hydrologic modifications within the Everglades ecosystem, yet still little is known about the ecosystem ecology of Everglades tree islands. As part of an ongoing study to investigate the effects of hydrologic restoration on short hydroperiod marshes of the southern Everglades, we report an ecosystem characterization of seasonally flooded tree islands relative to locations described by variation in freshwater flow (i.e. locally enhanced freshwater flow by levee removal). We quantified: (1) forest structure, litterfall production, nutrient utilization, soil dynamics, and hydrologic properties of six tree islands and (2) soil and surface water physico-chemical properties of adjacent marshes. Tree islands efficiently utilized both phosphorus and nitrogen, but indices of nutrient-use efficiency indicated stronger P than N limitation. Tree islands were distinct in structure and biogeochemical properties from the surrounding marsh, maintaining higher organically bound P and N, but lower inorganic N. Annual variation resulting in increased hydroperiod and lower wet season water levels not only increased nitrogen use by tree species and decreased N:P values of the dominant plant species (*Chrysobalanus icaco*), but also increased soil pH and decreased soil temperature. When compared with other forested wetlands, these Everglades tree islands were among the most nutrient efficient, likely a function of nutrient immobilization in soils and the calcium carbonate bedrock. Tree islands of our study area are defined by: (1) unique biogeochemical properties when compared with adjacent short hydroperiod marshes and other forested wetlands and (2) an intricate relationship with marsh hydrology. As such, they may play an important and disproportionate role in nutrient and carbon cycling in Everglades wetlands. With the loss of tree islands that has occurred with the degradation of the Everglades system, these landscape processes may have been altered. With this baseline dataset, we have established a long-term ecosystem-scale experiment to follow the ecosystem trajectory of seasonally flooded tree islands in response to hydrologic restoration of the southern Everglades.

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605. Effects of dominant species on vegetation change in Carolina bay wetlands following a multi-year drought.

Mulhouse, John M.; De Steven, Diane; Lide, Robert F.; and Sharitz, Rebecca R.

Journal of the Torrey Botanical Society 132(3): 411-420. (2005)

NAL Call #: QK1.J687; ISSN: 1095-5674

<http://www.srs.fs.usda.gov/pubs/21578>

Descriptors: Carolina bays/ climate variation/ depression wetlands/ drought/ plant colonization/ succession/ vegetation dynamics

Abstract: Wetland vegetation is strongly dependent upon climate-influenced hydrologic conditions, and plant composition responds in generally consistent ways to droughts. However, the extent of species composition change during drought may be influenced by the pre-existing structure of wetland vegetation. We characterized the vegetation of ten herbaceous Carolina bay wetlands on the South Carolina Upper Coastal Plain during a period of average rainfall and again near the end of a four-year drought. We hypothesized that, as a group, bays dominated by less robust plant species (characteristic of open-water pond and depression meadow vegetation types) would show greater compositional change than bays dominated by dense, robust-form clonal graminoids (characteristic of grass and sedge marsh vegetation types). Aquatic species decreased during the drought in all wetlands, regardless of vegetation group. Compared to grass/sedge marshes, pond/meadow wetlands acquired more species, particularly non-wetland species, during the drought. Pond/meadow wetlands also had greater increases in the abundances of species that require unflooded conditions to establish. Prior to the drought, all wetlands were ponded almost continuously, but during drought the pond/meadow wetlands had shorter and more variable hydroperiods than the grass/sedge marshes. Thus, vegetation change may be partly confounded with hydrologic conditions that provide greater opportunities for species recruitment in pond/meadow bays. The results suggest that Carolina bay vegetation dynamics may differ as a function of dominant vegetation and climate driven variation in wetland hydrologic condition.

This citation is from Treesearch.

606. Fish assemblage structure in relation to environmental variation in a Texas Gulf Coastal wetland.

Gelwick, F. P.; Akin, S.; Arrington, D. A.; and Winemiller, K. O.

Estuaries 24(2): 285-296. (2001)

NAL Call #: GC96.E79; ISSN: 0160-8347

Descriptors: wetlands/ community structure/ marshes/ coastal environments/ seasonal variations/ species diversity/ estuaries/ habitats/ salt marshes/ estuarine environment/ fish migration/ fish populations/ water depth/ flooding/ dissolved oxygen/ habitat/ seasons/ floods and flooding/ oxygen (dissolved)/ organism aggregations/ brackishwater fish/ freshwater fish/ community composition/ ecological zonation/ indicator species/ salinity gradients/ vertical distribution/ environmental factors/ pisces/ USA, Texas, Matagorda Bay/ seasonal variations

Abstract: We described seasonal fish-assemblages in an estuarine marsh fringing Matagorda Bay, Gulf of Mexico. Habitat zones were identified by patterns of fish species

abundance and indicator species optima along gradients in salinity, dissolved oxygen (DO), and depth in our samples. Indicators of the lower brackish zone (lower lake and tidal bayou closest to the bay) were gulf menhaden (*Brevoortia patronus*), bay anchovy (*Anchoa mitchilli*), silver perch (*Bairdiella chrysoura*), and spotted seatrout (*Cynoscion nebulosus*) at salinity > 15ppt, DO 7-10 mg l super(-1), and depth < 0.5 m. Indicators of the upper brackish zone (lake and fringing salt marsh) were pinfish (*Lagodon rhomboides*) and spot (*Leiostomus xanthurus*) at salinity 10-20ppt, DO > 10 mg l super(-1), and depth < 0.5 m. In the freshwater wetland zone (diked wetland, ephemeral pool, and perennial scour pool), indicators were sheepshead minnow (*Cyprinodon variegatus*), rainwater killifish (*Lucania parva*), mosquitofish (*Gambusia affinis*), and sailfin molly (*Poecilia latipinna*) at salinity < 5ppt, DO < 5 mg l super(-1), and depth greater than or equal to 1 m. In the freshwater channelized zone (slough and irrigation canal), indicators were three sunfish species (*Lepomis*), white crappie (*Pomoxis annularis*), and gizzard shad (*Dorosoma cepedianum*) at salinity < 5ppt, DO < 5 mg l super(-1), and depth > 1.5 m. In brackish zones, seasonal variation in species diversity among sites was positively correlated with temperature, but assemblage structure also was influenced by depth and DO. In the freshwater zones, seasonal variation in species diversity among sites was positively correlated with depth, DO, and salinity, but assemblage structure was weakly associated with temperature. Species diversity and assemblage structure were strongly affected by the connectivity between freshwater wetland and brackish zones. Uncommon species in diked wetlands, such as tarpon (*Megalops atlanticus*) and fat sleeper (*Dormitator maculatus*), indicated movement of fishes from the brackish zone as the water level rose during natural flooding and scheduled (July) releases from the diked wetland. From September to July, diversity in the freshwater wetland zone decreased as receding waters left small isolated pools, and fish movement became blocked by a water-control structure. Subsequently, diversity was reduced to a few species with opportunistic life histories and tolerance to anoxic conditions that developed as flooded vegetation decayed.

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607. Florida Everglades: Natural variability, invertebrate diversity, and foodweb stability.

Rader, Russell B.

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. 25-54.

Notes: ISBN: 0471292583

NAL Call #: QL365.4.A1158

Descriptors: Invertebrata/ food webs/ wetland community stability/ community structure/ Piscean predators/ predation influence on wetland communities/ chemical pollution/ eutrophication threat to wetland communities/ physical factors/ hydrological variation influence on wetland communities/ Florida/ Florida Everglades/ wetland community diversity and food web stability/ overview

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608. Florida Wetland Condition Index for depressional forested wetlands.

Reiss, K. C.

Ecological Indicators 6(2): 337-352. (2006);

ISSN: 1470-160X

Descriptors: biological integrity/ Florida wetland condition index/ forested wetlands/ landscape development intensity/ urban wetlands

Abstract: Increasingly in the last decade biological monitoring and assessment have been used by federal and state agencies to assess water quality standards as required under the Clean Water Act. These efforts have led to the development of indices of biological integrity (often referred to as IBIs). Many states have created multi-metric indices, incorporating individual metrics into a quantitative value of community condition or biological integrity. The primary objective of this study was to develop the Florida Wetland Condition Index (FWCI) as a tool to evaluate the biological integrity of Florida depressional freshwater forested wetlands. Vegetative community composition and chemical and physical water and soil parameters were measured at 118 wetlands throughout Florida. An independent measure of the human disturbance gradient, the Landscape Development Intensity (LDI) index, which is based on the use of nonrenewable energy within a 100 m buffer around a wetland, was calculated. Six macrophyte community composition metrics were selected for inclusion in the FWCI based on the strength of correlation with LDI ($P < 0.01$) and differentiation between low (LDI < 2.0) and high (LDI ≥ 2.0) LDI groups ($P < 0.01$). The metrics included tolerant indicator species, sensitive indicator species, exotic species, floristic quality assessment index, native perennial species, and wetland status species. Metrics were scaled between 0 and 10, with 10 representing the reference wetland condition (correlating to wetlands in undeveloped landscapes). Scaled metrics were then added together to create the FWCI, with values ranging from 0 to 60. The FWCI was significantly correlated with LDI ($P < 0.001$), and significantly differentiated among sample wetlands categorized by low and high LDI groups ($P < 0.001$). In addition, significant correlations were found among the six metrics, FWCI, and LDI with measured chemical and physical water and soil parameters, including water column pH, turbidity, ammonia-nitrogen concentration, and total phosphorus concentration, and soil moisture, organic matter, total Kjeldahl nitrogen, and total phosphorus concentration. The primary efficacy of the FWCI was the calculation of a quantitative value of biological integrity for wetlands across a gradient of anthropogenic land use activities, which can be used objectively to assess water quality standards of Florida wetlands.

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609. Floristics of wetland pine savannas in the Big Thicket National Preserve, southeast Texas.

MacRoberts, Barbara R. and MacRoberts, Michael H.

Phytologia 85(1): 40-50. (1998)

NAL Call #: 450 P563; ISSN: 0031-9430

Descriptors: wetland pine savanna/ checklist

Abstract: We describe the floristics and edaphic conditions of wetland pine savannas in southeastern Texas.

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610. Forested limesink wetlands of southwest Georgia: Invertebrate habitat and hydrologic variation.

Golladay, Stephen W.; Entrekin, Sally; and Taylor, Brad W. 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, 1999; pp. 197-216.

Notes: ISBN: 0471292583

Descriptors: Invertebrata/ community structure/ population density/ forested limesink wetland communities/ semiaquatic habitat/ forest and woodland/ physical factors/ flooding/ hydrologic influences on forested limesink wetland communities/ Georgia, USA/ hydrologic influences

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611. Forms and amounts of soil nitrogen and phosphorus across a longleaf pine-depressional wetland landscape.

Craft, Christopher B. and Chiang, Connie

Soil Science Society of America Journal 66(5):

1713-1721. (2002)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: freshwater ecology: ecology, environmental sciences/ soil science/ terrestrial ecology: ecology, environmental sciences/ carbon:nitrogen:phosphorus ratios/ drainage gradients/ landscape position: degree of wetness, drainage/ longleaf pine depressional wetland landscape/ longleaf pine wiregrass forests/ nutrient retention/ periodic waterlogging/ sandy soils/ soil organic matter

Abstract: Forms and amounts of soil N and P were measured across transects from freshwater depressional wetlands into longleaf pine-wiregrass forests of southwestern Georgia to evaluate changes in labile vs. recalcitrant N and P and C:N:P ratios across drainage gradients. Plant-available $\text{NO}_3\text{-N}$ (3.7 mug cm^{-3}) and organic N (2000 mug cm^{-3}) were significantly greater in wetland than upland soils ($\text{NO}_3\text{-N}=0.03 \text{ mug cm}^{-3}$, organic N= 890 mug cm^{-3}) and C:N increased from wetlands (17:1) into uplands (43:1). Forms and amounts of P were not as strongly related to landscape position as N. Labile organic P (Po , 2.6 mug cm^{-3}) was significantly greater in wetland than upland soils (0.88 mug cm^{-3}). Recalcitrant organic compounds accounted for 95 to 97% of the N and 50 to 82% of the P stored in wetland and upland soils. Wetland soils stored a disproportionately large share of N as compared with upland soils even though soil organic matter (C) content was uniform across the landscape. Landscape position (drainage, degree of wetness) is an important determinant of nutrient retention in sandy soils of the southeastern coastal plain. Periodic waterlogging favors sequestration of biological (organic) forms of N and P with proportionally greater storage of N relative to P. Soil waterlogging by promoting accumulation of N more than P favors a shift from N limitation in upland soils towards P limitation in wetland soils of the southeastern coastal plain.

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612. Functional equivalency of natural and excavated coastal plain ponds.

Zampella, R. A. and Laidig, K. J.

Wetlands 23(4): 860-876. (2003)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ ponds/ hydrology/ water quality/ vegetation patterns/ restoration/ pH/ species diversity/ community composition/ total organic carbon/ coastal zone/

environmental effects/ slopes (topography)/ ecological zonation/ biodiversity/ land use/ plant populations/ vegetation cover/ light transmission/ hydrogen ion concentration/ coastal plains/ vegetation/ organic carbon/ species composition/ water depth/ watersheds/ substrates/ Plantae/ USA, New Jersey/ comparative studies/ New Jersey pinelands

Abstract: A major obstacle to assessing functional equivalency of restored or created wetlands is the time needed to develop the functions of natural wetlands. We compared hydrologic, water-quality, and vegetation-composition functions of nine natural coastal plain ponds in the New Jersey Pinelands with those of four small, well-established excavated basins that are at least 50 years old. Our study revealed that well-established (> 50 yr old) excavated ponds achieved a moderate degree of functional equivalency with Pinelands wetlands, representing a range of coastal plain pond characteristics. Based on water-depth-fluctuation patterns and the similarity of most hydrologic indices, including high-water pond area, mean water depth, area of exposed substrate (drawdown), and the presence of a clay lens, the excavated ponds seemed to achieve hydrologic equivalency with the natural reference wetlands. However, steeper bank slopes found at most of the excavated ponds affected nearshore water depths and resulted in the absence of plant zonation that characterizes coastal plain ponds. The water-quality function, represented by pH, specific conductance, and total organic carbon, differed between pond types. The pH and specific conductance of the excavated ponds were higher and total organic carbon concentrations were lower compared with the natural ponds. We attributed these differences to landscape setting, reflected by adjacent vegetation and contrasting plant zonation. Elevated specific conductance values in the natural ponds were likely due to the higher hydrogen ion concentrations. Reduced light transmission due to higher organic carbon concentrations in the natural ponds may have greater ecological importance. However, differences in water-quality functions between the pond types may make excavated ponds more prone to changes in pH if constructed within landscapes with extensive developed or agricultural lands. The excavated ponds met or exceeded most vegetation-composition reference criteria associated with the natural wetlands. Total and herbaceous species richness were greater in the excavated ponds. Most importantly, the excavated ponds supported a native Pinelands species composition, thus preserving regional biodiversity. Because all ponds were acidic and displayed pH values within the range associated with native Pinelands plants, differences in pH may not have been the cause of the greater species richness. Although overall species composition differed between the two pond types, the flora of the created wetlands was similar to that of coastal plain ponds found in other regions and other areas of the Pinelands. The major difference in vegetation composition between ponds was both the lack of distinct vegetation zonation due to steeper slopes and lower patch-type diversity in the excavated ponds. These structural differences can be overcome by constructing ponds with slopes that are comparable to natural ponds. Because the transitional-upland location of the excavated ponds is a more likely location for a mitigation wetland, the effect of landscape setting on water quality may not be as easily remedied as the lack of nearshore slopes.

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613. Functions and values of forested wetlands in the southern United States.

Walbridge, M. R.

Journal of Forestry 91(5): 15-19. (1993)

NAL Call #: 99.8 F768; ISSN: 0022-1201

Descriptors: wetlands/ watershed management/ forest hydrology/ ecosystems/ flood control/ water quality/ water use/ land use/ biogeochemistry/ hydrology/ resource management/ USA/ resource management/ watershed management/ forest hydrology/ water use/ watershed protection/ conservation, wildlife management and recreation/ freshwater pollution

Abstract: Forested wetlands in the southern United States include bottomland hardwood forests, cypress swamps, and pocosin and bay forest ecosystems—a comparatively unique feature of the Carolina coastal plain. Hardwood swamps also line major black-, brown-, and redwater rivers of the Atlantic and Gulf coastal plain. This heterogeneous group of wetlands exhibits an equally diverse range of functions and values, from controlling flooding to maintaining water quality, coastal fisheries, and wildlife habitat. This article will quantify the importance of southern forested wetlands. It will also identify their specific functions and values, focusing on the biogeochemical functions that lead to improved water quality, and suggest strategies for wise use and management.

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614. The Great Dismal Swamp: An illustrated case study.

Carter, V.

In: Forested Wetlands/ Lugo, Ariel E.; Brinson, Mark M.; and Brown, S. K.; Series: Ecosystems of the World 15. New York: Elsevier Science Publishing Co., 1990; pp. 201-211.

Notes: ISBN: 0444428127

NAL Call #: QH540.E27 no.15

Descriptors: Great Dismal Swamp/ North Carolina/ plant populations/ remote sensing/ swamps/ Virginia/ wetland forests/ anthropogenic disturbance/ ecosystems/ hydrology/ litter/ nutrients/ phytoplankton/ vegetation/ water quality/ wildlife habitats

Abstract: The Great Dismal Swamp is an 84,000 ha forested wetland on the Virginia-North Carolina border in the southern Atlantic Coastal Plain of the United States. The organic soils of the swamp range in depth from 4 m in ancient drainage channels to less than 0.3 m along the outer edges. Lake Drummond, approximately 4 km in diameter, is almost centrally located within the swamp. The flora includes individual species and plant assemblages otherwise scattered widely to the north and south along the Coastal Plain. Anthropogenic disturbance of the natural vegetation has resulted in a wide diversity of wildlife habitats. Present studies include the dynamics of the wetland-to-upland transition zone, wetland hydrology, litter production and nutrient studies in individual communities, water quality and phytoplankton populations in the lake and ditches, vegetation trends and regeneration strategies, organic soil development and wildlife habitat requirements. Remotely-sensed data provide an overview and level of detail needed to put small areas into perspective with the total ecosystem represented by this swamp.

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615. 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; ISSN: 0038-4909
Descriptors: aquatic habitat/ forested wetlands/ habitat types/ habitat use
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616. Heterogeneity of hydromorphic features: Observations from a Coastal Plain hydrosequence.

Tangren, S. A.; Fanning, D. S.; Presteggaard, K. L.; and Rabenhorst, M. C.
 In: Quantifying soil hydromorphology Proceedings of a symposium, Indianapolis, Indiana, 4 November 1996.
 Rabenhorst, M. C.; Bell, J. C.; and McDaniel, P. A. (eds.)
 Madison, WI: Soil Science Society of America; pp. 173-193; 1998.
Descriptors: soil variability/ sampling/ soil classification/ sandy loam soils/ coastal plain soils/ soil/ redox potential/ soil morphology/ hydrosequences/ forests/ internal drainage/ upland soils/ wetland soils/ catenas
Abstract: The following are discussed: (i) the variability that results from choice of a sampling site within a pedon, (ii) how that variability affects the ability to detect catenary variation, (iii) within-pedon heterogeneity as a function of catenary position, and (iv) the implications of within-pedon heterogeneity for soil classification. The study site is a valley situated on glauconitic sandy-loams of the Coastal Plain in Maryland, USA. Six of forty pre-existing well sites were selected for replicate soil sampling. The well sites represent a variety of soil drainage conditions, from moderately well to poorly drained. Within a pedon-sized (10-m²) area around each of the six wells, six replicate auger holes have been drilled and the profiles described (36 descriptions total). For each description, the depth to redox concentrations and redox depletions was recorded. Standard errors of the six replicated descriptions were calculated and provide a quantitative indication of each pedon's redoximorphic variability. Upland pedons had a greater redoximorphic variability than wetland pedons. Variability within a pedon often affected the conclusions made about the soil. Although considerable, particularly in higher positions of the transect, variability was not so great as to obscure the landscape trend in depth to redoximorphic features. The spatial heterogeneity of hydromorphic features affected the determinations of soil drainage class, hydric soil indicators, and taxonomic classification.
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617. Historic landcover and recent landscape change in the North Indian River Lagoon Watershed, Florida, USA.

Duncan, B. W.; Larson, V. L.; and Schmalzer, P. A.
Natural Areas Journal 24(3): 198-215. (July 2004)
 NAL Call #: QH76.N37; ISSN: 0885-8608
Descriptors: wetlands/ historical ecology/ lagoons/ watersheds/ maps/ ecosystem management/ environment management/ land use/ coastal lagoons/ anthropogenic factors/ marshes/ resource management/ estuaries/ river basin management/ long-term changes/ urbanization/ agriculture/ photographs/ coastal zone/ canals/ time series

analysis/ man-induced effects/ USA, Florida, Indian River Lagoon/ surveying and remote sensing/ mechanical and natural changes/ management
Abstract: Terrestrial landcover features within watersheds greatly influence aquatic systems. Humans have settled primarily in coastal regions putting tremendous stress on coastal aquatic systems. The Indian River Lagoon (IRL), located along Florida's Atlantic coast, is one of North America's most diverse estuaries surrounded by a rapidly growing human population. To quantify changes that have occurred within the watershed, we produced landcover maps representing the northern portion of the Indian River Lagoon watershed for 1920, 1943, and 1990. The 1943 and 1990 maps were generated by photo interpretation and the 1920 map was produced by spatial modeling techniques. All anthropogenic landcover types increased throughout the study period, while all native landcover types decreased, with the exception of hammocks. The dominant, terrestrial landcover types in 1920 were flatwoods, scrub, and freshwater marsh. In 1943, flatwoods and scrub types were still dominant, but agriculture was the third most abundant type. In 1990 urban became the dominate landcover with flatwoods second and agriculture third. The remaining natural areas have been highly fragmented by roads, canals, and urban areas. Shoreline composition has changed, with 1% of the Indian River Lagoon study shoreline being comprised of urban in 1920 and 26% in 1990. This dataset is useful for identifying changes in functional landcover, which will help improve the management of resources within the IRL watershed and support important ecological studies investigating the relationships between nature and anthropogenic influences.
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618. History of Delaware and New Jersey salt marsh restoration sites.

Philipp, K. R.
Ecological Engineering 25(3): 214-230. (2005)
 NAL Call #: TD1.E26; ISSN: 0925-8574
Descriptors: diked marshes/ restoration planning/ tidal marsh geomorphology/ tidal marshland use
Abstract: Humans have modified the tidal marsh sites of the Public Service Enterprise Group Estuary Enhancement Program over the past 400 years as well as by natural processes such as sea level change and storms. We used the data reported here - photographs and maps that showed the range of changes and the time frame in which these changes occurred - as the basis for restoration design. These data show the ephemeral nature of some salt marsh features and the persistence of others, despite centuries of diking, hurricanes and flooding. These data were used to develop the restoration time lines and the expectations as to marsh form and function. The individual history of each restoration site is reviewed through historic maps and aerial photographs and is followed by reference to site features, such as drainage ditches, channels, tidal range, vegetation change, and land use over time.
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619. Influence of restoration and succession on bottomland hardwood hydrology.

Kolka, R. K.; Singer, J. H.; Coppock, C. R.; Casey, W. P.; and Trettin, C. C.

Ecological Engineering 15(Suppl. 1): S131-S140. (Sept. 2000)

NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: wetlands/ environmental restoration/ hydrology/ ecological succession/ vegetation cover/ ecosystem disturbance/ geomorphology/ USA, South Carolina/ reclamation/ protective measures and control
Abstract: The hydrologic pathways of four bottomland hardwood wetland sites were investigated with transects consisting of nests of shallow wells and piezometers. Sites included a disturbed but recently restored system, two disturbed systems that are recovering naturally and a relatively undisturbed reference site. Water table elevations in both uplands and bottomlands were significantly higher in the reference site than in disturbed sites. Hydrologic budgets were developed that included throughfall inputs, upland inputs, bottomland interflow, bottomland losses to the stream and evapotranspiration (ET) losses. The recently restored bottomland had significantly higher throughfall and lower ET than the naturally recovering sites. Higher throughfall and lower ET is attributed to canopy manipulations that occurred during restoration. Other hydrologic fluxes are relatively similar among the disturbed sites. Reference site flow pathways were significantly different than those of the disturbed sites. Higher ET in the reference site is attributed to differences in canopies between the reference and disturbed sites. Higher upland inputs, bottomland interflow, and bottomland losses to the stream are the result of higher water tables in the reference site. Lower water tables in disturbed sites may be caused by the geomorphic changes that occurred during elevated flow periods prior to recovery.

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620. Influences of herbivory and canopy opening size on forest regeneration in a southern bottomland hardwood forest.

Castleberry, S. B.; Ford, W. M.; Miller, K. V.; and Smith, W. P.

Forest Ecology and Management 131(1/3): 57-64. (2000)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: wetlands/ canopy gaps/ size/ bottomland forests/ natural regeneration/ browsing/ browsing damage/ wild animals/ seasonal variation/ species diversity/ fences/ species richness/ woody plants/ forbs/ habitats/ animal behaviour

Abstract: The effects were examined of white-tailed deer (*Odocoileus virginianus*) browsing and canopy opening size on relative abundance and diversity of woody and herbaceous regeneration in various sized forest openings in a southern bottomland hardwood forest at the Savannah River Site in South Carolina, USA, over 3 growing seasons (1995-1997). 36 canopy openings (gaps) were created by group selection timber harvest in December 1994, ranging from 7 to 40 m in radius. Fenced exclosures of 2 types (excluding either deer alone, or deer and swamp rabbits, *Sylvilagus aquaticus*) were constructed in the centre of each gap, with unfenced adjacent controls, and vegetation was sampled monthly from April to September. Plant species richness, diversity, evenness, relative abundance, and a browsing index were calculated for each gap size

and for each exclosure type. Herbaceous richness, diversity, or evenness did not differ among exclosure types in any year of the study. Browsing index was higher in the controls in 1996 and 1997. Browsing index for woody species was highest in the controls in 1995 and 1997. Relative abundance of herbaceous species was highest in the 29 m gap size in 1997. Richness and diversity of woody species were lowest in the 29 m gap size in 1995 and 1996. Overall browsing rates on both woody and herbaceous vegetation were low throughout all 3 years of the study. Low browsing rates reflect seasonal changes in habitat use by deer. Because of the low rates of browsing, vegetative differences among exclosure treatments and gap sizes likely are not attributable to deer herbivory. Other factors, such as soil disturbance, may have influenced the initial vegetative response more than herbivory or gap size.

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621. Insecticides for insect pest control in constructed wetlands for wastewater treatment: A dilemma.

Snoddy, E. L. and Cooney, J. C.

In: Pesticides in terrestrial and aquatic environments: Proceedings of a national research conference. (Held 11 May 1989-11 May 1989 at Virginia Water Resources Research Center, Blacksburg, Va.); pp. 440-443; 1989.

NAL Call #: QH545.P4P4844

Descriptors: wetlands/ pesticides/ wastewater treatment/ acid mine drainage/ aquatic plants/ cattails/ domestic wastewater/ macrophytes/ mosquitoes/ organophosphorus pesticides/ wastewater treatment processes/ lakes
Abstract: The utilization of macrophytes for both primary and secondary wastewater treatment is a relatively new technology now being utilized for domestic sewage, certain industrial discharges, and acid mine drainage. Some of the major insect problems associated with these facilities include mosquitoes and other biting flies produced as a result of facility construction and operation, and plant feeding insects that may destroy the planted flora. The macrophytes utilized in these constructed wetlands, particularly the cattail *Typha latifolia*, are subject to severe depredation by the armyworm complex. In order to control this pest, insecticides must be applied immediately upon discovery of this insect on the plants. An operational case study, which describes this particular problem and the use of organophosphorus (OP) insecticides for the control of the cattail army worm *Simyra henrici* (Lepidoptera: Noctuidae) is presented. The treatments and observations were made in acid drainage treatment wetlands at Widow 's Creek Steam-Electric Plant, Stevenson, Alabama.

(Author 's abstract)

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622. Interactive effects of seed availability, water depth, and phosphorus enrichment on cattail colonization in an Everglades wetland.

Miao, S. L.; McCormick, P. V.; Newman, S.; and Rajagopalan, S.

Wetlands Ecology and Management 9(1): 39-47. (2001)

NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861

Descriptors: wetlands/ nutrient enrichment/ seeds/ USA, Florida/ nutrients (mineral)/ phosphorus/ water depth/ environmental factors/ colonization/ recruitment/ air temperature/ germination/ growth/ *Typha domingensis*/ USA, Florida, Everglades/ grasses/ environmental effects/ reproduction and development

Abstract: The relative importance of seed availability, water depth, and soil phosphorus (P) concentrations on cattail (*Typha domingensis* pers.) early establishment in an Everglades wetland area was examined using seed bank analysis and controlled experiments. The experiment measured seed germination and seedling growth in tanks with cattail seed addition subjected to two P concentrations (un-enriched vs. enriched) and water depth (saturated vs. flooded soils). A limited seed bank (223 plus or minus 69 m super(2)) of cattail was found in the surface soil of the area studied. The germination of added seeds was inhibited under flooded conditions, and only 0.6% of the germination was found. In contrast, under-saturated soil conditions, a maximum of 6% and 15% germination was observed in P-un-enriched and P-enriched treatments, respectively. High mortality of seedlings occurred regardless of P treatments following a cold spell. However, P enrichment resulted in increased seedling growth and asexual propagation. These results suggested the importance of the concurrence of appropriate hydrologic regimes, P enrichment, and air temperature on the recruitment of plant species.

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623. Invertebrate communities of forested limesink wetlands in southwest Georgia, USA: Habitat use and influence of extended inundation.

Golladay, S. W.; Taylor, B. W.; and Palik, B. J.
Wetlands 17(3): 383-393. (1997)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ aquatic habitats/ invertebrates/ sinks/ limestone/ forests/ benthos/ population density/ flooding/ community composition/ ecosystem disturbance/ Invertebrata/ USA, Georgia, Dougherty Plain, Ichauway Ecological Reserve

Abstract: Limesink wetlands are a common aquatic habitat in southwest Georgia, USA. These wetlands are non-alluvial, occupying shallow depressions formed from dissolution of limestone bedrock and collapse of surface sands. They are seasonally inundated, with a typical hydroperiod extending from late February to early July. Little is known about factors influencing invertebrate community structure in limesink wetlands. Recently, it has been suggested that regular inundation and drying are important influences on community structure in some seasonal wetlands. We had an opportunity to examine this hypothesis in 3 forested limesink wetlands. Quantitative samples of invertebrates were taken monthly on benthic and wood surfaces from March 1994 through July 1995. This included a period of unusually heavy precipitation, summer and autumn of 1994, when the wetlands would normally be dry. Immediately following inundation, benthic samples were dominated by amphipods (*Crangonyx* sp.), isopods (*Caecidotea* sp.), cladocerans, and copepods. Maximum total densities (1000-4000 individuals per m super(2)) were observed within 3 months of inundation. During summer and autumn, densities decreased (< 500 individuals per m super(2)), and the benthos was dominated by larval chironomids. Wood surfaces were dominated by chironomids, with greatest densities (1000-3000 individuals per m super(2)) observed in summer and autumn. Although not quantified, freshwater sponge became very abundant on wood surfaces during autumn. During the following spring (1995), invertebrate densities on sediments remained low, and few amphipods, isopods, cladocerans, or copepods were collected. Chironomids

remained very abundant on wood. Our results suggest that extended inundation is a disturbance to some elements of wetland invertebrate communities. Extended inundation may cause short-term reductions in populations by eliminating summer refugia (amphipoda, isopoda) or by altering environmental cues necessary for the completion of life cycles (cladocerans, copepods).

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624. 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 in forested wetland/ semiaquatic habitat/ forest and woodland/ forested wetland/ communities associated with woody debris/ South Carolina/ Coosawhatchie River floodplain/ communities associated with woody debris in forested wetland/ survey and influencing factors

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.

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625. 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/ USA, Florida/ ecosystem management/ nature conservation/ habitat improvement/ hydrology/ water management/ USA, Florida, Everglades/ modeling, mathematics, computer applications/ protective measures and control/ reclamation

Abstract: As part of the effort to restore the similar to 10,000-km super(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.
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626. Landscape ecological assessment of the Chesapeake Bay Watershed.

Weber, T.

Environmental Monitoring and Assessment 94(1-3): 39-53. (June 2004)

NAL Call #: TD194; ISSN: 0167-6369

Descriptors: wetlands/ watersheds/ environmental monitoring/ ecosystem management/ conservation/ monitoring/ environmental conditions/ regional planning/ environmental policy/ land use/ resource management/ catchment areas/ ecology/ assessments/ environmental effects/ environmental protection/ catchment area/ water quality control/ environmental legislation/ agriculture/ urbanization/ rare species/ vulnerability/ policies/ runoff/ resource conservation/ nature conservation/ river basin management/ ecological evaluation/ landscape/ vegetation cover/ coniferous forests/ USA, Chesapeake Bay/ USA, Maryland/ USA, Washington, D.C./ USA, Virginia/ USA, Pennsylvania/ USA, Mid-Atlantic Region/ management/ environmental action/ water resources and supplies/ data acquisition/ conservation, wildlife management and recreation/ land/ general environmental engineering

Abstract: The Chesapeake Bay Watershed, located in the Mid-Atlantic Region of the United States, is experiencing rapid habitat loss and fragmentation from sprawling low-density development. The bay itself is heavily stressed by excess sediment and nutrient runoff. Three states, the District of Columbia, and the federal government signed an agreement in 2000 to address these problems. The commitments included an assessment of the watershed's resource lands, and targeting the most valued lands for protection. As part of this task, the Resource Lands Assessment identified an ecological network comprised of large contiguous blocks (hubs) of forests, wetlands, and streams, interconnected by corridors to allow animal and plant propagule dispersal and migration. Hubs were prioritized by ecoregion, by analyzing a variety of ecological parameters, including: rare species presence, rarity and population viability; vegetation and vertebrate richness;

habitat area, condition, and diversity; intactness and remoteness; connectivity potential; and the nature of the surrounding landscape. I found that much of the watershed was still fairly intact, although this varied dramatically by ecoregion. Current protection also varied, and an assessment of vulnerability will help focus protection efforts among the most valuable hubs and corridors.
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627. Landscape modeling for Everglades ecosystem restoration.

DeAngelis, D. L.; Gross, L. J.; Huston, M. A.; Wolff, W. F.; Fleming, D. M.; Comiskey, E. J.; and Sylvester, S. M. *Ecosystems* 1(1): 64-75. (Jan. 1998-Feb. 1998)

NAL Call #: QH540 .E3645; ISSN: 1432-9840

Descriptors: wetlands/ ecosystem management/ environmental protection/ marshes/ trophic structure/ habitat improvement/ hydrology/ food webs/ water management/ models/ landscape/ environmental restoration/ ecosystem recovery/ USA, Florida/ USA, Florida, Everglades/ ecosystems/ trophic level/ simulation/ model studies/ spatial distribution/ rehabilitation/ estimating/ habitats/ prediction/ water depth/ geographic information systems/ habitat/ USA, Florida, Everglades/ modelling/ spatial variations/ ATLSS/ landscape modeling/ conservation, wildlife management and recreation/ modeling, mathematics, computer applications/ environmental action/ reclamation

Abstract: A major environmental restoration effort is under way that will affect the Everglades and its neighboring ecosystems in southern Florida. Ecosystem and population-level modeling is being used to help in the planning and evaluation of this restoration. The specific objective of one of these modeling approaches, the Across Trophic Level System Simulation (ATLSS), is to predict the responses of a suite of higher trophic level species to several proposed alterations in Everglades hydrology. These include several species of wading birds, the snail kite, Cape Sable seaside sparrow, Florida panther, white-tailed deer, American alligator, and American crocodile. ATLSS is an ecosystem landscape-modeling approach and uses Geographic Information System (GIS) vegetation data and existing hydrology models for South Florida to provide the basic landscape for these species. A method of pseudotopography provides estimates of water depths through time at 28 x 28-m resolution across the landscape of southern Florida. Hydrologic model output drives models of habitat and prey availability for the higher trophic level species. Spatially explicit, individual-based computer models simulate these species. ATLSS simulations can compare the landscape dynamic spatial pattern of the species resulting from different proposed water management strategies. Here we compare the predicted effects of one possible change in water management in South Florida with the base case of no change. Preliminary model results predict substantial differences between these alternatives in some biotic spatial patterns.

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628. Long-term nutrient accumulation rates in the Everglades.

Reddy, K. R.; Delaune, R. D.; Debusk, W. F.; and Koch, M. S.

Soil Science Society of America Journal 57(4): 1147-1155. (1993)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Abstract: The study was conducted to determine potential rates for this ecosystem along a gradient of nutrient loading. Accumulation rates were calculated using the vertical peat accretion rates, as determined by ¹³⁷Cs dating, and nutrient concentration profiles. Vertical accretion rates of peat decreased logarithmically with distance from the inflow. The C/P and N/P accumulation ratios increased with distance from the inflow, suggesting that a greater proportion of P accumulated in the system, compared with C and N. These findings suggest that P was either directly adsorbed by soil or precipitated with Ca in the water column and deposited on the soil surface. This hypothesis was further supported by a highly significant correlation between P and Ca accretion rates, suggesting that Ca-bound P controls equilibrium concentrations in this ecosystem. -from Authors

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629. Melaleuca in Florida: A literature review on the taxonomy, distribution, biology, ecology, economic importance and control measures.

Serbesoff-King, K.

Journal of Aquatic Plant Management 41: 98-112. (2003)

NAL Call #: SB614.H9; ISSN: 0146-6623

Descriptors: trees/ aquatic weeds/ aquatic plants/ exotic species/ ecological effects/ economic impact/ lakes/ literature review/ marshes/ dispersion/ rare species/ biodiversity/ geographical distribution/ literature reviews/ seed production/ environmental impact/ Melaleuca quinquenervia/ USA, Florida/ bottle brush tree/ control of water on the surface/ species interactions: pests and control

Abstract: Melaleuca (*Melaleuca quinquenervia* (Cav.) S.T. Blake) is a large tree species that occurs naturally throughout eastern Australia, New Caledonia, Irian Jaya and southern New Guinea. In North America, melaleuca has primarily infested the Florida peninsula south of Lake Okechobee. It is classed as a Federal Noxious Weed in the United States and as a Prohibited Aquatic Plant and Noxious Weed in the state of Florida. In the continental United States, melaleuca has been recorded from Louisiana, Texas and California. Additionally, this tree has become moderately invasive in Puerto Rico and Hawaii. Melaleuca rapidly invades moist, open habitats, both disturbed and undisturbed, and forms dense, impenetrable monocultures. In general, invasion is less prominent in forested sites than marshes; however, only dense hammock-type communities seem to produce enough shade to prevent invasion. Invasive characteristics of melaleuca include its evergreen habit, prolific seed production, frequent flowering, and flood and drought tolerance. This tree threatens biodiversity of native flora and fauna by diminishing the value of their habitat. The large expanses of melaleuca on public lands have cost public agencies in Florida \$25 million in control efforts between 1989 and 1999. Estimations of economic impacts of melaleuca on recreation, tourism, fires, loss of endangered species, and more range from \$168 million

annually to \$2 billion over a period of 20 years. Various methods of control (chemical, mechanical, manual, biological and integrated) are evaluated.

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630. Metal uptake, transport and release by wetland plants: Implications for phytoremediation and restoration.

Weis, J. S. and Weis, P.

Environment International 30(5): 685-700. (2004)

NAL Call #: TD169.E54; ISSN: 0160-4120

Abstract: Marshes have been proposed as sites for phytoremediation of metals. The fate of metals within plant tissues is a critical issue for effectiveness of this process. In this paper we review studies that investigate the effects of plants on metals in wetlands. While most of these marsh plant species are similar in metal uptake patterns and in concentrating metals primarily in roots, some species retain more of their metal burden in belowground structures than other species, which redistribute a greater proportion of metals into aboveground tissues, especially leaves. Storage in roots is most beneficial for phytostabilization of the metal contaminants, which are least available when concentrated below ground. Plants may alter the speciation of metals and may also suffer toxic effects as a result of accumulating them. Metals in leaves may be excreted through salt glands and thereby returned to the marsh environment. Metal concentrations of leaf and stem litter may become enriched in metals over time, due in part to cation adsorption or to incorporation of fine particles with adsorbed metals. Several studies suggest that metals in litter are available to deposit feeders and, thus, can enter estuarine food webs. Marshes, therefore, can be sources and well as sinks for metal contaminants. *Phragmites australis*, an invasive species in the northeast U.S. sequesters more metals belowground than the native *Spartina alterniflora*, which also releases more via leaf excretion. This information is important for the siting and use of wetlands for phytoremediation as well as for marsh restoration efforts.

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631. Mid-Texas, USA coastal marsh vegetation pattern and dynamics as influenced by environmental stress and snow goose herbivory.

Miller, D. L.; Smeins, F. E.; Webb, J. W.; and Yager, L.

Wetlands 25(3): 648-658. (2005)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ snow/ vegetation patterns/ herbivory/ marshes/ precipitation/ ecotones/ vegetation/ geese/ salinity/ coastal marshes/ drought/ synergistic effects/ flooding/ history/ storms/ *Spartina*/ water level/ stress/ dynamics/ *Spartina patens*/ *Schoenoplectus americanus*/ USA, Texas

Abstract: Vegetation pattern and dynamics were characterized across a mid-Texas, USA coastal marsh ecotone subjected to snow goose herbivory, drought, and salt-water pulses. For eight years following snow goose feeding, species cover was evaluated in heavy and light goose-use patches at increasing distances from tidal influence. Just prior to and for two years after the feeding event, drought, and several salt-water pulses associated with tropical storms typified the hydrologic dynamics of the marsh. Herbivory history was more important than distance from tidal influence, salinity, or flooding in explaining spatial

and temporal vegetation pattern for three years. Precipitation variation influenced vegetation dynamics in areas heavily used by geese. Recovery to pre-herbivory composition and abundance required six years without further snow goose feeding. Extremes of annual precipitation, salinities, and water levels impacted cover of *Spartina patens* dominated patches little unless feeding snow geese uprooted vegetation. *Schoenoplectus americanus* was more impacted by extremes of environmental dynamics than *S. patens* but even more impacted by synergistic effects of uprooting and environmental extremes. During this period, the ecotone could be characterized as patchy, with a gulfward waxing and waning of *S. americanus*.

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632. A model for wetland hydrology: Description and validation.

Mansell, R. S.; Bloom, S. A.; and Sun, G. E.

Soil Science 165(5): 384-397. (2000)

NAL Call #: 56.8 So3; ISSN: 0038-075X

Descriptors: models and simulations: computational biology/ climatology: environmental sciences/ freshwater ecology: ecology, environmental sciences/ terrestrial ecology: ecology, environmental sciences/ soil science/ air temperature/ cypress pond/ evapotranspiration/ model simulation/ pine forest/ rainfall/ soil characteristics/ wetland hydrology

Abstract: WETLANDS, a multidimensional model describing water flow in variably saturated soil and evapotranspiration, was used to simulate successfully 3-years of local hydrology for a cypress pond located within a relatively flat Coastal Plain pine forest landscape. Assumptions included negligible net regional groundwater flow and radially symmetric local flow impinging on a truncated conical pond, deciduous cypress trees and shallow-rooted perennial undergrowth in the pond area, and pine trees in the upland area as well as within the outer 20% of the wetland area. A minimal observed parameter set of daily rainfall, daily air temperature, soil characteristics, and pond geometry provided model input. The model described temporal patterns of daily pond water and groundwater table elevations with relatively small average signed deviations of -2 and +11 cm, respectively. Potential exists for the model to be utilized as a predictive tool for wetland hydrology, even for conditions where available empirical data for a given site is minimal and appropriate simplifying assumptions are utilized.

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633. Modeling the hydrologic processes of a depression forested wetland in South Carolina, USA.

Sun, Ge; Callahan, Timothy; Pyzoha, Jennifer E.; Trettin, Carl C.; and Amatya, Devendra M.

In: *Advances in Hydro-science and Engineering. Volume VI: Proceedings of Abstracts and Papers (on CD-ROM) of the 6th International Conference on Hydro-Science and Engineering.* (Held 31 May 2004-3 Jun 2004 at Rydges South Bank Hotel, Brisbane, Australia.) Altinaker, M. S. (eds.); Vol. 6.

University, MS: University of Mississippi, National Center for Computational Hydroscience and Engineering; pp. 1-10; 2004.

<http://www.srs.fs.usda.gov/pubs/7166>

Abstract: Depression forested wetlands or geographically isolated wetlands such as cypress swamps and Carolina bays are common land features in the Atlantic Coastal Plain of the southeastern US. Those wetlands play important roles in providing wildlife habitats, water quality improvement, and carbon sequestration. Great stresses have been imposed on those important ecosystems due to rapid human population growth and climate change in the region. The objectives of this research were to (1) test a distributed forest hydrology model, FLATWOODS, for a Carolina bay wetland system using seven years of water table data and (2) apply the validated model to understand how wetland position (geomorphology) and geology affect lateral groundwater flow directions. The research site is a 6-ha depression wetland known as a Carolina bay and is located in Eamberg County, South Carolina on the Lower Coastal Plain of the southeastern US (32.88 N, 81.12 W). Model calibration (1998) and validation (1997, 1999-2003) data span a wet and a long drought period allowing testing of the model for a wide range of weather conditions. While the major input to the wetland is atmospheric rainfall and output from the wetland is through evapotranspiration, modeling results suggest that the Carolina bay is a flow-through wetland, receiving discharged groundwater from one part of the upland area, but losing water as groundwater recharge to the other side, especially during wet periods in winter months. The simulation study also suggests that groundwater flow direction is controlled by the gradient of the underlying hydrologic restricting layer beneath the wetland-upland continuum, not by the topographic gradient of land surface. Groundwater flow appeared to change flow direction during the transition period during the wet-dry cycle. The changes depend on the geomorphology and underlying geology of the wetland-upland continuum.

This citation is from Treeresearch.

634. Modeling wetland change along the United States Atlantic coast.

Koneff, Mark D. and Royle, J. Andrew

Ecological Modelling 177(1-2): 41-59. (2004)

NAL Call #: QH541.15.M3E25; ISSN: 0304-3800

Descriptors: conservation/ freshwater ecology: ecology, environmental sciences/ models and simulations: computational biology/ linear regression/ mathematical and computer techniques: logistic regression/ mathematical and computer techniques: zero inflation models/ mathematical and computer techniques/ U.S. Fish and Wildlife Service/ wetlands status and trends study sample plots/ lotic habitats/ model fit/ spatial structure/ waterfowl habitat conservation planning/ wetland area change/ wetland classes: estuarine emergent, forested, lacustrine, palustrine emergent, scrub shrub, unconsolidated bottom

Abstract: As an aid in waterfowl habitat conservation planning, we predicted change in wetland area between the 1950s and 1970s and the 1970s to 1990s along the United States Atlantic Coast. We developed zero-inflation models using logistic regression to predict occurrence and linear regression to predict area for six wetland classes: estuarine emergent, lacustrine, and palustrine emergent, forested, scrub-shrub, and unconsolidated bottom. A prediction grid of 10.36 km² cells was established for the study area. We predicted wetland class area for cells for four decades: 1950s, 1970s, 1980s, and 1990s. Wetland occurrence and area measurements from the U.S. Fish and Wildlife

Service's Wetlands Status and Trends Study (WST) sample plots served as response variables. Spatial structure in the WST data was preserved by interpolating residuals at plot locations and summing predicted residuals and predicted wetland area for each cell. Wetland changes reflect conversion both to and from upland as well as to and from other wetland classes. We predicted a 30.7 thousand ha decline in estuarine emergents in the study area from the 1950s to 1970s, but an increase of 0.9 thousand ha between the 1970s and 1990s. Predicted lacustrine area increased 161.6 thousand ha from the 1950s to 1970s, but declined 5.4 thousand ha from the 1970s to the 1990s. A loss of 731.4 thousand and 189.9 thousand ha of palustrine emergents was predicted from the 1950s to 1970s and from the 1970s to 1990s, respectively. Palustrine forested was predicted to have declined by 536.5 thousand ha between the 1950s and 1970s and 985.8 thousand ha between the 1970s and 1990s. Palustrine scrub-shrub was predicted to have declined 562.6 thousand ha between the 1950s and 1970s, but increased 119.2 thousand ha between the 1970s and 1990s. Finally, palustrine unconsolidated bottom wetlands were predicted to have increased 159.2 and 142.8 thousand ha between the 1950s and 1970s and 1970s and 1990s, respectively. Predictions were most reliable for estuarine emergent, lacustrine, and palustrine forested classes, probably due to the restricted distribution and relative constancy of the estuarine emergent and lacustrine classes. Reliable palustrine forested predictions were likely due to the association of this class with watercourses and the relationship between the predictor variables and lotic habitats. Predictor variables were likely less relevant for palustrine emergent, scrub-shrub, and unconsolidated bottom, where model fit was poorer. Human activities such as agriculture and forestry probably contributed to the poorer model fit for these classes. Published by Elsevier B.V.

