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Constructed Wetlands and Water Quality Improvement (II)

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If you are unable to determine the full name of a journal from its abbreviated name listed in this bibliography, you may find a journal title abbreviations list, such as ISI Journal Title Abbreviations, useful.

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1. **Albuquerque Constructed Wetland Pilot Project: Summary and Status of City of Albuquerque Project, September 1995.**
Glass, S., Thullen, J., Sartoris, J., and Roline, R.
Desired Future Conditions for Southwestern Riparian Ecosystems: Bringing Interests and Concerns Together, September 18-22, 1995, Albuquerque, New Mexico. Published: Fort Collins, Colo.: Rocky Mountain Forest and Range Experiment Station, U.S. Dept. of Agriculture. (1996). pp. 243-252.
NAL Call #: aSD11.A42-no.272

Descriptors: wetlands, waste-water-treatment, projects, new-mexico

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2. **Ammonia Effects on the Biomass Production of Five Constructed Wetland Plant Species.**
Hill, D. T., Payne, V. W. E., Rogers, J. W., and Kown, S. R.
Bioresour-Technol. 62: 3 pp.109-113. (Dec 1997).
NAL Call #: TD930.A32

Descriptors: animal-wastes, waste-treatment, biological-treatment, aquatic-plants

Abstract: The effect of four levels of ammonia concentration on the biomass production of Sagittaria latifolia (arrowhead), Phragmites australis (common reed), Scirpus acutus (bullrush), Typha latifolia (cattail), and Juncus roemerianus (common rush) was studied using field scale constructed wetland ponds of 3.05 x 0.6 m. These species of plants are common in constructed wetlands treating animal waste lagoon effluent. Twenty ponds were constructed to accommodate the five species and four ammonia levels. The experiment had three repetitions in time. Effluent from the second cell of a two cell anaerobic lagoon system treating flushed swine waste was utilized at four dilution levels, providing mean ammonia concentrations of 20.5, 41.1, 61.6 and 82.4 mg NH3-N/L for the study. Biomass production was determined by harvesting the plants at specified time intervals and measuring dry weight production. The ponds were operated as standard constructed wetlands with a water depth of 10-15 cm. After the 3 month field study was completed, statistical analysis of the data was performed. This analysis showed that the only species affected by ammonia concentration was Scirpus acutus. The remaining four species were statistically unaffected. Data from the study also shows a significant difference in the biomass production between species.

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3. **Ammonia Removal in a Lab-Scale Subsurface Flow Constructed Wetland at Low Temperatures.**
Lee, Michelle A.
Lincoln, NE.: University of Nebraska--Lincoln--Thesis (M.S.), 1997. 152 p.

NAL Call #: NBU LD3656-1997-L446

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4. **Application of Constructed Wetlands for Domestic Wastewater Treatment in an Arid Climate.**
Mandi, L., Bouhoum, K., and Ouazzani, N.
Water Quality International '98: Selected Proceedings of the 19th Biennial Conference of the International Association on Water Quality, Held in Vancouver, BC, Canada, 21-26

June 1996. An International Association on Water Quality Conference. Published: Oxford.: Pergamon. (1998). pp. 379-387. NAL Call #: TD420.A1P7-v.38-no.1

Descriptors: wetlands, phragmites-australis, waste-water-treatment, biological-treatment, sewage-effluent, arid-climate, nutrient-uptake, removal, ammonium, nitrogen, phosphate, phosphorus, chemical-oxygen-demand, morocco, artificial-wetlands

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5. **Application of Constructed Wetlands to Treatment Some Toxic Wastewaters Under Tropical Conditions.**
Polprasert, C., Dan, N. P., and Thayalakumaran, N.
Water-Sci-Technol. 34: 11 pp.165-171. (1996).
NAL Call #: TD420.A1P7

Descriptors: typha, wetlands, waste-water-treatment, waste-water, removal, pollutants, phenol, chromium, nickel, chemical-oxygen-demand, dissolved-oxygen, roots, wetland-soils, thailand, artificial-wetlands

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6. **Aquatic Macroinvertebrate Communities of Constructed and Natural Freshwater Marshes in Central Florida.**
Evans, David L
Gainesville, Fla.: University of Florida--Thesis (Ph. D.), 1996.
NAL Call #: FU LD1780-1996.E92

Descriptors: Aquatic-insects-Ecology-Florida, Freshwater-invertebrates-Ecology-Florida, Constructed-wetlands-Ecology-Florida

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7. **Assessing Hydrogeochemical Heterogeneity in Natural and Constructed Wetlands.**
Hunt, R. J., Krabbenhoft, D. P., and Anderson, M. P.
Biogeochemistry. 39: 3 pp.271-293. (Dec 1997).
NAL Call #: QH345.B564

Descriptors: wetland-soils, geochemistry, biogeochemistry, phosphorus, nitrate, nitrite, carbon, ammonium, wisconsin, dissolved-inorganic-carbon

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8. **Assessing the Functional Level of a Constructed Intertidal Marsh in Mississippi.**
LaSalle, Mark W. and United States. Army. Corps of Engineers. U.S. Army Engineer

Waterways Experiment Station. Wetlands Research Program (U.S.).
Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station, 1996. 64 p.
NAL Call #: TD756.5.L37--1996

Descriptors: Marshes-Mississippi-Design-and-construction, Constructed-wetlands-Mississippi

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9. **Bioremediation of Surface and Subsurface Contamination.**
Bajpai, Rakesh K. and Zappi, Mark E.
New York: New York Academy of Sciences, 1997. 341 p.
NAL Call #: 500--N484-v.829

Descriptors: Hazardous-waste-site-remediation-Congresses, Bioremediation-Congresses

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10. **Common Reed Top Aquatic Plant in Waste Management Wetlands.**
Hill, D. T. and Rogers, J.
Highlights-Agr-Res. 43: 4 pp.15. (Winter 1996).
NAL Call #: 100-A11H

Descriptors: animal-wastes, biological-treatment, wetlands, alabama, constructed-wetlands

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11. **Conjunctive Wetland Treatment/Aquifer Storage and Recovery at Regent Gardens Residential Development, Northfield, South Australia.**
Emmett, A. J., Clarke, S., and Howles, S.
Desalination. 106: 1/3 pp.407-410. (Aug 1996).
NAL Call #: TD478.D4

Descriptors: runoff-water, urban-areas, rain, storms, water-reuse, groundwater-recharge, aquifers, groundwater-extraction, wetlands, water-purification, flood-control, water-quality, stormwater

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12. **Constructed Reed Beds Clean Up Storm Overflows on Small Wastewater Treatment Works.**
Green, M. B. and Martin, J. R.
Water-Environ-Res. 68: 6 pp.1054-1060. (Sept/Oct 1996).
NAL Call #: TD419.R47

Descriptors: storms, rain, runoff, runoff-water, sewage, waste-water-treatment, phragmites-australis, wetlands, removal, ammonium-nitrogen, nitrogen, biochemical-oxygen-demand, organic-matter, water-purification, west-midlands-of-england, total-oxidized-nitrogen, total-suspended-solids, artificial-wetlands, constructed-wetlands, stormwater-treatment

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13. **Constructed Wetland and Aerobic Lagoon Use in the Treatment of Dairy Milkhouse Wastewater in Maine.**
Oldfield, Meghan K.
Orono, ME: University of Maine--Thesis (M.S.), 1996. 162 p.
NAL Call #: MeU Univ.-1996-.O45

Descriptors: Wastewater-treatment-Maine, Dairy-waste-Maine, Lagoons-Maine

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14. **Constructed Wetland (CW) for Industrial Waste Water Treatment.**
Vrhovsek, D., Kukanja, V., and Bulc, T.
Water-Res. 30: 10 pp.2287-2292. (Oct 1996).
NAL Call #: TD420.W3

Descriptors: food-industry, waste-water, waste-water-treatment, water-purification, wetlands, carex, phragmites-australis, aquatic-plants, slovenia, carex-gracilis, horizontal-subsurface-flow

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15. **A Constructed Wetland System for Water Quality Improvement of Nursery Irrigation Wastewater.**
Hoag, J. C.
National Proceedings, Forest and Conservation Nursery Associations, 1997. Published: Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station. (1997). pp. p. 132-135.
NAL Call #: aSD11.A46-no.419

Descriptors: wetlands, water-quality, forest-nurseries, irrigation-water, waste-water, runoff, water-pollution, semiarid-zones, sediment, contamination, filtration-

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16. **Constructed Wetland Treatment Systems Applied Research Program at the Electric Power Research Institute.**
Goodrich Mahoney, J. W.

Water-Air-Soil-Pollut. 90: 1/2 pp.205-217. (July 1996).
NAL Call #: TD172.W36

Descriptors: wetlands, waste-water-treatment, waste-water, power-industry, electricity, trace-elements, metal-ions, ion-uptake, biomass, aquatic-plants, lead, arsenic, selenium, biogeochemistry, pennsylvania, california, tennessee, electric-utility-industry, artificial-wetlands

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17. **Constructed Wetlands and Wastewater Management for Confined Animal Feeding Operations.**
Gulf of Mexico Program (U.S.). Nutrient Enrichment Committee.
Gainesville, Fla.: CH2MHILL, 1997. 23 p.
NAL Call #: TD756.5.C662--1997

Descriptors: Constructed-wetlands-North-America, Feedlot-runoff-North-America, Agricultural-pollution-North-America

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18. **Constructed Wetlands for Animal Waste Treatment : A Manual on Performance, Design, and Operation With Case Histories.**
CH2M Hill, Inc. Payne Engineering Firm Gulf of Mexico Program U. S. Nutrient Enrichment Committee. Alabama Soil and Water Conservation Committee. National Council of the Paper Industry for Air and Stream Improvement U. S.
Gainesville, Fla.: CH2M Hill, Inc., 1997.
NAL Call #: TD930.2-.C64-1997

Descriptors: Animal-waste-Management, Constructed-wetlands, Mexico,-Gulf-of-Nutrients

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19. **Constructed Wetlands for Livestock Wastewater Management : Literature Review, Database, and Research Synthesis.**
Gulf of Mexico Program (U.S.). Nutrient Enrichment Committee. CH2MHILL (Firm). Payne Engineering (Firm).
Gainesville, Fla.: CH2M Hill, Inc., 1997.
NAL Call #: TD930.2.C65--1997

Descriptors: Animal-waste-Management, Constructed-wetlands

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20. **Constructed Wetlands for on-Site Septic Treatment : A Guide to Selecting Aquatic Plants for Low-Maintenance Micro-Wetlands.**
East Texas Plant Materials Center.
Nacogdoches, Tex..: U.S. Dept. of Agriculture, Natural Resources Conservation Service, East Texas Plant Materials Center, 1998.
NAL Call #: aTD756.5-.C66-1998

Descriptors: Constructed-wetlands-United-States, Aquatic-plants-United-States, United-States---GLXX70, 70, wetlands---LDXX50, 80, aquatic-plants---ORXX15, 20-ORXX30, 10

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21. **Constructed Wetlands for the Management of Stormwater Runoff.: Constructed Wetlands.**
Cornell University. Educational Television Center. Cornell University. Media Services. Audiovisual Material Produced: Ithaca, N.Y.: Educational Television Center, Cornell University Media Services. (97).
1 videocassette (106 min.).
NAL Call #: Videocassette--no.2685

Descriptors: Constructed-wetlands-New-York-State, Water-quality-management-New-York-State

Abstract: Reviews three constructed wetlands case studies in New York State, followed by three presentations and panel discussion with call/fax questions from the satellite broadcast downlink sites.

