



Nutrient Criteria Technical Guidance Manual

Rivers and Streams

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<http://www.epa.gov/waterscience/criteria/nutrient/guidance/rivers/>

REFERENCES

- Agbeti, M. D. 1992. The relationship between diatom assemblages and trophic variables: A comparison of old and new approaches. *Can. J. Fish. Aquat. Sci.* 49:1171-1175.
- Alexander, R. B., J.R. Slack, A.S. Ludtke, K.K. Fitzgerald, and T.L. Schertz. 1996. Data from selected U.S. Geological Survey National Stream Water-Quality Monitoring Networks: USGS Digital Data Series DDS-37, 2 compact disks.
- Allan, J. D. 1995. *Stream Ecology: Structure and Function of Running Waters*. Chapman and Hall, U. K. 400 pp.
- Ameel, J. P., R. P. Axler, and C. S. Owen. 1993. Persulfate digestion for determination of total nitrogen and phosphorus in low-nutrient waters. *Am. Environ. Lab.* 10(93):1-11.
- Anderson, C. W., D. Q. Tanner, and D. B. Lee. 1994. *Water-quality data for the South Umpqua River Basin, Oregon, 1990-1992*. U.S. Geological Survey Open-File Rept. 94-40, Portland, OR.
- APHA. 2000. *Standard Methods for Examination of Water and Wastewater*. 21st ed. Eaton, A. D., L. C. Clesceri, and A. E. Greenberg (eds.). American Public Health Association, Washington, DC.
- Atlas, R. M. and R. Bartha. 1993. *Microbial Ecology Fundamentals and Applications*. The Benjamin/Cummings Publishing Company, Inc., Redwood City, CA.
- Baker, W. L. 1990. Climatic and hydrologic effects on the regeneration of *Populus angustifolia* James along the Animas River, Colorado. *J. Biogeog.* 17:59-73.
- Barbour, M. G., J. H. Burk, and W. D. Pitts. 1980. *Terrestrial Plant Ecology*. Benjamin/Cummings Publishing Company, Menlo Park, CA.
- Barbour, M. T., J. Gerritsen, G. E. Griffith, R. Frydenborg, E. McCarron, J. S. White, and M. L. Bastian. 1996. A framework for biological criteria for Florida streams using benthic macroinvertebrates. *J. N. Am. Benthol. Soc.* 15:185-211.
- Barbour, M. T., J. Gerritsen, B. D. Snyder, and J. B. Stribling. 1999. *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish*. 2nd ed. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA 841-B-99-002.
- Barko, J. W. and R. M. Smart. 1986. Sediment-related mechanisms of growth limitation in submersed macrophytes. *J. Ecol.* 67(5):1328-1340.
- Barko, J. W., D. Gunnison, and S. R. Carpenter. 1991. Sediment interactions with submersed macrophyte growth and community dynamics. *Aquat. Bot.* 41:41-65.

- Beal, Ernest O. 1977. A manual of marsh and aquatic vascular plants of North Carolina with habitat data. Technical Bulletin No. 247. North Carolina Agricultural Experiment Station, North Carolina State University, Raleigh, NC. 298 pp.
- Beaver, J. 1981. Apparent ecological characteristics of some common freshwater diatoms. Ontario Ministry of the Environment. Technical Support Section, Central Region, Don Mills.
- Bicknell, B. R., J. C. Imhoff, J. L. Kittle, Jr., A. S. Donigian, Jr., and R. C. Johanson. 1997. Hydrological Simulation Program—Fortran: User's manual for version 11: U.S. Environmental Protection Agency, National Exposure Research Laboratory, Athens, GA. EPA/600/R-97/080. 755 pp.
- Bicknell, B. R., J. C. Imhoff, J. L. Kittle, A. S. Donigian, and R. C. Johanson. 1993. Hydrological Simulation Program - FORTRAN (HSPF): User's manual for release 10.0. Environmental Research Laboratory, U.S. Environmental Protection Agency, Athens, GA. EPA 600/3-84-066.
- Biggs, B. J. F. 2000. Eutrophication of streams and rivers: Dissolved nutrient - chlorophyll relationships for benthic algae. *J. N. Am. Benthol. Soc.* 19:17-31.
- Biggs, B. J. F. 1995. The contribution of disturbance, catchment geology and land use to the habitat template of periphyton in stream ecosystems. *Freshwater Biol.* 33:419-438.
- Biggs, B. J. F. 1996. Patterns in benthic algae of streams. In: *Algal Ecology*. Stevenson, J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego, CA. pp. 31-51.
- Biggs, B. J. F. and M. E. Close. 1989. Periphyton biomass dynamics in gravel bed rivers: The relative effects of flows and nutrients. *Freshwater Biol.* 22:209-231.
- Biggs, B. J. F. and C. W. Hickey. 1994. Periphyton responses to a hydraulic gradient in a regulated river, New Zealand. *Freshwater Biol.* 32:49-59.
- Biggs, B. J. F., C. Kilroy, and R. L. Lowe. 1998a. Periphyton development in three valley segments of a New Zealand grassland river: Test of a habitat matrix conceptual model within a catchment. *Arch. Hydrobiol.* 143:147-177.
- Biggs, B. J. F. and R. L. Lowe. 1994. Responses of two trophic levels to patch enrichment along a New Zealand stream continuum. *N. Z. J. Mar. Freshwater Res.* 28:119-134.
- Biggs, B. J. F. and G. M. Price. 1987. A survey of filamentous algal proliferations in New Zealand rivers. *N. Z. J. Mar. Freshwater Res.* 21:175-191.
- Biggs, B. J. F., R. J. Stevenson, and R. L. Lowe. 1998b. A habitat matrix conceptual model for stream periphyton. *Arch. Hydrobiol.* 143:21-56.