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635. Natural and modified pocosins: Literature synthesis and management options.

Ash, A. N.; McDonald, C. B.; Kane, E. S.; and Pories, C. A. Washington, D.C.: U.S. Fish and Wildlife Service; FWS/OBS-83/04, 1983. 178 pp.

Notes: Publication Type: Unpublished Wildlife Report

Descriptors: wetlands/ bibliography/ ecosystems/ fish management/ forests/ geomorphology/ habitat changes/ habitat management/ history/ lakes/ land use/ mapping/ marshes, freshwater/ run-off/ soils/ vegetation/ vertebrates/ water resources management/ water, chemical properties/ water, physical properties/ watershed management/ wildlife management/ North America/ United States/ Virginia/ North Carolina/ South Carolina

Abstract: Literature is synthesized concerning pocosin origin, geographic distribution, ecological characters, historical and current human use, and value for water purification and wildlife management. Where possible, data from pocosins or related southeastern freshwater wetlands are used.

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636. 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.A1158

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

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637. Organic matter dynamics in four seasonally flooded forest communities of the Dismal Swamp USA.

Megonigal J. P. and Day F. P.

American Journal of Botany 75(9): 1334-1343. (1988)

NAL Call #: 450 Am36; *ISSN:* 0002-9122

Descriptors: bioenergetics: biochemistry and molecular biophysics/ development/ ecology: environmental sciences/ forestry/ metabolism/ physiology/ soil science/ leaf litter/ wood debris/ fine root turnover/ biomass/ allocation/ transfer/ accumulation/ net primary production/ wetland organic matter

Abstract: Budgets of organic matter dynamics for plant communities of the Great Dismal Swamp were developed to summarize an extensive data base, determine patterns of biomass allocation, transfer and accumulation, and make comparisons with other forested wetlands. Aboveground net primary production on the flooded sites (1,050-1,176 g m⁻² yr⁻¹) was significantly greater than on a rarely flooded site (831 g m⁻² yr⁻¹). Estimates of belowground net primary production were comparable to aboveground production on flooded sites (824-1,221 gm⁻² yr⁻¹). However, productivity was nearly three times greater belowground than aboveground on the rarely flooded site (2,256 g m⁻² yr⁻¹). Aboveground productivity in Dismal Swamp forests is relatively high compared to other forested wetlands. This is attributed to the timing and periodic nature of flood events. Fine root turnover is shown to be an important source of soil organic matter. Estimates indicate that roots contribute about 60% of the annual increment to soil organic matter. Leaf litter contributes 6-28% and wood debris contributes 5-15%. Comparisons with other forested wetlands suggest that detritus accounts for greater than half of the total organic matter (living + dead) in many wetland systems.

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638. Overview of ecology of mangroves and information needs for Florida Bay.

Snedaker, S. C.

Bulletin of Marine Science 44(1): 341-347. (1989);

ISSN: 0007-4977

Descriptors: ecology/ ecosystems/ estuaries/ mangrove swamps/ marine environment/ Florida Bay/ coastal marshes/ bays/ forests/ dissolved organic matter/ cycling nutrients/ aquatic habitats

Abstract: The mangrove forest areas bordering Florida Bay have provided research data and information that have formed the bases both for conservation laws and for the advances in mangrove research at other laboratories throughout the world. In this regard, the structural diversity of Florida Bay mangroves has been reasonably documented, but little research has been done on functional diversity, particularly, as it relates to the nearshore estuarine flora and fauna. What is already known about Florida Bay's coastal forest habitats is reviewed, and that which remains to be researched is outlined for mangrove-habitat diversity and the functional diversity among the mangrove habitats. It is postulated that the quantity, quality and timing of fluxes of dissolved organic matter (DOM) from different mangrove forest types may have a significant regulatory or control role in the structure and functioning of estuarine populations. At least three distinct roles for DOM are postulated: (1) as an alternate food source, (2) as the basis for heterotrophic microorganism food webs, and (3) as a source of chemical cues controlling the spatial and temporal distribution of estuarine species. This postulation focuses on a new area in chemical ecology that could lead to important new research findings on the interrelationships between mangrove forest habitats and the biological organization of estuarine communities. (Friedmann-PTT)
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639. Overview of wetlands and water resources of Maryland.

Clearwater, Denise; Turgeon, Paryse; Noble, Christi; and LaBranche, Julie Maryland Department of the Environment, 2000. 62 p.
<http://www.mde.state.md.us/assets/document/wetlandswaterways/h2Oresources.pdf>

640. Phosphorus retention in non-tidal palustrine forested wetlands of the Mid-Atlantic Region.

Walbridge, M. R. and Struthers, J. P.
Wetlands 13(2): 84-94. (1993)
NAL Call #: QH75.A1W47; ISSN: 0277-5212.
Notes: Special issue.
Descriptors: wetlands/ phosphorus/ soils/ hydrology/ sorption/ land use/ water quality/ USA, Virginia/ USA, Virginia, Caroline Cty./ phosphorus/ soils/ geochemistry of sediments
Abstract: We: 1) quantified the areal extent of wetlands by type in Caroline County, VA to estimate the relative importance of non-tidal palustrine forested wetlands as a component of the wetland resources in Virginia's mid-Atlantic coastal plain, 2) used a comparative literature review to identify factors that might be important in controlling P retention in these wetlands, and 3) evaluated three indices that have been used to compare P adsorption potentials in wetland soils. Non-tidal palustrine forested wetlands comprised 66.0% of the 11,372 ha of wetlands in Caroline Co. The majority were either seasonally (4000 ha) or temporarily (1596 ha) flooded wetlands dominated by broad-leaved deciduous species. These wetlands are both small (averaging 5.4 and 2.4 ha in area, respectively) and numerous in this region. Adsorption by Al and Fe (hydr)oxides and precipitation of Al, Fe, and Ca phosphates probably controls dissolved phosphate retention and long-term P storage in these wetlands, although P storage in the woody biomass of aggrading forests may also be important.

Phosphorus adsorption isotherms, a single-point phosphorus adsorption index, and concentrations of oxalate-extractable (noncrystalline) Al and Fe have all been used as comparative indices of P sorption potentials in wetland soils, although the latter may represent the best single index of P sorption capacity because of its direct relationship to the mechanisms controlling P adsorption in soil. When using these indices to compare wetland P sorption potentials, it is important to consider differences in soil depth, profile heterogeneity, and bulk density between sites. Actual amounts of phosphate retained by a wetland will also be influenced by the degree of phosphate loading it receives, as determined by hydrology, phosphate sources in the watershed, and the P sorption potentials of surrounding upland soils. Because of the low P sorption potentials of sandy soils in coastal plain uplands, non-tidal palustrine forested wetlands in the mid-Atlantic coastal plain may perform particularly important functions with respect to dissolved phosphate removal and retention on the landscape.
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641. Plant and water-level dynamics in an east Texas USA shrub-hardwood bottomland wetland.

Weller M. W.
Wetlands 9(1): 73-88. (1989)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: *Cephalanthus occidentalis/ Planera aquatica/ Quercus lyrata/ Quercus nigra/ Quercus phellos/ succession species diversity/ community composition/ hydrographic regime/ resource management*
Abstract: Plant distribution and layering were analyzed from four line transects across a nine-hectare shrub swamp and adjacent hardwood bottomlands, and water fluctuations and hydroperiod were assessed via six wells and staff gauges. Vegetational transition from deep to shallow water was buttonbrush *Cephalanthus occidentalis*, water elm *Planera aquatica*, overcup oak *Quercus lyrata*, water oak *Q. nigra*, willow oak *Q. phellos*, and several other hardwoods intermixed at less frequently flooded elevations. A past die-off of overcup oak and other vegetational changes suggest that a single event or a series of flooding events occurred during the growing season. Vegetative change included rapid establishment of herbaceous vegetation in shallow, open areas after overstory die-off, followed by gradual invasion of water elm. Further opening in adjacent bottomland woods is resulting from windfall of shallow-rooted oaks. Impoundments for green-tree reservoirs or other water-level modifications should be based upon an understanding of local plant succession since slight changes in water regime may modify plant species or cover-water patterns and seriously impact the wetland community. Where possible, natural water regimes should be preserved; where this is impossible due to watershed modifications, such regimes should be documented and duplicated by use of the most simple possible management system to avoid endangering natural plant communities.
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642. Predicting long-term wetland hydrology from hydric soil field indicators.

Vepraskas, Michael J. and Water Resources Research Institute of the University of North Carolina; Raleigh, NC: Water Resources Research Institute of the University of North Carolina (Series: Report 342), 2002. xv, 55 p.
Notes: "UNC-WRRI-2002-342." "August 2002." Includes bibliographical references (p. 53-55). Funded by through the Water Resources Research Institute of the University of North Carolina. WRRRI project no. 70175.
NAL Call #: TD201 .N6 no. 342
Descriptors: wetlands---hydrology---North Carolina/ soil absorption and adsorption---research---North Carolina/ sewage lagoons---North Carolina---hydrodynamics
 This citation is from AGRICOLA.

643. Proceedings of the Conference: Wetlands of the Chesapeake.

Groman, Hazel A.
 Washington D.C.: Environmental Law Institute, 1985. 389 p.
NAL Call #: QH76.5.C48P76
Descriptors: wetland conservation---Chesapeake Bay Region (Md. and Va.)---congresses/ wetlands---Chesapeake Bay Region (Md. and Va.)---congresses
Abstract: ISBN: 0911937196. Conference held: April 9-11 in Easton, Md.
 This citation is from AGRICOLA.

644. Reference simulations for evaluating wetland hydrology.

Skaggs, R. W.; Hunt, W. F.; Chescheir, G. M.; and Amatya, D. M.
 In: Versatility of Wetlands in the Agricultural Landscape. (Held 17 Sep 1995-20 Sep 1995 at Hyatt Regency, Tampa, Fla.)
 St Joseph, Mo.: American Society of Agricultural Engineers (ASAE); pp. 1-10; 1995.
NAL Call #: QH87.3.V47 1995
Descriptors: wetlands/ storage/ drainage/ depth/ rain/ water table/ soil water regimes/ groundwater level/ meteorology/ weather data/ models
Abstract: Reference Wetland Simulations (RWS) and short term groundwater levels may be used to determine wetland hydrology. Characteristic parameters and their hydrology can be identified and predicted by computer simulations (DRAINMOND). Simulations conducted for 4 soils from North Carolina using 2 depressional storages and 2 ditch depths for each soil showed that RWS were not strongly dependent on soil type, drain depth and surface depressional storage. It was concluded that RWS, computed with weather data for the monitoring period, could be used to interpret measured groundwater levels for all sites in a given area.
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645. Rehabilitation of impounded estuarine wetlands by hydrologic reconnection to the Indian River Lagoon, Florida (USA).

Brockmeyer, R. E.; Rey, J. R.; Virnstein, R. W.; Gilmore, R. G.; and Earnest, L.
Wetlands Ecology and Management 4(2): 93-109. (1997)
NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861.
Notes: Special issue: Hydrologic restoration of coastal wetlands.
Descriptors: wetlands/ estuaries/ hydrology/ flooding/ salt marshes/ mosquitoes/ water quality/ water control/ culverts/ water reclamation/ impoundments/ habitat improvement/ environmental restoration/ USA, Florida, Indian River Lagoon/ impoundments/ habitat improvement/ environmental restoration/ mosquitoes/ water control/ culverts/ water reclamation/ effects on water of human nonwater activities/ protective measures and control/ coastal zone management/ reclamation/ freshwater pollution/ aquaculture: general
Abstract: Salt marshes of the Indian River Lagoon, Florida (USA) were once prolific producers of mosquitoes. Mosquitoes lay their eggs on the infrequently-flooded high marsh surface when the soil surface is exposed. The eggs hatch when the high marsh is flooded by the infrequent high tides or summer rains. To control mosquito production, most of the salt marshes (over 16,200 ha) were impounded by the early 1970s. Flooding, usually by pumping water from the Lagoon, effectively controlled mosquitoes. However, impounding had a profoundly negative impact on the wetland plant, fish, and invertebrate communities. Isolation from the Lagoon cut off aquatic access by transient estuarine species that used the wetlands for feeding or as nursery area. In one study, the number of fish species dropped from 16 to 5 after impounding. Wetland vegetation within some impoundments was totally eliminated; other impoundments developed into freshwater systems. When tidal exchange is restored through hydrologic connection, usually by culverts installed through the perimeter dike, recovery to more natural conditions is often rapid. In one impoundment where wetland vegetation was totally eliminated, recovery of salt-tolerant plants began almost immediately. In another, cover of salt-tolerant plants increased 1,056% in less than 3 years. Fisheries species that benefitted the most were snook, ladyfish, and striped mullet. Over 1,500 juvenile snook were captured in a single 3-hr flood-tide culvert trap as they attempted to migrate into an impoundment. The zooplankton community rapidly returned to the more typical marsh-Lagoon community. Water quality and sediment sulfides returned to typical marsh values. Overall, reconnection enhances natural productivity and diversity, although water quality in the perimeter ditch, an artifact of dike construction, remains problematic. Earlier experiments demonstrated that flooding only during the summer mosquito breeding season provided as effective mosquito control as year-round flooding. In standard management, the impoundment is flooded in summer, then left open to the Lagoon through culverts the rest of the year. Culverts are typically opened when the fall sea level rise first floods the high marsh. Impoundment reconnection is being implemented by a multi-agency partnership. The total reconnected area is expected to reach 9,454 ha by the end of 1998, representing 60% of the impounded wetlands in the entire IRL system. One stumbling block is private ownership of many of the remaining isolated impoundments.
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646. 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. (Held 7 Jun 1988-10 Jun 1988 at 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)

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

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647. Responses of wetland tree species to hydrology and soils.

Wallace, P. M.; Kent, D. M.; and Rich, D. R.

Restoration Ecology 4(1): 33-41. (1996)

NAL Call #: QH541.15.R45R515; ISSN: 1061-2971

Descriptors: wetlands/ survival/ hydrology/ growth/ Florida/ soils/ plant populations/ trees/ soil hydrology/ soil types/ growth rate/ Taxodium/ Pinus serotina/ Fraxinus caroliniana/ Acer rubrum

Abstract: We conducted a study of the flood tolerance of nine wetland tree species on seven soil types. Seedlings were subjected to 11 months of continuous shallow inundation or moist soil conditions on three mineral soils, two organic soils, a manufactured soil designed to mimic the practice of layering muck over mineral soil, and a stockpiled topsoil. Taxodium ascendens, T. distichum, Acer rubrum, and Pinus serotina suffered no mortality; Fraxinus caroliniana (1%), Liquidambar styraciflua (8%), P. elliotii (8%), and Gordonia lasianthus (24%) suffered low to moderate mortality; and Persea palustris (46%) suffered significant mortality. In general, greatest net height and total biomass were achieved on moist organic soils, and least net height and total biomass were achieved on stockpiled topsoil and inundated soils. Responses to hydrological conditions were less pronounced for Taxodium spp. If the results of this experiment are transferable to the field, then Acer rubrum, Fraxinus caroliniana, Pinus serotina, Taxodium ascendens, and Taxodium distichum seedlings can reasonably be expected to survive at least one year under a broad range of hydrological and edaphic conditions. With the exception of Taxodium spp., first-year

growth for the species of this study can be facilitated by maintaining moist but not inundated conditions. These findings suggest that transfer of organic soils will benefit restoration and creation efforts, and that layering organic soil over mineral soil is more effective than using mineral soils or stockpiled topsoil.

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648. Restoration of coastal wetlands in southeastern Florida.

Milano, Gary R.

Wetland Journal 11(2): 15-24. (1999); ISSN: 1095-2063

http://www.miamidade.gov/derm/Ecosystems/library/Coastal_Wetlands_Restoration.pdf

649. A review of current salt marsh management issues in Florida.

Carlson, D. B.; O'Bryan, P. D.; and Rey, J. R.

Journal of the American Mosquito Control Association 7(1): 83-88. (1991)

NAL Call #: QL536.J686; ISSN: 8756-971X

Descriptors: Florida/ insect control/ mosquitoes/ salt marshes/ environmental protection/ legal aspects/ marshes/ public policy/ wetland impoundments

Abstract: For the past decade, salt marsh management in Florida has been a central issue in attempts to reconcile mosquito control and natural resource interests. Progress has been made in trying to maintain effective mosquito control while protecting and enhancing salt marsh resources primarily due to: (1) efforts by the Florida Coordinating Council on Mosquito Control and its Subcommittee on Managed Marshes, which are committees comprised of agencies responsible for wetlands resources, those mandated to provide mosquito control, and research institutions; and (2) funding of research to investigate ecosystem effects of marsh management techniques. Research and management experience have demonstrated that Rotational Impoundment Management (RIM) and rotary ditching can provide ecologically sound source reduction benefits. Salt marsh ownership, management of state lands and mariculture remain controversial salt marsh management issues. (Author's abstract)

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650. Review of historical tidal wetlands of the Delaware River estuary.

Philipp, K.

Philadelphia: U.S. Environmental Protection Agency, 1995. 33 p.

Descriptors: wetlands/ tidal flats/ dredging/ environmental impact/ impoundments/ historical account/ estuaries/ engineering/ tidal rivers/ drainage patterns/ history/ USA, Delaware R./ impoundments/ tidal rivers/ drainage patterns/ history/ environmental impact/ historical account/ tidal flats

Abstract: Historical Tidal Wetlands of the Delaware River and Bay have been characterized for the Delaware River Estuary Program. The characterization focused on the alteration mechanisms of Impoundments (waterfowl, agriculture, and stormwater), Filling (for Urban/Commercial/Residential Development and Dredge Material), Hydrological Alterations (road/rail/dredge material restrictions), Mosquito Control, Sea Level Rise (coastal inundation), Inlet Formation and Stabilization (and storm event changes), Phragmites Distribution, and Snow Goose

Grazing. The study was conducted through investigation of case study areas selected throughout the estuary that represented examples of these alteration mechanisms. The most pervasive of these impacts was the impoundment of tidal marshes and adjacent non-tidal wetland edges. Impoundments or meadows were created on nearly all freshwater, most brackish water, and some salt water marshes. The landscape of coastal marshes today clearly displays the patterns of these impoundments through changed drainage patterns, altered marsh vegetation, relic dikes, and the pattern of shoreline land use. Case study area reviews of historic tidal wetlands have shown the widespread impact of impoundments and the role of these impoundment meadows as related to large scale filling of historic wetland areas for made land.

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651. Sampling fish assemblages in forested floodplain wetlands.

Knight, J. G. and Bain, M. B.

Ecology of Freshwater Fish 5(2): 76-85. (1996);
ISSN: 0906-6691

Descriptors: wetlands/ flood plains/ freshwater fish/ community composition/ biological sampling/ sampling/ forests/ fish/ USA, Alabama/ Pisces/ habitat community studies/ methodology - general/ network design

Abstract: Four quantitative (area-standardized electrofishing, trap nets, small-mesh [1.3 and 2-cm bar mesh] gill nets, large-mesh [2.5 and 5-cm bar mesh] gill nets) and two qualitative (non-standardized electrofishing, dip netting) sampling techniques were concurrently used to capture larval to adult fish in forested wetland habitats on seasonally inundated floodplains of two Alabama (USA) streams. Standardized area electrofishing appeared to be the best sampling technique for collecting and quantifying species because of high catch rate, broad species and size coverage, and rapid sampling. Electrofishing accounted for most fish (47 and 57% of pooled catch), almost all taxa, and a broad range of fish sizes. Large-mesh gill nets captured few fish (2% and 8%), a distinct subset of the species present, and the largest fish. Light traps were the most efficient and taxa-comprehensive sampling technique for larval fish. Light traps captured the vast majority of the pooled larval fish catch, including 6 of 7 families recorded at the sites. Larval fish dip netting captured larval fish of most families known to be present but in low numbers. For surveys of species composition and rapid bioassessments, non-standardized electrofishing and larval fish dip netting appear adequate. For intensive research studies, the combination of area electrofishing, large-mesh (and in some cases small-mesh) gill nets, and light traps provide thorough and comprehensive data on wetland fish assemblages.

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652. Sediment accretion in coastal wetlands: A review and a simulation model of processes.

Callaway, J. C.; Nyman, J. A.; and Delaune, R. D.

Current Topics in Wetland Biogeochemistry 2: 2-23. (1996);
ISSN: 1076-4674

Descriptors: accretion/ simulation/ coasts/ computer models/ cores/ sensitivity analysis/ marshes/ sediments/ sea level/ elevation/ biogeochemistry/ sedimentation/ coastal landforms/ topographic features/ sea level changes/ British Isles, England, Norfolk, Stiffkey Marsh/ USA,

Mississippi, Biloxi Bay/ coastal landforms/ topographic features/ sea level changes/ computer models/ sensitivity analysis/ elevation

Abstract: Given the potential for future increases in eustatic sea-level rise, understanding accretion processes in coastal wetlands is extremely important. Coastal wetlands must maintain an elevation within the tidal range, or they will cease to function as wetlands. Many studies have evaluated accretion rates in coastal wetlands; however, there are problems comparing these studies: 1) they have been completed for a variety of reasons and with many different approaches; 2) they have used different vocabulary and methods; and 3) there is a complex relationship of sediment processes over both time and depth. Because of these problems a simple comparison of different studies is not possible, and miscommunication has been common. Modelling offers a potential way of consolidating current thought on accretion processes, synthesizing factors that affect accretion rates, and formalizing assumptions and ideas in order to make future gains in the understanding of sediment processes. We developed a computer model which simulates accretion rates and sediment characteristics throughout a sediment profile. The use of both accretion rates and sediment characteristics for model calibration made this model more realistic than other model of sediment accretion and belowground bio-geochemical processes that have been developed. The model used a cohort approach, allowing annual "cohorts" of mineral and organic sediment to accumulate on the marsh surface, while earlier cohorts were buried and subjected to belowground processes, including organic matter production, decomposition, and compaction. The model tracked the relative elevation of the marsh and was run over a 300-year time span. Using the model, we successfully simulated accretion rates for sediment cores from a high-marsh site at Stiffkey Marsh, Norfolk, England, and from a mid-marsh site at Biloxi Bay, Mississippi. The model was calibrated using accretion rates based on super(137)Cs dating, and the predicted rates of vertical accretion for a 100-year time span matched the rates were measured by super(210)Pb for the Stiffkey core, confirming the accuracy of the model. Through sensitivity analyses, we identified the most important factors affecting model-generated accretion rates, including: pore space, mineral matter deposition, initial elevation, sea-level rise, and belowground organic matter production. In addition, the model was a useful tool for predicting changes to marsh relative elevation and long-term survival due to potential increases in eustatic sea-level rise. The predicted relative elevation and accretion rates indicated that Stiffkey Marsh could withstand rates of sea-level rise up to 0.5 cm/yr without the loss of high-marsh habitat, although high-marsh was likely to be converted to low-marsh habitat at lower rates of sea-level rise.

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653. Soil organic carbon, nitrogen, and phosphorus as indicators of recovery in restored *Spartina* marshes.

Craft, C. B.

Ecological Restoration 19(2): 87-91. (2001)
NAL Call #: QH76.R47; ISSN: 1522-4740

Descriptors: wetlands/ nutrient availability/ environmental restoration/ soil nutrients/ carbon/ nitrogen/ phosphorus/ organic carbon/ salt marshes/ soils/ biochemical cycles/ restoration/ water quality/ biogeochemistry/ nutrient

concentrations/ *Spartina*/ USA, Georgia, Sapelo I./ nutrients/ reclamation/ composition of water/ habitat community studies/ protective measures and control/ marine pollution/ organic compounds

Abstract: In this article, I discuss a study where I measured soil nutrient (organic C, N, and P) concentrations, pools and ratios (0-10 cm depth) in a 42-year-old restored saltwater cordgrass marsh and a natural saltwater cordgrass marsh on Sapelo Island, Georgia to evaluate the development of biogeochemical cycles following restoration. Soil C:N ratios may be especially useful for evaluating the availability of nitrogen to wetland biota in these N-limited ecosystems. I also compared sediment and organic C, N, and P accumulations as a way of evaluating the capacity of the restored marsh to improve the quality of the water moving through it.

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654. Spatial patterns in soil water fluxes along a forest-marsh transect in the southeastern United States.

Gardner, L. R. and Reeves, H. W.

Aquatic Sciences 64(2): 141-155. (2002); ISSN: 1015-1621

Descriptors: wetlands/ soil water/ marshes/ forest hydrology/ time series analysis/ hydrologic cycle/ water level fluctuations/ hydrology/ water levels/ water budget/ salt marshes/ forests/ evapotranspiration/ ground water/ rainfall/ tidal effects/ soils/ tides/ USA, South Carolina, North Inlet/ water in soils/ ecosystems and energetics/ regional studies, expeditions and data reports/ physical oceanography

Abstract: Time series of water levels in piezometer nests along a forest-marsh transect near North Inlet, SC, show fluctuations that are attributable to recharge by precipitation and tidal flooding and to removal by evapotranspiration (ET) and seepage out of the soil. Volumes of water associated with these water level changes were estimated by correlating rain-induced water level increases with measured rainfalls. In the forest the ratio of water table rise to rainfall is about 10. This ratio increases with decreasing elevation to about 40 in the mid marsh where the antecedent soil moisture is generally higher. The relative influence of removal by ET and seepage and recharge by rain and tides varies systematically along the transect. In the mainland forest, loss of water by ET is somewhat less than infiltration, leading to a net recharge of fresh water which eventually discharges in the adjacent mid marsh. With decreasing elevation, the relative importance of recharge by rain decreases as recharge by tidal flooding increases. In the low marsh, however, these mechanisms of loss and recharge can not be discerned in the water level time series because the water table rarely, if ever, drops below the marsh surface.

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655. Spatiotemporal distributions of bacterivorous nematodes and soil resources in a restored riparian wetland.

Ettema, Christien H.; Coleman, David C.; Vellidis, George; Lowrance, Richard; and Rathbun, Stephen L.

Ecology 79(8): 2721-2734. (1998)

NAL Call #: 410 Ec7; ISSN: 0012-9658

Descriptors: geostatistics/ microbial respiration/ restored riparian wetland/ soil resources/ spatiotemporal distributions

Abstract: Spatial and temporal variability in soil biotic

populations reflect heterogeneity in soil resources, affect patterns of soil process rates, and facilitate coexistence of diverse biota. We investigated these relationships in a 0.7-ha restored riparian wetland in the Coastal Plain of Georgia, USA, for an abundant and diverse group of soil fauna, the bacterivorous nematodes. We quantified spatial distributions in four different seasons for the eight most dominant bacterivorous taxa in the wetland and related their individual distributions to patterns of microbial respiration, inorganic nitrogen, moisture, and soil organic matter. We used geostatistics to quantify spatial aggregation and draw isopleths. For all variates except two nematode taxa, 36-99% of sample population variance was spatially dependent, over ranges of 11-84 m. Isopleths and spatial trend analysis showed that individual bacterivorous taxa exhibited divergent spatial distributions, with populations aggregating into different hotspots in the wetland. Although these large-scale trends persisted at all sampling dates, small-scale patterning showed significant temporal variation due to rise and fall of local populations. Individual nematode distributions did not correspond well to the (temporally more static) soil resource patterns, except occasionally to soil moisture and nitrate content. We attribute the general lack of correlation between nematode and soil resource patterns in part to the young age (2.5-3.5 yr) of the investigated wetland site. Although nematode patterns remain inadequately explained, we suggest that the observed spatiotemporal divergence among populations of bacterivorous taxa has important implications for our understanding of soil ecosystem and community processes, notably the spatiotemporal distribution of nematode-influenced nitrogen cycling rates and the maintenance of field-scale nematode diversity.

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656. Submergence of wetlands as a result of human-induced subsidence and faulting along the upper Texas Gulf Coast.

White, William A. and Tremblay, Thomas A.

Journal of Coastal Research 11(3): 788-807. (1995);

ISSN: 0749-0208

Descriptors: estuary/ Gulf of Mexico/ habitat degradation/ river/ vegetation

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657. Values and function of Chesapeake wetlands for waterfowl.

Stotts, V. D.

In: *Wetlands of the Chesapeake: Proceedings of the Conference.* (Held 9 Apr 1985-11 Apr 1985 at Easton, Md.) Groman, Hazel A. (eds.)

Washington, D.C.: Environmental Law Institute; pp. 129-142; 1985.

NAL Call #: QH76.5.C48P76

Descriptors: wetlands/ economic aspects/ submerged plants/ aquatic plants/ geese/ bottomland/ tidewater/ mud flats/ tidal flats/ waterfowl/ Chesapeake Bay/ Maryland/ erosion

Abstract: Numbers of migrating waterfowl in the Chesapeake have been declining since the mid-1950's as well as changing in composition. Several surveys of Maryland's emergent wetlands have been made since the early 1950s; surveys from 1968 indicated that about 308,000 acres of this habitat remained intact. Of this total, about 2% was non-tidal. An omission from these figures is

the waters of non-tidal streams. None of these surveys has taken into account the important hardwood bottomlands along streams. These lands have been estimated to total about 355,000 acres, but 119,600 of this acreage has been subject to extensive alteration. Including these important bottomlands, a liberal estimate for total emergent wetlands within Maryland's Chesapeake basin was about 540,700 acres in 1970 (excluding coastal wetlands and bottomlands in eastern Worcester County). Open tidal waters of the Chesapeake and its tributaries also constitute a vital part of Maryland's wetlands. The most important to waterfowl are: mud flats (831 acres); 0'-6' depths of water (mlw) (399,737 acres) and 6'-12' depths of water (282,047 acres). The rest of the Bay and its tidal tributaries include 902,367 acres of open tidal waters more than 12' deep. The declines seem to parallel declines in submerged aquatic vegetation (SAV) particularly for some species. Some species of geese, however, have been increasing apparently due to adaptation to new food sources, i.e., agricultural crops and weeds. Waterfowl have high economic and social value, and measures such as improved filtration of drainage waters and reduction of shoreline erosion must be utilized to preserve remaining wetlands and the waterfowl that depend upon them.

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658. Vegetation of Upper Coastal Plain depression wetlands: Environmental templates and wetland dynamics within a landscape framework.

De Steven, Diane and Toner, Maureen M.

Wetlands 24(1): 23-42. (2004)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

<http://www.srs.fs.usda.gov/pubs/6388>

Descriptors: Carolina bay/ depressional wetlands/ environmental gradients/ hydrogeologic setting/ hydroperiod/ landscape/ reference wetlands/ wetland management/ restoration/ vegetation types

Abstract: Reference wetlands play an important role in efforts to protect wetlands and assess wetland condition. Because wetland vegetation integrates the influence of many ecological factors, a useful reference system would identify natural vegetation types and include models relating vegetation to important regional geomorphic, hydrologic, and geochemical properties. Across the U.S. Atlantic Coastal Plain, depression wetlands are a major hydrogeomorphic class with diverse characteristics. For 57 functional depression wetlands in the Upper Coastal Plain of South Carolina, we characterized the principal vegetation types and used a landscape framework to assess how local (wetland-level) factors and regional landscape settings potentially influence vegetation composition and dynamics. Wetland sites were stratified across three Upper Coastal Plain landscape settings that differ in soils, surface geology, topography, and land use. We sampled plant composition, measured relevant local variables, and analyzed historical transitions in vegetative cover types. Cluster analysis identified six vegetation types, ranging from open-water ponds and emergent marshes to closed forests. Significant vegetation-environment relationships suggested environmental "templates" for plant community development. Of all local factors examined, wetland hydrologic regime was most strongly correlated with vegetation type, but depression size, soil textural type, and disturbance history were also significant. Because hydrogeologic settings influence wetland features, local

factors important to vegetation were partly predictable from landscape setting, and thus wetland types were distributed non-randomly across landscape settings. Analysis of long-term vegetation change indicated relative stability in some wetlands and succession in others. We developed a landscape-contingent model for vegetation dynamics, with hydroperiod and fire as major driving variables. The wetland classification, environmental templates, and dynamics model provide a reference framework to guide conservation priorities and suggest possible outcomes of restoration or management.

This citation is from Treesearch.

659. 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: amphibian/ reptile/ bird/ emergent aquatic vegetation/ rainfall/ evaporation/ salinity/ barrier island

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.

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660. A water budget and hydrology model of a basin mangrove forest in Rookery Bay, Florida.

Twilley, Robert R. and Chen, Ronghua

Marine and Freshwater Research 49(4): 309-323. (1998)

NAL Call #: GC1.A85; ISSN: 1323-1650

Descriptors: estuarine ecology: ecology, environmental sciences/ models and simulations: computational biology/ basin mangrove forest/ evapotranspiration/ finite difference hydrology model: simulation model/ groundwater flow/ intertidal wetlands/ precipitation/ runoff/ seepage/ soil salinity/ soil saturation deficit/ stemflow/ throughfall/ tidal inundation/ water budget

Abstract: Water budgets of two basin mangrove forests in Rookery Bay were determined by measuring during a 2-year period the inputs of precipitation and tides, together with losses through seepage, runoff and evapotranspiration. Precipitation inputs to the forest floor were 75.1% from throughfall and 19% from stemflow for a total of 1097 mm year⁻¹, or 91% of annual rainfall. Runoff was estimated at 896 mm year⁻¹, or nearly 77% of the combined input of throughfall and stemflow. Loss from evapotranspiration was linear with saturation deficit of the atmosphere and was 967 mm year⁻¹ (0.7-4.5 mm day⁻¹). Loss from horizontal flow of groundwater in shallow mangrove soils was approx 285 mm year⁻¹. Frequency of tidal inundation was seasonal, ranging from <5 tides month⁻¹ in February to 30 tides month⁻¹ in September. Tides recharged soil saturation deficits, the cumulative tidal input being 12 276 mm year⁻¹ and efflux being 11 767 mm year⁻¹. The relative significance of tides and rainfall deficits

(rainfall - evapotranspiration) on the seasonal patterns of soil saturation (water levels) and soil salinity were simulated with a finite-difference hydrology model (HYMAN). Model simulations demonstrate that soil salinity at higher elevations in the intertidal zone, where tidal inundation frequency is reduced, is more sensitive to changes in rainfall deficit.

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661. A water chemistry assessment of wastewater remediation in a natural swamp.

Zhang, Xiaowei; Feagley, Sam E.; Day, John W.; Conner, William H.; Hesse, Irene D.; Rybczyk, John M.; and Hudnall, Wayne H.

Journal of Environmental Quality 29(6): 1960-1968. (2000)
NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: waste management/ sanitation/ advanced wastewater treatment/ tertiary wastewater treatment/ wastewater remediation/ water chemistry assessment/ applied and field techniques/ bottomland hardwood forest ridge/ cypress tupelo forests/ electrical conductivity/ five-day biological oxygen demand [BOD 5]/ hydraulic detention time/ hydraulic retention time/ natural forested wetland/ pH values/ secondarily treated municipal wastewater/ solids/ swamp water quality/ temperature

Abstract: Various aspects of water chemistry of a natural forested wetland were studied in order to determine the possibility of using the wetland for advanced wastewater treatment in Louisiana and to evaluate the wastewater effect on swamp water quality. The study was carried out by comparing treatment and control cypress-tupelo forests separated by a bottomland hardwood forest ridge. The treatment area (231 ha) received secondarily treated municipal wastewater at a rate of 6.3X10⁶ L d⁻¹. The calculated hydraulic detention time of the wastewater was 120 d. Electrical conductivity (EC), pH, and concentrations of 5-d biological oxygen demand (BOD₅), dissolved oxygen (DO), solids, nutrients, and trace metals were monitored. Mean concentrations for the wastewater were 14.6 mg L⁻¹ for total N and 2.5 mg L⁻¹ for total P. The dominant form of N in the wastewater was NO₃-N. The swamp system attenuated the NO₃-N by 100%, total Kjeldahl nitrogen (TKN) by 69%, and total P by 66%. It appears that tertiary wastewater treatment was achieved due to the nutrient attenuations. Based upon our findings, we predict that the high N attenuation efficiency would enable the swamp to work well if the N loading rate were doubled. However, P removal was dependent on loading rate, hydraulic retention time, and temperature. The swamp was more efficient in treating wastewater during warm seasons than cool seasons. During the monitoring period, trace metals were not significantly increased in the swamp water because of very low concentrations in the wastewater.

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662. 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/ USA, 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 time, water in swamps generally had higher levels of dissolved organic carbon, NH sub(4)-N, NO sub(3)-N, and PO sub(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.

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663. Wetland losses in Maryland's coastal bays watershed since the beginning of the twentieth century and their implications for wetlands restoration.

Spaur, C. C.; Nichols, B. E.; Hughes, T. E.; and Noy, P. M. In: Proceedings of the conference: Conservation of biological diversity: A key to the restoration of the Chesapeake Bay ecosystem and beyond. (Held 10 May 1998-13 May 1998 at Therres, G. D. (eds.); pp. 291-302; 2001.

NAL Call #: QH76.5.C48 C66 2001

Descriptors: wetlands/ man-induced effects/ land use/ agriculture/ forest industry/ rural development/ degradation/ ecosystems/ salt marshes/ watersheds/ restoration/ ecosystem management/ nature conservation/ species diversity/ biodiversity/ aerial photographs/ long-term records/ water quality control/ rivers/ coastal waters/ bays/ USA, Maryland, St. Martin R./ USA, Maryland, Turville Creek/ USA, Maryland, Herring Creek/ USA, Maryland, Newport Bay/ USA, Chesapeake Bay/ lost acreage/ conservation/ wildlife management and recreation

Abstract: Losses of salt marsh and forested wetlands to agriculture, development, and silviculture in the coastal bays watershed of Maryland from the beginning of the twentieth century through the 1980s were estimated through a review of soil, wetlands, and land-use maps and aerial photographs; and interpretive field surveys. Loss of salt marsh was estimated to be approximately 730 ha (1,810 acres), or 10% of the historic total. Losses were concentrated in the northern coastal bays, where approximately 620 ha (1,540 acres), or 37%, of the historic salt marshes were lost to development. Losses of forested wetlands by complete conversion to agriculture and development were estimated to be 10,000 ha (24,800 acres), or 44% of the historic total. Most of the remaining areas of historic forested wetlands still under forest cover have been hydrologically degraded by drainage; up to an additional 10,700 ha (26,400 acres) may fall into this status.

Combining these categories, up to 20,700 ha (51,200 acres), or 91%, of the historic forested wetlands of the watershed might have been lost or substantially degraded. Complete losses of forested wetlands are concentrated in the St. Martin River, Turville/Herring Creek, and Newport Bay subwatersheds. Efforts to restore and create salt marsh in the northern coastal bays should be undertaken wherever suitable sites exist, since losses have been substantial in this region, and the natural processes that create and maintain salt marsh are impaired. Salt marsh restoration efforts in the southern bays should focus on sites where losses have occurred. Loss of forested wetlands has occurred on such a large scale that restoration should be undertaken throughout the coastal bays watershed wherever suitable sites exist. To improve water quality in the coastal bays, restoration and creation of forested wetlands could be focused in the St. Martin River, Turville/Herring Creek, and Newport Bay subwatersheds.
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664. Wetland losses related to fault movement and hydrocarbon production, southeastern Texas coast.

White, W. A. and Morton, R. A.
Journal of Coastal Research 13(4): 1305-1320. (1997);
ISSN: 0749-0208

Descriptors: wetlands/ oil and gas production/ ecosystem disturbance/ faults/ subsidence/ coastal erosion/ remote sensing/ oil industry/ ecological effects/ *Spartina*/ erosion/ time series analysis/ flooding/ *Spartina patens*/ *Spartina alterniflora*/ USA, Texas/ subsidence

Abstract: Time series analyses of surface fault activity and nearby hydrocarbon production from the southeastern Texas coast show a high correlation among volume of produced fluids, timing of fault activation, rates of subsidence, and rates of wetland loss. Greater subsidence on the downthrown sides of faults contributes to more frequent flooding and generally wetter conditions, which are commonly reflected by changes in plant communities (e.g., *Spartina patens* to *Spartina alterniflora*) or progressive transformation of emergent vegetation to open water. Since the 1930s and 1950s, approximately 5,000 hectares of marsh habitat has been lost as a result of subsidence associated with faulting. Marshes have expanded locally along faults where hydrophytic vegetation has spread into former upland areas. Fault traces are linear to curvilinear and are visible because elevation differences across faults alter soil hydrology and vegetation. Fault lengths range from 1 to 13.4 km and average 3.8 km. Seventy-five percent of the faults visible on recent aerial photographs are not visible on photographs taken in the 1930's, indicating relatively recent fault movement. At least 80% of the surface faults correlate with extrapolated subsurface faults; the correlation increases to more than 90% when certain assumptions are made to compensate for mismatches in direction of displacement. Coastal wetlands loss in Texas associated with hydrocarbon extraction will likely increase where production in mature fields is prolonged without fluid reinjection.

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Effects of Agricultural Conservation Practices on Wetlands

665. Agricultural best management practices and the decline in surface water total phosphorus concentrations in an impounded Everglades marsh.

Maceina, M. J.
Lake and Reservoir Management 16(3): 235-247. (2000)
NAL Call #: TC401.L3; ISSN: 0743-8141

Descriptors: wetlands/ pollution control/ freshwater lakes/ agricultural pollution/ phosphorus/ water levels/ water quality control/ best management practices/ water pollution control/ marshes/ agricultural runoff/ farms/ lakes/ nutrients/ filtration/ water level/ runoff (agricultural)/ farms and farming/ water management/ agriculture/ nutrient concentrations/ historical account/ USA, Florida, Everglades/ agricultural best management practices

Abstract: Agricultural Best Management Practices (BMPs) in the 290,000 ha Everglades Agricultural Area (EAA) resulted in a 55% reduction in phosphorus loading to the remnant Florida Everglades in 1996-98, exceeding the 25% load reduction mandated by law. Consonant with this, discharge total phosphorus concentrations (TP) declined from 173 ug times L super(-1) in the 1980s to 103 ug times L super(-1) during 1996-98. Although not mandatory until 1995, BMP activity started in the EAA in the mid-1980s. I analyzed 3,798 surface water TP samples collected from 1980 to 1999 in a 54,700 ha impounded Everglades marsh that received surface water inflows from the EAA to examine temporal changes in TP. A gradient of high (> 100 ug times L super(-1)) to low (about 10 ug times L super(-1)) TP existed from northern regions that received EAA discharge south to interior regions of the marsh. During the

1980s, higher TP concentrations extended further south into the marsh, but that process reversed in the 1990s. During the 1990s, wet climatic conditions occurred and TP was inversely correlated to water levels throughout the marsh. However in nearly all regions, TP declined between 1980 and 1999 after accounting for the effects of water levels. Marsh TP was correlated to inflow TP in the regions nearest to the discharge gates, and inflow TP declined from about 150 to 50 ug times L super(-1) with the implementation of BMPs. In addition, this marsh was kept essentially flooded for 18 years to increase water supply, but a more normal "wet-dry" regulation schedule went into effect in late 1980 that permitted drying of the marsh. Three droughts followed by reflooding occurred during the 1980s that caused short-term "TP spikes" in the surface water. Lower inflow TP and possible stabilization of phosphorus between the sediment and the water in the marsh after being kept artificially flooded for so long appeared related to the decline in TP. The establishment of BMPs in the EAA have been successful to help in part to achieve phosphorus reduction goals throughout the remaining Everglades.

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666. Agricultural BMPs for phosphorus reduction in south Florida.

Izuno, F. T.; Bottcher, A. B.; Coale, F. J.; Sanchez, C. A.; and Jones, D. B.

Transactions of the ASAE 38(3): 735-744. (1995)
NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: wetlands/ agricultural practices/ phosphorus/

nonpoint pollution sources/ pollution load/ water quality control/ water pollution control/ agriculture/ fertilizers/ agricultural runoff/ water management/ nonpoint pollution/ pollution control/ agricultural pollution/ USA, Florida/ best management practices

Abstract: Four sets of eight or twelve 0.7 ha plots, designed for soil and hydraulic uniformity, were used to screen potential "Best Management Practices" (BMPs) for reducing total phosphorus (TP) concentrations and loadings in the Everglades Agricultural Area (EAA) of south Florida. The four production systems and their alternatives (treatments) studied were: (1) sugarcane (interspecific hybrids of *Saccharum* sp.) versus drained fallow plots; (2) fast versus slow drainage rates for sugarcane; (3) rice (*Oryza sativa* L.) in rotation following radishes to serve as P filter crop versus traditional flooding fallow; and (4) banding phosphorus (P) fertilizer at 50% of the soil-test recommendation rate for cabbage (*Brassica oleracea* L.) versus full-rate broadcast applications. The study showed that there were no differences in P concentrations in drainage water between sugarcane and drained fallow fields. Annual P loading to the plots in rainfall and irrigation water (0.63 kg TP ha super(-1)) exceeded the P loading of drainage waters (0.52 kg TP ha super(-1) for sugarcane and 0.59 kg TP ha super(-1) for drained fallow plots). Slow drained sugarcane plots exhibited significantly higher TP concentrations than the fast drained plots. However, TP loads were significantly higher (0.97 kg ha super(-1)) for fast drained plots than for the slow drained plots (0.67 kg ha super(-1)). Rice as a P filter crop following radishes reduced TP concentrations and loadings. Finally, banding P fertilizer at a reduced rate for cabbage reduced TP concentrations compared to those for broadcasted P at the full recommended level. Total phosphorus loadings in drainage water were 1.17 kg ha super(-1) for banded and 1.38 kg ha super(-1) for broadcast treatments. A total of 1.30 of 1.30 kg TP ha super(-1) entered the plots in rainfall and irrigation water. All treatment TP loadings leaving the plots in drainage water were close in magnitude to TP loadings to the plots, even under heavy fertilization. This indicates that the EAA system is currently a net assimilator of P.

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667. 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. (Apr. 2002)

NAL Call #: QH541.15.M3E25; ISSN: 0304-3800

Descriptors: wetlands/ agricultural ecosystems/ prairies/ economics/ biological diversity/ ecosystem models/ government policies/ decision making/ land use/ habitat/ agriculture/ water quality/ wildlife/ resource management/ aquatic birds/ habitat selection/ cost analysis/ biodiversity/ ecosystem disturbance/ policies/ *Oryza sativa*/ *Chen caerulescens caerulescens*/ USA, Texas/ rice/ lesser snow goose/ *Anser caerulescens caerulescens*/ modeling, mathematics, computer applications/ environmental action/ protective measures and control/ general environmental engineering

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.

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668. 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: animals and man/ disturbance by man/ commercial activities/ ecology/ habitat/ terrestrial habitat/ land and freshwater zones/ Nearctic region/ North America/ USA/ 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/ South/ community responses to helicopter timber harvesting/ forested wetlands/ Amphibia/ amphibians/ chordates/ vertebrates

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669. Analysis of on-farm best management practices in the Everglades Agricultural Area.

Willis, L. M.; Forest, S. B.; Nissen, J. A.; Hiscock, J. G.; and Kirby, P. V.

In: Environmentally Sound Agriculture: Proceedings of the Second Conference. (Held 20 Apr 1994-22 Apr 1994 at Orlando, Fla.) Campbell, Kenneth L.; Graham, Wendy D.; and Bottcher, A. B. (eds.)

