382. **Abundance of Alnus incana ssp. rugosa in Adirondack Mountain shrub wetlands and its influence on inorganic nitrogen.**
Kiernan, B. D.; Hurd, T. M.; and Raynal, D. J.
Environmental Pollution 123(3): 347-354. (2003)
NAL Call #: QH545.A1E52; *ISSN:* 0269-7491.
Notes: Environmental monitoringm evaluation and protection in New York: Linking science and policy. Selected conference papers, Albany, New York, USA, 24-25 September 2001.
Descriptors: wetlands/ acidification/ ammonium/ biomass/ mountain areas/ nitrate/ nitrogen/ nitrogen fixation/ nitrogen fixing trees/ polluted water/ species richness/ surface water/ trees/ water pollution/ water quality/ Alnus incana
Abstract: The purpose of this research was to determine the abundance of the nitrogen-fixing shrub, Alnus incana ssp. rugosa (speckled alder), in shrub wetlands of the Adirondack Mountain region of New York State and to determine whether its abundance affects the concentration or accumulation of inorganic nitrogen in wetland substrates. Alder/willow wetlands are the second most common wetland type in the Adirondack region. The Adirondack Park Agency's digital GIS database of wetland types was used to determine the areal extent of alder/willow wetlands in the Adirondacks. Randomly selected wetlands were sampled to determine the size and abundance of alder. Alder densities averaged ~7000 stems ha-1 and alder was present in 75% of the wetlands. As an indication of short-term accumulation of NO3- and NH4+ in wetland substrates, ion exchange resins were used to sample ground water in high and low alder density wetlands as well as from wetlands lacking alder and dominated by conifers. Additionally, NO3- and NH4+ concentrations in ground water samples were measured. NH4+ accumulation levels from exchange resins were low for all wetland types while groundwater NH4+ concentration was highest in the low-density alder sites. Wetlands with high alder density had approximately six times higher NO3- accumulation than other wetlands. Substrate groundwater NO3- concentrations in wetlands of high-density alder exceeded by three times levels in low or no alder wetlands, showing the importance of alder to local N budgets. To assess the recovery of shrub wetlands from acidification, future studies should determine the fate of fixed N in wetland systems.

383. **Biogeochemical fate of coal mine drainage pollutants in constructed wetlands.**
Tarutis, W. J. and Unz, R. F.
Current Topics in Wetland Biogeochemistry 2: 40-51. (1996); *ISSN:* 1076-4674
Descriptors: wetlands/ pyrite/ biogeochemistry/ acid mine drainage/ wastewater treatment/ research priorities/ design criteria/ optimization/ economic aspects/ fate of pollutants/ iron/ manganese/ coal/ degradation/ biodegradation/ sulfur/ mining/ mine tailings/ pollution control/ sulphur/ USA, Appalachian Mts.
Abstract: Acidic mine drainage (AMD) is a chronic water pollution problem in the Appalachian region of the United States. The formation of AMD occurs when pyrite (FeS sub(2)), naturally present in coal seams, is exposed to air and water through mining activities and often results in very high levels of acidity, iron, manganese, sulfate, and occasionally aluminum. The observation that natural (volunteer) wetlands are capable of improving mine water quality (Wieder and Lang, 1982) has prompted coal mine operators, chiefly in Pennsylvania and West Virginia (Wieder, 1989), to construct wetlands in an effort to reduce treatment costs. The characteristic features of wetlands (the presence of water, undrained hydric soil, and vegetation adapted to saturated conditions) make wetlands unique ecosystems and potentially valuable resources for wildlife as well as humans. Constructed wetlands have been used extensively as passive treatment systems for municipal wastewaters (Hammer, 1989), but only within the past decade have wetlands been used to treat AMD. The design and implementation of AMD treatment wetlands have, at least initially, been based on perceived economic benefits without regard to the biogeochemical processes important to the effluent removal and retention of the major mine water pollutants of concern. This "black-box" approach is useful to obtain necessary baseline data for input-output budgets, but does little to promote an understanding of the actual metal removal mechanisms involved. In order to achieve optimal pollutant removal over the long term, it is necessary to understand these processes in wetlands and to determine how wetlands can be designed so that the benefits of each removal mechanism are fully realized.

384. **Carbon dynamics in Appalachian peatlands of West Virginia and Western Maryland.**
Yavitt, J. B.
Water, Air, and Soil Pollution 77(3-4)(1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979.
Notes: Conference: Southern Appalachian Man and the Biosphere (SAMAB) Conference on Wetland Ecology, Management, and Conservation, Knoxville, TN (USA), 28-30 Sep 1993
Descriptors: wetlands/ peatlands/ carbon cycle/ organic matter/ peat/ peat bogs/ biological production/ peat bogs/ biological production/ peatlands
Abstract: Abundant production of organic matter that decomposes slowly under anaerobic conditions can result in substantial accumulation of soil organic matter in wetlands. Tedious means for estimating production and decomposition of plant material, especially roots, hampers our understanding of organic matter dynamics in such systems. In this paper, I describe a study that amended typical estimates for both production and decomposition of organic matter by measuring net flux of carbon dioxide (CO sub(2)) over the peat surface within a conifer swamp, a sedge-dominated marsh, and a bog in the Appalachian Mountain region of West Virginia and western Maryland, USA. The sites are relatively productive, with net primary production (NPP) of 30 to 82.5 mol C m super(-2)yr super(-1), but peat deposits are shallow with an average depth of about 1 m. In summer, all three sites showed net CO sub(2) flux from the atmosphere to the peat during the daytime (-20.0 to -30.5 mmol m super(-2) d super(-1)), supported by net photosynthesis, which was less than net CO sub(2) flux

from the peat into the atmosphere at nighttime (39.2 to 84.5 mmol m super(-2) d super(-1)), supported by ecosystem respiration. The imbalance between these estimates suggests a net loss of carbon (C) from these ecosystems. The positive net CO sub(2) flux seems to be so high because organic matter decomposition occurs throughout the peat deposit-and as a result concentrations of dissolved inorganic carbon (DIC) in peat pore waters reached 4,000 mu mol L super(-1) by late November, and concentrations of dissolved organic carbon (DOC) in peat pore waters reached 12,000 mu mol L super(-1). Comparing different approaches revealed several features of organic matter dynamics: (i) peat accretion in the top 30 cm of the peat deposit results in a C accumulation rate of about 15 mmol m super(-2) d super(-1); however, (ii) the entire peat deposit has a negative C balance losing about 20 mmol m super(-2) d super(-1).

385. **Characterization of high elevation central Appalachian wetlands.**
Francl, K. E.; Ford, W. M.; and Castleberry, S. B.
Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station; RP-NE-725, 2004. 26 p.
NAL Call #: A99.9 F7622Un no. 725
http://www.fs.fed.us/ne/newtown_square/publications/research_papers/pdfs/2004/ne_rp725.pdf
Descriptors: bog/ central Appalachian Mountains/ fen/ geology/ hydric soils/ hydrophytic vegetation/ wetland characterization
Abstract: We characterized 20 high elevation wetlands in the central Appalachian Mountains in West Virginia and Maryland, in terms of vegetation, soils, hydrology, and geology. Plant species were distributed along soil chemical (pH, conductivity) and physical (organic matter depth) gradients across sites. Topography and geology appear to explain differences among these wetlands, as reflected by soil and chemistry measures and vegetation distribution. Our work provides substantial quantitative baseline data for these uncommon high elevation wetlands, emphasizing the importance and diversity of these isolated systems.
This citation is from Treesearch.

386. **Classification and inventory of wetlands in the southern Appalachian region.**
Hefner, J. M. and Storrs, C. G.
Water, Air, and Soil Pollution 77(3-4)(1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979.
Notes: Conference: Southern Appalachian Man and the Biosphere (SAMAB) Conference on Wetland Ecology, Management, and Conservation, Knoxville, TN (USA), 28-30 Sep 1993
Descriptors: wetlands/ mapping/ inventories/ classification systems/ habitat/ land classification/ maps/ vegetation/ publications/ biological surveys/ vegetation cover/ USA, Appalachian Mts./ biological surveys/ vegetation cover/ land classification/ vegetation/ publications/ inventories/ classification systems/ habitat
Abstract: The National Wetlands Inventory of the U.S. Fish and Wildlife Service has prepared large scale (1:24,000) wetland maps for nearly all of the Southern Appalachian Region. Traditional and digital cartographic products are available from the Earth Science Information Centers of the United States Geological Survey and from State-run distribution outlets. Most of the materials prepared by the NWI within the region were cooperatively funded by the States and other Federal Agencies. NWI maps describe wetlands in terms of the life form of the dominant vegetation, substrata where vegetation is sparse or lacking, water chemistry, relative duration of inundation or saturation, and special modifiers. The maps display wetland polygons as small as 0.5 hectares in size and linear wetlands as narrow as 8 meters, showing the size, type of wetland, and relative position of the wetland on the landscape. The wetland inventory process is principally a remote sensing task, relying on the interpretation of high altitude color infrared aerial photography, supported with ground truth data and collateral information. The procedure has limitations related to scale, quality and timing of the aerial photography; experience and training of the photo interpreters; and the wetland types which are to be classified and delineated. Since wetland maps provide a static depiction of a dynamic resource, the NWI conducts periodic wetland status and trends studies to evaluate wetland change in aerial extend and the reasons for the change. Although trend surveys are routinely conducted nationally and selectively for regional and local areas, no study to specifically address the wetlands of the Southern Appalachian Region has been developed.