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22. **Constructed Wetlands for the Treatment of Landfill Leachates.**
Mulamoottil, George., McBean, Edward A., and Rovers, Frank.
Boca Raton, Fla.: Lewis Publishers, 1999. 281 p.
NAL Call #: TD756.5.C657-1999

Descriptors: Constructed-wetlands-Congresses, Sanitary-landfills-Leaching-Congresses, Constructed-wetlands-Case-studies-Congresses

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23. **Constructed Wetlands for Wastewater Treatment in the Czech Republic the First 5 Years Experience.**
Vymazal, J.
Water-Sci-Technol. 34: 11 pp.159-164. (1996).
NAL Call #: TD420.A1P7

Descriptors: wetlands, phragmites-australis, waste-water-treatment, waste-water, biological-treatment, sewage-effluent, removal, nitrogen, phosphorus, biochemical-oxygen-demand, chemical-oxygen-demand, artificial-wetlands

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24. **Constructed Wetlands in the Czech Republic--Survey of the Research and Practice Use.**
Zakora, Z.
Diffuse Pollution '95: Selected Proceedings of the 2nd IAWQ International Specialized Conference and Symposia on Diffuse Pollution, Held in Brno and Prague, Czech Republic, 13-18 August 1995. Published: New York: Pergamon. (1996). pp. p. 303-308.
NAL Call #: TD420.A1P7-v.33-no.4/5

Descriptors: wetlands, aquatic-plants, waste-water-treatment, pollution-control, water-pollution, czech-republic, nonpoint-source-pollution, artificial-wetlands

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25. **Constructed Wetlands to Treat Wastewater From Dairy and Swine Operations: A Review.**
Cronk, J. K.
Agric-Ecosyst-Environ. 58: 2/3 pp.97-114. (July 1996).
NAL Call #: S601.A34

Descriptors: dairy-effluent, piggery-effluent, biological-treatment, waste-water-treatment, wetlands, design, water-quality, reviews, waste-management-system

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26. **Constructed Wetlands Transform Raw Sewage into Pond Water.**
Krotz, R. M., McCaskey, T. A., Zhou, S. D., Lino, S., Dawkins, R. A., and Ruf, M. E.
Highlights-Agr-Res. 43: 3 pp.7-8. (Fall 1996).
NAL Call #: 100-Al1H

Descriptors: waste-water-treatment, aquatic-plants, biological-treatment, alabama

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27. **Construction and Preliminary Performance of Reedbed Treatment Systems at Castle Espie Wildfowl and Wetlands Trust Centre, Northern Ireland.**
Worrall, P., Peberdy, K., and McGinn, H.
J-Inst-Water-Environ-Manag. 12: 2 pp.86-91. (Apr 1998).
NAL Call #: TD420.W374

Descriptors: wetlands, phragmites, waste-water-treatment, septic-tank-effluent, water-flow, biochemical-oxygen-demand, chemical-oxygen-demand, phosphorus, nitrogen, nitrate, ammonium, northern-ireland, subsurface-flow, surface-flow, constructed-wetlands

Abstract: In 1993, the Wildfowl and Wetlands Trust constructed a demonstration reedbed treatment system at its Castle Espie Visitor Centre in Northern Ireland. The objectives of the project included (a) the treatment of septic-tank effluent, (b) the protection of water quality in Strangford Lough, and (c) the establishment of a research base for constructed wetland systems. Parallel beds of equally sized sub-surface and surface flow were constructed and planted, and a research project was initiated to provide data on performance.

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28. **Degradation of Phenanthrene and Hydraulic Characteristics in a Constructed Wetland.**
Machate, T., Noll, H., Behrens, H., and Kettrup, A.
Water-Res. 31: 3 pp.554-560. (Mar 1997).
NAL Call #: TD420.W3

Descriptors: wetlands, waste-water, waste-water-treatment, aquatic-plants, typha, scirpus-lacustris, phenanthrene, metabolites, nonionic-surfactants, microbial-degradation, bacteria, populations, dispersion, artificial-wetlands, artificial-waste-water, 1-hydroxy-2-naphthoic-acid, residence-time

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29. **Design Considerations and Applications for Wetland Treatment of High-Nitrate Waters.**
Baker, L. A.
Water Quality International '98: Selected Proceedings of the 19th Biennial Conference of the International Association on Water Quality, Held in Vancouver, BC, Canada, 21-26 June 1996. An International Association on Water Quality Conference. Published: Oxford: Pergamon. (1998). pp. p. 389-395.
NAL Call #: TD420.A1P7-v.38-no.1

Descriptors: wetlands, aquatic-plants, waste-water-treatment, biological-treatment, nitrate, removal, denitrification, water-purification, polluted-water, groundwater-pollution, return-flow, sewage-effluent, structural-design, hydraulics, constructed-wetlands

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30. **Design, Installation and Startup of a Constructed Wetland for on-Site**

Wastewater Treatment.
Glunz, Gregory G.
Lincoln, NE: University of Nebraska--Lincoln--Thesis (M.S.), 1998. 72 p.
NAL Call #: NBU LD3656-1998-G586

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31. **Design of a Constructed Wetlands Treatment System With Overland Flow for Nutrient Removal at a Florida Dairy Farm.**
Johnson, Sharon J.
Gainesville, Fla.: University of Florida--Thesis (M.S.), 1998. 88 p.
NAL Call #: FU LD1780-1998.J69

Descriptors: Constructed-wetlands, Dairying-Environmental-aspects-Florida, Dairy-waste-Purification

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32. **Designing Outlet Characteristics for Optimal Wetland Performance.**
Somes, N. L. G. and Wong, T. H. F.
Urban Storm Drainage 1996: Selected Proceedings of the Seventh IAHR/IAWQ International Conference on Urban Storm Drainage, Held in Hannover, Germany, 9-13 September 1996 /. 1st Ed. Published: Tarrytown, N.Y. Pergamon. (1997). pp. p. 235-240.
NAL Call #: TD420.A1P7-v.36-no.8-9

Descriptors: wetlands, hydraulic-structures, hydraulics, waste-water-treatment, runoff, rain, drainage, storms, urban-areas, simulation-models, pollution-control, outlet-structures, constructed-wetlands, stormwater, culvert-outlets, riser-outlets, siphon-outlets

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33. **Dispersal, Survivorship, and Host Selection of Culex Erythrothorax (Diptera: Culicidae) Associated With a Constructed Wetland in Southern California.**
Walton, W. E., Workman, P. D., and Tempelis, C. H.
J-Med-Entomol. 36: 1 pp.30-40. (Jan 1999).
NAL Call #: 421-J828

Descriptors: culex-erythrothorax, dispersal, survival, host-seeking-behavior, mark-release-recapture, distance-travelled, parous-rates, gonotrophic-cycles, wetlands, california-

Abstract: Three mark-recapture studies were carried out at a constructed wetlands facility in San Jacinto, CA, to examine the dispersal and population ecology of the most abundant host-seeking mosquito, Cullex erythrothorax Dyar, collected in carbon dioxide-baited traps. Recapture rates were 0.3, 7.4, and 13.9% for August, September, and October,

respectively. The mean distance traveled per night was approximately 0.5 km, and females were not recaptured farther than 2 km from the release site. Most marked individuals (">= or ="99.5%) were recaptured within 0.5 km of the release point. Marked individuals were recaptured for 33 d after release. Horizontal estimates of survival calculated using recapture data were 0.89, 0.87, and 0.84/d for August, September, and October, respectively. Temporal differences in the recapture rate were attributed to the effects of blood meal acquisition on host-seeking activity versus effects of mortality and strong developmental site fidelity on weekly recapture rates. Partially engorged females collected by CO2-baited traps at the wetland fed predominantly on cattle indicating that host-seeking females were using hosts at dairies surrounding the wetland and were returning to the wetland for resting before seeking an additional blood meal. Estimates of the gonotrophic cycle length and survivorship (vertical estimates) were problematical because of the low parity rates for females collected by CO2-baited traps. Limited dispersal and long survival of Cx. erythrothorax are important factors in the development of large populations at constructed wetlands.

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34. **Ecological Engineering for Wastewater Treatment. 2nd Ed.**
Etnier, Carl. and Guterstam, Bjorn.
Boca Raton, Fla.: CRC Press, 1997. 451 p.
NAL Call #: TD755.E43--1997

Descriptors: Sewage-Purification-Biological-treatment, Constructed-wetlands, Ecological-engineering

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35. **Effect of Marsh Design on the Abundance of Mosquitoes in Experimental Constructed Wetlands in Southern California.**
Walton, W. E. and Workman, P. D.
J-Am-Mosq-Control-Assoc. 14: 1 pp.95-107. (Mar 1998).
NAL Call #: QL536.J686

Descriptors: culicidae, culex, population-ecology, marshes, design, population-density, age-structure, mortality, invertebrates, predators-of-insect-pests, oviposition, oviposition-attractants, schoenoplectus, california, macroinvertebrates, schoenoplectus-californicus

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36. **Efficiency of a Subsurface Constructed Wetland System Using Native Southwestern U.S. Plants.**
Maschinski, J., Southam, G., Hines, J., and Strohmeyer, S.
J-Environ-Qual. 28: 1 pp.225-231. (Jan/Feb 1999).
NAL Call #: QH540.J6

Descriptors: aquatic-plants, wetlands, pollution-control, arizona-

Abstract: A small-scale three-cell (in series) subsurface (SSF) constructed wetland that used 16 previously untested native Arizona plants was found to be effective in the treatment of secondary waste at high elevation (2350 m) in northern Arizona. Fifteen of the 16 plant species survived in at least one of the cells in the system. Plant survival depended on their position in the cells, with increased survival rates downstream from the effluent input to cell 1, on water depth, and on individual species selection. The wetland was effective in removing both chemical pollutants (total Kjeldahl nitrogen [TKN], ammonia, nitrate, total Kjeldahl phosphorus [TP], and phosphate) and bacteriological indicator organisms of human pathogens (total coliforms and fecal coliforms). The fecal coliform counts of the effluent exiting the third cell were below the recreational full-body contact (swimming) standard (200 cfu/100 mL) in 14 out of the 15 mo of operation. The TKN and TP concentrations were reduced by M and 73%, respectively compared to nutrients entering the system. The loss of N suggests that a combined nitrification/denitrification process is active in the wetland. However, after 9 mo of operation, nitrate levels began to increase beyond the target of 1 mg/L indicating that nitrification rates are exceeding denitrification rates and that the wetland cells are aerobic. The constructed wetland system effectively conserves water. Because it is used to irrigate plantings near the constructed wetland, the nutrient concentrations in the effluent aid plant growth.

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37. **Engineering Approaches to Ecosystem Restoration Conference Proceedings : 1998 Wetlands Engineering & River Restoration Conference : March 22-27, 1998, Adams Mark, Denver, Colorado.: Protecting, Restoring and Managing the World's Water Resources.**
Hayes, Donald.
Reston, VA: ASCE, 1998.
NAL Call #: TC401-.W47-1998

Descriptors: Water-resources-development-Congresses, Restoration-ecology-Congresses, Wetland-conservation-Congresses, River-engineering-Congresses

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38. **Enhancing Nitrification in Vertical Flow Constructed Wetland Utilizing a Passive Air Pump.**
Green, M., Friedler, E., and Safrai, I.
Water-Res. 32: 12 pp.3513-3520. (Dec 1998).
NAL Call #: TD420.W3

Descriptors: waste-water-treatment, wetlands, effluents, nitrification, pumps, oxygen, spatial-distribution, oxygen-consumption, theory, simulated-secondary-effluents, vertical-

flow-beds, temporal-distribution

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39. **Estimating the Long-Term Phosphorus Accretion Rate in the Everglades: A Bayesian Approach With Risk Assessment.**
Qian, S. S. and Richardson, C. J.
Water-Resour-Res. 33: 7 pp.1681-1688. (July 1997).
NAL Call #: 292.8-W295

Descriptors: wetlands, pollutants, pollution, phosphorus, retention, risk-assessment, bayesian-theory, decision-making, linear-models, florida, constructed-wetlands, phosphorus-retention, nonpoint-source-pollution

Abstract: Using wetlands as a sink of nutrients, phosphorus in particular, is becoming an increasingly attractive alternative to conventional wastewater treatment technology. In this paper, we briefly review the mechanism of phosphorus retention in wetlands, as well as previous modeling efforts. A Bayesian method is then proposed for estimating the long-term phosphorus accretion rate in wetlands through a piecewise linear model of outflow phosphorus concentration and phosphorus mass loading rate. The Bayesian approach was used for its simplicity in computation and its ability to accurately represent uncertainty. Applied to an Everglades wetland, the Bayesian method not only produced the probability distribution of the long-term phosphorus accretion rate but also generated a relationship of acceptable level of "risk" and optimal phosphorus mass loading rate for the proposed constructed wetlands in south Florida. The latter is a useful representation of uncertainty which is of interest to decision makers.