St. Joseph, Mich.: American Society of Agricultural Engineers; pp. 93-99; 1994.

NAL Call #: S589.7.E57 1994; ISBN: 0929355474

Descriptors: book chapter/ fertilizer runoff/ meeting paper/ nonpoint source pollution/ resource management/ water quality

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670. Approach to the inventory of forested wetlands for timber-harvesting impact assessment.

Lea, R.; Mitchell, L. J.; Mader, S. F.; and Aust, W. M. *Forest Ecology and Management* 33: 215-225. (1990)
NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: ecological effects/ forest ecosystems/ forest management/ land use/ management planning/ wetland forests/ Alabama/ best management practices/ data interpretation/ economic aspects/ ecosystems/ forestry/ geohydrology/ nutrients/ primary productivity/ resources management/ sedimentation/ soil properties

Abstract: At present, available information describing the impact of forestry activities on forested-wetland functions is insufficient for use in planning optimal management strategies. A methodology has been developed to assess the impact of timber-harvesting in a tidal freshwater palustrine wetland in southwestern Alabama. Biophysical as well as socio-economic parameters were examined to estimate both stand timber stocks and the extent of disruption of ecosystem functions. Specifically, indices were chosen to detect changes in net primary productivity, plant nutrient assimilative capacity, soil nutrient retention and transformation, decomposition, sedimentation rate, hydrology, and wildlife habitat provision. Furthermore, methods were chosen for data collection efficiency, interpretive simplicity, and the ability to provide a relative index of both the integrity and recovery rates of a disturbed ecosystem. This assessment enables wetland managers to determine which parameters are sensitive to functional changes, as well as the relative effects of various harvesting methods for use in promoting best forest management practices. (Author 's abstract)

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671. 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.

672. Aquatic invertebrates in hardwood depressions of southwest Georgia.

Battle, J. M. and Golladay, S. W. *Southeastern Naturalist* 1(2): 149-158. (June 2002)
NAL Call #: IPSP11706; ISSN: 1528-7092

Descriptors: wetlands/ temporary ponds/ aquatic insects/ community composition/ zooplankton/ forests/ freshwater crustaceans/ rare species/ new records/ distribution records/ habitat/ geographical distribution/ nature conservation/ environmental protection/ conservation/ *Limnadia lenticularis*/ *Invertebrata*/ *Streptocephalus seali*/ *Cladocera*/ *Calanoida*/ *Conchostraca*/ *Chironomidae*/ *Copepoda*/ *Lynceus gracilicornis*/ USA, Georgia/ rare habitat/ hardwood depressions/ water fleas/ midges/ other aquatic communities/ conservation, wildlife management and recreation/ aquatic entomology/ geographical distribution

Abstract: Hardwood depressions in the southeastern United States have been extensively altered due to agriculture and other land management practices. They are small isolated wetlands dominated by oaks that typically become flooded every couple years for a few weeks to several months. We sampled the aquatic invertebrate assemblages of six depressions in 1998 and five depressions in 2001 and found they were composed primarily of clam shrimp, cladocerans, calanoid copepods, and chironomids. The primary functional feeding group was collector-filterers, which comprised >60% of the total numbers. Eubranchiopoda were well represented by two species of clam shrimp (*Lynceus gracilicornis* and *Limnadia lenticularis*) and one species of fairy shrimp (*Streptocephalus seali*). *L. lenticularis* is the first record of this species in Georgia. Consideration should be made for the conservation of hardwood depressions because of the rare invertebrates they accommodate.

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673. 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.

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674. Beaver lodge distributions and damage assessments in a forested wetland ecosystem in the southern United States.

King, Sammy L.; Keeland, Bobby D.; and Moore, Joseph L. *Forest Ecology and Management* 108(1-2): 1-7. (1998)
NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: *Castor canadensis* (Castoridae)/ population density/ distribution within habitat/ animal constructions/ lodge construction/ effect of tree felling on habitat/ impact on habitat/ tree felling for lodge construction effect/ semiaquatic habitat/ forest and woodland/ USA/ Louisiana/ Texas/ Caddo Lake/ distribution/ abundance and impact on habitat/ forested wetland

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675. Belowground nutrient dynamics following three harvest intensities on the Pearl River floodplain, Mississippi.

Schilling, E. B.; Lockaby, B. G.; and Rummer, R. *Soil Science Society of America Journal* 63(6): 1856-1868. (1999)

Abstract: The influence of clear and partial cut harvests on belowground nutrient cycling processes was examined on the Pearl River floodplain, Mississippi. Foci examined by this study included fine root biomass and detritus, fine root production, fine root nutrient contents, soil respiration rates, and microbial biomass C, N, and P during the first year post-harvest. Both the clearcut and partial cut initially reduced fine root biomass; however, fine root biomass levels within each treatment did not differ at this study's conclusion. Bimonthly fine root production within both the clearcut and partial cut declined initially following harvest; however, net primary production was greatest within the clearcut, followed by the partial cut, and lowest within the control. Soil respiration rates showed strong seasonal trends; however, increased soil respiration rates within the clearcut and partial cut were not found until almost 1 yr post-harvest. Decreased microbial biomass C levels were observed following both harvests. Only the clearcut treatment significantly reduced microbial biomass N. No treatment effects were found regarding microbial biomass P. Herbaceous and woody vegetation recolonization was vigorous within the clearcut and partial cut harvests, strongly influencing fine root production levels and soil respiration rates. It appears that fine roots from naturally recolonizing vegetation play a large role in belowground C storage following disturbance. The rapid increases in fine root production and biomass following both silvicultural methods indicates that, within these ecosystems, the negative influences of harvesting on belowground C and nutrient pools may be short lived. The influence of clear and partial cut harvests on belowground nutrient cycling processes was examined on the Pearl River floodplain, Mississippi. Foci examined by this study included fine root biomass and detritus, fine root production, fine root nutrient contents, soil respiration rates, and microbial biomass C, N, and P during the first year post-harvest. Both the clearcut and partial cut initially reduced fine root biomass; however, fine root biomass levels within each treatment did not differ at this study's conclusion. Bimonthly fine root production within both the clearcut and partial cut declined initially following harvest; however, net primary production was greatest within the clearcut, followed by the partial cut, and lowest within the control. Soil respiration rates showed strong seasonal trends; however, increased soil respiration

rates within the clearcut and partial cut were not found until almost 1 yr post-harvest. Decreased microbial biomass C levels were observed following both harvests. Only the clearcut treatment significantly reduced microbial biomass N. No treatment effects were found regarding microbial biomass P. Herbaceous and woody vegetation recolonization was vigorous within the clearcut and partial cut harvests, strongly influencing fine root production levels and soil respiration rates. It appears that fine roots from naturally recolonizing vegetation play a large role in belowground C storage following disturbance. The rapid increases in fine root production and biomass following both silvicultural methods indicates that, within these ecosystems, the negative influences of harvesting on belowground C and nutrient pools may be short lived.
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676. 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.

677. Biodegradation of 4-nitrophenol by indigenous microbial population in Everglades soils.

Laha, S. and Petrova, K. P. *Biodegradation* 8(5): 349-356. (1997)
NAL Call #: QR97.X46 B56

Descriptors: acclimation/ biodegradation/ bioremediation/ Everglades/ mineralization/ nitrophenol/ soil
Abstract: The Everglades in South Florida are a unique ecological system. As a result of the widespread use of pesticides and herbicides in agricultural areas upstream from these wetlands, there is a serious potential for pollution problems in the Everglades. The purpose of this study was to evaluate the ability of indigenous microbial populations to degrade xenobiotic organic compounds introduced by agricultural and other activities. Such biodegradation may facilitate the remediation of contaminated soils and water in the Everglades. The model selected in this study is 4-nitrophenol, a chemical commonly used in the manufacture of pesticides. The mineralization of 4-nitrophenol at various concentration was studied in soils collected from the Everglades. At concentrations of 10 and 100 µg/g soil, considerable mineralization occurred within a week. At a higher concentration, i.e., 10 mg/g soil, however, no mineralization of 4-nitrophenol occurred over a 4-month period; such a high concentration apparently produced an inhibitory effect. The rate and extent of 4-nitrophenol mineralization was enhanced on inoculation with previously isolated nitrophenol-degrading microorganisms. The mixture mineralization extent measured, however, was less than 30% suggesting conversion to biomass and/or unidentified intermediate products. These results indicate the potential for natural mechanisms to mitigate the adverse effects of xenobiotic pollutants in a complex system such as the Everglades.

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678. Changes in surface water table depth and soil physical properties after harvest and establishment of loblolly pine (*Pinus taeda* L.) in Atlantic coastal plain wetlands of South Carolina.

Xu, Yi Jun; Burger, James A.; Aust, W. Michael; Patterson, Steven C.; Miwa, Masato; and Preston, David P.

Soil and Tillage Research 63(3-4): 109-121. (2002)

NAL Call #: S590.S48; ISSN: 0167-1987

Descriptors: forestry/ soil science/ Coniferopsida: gymnosperms, plants, spermatophytes, vascular plants/ forest establishment/ post harvest soil characteristics/ soil physical properties/ surface water table depth change
Abstract: The surface water table is an important factor determining soil chemical, physical and biological processes, and thus affects the functions of forested wetlands. The objective of this study was to assess surface water table dynamics from timber harvesting through early forest plantation establishment in a coastal plain wetland area located in the southeastern United States. Simulated harvesting patterns included two replicates of clear-cutting when soils were dry (dry-weather harvest), three replicates of clear-cutting when soils were wet (wet-weather harvest), and one replicate of uncut control in three 20 ha wetland loblolly pine (*Pinus taeda* L.) forests of ages 20, 23 and 25 years. After harvesting, two site preparation levels (non-bed and bed; bedding is a tillage process of preparing a series of parallel ridges) were randomly assigned to both dry-weather and wet-weather harvested plots, while an additional level (mole-plow + bed) was assigned only to the wet-weather harvested plots. The harvest treatments were designed to create a broad gradient of surface soil disturbance, while the site preparation treatments were done to encompass a range of site drainage and aeration conditions. Areal changes in soil bulk density, macro- and total porosities, and saturated hydraulic conductivity following harvesting were quantified. The depths of water table were recorded at monthly intervals on a 20 m X 20 m grid across the 15 clear-cut and three uncut control plots (a total of 1409 PVC slotted wells) over 6 years (1992-1998), subdivided into five periods: pre-harvest, post-harvest, site preparation, and first year and second year after forest plantation establishment. The results showed that compared to the uncut control, the surface water table depth during a 1-year post-harvest period rose 14 cm for the dry-weather harvested site and 21 cm for the wet-weather harvested site. The difference in the water table rise between the two harvest treatments was small during the dormant season (<2 cm) but large during the growing season (> 10 cm). These results indicate the large influence of tree removal on the surface hydrology in forested wetlands and the strong impact of wet-weather harvesting on transpiring ground vegetation due to a larger surface area of soil disturbance. Bedding initially lowered water tables on both dry-weather and wet-weather harvested sites. However, this effect decreased rapidly during the first 2 years after forest plantation establishment. Among all treatments, the dry-weather harvested sites without bedding presented the fastest recovery of water table depth to that of the non-harvested references, suggesting that bedding may have been a further disturbance with respect to wetland surface hydrology.

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679. Compaction and rutting during harvesting affect better drained soils more than poorly drained soils on wet pine flats.

Aust, W. M.; Tippett, M. D.; Burger, J. A.; and McKee, W. H.

Southern Journal of Applied Forestry 19(2): 72-77. (1995)

NAL Call #: SD1.S63; ISSN: 0148-4419

Descriptors: wetlands/ soil air/ soil water regimes/ salvage felling and logging/ skidding/ soil degradation/ logging/ soil compaction

Abstract: Soil compaction and rutting (puddling, destruction of soil aggregates) are visually distinct types of wet-site harvesting disturbances; however, the way in which they affect soil physical properties and hydrology is not well documented. Three compacted and three rutted sites in wet pine flats on the Francis Marion National Forest, South Carolina, were evaluated to determine the effects of the disturbances during salvage logging after Hurricane Hugo on soil physical and hydrologic properties. Primary skid trails and nontrafficked areas were compared for each site. Both compaction and rutting increased bulk density, and reduced macropore space and saturated hydraulic conductivity. Water tables and reducing conditions were closer to the soil surface within the primary skid trails. For the compacted and rutted skid trails, changes were greatest on sites that initially had better drainage and aeration. Compacted sites may prove easier to mitigate with site preparation than rutted sites due to the shallower nature of the disturbances and drier site conditions that will facilitate mechanical mitigation.

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680. 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, 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/m², belowground = 828-1049 g/m²) than the ungrazed marsh (aboveground = 588-671 g/m²; belowground = 4,921-6,730 g/m²). 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/m²) and ungrazed (45,511 organisms/m²) marshes. However, the density of subsurface deposit feeders was significantly lower in the grazed marsh (10,370 organisms/m²) than in the ungrazed marsh (16,877 organisms/m²), 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.

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681. Composition and function of sulfate-reducing prokaryotes in eutrophic and pristine areas of the Florida Everglades.

Castro, H.; Reddy, K. R.; and Ogram, A.

Applied and Environmental Microbiology 68(12): 6129-6137. (Dec. 2002)

NAL Call #: 448.3 Ap5; ISSN: 0099-2240

Descriptors: wetlands/ soil microorganisms/ communities/ sulfate/ reduction/ most probable number/ methanogenesis/ sulfite reductase/ community composition/ bacterial/ sulphates/ soils/ nutrients (mineral)/ physicochemical properties/ agricultural runoff/ biogeochemistry/ ground water/ carbon cycle/ desulfotomaculum/ USA, Florida, Everglades/ soil and plants/ microorganisms

Abstract: As a result of agricultural activities in regions adjacent to the northern boundary of the Florida Everglades, a nutrient gradient developed that resulted in physicochemical and ecological changes from the original system. Sulfate input from agricultural runoff and groundwater is present in soils of the Northern Everglades, and sulfate-reducing prokaryotes (SRP) may play an important role in biogeochemical processes such as carbon cycling. The goal of this project was to utilize culture-based and non-culture-based approaches to study differences between the composition of assemblages of SRP in eutrophic and pristine areas of the Everglades. Sulfate reduction rates and most-probable- number enumerations revealed SRP populations and activities to be greater in eutrophic zones than in more pristine soils. In eutrophic regions, methanogenesis rates were higher, the addition of acetate stimulated methanogenesis, and SRP able to utilize acetate competed to a limited degree with acetoclastic methanogens. A surprising amount of diversity within clone libraries of PCR-amplified dissimilatory sulfite reductase (DSR) genes was observed, and the majority of DSR sequences were associated with gram-positive spore-forming Desulfotomaculum and uncultured microorganisms. Sequences associated with Desulfotomaculum fall into two categories: in the eutrophic regions, 94.7% of the sequences related to Desulfotomaculum were associated with those able to completely oxidize substrates, and in samples from pristine regions, all Desulfotomaculum-like sequences were related to incomplete oxidizers. This metabolic selection may be linked to the types of substrates that Desulfotomaculum spp. utilize; it may be that complete oxidizers are more versatile and likelier to proliferate in

nutrient-rich zones of the Everglades. Desulfotomaculum incomplete oxidizers may outcompete complete oxidizers for substrates such as hydrogen in pristine zones where diverse carbon sources are less available.

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682. Differential effects of surface and peat fire on soil constituents in a degraded wetland of the northern Florida Everglades.

Smith, S. M.; Newman, S.; Garrett, P. B.; and Leeds, J. A. *Journal of Environmental Quality* 30(6): 1998-2005. (2001) NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: fires/ burning/ peat/ surface layers/ wetland soils/ losses from soil/ carbon/ nitrogen/ organic compounds/ organophosphorus compounds/ phosphorus/ calcium/ soil chemistry/ volatilization/ burnt soils/ inorganic phosphorus/ Florida

Abstract: The effects of surface (aboveground) and peat (belowground) fire on a number of soil constituents were examined within a hydrologically altered marsh in the northern Florida Everglades. Peat fire resulted in losses of total carbon (TC), total nitrogen (TN), and organic phosphorus (Po), while inorganic phosphorus (Pi) and total calcium (TCa) concentrations increased. In addition, peat fire led to a more pronounced vertical gradient in constituent concentrations between upper and lower soil layers. Surface fire also affected soil constituents, but impacts were small relative to peat fire. The effects of physical versus chemical processes during burning were assessed using ratios of constituent to TCa concentrations. This measure indicated that increases in the levels of total phosphorus (TP) in peat-burned areas were due primarily to the physical reduction of soil, while decreases in TN and TC were the result of volatilization. Increases in concentrations of Pi fractions arose from both chemically and physically mediated processes. In an ecological context, the observed soil transformations may encourage the growth of invasive plant species, such as southern narrow-leaved cattail (*Typha domingensis* Pers.), which exhibits high growth rates in response to increased P availability.

This citation is from AGRICOLA.

683. Division S-10, Wetland soils: Turnover of detrital organic carbon in a nutrient-impacted Everglades marsh.

DeBusk, W. F. and Reddy, K. R.

Soil Science Society of America Journal 62(5): 1460-1468. (1998)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Abstract: Phosphorus loading to the Everglades from nearby agricultural areas has become a major concern, and is considered to be a significant factor in the encroachment of cattail (*Typha domingensis* Pers.) and other rapidly growing vegetation into endemic sawgrass (*Cladium jamaicense* Crantz) marsh. The objectives of this research were to evaluate the variability in turnover of organic C in plant and soil detrital pools along a P enrichment gradient in an Everglades marsh and to identify substrate characteristics and environmental factors controlling C turnover. Potential rates of C mineralization in plant litter and peat were determined by measuring aerobic and anaerobic microbial respiration under controlled conditions in laboratory incubations. Potential C mineralization decreased with depth and, consequently, substrate age, in

the plant-soil profile. Within individual detrital pools [standing dead plant material, soil litter layer, surface peat (0-10 cm depth) and subsurface peat (10-30 cm depth)], potential C mineralization decreased down gradient from the source of nutrient loading, to WCA-2A. Overall, 91% of the variability in aerobic C mineralization in peat and plant litter was accounted for by substrate P concentration and lignocellulose composition. Anaerobic C mineralization rates were consistently about one-third of aerobic rates. Results indicated that organic C turnover in detrital pools in WCA-2A is significantly affected by accelerated P loading, but is also controlled by O₂ availability and substrate C quality.

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684. Ecological responses of an oligotrophic floodplain forest to harvesting.

Lockaby, B. G.; Thornton, F. C.; Jones, R. H.; and Clawson, R. G.

Journal of Environmental Quality 23(5): 901-906. (1994)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: wetlands/ bottomland forests/ groundwater level/ clear felling/ Histosols/ denitrification/ helicopters/ skidders/ damage/ nitrogen/ phosphorus/ skidding/ ecology/ floodplains/ logging/ water quality

Abstract: Aerial (hand felling plus helicopter extraction) and ground-based (use of a feller-buncher on mats plus skidder log removal) logging systems were compared in terms of effects on gaseous and hydrologic transfers on N and P. The study sites in southern Alabama were narrow floodplains of low order blackwater streams and were dominated by P-deficient histosols and a mixed, primarily deciduous forest. There was no significant effect of logging on either denitrification or surface and groundwater chemistry. An unexpected effect of the clear fellings was a significant lowering of groundwater tables.

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685. Effect of land development and forest management on hydrologic response in southeastern coastal wetlands: A review.

Richardson, C. J. and Mccarthy, E. J.

Wetlands 14(1): 56-71. (1994)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ forest industry/ land use/ hydrology/ United States, Southeast/ literature reviews/ United States, North Carolina/ resource management/ runoff/ evapotranspiration/ environmental impact/ land development/ forest management/ hydrologic models/ environmental effects/ forest management/ Mechanical and natural changes/ Ecosystems and energetics/ Freshwater pollution/ Effects on water of human nonwater activities/ Environmental degradation

Abstract: Land development activities such as agriculture, clear cutting, peat mining, and the planting of forest plantations on wetlands can affect the hydrologic behavior of these ecosystems by affecting their water storage and release patterns on the landscape. The effects of these development activities on hydrologic fluxes in peatlands (Typic Medisaprists) were compared to the effects of forest management practices in North Carolina using a field-tested hydrologic simulation model (DRAINMOD). Simulations revealed that natural peat-based (Histosol) pocosin systems lose 66% (80 cm) of the 123 cm of average annual rainfall by evapo-transpiration (ET) and

34% (42 cm/yr) via annual runoff. Annual runoff values were 63 cm/yr for peat mining areas, 48 cm/yr for cleared peatlands, 46 cm/yr for peatlands converted to agriculture and 34 cm/yr for pine plantations, once the forest canopy is closed. Thus, these wetlands alterations, except for forestry, significantly increased runoff and decreased ET compared to the natural ecosystem. Forest pine plantation management decreased runoff and increased ET. A case study of the effects of forest management practices was reviewed for a 15-year-old drained loblolly pine plantation growing on fine sandy loam soils (Thermic Typic umbraquills) in the coastal plains of North Carolina. Forestry activities such as thinning (i.e., reduced leaf area index by 50%) decreased ET and canopy interception and nearly doubled drainage loss (38 cm/yr to 60 cm/yr). Commonly applied forest practices, such as drainage, increased the average number of flow events with flows > 5 mm/day to 86 days per year from 26 days per year under natural conditions.

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686. Effects of chemical and mechanical site preparation on bottomland hardwood regeneration after ten years.

Greene, T. A. and Lowe, W. J.

In: Proceedings of the Seventh Biennial Southern Silvicultural Research Conference. (Held 17 Nov 1992-19 Nov 1992 at Mobile, Ala.) Brissette, John C. (eds.) New Orleans, La.: Southern Forest Experiment Station; pp. 425-429; 1993.

NAL Call #: aSD11.U57

<http://www.srs.fs.usda.gov/pubs/viewpub.jsp?index=1407>

Descriptors: Quercus/ Liquidambar styraciflua/ clearcutting/ site preparation/ burning/ herbicides/ chemical control/ natural regeneration/ Texas

This citation is from AGRICOLA.

687. 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. (Held 5 Jul 1989-9 Jul 1989 at 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

688. Effects of forest management on biogeochemical functions in southern forested wetlands.

Walbridge, Mark R. and Lockaby, B. Graeme

Wetlands 14(1): 10-17. (1994)

Descriptors: denitrification/ forestry/ Georgia/ ground water/ growth/ hydraulic conductivity/ microorganism absorption/ nitrate/ nitrogen/ nutrients/ organic carbon/ phosphorus/ redox potential/ sediment deposition/ soil moisture/ soil temperature/ species composition

Abstract: Southern forested wetlands perform two important biogeochemical functions on the landscape: 1) nutrient (N and P) removal from incident surface, subsurface, and ground waters, and 2) export of organic

carbon and associated nutrients to aquatic ecosystems downstream. In addition to P sediment deposition, which can range from 1.6 to 36.0 kg ha⁻¹ yr⁻¹ P, denitrification of NO₃-N (0.5 to 350 kg ha⁻¹ yr⁻¹) and P adsorption (130 to 199 kg ha⁻¹ yr⁻¹) can be important mechanisms associated with N and P removal, respectively. Biological processes, uptake by plants (15.0 to 51.8 kg ha⁻¹ yr⁻¹ for N; 0.2 to 3.8 kg ha⁻¹ yr⁻¹ for P) and microorganism absorption (16.2 to 87.0 kg ha⁻¹ yr⁻¹ for N; 6.6 to 40.0 kg ha⁻¹ yr⁻¹ for P) are also important and are intimately associated with organic matter export. Clearcut harvests (ground-based or aerial), followed by natural regeneration, are the most common silvicultural techniques used in forested floodplains in the South. Ground-based methods have been shown to increase soil bulk density and decrease hydraulic conductivity and redox potential in wetter soils. In addition to the increases in soil temperature and soil wetness that frequently occur following forest harvesting, these added effects may be responsible for the reduced productivity and altered species composition observed following ground-based vs. aerial harvests. Changes in denitrification will be a function of the degree to which harvesting affects soil redox potential, substrate (C) availability, and nitrate production. In theory, denitrification rates should increase following harvesting, but low nitrate availability in acid soils may limit this effect. The effects of harvesting on P adsorption processes in forested wetland soils have not been studied. Reductions in plant uptake and litterfall and changes in species composition following harvesting could alter both nutrient retention/transformation and organic C export functions. On wetter sites, canopy removal may stimulate algal populations, providing a short-term mechanism for conserving geochemical exports. Clearcut harvest systems that minimize alterations in soil hydrology and promote rapid vegetation regrowth should have the least effect on biogeochemical functions in southern forested wetlands.

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689. Effects of grazing by feral horses, clipping, trampling, and burning on a Georgia salt marsh.

Turner, M. G.

Estuaries 10(1): 54-60. (1987)

NAL Call #: GC96.E79; ISSN: 0160-8347

Descriptors: *Spartina alterniflora*/ *Littorina*/ horses/ salt marshes/ grazing/ fires/ Georgia

This citation is from AGRICOLA.

690. Effects of group-selection timber harvest in bottomland hardwoods on fall migrant birds.

Kilgo, John C.; Miller, Karl V.; and Smith, Winston P.

Journal of Field Ornithology 70(3): 404-413. (1999)

NAL Call #: 413.8 B534; ISSN: 0273-8570

Descriptors: animals and man/ disturbance by man/ commercial activities/ behaviour/ ecology/ habitat/ terrestrial habitat/ land and freshwater zones/ Nearctic region/ North America/ USA/ Aves: forestry/ bottomland hardwood group selected timber harvest/ impacts on migrant communities/ migration/ community structure/ migrant communities/ impacts of forestry practices/ distribution within habitat/ habitat utilization/ forest and woodland/ South Carolina/ Aiken/ Barnwell and Allendale counties/ bottomland hardwood forest migrant communities/ forestry practices impacts/ Aves/ birds/ chordates/ vertebrates

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691. Effects of increased phosphorus loading on dissolved oxygen in a subtropical wetland, the Florida Everglades.

McCormick, P. V. and Laing, J. A.

Wetlands Ecology and Management 11(3): 199-215. (2003)

NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861

Descriptors: wetlands/ phosphorus/ nutrient loading/ dissolved oxygen/ eutrophication/ agricultural runoff/ nutrients (mineral)/ pollution effects/ periphyton/ aquatic plants/ biota/ short-term changes/ primary production/ USA, Florida, Everglades/ USA, Florida, Everglades Natl. Park/ freshwater pollution/ effects on organisms/ habitat community studies/ environmental degradation/ water pollution: monitoring, control & remediation

Abstract: The Florida Everglades is an oligotrophic, phosphorus (P)-limited wetland that is experiencing eutrophication as a result of P-enriched agricultural runoff. Effects of P enrichment on diel water-column dissolved oxygen concentration (DO) profiles were measured along nutrient gradients downstream of agricultural discharges in two northern Everglades marshes and in field enclosures (mesocosms) exposed to different P loading rates. Reference (i.e., water-column TP < 10 µg/L) areas in the marsh interior were characterized by strong diel fluctuations in DO, and aerobic conditions generally were maintained throughout the diel cycle. Enriched stations (water-column TP elevated to between 12 and 131 µg/L) were characterized by dampened diel fluctuations and reduced DO, and the extent of these changes was correlated strongly with marsh P concentrations. Mean DO declined from between 1.81 and 7.52 mg/L at reference stations to between 0.04 and 3.18 mg/L in highly enriched areas. Similarly, minimum DO declined from between 0.33 and 5.86 mg/L to between 0 and 0.84 mg/L with increasing enrichment, and the frequency of extremely low DO (< 1 mg/L) increased from between 0 and 20% to as high as 100% in the most enriched areas. Diel oxygen profiles in P-enriched mesocosms declined progressively with time; all loading treatments exhibited similar DO during the 1st year of P loading, but concentrations declined significantly at higher loads by year 3. Reductions in water-column DO with increased P enrichment were associated with reduced oxygen production by submersed periphyton and macrophytes and increased sediment oxygen demand. Increased emergent macrophyte cover in enriched areas likely contributed to these changes by shading the water-column, which inhibited submerged productivity, and by providing inputs of nutrient-rich detritus, which increased oxygen demand. Declines in marsh DO are associated with other ecological changes such as increased anaerobic metabolism and an increase in invertebrate taxa that tolerate low DO. While background oxygen concentrations in wetlands can be lower than those in lakes and rivers, declines in water-column DO caused by eutrophication can result in biological impacts similar to those in other aquatic ecosystems.

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692. 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 macroinvertebrate 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 macroinvertebrate community composition, chironomid deformity rate, and chironomid biomass between treatments suggests that imazapyr did not affect the macroinvertebrate community at the concentrations 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.

693. The effects of timber harvest in a South Carolina blackwater bottomland.

Perison, Donna; Phelps, Joseph; Pavel, Christina; and Kellison, Robert

Forest Ecology and Management 90(2-3): 171-185. (1997)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: animals and man/ disturbance by man/ commercial activities/ ecology/ habitat/ terrestrial habitat/ land and freshwater zones/ Nearctic region/ North America/ USA/ Amphibia/ Reptilia: forestry/ comparison of harvest methods/ community structure/ timber harvest effects/ forest and woodland/ timber harvest effects on communities/ USA/ South Carolina/ South Fork Edisto River/ timber harvest effects on community structure/ blackwater forested wetland/ amphibians/ chordates/ reptiles/ vertebrates

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694. Environmental contaminants in Texas, USA, wetland reptiles: Evaluation using blood samples.

Clark, D. R.; Bickham, J. W.; Baker, D. L.; and Cowman, D. F.

Environmental Toxicology and Chemistry 19(9): 2259-2265. (2000)

NAL Call #: QH545.A1E58; ISSN: 0730-7268

Descriptors: wetlands/ pesticides (organochlorine)/ DDE/ contaminants/ water pollution sources/ fate of pollutants/ water pollution effects/ arsenic/ animal populations/ bioaccumulation/ blood/ data collections/ ecological effects/ animal physiology/ water pollution/ ecology/ pesticides/ aquatic reptiles/ *Nerodia*/ *Agkistrodon piscivorus*/ *Trachemys scripta*/ *Nerodia erythrogaster*/ *Nerodia rhombifer*/ water snakes/ cottonmouth/ common slider/ USA, Texas/ organochlorine pesticides/ reptiles/ plain-bellied water snake/ diamondback water snake/ Old River Slough/ Municipal L.

Abstract: Four species of reptiles (diamondback water snake [*Nerodia rhombifer*], blotched water snake [*N. erythrogaster*], cottonmouth [*Agkistrodon piscivorus*], and red-eared slider [*Trachemys scripta*]) were collected at two contaminated and three reference sites in Texas, USA. Old River Slough has received intensive applications of agricultural chemicals since the 1950s. Municipal Lake received industrial arsenic wastes continuously from 1940 to 1993. Blood samples were analyzed for organochlorines, potentially toxic elements, genetic damage, and plasma cholinesterase (ChE). Dichlorodiphenyldichloroethylene (DDE) concentrations reached as high as 3.0 ppm (wet weight) in whole blood of a diamondback water snake at Old River Slough, a level probably roughly equivalent to the maximum concentration found in plasma of peregrine falcons (*Falco peregrinus*) in 1978 to 1979 when DDE peaked in this sensitive species. Possible impacts on diamondback water snakes are unknown, but at least one diamondback water snake was gravid when captured, indicating active reproduction. Arsenic was not found in red-eared sliders (only species sampled) from Municipal Lake. Red-eared sliders of both sexes at Old River Slough showed declining levels of ChE with increasing mass, suggesting a life-long decrease of ChE levels. Possible negative population consequences are unknown, but no evidence was found in body condition (mass relative to carapace length) that red-eared sliders at either contaminated site were harmed.

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695. Fate and effect of (14c)fenvaterate in a tidal marsh sediment ecosystem model.

Caplan, J. A.; Isensee, A. R.; and Nelson, J. O.

Journal of Agricultural and Food Chemistry 32(1): 166-171. (1984)

NAL Call #: 381 J8223; ISSN: 0021-8561

Descriptors: pesticides/ fenvaterate/ tidal marshes/ fate of pollutants/ sediments/ leaching/ microorganisms/ water pollution effects/ salt marshes

Abstract: A model salt marsh ecosystem was developed and used to evaluate the fate and effect of a pesticide under simulated salt marsh conditions. Fenvaterate was used as a reference pesticide. Fenvaterate is a pyrethroid insecticide that has great potential for control of a wide range of insect pests in agriculture. Two dosages (0.2 and 1.0 ppm) of C-14 labeled fenvaterate were uniformly applied to the sediment. Additionally, a third treatment (1.0

ppm) was applied to the top centimeter of a 3-cm column to monitor the vertical movement of the compound (plus metabolites). No adverse effects of C-14 fenvalerate on heterotrophic microorganisms were observed after 7 days at any treatment level, as measured by plate counts and substrate degradation assays (starch, cellulose, and protein). The half-lives of C-14 fenvalerate in the 0.2- and 1.0 ppm noncolumn treatments were 6.3 and 8.9 days, respectively. The lower half-life (3.2 days) observed in the 1.0 ppm column treatment was attributed to a higher leaching rate in that treatment. TLC analysis of sediment extracts revealed the presence of three identifiable metabolites in all treatments after 4 days of incubation.

(Baker-IVI)

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696. 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); 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/ USA, North Carolina

Abstract: [unedited] 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.

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697. First year analysis of the effects of phosphorus enrichment on slough communities of the Everglades: An experimental approach using a solar powered dosing system.

Richardson, C. J.; Qualls, R. G.; and Vaithiyathan, P.

Lake and Reservoir Management 9(2): 108. (1994)

NAL Call #: TC401.L3; ISSN: 0743-8141

Descriptors: wetlands/ water pollution effects/ agricultural runoff/ phosphorus/ nutrients/ ecosystems/ environmental effects/ macrophytes/ algae/ eutrophication/ nutrients (mineral)/ environmental impact/ environmental monitoring/ monitoring systems/ periphyton/ USA, Florida, Everglades/ nutrients (mineral)/ environmental impact/ environmental monitoring/ monitoring systems/ periphyton/ water pollution effects/ nutrients/ macrophytes

Abstract: The Everglades is a phosphorus limited system that historically received most inputs of nutrients via rainfall but has more recently been impacted by over 200 metric tons of P per year from agricultural drainage. To determine a threshold level of phosphorus responsible for changes in community structure and ecosystem processes, a replicated solar-driven, in situ mesocosm experiment was conducted during 1992-1993. Twelve channels, each 10 meters long, were dosed with 0, 30, 50, 75, and 150 $\mu\text{g/L}$ of PO sub(4)-P (Na sub(2) HPO sub(4)). Control SRP concentrations averaged 5.8 $\mu\text{g/L}$ (plus or minus 3.9) while channels receiving highest inputs (150 $\mu\text{g/L}$ of P) displayed varying P levels that averaged between 58 and 61 $\mu\text{g/L}$ of P 1 meter from the source but varied with water depth, season and distance down the channel. Density or percent cover of all dominant macrophytes was lower in the channel segments with highest average SRP concentrations (58 to 61 $\mu\text{g/L}$ PO sub(4)-P). Chara appeared to reach its maximum percent cover at an average concentration of about 20 $\mu\text{g/L}$ PO sub(4)-P. Two hundred and twenty-nine algal species, dominated by diatoms and blue-green algae, were observed. Increased SRP levels enhanced periphyton standing crop in certain microhabitats.

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698. Floristic quality indices for biotic assessment of depressional marsh condition in Florida.

Cohen, M. J.; Carstenn, S.; and Lane, C. R.

Ecological Applications 14(3): 784-794. (2004)

NAL Call #: QH540.E23; ISSN: 1051-0761

Descriptors: agricultural disturbance/ biological assessment/ coefficient of conservatism/ Florida (USA)/ floristic quality assessment index (FQAI)/ isolated depressional marshes/ landscape development intensity index (LDI)/ wetland condition

Abstract: Evaluation of wetland ecological condition requires quantitative biological indices for measuring anthropogenic impairment. We implemented a modified floristic quality assessment index (FQAI) protocol for 75 isolated, depressional herbaceous wetland systems, exploring refinements of FQAI standard methods. Species encountered during sampling ($n = 397$) were assigned coefficients of conservatism (CC) by ten expert botanists working independently. A quantitative summary metric of adjacent site buffer (up to 100 m) land use intensity, called the landscape development intensity (LDI) index, was calculated for each wetland system to quantify expected anthropogenic impairment. The association between LDI and wetland community mean CC scores was strong and

conditionally independent of ecoregion. Weaker associations with LDI were observed for other community summary metrics, including richness-weighted FQAI. We inverted LDI to compute an intensity coefficient (IC), which quantifies observed buffer development intensity tolerated by each species. IC scores were significantly associated with CC scores on a species basis and strongly associated on a site mean basis. Growing interest in floristic quality assessment for regulatory purposes provides opportunities for formally linking expert opinion and ground observations of species-specific disturbance tolerance.
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699. Forest harvesting effects on soil temperature, moisture and respiration in a bottomland hardwood forest.

Londo, A. J.; Messina, M. G.; and Schoenholtz, S. H. *Soil Science Society of America Journal* 63(3): 637-644. (1999)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: lowland forests/ bottomland soils/ soil temperature/ soil water content/ carbon dioxide/ losses from soil/ clearcutting/ felling/ biogeochemical cycles/ emissions/ soil respiration/ Texas

Abstract: The effect of forest disturbance on C cycling has become an issue, given concerns about escalating atmospheric C content. We examined the effects of harvest intensity on in situ and laboratory mineral soil respiration in an East Texas bottomland hardwood forest between 6 and 22 mo after harvesting. Treatments included a clearcut, a partial cut wherein approximately 58% of the basal area was removed, and an unharvested control. The soda-lime absorption technique was used for in situ respiration (CO₂) efflux and the wet alkali method (NaOH) was used for laboratory mineral soil respiration. Soil temperature and moisture content were also measured. Harvesting significantly (P = 0.05) increased in situ respiration during most sampling periods. This effect was attributed to an increase in live root and microflora activity associated with postharvesting revegetation. In situ respiration increased exponentially (Q(10) relationship) as treatment soil temperatures increased (mean range 8.3-29.1 degree C), but followed a parabolic-type pattern through the range of soil moisture measured (mean range 10.4-31.5%). Mean rates of laboratory mineral soil respiration measured during the study were unaffected by cutting treatment for most sampling sessions. Overall, the mean rate of CO₂ efflux in the clearcuts (7.15 g CO₂ m⁻² d⁻¹) was significantly higher than that in the partial cuts (5.95 g CO₂ m⁻² d⁻¹), which in turn was significantly higher than that in the controls (4.95 g CO₂ m⁻² d⁻¹). Mass balance estimates indicate that these treatment differences will have little or no long-term effect on C sequestration of these managed forests.

This citation is from AGRICOLA.

700. Forest harvesting influence on water table dynamics in a Florida flatwoods landscape.

Bliss, C. M. and Comerford, N. B. *Soil Science Society of America Journal* 66(4): 1344-1349. (2002)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: logging/ Pinus elliottii/ Taxodium distichum/ water table/ forest plantations/ swamps/ swamp soils/ wetland soils/ Florida

Abstract: Flatwoods are an important ecological plant community in the southeastern Coastal Plain with approximately one-third of Florida's flatwoods in timberland. This study was conducted to investigate hydroperiod changes in the water table of both hydric and nonhydric soils following harvest in a Florida cypress [Taxodium distichum (L.)]-pine (Pinus elliottii var. elliottii Engelm.) flatwoods landscape. Shallow water-table wells were established on a 42-ha area and divided into three harvesting treatments containing mature slash pine plantations and pine-cypress swamps: control, clearcut (both hydric and nonhydric soils harvested), and cypress swamps only harvested (hydric soils only harvested). Water-table measurements were obtained at 2-wk intervals for 6 yr. Harvesting treatments occurred 2 yr into the study. Regression equations created from preharvest water-table data between the control block and harvested blocks allowed us to predict uncut water-table responses in the cut areas. These predicted values were compared with the actual postharvest observations. The water-table level increased 48 and 49 cm and 19 and 21 cm in the hydric and nonhydric soils in the clearcut and cypress swamps only cut, respectively, during the first 126 d after harvesting. Significant differences (P < 0.10) in water-table depth because of harvesting occurred throughout the four postharvest years, but the differences were less than seen initially, and the pattern was seasonal. Compared with the predicted uncut condition, water tables tended to be lower (drier) during the growing season and higher (wetter) during the nongrowing season. These seasonal fluctuations were presumably driven by changes in evapotranspiration rates resulting from differences in leaf area of the pine canopy and understory.
This citation is from AGRICOLA.

701. Forestry and forest management impacts on wetlands.

McKee, W. H.
In: Proceedings of the Conference: Wetlands of the Chesapeake. (Held 9 Apr 1985-11 Apr 1985 at Easton, Md.) Groman, Hazel A. (eds.)
Washington D.C.: Environmental Law Institute; pp. 216-224; 1985.
NAL Call #: QH76.5.C48P76; ISBN: 0911937196
Descriptors: wetlands/ water quality/ drainage/ forest management/ hydrology/ logging/ South Carolina
This citation is from AGRICOLA.

702. Ground-water-table rise after forest harvesting on cypress-pine flatwoods in Florida.

Sun Ge; Riekerk, H.; and Kornhak, L. V. *Wetlands* 20(1): 101-112. (2000)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ forests/ harvesting/ ecosystems/ forest management/ upland areas/ water quality/ synecology/ wildlife/ habitats/ botanical composition/ logging/ hydrology/ forest influences/ groundwater level/ spatial variation/ temporal variation/ logging effects
Abstract: Forest removal represents one of the large-scale ecosystem disturbances that concern water quality degradation, species composition change, and wildlife habitat alteration along the Florida coast. A 5-year study was conducted with the objective of addressing the effects of 2 forest management scenarios on the water regimes of cypress/pine (Taxodium ascendens/Pinus elliottii, with

swamp tupelo *Nyssa sylvatica* var. *biflora* [*N. biflora*]) flatwoods ecosystems (cypress wetlands and pine uplands) in the lower coastal plain. Three experimental blocks (16-21 ha) were used in this study, with one representing control (C), one wetlands-harvest-only (W), and one wetlands + uplands harvest (ALL). Within the centre of each block, a representative cypress wetland and its surrounding pine upland were extensively instrumented to quantify the changes of each hydrological variable induced by tree removal. Water levels in cypress wetlands in both treatment areas were significantly elevated about 32-41 cm on average, and outflow doubled in the 5-month dry period immediately following the tree harvesting. The ground-water table in the upland was also raised by about 29 cm on average in the ALL treatment, but it was not affected significantly during the entire post-treatment period by treatment W. During wet periods, the treatment effects for both wetlands and uplands were not significant. Causes for spatial and temporal variability of hydrological responses to forest harvesting are speculated to be: (1) total evapotranspiration does not change significantly in flatwoods after tree removal during wet seasons; (2) specific yield of the flatwoods soils is variable in time and space; and (3) lateral water movement from uplands to wetlands. From this study, it is concluded that harvesting both uplands and wetlands causes greater response than harvesting wetlands only. The impacts lasted for more than 2 years but were most pronounced only in the dry periods. Temporal and spatial variations of each hydrological component should be considered in evaluating the hydrological impact of forest management on the flatwoods landscape.

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703. Harvest influences on floodwater properties in a forested floodplain.

Clawson, R. G.; Lockaby, B. G.; and Rummer, R. B. *Journal of the American Water Resources Association* 35(5): 1081-1088. (1999)

NAL Call #: GB651.W315; ISSN: 1093-474X

Descriptors: USA, Georgia/ forests/ water quality/ nutrients/ forestry/ biogeochemistry/ runoff/ flood plains/ water quality (natural waters)/ floodplains

Abstract: Floodplain forests directly influence water quality by serving as sinks, sources, or transformers of nutrients. Increases in the demand for timber raise the question of how silvicultural disturbance may affect this function. The objective of this research was to compare biogeochemical relationships between undisturbed vs. disturbed conditions in a floodplain forest. A randomized complete block design consisting of three blocks and two treatments (partial harvest and undisturbed) was installed on the Flint River floodplain, Georgia. The partial cut was conducted during September-October 1993. Automated water samplers were situated to sample during flood events as sheetflow entered and exited treatment plots during the 1994, 1995 and 1996 flood seasons. Pre- vs. post-contact comparisons indicated that the undisturbed floodplain has minimal influence on water chemistry at this scale of measurement. Although the partial harvest on an 8-ha scale had minimal effect upon sheetflow water chemistry for three years following harvest, the data suggest that harvests may stimulate a minor increase in Ca and K sink activity.

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704. Herbivorous insect response to group selection cutting in a southeastern bottomland hardwood forest.

Ulyshen, Michael D.; Hanula, James L.; Horn, Scott; Kilgo, John C.; and Moorman, Christopher E.

Environmental Entomology 34(2): 395-402. (2005)

NAL Call #: QL461.E532; ISSN: 0046-225X

<http://www.srs.fs.usda.gov/pubs/21698>

Descriptors: selection cutting/ uneven-aged silviculture/ forest openings/ forest management

Abstract: We compared the response of ground beetles (Coleoptera: Carabidae) to the creation of canopy gaps of different size (0.13, 0.26, and 0.50 ha) and age (1 and 7 years) in a bottomland hardwood forest (South Carolina, USA). Samples were collected four times in 2001 by malaise and pitfall traps placed at the center and edge of each gap, and 50 m into the surrounding forest. Species richness was higher at the center of young gaps than in old gaps or in the forest, but there was no statistical difference in species richness between old gaps and the forests surrounding them. Carabid abundance followed the same trend, but only with the exclusion of *Semiardistomis viridis* (Say), a very abundant species that differed in its response to gap age compared to most other species. The carabid assemblage at the gap edge was very similar to that of the forest, and there appeared to be no distinct edge community. Species known to occur in open or disturbed habitats were more abundant at the center of young gaps than at any other location. Generalist species were relatively unaffected by the disturbance, but one species (*Dicaelus dilatatus* Say) was significantly less abundant at the centers of young gaps. Forest inhabiting species were less abundant at the centers of old gaps than in the forest, but not in the centers of young gaps. Comparison of community similarity at various trapping locations showed that communities at the centers of old and young gaps had the lowest similarity (46.5%). The community similarity between young gap centers and nearby forest (49.1%) and old gap centers and nearby forest (50.0%) was similarly low. These results show that while the abundance and richness of carabids in old gaps was similar to that of the surrounding forest, the species composition between the two sites differed greatly.

This citation is from Treesearch.

705. Hydrological aspects of cypress wetlands in coastal-region pine forests and impacts of management practices.

Fares, Ali; Mansell, R. S.; and Comerford, N. B.

Soil and Crop Science Society of Florida Proceedings 55: 52-58. (1996)

NAL Call #: 56.9 So32; ISSN: 0096-4522

Descriptors: coastal region pine forest/ cypress wetlands/ evapotranspiration/ ground water/ habitat/ hydrology/ land development/ management practices/ mathematical model/ precipitation/ silviculture/ surface water/ terrestrial ecology

Abstract: Hydrology for cypress pond/flatwood pine (CPFP) systems located in coastal regions of the southeastern USA is a primary driving force influencing ecology, land development, and persistence of CPFP systems. Water budget analysis provides a means to quantify water entering, undergoing storage in, and leaving such systems. Precipitation, evapotranspiration, ground water, surface water and water storage in the vadose zone represent the main components of CPFP water budgets. Precipitation is considered the main water inflow component, and ET is the

major pathway of water consumption, with ground and surface waters being dynamically connected. Alternative silviculture management practices such as establishing unharvested buffer zones, and partial harvesting, should be tested in flatwood pine forests. However, field experiments involving these alternative scenarios are costly and time-consuming. Mathematical models can be used to lessen the number of required field experiments and to investigate important parameters and variables that most influence this system. A need exists for multi-dimensional mathematical models to describe water flow and solute transport for transient flow in a variably saturated media, such as the model WETLANDS. These models can be used to simulate the dynamic connection between free water in ponds and subsurface water in surrounding flatwood forests. The models should include temporal and spatial plant uptake of both water and solutes. This paper gives an overview of the hydrology of CFP systems, along with current and alternative management practices utilized for these environments. This type of information is helpful for field hydrologists, mathematical modelers working on such systems, and regulatory agencies dealing with these environments.

