1223. **Effect of compaction simulating cattle trampling on soil physical characteristics in woodland.**
Ferrero, A. F.
Soil and Tillage Research 19(2-3): 319-329. (1991)
NAL Call #: S590.S48; *ISSN:* 0167-1987
Descriptors: soil physics/ physical properties/ soil compaction/ trampling/ forest soils/ soil/ soil density/ soil water/ infiltration/ soil chemistry/ soil organic matter/ grazing/ ecology
Abstract: Changes in the physical, chemical and hydrological properties of a silt loam soil under deciduous coppiced woodland as a result of different intensities of compaction were studied. Repeated compaction only affected organic matter content and the bulk density of the topsoil. However compaction did reduce the infiltration capacity and increase the penetration resistance of the soil. Root development, dry root and green matter production were significantly affected by repeated compaction, especially in Phleum pratense. Assessment of the effectiveness of the techniques used in the analysis indicated that measurements of infiltration and penetration resistance were the most significant. Growth tests were effective only with species sensitive to compaction and only up to 50 days, after sowing.

1224. **Infiltration and runoff water quality response to silvicultural and grazing treatments on a longleaf pine forest.**
Wood, J. C.; Blackburn, W. H.; Pearson, H. A.; and Hunter, T. K.
Journal of Range Management 42(5): 378-381. (1989)
NAL Call #: 60.18 J82; *ISSN:* 0022-409X
http://jrm.library.arizona.edu/data/1989/425/7wood.pdf
Descriptors: coniferous forests/ silviculture/ grazing/ interrill erosion/ water quality/ losses from soil/ runoff/ Louisiana
This citation is from AGRICOLA.

1225. **Livestock grazing management impacts on stream water quality: A review.**
Agouridis, C. T.; Workman, S. R.; Warner, R. C.; and Jennings, G. D.
Journal of the American Water Resources Association 41(3): 591-606. (2005)
NAL Call #: GB651.W315; *ISSN:* 1093-474X
Descriptors: streams/ grazing/ water quality/ livestock/ nonpoint pollution sources/ reviews/ best management practices/ hydraulics/ nonpoint pollution/ pollution effects/ agricultural pollution/ USA/ grazing
Abstract: Controlling agricultural nonpoint source pollution from livestock grazing is a necessary step to improving the water quality of the nation's streams. The goal of enhanced stream water quality will most likely result from the implementation of an integrated system of best management practices (BMPs) linked with stream hydraulic and geomorphic characteristics. However, a grazing BMP system is often developed with the concept that BMPs will function independently from interactions among controls, climatic regions, and the multifaceted functions exhibited by streams. This paper examines the peer reviewed literature pertaining to grazing BMPs commonly implemented in the southern humid region of the United States to ascertain effects of BMPs on stream water quality. Results indicate that the most extensive BMP research efforts occurred in the western and midwestern U.S. While numerous studies documented the negative impacts of grazing on stream health, few actually examined the success of BMPs for mitigating these effects. Even fewer studies provided the necessary information to enable the reader to determine the efficacy of a comprehensive systems approach integrating multiple BMPs with pre-BMP and post-BMP geomorphic conditions. Perhaps grazing BMP research should begin incorporating geomorphic information about the streams with the goal of achieving sustainable stream water quality.

1226. **Nitrogen trace gas emissions from a riparian ecosystem in southern Appalachia.**
Walker, J. T.; Geron, C. D.; Vose, J. M.; and Swank, W. T.
Chemosphere 49(10): 1389-1398. (2002)
NAL Call #: TD172.C54; *ISSN:* 0045-6535
Descriptors: biogeochemistry/ riparian vegetation/ grazing/ rehabilitation/ air-earth interfaces/ nitrogen compounds/ mass transfer/ soil chemistry/ data collections/ nitrogen emissions/ nitrogen in ecosystems/ nitric oxide emissions from soil/ ammonia exchange, air-soil/ nitrous oxide emissions from soil/ livestock biometeorology/ renovation/ soil science/ riparian environments/ gas exchange/ atmospheric chemistry/ ammonia/ atmospheric gases/ soils/ ammonium compounds/ microorganisms/ compaction/ organic wastes/ restoration/ wetlands/ nitrates/ Bos/ USA, Appalachian Mts./ USA, Appalachia/ cattle effects/ nitrous oxide/ nitric oxide/ true cattle
Abstract: In this paper, we present two years of seasonal nitric oxide (NO), ammonia (NH sub(3)), and nitrous oxide (N sub(2)O) trace gas fluxes measured in a recovering riparian zone with cattle excluded and adjacent riparian zone grazed by cattle. In the recovering riparian zone, average NO, NH sub(3), and N sub(2)O fluxes were 5.8, 2.0, and 76.7 ng N m super(-2) s super(-1) (1.83, 0.63, and 24.19 kg N ha super(-1) y super(-1)), respectively. Fluxes in the grazed riparian zone were larger, especially for NO and NH sub(3), measuring 9.1, 4.3, and 77.6 ng N m super(-2) s super(-1) (2.87, 1.35, and 24.50 kg N ha super(-1) y super(-1)) for NO, NH sub(3), and N sub(2)O, respectively. On average, N sub(2)O accounted for greater than 85% of total trace gas flux in both the recovering and grazed riparian zones, though N sub(2)O fluxes were highly variable temporally. In the recovering riparian zone, variability in seasonal average fluxes was explained by variability in soil nitrogen (N) concentrations. Nitric oxide flux was positively correlated with soil ammonium (NH super(+) sub(4)) concentration, while N sub(2)O flux was positively correlated with soil nitrate (NO super(-) sub(3)) concentration. Ammonia flux was positively correlated with the ratio of NH super(+) sub(4) to NO super(-) sub(3). In the grazed riparian zone, average NH sub(3) and N sub(2)O fluxes were not correlated with soil temperature, N concentrations, or moisture. This was likely due to high variability in soil microsite conditions related to cattle effects such as compaction and N input. Nitric oxide flux in the

grazed riparian zone was positively correlated with soil temperature and NO super(-) sub(3) concentration. Restoration appeared to significantly affect NO flux, which increased approximately 600% during the first year following restoration and decreased during the second year to levels encountered at the onset of restoration. By comparing the ratio of total trace gas flux to soil N concentration, we show that the restored riparian zone is likely more efficient than the grazed riparian zone at diverting upper-soil N from the receiving stream to the atmosphere. This is likely due to the recovery of microbiological communities following changes in soil physical characteristics.

1227. **Recovery of some surface soil properties of ecological interest after sheep grazing in a semi-arid woodland.**
Braunack, M. V. and Walker, J.
Australian Journal of Ecology 10(4): 451-460. (1985)
NAL Call #: QH540.A8; *ISSN:* 0307-692X
Descriptors: Eucalyptus populnea/ population dynamics/ organic matter compaction/ Australia
Abstract: Solodic soils within a semi-arid poplar box (Eucalyptus populnea) woodland at Wycanna, in southern Queensland [Australia] have been subjected to impacts from sheep and cattle grazing for at least 100 years. The micromorphology of the surface of two soils, a gradational texture profile (Gn 3.13, Paleustalf) and a duplex profile (Db 1.23, Paleustalf) showed that compaction had occurred. Recovery of the soil surfaces following removal of animal grazing was measured in terms of porosity, presence of illuvial layrs, surface soil strength, some chemical properties and water infiltration rates. The grazing impact was greatest on the Gn 3.13 soil and visual signs of the grazing impact were still evident 16 years following sheep removal. Reduced soil organic matter and increased surface soil hardness as a result of grazing, rather than surface crusting or changes in water infilatration rates are suggested as the mechanisms controlling the observed increases in woody plant populations in these semi-arid woodlands.

1228. **Role of plant cover and stock trampling on runoff and soil erosion from semi-arid wooded rangelands.**
Greene, R. S. B.; Kinnell, P. I. A.; and Wood, J. T.
Australian Journal of Soil Research 32(5): 953-973. (1994)
NAL Call #: 56.8 Au7; *ISSN:* 0004-9573
Descriptors: soil-water-plant relationships/ soil erosion/ semiarid climates/ forest watersheds/ vegetation effects/ rainfall simulators/ erosion rates/ sediment erosion/ runoff/ rainfall/ plant populations/ stormwater runoff/ vegetation cover/ environment management/ Australia/ stormwater runoff/ vegetation cover/ environment management/ soil-water-plant relationships/ semiarid climates/ forest watersheds/ vegetation effects/ rainfall simulators/ erosion rates/ sediment erosion
Abstract: Relationships between plant cover, runoff and erosion of a massive red earth were investigated for a runoff zone of an intergrove area in a semi-arid wooded rangeland in eastern Australia. The measurements were carried out in small experimental paddocks with different stocking rates of sheep and kangaroos. A trailer-mounted rainfall simulator was used to apply rainfall at a time averaged rate of 30 mm/h to obtain runoff rates and sediment concentrations. There was a significant negative relationship (r super(2) = 0.58; P < 0.01) between final runoff rate and plant cover. It is probable that the plants increase infiltration and decrease runoff by (i) funnelling water down their stems and (ii) providing macropores at the base of the plant through which water can rapidly enter the soil. However, there was no significant effect of plant cover on sediment concentration. Probable reasons for this are: (i) even though plant cover will absorb raindrop energy and decrease the erosive stress on the soil, the nature of the plants investigated is such that they may not be 100% effective in protecting the soil beneath them, and (ii) the distribution of contact cover provided by the base of the plants is highly patchy and thus relatively inefficient at reducing sediment concentration. At zero cover final runoff rates from paddocks with a high and low stocking rate were similar, i.e. 23.4 and 22.3 mm/h respectively. However, at zero cover, the sediment concentration from the high stocking rate paddock was significantly (P < 0.01) greater than that from the low stocking rate paddock. Greater hoof activity and lower organic matter (and hence lower structural stability) of the 0-20 mm layer in the high stocking rate paddock caused the soil surface to be more susceptible to erosion. These results show that grazing by removing perennial grasses and pulverizing the surface soil can have a major impact on local water balances and erosion rates respectively within the intergrove areas. The implications of these results for the long-term stability of semi-arid mulga woodlands is briefly discussed.

1229. **Run-off and soil movement on mid-slopes in north-east Queensland [Australia] grazed woodlands.**
Scanlan, J. C.; Pressland, A. J.; and Myles, D. J.
Rangeland Journal 18(1): 33-46. (1996)
NAL Call #: SF85.4.A8A97; *ISSN:* 1036-9872
Descriptors: woodlands/ soil movement/ rain/ erosion/ sediment yield/ vegetation/ ground cover/ pastures/ soil water balance/ runoff/ grasslands/ woodland grasslands/ soil
Abstract: Runoff, bed load and sediment concentration data were collected over a five-year period from unbounded catchments in grazed and exclosed pastures in woodlands. Cover varied from <5% during drought conditions to almost 100% in exclosed areas after above-average rainfall. High bed load soil loss, sediment concentration and runoff percentages were associated with low cover (<30%). Runoff as a percentage of rainfall increased linearly with rainfall intensity; decreased linearly with cover; decreased slightly as soil moisture status declined; and reached a maximum at intermediate rainfall events. Interactions between these factors were observed. Runoff was up to 30% of rainfall in moderate rainfall events (30-40 mm) where maximum rainfall intensity over any 15 minute period (I15) exceeded 70 mm/h. When soil moisture status was high, mean run-off exceeded 30% for 40-80 mm rainfall events. For all rainfall event sizes, run-off exceeded 20% where I15 exceeded 60 mm/h. Cover had very little effect on runoff when rainfall intensity was low (I15 <20 mm/h), soil water deficit was low (<10 mm) or when rainfall events were >75 mm or <10 mm. Bed load plus suspended sediment loads ranged from negligible to 1 t/ha per year, depending principally on cover. Soil movement from areas with >40-50% cover was very low. Pastures dominated by

Bothriochloa pertusa (a stoloniferous, naturalised grass) had lower runoff and lower rates of soil movement than pastures dominated by Heteropogon contortus (a native tussocky perennial grass) when compared at the same level of cover. Differences between grazed and exclosed areas could be attributed solely to differences in cover.

1230. **Soil hydrologic response to intensive rotation grazing: A state of knowledge.**
Warren, S.
In: Infiltration development and application/ Fok, Yu-Si. Manoa, Hawaii: Water Resources Research Center, 1987; pp. 488-501
NAL Call #: QD543.I5 1987
Descriptors: soil water movement/ infiltration/ grazing/ stocking rate/ animal husbandry
Abstract: An extensive review of the available scientific literature provides no support for a hypothesis suggesting that infiltration rates improve with the implementation of intensive systems of rotational grazing. Intensive rotational grazing systems are generally characterized by significantly lower infiltration rates than are ungrazed exclosures, indicating a negative hydrologic impact. The detrimental impact of intensive rotation grazing is very similar to that incurred under comparably stocked continuous grazing regimes. The decline in infiltration rates is most apparent in recently grazed pastures versus rested pastures, and is related to reductions in protective organic cover and modifications of surface soil properties which accompany intense periodic livestock activity. Stocking rate may be the most important variable governing the hydrologic impact of intensive rotation grazing systems. As stocking rates increase beyond recommended moderate levels, infiltration rates decline dramatically.

1231. **Soil quality of harvested and grazed forest cutblocks in southern British Columbia.**
Krzic, M.; Broersma, K.; Newman, R. F.; Ballard, T. M.; and Bomke, A. A.
Journal of Soil and Water Conservation 56(3): 192-197. (2001)
NAL Call #: 56.8 J822; *ISSN:* 0022-4561
Descriptors: cattle grazing/ forest soil/ lodgepole pine/ soil compaction/ soil quality
Abstract: This study evaluated soil chemical and physical properties as affected by timber harvesting and cattle grazing on cutblocks planted to lodgepole pine (Pinus contorta Dougl. ex Loud. var. latifolia Engelm.). Soil conditions on the ungrazed exclosures (representing disturbance by harvest only) and pastures grazed over 10 years to achieve 50% forage utilization (representing disturbance by harvest and grazing) were compared to the nearby forest without harvest and cattle grazing. Soil chemical properties showed no detrimental impacts from harvesting and/or livestock grazing. Inject, greater CEC, Ca, C, and N values on disturbance treatments should improve these soils as rooting media. Soil physical properties, although less favorable for tree growth on the two disturbance treatments than the mature forest, showed that a majority of the soil profile was not compacted above root-restricting threshold conditions. Results obtained from this study support the integrated use of forested rangelands in southern British Columbia.