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40. **Evaluation of a Subsurface Flow Constructed Wetland System for Small-Community Wastewater Treatment in Southeastern Nebraska.**
Vanier, Scott M.
Lincoln, NE: University of Nebraska--Lincoln--Thesis (M.S.), 1997. NAL Call #: NBU LD3656-1997-V365

Descriptors: Constructed-wetlands-Nebraska, Subsurface-drainage-Nebraska

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41. **Evaluation of a Wetland System Designed to Meet Stringent Phosphorus Discharge Requirements.**
Adler, P. R., Summerfelt, S. T., Glenn, D. M., and Takeda, F.
Water-Environ-Res. 68: 5 pp.836-840. (July/Aug 1996).
NAL Call #: TD419.R47

Descriptors: wetlands, phalaris-arundinacea, agrostis-alba, agrostis-gigantea, poa-trivialis, waste-water-treatment, nutrient-uptake, phosphorus, shoots, harvesting, nitrate, nitrogen-content, nutrient-content, biomass, effluents, model-aquaculture-effluent, nutrient-removal, synthetic-rainbow-trout-effluent, constructed-wetlands, artificial-wetlands

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42. **Evaluation of Free-Water-Surface Constructed Wetlands for the Treatment of Poultry Lagoon Effluent.**
Hill, D. T., Rogers, J. W., Payne, V. W. E., and Kown, S. R.
Trans-ASAE. 39: 6 pp.2113-2117. (Nov/Dec 1996).
NAL Call #: 290.9-Am32T

Descriptors: poultry, animal-wastes, lagoons, effluents, biological-treatment, waste-water-treatment, wetlands, sagittaria, scirpus, phragmites-australis, efficacy, groundwater, water-quality, pollution-control, alabama, engineered-wetlands, waste-removal-efficiency

Abstract: A free-water-surface constructed wetlands system was installed at the Auburn University poultry unit in Auburn, Alabama. The wetlands system, consisting of three series of dual cell wetlands, was installed for the purpose of treating effluent from an anaerobic poultry waste lagoon. The first series (two cells) contained Sagittaria lancifolia which occupied approximately 10% of the water column. The second series contained Phragmites australis and Scirpus spp. which occupied approximately 5% of the water column. The third series was not vegetated in order to provide a research control. Samples were collected from the influent and effluent of the system during the period from August 1993 until March 1994 in order to evaluate the ability of constructed wetlands to treat poultry lagoon wastewater and the effects cold winter months have on the treatment process. To investigate and monitor groundwater impact, two lysimeters were installed in each cell of each series at depths of 0.6 m and 1.3 m. Monitored variables included COD, BOD, TKN, NH4, PO4 and K in the influent and effluent. The lysimeter samples were analyzed for the same parameters with the exception of not analyzing COD and BOD and analyzing NO3.

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43. **Experimental Reedbed Systems for the Treatment of Airport Runoff.**
Revitt, D. M., Shuttes, R. B. E., Llewellyn, N. R., and Worrall, P.
Urban Storm Drainage 1996: Selected Proceedings of the Seventh IAHR/IAWQ International Conference on Urban Storm Drainage, Held in Hannover, Germany, 9-13 September 1996 /. 1st Ed. Published: Tarrytown, N.Y.: Pergamon. (1997). pp. p. 385-390.
NAL Call #: TD420.A1P7-v.36-no.8-9

Descriptors: airports, runoff, storms, rain, waste-water-treatment, wetlands, water-flow, phragmites, phosphate, nitrate, water-purification, biochemical-oxygen-demand, heavy-metals, chemical-oxygen-demand, potassium, ammonium, south-east-england, airport-runways, constructed-wetlands, surface-flow, subsurflow-flow

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44. **The Fate and Transport of Viruses Through Surface Water Constructed Wetlands.**
Chendorain, M., Yates, M., and Villegas, F.
J-Environ-Qual. 27: 6 pp.1451-1458. (Nov/Dec 1998).
NAL Call #: QH540.J6

Descriptors: viruses, disease-transmission, wetlands, pathogenic-enteroviruses

Abstract: Coliphage removal efficiency and the effects of wetland hydrology on virus transport were determined for constructed wetlands in San Jacinto, CA. Mathematical models were used to further characterize virus transport. MS2, an F-specific RNA (FRNA) coliphage was used as a model for human enteric viral behavior. Two wetland types were studied, a one-phase cell and three-phase cell. These wetlands received unchlorinated secondary effluent at a constant rate. The mean residence time in the wetlands was 9 +/- 3 d as determined using bromide as a conservative tracer. Assuming 100% porosity, a plug flow model predicts this mean residence time within the experimental standard deviation (8 d). This suggests that a negligible volume was occupied by vegetation and settled solids. The convection-dispersion equation adequately simulated the residence time distribution of the conservative tracer. MS2 removal in the wetlands was experimentally determined to be 97 +/- 3%. There was no distinction between the two wetland types in terms of removal efficiency. The average coliphage decay rate was calculated to be 0.44 per day. However, the error involved with using the first order decay rate was high, 83 +/- 12%. Therefore, first order decay does not adequately describe removal processes within the wetland. Most virus removal occurred within the first 3 m (k = 4.0 +/- 1.8 d(-1)) with a removal efficiency of 85.3 +/- 0.6%. The remainder had a decay rate of 0.20 +/- 0.17 d(-1) with a removal efficiency of 56 +/- 33%.

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45. **The Fate of Groundwater Ammonium in a Lake Edge Wetland.**
Lusby, F. E., Gibbs, M. M., Cooper, A. B., and Thompson, K.
J-Environ-Qual. 27: 2 pp.459-466. (Mar/Apr 1998).
NAL Call #: QH540.J6

Descriptors: ammonium-nitrogen, groundwater-flow, biogeochemistry-

Abstract: The removal of ammonium-notrogen (NH4-N) from groundwater flowing

through a grey willow (Salix cinerea) and native raupo (Typha orientalis) lake edge wetland was investigated over 10 mo. Montly groundwater sampling showed that more than 95% of incomeing NH4-N was removed by the wetland. Laboratory assays found that the potential for NH4-N removal by nitrification and subsequent denitrification was significantly higher in the organic surface sediments than in deeper, sandy, root zone sediments. In a laboratory 15N-tracer experiment, Salix cinerea and Typha orientalis readily assimilated NH4-N from the root zone and were found to enhance the natural diffusion of NH4-N up through the organic sediment layer and into the overlying water. Estimated rates of removal of NH4-N by coupled nitrification-denitrification and plant assimilation were 8 to 9 mg of N m-2 d-1 and 9 to 46 mg of N m-2 d-1, respectively. Assimilated N, returned to the overlying water-sediment surface via litter fall may be subject to sequential mineralization, nitrification, and denitrification, resulting in gaseous N loss. Sixty-five percent of the 15N in Salix leaf litter was transformed in such a way. The results of this study indicate that plants play a central role in the NH4-N processing capacity of wetlands. The relevance of our findings to constructed wetland design is discussed.

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46. **Functional Comparison of Created and Natural Wetlands in the Atchafalaya Delta, Louisiana.**
Faulkner, Stephen P., Poach, Matthew E., and United States. Army. Corps of Engineers. U.S. Army Engineer Waterways Experiment Station. Wetlands Research Program (U.S.). Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station, 1996. 106 p.

NAL Call #: TD756.5.F38--1996

Descriptors: Wetlands-Louisiana, Constructed-wetlands-Louisiana, Atchafalaya-River-Watershed-La

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47. **In Situ Measurements of Denitrification in Constructed Wetlands.**
Xue, Y., Kovacic, D. A., David, M. B., Gentry, L. E., Mulvaney, R. L., and Lindau, C. W.
J-Environ-Qual. 28: 1 pp.263-269. (Jan/Feb 1999).
NAL Call #: QH540.J6

Descriptors: nitrate-nitrogen, denitrification, tile-drainage, wetlands, pollution-control

Abstract: Quantitative estimates of denitrification are needed in designing artificial wetlands to optimize nitrate (NO3-) removal. Acetylene blockage and 15N-tracer methods were employed to quantify denitrification in constructed wetlands receiving agricultural tile drainage, using plastic tubes to enclose in situ mesocosms. Estimates were also made through NO3- disappearance from mesocosm water columns. The 15N

and C2H2 methods yielded comparable rates. At 4 to 25 degrees C, and with 9 to 20 mg NO3(-)-N L-1 initially in the mesocosm water columns, denitrification rates by the C2H2 technique ranged from 2.0 to 11.8 mg N m-2 h-1. In the June-August 15N experiment, when wetland NO3(-) was below detection, a time series of denitrification rates followed a bell-shaped curve after a pulse input of NO3- (approximately 15 mg N L-1, 70 atom% 15N). The maximal denitrification rate (9.3 mg N m-2 h-1) was observed 5.4 d after the pulse. After 33 d, 58% of the 15NO3- had been evolved as N2, only approximately 0.1% as N2O; 6 to 10% was recovered in plant shoots and as organic N in the upper 5 cm of sediment. From 32 to 36% of the 15NO3- spike was not recovered, and presumably seeped into the sediments. The NO3- disappearance rates in the water column ranged from 12 to 63 mg N m-2 h-1 at 11 to 27 degrees C. Because water infiltration carries NO3- through the anaerobic sediment/water interface for denitrification, a subsurface-flow wetland may denitrify more NO3- than a surface-flow wetland.

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48. **In-Stream Wetland Improves Water Quality.**
Becker, H.
Agric-Res. 46: 6 pp.18. (June 1998).
NAL Call #: 1.98-Ag84

Descriptors: wetlands, streams, water-pollution, pollution-control, north-carolina, constructed-wetlands

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49. **Influence of Temperature on Treatment Efficiency of Constructed Wetlands.**
Hill, D. T. and Payton, J. D.
Trans-ASAE. 41: 2 pp.393-396. (Mar/Apr 1998).
NAL Call #: 290.9-Am32T

Descriptors: wetlands, animal-wastes, poultry, lagoons, slurries, biological-treatment, water-quality, chemical-oxygen-demand, biochemical-oxygen-demand, ammonium-nitrogen, nitrate-nitrogen, phosphorus, water-temperature, orthophosphorus, organic-nitrogen

Abstract: An existing free-water-surface constructed wetland system at the Auburn University Poultry Science Unit was used to evaluate the effects of water temperature on the treatment of poultry lagoon effluent. Each wetland consisted of two cells in series. One series was planted with an approximate 10% fill of Sagittaria lancifolia. A second series contained Phragmites australis and Scirpus spp. with an approximate 5% fill of plants. A third series was unvegetated and acted as a control. Wastewater samples were collected approximately every 12 days at the influent and effluent of each cell and analyzed for TKN, ammonia, nitrate, BOD5, COD, total phosphorus, orthophosphorus, and potassium. Water temperature was measured using thermographs placed at the

midpoint of each cell with temperature readings being taken each hour from July 1995 until June 1996. The percent removal of each wastewater pollutant from each series was compared to the average water temperature over the sampling period (every 12 days) to determine what effect, if any, temperature had on treatment. For most cases, temperature was not found to significantly affect treatment of poultry wastewater. Treatment efficiency (percent removal) was significantly correlated to temperature in one series for ammonia, one series for nitrate, one series for total phosphorus and one series for orthophosphorus. Mass removal was not correlated to temperature in any of the cases studied.