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706. Hydrological/environmental impacts of tree harvesting within flatwood pine forests upon local wetlands.

Fares, A.; Mansell, R. S.; and Bloom, S. A.

In: *Subsurface hydrological responses to land cover and land use changes*/ Taniguchi, Makoto.

Boston: Kluwer Academic, 1997; pp. 167-186

NAL Call #: GB1001.2.S83 1997

Descriptors: wetlands/ swamps/ land management/ water quality/ flow/ groundwater/ hydrology/ environmental impact/ forests/ harvesting/ models/ pollution/ clear felling/ contamination

Abstract: The impact of different management practices on the hydrology of cypress (*Taxodium distichum*) pond/flatwood (*Pinus elliotti* and *Pinus palustris*) systems was simulated using a multi-dimensional water flow and solute transport model (WETLANDS). Three hypothetical weather years were used. Results of these simulations revealed that during periods of positive net water input (NWI) flatwood areas undergo slow surface drainage by inter-connected strands of cypress ponds. It is during such times of the year that a high potential exists for contamination of the pond surface water. However, there is no concern about contaminant movement into the pond during a H&W year where NWI is negative throughout the year. Total tree harvest resulted in suppressed water consumption by ET such that water levels in the cypress pond were higher and water table depths were shallower. Total clear cut of the forest resulted in higher potential of contaminant movement into the pond as a result of the high NWI and a high water table through the simulated year. Unharvested buffer zones adjacent to ponds provided significant hydrological/environmental benefits to total harvesting.

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707. The hydrology of cypress wetlands in Florida pine flatwoods.

Riekerk, H. and Korhnak, L. V.

Wetlands 20(3): 448-460. (2000)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ hydrology/ logging/ runoff/ best management practices/ lumber/ environmental impact/ ecosystem disturbance/ forest industry/ evapotranspiration/ *taxodium ascendens*/ USA, Florida/ USA, Florida/ habitat community studies

Abstract: The poorly drained pine flatwoods of the Lower Coastal Plain of the Southern United States, including Florida, contain many pond cypress (*Taxodium ascendens*) wetlands, which cover about one-third of the area. Management of the resource includes pine silviculture and cypress harvesting for lumber, plywood, paper, and mulch. Concern about the ecological impacts and hydrologic effects prompted a cooperative study of cypress wetlands integrating several disciplines. This paper reports results of clear-cut harvesting on the wetland hydrology. Three wetlands of about 0.5 ha were selected and instrumented to measure the climatic and hydrologic variables before and after treatments from January 1993 to January 1997. Silvicultural treatments were wetland-only clear-cut harvesting, wetland plus surrounding upland clear-cut harvesting, and an undisturbed control. The absence of observable soil surface runoff (high infiltration rate) and slow ground-water movement in the upland pine flatwoods suggested that normally the precipitation and evapotranspiration balanced each other and that the wetlands generated most of the runoff from the landscape mosaic as a whole. However, the results showed that open-water evaporation after wetland harvesting exceeded evapotranspiration of the control, explaining in part a decrease in outflow after wetland-only harvesting. Increased runoff from the pine upland, generated by reduced evapotranspiration and expanded saturated areas after clear-cut harvesting, apparently was buffered to some extent by increased evaporation from the embedded clear-cut cypress wetland. The average open-water area was about fifty percent larger than the wetland area as defined by the vegetation. However, excess wetland water balance data suggested the presence of a rain-catchment area that was 2-3 times larger than the vegetative wetland area because of semi-saturated soil in the low slopes. Therefore, the actual catchment area of a cypress wetland in the pine flatwoods may be variable in time, space, and silviculture depending on the topography, the extent of open water, and saturated soil. The application of this information in water management is for better control of first-year runoff from the pine-cypress landscape as a whole. Furthermore, silvicultural Best Management Practices for cypress wetland water management need to consider a variable source area for surface-water pollution that is larger than the wetland area as defined by the vegetation.

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708. Impact of agricultural drainage activities in the coastal flats region of the Chesapeake Bay.

Hall, T. N.

In: *Proceedings of the Conference: Wetlands of the Chesapeake*. (Held 9 Apr 1985-11 Apr 1985 at Easton, Md.) Groman, Hazel A. (eds.)

Washington D.C.: Environmental Law Institute; pp. 199-207; 1985.

NAL Call #: QH76.5.C48P76; ISBN: 0911937196

Descriptors: wetlands/ drainage/ water quality/ water conservation/ coasts/ Maryland

This citation is from AGRICOLA.

709. Impact of harvesting activities on oak seedling establishment in a bottomland hardwood forest.

Barry, J. E. and Nix, L. E.

In: Proceedings of the Seventh Biennial Southern Silvicultural Research Conference. (Held 17 Nov 1992-19 Nov 1992 at Mobile, Ala.) Brissette, John C. (eds.) New Orleans, La.: Southern Forest Experiment Station; pp. 155-159; 1993.

NAL Call #: aSD11.U57

<http://www.srs.fs.usda.gov/pubs/viewpub.jsp?index=1407>

Descriptors: Quercus/ lowland forests/ natural regeneration/ harvesting

This citation is from AGRICOLA.

710. Impact of tracked and rubber-tired skidders traffic on a wetland site in Mississippi.

Murosky, D. L. and Hassan, A. E.

Transactions of the ASAE 34(1): 322-327. (1991)

NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: skidders/ tires/ environmental impact/ soil compaction/ soil physical properties/ trafficability/ lowland forests/ forest soils/ hardwood/ Mississippi

Abstract: One tracked and two rubber-tired skidders operating on a bottomland hardwood site in Mississippi were evaluated to determine the effect of machine traffic on soil compaction, soil physical properties, and site damage. Each system operated during a wet and a dry season. The machine treatments were compared with a control plot where no machine traffic was allowed. The tracked skidder and the skidder with wide tires (68X50X32) created less compaction and less site damage. Less site disturbance resulted from the wet than dry season harvest.

This citation is from AGRICOLA.

711. 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: wetlands/ community structure/ species richness/ nutrient concentrations/ water column/ 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/ USA, 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.

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712. Influence of harvesting on biogeochemical exchange in sheetflow and soil processes in a eutrophic floodplain forest.

Lockaby, B. G.; Clawson, R. G.; Flynn, K.; Rummer, R.; Meadows, S.; Stokes, B.; and Stanturf, J.

Forest Ecology and Management 90(2-3): 187-194. (1997)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: wetlands/ water quality/ biogeochemistry/ runoff/ nutrients/ land management/ forest management/ laminar flow/ watershed management/ USA, Georgia/ silviculture

Abstract: Floodplain forests contribute to the maintenance of water quality as a result of various biogeochemical transformations which occur within them. In particular, they can serve as sinks for nutrient run-off from adjacent uplands or as nutrient transformers as water moves downstream. However, little is known about the potential that land management activities may have for alteration of these biogeochemical functions. This paper examines the effects of three harvesting regimes (unharvested control, clearcut, and partial cut) on the physical and chemical parameters within the Flint River floodplain located in southwestern Georgia, USA. Data presented in this paper were collected during the year following initiation of the harvesting treatments which occurred in September of 1993. Sheetflow water chemistry (total suspended solids (TSS), total dissolved solids (TDS), nitrate (NO₃⁻), phosphate (PO₄³⁻), sulfate (SO₄²⁻), calcium (Ca²⁺), potassium (K⁺), magnesium (Mg²⁺), ammonium (NH₄⁺), total phosphorous (P), total nitrogen (N), total carbon (C), dissolved organic carbon (DOC)), sedimentation rates, depth of soil oxidation after flooding, saturated hydraulic conductivity, and bulk density were measured. During the year immediately after treatment installation, alterations in some of the physical and chemical properties (TDS, NO₃⁻, total P, and K⁺) of floodwaters crossing harvest plots were detected. Soil oxidation depths, saturated hydraulic conductivity and bulk density also changed with treatment. The meaning of the changes detected is uncertain but they suggest the nature of potential changes in nutrient spiralling

and non-point source cumulative effects that may occur within a managed watershed. Second-year data may offer an interesting comparison of sheetflow chemistry and sedimentation changes between vegetated and non-vegetated conditions.

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713. Influence of nitrate and phosphorus loading on denitrifying enzyme activity in Everglades wetland soils.

White, J. R. and Reddy, K. R.

Soil Science Society of America Journal 63(6): 1945-1954. (1999)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: wetland soils/ denitrification/ soil enzymes/ enzyme activity/ soil heterogeneity/ seasonal variation/ correlation/ soil properties/ nitrates/ phosphorus/ pollution/ pollution load/ Florida

Abstract: There has been recent concern about the impact of increased nutrient loading on the northern Everglades ecosystem. We investigated the spatial and temporal distribution of denitrifying enzyme activity (DEA) along a P-enrichment gradient in the Water Conservation Area 2A (WCA-2A) and determined the effects of added P and NO₃⁻ on DEA. The DEA in soil and detritus layers was measured under anaerobic conditions four times during 2 yr, using the acetylene blockage technique. The DEA ranged from 0.004 to 7.75 mg N(2)O-N kg⁻¹ h⁻¹. Highest rates of DEA were found in the detritus and surface (0-10 cm) soils, and rates decreased exponentially with increasing distance from the surface-water inflow point, where nutrients are loaded to the wetland. Nitrate was found to be limiting, while the addition of P had no effect on the distribution of DEA in these soils. There was a seasonal effect on DEA, with higher activity observed during the summer when temperatures and hydraulic and nutrient loading were highest. Soils from outside the impacted zone demonstrated denitrifying potentials, within 10 h when spiked with inflow concentrations of NO₃⁻, similar to DEA of soils from within the impacted zone. This suggests that soils from outside the impacted zone can increase denitrification rates when exposed to higher NO₃⁻ concentrations in a relatively short time. Agricultural drainage water discharge, and consequent NO₃⁻ loading, has created a zone of elevated DEA proximal to the S-10C surface-water inflow point in WCA-2A. This citation is from AGRICOLA.

714. Influence of nitrogen on atrazine and 2,4 dichlorophenoxyacetic acid mineralization in blackwater and redwater forested wetland soils.

Entry, J. A.

Biology and Fertility of Soils 29(4): 348-353. (1999)

NAL Call #: QH84.B46; ISSN: 0178-2762

Descriptors: wetland soils/ forest soils/ soil types/ atrazine/ 2,4-D/ degradation/ mineralization/ soil fungi/ soil bacteria/ biomass/ biological activity in soil/ nitrogen fertilizers/ application rate/ Florida

Abstract: Microcosms were used to determine the influence of N additions on active bacterial and fungal biomass, atrazine and dichlorophenoxyacetic acid (2,4-D) mineralization at 5, 10 and 15 weeks in soils from blackwater and redwater wetland forest ecosystems in the northern Florida Panhandle. Active bacterial and fungal biomass was determined by staining techniques combined

with direct microscopy. Atrazine and 2,4-D mineralization were measured radiometrically. Treatments were: soil type, (blackwater or redwater forested wetland soils) and N additions (soils amended with the equivalent of 0, 200 or 400 kg N ha⁻¹) as NH₄NO₃). Redwater soils contained higher concentrations of C, total N, P, K, Ca, Mn, Fe, B and Zn than blackwater soils. After N addition and 15 weeks of incubation, active bacterial biomass in redwater soils was lower when N was added. Active bacterial biomass in blackwater soils was lower when 400 kg N ha⁻¹, but not when 200 kg N ha⁻¹, was added. Active fungal biomass in blackwater soils was higher when 400 kg N ha⁻¹, but not when 200 kg N ha⁻¹, was added. Active fungal biomass in redwater soils was lower when 200 kg N ha⁻¹, but not when 400 kg N ha⁻¹, was added. After 15 weeks of incubation 2,4-D degradation was higher in redwater wetland soils than in blackwater soils. After 10 and 15 weeks of incubation the addition of 200 or 400 kg N ha⁻¹ decreased both atrazine and 2,4-D degradation in redwater soils. The addition of 400 kg N ha⁻¹ decreased 2,4-D degradation but not atrazine degradation in blackwater soils after 10 and 15 weeks of incubation. High concentrations of N surface runoff and groundwater resulting from agricultural operations may have resulted in the accumulation of N in many wetland soils. Large amounts of N accumulating in wetlands may decrease mineralization of toxic agricultural pesticides.

This citation is from AGRICOLA.

715. Influence of selected inorganic electron acceptors on organic nitrogen mineralization in Everglades soils.

White, J. R. and Reddy, K. R.

Soil Science Society of America Journal 65(3): 941-948. (2001)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Abstract: Organic N mineralization can regulate the bioavailability of N in wetland soils and be controlled by the availability of inorganic electron acceptors. During the past 40 yr, the northern Everglades has been affected by nutrient loading as a consequence of the diversion of surface water runoff from agricultural lands. The greatest hydraulic loading occurs in the summer season when precipitation is highest. Fluctuations in water levels and loading of alternate electron acceptors (NO₃⁻ and SO₄²⁻) could result in variable N turnover rates. The effect of aerobic, NO₃⁻ reducing, SO₄²⁻ reducing, and methanogenic conditions on potential organic N mineralization rate was investigated. Soil at 0- to 10- and 10- to 30-cm depths and overlying plant detritus were collected from eight stations along a 10-km eutrophic gradient in the northern Everglades, Florida. Selected soil characteristics including microbial biomass C and N (MBC and MBN), total P, and extractable NH₄⁺ were measured. Significantly (P < 0.05) higher rates of N mineralization were observed in the detritus, lower rates in the 0- to 10-cm depth, and lowest rates in the 10- to 30-cm depth under each of aerobic, NO₃⁻ reducing, SO₄²⁻ reducing, and methanogenic conditions. Organic N mineralization rates decreased sequentially from aerobic to NO₃⁻ and SO₄²⁻ reducing conditions to methanogenic conditions. Total P, MBC, and MBN were all significantly correlated (P < 0.05) to the N mineralization rates under dominance of each electron acceptor. Of all the measured soil characteristics, extractable NH₄⁺ was the most strongly correlated (P < 0.01; r = 0.62-0.92) indicator of potential N mineralization

rates. Results of this research have important implications for the biogeochemical cycling of N and ecosystem productivity in wetland systems.

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716. 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/ USA, 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.

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717. Initial responses of woody vegetation, water quality, and soils to harvesting intensity in a Texas bottomland hardwood ecosystem.

Messina, M. G.; Schoenholtz, S. H.; Lowe, M. W.; Wang, Ziyin; Gunter, D. K.; and Londo, A. J.

Forest Ecology and Management 90(2-3): 201-215. (1997)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: wetlands/ species diversity/ soil erosion/ clear-cutting/ forestry/ water quality/ soil physical properties/ surface water/ groundwater/ clear cutting/ environmental impact/ USA, Texas/ clear cutting/ environmental impact/ clear-cutting/ soil physical properties/ groundwater

Abstract: Sustainable management of bottomland hardwood forest ecosystems requires a knowledge of responses to management impacts, including timber harvesting. The effects of clearcutting and partial cutting on woody vegetation regeneration dynamics, surface and groundwater quality, soil physical properties, and soil respiration were tested in a bottomland hardwood

ecosystem in southeastern Texas, USA, through comparison with non-cut control areas. Overstory removal only slightly affected composition of woody vegetation regeneration 1 year after harvesting compared with pre-harvest composition. Initial composition in both cutting treatments appeared to be the strongest determinant of post-harvest composition, at least for the first year after harvesting. There were few significant differences in groundwater properties when harvesting treatments were compared with control areas during a 17-month period following harvest. Turbidity, temperature, electrical conductivity, dissolved O₂, NH₄-N, NO₃-N, and PO₄-P of streamwater did not vary significantly among treatments. Slight decreases in total and macroporosity were observed in association with higher bulk densities at 0-5 cm depth in the clearcut and partial cut treatments. Saturated hydraulic conductivity values did not decline significantly with treatment intensity. No significant differences among treatments in measured soil physical properties were observed at 5-10 cm depth. Although in situ soil respiration increased with harvest intensity, treatment had no significant effect on mineral soil respiration. In summary, most variables showed only slight response to harvesting, thereby indicating that harvesting practices can be conducted with minimal initial impacts on measured response variables.

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718. Long-term relationship between phosphorus inputs and wetland phosphorus concentrations in a northern Everglades marsh.

Smith, E. P. and McCormick, P. V.

Environmental Monitoring and Assessment 68(2): 153-176. (May 2001)

NAL Call #: TD194; ISSN: 0167-6369

Descriptors: wetlands/ human impact/ nutrients/ water management/ nutrient loading/ marshes/ agricultural practices/ runoff/ nutrient enrichment/ environmental factors/ soil/ land/ phosphorus/ nutrient concentrations/ statistical analysis/ historical account/ agricultural runoff/ canals/ hydrology/ freshwater pollution/ water budget/ agricultural pollution/ monitoring/ assessments/ water depth/ marsh management/ USA, Florida/ USA, Florida, Everglades/ human population-hydrosphere interactions/ water resources and supplies/ freshwater pollution/ prevention and control/ water pollution: monitoring, control and remediation/ sources and fate of pollution

Abstract: Assessments of long-term relationships between changes in nutrient inputs and wetland nutrient concentrations can be complicated by fluctuations in other environmental factors as well as by problems typical of long-term monitoring data. Consequently, statistical analysis of these types of data sets requires careful consideration of environmental covariates, potential biases in the monitoring design, and irregularities caused by changes in field sampling protocols. We evaluated the relationship between anthropogenic phosphorus (P) inputs and water-column total P (TP) concentrations in a northern Everglades marsh by statistically analyzing available data collected from several sampling programs over the past 20 years (1978-1997). Canal inputs of agricultural runoff contribute most of the P to the marsh and have produced a zone of enrichment within the marsh during the past few decades. Regression analyses showed that both canal and marsh TP concentrations increased during the 1980s and

then decreased in the 1990s. However, the statistical relationship between canal P inputs and marsh TP, while significant, generally was weak except for marsh locations adjacent to the canal. Stronger relationships existed between marsh TP and hydrologic parameters such as marsh water depth, which is controlled by changes in weather patterns and marsh management. In particular, dry conditions during the 1980s may have contributed to observed increases in marsh P concentrations and the movement of a P 'front' further into the marsh. Higher rainfall and water depths and agricultural best management programs initiated during the 1990s have been associated with reduced P concentrations in canal waters entering the marsh. While it is anticipated that this reduction eventually will result in lower marsh TP concentrations, this effect is not yet evident, possibly due to internal loading of P from enriched marsh soils. Our findings illustrate some of the environmental factors that can complicate attempts to develop empirical relationships between P inputs and wetland P concentrations and to use such relationships to forecast changes in marsh concentrations based on past monitoring data alone.

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719. Methods to determine lateral effect of a drainage ditch on wetland hydrology.

Skaggs, R. W.; Chesheir, G. M.; and Phillips, B. D.

Transactions of the ASAE 48(2): 577-584. (2005)

NAL Call #: 290.9 Am32T; ISSN: 0001-2351

Descriptors: wetlands/ drainage channels/ drainage/ hydrology/ hydrologic models/ simulation models/ mathematical models/ water table/ North Carolina

Abstract: A method was developed to estimate the lateral effect of a single drainage ditch on wetland hydrology. The method can be used to calculate the distance of influence of a single ditch constructed through a wetland, where the distance of influence is defined as the width of a strip adjacent to the ditch that is drained such that it will no longer satisfy the wetland hydrologic criterion. Simulation analyses were conducted with DRAINMOD to define the minimum, or threshold, drainage intensity that would result in failure of a site to satisfy the wetland hydrologic criterion. Analyses were conducted for five hydric soils spanning a wide range of profile hydraulic transmissivities. DRAINMOD was used to predict water table fluctuations between parallel ditches for a 50-year period of climatological record. For each soil, simulations were conducted for a range of ditch spacings and depths to determine the combinations that would result in the land midway between the ditches just barely satisfying the wetland hydrologic criterion. Analyses were conducted for climatological conditions for three locations in eastern North Carolina. Results for Wilmington, North Carolina, showed that the threshold drainage intensities would result in water table drawdown from an initially ponded surface to a depth of 25 cm in approximately 6 days. That is, ditch depths and spacings sufficient to lower the water table from the surface to a depth of 25 cm in a threshold time of about 6 days would result in hydrologic conditions that would just barely satisfy the wetland hydrologic criterion for that location. The threshold time is denoted T25 and is used as a surrogate for quantifying the water table drawdown rate of sites that barely satisfy the wetland hydrologic criterion. T25 was found to depend somewhat on drain depth, but it was essentially constant for all five of the soils examined.

Similar results were obtained for the other two locations, but because of differences in weather and in the growing season, the threshold time (T25) was found to be dependent on location. The T25 value is also dependent on surface depressional storage, decreasing with increasing storage. The discovery that water table conditions barely satisfying the wetland hydrologic criterion are well correlated to the time required for water table drawdown of 25 cm (T25 values) makes it possible to predict the effects of subsurface drains on wetland hydrology. The lateral effect of a single ditch on wetland hydrology can be computed by using T25 values in solutions to the Boussinesq equation for water table drawdown due to drainage to a single drain. While the method was developed for drainage ditches, it may also be used for subsurface drains.

This citation is from AGRICOLA.

720. Metolachlor fate and mobility in a tidal wetland soil.

Seybold, C. A. and Mersie, W.

Wetlands 19(1): 228-235. (1999)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ fate of pollutants/ tidal marshes/ herbicides/ mineralization/ soil columns/ agricultural runoff/ intertidal environment/ soils/ pollution dispersion/ marshes/ mineralization/ soil

Abstract: A study was conducted to determine the fate of the herbicide metolachlor in a tidal wetland soil located along the James River in Virginia, USA. Soil adsorption/desorption and mineralization characteristics and mobility of metolachlor were determined on the Levy tidal wetland soil. The metolachlor K sub(d) value was 65.8 L kg super(-1) and K sub(oc) value was 810 L kg super(-1) C super(-1), which are much greater than would be found on typical agricultural soils. After four 24-h desorption periods, the total amount of metolachlor that desorbed ranged from 16 to 22% of the amount initially adsorbed. Metolachlor mineralization was about 0.46% of the amount applied after 84 days, which indicates that it does not mineralize very readily in the Levy soil. The amount of metolachlor that leached from the soil columns averaged 1.64% of the amount applied after 84 days, showing a low degree of mobility. These results suggest that the Levy tidal wetland soil can function as an effective filter of metolachlor and other similar herbicides that enter via agricultural runoff, protecting surface and ground waters.

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721. Minimizing adverse impacts on wetlands of water quality associated with forest and agricultural practices.

Lee, C. R.

In: Proceedings of the Conference: Wetlands of the Chesapeake. (Held 9 Apr 1985-11 Apr 1985 at Easton, Md.) Groman, Hazel A. (eds.)

Washington D.C.: Environmental Law Institute; pp. 225-230; 1985.

NAL Call #: QH76.5.C48P76; ISBN: 0911937196

Descriptors: wetlands/ water quality/ fertilizers/ pollution/ runoff/ Maryland/ Virginia

This citation is from AGRICOLA.

722. Model prediction of the effects of changing phosphorus loads on the Everglades Protection Area.

Munson, R. K.; Roy, S. B.; Gherini, S. A.; MacNeill, A. L.; Hudson, R. J. M.; and Blette, V. L.
Water, Air, and Soil Pollution 134(1-4): 255-273. (2002)
 NAL Call #: TD172.W36; ISSN: 0049-6979
Descriptors: wetlands/ wilderness areas/ nonpoint pollution sources/ phosphorus/ fate of pollutants/ water pollution control/ water quality/ prediction/ model studies/ calibrations/ simulation/ hydrology/ runoff/ water management/ national parks/ mathematical models/ pollution dispersion/ USA, Florida, Everglades
Abstract: The Everglades Phosphorus and Hydrology (EPH) model was developed to simulate water movement and phosphorus transport in the Everglades Protection Area which is comprised of the Everglades National Park (ENP) and surrounding wetlands known as the Water Conservation Areas (WCAs). Water flows from the Everglades Agricultural Area (EAA) through the WCAs into Everglades National Park (ENP). The model is designed to represent the system as a series of cells in which water flows from one cell to the next. The code allows for pumped inputs and pumped outputs of water as well as sorption and removal of phosphorus through peat accretion. Model application involved dividing the system into twenty cells representing different segments of the WCAs. Inputs to each cell consisted of water pumped from the EAA (where appropriate), flow from upgradient cells, and precipitation. Outputs included pumped outputs and flow out of each cell. Using data collected by the South Florida Water Management District, the model was calibrated by matching simulated and observed flows, water elevations, and phosphorus (P) concentrations for the period 1980-1988. The model was then validated for the 1988-1992 period using the same model parameters derived from the calibration process and comparing simulated and observed values. Reasonable agreement between simulated and observed values was attained for both the calibration and validation periods. The calibrated and validated model was used to simulate the impacts on annual average total P concentrations in each cell resulting from the implementation of the management plan mandated by the Everglades Forever Act. This plan calls for the construction of six Stormwater Treatment Areas (STAs) to treat discharges from the EAA, hydrologic modifications of the system to promote sheet flow, and the implementation of Best Management Practices to reduce P runoff from individual farms. In addition, the model was used to evaluate the impact of not building one of the STAs (STA 3/4), and sensitivity analyses were conducted to determine the effects of changing STA outlet P concentrations throughout the system. Model results indicate that phosphorus concentration reductions will occur in areas near EAA discharges in response to reductions in input P concentrations. However these measures will have little impact on phosphorus concentrations for 85% of the area of the WCAs and on the water entering Everglades National Park. The scenario analyses also indicate that phosphorus concentrations throughout most of the WCAs are similar with or without the construction of STA-3/4.
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723. Modeling the hydrologic impacts of forest harvesting on Florida flatwoods.

Sun, G.; Riekerk, H.; and Comerford, N. B.
Journal of the American Water Resources Association 34(4): 843-854. (1998)
 NAL Call #: GB651.W315; ISSN: 1093-474X
<http://www.srs.fs.usda.gov/pubs/22238>
Descriptors: wetlands/ logging/ clearcutting/ forest management/ crop rotation/ Pinus/ national forests/ coastal plains/ watersheds/ precipitation/ hydrology/ runoff/ evapotranspiration/ temporal variation/ spatial variation/ mathematical models/ highlands/ forest hydrology/ Florida
Abstract: The great temporal and spatial variability of pine flatwoods hydrology suggests traditional short-term field methods may not be effective in evaluating the hydrologic effects of forest management. The FLATWOODS model was developed, calibrated and validated specifically for the cypress wetland-pine upland landscape. The model was applied to two typical flatwoods sites in north central Florida. Three harvesting treatments (Wetland Harvesting, Wetland + Upland Harvesting, and Control) under three typical climatic conditions (dry, wet, and normal precipitation years) were simulated to study the potential first-year effects of common forest harvesting activities on flatwoods. Long-term (15 years) simulation was conducted to evaluate the hydrologic impacts at different stages of stand rotation. This simulation study concludes that forest harvesting has substantial effects on hydrology during dry periods and clear cutting of both wetlands and uplands has greater influence on the water regimes than partial harvesting. Compared to hilly regions, forest harvesting in the Florida coastal plains has less impact on water yield. This citation is from AGRICOLA.

724. Morphological changes in soils produced when hydrology is altered by ditching.

Hayes, W. A. and Vepraskas, M. J.
Soil Science Society of America Journal 64(5): 1893-1904. (2000)
 NAL Call #: 56.9 So3; ISSN: 0361-5995
Descriptors: wetland soils/ coastal plain soils/ soil morphology/ iron/ soil morphological features/ hydrology/ water table/ drainage/ oxidation/ reduction/ genetic soil types/ North Carolina
Abstract: A soil's hydrology (seasonal saturation occurrence) must be estimated in the field to delineate jurisdictional wetlands and to evaluate soil suitability for on-site waste disposal. It is difficult to predict soil hydrology on lands that contain ditches, because the areal extent of hydrologic alteration by an individual ditch is generally unknown. This study evaluated whether morphological changes occurred in soils after a drainage ditch had been installed. Four transects of plots were established parallel to a ditch with plots at distances of 7, 30, 60, and 80 m from the ditch. Each transect contained plots in the following soils: Aquic Paleudults, Aeris Paleaquults, and Typic Paleaquults. Soils within 30 m of the ditch had a significantly (0.10 level) greater volume of Fe masses at depths of 40 to 100 cm than soils further from the ditch. Duration of saturation did not vary significantly with distance from the ditch, but within 30 m of the ditch water tables fluctuated more frequently than those in soils further away. Concentrations of Fe(II) in groundwater at a depth of 60 cm were higher at 7 m from the ditch than at 60 m, but redox potentials at a depth of 60 cm were <500 mv for

shorter periods of time at 7 m than at greater distances from the ditch. We hypothesized that groundwater flowing into the soils within 30 m of the ditch introduced Fe(II) into the Bt horizons. The Fe(II) oxidized and formed Fe masses as the water table fell. Our results indicate that soil colors can change within 30 yr as a result of ditching. We suggest that the major area of soil influenced by the ditch can be identified by where the Fe masses in the argillic horizons increase as one approaches the ditch.

This citation is from AGRICOLA.

725. 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 behaviour/ population density/ grazing/ microhabitats/ environment management/ rice fields/ ecological distribution/ agriculture/ aquatic birds/ *Anas fulvigula maculosa*/ *Oryza sativa*/ *Rubus trivialis*/ USA, 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).

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726. Nutrient enrichment of wetland vegetation and sediments in subtropical pastures.

Gathumbi, S. M.; Bohlen, P. J.; and Graetz, D. A.

Soil Science Society of America Journal 69(2):

539-548. (2005)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: seasonal wetlands/ pastures/ wetland plants/ wetland soils/ sediments/ nutrient enrichment/ soil depth/ land use/ subtropics/ Florida

Abstract: Land use practices exert a major influence on plant productivity, soil and plant nutrient content, and within-stand nutrient cycling in wetlands in agricultural

landscapes. We examined differences between improved and seminative pastures in plant and soil nutrient characteristics in seasonally flooded wetlands in subtropical grazing land of south central Florida. The wetlands were embedded within either grazed improved pastures with a long-term history of fertilizer application or seminative pastures with no history of previous fertilizer application. Soil nutrient concentrations decreased with soil depth for both land use types. Total C, N, and P were significantly greater ($P < 0.05$) in the 0- to 15-cm mineral layer compared with the deeper layers (15-30, 30-45 cm) for both improved and seminative pasture wetland soils. Improved pasture wetlands had greater amounts of total P (22.3 kg P ha⁻¹) in the upper 0- to 15-cm soil layer than did the seminative pasture wetlands (15.7 kg P ha⁻¹). Plant and soil (0-15 cm) N/P and C/P ratios were lower in improved pasture wetlands compared with seminative pasture wetlands, suggesting greater P enrichment in improved pasture wetlands. Microbial biomass C and N decreased with soil depth in both pasture types. Soil microbial biomass C/total C ratios decreased with soil depth and were similar for both improved and seminative pasture wetlands. Our results suggest that plant and soil nutrient enrichment and storage in temporary wetlands may be impacted by adjacent land use practices, which potentially leads to the alteration of the structure and functions of these wetland ecosystems.

This citation is from AGRICOLA.

727. Phosphorus in drainage water from sugarcane in the Everglades agricultural area as affected by drainage rate.

Coale, F. J.; Izuno, F. T.; and Bottcher, A. B.

Journal of Environmental Quality 23(1): 121-126. (1994)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: wetlands/ agricultural pollution/ drainage/ phosphorus/ crops/ freshwater pollution/ flow rates/ agricultural runoff/ water pollution/ organic soils/ drainage water/ water pollution sources/ saccharum/ USA, Florida, Everglades/ organic soils/ drainage water/ water pollution sources/ agricultural pollution/ saccharum/ freshwater pollution

Abstract: Sugarcane (interspecific hybrids of *Saccharum* spp.) is grown on 78% (156,000 ha) of the cultivated organic soils of the Everglades Agricultural Areas (EAA) of southern Florida. Recently, the EAA has come under scrutiny because of concerns with the impact of nutrient-rich drainage water from organic soils on the ecology of adjoining bodies of water and wetlands. The objectives of our research were to determine the effects of field drainage rate on P concentration and off-field P loads in drainage water from sugarcane grown on organic soils of the EAA and to determine the effect of field drainage rate on sugarcane productivity and sugar yield. The research site was on a Terra Ceia muck soil (euic, hyperthermic Typic Medisaprist) on a commercial sugarcane farm located in the EAA. The treatments were commercial sugarcane farm located in the EAA. The treatments were fast and slow field drainage rates. Nine drainage events were monitored between Nov. 1988 and Aug. 1990.

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728. Phosphorus load reductions under best management practices for sugarcane cropping systems in the Everglades Agricultural Area.

Rice, R. W.; Izuno, F. T.; and Garcia, R. M.
Agricultural Water Management 56(1): 17-39. (2002)
 NAL Call #: S494.5.W3A3; ISSN: 0378-3774

Descriptors: phosphorus/ nutrients/ crops/ agricultural runoff/ farming/ water quality control/ USA, Florida, Everglades

Abstract: Stormwater run-off from the 290,000 ha Everglades Agricultural Area (EAA) is directed into South Florida's Everglades wetland ecosystem. Concerns regarding run-off water quality and environmental impact led to a 1992 regulatory program which requires P levels in basin run-off be reduced by at least 25% relative to historic trends. Farmers must collectively achieve this annual basin-level target by implementing best management practices (BMPs) to reduce P levels in farm drainage waters. At the time, proposed BMP strategies were largely untested, and to what extent they might reduce farm-level P discharge trends (also poorly documented) was unknown. Given these uncertainties, objectives of this study were to: (1) document long-term drainage P trends for EAA sugarcane systems and (2) quantify BMP effects on-farm drainage P loading. In late-1992, discharge pumps at five farm sites (cropped to sugarcane, sugarcane-vegetables, and/or sugarcane-rice) were instrumented to collect water samples for P analysis during all drainage events throughout baseline (BL; pre-BMP) and BMP operations. Highly variable rainfall distributions in the region strongly influence farm drainage requirements, thus, meaningful interpretations of water quality trends require hydrologic adjustment to P load data. Five rainfall-adjustment analyses were applied to the 6-year farm-level databases. Two analysis methods compared P load trends for the entire BL and BMP monitoring periods. In Method 1, unit area P load (UAL) to rainfall ratios (UAL:R) during BMP operations were 20.4-47.3% smaller across all five sites than those recorded during BL. In Method 2, slope coefficients describing cumulative UAL versus cumulative rainfall trends during BMPs were 14.9-25.0% smaller than BL slopes. The remaining three methods assessed data trends across five consecutive "water years" (WY). In Method 3, slope coefficients describing WY96-98 cumulative UAL versus rainfall distributions were 32.8% lower in magnitude relative to WY94. In Method 4, average UAL:R for the WY96-98 period were 31.0% smaller than for WY94. Basin-level P loads are calculated every WY by state water management regulators, using a hydrologic adjustment model calibrated to a historic load and rainfall database. During the first 3 years (WY96-98) of required BMP implementation, the basin recorded a 55% P load reduction. When this model was applied to the farm data (Method 5), farm P load reductions for WY96-98 averaged 59.7%. All five analytical methods confirm favorable P-reduction trends under recommended BMP strategies for EAA sugarcane-based cropping systems.

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729. Phosphorus sorption capacities of wetland soils and stream sediments impacted by dairy effluent.

Reddy, K. R.; O'Connor, G. A.; and Gale, P. M.
Journal of Environmental Quality 27(2): 438-447. (1998)

Descriptors: phosphorus/ streams/ wetland soils/ sediments

Abstract: The ability of stream sediments and adjacent wetlands to retain added P depends on the P sorption capacity and physico-chemical properties of sediments or wetland soils. The objectives of this study were to: (i) determine the potential P sorption capacities of wetland soils and stream sediments in systems with distinctly different P loadings, and (ii) establish the relationship between P sorption capacity and selected physico-chemical properties. Batch sorption isotherms were measured under aerobic and anaerobic conditions for sediments and wetland soils along a stream-wetland-upland continuum at two sites in the Lower Kissimmee River Basin and Taylor Creek/Nubbin slough of the Okeechobee Basin, Florida. Soluble P and equilibrium P concentration (EPC) of stream sediments generally decreased along the wetland-upland continuum. The EPC values were about twofold greater under anaerobic conditions than aerobic conditions; however, P sorption capacities decreased by about 35% under anaerobic conditions compared with aerobic conditions. The P sorption maxima, estimated by a single point isotherm measured at an added P level of 1000 mg P kg⁻¹, correlated well with Langmuir adsorptive maxima. Phosphorus retention by stream sediments and wetland soils was strongly correlated with contents of amorphous and poorly crystal-line forms of Fe and Al, which explained 87% of the variability in P retention maximum. Addition of total organic C to predictive equations improved the predictability by only 5%.

This citation is from AGRICOLA.

730. Prescribed fire's impact on water quality of depressional wetlands in southwestern Georgia.

Battle, Juliann and Golladay, Stephen W
American Midland Naturalist 150(1): 15-25. (2003)
 NAL Call #: 410 M58; ISSN: 0003-0031

Descriptors: conservation/ pollution assessment control and management/ ANOVA/ analysis of variance, mathematical and computer techniques/ prescribed burning/ applied and field techniques/ alkalinity/ annual differences/ coastal plains/ depressional wetlands/ environmental impact/ longleaf pine forests/ longleaf pine wiregrass ecosystems/ pH/ prescribed fire/ soils/ vegetation/ water quality

Abstract: Depressional wetlands are a natural feature of the longleaf pine-wiregrass ecosystem on the southeastern Coastal Plain. Fire is an essential part of the longleaf pine forest with prescribed burns occurring at 1-3 y intervals. In 2000 and 2001 we sampled wetlands whose surrounding uplands had been burned and reference wetlands (i.e., no fire) to determine the short-term changes (<1 mo) in surface water quality. In 2000 pH, alkalinity and dissolved inorganic carbon (DIC) were higher in burned wetlands than reference sites based on ranked ANOVA. In 2001 dissolved organic carbon (DOC) and NH₄-N were higher in burned wetlands than reference ones. Differences between years suggest that field conditions are very important in determining fire's affect on water quality. To clarify our findings we conducted a laboratory experiment where we looked at changes in water quality when exposed to material (wiregrass, dead pine needles and soil) that had undergone simulated fire (muffle furnace at 340 C for 1 h). Results indicated that water exposed to burned soil had elevated pH, alkalinity, DOC, NH₄-N and soluble reactive phosphorus (SRP) compared to unburned soil. Burned wiregrass and pine needles had lower DOC and DIC levels

compared to unburned material, but burned wiregrass had higher NH₄-N and SRP concentrations than the unburned treatment. Overall our results suggest that the linkage of fire and water quality of wetlands is through fire's effect on soils rather than vegetation.

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731. Recovery of ecosystem functions and plant community structure by a tupelo-cypress wetland following timber harvesting.

Mader, S. F.

Raleigh, NC: North Carolina State University, 1990.

Notes: Diss. Ph.D.: Order No.: DA9025641.

Descriptors: ecosystem disturbance/ ecosystem resilience/ aquatic plants/ community composition/ swamps/ biodegradation/ nutrient cycles/ vegetation cover/ environmental effects/ forest industry/ USA, Alabama/ timber harvesting/ mechanical and natural changes

Abstract: First- and second-year responses of aboveground net primary productivity, plant nutrient assimilation (N, P, K, Ca, and Mg), soil cellulose decomposition rates, and plant community structure following clearcutting were determined for a tidal water tupelo - bald cypress swamp in southwestern Alabama. Responses to helicopter and rubber-tired skidder timbering harvest systems were compared to each other and an adjacent, undisturbed reference forest. Additionally, cellulose decomposition was measured on plots treated with glyphosate herbicide as a means for assessing the effect of revegetation on decay rates. The greatest impact of timber harvesting was the change in plant community structure, particularly total standing biomass, habitat suitability, and the two-fold increase in plant species richness. Aggressively invading herbaceous vegetation and fast-growing stump sprouts propelled a rapid recovery of important ecosystem functions and indicated high system resilience following ecological disturbance. Plant productivity was 45-65 percent and 70-71 percent of the reference forest in the first and second years, respectively. Much of the nutrient retention function had recovered by the first year and over 80 percent of this function was achieved for all 5 nutrients by the second year. In fact, rates of P and K accumulation surpassed the reference forest rates in both years. Additionally, revegetation fueled the rapid return of soil cellulose decay rates toward preharvest levels. A historical investigation revealed that the wetland ecosystem responded similarly to more severe forestry impacts near the turn of this century. Helicopter logging is without a clear biological advantage over skidder logging with respect to minimizing impacts on certain ecosystem- and community-level attributes of tidal forests. This holds true despite the alteration of hydrologic and soil physical and chemical characteristics induced by the skidder. Both harvesting methods appear to be acceptable forestry management practices. (DBO)

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732. Recovery status of a tupelo-cypress wetland seven years after disturbance: Silvicultural implications.

Aust, W. M.; Zaebst, T. W.; Schoenholtz, S. H.; and Szabo, B. A.

Forest Ecology and Management 90(2-3): 161-169. (1997)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: forested wetlands/ timber harvesting

Abstract: Three disturbance treatments were imposed on a palustrine forested wetland (*Nyssa aquatica*-*Taxodium distichum*) located in southwestern Alabama in 1986: (i) clearcutting with helicopter log removal (HELI), (ii) HELI followed by rubber-tired skidder traffic simulation (SKID) and (iii) HELI followed by removal of all vegetation during the first two growing seasons via glyphosate herbicide application (GLYPH). After two growing seasons, it was hypothesized that eventual woody plant growth would be best in the HELI-treated areas, because SKID plots had reduced rates of water movement and soil aeration.

However, measurements at stand age seven years indicate that SKID actually has greater total above-ground biomass (65 979 kg/ha) than HELI (46 748 kg/ha) and SKID plots have a higher proportion of the most desirable timber species (*Nyssa aquatica*). GLYPH areas resemble freshwater marshes, although the areas are being invaded by *Salix nigra* seedlings. All disturbance treatments have significant groundflora components that have increased sediment accumulation 70-175% relative to an undisturbed reference area. By age seven years, regrowth of vegetation has lowered the water table during the growing season but has had little effect on soil redox potential and pH. Our observations suggest that this wetland system is rapidly recovering from logging disturbance seven years ago.

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733. Reducing diffuse pollution through implementation of agricultural best management practices: A case study.

Cook, M. G.; Hunt, P. G.; Stone, K. C.; and Canterberry, J. H.

Water Science and Technology 33(4-5)(1996)

NAL Call #: TD420.A1P7; ISSN: 0273-1223.

Notes: Conference: 2. IAWQ Int. Specialized Conference and Symposia on Diffuse Pollution, (Czech Rep.), 13-18 Aug 1995

Descriptors: water quality/ monitoring/ agricultural practices/ nutrients/ animal wastes/ waste management/ nonpoint pollution sources/ case studies/ pesticides/ pollution monitoring/ agricultural pollution/ USA, North Carolina, Duplin Cty./ pollution monitoring/ agricultural pollution/ monitoring/ agricultural practices/ nonpoint pollution sources/ case studies

Abstract: A system of agricultural best management practices (BMPs) was implemented on a 2,100 ha watershed in Duplin County, North Carolina, USA, for the purpose of improving water quality. The BMPs included: Nutrient, pest, and animal waste management; and soil conservation practices. Both surface and ground water were continually analyzed to assess the water quality impacts. Nutrient management plans have been developed for over 80% of the cropland. Pest management plans have been developed for over 60% of the cropland. Over one-half of all plans have been implemented. Poultry mortality composting and improved swine waste management have decreased the potential adverse effects of animal operations. A constructed wetland shows promise as a pre-treatment of swine waste prior to land application. Stream monitoring shows decreasing amounts of nitrate- and ammonium-nitrogen in the surface waters of the watershed. Ground water monitoring shows relatively high concentrations of nitrate in areas of intensive swine and poultry operations. Ground water monitoring of pesticides reveals low levels of alachlor, atrazine, and metolachlor

even though large amounts of these chemicals are used on crops. The successful implementation of agricultural BMPs appears to be having a positive effect on water quality. Both stream and ground water monitoring will be continued for several years to assess more definitively the changes in water quality.

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734. Removal of floodwater sediments by a clearcut tupelo-cypress wetland.

Aust, W. M.; Lea, R.; and Gregory, J. D.

Water Resources Bulletin 27(1): 111-116. (1991)

NAL Call #: 292.9 AM34; ISSN: 0043-1370

Descriptors: wetlands/ deltas/ water quality/ *Nyssa aquatica*/ *Taxodium distichum*/ clearcutting/ logging/ glyphosate/ sediments/ Alabama

Abstract: A palustrine water tupelo (*Nyssa aquatica* L.)-baldcypress (*Taxodium distichum* (L.) Rich.) swamp in southwestern Alabama was subjected to three types of disturbance, including helicopter logging, rubber-tired skidder logging simulation, and helicopter logging followed by an herbicide application. An adjacent undisturbed stand served as a control area. Post-harvest collection of sedimentation data revealed that the herbaceous and woody vegetation regrowth within the helicopter and skidded clearcut areas trapped more sediments than did the control or herbicide treatment areas. Clearcutting, followed by plant regrowth, improved the wetland's capacity to remove sediments from overbank flow flood waters. This citation is from AGRICOLA.

735. 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)/ USA, 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 Emerald 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 plus or minus 241 µg/kg), sum of DDT, DDD, and DDE (7,173 plus or minus 1,710 µg/kg), and toxaphene (39,444 plus or minus 11,284 µg/kg). Sum of chlordane residuals was highest in area 5 (1,766 plus or minus 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.

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736. 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

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737. 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 and conservation implications/ habitat management/ implications/ community structure/ population dynamics/ wetland taxa/ responses to upland forest management and conservation implications/ semiaquatic habitat/ isolated wetland/ taxa responses to upland forest management/ South Carolina/ Marion County/ Woodbury tract/ wetland taxa community/ ecology related to upland forest management/ conservation implications

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 [gtoreq]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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738. Runoff from tomato cultivation in the estuarine environment: Biological effects of farm management practices.

Arnold, G. L.; Luckenbach, M. W.; and Unger, M. A. *Journal of Experimental Marine Biology and Ecology* 298(2): 323-346. (2004)

NAL Call #: QH91.A1J6; ISSN: 0022-0981

Descriptors: agriculture/ bioindicators/ pesticides/ plastic mulch/ runoff/ toxicity

Abstract: The use of plastic row covers (plastic mulch) on vegetable farms increases runoff of pesticides after rainfall events and has been linked to toxic events in adjacent tidal waters. In coastal Virginia, USA, runoff from tomato fields with plastic mulch was suspected of causing mortality of commercial hard clam larvae at a hatchery located downstream of farming operations. Concern about the putative impacts of this practice on local waters resulted in a collection of studies to: (1) determine the sensitivity of early life stages of bivalves to copper, a commonly used fungicide; (2) examine acute and chronic biological effects of runoff on tidal creeks; and (3) examine the efficacy of management practices designed to reduce the delivery of pesticides to adjacent creeks. Laboratory bioassays revealed that 48-h LC50 values for embryonic clams *Mulinia lateralis* and *Mercenaria mercenaria* were 38 and 20 µg/l, respectively. In situ bioassays with *Palaemonetes pugio* showed that pulsed toxic conditions sometimes occur downstream of some tomato farms in plastic mulch following rainfall events. Growth, mortality rates and bioaccumulation of copper and organic pesticides in oysters were not correlated with the use of plastic mulch in watersheds. Sediment bioassays indicated potential toxicity in sediment collected downstream of some tomato fields in plastic mulch, but the effects were not consistent between years. Closer examination of management practices on the farms suggests that controlling runoff can prevent toxic impacts. Elevated levels of crop protectants measured at the outflow of farm ponds suggested that they may do little

to reduce loadings of some pesticides. However, forested buffer zones and ephemeral sedimentation basins appeared to be effective in reducing pesticide concentrations in runoff and pulsed toxicity in tidal creeks. © 2006 Elsevier B.V. All rights reserved.