- Birks H. H., H. J. B. Birks, P. E. Kaland, and D. Moe (eds.). 1988. *The Cultural Landscape: Past, Present and Future*. Cambridge University Press, Cambridge, England. 521 pp.
- Birks, H. J. B. 1998. Numerical tools in palaeolimnology—Progress, potentialities, and problems. *J. Paleolimnol.* 20:307-332.
- Blaney, H. and W. Criddle. 1962. *Determining Consumptive Use and Irrigation Water Requirements*. USDA Technical Bulletin Number 1275. 59 pp.
- Borchardt, M. A. 1996. Nutrients. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego, CA.
- Boston, H. L. and W. R. Hill. 1991. Photosynthesis-light relations of stream periphyton communities. *Limnol. Oceanogr.* 36:644-656.
- Bothwell, M. L. 1985. Phosphorus limitation of lotic periphyton growth rates: An intersite comparison using continuous-flow troughs (Thompson River System, British Columbia). *Limnol. Oceanogr.* 30:527-542.
- Bothwell, M. L. 1989. Phosphorus-limited growth dynamics of lotic periphytic diatom communities: Areal biomass and cellular growth rate responses. *Can. J. Fish. Aquat. Sci.* 46:1293-1301.
- Bourassa, N. and A. Cattaneo. 1998. Control of periphyton biomass in Laurentian streams (Québec). *J. N. Am. Benthol. Soc.* 17:420-429.
- Braico, R. D. 1973. *Dissolved Oxygen and Temperature Diurnal Variations in the Clark Fork River, August 1973*. Report to the MT Dept. Health and Env. Sciences (now the Dept. Env. Quality).
- Brezonik, P. L., K. W. Easter, L. Hatch, D. Mulla, and J. Perry. 1999. Management of diffuse pollution in agricultural watersheds: Lessons learned from the Minnesota River Basin. *Water Sci. Tech.* 39(12):323-330.
- Brick, C. M. and J. N. Moore. 1996. Diel variation of trace metals in the upper Clark Fork River, Montana. *Environ. Sci. Technol.* 30:1953-1960.
- Brown, L. C. and T. O. Barnwell. 1987. The enhanced stream water quality model QUAL2E and QUAL2E-UNCAS: Documentation and user manual. U.S. Environmental Protection Agency, Athens, GA. EPA 600/3-87/007.
- Burkholder, J. M., E. J. Noga, C. H. Hobbs, and H. B. Glasgow, Jr. 1992. New 'phantom' dinoflagellate is the causative agent of major estuarine fish kills. *Nature* 358:407-410.
- Busch, D. E. and S. G. Fisher. 1981. Metabolism of a desert stream. *Freshwater Biol.* 11:301-308.