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50. **Integrating Constructed Wetlands into an Ecological Stormwater Management Plan for an Urban Watershed in Miami, Florida.**
Kendall, Andrea Lynne
Gainesville, Fla.: University of Florida--Thesis (M.S.), 1997.
NAL Call #: FU LD1780-1997.CK33

Descriptors: Constructed-wetlands-Florida-Miami, Urban-runoff-Management, Stormwater-infiltration

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51. **Investigating Dairy Lagoon Effluent Treatability in a Laboratory-Scale Constructed Wetlands System.**
Benham, B. L. and Mote, C. R.
Trans-ASAE. 42: 2 pp.495-502. (Mar/Apr 1999).
NAL Call #: 290.9-Am32T

Descriptors: dairy-effluent, water-quality, waste-water-treatment, wetlands, design, water-pollution, pollution-control, constructed-wetlands

Abstract: Dairy lagoon supernatant treatability was evaluated using 10 laboratory-scale (1.5 m X 0.45 m) constructed wetlands. Selected design and operational variables were examined. Tested treatments were combinations of three organic loading rates (high, medium, and low) and three types of microbial attachment sites (vegetated, inert, and none). Five combinations (two replications each) of organic loading rate and microbial attachment sites were tested. Removal efficiencies were based on analysis of influent/effluent waste constituent levels. Dominant nitrogen removal mechanisms were determined from an examination of influent/effluent nitrogen specialization. In addition, an analysis of waste degradation kinetics provided insight with respect to the applicability of a widely used design model. Results showed consistently high nitrogen-removal efficiencies (65 to 81%) for all treatments. Nitrogen specialization results indicate that nitrification/denitrification was the dominant nitrogen removal mechanism. Carbon removal was less efficient (6 to 39%), and varied with influent strength. Waste utilization

kinetic rate-constants from the five treatments were not statistically different (alpha = 0.05). The design model uses microbial attachment site parameters, such as specific surface area, to modify a base reaction rate-constant (i.e., a rate-constant for a system with no microbial attachment sites). In this case, the rate-constant for the control (treatments with no microbial attachment sites) was not statistically different from either the vegetated or the inert treatments.

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52. **Investigation and Long-Term Monitoring of Phragmites Australis Within Virginia's Constructed Wetland Sites.**
Havens, K. J., Priest, W. I. III., and Berquist, H.
Environ-Manage. 21: 4 pp.p. 599-605 (July/Aug 1997).
NAL Call #: HC79.E5E5

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53. **An Investigation of Sanitary Indicator Bacteria in a Macrophyte Wastewater-Treatment System.**
Perkins, J. and Hunter, C.
J-Inst-Water-Environ-Manag. 13: 2 pp.141-145. (Apr 1999).
NAL Call #: TD420.W374

Descriptors: yorkshire-and-lancashire, wetlands, typha, waste-water-treatment, sewage, indicator-species, fecal-coliforms, streptococcus, bacterial-count, constructed-wetlands, fecal-streptococci

Abstract: During recent years, many studies have attempted to determine the efficiency of macrophyte systems in removing a wide range of chemical substances and in the amelioration of wastewaters to attain effluent-quality standards. However, despite the importance of micro- biological indicators of water quality for determining the suitability of water for recreational and public-supply purposes, little research has focused on the dynamics of sanitary indicator bacteria in macrophyte systems. This study reports the initial findings of such an investigation for a macrophyte raft-lagoon system which was used in the treatment of sewage at Sowerby Bridge, West Yorkshire, England.

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54. **Iron Oxidation States on Root Surfaces of a Wetland Plant (Phragmites Australis).**
Wang, T. and Peverly, J. H.
Soil-Sci-Soc-Am-j. 63: 1 pp.p. 247-252 (Jan/Feb 1999).
NAL Call #: 56.9-So3

Descriptors: phragmites-australis, roots, oxidation, iron, rhizosphere, redox-reactions,

environmental-factors, edaphic-factors, wetlands, hydroponics, wetland-soils

Abstract: Iron in root plaque is usually thought to be Fe(III) because of rhizosphere oxidation. This study was conducted to examine Fe oxidation states on root surfaces of the common reed [Phragmites australis (Cav.) Trin. ex Steudel]. Using an EDTA-BPDS method, Fe(II) and Fe(III) on the surfaces of roots sampled from various environments were stabilized, extracted and determined simultaneously. The proportion of extracted Fe (II) to total Fe ranged from 0.17 to 0.65 for the roots grown in constructed wetlands, fields, and hydroponic culture; and from 0.34 to 0.70 for different sections of wetlands plant roots. The observed results suggested that De plaque is caused not only by rhizosphere oxidation, but also by Fe(II) compound formation on the root surfaces.

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55. **Long-Term Phosphorus Assimilative Capacity in Freshwater Wetlands: A New Paradigm for Sustaining Ecosystem Structure and Function.**
Richardson, C. J. and Qian, S. S.
Environ-Sci-Technol. 33: 10 pp.1545-1551. (May 15, 1999).
NAL Call #: TD420.A1E5

Descriptors: databases, ecology, phosphorus, assimilation, florida, everglades, north-american-wetlands-for-water-quality-treatment-database, phosphorus-loading

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56. **Managing Dairy Waste Using Commercial Constructed Wetlands and Composting.**
Cooperband, L.
Research Projects -- Northeast Region. Project Number: LNE95-62: Sustainable Agriculture Research and Education (SARE), 1997. 22 p.
NAL Call #: S441.S855

Descriptors: dairy-wastes, waste-treatment, wetlands, composting, dairy-farms, sustainability, maryland, waste-management

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57. **Managing Dairy Waste Using Constructed Wetlands and Composting.**
Baldwin, A. H.
Research Projects -- Northeast Region. Project Number: LNE95-62: Sustainable Agriculture Research and Education (SARE), 1997. 23 p.
NAL Call #: S441.S855

Descriptors: dairy-wastes, dairy-effluent, waste-disposal, wetlands, composting, water-quality, water-pollution, pollution-control, maryland, waste-management

58. **Metal Concentration in Aquatic Macrophytes As Influenced by Soil and Acidification.**
Sparling, D. W. and Lowe, T. P.
Water-Air-Soil-Pollut. 108: 1/2 pp.203-211. (Nov 1998).
NAL Call #: TD172.W36

Descriptors: polygonum, potamogeton-diversifolius, utricularia, aquatic-plants, metals, metal-ions, ion-uptake, acidification, water, acidity, wetlands, wetland-soils, clay-soils, sandy-loam-soils, plant-composition, water-quality, polygonum-sagittatum, sparganium-americanum, utricularia-vulgaris, constructed-experimentally-acidified-wetlands

59. **Methane Emissions From Constructed Wetlands Treating Agricultural Wastewaters.**
Tanner, C. C., Adams, D. D., and Downes, M. T.
J-Environ-Qual. 26: 4 pp.1056-1062. (July/Aug 1997).
NAL Call #: QH540.J6

Descriptors: methane-production, pollution-control, waste-water-treatment

Abstract: Methane emissions were measured during mid-summer in four pilot-scale constructed wetlands that had treated dairy farm wastewaters for a period of 2 yr. Measurements were made at up and downstream sites in wetlands receiving low and high wastewater loadings (approximately 26 and 45 mm d-1), both in the presence of wetland vegetation (Schoenoplectus validus). An automated flux chamber (enclosure area 0.25 m2) and gas circulation system, and associated sampling and chromatographic analysis system, were used to make measurements directly in the field. Median emissions ranged between 48 and 482 mg CH4 m-2 d-1, without discernible diurnal patterns. Upstream sites, closest to wastewater inflows, generally showed significantly higher ($P < 0.05$) emissions than downstream sites in the same wetland. Unvegetated sites tended to show higher emission rates than corresponding vegetated sites, with highest rates recorded at the highest loaded unvegetated site. Redox potentials in the surface 100 mm of the substratum at upstream sites, with and without vegetation, showed consistently more oxidized conditions in the presence of plants. This suggests that plant root-zone oxidation was acting to suppress methanogenesis and/or enhance methane oxidation in the vegetated wetlands. Emissions from the vegetated constructed wetlands were comparable with those reported for natural wetlands and inorganically fertilized rice paddies. Methane emissions were estimated to account for around 2 to 4% of wastewater C loadings to the vegetated wetlands and 7 to 8% of loadings to the unvegetated systems during the period of measurement.

60. **Microbial Selenium Volatilization in Rhizosphere and Bulk Soils From a Constructed Wetland.**
Azaizeh, H. A., Gowthaman, S., and Terry, N.
J-Environ-Qual. 26: 3 pp.666-672. (May/June 1997).
NAL Call #: QH540.J6

Abstract: The potential of rhizosphere and bulk soil microbes to volatilize selenate, selenite, and selenomethionine was studied in liquid cultures under controlled conditions. Microbes cultured from the rhizosphere of bulrush (Scirpus robustus) plants showed higher Se volatilization than those from bulk soil of a flow-through, constructed wetland area contaminated with selenite. The data show that bacteria are the dominant microbes involved in Se volatilization; fungi contribute relatively little to this process. Bactericides significantly decreased both Se volatilization and the number of culturable bacteria in rhizosphere cultures compared to an untreated control. In the absence of added C, Se volatilization was greatest from selenomethionine, then selenite, then selenate. Aeration substantially increased the percentages of Se volatilized from rhizosphere soil cultures to which no C was added. Up to 95, 21, and 3% of the Se was volatilized from selenomethionine, selenite, and selenate, respectively. When both C and aeration treatments were applied to the rhizosphere cultures, the corresponding percentages changed to 20, 57, and 4%, that is, selenomethionine volatilization by rhizosphere microbes decreased when C was added while selenite volatilization substantially increased. Since selenite volatilization was the greatest when rhizosphere microbes were supplied with C and aeration, we suggest that microbes in this selenite-contaminated wetland are adapted to volatilize Se by using C released from roots, and that Se volatilization may be enhanced by oxygen and environmental conditions provided by the plants.

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61. **A Model for Organic Matter Removal in Free Water Surface Constructed Wetlands.**
Polprasert, C., Khatiwada, N. R., and Bhurtel, J.
Water Quality International '98: Selected Proceedings of the 19th Biennial Conference of the International Association on Water Quality, Held in Vancouver, BC, Canada, 21-26 June 1996. An International Association on Water Quality Conference. Published: Oxford: Pergamon. (1998). pp. p. 369-377.
NAL Call #: TD420.A1P7-v.38-no.1

Descriptors: wetlands, waste-water-treatment, biological-treatment, chemical-oxygen-demand, removal, biofilms, bacteria, organic-matter, mathematical-models, artificial-wetlands

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62. **Modeling Phosphorus Trapping in Wetlands Using Nonparametric Bayesian**

Regression.
Qian, S. S. and Reckhow, K. H.
Water-Resour-Res. 34: 7 pp.1745-1754. (July 1998).
NAL Call #: 292.8-W295

Descriptors: wetlands, agricultural-land, runoff, phosphorus, water-quality, water-management, prediction, bayesian-theory, regression-analysis, mathematical-models, florida, everglades-wetlands, everglades-agricultural-area, agricultural-runoff

Abstract: Phosphorus-enriched agricultural runoff from the Everglades Agriculture Area is believed to have caused ecological changes in the northern part of the Everglades wetlands. A number of efforts have been made to assess the effectiveness of using constructed wetlands as a means of phosphorus removal from the agricultural runoff. The objective of this study is to develop a predictive model for the total phosphorus effluent concentration of an Everglades wetland that has received this runoff for over 20 years. We used Bayesian nonparametric regression to develop a predictive model combining information from an Everglades wetland data set and a cross-sectional data set. The prior model was based on the cross-sectional data set and expert opinion; this prior model, when combined with data from the Everglades wetland, yielded the posterior model, which can be used to (1) estimate the probability of an outflow concentration standard violation and (2) provide the posterior distributions of effluent concentrations at different loading rates and water levels. The primary use of this model is to support decision making in sizing the proposed constructed wetlands in south Florida as well as keeping a practical management strategy.