Fish and Wildlife Effects

1232. **Avian and amphibian use of fenced and unfenced stock ponds in northeastern Oregon forests.**
Bull, E. L.; Deal, J. W.; and Hohmann, J. E. USDA Forest Service Rocky Mountain Research Station; PNW-RP-539, 2001. 9 p.
NAL Call #: A99.9 F7625Uni no. 539
http://www.treesearch.fs.fed.us/pubs/2964
Descriptors: amphibians/ birds/ livestock grazing/ northeastern Oregon/ stock ponds
Abstract: The abundance of birds and amphibian larvae was compared between fenced and unfenced stock ponds in 1993 to determine if fencing improved the habitat for these species in northeastern Oregon. Stock ponds that were fenced had significantly higher densities of bird species, guilds, and taxonomic groups than stock ponds that were unfenced. No differences in the relative abundance of larvae of Pacific treefrogs (Pseudacris regilla) or long-toed salamanders (Ambystoma macrodactylum) were found between fenced and unfenced ponds. Fencing at least a portion of stock ponds in forested areas provides habitat for a greater diversity and abundance of birds.

1233. **Breeding bird response to cattle grazing of a cottonwood bottomland.**
Sedgwick, J. A. and Knopf, F. L.
Journal of Wildlife Management 51(1): 230-237. (1987)
NAL Call #: 410 J827; *ISSN:* 0022-541X
Descriptors: Troglodytes aedon/ Toxostoma rufum/ Turdus migratorius/ Geothlypis trichas/ Icteria virens/ Pipilo erythrophuthalmus/ Populus sargentii/ foraging
Abstract: We studied avian habitat relationships and the impact of grazing on breeding densities of selected migratory birds in a plains cottonwood (Populus sargentii) bottomland in northeastern Colorado. Five 16-ha plots served as controls and 5 were fenced and fall-grazed October-November 1982-84 following a season of pre-treatment study in the spring of 1982. We focused our analysis on bird species directly dependent on the grass-herb-shrub layer of vegetation for foraging, nesting, or both. The guild included house wren (Troglodytes aedon), brown thrasher (Toxostoma rufun), American robin (Turdus migratorius), common yellowthroat (Geothlypis trichas), yellow-breasted chat (Icteria virens), and rufous-sided towhee (Pipilo erythropthalmus). Moderate, late-fall grazing had no detectable impact on calculated densities of any of the 6 species, implying that proper seasonal grazing of a cottonwood floodplain is, at least initially (3 years), compatible with migratory bird use of a site for breeding.

Habitat associations suggested that common yellowthroats and yellow-breasted chats were most unique and most likely to respond negatively to higher levels of grazing. We suggest that these latter 2 species are appropriate ecological indicators of the quality of ground-shrub vegetation as breeding bird habitats in lowland floodplains of the Great Plains.

1234. **Brown-headed cowbird behavior and movements in relation to livestock grazing.**
Goguen, Christopher B. and Mathews, Nancy E.
Ecological Applications 11(5): 1533-1544. (2001)
NAL Call #: QH540.E23; *ISSN:* 1051-0761
Descriptors: animals and man/ disturbance by man/ commercial activities/ conservation/ nutrition/ feeding behaviour/ reproduction/ reproductive behaviour/ associations/ parasites diseases and disorders/ land and freshwater zones/ Nearctic Region/ North America/ USA/ Passeriformes: farming and agriculture/ conservation measures/ nest parasitism/ Molothrus ater (Aves)/ brood parasite livestock grazing associations/ conservation implications/ New Mexico/ Colfax County/ livestock grazing control related to brood parasite associations/ Passeriformes/ Aves/ birds/ chordates/ vertebrates
Abstract: The Brown-headed Cowbird (Molothrus ater) is a widespread brood parasite which often engages in a commensalistic feeding relationship with domestic livestock. We studied the behavior of female cowbirds breeding in pinyon-juniper woodlands in New Mexico, USA, on two adjacent sites, one an active cattle ranch, and the other a site that was not grazed by domestic livestock throughout the songbird breeding season. In 1994, we conducted morning and afternoon surveys of cowbird abundance in pinyon-juniper and prairie habitats; from 1995 to 1997 we used radio telemetry to monitor daily and seasonal movement and behavioral patterns of female cowbirds. Our objectives were to measure how closely cowbird feeding behavior was linked to livestock grazing, and how the presence or absence of active livestock grazing within a female's breeding range influenced diurnal patterns of behavior. During morning surveys, we detected cowbirds primarily in pinyon-juniper habitat, but in similar numbers in the ungrazed and actively grazed woodlands. In the afternoon, we detected cowbirds feeding almost exclusively in actively grazed prairies but found that they deserted those sites when cattle were removed in early July. Radio telemetry confirmed that individual females were commuting daily between these habitats. Females (n = 30) were generally located in pinyon-juniper habitats from 0500 to [approximately]1200, presumably breeding. Females that bred within actively grazed pinyon-juniper habitat often fed on the ground with livestock on their morning ranges, while those breeding in ungrazed habitat did not. In total, 98% of cowbird feeding observations occurred with livestock. Although most females commuted <3 km between breeding and feeding ranges, some individuals with breeding ranges located toward the center of the ungrazed property averaged 7.7 km. When cattle were rotated out of the main feeding pasture in early July, females immediately extended their commutes by [approximately]1.2 km to access remaining actively grazed pastures. Overall home range sizes were large (160-4344 ha) and tended to increase with distance between the females' breeding range and active livestock grazing. This increase was reflected mainly by differences in feeding range sizes rather than breeding range sizes. The observed link between cowbird behavior and the distribution of livestock suggests that in regions where livestock grazing is the dominant land use, manipulations of livestock grazing patterns may provide an effective tool to manage cowbird parasitism.

1235. **Cattle grazing in a national forest greatly reduces nesting success in a ground-nesting sparrow.**
Walsberg, Glenn E.
Condor 107(3): 714-716. (2005)
NAL Call #: QL671.C6; *ISSN:* 0010-5422
Descriptors: dark-eyed junco/ Pinus ponderosa/ ponderosa pine/ Arizona/ cattle grazing/ Coconino County, Kaibab National Forest/ commercial enterprises/ disturbances/ farming and agriculture/ forest/ grazing/ habitat destruction/ land zones/ nearctic region/ nesting success/ North America/ predation/ productivity/ reproduction/ savanna/ terrestrial ecology/ USA/ vegetation cover/ wildlife/ human relationships/ junco/ Junco hyemalis/ nest success/ cattle
Abstract: Grazing of domestic livestock on public lands in the western United States is a major source of habitat destruction. I quantified nest success of ground-nesting Dark-eyed Juncos (Junco hyemalis) breeding in ponderosa pine forests and pine savanna in the Kaibab National Forest of northern Arizona. Comparison. of results for areas grazed by cattle to results for immediately adjacent areas protected from grazing revealed that cattle grazing was associated with a dramatic (75%) reduction in nest success. Cattle grazing reduced vegetation cover over nests by an average of 41%, exposing the nest to more extreme climatic conditions as well as possibly making them more conspicuous to predators.

1236. **Changing fire regimes and the avifauna of California oak woodlands.**
Purcell, Kathryn L. and Stephens, Scorr L.
Studies in Avian Biology(30): 33-45. (2005)
NAL Call #: QL671.S8; *ISSN:* 0197-9922
Descriptors: violet-green swallow/ western bluebird/ western kingbird/ anthropogenic/ avian diversity/ fire/ fire frequency/ fire intensity/ fire suppression/ livestock grazing/ oak woodlands
Abstract: Natural and anthropogenic fire once played an important role in oak woodlands of California. Although lightning-ignited fires were infrequent, the California Indians used fire to modify oak woodland vegetation for at least 3,000 yr. These high-frequency, low-intensity fires likely resulted in little mortality of mature oaks, low but continuous tree recruitment, an open understory, and a fine-grained mosaic of vegetation patches. Following settlement by Europeans in the mid-1800s, ranchers burned to reduce shrub cover and to increase grassland area and forage production; surface fires were common with average fire-return intervals of 8-15 yr. Fire suppression, begun in the 1940s to 1950s, led to increases in surface and crown fuels, invasion of woody vegetation in the understory, and increased tree density. In the absence of demonstrated fire effects on oak woodland birds, we used changes in vegetation structure expected to result from fire and fire suppression to predict the response of oak woodland birds to fire and fire suppression based on nesting habitat of 17

common oak woodland species breeding at the San Joaquin Experimental Range, Madera County, California. Our results suggest that populations of Western Kingbirds (Tyrannus verticalis), Western Bluebirds (Sialia mexicana), and Violet-green Swallows (Thchycineta thalassina), would increase in abundance following fire, because they consistently nested in habitat similar to that expected to result from frequent, low-intensity fire. The species predicted to respond negatively to changes resulting from fire differed among the variables examined. If fire produces a mosaic of habitat patches rather than a homogeneous landscape, we expect that the differing habitat needs of most species will be provided for. As with fire, the most obvious change resulting from excluding livestock was an increase in shrub cover. The question naturally arises to what extent livestock grazing creates habitat similar to that created by historical fire, but this question remains unstudied. More fire-history research is needed to understand past fire regimes of oak woodlands and the effects of fire, including prescribed fire, on the vegetation and the bird community. The effects of grazing and the extent to which grazing mimics fire clearly require more study. We encourage others to test our hypotheses regarding responses of birds to variables expected to be altered by fire: shrub cover, tree density, and numbers of snags, saplings, and logs. Finally, we need to test our working hypothesis that a mosaic of habitat patches will provide the habitat conditions needed to sustain the high avian diversity characteristic of oak woodlands. (Author)

1237. **Comparison of rodent communities in sites with different degrees of disturbance in deciduous forest of southeastern Morelos, Mexico.**
Garcia Estrada, Carlos; Romero Almaraz, Ma De Lourdes; and Sanchez Hernandez, Cornelio
Acta Zoologica Mexicana Nueva Serie(85): 153-168. (2002); *ISSN:* 0065-1737
Descriptors: age structure/ cattle grazing/ climates/ community composition/ conservation biology/ deciduous forests: habitat/ demographic parameters/ environmental disturbance/ firewood extraction/ intersite differences/ lumber harvesting/ microhabitat preference/ population density/ soils/ species diversity/ species evenness/ topography
Abstract: This study is the first work that compares rodent communities in a deciduous forest in Mexico. It documents differences between sites experiencing different degrees of disturbance caused by firewood and lumber extraction, and cattle grazing; a relatively undisturbed site (Site 1) and another more disturbed site (Site 2) in southeastern Morelos State. In each site we captured six species of rodents. Though habitat disturbance did not modify diversity or evenness of rodent species, the total number of individuals captured in Site 1 (n=319) was greater than in Site 2 (n=90). Effects of habitat fragmentation were expressed in significant differences in population density, age structure and microhabitat preference between two sites for Baiomys musculus, Peromyscus levipes and P. melanophrys. The disturbance of deciduous forest appears to be the principal factor explaining differences in demographic parameters of rodent species between the two study sites, as these two sites have the same climate, similar soils, and topography which differ only slightly.

1238. **Effect of domestic cattle on the condition of female white-tailed deer in southern pine-bluestem forests, USA.**
Jenks, Jonathan A.; Leslie, David M.; and Leslie, D. M.
Acta Theriologica 48(1): 131-144. (2003)
NAL Call #: 410 AC88; *ISSN:* 0001-7051
Descriptors: Arkansas/ carcass weight/ cattle stocking/ commercial enterprises/ disturbances/ ecosystems/ farming and agriculture/ fat/ femur/ food competition/ food supply/ forest management/ forests/ globulin/ glucose/ habitat use/ Howard & Pike Counties/ interspecies relationships/ interspecies relationships or intraspecies relationships/ kidneys/ land zones/ McCurtain County/ Nearctic Region/ North America/ nutrition/ nutritional condition/ Oklahoma/ physical condition/ physiological indices/ physiology/ productivity/ reproduction/ soils/ southern pine bluestem forests/ stocking intensity/ USA/ vegetation/ wildlife management/ wildlife/ human relationships/ white-tailed deer/ cattle/ agriculture/ condition/ weight/ competition/ food/ pregnancy/ blood/ white-tailed deer
Abstract: [unedited] Effect of domestic cattle stocking on the nutritional condition of white-tailed deer Odocoileus virginianus (Zimmermann, 1780) was assessed using physiological indices of collected specimens. Three study areas were delineated in McCurtain County, Oklahoma (heavy cattle stocking), and Howard (moderate to light cattle stocking) and Pike (no cattle stocking) counties, Arkansas that were similar with respect to soils and vegetation but differed with respect to cattle stocking rate. Female white-tailed deer were collected from study areas in February and August 1987-1988 to assess nutritional condition. Deer collected from study areas exposed to cattle grazing in February had lower carcass weights, fat attributes (femur marrow and kidney fat), and reproductive rates (fetuses/doe) than deer that were not exposed to cattle grazing. In August, deer collected from the moderate cattle area had heavier eviscerated carcass weights, serum glucose, albumin, and albumin/globulin ratios than deer collected from the heavy cattle area. Results suggest that if cattle are removed from managed forests in winter, nutritional condition of deer would be improved because of reduced competition for food.

1239. **The effect of habitat fragmentation and livestock grazing on animal communities in remnants of gimlet Eucalyptus salubris woodland in the Western Australian wheatbelt: Lizards.**
Smith, G. T.; Arnold, G. W.; Sarre, S.; Abensperg Traun, M.; and Steven, D. E.
Journal of Applied Ecology 33(6): 1302-1310. (1996)
NAL Call #: 410 J828; *ISSN:* 0021-8901
Descriptors: biogeography/ forests/ woodlands/ fragmentation/ habitats/ animal ecology/ forest litter/ understorey/ shrubs/ stand density/ species diversity/ forest fragmentation/ grazing/ wildlife/ effects/ nature conservation/ animal communities
Abstract: The study examined relationships between habitat and biogeographic variables and the presence of lizard groups and individual lizard species in remnants of gimlet Eucalyptus salubris woodland in Western Australia. The lizard species found in various gimlet woodland remnants are sub-sets of those found prior to fragmentation. Regression analysis showed that woody litter, percentage shrub cover and number of trees were the

only habitat variables to influence species richness of the lizard taxa. Area, connectivity and distance to the nearest native vegetation were the only biogeographical variables to influence species richness of geckos, other lizard species and total lizards. Three individual species showed no significant relationships with any variables, whereas three species had significant relationships with variables related to cover/shelter only. Disturbance from sheep grazing and trampling had no influence on the species richness of the different lizard taxa, but may have influenced the persistence of individual species in some remnants. The implications of these findings for management of remnant vegetation are discussed.