387. **Colonization and establishment of red maple (Acer rubrum) in a southern Appalachian wetland.**
Warren, R. J.; Rossell, I. M.; and Moorhead, K. K.
Wetlands 24(2): 364-374. (June 2004)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ recruitment/ colonization/ canopies/ alternation learning/ seedlings/ trees/ understory/ flood plains/ age composition/ size/ temporal variations/ forests/ growth rings/ height/ ecosystem disturbance/ regression analysis/ water levels/ model studies/ maple trees/ canopy/ water level/ fluctuations/ streams/ habitats/ Acer rubrum/ USA, North Carolina, Tulula Creek/ USA, North Carolina/ red maple/ other angiosperms/ population dynamics/ water and plants
Abstract: We characterized the post-disturbance recruitment window for red maple (Acer rubrum) in a southern Appalachian wetland using size-class distributions and forest stand models. The DBH and core age of understory and overstory trees were measured in 108 plots in forested (closed) and unforested (open) fen and floodplain sites at the Tulula Creek wetland complex (a southern Appalachian wetland in Graham County, North Carolina) in 1994 and 2001 as part of a larger ecological study. In addition, the heights of red maple seedlings were measured in 379 quadrats in an unforested floodplain in 1996 and 2001. We examined the temporal patterning of wetland recruitment using red maple size-class data in order to determine (1) the recruitment window for seedling colonization and (2) temporal recruitment patterning based on the size/age structure of established tree stands. Diameter and height distributions were compared with power function, negative exponential and quadratic models in order to determine goodness of fit using the coefficient of determination (R2). Diameter distributions and stand models showed that recruitment continued (at a diminishing rate) at sites that were last cleared 7, 14, and approximately 30 years earlier and ceased at a fourth site cleared approximately 45 years earlier. While there were

minor recruitment fluctuations that possibly coincided with water-level changes, the unimodal size class distributions indicated that recruitment did not pulse subsequent to initial canopy disturbance. These results show that red maple readily colonized wetland habitats and that the recruitment window lasts at least twice as long as that reported in terrestrial systems. In addition, size-class distribution and regression analysis indicate that the colonization window is directly impacted by canopy disturbance and only indirectly influenced by water levels.

388. **A comparison of plant communities in mitigation and reference wetlands in the mid-Appalachians.**
Balcombe, C. K.; Anderson, J. T.; Rentch, J. S.; Grafton, W. N.; Fortney, R. H.; and Kordek, W. S.
Wetlands 25(1): 130-142. (2005)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: constructed wetland/ hydrophytic vegetation/ man-made wetland/ mitigation wetland/ reference wetland/ wetland management/ wetland mitigation
Abstract: Wetland destruction has plagued the U.S. for decades, but the need to compensate for these losses has only been embraced within the last 20 years. Because so many compensatory mitigation wetlands have been created, there is a need to assess the function of these valuable ecosystems relative to natural wetlands. The goal of this study was to evaluate the functional equivalency of mitigation wetlands in West Virginia in supporting hydrophytic plant communities. A series of nested quadrats was used to compare plant community structure among eleven mitigation and four naturally occurring reference wetlands. For all species combined, mean total percent cover across all sampling quadrats per wetland was similar between mitigation and reference wetlands. Species richness, evenness, and diversity were greater in mitigation than in reference wetlands. Mean weighted averages of plant communities calculated using cover values and wetland indicator status were similar between mitigation and reference wetlands. There were, however, major differences in species composition. Mitigation sites tended to have more pioneer species, non-native dominants, and species with relatively lower conservation quality. Ordination analyses suggested that compositional differences become smaller as mitigation sites age. Both mitigation and natural wetlands met criteria for hydrophytic vegetation according to the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual. These data suggest that the mitigation wetlands investigated in this study adequately support hydrophytic vegetation and appear to be developing vegetation similar to reference standards. © 2005, The Society of Wetland Scientists.

389. **Control of methane metabolism in a forested northern wetland, New York State, by aeration, substrates, and peat size fractions.**
Coles, Janice R. P. and Yavitt, Joseph B.
Geomicrobiology Journal 19(3): 293-315. (2002);
ISSN: 0149-0451
Descriptors: freshwater ecology: ecology, environmental sciences/ soil science/ forested northern wetland/ soil factors: aeration, peat size fractions, substrate
Abstract: Although many northern peat-forming wetlands (peatlands) are a suitable habitat for anaerobic CH4-producing bacteria (methanogens), net CH4 fluxes are typically low in forested systems. We examined whether soil factors (aeration, substrate availability, peat size fractions) constrained net CH4 production in peat from a Sphagnum-moss dominated, forested peatland in central New York State. The mean rate of net CH4 production measured at 24degreeC was 79 nmol g-1d-1, and the mean rate of CO2 production (respiration) was 5.7 mumol g-1 d-1, in surface (0 to 10 cm) and subsurface (30 to 40 cm) peat. Saturated peat (900% water content) exposed to oxic conditions for 2 days or 14 days showed no net CH4 production when subsequently exposed to anoxic conditions. Rates of CO2 production, measured concomitantly, were essentially the same under oxic and anoxic conditions, and net CH4 consumption under oxic conditions was barely affected by short-term exposure to anoxic conditions. Therefore, methanogens were particularly sensitive to aeration. Net CH4 production in whole peat increased within hours of adding either acetate, glucose, or ethanol, substrates that methanogens can convert directly or indirectly into CH4, indicating that availability of these substrate might limit net CH4 production in situ. In longer incubations of 30 days, only ethanol addition stimulated a large increase in net CH4 production, suggesting growth in the population of methanogens when ethanol was available. We fractionated peat into size fractions and the largest sized fraction (>1.19 mm), composed mostly of roots, showed the greatest net CH4 production, although net CH4 production in smaller fractions showed the largest response to ethanol addition. The circumstantial evidence presented here, that ethanol coming from plant roots supports net CH4 production in forested sites, merits more research.

390. **The effects of beaver-created wetlands on the benthic macroinvertebrate assemblages of two Appalachian streams.**
Margolis, B. E.; Raesly, R. L.; and Shumway, D. L.
Wetlands 21(4): 554-563. (2001)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ zoobenthos/ macrofauna/ streams/ dams/ beavers/ environmental effects/ aquatic populations/ benthic fauna/ macroinvertebrates/ species composition/ spatial distribution/ data collections/ comparison studies/ impoundments/ environmental impact/ community composition/ aquatic mammals/ aquatic plants/ ecosystem disturbance/ Castor canadensis/ USA, Maryland, Herrington Creek/ USA, Appalachian Mts./ USA, Pennsylvania, Mountain Run/ USA, Maryland, Garrett Cty./ USA, Pennsylvania, Somerset Cty./ beaver dams/ American beaver
Abstract: We examined the effects of beaver impoundments on the benthic macroinvertebrate assemblages of two small Appalachian streams, Mountain Run (Somerset County, Pennsylvania) and a tributary to Herrington Creek (Garrett County, Maryland). Benthic macroinvertebrate assemblages above the impoundments were compared with assemblages within the impoundments and 1 m, 10 m, and 100 m below the impoundments. The results of our study indicate that beaver affect both within-impoundment and downstream benthic macroinvertebrate assemblages. Taxonomic and functional changes in benthic

macroinvertebrate assemblages of the beaver-altered streams were a result of direct (impoundment) and indirect (changes in temperature, water chemistry, plant growth) alterations of the stream environment.

391. **Effects of drought on the water-table dynamics of a southern Appalachian mountain floodplain and associated fen.**
Moorhead, K. K.
Wetlands 23(4): 792-799. (2003)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ drought/ groundwater level/ hydrology/ water table fluctuations/ precipitation/ flood plains/ groundwater recharge/ hydraulic gradient/ piezometers/ seasonal variations/ evapotranspiration/ water depth/ droughts/ water table/ restoration/ river discharge/ temporal variations/ USA, North Carolina
Abstract: Annual and seasonal variations in precipitation have been shown to influence the hydrology of nontidal wetlands, including depth to water table. Water-table depth is assessed in wetlands for a variety of reasons, most notably for wetland delineations or determining the success of restoration projects. Many short-term assessment efforts probably occur during periods of abnormal precipitation and, as such, may not provide a thorough understanding of wetland hydrology. I have been evaluating water-table dynamics of a wetlands complex in western North Carolina for seven years in support of a wetlands restoration project. A series of water-table wells and piezometers were installed to determine the spatial and temporal patterns of the water table and vertical hydraulic gradient (VHG). For over three years, the area was classified as having conditions of moderate to severe drought. The drought lowered the average monthly water table by 26 cm in a mountain fen and 22 cm in the adjacent floodplain. The fen was a constant ground-water recharge area before the drought and a discharge area for three of 12 months during the drought. The drought also impacted a shallow, constant ground-water source to the fen on an adjacent hillslope. The impacts of the drought were greater during the active growing season, presumably due to increased evapotranspiration. The results support the need for long-term hydrologic assessment of wetlands and the need to relate wetland hydrology to annual, seasonal, and monthly precipitation patterns.