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63. **Modeller og analyser av okonomi og miljo for jordrenseanlegg, vatmarksfiltre og minirenseanlegg : Models and Analyses, Economic and Environmental Costs for Wastewater Treatment with Infiltration Constructed Wetlands and Package Treatment Plants.**
Refsgaard, K., Hoyas, A., Maehlum, T.
NILF-rapport 1998-2 (Serial document in Norwegian language).
Published: Oslo, Norway: Norsk institutt for landbruksokonomisk forskning (1998). 44 p.
NAL Call #: HD2011.N54-no.1998:2

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64. **Monitoring and Mass Budget for Mercury in the Everglades Nutrient Removal Project.**
Miles, C. J. and Fink, L. E.
Arch-Environ-Contam-Toxicol. 35: 4 pp.549-557 (Nov 1998).
NAL Call #: TD172.A7

Descriptors: water-reservoirs, mercury, monitoring, water-pollution, florida, constructed-

wetlands, ecosystem-restoration, everglades-nutrient-removal-project

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65. **Mosquito Species Distribution and Abundance in a Wastewater Wetlands System in Orange County, Florida.**
Piazza, Michelle H.
Gainesville, Fla.: University of Florida--Thesis (M.S.), 1996.
NAL Call #: FU LD1780-1996.P584

Descriptors: Mosquitoes-Florida-Geographical-distribution, Constructed-wetlands-Ecology-Florida

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66. **Natural Treatment and on-Site Processes.**
Kruzic, A. P.
Water-Environ-Res. 69: 4 pp.522-526. (June 1997).
NAL Call #: TD419.R47

Descriptors: waste-water-treatment, infiltration, soil, wetlands, ponds, application-to-land, literature-reviews, constructed-wetlands

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67. **Natural Treatment and on-Site Processes.**
White, K. D. and Burken, J. G.
Water-Environ-Res. 70: 4 pp.540-550. (June 1998).
NAL Call #: TD419.R47

Descriptors: waste-water, waste-water-treatment, wetlands, aquatic-plants, water-flow, bioremediation, polluted-soils, plants, pollutants, removal, constructed-wetlands, phytomediation, submerged-flow

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68. **Nitrate Removal in Wetland Microcosms.**
Ingersoll, T. L. and Baker, L. A.
Water-Res. 32: 3 pp.677-684. (Mar 1998).
NAL Call #: TD420.W3

Descriptors: nitrate, contaminants, water, sediment, wetlands, denitrification, carbon, temperature, groundwater-pollution, constructed-wetlands, dissolved-organic-carbon

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69. **Nutrient Removal From a Stormwater Detention Pond Using Duckweed.**
Perniel, M., Ruan, R., and Martinez, B.
Appl-Eng-Agric. 14: 6 pp.605-609. (Nov 1998).
NAL Call #: S671.A66

Descriptors: lemnaceae, storms, rain, species-differences, nutrient-uptake, ponds, biomass-production, phosphorus, nitrogen, ammonia, field-experimentation, pollution-control, lemna-minor, spirodela-polyrhiza, water-pollution, wetlands, minnesota, constructed-wetlands

Abstract: Different species of Lemnaceae (duckweed) were grown in pure and mixed cultures to examine nutrient absorption capacity in a stormwater detention pond. The duckweed was grown in 0.4 m2 equilateral triangular floating Pens in a stormwater retention pond, which is part of a constructed wetland in Roseville, Minnesota. Both biomass productivity and nutrient (phosphorus and nitrogen) removal were measured for each species. It was concluded that: (1) monoculture Lemna minor consistently removed the largest amount of ammonia from stormwater and had the largest biomass density; and (2) a polyculture of lemna minor and Spirodela polyrhiza was the most stable nutrient sink and removed the largest amount of phosphorus from stormwater in eight weeks.

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70. **Nutrient Removal Using Reed Bed Systems in Greece.**
Markantonatos, P. G., Bacalis, N. C., Lazaras, G., and Angelidis, M. O.
J-Environ-Sci-Health-Part-A,-Environ-Sci-Eng-Toxic-Hazard-Substance-Control. A31: 6 pp.1423-1434. (1996).
NAL Call #: TD172.J6

Descriptors: waste-water-treatment, phragmites, sewage, nitrogen, phosphorus, removal, nitrification, denitrification, seasonal-variation, pollution-control, greece

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71. **Oxidation States and Fractionation of Plaque Iron on Roots of Common Reeds.**
Wang, T. and Peverly, J. H.
Soil-Sci-Soc-Am-j. 60: 1 pp.323-329 (Jan/Feb 1996).
NAL Call #: 56.9-So3

Descriptors: phragmites-australis, roots, iron, coatings, characterization, oxidation, fixation, wetland-soils, biogeochemistry, extraction, ph, stability, rhizosphere-

Abstract: Characterization of iron plaque stability on roots of wetland plants is of value in consideration of several wetland issues. Active and dormant roots of common reed [Phragmites australis (Cav.) Trin. ex Steudel] sampled from a constructed wetland were treated sequentially with 0.5 M MgCl2 (salt extraction), HCl solution at pH 3, 2, 1.6, 0.6,

0.3, and 0 (acid extraction), and 0.385 M Na2S2O4 (reductant extraction). Iron was measured with an orthophenanthrolene method. Results indicated that dormant roots contained 6, 890, 180, and 140 micrograms Fe g-1 fresh root weight in salt extractable, acid extractable, reductant extractable, and residual fractions, respectively, and active roots had a higher proportion of acid extractable Fe and lower proportions of reductant extractable and residual Fe than dormant roots. Following acid extraction, substantial Fe2+ was detected. Ferric iron reduction after extraction was also found. The models of Fe extraction dynamics at different pH levels were fit to standard equations. According to the comparison of the constants in these models, the Fe release rate and potential for extraction in the acid solutions tended to increase as the pH decreased, but the effect on Fe extraction became saturated when pH approached zero. The oxidation state of Fe in root plaque was examined with Mossbauer spectroscopy after the roots were dried at 80 degrees C in a regular oven and were powdered. The results indicated that the Fe(II) proportion is 33% in powdered dormant roots, and 27% in active roots. Based on these results, we suggest that the previously accepted concept of plaque composed entirely of Fe3+ needs to be further examined.

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72. **Performance Evaluation and Temperature Effects on a Subsurface Flow Constructed Wetland in Eastern Nebraska.**
Lionberger, Holly S.
Lincoln, NE: University of Nebraska--Lincoln--Thesis (M.S.), 1999. 135 p.
NAL Call #: NBU LD3656-1999-L5686

Descriptors: Constructed-wetlands-Nebraska

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73. **Performance of a Subsurface Constructed Wetland in Iran.**
Badkoubi, A., Ganjidoust, H., Ghaderi, A., and Rajabi, A.
Water Quality International '98: Selected Proceedings of the 19th Biennial Conference of the International Association on Water Quality, Held in Vancouver, BC, Canada, 21-26 June 1996. An International Association on Water Quality Conference. Published: Oxford: Pergamon. (1998). pp. p. 345-350.
NAL Call #: TD420.A1P7-v.38-no.1

Descriptors: wetlands, waste-water-treatment, biological-treatment, phragmites-australis, sewage-effluent, water-flow, chemical-oxygen-demand, iran, artificial-wetlands, subsurface-flow

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74. **Performance of Four Constructed Wetlands Treating Anaerobic Swine Lagoon Effluents.**

Sievers, D. M.
Trans-ASAE. 40: 3 pp.769-775. (May/June 1997).
NAL Call #: 290.9-Am32T

Descriptors: pigs, animal-wastes, waste-treatment, lagoons, biological-treatment, wetlands, water-pollution, pollution-control, scirpus-lacustris, juncus-effusus, sagittaria, effluents, sagittaria-latifolia

Abstract: Effluents from both cells of a two-cell anaerobic lagoon system beating flushed swine waste were loaded into two types of constructed wetlands [submerged flow (SF) and free water surface (FWS)]. The wetlands were planted to Scirpus lacustris (Bulrush), Juncus Effusus (Soft Rush), and Saggitaria latifolia (Arrowhead). Passing anaerobic lagoon effluents through the constructed wetlands resulted in the following average reductions in water quality parameters: BOD5, 18 to 50%; NH3-N, 17 to 41%; TSS, 34 to 48%; total phosphorus, 15 to 30%. Effluents from the lagoons were too concentrated to achieve wetland effluent criteria suggested by the Natural Resource Conservation Service. This study showed that the Rational Method for sizing constructed wetlands to treat anaerobic swine lagoon wastewaters to achieve a wetland effluent criteria <30 mg/L BOD5 was inadequate. Continuous reduced environmental conditions in the wetlands was the primary reason for this, but high ammonia and TKN loadings also contributed.

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75. **Phosphate Adsorption Characteristics of Soils, Slags and Zeolite to Be Used As Substrates in Constructed Wetland Systems.**
Sakadevan, K. and Bavor, H. J.
Water-Res. 32: 2 pp.393-399. (Feb 1998).
NAL Call #: TD420.W3

Descriptors: waste-water, pollutants, waste-water-treatment, wetlands, phosphorus, phosphates, adsorption, substrates, soil, slags, zeolites, physicochemical-properties, new-south-wales

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76. **Phosphorus Immobilization by Chemical Amendments in a Constructed Wetland.**
Ann, Yoeng Kwan
Gainesville, Fla.: University of Florida--Thesis (Ph. D.), 1996. 220 p.
NAL Call #: FU LD1780-1996.A613

Descriptors: Constructed-wetlands-Ecology, Water-Phosphorus-content

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77. **Phosphorus Release and Retention Potential of Constructed Wetlands in the Emeralda Marsh Conservation Area.: Emeralda Marsh Conservation Area.**
Reddy, Konda Rameshwer, Robinson, J. S. J. Steve, Yang, Y. Yu, and Marburger, Joy Elaine.
Palatka, Fla.: St. Johns River Water Management District (Fla.), 1997. 110 p.
NAL Call #: FU S605.2.U6P641-1997;S605.2.U6P461-1997

Descriptors: Reclamation-of-land-Florida-Oklawaha-River-Watershed, Water-Phosphorus-content-Florida-Oklawaha-River-Watershed, Restoration-ecology-Florida-Oklawaha-River-Watershed, Wetland-conservation-Florida-Oklawaha-River-Watershed, Wetland-ecology-Florida-Oklawaha-River-Watershed, Agricultural-chemicals-Environmental-aspects-Florida-Oklawaha-River-Watershed

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78. **Phosphorus Removal Rates in Bucket Size Planted Wetlands With a Vertical Hydraulic Flow.**
Lantzke, I. R., Heritage, A. D., Pistillo, G., and Mitchell, D. S.
Water-Res. 32: 4 pp.1280-1286. (Apr 1998).
NAL Call #: TD420.W3

Descriptors: phosphorus, orthophosphates, wetlands, schoenoplectus, rhizosphere, waste-water, waste-water-treatment, sorption, age, biochemical-oxygen-demand, temperature, schoenoplectus-validus, vertical-flow-systems, constructed-wetlands

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79. **Phosphorus Retention in the Soil Matrix of Constructed Wetlands.**
Zurayk, R., Nimah, M., Geha, Y., and Rizk, C.
Commun-Soil-Sci-Plant-Anal. 28: 6/8 pp.521-535. (1997).
NAL Call #: S590.C63

Descriptors: waste-water-treatment, eutrophication, pollution-control, wetlands, design, wetland-soils, phosphorus, fixation, sorption, desorption, eichhornia, phragmites, typha, calcium-carbonate, liming-materials, application-rates, hydrophyte-beds, soilless-versus-soil-based-beds

Abstract: Constructed wetlands may be described as soil/plant systems for wastewater treatment in which pollutant removal is based on general principles of nutrient transformation in soils. Currently perceived as "black boxes" by engineers, the design and operation of these systems may be greatly improved based on the knowledge gained from several decades of studying nutrient cycling in soil-plant systems. This paper reports on an attempt to operate this linkage. Three pilot scale systems planted with reed, cattail, and water hyacinth were used to study the role of the soil matrix in phosphorus (P) removal over a period of five months. Phosphorus removal was superior in the soil-based systems

with a mean P reduction from the influent concentration (24 mg.mL-1) of 80% compared with 54% in the soilless bed. Recycling the effluent into the system in order to increase the detention time did not contribute to improving removal, except in the soilless bed. This indicates that P removal in the soil-based systems is rapid, and that an equilibrium value may be reached beyond which no further removal is possible. The effect of a lime amendment on the improvement of P removal was studied in batch tests in a decarbonated sand amended with 1.4%, 12.2%, 21%, 38%, and 49% calcium carbonate (CaCO3). Phosphorus removal from solution can be significantly improved by the addition of small amounts of lime (2-4%). Fixation is also faster and sustainable in lime-amended sands. These results suggest that P removal from wastewater can be greatly enhanced by the addition of small amounts of lime to the soil substrate.