1240. **Effects of cattle grazing and haying on wildlife conservation at National Wildlife Refuges in the USA.**
Strassman, B. I.
Environmental Management 11(1): 35-44. (1987)
NAL Call #: HC79.E5E5; *ISSN:* 0364-152X
Descriptors: grass/ bird/ Fish and Wildlife Service/ regulatory agencies/ government agency/ environmental protection/ economics/ cost/ prescribed burning/ environmental law/ cattle industry/ feed industry
Abstract: The National Wildlife Refuge System is perhaps the most important system of federal lands for protecting wildlife in the USA. Only at refuges has wildlife conservation been legislated to have higher priority than either recreational or commercial activities. Presently, private ranchers and farmers graze cattle on 981,954 ha and harvest hay on 12,021 ha at 123 National Wildlife Refuges. USA Fish and Wildlife Service policy is to permit these uses primarily when needed to benefit refuge wildlife. To evaluate the success of this policy, I surveyed grassland management practices at the 123 refuges. The survey results indicate that in fiscal year 1980 there were 374,849 animal unit months (AUMs) of cattle grazing, or 41% more than was reported by the Fish and Wildlife Service. According to managers' opinions, 86 species of wildlife are positively affected and 82 are negatively affected by refuge cattle grazing or haying. However, quantitative field studies of the effect of cattle grazing and haying on wildlife coupled with the survey data on how refuge programs are implemented suggest that these activities are impeding the goal of wildlife conservation. Particular management problems uncovered by the survey include overgrazing of riparian habitats, wildlife mortality due to collisions with cattle fences, and mowing of migratory bird habitat during the breeding season. Managers reported that they spend $919,740 administering cattle grazing and haying; thus refuge grazing and haying programs are also expensive. At any single refuge these uses occupy up to 50% of refuge funds and 55% of staff time. In light of these results, prescribed burning may be a better wildlife management option than is either cattle grazing or haying.

1241. **The effects of domestic livestock grazing on breeding nongame birds in northeastern New Mexico.**
Goguen, C. B. Texas Tech University, 1994.
Descriptors: animals, non-game/ birds/ birds, passerine/ blackbirds and cowbirds/ gnatcatchers/ grazing/ habitat/ interspecies relationships/ livestock/ mortality/ nests and nesting/ predation/ statistics/ surveys/ vegetation/ North America/ United States/ New Mexico/ Northeastern Region/ Colfax County
Abstract: Objectives were to compare the following features of ungrazed and grazed pinyon-juniper woodlands: habitat and vegetation characteristics; songbird diversity and abundance; and songbird nesting success and cause-specific nest mortality levels. Study was conducted on the NRA Whittington Center and the adjacent Van Sweden Ranch in Colfax County. Thesis is divided into the following section titles: (1) The Influence of Domestic Livestock Grazing on Breeding Nongame Birds in Pinyon-Juniper Woodlands in Northwestern New Mexico; (2) Brown-headed Cowbird Parasitism of Grazed and Ungrazed Pinyon- Juniper Woodlands in Northeastern New Mexico; and (3) Nest Desertion and Moving by the Blue-Gray Gnatcatcher in Association with Brown- headed Cowbird Parasitism

1242. **The effects of habitat fragmentation and livestock-grazing on animal communities in remnants of gimlet Eucalyptus salubris woodland in the Western Australian wheatbelt. I. Arthropods.**
Abensperg Traun, M.; Smith, G. T.; Arnold, G. W.; and Steven, D. E.
Journal of Applied Ecology 33(6): 1281-1301. (1996)
NAL Call #: 410 J828; *ISSN:* 0021-8901
Descriptors: biogeography/ forests/ woodlands/ fragmentation/ isolation/ effects/ habitats/ arthropod communities/ forest litter/ understorey/ shrubs/ species diversity/ forest fragmentation/ grazing/ wildlife/ nature conservation/ ecology/ forest trees/ biology/ agricultural entomology
Abstract: The effects of habitat fragmentation and livestock activity on arthropod communities were examined within 26 remnants of gimlet Eucalyptus salubris woodland in Western Australia. Significant correlations were found between various remnant biogeographical variables: remnant area and connectivity (positive), and connectivity and distance from the study remnant to the nearest patch of native vegetation (negative). Remnant disturbance indices (sheep faecal pellet density, percentage cover of weeds) were significantly correlated with remnant biogeographic characteristics. Small and poorly connected remnants showed significantly higher intensities of disturbance than larger and better connected remnants. When disturbance indices were used to categorize study remnants into groups with high, moderate or low disturbance, remnants with high intensities of disturbance had significantly less lichen, litter and shrub cover. Highly disturbed remnants were associated with fewer scorpion species, lower termite and ant diversity, a lower abundance of scorpions, termites and mygalomorph spiders, more beetle species and higher beetle diversity, and greater abundance of earwigs and beetles. Cockroach, earwig and ant species richness showed no significant response to disturbance. Species richness of termites, and the abundance of lycosid and idiopid (mygalomorph) spiders, isopods, cockroaches and ants, was highest under moderate disturbance. Significant biogeographical covariates were area (abundance of araneomorph spiders, 'associated subordinate' and 'opportunistic' ants; richness of carabid, scarabaeid and 'other' beetle species, subordinate and opportunistic ants), connectivity (richness of termites, scarabaeid beetles) and distance to the nearest native vegetation (richness of

'dominant' ants). When disturbance and biogeographical effects were combined, total termite richness, and the richness of termite functional groups, declined markedly in highly disturbed, small and poorly connected remnants. Termite communities in relatively undisturbed remnants were more similar in species composition to communities in moderately disturbed quadrats than to communities in highly disturbed quadrats. Community similarity values for ants and beetles were similar across the study quadrats with different degrees of disturbance. Arthropod communities were also examined by canonical variate analyses across remnants with different degrees of disturbance, using total abundance and richness, and abundance and richness of predators (scorpions, spiders, carabid beetles, ants) and detritivores/herbivores (termites, isopods, earwigs, cockroaches, weevil and scarabaeid beetles). Effective site separation into the 3 disturbance categories was found for abundance and richness of all arthropods, and for predators alone. Abundance and richness of detritivores/herbivores separated into 2 groups of sites: high disturbance sites, and sites with low or moderate disturbance with no separation. In stepwise regression analyses, lichen cover, weed cover and sheep faecal pellet density were the most significant indicators of faunal abundance, richness and diversity. Remnant biogeographic variables explained a low percentage of variation in faunal characteristics. Habitat disturbance was the major influence on the arthropod communities, with remnant biogeographical factors consistently explaining low variations in the abundance or diversity of the fauna. Implications for the management of remnant vegetation are discussed.

1243. **Impact of livestock grazing activities on stream insect communities and the riverine environment.**
Strand, M. and Merritt, R. W.
American Entomologist 45(1): 13-30. (1999)
NAL Call #: QL461.A52; *ISSN:* 1046-2821
Descriptors: grazing/ community composition/ riparian environments/ aquatic insects/ environment management/ ecosystem disturbance/ insecta/ insects

1244. **Impacts of domestic livestock grazing on small mammals of forest grazing allotments in southeastern Idaho.**
Johnson, S. J.
In: Proceedings of the Wildlife-Livestock Relationships Symposium. (Held 20 Apr 1981-22 Apr 1981 at Coeur D'alene, Idaho.) Peek, James M. and Dalke, P. D. (eds.) Moscow, Idaho: Forest, Wildlife & Range Experiment Station, University of Idaho; pp. 242-250; 1982.
NAL Call #: SF84.84.W5 1981
Descriptors: Idaho
This citation is from AGRICOLA.

1245. **Impacts of grazing and burning on spider assemblages in dry eucalypt forests of north-eastern New South Wales, Australia.**
Harris, Rebecca; York, Alan; and Beattie, Andrew J.
Austral Ecology 28(5): 526-538. (2003)
NAL Call #: QH540 .A8; *ISSN:* 1442-9985
Descriptors: litter extraction: applied and field techniques/ pitfall trapping: applied and field techniques/ prescribed burning: applied and field techniques/ sweep sampling: applied and field techniques/ assemblage structure/ dry eucalypt forests/ grazing behavior/ habitat variability/ management strategies/ spatial relationships/ spatial scales/ stocking rates
Abstract: In the dry eucalypt forests of north-eastern New South Wales, Australia, cattle grazing occurs at low intensities and is accompanied by frequent low-intensity burning. This study investigated the combined effects of this management practice on the ground-dwelling and arboreal (low vegetation) spider assemblages. Spiders were sampled at 49 sites representing a range of grazing intensities, using pitfall trapping, litter extraction and sweep sampling. A total of 237 spider morphospecies from 37 families were collected using this composite sampling strategy. The abundance, richness, composition and structure of spider assemblages in grazed and ungrazed forest sites were compared and related to a range of environmental variables. Spider assemblages responded to a range of environmental factors at the landscape, habitat and microhabitat scales. Forest type, spatial relationships and habitat variability at the site scale were more important in determining spider assemblages than localized low-intensity grazing and burning. However, it is possible that a threshold intensity of grazing may exist, above which spiders respond to grazing and burning. Although low-intensity grazing and burning may not affect spider assemblages below a threshold stocking rate, that stocking rate has yet to be established.

1246. **Impacts of grazing and burning on terrestrial invertebrate assemblages in dry eucalypt forests of north-eastern New South Wales: Implications for biodiversity conservation.**
York, Alan and Tarnawski, Jaynia
In: Conservation of Australia's forest fauna/ Lunney, Daniel. Mosman: Royal Zoological Society of New South Wales, 2004; pp. 845-859.
Notes: ISBN: 095860858X
Descriptors: animals and man/ disturbance by man/ commercial activities/ conservation/ conservation measures/ ecology/ habitat/ terrestrial habitat/ abiotic factors/ physical factors/ land zones/ Australasian Region/ Australasia/ Australia/ Invertebrata: farming and agriculture/ cattle grazing/ effects on terrestrial communities and conservation implications/ habitat management/ dry eucalypt forests management/ grazing and burning effects on terrestrial communities implications/ community structure/ ground active taxa/ forest and woodland/ terrestrial communities/ grazing and burning effects and conservation implications/ fire/ burning effects on terrestrial communities and conservation implications/ New South Wales/ north east/ grazing and burning effects on terrestrial taxa and conservation implications/ dry eucalypt forests/ invertebrates

1247. **Impacts of logging, fire and grazing regimes on bird species assemblages of the Pilliga woodlands of New South Wales.**
Date, E. M.; Ford, H. A.; and Recher, H. F.
Pacific Conservation Biology 8(3): 177-195. (2002); *ISSN:* 1038-2097
Descriptors: adaptive management strategies/ assemblage composition/ assemblage distribution/ boxironbark woodlands/ fire/ fire exclusion/ fuel reduction/ grazing regimes/ logging/ species assemblages
Abstract: We investigated the composition and distribution of bird assemblages in the continuous Pilliga woodlands of northwest New South Wales in relation to floristic assemblages and disturbance (logging, fire and grazing) patterns. Box-ironbark woodlands contained high densities of White Cypress Pine Callitris glaucophylla and Narrow-leaved Ironbark Eucalyptus crebra, had a sparse, depauperate understorey, and were associated with frequent, intense logging and infrequent fires (due to fire exclusion and the use of grazing for fuel reduction). Box-ironbark woodlands were characterized by high frequencies of 12 bird species that occurred throughout the Pilliga and low frequencies of many other species. Blakely's Red Gum E. blakelyi woodlands typical of creeks and Broad-leaved Ironbark E. fibrosa woodlands typical of poor soils contained lower densities or smaller trees of C. glaucophylla and E. crebra, had a moderately dense, diverse understorey, and were associated with infrequent low-intensity logging and moderately frequent wildfire. Bird species assemblages of Broad-leaved Ironbark woodlands were similar to those of box-ironbark woodlands. Blakely's Red Gum woodlands were characterized by 36 bird species that were virtually absent from box-ironbark and Broad-leaved Ironbark woodlands, including 10 threatened and declining species. The 10 are among 48 woodland species that are known or thought to be declining and that are dependent on woodlands with mature trees and grassy or patchy grass/shrub understorey. We conclude that these species have declined in the Pilliga and will continue to decline under existing disturbance regimes, particularly in box-ironbark woodlands. We suggest adaptive management strategies for maintaining and rehabilitating their habitats.

1248. **Influence of fire and other anthropogenic practices on grassland and shrubland birds in New England.**
Vickery, Peter D.; Zuckerberg, Benjamin; Jones, Andrea L.; Gregory Shrjver, W.; and Weik, Andrew P.
Studies in Avian Biology(30): 139-146. (2005)
NAL Call #: QL671.S8; *ISSN:* 0197-9922
Descriptors: upland sandpiper/ upland sandpipers/ vesper sparrow/ vesper sparrows/ blueberry barrens/ farmland/ grassland birds/ New England/ prescribed fire/ shrubland birds
Abstract: The extent of grassland and shrubland habitat in New England has changed dramatically over the past 400 yr as a result of changing land uses. Presently, grasslands and shrublands in New England have been created and maintained primarily as a result of four types of habitat management: mowing, livestock grazing, clearcutting, and prescribed burning. Hayfields and pastures comprise the largest proportion of open land, approximately 718,500 ha. Clearcutting has created extensive shrubland patches in northern Maine, where 3.5% (243,000 ha) of the commercial forestland has been harvested in the past 20 yr. creating ephemeral, early successional shrublands used by a wide variety of warblers, sparrows, and other birds. The most widespread use of prescribed fire is agricultural and takes place on commercial lowbush blueberry (Vaccinium angustjfolium) barrens in Maine, where approximately 3,000 ha are burned annually. These barrens are especially important habitats for Upland Sandpipers (Bartramia longicauda) and Vesper Sparrows (Pooecetes gramineus). The scale of ecological prescribed burns in New England for habitat management of endangered ecosystems has been small; in recent years fewer than 300 ha have been burned annually. The effects of burning differ in grasslands versus shrublands. In native grasslands, burning has a strong effect on vegetation structure, which, in turn, has clear effects on most grassland specialist birds. Shrubland fires have less impact on shrubland birds because most of the woody structure remains intact. (Author)

1249. **Influence of forest and rangeland management on anadromous fish habitat in western North America: Effects of livestock grazing.**
Platts, W. S. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station; General Technical Report PNW-124, 1981. 25 p. ill.
Notes: ISSN 0368-6224
NAL Call #: aSD11.A46
Descriptors: North America
This citation is from AGRICOLA.

1250. **The influence of livestock grazing and weed invasion on habitat use by birds in grassy woodland remnants.**
Maron, Martine and Lill, Alan
Biological Conservation 124(4): 439-450. (2005)
NAL Call #: S900.B5; *ISSN:* 0006-3207
Descriptors: grazing/ habitat degradation/ conservation strategy/ weed invasion/ ground foraging birds/ grassy woodland remnants/ cryptogamic crust/ prey attack manoeuvre
Abstract: Remnants of native vegetation in regions dominated by agriculture are subject to degradation, especially by livestock grazing and weed invasion. Ground-foraging birds are amongst the most threatened bird groups in Australia, and these agents of degradation might be contributing to their decline by causing a reduction in food availability. We studied the foraging behaviour and microhabitat use of seven species of ground-foraging insectivores in south-eastern Australian buloke woodland remnants with native, grazed and weedy ground-layers. If birds must resort to using more energetically expensive prey-attack manoeuvres, or selectively use substrates and microhabitats that are less available in degraded habitats, then such degradation is likely to be negatively impacting on these species. We found evidence of a negative impact of one or both of these types of degradation on five of the seven bird species. Three species that employ a range of foraging manoeuvres to attack prey used potentially more energetically expensive aerial manoeuvres significantly more frequently in weedy remnants than in remnants with a native or grazed ground layer. Red-capped robins Petroica goodenovii and brown treecreepers Climacteris picumnus

both selectively foraged near trees in grazed sites, and hooded robins Melanodryas cucullata, red-capped robins and willie wagtails Rhipidura leucophrys avoided foraging in microhabitats with a high percentage cover of exotic grasses in weedy sites. Brown treecreepers were also less likely to be present in weedy sites that had been protected from grazing than in either grazed or native sites. These results suggest that although grazing appears to have a detrimental impact on foraging habitat of ground-foraging birds, the exclusion of livestock grazing from previously disturbed buloke remnants alone is not adequate to restore habitat values for ground-foraging birds. A conservation strategy for this habitat type should consider the exclusion of heavy grazing from sites with an intact cryptogamic crust and the management of weeds in disturbed remnants, potentially through the use of carefully controlled light grazing. (c) 2005 Elsevier Ltd. All rights reserved.

