Nitrogen Attenuation Literature

Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Aerts, R., Verhoeven, J.T.A., and D.F. Whigham	Plant-mediated controls on nutrient cycling in temperate fens and bogs	Ecology 80(7), pp. 2170-2181	1999	1	Bogs, Fens, Peatlands	1	0	0
Bridgham, S.D., Updegraff, K., and J. Pastor	Carbon, nitrogen, and phosphorus mineralization in northern wetlands	Ecology 79(5), pp. 1545-1561	1998	1	Bogs, Fens, Peatlands	1	0	0
Busse, L.R., G. Gunkel	Riparian alder fens - source or sink for nutrients and dissolved organic carbon? - 1. Effects of water level fluctuations.	Limnologica 31, pp. 307-315	2001	1	Bogs, Fens, Peatlands	1	1	0
Busse, L.R., G. Gunkel	Riparian alder fens - source or sink for nutrients and dissolved organic carbon? - 2. Major sources and sinks.	Limnologica 32, pp. 44-53	2002	1	Bogs, Fens, Peatlands	1	1	0
Chapin, C.T., Bridgham, S.D., J. Pastor	pH and nutrient effects on above-ground net primary production in a Minnesota, USA bog and fen	Wetlands 24(1), pp. 186-201	2004	1	Bogs, Fens, Peatlands	1	1	0
Hemond, H.F.	Biogeochemistry of Thoreau's Bog, Concord, Massachusetts	Ecological Monographs 50(4), pp. 507-526	1980	1	Bogs, Fens, Peatlands	1	1	1
Leonardson, L., L. Bengtsson, T. Davidsson, T. Persson and U. Emanuelsson	Nitrogen retention in artificially flooded meadows	Ambio 23(6), pp. 332-341	1994	0	Bogs, Fens, Peatlands	1	1	1
Verhoeven, J.T.A.	Nutrient dynamics in minerotrophic peat mires	Aquatic Botany 25, pp. 117-137	1986	1	Bogs, Fens, Peatlands	1	0	0
Wiegner, T.N., and S.P. Seitzinger	Seasonal bioavailability of dissolved organic carbon and nitrogen from pristine and polluted freshwater wetlands	Limnology and Oceanography 49(5), pp. 1703-1712	2004	1	Bogs, Fens, Peatlands	1	0	1
Howes, B.L. and J. M. Teal	Nutient balance in a Massachusetts cranberry bog and relationships to coastal eutrophication	Environmental Science and Technology 29. 960-974	1995	0	Cranberry Bog	1	1	1
Mitsch, WJ, L Zhang, CJ Anderson, and AE Altor.	Creating riverine wetlands: ecological succession, nutrient retention, and pulsing effects.	Ecological Engineering 25:510-527.	2005	1	Constructed Wetlands	1	1	1
Peterson, S.B. and J.M. Teal	The role of plants in ecologically engineered wastewater treatment systems	Ecological Engineering 6:137-148	1996	1	Constructed Wetlands	1	1	1
Allen, W.C., P.B. Hook, J.A. Biederman and O.R. Stein	Temperature and wetland plant species effects on wastewater treatment and root zone oxidation	Journal of Environmental Quality 31, pp. 1010-1016	2002	1	Constructed Wetlands	1	1	1
Axler, R., B. McCarthy, and J. Henneck	NERCC Individual Alternative Wastewater Treatment Systems: Pollutant Removal in 2003 and Long-term Performance	Natural Resources Research Institute, University of Minnesota, Duluth NRRI Tech Report 2004/28	2004	1	Constructed Wetlands	1	1	1
Axler, R., J. Henneck, and B. McCarthy	Residential subsurface flow treatment wetlands in northern Minnesota	Water Science and Technology 44(11-12), pp. 345-352	2001	1	Constructed Wetlands	1	1	1
Crumpton, W.G., T.M. Isenhart, and S.W. Fisher	Fate of non-point source nitrate loads in freshwater wetlands: results from experimental wetland mesocosms	Ch. 29 in Constructed Wetlands for Water Quality Improvement. GA Moshiri, Ed. Lewis Publishers Boca Raton	1993	0	Constructed Wetlands	0	1	1
Davido, R.L. and T.E. Conway	Nitrification and denitrification at the Iselin marsh/pond/meadow facility	Ch. 37 in Constructed Wetlands for Wastewater Treatment: Municipal, Industrial, and Agricultural. DA Hammer, Ed.	1997	0	Constructed Wetlands	1	1	1
Dornbush, J.N.	Constructed wastewater wetlands: the answer in South Dakota's challenging environment	Ch. 63 in Constructed Wetlands for Water Quality Improvement. GA Moshiri, Ed.	1993	0	Constructed Wetlands	0	1	1
EPA	NADB (North American Treatment Wetland Database)	Electronic database created by R. Knight, R Ruble, R Kadlec and S Reed for USEPA; copies available from Don Brown, USEPA 513-569-7630	1993	1	Constructed Wetlands	Throughout US	1	1

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EPA	Free Water Surface Wetlands for Wastewater Treatment: A Technology Assessment	EPA 832-S-99-002, Office of Water	1999	1	Constructed Wetlands	1	0	0
EPA	Treatment wetland Habitat and Wildlife Use Assessment and North American Treatment Wetland Database (NADB) Version 2	EPA 832-S-99-001. Prepared by CH_2M Hill	1999	1	Constructed Wetlands	Throughout US	0	0
Fleischer, S., A. Gustafson, A. Joelsson, J. Pansar and L. Stibe	Nitrogen removal in created ponds	Ambio 23(6), pp. 349-357	1994	0	Constructed Wetlands	Throughout US	1	1
Geiger, S., J. Luzier and J. Jackson	Nitrogen and phosphorus reduction in secondary effluent using a 15-acre, multiple-celled reed canarygrass (Phalaris arundinacea) wetland	Ch. 33 in Constructed Wetlands for Water Quality Improvement. G. Moshiri, Ed.	1993	0	Constructed Wetlands	0	1	1
Gersberg, R.M., B.V. Elkins and C.R. Goldman	Nitrogen removal in artificial wetlands	Water Research 17(9), pp. 1009-1014	1983	1	Constructed Wetlands	1	1	1
Green, M.B. and J. Upton	Reed Bed Treatment for Small Communities - UK Experience	Ch. 57 in Constructed Wetlands for Water Quality Improvement, GA Moshiri, Ed. CRC Press	1993	0	Constructed Wetlands	1	1	1
Hansson, L.A., C. Bronmark, P. Anders Nilsson and K. Abjornsson	Conflicting demands on wetland ecosystem services: nutrient retention, biodiversity, or both?	Freshwater Biology 50, pp. 705–714	2005	1	Constructed Wetlands	0	1	1
Healy, M. and A.M. Cauley	Nutrient processing capacity of a constructed wetland in Western Ireland	Journal of Environmental Quality 31, pp. 1731-1739	2002	1	Constructed Wetlands	1	1	1
Hey D.L., A.L. Kenimer and K.R. Barrett	Water quality improvement by four experimental wetlands.	Ecological Engineering 3, pp. 381-397.	1994	1	Constructed Wetlands	1	1	1
Hey, D.L., J.A. Kostel, A.P. Hurter, and R.H. Kadlec	Nutrient farming and traditional removal: An economic comparison.	Water Environment Research Foundation (WERF) 03-WSM-6CO	2005	1	Constructed Wetlands	1	0	0
Hofmann, K.	The role of plants in subsurface flow constructed wetlands	Ch. 17, pages 183-196 in Ecological Engineering for Wastewater Treatment. C. Etnier and B Guterstam, editors.2nd Edition. CRC Press	1997	0	Constructed Wetlands	1	0	0
Kadlec, R.H. and R.L. Knight	Wetland Treatment System Inventory	Ch. 26 in Treatment Wetlands, Lewis Publishers, pp. 717-737	1996	0	Constructed Wetlands	Throughout US	1	0
Kadlec, R.H., C.C. Tanner, V.M. Hally, and M.M. Gibbs	Nitrogen spiraling in subsurface-flow constructed wetlands: implications for treatment response	Ecological Engineering 25, pp. 365-381	2005	1	Constructed Wetlands	1	1	1
Kadlec, R.H., R. Axler, B. McCarthy, and J. Henneck	Subsurface treatment wetlands in the cold climate of Minnesota	Ch. 2 in Constructed Wetlands for Wastewater Treatment in Cold Climates U Mander and PD Jenssen, eds. WIT Press, Southampton, Boston	2003	0	Constructed Wetlands	1	1	1
Knight, R.L., R.W. Ruble, R.H. Kadlec and S. Reed	Wetlands for Wastewater Treatment: Performance Database	Ch. 4 in Constructed Wetlands for Water Quality Improvement. GA Moshiri, Ed. Lewis Publishing Boca Raton	1993	0	Constructed Wetlands	1	1	0
Lund, L.J., A.J. Horne, and A.E. Williams	Estimating denitrification in a large constructed wetland using stable nitrogen isotope ratios	Ecological Engineering 14, pp. 67-76.	2000	1	Constructed Wetlands	0	1	1
Mitsch, W.J., L. Zhang, C.J. Anderson, A.E. Altor, and M.E. Hernandez	Creating riverine wetlands: Ecological succession, nutrient retention, and pulsing effects	Ecological Engineering 25, pp. 510-527	2005	0	Constructed Wetlands	1	1	1