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80. **Phytoaccumulation of Trace Elements by Wetland Plants. I. Duckweed.**
Zayed, A., Gowthaman, S., and Terry, N.
J-Environ-Qual. 27: 3 pp.715-721. (May/June 1998).
NAL Call #: QH540.J6

Descriptors: lemna-minor, heavy-metals, concentration, bioremediation, water-pollution, pollution-control

Abstract: There has been much interest recently in the use of constructed wetlands for the removal of toxic trace elements from wastewaters. Wetland plants play an important role in the trace elements removal process. It is not known, however, which wetland plant species absorb specific trace elements at the fastest rates. Such knowledge is essential to maximize the efficiency of trace element removal by wetlands. In this study, we investigated the potential of duckweed (Lemna minor L.) to accumulate Cd, Cr, Cu, Ni, Pb, and Se when supplied individually in a nutrient solution at a series of concentrations ranged from 0.1 to 10 mg L-1. The results show that under experimental conditions, duckweed proved to be a good accumulator of Cd, Se, and Cu, a moderate accumulator of Cr, and a poor accumulator of Ni and Pb. The highest concentrations of each trace element accumulated in duckweed tissues were 13.3 g Cd kg-1, 4.27 g Se kg-1, 3.36 g Cu kg-1, 2.87 g Cr kg-1, 1.79 g Ni kg-1, and 0.63 g Pb kg-1. Duckweed exhibited some symptoms of toxicity (e.g., reduced growth, chlorosis) at higher levels of element supply (except for Cr). The toxicity effect of each trace element on plant growth was, in descending order of damage, Cu > Se > Pb > Cd > Ni > Cr. We conclude that duckweed shows promise for the removal of Cd, Se, and Cu from contaminated wastewater since it accumulates high concentrations of these elements. Further, the growth rates and harvest potential make duckweed a good species for phytoremediation activities.

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81. **Phytoaccumulation of Trace Elements by Wetland Plants. II. Water Hyacinth.**
Zhu, Y. L., Zayed, A. M., De Souza, Q. M., and Terry, N.

J-Environ-Qual. 28: 1 pp.339-344. (Jan/Feb 1999).
NAL Call #: QH540.J6

Descriptors: eichhornia-crassipes, aquatic-plants, arsenic, cadmium, chromium, copper, nickel, selenium, bioremediation, waste-water-treatment

Abstract: Wetland plants are being used successfully for the phytoremediation of trace elements in natural and constructed wetlands. This study demonstrates the potential of water hyacinth (Eichhornia crassipes), an aquatic floating plant, for the phytoremediation of six trace elements. The ability of water hyacinth to take up and translocate six trace elements--As(V), Cd(II), Cr(VI), Cu(II), Ni(II), and Se(VI)--was studied under controlled conditions. Water hyacinth accumulated Cd and Cr best, Se and Cu at moderate levels, and was a poor accumulator of As and Ni. The highest levels of Cd found in shoots and roots were 371 and 6103 mg kg-1 dry wt., respectively, and those of Cr were 119 and 3951 mg kg-1 dry wt., respectively. Cadmium, Cr, Cu, Ni, and As were more highly accumulated in roots than in shoots. In contrast, Se was accumulated more in shoots than in roots at most external concentrations. Water hyacinth had high trace element bioconcentration factors when supplied with low external concentrations of all six elements, particularly Cd (highest BCF = 2150), Cr (1823), and Cu (595). Therefore, water hyacinth will be very efficient at phytoextracting trace elements from wastewater containing low concentrations of these elements. We conclude that water hyacinth is a promising candidate for phytoremediation of wastewater polluted with Cd, Cr, Cu, and Se.

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82. **Phytoaccumulation of Trace Elements by Wetland Plants. III. Uptake and Accumulation of Ten Trace Elements by Twelve Plant Species.**
Qian, J. H., Zayed, A., Zhu, Y. L., Yu, M., and Terry, N.
J-Environ-Qual. 28: 5 pp.1448-1455. (Sept/Oct 1999).
NAL Call #: QH540.J6

Descriptors: aquatic-plants, trace-elements, uptake, dry-matter-accumulation, bioremediation, pollution-control

Abstract: Interest is increasing in using wetland plants in constructed wetlands to remove toxic elements from polluted wastewater. To identify those wetland plants that hyperaccumulate trace elements, 12 plant species were tested for their efficiency to bioconcentrate 10 potentially toxic trace elements including As, B, Cd, Cr, Cu, Pb, Mn, Hg, Ni, and Se. Individual plants were grown under carefully controlled conditions and supplied with 1 mg L(-1) of each trace element individually ror 10 d. Except B, all elements accumulated to much higher concentrations in roots than in shoots. Highest shoot tissue concentrations (mg kg(-1)DW) of the various trace elements were attained by the following species; umbrella plant (Cyperus alternifolius L.) for Mn (198) and Cr (44);

water zinnia (Wedelia trilobata Hitchc.) for Cd (148) and Ni (80); smartweed (Polygonum hydropiperoides Michx.) for Cu (95) and Pb (64); water lettuce (Pistia stratiotes L.) for Hg (92), As (34), and Se (39); and mare's tail (Hippuris vulgaris L.) for B (1132). Whereas, the following species attained the highest root tissue concentrations (mg kg(-1) DW): stripped rush (Baumia rubiginosa) for Mn (1683); parrot's feather (Myriophyllum brasiliense Camb.) for Cd (1426) and Ni (1077); water lettuce for Cu (1038), Hg (1217), and As (177); smartweed for Cr (2980) and Pb (1882); mare's tail for B (1277); and monkey flower (Mimulus guttatus Fisch.) for Se (384). From a phytoremediation perspective, smartweed was probably the best plant species for trace element removal from wastewater due to its faster growth and higher plant density.

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83. **Phytoremediation by Constructed Wetlands: Assessment of Biopedological Techniques for Resource-Efficient Farming With Livestock.**
Kowalik, P., Toczylowska, I., Vola, G., Scalenghe, R., Boero, V., Ambrosoli, R., Zanini, E., and Edwards, A. C.
Acta-Hortic.: 457 pp.187-194. (July 1998).
NAL Call #: 80-Ac82

Descriptors: wetlands, bioremediation, livestock-farming, water-pollution, pollution-control, mountain-areas, italy

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84. **Phytoremediation of Herbicide-Contaminated Surface Water with Aquatic Plants.**
Rice, P. J., Anderson, T. A., and Coats, J. R.
Phytoremediation of soil and water contaminants. Published: Washington, D.C.: American Chemical Society. (97). pp. <25 Location in Work>.
NAL Call #: QD1.A45-no.664

Abstract: There is current interest in the use of artificial wetlands and macrophyte-cultured ponds for the treatment of agricultural drainage water, sewage, and industrial effluents. Aquatic plant-based water treatment systems have proved effective and economical in improving the quality of wastewaters containing excess nutrients, organic pollutants, and heavy metals. This investigation was conducted to test the hypothesis that herbicide-tolerant aquatic plants can remediate herbicide-contaminated waters. The addition of Ceratophyllum demersum (coontail, hornwort), Elodea canadensis (American elodea, Canadian pondweed), or Lemna minor (common duckweed) significantly (p less than or equal to <0.01) reduced the concentration of [14C]metolachlor (MET) remaining in the treated water. After a 16-day incubation period, only 1.44%, 4.06%, and 22.7% of the applied [14C]MET remained in the water of the surface water systems containing C. demersum, E. canadensis, or L. minor whereas 61% of the applied [14C]MET persisted in the surface water systems without plants. C. demersum and E. canadensis significantly

(p less than or equal to < 0.01) reduced the concentration of [14C] atrazine (ATR) in the surface water. Only 41.3% and 63.2% of the applied [14C]ATR remained in the water of the vegetated systems containing C. demersum and E. canadensis, respectively. Eighty-five percent of the applied [14C]ATR was detected in the water of the L. minor and nonvegetated systems. Our results support the hypothesis and provide evidence that the presence of herbicide-tolerant aquatic vegetation can accelerate the removal and biotransformation of metolachlor and atrazine from herbicide-contaminated waters.

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85. **Potential Reduction of Struvite Formation From Anaerobic Swine Lagoon Effluent by Treatment in Constructed Wetlands.**
Sievers, D. M.
Trans-ASAE. 40: 3 pp.803-805. (May/June 1997).
NAL Call #: 290.9-Am32T

Descriptors: pig-slurry, waste-water-treatment, wetlands, lagoons, magnesium, ammonium, phosphates, ammonium-magnesium-phosphate-deposits

Abstract: Effluents from both cells of a two-cell anaerobic lagoon system treating flushed swine waste from the University of Missouri Swine Farm were treated in parallel constructed wetlands-submerged flow (SF) and free water surface (FWS). Reductions in magnesium, ammonium, and total phosphorus ion concentrations in the wetlands were measured and used to calculate ion activity products (IAP) for struvite and compared to struvite solubility products (Ksp). Comparison of IAPs with Ksps indicated that the wetlands reduced the potential for struvite formation by 54 to 70%. The reductions were largely due to ammonium losses from the wetlands.

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86. **A Proposed Methodology for Measuring Incremental Environmental Benefits From Using Constructed Wetlands to Control Agricultural Non-Point Source Pollution.**
MacDonald, H. F., Bergstrom, J. C., and Houston, J. E.
J-Environ-Manage. 54: 4 pp.259-267. (Dec 1998).
NAL Call #: HC75.E5J6

Descriptors: wetlands, pollution-control, valuation, runoff-water, non-market-benefits, case-studies, methodology, water-quality, mathematical-models, georgia, contingent-valuation, binary-response-model

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87. **Purification of Fuel and Nitrate Contaminated Ground Water Using a Free Water Surface Constructed Wetland Plant.**

Machate, T., Heuermann, E., Schramm, K. W., and Kettrup, A.
J-Environ-Qual. 28: 5 pp.1665-1673. (Sept/Oct 1999).
NAL Call #: QH540.J6

Descriptors: typha, contaminants, scirpus-lacustris, biological-treatment, bioremediation, groundwater-pollution, pollution-control

Abstract: Contaminated ground water from a former coke plant site was purified in a free water surface (FWS) constructed wetland plant during a 3-mo short-term experiment. The pilot plant (total surface area 27 m(2)) was filled with a 1 m thick lava-gravel substrate planted with cattail (Typha spp.) and bulrush (Scirpus lacustris). Major contaminants were low to moderate concentrations of polycyclic aromatic hydrocarbons (PAH 50-9000 microgram L(-1) according to USEPA, 1-methyl-naphthalene 2-1900 microgram L(-1), 2-methylnaphthalene 3-4300 microgram L(-1)), BTEX (10-450 microgram L(-1)), nitrate (60 mg L(-1) as N), and nitrite (7 mg L (-1) as N). The wetland was dosed at hydraulic loading rates of q(A) = 4.8 and 9.6 cm d(-1) with a hydraulic residence time (HRT) of 13.7 and 6.8 d. The surface removal rates of PAH were between 98.8 and 1914 mg m(-2) d(-1). Efficiency was always >99%. Extraction of lava gravel showed that approx. 0.4% of the applied PAH were retained on the substratum. The ratio of (sigma)2,3-ring PAH and (sigma)4,5,6-ring PAH showed a shift from 1:0.11 in water (influent) to 1:25 in lava (Tank 1). The removal of BTEX was >99%, but might be in part due to volatilization. The efficiency in the removal of nitrite was 91% (2.47-3.34 g m(-2) d(-1)) and of nitrite was 97% (0.034-0.036 g m(-2) d(-1)). Purification performance was not influenced by hydraulic loading rates or after die-hack of the macrophytes.