- Cairns Jr., J. 1956. Effects of increased temperatures on aquatic organisms. *Ind. Waste* 1:150-152.
- Campbell, R.C. 1989. *Statistics for Biologists*. 3rd ed. Cambridge University Press, Cambridge.
- Canfield, D. E. G., K. A. Langeland, S. B. Linda, and T. W. Haller. 1985. Relations between water transparency and maximum depth of macrophyte colonization in lakes. *J. Aquat. Plant Manage.* 23:25-28.
- Caraco, N. F., J. J. Cole, P. A. Raymond, D. L. Strayer, M. L. Pace, S. E. G. Findlay, and D. T. Fischer. 1997. Zebra mussel invasion in a large, turbid river: Phytoplankton response to increased grazing. *Ecology* 78(2):588-602.
- Carlson, R. E. 1977. A trophic state index for lakes. *Limnol. Oceanogr.* 22:361-368.
- Carmichael, W. W. 1986. Algal toxins. *Adv. Bot. Res.* 12:47-101.
- Carmichael, W. W. 1994. The toxins of cyanobacteria. *Sci. Am.* Jan. 1994:78-84.
- Carpenter, S. R., W. A. Brock, and P. C. Hanson. 1999. Ecological and social dynamics in simple models of ecosystem management. *Conserv. Ecol.* 3(2):4. www.consecol.org/vol3/iss2/art4.
- Carpenter, S. R., N. F. Caraco, D. L. Correll, R. W. Howarth, A. N. Sharpley, and V. H. Smith. 1998. Nonpoint pollution of surface waters with phosphorus and nitrogen. *Ecol. Appl.* 8(3):559-568.
- Cattaneo, A., T. Kerimian, M. Roberge, and J. Marty. 1997. Periphyton distribution and abundance on substrata of different size along a gradient of stream trophity. *Hydrobiologia* 354:101-110
- Chambers, P. A., R. E. DeWreede, E. A. Irlandi, and H. Vandermeulen. 1999. Management issues in aquatic macrophyte ecology: A Canadian perspective. *Can. J. Bot.* 77:471-487.
- Chambers, P. A. and J. Kalff. 1985. Depth distribution and biomass of submerged aquatic macrophyte communities in relation to Secchi depth. *Can. J. Fish. Aquat. Sci.* 42:701-709.
- Charles, D. F. and J. P. Smol. 1988. New methods for using diatoms and chrysophytes to infer past pH of low-alkalinity lakes. *Limnol. Oceanogr.* 33:1451-62.
- Charlton, S. E. D., H. R. Hamilton, and P. M. Cross. 1986. *The Limnological Characteristics of the Bow, Oldman and South Saskatchewan Rivers (1979-82)*. Alberta Environment, Edmonton, AL.
- Chauvet, E. and H. Decamps. 1989. Lateral interactions in a fluvial landscape: The River Garonne, France. *J. N. Am. Benthol. Soc.* 8(1):9-17.
- Chessman, B. C., P. E. Hutton, and J. M. Burch. 1992. Limiting nutrients for periphyton growth in sub-alpine, forest, agricultural and urban streams. *Freshwater Biol.* 28:349-361.

- Chetelat, J., F. R. Pick, and A. Morin. 1999. Periphyton biomass and community composition in rivers of different nutrient status. *Can. J. Fish Aquat. Sci.* 56(4):560-569.
- Chorley, R. J. and B. A. Kennedy. 1971. *Physical Geography: A Systems Approach*. Prentice-Hall, London.
- Collins, G. B. and C. I. Weber. 1978. Phycoperiphyton (algae) as indicators of water quality. *Trans. Am. Microscop. Soc.* 97:36-43.
- Cockrum, D. K. and J. J. Warwick. 1994. Assessing the impact of agricultural activities on water quality in a periphyton dominated stream using the Water Quality Analysis Program (WASP). In: *Proceedings of the Symposium on the Effects of Human-Induced Changes on Hydrologic Systems*. American Water Resources Association. Jackson Hole, WY, June 26-29, 1994.
- Cooke, G. D., E. B. Welch, S. A. Peterson, and P. R. Newroth. 1993. *Restoration and Management of Lakes and Reservoirs*. Lewis Publ., Boca Raton, FL.
- Correll, D. L. 1998. The role of phosphorus in the eutrophication of receiving waters: A review. *J. Environ. Qual.* 27:261-266.
- Coupe, R. H., D. A. Goolsby, J. L. Iverson, D. J. Markovichick, and S. D. Zaugg. 1995. *Pesticide, Nutrient, Water-discharge and Physical-Property Data for the Mississippi River and Some of its Tributaries, April 1991-September 1992*. U.S. Geological Survey Open-File Report 93-406. 66 pp.
- Dahm, C. N., N. B. Grimm, P. Marmonier, H. M. Valett, and P. Vervier. 1998. Nutrient dynamics at the interface between surface waters and ground waters. *Freshwater Biol.* 40:427-451.
- Dahm, C. N., E. H. Trotter, and J. R. Sedell. 1987. Role of anaerobic zones and processes in stream ecosystem productivity. In: *Chemical Quality of Water and the Hydrologic Cycle*. Averett, R. A. and D. M. McKnight (eds.). Lewis Publ., Chelsea, MI. pp. 157-178.
- Daniel, T. C., A. N. Sharpley, J. L. Lemunyon, and J. T. Sims. 1997. *Agricultural Phosphorus and Eutrophication: An Overview*. Department of Agronomy, University of Arkansas, Fayetteville, AR.
- Darley, W. M. 1982. *Algal Biology: A Physiological Approach*. Blackwell Scientific Publications, Oxford, UK.
- Davies, B. R., M. C. Thoms, K. F. Walker, J. H. O'Keeffe, and J. A. Gore. 1994. Dryland rivers: Their ecology, conservation and management. In: *The Rivers Handbook, Vol. 2*. Calow, P. and G. E. Pets (eds.). Blackwell Scientific, Oxford. pp. 484-512.
- Davies-Colley, R. J. 1988. Measuring water clarity with a black disk. *Limnol. Oceanogr.* 33:616-623.