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Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Newman, J., J.C. Clausen, and J.A. Neafsey	Seasonal performance of a wetland constructed to process dairy milkhouse wastewater in Connecticut	Ecological Engineering 14:181-198	2000	1	Constructed Wetlands	1	1	1
Obarska-Pempkowiak, H.	Seasonal variations in the efficiency of nutrient removal from domestic effluent in a quasi-natural field of reeds (Phragmites australis)	Ch. 19, pages 207-216 in Ecological Engineering for Wastewater Treatment. 2nd Edition	1997	0	Constructed Wetlands	0	1	1
Phipps, R.C. and W.G. Crumpton	Factors affecting nitrogen loss in experimental wetlands with different hydrologic loads	Ecological Engineering 3, pp. 399-408	1994	1	Constructed Wetlands	1	1	1
Schipper, L.A. and M. Vojvodic-Vukovic	Nitrate removal from groundwater and denitrification rates in a porous treatment wall amended with sawdust	Ecological Engineering 14, pp. 269-278	2000	1	Constructed Wetlands	0	1	0
Spiels, D.J. and W.J. Mitsch	The effects of season and hydrologic and chemical loading on nitrate retention in constructed wetlands: a comparison of low- and high-nutrient riverine systems	Ecological Engineering 14, pp. 77-91	2000	1	Constructed Wetlands	1	1	1
Steiner G.R. and D.W. Combs	Small constructed wetlands systems for domestic wastewater treatment and their performance	Ch. 54 in Constructed Wetlands for Water Quality Improvement, GA Moshiri, Ed. CRC Press	1993	0	Constructed Wetlands	0	1	1
Sunblad, K. and Hans-B. Wittgren	Wastewater nutrient removal and recovery in an infiltration wetland	Ch. 18, pages 197-214 in Ecological Engineering for Wastewater Treatment. 2nd Edition. C. Etnier and B Guterstam. CRC Press.	1997	0	Constructed Wetlands	1	1	0
Tittleton, R.P., F.G. Howell, and R.P. Reaves	Performance of a constructed marsh in the tertiary treatment of bleach Kraft pulp mill effluent: results of a 2-year pilot project	Ch. 46 in Constructed Wetlands for Water Quality Improvement. GA Moshiri, Ed. Lewis Publishers Boca Raton	1993	0	Constructed Wetlands	1	1	1
Toet, S., R.S.P. van Logtestijn, R. Kampf, R. Schreijr, and J.T.A. Verhoeven	The effect of hydraulic retention time on the removal of pollutants from sewage treatment plant effluent in a surface-flow wetland system	Wetlands 25(2), pp. 375-391	2005	1	Constructed Wetlands	1	1	1
Hurd, T.M. and D.J. Raynal	Comparison of nitrogen solute concentrations within Alder (Alnus incana, ssp rugosa) and non-alder wetlands	Hydrological Processes 18, pp. 2681-2697	2004	1	Emergent Shrub-Scrub	1	1	1
Hurd, T.M., D.J. Raynal, and C.R. Schwintzer	Symbiotic fixation of Alnus incana ssp. rugosa in shrub wetlands of the Adirondack mountains, New York, USA	Oecologia 126, pp. 94-103	2001	1	Emergent Shrub-Scrub	1	1	1
Hurd, T.M., K. Gokkaya, B..D Kiernan, and D.J. Raynal	Nitrogen sources in Adirondack wetlands dominated by nitrogen-fixing shrubs	Wetlands 25(1), pp. 192-199	2005	1	Emergent Shrub-Scrub	1	1	1
Kao J.T., J.E. Titus, and W-X. Zhu	Differential nitrogen and phosphorus retention by five wetland plant species	Wetlands 23(4), pp. 979–987	2003	1	Emergent Shrub-Scrub	1	1	0
Kiernan, B.D., T.M. Hurd and D.J. Raynal	Abundance of Alnus incana ssp. Rugosa in Adirondack Mountain shrub wetlands and its influence on inorganic nitrogen	Environmental Pollution 123, pp. 347-357	2003	1	Emergent Shrub-Scrub	1	1	0
Moore, D.R.J., P.A. Keddy, C.L. Gaudet and I.C. Wisheu	Conservation of wetlands: do infertile wetlands deserve a higher priority	Biological Conservation 47:203-217.	1989	1	Emergent shrub-scrub	1	0	0
Bowden, W.B.	Nitrogen and phosphorus in the sediments of a tidal, freshwater marsh in Massachusetts	Estuaries 7(2), pp. 108-118	1984	1	Estuaries	1	1	0
Bowden, W.B.	Nitrification, nitrate reduction, and nitrogen immobilization in a tidal freshwater marsh sediment	Ecology 67(1), pp. 88-99	1986	1	Estuaries	1	1	1
Nowicki, B.L.	The effect of temperature, oxygen, salinity, and nutrient enrichment on estuarine denitrification rates measured with a modified nitrogen gas flux technique	Estuarine, Coastal, and Shelf Science 38, pp. 137-156	1994	1	Estuaries	1	0	1

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Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Ogilvie, B., Nedwell, D.B., Harrison, R.M., Robinson, A., and A. Sage	High nitrate, muddy estuaries as nitrogen sinks: the nitrogen budget of the River Colne estuary (United Kingdom)	Marine Ecology Progress Series 150, pp. 217-228	1997	0	Estuaries	1	1	0
Reay, W.G., Gallagher, D.L., and G.M. Simmons Jr.	Sediment-water column oxygen and nutrient fluxes in nearshore environments of the lower Delmarva Peninsula, USA	Marine Ecology Progress Series 118, pp. 215-227	1995	0	Estuaries	1	1	1
Risgaard-Petersen, N.	Coupled nitrification-denitrification in autotrophic and heterotrophic estuarine sediments: On the influence of benthic microalgae	Limnology and Oceanography 48(1), pp. 93-105	2003	1	Estuaries	0	0	0
Seitzinger, S., Nixon, S., Pilson, M.E.Q., and S. Burke	Denitrification and N2O production in near-shore marine sediments	Geochimica et Cosmochimica Acta 44, pp. 1853-1860	1980	1	Estuaries	1	0	0
Seitzinger, S.P.	Denitrification in freshwater and coastal marine ecosystems: Ecological and geochemical significance	Limnology and Oceanography 33(4), pp. 702-724	1988	1	Estuaries	1	0	0
Seitzinger, S.P., and S.W. Nixon	Eutrophication and the rate of denitrification and N20 production in coastal marine sediments	Limnology and Oceanography 30(6), pp. 1332-1339	1985	1	Estuaries	1	1	1
Shaver, G.R. and J.M. Melillo	Nutrient budgets of marsh plants: efficiency concepts and relation to availability	Ecology 65(5), pp. 1491-1510	1984	1	Estuaries	1	0	0
Aber, J.D., A. Magill, R.D. Boone, J.M. Melillo, P. Steudler and R. Bowden	Plant and soil responses to chronic nitrogen additions at the Harvard forest, Massachusetts	Ecological Applications 3(1), pp. 156-166	1993	1	Forested Watersheds	1	1	0
Aber, J.D., A. Magill, S.G. McNulty, R.D. Boone, K.J. Nadelhoffer, M. Downs and R. Hallett	Forest biogeochemistry and primary production altered by nitrogen saturation	Water, Air, and Soil Pollution 85:1665-1670	1995	0	Forested Watersheds	1	0	0
Aber, J.D., J.M. Melillo, K.J. Nadelhoffer, J. Pastor and R.D. Boone	Factors controlling nitrogen cycling and nitrogen saturation in northern temperate forest ecosystems	Ecological Applications 1(3), pp. 303-315	1991	1	Forested Watersheds	1	0	0
Aber, J.D., K.J. Nadelhoffer, P. Steudler and J. Melillo	Nitrogen saturation in forest ecosystems	Bioscience 39(6), pp. 378-386	1989	1	Forested Watersheds	1	0	0
Aber, J.D., S.V. Olliner and C.T. Driscoll	Modeling nitrogen saturation in forest ecosystems in response to land use and atmospheric deposition	Ecological Modelling 101, pp. 67-78	1997	1	Forested Watersheds	1	0	0
Aber, J.D., W. McDowell, K.J. Nadelhoffer, A. Magill, G. Berntson, M. Kamakea, S. McNulty, W. Currie, L. Rustad, and I. Fernandez	Nitrogen saturation in forest ecosystems: hypotheses revisited	Bioscience 48(11), pp. 921-934	1998	1	Forested Watersheds	1	0	0
Addy, K., A.J. Gold, P.M. Groffman and P.A. Jacinthe	Ground water nitrate removal in subsoil of forested and mowed riparian buffer zones.	Journal of Environmental Quality 28, pp. 962-970	1999	1	Forested Watersheds	1	0	1
Berntson, G.M. and J.D. Aber	Fast nitrate immobilization in N saturated temperate forest soils	Soil Biology and Biochemistry 32, pp. 151-156	2000	1	Forested Watersheds	1	1	0
Bischoff, J.M., P. Bukaveckas, M.J. Mitchell and T. Hurd	N Storage and cycling in vegetation of a forested wetland: implications for watershed N processing	Water, Air, and Soil Pollution 128, pp. 97-114	2001	0	Forested Watersheds	1	1	1
Brettar I. and M.G. Hofle	Close correlation between the nitrate elimination rate by denitrification and the organic matter content in hardwood forest soils of the upper Rhine floodplain (France)	Wetlands 22(2), pp. 214-224	2002	1	Forested Watersheds	1	1	0
Campbell, J.L., Hornbeck, J.W., Mitchell, M.J., Adams, M., Castro, M.S., Driscoll, C.T., Kahl, J.S., Kochenderfer, J.N., Likens, G.E., Lynch, J.A., Murdoch, P.S., Nelson, S.J., and J.B. Shanley	Input-output budgets of inorganic nitrogen for 24 forest watersheds in the northeastern United States: a review	Water, Air, and Soil Pollution 151, pp. 373-396	2004	1	Forested Watersheds	1	0	0
Compton, J.E., Boone, R.D. Motzkin G. and Foster, D.R.	Soil carbon and nitrogen in a pine-oak sand plain in central Massachusetts: role of vegetation and land use history	Oecologia 116, pp. 536-542	1998	0	Forested Watersheds	1	1	0