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88. **Removal of Metals and Ammonia in Constructed Wetlands.**
Crites, R. W., Dombeck, G. D., Watson, R. C., and Williams, C. R.
Water-Environ-Res. 69: 2 pp.132-135. (Mar/Apr 1997).
NAL Call #: TD419.R47

Descriptors: wetlands, metals, ammonia, removal, uptake, waste-water, waste-water-treatment, typha, schoenoplectus, wetland-soils, pollution-control, california, artificial-wetlands, schoenoplectus-acutus

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89. **Retention and Compartmentalization of Lead and Cadmium in Wetland Microcosms.**
Debusk, T. A., Laughlin, R. B. Jr., and Schwartz, L. N.
Water-Res. 30: 11 pp.2707-2716. (Nov 1996).
NAL Call #: TD420.W3

Descriptors: wetlands, typha-domingensis, lemna-minor, sediment, lead, cadmium, trace-

elements, heavy-metals, landfill-leachates, contaminants, bioremediation, constructed-wetlands, water-treatment

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90. **Role of Plant Uptake on Nitrogen Removal in Constructed Wetlands Located in the Tropics.**
Koottatep, T. and Polprasert, C.
Water Quality Conservation in Asia Selected Proceedings of Asian Waterqual '97, the 6th IAWQ Asia-Pacific Regional Conference, Held in Seoul, Korea, 20-23 May, 1997 / IAWQ Asian Regional Conference on Water Conservation and Pollution Control. 1st Ed.
Published: Tarrytown, N.Y.: Pergamon. (1997). pp. 1-8.
NAL Call #: TD420.A1P7-v.36-no.12

Descriptors: waste-water-treatment, typha-angustifolia, nitrogen, removal, nutrient-uptake, wetlands, biomass, harvesting, nitrogen-content, chemical-oxygen-demand, nitrate, ammonium, organic-nitrogen-compounds, redox-potential, dissolved-oxygen, nitrification, denitrification, thailand, artificial-wetlands, nitrogen-mass-balance

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91. **Selenium Removal by Constructed Wetlands: Role of Biological Volatilization.**
Hansen, D., Duda, P. J., Zayed, A., and Terry, N.
Environ-Sci-Technol. 32: 5 pp.591-597. (Mar 1, 1998).
NAL Call #: TD420.A1E5

Descriptors: estuaries, effluents, water-pollution, california, san-francisco-bay,-california

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92. **Shrimp Pond Effluent:Pollution Problems and Treatment by Constructed Wetlands.**
Sansanayuth, P., Phadungchep, A., Ngammontha, S., Ngdngam, S., Sukasem, P., Hoshino, H., and Ttabucanon, M. S.
Water-Sci-Technol. 34: 11 pp.93-98. (1996).
NAL Call #: TD420.A1P7

Descriptors: shrimp-culture, ponds, effluents, waste-water, water-pollution, waste-water-treatment, wetlands, biological-treatment, removal, nitrogen, phosphorus, carbon, biochemical-oxygen-demand, acrostichum-aureum, thailand, artificial-wetlands, total-organic-carbon

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93. **Spatial Characterization of Hydrogeochemistry Within a Constructed Fen,**

Greene County, Ohio.
Hite, C. D. and Cheng, S.
Ground-Water. 34: 3 pp.415-424 (May/June 1996).
NAL Call #: TD403.G7

Descriptors: fens, wetlands, fen-soils, aquatic-plants, rhizosphere, groundwater, anions, cations, alkalinity, redox-potential, ferric-hydroxide, soil-organic-matter, oxidation, calcite, dolomite, biological-activity-in-soil, ohio, artificial-fens, constructed-wetlands

Abstract: An artificial fen environment was constructed near the municipality of Beavercreek, Ohio. The constructed wetland environment utilizes local ground-water flow patterns to maintain a high degree of water saturation. Chemical reactions driven by the activity of plant roots and soil microorganisms affect the spatial distribution and magnitude of hydrogeochemical parameters, including alkalinity, pH, redox potential, and concentrations of Ca+2, Mg+2, total iron, NO3(-), and SO4(-2). The purpose of this study is to investigate the chemical interactions between wetland plants and ground water by means of characterizing the spatial variation in hydrogeochemical parameters. Nested piezometers within the artificial fen are used to monitor ground-water chemistry within, and immediately adjacent to, the rhizosphere of cultivated plant species. The major reactions at the site include oxidation of organic matter by Fe(OH)3 and dissolution of carbonate minerals driven by high CO2 production in the root zone. The relationship between alkalinity and dissolved concentrations of Ca+2 and Mg+2 suggests that organic anions could also be major alkalinity contributors. Redox potential is buffered by the reduction of Fe(OH)3 and is typically maintained in the range of 100-200 mV. This buffering effect prevents the formation of sulfide and methane commonly found in similar wetland environments. This finding suggests that methane production associated with rice cultivation can be prevented by the addition of Fe(OH)3 to rice fields.

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94. **Spring Recovery of Constructed Wetland Plants Affects Nutrient Removal From Nursery Runoff.**
Arnold, M. A., Lesikar, B. J., Kenimer, A. L., and Wilkerson, D. C.
J-Environ-Hortic. 17: 1 pp.5-10. (Mar 1999).
NAL Call #: SB1.J66

Descriptors: wetlands, vegetation, nurseries, effluents, nutrient-availability, runoff, demand, crop-quality, water-reuse, water-pollution, waste-water-treatment, electrical-conductivity, salinity, nitrate-nitrogen, ammonium, nitrite, plants, irrigation, species-differences, pot-culture, water-purification, growing-media, texas

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95. **Subsurface Drainage Outflow Improvement With Constructed Wetland.**
Miller, P. S., Mitchell, J. K., Walker, S. E., and Hirschi, W. M. C.

Proceedings National Watershed Water Quality Project Symposium / National Watershed Water Quality Project Symposium.: Environmental Protection Agency, Office of Research and Development, Office of Water. (1997). pp. p. 103-108.
NAL Call #: TD223.N386-1997

Descriptors: nitrate, water-pollution, pollution-control, phosphorus, pesticide-residues, illinois

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96. **Subsurface Flow Constructed Wetlands Treating Municipal Wastewater for Nitrogen Transformation and Removal.**
Kemp, M. C. and George, D. B.
Water-Environ-Res. 69: 7 pp.1254-1262. (Nov/Dec 1997).
NAL Call #: TD419.R47

Descriptors: wetlands, water-flow, waste-water-treatment, ammonia, ammonium, removal, nitrification, denitrification, scirpus-validus, biochemical-oxygen-demand, ammonium-nitrogen, tennessee, artifical-wetlands

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97. **Temperature Effects on Wastewater Nitrate Removal in Laboratory-Scale Constructed Wetlands.**
Wood, S. L., Wheeler, E. F., Berghage, R. D., and Graves, R. E.
Trans-ASAE. 42: 1 pp.185-190. (Jan/Feb 1999).
NAL Call #: 290.9-Am32T

Descriptors: nitrate-nitrogen, pollutants, wetlands, temperature, iris-pseudacorus, biomass-production, waste-water-treatment, pollution-control, agricultural-wastes, greenhouse-wastes

Abstract: Constructed wetlands may be used for removal of high nutrient loads in groundhouse wastewater prior to discharge into the environment. Temperature affects both the physical and biological activities in wetland systems. Since nitrification and denitrification are temperature-dependent processes, effluent nitrate concentrations will fluctuate due to changes in air and wetland temperature. In a cold climate, constructed wetlands can function in a temperature-controlled, greenhouse environment year-round. This work evaluates four temperature treatments on nitrate removal rates in five planted and five unplanted laboratory-scale wetlands. Wetlands were supplied with a nutrient solution similar to the fertigation runoff solution (100 PPM nitrate-N) used in greenhouse crop production. A first-order kinetic model was used to describe experimental nitrate depletion data and to predict nitrate removal rate constants (k) in the wetlands planted with Iris pseudocoras. The negligible removal in unplanted wetlands was thought to be due to lack of carbon source in the fertigation solution. Between 18 and 23 degrees C in

planted systems, k increased from 0.062 to 0.077 h-1, appeared to peak around 30 degrees C (k = 0.184 h-1), but decreased at 38 degrees C (k = 0.099 h-1). Based on the Arrhenius equation, k was a first-order exponential function of temperature between 18 and 30 degrees C in planted systems. Quantification of temperature effects on planted and unplanted laboratory-scale constructed wetlands can be used to enhance the design and management of wastewater treatment wetlands.

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98. **Toxicological Evaluation of Constructed Wetland Habitat Sediments Utilizing Hyalella Azteca 10-Day Sediment Toxicity Test and Bacterial Bioluminescence.**
Steevens, J. A., Vansal, S. S., Kallies, K. W., Knight, S. S., Cooper, C. M., and Benson, W. H.
Chemosphere. 36: 15 pp.3167-3180. (June 1998).
NAL Call #: TD172.C54

Descriptors: wetlands, sediment, pollution-control, water-purification, toxicity, bioassays, hyalella-azteca, cytotoxicity, bioluminescence, vibrio, runoff, agricultural-land, habitats, water-quality, copper, arsenic, dieldrin, hch, insecticide-residues, mercury, water-pollution, mississippi, artificial-wetlands, vibrio-fischeri, sediment-pore-water

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99. **Treatment of Agricultural Wastewater in Downflow Reed Beds: Experimental Trials and Mathematical Model.**
Sun, G., Gray, K. R., and Biddlestone, A. J.
J-Agric-Eng-Res. 69: 1 pp.63-71. (Jan 1998).
NAL Call #: 58.8-J82

Descriptors: waste-water-treatment, agricultural-wastes, biological-treatment, pollutants, biochemical-oxygen-demand, chemical-oxygen-demand, water-quality, mathematical-models, phragmites-australis

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100. **The Treatment of Aquaculture Wastewaters--a Botanical Approach.**
Redding, T., Todd, S., and Midlen, A.
J-Environ-Manage. 50: 3 pp.283-299. (July 1997).
NAL Call #: HC75.E5J6

Descriptors: wetlands, freshwater-fishes, aquaculture, waste-water-treatment, water-quality, monitoring, efficiency, environmental-management, nasturtium-officinale, azolla-filiculoides, elodea-nuttallii, constructed-wetlands, botanical-treatment-systems

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101. **Treatment of Dilute Piggery Effluent With Vertical Flow Reed Beds.**
Parkes, M. E., McBride, A. D., and Waalkens, A.
J-Environ-Qual. 27: 4 pp.783-788. (July/Aug 1998).
NAL Call #: QH540.J6

Descriptors: piggery-effluent, waste-water-treatment, pollution-control

Abstract: Washwater from pig pens was led from a lagoon and treated in a series of vertical flow reed beds over 2 yr. A recirculation component was added in the second yr. Five-day biochemical oxygen demand (BOD5), chemical oxygen demand (COD), ammonium-N (NH4-N), and nitrate-N (NO3-N) were measured during the late winter/early spring periods for the 2 yr. Values of KBOD, to describe performance of horizontal flow reed beds, were determined for the vertical flow beds and compared with values derived from the literature. Maximum BOD5 removal was 96%, but averaged 65 and 61% over the first and second year periods, respectively. Performance of each stage, as indicated by percent removal of BOD5, was best described by an inverse logarithmic function of hydraulic load. Ponding was a problem, indicating a need for control of organic loading. Efficient nitrification was not achieved so that the treatment did not result in waste suitable for direct discharge to surface water.