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

393. **Identification of wetlands in the southern Appalachian region and the certification of wetland delineators.**
Wakeley, J. S.
Water, Air, and Soil Pollution 77(3-4)(1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979.
Notes: Conference: Southern Appalachian Man and the Biosphere (SAMAB) Conference on Wetland Ecology, Management, and Conservation, Knoxville, TN (USA), 28-30 Sep 1993
Descriptors: wetlands/ hydrology/ surveys/ classification systems/ land classification/ vegetation/ soil types/ site surveys/ USA, Appalachian Mts./ site surveys/ land classification/ vegetation/ soil types/ classification systems
Abstract: According to the Corps of Engineers Wetlands Delineation Manual, wetlands are identified by the presence of field indicators of hydrophytic vegetation, hydric soils, and wetland hydrology. In the southern Appalachian region, situations that present problems for wetland delineators include (1) wetlands developed on recently deposited alluvial soils that may show little evidence of hydric conditions, (2) areas occupied by FAC-dominated plant communities, (3) wetlands affected by past or present drainage practices, (4) man-induced wetlands that may lack certain wetland field indicators, and (5) hydric soil units that are too small or narrow to be delineated separately on soil survey map sheets. In March 1993, under direction of Section 307(e) of the Water Resources Development Act of 1990, the Corps of Engineers initiated a Wetland Delineator Certification Program. A 1-year demonstration program has recently ended in Maryland, Florida, and Washington, with nationwide implementation scheduled for later in 1994. This voluntary program is designed to increase the quality of wetland delineations submitted with Section 404 permit applications, and reduce processing time by reducing the need for extensive field verification of wetland boundaries.

394. **Impacts of sedimentation and nitrogen enrichment on wetland plant community development.**
Mahaney, W. M.; Wardrop, D. H.; and Brooks, R. P.
Plant Ecology 175(2): 227-243. (2004)
NAL Call #: QK900 .P63; *ISSN:* 1385-0237
Abstract: Many factors influence which plant species are found in a particular wetland. The species pool is composed of the species present in the seed bank and species able to disperse into the wetland, and many abiotic and biotic factors interact to influence a species performance and abundance in the plant community. Anthropogenic activities produce specific stressors on wetland systems that alter these abiotic and biotic interactions, potentially altering species composition. We simulated three common wetland hydrogeomorphic (HGM) subclasses in a greenhouse to examine the effects of two stressors-sedimentation and nitrogen (N) enrichment-on the performance of 8 species grown in artificial communities. Species establishment, height, biomass, and foliar N and P concentrations were measured to explore species responses to stressors and competition, as well as the potential impacts of changes in species composition on ecosystem processes. Species were affected differently by sedimentation and N enrichment, and there were differences in overall community sensitivity to stressors between wetland subclasses. Sedimentation generally reduced seedling establishment, while N enrichment

produced variable effects on height and biomass. Interspecific competition had little effect on establishment but significantly reduced most species biomass. Sedimentation generally lowered community biomass, diversity, and richness, while enrichment increased community biomass. Establishment, biomass, and foliar nutrient concentrations significantly differed between many species, suggesting that shifts in species composition may impact ecosystem processes such as nutrient cycling and carbon storage. Phalaris arundinacea, an aggressive clonal graminoid, universally dominated all wetland subclasses. This dominance across a range of environmental conditions (sedimentation, fertility, and hydrology) has important implications for both restoration and predicting the impacts of human activities on species composition. Our results suggest that, in regions where P. arundinacea is common, restoration projects that establish communities from seeds and human activities that cause vegetation removal are likely to become dominated by P. arundinacea.
This citation is from AGRICOLA.

395. **Landscape-level processes and wetland conservation in the southern Appalachian Mountains.**
Pearson, S. M.
Water, Air, and Soil Pollution 77(3-4)(1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979.
Notes: Conference: Southern Appalachian Man and the Biosphere (SAMAB) Conference on Wetland Ecology, Management, and Conservation, Knoxville, TN (USA), 28-30 Sep 1993
Descriptors: wetlands/ conservation/ landscape/ ecosystem management/ nature conservation/ environmental protection/ environmental impact/ ecosystem disturbance/ ecosystems/ environmental effects/ hydrology/ USA, Appalachian Mts./ landscape/ ecosystem management/ nature conservation/ environmental impact/ ecosystem disturbance/ environmental effects
Abstract: The function of wetland ecosystems is not independent of the landscapes in which they are embedded. They have strong physical and biotic linkages to the surrounding landscape. Therefore, incorporating a broad-scale perspective in our study of wetland ecology will promote our understanding of these habitats in the southern Appalachians. Changes in the surrounding landscape will likely affect wetlands. Broad-scale changes that are likely to affect wetlands include: 1) climate change, 2) land use and land cover change, 3) water and air-borne pollution, 4) a shift in disturbance/recovery regimes, and 5) habitat loss and fragmentation. Changes in climate and land cover can affect the hydrology of the landscape and, therefore, the water balance of wetlands. Excessive nutrients and toxin transported by air and water to wetlands can disrupt natural patterns of nutrient cycling. Periodic disturbances, like flooding in riparian zones, is required to maintain some wetlands. A change in disturbance regimes, such as an increase in fire frequency, could alter species composition and nutrient cycles in certain wetlands. Many plant and animal species that found in small, isolated wetlands have populations that are dependent on complementary habitats found in the surrounding landscape. Loss or fragmentation of these complementary habitats could result in the collapse of wetland populations.

396. **Methane production and sulfate reduction in two Appalachian peatlands USA.**
Wieder R. K.; Yavitt J. B.; and Lang G. E.
Biogeochemistry 10(2): 81-104. (1990)
NAL Call #: QH345 .B564; *ISSN:* 0168-2563
Descriptors: sphagnum/ bog/ anaerobic/ carbon/ mineralization/ carbon dioxide
Abstract: Anaerobic carbon mineralization was evaluated over a 1-year period in two Sphagnum-dominated peatlands, Big Run Bog. West Virginia, and Buckle's Bog, Maryland. In the top 35 cm of peat, mean rates of methane production, anaerobic carbon dioxide production, and sulfate reduction at Big Run Bog were 63, 406 and 146 .mu.mol L-1 d-1, respectively, and at Buckle's Bog were 18, 486 and 104 .mu.mol L-1 d-1. Annual anaerobic carbon mineralization to methane and carbon dioxide at Big Run Bog and Buckle's Bog was 52.8 and 57.2 mol m-2, respectively. Rates of methane production were similar to rates reported for other freshwater peatlands, but methane production accounted for only 11.7 and 2.8%, respectively, of the total anaerobic carbon mineralization at these two sites. Carbon dioxide production, resulting substantially from sulfate reduction, dominated anaerobic carbon mineralization. Considerable sulfate reduction despite low instantaneous dissolved sulfate concentrations (typically < 300 .mu.mol L-1 of substrate) was apparently fueled by oxidation and rapid turnover of the reduced inorganic sulfur pool. The coincidence of high sulfate inputs to the Big Run Bog and Buckle's Bog watersheds through acid precipitation with the unexpected importance of sulfate reduction leads us to suggest a new hypothesis: peatlands not receiving high sulfate loading should exhibit low rtes of anaerobic decomposition, and a predominance of methane production over sulfate reduction; however, if such peatlands become subjected to high rates of sulfur deposition, sulfate reduction may be enhanced as an anaerobic mineralization pathway with attendant effects on carbon balance and peat accumulation.

397. **Microhabitat selection by small mammals in a southern Appalachian fen in the USA.**
Rossell, C. R. and Rossell, I. M.
Wetlands Ecology and Management 7(4): 219-224. (1999)
NAL Call #: QH541.5.M3 W472; *ISSN:* 0923-4861
Descriptors: wetlands/ habitat selection/ vegetation cover/ plant populations/ ecological distribution/ microhabitats/ fens/ vegetation/ mammals/ canopy/ Mammalia/ Ochrotomys nuttalli/ Zapus hudsonius/ Peromyscus leucopus/ Blarina brevicauda/ mammals/ fens/ meadow jumping mouse/ white-footed mouse/ northern short-tailed shrew/ golden mouse/ USA, Appalachian Mts.
Abstract: Little ecological information is available on small mammals inhabiting wetlands in the southern Appalachian mountains of the USA. These wetland systems are becoming rare features in southern landscapes due to human activities. We investigated the small mammal fauna and examined the microhabitat associations of the two most abundant species in a southern Appalachian fen. Four species of small mammals were captured: the meadow jumping mouse (Zapus hudsonius), short-tailed shrew (Blarina brevicauda), white-footed mouse (Peromyscus leucopus), and golden mouse (Ochrotomys nuttalli). Peromyscus and Ochrotomys, which were caught in the largest numbers, preferred sites characterized by moderate

herbaceous cover and substantial canopy closure. Peromyscus, however, selected areas with greater canopy closure and higher tree densities, suggesting that they are greater habitat specialists than Ochrotomys in this wetland community.

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

399. **Modification of acid mine drainage by Sphagnum-dominated wetlands and the effect on stream water quality.**
Lang, G. E. and Wieder, R. K.
In: Proceedings of the Conference: Wetlands of the Chesapeake. (Held 9 Apr 1985-11 Apr 1985 at Easton, Md.) Groman, Hazel A. (eds.)
Washington D.C.: Environmental Law Institute; pp. 176-184; 1985.
NAL Call #: QH76.5.C48P76; *ISBN:* 0911937196
Descriptors: wetlands/ mine spoil/ water quality/ water pollution/ iron/ streams/ mosses and liverworts/ West Virginia
This citation is from AGRICOLA.