- Davis, F. W. 1985. Historical changes in submerged macrophyte communities of upper Chesapeake Bay. *Ecology* 66(3):981-993.
- DeNicola, D. 1996. Periphyton responses to temperature. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego. pp. 149-181.
- Dent, C. L. and N. B. Grimm. (In press). Spatial heterogeneity in stream water nutrient concentrations over successional time. *Ecology*.
- Dillon, P. J. and F. H. Rigler. 1974. The phosphorus-chlorophyll relationship in lakes. *Limnol. Oceanogr.* 19:767-773.
- Dodds, W. K. 1991. Factors associated with dominance of the filamentous green alga *Cladophora glomerata*. *Water Res.* 25:1325-1332.
- Dodds, W. K. 1995. Availability, uptake and regeneration of phosphate in mesocosms with varied levels of P deficiency. *Hydrobiologia* 297:1-9.
- Dodds W. K. and J. Brock. 1998. A portable flow chamber for *in situ* determination of benthic metabolism. *Freshwater Biol.* 39:49-59.
- Dodds, W. K., J. M. Blair, G. M. Henebry, J. K. Keolliker, R. Ramundo, and C. M. Tate. 1996. Nitrogen transport from tallgrass prairie watersheds. *J. Environ. Qual.* 25:973-981.
- Dodds, W. K., J. R. Jones, and E. B. Welch. 1998. Suggested classification of stream trophic state: Distributions of temperate stream types by chlorophyll, total nitrogen, and phosphorus. *Water Res.* 32:1455-1462.
- Dodds, W. K., V. H. Smith, and B. Zander. 1997. Developing nutrient targets to control benthic chlorophyll levels in streams: A case study of the Clark Fork River. *Water Res.* 31:1738-1750.
- Dodds, W. K. and E. B. Welch. 2000. Establishing nutrient criteria in streams. *J. N. Am. Benthol. Soc.* 19:186-196.
- Dorin, G. 1981. Organochlorinated compounds in drinking water as a result of eutrophication. In: *Restoration of Lakes and Inland Waters*. U.S. Environmental Protection Agency, Washington, DC. EPA 440/5-83-001. pp. 373-378.
- Dunne, T. and L. B. Leopold. 1978. *Water in Environmental Planning*. W. H. Freeman, San Francisco.
- Edmonson, W. T. 1994. Sixty years of Lake Washington: A curriculum vitae. *Lake Reservoir Manage.* 10:75-84.

- ELI (Environmental Law Institute). 1988. *Almanac of Enforceable State Laws to Control Nonpoint Source Water Pollution*, ELI Project # 970301, Washington, DC. 293 pp.
- Elswick, D. A. 1998. *Spatial Prediction of Phosphorus and Algal Biomass in Cobble/Gravel-bed Rivers During Summer Conditions*. Ph.D. Dissertation, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA.
- Fisher, S. G. 1983. Succession in streams. In: *Stream Ecology: Application and Testing of General Ecological Theory*. Barnes, J. and G.W. Minshall (eds.). Plenum Press, New York. pp. 7-27.
- Fisher, S. G. 1986. Structure and dynamics of desert streams. In: *Pattern and Process in Desert Ecosystems*. W. Whitford (ed.). University of New Mexico Press, Albuquerque. pp. 114-139.
- Fisher, S. G., L. J. Gray, N. B. Grimm, and D. E. Busch. 1982. Temporal succession in a desert stream following flash flooding. *Ecol. Monogr.* 52:93-110.
- Fisher, S. G. and N. B. Grimm. 1983. *Water Quality and Nutrient Dynamics of Arizona Streams*. OWRT Project Completion Report A-106-ARIZ. Office of Water Research and Technology.
- Fisher, S. G. and N. B. Grimm. 1988. Disturbance as a determinant of structure in a Sonoran Desert stream ecosystem. *Internationale Vereinigung für Theoretische und Angewandte Limnologie, Verhandlungen* 23:1183-1189.
- Fisher, S. G. and N. B. Grimm. 1991. Streams and disturbance: Are cross-ecosystem comparisons useful? In: *Comparative Analyses of Ecosystems: Patterns, Mechanisms and Theories*. Cole, J. C., G. M. Lovett, and S. E. G. Findlay (eds.). Springer-Verlag, New York, New York, US. pp. 196-221.
- Fisher, S. G., N. B. Grimm, E. Marti, and R. Gomez. 1998a. Hierarchy, spatial configuration, and nutrient cycling in streams. *Austral. J. Ecol.* 23:41-52.
- Fisher, S. G., N. B. Grimm, E. Martí., J. B. Jones, Jr., and R. M. Holmes. 1998b. Material spiraling in river corridors: A telescoping ecosystem model. *Ecosystems* 1:19-34.
- Fisher, S. G. and W. L. Minckley. 1978. Chemical characteristics of a desert stream in flash flood. *J. Arid Environ.* 1:25-33.
- Fitzpatrick, F. A., I. R. Waite, P. J. D'Arconte, M. R. Meador, M. A. Maupin, and M. E. Gurtz. 1998. *Revised Methods for Characterizing Stream Habitat in the National Water-Quality Assessment Program*. U.S. Geological Survey Water-Resources Investigations Report 98-4052. 67 pp.
- Fry, J. C. (ed.). 1993. *Biological Data Analysis: A Practical Approach*. Oxford University Press, Oxford, England.