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102. **Treatment Wetlands.**
Kadlec, Robert H. and Knight, Robert L. Robert Lee 1948
Boca Raton, Fla.: Lewis Publishers, 1996. 893 p.
NAL Call #: TD755.K33--1996

Descriptors: Sewage-Purification-Biological-treatment, Wetlands

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103. **Uprating and Rescuing Small Wastewater Treatment Facilities by Adding Tertiary Treatment Reed Beds.**
Green, M. B., O'Connell, P. J., and Griffin, P.
Water-Environ-Res. 70: 7 pp.1307-1313. (Nov/Dec 1998).
NAL Call #: TD419.R47

Descriptors: waste-water-treatment, wetlands, sewage-effluent, phragmites-australis, biochemical-oxygen-demand, chemical-oxygen-demand, ammonium, england, artificial-wetlands, secondary-effluent, tertiary-treatment

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104. **Use of Artificial Wetland for the Treatment of Surface and Wastewater.**
Salek, J., Marcian, F., and Elazizy, I.

Diffuse Pollution '95: Selected Proceedings of the 2nd IAWQ International Specialized Conference and Symposia on Diffuse Pollution, Held in Brno and Prague, Czech Republic, 13-18 August 1995 /. 1st Ed. Published: New York: Pergamon Press. (1996). pp. 309-313.
NAL Call #: TD420.A1P7-v.33-no.4/5

Descriptors: wetlands, aquatic-plants, waste-water-treatment, ammonia, removal, nitrification, roots, filter-beds, biochemical-oxygen-demand, chemical-oxygen-demand, constructed-wetlands, vegetative-root-zones

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105. **Use of Constructed Wetlands for Stormwater Runoff.**
Cornell University. Educational Television Center.
Audiovisual Material Produced: Ithaca, NY: Cornell University. (99).
1 videocassette (20 min.).
NAL Call #: Videocassette-no.-2786

Descriptors: Constructed-wetlands, Water-quality, Habitat-Ecology

Abstract: Video shows how properly designed and constructed wetlands moderate flow extremes and improve water quality.

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106. **The Use of Constructed Wetlands for the Treatment of Run-Off and Drainage Waters: the UK and Ukraine Experience.**
Magmedov, V. G., Zakharchenko, M. A., Yakovleva, L. I., and Ince, M. E.
Diffuse Pollution '95: Selected Proceedings of the 2nd IAWQ International Specialized Conference and Symposia on Diffuse Pollution, Held in Brno and Prague, Czech Republic, 13-18 August 1995 /. 1st Ed. Published: New York: Pergamon Press. (1996). pp. 315-323.
NAL Call #: TD420.A1P7-v.33-no.4/5

Descriptors: wetlands, aquatic-plants, pollution-control, runoff-water, drainage-water, water-purification, removal, biochemical-oxygen-demand, nitrogen, water-flow, phragmites-australis, uk, ukraine, artificial-wetlands, nonpoint-source-pollution, subsurface-flow

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107. **Use of Constructed Wetlands for Urban Stream Restoration: A Critical Analysis.**
Helfield, J. M. and Diamond, M. L.
Environ-Manage. 21: 3 pp.329-341 (May/June 1997).

NAL Call #: HC79.E5E5

Descriptors: wetlands, land-use, land-diversion, urban-areas, rivers, water-quality, ontario, don-river, toronto,-ontario

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108. **Use of Constructed Wetlands to Process Agricultural Wastewater.**
Peterson, H. G.
Can-j-Plant-Sci. 78: 2 pp.199-210. (Apr 1998).
NAL Call #: 450-C16

Descriptors: wetlands, waste-water, agricultural-wastes, water-quality, waste-water-treatment, nitrogen, phosphorus, organic-matter, decontamination, pollutants, techniques, survival, vegetation, literature-reviews, biological-treatment, nutrient-uptake

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109. **The Use of Treatment Wetlands for Petroleum Industry Effluents.**
Knight, R. L., Kadlec, R. H., and Ohlendorf, H. M.
Environ-Sci-Technol. 33: 7 pp.973-980. (Apr 1, 1999).
NAL Call #: TD420.A1E5

Descriptors: waste-water, waste-water-treatment, pollutants

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110. **Using Nature's Technology: Constructed Wetlands.**
Mundy, K.
Horiz. 9: 5 pp.5 (Sept/Oct 1997).
NAL Call #: HD1775.V8H6

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111. **Using Stable Isotopes of Water and Strontium to Investigate the Hydrology of a Natural and a Constructed Wetland.**
Hunt, R. J., Bullen, T. D., Krabbenhoft, D. P., and Kendall, C.
Ground-Water. 36: 3 pp.434-443 (May/June 1998).
NAL Call #: TD403.G7

Descriptors: wetlands, hydrology, groundwater-flow, stable-isotopes, deuterium, oxygen, water, strontium, evapotranspiration, capillary-fringe, rain, peat, cation-exchange, pores, wisconsin, artificial-wetlands

Abstract: Wetlands cannot exist without water, but wetland hydrology is difficult to characterize. As a result, compensatory wetland mitigation often only assumes the proper

hydrology has been created. In this study, water sources and mass transfer processes in a natural and constructed wetland complex were investigated using isotopes of water and strontium. Water isotope profiles in the saturated zone revealed that the natural wetland and one site in the constructed wetland were primarily fed by ground water; profiles in another constructed wetland site showed recent rain was the predominant source of water in the root zone. Water isotopes in the capillary fringe indicated that the residence time for rain is less in the natural wetland than in the constructed wetland, thus transpiration (an important water sink) was greater in the natural wetland. Strontium isotopes showed a systematic difference between the natural and constructed wetlands that we attribute to the presence or absence of peat. In the peat-rich natural wetland, delta 87Sr in the pore water increased along the flowline due to preferential weathering of minerals containing radiogenic Sr in response to elevated Fe concentrations in the water. In the constructed wetland, where peat thickness was thin and Fe concentrations in water were negligible, delta 87Sr did not increase along the flowline. The source of the peat (on-site or off site derived) applied in the constructed wetland controlled the delta 87Sr at the top of the profile, but the effects were restricted by strong cation exchange in the underlying fluvial sediments. Based on the results of this study, neither constructed wetland site duplicated the. water source and weathering environment of the adjoining natural wetland. Moreover, stable isotopes were shown to be effective tools for investigating wetlands and gaining insight not easily obtained using non-isotopic techniques. These tools have potential widespread application to wetlands that have distinct isotopic endmember sources.

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112. **Wastewater Treatment by Reed Beds an Experimental Approach.**
Mandi, L., Houhoum, B., Asmama, S., and Schwartzbrod, J.
Water-Res. 30: 9 pp.2009-2016. (Sept 1996).
NAL Call #: TD420.W3

Descriptors: phragmites-australis, waste-water-treatment, purification, bioremediation, arid-climate, efficiency, helminth-ova, soil-chemistry, water, chemistry, plant-composition, biomass, biomass-production, temporal-variation, spatial-variation

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113. **Water Quality and Occurrences of Protozoa and Metazoa in Two Constructed Wetlands Treating Different Wastewaters in Thailand.**
Panswad, T. and Chavalparit, O.
Water Quality Conservation in Asia: Selected Proceedings of Asian Waterqual '97, the 6th IAWQ Asia-Pacific Regional Conference, Held in Seoul, Korea, 20-23 May, 1997 / IAWQ Asian Regional Conference on Water Conservation and Pollution Control. 1st Ed.
Published: Tarrytown, N.Y.: Pergamon. (1997). pp. 183-188.
NAL Call #: TD420.A1P7-v.36-no.12

Descriptors: waste-water-treatment, wetlands, lagoons, sewage, factory-effluents, water-quality, protozoa, aquatic-organisms, indicator-species, seasonal-variation, species-diversity, thailand, artificial-wetlands

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114. **Wetland Systems for Water Pollution Control 1996 : Selected Proceedings of the 5th International Conference on Wetland Systems for Water Pollution Control, Held in Vienna, Austria, 15-19 September, 1996. 1st Ed.**
Haberl, R.
Tarrytown, N.Y. Pergamon, 1997.
NAL Call #: TD420.A1P7--v.35-no.5

Descriptors: Water-Pollution-Congresses, Wetlands-Congresses, Constructed-wetlands-Congresses, Water-quality-management-Congresses

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115. **Wetland Systems for Water Pollution Control 1998 : Selected Proceedings of the 6th International Conference on Wetland Systems for Water Pollution Control, Held in Aguas De Sao Pedro, SP, Brazil, 27 September-2 October, 1998. International Association on Water Quality.**
Cooper, P. F.
Tarrytown, N.Y.: Pergamon, 1999.
NAL Call #: TD420.A1-P7-v.-40-no.-3

Descriptors: Water-Pollution-Congresses, Wetlands-Congresses, Constructed-wetlands-Congresses, Water-quality-management-Congresses

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116. **Wetlands and Aquatic Processes.**
Demchik, M. and Garbutt, K.
J-Environ-Qual. 28: 1 pp.243-249. (Jan/Feb 1999).
NAL Call #: QH540.J6

Descriptors: scirpus, growth, acid-mine-drainage

Abstract: Acid mine drainage (AMD) has impacted more than 3200 km (2000 miles) of streams in West Virginia. Constructed wetlands have been used for passive AMD treatment since the early 1980s, and plant growth studies in constructed wetlands are scarce. Two populations of woolgrass [Scirpus cyperinus (L.) Kunth], a bulrush species common in naturally present AMD wetlands, were investigated to determine population level differences in aboveground and belowground growth response to AMD. Differences at the level of population were found in aboveground parameters. One population had

significantly greater aboveground growth than the other population during portions of the growing season when growing in AMD, suggesting greater ability to grow in AMD wetlands. Differences at the level of population were also found for root growth: however, the root growth response to AMD was not different between populations. Treatment with AMD slightly increased aboveground growth but reduced belowground growth. This suggests a potential for differential allocation to different growth components under AMD treatment. These results suggest there is a potential for selecting genotypes of woolgrass for increased performance in the presence of AMD.

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117. **Wetlands Treatment: Getting Close to Nature.**
Gillette, B.
Biocycle. 37: 10 pp.74-76, 78 . (Oct 1996).
NAL Call #: 57.8-C734

Descriptors: waste-water-treatment, wetlands, design, usa, constructed-wetlands

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118. **Zinc, Lead and Cadmium Tolerance, Uptake and Accumulation by the Common Reed, Phragmites Australis (Cav.) Trin. Ex Steudel.**
Ye, Z. H., Baker, A. J. M., Wong, M. H., and Willis, A. J.
Ann-Bot. 80: 3 pp.363-370. (Sept 1997).
NAL Call #: 450-An7

Descriptors: phragmites-australis, zinc, lead, cadmium, metal-tolerance, seedlings, soil-pollution, provenance, uptake, growth, selection-pressure, shoots, roots, dry-matter, polluted-soils, belgium, uk, hong-kong, heavy-metal-tolerance

Abstract: Zinc (Zn), lead (Pb) and cadmium (Cd) tolerance in populations of seedlings of Phragmites australis raised from seeds collected from a mine site (Plombieres, Belgium) contaminated with Zn, Pb and Cd and three 'clean' sites (Felixstowe, UK; Wisbech, UK; and Mai Po, Hong Kong) were studied under glasshouse conditions. Small differences were found between the metal-contaminated population and the three 'clean' populations when seedlings were grown in 1.0 micrograms ml-1 Zn and 10.0 microgram ml-1 Pb treatment solutions. In general, however, different populations of seedlings showed similar growth responses, metal uptake and indices of Zn, Pb and Cd tolerance when cultured in the same metal-contaminated media for 89 d or in the same metal treatment solutions (ZnSO4: 1.0 and 4.0 micrograms ml-1 Zn; Pb(NO3)2: 10.0 and 25.0 micrograms Pb; CdSO4: 0.5 and 1.0 micrograms ml-1 Cd) for 3 weeks. There was insufficient evidence to support the hypothesis that the metal-contaminated population has evolved to a Zn-, Pb- or Cd-tolerant ecotype but the results indicated some differentiation between the populations with that from Hong Kong being the least productive under the experimental conditions used. The implications of the findings on

selection of provenances for use in constructed wetlands for wastewater treatment are discussed.

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