739. Season length indicators and land-use effects in southeast Virginia wet flats.

Burd, A. C.; Galbraith, J. M.; and Daniels, W. L.

Soil Science Society of America Journal 69(5): 1551-1558. (2005)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: wetlands/ wetland soils/ growing season/ land use/ swamps/ water table/ swamp soils/ soil temperature/ ecological succession/ plant ecology/ forests/ fields/ Virginia
Abstract: The growing season concepts used by federal agencies in defining and regulating wetland hydrology ignore land use and rely on published surrogate indicators. This study compared several growing season indicators with measured air and soil temperature and hydrology data on three land-use types in the Great Dismal Swamp ecosystem of Southeast Virginia to determine how accurate the indicators are on each land use. Water-table depths, 1-m air temperatures, and soil temperature at 50-cm depths were measured for 18 mo at plots representing forest, early successional field (field), and tilled (bare ground) land-use treatments at two study areas. Land use affected air and soil temperature through vegetation type and soil surface properties, both of which are important for wetland restoration. Based on soil temperature at 50 cm, the growing season was continuous in forests but was interrupted in January for 1 to 7 d in some field and bare ground plots. Soil temperatures at 50 cm rose above biological zero (5 degrees C) 90 to 128 d before the published -2.2 degrees C growing season started. The published -2.2 degrees C growing season was 28 to 88 d longer than the measured equivalent, and began after the water tables rose and stayed continuously in the upper 30 cm. A continuous growing season declaration is proposed for federal regulations in thermic wet flats on all land uses. Lengthening the growing season did not cause the studied wetlands to fail the minimum federal wetland hydrology requirements for identification or delineation. This citation is from AGRICOLA.

740. Sediment and nutrient accumulation in floodplain and depressional freshwater wetlands of Georgia, USA.

Craft, C. B. and Casey, W. P.

Wetlands 20(2): 323-332. (June 2000)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ sedimentation/ nutrients (mineral)/ agricultural runoff/ eutrophication/ historical account/ sediment pollution/ flood plains/ organic carbon/ Caesium 137/ Lead 210/ USA, Georgia/ sediments/ nutrients/ cores/ variability/ accumulation/ sinks/ watersheds/ land use/ deposition/ USA, Georgia/ habitat community studies/ sediments and sedimentation/ mechanical and natural changes

Abstract: Soil accretion, sediment deposition, and nutrient (N, P, organic C) accumulation were compared in floodplain and depressional freshwater wetlands of southwestern Georgia, USA to evaluate the role of riverine (2600 km super(2) catchment) versus depressional (<10 km super(2) catchment) wetlands as sinks for sediment and nutrients. Soil cores were collected from three floodplain (cypress-

gum) and nine depressional (three each from cypress-gum forest, cypress-savannah, and herbaceous marsh) wetlands and analyzed for radionuclides (super(137)Cs, super(210)Pb), bulk density, N, P, and organic C to quantify recent (30-year) and long-term (100-year) rates of sediment and nutrient accumulation. There was no significant difference in organic C, N, or sediment accumulation between depressional and floodplain wetlands. However, P accumulation was 1.5 to three times higher in the floodplain (0.12-0.75 g/m super(2)/yr) than in the depressional wetlands (0.08-0.25 g/m super(2)/yr). Sediment and nutrient accumulations were highly variable among depressional wetland types, more so than between depressional and floodplain wetlands. This variability likely is the result of differences in historical land use, hydrology, vegetation type, NPP, and perhaps fire frequency. Mean (n = 12) one-hundred-year rates of sediment deposition (1036 g/m super(2)/yr), organic C (79 g/m super(2)/yr), N (6.0 g/m super(2)/yr), and P accumulation (0.38 g/m super(2)/yr) were much higher than 30-year rates (sediment = 118 g/m super(2)/yr, C = 20 g/m super(2)/yr, N = 1.5 g/m super(2)/yr, P = 0.09 g/m super(2)/yr). Higher 100-year (super(210)Pb) sediment and nutrient accumulations likely reflect the greater numbers of farms, greater grazing by livestock, and the absence of environmentally sound agricultural practices in southwestern Georgia at the turn of the century. Our findings suggest that the degree of anthropogenic disturbance within the surrounding watershed regulates wetland sediment, organic C, and N accumulation. Phosphorus accumulation also is greater in floodplain wetlands that have large catchments containing fine textured (clay) sediments that are co-deposited with P.
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741. Sediment concentrations from intensively prepared wetland sites.

Askew, G. R. and Williams, T. M.
Southern Journal of Applied Forestry 8(3): 152-157. (1984)
Descriptors: sedimentation/ logging/ drainage systems/ bay lands/ South Carolina/ suspended sediments/ erosion/ roads/ drainage ditches/ construction wetlands/ water pollution sources/ water pollution control
Abstract: Conversion of pocosin and bay lands in the southeastern US from natural hardwood stands to loblolly pine plantations usually involves the installation of some form of drainage system followed by logging, site preparation, and planting. The drainage system may provide a pathway for sediment produced by these activities to reach natural streams. Suspended sediment concentrations were measured in water draining from a 5,900-acre Carolina bay located in southeastern Georgetown County, South Carolina, which is undergoing conversion to loblolly pine plantations. Samples were collected during the first storm-flow event of each month between January 1981 and December 1982 from subwatersheds involved in some of several phases of conversion. Suspended sediment concentrations in water draining from the bay averaged 16 mg/l despite logging, site preparation road maintenance and use, and installation of drainage ditches. Road erosion and ditch installation produced the highest suspended sediment concentrations. Suspended sediment concentrations decreased substantially with increasing distance from the sediment source. Logging and site preparation did not lead to increased sedimentation as long as heavy equipment was

not allowed to operate in the ditches. Apparently on the flat coastal soils overload flow normally transports sediment only from roads or from disturbed sites immediately adjacent to drainage ditches. One way to minimize the impact of roads and new drainage ditches is to use a drainage system that contains a length of main channel between sediment sources and sensitive areas. (Moore-IVI)
© CSA

742. Sediment deposition in a forested inland wetland with a steep-farmed watershed.

McIntyre, S. C. and Naney, J. W.
Journal of Soil and Water Conservation 46(1): 64-66. (1991)
NAL Call #: 56.8 J822; *ISSN:* 0022-4561
Descriptors: wetlands/ wetland soils/ sediment deposition/ watersheds/ Tennessee
This citation is from AGRICOLA.

743. Sedimentation in bottomland hardwoods downstream of an east Texas dam.

Phillips, J. D.
Environmental Geology 40(7): 860-868. (2001)
NAL Call #: QE1.E5; *ISSN:* 1073-9106
Descriptors: sediment deposition/ alluvium/ floodplains/ lowland forests/ sediments/ Texas
Abstract: Dams and reservoirs are often efficient sediment traps, and conventional wisdom holds that fluvial sediment supplies are reduced well downstream. However, there are reasons to question the extent to which fluvial and alluvial sediment supplies are reduced more than a few kilometers downstream of dams. Sedimentation in bottomlands of Loco Bayou, east Texas, was investigated at a site less than 16 km downstream of Loco Dam and Lake Nacogdoches, which controls 86% of the 265-km² drainage area. Turbidity levels are generally as high or higher than those on Loco Bayou upstream of the lake. Sedimentation rates on the lower floodplain since the dam was completed are 11 mm year⁻¹ or more. This rate is high enough to suggest that the dam has no effect on sediment supplies 16 km downstream. The spatial pattern of sedimentation and the vegetation distribution suggest that the elevation and frequency of flooding, not fluvial sediment availability, are the critical factors in determining sediment supplies to these floodplains.
This citation is from AGRICOLA.

744. Short-term breeding bird response to two harvest practices in a bottomland hardwood forest.

Harrison, Charles A. and Kilgo, John C.
Wilson Bulletin 116(4): 314-323. (2004)
NAL Call #: 413.8; *ISSN:* 0043-5643
Descriptors: animals and man/ disturbance by man/ commercial activities/ conservation/ conservation measures/ ecology/ community structure/ population dynamics/ habitat/ terrestrial habitat/ land zones/ Nearctic region/ USA/ North America/ Aves: forestry/ clearcutting and patch retention harvesting/ short term breeding population responses/ habitat management/ forest management/ species diversity/ breeding species richness/ short term responses to different harvest practices/ population density/ breeding population density/ short term responses to clearcutting vs. patch retention harvesting/ forest and woodland/ short term breeding population responses to clearcutting vs. patch retention harvesting/

South Carolina/ Lower Coastal Plain/ Coosawhatchie River/ short term breeding population responses to different harvest practices/ bottomland hardwood forest/ Aves/ birds/ chordates/ vertebrates

Abstract: Clearcutting is the preferred timber harvest method in bottomland hardwood forests because it is most likely to result in regeneration of preferred species. However, clearcutting generally has negative impacts on forest birds. Patch-retention harvesting may provide similar silvicultural benefits, but its effects on birds are unknown. We surveyed breeding birds in uncut control, clearcut, and patch-retention treatment areas (11-13 ha) for one season prior to harvest and two seasons postharvest in a bottomland hardwood forest in the Lower Coastal Plain of southeastern South Carolina. Bird observations recorded along line transects were analyzed using the software EstimateS to estimate species richness and program Distance to estimate densities. We found greater species richness and bird densities in the patch-retention treatment than in the clearcut in both postharvest seasons. We detected no forest-interior birds in the clearcut after the harvest, but by the second postharvest season in the patch-retention treatment, the density of forest-interior birds had returned to approximately half of its preharvest level. Thus, based on density response, patch-retention harvesting appears to be less detrimental to forest birds than clearcutting. However, additional work is needed to determine whether retained patches influence avian survival and productivity.

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745. Slash incorporation for amelioration of site, soil and hydrologic properties on pocosins and wet flats in North Carolina.

Lakel, W. A.; Aust, W. M.; Carter, E. A.; Stokes, B. J.; Buford, M. A.; and Sanchez, F. G.

In: Proceedings of the tenth biennial southern silvicultural research conference/ Haywood, James D. Southern Research Station, USDA Forest Service (Series: General Technical Report SRS-30), 1999. 298-301

NAL Call #: aSD143 .G46 no. 30

<http://www.treesearch.fs.fed.us/pubs/2141>

Descriptors: incorporation/ mulching/ site preparation/ soil water/ water table/ forests/ tillage/ mounds/ forest soils/ wetland soils/ Ultisols/ groundwater level/ amelioration of forest sites/ slash/ mulches/ soil water content/ soil solution/ chemical composition/ nitrate/ ammonium

Abstract: It was hypothesized that mulching and incorporation of slash as part of site preparation treatments could affect soil water characteristics. Two forested wetland sites, an organic pocosin (Pantego series soil, fine, loamy, siliceous, thermic Umbric Paleaquult) and a mineral wet flat (Lenoir series soil, clayey, mixed, thermic, Aeric Paleaquult), located in the lower coastal plain of North Carolina, were selected for treatments. Treatments consisted of slash mulching and incorporation in combinations with bedding and flat planting. These treatments were arranged in a randomized complete block design and an incomplete block design. Volumetric soil moisture percent, water table depths, and soil water chemical characteristics were monitored for one year following treatment installation. Preliminary results suggest that bedding in general affects soil water characteristics while differing methods of slash incorporation do not.

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746. Soil bulk density, soil strength, and regeneration of a bottomland hardwood site one year after harvest.

Hassan, A. E. and Roise, J. P.

Transactions of the ASAE 41(5): 1501-1508. (1998)

NAL Call #: 290.9 Am32T; ISSN: 0001-2351

Descriptors: soil strength/ bulk density/ soil water content/ forest soils/ regeneration/ lowland forests

Abstract: The first year soil physical properties and regeneration measurements following harvest indicate ample regeneration on all treatments including the landing areas. Comparisons included three machine systems (three skidders) and a helicopter-yarded control that were field tested for harvesting a bottomland hardwood site under adverse conditions. The results also demonstrate a significantly greater number of tree stem count following the winter than the summer harvest. Results of the statistical analysis of soil bulk density indicate that the soil had partially recovered from machine traffic one year after harvest.

This citation is from AGRICOLA.

747. Soil, groundwater, and floristics of a southeastern United States blackwater swamp 8 years after clearcutting with helicopter and skidder extraction of the timber.

Rapp, J.; Shear, T.; and Robison, D.

Forest Ecology and Management 149(1-3): 241-252. (2001)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: wetlands/ soil chemistry/ organic matter/ ground water/ community composition/ revegetation/ forest management/ USA, South Carolina/ forest hydrology/ lumber/ swamps/ groundwater/ plant populations

Abstract: We compared the impacts of helicopter and rubber-tired skidder extraction of timber after harvesting on the structure and function of a blackwater forested wetland. This study was initiated in 1991, in a cypress-tupelo forest adjacent to the South Fork Edisto River in South Carolina, USA. Our objective, eight growing seasons after harvest, was to focus on the properties that showed effects of the harvest after three years: soil chemistry, organic matter decomposition, groundwater chemistry, and plant community composition. Concentrations of total nitrogen, phosphorous, and magnesium were lower in some of the harvest treatments than in the unharvested control. Cellulose decomposition at 5 and 10 cm below the soil surface was significantly greater in the harvested treatments than the unharvested, though there were no differences in soil temperature. There were no differences among treatments in the concentrations of NO sub(3) super(-), NH sub(4) super(+), and PO sub(4) in groundwater sampled from depths of 0.2 and 1 m. Sedimentation was significantly greater in the harvested treatments than the unharvested treatment, and had apparently filled the ruts caused by the skidder. Ordination of the canopy vegetation plots using their importance values showed no separation of vegetation communities by treatment. In contrast, ordination of the midstory and understory vegetation plots cover showed a separation of communities between the harvested and unharvested treatments. There was no apparent environmental advantage to using helicopters rather than skidders to extract timber from this forest.

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748. Soil physical and hydrological changes associated with logging a wet pine flat wide-tired skidders.

Aust, W. M.; Reisinger, T. W.; Burger, J. A.; and Stokes, B. J.

Southern Journal of Applied Forestry 17(1): 22-25.

NAL Call #: SD1.S63; ISSN: 0148-4419

Descriptors: wetlands/ logging/ harvesting/ skidders/ tires/ soil physical properties/ bulk density/ hydraulic conductivity/ porosity/ width

Abstract: A wet pine flat in the coastal plain of South Carolina was harvested with a rubber-tired skidder equipped with 68-in.-wide tires. Soil physical properties were measured immediately before and after a salvage harvest to document changes associated with traffic disturbance. Paired t-tests indicate that the wide-tired operation significantly increased soil volumetric water content, bulk, density, and soil strength, and decreased saturated hydraulic conductivity, soil porosity, and depth to the water table. Changes were greatest for the more disturbed areas, and rutting that occurred in the skid trails apparently interrupted subsurface drainage.

This citation is from AGRICOLA.

749. Soil redox potential in small pondcypress swamps after harvesting.

Casey, W. P. and Ewel, K. C.

Forest Ecology and Management 112(3): 281-287. (1998)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: Taxodium distichum/ swamps/ redox potential/ soil chemistry/ logging/ forest plantations/ Pinus elliotii/ water/ depth/ Florida

This citation is from AGRICOLA.

750. Spatiotemporal responses of reptiles and amphibians to timber harvest treatments.

Goldstein, Michael I.; Wilkins, R. Neal.; and Lacher, Thomas E.

Journal of Wildlife Management 69(2): 525-539. (2005)

NAL Call #: 410 J827; ISSN: 0022-541X

Descriptors: animals and man/ disturbance by man/ commercial activities/ ecology/ habitat/ terrestrial habitat/ land zones/ Nearctic region/ USA/ North America/ Amphibia/ Reptilia: forestry/ clearcut and selective timber harvest treatments/ impact on bottomland hardwood forest communities/ community structure/ forest and woodland/ bottomland hardwood forest/ Texas/ Tyler County/ bottomland hardwood forest communities/ influence of clearcut and selective timber harvest treatments/ amphibians/ chordates/ reptiles/ vertebrates

Abstract: We compared the influence of clearcut and selective timber harvest treatments on spatial and temporal variability of amphibians and reptiles in an east Texas bottomland hardwood forest. The dataset represented a time series of 5 years post-treatment. A total of 18,645 amphibians and reptiles was captured in 144 pitfall arrays. We used 9 plots Q clearcut, 3 select cut, and 3 untreated). Each plot had 16 arrays and was bisected by 1 of 3 streams. Pitfall captures represented 46 species (16 amphibians, 30 reptiles). When analyzed with a traditional ANOVA approach, these data suggested an increase in reptile species richness in response to clearcut treatments; amphibian species richness did not respond to treatment. When analyzed as a time series, however, the data revealed fluctuations in site use by species and species groups, and these fluctuations were independent of

treatment effects. Exploratory analyses of spatio-temporal dynamics showed that species richness and the relative abundance of common species displayed spatial patterns that remained consistent over time. In control and select cut treatments, spatial patterns of richness and abundance shifted over time and were not necessarily confined to areas adjacent to streams. In clearcuts, stationary habitat refugia were located within riparian management zones.
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751. Strategies for protecting Florida's Everglades: The best management practice approach.

Izuno, F. T. and Capone, L. T.

Water Science and Technology 31(8): 123-131. (1995)

NAL Call #: TD420.A1P7; ISSN: 0273-1223

Descriptors: wetlands/ fertilizers/ hydraulics/ sediment/ water quality/ management/ practice/ pollution/ water pollution/ control/ land management

Abstract: The Everglades Agricultural Area (EAA), Florida, USA, consists of an artificially drained area of ~ 280 000 ha of organic cultivated soils. Hydroperiods and excessive nutrients in surface water inflows have been identified as potentially disruptive to the natural ecosystem, with phosphorus (P) the limiting nutrient. Hence, agricultural drainage water from the EAA, containing higher than background P loads and concentrations, has been targeted as a source of the problem. To reduce P loads and concentrations in the drainage water leaving farms in the EAA, on-farm best management practices (BMPs) can be used. These BMPs have been identified and tested at the large plot scale and presently being implemented and their efficacy verified at the farm level. It is currently estimated that P loading from the EAA can be reduced by 20% to 60% using BMPs. A 45% reduction should be attainable while keeping within acceptable cost-benefit ratios. The use of BMPs, however, will require higher levels of farm management and more sophisticated tools for decision-making.

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752. Stream water quality changes following timber harvest in a coastal plain swamp forest.

Ensign, S. H. and Mallin, M. A.

Water Research 35(14): 3381-3390. (2001)

NAL Call #: TD420.W3; ISSN: 0043-1354

Descriptors: water quality (natural waters)/ streams (in natural channels)/ wood/ swamps/ forests/ bacteria/ logging/ water quality/ streams/ coastal plains/ riparian land/ forest hydrology/ land use/ coastal zone/ deforestation/ physicochemical properties/ environmental impact/ fecal coliforms/ algal blooms/ microbial contamination/ dissolved oxygen/ suspended particulate matter/ watersheds/ phosphorus/ phytoplankton/ biological pollutants/ pollution monitoring/ resource management/ environmental monitoring/ man-induced effects/ anthropogenic factors/ harvesting/ forest industry/ USA, North Carolina, Goshen Swamp/ logging/ coastal plains

Abstract: The Goshen Swamp, a fourth order blackwater creek in southeastern North Carolina, was clearcut of 130 acres of riparian and seasonally flooded forest in late May through September 1998. Downstream water quality had been monitored monthly for 2 1/2 years before the clearcut, during the clearcut, and for two years following the clearcut. The objective of this paper was to test the hypothesis that clearcutting in the Goshen Swamp watershed negatively

impacted downstream water quality. To do so, data from the Goshen Swamp were compared with data collected from a neighboring control creek (Six Runs Creek) of similar size, land use, and hydrologic characteristics. Compared with the control creek, the post-clearcut Goshen Swamp displayed significantly higher suspended solids, total nitrogen, total phosphorus, total Kjeldahl nitrogen and fecal coliform bacteria, and significantly lower dissolved oxygen over a 15 month period. Longer-term deleterious effects included recurrent nuisance algal blooms that had not been present during the 2 1/2 years before the clearcut. Although a 10 m uncut buffer zone was left streamside, this was insufficient to prevent the above impacts to stream water quality.

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753. Sugarcane production impact on nitrogen and phosphorus in drainage water from an Everglades histosol.

Coale, F. J.; Izuno, F. T.; and Bottcher, A. B.
Journal of Environmental Quality 23(1): 116-120. (1994)
NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: agricultural pollution/ drainage/ nitrogen/ phosphorus/ freshwater pollution/ agricultural runoff/ water pollution sources/ drainage water/ saccharum/ USA, Florida, Everglades/ water pollution sources/ drainage water/ agricultural pollution/ saccharum/ freshwater pollution

Abstract: The Everglades Agricultural Area (EAA) in southern Florida is a 280,000-ha tract of land that has come under scrutiny by environmental, agricultural industry, and government water management groups that are concerned with the impact of nutrient-enriched drainage water on the ecology of adjoining bodies of water and wetlands.

Sugarcane (*Saccharum* sp.) is grown on 155,000 ha or 78% of the cultivated organic soils in the EAA. The objectives of this study were to determine the N and P concentrations and off-field loads in drainage water from sugarcane and fallow fields. It was concluded that, due to the large quantity of soil N and P mineralized and due to crop N and P uptake, the impact of sugarcane production on drainage water N and P concentrations was minimal.

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754. Surface water nutrient concentrations and litter decomposition rates in wetlands impacted by agriculture and mining activities.

Lee, A. A. and Bukaveckas, P. A.
Aquatic Botany 74(4): 273-285. (2002)
NAL Call #: QK102.A65; ISSN: 0304-3770

Descriptors: wetlands/ phosphorus/ waterlit/ water column/ nutrient recycling/ C:N [carbon to nitrogen] ratio/ sediment/ season/ evaluation/ site specific/ surface water/ litter decomposition/ nutrient concentration/ time scale/ floods/ impact of forestry or agriculture/ climate, weather, current, tide/ experimental research/ impacts of industry or mining/ North America/ United States/ Kentucky/ Insertae/ sedis/ *Typha latifolia*

Abstract: Decomposition rates of a site-specific dominant litter, a standard litter (*Typha latifolia*) and cellulose were quantified in 10 western Kentucky wetlands using the litterbag technique. Short-term (60 and 42 days) incubations were conducted during fall 1998 and spring 1999. The effect of variable tissue nitrogen content on decomposition rates was evaluated by comparing mass

loss among site-specific dominant species from each wetland. Effects of variable surface water and sediment nutrient concentrations on decomposition were assessed by measuring mass loss of standard litter materials (*Typha latifolia* and cellulose) of uniform C:N ratio. Decomposition of the site-specific dominant litter was significantly correlated with tissue C:N ratios and phosphorus concentrations in wetland waters and sediments. Water column and sediment phosphorus were also significant predictors of decomposition rates for the standard litter types. Nitrogen concentrations in surface waters were not significant predictors of decomposition for any of the substrates in either season. Wetlands impacted by mine drainage exhibited slower decomposition rates and lower nutrient levels in comparison to wetlands occurring in predominantly agricultural areas.

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755. 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/ Nearctic region/ North America/ USA/ Invertebrata/ Pisces: biomass/ species diversity/ low biodiversity/ semiaquatic habitat/ oligotrophic wetland biomass and biodiversity/ conservation aspects/ enrichment of oligotrophic wetlands/ Florida/ Everglades/ biomass and biodiversity/ conservation significance/ chordates/ fish/ invertebrates/ vertebrates

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756. Temporal and spatial patterns of wetland sedimentation, West Tennessee.

Hupp, C. R. and Bazemore, D. E.
Journal of Hydrology 141(1/4): 179-196. (1993)
NAL Call #: 292.8 J82; ISSN: 0022-1694

Descriptors: wetlands/ forests/ geomorphology/ growth rings/ sediment deposition/ temporal variation/ spatial variation/ streams/ agriculture/ road construction/ altitude/ sediments/ Tennessee

Abstract: Dendrogeomorphic techniques were used to describe and interpret patterns of sedimentation rates at two forested wetland sites in West Tennessee. Fifty-five sampling stations were established along transects upstream and downstream from bridge structures, and 515 trees were examined for depth of sediment accretion and cored for age determination. Temporal variation in sedimentation rate may be related more to stream channelization and agricultural activity than to bridge and causeway construction. Sedimentation rates have increased substantially in the last 28 years, although channelized streams may have overall lower rates than unchannelized streams. Comparisons of sedimentation rates from deposition over artificial markers (short term) with those determined from tree-ring analysis (long-term) indicate that trends are similar where hydrogeomorphic conditions have not been altered substantially. No tendency for increased sedimentation upstream from bridges was observed. Deposition rates were inversely correlated with elevation and degree of ponding. Downstream deposition of sand splays appears to be related to flow constrictions and

may be extensive. Mean overall rates of sedimentation (between 0.24 and 0.28 cm year⁻¹), determined dendrogeomorphically, are comparable with other published rates.

This citation is from AGRICOLA.

757. Timber harvesting effects After 16 years in a tupelo-cypress swamp.

Gellerstedt, Paul A. and Aust, W. Michael.

In: Proceedings of the 12th Biennial Southern Silvicultural Research Conference. (Held 24 Feb 2003-28 Feb 2003 at Biloxi, Mississippi.) Connor, Kristina F. (eds.)

Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station; pp. 524-527; 594 p.

NAL Call #: aSD143 .G46 no. 71

<http://www.srs.fs.usda.gov/pubs/6693>

Abstract: A variety of concerns have been expressed regarding harvesting in forested wetlands. These concerns usually revolve around such issues as potential losses in site productivity, altered wetland functional processes, and development of appropriate best management practices. In 1985 a long-term study was established to evaluate harvest disturbance effects on water quality, soil properties, hydrology, and site productivity in a water tupelo (*Nyssa aquatica*) -baldcypress (*Taxodium distichum*) swamp. The study site is a deltaic red river bottomland within the Mobile-Tensaw River Delta in southwestern Alabama. After 1 year of baseline data collection, three disturbance treatments were installed in 1986: Clearcutting with helicopter removal, clearcutting with rubber-tired skidder trafficking, and clearcutting followed by complete vegetation control via glyphosate application. The three disturbance treatments were installed as three 3 X 3 Latin squares. Data were also collected from adjacent non-disturbed reference areas for comparison with disturbance treatments. Measurements of soil, water, and vegetation have been conducted at treatment ages 0-2, 7-8, 10, 12, and 16. The skidder and helicopter treatment plots have recovered since harvest due to frequent flooding, shrink-sell soils, and sediment accumulation on the site. Sediment accumulation on treatment plots increased after harvest and has returned to near pre-harvest levels at age 16. The skidder treatment has shown somewhat better recovery than the helicopter treatment, although the differences between the helicopter and skidder treatments are becoming less pronounced. As the treatment plots mature, the species composition is becoming similar to that of the reference area, and the treatment areas are expected to fully recover from disturbance.

This citation is from Treesearch.

758. 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: behavior/ 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 ($x^2 = 1008$, $p < 0.0001$), 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. © The Thomson Corporation

759. Vegetation changes and land-use legacies of depression wetlands of the western coastal plain of South Carolina: 1951-1992.

Kirkman, L. Katherine; Lide, Robert F.; Wein, Gary; and Sharitz, Rebecca R

Wetlands 16(4): 564-576. (1996)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ ecology: environmental sciences/ freshwater ecology: ecology, environmental sciences/ soil science/ agricultural disturbance/ hydrology/ land cover/ land use legacy/ terrestrial ecology/ vegetation changes

Abstract: We examined historical patterns of land use of depression wetlands (Carolina Bay and bay-like wetlands) to determine if a relationship between vegetative successional changes over a 41-year period and previous human disturbances (primarily agricultural) could be established. Land cover was interpreted from 1951 (black and white) and 1992 (false color infrared) aerial photography of the Savannah River Site (a 780 km² federal nuclear facility in which wetlands have been relatively undisturbed since 1951). Patterns of change from one land cover to another were detected by constructing a series of frequency tables. About one fourth of the 299 wetlands identified were either pasture or cultivated in 1951. and the majority had been ditched for drainage. Agriculturally disturbed wetlands primarily became mixed hardwood/pine or were converted to pine plantations by 1992; however, no successional differences between wetlands that were cultivated versus pasture were detectable. The type of land use of many of the depression wetlands prior to 1951 probably was determined by

physical characteristics of the wetlands (e.g., topographic position, size, and hydrologic features). Thus, in many cases, separation of recovery trajectories from other successional pathways, initial hydrogeomorphic differences, and/or continued human influences is not possible in this study. However, from this change-detection study, we recognize that many of the currently protected depression wetlands at SRS were disturbed by agricultural practices or were impacted by hydrologic alterations prior to 1951, implying considerable resilience in the recovery toward a functioning wetland condition if hydrologic regimes are restored. A significant finding of this study is the relative stability of herb-dominated bays, which indicates that this vegetation type is not necessarily a successional continuum toward an eventual hardwood forest, at least in the temporal scale of the study. Thus, we suggest that management prescriptions for the restoration/conservation of herb-dominated wetlands should incorporate concepts of temporal stability within a framework of cyclical hydrologic and vegetation changes.
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760. Vegetation responses to helicopter and ground based logging in blackwater floodplain forests.

Jones, R. H.; Stokes, S. L.; Lockaby, B. G.; and Stanturf, J. A.
Forest Ecology and Management 139(1-3): 215-225. (2000)
NAL Call #: SD1.F73; ISSN: 0378-1127
Descriptors: logging/ environmental impact/ forests/ species composition/ forest management/ freshwater ecosystems/ freshwater environments/ soil characteristics/ flood plains/ streams/ harvesting/ vegetation/ community structure/ species richness/ community composition/ soil erosion/ forestry/ water quality/ detritus/ land management/ environmental quality/ *Cliftonia monophylla*/ *Acer rubrum*/ *Cyrilla racemiflora*/ *Liriodendron tulipifera*/ *Magnolia virginiana*/ USA, Alabama/ buckwheat tree/ red maple/ swamp cyrilla/ tulip poplar/ sweetbay
Abstract: Logging in floodplains of low order, blackwater streams may damage existing seedlings and rootstocks, and create soil conditions that inhibit establishment and growth of regeneration after harvest. Removal of logs via helicopters has been advocated to minimize soil damage and facilitate rapid revegetation. We tested impacts of helicopter versus conventional skidder harvest systems on regeneration, woody plant community structure and biomass growth in three blackwater stream floodplains in southern Alabama. The helicopter treatment resulted in significantly greater woody plant density (19,900 versus 14,300 stems/ha by Year 8), but both treatments were well-stocked with commercially valuable species. By Year 8, treatment effects on density of individual species were generally not significant; however, density of *Cliftonia monophylla* was lower on skidder plots ($p=0.001$) and density of *Nyssa sylvatica* var. *biflora* was lower on helicopter plots ($p=0.092$). In both treatments, species richness within 0.004 ha regeneration plots declined slightly between pre- and post harvest, but the Shannon diversity and evenness indices remained essentially unchanged through 8 years after treatment. Post-harvest survival of *Acer rubrum*, *Cyrilla racemiflora* and *C. monophylla* rootstocks was significantly lower on the skidder plots. In both treatments, species dominant before harvest remained so afterwards. Species with the tallest sprouts in Year 8 were *Liriodendron tulipifera*, *Magnolia virginiana*, and *A.*

rubrum. During the first 2 years after logging, aboveground biomass was greater in the helicopter treatment, but the difference was only significant in Year 1. We conclude that both harvesting methods had little effect on species composition. Skidding may result in a stand structure more favorable for commercial timber production; however, impacts of skidding on long-term productivity are not yet known.
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761. Water quality changes associated with forest drainage.

Williams, T. M.
Technical Publication R8 (United States Department of Agriculture, Forest Service, Southern Region) 20: 76-83. (1994)
NAL Call #: aSD11.U5962; ISSN: 0749-5536
Descriptors: wetlands/ forest management/ forest plantations/ water quality/ drainage/ road construction/ evapotranspiration/ hydrology/ nutrients/ sulfates/ cations/ hydrogen ions/ sediments/ literature reviews
This citation is from AGRICOLA.

762. Water quality within lightly-grazed and protected isolated wetlands in south-central Florida.

Tanner, G. W. and Terry, W. S.
Proceedings of the Soil and Crop Science Society of Florida 50: 80-84. (1991)
NAL Call #: 56.9 So32; ISSN: 0096-4522
Descriptors: wetlands/ hydrology/ water quality/ grazing/ animal husbandry/ land types
Abstract: Total N and P, chlorophyll a, dissolved oxygen and pH of surface water collected from wetlands in Florida were measured over an 1.5-yr period. There were no significant differences in these water quality parameters between grazed and ungrazed wetlands. All wetlands were acidic (mean pH about 4.0) and eutrophic in terms of total N and chlorophyll a concn. Dissolved oxygen was always >3 ppm, and mesotrophic in terms of total P concn. Water quality was most degraded during a period of extreme low water. Light to moderate levels of cattle grazing did not degrade water quality within the wetlands studied.
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763. Wet-weather timber harvesting and site preparation effects on coastal plain sites: A review.

Miwa, M.; Aust, W. M.; Burger, J. A.; Patterson, S. C.; and Carter, E. A.
Southern Journal of Applied Forestry 28(3): 137-151. (2004)
NAL Call #: SD1.S63; ISSN: 0148-4419
Descriptors: site preparation/ site productivity/ timber harvesting impacts
Abstract: Increased interest in sustainable forestry has intensified the need for information on the interactions of forest soils, harvesting methods, site disturbances, and the efficacy of methods for ameliorating disturbances. On wet pine flats, such as those commonly found in the Atlantic and Gulf Coastal Plains, conditions such as frequent rainfall, low relief, and poor internal soil drainage often predispose forest soils to harvest disturbances and potential damage. Typical forest operations use heavy logging equipment, such as rubber-tired feller-bunchers and skidders. During dry soil conditions, these machines cause little soil disturbance, but under moist to saturated

conditions, such operations may compact soils and interfere with normal soil drainage. Many studies have been conducted to characterize soil disturbance and site preparation effects on tree seedling survival and growth and to evaluate the amelioration effect of site preparation on disturbed soils. However, results are sometimes contradictory due to site specificity, and results have not been summarized in the context of pine plantation management. This article summarizes previous research results of the wet-weather harvesting and bedding effects on soil properties as related to loblolly pine (*Pinus taeda*) productivity for a variety of Coastal Plain region sites types. © 2004 by the Society of American Foresters. © 2006 Elsevier B.V. All rights reserved.

764. Wetland agriculture in the Everglades: A concept for sustaining agriculture and the ecosystem.

Deren, C. W.; Glaz, B.; and Snyder, G. H.
In: Versatility of Wetlands in the Agricultural Landscape. (Held -17-20 September, 1995 at Hyatt Regency, Tampa)

St Joseph, Mo.: American Society of Agricultural Engineers (ASAE); pp. 35-43; 1995.

NAL Call #: QH87.3.V47 1995

Descriptors: wetlands/ farming systems/ sustainability/ drainage/ soil depth/ subsidence/ flooding/ rice/ sugarcane/ vegetables/ Histosols/ agriculture/ ecosystems/ land types/ arable land

Abstract: Sugarcane, rice, vegetables and grasslands are cultivated on 283 000 ha organic soils (Histosols) of the Everglades Agricultural area (EAA) in Florida, USA. Present farming methods do not sustain a good agricultural production. The drained Histosols subside ~2.5 cm/year mainly because of microbial oxidation and soil depths in some areas are only 40-50 cm over bedrock. It is suggested that a wetland agriculture based on rice and sugarcane or on crops tolerant to flooding or high groundwater levels may help sustain agricultural ecosystems and reduce soil subsidence.

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Wetlands as Agricultural Conservation Practices

765. Acute toxicity of methyl-parathion in wetland mesocosms: Assessing the influence of aquatic plants using laboratory testing with *Hyalella azteca*.

Schulz, R.; Moore, M. T.; Bennett, E. R.; Milam, C. D.; Bouldin, J. L.; Farris, J. L.; Smith, S.; and Cooper, C. M.
Archives of Environmental Contamination and Toxicology 45(3): 331-336. (Oct. 2003)

NAL Call #: TD172.A7; ISSN: 0090-4341

Descriptors: wetlands/ *Hyalella azteca* (amphipoda)/ pollutants/ toxicity/ semiaquatic habitat/ fertilizer and pesticide pollution/ fertilizers and pesticides/ methylparathion pesticide/ physical factors/ aquatic vegetation cover/ Mississippi/ pesticide toxicity/ aquatic vegetation effects

Abstract: Methyl-parathion (MeP) was introduced into constructed wetlands for the purpose of assessing the importance of distance from the source of contamination and the role of emergent vegetation on the acute toxicity to *Hyalella azteca* (Crustacea: Amphipoda). A vegetated (90% cover: mainly *Juncus effusus*) and a nonvegetated wetland (each with a water body of 50 x 5.5 x 0.2 m) were each exposed to a simulated MeP storm runoff event. *H. azteca* was exposed for 48 h in the laboratory to water samples taken from the wetlands at a distance of 5, 10, 20, and 40 m from the pesticide inlet 3 h, 24 h, 96 h, and 10 days following application. Methyl-parathion was detected throughout the nonvegetated wetland, whereas the pesticide was only transported halfway through the vegetated wetland. A repeated-measure three-way analysis of variance (ANOVA) using time, location, and vegetation indicated significantly lower toxicity in the vegetated wetland. Furthermore, the mortality decreased significantly with both increasing distance from the inlet and time (48-h LC50 [plus or minus] 95% CI: 9.0 [plus or minus] 0.3 [µg/L]). A significant three-way interaction of time x vegetation x location confirmed higher toxicity at the inlet area of the nonvegetated wetland immediately after contamination. Significant linear regressions of maximum mortality (independent of time) versus distance from the pesticide inlet indicated that 44 m of vegetated and 111 m

of nonvegetated wetland would reduce *H. azteca* mortality to <=5%. These results suggest that vegetation contributes to reduced MeP effects in constructed wetlands.

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766. Ammonia volatilization from constructed wetlands that treat swine wastewater.

Poach, M. E.; Hunt, P. G.; Sadler, E. J.; Matheny, T. A.; Johnson, M. H.; Stone, K. C.; Humenik, F. J.; and Rice, J. M.

Transactions of the ASAE 45(3): 619-627. (2002)

NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: wastewater treatment/ animal wastes/ ammonia/ vaporization/ nitrogen removal/ livestock/ artificial wetlands/ barn wastewater/ testing procedures/ nitrogen

Abstract: Increasingly, large-scale animal production occurs in confinement where large per-unit-area quantities of waste are generated. With the increased scale of production, new environment-friendly technologies are needed to deal with the waste. Constructed wetlands are considered an alternative treatment, but it is not known if volatilization of free ammonia (NH sub(3)) governs nitrogen removal in these systems. The objective of this research was to quantify the NH sub(3) volatilization from constructed wetlands that treat swine wastewater. In May and July of 2000, a specially designed enclosure was used to measure NH sub(3) volatilization from constructed wetlands receiving swine wastewater. Laboratory and field calibration tests indicated that the enclosure was effective at measuring NH sub(3) volatilization. Wetland tests indicated that NH sub(3) volatilization was occurring. From average hourly rates, it was estimated that 7% to 16% of the nitrogen load to the wetlands was removed through NH sub(3) volatilization. Although NH sub(3) losses should not be ignored, results indicated that NH sub(3) volatilization was not responsible for removing the majority of nitrogen from the swine wastewater.

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767. 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 interspersions 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.

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768. Assessing the functional level of a constructed intertidal marsh in Mississippi.

LaSalle, Mark W.

Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station, 1996. 64 p. Wetlands Research Program Technical Report.

NAL Call #: TD756.5.L37 1996

Descriptors: marshes---Mississippi---design and construction/ constructed wetlands---Mississippi
This citation is from AGRICOLA.

769. 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.

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770. 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.

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771. Beneficial use of dredged material to enhance the restoration trajectories of formerly diked lands.

Weinstein, M. P. and Weishar, L. L.

Ecological Engineering 19(3): 187-201. (Sept. 2002)

NAL Call #: TD1.E26; ISSN: 0925-8574.

Notes: Special issue: NOAA - Sea Grant Symposium on the beneficial Uses of dredge materials for Coastal Ecosystem restoration.

Descriptors: wetlands/ environmental restoration/ dredge spoil/ coastal zone/ marshes/ spoil banks/ dredging/ waste disposal/ coastal waters/ restoration/ waste utilization/ coastal zone management/ nearshore dynamics/ shore protection/ USA, Delaware Bay/ environmental action/ reclamation/ ultimate disposal of wastes/ general environmental engineering/ protective measures and control

Abstract: Throughout the United States, coastal wetlands are being restored from formerly diked lands drained for agriculture. One such site, the 1620 ha Commercial Township Salt Hay Farm (CTSHF) is located on the southern Delaware Bay, USA. A common problem with these sites is their low elevation associated with long-term lack of tidal inundation and sediment accretion, compaction by heavy equipment, and oxidation associated with exposure to the atmosphere. With the reintroduction of tide, these areas, which have subsided by several meters or more, may become open water and tidal flats for extended periods before they return to wetland habitat. Different levels of subsidence also result in a wide range of marsh planforms including flats with little or no vegetation and/or semblance to the geomorphology of natural systems. The potential use of dredged materials for several aspects of the marsh restoration process - enhancing the sediment budget at low elevations, accelerating the restoration trajectories toward acceptable endpoints, improving the geomorphology of the marsh planform, providing high marsh refugia for species that depend on this habitat type for survival, reestablishing upland dike elevations for off-site protection of people and property, and stabilizing shorelines to reduce erosion rates - are the subjects of this paper. The abundance of dredged materials from channel deepening projects that will occur nation-wide, the maintenance dredging of major ports, on-site construction and other projects provide a wealth of opportunities to combine dredging needs with coastal marsh rehabilitation and restoration.

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772. 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. (Held 10 May 1998-13 May 1998 at 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/ USA, 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 holbrookii*), 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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773. Biomass and nutrient dynamics in restored wetlands on the outer coastal plain of Maryland, USA.

Whigham, Dennis; Pittek, Mary; Hofmockel, Kirsten H.; Jordan, Thomas; and Pepin, Antoinette L.

Wetlands 22(3): 562-574. (2002)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: conservation/ ecology: environmental sciences/ nutrition/ agricultural landscape/ biomass/ depressional wetlands/ hydrologic conditions/ nutrient concentrations/ nutrient dynamics/ nutrient standing stock/ outer coastal plain/ restored wetlands/ vegetation conditions

Abstract: A three-year study of aboveground biomass and nutrient dynamics in twelve restored depressional wetlands of different ages demonstrated significant annual variability among sites. Annual variations appeared to be primarily due to differences in hydrologic conditions over the three years of the study. Differences among wetlands were not related to time since restoration. When data for all sites were combined, annual differences in biomass and most measurements of nutrients (concentrations and standing stocks) did not, however, differ significantly. These results suggest that differences that are measured at individual wetland sites may be less important at the landscape level. Biomass decreased from the outer temporary to inner

submersed zone, and there were few differences among wetlands when the temporary, seasonal, and submersed zones were compared. Nutrient concentrations in the plant biomass increased from the temporary zone to the submersed zone, resulting in few differences in nutrient standing crops across zones. Results from this study demonstrate that some measurements of restoration success (i.e., biomass production) should be used cautiously because they are likely to be highly variable among sites and across years and thus may be of limited use in post-restoration monitoring. Other ecosystem parameters (e.g., nutrient concentrations of biomass) are much more constant spatially and temporally, indicating that nutrient cycling processes in vegetation were established quickly following restoration. Nutrient characteristics of wetland vegetation thus may be a useful metric for evaluating restoration success or failure.

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774. 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/ Aves/ USA, Texas/ Aves/ habitat utilization/ summer/ marine birds/ habitat selection/ environment management/ USA, Texas, San Bernard Natl. Wildlife Refuge/ ecological zonation/ birds/ habitats/ estuarine environment/ plant populations/ wildlife management

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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775. Characterization of oxidation-reduction processes in constructed wetlands for swine wastewater treatment.

Szogi, A. A.; Hunt, P. G.; Sadler, E. J.; and Evans, D. E. *Applied Engineering in Agriculture* 20(2): 189-200. (2004)
NAL Call #: S671.A66; ISSN: 0883-8542

Descriptors: aerobic conditions/ anaerobic conditions/ animal wastes/ artificial wetlands/ denitrification/ enzyme activity/ enzymes/ flooded rice/ nitrification/ nitrogen/

phosphorus/ pig manure/ redox potential/ rice/ soybeans/ waste management/ waste water

Abstract: Constructed wetlands designed and properly operated for treatment of swine wastewater may enhance oxidation-reduction processes and nutrient treatment performance. The objective of this investigation was to characterize soil wetland processes related to nitrogen (N) treatment (nitrification-denitrification) and phosphorus (P) removal using soil oxidation-reduction potential (ORP) data. We evaluated three surface-flow wetland systems constructed for treatment of swine wastewater in Duplin Co., North Carolina, in 1992. Each system consisted of two 3.6- x 33.5-m cells connected in series. The three systems were planted to bulrushes, cattails, and agronomic crops (soybean in saturated soil culture and flooded rice), respectively. Soil aerobic/anaerobic conditions were determined by monitoring soil ORP at 18 sites using platinum (Pt) electrodes. Three monitoring sites were established in each wetland cell. Each site consisted of five Pt electrodes at three soil depths (0.02, 0.05, and 0.10 m) and a reference electrode. A data logger was used for hourly acquisition of soil ORP and temperature records. Hourly ORP data were averaged on a 24-h basis and corrected to standard hydrogen electrode readings (Eh). Frequency analysis of daily soil Eh showed that bulrush and soybean cells were moderately reduced (+100<Eh<+300 mV) and anaerobic (Eh<+300 mV) about 70% of the time. However, cattail and rice cells were anaerobic 100% of the time and had reduced (-100<Eh<+100 mV) to highly reduced (Eh<-100 mV) soil conditions. These results indicate that different wetland plant species promote distinct anaerobic and reducing soil conditions. Outflow concentration of ammonia-N (NH₃-N) and soluble P increased with increasing ORP values for bulrush and soybean-rice wetland cells due to lower temperatures during fall and winter, but not for cattails. Denitrification enzyme activities and ORP indicated that soils in bulrush wetlands promoted better conditions for nitrification-denitrification than cattails or rice soils. However, equivalent NH₃-N removal rates (4.8-5.6 kg ha⁻¹ d⁻¹) for cattails and bulrush suggested that treatment occurred mostly in the water column for cattails rather than the wetland soil. Prevalent anaerobic soil conditions and soluble P outflow concentrations determined rather poor P retention capacity for all three wetlands.

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776. 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.

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777. Comparative economic analysis of using different sizes of constructed wetlands in recirculating catfish pond production.

Posadas, C.

Journal of Applied Aquaculture 11(3): 1-20. (2001)

NAL Call #: SH135.J69; ISSN: 1045-4438

Descriptors: wetlands/ freshwater aquaculture/ fish culture/ aquaculture economics/ water quality/ recirculating systems/ aquaculture/ fish (catfish families)/ economics/ ponds/ fishing and fisheries/ recycling/ USA, Mississippi/ catfish/ economic aspects/ fisheries/ artificial wetlands/ water circulation/ USA, Mississippi/ fish culture/ fish culture/ industrial effluents/ fisheries engineering

Abstract: Results of experiments using constructed wetlands at the Mississippi State University-Coastal Aquaculture Unit (MSU-CAU) were used to evaluate the investment and operation costs of integrating different sizes of constructed wetlands in recirculating catfish pond production. In order to create the commercial pond-wetland systems used in this analysis, each wetland was placed adjacent to each of the ponds used in catfish production. Hypothetical recirculating catfish production systems consisting of six 3.24-ha ponds and six 0.489-, 0.809- or 1.134-ha constructed wetlands were evaluated. Higher investment and operating costs were required for catfish production systems with larger constructed wetlands.