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Currie, W.S. and K.J. Nadelhoffer	Dynamic redistribution of isotopically labeled cohorts of nitrogen in two temperate forests	Ecosystems 2, pp. 4-18	1999	1	Forested Watersheds	1	1	0
Currie, W.S. and K.J. Nadelhoffer	The imprint of land use history: patterns of carbon and nitrogen in downed woody debris at the Harvard Forest	Ecosystems 5, pp. 446-460	2002	1	Forested Watersheds	1	1	0
Dail, D.B., E.A. Davidson and J. Chorover	Rapid abiotic transformation of nitrate in an acid forest soil	Biogeochemistry 54, pp. 131–146	2001	1	Forested Watersheds	1	1	0
Fenn, M.E., M.A. Poth, J.D. Aber, J.S. Baron, B.T. Bormann, D.W. Johnson, A.D. Lemly, S.G. McNulty, D.F. Ryan, and R. Stottlemyer	Nitrogen excess in North American Ecosystems: Predisposing factors, ecosystem responses, and management strategies	Ecological Applications 8(3), pp. 706-733	1998	1	Forested Watersheds	1	0	0
Flite, O.P., R.D. Shannon, R.R. Schnabel, and R.R. Parizek	Nitrate removal in a riparian wetland of the Appalachian valley and ridge physiographic province	Journal of Environmental Quality 30, pp. 254-261	2001	1	Forested Watersheds	1	1	1
Goodale, C.L., K. Lajtha, K.J. Nadelhoffer, E.W. Boyer and N.A. Jaworski	Forest nitrogen sinks in large eastern US watersheds: estimates from forest inventory and an ecosystem model	Biogeochemistry 57/58, pp. 239-266	2002	1	Forested Watersheds	1	1	0
Hill, A.R., Kemp, W.A., Buttle, J.M., and D. Goodyear	Nitrogen chemistry of subsurface storm runoff on forested Canadian Shield hillslopes	Water Resources Research 35(3), pp. 811-821	1999	1	Forested Watersheds	1	1	0
Hunter, R.G. and S.P. Faulkner	Denitrification potentials in restored and natural bottomland hardwood wetlands	Soil Science Society of America Journal 65, pp. 1865-1872	2001	0	Forested Watersheds	0	1	0
Ito, M., M.J. Mitchell, C.T. Driscoll and K.M. Roy	Nitrogen input-output budgets for lake-containing watersheds in the Adirondack Region in New York	Biogeochemistry 72, pp. 283-314	2005	1	Forested Watersheds	1	1	1
Jacks, G., Joelsson, A., and S. Fleischer	Nitrogen retention in forested wetlands	Ambio 23(6), pp. 358-362	1994	0	Forested Watersheds	1	1	0
Lewis, W.M.	Yield of nitrogen from minimally disturbed watersheds of the United States	Biogeochemistry 57/58, pp. 375-385	2002	1	Forested Watersheds	1	1	0
Magill, A.M., J.D. Aber, G.M. Berntson, W.H. McDowell, K.J. Nadelhoffer, J.M. Melillo, and P. Steudler	Long-term nitrogen additions and nitrogen saturation in two temperate forests	Ecosystems 3, pp. 238-253	2000	1	Forested Watersheds	1	1	0
McHale, M.R., McDonnell, J.J., Mitchell, M.J., and C.P. Cirmo	A field-based study of soil water and groundwater nitrate release in an Adirondack forested watershed	Water Resources Research 38(4), pp. 1031	2002	1	Forested Watersheds	1	1	0
Mitchell, M.J., C.T. Driscoll, J.S. Owen, D. Schaefer, R. Michener, and D.J. Raynal	Nitrogen biogeochemistry of three hardwood ecosystems in the Adirondack region of New York	Biogeochemistry 56(2), pp. 93-133	2001	1	Forested Watersheds	1	1	0
Mitchell, M.J., C.T. Driscoll, S. Inamdar, G.G. McGee, M.O. Mbila and D.J. Raynal	Nitrogen biogeochemistry in the Adirondack Mountains of New York: hardwood ecosystems and associated surface waters	Environmental Pollution 123, pp. 355-364	2003	1	Forested Watersheds	1	1	0
Nadelhoffer, K.J., M. Downs, B. Fry, A. Magill and J. Aber	Controls on N retention and exports in a forested watershed	Environmental Monitoring and Assessment 55, pp. 187-210	1999	1	Forested Watersheds	1	1	0
Nelson W.M., A.J. Gold, and P.M. Groffman	Spatial and Temporal Variation in Groundwater Nitrate Removal in a Riparian Forest	Journal of Environmental Quality 24, pp. 691-699	1995	1	Forested Watersheds	1	1	0
Perakis, S.S., J.E. Compton and L.O. Hedin	Nitrogen retention across a gradient of 15N additions to unpolluted forest soil in Chile.	Ecology 86(1), pp. 96-105	2005	1	Forested Watersheds	0	1	0
Rotkin-Ellman, M., K. Addy, A.J. Gold, and P.M. Groffman	Tree species, root decomposition, and subsurface denitrification potential in riparian wetlands.	Plant and Soil 263, pp. 335-344	2004	1	Forested Watersheds	1	1	0
Seely B., K. Lajtha and G.D. Salvucci	Transformation and retention of nitrogen in a coastal forest ecosystem	Biogeochemistry 42, pp. 325-343	1998	0	Forested Watersheds	1	1	0
Jacinthe, P.A., P.M. Groffman, A.J. Gold, and A. Mosier	Patchiness in microbial nitrogen transformations in groundwater in a riparian forest	Journal of Environmental Quality 27, pp. 156-164	1998	1	Forested Watersheds	1	1	1
Bartlett, M.S., Brown, L.C., Hanes, N.B., and N.H. Nickerson	Denitrification in freshwater wetland soil	Journal of Environmental Quality 8(4), pp. 460-464	1979	0	Freshwater emergent	1	0	0