400. **Nitrate removal in a riparian wetland of the Appalachian Valley and Ridge physiographic province.**
Flite, O. P.; Shannon, R. D.; Schnabel, R. R.; and Parizek, R. R.
Journal of Environmental Quality 30(1): 254-261. (2001)
NAL Call #: QH540.J6; *ISSN:* 0047-2425
Descriptors: wetlands/ path of pollutants/ fate of pollutants/ groundwater pollution/ nitrates/ riparian waters/ denitrification/ soil horizons/ soil saturation/ organic carbon/ pollution (groundwater)/ nitrate/ riparian environments/ groundwater/ enzymes/ nutrient loading/ soil/ USA, Appalachian Mts./ USA, Appalachian Mts.
Abstract: Riparian zones within the Appalachian Valley and Ridge physiographic province are often characterized by localized variability in soil moisture and organic carbon content, as well as variability in the distribution of soils formed from alluvial and colluvial processes. These sources of variability may significantly influence denitrification rates. This investigation studied the attenuation of nitrate (NO sub(3) super(-)-N) as wastewater effluent flowed through the shallow ground water of a forested headwater riparian zone within the Appalachian Valley and Ridge physiographic province. Ground water flow and NO sub(3) super(-)-N measurements indicated that NO sub(3) super(-)-N discharged to the riparian zone preferentially flowed through the A and B horizons of depressional wetlands located in relic meander scars, with NO sub(3) super(-)-N decreasing from >12 to <0.5 mg L super(-1). Denitrification enzyme activity (DEA) attributable to riparian zone location, soil horizon, and NO sub(3) super(-)-N amendments was also determined. Mean DEA in saturated soils attained values as high as 210 mu g N kg super(-1) h super(-1), and was significantly higher than in unsaturated soils, regardless of horizon ($p < 0.001$). Denitrification enzyme activity in the shallow A horizon of wetland soils was significantly higher ($p < 0.001$) than in deeper soils. Significant stimulation of DEA ($p = 0.027$) by NO sub(3) super(-)-N amendments occurred only in the meander scar soils receiving low NO sub(3) super(-)-N (<3.6 mg L super(-1)) concentrations. Significant denitrification of high NO sub(3) super(-)-N ground water can occur in riparian wetland soils, but DEA is dependent upon localized differences in the degree of soil saturation and organic carbon content.

401. **Non-alluvial wetlands of the Southern Blue Ridge: Diversity in a threatened ecosystem.**
Weakley, A. S. and Schafale, M. P.
Water, Air, and Soil Pollution 77(3-4): 359-383. (1994)
NAL Call #: TD172.W36; *ISSN:* 0049-6979
Abstract: The generally steep landscape of the Southern Blue Ridge is not conducive to the formation of extensive wetlands, but wetlands do occur. Wetlands in this region are mostly small in size (<10 ha), and are found in locations where topography is unusually gentle or where seepage is unusually strong or constant. Despite their rarity and small size, such wetlands show great species and community diversity, and are one of the most important habitats for rare (endemic and disjunct) plants and animals in the region. Community species composition seems to vary primarily in relation to elevation, topographic position, hydrology, underlying bedrock composition, recent land use, and biogeographic history. Based on differences in vegetation structure and composition, landscape position,

and hydrology, we recognize nine groups of non-alluvial wetlands in the Southern Blue Ridge. An inventory of non-alluvial wetlands in the mountains of North Carolina revealed that the majority of these naturally rare communities are now destroyed or severely altered. Bogs and fens of the North Carolina mountains have been reduced nearly six-fold from an original extent of about 2000 ha, so that only about 300 ha remain in reasonably intact condition, and most of the remnants are compromised by hydrologic alteration and nutrient inputs. Because wetlands tend to be concentrated in valley bottoms and at low elevations where most land is privately owned. Efforts to assure their long-term viability will require innovative protection and restoration tools. Based on differences in vegetation structure and composition, landscape position, and hydrology, nine groups of non-alluvial wetlands in the Southern Blue Ridge are recognized. An inventory of non-alluvial wetlands in the mountains of South Carolina revealed that the majority of these naturally rare communities are now destroyed or severely changed. Bogs and fens of the North Carolina mountains have been reduced nearly six-fold from the original gamut of about 2000 ha, so that only about 300 ha remain in reasonably intact condition, and most of the remnants are compromised by hydrologic alteration and nutrient inputs. Because wetlands tend to be concentrated in valley bottom and low elevations where most land is privately owned, efforts to assure their long-term viability will require innovative protection and restoration tools.

402. **The occurrence and impact of sedimentation in central Pennsylvania wetlands.**
Wardrop, Denise H. and Brooks, Robert P.
Environmental Monitoring and Assessment 51(1-2): 119-130. (1998)
NAL Call #: TD194; *ISSN:* 0167-6369
Descriptors: wetlands/ environmental impact/ headwater floodplain/ hydrogeomorphology/ impoundment/ land use management/ landscape disturbance/ mineral accretion rates/ organic accretion rates/ riparian depression/ sedimentation rate/ slope/ wetland plant communities
Abstract: Sedimentation rates and deposited sediment characteristics in twenty-five wetlands in central Pennsylvania were measured during the period Fall 1994 to Fall 1995. Wetlands were located primarily in five watersheds, and represented a variety of hydrogeomorphic (HGM) subclasses surrounding land use. Sedimentation rates were measured via the placement of 135 Plexiglas disks. Annual organic and inorganic loadings were determined. Sedimentation rates ranged from 0 to 8 cm/year, with sedimentation rates significantly correlated with surrounding land use and HGM subclass. Overall mean mineral and organic accretion rates were 778 g m2 yr-1 (+/- 1417) and 550 g m2 yr-1 (+/- 589), respectively. Mean mineral and organic accretion rates were significantly different by HGM subclass. The highest mineral accretion rates were for headwater floodplains, followed by impoundments, riparian depressions, mainstem floodplains, and slopes. The highest organic accretion rates were for riparian depressions, followed by impoundments, slopes, headwater floodplains, and mainstem floodplains. The potential effects of landscape disturbance on these sedimentation rates was also investigated, in order to develop a conceptual model to predict sedimentation rates for a given wetland in a variety of landscape settings. Different HGM subclasses exhibited significantly different mineral and organic accumulation rates, and varied in their responses to landscape disturbance and spatial variability in sedimentation patterns. Characterization of wetland plant communities in these same wetlands showed clear associations between individual plant species and ability to tolerate sediment. Species were categorized as very tolerant, moderately tolerant, slightly tolerant, and intolerant based on their association with environments of varying sedimentation magnitude. In general, species that were categorized as very tolerant or moderately tolerant increased their percent cover (dominance) over the sedimentation gradient. These observations were supported by greenhouse germination trials of eight species of wetland plants under a variety of sediment depths, ranging from 0 to 2 cm.

403. **Patterns of wetland hydrology in the Ridge and Valley province, Pennsylvania, USA.**
Cole, C. A. and Brooks, R. P.
Wetlands 20(3): 438-447. (2000)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ USA/ hydrology/ sampling/ hydrodynamics/ geomorphology/ surface water/ riparian land/ flood plains/ classification systems/ USA, Pennsylvania
Abstract: Developing an understanding of wetland hydrology that is free from site-specific constraints is difficult. Many hydrologic studies are focused upon a single site and the development of water-budget components. Our previous research examined the hydrology of several wetlands based upon monthly sampling during the growing season. Those data did not provide adequate information on moisture regimes and did not tell us enough about year-round hydrodynamics. Our new objective was to expand hydrologic analyses to a larger proportion of our reference wetlands and extend them over a longer period of time. We continued to organize our wetlands and our analyses around hydrogeomorphic (HGM) principles. We found ground-water-dominated wetlands (riparian depressions and slopes) to be the wettest sites. Surface-water systems (headwater and mainstem floodplain wetlands) were drier. We found little difference between slopes and the floodplain wetlands in the amount of time water was within the root zone. Riparian depressions were wetter longer, as the average duration of water within the root zone was almost a year for riparian depressions and much less for all other wetland types. Disturbance seemed to play a large role in hydrologic behavior, even more than did HGM classification. We believe that knowledge of HGM subclass might serve as a useful surrogate for actual knowledge of site-specific hydrology. The level of uncertainty increases with surface-water systems, but we have shown a large degree of predictability by HGM subclass. Our data likely have applicability within the entire Ridge and Valley province of the Appalachian Mountains in the United States, although our conclusions have not been tested over that wide latitudinal range.

404. **Plant community composition and surface water chemistry of fen peatlands in West Virginia's Appalachian Plateau.**
Walbridge, M. R.
Water, Air, and Soil Pollution 77(3-4)(1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979.
Notes: Conference: Southern Appalachian Man and the Biosphere (SAMAB) Conference on Wetland Ecology, Management, and Conservation, Knoxville, TN (USA), 28-30 Sep 1993
Descriptors: wetlands/ peatlands/ plant communities/ water chemistry/ surface water/ chemical analysis/ plants/ fens/ geomorphology/ river basins/ peat/ community composition/ geochemistry/ peat bogs/ vegetation cover/ USA, West Virginia, Appalachian Mts., Allegheny Plateau/ geochemistry/ peat bogs/ vegetation cover/ plant communities/ water chemistry/ fens/ geomorphology/ peatlands/ community composition/ plants
Abstract: I analyzed plant community composition, surface water chemistry, soil saturation, landscape position, and disturbance history in 4 small peatlands in West Virginia's Allegheny Plateau, to determine vegetational differences among communities and identify environmental variables associated with community patterning. Thirty-four plant communities were identified, representing 5 physiognomic types: forest, tall and low shrub, herbaceous, and bryophyte. Of 138 species, only 34 were common to all sites; 56 were unique to single sites. Principal components analysis identified a major physiognomic separation between forest and tall shrub communities with less acid surface waters (pH 4.6-5.0) dominated by base cations (Ca super(++), Mg super(++), Na super(+), K super(+)), vs. low shrub and bryophyte communities with more acidic surface waters (pH 4.0-4.4). Much of the variation in community composition resulted from changes in the distributions of Hypericum densiflorum, Rubus hispidus, Polytrichum commune, and Sphagnum fallax, with changes in soil saturation. Community distribution reflected an underlying pattern of basin geomorphology modified by beaver disturbance.