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778. A comparative study of nitrogen and phosphorus cycling in tidal and non-tidal riverine wetlands.

Verhoeven, Jos T. A.; Whigham, Dennis F.; Van Logtestijn, Richard; and O'Neill, Jay

Wetlands 21(2): 210-222. (2001)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: freshwater ecology: ecology, environmental sciences/ methods and techniques/ soil science/ comparative study/ comparison method/ principal components analysis/ analytical method/ interstitial water chemistry/ nutrient cycling processes: riverine wetlands/ riverine wetlands: forested, geographical separation, hydrodynamic differences, natural, nutrient dynamics, restored, vegetation differences/ soil variables: bulk density, organic matter, total nitrogen, total phosphorus

Abstract: This paper describes a study of nutrient dynamics in 12 tidal and non-tidal freshwater riverine wetlands in The Netherlands, Belgium, and Maryland (USA). The purpose of the study was to investigate the relationships between nutrient cycling processes in riverine wetlands that were geographically separated, that were dominated by different types of vegetation, and that had different hydrodynamics. We also compared restored and natural riverine wetlands. The results showed distinct differences in interstitial water chemistry between the sites in Maryland and Europe. No such regional differences were found in the soil variables, except for soil phosphorus, which was higher in The Netherlands. Soil organic matter, total nitrogen and phosphorus content, and bulk density were higher in tidal freshwater wetland soils. Forested wetland soils had higher organic matter and total nitrogen and lower bulk density and total phosphorus than soils from wetlands dominated by herbaceous species. Restored wetlands had lower soil organic matter and total soil nitrogen and phosphorus than similar types of natural riverine wetlands. There were no differences in nutrient-related process rates nor plant nutrient concentrations in tidal versus non-tidal riverine wetlands. Lower nitrogen and phosphorus concentrations in plants at the restored sites suggest that nutrient uptake by vegetation may be poorly coupled to rates of nutrient cycling during early stages of vegetation development. A principal components analysis of the data identified groupings of soil and water variables that were similar to those that had been previously identified when we applied the same methods to peatlands that were also geographically widely separated. Results of the study demonstrate that the techniques that we have been using are robust and repeatable. They are especially useful for making general comparisons of nitrogen and phosphorus cycling when there are limitations on the number of wetland that can be sampled. The approach that we have developed may also be used to calibrate and refine nutrient cycling models that are incorporated into wetland assessment procedures.

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779. Comparing ecological functions of natural and created wetlands for shorebirds in Texas.

Brusati, Elizabeth D.; DuBow, 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.

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780. Conceptual assessment framework for forested wetland restoration: The Pen Branch experience.

Kolka, R. K.; Nelson, E. A.; and Trettin, C. C.

Ecological Engineering 15(Suppl 1): S17-S2.

(Sept. 2000)

NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: wetlands/ environmental restoration/ forests/ pollution control/ ecosystem management/ hydrology/ geomorphology/ vegetation cover/ analytical techniques/ sustainable development/ USA, South Carolina/ reclamation/ protective measures and control/ environmental action

Abstract: Development of an assessment framework and associated indicators that can be used to evaluate the effectiveness of a wetland restoration is critical to demonstrating the sustainability of restored sites. Current wetland restoration assessment techniques such as the index of biotic integrity (IBI) or the hydrogeomorphic method (HGM) generally focus on either the biotic or abiotic components of wetlands. In addition, current methods generally rely on qualitative or semi-quantitative rankings in the assessment. We propose a quantitative, ecosystem level assessment method similar to that developed by the US EPA's Wetland Research Program (WRP approach) that includes both biotic and abiotic metrics. Similar to the IBI and HGM approaches, biotic and abiotic parameters are compared to those of reference communities, however, the proposed comparisons are quantitative. In developing the assessment method, bottomland reference systems at various stages of succession were compared to a recently restored site in South Carolina (Pen branch). Studies involving hydrology, soil organic matter and nutrient dynamics, vegetation communities, seedling establishment and competition, and avian, small mammal, herpetofauna, fish and macroinvertebrate communities were implemented. In this paper, we discuss the conceptual framework in which we developed our assessment technique.

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781. Constructed wetland design and performance for swine lagoon wastewater treatment.

Stone, K. C.; Hunt, P. G.; Szoegi, A. A.; Humenik, F. J.; and Rice, J. M.

Transactions of the ASAE 45(3): 723-730. (2002)

NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: artificial wetlands/ livestock/ wastewater treatment/ animal wastes/ lagoons/ nitrogen/ hydraulic loading/ cattails/ phosphorus/ barn/ wastewater/ bulrushes/ natural resources/ regression analysis/ ammonia/ USA, North Carolina, Duplin Cty.

Abstract: Although constructed wetlands have been identified as a potentially important component of animal wastewater treatment systems, their design requirements have been based mainly on municipal systems. The objective of this investigation was to examine various

design approaches for constructed wetlands in relation to the performance of our constructed wetlands for swine wastewater treatment. The free water surface wetlands in Duplin County, North Carolina, investigated in this study were constructed in 1992 based on the Natural Resources Conservation Service (NRCS) presumptive design method. We used four wetland cells (3.6 m x 33.5 m) with two cells connected in series; the two series of cells were planted and predominated, respectively, by either bulrushes or cattails and were studied from 1993 to 1999. The wetlands were effective in treating nitrogen with mean total nitrogen and ammonia-N concentration reductions of approximately 85%; however, they were not effective in the treatment of phosphorus. Regression analyses of outflow concentration vs. inflow concentration and hydraulic loading rate for total N and ammonia-N were reasonably correlated (r super(2) greater than or equal to 0.66 and r super(2) greater than or equal to 0.65, respectively). Our calculated first-order plug-flow kinetics model rate constants (K sub(20)) for total-N and ammonia-N (8.4 and 8.9, respectively) were slightly lower than those reported in the limited literature and currently recommended for use in constructed wetland design. Nonetheless, use of our calculated rate constants would result in about the same size constructed wetland for treating swine lagoon wastewater.

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782. Constructed wetland system for mitigation of nutrient contaminants in offsite drainage from a commercial nursery.

Whitwell, Ted; Taylor, Milton; and Klaine, Steve

Hortscience 38(5): 672. (2003)

NAL Call #: SB1.H6; ISSN: 0018-5345.

Notes: Conference: American Association for Horticultural Science Centennial Conference, Providence, RI, USA; October 03-06, 2003

Descriptors: horticulture: agriculture/ pollution assessment control and management/ bioremediation/ applied and field techniques/ constructed wetland system/ commercial nursery drainage

Abstract: Container-grown plants from commercial nurseries require large amounts of water and nutrients during their production cycle. Nutrients may be delivered through incorporation in potting media, by top-dressing with granular or slow-release fertilizers, or through liquid feeding by injection into irrigation water. Thus, mitigation of offsite movement of nutrients in runoff is a serious concern. Wight Nurseries of Cairo, Georgia has installed 9.31 acres of planted wetlands to receive direct runoff in excess of recapture needs from over 30 acres of growing beds and excess water diverted from a retention basin and pond used to retain water for an adjacent watershed. Water flows through trench drains between wetland cells and eventually into stilling ponds before it is allowed to exit the property. Water flow through the wetlands ranges from 1.6 million to 2.2 million liters per day. Monitoring data indicates strong seasonal differences in nitrate and nitrite nitrogen removal efficiencies. Nitrogen removal between April and November averaged 93.3% while removal during winter months averaged 44.1%. Nitrite was never found in wetland discharge water. Nitrogen as nitrate in discharge water varied from 0.05 ppm to 4.3 ppm, well below drinking water quality standards, and was below 0.6 ppm between June and November except in September during construction activity. Orthophosphate phosphorus removal was highly

variable with highest removal occurring during late spring, averaging 33.6%. and some removal occurring during early fall, averaging 13.8%. However, there was a net export of phosphorus from the wetlands during winter months. Phosphorus levels ranged between 0.9 and 1.9 ppm. While there is currently no legal water quality standard, these levels are above the generally accepted level of 0.01 ppm for preventing downstream eutrophication.
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783. Constructed wetlands as recirculation filters in large-scale shrimp aquaculture.

Tilley, D. R.; Badrinarayanan, H.; Rosati, R.; and Son, J. *Aquacultural Engineering* 26(2): 81-109. (2002)
NAL Call #: SH1.A66; ISSN: 0144-8609

Descriptors: wetlands/ shrimp culture/ water quality/ potential resources/ recirculating systems/ aquaculture engineering/ shellfish culture/ shellfish culture

Abstract: Effluent waters from shrimp aquaculture, which can contain elevated levels of phosphorus, ammonia, nitrate, and organics, must be managed properly if shrimp aquaculture is to achieve sustainability. Constructed wetlands are ecologically beneficial, low cost treatment alternatives proven capable of reducing suspended solids, biochemical oxygen demand (BOD), nitrogen, phosphorus and heavy metals from wastewater of many sources. The goal of this study was to determine how well a constructed wetland performed as a filter in a full-scale shrimp aquaculture operation. A 7.7 ha (19 ac) mesohaline (3-8 ppt) constructed wetland treating 13,600 m³ per day (3.6 MGD) of effluent from 8.1 ha (20 ac) of intensively farmed shrimp ponds at the Loma Alta Shrimp Aquaculture Facility (LASAF), located along the coast of the Gulf of Mexico in semi-arid South Texas, was found to reduce concentrations of total phosphorus (TP), total suspended solids (TSS) and inorganic suspended solids (ISS) by 31, 65 and 76%, respectively, during recirculation, and maintained consistently low levels of mean BOD (< 9 mg l⁻¹ super(-1)), total ammonia (1.8 mg N l⁻¹ super(-1)) and nitrate (< 0.42 mg N l⁻¹ super(-1)). Determination of parameter values for the k-C wetland design model for ISS or TP showed that mean target levels could be achieved, given expected influent concentrations, when the ratio of pond surface to wetland surface was 12. Constructed wetlands can perform satisfactorily as recirculation filters in large-scale shrimp aquaculture operations, reducing the impact of effluent on local water bodies, conserving large quantities of water and providing valuable ecological habitat.

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784. Constructed wetlands for mitigation of atrazine-associated agricultural runoff.

Moore, M. T.; Rodgers, J. H.; Cooper, C. M.; and Smith, S. *Environmental Pollution* 110(3): 393-399. (2000)
NAL Call #: QH545.A1E52; ISSN: 0269-7491

Descriptors: atrazine/ pesticides/ agricultural runoff/ water sampling/ aquatic plants/ sediments/ pollution control/ water pollution treatment/ stormwater runoff/ artificial wetlands/ fate of pollutants/ storm runoff/ agricultural chemicals/ nonpoint pollution sources/ runoff (agricultural)/ pesticides/ runoff/ pollution (nonpoint sources)/ performance assessment/ constructed wetlands/ freshwater pollution/ prevention and control/ wastewater treatment processes/ sewage

Abstract: Atrazine was amended into constructed wetlands (59-73x14x0.3 m) for the purpose of monitoring transport and fate of the pesticide to obtain information necessary to provide future design parameters for constructed wetlands mitigation of agricultural runoff. Following pesticide amendment, a simulated storm and runoff event equal to three volume additions was imposed on each wetland. Targeted atrazine concentrations were 0 mu g/l (unamended control), 73 mu g/l, and 147 mu g/l. Water, sediment, and plant samples were collected weekly for 35 days from transects longitudinally distributed throughout each wetland and were analyzed for atrazine using gas chromatography. Between 17 and 42% of measured atrazine mass was within the first 30-36 m of wetlands. Atrazine was below detection limits (0.05 mu g/kg) in all sediment and plant samples collected throughout the duration of this study. Aqueous half lives ranged from 16 to 48 days. According to these data, conservative buffer travel distances of 100-280 m would be necessary for effective runoff mitigation.

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785. Constructed wetlands for treatment of channel catfish pond effluents.

Schwartz, M. F. and Boyd, C. E. *Progressive Fish Culturist* 57(4): 255-266. (1995)
NAL Call #: 157.5 P94; ISSN: 0033-0779

Descriptors: wetlands/ wastewater treatment/ fish culture/ aquaculture effluents/ pond culture/ pollution control/ plant populations/ ponds/ aquaculture/ effluents/ fish/ Ictalurus punctatus/ USA, Alabama/ fish culture/ aquaculture effluents/ pond culture/ plant populations/ fish/ pollution control/ ictalurus punctatus/ prevention and control/ fish culture/ fish culture/ environmental applications/ impact/ wastewater treatment processes/ sewage & wastewater treatment

Abstract: Water from a production pond for channel catfish (*Ictalurus punctatus*) in Hale County, Alabama, was passed through a constructed wetland consisting of two cells, one planted with California bulrush (*Scirpus californicus*) and giant cutgrass (*Zizaniopsis miliacea*) and one planted with Halifax maidencane (*Panicum hemitomon*). The removal of potential pollutants from water flowing through the wetland was determined for 1-, 2-, 3-, and 4-d hydraulic residence times (HRTs), with hydraulic loading rates of 77-91 L/m² super(2) of wetland per day. Concentrations of potential pollutants were much lower in effluent from the wetland than in influent from the channel catfish ponds. The following reductions in concentrations were recorded: total ammonia nitrogen, 1-81%; nitrite-nitrogen, 43-98%; nitrate-nitrogen, 51-75%; total Kjeldahl nitrogen, 45-61%; total phosphorus, 59-84%; biochemical oxygen demand, 37-67%; suspended solids, 75-87%; volatile suspended solids, 68-91%; and settleable solids, 57-100%. Overall performance of the wetland was best when operated with a 4-d HRT in the vegetative season, but good removal of potential pollutants was achieved for shorter HRTs and when vegetation was dormant.

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786. Constructed wetlands for treatment of swine wastewater from an anaerobic lagoon.

Hunt, P. G.; Szoegi, A. A.; Humenik, F. J.; Rice, J. M.; Matheny, T. A.; and Stone, K. C.

Transactions of the ASAE 45(3): 639-647. (2002)

NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: bulrushes/ cattails/ artificial wetlands/ load distribution/ anaerobic lagoons/ denitrification/ barn wastewater/ wastewater treatment/ enzymes/ animal wastes/ nitrates/ USA, North Carolina

Abstract: Animal waste management is a national concern that demands effective and affordable methods of treatment. We investigated constructed wetlands from 1993 through 1997 at a swine production facility in North Carolina for their effectiveness in treatment of swine wastewater from an anaerobic lagoon. We used four wetland cells (3.6 x 33.5 m) with two cells connected in series. The cells were constructed by removing topsoil, sealing cell bottoms with 0.30 m of compacted clay, and covering with 0.25 m of loamy sand topsoil. One set of cells was planted with bulrushes (*Scirpus americanus*, *Scirpus cyperinus*, and *Scirpus validus*) and rush (*Juncus effusus*). The other set of cells was planted with bur-reed (*Sparganium americanum*) and cattails (*Typha angustifolia* and *Typha latifolia*). Wastewater flow and concentrations were measured at the inlet of the first and second cells and at the exit of the second cell for both the bulrush and cattail wetlands. Nitrogen was effectively removed at mean monthly loading rates of 3 to 40 kg N ha super(-1) day super(-1); removals were generally >75% when loadings were <25 kg ha super(-1) day super(-1). In contrast, P was not consistently removed. Neither plant growth nor plant litter/soil accumulation was a major factor in N removal after the loading rates exceeded 10 kg N ha super(-1) day super(-1). However, the soil-plant-litter matrix was important because it provided carbon and reaction sites for denitrification, the likely major treatment component. Soil Eh (oxidative/reductive potential) values were in the reduced range (<300 mV), and nitrate was generally absent from the wetlands. Furthermore, the wetlands had the capacity to remove more nitrate-N according to denitrification enzyme activity determinations. Our results show that constructed wetlands can be very effective in the removal of N from anaerobic lagoon-treated swine wastewater. However, wetlands will need to be augmented with some form of enhanced P removal to be effective in both P and N treatments at high loading rates.

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787. Control of upland bank erosion through tidal marsh construction on restored shores: Application in the Maryland portion of Chesapeake Bay.

Garbisch, E. W. and Garbisch, J. L.

Environmental Management 18(5): 677-691. (1994)

NAL Call #: HC79.E5E5; ISSN: 0364-152X

Abstract: During the period of 1972 through 1993, Environmental Concern Inc. (EC) and its recent (1989) affiliate Environmental Construction Company (ECC) have completed 216 marsh construction projects to control upland bank erosion in tributaries of the Maryland portion of Chesapeake Bay. Of these projects, 26 have involved marsh construction on unaltered existing shores and 190 have utilized marsh construction on shores that have been restored to former increased elevations through shoreline filling and grading. This paper describes the latter

restoration technique. Throughout the 21-year period of applying the technique for long-term upland bank erosion control, refinements to the design standards and criteria for site suitability have been made so as to optimize its successful application. As a result of this experience, a reliable bioengineering restoration technique has evolved to control upland bank erosion. This paper describes the details of this successful technique through a review of: (1) its objectives and benefits, (2) suitability of sites for its application, (3) the design of its shore restoration, (4) its construction, (5) its maintenance, and (6) comparison of its cost with those of structural techniques for bank erosion control. Although the technique has only been applied in the Maryland portions of Chesapeake Bay, its applicability should, with modifications, be broadly applicable to all water bodies.

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788. Creation and restoration of tidal wetlands of the southeastern United States.

Broome, S. W.

In: *Wetland Creation and Restoration: The Status of the Science.*

Covelo, Calif.: Island Press, 1990; pp. 37-72.

Notes: ISBN: 1559630450

NAL Call #: QH541.5.M3W462

Descriptors: artificial wetlands/ habitat restoration/ tidal marshes/ water resources management/ wetland restoration/ economic aspects/ environmental engineering/ management planning/ marsh management/ soil properties/ tidal effects/ water resources development

Abstract: Methods of creation and restoration of tidal wetlands in the southeastern United States have been summarized from published papers, reports, and first-hand experience. Publications by the U.S. Army Corps of Engineers which report research related to marsh habitat creation with dredged material and for shoreline erosion control were significant sources of information. Critical aspects which should be considered in planning and implementing a tidal marsh creation or restoration project are: initial planning, elevation in relation to tide level, wave climate and currents, salinity, slope and tidal range, soil chemical and physical properties, timing of construction, cultural practices, and maintenance. Critical research needs include: site selection, revegetation, and documentation of tidal marsh development. Practical and economical methods are needed to evaluate success of individual marsh creation or restoration.

(Author 's abstract)

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789. Decomposition of roots in a seasonally flooded swamp ecosystem.

Day, F. P. and Tupacz, E. G.

Aquatic Botany 37(3): 199-214. (Aug. 1990)

NAL Call #: QK102.A65; ISSN: 0304-3770.

Notes: NSF grant bsr-8405222

Descriptors: wetlands/ decomposition/ Great Dismal Swamp/ roots/ swamps/ annual floods/ decay rates/ detritus/ environmental effects/ forests/ lakes

Abstract: Decomposition rates of roots to a depth of 40 cm were estimated by two methods in four plant communities in the periodically flooded Great Dismal Swamp. The community dominants were: (1) *Chamaecyparis thuyoides*; (2) *Taxodium distichum*; (3) mixed *Quercus* spp. and (4)

Acer rubrum -*Nyssa* spp. respectively. Modified litter bags and a core method were simultaneously employed on three flooded sites and an unflooded site. Long vertical litter bags were developed to measure root decay over a vertical soil profile with minimal disturbance to the soil. Reciprocal samples (litter from each of the other sites) were placed on each site to examine the effects of litter quality. Roots in the cores exhibited higher decay rates than in the litter bags; rates in the bags ranged from 0.48 to 1.00 mg/g/d and the range for the cores was 1.15-2.74 mg/g/d. The core method was ineffective in estimating decay rates for the >5 mm diameter roots because of high sample variability. Reciprocal samples revealed statistically significant differences between root types, with roots from the mixed *Quercus* site being most resistant to decay. Just as leaf litter quality has been shown to regulate aboveground decomposition, root quality appears to play a major role in belowground decay. The study also demonstrated the importance of environmental influences since root decay was slowest on the sites (*Chamaecyparis* and *Acer-Nyssa*) with the longest duration of soil saturation. Both techniques exhibited slow decay rates with increasing depth. The litter bag technique is the recommended approach; several problems make the core technique a less than satisfactory method. (Author 's abstract)

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790. Demographic, landscape, and meteorological factors controlling the microbial pollution of coastal waters.

Mallin, M. A.; Ensign, S. H.; McIver, M. R.; Shank, G. C.; and Fowler, P. K.

Hydrobiologia 460(1-3): 185-193. (Sept. 2001)

NAL Call #: 410 H992; ISSN: 0018-8158

Descriptors: wetlands/ coastal waters/ pathogens/ water pollution/ fecal coliforms/ landscape/ agriculture/ bacterial demography/ coastal environments/ urban runoff/ urbanization/ biological pollutants/ pollutant persistence/ agricultural pollution/ agricultural runoff/ biodegradation/ microbial contamination/ public health/ environmental factors/ watersheds/ feces/ environmental effects/ shellfish/ USA, North Carolina/ shellfish/ bacteria/ other water systems/ pollution characteristics and fate/ public health, medicines, dangerous organisms/ viruses, bacteria, protists, fungi and plants/ marine pollution/ environment and ecology/ effects of pollution/ effects on water of human nonwater activities

Abstract: Coastal areas in the United States and many other countries are considered to be desirable regions to live and recreate. However, as human use of coastal land and water increases, so does the incidence of aquatic-borne disease from contact with contaminated water and eating contaminated shellfish. Movement of humans into coastal areas both greatly increases the number of sources of microbial pathogens and radically alters the landscape through increased construction activity and paving of former natural areas. On a regional scale, increases in human population over a 14-year period in coastal North Carolina were strongly correlated with increases in shellfish bed closures due to high fecal coliform bacterial counts. On a watershed scale, an analysis of several tidal creeks found strong correlations between mean estuarine fecal coliform bacterial counts and watershed population, percent developed area and especially with percent impervious surface coverage. Conversion of natural landscapes to

impervious surfaces (roads, drives, sidewalks, parking lots and roofs) removes the land's natural filtration capability, allows for increased concentration of pollutants at the land's surface and provides a means of rapid conveyance of pollutants to downstream waterways. An analysis of rural watersheds in the Coastal Plain found that stream fecal coliform counts and turbidity were both strongly correlated with rainfall in the previous 24 h in watersheds containing extensive industrial swine and poultry operations, as well as watersheds containing more traditional agriculture and cattle husbandry. In contrast, in watersheds rich in swamp wetlands these relationships were not significant, even in watersheds containing extensive animal production. Based on these findings, we suggest that waterborne microbial pathogen abundance can be minimized in urbanizing coastal areas through reduced use of impervious surfaces and maximal use of natural or constructed wetlands for passive stormwater runoff treatment. In animal husbandry areas, retention of natural wetlands and management practices designed to minimize sediment runoff can likely reduce inputs of pathogenic microbes into streams.

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791. Denitrification in a restored riparian forest wetland.

Lowrance, Richard; Vellidis, George; and Hubbard, Robert K.

Journal of Environmental Quality 24(5): 808-815. (1995)

NAL Call #: QH540.J6; ISSN: 0047-2425

<http://www.cpes.peachnet.edu/sewrl/Papers/denitrification.PDF>

Descriptors: wetlands/ denitrification/ riparian forests/ ecological restoration/ liquid manure/ nitrogen/ land application/ groundwater contamination/ nutrient management/ hydrogeology/ spatial variation/ temporal variation/ coastal plains/ southeastern United States

792. Depressional wetland vegetation types: A question of plant community development.

Kirkman, Katherine L.; Goebel, Charles P.; West, Larry; Drew, Mark B.; and Palik, Brian

Wetlands 20(2): 373-385. (2000)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

<http://www.treesearch.fs.fed.us/pubs/12569>

Descriptors: depressional wetlands/ isolated wetlands/ non-alluvial wetlands/ wetland plant communities/ reference wetlands/ wetland restoration/ fire/ succession

Abstract: When wetland restoration includes re-establishing native plant taxa as an objective, an understanding of the variables driving the development of plant communities is necessary. With this in mind, we examined soil and physiographic characteristics of depressional wetlands of three vegetation types (cypressgum swamps, cypress savannas, and grass-sedge marshes) located in a fire-maintained longleaf pine ecosystem in southwestern Georgia, USA. Our objective was to establish whether plant community development in these wetlands is controlled primarily by hydrogeomorphic features or by different disturbance histories. We did not identify physical features that uniquely separate the wetland vegetation types. Instead, we observed a range of topographic conditions that likely drive variations in hydrologic regimes, which in turn, are probable influences on fire regime. We propose that several long-term successional trajectories may be initiated in the prolonged absence of

fire, altered hydrology, or both, which link the distinctive vegetation types. Thus, a range of vegetation types may be suitable as potential restoration goals for these depressional wetlands. We suggest that the opportunities or constraints for use of prescribed fire in the long-term management of restored wetlands and adjacent uplands should be a significant consideration in the development of restoration strategies targeting specific plant communities. This citation is from Treeseearch.

793. Distribution of ammonium-N in the water-soil interface of a surface-flow constructed wetland for swine wastewater treatment.

Szogi, A. A. and Hunt, P. G.

Water Science and Technology 44(11/12): 157-162. (2001)
NAL Call #: TD420.A1P7; ISSN: 0273-1223

Descriptors: ammonia/ ammonium nitrogen/ artificial wetlands/ denitrification/ denitrifying microorganisms/ diffusion/ nitrification/ piggery effluent/ polluted water/ pollution control/ soil water/ volatilization/ waste management/ waste water/ waste water treatment/ water pollution

Abstract: Most livestock waste waters treated in constructed wetlands are typically rich in ammonium N. The objective of this study, which was conducted in North Carolina, USA, was to evaluate the soil-water ammonium distribution and the diffusive flux through the soil-water interface. Wetland system 1 was planted to rush (*Juncus effusus*) and bulrushes (*Scirpus americanus*, *S. cyperinus* and *S. validus*), and wetland system 2 was planted to bur-reed (*Sparganium americanum*) and cattails (*Typha latifolia* and *T. angustifolia*). Nitrogen was applied at a rate of 2.5 g m⁻² day⁻¹. Interstitial soil water was sampled at 9, 24, 50, and 70 m from the inlet. In both wetlands, we found that NH₄⁺ diffusion gradient and N losses were highest in the wetland system with lowest water depth. From other studies, we knew that shallower depths may have promoted a more effective interfacing of nitrifying and denitrifying environments. In turn, this N reduction in the water column may be the reason for steady NH₄⁺-N upward diffusion fluxes. The assumed mechanism for N removal has been nitrification and denitrification but ammonia volatilization could also have occurred. Although diffusion may explain a significant portion of the material transport between the soil-water interface, the large differences in concentrations between outlet and inlet need further explanation.

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794. Ecotone characterization between upland longleaf pine/wiregrass stands and seasonally-ponded isolated wetlands.

Kirkman, L. K.; Drew, M. B.; West, L. T.; and Blood, E. R.
Wetlands 18(3): 346-364. (Sept. 1998)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ seasonal variations/ vegetation/ rehabilitation/ multivariate analysis/ soil properties/ karst/ grasses/ species diversity/ decision making/ moisture/ community composition/ plant populations/ ecological distribution/ fire/ soils/ nature conservation/ ecosystem management/ environment management/ environmental factors/ ecotones/ forests/ fires/ soil/ USA, Georgia, Southwestern/ depressional wetlands/ water and plants/ habitat community studies/ conservation, wildlife management and recreation/ freshwater pollution

Abstract: We examined the physical and ecological

characteristics of ecotones between longleaf pine/wiregrass upland and seasonally-ponded isolated wetlands dominated by herbaceous species in a fire-maintained karst landscape of southwestern Georgia. The purpose of this study was to 1) examine patterns of plant species richness across the upland/wetland transitional zone relative to elevation and moisture gradients; 2) identify discontinuities (boundaries) of soil morphological characteristics, soil moisture, soil nutrient availability, and vegetation and their spatial relationships in the ecotone; and 3) examine the degree of coincidence of ecological thresholds with that of jurisdictional wetland/upland boundaries. Transects from upland to wetland were established relative to hydric soil boundaries for measurements of vegetation abundance, biomass, volumetric soil moisture, oxidation reduction potential, relative elevation, soil textural analysis by horizon, and available nitrogen and phosphorous. We used a moving windows analysis and multivariate analyses to examine ecological discontinuities in the ecotone. Ground-cover species richness was high along all transects with a peak in species richness in the non-hydric ecotonal zone. Abrupt changes in vegetation and environmental variables (soil moisture, soil depth to argillic horizon, and soil texture) were generally located below the hydric soil boundary and are likely related to frequent fire regimes. Discrepancies occurred in the determination of hydrophytic vegetation depending on methodology. These results have implications for the conservation of regional diversity, for depressional wetland restoration, and for regulatory decisions.

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795. Effect of a mesohaline constructed wetland on water chemistry discharged from a shrimp aquaculture facility in South Texas.

Badrinarayanan, H. 2001.

Texas A&M University - Kingsville

Notes: Degree: MS

Descriptors: wetlands/ shrimp culture/ aquaculture effluents/ water quality/ pollution control/ eutrophication/ USA, Texas/ effects of aquaculture on the environment/ effects of aquaculture on the environment/ prevention and control/ water & wastewater treatment

Abstract: A 7.69 ha (19-acre) mesohaline (3-8 ppt) constructed wetland treating 13644 m³/day (3.6 MGD) of effluent from 8.09 ha (20 acres) of intensively farmed shrimp ponds at the Loma Alta Shrimp Aquaculture Facility (LASAF), located in the semi-arid environment of South Texas, was found to reduce concentrations of total phosphorus, total suspended solids and inorganic suspended solids by 19%, 51% and 62%, respectively during the recirculation period and maintained consistently low levels of carbonaceous biochemical oxygen demand, dissolved oxygen, total ammonia and nitrate. Additionally, the size of wetland needed to treat total phosphorus, total suspended solids and inorganic suspended solids in the shrimp pond effluent to minimum achievable levels during recirculation was found to be in the ratio of 13:1, 6:1 and 6:1 (pond:wetland), respectively. The model, MARSH- DO, was developed and simulated to understand the effects of inorganic and organic loads on long-term behavior of dissolved oxygen in the wetland. Based on MARSH-DO, organic loading had the greatest impact on the dissolved oxygen concentration in the system. The goal of this study was to determine how well a constructed wetland

performed as a filter in a full-scale shrimp aquaculture operation. A constructed wetland was shown to perform satisfactorily as a recirculation filter in a full-scale shrimp aquaculture operation, reducing the impact of effluent on local water bodies, saving large quantities of water and providing valuable ecological habitat. (Abstract shortened by UMI.)

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796. Effect of forested wetlands on nitrate concentrations in ground water and surface water on the Delmarva Peninsula.

Phillips, P. J.; Denver, J. M.; Shedlock, R. J.; and Hamilton, P. A.

Wetlands 13(2 Special issue): 75-83. (1993)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ hydrology/ vegetation cover/ agriculture/ water quality/ nitrates/ ground water/ surface water/ forests/ USA, Maryland/ USA, Delaware/ USA, Virginia/ forests/ USA, Delmarva Peninsula/ vegetation cover/ nitrates/ geochemistry of sediments

Abstract: The Delmarva Peninsula is an extensively farmed region in which nitrate from commercial fertilizers and poultry has entered the ground water and streams. The peninsula contains forested wetlands in a variety of settings, and their size and location are a result of the surrounding hydrologic and soil conditions. Three regions, here referred to as hydrogeomorphic regions, were selected for study. Each region has characteristic geologic and geomorphic features, soils, drainage patterns, and distribution of farmland, forests, and forested wetlands. In all three regions, forested wetlands generally occupy poorly drained areas whereas farmlands generally occupy well-drained areas. The three hydrogeomorphic regions studied are the well-drained uplands, the poorly drained uplands, and the surficial-confined region. The well-drained uplands have the largest amount of farmland and the smallest amount of forested wetlands of the three regions; here the forested wetlands are generally restricted to narrow riparian zones. The poorly drained uplands contain forested wetlands in headwater depressions and riparian zones that are interspersed among well-drained farmlands. The surficial-confined region has the smallest amount of farmland and largest amount of forested wetlands of the three regions studied. Wetlands in this region occupy the same topographic settings as in the poorly drained uplands. Much of the farmland in the surficial-confined region was previously wetland. Nitrate concentrations in ground water and surface water on the peninsula range widely, and their distribution reflects (1) the interspersed of forests among farmland, (2) hydrogeologic conditions, (3) types of soils, and (4) the ground-water hydrology of forested wetlands. The well-drained uplands had higher median nitrate concentrations in ground water than the poorly drained uplands or the surficial-confined region. The highest nitrate concentrations were in oxic parts of the aquifer, which are beneath well-drained soils that are farmed, and the lowest were in anoxic parts of the aquifer, which are beneath poorly drained soils overlain by forested wetlands. The effect of forested wetlands on water quality depends on the hydrogeologic conditions, extent of farming, and type of soils. The three regions contain differing combinations of these factors and thus are useful for isolating the effects of forested wetlands on water quality.

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797. Effects of agriculture and wetland restoration on hydrology, soils, and water quality of a Carolina bay complex.

Bruland, G. L.; Hanchey, M. F.; and Richardson, C. J. *Wetlands Ecology and Management* 11(3): 141-156. (2003) NAL Call #: QH541.5.M3 W472; ISSN: 0923-4861

Descriptors: wetlands/ water quality/ agriculture/ soil/ hydrology/ ecosystems/ forests/ restoration/ environment management/ soils/ swamps/ water table/ agricultural pollution/ sediment chemistry/ nutrients (mineral)/ nitrogen/ phosphorus/ outflow/ environmental restoration/ USA, North Carolina, Cumberland ct./ USA, North Carolina/ nitrogen/ phosphorus/ Carolina bays

Abstract: We compared hydrology, soils, and water quality of an agricultural field (AG), a two-year-old restored wetland (RW), and two reference ecosystems (a non-riverine swamp forest (NRSF) and a high pocosin forest (POC)) located at the Barra Farms Regional Wetland Mitigation Bank, a Carolina bay complex in Cumberland County, North Carolina. Our main objectives were to: 1) determine if the RW exhibited hydrology comparable to a reference ecosystem, 2) characterize the soils of the AG, RW, and reference ecosystems, and 3) assess differences in water quality in the surface outflow from the AG, RW, and reference ecosystems. Water table data indicated that the hydrology of the RW has been successfully reestablished as the hydroperiod of the RW closely matched that of the NRSF in 1998 and 1999. Jurisdictional hydrologic success criterion was also met by the RW in both years. To characterize soil properties, soil cores from each ecosystem were analyzed for bulk density (D sub(b)), total carbon (C sub(t)), nitrogen (N sub(t)), and phosphorus (P sub(t)), extractable phosphate (PO sub(4w)), nitrogen (N sub(ex)), and cations (Ca sub(ex), Mg sub(ex), K sub(ex), Na sub(ex)), as well as pH. Bulk density, P sub(t), Ca sub(ex), Mg sub(ex), and pH were greatly elevated in the AG and RW compared to the reference ecosystems. Water quality monitoring consisted of measuring soluble reactive phosphorus (SRP), total phosphorus (TP), nitrate + nitrite (NOX), and total nitrogen (TN) concentrations in surface water from the AG, RW, and reference outflows. Outflow concentrations of SRP, TP, and NOX were highest and most variable in the AG, while TN was highest in the reference. This study suggested that while restoration of wetland hydrology has been successful in the short term, alteration of wetland soil properties by agriculture was so intense, that changes due to restoration were not apparent for most soil parameters. Restoration also appeared to provide water quality benefits, as outflow concentrations of SRP, TP, NOX, and TN were lower in the RW than the AG.

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798. Effects of pumped agricultural drainage water on wetland water quality.

Gilliam, J. W.; Chescheir, G. M.; Skaggs, R. W.; and Broadhead, R. G.

In: *Ecology and management of wetlands: Management, use and value of wetlands.* Hook, D. D. (eds.); Vol. 2. Beckenham, Kent, UK: Croom Helm Ltd.; pp. 275-283; 1988.

Descriptors: wetlands/ drainage systems/ land types/ drainage water/ nutrients/ removal/ sediment

Abstract: Two wetland filter areas in North Carolina were very effective in removing sediment, total P, total Kjeldahl N and nitrate N from pumped drainage water before it

reached an outlet. The occurrence of a "worst case" event (a very wet period during May-June shortly after fertilization and tillage) led to improvement of the design.
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799. Effects of soil pH, redox potential, and elevation on survival of *Spartina patens* planted at a west central Florida salt marsh restoration site.

Anastasiou, C. J. and Brooks, J. R.
Wetlands 23(4): 845-859. (Dec. 2003)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: wetlands/ salt marshes/ survival/ environmental restoration/ soil chemistry/ pH effects/ soils/ redox potential/ transplants/ restoration/ abiotic factors/ plant populations/ vegetation cover/ transplantation/ introduced species/ environmental effects/ sediment chemistry/ aquatic plants/ hydrogen ion concentration/ *Spartina*/ salinity/ grasses/ acidic soils/ *Spartina patens*/ *Casuarina*/ USA, Florida, Tampa Bay/ reclamation/ physiology, biochemistry, biophysics/ conservation, wildlife management and recreation/ chemical processes
Abstract: Planting *Spartina patens* (Salt Meadow Cord Grass) is an integral part of restoring salt marshes along Tampa Bay, Florida, USA. Of the salt marsh species that are planted, *S. patens* often has the lowest survivorship. State managers have hypothesized that this low survivorship is related to transplant shock and to acidic soil conditions commonly found under dense stands of *Casuarina* sp. (Australian Pine), an exotic invasive. This study documents planted *S. patens* health and survivorship over 11 months at a restoration site previously dominated by *Casuarina* sp. Three plots of 100 plants each were established in varying soil pH, with each plot covering above and below the recommended elevation range for *S. patens*. Transplant shock occurred within the first thirty days after planting and affected overall survival. *Spartina patens* survival was not affected by soil pH ($p = 0.827$) as evidenced by the presence of healthy individuals outside the plots, in soil pH ranging from 4.76 to 8.94. However, there was a sharp decline in plant health when redox potentials fell below -50 mV. Although elevation and redox potential were highly correlated ($p < 0.001$, $R^2 = 0.736$), plant health varied more with elevation ($p < 0.001$, $R^2 = 0.387$) than redox potential ($p < 0.001$, $R^2 = 0.950$), suggesting that elevation, while a good coarse predictor of site suitability, may not always be the best measure. Redox potential should be monitored, in addition to measuring elevation, to avoid planting in highly reduced areas. Furthermore, adjusting the lower limit of the target elevation range to a higher elevation will increase the amount of survivorship.

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800. 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.

801. Elevation, competition control, and species affect bottomland forest restoration.

McLeod, K. W.; Reed, M. R.; and Wike, L. D.
Wetlands 20(1): 162-168. (2000)
NAL Call #: QH75.A1W47; ISSN: 0277-5212
Descriptors: bottomland hardwood/ competition/ reforestation/ restoration/ southeastern United States/ swamp/ vegetation control
Abstract: This experiment examined how elevation and control of early successional vegetation would affect the growth and survival of tree species used in restoration. Vegetation was controlled by either mowing or spraying with Accord [glyphosate, -(phosphonomethyl)glycine, in the form of its isopropylamine salt] herbicide. These control methods were applied to either the entire plot or a narrow 1-m strip where seedlings were to be planted. A fifth treatment (control) had seedlings planted into the existing vegetation. Species planted were baldcypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), willow oak (*Quercus phellos*), Nuttall oak (*Q. nuttallii*), overcup oak (*Q. lyrata*), and cherrybark oak (*Q. falcata* var. *pagodaefolia*). Seedlings were randomly planted in late April 1993 with six rows in each plot and six trees per row on a 2 x 2 m spacing with five replicate plots per treatment. Survival was not enhanced by any competition control treatment, but survival among species differed. All six species had overall survival > 90% in autumn 1993. Species survival was affected by several summer floods during 1994. Baldcypress and overcup oak survival was greater than 89%, while water tupelo, Nuttall oak, and willow oak were all approximately 70%, and cherrybark oak was only 29%. By the end of 1995, survival of all species decreased further, but the species groupings remained the same. Survival and height growth of baldcypress and water tupelo were greatest at lower planting elevations. At higher elevations, survival of cherrybark oak and willow oak were greatest, while overcup oak and Nuttall oak were unaffected by elevation. Thus, controlling the herbaceous vegetation did not affect survival or growth as much as relative planting elevation due to site flooding and the flood tolerance of the species. All of the species in this experiment except cherrybark oak were successfully established.

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802. Environmental impacts to the Everglades ecosystem: A historical perspective and restoration strategies.

Chimney, M. J. and Goforth, G.
Water Science and Technology 44(11-12): 93-100. (2001)
NAL Call #: TD420.A1P7; ISSN: 0273-1223.
Notes: Conference: 7th International Conference on Wetland Systems for Water Pollution Control 2000, Lake Buena Vista, FL [USA], 11-16 Nov 2000; Issue editors: Kadlec, R. H. and Reddy, K. R.; ISBN: 1843394073
Descriptors: regional development/ environmental effects/ nonpoint pollution sources/ storm runoff/ water pollution control/ case studies/ history/ rehabilitation/ hydrology/ pollution (environmental)/ pollution (nonpoint sources)/ runoff/ case study/ renovation/ restoration/ environment management/ introduced species/ eutrophication/ pollution control/ freshwater pollution/ habitat improvement (physical)/ river engineering/ wastewater treatment/ regional planning/ governments/ environmental restoration/ stormwater runoff/ historical account/ nutrient loading/ USA,

Florida, Everglades/ treatment wetlands/ water quality control/ water resources and supplies/ conservation, wildlife management and recreation/ freshwater pollution/ water and wastewater treatment

Abstract: The Everglades is a vast subtropical wetland that dominates the landscape of south Florida and is widely recognized as an ecosystem of great ecological importance. As a result of anthropogenic disturbances over the past 100 years (i.e., agricultural and urban development, eutrophication resulting from stormwater runoff, changes in hydrology and invasion of exotic species), the biotic integrity of the entire Everglades is now threatened. To protect this valuable resource, the state of Florida and the Federal Government, in cooperation with other interested parties, have developed a comprehensive restoration strategy that addresses controlling excess nutrient loading and reestablishment of a more natural hydrology. These efforts include building approximately 17,000 ha of treatment wetlands, referred to as Stormwater Treatment Areas, to treat surface runoff before it is discharged into the Everglades. We briefly discuss the history of the Everglades in the context of environmental disturbance and outline the steps being taken to ensure its survival for future generations.

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803. Estimating the effectiveness of vegetated floodplains/wetlands as nitrate-nitrite and orthophosphorus filters.

Yates, P. and Sheridan, J. M.

Agriculture, Ecosystems and Environment 6(3): 303-314. (May 1983)

NAL Call #: S601.A34; ISSN: 0167-8809

Descriptors: wetlands/ floodplains/ nitrates/ nitrites/ orthophosphorus/ forest watersheds/ agricultural watersheds/ vegetation/ water quality/ nonpoint pollution sources/ fate of pollutants/ dilution/ sources and fate of pollution/ water quality control

Abstract: The role of vegetated floodplains/wetlands on the stream water quality of agroecosystems in the Coastal Plain region of the southeastern United States is reported. Water-borne nitrate plus nitrite nitrogen budgets and orthophosphate phosphorus budgets from a cropped agricultural area were compared with those of a watershed with alluvial forests below the cropped areas. Analyses were made to determine if observed differences in nutrient concentrations and loads were the result of dilution of cropped area runoff by flows from non-cropped areas. Reductions in the observed levels of nitrate plus nitrite nitrogen and orthophosphate phosphorus between upland cropped areas and watershed outlets exceed reductions that would be caused by dilution effects. Significant portions of the observed nutrients leaving cropped areas were retained, utilized and/or transformed in the vegetated floodplains/wetlands characteristic of these Coastal Plain watersheds. (Author's abstract)

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804. 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/ 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 [µg] 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 [µg]/L and from 0.1 to 27.0 [µg]/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 [µg]/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. [copyright] 2004 Wiley Periodicals, Inc.

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805. Evaluation of wetland buffer areas for treatment of pumped agricultural drainage water.

Chescheir, G. M.; Skaggs, R. W.; and Gilliam, J. W.

Transactions of the ASAE 35(1): 175-182. (1992)

NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: drainage water/ decontamination/ hydrology/ simulation models/ wetland soils/ North Carolina

Abstract: A computer method was developed for predicting nutrient and sediment removal from agricultural drainage water pumped onto wetland buffer areas. The method utilizes a model for simulating drainage from agricultural land and a model for simulating overland flow, and nutrient and sediment removal on wetlands. Both simulation models were calibrated using data collected in field experiments. The simulation models were then coupled to predict the percent removal of sediment, total phosphorus (P), total

Kjeldahl nitrogen (TKN), and nitrate nitrogen (NO₃-N) from drainage water for a 20-year period of climatological data. This method predicted that the 240 ha wetland buffer at the field research site could be expected to remove over 79% of the TKN, NO₃-N, P, and sediment in drainage water from a 1250 ha agricultural watershed. The method was used to evaluate the effects of buffer size and shape on the nutrient and sediment removal effectiveness of the wetland. This citation is from AGRICOLA.

806. Evapotranspiration from Florida pondcypress swamps.

Ewel, K. C. and Smith, J. E.

Water Resources Bulletin 28(2): 299-304.

(Mar. 1992-Apr. 1992)

NAL Call #: 292.9 AM34; ISSN: 0043-1370.

Notes: USDI grant no. 14-08-0001-G899

Descriptors: evapotranspiration/ Florida/ cypress swamps/ clear cutting/ forest management/ coastal plain/ water level/ swamps/ canopy/ trees/ growth/ pine trees/ interception/ wetland enhancement/ water resources management/ evaporation and transpiration/ watershed protection

Abstract: Pondcypress (*Taxodium distichum* var. *nutans*) dominates small isolated swamps throughout Florida and the southeastern coastal plain. The wide distribution of coastal swamps and the increasing interest in managing them for various purposes have made it important that the role of cypress swamps in regional ecological relationships be better understood. Diurnal changes in water levels in 3 swamps dominated by pondcypress, were measured in central Florida for 4 years to obtain additional documentation of relatively low evapotranspiration (ET) rates. Two of these swamps were monitored for another 3 years after one of them was clearcut. Estimated annual ET from undisturbed cypress swamps varied from 38 cm/yr, averaging 60 cm (not including interception). Faster ET rates may have been related to faster pondcypress growth rates, a greater proportion of hardwoods in the canopy, and clearcutting in the surrounding pine plantation. The average ET rate was considerably lower than ET rates that have been estimated for north Florida pine plantations. However, incorporating estimates of interception indicates that overall ET rates in pondcypress swamps may be only slightly lower than ET from pine plantations. ET decreased only 5% in one swamp after it was clearcut, indicating that this management practice is not likely to affect regional water balances. (Author's abstract)

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807. The Everglades nutrient removal project: A constructed wetland designed to treat agricultural runoff drainage.

Abtew, W.; Chimney, M. J.; Kosier, T.; Guardo, M.; Newman, S.; and Obeysekera, J.

In: *Versatility of Wetlands in the Agricultural Landscape*.

(Held 17 Sep 1995-20 Sep 1995 at Hyatt Regency, Tampa, Fla.)

St Joseph, Mo.: American Society of Agricultural Engineers (ASAE); pp. 45-56; 1995.

NAL Call #: QH87.3.V47 1995

Descriptors: wetlands/ marshes/ variation/ aerial photography/ nutrients/ removal/ losses from soil/ runoff/ drainage water/ phosphorus/ land types

Abstract: The 1544 ha Everglades Nutrient Removal Project (ENR) was designed to reduce P contents in

agricultural runoff/drainage. ENR was built on former cropland and consists of 5 cells ranging from 55 (buffer cell) to 525 ha. The Buffer Cell distributes inflow to 2 independent treatment trains. The other cells are either natural cattail marshes, planted mixed marsh or periphyton/submerged macrophyte community. Aerial photography was used to document spatial and temporal changes in the ENR macrophyte community. Preliminary observations showed that total P outflow was about 5 times lower than the inflow amounts.