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Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Bernard, J.M. and G. Hankinson	Seasonal changes in standing crop, primary production, and nutrient levels in a Carex rostrata wetland	Oikos 32, pp. 328-336	1979	0	Freshwater emergent	1	1	0
DeSimone L.A. and B.L. Howes	Nitrogen transport and transformations in a shallow aquifer receiving wastewater discharge: A mass balance approach	Water Resources Research 34(2), pp. 271-285	1998	0	Mixed-Use Watersheds	1	1	1
Howes B., J.S. Ramsey, S.W. Kelley, R. Samimy, D. Schlezinger, E. Eichner	Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Great/Perch Pond, Green Pond, and Bournes Pond, Falmouth, Massachusetts	Massachusetts Estuaries Project, Massachusetts Department of Environmental Protection, Boston, MA. 205 pp + Executive Summary, 11 pp	2005	1	Mixed-Use Watersheds	1	1	1
Krieger, K.A.	Effectiveness of a coastal wetland in reducing pollution of a Laurentian Great Lake: hydrology, sediment, and nutrients	Wetlands 23(4), pp. 778-791	2003	1	Mixed-Use Watersheds	1	1	1
Lajtha,K. et al.	Retention and leaching losses of atmospherically-derived nitrogen in the aggrading coastal watershed of Waquoit Bay, MA	Biogeochemistry 28, pp. 33-54	1995	1	Mixed-Use Watersheds	1	1	0
Nowicki, B.L., E. Requintina, D. Van Keuren, and J. Portnoy	The role of sediment denitrification in reducing groundwater-derived nitrate inputs to Nauset Marsh Estuary, Cape Cod, Massachusetts	Estuaries 22(2A), pp. 245-259	1999	1	Mixed-Use Watersheds	1	1	1
Weiskel P.K. and B.L. Howes	Differential transport of sewage-derived nitrogen and phosphorus through a coastal watershed.	Environmental Science and Technology 26(2), pp. 352-368	1992	0	Mixed-Use Watersheds	1	0	0
Alexander, R.B., P.B. Johnes, E.W. Boyer and R.A. Smith	A comparison of models for estimating the riverine export of nitrogen from large watersheds	Biogeochemistry 57/58, pp. 295-339	2002	1	Modeled Wetlands	0	0	0
Arheimer B. and H.B. Wittgren	Modelling the effects of wetlands on regional nitrogen transport	Ambio 23(6), pp. 378-386	1994	0	Modeled Wetlands	1	0	0
Bowen, J., and I. Valiela	Nitrogen loads to estuaries: using models to assess the effectiveness of management options to restore estuarine water quality	Estuaries 27, pp. 482-500	2004	1	Modeled Wetlands	1	1	1
Dorge, J.	Modelling nitrogen transformations in freshwater wetlands. Estimating nitrogen retention and removal in natural wetlands in relation to their hydrology and nutrient loadings	Ecological Modelling 75/76, pp. 409-420	1994	1	Modeled Wetlands	0	0	0
Hicks, D.M. and J.A. Moore	Modeling nitrogen dynamics in treatment wetlands: the use of plant efficiency concepts	Research & Extension Regional Water Quality Conference	2002	1	Modeled Wetlands	0	0	0
Johnes, P.J.	Evaluation and management of the impact of land use change on nitrogen and phosphorus load delivered to surface waters: the export coefficient modelling approach	Journal of Hydrology 183, pp. 323-349	1996	1	Modeled Wetlands	0	0	0
Johnes, P.J. and D. Butterfield	Landscape, regional, and global estimates of nitrogen flux from land to sea: errors and uncertainties	Biogeochemistry 57/58, pp. 429-476	2002	1	Modeled Wetlands	0	0	0
Valiela, I., J. Bowen and K. Kroeger	Assessment of models for estimation of land-derived nitrogen loads to shallow estuaries	Applied Geochemistry 17, pp. 935-953	2002	1	Modeled Wetlands	0	0	0
Schwintzer, C.R.	Nitrogen fixation by Myrica gale root nodules in a Massachusetts wetland	Oecologia 43, pp. 283-294	1979	0	Bogs, Fens, Peatlands	1	1	1
Bowden, W.B.	The biogeochemistry of nitrogen in freshwater wetlands	Biogeochemistry 4, pp. 313-348	1987	1	Reviews	1	0	0
Galloway, J.N., J.D. Aber, J.W. Erisman, S.P. Seitzinger, R.W. Howarth, E.W. Cowling, and J. Cosby	The nitrogen cascade	Bioscience 53(4), pp. 341-356	2003	1	Reviews	0	0	0
Howard-Williams, C.	Cycling and retention of nitrogen and phosphorus in wetlands: a theoretical and applied perspective	Freshwater Biology 15, pp. 391-431	1985	0	Reviews	0	0	0
Jansson, M.R. Andersson, H. Berggren, and L. Leonardson	Wetlands and lakes as nitrogen traps	Ambio 23(6), pp. 320-325	1994	0	Reviews	0	0	0

Nitrogen Attenuation Literature

Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Johnston, C., T. Johnson, M. Kuehl, D. Taylor, and J. Westman	The effects of freshwater wetlands on water quality: a compilation of literature values	Report prepared for the Environmental Protection Agency November 15, 1990	1990	Throughout US	Reviews	1	0	0
Johnston, C.A.	Sediment and nutrient retention by freshwater wetlands: effects on surface water quality	Critical Reviews in Environmental Control 21(5,6), pp. 491-565	1991	0	Reviews	1	0	0
Johnston, C.A.	Mechanisms of wetland water quality interaction	Ch. 30 in Constructed Wetlands for Water Quality Improvement. GA Moshiri, Ed. Lewis Publishers Boca Raton	1993	0	Reviews	1	0	0
Reddy, K.R. and W.H. Patrick	Nitrogen transformations and loss in flooded soils and sediments	Critical Reviews in Environmental Control 13(4), pp. 273-302	1984	0	Reviews	1	0	0
Stoddard, J.L.	Long-term changes in watershed retention of nitrogen	Ch. 8 in Environmental Chemistry of Lakes and Reservoirs. LA Baker, Ed. Advances in Chemistry Series #237. American Chemical Society, Washington, DC.	1994	0	Reviews	1	0	0
Straughan Environmental Services Inc.	Literature Review: Nitrogen Sequestration in Headwater Streams	Prepared for Christine Conn Maryland Department of Natural Resources	2003	1	Reviews	1	0	0
vanBreeman, N., E.W. Boyer, C.L. Goodale, N.A. Jaworski, K. Paustian, S.P. Seitzinger, K. Lajtha, B. Mayer, D. VanDam, R. Howarth, K.J. Nadelhoffer, M. Eve, and G. Billen	Where did all the nitrogen go? Fate of nitrogen inputs to large watersheds of the northeastern USA	Biogeochemistry 57/58, pp. 267-293	2002	1	Reviews	1	1	0
Addy, K., D.Q. Kellog, A.J. Gold, P.M. Groffman, G. Ferendo and C. Sawer	In situ push-pull method to determine ground water denitrification in riparian zones	Journal of Environmental Quality 31, pp. 1017-1042.	2002	1	Riparian Zones	1	1	0
Burns, D.A.	Retention of NO3- in an upland stream environment: a mass balance approach	Biogeochemistry 40, pp. 73-96	1998	1	Riparian Zones	1	1	0
Casey, R.E. and S.J. Klaine	Nutrient attenuation by a riparian wetland during natural and artificial runoff events	Journal of Environmental Quality 30, pp. 1720–1731	2001	1	Riparian Zones	0	1	0
Cirmo, C.P., and J.J. McDonnell	Linking the hydrologic and biogeochemical controls of nitrogen transport in near-stream zones of temperate -forested catchments: a review.	Journal of Hydrology 199, pp. 88-120	1997	1	Riparian Zones	1	0	0
Forshay, K.J. and E.H. Stanley	Rapid nitrate loss and denitrification in a temperate river floodplain	Biogeochemistry 75, pp. 43-64	2005	1	Riparian Zones	1	1	0
Gold, A.J., P.M. Jacinthe, W.R. Wright and R.H. Puffer	Patchiness in groundwater nitrate removal in a riparian forest	Journal of Environmental Quality 27, pp. 147-155	1998	1	Riparian Zones	1	1	1
Kellog, D.Q., A.J. Gold, P.M. Groffman, K. Addy, H. Stolt, and G. Blazejewski	In-situ ground water denitrification in stratified, permeable soils underlying riparian wetlands.	Journal of Environmental Quality 34, pp. 524-533	2005	1	Riparian Zones	1	1	0
Mander U., V. Kuusements, D. Lohmus, and T. Mauring	Efficiency and dimensioning of riparian buffer zones in agricultural catchments	Ecological Engineering 8, pp. 299-324	1997	1	Riparian Zones	1	0	0
Mayer, PM, SK Reynolds, and TJ Canfield.	Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations.	EPA 600/R-05/118. October.	2005	1	Riparian Zones	1	1	1
Mitsch, W.J. and Reeder, B. C.	Nutrient and hydrologic budgets of a Great Lakes coastal freshwater wetland during a drought year	Wetlands Ecology and Management 1(4), pp. 211-222	1992	1	Riparian Zones	1	1	1
Pinay, G., Roques, L., and A. Fabre	Spatial and temporal patterns of denitrification in a riparian forest	Journal of Applied Ecology 30, pp. 581-591	1993	1	Riparian Zones	1	0	0