405. **Plant litter decomposition in wetlands receiving acid mine drainage.**
Kittle, D. L.; McGraw, J. B.; and Garbutt, K.
Journal of Environmental Quality 24(2): 301-306. (1995)
NAL Call #: QH540.J6; *ISSN:* 0047-2425
Descriptors: wetlands/ Acorus calamus/ Juncus effusus/ Scirpus/ Typha latifolia/ stems/ leAves/ degradation/ acid mine drainage/ heavy metals/ pH/ plant litter/ West Virginia
Abstract: The impact of acid mine drainage on the decomposition of wetland plant species of northern West Virginia was studied to determine if the potential exists for nutrient cycling to be altered in systems used to treat this drainage. There were two objectives of this study. First, decomposition of aboveground plant material was measured to determine species decomposition patterns as a function of pH. Second, decomposition of litter from various pH environments was compared to assess whether litter origin affects decomposition rates. Species differences were detected throughout the study. Decomposition rates of woolgrass [Scirpus cyperinus (L.) Kunth] and common rush (Juncus effusus L.) were significantly lower than those of calamus (Acorus calamus L.) and rice cutgrass (Leersia oryzoides L.). Differences among species explained a large proportion of the variation in percentage of biomass remaining. Thus, differences in litter quality among species was important in determining the rate of decomposition. In general, significantly more decomposition occurred for all species in high pH environments, indicating impeded decomposition at low pH. While decomposition of some species litter differed depending on its origin, other species showed no effect. Cattail (Typha latifolia L.), in particular, was found to have lower decomposition rates occurring with material grown at low pH. Lower decomposition rates could result in lower nutrient availability leading to further reduction of productivity under low pH conditions.
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406. **Rare and endangered plants and animals of Southern Appalachian wetlands.**
Murdock, N. A.
Water, Air, and Soil Pollution 77(3-4): 385-405. (1994)
NAL Call #: TD172.W36; *ISSN:* 0049-6979
Abstract: At least one-third of the threatened and endangered species of the United States live in wetlands. Southern Appalachian bogs and fens, in particular, support a wealth of rare and unique life forms, many of which are found in no other habitat type. In North Carolina alone, nonalluvial mountain wetlands provide habitat for nearly 90 species of plants and animal that are considered rare, threatened, or endangered by the North Carolina Plant Conservation Program, the North Carolina Natural Heritage Program, the North Carolina Wildlife Resources Commission, or the U.S. Fish and Wildlife Service. These species include the bog turtle, mountain sweet pitcher plant, green pitcher plant, swamp pink, bunched arrowhead, and Gray's lily, all of which are either on the federal list of endangered and threatened species or under consideration for that list. Mountain wetlands habitats for these species are being destroyed and degraded at an accelerating rate for highway construction and expansion and residential and recreational development, as well as for industrial and agricultural use. At least one-third of the threatened and endangered species of the United States live in wetlands. Southern Appalachian bogs and fens, in particular, support a wealth of rare and unique life forms, many of which are found in no other habitat type. In North Carolina alone, nonalluvial mountain wetlands provide habitat for nearly 90 species of plants and animals that are considered rare, threatened, or endangered by the North Carolina Plant Conservation Program, the North Carolina Natural Heritage Program, the North Carolina Wildlife Resources Commission, or the U.S. Fish and Wildlife Service. These species include the bog turtle, mountain sweet pitcher plant, green pitcher plant, swamp pink, bunched arrowhead, and Gray's lily, all of which are either on the federal list of endangered and threatened species or under consideration for that list. Mountain wetland habitats for these species are being destroyed and degraded at an accelerating rate for highway construction and expansion and residential and recreational development, as well as for industrial and agricultural uses.

407. **Response of amphibians to restoration of a southern Appalachian wetland: A long-term analysis of community dynamics.**
Petranka, J. W.; Kennedy, C. A.; and Murray, S. S.
Wetlands 23(4): 1030-1042. (Dec. 2003)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ environmental restoration/ community structure/ species diversity/ amphibians/ monitoring/ frogs/ dynamics/ salamanders/ ecosystems/ restoration/ colonization/ community composition/ environmental impact/ breeding seasons/ Ambystoma maculatum/ Rana sylvatica/ Notophthalmus viridescens/ Anura/ USA, North Carolina/ spotted salamander/ wood frog/ reclamation/ effects of pollution/ conservation, wildlife management and recreation/ water pollution: monitoring, control and remediation
Abstract: Although amphibians are increasingly being used to assess ecosystem function of compensatory wetlands, there are almost no long-term studies of responses to ecological restoration. Consequently, much uncertainty exists about the appropriate timeframes and best criteria for evaluating responses to wetland restoration. We studied aspects of pond colonization and long-term community dynamics in ponds created at a mitigation site in western North Carolina. We examined whether landscape variables influenced the initial colonization of 22 constructed ponds and conducted a long-term study of changes in species richness and community composition in ten constructed and ten reference ponds over seven breeding seasons. During the first year of pond filling, species richness and the number of egg masses of the wood frog (Rana sylvatica) and spotted salamander (Ambystoma maculatum) were positively correlated with pond size, depth, and hydroperiod but independent of distance to the nearest forest, paved road, or source pond. The ten constructed ponds in the long-term study first filled in 1996 and were larger, deeper, warmer, more oxygen-rich, and of longer seasonal hydroperiod than reference ponds. Seven species bred in the constructed ponds during the first year of filling, and species richness reached equilibrium within two years of initial pond filling. Most species colonized constructed ponds rapidly, but frequency of use by eastern newts (Notophthalmus viridescens) increased slowly over five years. Constructed ponds supported significantly more species than reference ponds, and the annual turnover rate of breeding populations was approximately 25% for both pond types. Our data suggest that post-restoration monitoring for 2-3 years may be sufficient to characterize species and communities that will utilize ponds for the first decade or so after pond creation.

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

409. **The roles of spent mushroom substrate for the mitigation of coal mine drainage.**
Stark, Lloyd R. and Williams, Frederick M.
Compost Science and Utilization 2(4): 84-94. (1994)
NAL Call #: TD796.5.C58; *ISSN:* 1065-657X
Descriptors: iron/ manganese/ carbon/ nitrogen/ sulfate/ Basidiomycetes (Fungi Unspecified)/ fungi/ microorganisms/ nonvascular plants/ plants/ acidity/ iron/ limestone dissolution/ manganese/ nitrogen/ organic carbon/ pH/ sulfate reduction/ water quality
Abstract: Spent mushroom substrate (SMS) has been used widely in coal mining regions of the USA as the primary

substrate in constructed wetlands for the treatment of coal mine drainage. Such mine drainage is usually acidic and contains high concentrations of dissolved Fe and, less commonly, Mn. In laboratory and mesocosm studies, SMS has emerged as one of the substrates for mine water treatment, owing to its high organic carbon and limestone content. Processes that are responsible in waterlogged SMS for the successful treatment of acidity and Fe include limestone dissolution, sulfate reduction, and Fe oxidation. Provided the pH of the mine water does not fall below 3.0, SMS can be used in the mitigation plan. However, neither Mn nor dissolved ferric Fe appears to be treatable using reducing SMS wetlands. Care must be taken to create reducing conditions in the SMS wetlands, since if the SMS volume is too low, oxidizing conditions will obtain throughout the profile of the SMS, and eventually the SMS will fail to treat the water. Since after a few years much of the nonrefractive organic carbon in SMS will have been decomposed and metabolized, carbon supplementation can significantly extend the life of the SMS treatment wetland and improve water treatment. Several species of plants thrive in SMS under mine water conditions, but none improve water quality over the short term in excess of the treatment provided by SMS. Nitrogen leakage from SMS wetlands is not problematic after several weeks of operation.

410. **The seed banks of a southern Appalachian fen and an adjacent degraded wetland.**
Rossell, I. M. and Wells, C. L.
Wetlands 19(2): 365-371. (1999)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ seeds/ fens/ conservation/ land management/ seedlings/ soil types/ seed banks/ nature conservation/ flood plains/ biological surveys/ vegetation cover/ hydrology/ USA/ USA, Appalachian Mts./ USA, North Carolina/ fens
Abstract: Bogs and fens are rare communities in the southern Appalachians of the USA. Many have been degraded, and little ecological information beyond cursory floral inventories is available to help guide conservation and restoration efforts. The seedling emergence technique was used to examine the soil seed banks of open and closed canopy regions of a southern mountain fen in North Carolina. We also examined the seed bank of an adjoining portion of the floodplain, which had been drained and cleared for a golf fairway and is now slated for restoration. A total of 32 taxa emerged, with graminoids (particularly Juncus spp.) dominating all three seed banks. Seedlings were assigned to one of five plant types: woody, rush, sedge, grass, or forb. Significantly more woody seedlings emerged in soils from the closed canopy fen than in soils from the other two areas. Most rush seedlings emerged in open canopy fen soils, more sedge and forb seedlings emerged in floodplain soils, and more grass seedlings emerged in floodplain soils than in closed canopy fen soils. A discriminant function analysis separated the open canopy fen from the closed canopy fen and floodplain by seedlings of woody plants and rushes. The floodplain was separated from the open and closed regions of the fen by sedge and grass seedlings. These patterns in seed bank composition bore little similarity to the standing vegetation in the three areas. Restoration activities planned for the floodplain are intended to restore its hydrology and microtopography, which will strongly influence recruitment from the seed bank and surrounding seed sources.