1251. **Livestock grazing effects in western North America.**
Saab, Victoria A.; Bock, Carl E.; Rich, Terrell D.; and Dobkin, David S.
In: Ecology and management of neotropical migratory birds: A synthesis and review of critical issues/ Finch, Deborah M. and Martin, Thomas E.
New York: Oxford University, 1995; pp. 311-353.
Notes: ISBN: 0195084403
NAL Call #: QL680.E28 1995
Descriptors: animals and man/ disturbance by man/ commercial activities/ conservation/ conservation measures/ ecology/ habitat/ terrestrial habitat/ man made habitat/ land and freshwater zones/ Nearctic Region/ North America/ Aves: farming and agriculture/ habitat management/ recommendations to reduce impact of grazing livestock on migrants/ population dynamics/ abundance/ effect of livestock grazing/ forest and woodland/ grassland/ riparian habitat/ cultivated land habitat/ USA/ livestock grazing/ consequences for migrants/ recommendations/ Aves/ birds/ chordates/ vertebrates

1252. **Local gradients of cowbird abundance and parasitism relative to livestock grazing in a western landscape.**
Goguen, Christopher B. and Mathews, Nancy E.
Conservation Biology 14(6): 1862-1869. (2000)
NAL Call #: QH75.A1C5; *ISSN:* 0888-8892
Descriptors: livestock grazing/ mixed conifer forest: habitat/ parasitism rate/ pinyon juniper forest: habitat/ species abundance
Abstract: We studied local patterns of Brown-headed Cowbird (Molothrus ater) abundance, parasitism rates, and nest success of a common host, the Plumbeous Vireo (Vireo plumbeus), in relation to the distribution of livestock grazing in an undeveloped region of northeastern New Mexico, 1992-1997. We predicted that both cowbird abundance and parasitism rates of vireo nests would decrease with increasing distance from active livestock grazing, and that the nesting success of vireos would increase. We measured cowbird abundance and host density and located and monitored vireo nests in pinyon-juniper and mixed-conifer habitats that ranged from actively grazed to isolated from livestock grazing by up to 12 km. Cowbird abundance declined with distance from active livestock grazing and was not related to host density or habitat type. Brood parasitism levels of vireo nests (n = 182) decreased from >80% in actively grazed habitats to 33% in habitats that were 8-12 km from active grazing but did not vary by habitat type or distance to forest edge. Vireo nesting success was higher in mixed-conifer habitat than in pinyon-juniper but was unrelated to distance from active livestock grazing. Nest losses due to parasitism declined with distance from active livestock grazing. Our results suggest that cowbird abundance and parasitism rates of hosts may be distributed as a declining gradient based on distance from cowbird feeding sites and that isolation from feeding sites can reduce the effects of parasitism on host populations. These findings provide support for management techniques that propose to reduce local cowbird numbers and parasitism levels by manipulating the distribution of cowbird feeding sites. The presence of parasitized nests >8 km from active livestock grazing suggests that, in some regions, management efforts may need to occur at larger scales than previously realized.

1253. **Migratory bird responses to grazing.**
Wetlands Reserve Program Grasslands Workgroup Natural Resources Conservation Service, U.S. Department of Agriculture, 2005.
ftp://ftp-fc.sc.egov.usda.gov/NHQ/ecs/Wild/WRPgrassland.pdf
Descriptors: grazing/ birds/ environmental impact

1254. **Riparian bird communities in relation to land management practices in floodplain woodlands of south-eastern Australia.**
Jansen, Amy and Robertson, Alistar I.
Biological Conservation 100(2): 173-185. (2001)
NAL Call #: S900.B5; *ISSN:* 0006-3207
Descriptors: agricultural regions/ community composition/ floodplain woodlands: habitat/ grazing/ habitat quality: degradation/ land clearing/ land management practices/ lowland rivers/ off river watering points/ shrub cover/ species abundance/ species diversity/ stocking rates
Abstract: Bird communities are declining in south-eastern Australia and riparian woodlands are critical habitats for birds in this agricultural region. We investigated how terrestrial bird communities varied with different land management practices (levels of grazing by domestic livestock and extent of clearing) and with habitat quality on the floodplains of the Murrumbidgee and Murray Rivers. Bird community composition in ungrazed and lightly grazed sites was significantly different to that in more heavily grazed sites, and these differences were related to tree and shrub cover, as well as tree species diversity and abundance of standing dead trees. Grazing appeared to have an effect on bird communities separate from that caused by clearing. Indicator species were identified for the effects of grazing and clearing. Grazing by livestock has had negative impacts on riparian birds through degradation of habitat quality. A combination of lower stocking rates, strategic placement of off-river watering points for stock, and the introduction of rotational grazing practices may be used to restore riparian habitat quality. The grazing-sensitive species we identified could be used as indicator species for the success of rehabilitation efforts.

1255. **Small mammal community composition in relation to cattle grazing and associated burning in eucalypt forests of the Northern Tablelands of New South Wales.**
Tasker, Elizabeth M. and Dickman, Christopher R.
In: Conservation of Australia's forest fauna/ Lunney, Daniel. Mosman: Royal Zoological Society of New South Wales, 2004; pp. 721-740.
Notes: ISBN: 095860858X
Descriptors: animals and man/ disturbance by man/ commercial activities/ conservation/ conservation measures/ ecology/ habitat/ terrestrial habitat/ abiotic factors/ physical factors/ land zones/ Australasian Region/ Australasia/ Australia/ Mammalia: farming and agriculture/ habitat management/ cattle grazing and associated burning/ community structure/ small taxa/ forest and woodland/ fire/ burning regime/ effects on small taxa community structure/ conservation implications/ New South Wales/ Northern Tablelands/ small taxa community structure/ cattle grazing and burning effects/ eucalypt forests/ Mammalia/ chordates/ mammals/ vertebrates

1256. **Small mammal response to the introduction of cattle into a cottonwood floodplain.**
Samson, F. B.; Knopf, F. L.; and Hass, L. B.
In: Management of amphibians, reptiles, and small mammals in North America. (Held 19 Jul 1988-21 Jul 1988 at Flagstaff, Ariz.) Szaro, R. C.; Severson, K. E.; and Patton, D. R. (eds.); Vol. GTR-RM-166.
Fort Collins, Colo.: U.S. Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station; pp. 432-438; 1988.
Notes: ISSN: 0094-4823
NAL Call #: aSD11.A42 No. 166
Descriptors: ecology/ community/ habitat/ terrestrial habitat/ land and freshwater zones/ Nearctic Region/ North America/ USA/ Mammalia: community structure/ comparisons of grazed and ungrazed grassland/ community comparisons/ habitat exploitation/ grazed and ungrazed grassland/ comparison/ grassland/ grazed and ungrazed grassland communities/ comparisons/ Colorado/ Logan County/ South Platte State Wildlife Area/ comparison of grazed and ungrazed grassland/ small taxa/ Mammalia/ chordates/ mammals/ vertebrates

1257. **Songbird community composition and nesting success in grazed and ungrazed pinyon-juniper woodlands.**
Goguen, Christopher B. and Mathews, Nancy E.
Journal of Wildlife Management 62(2): 474-484. (1998)
NAL Call #: 410 J827; *ISSN:* 0022-541X
Descriptors: Bos taurus/ Fringillidae/ Passeriformes/ Molothrus ater/ Aves/ behavior/ birds/ communities/ ecosystems/ habitat alterations/ habitat use/ interspecies relationships/ juniper/ nest parasitism/ nests/ nesting/ pinyon pine/ productivity/ wildlife/ livestock relationships/ wild birds/ reproduction/ woodlands/ land use/ neotropical migrant songbirds/ breeding success/ livestock grazing/ natural resources/ animal science - animal ecology and behavior/ plant science (general) - plant production (general) - plant production (range and pasture grasses)/ abundance/ birds, passerine/ blackbirds and cowbirds/ cattle/ grazing/ habitat/ livestock/ nests and nesting/ parasitic habits/ sampling/ surveys/ vegetation/ agriculture/ prairie/ forest/ nest/ brood/ egg/ fertility/ recruitment/ brown-headed cowbird/ songbird/ biotop/ vegetation/ North America/ United States/ New Mexico/ Northeastern Region/ Colfax County/ Sangre de Cristo Mountains
Abstract: Liverstock grazing is a dominant land use of pinyon-juniper habitats in the western United States, yet the effects of grazing on breeding bird communities in this habitat have been poorly studied. The authors compared habitat structure, songbird abundance, and nesting productivity within pinyon-juniper woodlands on an actively grazed site and a site experiencing long-term relief from livestock grazing in northeastern New Mexicon. From 1992 to 1995, they performed vegetation sampling, conducted songbird point counts, and located and monitored nests on 8.35-ha study plots. Four of these plots experienced moderate cattle grazing and four were ungrazed since 1973. They found no differences in habitat or vegetation features between grazed and ungrazed plots. Bird communities were similar, with only one of the 11 species they tested more abundant on the ungrazed treatment (western scrub-jay; Aphelocoma californicus). They detected no differences in nesting success or cause-specific rates of nest failure for seven common bird species ($P<0.05$), and detected no differences in brown-headed cowbird (Molothrus ater) parasitism rates for the major hosts between grazed and ungrazed areas. Greater than 75% of the nests of the solitary vireo (Vireo solitarius), western tanager (Piranga ludoviciana), and blue-gray gnatcatcher (Polioptila caerulea) were parasitized on both treatments. These high parasitism rates may be the result of high densities of local cowbirds because of abundant feeding sites (i.e., livestock), the high mobility of cowbirds, and the close proximity of ungrazed plots to grazed areas (all < 4 km). The results suggest that 20 years of relief from grazing had little influence on the habitat structure or bird species composition of the pinyon-juniper woodlands on the study site. However, livestock grazing has indirectly affected the nesting success of some songbird species via the influence of grazing on cowbird abundance. The authors' findings highlight the need for studies that incorporate nest monitoring and landscape-scale approaches to better understand the relation between cowbirds, livestock, and songbirds and the time required for recovery from grazing effects.

1258. **Will conversion of Conservation Reserve Program (CRP) lands to pasture be detrimental for grassland birds in Kansas?**
Klute, D. S.; Robel, R. J.; and Kemp, K. E.
American Midland Naturalist 137(2): 206-212. (1997)
NAL Call #: 410 M58; *ISSN:* 0003-0031
Descriptors: wild birds/ reproduction/ policy/ grasslands/ permanent grasslands/ abandoned land/ comparisons/ plant height/ seasonal variation/ nature conservation/ grazing/ grazing intensity/ farming systems/ land diversion/ setaside
Abstract: The Conservation Reserve Program (CRP) involving land diversion was established by the 1985 Food Security Act (Farm Bill). Unless renewed, most CRP contracts will expire in 1997 and up to 70% of CRP fields in Kansas may be converted to pasture. Data on vegetative structure, avian abundance, and avian reproductive success were collected on 5 CRP fields and 5 pastures

during summer 1993. Pastures had significantly greater vegetative cover and CRP fields had more bare ground. The sward was significantly taller in CRP fields late in the summer. Total avian abundance and that of dickcissels, grasshopper sparrows, meadowlarks, brown-headed cowbirds and upland sandpipers were greater in pastures than in CRP fields. Reproductive success and rates of nest parasitism by brown-headed cowbirds did not differ between the habitats, but nests were more numerous in grazed pastures. If the CRP is not reauthorized in the 1995 Farm Bill and most of the Kansas land currently enrolled in CRP is converted to pasture, the conversion probably will not be detrimental to grassland bird populations provided that the grazing intensity is moderate.

Plant Ecology, Biodiversity, and Other Environmental Effects

1259. **Birch sapling responses to severity and timing of domestic herbivore browsing: Implications for management.**
Hester, A. J.; Lempa, K.; Neuvonen, S.; Hoegh, K.; Feilberg, J.; Arnthorsdottir, S.; and Iason, G.
In: Plant ecology, herbivory, and human impact in Nordic mountain birch forests/ Wielgolaski, F. E.; Vol. 180; Series: Ecological Studies.
Berlin: Springer, 2005; pp. 139-155.
Notes: ISSN 0070-8356
NAL Call #: QH540.E288
Descriptors: economics/ herbivore grazing/ sapling responses/ domestic herbivore browsing/ browsing severity/ browsing timing/ locational effects/ birch forest area

1260. **Cattle grazing and the regeneration of totara (Podocarpus totara var. waihoensis) on river terraces, South Westland, New Zealand.**
Miller, Craig and Wells, Andrew
New Zealand Journal of Ecology 27(1): 37-44. (2003)
NAL Call #: QH540.N43; *ISSN:* 0110-6465
Descriptors: cattle grazing/ forest type/ managed succession/ regeneration/ river terraces/ totara-matai forests
Abstract: Totara-matai forests are an under-represented forest type in Westland, relative to their original extent, and require protection and enhancement where possible. This study examined the regeneration of totara on gorse-covered river terraces of the Whataroa and Waiho Rivers, on a site grazed by cattle at Whataroa, and ungrazed sites at both locations. Totara is regenerating prolifically at all sites. Tall-seedling densities were significantly higher at the grazed Whataroa site than at the ungrazed Whataroa site. Conversely densities of small seedlings were significantly higher at the ungrazed Waiho site, with the majority of seedlings occurring on raised surfaces created by rafted logs or occasional silt patches, than at either of the Whataroa sites where seedlings established on the ground. Sapling and tree densities were similar at both Whataroa sites, but significantly greater than at the Waiho site. There was a significant relationship between the density of saplings and trees with terrace age at the Whataroa sites. Gorse cover and seedling density were significantly related at both ungrazed sites, but not at the grazed site. Grazing and gorse cover both appear to have roles in totara regeneration on river terraces. The implications of current management for future forest development are discussed, and it is considered that these areas warrant designation as areas of significant indigenous vegetation because of their conservation potential.