Nitrogen Attenuation Literature

Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Rosenblatt, A.E., A.J. Gold, M.H. Stolt, P.M. Groffman, and D.Q. Kellog	Identifying riparian sinks for watershed nitrate using soil surveys	Journal of Environmental Quality 30, pp. 1596-1604	2001	1	Riparian Zones	1	0	0
Vought, L.B-M., J. Dahl, C.L. Pedersen, and J.O. Lacoursiere	Nutrient retention in riparian ecotones	Ambio 23(6), pp. 342-347	1994	0	Riparian Zones	1	1	0
Bertness, M.D., P.J. Ewanchuk, and B.R. Silliman.	Anthropogenic Modification of New England Salt Marsh Landscapes.	Proceedings of the National Academy of Science 99:1395-1398.	2002	1	Salt Marshes, Mudflats	1	1	0
Emery, N, P Ewanchuk, and MD Bertness. Ecology 82(9): 2471-2485.	Competition and salt-marsh plant zonation: stress tolerators may be dominant competitors.	Ecology 82(9): 2471-2485.	2001	1	Salt Marshes, Mudflats	1	1	0
Silliman, B. R. and M. D. Bertness.	Shoreline Development Drives the Invasion of Phragmites australis and the Loss of New England Salt Marsh Plant Diversity.	Conservation Biology 18: 1424- 1434	2004	1	Salt Marshes, Mudflats	1	1	0
Wigand, C., McKinney, R., Chintala, M., Charpentier, M., and G. Thursby.	Relationships of nitrogen loadings, residential development, and physical characteristics with plant structure in New England salt marshes.	Estuaries 26(6): 1494-1504	2003	1	Salt Marshes, Mudflats	1	1	1
Addy, K., A. Gold, B. Nowicki, J. McKenna, M. Stolt, and P. Groffman	Denitrification capacity in a subterranean estuary below a Rhode Island fringing salt marsh.	Estuaries 2(6), pp. 896-908	2005	1	Salt Marshes, Mudflats	1	1	1
Cabrita, M.T. and V. Brotas	Seasonal variation in denitrification and dissolved nitrogen fluxes in intertidal sediments of the Tagus estuary, Portugal	Marine Ecology Progress Series 202, pp. 51-65	2000	1	Salt Marshes, Mudflats	0	1	1
Dausse, A., Merot, P., Bouzille, J.-B., Bonis, A., and J.-C. Lefeuvre	Variability of nutrient and particulate matter fluxes between the sea and a polder after partial tidal restoration, Northwestern France	Estuarine, Coastal, and Shelf Science 64, pp. 295-306	2005	1	Salt Marshes, Mudflats	1	1	1
Davis, J.L., Nowicki, B., and C. Wigand	Denitrification in fringing salt marshes of Narragansett Bay, Rhode Island, USA	Wetlands 24(4), pp. 870-878	2004	1	Salt Marshes, Mudflats	1	1	0
Findlay, S.E.G., S. Dye, and K.A. Kuehn	Microbial growth and nitrogen retention in litter of *Phragmites australis* compared to *Typha augustifolia*	Wetlands 22(3), pp. 616–625	2002	1	Salt Marshes, Mudflats	1	1	1
Hamersley, M.R. and B.L. Howes	Contribution of denitrification to nitrogen, carbon, and oxygen cycling in tidal creek sediments of a New England salt marsh	Marine Ecology Progress Series 262, pp. 55-69	2003	1	Salt Marshes, Mudflats	1	1	1
Hamersley, M.R. and B.L. Howes	Nitrogen fluxes and mitigation strategies in the Audubon Skunknett River Wildlife Sanctuary	Report to the Town of Barnstable April 27, 2004	2004	0	Salt Marshes, Mudflats	1	1	1
Howes, B.L., Weiskel, P.K., Goehringer, D.D., and J.M. Teal	Interception of freshwater and nitrogen transport from uplands to coastal waters: the role of salt marshes	Pp. 287-310 in Nordstrom, K.F. and C.T. Roman, eds. Estuarine Shores: Environmental and Human Alterations. John Wiley and Sons Ltd	1996	0	Salt Marshes, Mudflats	1	1	1
Hussein, A.H. and M.C. Rabenhorst	Modeling of nitrogen sequestration in coastal salt marsh soils	Soil Science Society of America Journal 66, pp. 324-330	2002	1	Salt Marshes, Mudflats	0	1	0
Jordan, T.E., Correll, D.L., and D.F. Whigham	Nutrient flux in the Rhode River: tidal exchange of nutrients by brackish marshes	Estuarine, Coastal and Shelf Science 17, pp. 651-667	1983	1	Salt Marshes, Mudflats	0	1	1
Kaplan, W., Valiela, I., and J.M. Teal	Denitrification in a salt marsh ecosystem	Limnology and Oceanography 24(4), pp. 726-734	1979	1	Salt Marshes, Mudflats	1	1	0
Mortimer, R.J.G, Davey, J.T., Krom, M.D., Watson, P.G., Frickers, P.E., and R.J. Clifton	The effect of macrofauna on the porewater profiles and nutrient fluxes in the intertidal zone of the Humber Estuary	Estuarine, Coastal and Shelf Science 48, pp. 683-699	1999	1	Salt Marshes, Mudflats	1	1	1
Mortimer, R.J.G., Krom, M.D., Watson, P.G., Frickers, P.E., Davey, J.T., and R.J. Clifton	Sediment-water exchange of nutrients in the intertidal zone of the Humber Estuary, UK	Marine Pollution Bulletin 37(3-7), pp. 261-279	1999	1	Salt Marshes, Mudflats	1	1	0
Owens, N.J.P. and W.D.P. Stewart	Enteromorpha and the cycling of nitrogen in a small estuary	Estuarine, Coastal and Shelf Science 17, pp. 287-296	1983	1	Salt Marshes, Mudflats	1	1	1
Portnoy, J., B.L. Nowicki, C.T. Roman, and D.W. Urish	The discharge of nitrate-contaminated groundwater from developed shoreline to marsh-fringed estuary	Water Resources Research 34(2), pp. 3095-3104	1998	1	Salt Marshes, Mudflats	1	1	1
Sakamaki, T., Nishimura, O., and R. Sudo	Tidal time-scale variation in nutrient flux across the sediment-water interface of an estuarine tidal flat	Estuarine, Coastal and Shelf Science 67, pp. 653-663	2006	1	Salt Marshes, Mudflats	0	1	1

Nitrogen Attenuation Literature

Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Thompson, S.P., Paerl, H.W., and M.C. Go	Seasonal patterns of nitrification and denitrification in a natural and a restored marsh	Estuaries 18(2), pp. 399-408	1995	1	Salt Marshes, Mudflats	0	1	0
White, D.S. and B.L. Howes	Long-term 15N-nitrogen retention in the vegetated sediments of a New England salt marsh	Limnology and Oceanography 39(8), pp. 1878-1892	1994	1	Salt Marshes, Mudflats	1	1	0
Ahlgren, I., F. Sorensson, T. Waara, and K. Vrede	Nitrogen budgets in relation to microbial transformations in lakes	Ambio 23(6), pp. 367-377	1994	0	Streams, Rivers, Lakes	1	1	1
Alexander, R.B., R.A. Smith, and G.E. Schwarz	Effect of stream channel size on the delivery of nitrogen to the Gulf of Mexico	Nature 403, pp. 758-761	2000	1	Streams, Rivers, Lakes	0	0	0
Bernhardt, E., R.O. Hall, and G.E. Likens	Whole-system estimates of nitrification and nitrate uptake in streams of the Hubbard Brook experimental forest	Ecosystems 5, pp. 419-430	2002	1	Streams, Rivers, Lakes	1	1	0
Bernot, M.J. and W.K. Dodds	Nitrogen retention, removal, and saturation in lotic ecosystems	Ecosystems 8, pp. 442-453	2005	1	Streams, Rivers, Lakes	0	1	0
Boulton, A.J., S. Findlay, P. Marmonier, E.H. Stanley, and H.M. Valett	The functional significance of the hyporheic zone in streams and rivers	Annual Review of Ecology and Systematics 29, pp. 59-81	1998	1	Streams, Rivers, Lakes	1	0	0
Boyer, E., C.L. Goodale, N.A. Jaworski, and R.W. Howarth	Anthropogenic nitrogen sources and relationships to riverine nitrogen export in the Northeastern USA	Biogeochemistry 57/58, pp. 137-169	2002	1	Streams, Rivers, Lakes	1	1	0
Dillon, P.J. and L.A. Molot	The role of ammonium and nitrate retention in the acidification of lakes and forested catchments	Biogeochemistry 11, pp. 23-43	1990	1	Streams, Rivers, Lakes	1	1	1
Gergel, S.E., S.R. Carpenter, and E.H. Stanley	Do dams and levees impact nitrogen cycling? Simulating the effects of flood alterations on floodplain denitrification	Global Change Biology 11, pp. 1352-1367	2005	1	Streams, Rivers, Lakes	0	1	0
Goodale, C.L., J.D. Aber, and W. McDowell	The long-term effects of disturbance on organic and inorganic nitrogen export in the White Mountains, New Hampshire	Ecosystems 3, pp. 433-450	2000	1	Streams, Rivers, Lakes	1	1	0
Grimm, N.B., R.W. Sheibley, C.L. Crenshaw, C.N. Dahm, W.J. Roach, and L.H. Zeglin	N retention and transformation in urban streams	Journal of the American Benthological Society 24(3), pp. 626-642	2005	1	Streams, Rivers, Lakes	0	1	1
Hall, R.O., E.S. Bernhardt, and G.E. Likens	Relating nutrient uptake with transient storage in forested mountain streams	Limnology and Oceanography 47(1), pp. 255-165	2002	1	Streams, Rivers, Lakes	1	1	1
Hamilton, S.K., J.L. Tank, D.F. Raiko, W.M. Wollheim, B.J. Peterson, and J.R. Webster	Nitrogen uptake and transformation in a Midwestern U.S. stream: a stable isotope enrichment study	Biogeochemistry 54, pp. 297-340	2001	1	Streams, Rivers, Lakes	0	1	1
Hill, A.R. and K. Sanmugadas	Denitrification rates in relations to stream sediment characteristics	Water Research 19(12), pp. 1579-1586	1985	1	Streams, Rivers, Lakes	1	1	1
Hill, A.R., P.G.F. Vidon, and J. Langat	Denitrification potential in relation to lithology in five headwater riparian zones	Journal of Environmental Quality 33, pp. 911-919	2004	1	Streams, Rivers, Lakes	0	1	0
Jansson M.R., L. Leonardson, and J. Fejes	Denitrification and nitrogen retention in a farmland stream in southern Sweden	Ambio 23(6), pp. 326-331	1994	0	Streams, Rivers, Lakes	1	1	1
Lovett, G.M., K.C. Weathers, and W.B. Sobczak	Nitrogen saturation and retention in the forested watersheds of the Catskill Mountains, New York	Ecological Applications 10(1), pp. 73-84	2000	1	Streams, Rivers, Lakes	1	1	1
Mulholland, P.J.	Regulation of nutrient concentrations in a temperate forest stream: roles of upland, riparian, and in-stream processes	Limnology and Oceanography 37(7), pp. 1512-1526	1992	1	Streams, Rivers, Lakes	0	1	1
Mulholland, P.J., Tank, J.L., Sanzone, D.M., Wollheim, W.M., Peterson, B.J., Webster, J.R., and J.L. Meyer	Nitrogen cycling in a forest stream determined by a 15-N tracer addition	Ecological Monographs 70(3), pp. 471-493	2000	1	Streams, Rivers, Lakes	1	1	1
Peterson, B.J., W.M. Wollheim, P.J. Mulholland, J.R. Webster, J.L. Meyer, J.L. Tank, E. Marti, W.B. Bowden, H.M. Valett, A.E. Hershey, W.H. McDowell, W.K. Dodds, S.K. Hamilton, S. Gregory, and D.D. Morall	Control of nitrogen export from watersheds by headwater streams	Science 292, pp. 86-90	2001	1	Streams, Rivers, Lakes	1	0	0