411. **Small mammal communities of high elevation central Appalachian wetlands.**
Francl, K. E.; Castleberry, S. B.; and Mark Ford, W.
American Midland Naturalist 151(2): 388-398. (2004)
NAL Call #: 410 M58; *ISSN:* 0003-0031
Descriptors: wetlands/ population levels/ species richness/ disturbance/ land use/ mountains/ community composition/ species diversity/ population density/ biological surveys/ quantitative distribution/ environment management/ environmental factors/ mammals/ density/ meadows/ elevation/ roads/ deciduous forests/ distribution/ Mammalia/ Microtus pennsylvanicus/ Clethrionomys gapperi/ Sorex cinereus/ Synaptomys cooperi/ Blarina brevicauda/ USA, West Virginia/ USA, Maryland/ USA, West Virginia, Appalachian Mts./ USA, Maryland, Appalachian Mts.
Abstract: We surveyed small mammal assemblages at 20 high-elevation wetlands in West Virginia and Maryland and examined relationships among mammal capture rates, richness and evenness and landscape features at multiple spatial scales. In 24,693 trap nights we captured 1451 individuals of 12 species. Small mammal species richness increased with wetland size and was negatively correlated with trail density. Generalists, such as meadow voles (Microtus pennsylvanicus) and shrews (Sorex cinereus, Blarina brevicauda), dominated larger, more open wetlands, whereas southern red-backed voles (Clethrionomys gapperi) were more prevalent at smaller sites surrounded by mixed coniferous-deciduous forest stands. Furthermore, meadow voles were captured more often at sites with higher road density and lower trail density. Southern bog lemmings (Synaptomys cooperi) were captured at less than half the sites, all of which were surrounded by a high proportion of deciduous forest. Although significant relationships were found, landscape features explained <20% of total variation at any spatial scale. Other factors, such as land use history or competition, likely have exerted a greater influence in small mammal abundance and distribution at these sites.

412. **Soil characteristics of four southern Appalachian fens in North Carolina, USA.**
Moorhead, K. K.; Moynihan, R. E.; and Simpson, S. L.
Wetlands 20(3): 560-564. (2000)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ fens/ organic carbon/ soil properties/ hydrogen ion concentration/ flood plains/ groundwater/ seepage/ sediment properties/ sediment chemistry/ classification systems/ hydrology/ geomorphology/ USA, North Carolina/ USA, North Carolina
Abstract: Mountain fens are uncommon and unique wetlands in the southern Appalachian Highlands. We selected four mountain fens in North Carolina to compare soil particle-size distribution, organic carbon, pH, cation exchange capacity (CEC), and exchangeable Mg super(+2), Ca super(+2), and K super(+). Three of the sites are depressional areas on alluvial floodplains at elevations between 700 and 1130 m above sea level, while the fourth site is located on a slope intersecting ground-water

seepage at an elevation of 950 m. Peat accumulation amounted to a shallow surface Sphagnum layer (usually <5 cm) at three sites, and the organic carbon content of the surface soil horizon ranged from 4 to 21%. Three of the soils would be classified as Cumulic Humaquepts, and the other is a Terric Haplohemist. The pH of the surface horizon of the four soils ranged from 4.3 to 4.9. The alluvial fens had higher silt concentrations than the seepage fen, and two of the alluvial fens had a subsurface, fine-textured deposit. The seepage fen showed little textural variation with depth. Exchangeable Ca super(+2) concentrations were higher for the seepage fen. The CEC ranged from 15 to 62 cmol sub(c) kg super(-1) in the surface horizon, and base saturation (Ca super(+2), Mg super(+2) and K super(+)) was <12% for the three alluvial fens and 20% for the seepage fen. Base saturation increased to 40% in the lower horizons of the seepage fen but remained <10% for the alluvial fens. The differences in soil characteristics suggest that geomorphic location should be considered when comparing mountain fens.

413. **Treatment of domestic wastewater by three plant species in constructed wetlands.**
Coleman, J.; Hench, K.; Garbutt, K.; Sexstone, A.; Bissonnette, G.; and Skousen, J
Water, Air, and Soil Pollution 128(3-4): 283-295. (2001)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979
Descriptors: pollution control/ wastewater treatment/ aquatic plants/ biochemical oxygen demand/ water pollution treatment/ nitrogen/ ammonia/ gravel/ phosphates/ suspended particulate matter/ domestic wastes/ plants/ effluents/ phytoremediation/ Juncus effusus/ Scirpus validus/ Typha latifolia/ USA, West Virginia/ artificial wetlands/ experimental design/ plant growth/ species composition/ wastewater analysis/ performance evaluation/ domestic wastewater/ sewages
Abstract: Three common Appalachian plant species (Juncus effusus L., Scirpus validus L., and Typha latifolia L.) were planted into small-scale constructed wetlands receiving primary treated wastewater. The experimental design included two wetland gravel depths (45 and 60 cm) and five planting treatments (each species in monoculture, an equal mixture of the three species, and controls without vegetation), with two replicates per depth x planting combination. Inflow rates (19 L day super(-1)) and frequency (3 times day super(-1)) were designed to simulate full-scale constructed wetlands as currently used for domestic wastewater treatment in West Virginia. Influent wastewater and the effluent from each wetland were sampled monthly for ten physical, chemical and biological parameters, and plant demographic measurements were made. After passing through these trough wetlands, the average of all treatments showed a 70% reduction in total suspended solids (TSS) and biochemical oxygen demand (BOD), 50 to 60% reduction in nitrogen (TKN), ammonia and phosphate, and a reduction of fecal coliforms by three orders of magnitude. Depth of gravel (45 or 60 cm) had little effect on wetland treatment ability, but did influence Typha and Scirpus growth patterns. Gravel alone provided significant wastewater treatment, but vegetation further improved many treatment efficiencies. Typha significantly out-performed Juncus and Scirpus both in growth and in effluent quality improvement. There was also some evidence that the species mixture out-performed species monocultures. Typha was the superior competitor in mixtures, but a decline in Typha growth with distance from the influent pipe suggested that nutrients became limiting or toxicities may have developed.

414. **Vegetation, invertebrate, and wildlife community rankings and habitat analysis of mitigation wetlands in West Virginia.**
Balcombe, C. K.; Anderson, J. T.; Fortney, R. H.; and Kordek, W. S.
Wetlands Ecology and Management 13(5): 517-530. (2005)
NAL Call #: QH541.5.M3 W472; *ISSN:* 0923-4861
Descriptors: created wetland/ man-made wetland/ mitigation wetland/ reference wetland/ restored wetland/ wetland management/ wetland mitigation
Abstract: Numerous efforts have been made in West Virginia to construct and restore compensatory wetlands as mitigation for natural wetlands destroyed through highway development, timbering, mining, and other human activities. Because such little effort has been made to evaluate these wetlands, there is a need to evaluate the success of these systems. The objective of this study was to determine if mitigation wetlands in West Virginia were adequately supporting ecological communities relative to naturally occurring reference wetlands and to attribute specific characteristics in wetland habitat with trends in wildlife abundance across wetlands. Specifically, avian and anuran communities, as well as habitat quality for eight wetland-dependent wildlife species were evaluated. To supplement this evaluation, vegetation and invertebrate communities also were assessed. Wetland ranks were assigned based on several parameters including richness, abundance, diversity, density, and biomass, depending on which taxa was being analyzed. Mitigation wetlands consistently scored better ranks than reference wetlands across all communities analyzed. Canonical correspondence analysis revealed no correlations between environmental variables and community data. However, trends relating wetland habitat characteristics to community structure were observed. These data stress the need to maintain specific habitat characteristics in mitigated wetlands that are compatible with wildlife colonization and proliferation. © Springer 2005.

415. **Wetland nitrogen dynamics in an Adirondack forested watershed.**
McHale, Michael R.; Cirmo, Christopher P.; Mitchell, Myron J.; and McDonnell, Jeffrey J.
Hydrological Processes 18(10): 1853-1870. (2004)
NAL Call #: GB651.H93; *ISSN:* 0885-6087
Descriptors: wetlands/ groundwater/ streams/ nitrogen/ nutrients/ surface water/ nitrogen compounds/ stream discharge/ lysimeters/ cross-sections/ forest watersheds/ nitrates/ watersheds/ stream flow/ coastal inlets/ dissolved organic nitrogen/ surface chemistry/ USA, New York, Adirondack Mts./ chemical processes/ physics and chemistry
Abstract: Wetlands often form the transition zone between upland soils and watershed streams, however, stream-wetland interactions and hydrobiogeochemical processes are poorly understood. We measured changes in stream nitrogen (N) through one riparian wetland and one beaver meadow in the Archer Creek watershed in the Adirondack

Mountains of New York State, USA from 1 March to 31 July 1996. In the riparian wetland we also measured changes in groundwater N. Groundwater N changed significantly from tension lysimeters at the edge of the peatland to piezometer nests within the peatland. Mean N concentrations at the peatland perimeter were 1.5, 0.5 and 18.6 mu mol L super(-1) for NH sub(4) super(+), NO sub(3) super(-) and DON (dissolved organic nitrogen), respectively, whereas peatland groundwater N concentration was 56.9, 1.5 and 31.6 mu mol L super(-1) for NH sub(4) super(+), NO sub(3) super(-) and DON, respectively. The mean concentrations of stream water N species at the inlet to the wetlands were 1.5, 10.1 and 16.9 mu mol L super(-1) for NH sub(4) super(+), NO sub(3) super(-) and DON, respectively and 1.6, 28.1 and 8.4 mu mol L super(-1) at the wetland outlet. Although groundwater total dissolved N (TDN) concentrations changed more than stream water TDN through the wetlands, hydrological cross-sections for the peatland showed that wetland groundwater contributed minimally to stream flow during the study period. Therefore, surface water N chemistry was affected more by in-stream N transformations than by groundwater N transformations because the in-stream changes, although small, affected a much greater volume of water. Stream water N input-output budgets indicated that the riparian peatland retained 0.16 mol N ha super(-1) day super(-1) of total dissolved N and the beaver meadow retained 0.26 mol N ha super(-1) day super(-1) during the study period. Nitrate dominated surface water TDN flux from the wetlands during the spring whereas DON dominated during the summer. This study demonstrates that although groundwater N changed significantly in the riparian peatland, those changes were not reflected in the stream. Consequently, although in-stream changes of N concentrations were less marked than those in groundwater, they had a greater effect on stream water chemistry-because wetland groundwater contributed minimally to stream flow.