- Fuhrer, G. J., R. J. Gilliom, P. A. Hamilton, J. L. Morace, L. H. Nowell, J. F. Rinella, J. D. Stoner, and D. A. Wentz. 1999. *The Quality of Our Nation's Waters. Nutrients and Pesticides*. U.S. Geological Survey Circular 1225. 82 pp.
- Fuller, W. H. 1975. *Soils of the Desert Southwest*. University of Arizona Press. 102 pp.
- Gilbert, R. O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold, New York.
- Gilliom, R. J., W. M. Alley, and M. E. Gurtz. 1995. *Design of the National Water-Quality Assessment Program: Occurrence and Distribution of Water-Quality Conditions*. U.S. Geological Survey Circular 1112. 33 pp. [URL: <http://water.usgs.gov/pubs/circ1112/>]
- Glasgow, H. B., J. M. Burkholder, D. E. Schmechel, P. A. Tester, and P. A. Rublee. 1995. Insidious effects of a toxic estuarine dinoflagellate on fish survival and human health. *J. Toxicol. Environ. Health* 46:501-522.
- Goldman, C. R. and A. J. Horne. 1983. *Limnology*. McGraw-Hill, New York.
- Goolsby, D. A., R. C. Coupe, and D. J. Markovchick. 1991. *Distribution of Selected Herbicides and Nitrate in the Mississippi River and its Major Tributaries, April Through June 1991*. U.S. Geological Survey Water-Resources Investigations Report 91-4163. 35 pp.
- Graff, W. L. 1988. *Fluvial Processes in Dryland Rivers*. Springer-Verlag, New York.
- Gray, L. J. 1981. Species composition and life histories of aquatic insects in a lowland Sonoran Desert stream. *Am. Midland Naturalist* 106:229-242.
- Green, R. H. 1979. *Sampling Design and Statistical Methods for Environmental Biologists*. John Wiley, New York. 257 pp.
- Grimm, N. B. 1987. Nitrogen dynamics during succession in a desert stream. *Ecology* 68:1157-1170.
- Grimm, N. B. 1988. Role of macroinvertebrates in nitrogen dynamics of a desert stream. *Ecology* 69:1884-1893.
- Grimm, N. B. 1992. Biogeochemistry of nitrogen in arid-land stream ecosystems. *J. Arizona-Nevada Acad. Sci.* 26:130-146.
- Grimm, N. B. and S. G. Fisher. 1986a. Nitrogen limitation potential of Arizona streams and rivers. *J. Arizona-Nevada Acad. Sci.* 21:31-43.
- Grimm, N. B. and S. G. Fisher. 1986b. Nitrogen limitation in a Sonoran Desert stream. *J. N. Am. Benthol. Soc.* 5:2-15.

- Grimm, N. B. and S. G. Fisher. 1989. Stability of periphyton and macroinvertebrates to disturbance by flash floods in a desert stream. *J. N. Am. Benthol. Soc.* 8:293-307.
- Grimm, N. B., S. G. Fisher, and W. L. Minckley. 1981. Nitrogen and phosphorus dynamics in hot desert streams of Southwestern U.S.A. *Hydrobiologia* 83:303-312.
- Grimm, N. B. and K. C. Petrone. 1997. Nitrogen fixation in a desert stream ecosystem. *Biogeochemistry* 37:33-61.
- Hall, C. A. S. and R. Moll. 1975. Methods of assessing aquatic primary productivity. In: *Primary Productivity of the Biosphere*. H. Leith and R. H. Whittaker (eds.). Springer-Verlag, New York. pp. 19-54.
- Halloway, J. M., R. A. Dahlgren, B. Hansen, and W. H. Casey. 1998. Contribution of bedrock nitrogen to high nitrate levels in stream water. *Nature* 395:785-788.
- Harris, M.A. and S.D. Porter. (Unpublished manuscript). *Relating Epidendric Macroinvertebrate Communities to Physical and Chemical Factors in Upper Midwest Streams*. U.S. Geological Survey Water-Resources Investigations Report.
- Hauer, F. R. and V. H. Resh. 1996. Benthic macroinvertebrates. In: *Methods in Stream Ecology*. Hauer, F. R. and G. A. Lamberti (eds.). Academic Press, San Diego, CA. pp. 339-369.
- Hayek, L. C. 1994. Research design for quantitative amphibian studies. In: *Measuring and Monitoring Biological Diversity, Standard Methods for Amphibians*. Smithsonian Institution Press, Washington, DC. pp. 21-38.
- Heintz, A. J. 1970. *Low-Flow Characteristics of Iowa Streams Through 1966*. Iowa Natural Resources Council Bulletin No. 10. 176 pp.
- Heiskary, S. A., C. B. Wilson, and D. P. Larsen. 1987. Analysis of regional patterns in lake water quality: Using ecoregions for lake management in Minnesota. *Lake Reservoir Manage.* 3:337-344.
- Herlihy, A. T., J. L. Stoddard, and C. B. Johnson. 1998. The relationship between stream chemistry and watershed land cover data in the Mid-Atlantic region, U.S. *Water, Air, and Soil Pollution* 105:377-386.
- Hickey, C. W. 1987. Benthic chamber for use in rivers: Testing against oxygen mass balance. *J. Environ. Eng.* 114:828-845.
- Hilborn, R. and M. Mangel. 1997. *The Ecological Detective: Confronting Models with Data*. Princeton University Press, Princeton, NJ.