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808. Extreme spatial variability and unprecedented methylmercury concentrations within a constructed wetland.

Rumbold, D. G. and Fink, L. E.

Environmental Monitoring and Assessment 112(1-3): 115-135. (2006)

NAL Call #: TD194; ISSN: 0167-6369

Descriptors: toxicology/ freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ bioprocess engineering/ constructed wetland/ applied and field techniques/ spatial variability/ agricultural runoff/ surfacewater/ eutrophication reduction/ stormwater treatment area

Abstract: We began monitoring concentrations of both total mercury (THg) and methylmercury (MeHg) in surface water at Stormwater Treatment Area-2 (STA) on July 20, 2000.

This 2602 hectare STA was constructed with three independent marshes to remove phosphorus from agricultural runoff and reduce eutrophication in the northern Everglades. However, there was concern that in doing so, STA-2 might inadvertently worsen the existing mercury problem in the Everglades. Accordingly, operating permits stipulated that flow-through operation of these treatment cells could not begin until concentrations of THg and MeHg in the interior marsh were not significantly greater than corresponding concentrations in the supply canal. Cells 2 and 3 quickly met the start-up criteria in the fall of 2000. In contrast, Cell 1 exhibited anomalously high MeHg concentrations in the fall of 2000 and 2001, and the summer of 2002. During the last such event, water-column concentrations in Cell 1 reached 32 ng THg/L and an unprecedented 20 ng MeHg/L. Tissue Hg in resident fishes reached levels as high as 430 ng/g in mosquitofish, *Gambusia holbrooki*, 930 ng/g in sunfish, *Lepomis* spp., and 2000 ng/g in largemouth bass, *Micropterus salmoides*. Guided by results from the monitoring program, flow rate and water depth were managed as a means to alter sulfur biogeochemistry and, thereby, reduce in situ mercury methylation. This adaptive management strategy likely played a role in the decline in water-column concentrations of THg and MeHg in Cell 1 by late 2002 and the subsequent declines in tissue Hg levels in resident fishes. Cell 1 finally met formal start-up criteria on November 26, 2002.

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809. Factors affecting phosphate uptake by peat soils of the Florida Everglades.

Amador, J. A.; Richany, G. H.; and Jones, R. D.

Soil Science 153(6): 463-470. (June 1992)

NAL Call #: 56.8 So3; ISSN: 0038-075X.

Notes: National Park Service Grant no. Ca-5280-8-8007.

Descriptors: wetlands/ phosphates/ path of pollutants/ farm

wastes/ peat soils/ Florida Everglades/ environmental impact/ freshwater pollution/ water pollution control/ surface runoff/ soil chemistry/ soil chemistry/ agricultural runoff/ fertilizers/ nutrients/ phosphorus/ sources and fate of pollution/ estuaries

Abstract: The Florida Everglades constitutes a unique, historically oligotrophic ecosystem threatened by the effects of phosphate (PO₄) pollution resulting from agricultural runoff. The Florida Everglades was investigated to determine its capacity to remove PO₄ from solution and to study the effects of total P content of the soil, PO₄ concentration of the water, autoclaving, and glucose and ammonium addition on PO₄ removal by neutral peats of the Florida Everglades. Samples of peat soils were obtained from an area impacted by water with a high total P content and an unimpacted area, both within Everglades National Park. PO₄ removal was determined by passing a solution containing a known PO₄ concentration (0 to 12.5 microM) through a soil column and measuring the difference in concentration between the influent and effluent solutions over time. Removal rates for both soils were nearly constant with time at the lower PO₄ concentrations, but decreased with time at higher PO₄ concentrations; these values were consistently higher for the soil from the unimpacted site than for the impacted site. Autoclaving the unimpacted soil diminished the initial rate and extent of PO₄ removal by the soil. Addition of 100 microM NH₄Cl to the unimpacted soil increased the removal of P from 1.0 and 10.0 microM solutions. Glucose (15 mg C/L) had no effect on the removal from 2.5 and 10 microM PO₄ by the unimpacted soil. PO₄ removal in natural peats is controlled by a combination of biotic and abiotic processes, the relative importance of which is determined by the concentration of PO₄ in the water. (Author's abstract)
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810. 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: USA, 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 gulosus* 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.
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811. Has the conversion of natural wetlands to agricultural land increased the incidence and severity of damaging freezes in south Florida?

Marshall, Curtis H.; Pielke, Roger A.; and Steyaert, Louis T.
Monthly Weather Review 132(9): 2243-2258. (2004);
ISSN: 1520-0493
<http://blue.atmos.colostate.edu/publications/pdf/R-281.pdf>

Descriptors: land use effects on temperature/ land use effects on wetlands/ climate and agriculture/ freezing temperatures/ frost damage to crops/ Regional Atmospheric Modeling System (RAMS)/ U.S. satellite, LANDSAT/ energy budget at Earth's surface/ time series analysis/ land use/ climatic changes/ agriculture/ temperature effects/ freezing crops/ man-induced effects/ moisture transfer/ temperature differences/ environment management/ climate/ air temperature/ energy budget/ ocean-atmosphere system/ anthropogenic factors

Abstract: On several occasions, winter freezes have wrought severe destruction on Florida agriculture. A series of devastating freezes around the turn of the twentieth century, and again during the 1980s, were related to anomalies in the large-scale flow of the ocean-atmosphere system. During the twentieth century, substantial areas of wetlands in south Florida were drained and converted to agricultural land for winter fresh vegetable and sugarcane production. During this time, much of the citrus industry also was relocated to those areas to escape the risk of freeze farther to the north. The purpose of this paper is to present a modeling study designed to investigate whether the conversion of the wetlands to agriculture itself could have resulted in or exacerbated the severity of recent freezes in those agricultural areas of south Florida. For three recent freeze events, a pair of simulations was undertaken with the Regional Atmospheric Modeling System. One member of each pair employed land surface properties that represent pre-1900s (near natural) land cover, whereas the other member of each pair employed data that represent near-current land-use patterns as derived from analysis of Landsat data valid for 1992/93. These two different land cover datasets capture well the conversion of wetlands to agriculture in south Florida during the twentieth century. Use of current land surface properties resulted in colder simulated minimum temperatures and temperatures that remained below freezing for a longer period at locations of key agricultural production centers in south Florida that were once natural wetlands. Examination of time series of the surface energy budget from one of the cases reveals that when natural land cover is used, a persistent moisture flux from the underlying wetlands during the nighttime hours served to prevent the development of below-freezing temperatures at those same locations. When the model results were subjected to an important sensitivity factor, the depth of standing water in the wetlands, the outcome remained consistent. These results provide another example of the potential for humans to perturb the climate system in ways that can have severe socioeconomic consequences by altering the land surface alone.
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812. 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/ gap and skidder rut wetland creation/ conservation/ implications of community responses to forest gap and skidder rut wetland creation/ community structure/ response to gap and skidder rut wetland creation/ forest and woodland/ bottomland

hardwood forest/ man made habitat/ skidder rut wetland/ forest habitat/ community responses/ South Carolina/ Barnwell County/ Savannah River site/ community response to gap and skidder rut wetland creation/ hardwood forests

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.
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813. Hydrodynamic modeling of wetlands for flood detention.

Tsihrintzis, V. A.; John, D. L.; and Tremblay, P. J. *Water Resources Management* 12(4): 251-269. (Aug. 1998)
NAL Call #: TC401.W27; ISSN: 0920-4741 [WRMAEJ]

Descriptors: wetlands/ flood control/ hydrodynamics/ drainage/ hydraulic structures/ simulation models/ mathematical models/ structural design/ water flow/ Florida/ detention basins/ SWMM EXTRAN model

Abstract: The application of a link-node model in modeling hydrodynamics of wetland areas related to flood detention design is presented through the description of modeling and design efforts of an actual project, the first privately-owned wetland mitigation bank in Florida. The 142-ha project is located in the Chapel Trail Preserve of the City of Pembroke Pines, South Florida, where a degraded site is transformed into a healthy, self-sustaining wetland ecosystem. Creation of the wetlands, located adjacent to an existing development, required careful evaluation of drainage conditions. To properly design the wetland site, a hydrodynamic model was developed which allowed sizing of hydraulic structures and computation of maximum water surface elevations. The paper presents model description and calibration using field data, parameter sensitivity, general application in the project and use as a design tool. The model was found to be a valuable tool that can be applied in similar projects.

This citation is from AGRICOLA.

814. Hydrologic balance for a subtropical treatment wetland constructed for nutrient removal.

Guardo, M. *Ecological Engineering* 12(3-4): 315-337. (1999)
NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: agricultural runoff/ drainage/ constructed wetlands/ environmental restoration/ Everglades ecosystem/ hydraulic retention time/ hydrologic balance/ hydroperiod/ seepage

Abstract: This paper reports on an analysis of a water budget for the Everglades Nutrient Removal (ENR) Project in South Florida, USA, for the first 2 years of operation. Estimates of nominal hydraulic retention time (HRT) based on average monthly values are compared with HRT obtained from steady-state two-dimensional hydrodynamic simulations, and show good agreement. Statistical analysis is performed to develop stage- and depth-duration curves for the ENR Project. The ENR Project was constructed south of Lake Okeechobee by the South Florida Water Management District to begin the process of removing nutrients (especially phosphorus) from agricultural drainage and stormwater run-off before entering the Everglades. The State of Florida's Everglades Forever Act of 1994 mandates, among other things, completion of stormwater treatment areas (STAs), and research to optimize phosphorus retention capacity, and to define threshold phosphorus concentrations that lead to an imbalance of biota. The ENR Project, a 1544-ha wetland, was designed and constructed as a pilot project to gain experience on design, construction, and operation of the STAs. It began operation in August 1994. For the 732 days analyzed (19 August 1994-19 August 1996), the average water inputs into the project were as follows: 86.2% from the inflow pumps, 11.2% from rainfall, and 2.6% as emerging measured and estimated seepage from an adjacent area with higher stages (Water Conservation Area 1). The average water outputs from the project consisted of 85.1% from the outflow pumps, 8.9% as evapotranspiration, and 6.0% as a net seepage and groundwater component. This net component accounts for elements of the surface/subsurface water interaction, either entering or leaving the project, which are unknown at this time. Considering monthly average values, there were only 3 months within the study period with positive values of this net component. These months were June 1995, and March and July 1996. The two most important elements included in the net seepage and groundwater component are expected to be the surficial aquifer recharge (outflow), and the unmeasured seepage (inflow) from Water Conservation Area 1 (subsurface seepage). The unmeasured subsurface seepage has recently been determined from computer model simulations.

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815. Hydrologic characterization of two prior converted wetland restoration sites in eastern North Carolina.

Tweedy, K. L. and Evans, R. O. *Transactions of the ASAE* 44(5): 1135-1142. (Sept. 2001-Oct. 2001)
NAL Call #: 290.9 AM32T; ISSN: 0001-2351

Descriptors: wetlands/ USA, North Carolina, Beaufort Cty./ USA, North Carolina, Craven Cty./ water resources management/ hydrology/ agricultural practices/ environmental policy/ restoration/ water management/ topographic effects/ outflow/ water levels/ USA, North Carolina, Beaufort Cty./ USA, North Carolina, Craven Cty./ protective measures and control/ general environmental engineering

Abstract: Wetland losses resulting from conversion to agriculture and other land uses has generated considerable

interest in wetland restoration. Increased federal and local regulations have mandated that wetland areas must be protected, and when loss is unavoidable, mitigation and restoration efforts are required. Establishing appropriate hydrologic functions will inherently influence wetland restoration success. This research involved a three-year field study to develop guidelines for restoring wetland hydrologic function to drained agricultural fields. Two field sites (9.2 ha and 10.4 ha) located in Beaufort and Craven Counties, North Carolina, were instrumented and monitored to evaluate the effectiveness of the restoration treatments used. Experimental treatments included two levels of water table management (high outlet control at 15 cm above average land surface and low outlet control at 15 cm below average land surface) and two types of surface contouring (smooth and rough) to control runoff. The restoration treatments imposed at the Beaufort County site created a range of wet conditions. The high water table management, rough microtopography treatment displayed the most consecutive and total number of days with the water table less than 30 cm deep, while the low water table management, smooth microtopography treatment displayed the driest conditions. The restored wetland status of the Craven County site was marginal. Due to both lateral seepage and seepage around the water control structures, the intended levels of water table management at the Craven County site could not be maintained. Roughing of the soil surface reduced the amount of outflow from restoration treatments by approximately 30% compared to the smooth microtopography treatments. Rough microtopography also reduced peak outflow rates and increased the duration of outflow events.

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816. Hydrologic influence on stability of organic phosphorus in wetland detritus.

Pant, H. K. and Reddy, K. R.

Journal of Environmental Quality 30(2): 668-674. (Mar. 2000-Apr. 2000)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: wetlands/ organic matter/ environmental management/ phosphorus/ phosphates/ detritus/ hydrology/ nutrients/ biogeochemistry/ USA, Florida/ nutrient removal/ residence time/ organic phosphorus/ nutrients (mineral)/ aquatic plants/ drainage water/ agricultural runoff/ agricultural pollution/ microorganisms/ dispersion/ flooding/ water table/ typha/ USA, Florida, Everglades/ water resources and supplies/ freshwater pollution/ water in soils/ characteristics, behavior and fate/ water pollution: monitoring, control & remediation

Abstract: Accretion of organic matter in wetlands provides long-term storage for nutrients and other contaminants. Water-table fluctuations and resulting alternate flooded and drained conditions may substantially alter the stability of stored materials including phosphorus (P). To study the effects of hydrologic fluctuation on P mobilization in wetlands, recently accreted detrital material (derived primarily from *Typha* spp.) was collected from the Everglades Nutrient Removal Project (ENRP), a constructed wetland used to treat agricultural drainage water in the northern Everglades. The detrital material was subjected to different periods of drawdown and consecutive reflooding under laboratory conditions. The super(31)P nuclear magnetic resonance (super(31)P NMR) spectroscopy analysis revealed that sugar phosphate,

glycerophosphate, polynucleotides, and phospholipids (glycerophosphoethanolamine and glycerophosphocholine) were the major forms of P in the detrital material. After 30 d of drawdown, polynucleotides were reduced to trace levels, whereas sugar phosphate, glycerophosphate, and phospholipids remained the major fractions of organic P. Microorganisms seemed to preferentially utilize nucleic acid P, perhaps to obtain associated nutrients including carbon and nitrogen. At the end of the 30-d reflooding period, cumulative P flux from detritus to water column accounted for 3% of the total P (less than or equal to 15 d of drawdown) and further decreased to 2% at 30 d of drawdown, but increased to 8% at 60 d of drawdown. The drawdown (less than or equal to 30 d) not only reduced P flux to the water column, but also increased the humification and microbial immobilization of P. Excessive drawdown (60 d), however, triggered the release of P into the water column as the water content of detritus decreased from 95 to 11%.

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817. Hydrology and pollutant removal effectiveness of wetland buffer areas receiving pumped agricultural drainage water.

Chescheir, G. M.; Gilliam, J. W.; Skaggs, R. W.; Broadhead, R. G.; and Lea, R.

Raleigh, N.C.: North Carolina Water Resources Research Institute; Report No. 231, 1987. 170 p.

Notes: NTIS number: PB88-128061

Descriptors: agricultural runoff/ wetland buffers/ swamps/ pumped agricultural drainage/ surface drainage/ North Carolina/ water quality/ drainage effects/ drainage ditches/ nutrients/ sediment loading/ tidewater region/ drainmod model

Abstract: The hydrology and pollutant-removing effectiveness of two wetland areas being used to buffer impacts of pumped agricultural drainage in Eastern North Carolina were studied. Collection and analysis of field data over a two-year period showed that buffer one, originally equipped with an efficient diffuser canal, was essentially 100% effective for pollutant removal for all observed events. Less effective flow distribution, less area and faster drainage resulting from a greater elevation at buffer two resulted in less effective removal. Hydrology of a buffer area was simulated with a wetland simulation model for overland flow through vegetated areas. A routine was added to calculate residence time of the water on the buffer and percent removal of nutrients. Hourly surface and subsurface field drainage volumes calculated by a water management model. The two models estimated that over a 20-year period, study buffer one would remove 79% of total Kjeldahl nitrogen, 82% of nitrate nitrogen, 81% of total phosphorus, and 92% of sediment. Study of the response of wetland forest to pumped agricultural drainage showed pronounced overstory thinning and resultant increased floor regeneration, decreased plant diversity, and decreased annual tree diameter increment at buffer one, and decreased annual tree diameter at buffer two. (Lambert-UNC-WRRI)

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818. Importance of small isolated wetlands for herpetofaunal diversity in managed, young growth forests in the Coastal Plain of South Carolina.

Russell, Kevin R.; Guynn, David C.; and Hanlin, Hugh G. *Forest Ecology and Management* 163(1-3): 43-59. (June 2002)

NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: Amphibia/ Reptilia/ community structure/ semiaquatic habitat/ small isolated wetlands in managed forests/ forest and woodland/ managed forests/ South Carolina/ Marion County/ Woodbury tract/ isolated wetlands in managed forests

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.

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819. In-stream wetland design for non-point source pollution abatement.

Stone, K. C.; Hunt, P. G.; Novak, J. M.; and Johnson, M. H. *Applied Engineering in Agriculture* 19(2): 171-175. (2003)

NAL Call #: S671.A66; ISSN: 0883-8542

Descriptors: wetlands/ ammonia/ design/ nitrogen

Abstract: Nonpoint source pollution (NPS) of rivers and streams is a major concern worldwide. Most methods for NPS mitigation focus on source reductions; few have been developed to mitigate NPS once nutrients have entered streams. One system that has been shown to be effective in reducing stream nitrogen is by using in-stream wetlands (ISW). The objective of this research was to determine if design approaches used in constructed wetlands could be applied to predict ISW effectiveness in treating NPS. The

3.3-ha ISW studied was located in a 425-ha watershed in eastern North Carolina. We analyzed the data from the ISW to calculate the first-order rate constants (K20 and dimensionless temperature coefficient, θ) for the k-C* model used in constructed wetland design. We found that our calculated rate constants were in close agreement with literature estimates with TN K20 = 19-20 m/y and θ = 1.0-1.03. NO3-N rate constants were K20 = 38 - 54 m/y and θ = 1.07 - 1.13. The design equations used for constructed wetlands can be successfully used to predict the performance of the ISW'S prior to their implementation. © 2006 Elsevier B.V. All rights reserved.

820. Influence of a riparian wetland on nitrate and herbicides exported from an agricultural field.

Angier, J. T.; McCarty, G. W.; Rice, C. P.; and Bialek, K. *Journal of Agricultural and Food Chemistry* 50(15): 4424-4429. (2002)

NAL Call #: 381 J8223; ISSN: 0021-8561

Descriptors: wetlands/ nitrates/ herbicide residues/ losses from soil/ fields/ agricultural land/ streams/ water pollution/ groundwater contamination

Abstract: Agrochemicals are a major source of nonpoint pollution. Forested corridors along stream channels (riparian zones) are thought to be potential sites for removal of agricultural contaminants from ground and surface waters. First-order riparian wetlands are reputed to be especially effective at groundwater remediation. The study site is a fairly typical (for eastern Maryland) small, first-order stream in an agricultural watershed. Preferential flow supplies most of the stream water within the riparian headwater wetland. This upstream area also contains the highest average stream N and pesticide loads in the entire first-order riparian system. Zones of active groundwater emergence onto the surface display high concentrations of nitrate throughout the soil profile and in the exfiltrating water, whereas inactive areas (where there is no visible upwelling) show rapid attenuation of nitrate with decreasing depths. Atrazine degradation products appear to penetrate more readily through the most active upwelling zones, and there is a correlation between zones of high nitrate and high atrazine metabolite levels. Deethylatrazine/atrazine ratios (DAR) seem to indicate that stream flow is dominated by ground water and that much of the ground water may have reached the stream via preferential flow. Remediative processes appear to be very complex, heterogeneous, and variable in these systems, so additional research is needed before effective formulation and application of riparian zone initiatives and guidelines can be accomplished. This citation is from AGRICOLA.

821. Influence of a willow canopy on tree seedling establishment for wetland restoration.

McLeod, K. W.; Reed, M. R.; and Nelson, E. A. *Wetlands* 21(3): 395-402. (Sept. 2001)

Descriptors: wetlands/ plant populations/ microhabitats/ restoration/ interspecific relationships/ riparian environments/ environmental restoration/ canopies/ floods/ canopy/ habitats/ riparian vegetation/ willow trees/ oak trees/ trees/ seedlings/ flooding/ habitat/ Quercus lyrata/ Carya aquatica/ Taxodium distichum/ Salix nigra/ Quercus laurifolia/ black willow/ overcup oak/ baldcypress/ water hickory/ restoration/ laurel oak/ protective measures and control/ reclamation/ environmental action

Abstract: Black willow (*Salix nigra*) is a well-known pioneer

species of disturbed riparian areas. It competes for nutrients, light, and water, but it may also act as a "nurse" crop, providing shelter for other species from high light and temperature; so, the overall effect on species planted under a willow canopy could be positive or negative. This experiment examined the response of container-grown seedlings of four tree species outplanted into three habitats: 1) an existing willow stand, 2) a similar habitat, but with the willow canopy removed, and 3) an adjacent grass-dominated area free of willow. After three years, survival rates of overcup oak (*Quercus lyrata*), baldcypress (*Taxodium distichum*), and water hickory (*Carya aquatica*) were not reduced under the willow canopy relative to the other two treatments. Laurel oak (*Q. laurifolia*) was killed by several floods during the first growing season. Height of baldcypress seedlings planted under a willow canopy was less than for seedlings where the willow had been removed. Water hickory and overcup oak height were not affected by the willow canopy. Elevation of the planting sites, indicating probable soil wetness, was a good indicator of survival when used in conjunction with the species flood-tolerance. The existing willow stand was not detrimental to survival of three of the outplanted tree species. Thus, willow removal is unnecessary for successful outplanting, saving time and money.

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822. Influence of temperature on treatment efficiency of constructed wetlands.

Hill, D. T. and Payton, J. D.

Transactions of the ASAE 41(2): 393-396. (1998)

NAL Call #: 290.9 Am32T; ISSN: 0001-2351

Descriptors: wetlands/ poultry/ slurries/ biological treatment/ water quality/ chemical oxygen demand/ biochemical oxygen demand/ ammonium nitrogen/ nitrate nitrogen/ phosphorus/ water temperature/ animal manures/ excreta/ lagoons/ orthophosphorus/ organic nitrogen

Abstract: An existing free-water-surface constructed wetland system at the Auburn University Poultry Science Unit was used to evaluate the effects of water temperature on the treatment of poultry lagoon effluent. Each wetland consisted of two cells in series. One series was planted with an approximate 10% fill of *Sagittaria lancifolia*. A second series contained *Phragmites australis* and *Scirpus* spp. with an approximate 5% fill of plants. A third series was unvegetated and acted as a control. Wastewater samples were collected approximately every 12 days at the influent and effluent of each cell and analyzed for TKN, ammonia, nitrate, BOD₅, COD, total phosphorus, orthophosphorus, and potassium. Water temperature was measured using thermographs placed at the midpoint of each cell with temperature readings being taken each hour from July 1995 until June 1996. The percent removal of each wastewater pollutant from each series was compared to the average water temperature over the sampling period (every 12 days) to determine what effect, if any, temperature had on treatment. For most cases, temperature was not found to significantly affect treatment of poultry wastewater. Treatment efficiency (percent removal) was significantly correlated to temperature in one series for ammonia, one series for nitrate, one series for total phosphorus and one series for orthophosphorus. Mass removal was not correlated to temperature in any of the cases studied.

This citation is from AGRICOLA.

823. 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/ USA, 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 farmers more flexibility to manage their farms, to diversify their incomes, and to be good land stewards.

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824. Large-scale constructed wetlands for nutrient removal from stormwater runoff: An Everglades restoration project.

Guardo, M.; Fink, L.; Fontaine, T. D.; Newman, S.;

Chimney, M.; Bearzotti, R.; and Goforth, G.

Environmental Management 19(6): 879-889. (1995)

NAL Call #: HC79.E5E5; ISSN: 0364-152X

Descriptors: environmental restoration/ storm water/ nutrient uptake/ agrochemicals/ nutrients/ artificial wetlands/ pollution control/ bioaccumulation/ biodegradation/ water reclamation/ environment management/ stormwater runoff/ agricultural runoff/ storm runoff/ water pollution treatment/ agricultural chemicals/ nutrients (mineral)/ USA, Florida/ USA, Florida, Everglades/ stormwater runoff/ storm runoff/ water pollution treatment/ agricultural chemicals/

agricultural runoff/ nutrients (mineral)/ storm water/ nutrient uptake/ artificial wetlands/ water reclamation/ environmental restoration/ agrochemicals/ pollution control/ environment management/ nutrients/ reclamation/ environmental action/ water quality control/ prevention and control

Abstract: The South Florida Water Management District (SFWMD) constructed a wetland south of Lake Okeechobee to begin the process of removing nutrients (especially phosphorus) from agricultural stormwater runoff entering the Everglades. The project, called the Everglades Nutrient Removal (ENR) project, is a prototype for larger, similarly constructed wetlands that the SFWMD will build as part of the Everglades restoration program. This innovative project is believed to be one of the largest agricultural stormwater cleanup projects in the United States, if not in the world. This publication describes the ENR project's design, construction, and proposed operation, as well as the proposed research program to be implemented over the next few years.

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825. Long-term effects of a lock and dam and greentree reservoir management on a bottomland hardwood forest.

King, Sammy L.; Allen, James A.; and McCoy, John W. *Forest Ecology and Management* 112(3): 213-226. (1998)
NAL Call #: SD1.F73; ISSN: 0378-1127

Descriptors: bottomland hardwood forest/ competition/ dam management/ flooding/ greentree reservoir/ habitat/ lock management/ resource management/ riparian wetland/ stress response/ succession

Abstract: We investigated the long-term effects of a lock and dam and greentree reservoir management on a riparian bottomland hardwood forest in southern Arkansas, USA, by monitoring stress, mortality, and regeneration of bottomland hardwood trees in 53 permanent sampling plots from 1987-1995. The lock and dam and greentree reservoir management have altered the timing, depth, and duration of flooding within the wetland forest. Evaluation of daily river stage data indicates that November overbank flooding (i.e. 0.3 m above normal pool) of 1 week duration occurred only 10 times from 1950 to 1995 and four of these occurrences were the result of artificial flooding of the greentree reservoir. Results of the vegetation study indicate that the five most common dominant and co-dominant species were overcup oak, water hickory, Nuttall oak, willow oak, and sweetgum. Mortality of willow oak exceeded that of all other species except Nuttall oak. Nuttall oak, willow oak, and water hickory had much higher percentages of dead trees concentrated within the dominant and co-dominant crown classes. Probit analysis indicated that differences in stress and mortality were due to a combination of flooding and stand competition. Overcup oak appears to exhibit very little stress regardless of crown class and elevation and, with few exceptions, had a significantly greater probability of occurring within lower stress classes than any other species. Only 22 new stems were recruited into the 5 cm diameter-at-breast height size class between 1990-1995 and of these, three were Nuttall oak, three were water hickory, and one was sweetgum. No recruitment into the 5 cm diameter-at-breast height size class occurred for overcup oak or willow oak. The results of the study suggest that the forest is progressing to a more

water-tolerant community dominated by overcup oak. A conservative flooding strategy would minimize tree stress and maintain quality wildlife habitat within the forested wetland.

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826. Long-term phosphorus removal in Florida aquatic systems dominated by submerged aquatic vegetation.

Knight, R. L.; Gu, B.; Clarke, R. A.; and Newman, J. M. *Ecological Engineering* 20(1): 45-63. (2003)

NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: phosphorus cycle/ aquatic environment/ eutrophication/ water treatment/ phosphorus removal/ vegetation/ aquatic plants/ environmental engineering/ rivers/ lakes/ artificial wetlands/ mesocosms/ coastal inlets/ phosphorus/ water quality control/ emergent vegetation/ anthropogenic factors/ fluvial sediments/ inlets/ sediments/ hydraulic loading/ sinks/ pollution load/ river systems/ USA, Florida/ submerged aquatic vegetation

Abstract: Anthropogenic phosphorus (P) loads have been implicated in eutrophication of lakes and wetlands throughout Florida. One technology that holds considerable promise for controlling these loads in a cost-effective manner is the use of treatment wetlands. Preliminary research in south Florida on the use of submerged aquatic vegetation (SAV) as the dominant vegetation in these treatment wetlands is reporting higher P removal performance than wetlands dominated by rooted, emergent plants. This research has been based to-date primarily on relatively small-scale mesocosms (5-2000 m²) and on a larger scale treatment wetland (148 ha) that has been operated for about 7 years. Considering the magnitude of engineering decisions and project costs to implement P control in the Everglades Agricultural Area and elsewhere in Florida, it is prudent to look for additional confirmation of P removal performance from other existing SAV-dominated systems in Florida that have a longer operational period. This paper describes an analysis of existing data collected from a number of SAV-dominated, flow-through lakes and rivers in Florida with characteristics similar to the proposed SAV treatment systems. While these existing input-output data were not specifically collected for the purpose of preparing mass balances and P removal rate estimates, they can be judiciously applied to that analysis. The overall conclusion of this analysis is that SAV-dominated lakes and rivers do typically remove P from the water column. The likely long-term sink for this P is the newly accreted sediment. The long-term average P removal rate for 13 SAV-dominated lake and river systems in Florida was 1.2 g/m² per year. This result compares favorably with an average net sediment P accumulation rate of 1.2 g/m² per year reported by others for 11 SAV-dominated Florida lakes. These estimated long-term P removal rates are higher than those for full-scale wetlands dominated by emergent vegetation. Average first-order P removal rate constants for SAV-dominated lakes (15 m/year) and rivers (46 m/year) are generally less than those estimated in SAV-dominated mesocosms (60-140 m/year) and similar to a large-scale SAV-dominated stormwater treatment area (STA) (40 m/year). P removals in all of these SAV-dominated systems are influenced by inlet P loading rates, with removal rates positively correlated to both P inlet concentration and hydraulic loading rate (HLR). Based on

this analysis, caution is recommended when extrapolating the P removal results from relatively short-term or small-scale mesocosm studies to the design of full-scale, long-term operating SAV-dominated wetlands.

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827. 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/ habitat/ 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*/ USA, 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 super(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.

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828. Mitigation of metolachlor-associated agricultural runoff using constructed wetlands in Mississippi, USA.

Moore, M. T.; Rodgers, J. H.; Smith, S.; and Cooper, C. M. *Agriculture, Ecosystems & Environment* 84(2):

169-176. (2001)

NAL Call #: S601.A34; ISSN: 0167-8809

Descriptors: pesticides/ water quality/ agricultural runoff/ gas chromatography/ water management/ sediments/ aquatic plants/ artificial wetlands/ freshwater pollution/ pollution control/ mesocosms/ agricultural pollution/ chemical pollutants/ herbicides/ restoration/ environment management/ USA, Mississippi/ metolachlor/ constructed wetlands

Abstract: A loss of marginal wetland acreage adjoining agricultural fields has created a potential problem with water quality enhancement of agricultural runoff via wetlands. Current research is investigating the utility of constructed wetlands for pesticide mitigation purposes, thereby restoring water quality enhancement capability to the area. Constructed wetland mesocosms (59-73 m x 14 m), located at the University of Mississippi Field Station (Lafayette County, MS), were amended with metolachlor to simulate a cropland runoff event. Target concentrations for wetlands were 73 and 147 µg/l metolachlor in addition to an unamended control (0 µg/l). Water, sediment, and plant samples were collected weekly for 35 days following metolachlor amendment. Samples were collected from sites, longitudinally distributed within each wetland, and analyzed for metolachlor using gas chromatography. Between 7 and 25% of measured metolachlor mass was in the first 30-36 m (from inflow) of wetlands immediately following application and simulated rainfall. Approximately 10% of measured metolachlor mass was in plant samples. Suggested wetland travel distances for effective mitigation of metolachlor runoff ranged from 100 to 400 m. According to the results from this research, aquatic receiving system impacts due to metolachlor runoff could be mitigated by using constructed wetlands as buffers. Landowners and government agencies can integrate this information into a water management plan, allowing for better control of both quantity and quality of runoff water from individual agricultural fields.

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829. Modeling biogeochemistry and forest management practices for assessing GHGs mitigation strategies in forested wetlands.

Cui, J.; Li, C.; and Trettin, C.

Environmental Modeling and Assessment 10(1):

43-53. (Mar. 2005)

NAL Call #: GE1 .E545; ISSN: 1420-2026

Descriptors: wetlands/ greenhouse gases/ mortality/ forests/ biogeochemistry/ seasonal variations/ sulfur dioxide/ water table/ trees/ carbon cycle/ biomass/ USA, Florida/ air pollution/ air pollution: monitoring, control & remediation

Abstract: Despite the importance of forested wetland in the

global carbon cycle, no widely applicable ecosystem model exists for this ecosystem. This study reports the linkage between Wetland-DNDC and MIKE SHE for carbon dynamics and GHGs mitigation strategies analyses in forested wetland. Wetland-DNDC was modified by parameterizing forest management practices and refining anaerobic biogeochemical processes. Mortality due to senescence was estimated as a function of tree age or as a function of the relative biomass. We used a harvesting damage mortality coefficient as a linear function of time with three parameters: Initial mortality, Duration of the damage and intensity of the initial harvesting. The model was validated against experimental data obtained from the GNF site near Florida. As a preliminary application, we simulated the effect of water table position and forest management practices on GHGs emissions and carbon dynamics to test the capabilities of the models for simulating seasonal and long-term carbon budget in forested wetland.

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830. Modeling phosphorus trapping in wetlands using nonparametric Bayesian regression.

Qian, Song S. and Reckhow, K. H.

Water Resources Research 34(7): 1745-1754. (July 1998)

NAL Call #: 292.8 W295; ISSN: 0043-1397

Descriptors: wetlands/ phosphorus/ agricultural runoff/ phosphorus removal/ water level/ water management/ water pollution/ nonpoint pollution sources/ water quality control/ USA, Florida, Everglades/ environment management/ ecosystem management/ agricultural pollution/ pollution control/ biodegradation/ sources and fate of pollution/ freshwater pollution/ protective measures and control/ composition of water

Abstract: Phosphorus-enriched agricultural runoff from the Everglades Agriculture Area is believed to have caused ecological changes in the northern part of the Everglades wetlands. A number of efforts have been made to assess the effectiveness of using constructed wetlands as a means of phosphorus removal from the agricultural runoff. The objective of this study is to develop a predictive model for the total phosphorus effluent concentration of an Everglades wetland that has received this runoff for over 20 years. We used Bayesian nonparametric regression to develop a predictive model combining information from an Everglades wetland data set and a cross-sectional data set. The prior model was based on the cross-sectional data set and expert opinion; this prior model, when combined with data from the Everglades wetland, yielded the posterior model, which can be used to (1) estimate the probability of an outflow concentration standard violation and (2) provide the posterior distributions of effluent concentrations at different loading rates and water levels. The primary use of this model is to support decision making in sizing the proposed constructed wetlands in south Florida as well as keeping a practical management strategy.

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831. Nitrate removal in riparian wetland soils: Effects of flow rate, temperature, nitrate concentration and soil depth.

Willems, Hans P.; Rotelli, Matthew D.; Berry, Duane F.; Smith, Eric P.; Reneau, Raymond B.; and Mostaghimi, Saied

Water Research 31(4): 841-849. (1997)

NAL Call #: TD420.W3; ISSN: 0043-1354

Descriptors: biochemistry and molecular biophysics/ freshwater ecology: ecology, environmental sciences/ pollution assessment control and management/ soil science/ toxicology/ waste management: sanitation/ biobusiness/ concentrations/ flow rate/ groundwater ecology/ managed agricultural field/ nitrate/ nomini creek watershed/ nutrient contamination removal/ pollution/ removal/ riparian wetland soils/ soil columns/ soil depth/ temperature/ toxicology/ water pollution

Abstract: Riparian zones, located adjacent to intensely managed agricultural fields, are thought to play an important role in removal of nutrient contaminants including NO₃⁻ from groundwater. We studied the effect of flow rate, NO₃⁻ concentration and temperature on NO₃⁻ removal in soil columns under saturated-flow conditions. Bibb (coarse-loamy, siliceous, acid thermic Typic Fluvaquent) sandy loam soil was collected from a riparian forest located in Nomini Creek Watershed, Virginia. Soils included in the study were a permanently inundated surface horizon, a seasonally saturated surface horizon, a shallow subsurface horizon and a deep subsurface horizon. Soil columns were infiltrated with NO₃⁻ amended groundwater at concentrations from 14 to 36 mg NO₃⁻-N L⁻¹. Column operating temperatures varied between 8 and 20 degree C and flow rates between 0.01 and 0.09 mL min⁻¹. Following a 48 h equilibrium period, effluent NO₃⁻ and N-2O concentrations were determined. Denitrification was the primary mechanism of NO₃⁻ removal, with higher denitrification capacities found in the surface horizons. Effluent NO₃⁻ concentrations could be described by a linear combination of temperature, flow rate and influent NO₃⁻ concentrations. Low temperatures and increased flow rates reduced the denitrification capacity in all soils. Our results showed that the NO₃⁻ removal capacity present in the Bibb soil should theoretically be sufficient to remove most, if not all, NO₃⁻ from the groundwater at the Nomini Creek study site. However, on-site measurements of NO₃⁻ concentration in receiving streams indicated that this capacity is not fully realized in the field, suggesting the importance of other factors such as local hydrology and groundwater flow patterns.

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832. Nutrient and sediment removal by a restored wetland receiving agricultural runoff.

Jordan, T. E.; Whigham, D. F.; Hofmockel, K. H.; and Pittek, M. A.

Journal of Environmental Quality 32(4): 1534-1547. (2003)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: wetlands/ ammonia/ total suspended solids (TSS)/ agricultural runoff/ runoff/ water contamination

Abstract: Few studies have measured removal of pollutants by restored wetlands that receive highly variable inflows. We used automated flow-proportional sampling to monitor the removal of nutrients and suspended solids by a 1.3-ha restored wetland receiving unregulated inflows from a 14-ha agricultural watershed in Maryland, USA. Water entered the wetland mainly in brief pulses of runoff, which sometimes exceeded the 2500-m³ water holding capacity of the wetland. Half of the total water inflow occurred in only 24 days scattered throughout the two-year study. Measured annual water gains were within 5% of balancing water losses. Annual removal of nutrients differed greatly between the two years of the study. The most removal occurred in the first year, which included a three-month

period of decreasing water level in the wetland. In that year, the wetland removed 59% of the total P, 38% of the total N, and 41% of the total organic C it received. However, in the second year, which lacked a drying period, there was no significant ($p > 0.05$) net removal of total N or P, although 30% of the total organic C input was removed. For the entire two-year period, the wetland removed 25% of the ammonium, 52% of the nitrate, and 34% of the organic C it received, but there was no significant net removal of total suspended solids (TSS) or other forms of N and P. Although the variability of inflow may have decreased the capacity of the wetland to remove materials, the wetland still reduced nonpoint-source pollution.

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833. Nutrient attenuation by a riparian wetland during natural and artificial runoff events.

Casey, R. E. and Klaine, S. J.

Journal of Environmental Quality 30(5): 1720-1731. (2001)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: wetlands/ water pollution treatment/ nonpoint pollution sources/ golf courses/ storm runoff/ nitrates/ phosphates/ data collections/ experimental data/ performance evaluation/ pollution (nonpoint sources)/ runoff/ nitrate/ riparian environments/ nutrients (mineral)/ stormwater runoff/ pollution dispersion/ fertilizers/ golf courses/ water quality control/ water treatment/ protective measures and control/ water & wastewater treatment

Abstract: Due to chronic nutrient enrichment of surface water, wetlands adjacent to land managed with fertilizer have been studied to determine their role in nutrient dynamics. We sampled golf course runoff and determined the loads of NO₃⁻ and PO₄³⁻ transported during storms and the attenuation of those loads when runoff passed through a riparian wetland. All sampled storm events contained NO₃⁻ (2 to 1470 g NO₃⁻-N per event) and PO₄³⁻ (1 to 4156 g PO₄³⁻-P per event). Extensive nutrient attenuation occurred when water passed through the riparian wetland. In 11 events, NO₃⁻ and PO₄³⁻ attenuation averaged 80 and 74%, respectively. In subsequent experiments, we created a stream of water flowing into the wetland and amended it with NO₃⁻, PO₄³⁻ and Br⁻, creating an artificial runoff event. The experiments were conducted using conditions similar to those of natural runoff events. We observed rapid and complete attenuation of PO₄³⁻ immediately after runoff water infiltrated into the wetland subsurface. No PO₄³⁻ was observed in discharge from the wetland. Nitrate attenuation occurred following a lag phase of several hours that was probably due to reactivation of denitrifying enzymes. Nitrate attenuation was initially less than 60% but increased to 100% in all experiments. We observed extensive dilution of runoff water in the wetland subsurface indicating mixing with pre-event ground water in the wetland. The results indicated that intermittent inputs of NO₃⁻ and PO₄³⁻ could be successfully attenuated in the wetland on the time scale of natural storm events.

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834. Nutrient removal from eutrophic lake water by wetland filtration.

Coveney, M. F.; Stites, D. L.; Lowe, E. F.; Battoe, L. E.; and Conrow, R.

Ecological Engineering 19(2): 141-159. (2002)

Descriptors: ammonia/ aquatic plants/ artificial wetlands/ bioremediation/ eutrophication/ evapotranspiration/ filtration/ floodplains/ geological sedimentation/ lakes/ nature conservation/ nitrate/ nitrogen/ phosphorus/ phytoplankton/ rain/ seepage/ suspended solids/ water management/ water quality/ plants

Abstract: Lake Apopka is a large (125 km²), shallow (mean depth 1.6 m) lake in Florida, USA. The lake was made hypereutrophic by phosphorus loading from floodplain farms and has high levels of nutrients, phytoplankton (Chl a 80 micro g l⁻¹), and suspended matter. The restoration plan developed by the St. Johns River Water Management District encompasses the biomanipulation concept in which the critical step for large shallow lakes is increasing the transparency of the water to allow the re-establishment of submerged macrophytes. Restoration includes operation of a treatment wetland, reduction in external P loading, harvest of fish, fluctuation of lake levels, and littoral planting. The District constructed a 2-km² pilot-scale treatment wetland to test nutrient-removal and hydraulic performance. Lake water was recirculated for 29 months, and the removal of suspended solids and particle-bound nutrients was assessed. Hydraulic loading rate varied from 6.5 to 65 m year⁻¹ with a mean hydraulic residence time of about 7 days. The inflow contained 40-180 mg l⁻¹ TSS, 80-380 micro g l⁻¹ TP (mostly particulate organic), and 3-9 mg l⁻¹ TN (mostly dissolved and particulate organic). Overall, particulate matter was removed (>90%) by the wetland, and soluble organic compounds were unaffected. Soluble inorganic compounds such as nitrate, ammonia, and soluble reactive phosphate (SRP) were low in the lake water but increased during passage through the wetland. Particulate matter at the outlet was enriched in both N (2-fold) and P (5-fold) compared to particles in the inflow. Mass removal efficiencies were 89-99 (TSS), 30-67 (TP), and 30-52% (TN), but efficiency fell when hydraulic short-circuiting occurred. First-order removal coefficients were 107 (TSS), 63 m year⁻¹ (TP) and 98 m year⁻¹ (particulate N). Areal particulate removal rates were 5.4 g dry matter m⁻² day⁻¹, 0.18 g PON m⁻² day⁻¹, and 0.006 g POP m⁻² day⁻¹. The ratio of N:P removal was 28:1. Total sedimentation rate was 0.4 mm day⁻¹ of very light matter (4.4 g dw l⁻¹). About 40% of the dry matter and nitrogen removed and about 80% of the phosphorus was found in the new sediments. Relative to the inflow of lake water, evapotranspiration (4.3%), seepage (2.6%), and rainfall (2.8%) were low. Major problems were initial leaching of SRP, but not ammonia, from native organic soils and vegetation when this former farmland was flooded; hydraulic short-circuiting via former drainage ditches; and low inflows under drought conditions. After 6 months SRP release declined, and initial SRP leaching could be prevented with soil treatment. Hydraulic short-circuiting occurred only after modifications were made. Low gravity flows were augmented with pumped inflows. With these improvements P-removal should increase from the measured 0.48 to at least 3 g P m⁻² year⁻¹. Based on the

pilot project results, the first phase of an improved 14-km² wetland filter has been constructed. This project should accelerate improvements in the water quality of Lake Apopka and, ultimately, create a new, large wildlife-rich marsh.

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835. Nutrient retention dynamics of the Everglades Nutrient Removal Project.

Moustafa, M. Z.

Wetlands 19(3): 689-704. (Sept. 1999)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ nutrients/ storm runoff/ agriculture/ water quality/ phosphorus/ water quality control/ nutrient removal/ stormwater runoff/ pollution control/ nutrients (mineral)/ agricultural pollution/ water treatment/ USA, Florida, Everglades/ chemical processes/ prevention and control

Abstract: The Everglades Nutrient Removal (ENR) Project was constructed to reduce nutrient concentrations in stormwater runoff water from the Everglades Agricultural Area. Although nutrient concentrations of influent water ranged from 66 to 201 µg TP L⁻¹ and 140 to 541 µg TN L⁻¹ and varied substantially over time, the outlet concentrations remained low, 9 to 39 µg TP L⁻¹ and 99 to 286 µg TN L⁻¹, during the first three years of operation (from August 1994 through August 1997). Nutrient removal efficiency was calculated in terms of decrease in both loads and nutrient concentrations. Nutrient loading rates averaged 1.17 g TP m⁻² year⁻¹ (plus or minus 0.12 SE) and 31.56 g TN m⁻² year⁻¹ (plus or minus 2.92 SE) at the inflow and 0.23 g TP m⁻² year⁻¹ (plus or minus 0.02 SE) and 20.71 g TN m⁻² year⁻¹ (plus or minus 1.63 SE) at the outflow. TP load removal ranged from 66% to 91% and averaged 82% for the period of record, while TN load removal ranged from 11% to 76% and averaged 55%. Rainfall contribution to the ENR Project nutrient budgets was small, averaging only 4% and 3% for TP and TN, respectively. The ENR Project performance results during the first three years suggest that additional Stormwater Treatment Areas (STAs) will be effective in removing TP from stormwater runoff.

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836. Nutrient transport in a restored riparian wetland.

Vellidis, G.; Lowrance, R.; Gay, P.; and Hubbard, R. K.

Journal of Environmental Quality 32(2): 711-726. (Mar. 2003-Apr. 2003)

NAL Call #: QH540.J6; ISSN: 0047-2425

Descriptors: wetlands/ plumes/ nitrates/ groundwater pollution/ water quality/ nutrient removal/ surface runoff/ denitrification/ ammonium/ phosphorus/ hydrology/ pastures/ preferential flow/ manure/ environmental effects/ ammonium compounds/ nutrients (mineral)/ agricultural runoff/ USA, Georgia/ sources and fate of pollution/ composition of water/ characteristics, behavior and fate/ water resources and supplies

Abstract: We determined the water quality effect of a restored forested riparian wetland adjacent to a manure application area and a heavily fertilized pasture in the Georgia Coastal Plain. The buffer system was managed based on USDA recommendations and averaged 38 m in width. Water quality and hydrology data were collected from 1991-1999. A nitrate plume in shallow ground water with

concentrations exceeding 10 mg NO₃-N L⁻¹ moved into the restored forested riparian wetland. Along most of the plume front, concentrations were less than 4 mg NO₃-N L⁻¹ within 25 m. Two preferential flow paths associated with past hydrologic modifications to the site allowed the nitrate plume to progress further into the restored forested riparian wetland. Surface runoff total N, dissolved reactive phosphorus (DRP), and total P concentrations averaged 8.63 mg N L⁻¹, 1.37 mg P L⁻¹, and 1.48 mg P L⁻¹, respectively, at the field edge and were reduced to 4.18 mg N L⁻¹, 0.31 mg P L⁻¹, and 0.36 mg P L⁻¹, respectively, at the restored forested riparian wetland outlet. Water and nutrient mass balance showed that retention and removal rates for nitrogen species ranged from a high of 78% for nitrate to a low of 52% for ammonium. Retention rates for both DRP and total P were 66%. Most of the N retention and removal was accounted for by denitrification. Mean annual concentrations of total N and total P leaving the restored forested riparian wetland were 1.98 mg N L⁻¹ and 0.24 mg P L⁻¹, respectively.