Nitrogen Attenuation Literature

Authors	Title	Citation	Year	Electronic copy provided?	Wetland type	Climate similar or same as MA?	Size	Depth
Rysgaard, S., Risgaard-Petersen, N., Sloth, N.P., Jensen, K., and Nielsen, L.P.	Oxygen regulation of nitrification and denitrification in sediments	Limnology and Oceanography 39(7), pp. 1643-1652	1994	1	Streams, Rivers, Lakes	0	0	0
Saunders, D.L. and J. Kalff	Nitrogen retention in wetlands, lakes, and rivers	Hydrobiologia 443, pp. 202-212	2001	1	Streams, Rivers, Lakes	1	0	0
Seitzinger S.P., R.V. Styles, E.W. Boyer, R.B. Alexander, G.H. Billen, R.W. Howarth, B. Mayer, and N. Van Breeman	Nitrogen retention in rivers: model development and application to watersheds in northeastern USA	Biogeochemistry 57/58, pp. 199-237	2002	1	Streams, Rivers, Lakes	0	0	0
Tank, J., J.L. Meyer, D.M. Sanzone, P.J. Mulholland, J.R. Webster, B.J. Peterson, W.L. Wollheim, and N.E. Leonard	Analysis of nitrogen cycling in a forest stream during autumn using a 15-N tracer addition	Limnology and Oceanography 45(5), pp. 1013-1029	2000	1	Streams, Rivers, Lakes	0	1	1
Willet, V.B., B.A. Reynolds, P.A. Stevens, S.J. Ormerod, and D.L. Jones	Dissolved organic nitrogen regulation in fresh waters	Journal of Environmental Quality 33, pp. 201-209	2004	1	Streams, Rivers, Lakes	1	1	1
Windolf, J., E. Jeppesen, J.P. Jensen, and P. Kristensen	Modelling of seasonal variation in nitrogen retention and in-lake concentration: a four-year mass balance study in 16 shallow Danish lakes.	Biogeochemistry 33(1), pp. 25-44	1996	1	Streams, Rivers, Lakes	1	1	1
Wollheim, W.M., B.J. Peterson, L.A. Deegan, J.E. Hobbie, B. Hooker, W.B. Bowden, K.J. Edwardson, D.A. Arscott, A.E. Hershey, and J. Finlay	Influence of stream size on ammonium and suspended particulate nitrogen processing	Limnology and Oceanography 46(1), pp. 1-13	2001	1	Streams, Rivers, Lakes	0	1	1

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0
0	1	0	0	1	1	0	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0
0	1	0	0	1	1	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
0	1	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0
0	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
1	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	1	1	1	0	0	0	0
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1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0
1	1	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0
0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0
1	1	0	1	0	0	0	1	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	1	1	1	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0
1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	some	0	0	1	1	1	1	1	0	0	0	0
1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	COD	1	1	1	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	0	1	1	1	1	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
1	1	0	0	1	0	0	1	1	1	1	0	0	0	1	1	1	1	1	0	1	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0
0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	0	0	1	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0	0
1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	COD	1	1	1	1	1	1	0	0
0	1	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0
0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1	1	1	0	0	0	0
0	1	0	1	1	0	0	1	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0
1	1	1	1	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
1	1	1	1	1	1	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	0
1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	1	1	0	1	0	0	0	1	1	1	1	0	1	0	1	1	0	0	0	0
1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1
0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1	1	1	1		1	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	1	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0
0	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	0	0	1	0	0	1	1	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0
0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0
1	1	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment)rganic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0
1	1	1	1	1	1	0	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	0	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	PO4	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0
0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	PO4	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	1	0	1	0	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment)rganic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**
0	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
1	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**		**0**	**1**	**0**	**1**	**1**	**1**	**PO4**	**0**	**0**	**0**	**0**
1	**0**	**0**	**0**	**ganic suspend**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
1	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**
0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
1	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
1	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**PO4**	**0**	**0**	**0**	**0**
0	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
0	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**
1	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
1	**1**	**1**	**1**	**0**	**1**	**0**	**1 (fauna)**	**1 (fauna)**	**1 (fauna)**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**. (PO4**	**0**	**0**	**0**	**0**
0	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**and P(**	**0**	**0**	**0**	**0**
0	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
0	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
1	**1**	**1**	**1**	**1**	**1**	**0**	**1 (fauna)**	**1 (fauna)**	**1 (fauna)**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**. (PO4**	**0**	**0**	**1**	**0**

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	1	1	1	1	1	0	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0
1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1`	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
1	1	1	0	1	0	0	1	1	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0

Water Volume	Soil Type	Sediment Volume	Sediment Depth	Sediment Organic Matte	Grain Size	Stream Sinuosity	Vegetation Taxa	Vegetation Abundance	Vegetation Density	Vegetation Diversity	Wildlife Types	Eutrophic	Redox Potential	DO	BOD	Total N	NHx	NO3	TP	Pathogens	Contaminants	Sunny	Windy
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	0	0	0
0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Plant nutrients no water measures	year round	0	0	0	0	0	0	0	Also measured plant N, P uptake, resorption, decomposition.
Surface and near subsurface	September-October	0	0	0	0	0	0	0	
Subsurface, surface	year round	0	0	0	0	1	1	0	Part 1: Seasonal Study of O2, PO4, NO3, NH4, DOC in alder fen and stream
Subsurface, surface	year round	0	0	0	0	0	0	0	Part 2: Seasonal Study of Denitrification, sedimentation, and an N & P Budget for an alder fen and stream
Surface vegetation	year round	0	0	0	0	0	0	0	Looks at annual net primary production due to nutrient limitation
bog groundwater	year round	0	0	0	0	0	0	0	
Generally wet but not completely covered with water throughout	Ten irrigation cycles during the year	1	0	0	0	0	0	1	Also looked at denitrification
Subsurface water	year round	0	0	0	0	0	0	0	Reported average N, NO3, P, PO4 values
Bog groundwater	spring, summer, fall	0	0	0	0	1	0	0	Nutrient cycling in pristine/eutrophic cedar bogs
Bog groundwater, surface water	Year round	0	0	0	0	0	0	0	
Surface water	Year round	1	0	0	0	1	1	1	
Surface water	Year round	1	0	0	0	0	0	1	
NA - microcosms	year round 28-mo study with a series of 20-day incubations	0	0	0	1	1	0	0	Also measured COD and DOC in water
Surface and near surface groundwater	year round	0	0	0	0	1	0	1	Report gives data from a number of sampling events, plus seasonal (winter vs. summer) averages over several years
Near surface	year round	0	0	0	0	0	0	0	
Mesocosms - subsurface	Short-term studies during the growing season	0	0	0	0	0	0	1	Evaluated percent nitrate retention during flowthrough studies with low (3mg/l) and high (15 mg/l) nitrate nitrogen concentrations
Surface water	summer	1	0	0	0	1	0	0	
Surface water	October-November	1	0	0	0	0	0	0	
Surface and subsurface	Annual estimates	1	0	0	0	0	0	1	Electronic database with summary data from a variety of treatment wetlands