416. **Wildlife and vegetation response to wetland restoration in the Montezuma Marsh Complex of central New York.**
Sleggs, Sheila E. and VanDruff, Larry W.
Syracuse, New York: State University of New York, 1997.
Descriptors: wetlands/ restoration/ ecology/ wetland plants

417. **Wildlife use of southern Appalachian wetlands in North Carolina.**
Boynton, A. C.
Water, Air, and Soil Pollution 77(3/4): 349-358. (1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979
Descriptors: wetlands/ habitats/ wildlife/ community ecology/ vegetation/ wild animals/ endangered species
This citation is from AGRICOLA.

Effects of Agricultural Conservation Practices on Wetlands

418. **Best management practices for forested wetlands in the southern Appalachian region.**
Aust, W. M.
Water, Air, and Soil Pollution 77(3-4)(1994)
NAL Call #: TD172 .W36; *ISSN:* 0049-6979.
Notes: Conference: Southern Appalachian Man and the Biosphere (SAMAB) Conference on Wetland Ecology, Management, and Conservation, Knoxville, TN (USA), 28-30 Sep 1993
Descriptors: wetlands/ forest management/ forestry/ nature conservation/ watersheds/ pollution control/ water quality/ resource management/ nonpoint pollution/ water quality control/ nonpoint pollution sources/ river basin management/ USA, Appalachian Mts./ best management practices/ nonpoint pollution/ nonpoint pollution sources/ water quality control/ river basin management/ forest management/ nature conservation/ pollution control/ resource management/ forestry
Abstract: Forestry best management practices (BMPs) have been developed for all of the states included in the Southern Appalachian Region (Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, West Virginia). All of the state forestry BMPs were developed to reduce nonpoint source pollution from forestry operations. However, the states have developed BMPs that differ substantially with regard to methodology, particularly for forested wetlands. The state BMP guidelines vary in several major areas, including wetland types, BMP manual detail, streamside management zones, harvesting operations, site preparation operations, regeneration systems, road construction, and timber removal activities. An understanding of the similarities and differences between the state BMP guidelines will allow the forested wetland manager to comply with or improve upon existing forestry BMPs for wetlands.

419. **Effect of landscape position on N mineralization and nitrification in a forested watershed in the Adirondack Mountains of New York.**
Ohrui, Kiyokazu; Mitchell, Myron J.; and Bischoff, Joseph M.
Canadian Journal of Forest Research 29(4): 497-508. (1999)
NAL Call #: SD13.C35; *ISSN:* 0045-5067
Descriptors: pollution assessment control and management/ forest ecosystem/ forested watershed/ landscape position effect/ wetland ecosystem
Abstract: Within a forest ecosystem in the Adirondack Mountains of New York, net N mineralization and nitrification rates were measured at different landscape positions (zones). Net N mineralization rates (0-15 cm depth) were less (39 kg Ncntdotha-1 per year) within a wetland without alder and with a coniferous overstory than an upland conifer zone (82 kg Ncntdotha-1 per year) and an upland hardwood zone (107 kg Ncntdotha-1 per year). Net N mineralization rates (39 to 82 kg Ncntdotha-1 per year) and the forest floor N concentrations (2.3 to 2.5%) were higher than values reported (1.2-29 kg Ncntdotha-1 and 1.1-2.12%, respectively) for other spruce forests. The

net nitrification rates were higher at the upland hardwood zone (29 kg Ncntdotha-1 per year) than the upland conifer zone (2 kg Ncntdotha-1 per year). The wetland conifer zone without alders had an intermediate rate of net nitrification (13 kg Ncntdotha-1 per year) compared with the upland zones. The presence of white alder (Alnus incana (L.) Moench) in the wetland increased the NO3- content and net nitrification rate of the soil.

420. **Effects of drainage ditches on vegetation patterns in abandoned agricultural peatlands in central New York.**
Fisher, A. S.; Podniesinski, G. S.; and Leopold, D. J.
Wetlands 16(4): 397-409. (1996)
NAL Call #: QH75.A1W47; *ISSN:* 0277-5212
Descriptors: wetlands/ peat/ marshes/ environmental impact/ plant populations/ agriculture/ environmental effects/ vegetation patterns/ vegetation/ vegetation establishment/ drainage ditches/ hydrological regime/ USA, New York/ drainage ditches/ vegetation patterns/ vegetation establishment/ hydrological regime/ vegetation/ plant populations/ environmental impact/ environmental effects
Abstract: Drainage ditches and ground-water gradients in abandoned agricultural sapric peatlands (mucklands) produce distinctive vegetation patterns. Ditches in abandoned mucklands were ineffective in creating ground-water depression in adjacent soil, while ditches in a newly-cleared muckland were effective in doing so. Upon abandonment, drainage ditches are subject to bank erosion and sedimentation. Coupled with years of soil subsidence and an altered hydrologic regime, ditches lose effectiveness in draining and function merely as small-scale topographic depressions, providing linear zones of seasonally high water levels. Species are distributed on abandoned mucklands in association with soil moisture conditions induced by topographic variation at both small (i.e., ditches) and larger (i.e., site-wide) spatial scales. Vegetation that is usually restricted to moist or saturated soils had greater cover closer to or within drainage ditches or in other topographically low areas, while species with low fidelity to saturated soil dominated the remaining drier areas. Some shrub species had slightly greater stem densities either within or immediately adjacent to ditches, resulting in a "parallel" distribution (i.e., illustrating ditch fidelity). Species having higher affinity to lower soil moisture conditions, such as quaking aspen (Populus tremuloides), showed significantly greater stem density in areas farther away from ditches. Ground-water levels are of primary importance in affecting distribution patterns on naturally revegetating, abandoned agricultural mucklands. The accuracy of the wetland indicator status for woody and herbaceous species encountered on these abandoned mucklands is supported quantitatively by direct gradient analysis. The functioning of existing drainage ditch systems should be assessed prior to any mitigation or restoration activities.

421. **Factors influencing amphibian and small mammal assemblages in central Appalachian forests.**
Mitchell, J. C.; Rinehart, S. C.; Pagels, J. F.; Buhlmann, K. A.; and Pague, C. A.
Forest Ecology and Management 96(1/2): 65-76. (1997)
NAL Call #: SD1.F73; *ISSN:* 0378-1127
Descriptors: wetlands/ biodiversity/ species diversity/ community ecology/ forest management/ forest ecology/ small mammals/ deciduous forests/ forest plantations/ clear felling/ plant succession/ seral stages/ climax communities/ habitats/ stand characteristics/ synecology/ age of trees/ stand density/ mixed forests/ wild animals/ Amphibia/ frogs/ insectivores/ rodents/ Pinus strobus/ Quercus alba/ Quercus rubra/ Betula lenta/ Carya glabra/ Acer rubrum/ Soricidae/ Quercus montana
Abstract: Terrestrial amphibian and small mammal assemblages were studied using drift fences and pitfall traps in five forested stands during 1987-88 on Shenandoah Mountain in the George Washington National Forest, Virginia, USA. The stands were (1) recently clear felled (2 yr old, dominant species Pinus strobus, Quercus alba), (2) white pine (P. strobus) managed forest, (3) mixed hardwood forest (dominant species Q. rubra, Betula lenta), (4) oak/hickory forest (dominant species Q. prinus, Q. alba, Carya glabra) and (5) climax hardwood forest (dominant species Q. rubra, Acer rubrum, Q. alba). Eleven species of salamanders, 5 species of frogs, 5 species of shrews, and 7 species of rodents were monitored. Amphibians were significantly more abundant in forest stands consisting of mature hardwoods than in the recently clear felled area and the white pine forest. Although there was considerable variation in abundance among species in the 5 stands, small mammal abundance was high in all the habitats studied. Amphibian species diversity (Shannon Index) was less than half that for small mammals because red-backed salamanders (Plethodon cinereus) were dominant in most assemblages. Amphibian and small mammal diversity and total species richness were not related to estimated stand age, total number of canopy trees, tree diversity, or frequency of underground rocks. Maintenance of amphibian biodiversity requires the combination of mature hardwoods and wetland habitats (e.g. wildlife ponds and seepages). Most of the small mammals encountered were habitat generalists. Management focus on mature hardwood forests would maintain populations of small mammals requiring cool, moist situations in upper-altitude habitats in the central Appalachian Mountains.