- Hill, M. O. 1979. *TWINSPAN-A FORTRAN Program for Detrended Correspondence Analysis and Reciprocal Averaging*. Cornell University, Ithaca, New York, USA.
- Hill, B. H., A. T. Herlihy, P. R. Kaufmann, R. J. Stevenson, F. H. McCormick, and C. B. Johnson. 2000. The use of periphyton assemblage data as an index of biotic integrity. *J. N. Amer. Benthol. Soc.* 19:50-67.
- Hill, W. 1996. Effects of light. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego. pp. 121-148.
- Hill, W. R. and A. K. Knight. 1988. Concurrent grazing effects of two stream insects on periphyton. *Limnol. Oceanogr.* 33:15-26.
- Hirsch, R. M., J. R. Slack, and R. A. Smith. 1982. Techniques in trend analysis for monthly water quality data. *Water Res.* 18:107-121.
- Holmes, R. M., S. G. Fisher, and N. B. Grimm. 1994. Parafluvial nitrogen dynamics in a desert stream ecosystem. *J. N. Am. Benthol. Soc.* 13:468-478.
- Holmes, R. M., J. B. Jones, Jr., S. G. Fisher, and N. B. Grimm. 1996. Denitrification in a nitrogen-limited stream ecosystem. *Biogeochemistry* 33:125-146.
- Horner, R. R., E. B. Welch, M. R. Seeley, and J. M. Jacoby. 1990. Responses of periphyton to changes in current velocity, suspended sediment and phosphorus concentration. *Freshwater Biol.* 24:215-232.
- Horner, R. R., E. B. Welch, and R. B. Veenstra. 1983. Development of nuisance periphytic algae in laboratory streams in relation to enrichment and velocity. In: *Periphyton of Freshwater Ecosystems: Proceedings of the First International Workshop on Periphyton of Freshwater Ecosystems*. R. G. Wetzel (ed.). Developments in Hydrobiology Series, Vol. 17. Kluwer, Boston. pp. 21-134.
- Horton, R. E. 1945. Erosional development of streams and their drainage basins; hydrophysical approach to quantitative morphology. *Geol. Soc. Am. Bull.* 56:275-370.
- Hoyer, M. V., D. E. Canfield, Jr., C. A. Horsburgh, K. Brown. 1996. Florida Freshwater Plants. A Handbook of Common Aquatic Plants in Florida Lakes. University of Florida, Institute of Food and Agricultural Sciences. Publication SP 189.
- Hughes, R. M. and D. P. Larsen. 1988. Regional, chemical and biological goals for surface waters. *J. Water Pollut. Control Fed.* 60:486-493.
- Humphrey, K. P. and R. J. Stevenson. 1992. Responses of benthic algae to pulses in current and nutrients during simulations of subscouring spates. *J. N. Am. Benthol. Soc.* 11:37-48.