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Surface water	Annual Estimates	1	0	0	1	1	0	1	
Surface and subsurface	Annual estimates	0	0	0	0	0	0	1	Evaluated habitat use by wildlife in treatment wetlands, and potential contamination of these by waterfowl
Surface water	various sampling times throughout the growing season	0	0	1	0	0	0	1	Also measured denitrification
Surface water	Summer	1	0	0	0	0	0	0	
Surface water	4 Seasons	0	0	0	0	0	0	1	
Subsurface	Growing season	1	0	0	0	0	0	1	
Surface water	summer and winter (Nov and July)	1	0	0	0	0	0	1	Looked at biodiversity and N retention in relation to various wetland characteristics
Surface water	Year round	1	0	0	0	0	0	0	
Surface - diverted river water	April-Sept	1	0	0	0	0	0	0	Also measured total suspended solids (TSS)
Not given	Annual averages	0	0	0	0	0	0	1	Using a data summary from various other studies, evaluates the cost of removing nutrients using wetlands and compares with septic treatment upgrades
Surface water	Not certain	0	0	0	0	0	0	0	
Subsurface and surface water	Annual averages	0	0	0	0	0	0	1	Description of Constructed Wetland Systems, including nutrient retention, in EPA's North American Wetland Treatment System Database
Surface water	Southern Hemisphere summer	1	0	0	0	0	0	0	Measured denitrification, water detention time and 15-N detention time
Subsurface	Year round	1	0	0	1	1	0	0	
Various	Annual averages	1	0	0	0	0	0	0	EPA sponsored database of treatment wetlands throughout the northeast
Surface water	September-December	0	0	0	0	0	0	0	
Surface - diverted river water	Year round, 10 year study	1	0	0	1	1	0	1	Describes two experimental wetland systems, one planted with macrophytes one not planted.

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Surface water	year round; two year study	1	0	0	0	0	0	0	
Surface water	Year round	0	0	0	0	0	0	0	
Surface water	study done in lab; temps controlled to look at effect of temp	1	0	0	1	1	0	1	
shallow groundwater	Sept, Oct, Nov, Dec, and June samples	0	0	0	0	soil temp	0	1	Also measured denitrification rate, denitrification potential, denitrification enzyme activity
Surface water	year round	1	0	0	1	1	0	1	
Surface water	July	1	0	0	0	0	0	0	
Surface water	Spring through Fall	0	0	0	average	0	0	0	Also measured biomass of reed sweetgrass, Glyceria maxima after 2 harvests
Surface water	Fall and Winter values for first year; April-Sept in second year	1	0	0	0	0	0	0	
Surface water	Year round	1	0	0	0	0	0	0	
shallow groundwater	year round	0	0	0	1	0	0	0	
Near surface and surface	May-November	0	0	0	1	1	0	1	Looked at nitrogen fixation by Alders and potential contribution to N budgets
Near surface and surface	Summer	0	0	0	0	0	0	0	Looked at nitrogen fixation by Alders and contribution to N budgets for these wetlands
N/A microcosms	Spring-Summer	0	0	0	0	0	0	0	Compared five species with respect to N and P accumulation over a growing season; also looked at decomposition rate over a 150-day period
Surface or near surface groundwater	mid-September throu8gh mid-November 1988	0	0	0	0	0	0	0	Wetlands with high Alder density had about six times higher N)3-accumulation than other wetlands
Not given	One-time survey during growing season	0	0	0	0	0	0	1	
Estuarine water/sediments	year round	0	1	0	0	0	1	0	quantification of N and P conc. in fresh marsh sediments
Estuarine water/sediments	spring, summer, fall	0	1	0	0	0	1	0	Lab/field experiment in Massachusetts
Estuarine sediments, water column	year round	0	1	1	1	1	1	0	Evaluates MA/RI estuarine sediments denitrification

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Estuarine mud/sand flat	year round	0	1	1	0	1	1	0	UK study
Estuarine subtidal mudflat	year round	0	1	0	0	1	1	0	Chesapeake Bay
Estuarine water/sediments	Various studies; sampling dates not given	0	1	0	0	1	1	0	
Estuarine water/sediments	July	0	1	0	0	0	0	0	
Estuarine water/sediments	year round	0	1	0	1	1	1	1	Review of denitrification rates in various aquatic ecosystems
Estuarine water/sediments	3 month, June start	0	0	1	1	1	1	1	Lab microcosm experiment to model Narragansett Bay
Plant material	year round	0	0	0	1	0	0	1	Quantified plant nutrient efficiencies
Near surface	year round 3 year study	0	0	0	0	0	0	0	
Not given	Annual estimates	0	0	0	0	0	0	0	
NA - model	N/A - model	0	0	0	0	0	0	0	
NA - review article	0	0	0	0	0	0	0	0	Discusses mechanisms underlying response of forest ecosystems to increased nitrogen input
NA - model	N/A - model	0	0	0	0	0	0	0	Validated model with data from Hubbard Brook and Harvard forest
NA - review article	0	0	0	0	0	0	0	1	Discusses mechanisms underlying response of forest ecosystems to increased nitrogen input
Near surface	controlled environment - 11degrees C to simulate spring and fall groundwater temps	0	0	0	1	1	0	1	Also measured soil organic carbon, denitrification rates
Near surface	September	0	0	0	0	0	0	0	Looked at nitrate immobilization in various soil types (conifer forest vs. hardwood)
Near surface	Summer and Fall	0	0	0	1	0	0	0	
Near surface	growing season	0	0	0	1	1	0	1	
Near surface	year round	0	0	0	0	0	0	0	N budgets, N Retention
Near surface	Year round	0	0	0	0	0	0	0	Soil C and N in various stands, some of which had been in agricultural use

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Near surface	year round 4-yr study	0	0	0	0	0	0	0	
Near surface	Year round	0	0	0	0	0	0	0	Annual carbon and nitrogen budgets for pine and Oak - dominated stands at Harvard Forest
Near surface	short experiments during the warm season	0	0	0	0	0	0	0	
N/A	N/A	0	0	0	0	0	0	0	Overview article - potentially useful for background information on nitrogen saturation, retention, and leaching in forests
Near surface	Summer	0	0	0	0	0	0	0	Sampled nitrate removal in a constructed wetland serving a summer campground
Various; mostly near-surface	various studies	0	0	0	nual aver	0	0	0	Developed nitrogen budgets for 16 forests in the northeast using both empirical data and a model
Near surface	October-November	0	0	0	0	0	0	1	
Surface and near surface	Year round	0	0	0	0	0	0	1	Located in Louisiana - different climate; measured denitrification potential; found it was significantly higher in natural wetlands than in restored ones.
Surface water	Year round multi-year study	1	0	0	0	0	0	0	Annual input-output N budgets for a number of lakes in the Adirondacks
forested wetland, fen/bog	year round	0	0	0	1	0	0	1	Swedish forest NO3 retention
Near surface	Annual averages	0	0	0	0	0	0	0	Used USGS discharge data to look at correlation between N discharge and elevation, runoff volume, and watershed area
Near surface	Annual averages, 9 year study	0	0	0	0	0	0	0	
stream, soil, and groundwater	year round	0	0	0	1	0	0	1	Watershed NO3 chemistry, upland nitrification and transport to streams
Near surface	Year round multi-year study	0	0	0	0	0	0	0	
Forested stream	year round	0	0	0	0	0	0	0	Soil N chemistry in forested watershed
Near surface	Year round multi-year study	0	0	0	0	0	0	0	
Near surface	year round	0	0	0	1	1	0	0	
Near surface	year round	0	0	0	1	1	0	1	
Near surface	Summer	0	0	0	1	0	0	1	Measured denitrification enzyme activity and sediment organic matter and root decomposition rate in pine and red maple stands
Near surface			0	0	0	0	0	1	
Near surface	July	1	0	0	1	1	0	1	
Sediment porewater	NOV-DEC	0	0	0	0	1	0	0	Denitrification rates/percentage use in fresh marsh soils