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837. Nutrient uptake and growth response of six wetland/riparian plant species receiving swine lagoon effluent.

Hubbard, R. K.; Ruter, J. M.; Newton, G. L.; and Davis, J. G.

Transactions of the ASAE 42(5): 1331-1341. (1999)

NAL Call #: 290.9 Am32T; ISSN: 0001-2351

Descriptors: wastewater treatment/ Ilex cassine/ Itea/ Spartina patens/ Juncus effusus/ Panicum/ nutrient uptake/ bioremediation/ filter strips/ Cephalanthus occidentalis/ wetland plants

This citation is from AGRICOLA.

838. Operational restoration of the Pen Branch bottomland hardwood and swamp wetlands: The research setting.

Nelson, E. A.; Duloher, N. C.; Kolka, R. K.; and McKee, W. H.

Ecological Engineering 15(Suppl. 1): S23-S33. (Sept. 2000)

NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: wetlands/ environmental restoration/ forests/ rivers/ flood plains/ dams/ USA, South Carolina/ hydrology/ vegetation cover/ habitat improvement (biological)/ ecosystem disturbance/ Taxodium distichum/ Nyssa aquatica/ USA, South Carolina, Aiken, Savannah River Site/ USA, South Carolina, Savannah R./ baldcypress/ water tupelo/ reclamation/ protective measures and control

Abstract: The Savannah River swamp, a 3020 ha forested wetland on the floodplain of the Savannah River, USA is located on the Department of Energy's Savannah River site (SRS) near Aiken, SC. Historically, the swamp consisted of approximately 50% bald cypress-water tupelo (*Taxodium distichum*-*Nyssa aquatica*) stands, 40% mixed bottomland hardwood stands, and 10% shrub, marsh, and open water. Creek corridors were typical of southeastern bottomland hardwood forests. Hydrology was controlled by flooding of the Savannah River and by flow from four creeks that drain into the swamp prior to flow into the Savannah River. Upstream dams have caused some alteration of the water levels and timing of flooding within the floodplain. Major impacts to the swamp hydrology occurred with the completion of the production reactors and one coal-fired

powerhouse at the SRS in the early 1950s. Flow in one of the tributaries, Pen Branch, was typically 0.3 m super(3) s super(-1) (10-20 cfs) prior to reactor pumping and 11.0 m super(3) s super(-1) (400 cfs) during pumping from 1954 to 1988. Sustained increases in water volume resulted in overflow of the original stream banks, the creation of additional floodplains, considerable erosion of the original stream corridor, and deposition of a deep silt layer on the newly formed delta. Heated water was discharged directly into Pen Branch and water temperature in the stream often exceeded 65 degree C. The nearly continuous flooding of the swamp, the thermal load of the water, and the heavy silting resulted in complete mortality of the original vegetation in large areas of the floodplain. In the years since pumping was reduced, no volunteer seedlings of heavy-seeded hardwoods or cypress have been found in the floodplain corridor. Research was conducted to determine methods to reintroduce tree species characteristic of more mature forested wetlands. Species composition and selection were altered based on the current and expected hydrological regimes that the reforestation areas will be experiencing.
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839. Particulate phosphorus removal via wetland filtration: An examination of potential for hypertrophic lake restoration.

Lowe, E. F.; Battoe, L. E.; Stites, D. L.; and Coveney, M. F. *Environmental Management* 16(1): 67-74. (1992)
NAL Call #: HC79.E5E5; ISSN: 0364-152X

Descriptors: wetlands/ phosphorus cycle/ filtration/ particulate pollution/ environmental restoration/ lakes/ hypertrophy/ phosphorus/ USA, Florida, Apopka L./ hypertrophic environments/ phosphorus/ Florida, Apopka L./ particulate pollution/ environmental restoration/ hypertrophy/ reclamation/ prevention and control/ freshwater pollution

Abstract: Lake Apopka in Florida, USA, is a large (area = 124 km super(2)), hypertrophic (mean total phosphorus = 0.220 g/m super(3); mean chlorophyll a = 60 mg/m super(3)) lake, with a large sedimentary store of available P (1635 x 10 super(6) g P). Phosphorus loading from floodplain farms (132 x 10 super(6) g P/yr) has been the primary cause of eutrophication. Assuming elimination of farm P loading, the Vollenweider model predicts a decline in equilibrium P concentration from 0.270 to 0.024 g/m super(3), if the P sedimentation coefficient (sigma) remains constant. Recirculation of lake water through a 21-km super(2), created wetland and elimination of farm P loading is projected to result in a negative P balance for the lake (- 23 x 10 super(6) g P/yr) leading to depletion of P stores in the lake in about 60 yr.
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840. Performance of a recirculating wetland filter designed to remove particulate phosphorus for restoration of Lake Apopka (Florida, USA).

Coveney, M. F.; Lowe, E. F.; and Battoe, L. E. *Water Science and Technology* 44(11-12): 131-136. (2001)
NAL Call #: TD420.A1P7; ISSN: 0273-1223.

Notes: Conference: 7th International Conference on Wetland Systems for Water Pollution Control 2000, Lake Buena Vista, FL [USA], 11-16 Nov 2000; Issue editors: Kadlec, R. H. and Reddy, K. R.; ISBN: 1843394073
Descriptors: USA, Florida, Apopka L./ water quality control/

lake restoration/ recirculated water/ phosphorus removal/ particulate matter/ feasibility studies/ performance evaluation/ model studies/ optimization/ recycled water/ particles/ environment management/ lake reclamation/ eutrophic lakes/ eutrophication/ pollution effects/ particulate organic phosphorus/ pollution control/ filters/ water filtration/ recirculating systems/ performance assessment/ lakes/ hydrology/ environmental restoration/ water pollution control/ artificial wetlands/ treatment wetlands/ water quality control/ water treatment/ prevention and control/ freshwater pollution/ water pollution: monitoring, control and remediation

Abstract: Operation of a 14-km super(2) wetland filter for removal of total phosphorus (TP) from lake water is part of the restoration program for hypereutrophic Lake Apopka, Florida. This system differs from most treatment wetlands because 1) water is recirculated back to the lake, and 2) the goal is removal of particulate phosphorus (P), the dominant form of P in Lake Apopka. The operational plan for the wetland is maximization of the rate rather than the efficiency of P removal. The St. Johns River Water Management District operated a 2-km super(2) pilot-scale wetland to examine the capacity of a wetland system to remove suspended solids and particulate nutrients from Lake Apopka. TP in the inflow from Lake Apopka ranged from about 0.12 to 0.23 mg l super(-1), and hydraulic loading rate (HLR) varied from 6.5 to 42 m yr super(-1). The performance of the pilot-scale wetland supported earlier predictions. Mass removal efficiencies for TP varied between about 30% and 67%. A first-order, area-based model indicated a rate constant for TP removal of 55 m yr super(-1). We compared actual removal of P with model predictions and used modeled performance to examine optimal operational conditions. Correspondence between observed and modeled outflow TP was not good with constant variable values. Monte Carlo techniques used to introduce realistic stochastic variability improved the fit. The model was used to project a maximal rate of P removal of about 4 g P m super(-2) yr super(-1) at P loading 10-15 g P m super(-2) yr super(-1) (HLR 60-90 m yr super(-1)). Data from the pilot wetland indicated that actual rates of P removal may prove to be higher. Further operation of the wetland at high hydraulic and P loading rates is necessary to verify or modify the application of the model.
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841. Phosphorus removal from Everglades agricultural area runoff by submerged aquatic vegetation/Limerock treatment technology: An overview of research.

Gu, B.; Debusk, T. A.; Dierberg, F. E.; Chimney, M. J.; Pietro, K. C.; and Aziz, T. *Water Science and Technology* 44(11-12): 101-108. (2001)
NAL Call #: TD420.A1P7; ISSN: 0273-1223.

Notes: Conference: 7th International Conference on Wetland Systems for Water Pollution Control 2000, Lake Buena Vista, FL [USA], 11-16 Nov 2000; Issue editors: Kadlec, R. H. and Reddy, K. R.; ISBN: 1843394073
Descriptors: United States, Florida, Everglades/ water pollution control/ nonpoint pollution sources/ agricultural runoff/ advanced wastewater treatment/ phosphorus removal/ submerged plants/ accumulation/ feasibility studies/ experimental data/ performance evaluation/ pollution (nonpoint sources)/ runoff (agricultural)/ advanced treatment/ aquatic macrophytes/ aquatic plants/ vegetation/ lime/ macrophytes/ artificial wetlands/ water quality control/

water treatment/ freshwater pollution/ water pollution:
monitoring, control & remediation

Abstract: The 1994 Everglades Forever Act mandates the South Florida Water Management District and the Florida Department of Environmental Protection to evaluate a series of advanced treatment technologies to reduce total phosphorus (TP) in Everglades Agricultural Area runoff to a threshold target level. A submerged aquatic vegetation/limerock (SAV/LR) treatment system is one of the technologies selected for evaluation. The research program consists of two phases. Phase I examined the efficiency of SAV/LR treatment system for TP removal at the mesocosm scale. Preliminary results demonstrate that this technology is capable of reducing effluent TP to as low as 10 $\mu\text{g/L}$ under constant flows. The SAV component removes the majority of the influent soluble reactive P, while the limerock component removes a portion of the particulate P. Phase II is a multi-scale project (i.e., microcosms, mesocosms, test cells and full-size wetlands). Experiments and field investigations using various environmental scenarios are designed to (1) identify key P removal processes; (2) provide management and operational criteria for basin-scale implementation; and (3) provide scientific data for a standardized comparison of performance among advanced treatment technologies.
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842. Phosphorus retention and soil organic carbon in restored and natural freshwater wetlands.

Hogan, D. M.; Jordan, T. E.; and Walbridge, M. R.

Wetlands 24(3): 573-585. (Sept. 2004)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ soil/ sorption/ phosphorus/ soil chemistry/ carbon/ soil properties/ freshwater environments/ restoration/ forests/ aquatic plants/ nitrogen/ nutrients (mineral)/ pH/ soils/ inland water environment/ chemical properties/ physical properties/ total organic carbon/ organic carbon/ water quality/ capacity/ retention/ density/ nutrients/ hydrogen ion concentration/ clays/ USA, Maryland, Kent Island/ reclamation/ habitat community studies/ conservation, wildlife management and recreation/ chemical processes

Abstract: Nutrient (e.g., phosphorus) retention is an important function of wetlands that can improve water quality. We examined soil physical and chemical characteristics and phosphorus (P) sorption capacities in three recently restored herbaceous wetlands (RWs) on previously cultivated soils and three adjacent natural forested wetlands (NWs) on Kent Island, Maryland, USA. Our objective was to compare P retention in these two wetland types. As hypothesized, NW soils differed fundamentally in soil chemistry and had significantly higher total organic carbon (TOC) contents than RW soils (5.7 plus or minus 1.7% vs. 1.2 plus or minus 0.1%, respectively, $p < 0.05$). A number of soil properties (bulk density, pH, labile organic and microbial P, total N, and total N: total P ratios) differed between natural and restored wetlands, as expected from the differences in TOC. Concentrations of pyrophosphate-extractable (organically-bound) Al (Alp) were an order of magnitude larger in NW than in RW soils (2099.1 plus or minus 365.5 vs. 767.0 plus or minus 194.7 kg/ha , respectively). Although past studies have suggested that higher concentrations of organically-bound Al can enhance P sorption, P-sorption capacities were significantly greater in the RW soils, likely due to differences in soil

chemistry. In the RWs, 15 soil chemical parameters were significantly correlated with P sorption (based on single factor regression), including residual Al, oxalate-extractable Al and Fe, clay, HCl-extractable Fe and pyrophosphate-extractable Fe ($r^2 = 0.90, 0.89, 0.87, 0.85, 0.83$ and 0.82 , respectively). In contrast, P sorption in the NWs was correlated only with Alp ($r^2 = 0.68$). As restored wetland soils are likely in transition from a non-hydric to a hydric state, they should be reevaluated periodically to determine the ultimate effects of this transition on their capacity to retain P.

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843. Phosphorus-sorption characteristics of calcareous soils and limestone from the southern Everglades and adjacent farmlands.

Zhou, Meifang and Li, Yuncong

Soil Science Society of America Journal 65(5):

1404-1412. (2001)

NAL Call #: 56.9 So3; ISSN: 0361-5995

Descriptors: soil science/ Langmuir isotherm/ farmland/ fertilizer management/ pineland/ wetland

Abstract: The understanding of P sorption and desorption by soils is important for safeguarding water quality and for fertilizer management. Little is known about the P-sorption characteristics of the calcareous soils and limestone bedrocks in southern Florida. In this study, 19 samples of calcareous soil and subsurface limestone bedrock were collected from the southern Everglades wetland, pineland, and nearby farmland. At very low P concentrations, P sorption in these soils fit the linear isotherm. The equilibrium P concentration at zero-net P sorption (EPCo) of soils correlated positively with P saturation. Phosphorus-sorption data of soils at medium P concentrations fit the Freundlich and Langmuir equations up to a point at high P concentrations where the slope of the isotherm changed abruptly. In bedrock samples the sorption-isotherm-inflection point, which is caused by P precipitation, occurred at much lower solution P concentrations than in the case of soils (4-18 vs. 400-600 mg mL^{-1}). Also bedrock samples had significantly lower Freundlich values, Kf, than soils. The sorption of P in soils occurred at relatively low solution P concentrations (as indicated by Freundlich value, Kf), and appears to be caused by strong affinity of the noncarbonate clay, while the P sorption at relatively high solution concentrations (as indicated by Langmuir maximum sorption, Smax) appears to be caused by the affinities of both the noncarbonate clay and carbonate clay. Phosphorus-sorption values (P_{sorption}) estimated from the one-point isotherm were comparable with the Smax values calculated from the Langmuir isotherm. Phosphorus saturation and the P-retention capacities (Smax or P_{sorption}) were correlated strongly to the percentage of P desorption.
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844. Phosphorus storage and release in response to flooding: Implications for Everglades stormwater treatment areas.

Newman, S. and Pietro, K.

Ecological Engineering 18(1): 23-38. (Oct. 2001)

NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: wetlands/ phosphorus/ environmental restoration/ nutrient uptake/ water flow/ agricultural land/ storm runoff/ water pollution control/ artificial wetlands/ ecosystems/ sediment-water interfaces/ nutrient removal/

organic soils/ water quality/ data collections/ storage/ flooding/ stormwater runoff/ agricultural runoff/ nitrogen/ nutrients/ water management/ nutrients (mineral)/ restoration/ environment management/ soils/ uptake/ USA, Florida/ USA, Florida, Everglades/ reclamation/ water quality control/ freshwater pollution/ chemistry of suspended matter/ characteristics, behavior and fate/ general environmental engineering

Abstract: As part of the Everglades restoration program, 16 000 ha of constructed wetlands will be reestablished on land presently in agricultural production. These wetlands will be used to remove Phosphorus (P) from agricultural runoff before it enters the Everglades. Histosols, organic soils, are the predominant soil type in the Everglades Agricultural Area (EAA), and the conversion of these soils from drained to flooded conditions has important implications for P storage. Phosphorus storage in organic soils has been shown to be both positively and negatively affected by anaerobic conditions. In this study, P storage and release was followed in a 146 ha area during its conversion from farmland to wetland. The development of a productive biological community, as evidenced by strong diel dissolved O₂ and pH cycles, occurred within 3 weeks of flooding at one site and 2 months at a second site. This biological community was considered influential in maintaining the low concentrations of both N and P in the water column relative to soil porewater concentrations. Maximum total P (TP) and total Kjeldahl N (TKN) concentrations of 0.3 and 5 mg l⁻¹, respectively, were recorded in the water column following flooding. These concentrations declined to background levels within 2-3 months. Soil porewater TP and total dissolved Kjeldahl N (TDKN) concentrations increased to maxima of 4 and 24 mg l⁻¹, respectively, 2 months following flooding. Nutrient profiles across the soil-water interface were used to estimate flux rates. Calculated NH₄⁺-N flux rates ranged between 0.18 and 0.74 μg cm⁻² d⁻¹ and P fluxes ranged between 0.03 and 0.15 μg cm⁻² d⁻¹. Phosphorus fluxes from the soil to the overlying water are a function of the mobility of different P fractions.

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845. Plant colonization after complete and partial removal of disturbed soils for wetland restoration of former agricultural fields in Everglades National Park.

Dalrymple, G. H.; Doren, R. F.; O'Hare, N. K.; Norland, M. R.; and Armentano, T. V.

Wetlands 23(4): 1015-1029. (Dec. 2003)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ environmental restoration/ agricultural ecosystems/ conservation/ national parks/ soil characteristics/ soils/ colonization/ aquatic plants/ nature conservation/ environment management/ flooding/ canopies/ introduced species/ fire/ agriculture/ chemical fertilizers/ herbicides/ restoration/ pesticides/ land reclamation/ substrates/ Hydrophytes/ agricultural chemicals/ nutrients/ fertilizers/ testing procedures/ Schinus terebinthifolius/ USA, Florida/ USA, Florida, Everglades Natl. Park/ Brazil peppertree/ reclamation/ habitat community studies/ conservation, wildlife management and recreation/ techniques of planning

Abstract: The Hole-in-the-Donut is a 4000-ha region of former farmlands within Everglades National Park that is dominated by a monoculture of the non-indigenous pest

plant *Schinus terebinthifolius* (Brazilian pepper). Prior to extensive farming in the region, the area consisted of short hydroperiod graminoid wetlands and mesic pine savannah. Rock plowing in preparation of these lands for farming created an artificial soil layer that broke up the limestone substrate, mixed and aerated the native marl soil layer with the broken limestone, and elevated the surface slightly. Farming practices also included the use of chemical fertilizers and pesticides. The modified soil substrate quickly became dominated by *S. terebinthifolius* when farming ceased in 1975, despite efforts to control its establishment, such as prescribed fire, herbicide treatment, and mowing. Preliminary evidence indicated that soil removal would prevent re-invasion by *S. terebinthifolius* and could lead to colonization by native wetlands plants. Two trials, a partial soil removal (PSR) and a complete soil removal (CSR), were performed on a pilot test site beginning in 1989 to determine whether all or only a portion of this modified soil substrate needed to be removed to attain desired results. Removal of rock-plowed surface material lowered elevation in both treatments. While the PSR treatment did show an increase in the number and coverage of hydrophytes for a few years, it did not prohibit re-colonization and re-establishment of a canopy of *S. terebinthifolius*, and by 1996, the site was again dominated by a monoculture of *S. terebinthifolius*. By contrast, the CSR treatment showed rapid colonization by hydrophytes and no successful re-colonization by *S. terebinthifolius*. Lowering elevations by 15 to 45 cm allowed for longer periods of flooding and rapid colonization by hydrophytes on both sites. After the sites were cleared, the average difference in elevation between the two treatment areas was less than a tenth of a meter, but this resulted in a slightly shorter hydroperiod on the PSR site. The small amount of residual rock-plowed soil with high levels of nutrients, along with its slightly shorter hydroperiod on the PSR site, appear to have contributed significantly to the success of *S. terebinthifolius* in re-colonizing this treatment area.

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846. Quantifying time-varying ground-water discharge and recharge in wetlands of the northern Florida Everglades.

Choi, Jungyill and Harvey, Judson W.

Wetlands 20(3): 500-511. (2000)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: mathematical biology: computational biology/ freshwater ecology: ecology, environmental sciences/ Everglades nutrient removal project/ agricultural drainage/ chemical budget/ constructed wetland/ ground water discharge/ ground water recharge/ mass balance/ time varying ground water discharge/ time varying ground water recharge/ water budget

Abstract: Developing a more thorough understanding of water and chemical budgets in wetlands depends in part on our ability to quantify time-varying interactions between ground water and surface water. We used a combined water and solute mass balance approach to estimate time-varying ground-water discharge and recharge in the Everglades Nutrient Removal project (ENR), a relatively large constructed wetland (1544 hectare) built for removing nutrients from agricultural drainage in the northern Everglades in South Florida, USA. Over a 4-year period (1994 through 1998), ground-water recharge averaged 13.4

hectare-meter per day (ha-m/day) or 0.9 cm/day, which is approximately 31% of surface water pumped into the ENR for treatment. In contrast, ground-water discharge was much smaller (1.4 ha-m/day, or 0.09 cm/day, or 2.8% of water input to ENR for treatment). Using a water-balance approach alone only allowed net ground-water exchange (discharge - recharge) to be estimated (-12 +/- 2.4 ha-m/day). Discharge and recharge were individually determined by combining a chloride mass balance with the water balance. For a variety of reasons, the ground-water discharge estimated by the combined mass balance approach was not reliable (1.4 +/- 37 ha-m/day). As a result, ground-water interactions could only be reliably estimated by comparing the mass-balance results with other independent approaches, including direct seepage-meter measurements and previous estimates using ground-water modeling. All three independent approaches provided similar estimates of average ground-water recharge, ranging from 13 to 14 ha-m/day. There was also relatively good agreement between ground-water discharge estimates for the mass balance and seepage meter methods, 1.4 and 0.9 ha-m/day, respectively. However, ground-water-flow modeling provided an average discharge estimate that was approximately a factor of four higher (5.4 ha-m/day) than the other two methods. Our study developed an initial understanding of how the design and operation of the ENR increases interactions between ground water and surface water. A considerable portion of recharged ground water (73%) was collected and returned to the ENR by a seepage canal. Additional recharge that was not captured by the seepage canal only occurred when pumped inflow rates to ENR (and ENR water levels) were relatively high. Management of surface water in the northern Everglades therefore clearly has the potential to increase interactions with ground water.

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847. 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/ USA, 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*).

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848. Restoration of pitcher plant bogs in eastern Texas, USA.

Mize, R.; Evans, R. E.; Macroberts, B. R.; Macroberts, M. H.; and Rudolph, D. C.

Natural Areas Journal 25(2): 197-201. (2005)

NAL Call #: QH76.N37; ISSN: 0885-8608

Descriptors: bogs/ environmental restoration/ fires/ soil/ conservation/ revegetation/ succession/ *Sus scrofa*/ USA, Texas/ pig

Abstract: Pitcher plant bogs, also referred to as hillside seepage bogs or hillside bogs, are extremely restricted on the West Gulf Coastal Plain. The number and extent of extant bogs is in the low hundreds, comprising no more than a few thousand hectares of habitat. These bogs support a large number of plant species of significant conservation concern. Threats to existing bogs include: land use changes, silvicultural impacts, fire scarcity, vehicle damage, negative feral hog (*Sus scrofa*) impact, and ground water regime alterations. Two pitcher plant bogs on the Angelina National Forest were subjected to severe damage from vehicular impacts that eliminated herbaceous vegetation, disturbed the soil to substantial depths, and initiated severe erosion. A restoration effort that replaced lost soil, reduced erosion, and allowed subsequent revegetation was implemented. Approximately four years post-treatment, bogs are intact, soil erosion is controlled, revegetation is complete or progressing, and at least some species of conservation concern are present in the revegetated areas. These restoration projects have demonstrated that degraded pitcher plant bogs that have suffered severe damage due to vehicular impacts can be substantially restored if sufficient resources are available. However, pitcher plant bogs on the West Gulf Coastal Plain continue to be threatened by uncontrolled off-road vehicles and other impacts. The most insidious threat may be the widespread lack of sufficient fire required to preclude or reverse succession to communities dominated by woody vegetation and the subsequent loss of the herbaceous bog species.

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849. Restoration of wetland vegetation on the Kissimmee River floodplain: Potential role of seed banks.

Wetzel, P. R.; Van Der Valk, A. G.; and Toth, L. A.

Wetlands 21(2): 189-198. (June 2001)

NAL Call #: QH75.A1W47; ISSN: 0277-5212

Descriptors: wetlands/ vegetation/ rivers/ flood plains/ drainage/ pastures/ shrubs/ species composition/ seed banks/ environmental restoration/ plant communities/ seeds/ vegetation cover/ aquatic plants/ restoration/ *Juncus effusus*/ *Plantae*/ USA, Florida, Kissimmee R./ seed banks/ restoration/ broadleaf marsh/ reclamation/ habitat community studies/ ecological impact of water development

Abstract: The composition of seed banks of areas on the drained Kissimmee River floodplain (Florida, USA) that are currently pasture and formerly had been wet prairie, broadleaf marsh, and wetland shrub communities was compared to that of seed banks of areas that have extant stands of these communities. The species composition of the seed banks of existing wet prairie and former wet prairie

sites were the most similar, with a Jaccard index of similarity of 55. Existing and former broadleaf marsh and wetland shrub communities had Jaccard indices of 38 and 19, respectively. Although existing and former wet prairie seed banks had nearly the same species richness, species richness at former broadleaf marsh and wetland shrub sites was higher than at existing sites. Mean total seed densities were similar in existing and former wet prairies (700 to 800 seeds m⁻²). However, seed densities in former broadleaf marsh and wetland shrub sites were significantly greater than in comparable existing communities (>4,900 seeds m⁻²) at former sites versus 200 to 300 in existing communities). The higher seed densities in former broadleaf marsh and wetland shrub sites was due to over 4,000 seeds m⁻² of *Juncus effusus* in their seed banks. Half of the species that characterize wet prairies were found in the seed banks at former and existing wet prairie sites. At existing broadleaf marsh and wetland shrub sites, most of the characteristic species were found in their seed banks. However, only one characteristic broadleaf species was found in the seed banks of the former broadleaf marsh sites, and no characteristic wetland shrub species were found in the seed banks of the former wetland shrub sites. The seeds of only two non-indigenous species were found in the seed banks of former wetland communities at very low densities. For all three vegetation types, but particularly for the broadleaf marsh and wetland shrub sites, re-establishment of the former vegetation on the restored floodplain will require propagule dispersal from off-site sources.

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850. 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

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.

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851. Shrimp farms' effluent waters, environmental impact and potential treatment methods.

Samocha, T. M. and Lawrence, A. L.

In: 24th U.S.-Japan Aquaculture Panel Symposium, TAMU-SG-97-102/ Keller, B. J.; Park, P. K.; McVey, J. P.; Takayanagi, Kazufumi; and Hosoya, Kazumi, 1997.

Notes: Conference: 24. U.S.-Japan Aquaculture Panel Symp., Corpus Christi, TX (USA), 8-10 Oct 1995

Descriptors: wetlands/ aquaculture effluents/ environmental impact/ wastewater aquaculture/ wastewater treatment/ shrimp culture/ aquaculture regulations/ aquaculture enterprises/ pond culture/ aquaculture techniques/ USA, Texas/ shellfish culture

Abstract: Texas has a 2280 km (1,425 mile) coastline and vast amount of coastal land which is not suitable for traditional agriculture crops. This land can be used for the development of a shrimp farming industry with an estimated value of \$100 million or greater within the next 10 yr. However, this industry will face restrictions from regulatory agencies that will limit future growth and may even reduce the present production level of shrimp in Texas. The concern of the agencies lies with the emission of effluent water generated by shrimp farms. In an effort to reduce the potential negative impact on coastal waters, current regulation by the Texas Natural Resources Conservation Commission (TNRCC) requires effluent water from shrimp farms to meet standards set for municipal and industrial wastewaters. Preliminary effluent characterization of three farms in south Texas suggests that in two farms, the total suspended solids (TSS) and ammonia (NH sub(3)-N) levels were higher than the standards set by TNRCC. The TSS and five-day carbonaceous biochemical oxygen demand (CBOD sub(5)) for the third farm were higher than the required standards. Coagulation methods, although effective in decreasing inorganic effluent TSS level, were cost-prohibitive and not adequate for ammonia and algal removal. A research team from Texas Agricultural Experiment Station, Texas Agricultural Extension Service, Texas A&M University-Kingsville (TAMU-Kingsville), Texas A&M University-Corpus Christi and The University of Texas-San Antonio is currently working with the shrimp producers to evaluate potential methods to improve effluent water quality. Studies were initiated to develop alternative feeding and pond management practices including reduction in pond water exchange rates. Development of a low protein, low pollution diet with higher nitrogen and phosphorus digestibility is another promising option to decrease effluent nutrient loads. Circulating effluent waters via settling basins, bivalves and seaweed beds, and constructed wetlands are another potential alternative to give the shrimp farmers cost-effective effluent treatment methods. Due to the recent Taura virus disease outbreak in south Texas, only initial evaluation of the above effluent treatment strategies was carried out during the 1995 season.

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852. Species selection trials and silvicultural techniques for the restoration of bottomland hardwood forests.

McLeod, K. W.

Ecological engineering 15(Suppl. 1): S35-S46. (Sept. 2000)

NAL Call #: TD1.E26; ISSN: 0925-8574

Descriptors: wetlands/ environmental restoration/ silviculture/ forests/ trees/ flooding/ swamps/ USA, South Carolina/ habitat improvement (biological)/ vegetation cover/ flood plains/ ecosystem management/ transplantation/ *Fraxinus pennsylvanica*/ *Carya aquatica*/ USA, South Carolina/ green ash/ water hickory/ reclamation/ protective measures and control

Abstract: Since 1990, a series of experiments has examined the appropriateness of 24 tree species for

restoring a bottomland and swamp forest in the delta of Fourmile Branch in the coastal plain of South Carolina, USA. In addition, various silvicultural techniques used to maximize the survival of tree plantings, have been appraised for effectiveness. While the topographic relief on the delta is small (dm differences between most sites), it is sufficient to utilize woody species with different flood tolerances. Hence, a diverse forest community can be established, using these elevation differences. In the wettest sites where water persists virtually continuously and may be one to two meters deep during large flood events, only the most flood-tolerant species, such as *Taxodium distichum* and *Nyssa aquatica*, can survive. These species will also survive very well at higher elevations, because the permanent water table never fell below one meter deep. In sites that are not flooded, unless the entire swamp is flooded, several additional species can be used. These include *Fraxinus pennsylvanica*, *Carya aquatica*, and *Quercus lyrata*. Finally, in slightly higher areas, *Q. michauxii*, *Q. nuttallii* and *Q. phellos* would have adequate survival. To minimize herbivory and maximize survival, tree shelters should be used if herbivore pressure is high. The prime herbivore of concern is beaver. Thus, any plantings that are frequently flooded may require protection. Other silvicultural techniques, including fertilization and control of herbaceous and willow competition, were not essential to ensure growth and survival. Finally, survival of the least expensive planting stock, bare root saplings, was nearly as good as balled and burlapped stock. Thus, unless absolute maximal survival is required, bare root stock will produce good survival at a fraction of the cost. One critical characteristic of the bare root stock is height, which must exceed the flood depth during the growing season. In the case of the Fourmile Branch delta, this was at least 45-60 cm tall.

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853. Spectral reflectance patterns of wetland vegetation along a water quality gradient in a self-organizing mesohaline constructed wetland in south Texas (*Typha latifolia*, *Borrchia frutescens*).

Ahmed, M. 2001.

Texas A&M University, Kingsville

Notes: Degree: MS

Descriptors: wetlands/ light reflection/ salinity/ phosphorus/ ammonia/ nitrogen/ water quality/ vegetation cover/ shrimp fisheries/ man-induced effects/ aquaculture effluents/ *typha latifolia*/ *Borrchia frutescens*/ USA, Texas/ effects of aquaculture on the environment/ optical properties/ effects on organisms/ effects of aquaculture on the environment/ mechanical and natural changes

Abstract: This study investigated the relationship between the spectral reflectance patterns of wetland plant species (*Typha latifolia* (Cattail), *Borrchia frutescens* (Sea Oxeye)) and water quality parameters (salinity, total phosphorus, total ammonia and nitrogen) in a mesohaline constructed wetland that treated effluent from the Loma Alta Shrimp Aquaculture Facility, located 15 miles east of Raymondville, Texas. A field spectroradiometer [ASD Field Spec, UV/VNIR-Open Sky (300-1100nm)] was used to measure plant reflectance at locations corresponding to water quality sampling stations that were part of a water quality monitoring project. Water quality parameters were determined by USEPA accepted methods. The spectral reflectance of the plant species and the quality of water was

measured along the direction of flow in the wetland at 4 points. Spectral reflectance at specific wavelengths [blue (450nm), green (550nm), red (700nm) and near infrared (700-1100nm)] and indices derived from these wavelengths [Blue normalized difference vegetation index (NDVI), Green NDVI and Red NDVI] were related to water quality parameters for each species. (Abstract shortened by UMI.)
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854. Stability of phosphorus within a wetland soil following ferric chloride treatment to control eutrophication.

Sherwood, L. J. and Qualls, R. G.

Environmental Science and Technology 35(20): 4126-4131. (Oct. 2001)

NAL Call #: TD420.A1E5; ISSN: 0013-936X

Descriptors: wetlands/ water quality control/ eutrophication/ chemcontrol/ phosphorus removal/ iron compounds/ chemical precipitation/ sediment-water interfaces/ redox reactions/ water pollution control/ phosphorus/ agricultural runoff/ chemical treatment/ iron/ sediment-water interface/ soils/ aluminium compounds/ agricultural pollution/ restoration/ runoff (agricultural)/ USA, Florida, Everglades/ ferric chloride/ water quality control/ freshwater pollution/ protective measures and control/ water & wastewater treatment

Abstract: Addition of iron and aluminum compounds has become an increasingly popular method to regulate phosphorus eutrophication in lakes and reservoirs. It has been proposed that ferric chloride addition to agricultural runoff entering the northern Everglades could provide a means for enhancing natural mechanisms of phosphorus removal from the wetland. In this study we added ferric chloride to Everglades water spiked with super(32)PO sub(4), incubating the resulting precipitates in microcosms simulating the Everglades ecosystem. super(32)P activity and reduction-oxidation (redox) potentials were monitored to determine if the super(32)P was released into the overlying water column due to iron reduction. Results of redox potential measurements and super(32)P activity indicate that although reducing conditions exist in the soil, on average less than 1% of the added super(32)P was measured in the water column during the 139-day incubation. Ferric chloride addition thus might prove an effective means of long-term phosphorus retention in the Florida Everglades and perhaps other wetland systems.
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855. Success criteria and adaptive management for a large-scale wetland restoration project.

Weinstein, M. P.; Balletto, J. H.; Teal, J. M.; and Ludwig, D. F.

Wetlands Ecology and Management 4(2): 111-127. (1997)

Notes: Special issue: Hydrologic restoration of coastal wetlands

Descriptors: wetlands/ management planning/ photography/ dikes/ salt marshes/ land reclamation/ *Spartina*/ macrophytes/ water reclamation/ coastal zone management/ habitat improvement/ environmental restoration/ USA, Delaware/ USA, New Jersey, Delaware Bay/ habitat improvement/ USA, Delaware Bay

Abstract: We are using a 20+ year photographic history of relatively undisturbed and formerly diked sites to predict the restoration trajectories and equilibrium size of a 4,050 ha salt marsh on Delaware Bay, New Jersey (USA). The

project was initiated to offset the loss of finfishes from once-through cooling at a local power plant. We used a simple food chain model to estimate the required restoration size. This model assumed that annual macrophyte detritus production and benthic algal production resulted in production of finfishes, including certain species of local interest. Because the marsh surface and intertidal drainage system are used by many finfishes and are the focal points for exchange of detrital materials, the restoration planning focused on both vegetational and hydrogeomorphological parameters. Recolonization by *Spartina* spp. and other desirable taxa will be promoted by returning a natural hydroperiod and drainage configuration to two types of degraded salt marsh: diked salt hay (*Spartina patens*) farms and brackish marsh dominated by *Phragmites australis*. The criteria for success of the project address two questions: What is the "bound of expectation" for restoration success, and how long will it take to get there? Measurements to be made are macrophyte production, vegetation composition, benthic algal production, and drainage features including stream order, drainage density, channel length, bifurcation ratios and sinuosity. A method for combining these individual parameters into a single success index is also presented. Finally, we developed adaptive management thresholds and corrective measures to guide the restoration process.

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856. **Surmounting the engineering challenges of Everglades restoration.**

Goforth, G. F.

Water Science and Technology 44(11-12): 295-302. (2001)

Notes: Conference: 7th International Conference on Wetland Systems for Water Pollution Control 2000, Lake Buena Vista, FL [USA], 11-16 Nov 2000; Issue editors: Kadlec, R. H. and Reddy, K. R.; ISBN: 1843394073

Descriptors: water pollution control/ storm runoff/ artificial wetlands/ phosphorus removal/ environmental engineering/ design criteria/ case studies/ environmental protection/ rehabilitation/ runoff/ engineering/ design data/ case study/ pollution control (environmental)/ renovation/ restoration/ environment management/ ecosystem management/ water quality control/ pollution control/ nutrients (mineral)/ phosphorus/ stormwater runoff/ eutrophication/ river engineering/ environmental restoration/ nutrient loading/ hydrology/ USA, Florida, Everglades/ water treatment/ conservation, wildlife management and recreation/ freshwater pollution/ water pollution: monitoring, control and remediation/ prevention and control

Abstract: The South Florida Water Management District, in partnership with other agencies and stakeholders, is undertaking one of the world's largest ecosystem restoration programs. The foundation of the nutrient control program for the Everglades is a set of six large constructed wetlands, referred to as Stormwater Treatment Areas (STAs). The initial treatment goal is to reduce phosphorus entering the Everglades to 50 parts per billion. The STAs comprise almost 17,000 hectares with a capital cost of approximately \$700 million. Approximately 4,720 hectares are currently operational, another 2,600 hectares are in the start-up phase, and construction is just getting under way on the remaining areas. Throughout the design process, engineers and scientists collaborated to capture the best available information on wetland treatment systems, and to develop the most appropriate design criteria. Some of the

more challenging issues included characterizing stormwater inflows and phosphorus loads, determining appropriate nutrient removal performance characteristics, and estimating hydraulic design parameters relating to densely vegetated systems. The design process combined in-house staff with engineering consultants, construction contractors, external review groups and independent peer-review. This paper summarizes major design aspects and key assumptions, and sets the stage for addressing future challenges associated with achieving long-term water quality goals of Everglades restoration.

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857. **Toxicological evaluation of constructed wetland habitat sediments utilizing *Hyalella azteca* 10-day sediment toxicity test and bacterial bioluminescence.**

Steevens, J. A.; Vansal, S. S.; Kallies, K. W.; Knight, S. S.; Cooper, C. M.; and Benson, W. H.

Chemosphere 36(15): 3167-3180. (June 1998)

NAL Call #: TD172.C54; ISSN: 0045-6535

Descriptors: toxicity tests/ agricultural runoff/ pesticides/ erosion/ indicator species/ underwater habitats/ pollution control/ sediment contamination/ toxicity/ habitats/ bioassay/ interstitial water/ water pollution effects/ sediments/ artificial wetlands/ toxicity testing/ bioassays/ agricultural practices/ pore water/ bacteria/ luminescence/ habitat/ *Hyalella azteca*/ methods and instruments/ network design/ toxicity testing/ toxicology and health

Abstract: A toxicological evaluation was conducted on wetland habitats created as a result of run-off from agricultural areas. These temporary wetlands were created by using drop pipes as a means of reducing erosional cutting in agricultural fields. Toxicity bioassays utilizing bacterial bioluminescence and *Hyalella azteca* were used to assess sediment pore water and whole sediment, respectively. Inhibition of bacterial bioluminescence was initially used to determine relative toxicities of pore water from ten wetland sites. Constructed wetland sites were compared to the University of Mississippi Biological Field Station, a relatively pristine reference site. The *H. azteca* ten day sediment toxicity test was utilized to assess sediment from four selected sites using survival and growth as toxicological endpoints. Results from the toxicological evaluation, along with extensive ecological evaluations, were used to assess the best approach for implementation of temporary wetland habitats with existing agricultural practices.

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858. **Treatment of swine wastewater using a saturated-soil-culture soybean and flooded rice system.**

Szögi, A. A.; Hunt, P. G.; and Humenik, F. J.

Transactions of the ASAE 43(2): 327-336. (2000)

Descriptors: wetlands/ wastewater treatment/ rice/ crops/ soybeans/ livestock

Abstract: Constructed wetlands have potential for treatment of livestock wastewater, but they generally contain wetland plants rather than agronomic crops. We evaluated two agronomic crops, saturated-soil-culture (SSC) soybean and flooded rice, in a constructed wetland system used for swine wastewater treatment. Both crop production and treatment efficiency were evaluated from 1993 to 1996 in two 4-m x 33.5-m constructed wetland cells that were connected in series. The first cell contained SSC soybean - four cultivars planted in a randomized complete

block design with four replications. Flooded rice 'Maybelle' was planted in the second cell. From the first to fourth year, wastewater application rates were gradually increased to obtain rates of 2.0 to 8.8 and 0.5 to 2.2 kg ha super(-1) d super(-1) for total N and P, respectively. The best soybean grain and dry matter yields were 4.0 and 9.1 Mg ha super(-1), respectively. These were obtained with soybean 'Young' at the lowest wastewater application rate. Increasing total N loading rates and the associated higher NH sub(4)-N concentrations depressed soybean seed yield and dry matter production. On the other hand, both rice grain and dry matter production were stable over the application range; mean values were 4.0 and 10.9 Mg ha super(-1), respectively. Nutrient mass reductions were good; removal values increased linearly with loading rates ($y = 0.69N \text{ load} + 0.45$, $R \text{ super}(2) = 0.99$ and $y = 0.45P \text{ load} + 0.20$, $R \text{ super}(2) = 0.95$). At the highest loading rate, the system removed 751 and 156 kg ha super(-1) yr super(-1) N and P, respectively. It appears that the SSC soybean and flooded rice system could be useful for liquid manure management in confined livestock production. The system produced comparable treatment to systems with natural wetland plants; moreover, the soybean and rice are marketable crops. However, the flooded rice seems to be the more robust component for high wastewater application rates.

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859. Using historical records of land use to improve wetland mitigation.

Ewing, J. M.; Vepraskas, M. J.; and Zanner, C. W. *Southeastern Geographer* 45(1): 25-43. (2005);

Descriptors: Carolina bays/ historical records/ organic soils/ subsidence/ wetland mitigation

Abstract: Successful wetland mitigation is determined by goals and performance standards of a U.S. Army Corp of Engineers approved mitigation plan. This study collected and reviewed historical data for a mitigation site prior to construction to reduce the cost and risk of mitigation failure. Historical records were reviewed to evaluate the hydrology, vegetation, and soils of a drained Carolina bay wetland. Historical data were obtained from courthouse records, aerial photographs, personal interviews, the local Natural Resources Conservation Service, and the National Railroad Historical Society. Photographs and interviews indicated there was open water before drainage, suggesting a potential source of consistent hydrology. Organic soils subside when influenced by land clearance, drainage, and agricultural activities and could result in a water table above the soil surface once hydrology is restored. Aerial photographs show that several drainage systems have existed over the last 90 yr. Soils along the lines of the earlier drainage ditches and a former railroad line still show disturbance to depths of 1 m. These areas of disturbance could affect vegetation establishment. Records of agricultural practices suggest higher nutrient levels than those of undisturbed Carolina bays, indicating that undesired vegetation could compete with desired vegetation. Historical information verified that Juniper Bay is a viable restoration site and identified areas where design change could help improve chances for success. Similar historical reviews with other mitigation sites can help reduce cost and risk through evaluation of hydrology, soils, and vegetation.

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860. 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

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861. Wetland buffer areas for treatment of pumped agricultural drainage water.

Chescheir, G. M.; Skaggs, R. W.; Gilliam, J. W.; and Broadhead, R. G.

In: Coastal water resources: Proceedings of a symposium held in Wilmington, North Carolina. Bethesda, Maryland: American Water Resources Association; 255-263; 1988. *NAL Call #:* TC401.A5 no.88-1

Descriptors: agricultural runoff/ coastal waters/ nutrients/ wastewater treatment/ wetland wastewater treatment/ field tests/ hydrologic properties/ model studies/ nitrates/ nitrogen/ phosphorus/ sediment load/ water pollution control/ water sampling/ water quality control/ wastewater treatment processes/ estuaries

Abstract: The hydrology and pollutant removal effectiveness of wetland buffer areas receiving agricultural drainage water are analyzed. Field experiments were conducted on two wetland buffer areas. During selected pumping events, water level measurements and water quality samples were taken over a network of stations. Automatic water samplers and water level recorders were used to monitor water quality and water table elevations between sampling events. Rhodamine dye studies were conducted to determine water velocities and wetland roughness coefficients. The hydrology of the buffer areas was simulated using a model for overland flow through vegetated areas. A routine was added to the model to calculate the residence time of the water on the wetland and to calculate the percent removal of nutrients and sediment. The water management model, DRAINMOD was used to determine the frequency and intensity of pumping events by calculating drainage and runoff volumes from the drained agricultural areas. Results from the two models compared well to the field data. It was found that pumping agricultural drainage water through wetland buffer areas will significantly reduce the concentration of sediments and other nutrients in the water before it reaches an outlet. The effectiveness of removing these pollutants can be increased by facilitating even distribution of the water over the buffer area with a diffuser canal. Lower water velocities were observed on the Laurel Bay buffer than on the Northwest Fork buffer. Of the two buffers, the Laurel Bay buffer was larger with less gradient and greater resistance to flow. Estimates of the percent of nutrient removal from the total mass of nutrient pumped onto the buffer over a 20 year period was 79% for total Kjeldahl nitrogen, 82% for nitrate nitrogen, 81% for total phosphorus, and 92% for sediment. (Author 's abstract)

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862. 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.

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863. Winter feeding ecology of northern shovelers on freshwater and saline wetlands in south Texas.

Tietje, W. D. and Teer, J. G.

Journal of Wildlife Management 60(4): 843-855. (1996)

NAL Call #: 410 J827; ISSN: 0022-541X

Descriptors: wetlands/ foraging behavior/ food preferences/ activity patterns/ overwintering/ marshes/ salt marshes/ behavior/ aquatic birds/ feeding behaviour/ foods/ waterfowl/ USA, Texas, Welder Wildlife Refuge/ food organisms/ behavior/ *Anas clypeata*

Abstract: During October-May 1982-84, we compared food availability, food use, and gut morphology of northern shovelers (*Anas clypeata*) on coastal estuarine wetlands in South Texas and on several freshwater lakes 18 km inland to evaluate the relative importance of estuarine versus freshwater habitats. Of 3 seasons and 3 times of day examined, shovelers spent more time feeding in saltwater than freshwater during early winter ($P = 0.005$) and afternoon ($P = 0.005$). Available biomass of plankton, nekton, and seeds was greater ($P < 0.001$) in freshwater than saltwater. Animal foods composed 80% of the saltwater compared to 50% of the freshwater diet. Although plankton composed similar ($P = 0.56$) proportions of the freshwater and saltwater diets, shovelers ingested more vegetation ($P < 0.001$) in freshwater and more nekton ($P < 0.001$) in saltwater. A preference assessment of 8 taxa of shoveler animal foods ranked plankton first and freshwater shrimp (*Palaemonetes* spp.) last in both habitats. Shoveler intestines were heavier in freshwater during 1982-83 ($P < 0.001$), but heavier in saltwater ($P = 0.048$) in 1983-84. During midwinter, shoveler intestines were longer ($P = 0.0044$) and gizzards were heavier ($P < 0.001$) in saltwater than freshwater. Overall, ceca mass ($P < 0.001$) and length ($P < 0.001$) were greater in freshwater. Food availability and gut morphology data suggest that freshwater wetlands were of higher quality than saltwater wetlands for wintering shovelers. Management of waterfowl habitats in the Texas Gulf Coastal Zone should emphasize protection of freshwater areas from saltwater intrusion and other development activities to maintain optimal wintering habitat for northern shovelers, and perhaps other waterfowl as well.

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