- Hurlburt, S. H. 1984. Pseudoreplication and the design of ecological field experiments. *Ecol. Monogr.* 54:187-211.
- Hutchinson, G. E. 1967. *A Treatise on Limnology*. Vol. 2. John Wiley, New York.
- Hutchinson, G. E. 1975. *A Treatise on Limnology*. Vol. 3, Limnological Botany. John Wiley, New York. 660 pp.
- Hynes, H. B. N. 1969. The enrichment of streams. In: *Eutrophication: Causes, Consequences, Correctives-Proceedings of a Symposium*. National Academy of Sciences, Washington, DC. pp. 188-196.
- Ibelings, B., W. Admiraal, R. Bijker, T. Letswaart, and H. Prins. 1998. Monitoring of algae in Dutch rivers: Does it meet its goals? *J. Appl. Phycol.* 10:171-181.
- Jasper, S. and M. L. Bothwell. 1986. Photosynthetic characteristics of lotic periphyton. *Can. J. Fish. Aquat. Sci.* 43:1960-1969.
- Jaworski, N. A., R. W. Howarth, and L. J. Hetling. 1997. Atmospheric deposition of nitrogen oxides onto the landscape contributes to coastal eutrophication in the northeast United States. *Environ. Sci. Technol.* 31:1995-2004.
- Johnson, H. E. and C. L. Schmidt. 1988. *Clark Fork Basin Status Report & Action Plan*. Montana Governor's Office, Helena, MT.
- Jones, Jr., J. B. 1995. Factors controlling hyporheic respiration in a desert stream. *Freshwater Biol.* 34:101-109.
- Jones, Jr., J. B., S. G. Fisher, and N. B. Grimm. 1995. Nitrification in the hyporheic zone of a desert stream ecosystem. *J. N. Am. Benthol. Soc.* 14:249-258.
- Jones, J. R. and R. W. Bachmann. 1976. Prediction of phosphorus and chlorophyll levels in lakes. *J. Water Pollut. Control Fed.* 48:2176-2182.
- Kadono, Y. 1980. Photosynthetic carbon sources in some Potamogeton species. *Botanical Magazine Tokyo* 93:185-193.
- Kaplan, L. A. 1992. Comparison of high-temperature and persulfate oxidation methods for determination of dissolved organic carbon in freshwaters. *Limnol. Oceanogr.* 37:1119-1125.
- Karr, J. R. and E. W. Chu. 1999. *Restoring Life in Running Waters*. Island Press, Washington, DC.
- Kelly, M. G. and B. A. Whitton. 1995. The trophic diatom index: A new index for monitoring eutrophication in rivers. *J. Appl. Phycol.* 7:433-444.

- Kelly, M. G., C. J. Penny, and B. A. Whitton. 1995. Comparative performance of benthic diatom indices used to assess river water quality. *Hydrobiologia* 302:179-88.
- Kelly, M. G., A. Cazaubon, E. Coring, A. Dell'Uomo, L. Ector, B. Goldsmith, H. Guasch, J. Hürlimann, A. Jarlman, B. Kawecka, J. Kwadrans, R. Laugaste, E.-A. Lindstrøm, M. Leitao, P. Marvan, J. Padišák, E. Pipp, J. Prygiel, E. Rott, S. Sabater, H. van Dam, and J. Viznet. 1998. Recommendations for the routine sampling of diatoms for water quality assessments in Europe. *J. Appl. Phycol.* 10:215-224.
- Kentucky Division of Water. 1993. *Methods for Assessing Biological Integrity of Surface Waters*. Kentucky Natural Resources and Environmental Protection Cabinet, Frankfort, KY.
- Kerans, B. L. and J. R. Karr. 1994. A benthic index of biotic integrity (B-IBI) for rivers of the Tennessee Valley. *Ecol. Appl.* 4:768-785.
- Klotz, R. L. 1992. Factors influencing alkaline phosphatase activity of stream epithelion. *J. Freshwater Ecol.* 7(2):233-242.
- Kolkwitz, R. and M. Marsson. 1908. Ökologie der pflanzliche Saprobien. *Ber. Deutsche Bot. Ges.* 26:505-519.
- Land & Water Consulting. 1996. Water Quality Status and Trends Monitoring System for the Clark Fork-Pend Oreille Watershed. Report to Montana Dept. Env. Quality.
- Leopold, L. B., M. G. Wolman, and J. P. Miller. 1964. *Fluvial Processes in Geomorphology*. W. H. Freeman, San Francisco, CA.
- Lohman, K., J. R. Jones, and C. Baysinger-Daniel. 1991. Experimental evidence for nitrogen limitation in an Ozark stream. *J. N. Am. Benthol. Soc.* 10:13-24.
- Lohman, K., J. R. Jones, and B. D. Perkins. 1992. Effects of nutrient enrichment and flood frequency on periphyton biomass in northern Ozark streams. *Can. J. Fish. Aquat. Sci.* 49:1198-1205.
- Lowe, R. L. 1974. *Environmental Requirements and Pollution Tolerance of Freshwater Diatoms*. U.S. Environmental Protection Agency, Cincinnati, OH. EPA-670/4-74-005.
- Lowe, R. L. and G. D. LaLiberte. 1996. Benthic Stream Algae: Distribution and Structure. In: *Methods in Stream Ecology*. Hauer, F. R. and G. A. Lamberti (eds.). Academic Press, San Diego, CA. pp. 269-293.
- Lowe, R. L., and Y. Pan. 1996. Benthic algal communities and biological monitors. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego, CA. pp. 705-739.