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Plant material	year round	0	0	0	0	0	0	0	Study on N & P use in Carex
Near surface		0	0	0	0	0	0	1	
Shallow groundwater	year round	1	1	1	1	1	1	0	Estimates of N attenuation in streams and ponds; measures N flux from sediments in coastal ponds
Surface and near-surface	year round; two year study	0	0	0	0	0	0	0	
Near surface	Year round	0	0	0	0	0	0	0	
Tidal marsh; measured groundwater near surface	Year round	1	1	1	1	1	1	1	
Groundwater near surface	Dec-June monthly samples	0	0	0	0	0	0	1	
Modeled riverine/riparian systems	0	0	0	0	0	0	0	0	Looked at 6 different models and evaluates error and accuracy of prediction of total N and nitrate export
NA - model	NA Model	0	0	0	0	0	0	1	
Near surface		0	0	0	0	0	0	0	
Not given	0	0	0	0	0	0	0	1	
NA - model	0	0	0	0	0	0	0	0	
Not given	0	0	0	0	0	0	0	0	
Not given	0	0	0	0	0	0	0	0	
Not given	0	0	0	0	0	0	0	0	
Peat porewater/groundwater, lake water column	year round	0	0	0	0	1	0	0	Nitrogenase activity used to quantify N fixation
Near surface and surface	Annual estimates	0	0	0	0	0	0	0	Overview of nitrogen cycling in various types of freshwater wetland
N/A Review article	N/A	0	0	0	0	0	0	0	
N/A Review article	0	0	0	0	0	0	0	0	A review of nutrient (N) in wetlands
Various	0	0	0	0	0	0	0	1	

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Various	Annual averages	0	0	0	0	0	0	1	Review of data on freshwater wetland retention of nutrients and contaminants
Surface and near surface	Annual averages	0	0	0	0	0	0	1	Looked at mechanisms of N uptake and storage in freshwater wetland
NA - review article	N/A	0	0	0	0	0	0	0	Overview of nitrogen uptake in plants, leaching and litterfall loss, net annual retention, and percent retention for various types of wetlands (fen, bog, wet tundra)
N/A - review article	0	0	0	0	0	0	0	0	Review article, discusses N transformations and losses in hydric soils. Discusses the role of roots in redox potential; also derives first-order rate coefficients for nitrification and denitrification in various soil types at different temps
Various	Annual Average	0	0	0	0	0	0	1	Discusses long-term changes in N retention using long-term monitoring data
N/A - review article	0	0	0	0	0	0	0	1	
N/A -review article	annual average	0	0	0	1 (annual	0	0	1	Evaluated N input and export for 16 watersheds in the northeast
Near surface	year round	0	0	0	1	1	0	1	Also measured DEA in soil matrix and organic patches
Surface water	Fall	0	0	ischarge ra	0	1	0	0	
Near surface	year round	0	0	0	1	0	0	1	Simulated artificial storm/runoff events and evaluated N attenuation
Surface	0	0	0	0	0	0	0	0	Literature review article
Periodic flooding	Spring/Summer	0	0	0	0	0	0	1	Evaluated nitrogen uptake and denitrification before, during and after natural flooding, and simulated flooding using spray nitrogen additions
Near surface	Summer	0	0	0	0	1	0	1	
Near surface	Year round	0	0	0	1	1	1	1	
Shallow and surface	year round	0	0	0	0	0	0	0	Reviews N and P budgets for a number of different wetland types and reports on nutrient retention and removal in each
0	Various	0	0	0	0	0	0	1	
Surface and near-surface	March-Sept	0	0	0	0	0	0	0	
groundwater	year round	0	0	0	1	0	0	1	Focus on denitrification

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Near surface	0	0	0	0	0	0	0	1	Model study aimed at identifying N sinks
surface or near surface groundwater	review article -	0	0	0	0	0	0	1	Looked at width of buffer strips from grass pasture, brush/grass, and beech forest areas
Tidal marsh	Summer	0	1	0	0	0	0	0	
Tidal marsh	Summer	0	1	0	0	0	0	1	
Tidal marsh	Summers 2001 and 2002	0	1	0	0	0	1	1	
Tidal marsh	Summer	0	1	0	0	0	0	1	
Near surface	warm and cold season	0	0	0	0	1	1	1	
Estuarine water/sediments	year round	1	1	1	0	1	1	1	Also measured denitrification
Surface water	Year round	0	1	1	0	0	1	0	
Salt marsh sediments/water	summer	0	1	0	1	1	1	1	Quantification of N2 flux (nitrification[-]/denitrification[+]) in Narragansett Bay salt marshes
Tidal	Spring-summer	0	1	0	0	0	0	1	Looked at differences in N uptake in plant biomass and associated microbes in stands dominated by Typha and Spartina
Estuarine water/sediments	year round	0	1	0	0	1	1	1	Field/lab measurements of denitrification and C, O cycling on Cape Cod; good comprehensive study.
Surface water	Year round	1	1	1	0	1	0	1	
Shallow groundwater, surface water	growing season	1	1	1	0	0	1	1	
Groundwater near surface and at surface	Not certain	0	0	0	0	0	0	0	Also looked at deep cores and dated them to evaluate long-term changes in N sequestration and organic matter
Salt marsh/mud flat sediments	year round	0	1	1	0	0	1	0	Fflux along a gradient of salt marsh to mud flat, with quantified concentrations and retentions
Marsh and creek sediments	year round	0	1	0	1	0	0	1	Great Sippewisset Marsh denitrification rate
Estuarine intertidal mud flats	year round	0	1	0	1	1	1	0	Nutrient flux at sediment-water interface of UK mud flats, and benthic macrofaunal effects
Estuarine intertidal mud flats	year round	0	1	0	1	1	1	0	Nutrient flux at sediment-water interface of UK mud flats
Plant uptake/assimilation	year round	0	1	0	0	0	0	0	NH4-N assimilation of an algae growing on mud flats: assimilation, burial, and association with N-fixing bacteria
Shallow	year round	1	1	1	0	0	1	1	
Estuarine intertidal flats, mud and sand	summer	0	1	0	0	1	1	0	Nutrient flux at sediment-water interface of Japanese mud and sand flats

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Salt marsh sediments/water	year round	0	1	0	0	0	0	1	Review of rates of nitrification and denitrification in mature and restored (new/young) salt marshes
Marsh sediments, plants	year round	0	1	0	0	0	0	0	Great Sippewisset Marsh
Surface water	year round, 2 year study	1	0	0	0	0	0	1	Nitrogen, phosphorus and iron budgets for two lakes
N/A	0	0	0	0	0	0	0	0	
Surface water	summers for 2 years	0	0	0	0	0	0	0	
Surface water	year round	0	0	0	0	0	0	1	Review article based on data from USGS monitoring studies throughout the US
N/A	0	0	0	0	0	0	0	1	Review article - discusses mechanisms and factors involved in nitrogen transfers in hyporheic zone
Various mostly near surface	0	0	0	0	Annual a	0	0	0	Evaluated nitrogen budgets for 16 large watersheds in the northeast
Surface water	Annual averages	1	0	0	0	0	0	0	Nitrogen budgets for NO3 and NH4+for catchments and lakes in Ontario
Modeled river floodplain	0	0	0	0	0	0	0	0	Modeled the effects of dams and levees on nitrate loss via denitrification
Surface water	Growing season	Estimated r	0	0	0	0	0	1	
Surface water	Year round	1	0	0	0	0	0	0	
Surface water	Year round	0	0	0	0	0	0	0	
Surface water	June-July	0	0	0	0	0	0	0	
Surface water	May-June	0	0	0	1	0	0	0	
Shallow	March, May, July, and Sept	0	0	0	0	0	0	1	Measured denitrification potential
Surface water	March-November	0	0	discharge	0	1	0	1	Also measured denitrification in three types of sediment from the study area (low, med, high OM sediment)
Surface water	Year round	0	0	0	0	0	0	0	
Surface water	year round; two year study	0	0	0	0	0	0	0	
Surface water	Spring (April-May)	1	0	0	1	1	0	0	
Surface water	various - comparative 15-N study	`0	0	0	0	0	0	0	

Hydrologic Regime/ Groundwater Depth	Season	Residence Time	Tidal	Flushing Rate	Air Temp	Water Temp	Salinity	Annotated?	Notes
Surface water	not indicated	0	0	0	0	1	0	0	
Various - surface and shallow	0	0	0	0	0	0	0	1	Review article - uses annual average N data from a number of other site-specific studies
Surface water	0	0	0	0	0	0	0	0	Applied the model to various river systems; compares to measured values
Surface water	Nov-Dec	0	0	0	1	1	0	0	
Surface water	Dec-September	1	0	0	0	0	0	0	Also measured DON, pH, and DOC
Lakes	year round	1	0	0	1	1	0	0	
Surface water	Summers 1991-1997	0	0	0	0	0	0	0	Also provides a conceptual model for looking at physical vs. biological/chemical controls on nitrate retention in streams