1261. **Cattle grazing effects on understory cover and tree growth in mixed conifer clearcuts.**
Allen, B. H. and Bartolome, J. W.
Northwest Science 63(5): 214-220. (1989)
NAL Call #: 470 N81; *ISSN:* 0029-344X
Descriptors: white fir/ douglas fir/ deer/ vegetation reduction/ timber management/ Sierra Nevada/ California/ USA
Abstract: A long-term study of cattle grazing effects on shrub and herbaceous cover and tree growth in mixed conifer clearcuts began at Blodgett Forest Research Station on the west slope of the Sierra Nevada (California, USA) in 1977. Until that time, no studies had quanitified the relationships between cattle grazing and reduction in non-tree vegetation, and grazing damage to tree regeneration. Yet, with the ban on use of herbicides in Federal forest management, alternative tools for reducing unwanted vegetation were needed. Cattle grazing reduced shrub and herbaceous canopy cover to 8 percent six years after harvesting, and 31 percent eight years after harvesting on two mixed conifer clearcuts. These cover levels were within timber management objectives for tree growth. No significant trampling damage occurred and browsing damage to white and Douglas-fir seedlings was primarily caused by deer. Tree seedlings showed no significant differences in height or basal diameter growth under any treatment. Thus, cattle grazing appears to be a viable tool for meeting brush/grass objectives in forest plantations.

1262. **Changes in composition and structure of a tropical dry forest following intermittent cattle grazing.**
Stern, Margaret; Quesada, Mauricio; and Stoner, Kathryn E.
Revista de Biologia Tropical 50(3-4): 1021-1034. (2002)
NAL Call #: 442.8 R328; *ISSN:* 0034-7744
Descriptors: Shannon index of diversity/ community structure/ floristic composition/ forest composition/ forest structure/ intermittent cattle grazing/ species composition/ tropical dry forest
Abstract: In northwestern Costa Rica, cattle are being used as a "management tool" to reduce the amount of combustible material, mainly dominated by Hyparrhenia rufa, an African grass. This project is being developed within Parque Nacional Palo Verde and Reserva Biologica Lomas Barbudal, both of which form part of the only remaining tropical dry forests in Mesoamerica. To determine the short-term effects of cattle grazing on the natural vegetation, we compared the floristic composition within Palo Verde in an area under intermittent cattle grazing with an area that has not been grazed. There were significantly fewer plant species in the area with intermittent cattle grazing compared to the area with no grazing.

Floristic composition of these two habitats was different as reflected by both Fisher's alpha values and the Shannon index of diversity, both of which were significantly higher in the ungrazed site. The ungrazed area contained more plant species and was more similar to mature forest. The structure of the vegetation was significantly different between the intermittently grazed and ungrazed sites with more small stems (1-5 cm dbh) and fewer large stems (>5 cm dbh) in the intermittently grazed habitat. These results indicate that cattle grazing has an impact on the dry forest by reducing the relative abundance and density of larger tree species and by changing the species composition and structure of the community. The current management plan implemented in Palo Verde and Lomas Barbudal is not appropriate because of the impact that cattle have on the structure of the natural vegetation and should not be considered a viable alternative in other protected areas of dry forest in the Neotropics. We suggest that alternative fire prevention measures be evaluated including hand-cutting H. rufa, the creation of more frequent and larger fire breaks, and the development of green breaks.

1263. **Correlation of burning and grazing indicators with composition of woody understorey flora of dells in a temperate eucalypt forest.**
Henderson, Meredith K. and Keith, David A.
Austral Ecology 27(2): 121-131. (2002)
NAL Call #: QH540 .A8; *ISSN:* 1442-9985
Descriptors: disturbance factors: fire, grazing/ temperate eucalypt forest: dell woody understory flora
Abstract: Areas of warm temperate eucalypt forests of northern NSW escarpment, previously managed for cattle production, have recently been transferred into the conservation reserve system. The forests were seasonally grazed by cattle and were burnt frequently to promote green pick for stock feed. The hypothesis that disturbances associated with previous management had led to a simplification of the forest understorey, particularly a depletion in the density and species richness of shrubs was investigated. A disturbance history of the study area was constructed by compiling fire history records and using surrogate measures for recent and historical grazing. Shrub species composition was sampled in randomly located quadrats in dells within the forest, with a set of environmental and spatial covariables. Variation in shrub composition was partitioned among three sources (disturbance, environment and space) using a stepwise canonical correspondence analysis. Grazing and burning disturbance explained substantially more variation in vegetation than the environmental and spatial variables combined. Between 15 and 45% of total variation in adult shrub composition was attributable to the disturbance indicators. Similar results were obtained for composition of juvenile shrubs. Species richness and population densities of woody species were lower where disturbance was more intensive. It is concluded that historical grazing and burning practices had a substantial impact on the woody understoreys of the north-east escarpment forests. The species that were adversely affected spanned a range of life-history functional types. Estimates of the magnitude of grazing and burning impacts were limited by the lack of spatially explicit disturbance history data over the full period of pastoral exploitation and the unavailability of suitable ungrazed 'controls' for sampling.

1264. **Cumulative effects of wild ungulate and livestock herbivory on riparian willows.**
Brookshire, E. N. Jack; Kauffman, J. Boone; Lytjen, Danna; and Otting, Nick
Oecologia (Berlin) 132(4): 559-566. (2002)
NAL Call #: QL750.O3; *ISSN:* 0029-8549
Descriptors: nutrition/ diet/ feeding behaviour/ ecology/ habitat/ terrestrial habitat/ land and freshwater zones/ Nearctic Region/ North America/ USA/ Cervus elaphus/ Odocoileus hemionus (Cervidae): food plants/ Salix boothii and Salix geyeriana/ browsing effect on plant growth/ foraging/ browsing/ impact on habitat/ riparian habitat/ Oregon/ Blue Mountains/ Upper Meadow Creek/ browsing effect on food plant growth/ reproduction and structure/ Cervidae/ Artiodactyla/ Mammalia/ chordates/ mammals/ vertebrates
Abstract: We examined the effects of wild ungulates (deer and elk) and domestic sheep browsing on the growth, structure, and reproductive effort of two common willow species, Salix boothii and S. geyeriana, in a montane northeast Oregon riparian zone. With the use of exclosures, large herbivore effects on willows were studied in an area browsed by native mammals only and an adjacent area in which domestic sheep also lightly grazed during summer months. Growth variables were repeatedly measured on individual plants over a 5-year period to understand physiognomic and flowering responses of native willows to different levels of browsing pressure. At the beginning of the study, all willows were intensely browsed but were significantly taller in the area browsed only by native mammals than in the area also grazed by sheep (69 versus 51 cm, respectively). Willows inside exclosures responded with pronounced increases in height, crown area, and basal stem diameters while the stature of browsed plants outside exclosures stayed constant or declined. In the area browsed by both sheep and wild herbivores, the size of browsed plants remained at pre-treatment levels (<60 cm in height) for the duration of the study. There was no significant difference in growth rates of enclosed willows, indicating that current herbivory was the primary cause of growth retardation in the study area. Foliar area was strongly correlated with basal stem numbers for enclosed plants but much less so for browsed plants. Willows inside exclosures had more than twice as much foliar area per stem. Stem diameters were a positive function of crown area: stem-number ratios, suggesting lower photosynthetic potential was correlated with diminished radial growth among browsed plants. No flowering was observed until 2 years after exclusion when plants inside all exclosures and browsed willows in the wild ungulate area responded with a large pulse in flowering. Browsed plants in the sheep + wild ungulate area did not flower. The number of catkins produced per plant was significantly associated with willow height and plants <70 cm in height did not flower, thus suggesting a size threshold for reproduction in these species. Our results suggest that even relatively light levels of domestic livestock grazing, when coupled with intense wild ungulate browsing, can strongly affect plant structure and limit reproduction of riparian willows.

1265. **Effect of grazing management and fertilizer application on vegetation and soil properties of a moist temperate forest range in Siran Valley (Mansehra), NWFP.**
Rafique, Sardar Mohammad
Pakistan Journal of Forestry 44(1): 20-29. (1994)
NAL Call #: 99.8 P17; *ISSN:* 0030-9818
Descriptors: bulk density/ forage production/ Northwest Frontier Province/ plant cover/ soil infiltration rate/ trampling
Abstract: Uncontrolled heavy grazing in blanks of moist temperate forests of the mountaineous tract of NWFP is a common practice of the local and nomad livestock herders. These blanks have been created as a result of compaction and trampling by livestock. This study was carried out in two blanks in moist temperate forest range at Kund, Manschra during June. 1989 and was maintained for 5 years. It study aimed at investigating the effects of grazing management and application of fertilizer on forage production, cover percent. soil protective cover, soil infiltration rate and soil bulk density. Three major treatments namely; one clipping (no grazing), two clippings (simulated rotational grazing) and conventional grazing (continuous seasonal grazing) were applied randomly in 3 plots of 10 times 10 meter size. Similarly, three sub plots of 10 times 5 meters size were fertilized with single dose of NPK (1:2:2) at the rate of 100 Kg N + 200 Kg P + 200 Kg K per ha. in split plot design. Ten permanent sample plots of 1 times 1 meter size (Braun-Blanquet's method) in each sub plot were established for estimation of forage production by clipping method, cover percentage and percentage soil protective cover. The study revealed 2.3 times improvement in forage production at present production level through protection (zero grazing) and fertilizer application. The percentage vegetation cover percentage and soil protective cover have also shown manyfold increase in the treated plots. Further the study revealed appreciably higher soil porosity through decrease in soil bulk density and increase in water intake capacity (infiltration rate) with grazing management and application of fertilizer.

1266. **Effect of grazing on restoration of endemic dwarf pine (Pinus culminicola Andresen et Beaman) populations in northeastern Mexico.**
Jimenez, Javier; Jurado, Enrique; Aguirre, Oscar; and Estrada, Eduardo
Restoration Ecology 13(1): 103-107. (2005)
NAL Call #: QH541.15.R45R515; *ISSN:* 1061-2971
Descriptors: grazing
Abstract: A pilot experiment designed to test the effect of cattle, small mammals, and elevation on the success of reforestation of an endemic dwarf pine species in northeastern Mexico was implemented. Pinus culminicola (Andresen et Beaman) grows only in four high peaks in the Sierra Madre Oriental and is under pressure from grazing, wildfires, and human activities such as mining, road development for timber extraction, and telecommunication and aerial navigation devices. We planted and monitored 2-year-old seedlings at three elevations within the natural distribution range of this species at Cerro El Potosi in Nuevo Leon, Mexico. At each elevation three treatments were established: (1) seedlings protected from cattle plus small mammals, (2) seedlings protected from cattle, and (3) seedlings with free access to cattle and small mammals. Seedling survival was approximately 50% in (1) after 4 years, but there were no surviving seedlings with free access to cattle. Elevation in general did not account for variation in survival. Seedling growth was poor during the 4 years, which implies that seedlings remain susceptible to grazing and trampling by cattle and small mammals. The implications for a large-scale restoration program are discussed.

1267. **Effect of summer cattle grazing on aspen stem injury, mortality and growth.**
Dockrill, C. W. M.; Blenis, P. V.; Bailey, A. W.; and King, J. R.
Forestry Chronicle 80(2): 257-261. (2004)
NAL Call #: 99.8 F7623; *ISSN:* 0015-7546
Descriptors: browsing/ cattle husbandry/ density/ foraging/ grazing/ growth/ injuries/ mortality/ plant height/ regeneration/ trampling
Abstract: Conflicts may arise between cattle and aspen (Populus tremuloides) fibre production if both occur on the same landbase. The effect of cattle on aspen regeneration was evaluated in Alberta (Canada) by determining the effect of four treatments (No grazing, June-only grazing, July-only grazing and continuous June-July grazing) on five variables (aspen height and density, percentage of aspen trampled, foraged and dead). Continuous June-July grazing impeded aspen regeneration relative to the control. The effect of cattle on aspen mortality was likely indirect, rather than a consequence of foraging and trampling. Reducing stocking levels or delaying cattle grazing may be necessary to reduce the adverse effect of cattle grazing on aspen regeneration.

1268. **Effects of cattle and deer on regenerating mixed conifer clearcuts.**
Kosco, B. H. and Bartolome, J. W.
Journal of Range Management 36(2): 265-268. (1983)
NAL Call #: 60.18 J82; *ISSN:* 0022-409X
http://jrm.library.arizona.edu/data/1983/362/33kosc.pdf
Descriptors: California
This citation is from AGRICOLA.

1269. **Effects of cattle grazing on woodlands in central Iowa.**
Mabry, Cathy
Journal of the Iowa Academy of Science 109(3-4): 53-60. (2002)
NAL Call #: Q11.J68; *ISSN:* 0896-8381
Descriptors: canopy loss/ grazing/ human disturbance/ human impact/ sod formation/ woodlands
Abstract: Iowa's forests have undergone a dramatic decline in area since settlement by Europeans. Most of the remaining forests have been degraded by an assortment of human impacts, with cattle grazing the most prominent among them. Using a matched pairs study designed to control for environmental differences among plots, I examined the impact of cattle grazing on the forest understory, canopy trees, and tree regeneration. There were distinct groups of understory species associated with ungrazed and grazed plots. Species associated with ungrazed plots were all native and tended to be perennial herbs with fleshy roots. Ungrazed plots also had species preferring moist forests with closed canopies, habitats

lacking human disturbance, and with ranges restricted to the eastern United States. In contrast, 30% of species associated with grazed plots were exotic, and the species associated with these sites were more likely to be annuals, have fibrous roots, occur in a wide variety of habitats, and have a cosmopolitan distribution. There were fewer seedlings found in grazed compared to ungrazed woods, and for canopy trees and seedlings, there was evidence for species specific responses to grazing. Woods that have been grazed, but not to the point of canopy loss and sod formation, are representative of the majority of the remaining woods in Iowa; thus, the results of this study are relevant to understanding the dynamics of Iowa forests and to developing plans for their restoration.

1270. **The effects of domestic livestock exclosure on broadleaved woodland regeneration in three Scottish environmentally sensitive areas.**
Henderson, D. J.; Nolan, A. J.; Madden, S.; and Still, M. J.
Scottish Forestry 51(1): 6-14. (1997)
NAL Call #: 99.8 SCO3; *ISSN:* 0036-9217
Descriptors: effects/ livestock/ protection of forests/ nature conservation/ broadleaves/ forest trees/ browsing damage/ wild animals/ climate/ seed production/ environmental protection/ vegetation types/ woodlands/ grazing/ natural regeneration
Abstract: The effects of stock exclosure on seedling and sapling numbers and sapling heights in broadleaved woodlands of the Breadalbane and Loch Lomond (Central Highlands) and Stewartry (Dumfries and Galloway) Environmentally Sensitive Areas (ESAs) between 1989 and 1993 are described. Seedling and sapling numbers generally increased both in woods where domestic livestock were excluded within the ESAs and at control sites grazed by domestic livestock without the ESAs, indicating that the sites may be more strongly influenced by natural variations of climate and seed production than by stock exclosure. Apart from a few woods within the Breadalbane ESA, saplings showed only small annual height increments, suggesting that wild herbivore browsing was maintaining the suppression of sapling growth in the absence of domestic herbivores. In the Breadalbane and Loch Lomond ESAs, the heights of ground vegetation strata (grasses, forbs and mosses) were greater in 1993 where stock had been exclosed for 2-4 yr than on similar adjacent areas where domestic stock continued to graze. It is argued that individual site assessments are required for the formulation of appropriate site-specific management plans to promote successful broadleaved woodland regeneration.