422. **Forest management and wildlife in forested wetlands of the southern Appalachians.**
Wigley, T. Bently and Roberts, Thomas H.
Water, Air, and Soil Pollution 77(3-4): 445-456. (1994)
NAL Call #: TD172.W36; *ISSN:* 0049-6979
Descriptors: animal (Animalia unspecified)/ plant (Plantae unspecified)/ Animalia (Animalia unspecified)/ Plantae (Plantae unspecified)/ animals/ plants/ biodiversity/ ecology/ environmental protection/ forestry/ habitat/ resource management
Abstract: The southern Appalachian region contains a variety of forested wetland types. Among the more prevalent types are riparian and bottomland hardwood forests. In this paper we discuss the temporal and spatial changes in wildlife diversity and abundance often associated with forest management practices within

bottomland and riparian forests. Common silvicultural practices within the southern Appalachians are diameter-limit cutting, clearcutting, single-tree selection, and group selection. These practices alter forest composition, structure, and spatial heterogeneity, thereby changing the composition, abundance, and diversity of wildlife communities. They also can impact special habitat features such as snags, den trees, and dead and down woody material. The value of wetland forests as habitat also is affected by characteristics of adjacent habitats. More research is needed to fully understand the impacts of forest management in wetlands of the southern Appalachians.

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

Wetlands as Agricultural Conservation Practices

424. **Evaluating the efficiency of toxicity abatement in a constructed wetland with Ceriodaphnia dubia.**
Belin, J. I.; McCaskey, T. A.; and Black, M. C.
Journal of Toxicology and Environmental Health, Part A 60(2): 137-151. (2000)
NAL Call #: RA565.A1J6; *ISSN:* 0098-4108
Descriptors: wetlands/ wastewater treatment/ nutrients/ biochemical oxygen demand/ animal wastes/ toxicity testing/ nitrate/ toxicity/ agriculture/ municipal wastewater/ monitoring/ nitrogen/ phosphorus/ oxygen demand/ nitrates/ agricultural wastes/ effluents/ Ceriodaphnia dubia/ toxicity abatement/ pigs/ Ceriodaphnia dubia/ swine/ wastewater treatment processes/ sewage & wastewater treatment/ toxicology and health
Abstract: Constructed wetlands are becoming increasingly popular as low-cost, high-efficiency means of treating agricultural and municipal wastewaters. Monitoring programs for constructed wetlands usually measure physical and chemical characteristics of wetland treatment, including hydraulic residence time and removal of nutrients (N, P), suspended solids, and biochemical oxygen demand (BOD). However, toxicity abatement is seldom measured as evidence of wetland treatment efficiency. In this study, toxicity tests combined with chemical measurements were employed to measure the efficiency of a constructed wetland in treating swine wastes during fall and winter sampling periods. Although the wetland system operated at three wastewater loading rates, only the high-loading-rate cells were tested because of their year-round flows. Wastewater samples were collected prior to, during, and following wetland treatment to track treatment progress as effluents passed through the wetland cells. Toxicity tests with Ceriodaphnia dubia showed significant toxicity abatement of wastewater as it progressed through the constructed wetland system; however, residual toxicity was still observed in the final wetland effluent. No seasonal differences were observed in toxicity abatement between fall and winter wastewater samples, although nitrate and BOD were removed more efficiently during the fall. Results suggest that, while the constructed wetland system is effective in reducing toxicity in swine wastewater, further pre- or posttreatment or additional dilution is necessary before treated effluents are discharged into surface water.

425. **An evaluation of a constructed wetland to treat wastewater from a dairy farm in Maryland, USA.**
Schaafsma, J. A.; Baldwin, A. H.; and Streb, C. A.
Ecological Engineering 14(1-2): 199-206. (2000)
NAL Call #: TD1.E26; *ISSN:* 0925-8574
Descriptors: wastewater treatment/ agricultural pollution/ USA, Maryland, Frederick Cty./ dairy wastes/ agricultural runoff/ artificial wetlands/ phosphorus/ best management practices/ animal wastes/ technology/ dairies/ water sampling/ physicochemical properties/ nutrients/ biochemical oxygen demand/ dairy industry waste waters/ runoff (agricultural)/ animal manures/ USA, Maryland, Frederick Cty./ dairy pollution
Abstract: In the Chesapeake Bay drainage basin, wastewater from animal operations laden with nutrients, sediment, and biochemical oxygen demand (BOD) contributes to the degradation of surface water quality. A constructed wetland system was built to treat wastewater from a dairy farm in Frederick County, Maryland to evaluate the use of wetland technology as a best management practice for dairy waste. To assess treatment effects, we sampled water once a month at several sites through the system, which consists of two settling basins, two cells, and a vegetated filter strip. Samples were analyzed for total nitrogen, ammonia, nitrate/nitrite, total phosphorus, ortho-phosphate, total suspended solids, biochemical oxygen

demand, dissolved oxygen, temperature, conductivity, and pH. Flow through the wetland system resulted in significant reductions in concentrations of all analytes except nitrate/nitrite. Relative to initial concentrations, total nitrogen was reduced 98%, ammonia 56%, total phosphorus 96%, ortho-phosphate 84%, suspended solids 96%, and biochemical oxygen demand 97%. Nitrate/nitrite increase by 82%, although mean concentrations were much lower than concentrations of ammonia or total nitrogen. The increase in nitrate/nitrite is probably due to the oxidation of ammonia via nitrification in the vegetated filter strip. Our results suggest that while reductions are large, further removal is necessary to meet design requirements. This may be possible through the addition of another anaerobic wetland cell downstream of the system or recirculation of wastewater through the wetland cells to promote denitrification and uptake of nutrients by plants.
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426. **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. (Dec. 2002)
NAL Call #: TD172.C54; *ISSN:* 0045-6535
Descriptors: wetlands/ 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/ nitrates/ BOS/ USA, Appalachian Mts./ cattle effects/ nitrous oxide/ nitric oxide/ true cattle/ chemical processes/ air pollution/ water resources and supplies/ mechanical and natural changes/ atmospheric chemistry
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.
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427. **Periodic draining reduces mosquito emergence from free-water surface constructed wetlands.**
Mayhew, C. R.; Raman, D. R.; Gerhardt, R. R.; Burns, R. T.; and Younger, M. S.
Transactions of the ASAE 47(2): 567-573. (Mar. 2004-Apr. 2004)
NAL Call #: 290.9 Am32T; *ISSN:* 0001-2351
Descriptors: constructed wetlands/ waste treatment/ wastewater/ dairies/ cattle manure/ chemical oxygen demand/ nitrogen/ phosphorus/ biological treatment/ mosquito control/ drainage/ temporal variation/ Culicidae/ population density/ larvae/ pupae/ eclosion/ Tennessee
Abstract: Both subsurface flow and free-water surface constructed wetland systems have been used for partial treatment of manure-laden wastewater from animal production systems. Subsurface flow systems are considerably more expensive but do not breed mosquitoes. The less expensive free-water surface systems have significant mosquito production potential, which is a serious drawback, especially because of increasing concerns about emerging mosquito-borne disease organisms. Periodically draining constructed wetlands has been suggested as a method of mosquito control. To test this approach, eight free-water surface constructed wetland mesocosms (0.7 m2 each) were operated on a one-week drain/fill cycle. Simultaneously, four subsurface flow mesocosms were operated continuously, to compare nitrogen, phosphorus, and organic matter removal between the two systems. Mosquito populations (larvae, pupae, and emerged adults) were monitored in the free-water surface cells, with results demonstrating that periodic draining prevents mosquito emergence in all but high-rainfall conditions. During high-rainfall periods, supplemental drainage or chemical controls might be required to prevent mosquito emergence. Pollutant removal rates, expressed as mass removal rate per unit area, were similar for the free-water surface cells and the subsurface flow cells.
This citation is from AGRICOLA.

428. **Pesticide removal from container nursery runoff in constructed wetland cells.**
Stearman, G. K.; George, D. B.; Carlson, K.; and Lansford, S.
Journal of Environmental Quality 32(4): 1548-1556. (2003)
NAL Call #: QH540.J6; *ISSN:* 0047-2425
Descriptors: wetlands/ pesticide effects/ simazine/ water contamination
Abstract: The increased use of pesticides by container nurseries demands that practices for removal of these

potential contaminants from runoff water be examined. Constructed wetlands may be designed to clean runoff water from agricultural production sites, including container nurseries. This study evaluated 14 constructed wetlands cells (1.2 by 4.9 m or 2.4 by 4.9 m, and 30 or 45 cm deep) that collected pesticide runoff from a 465-m2 gravel bed containerized nursery in Baxter, TN. One-half of the cells were vegetated with bulrush, Scirpus validus. The cells were loaded at three rates or flows of 0.240, 0.120, and 0.060 m3 d-1. Herbicides - simazine (Princep) [2-chloro-4,6-bis(ethylamino)-s-triazine] and metolachlor (Pennant) [2-chloro-N-(2-ethyl-6methylphenyl)-N-2-methoxy-l-methylethyl-acetamide] - were applied to the gravel portion of the container nursery at rates of 4.78 and 2.39 kg ha-1, respectively, 9 July 1998, and at rates of 2.39 and 1.19 kg ha-1, respectively, 17 May 1999. Pesticides entering the wetland and wetland cell water samples were analyzed daily to determine pesticide removal. At the slower flow rate, which corresponds to lower mass loading and greater hydraulic retention times (HRTs), a greater percentage of pesticides was removed. During the 2-yr period, cells with plants removed 82.4% metolachlor and 77.1% simazine compared with cells without plants, which removed 63.2% metolachlor and 64.3% simazine. At the lowest flow rate and mass loading, wetland cells removed 90.2% metolachlor and 83% simazine. Gravel subsurface flow constructed wetlands removed most of the pesticides in runoff water with the greatest removal occurring at lower flow rates in vegetated cells.