1271. **Effects of grazing and cultivation on forest plant communities in Mount Elgon National Park, Uganda.**
Reed, Mark S. and Clokie, Martha R. J.
African Journal of Ecology 38(2): 154-162. (2000)
NAL Call #: 409.6 Ea7; *ISSN:* 0141-6707
Descriptors: agricultural disturbance/ cultivation/ forest plant community/ grazing/ land use/ species composition
Abstract: Plant communities in the montane forest of Mount Elgon National Park were studied in order to assess the impact of grazing and cultivation on species composition. Present and former land uses, tree, shrub and herb species, soil properties and the percentage cover and height of trees, shrubs and herbs were determined in 40 plots. An indirect ordination of these plots showed that species composition was primarily determined by successional stage and agricultural disturbance. In forest plots (ordinated separately) where the widest range of former and current grazing intensities had occurred, evidence of grazing history, soil phosphorus and vegetation height correlated negatively with the strongest ordination axis. Least grazed forest plots had fewer tree seedlings and saplings than more intensively grazed plots. This may be due to the increase in Mimulopsis alpina (Acanthaceae) in less grazed forest where tree regeneration might otherwise be more advanced. Tree seedlings and saplings were uncommon in the forest, rarely exceeding 30 cm in height and there was no tree understorey. Although grazing is important for preserving species diversity in Mount Elgon National Park through the maintenance of species-rich grasslands, long-term effects on montane forest communities must be considered in future park management.

1272. **Effects of livestock grazing on forest habitats.**
Dennis, Ann
In: Conservation in highly fragmented landscapes/ Schwartz, Mark W.
New York: Chapman and Hall, 1997; pp. 313-341.
Notes: ISBN 0412070316
NAL Call #: QH76.5.M53C66 1997
Descriptors: forest habitats/ livestock grazing effects/ long term conservation/ book chapter

1273. **Effects of livestock grazing on stand dynamics and soils in upland forests of the interior west.**
Belsky, A. Joy and Blumenthal, Dana M.
Conservation Biology 11(2): 315-327. (1997)
NAL Call #: QH75.A1C5; *ISSN:* 0888-8892
http://www.onda.org/library/papers/standdynamics.pdf
Descriptors: pine (Coniferopsida)/ gymnosperms/ plants/ spermatophytes/ vascular plants/ conservation/ livestock grazing/ mixed conifer forests/ soil erosion/ species composition/ stand dynamics/ upland forests/ Western USA
Abstract: Many ponderosa pine and mixed-conifer forests of the western, interior United States have undergone substantial structural and compositional changes since settlement of the West by Euro-Americans. Historically, these forests consisted of widely spaced, fire-tolerant trees underlain by dense grass swards. Over the last 100 years they have developed into dense stands consisting of more fire-sensitive and disease-susceptible species. These changes, sometimes referred to as a decline in 'forest health,' have been attributed primarily to two factors: active suppression of low-intensity fires (which formerly reduced tree recruitment, especially of fire-sensitive, shade-tolerant species), and selective logging of larger, more fire-tolerant trees. A third factor, livestock grazing, is seldom discussed, although it may be as important as the other two factors. Livestock alter forest dynamics by (1) reducing the biomass and density of understory grasses and sedges, which otherwise outcompete conifer seedlings and prevent dense tree recruitment, and (2) reducing the abundance of fine fuels, which formerly carried low-intensity fires through forests. Grazing by domestic livestock has thereby contributed to increasingly dense western forests and to changes in tree species composition. In addition, exclosure

studies have shown that livestock alter ecosystem processes by reducing the cover of herbaceous plants and litter, disturbing and compacting soils, reducing water infiltration rates, and increasing soil erosion.

1274. **Fluvial disturbance patches and cottonwood recruitment along the Upper Missouri River, Montana.**
Auble, G. T. and Scott, M. L.
Wetlands 18(4): 546-556. (1998)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: rivers/ cottonwood trees/ riparian vegetation/ seedlings/ grazing/ mortality/ geomorphology/ livestock/ disturbance/ recruitment/ streams (in natural channels)/ plants (see also aquatic macrophytes)/ death/ livestock (see also individual animals)/ USA, Montana, Missouri R./ fluvial/ cottonwood trees/ seedlings
Abstract: The disturbance patches most suitable for seedling establishment of pioneer riparian trees are also subject to future disturbances that produce high seedling mortality. We are monitoring plains cottonwood seedling establishment and mortality along the Wild and Scenic reach of the Missouri River upstream of Fort Peck Reservoir, Montana at four sites subject to livestock grazing and four paired, ungrazed exclosures. New seedlings at these sites were largely restricted to surfaces inundated by spring and summer flows. Winter ice drives and livestock grazing are important mortality factors along the study reach. Livestock grazing reduced seedling densities, although the position of these seedlings in normal flow years means it is unlikely that they will survive future disturbance. Average values of the maximum density parameter of a Gaussian curve of seedling distribution along a hydraulic gradient of inundating discharge were 30 and 114 seedlings/m super(2) on ungrazed sites in 1996 and 1997, compared to 19 and 18 seedlings/m super(2) for grazed sites. Water-surface elevations produced by ice drives and damming in the severe winter of 1995-1996 corresponded to inundating discharges of 1,670 to 4,580 m super(3)/s. No existing trees at the study sites occurred at inundating discharges below 1,625 m super(3)/s. Seedlings established as a result of maximum summer flows of 827 and 1,201 m super(3)/s in 1996 and 1997 were all below the elevation of the 10-year return flow of 1,495 m super(3)/s. Recruitment of plains cottonwood trees along this reach of the Missouri River is strongly dependent on infrequent high flows that position moist, bare disturbed patches high enough for seedlings to establish and survive subsequent flooding and ice scour, in contrast to other reaches and streams where hydrogeomophic processes of channel meandering and narrowing produce different patterns of disturbance patches.

1275. **Forest stand dynamics and livestock grazing in historical context.**
Borman, M. M.
Conservation Biology 19(5): 1658-1662. (2005)
NAL Call #: QH75.A1C5; *ISSN:* 0888-8892
Descriptors: climate/ environmental impact/ fire suppression/ forest fires/ forest health/ forest plantations/ grazing/ grazing intensity/ grazing systems/ grazing time/ history/ livestock/ logging
Abstract: Livestock grazing has been implicated as a cause of the unhealthy condition of ponderosa pine forest stands in the western United States. An evaluation of livestock grazing impacts on natural resources requires an understanding of the context in which grazing occurred. Context should include timing of grazing, duration of grazing, intensity of grazing, and species of grazing animal. Historical context, when and under what circumstances grazing occurred, is also an important consideration. Many of the dense ponderosa pine forests and less-than-desirable forest health conditions of today originated in the early 1900s. Contributing to that condition was a convergence of fire, climate, and grazing factors that were unique to that time. During that time period, substantially fewer low-intensity ground fires (those that thinned dense stands of younger trees) were the result of reduced fine fuels (grazing), a substantial reduction in fires initiated by Native Americans, and effective fire-suppression programs. Especially favorable climate years for tree reproduction occurred during the early 1900s. Exceptionally heavy, unregulated, unmanaged grazing by very large numbers of horses, cattle, and sheep during the late nineteenth and early twentieth centuries occurred in most of the U.S. West and beginning earlier in portions of the Southwest. Today, livestock numbers on public lands are substantially lower than they were during this time and grazing is generally managed. Grazing then and grazing now are not the same.

1276. **Grazing animals as weed control agents.**
Popay, Ian and Field, Roger
Weed Technology 10(1): 217-231. (Mar. 1996)
NAL Call #: SB610.W39; *ISSN:* 0890-037X
Descriptors: agriculture/ agronomy/ forestry/ grazing/ pest assessment, control, and management/ weed control
Abstract: Literature on the effectiveness of grazing animals (especially cattle, goats, and sheep) in controlling weeds is reviewed. Availability of animals and the ability to fence them onto or off weed infestations are essential. Weeds of pastures are the most suitable subjects for control, although weeds of arable crops, forestry, and waste places are sometimes amenable to control by grazing animals. Although grazing animals themselves often cause weed problems in pasture, adjusting grazing timing or intensity or both can sometimes redress the balance. Increasing sheep or cattle stocking rates prevents animals from grazing selectively and can help control some weeds. Adjusting grazing pressure can also improve the growth of desirable pasture species so that these are more competitive and able to resist invasion of annual or biennial weeds. Introducing a different class of stock, like sheep into a cattle system or goats into a sheep system can control many weeds. Goats are capable of browsing on and controlling spiny or poisonous brush weeds, including gorse and poison ivy, without suffering adverse effects. Examples are given of the use of grazing animals for weed control in crops and forestry.

1277. **Grazing impacts on spatial distribution of soil and herbaceous characteristics in an Australian tropical woodland.**
Northup, B. K.; Brown, J. R.; and Ash, A. J.
Agroforestry Systems 65(2): 137-150. (2005)
NAL Call #: SD387 .M8A3; *ISSN:* 0167-4366
Descriptors: tropical forests/ woodlands/ grazing/ spatial variation/ silvopastoral systems/ soil chemistry/ forage

grasses/ soil-plant interactions/ soil fertility/ nitrogen/ carbon/ soil organic matter/ forage/ grazing management/ plant communities/ Queensland
This citation is from AGRICOLA.

1278. **Grazing management of ruminant animals in sustainable agriculture.**
DeRamus, H. A.
Outlook on Agriculture 33(2): 93-100. (June 2004)
NAL Call #: 10 Ou8; *ISSN:* 0030-7270
Descriptors: grazing/ ruminants/ ruminant nutrition/ sustainable agriculture/ soil nutrient balance/ range management/ forage/ digestibility
This citation is from AGRICOLA.

1279. **Grazing on regeneration sites encourages pine seedling growth.**
Ratliff, R. D. and Denton, R. G.
Albany, Calif.: Pacific Southwest Research Station; Research Paper PSW-RP-223, 1995. 11 p.
NAL Call #: A99.9 F7652P
Descriptors: Pinus ponderosa/ seedlings/ seedling growth/ grazing/ cattle/ artificial regeneration/ national forests/ California
This citation is from AGRICOLA.

1280. **Influence of deer, cattle grazing and timber harvest on plant species diversity in a longleaf pine bluestem ecosystem.**
Brockway, Dale G. and Lewis, Clifford E.
Forest Ecology and Management 175: 49-69. (2003)
NAL Call #: SD1.F73; *ISSN:* 0378-1127
http://www.srs.fs.usda.gov/pubs/ja/ja_brockway024.pdf
Abstract: Despite a recent slowing in the negative historical trend, losses of naturally-regenerated longleaf pine forests currently continue, largely as a result of conversion to plantations of faster growing pine species. Comparing the impacts of type conversion with silvicultural approaches that maintain longleaf pine and ascertaining their interaction with the influence of other resource management practices, such as grazing, on plant species diversity are essential in discerning the effects of these activities on the long-term sustainability of these ecosystems. A flatwoods longleaf pine bluestem ecosystem, which naturally regenerated following timber harvest during the early 20th century, on the coastal plain of southern Alabama was thinned to a residual basal area of 17 m2/ha or clearcut, windrowed and planted with slash pine (Pinus elliottii) seedlings in 1972 and then fenced in 1977 to differentially exclude grazing by deer and cattle. Neither grazing by deer alone nor deer in combination with cattle significantly altered vascular plant cover or species diversity; however, substantial differences were noted between the understory plant communities in the thinned forests and clearcut areas. Woody understory vegetation steadily increased through time, with woody plant cover in clearcuts (41%) dominated by the tree seedlings of Pinus elliottii and Quercus spp. being greater than that in thinned forests (31%) which were dominated by shrubs, principally Ilex glabra. While grass cover dominated by Schizachrium scoparium and Andropogon spp. remained stable (~81%), the foliar cover of all forbs declined through time (from 42 to 18%) as woody plant cover increased. Although the overall species richness and diversity declined and evenness increased through time, understory species richness and diversity were consistently higher in thinned forests than in artificially-regenerated clearcuts. Despite a modest short-term decline in this differential, indicating a partial recovery of the clearcut areas over time, the disparity in understory plant diversity between thinned forests and clearcuts persisted for at least a decade. Whether grazing includes domestic cattle or is limited to native ungulates, such as white-tailed deer, we recommend that longleaf pine forests not be clearcut and replaced by plantations of other pines, if the ecological diversity is to be conserved, high quality habitat is to be maintained and longleaf pine ecosystems are to be sustained.
This citation is from Treesearch.

1281. **Livestock grazing influences on community structure, fire intensity, and fire frequency within the Douglas fir/ninebark habitat type.**
Zimmerman, G. T. and Neuenschwander, L. F.
Journal of Range Management 37(2): 104-110. (1984)
NAL Call #: 60.18 J82; *ISSN:* 0022-409X
http://jrm.library.arizona.edu/data/1984/372/3zimm.pdf
Descriptors: Idaho
This citation is from AGRICOLA.

1282. **Long-term changes in the vegetation after the cessation of livestock grazing in Eucalyptus marginata (jarrah) woodland remnants.**
Pettit, N. E. and Froend, R. H.
Austral Ecology 26(1): 22-31. (2001)
NAL Call #: QH540 .A8; *ISSN:* 1442-9985
Descriptors: DCA/ floristics/ life form/ ordination/ regeneration/ vegetation dynamics/ vegetation model
Abstract: This paper documents changes in the floristic composition of Eucalyptus marginata Donn (jarrah) woodlands over 7 years of recovery from continual, intensive livestock grazing. In remnants of native woodland left after agricultural clearing, which have been subjected to livestock grazing, comparisons were made between the floristics of fenced exclosure plots and open plots that continued to be grazed. The vegetation in nearby remnants, which had not been subjected to livestock grazing, was also surveyed. An initial increase in annual exotic pasture species after grazing relief was only temporary and highly influenced by fluctuations in annual climatic patterns, particularly rainfall distribution and abundance. Subsequent years saw a decrease in exotic annuals in exclosure plots and an increase in native perennials, in a trend towards becoming more floristically similar to the ungrazed sites. Germination of overstorey species was observed in the exclosure plots, however, development of seedlings and saplings was sparse. Results indicate that for jarrah woodland in southwestern Australia, natural regeneration is possible after the removal of livestock, with the return (within 6 years) of native species richness to levels similar to those found in ungrazed vegetation. Re-establishment of cover, however, appears to take longer. The floristic dynamics are described in terms of a nonequilibrium model. Two vegetation states exist, degraded remnants with an understorey dominated by annual species, and ungrazed vegetation with an understorey dominated by perennial shrubs and herbs. The former state is maintained by continual heavy grazing by livestock. Upon relief from grazing, the vegetation undergoes a transition towards

floristic similarity to ungrazed vegetation. After 6 years, vegetation change in the exclosure plots appears to be continuing and therefore it is still in transition.

1283. **Management of forests combining pines and grazing in Australia.**
Moore, R.
In: Forest management in Australia. (Held 18 Sep 1987-22 Sep 1987 at Perth, Western Australia, Australia.) McKinnell, F. H.; Hopkins, E. R.; and Fox, J. E. D. (eds.)
Chipping Norton, New South Wales, Australia: Surrey Beatty and Sons; pp. 364-374; 380 p.; 1991.
Notes: Biennial Conference of the Institute of Foresters of Australia
NAL Call #: SD243.F67; *ISBN:* 0949324361
Descriptors: tree growth/ easy access/ pasturage/ resource utilization

1284. **Nitrous oxide emissions from grazed grassland.**
Oenema, O.; Velthof, G. L.; Yamulki, S.; and Jarvis, S. C.
Soil Use and Management 13(4 [supplement]): 288-295. (1997)
NAL Call #: S590.S68; *ISSN:* 0266-0032
Descriptors: nitrous oxide: emission, greenhouse gas/ livestock (Mammalia): grazer/ animals/ chordates/ mammals/ nonhuman mammals/ nonhuman vertebrates/ vertebrates/ agriculture/ climate change/ grazed grassland
Abstract: Grazing animals on managed pastures and rangelands have been identified recently as significant contributors to the global N|2O budget. This paper summarizes relevant literature data on N|2O emissions from dung, urine and grazed grassland, and provides an estimate of the contribution of grazing animals to the global N|2O budget. The effects of grazing animals on N|2O emission are brought about by the concentration of herbage N in urine and dung patches, and by the compaction of the soil due to treading and trampling. The limited amount of experimental data indicates that 0.1 to 0.7% of the N in dung and 0.1 to 3.8% of the N in urine is emitted to the atmosphere as N|2O. There are no pertinent data about the effects of compaction by treading cattle on N|2O emission yet. Integral effects of grazing animals have been obtained by comparing grazed pastures with mown-only grassland. Grazing derived emissions, expressed as per cent of the amount of N excreted by grazing animals in dung and urine, range from 0.2 to 9.9%, with an overall mean of 2%. Using this emission factor and data statistics from FAO for numbers of animals, the global contribution of grazing animals was estimated at 1.55 Tg N|2O-N per year. This is slightly more than 10% of the global budget.

1285. **Plant responses to pine management and deferred-rotation grazing in north Florida.**
Lewis, C. E.; Tanner, G. W.; and Terry, W. S.
Journal of Range Management 41(6): 460-465. (1988)
NAL Call #: 60.18 J82; *ISSN:* 0022-409X
http://jrm.library.arizona.edu/data/1988/416/2lewi.pdf
Descriptors: Pinus elliottii/ Pinus palustris/ Aristida stricta/ wiregrass/ growth disturbance/ community structure/ burning
Abstract: Responses of herbaceous and woody plants to combinations of 4 pine management and 4 grazing management systems were tested on a wet-flatwoods site in the pine-wiregrass vegetation type of north Florida. Frequency of occurrence of herbaceous species and foliar cover of woody species were determined in natural strands of 50-year-old slash and longleaf pine (Pinus elliotti Englem. and P. palustris Mill.) and compared to similar forest sites that were harvested and site prepared by double-chopping and not replanted with slash pine, or replanted to 1,112 trees/ha in single- and double-row configurations. In addition, these sites were ungrazed or grazed using 3 deferred-rotation systems. Prescribed burning in the natural stands increased occurrence of most herbs and stimulated new species to occur, but had little effect on woody plant composition. However, harvesting of pines and double-chopping resulted in the occurrence of many new herbaceous species and increased occurrence of most initially present. Pineland threeawn (Aristida stricta Michx.), the major herb, initially decreased in occurrence with intensive site disturbance. Six years after disturbance, most herbaceous species were declining in occurrence. Grazing or growth of replanted pines had little influence on occurrence of herbaceous species. Both burning and mechanical disturbances initially reduced foliar ground cover of most woody species; however, few species were eliminated from the community. Most woody species were recovering within 6 yr from treatment, but succession was somewhat slower on mechanically treated areas. Survival and growth of planted pines were not affected by grazing, nor did planting configuration affect pine growth.

1286. **Quantitative effects of grazing on vegetation and soils over a global range of environments.**
Milchunas, D. G. and Lauenroth, W. K.
Ecological Monographs 63(4): 327-366. (1993)
NAL Call #: 410 Ec72; *ISSN:* 0012-9615
Descriptors: aboveground net primary production/ plant animal interactions/ productivity/ root biomass/ soil nutrients/ statistical analysis management
Abstract: Multiple regression analyses were performed on a worldwide 236-site data set compiled from studies that compared species composition, aboveground net primary production (ANPP), root biomass, and soil nutrients of grazed vs. protected, ungrazed sites. The objective was to quantitatively assess factors relating to differential sensitivities of ecosystems to grazing by large herbivores. A key question in this assessment was: Do empirically based, broad-scale relationships correspond to ecological theories of plant-animal interactions and conceptual frameworks for management of the world's grazing lands? Changes in species composition with grazing were primarily a function of ANPP and the evolutionary history of grazing of the site, with level of consumption third in importance. Changes in species composition increased with increasing productivity and with longer, more intense evolutionary histories of grazing. These three variables explained gt 5 0% of the variance in the species response of grasslands or grasslands-plus-shrublands to grazing, even though methods of measurement and grazing systems varied among studies. Years of protection from grazing was a significant variable only in the model for shrublands. Similar variables entered models of change in the dominant species with grazing. As with species composition, sensitivities of change in dominant species were greater to varying ecosystem-environmental variables than to varying

grazing variables, from low to high values. Increases of the dominant species under grazing were predicted under some conditions, and decreases were more likely among bunch grasses than other life-forms and more likely among perennials than annuals. The response of shrublands was different from that of grasslands, both in terms of species composition and the dominant species. Our analyses support the perception of grazing as a factor in the conversion of grasslands to less desirable shrublands, but also suggest that we may be inadvertently grazing shrublands more intensively than grasslands. Percentage differences in ANPP between grazed and ungrazed sites decreased with increasingly long evolutionary histories of grazing and increased with increasing ANPP, levels of consumption, or years of treatment. Although most effects of grazing on ANPP were negative, some were not, and the statistical models predicted increases in ANPP with grazing under conditions of long evolutionary history, low consumption, few years of treatment, and low ANPP for grasslands-plus-shrublands. The data and the models support the controversial hypothesis that grazing can increase ANPP in some situations. Similar to species variables, percentage differences in ANPP between grazed and ungrazed treatments were more sensitive to varying ecosystem-environmental variables than to varying grazing variables. Within levels not considered to be abusive "overgrazing," the geographical location where grazing occurs may be more important than how many animals are grazed or how intensively an area is grazed. Counter to the commonly held view that grazing negatively impacts root systems, there was no relationship between difference in ANPP with grazing and difference in root mass; as many positive as negative differences occurred, even though most ANPP differences were negative. Further, there was a weak relationship between change in species composition and change in ANPP, and no relationship with root mass, soil organic matter, or soil nitrogen. All three belowground variables displayed both positive and negative values in response to grazing. Current management of much of the world's grazing lands based on species composition criteria may lead to erroneous conclusions concerning the long-term ability of a system to sustain productivity.

1287. **Regulating competition on conifer plantations with prescribed cattle grazing.**
Karl, M. G. and Doescher, P. S.
Forest Science 39(3): 405-418. (1993)
NAL Call #: 99.8 F7632; *ISSN:* 0015-749X
Descriptors: forest plantations/ Pseudotsuga menziesii/ Pinus ponderosa/ cattle/ water stress/ Dactylis glomerata/ roots/ soil water/ plant competition/ grazing/ Oregon
Abstract: On conifer plantations, competitive understory vegetation often retards growth and establishment of tree seedlings. Livestock grazing exemplifies a method of controlling the understory vegetation and increasing the availability of site resources to tree seedings. We hypothesized that prescribed cattle grazing ameliorates water stress of young tree seedlings by reducing root growth of competing understory species. On a Douglas-fir (Pseudotsuga menziesii [Mirb.] Franco) and ponderosa pine (Pinus ponderosa Dougl.) plantation in southwest Oregon planted in 1986, seedling water stress was evaluated with the pressure chamber technique and supplemented with gravimetric sod water determinations in 1986-1989. Root growth of orchardgrass (Dactylis glomerata L.), the major understory competing species, was quantified in 1988 and 1989 with the root periscope/mini-rhizotron technique. Seedling water stress levels during spring and summer were similar in a cattle-grazed vs. ungrazed area in 1986 through 1988, but in summer 1989, water stress was reduced significantly in the grazed area. Soil water content was higher in the grazed area in 1989, especially at the 10-20 cm soil depth. End of season (July) orchardgrass root growth was reduced 18% and 15% with grazing in 1988 and 1989, respectively. We conclude that repeated cattle grazing of orchardgrass reduced transpirational surface area and root growth sufficiently to increase soil water availability to seedlings. Thus, prescribed cattle grazing on conifer plantations can enhance seedling physiological status by acting as a regulator of above- and belowground competition.

1288. **Relationship of native and introduced grasses with and without cattle in a young ponderosa pine plantation.**
Mcdonald, Philip M. and Fiddler, Gary O.
Western Journal of Applied Forestry 17(1): 31-36. (2002)
NAL Call #: SD388.W6; *ISSN:* 0885-6095
Descriptors: agroforestry/ fencing effect/ grass density/ grazing effect/ native plant community response/ plant community/ seeding effect
Abstract: On an above-average site in northern California, an early shrub-forb-grass plant community was treated by artificially seeding two forage grass species at plantation age 3, cattle grazing with and without seeded grasses, and applying a soil-active chemical (Velpar). Planted ponderosa pines (Pinus ponderosa var. ponderosa) were part of this community. Results for a 10 yr period (1988-1997) are presented for a native, naturally invading needlegrass (Achnatherum nelsonnii), introduced orchard grass (Dactylis glomerata) and introduced pubescent wheatgrass (Agropyron trichophorum). In general, all three grasses became established, grew well, and spread throughout the study area. Density of needlegrass was highest in the Velpar, fenced control, and grazed control treatments (more than 72,000 plants/ac). Orchard grass density was highest in the seeded and grazed and seeded and fenced treatments (more than 14,000 plants/ac) and relatively high in the Velpar treatment (8,400 plants/ac). Pubescent wheatgrass established well in both seeded treatments (more than 24,000 plants/ac) and spread best to the grazed control (6,950 plants/ac). Ecologically, the introduced grasses had no major effect on the native plant community, and, economically, their effect was positive, although minor.

1289. **Responses of main shrub species to different grazing regimes in Galicia.**
Rigueiro Rodriguez, A.; Lopez Diaz, M. L.; and Mosquera Losada, M. R.
In: Towards the sustainable use of Europe's forests - Forest ecosystem and landscape research: Scientific challenges and opportunities/ Andersson, Folke; Birot, Yves; and Päivinen, Risto; Series: EFI Proceedings 49.
Finland: European Forest Institute, 2004; pp. 301-307.
Notes: ISSN: 1237-8801
NAL Call #: SD177 .E44 no. 49
http://www.efi.fi/publications/proceedings/49.html

Descriptors: continuous grazing/ crude protein/ grasslands/ grazing/ rotational grazing/ silvopastoral systems/ sown grasslands
Abstract: The objective of the experiment was to evaluate the effect of two grazing systems (rotational and continuous) on crude protein and pasture production under a 25-year old plantation of Pinus radiata (800 trees/ha) Horse grazing reduces pasture production and therefore the risk of fire. Differences in pasture production between treatments were not important, which makes a continuous grazing system more recommendable. Species' persistence depends on the horses' preferences. They preferred gorses instead of fern or bramble. Differences in pasture protein percentages were not important, with the exception of Pteridium, which had higher protein content when lamina percentage was higher.

1290. **Riparian restoration through grazing management: Considerations for monitoring project effectiveness.**
Medina, A. L.; Rinne, J. N.; and Roni, P.
In: Monitoring stream and watershed restoration. Bethesda, USA: American Fisheries Society, 2005; pp. 97-126.
Notes: ISBN: 1888569638
Descriptors: case studies/ design/ fisheries/ grazing/ monitoring/ riparian vegetation
Abstract: This paper provides the reader with practical information on issues of monitoring riparian areas, with emphasis on fisheries. First, an overview of considerations in designing a monitoring and evaluation programme (e.g., questions and hypotheses, study design, and duration) and selecting useful monitoring parameters, is given. Then, presents three grazing case studies wherein the purpose of the study, problems and issues, methods, and what was measured and what was learned. Finally, the general principles from the case studies that should apply for any monitoring programme when addressing grazing and fencing in riparian areas are synthesized.

1291. **Sheep as a silvicultural management tool in temperature conifer forest.**
Sharrow, S. H.
Sheep Research Journal: 97-104. (1994)
NAL Call #: SF371.R47; *ISSN:* 1057-1809
Descriptors: sheep/ grazing intensity/ agroforestry/ brush control/ browsing/ coniferous forests/ ecological competition/ liveweight gain/ costs and returns/ grazing/ literature reviews
This citation is from AGRICOLA.

1292. **Sheep grazing effects on coastal douglas fir forest growth: A ten-year perspective.**
Sharrow, S. H.; Leininger, W. C.; and Osman, K. A.
Forest Ecology and Management 50(1-2): 75-84. (1992)
NAL Call #: SD1.F73; *ISSN:* 0378-1127
Descriptors: Pseudotsuga menziesii/ Alnus rubra/ timber industry/ livestock effects/ biological control/ weed control
Abstract: Interest in using livestock as a biological control agent to suppress unwanted vegetation in conifer plantations has expanded rapidly in the last 10 years. Additional information concerning the silvicultural implications of livestock grazing, particularly the effects of browsing and competition suppression on timber tree growth, are needed if grazing is to be widely adopted as a forest management tool. Tree diameter and height growth were measured during 1981-1990 for ungrazed and grazed tree stands in a coastal Oregon Douglas fir (Pseudotsuga menziesii) forest. Grazed stands were intensively used by a herded flock of 700-900 sheep for 3-4 days each May and August in 1981 and 1982. Understory vegetation phytomass and its utilization by sheep was evaluated using a beftore-and-after technique in 1981 and 1982. Sheep removed 28% and 64% of new tree lateral branches in 1981 and 1982, respectively. The major effect of browsing, however, appeared to be removal of terminal leaders which reduced 1990 Douglas fir tree height by 61 cm and diameter at breast height (dbh) by 1.9 cm for each terminal removed. Sheep browsed terminal leaders of 38% and 77% of grazed-plantation trees in 1981 and 1982, respectively. Grazing proved very effective in reducing red alder (Alnus rubra) establishment and growth. Total tree basal area in 1990 was similar for grazed and ungrazed stands. However, alder trees contributed over 45% of the tree basal area present on ungrazed stands compared to only 19% on grazed stands. Vegetation control by sheep, without associated browsing of terminal leaders, increased 1990 Douglas fir height by 16% and dbh by 34%. The net effect of grazing, reflecting the negative impacts of browsing together with the positive effects of reduced competing vegetation, was to increase the 1990 Douglas fir height by 6% and dbh by 22% on grazed compared to ungrazed timber stands.

1293. **Shifting mosaics in grazed woodlands driven by the alternation of plant facilitation and competition.**
Olff, H.; Vera, F. W. M.; Bokdam, J.; Bakker, E. S.; Gleichman, J. M.; De Maeyer, K.; and Smit, R.
Plant Biology 1(2): 127-137. (1999)
NAL Call #: QK1.P436; *ISSN:* 1435-8603
Descriptors: cyclical successional competition/ woodlands: grazing, shifting mosaics
Abstract: Free-ranging large grazers, such as cattle and horses, are increasingly reintroduced to former agricultural areas in Western Europe in order to restore natural and diverse habitats. In this review we outline mechanisms by which large grazers induce and maintain structural diversity in the vegetation (mosaics of grasslands, shrub thickets and trees). This variation in vegetation structure is considered to be important for the conservation of biodiversity of various plant and animal groups. The process of spatial association with unpalatable plants (associational resistance) enables palatable plants to establish in grasslands maintained by large grazers. In this way, short unattractive (thorny, low quality or toxic) species facilitate taller unattractive shrubs, which facilitate palatable trees, which in turn outshade the species that facilitated their recruitment. Established trees can, therefore, not regenerate under their own canopy, leading to cyclic patch dynamics. Since this cyclicdynamic occurs on a local scale, this contributes to shifting mosaics. The mechanisms involved in creating and maintaining the resulting shifting mosaics are described for temperate floodplain and heathland ecosystems, including the effects on nutrient transport within grazed landscapes. How grazing leads to shifting mosaics is described in terms of plant functional types, allowing potential generalisation to other

ecosystems. The resulting interaction web of grasses, unpalatable forbs and shrubs, palatable light-demanding trees and shade-tolerant trees is discussed, and was found to contain various interesting direct and indirect effects. The key process contributing to spatial diversity in vegetation structure is the alternation of positive (facilitation) interactions between plant species at one life cycle stage, and competitive displacement at another stage. Grazing thus causes directional successional sequences to change to shifting mosaics. The implications of this theory for nature conservation are discussed, including the relevant management problems, possible choices and practical solutions. We conclude that the theoretical framework outlined in this review provides helpful insights when coping with nature conservation issues in temperate woodland habitats.

1294. **Short-term responses of rehabilitating coastal dune forest ground vegetation to livestock grazing.**
Wassenaar, Theo D. and Van Aarde, Rudi J.
African Journal of Ecology 39(4): 329-339. (2001)
NAL Call #: 409.6 Ea7; *ISSN:* 0141-6707
Descriptors: coastal dune forest ground vegetation/ grazing/ rainfall/ rehabilitation/ species richness/ vegetation cover
Abstract: We investigated the responses of the ground vegetation in a 17-year-old coastal dune forest plant community to four levels of experimentally applied livestock grazing (three grazing levels and one ungrazed control) from May 1994 to March 1996. The effects of grazing were apparently subordinate to site-specific intrinsic vegetation change and there were some indications that rainfall interacted with grazing level. Grazing had some apparent but no significant effects on plant species composition, significantly affected plant species richness over time, and significantly increased the range of species richness and vegetation cover values as well as the relative abundance and numbers of plant species with erect growth forms. Vegetation cover changed significantly over time, independently of grazing. Our results point to two important, easily measured mechanisms for the conservation management of coastal dune forests-the interaction of disturbance type with plant growth form and the increase of variation in community structural variables under disturbance. These mechanisms, although they potentially have wide application and predictive power, have not been studied adequately.

1295. **Soil phosphorus and tree cover modify the effects of livestock grazing on plant species richness in Australian grassy woodland.**
Dorrough, J.; Moxham, C.; Turner, V.; and Sutter, G.
Biological Conservation 130(3): 394-405. (2006)
NAL Call #: S900.B5; *ISSN:* 0006-3207
Descriptors: fertilizer/ grassland/ herbivory/ productivity/ soil nutrients/ species diversity/ tree clearing
Abstract: The effects of grazing on the richness of understorey plant communities are predicted to vary along gradients of resources and tree cover. In temperate Australia livestock management has involved phosphorus addition and tree removal but little research has examined how the effects of grazing on plant species richness may vary with these management regimes. Patterns of understorey plant species richness were examined in 519, 0.09 ha quadrats in grazed pastures and remnant grassy forests and woodlands in southern Australia. Sheep grazing was the primary land use and sites varied widely in grazing frequency and density, tree cover and phosphorus fertiliser history. Using an information theoretic approach the available data provides strong evidence that the effect of grazing on total species richness varies according to available phosphorus and tree cover. Intermittent grazing and no grazing were associated with high total and native plant richness, but only at low phosphorus concentrations. Phosphorus was strongly negatively correlated with richness, particularly at low grazing frequency. Total species richness was positively correlated with tree cover except under frequent grazing at high stocking rates, suggesting that heavy grazing eliminates spatial and temporal heterogeneity imposed by trees. Native plant species richness was negatively correlated with a history of cultivation, positively correlated with tree cover and varied according to landscape position and geological substrate. Frequent high density grazing, particularly when associated with clearing, cultivation and fertiliser addition, was associated with the persistence of very few native plant species. In contrast, the richness of exotic plant species was relatively invariant and performance of the best model was low. While several studies have highlighted the importance of the grazed and cleared matrix for the conservation of native plant species, this benefit may be limited in landscapes where intensive grazing management systems dominate. Strong evidence for interactions between grazing, phosphorus and tree cover suggest that failure to consider other land use practices associated with grazing management systems could lead to erroneous conclusions regarding vegetation responses to livestock grazing.

1296. **Subsoiling and grazing effects on growth of nitrogen-fixing species.**
Java Sharpe, B.; Everett, R.; Zabowski, D.; and Radek, K.
In: Proceedings of a symposium on sustaining rangeland ecosystems. (Held 29 Aug 1994-31 Aug 1994 at Eastern Oregon State College, La Grande, Oregon.) Edge, W. D. and Olsen-Edge, S. L. (eds.); Vol. Special Report 953. Corvallis, Ore.: Oregon State University Extension Service; pp. 201-205; 1996.
NAL Call #: 100 Or3M no.953
Descriptors: revegetation/ logging effects/ inceptisols/ grazing/ forest management/ silvopastoral systems/ reclamation/ disturbed land/ soil compaction/ establishment/ trees/ cultivation/ subsoiling/ site preparation/ nitrogen fixing trees/ nitrogen fixation/ Lupinus albicaulis
Abstract: Three methods for alleviating compaction on logging tracks at 1707 m altitude in Okanogan National Forest, Washington State were compared on a loamy-skeletal mixed andic cryochrepts. The soil was subsoiled or not subsoiled, grazing was excluded or allowed to continue and broadcast sowing of Trifolium hybridum, Medicago lupulina, Lupinus albicaulis or Alnus sinuata took place. Soil compaction was unaffected by the treatments. Subsoiling increased root penetration but not root numbers. Trifolium hybridum grew the most roots and they extended deeper

into the soil profile than the other species. L. albicaulis growth was variable, A. sinuata did not germinate until the 2nd year and M. lupulina was unsuited to the area.

1297. **Timber thinning and prescribed burning as methods to increase herbage on grazed and protected longleaf pine ranges.**
Wolters, G. L.
Journal of Range Management 34(6): 494-497. (1981)
NAL Call #: 60.18 J82; *ISSN:* 0022-409X
http://jrm.library.arizona.edu/data/1981/346/13wolt.pdf
This citation is from AGRICOLA.

1298. **Tree/wood quality in slash pine following longterm cattle grazing.**
Cutter, B. E.; Hunt, K.; and Haywood, J. D.
Agroforestry Systems 44: 305-312. (1999)
NAL Call #: SD387 .M8A3; *ISSN:* 0167-4366
http://www.srs.fs.usda.gov/pubs/ja/ja_cutter01.pdf
Descriptors: growth rate/ Pinus elliottii/ specific gravity/ tracheid length/ tree grade
Abstract: Tree height, diameter, and grade were measured on 14 cattle grazing trial plots located on the Palustris Experimental Forest in Louisiana's Kisatchie National Forest. These plots had been established in the early 1960s. Mensurational data was gathered on 28 trees from grazed sites and another 28 from ungrazed plots. Increment cores were also taken from these trees. Statistical analyses showed no effect attributable to grazing on any of the variables measured: tree height, tree diameter at breast height, tree grade, growth rate, amount of latewood, unextracted specific gravity, or tracheid length.
This citation is from Treesearch.

1299. **The use of sheep in forest vegetation management.**
Newsome, T.
Frda Report 251: 67-74. (Sept. 1996)
NAL Call #: SD14.B7F7; *ISSN:* 0835-0752
Descriptors: forests/ sheep/ predation/ plant communities/ weeds/ grasses/ weed control/ Epilobium angustifolium/ Poaceae/ Populus tremuloides/ Salix/ Valeriana/ seedlings/ wildlife/ plant competition/ feeding preferences/ grazing/ diameter/ literature reviews/ British Columbia
This citation is from AGRICOLA.

1300. **Vegetational and faunal changes in an area of heavily grazed woodland following relief of grazing.**
Putman, R. J.; Edwards, P. J.; Mann, J. C. E.; How, R. C.; and Hill, S. D.
Biological Conservation 47(1): 13-32. (1989)
NAL Call #: S900.B5; *ISSN:* 0006-3207
Descriptors: birch/ beech/ oak/ scots pine/ douglass fir/ holly/ herbivore conservation
Abstract: Two 5.6 ha inclosures were established in 1963 within an area of heavily grazed deciduous woodland in the New Forest, Hampshire. In one, a constant grazing pressure was maintained (at c. 1 fallow deer ha-1); the other was kept free of all large herbivores. The vegetation of both was surveyed 6 years, 14 years and 22 years after inclosure. Changes over time in species composition and age structure of trees in the two areas are discussed, as are changes in composition, diversity and biomass of the ground flora and shrub layer. Clear differences were apparent between the two and also, within the ungrazed site, over time. While in the grazed plot no regeneration was apparent, rapid regeneration of birch, beech, oak, Scots pine, Douglas fir and holly had occurred in the ungrazed plot by 1969; by 1985, with closure of the canopy, establishment had virtually ceased. Clear differences were also recorded in species composition of both trees and ground flora, with species resistant to grazing more abundant in the grazed plot and with many graze-sensitive or palatable species absent in that plot becoming re-established in the ungrazed area. Analysis of the three-dimensional profile of the vegetation also showed clear differences in vertical distribution in the two plots. Surveys were undertaken in 1983-84 and in 1985 of the small mammal communities and ground invertebrates in the two areas. Marked differences in species composition again reflect structure and species composition of the vegetation under the grazed and ungrazed regimes. The factors affecting the succession which followed relief of grazing are discussed. Even after 22 years, the vegetation of the ungrazed area remains strikingly species-poor, and reasons for this-and implications for conservation-are considered.

1301. **Vegetative trends in a young conifer plantation after 10 years of grazing by sheep.**
McDonald, P. M. and Fiddler, G. O.
Albany, Calif.: Pacific Southwest Research Station; Research Paper PSW-RP-215 , 1993. 13 p.
NAL Call #: A99.9 F7652P
Descriptors: forest plantations/ Pinus ponderosa/ ewes/ sheep/ seedlings/ seedling growth/ mortality/ plant competition/ grasses/ shrubs/ grazing/ California
This citation is from AGRICOLA.

1302. **Water relations and growth of conifer seedlings during three years of cattle grazing on a southwest Oregon plantation.**
Doescher, P. S.; Tesch, S. D.; and Drewien, W. E.
Northwest Science 63(5): 232-240. (1989)
NAL Call #: 470 N81; *ISSN:* 0029-344X
Descriptors: Pseudotsuga menziesii/ Pinus ponderosa/ stomatal conductance/ predawn xylem potential/ competition/ soil moisture/ resource management/ pressure chamber
Abstract: Cattle grazing, beginning one year after planting, was found to enhance water relations and growth of conifer seedlings on a young plantation in southwest Oregon. During 1984, because of the rocky nature of soils on the study area, availability of soil moisture to seedlings was assessed using the pressure chamber. Predawn xylem potentials of Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) and ponderosa pine (Pinus ponderosa Laws.) seedlings were evaluated within three levels of competing vegetation that included ungrazed, grazed, and no competition environments. For ponderosa pine, little difference in predawn xylem potentials during 1984 were detected among the three levels of competition. For Douglas-fir, seedlings on the ungrazed plots exhibited significantly more negative predawn xylem potentials earlier in the growing season in comparison to the grazed and no competition treatments. Comparison of both ponderosa pine and Douglas-fir in 1986 between grazed and ungrazed treatments revealed significantly less negative predawn

potentials and significantly greater stomatal conductance on grazed plots early in the growing season. Improved water relations was one factor felt to increase growth and vigor of conifer seedlings on the grazed area. After 3 years, significantly greater seedling volume was found for both ponderosa pine and Douglas-fir on the grazed plots. Controlled cattle grazing improved plant water relations and enhanced the growth performance of young conifer seedlings.

1303. **Woodland regeneration in relation to grazing and fencing in Coed-Gorswen, North Wales.**
Linhart, Y. B. and Whelan, R. J.
Journal of Applied Ecology 17(3): 827-840. (1980)
NAL Call #: 410 J828; *ISSN:* 0021-8901
Descriptors: oak/ Quercus/ alder/ Alnus glutinosa/ ash/ Fraxinus excelsior/ rowan/ Sorbus aucuparia/ hawthorn/ Crataegus monogyna/ sycamore/ Acer pseudoplatanus/ sheep/ gap replacement
Abstract: Seedling regeneration of tree species was studied in woodland composed primarily of oak (Quercus), alder (Alnus glutinosa), ash (Fraxinus excelsior), rowan (Sorbus aucuparia) and hawthorn (Crataegus monogyna). Species diversity and abundance of seedlings and saplings did not reflect the relative abundances of mature trees. Most seedlings were of ash but most saplings of sycamore and ash. Oak regeneration was almost non-existent. The effects of grazing on regeneration were studied by comparing species diversity and numbers of seedlings and saplings in fenced and unfenced 0.1 ha plots. There were many seedlings throughout the plots, but in unfenced, grazed plots, few seedlings survived beyond 2 yr. Sycamore (Acer pseudoplatanus) seemed most susceptible to grazing and hawthorn least susceptible. Observations made on seedlings and saplings when sheep broke into fenced areas suggest that grazing pressure may reduce sycamore regeneration without influencing that of ash and rowan. In fenced areas, saplings of sycamore and ash had the greatest probabilities of filling gaps caused by death of mature trees. In unfenced grazed areas, saplings of hawthorn and ash were the most likely to replace mature trees.