- Lowrance, R., R. Todd, J. Fail, Jr., O. Hendrickson Jr., R. Leonard, and L. Asmussen. 1984. Riparian forests as nutrient filters in agricultural watersheds. *Bioscience* 34(6):374-377.
- Lung, W. and K. Larson. 1995. Water quality modeling of the Upper Mississippi River and Lake Pepin. *J. Env. Engineering* 121:691-699.
- Martí, E., S. G. Fisher, J. J. Schade, and N. B. Grimm. (In press). (b) Effect of flood frequency on hydrological and chemical linkages between streams and their riparian zones: An intermediate disturbance model. In: *Surface-Subsurface Interactions in Streams*. Jones, Jr., J. B. and P. J. Mulholland (eds.).
- Martí, E., S. G. Fisher, J. J. Schade, J. R. Welter, and N. B. Grimm. (n press). (a) Hydrological and chemical linkages between streams and their riparian zones: An intermediate disturbance model. *Internationale Vereinigung fur Theoretische und Angewandt Limnologie, Verhandlungen* 27.
- Marti, E., N. B. Grimm, and S. G. Fisher. 1997. Pre- and post-flood nutrient retention efficiency in a desert stream ecosystem. *J. N. Am. Benthol. Soc.* 16:805-819.
- Marzolf, E. R., P. J. Mulholland, and A. D. Steinman. 1994. Improvements to the diurnal upstream-downstream dissolved oxygen change technique for determining whole-stream metabolism in small streams. *Can. J. Fish. Aquat. Sci.* 51:1591-1599.
- Marzolf, E. R., P. J. Mulholland, and A. D. Steinman. 1998. Reply: Improvements to the diurnal upstream-downstream dissolved oxygen change technique for determining whole-stream metabolism in small streams. *Can. J. Fish. Aquat. Sci.* 55:1786-1787.
- May, C. W., E. B. Welch, R. R. Horner, J. R. Karr, and B. W. Mar. 1997. *Quality Indices for Urbanization Effects in Puget Sound Lowland Streams*. Department of Civil Engineering, University of Washington, Water Res. Series Tech. Rep. No. 154.
- McCormick, P. V. and J. Cairns, Jr. 1994. Algae as indicators of environmental change. *J. Appl. Phycol.* 6:509-526.
- McCormick, P. V. and R. J. Stevenson. 1998. Periphyton as a tool for ecological assessment and management in the Florida Everglades. *J. Appl. Phycol.* 34:726-733.
- McGarrigle, M. L. 1993. Aspects of river eutrophication in Ireland. *Ann. Limnol.* 29:355-364.
- McIntire, C. D., S. V. Gregory, A. D. Steinman, and G. A. Lamberti. 1996. Modeling benthic algal communities: An example from stream ecology. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego, CA. pp. 669-704.

- McIntire, C. D. and H. K. Phinney. 1965. Laboratory studies of periphyton production and community metabolism in lotic environments. *Ecol. Monogr.* 35:237-258.
- Miltner, R. J. and E. T. Rankin. 1998. Primary nutrients and the biotic integrity of rivers and streams. *Freshwater Biol.* 40:145-158.
- Molles, M. C., Jr. and C. N. Dahm. 1990. A perspective on El Niño and La Niña: Global implications for stream ecology. *J. N. Am. Benthol. Soc.* 9:68-76.
- Moore, L. W., C. Y. Chew, R. H. Smith, and S. Sahoo. 1992. Modeling of best management practices on North Reelfoot Creek, Tennessee. *Water Environ. Res.* 64:241-247.
- Mueller, D. K. 1998. *Quality of Nutrient Data from Streams and Ground Water Sampled During 1993-95*. National Water-Quality Assessment Program: U.S. Geological Survey Open-File Report 98-276. 25 pp.
- Mueller, D. K., P. A. Hamilton, D. R. Helsel, K. J. Hitt, and B. C. Ruddy. 1995. *Nutrients in Ground Water and Surface Water of the United States--Analysis of Data Through 1992*. U.S. Geological Survey Water-Resources Investigations Report 95-4031. 74 pp.
- Mueller, D. K., J. D. Martin, and T. J. Lopes. 1997. *Quality-Control Design for Surface-Water Sampling in the National Water-Quality Assessment Program*. U.S. Geological Survey Open-File Report 7-223. 17 pp.
- Mulholland, P. J., E. R. Marzolf, S. P. Hendricks, R. V. Wilkerson, and A. K. Baybayan. 1995. Longitudinal patterns of nutrient cycling and periphyton characteristics in streams: A test of upstream-downstream linkage. *J. N. Am. Benthol. Soc.* 14(3):357-370.
- Munn, M. D., L. L. Osborne, and M. J. Wiley. 1989. Factors influencing periphyton growth in agricultural streams of central Illinois. *Hydrobiologia* 174:89-97.
- Myers, R. 1990. *Classical and Modern Regression with Applications*. PWS-Kent, Boston, MA.
- Nebel, B. J. and R. T. Wright. 2000. *Environmental Science: The Way the World Works*. 7th ed. Prentice-Hall, Upper Saddle River, NJ.
- Newbold, J. D., J. W. Elwood, R. V. O'Neill, and W. Van Winkle. 1981. Measuring nutrient spiraling in streams. *Can. J. Fish. Aquat. Sci.* 38:860-863.
- Nolan, B. T., B. C. Ruddy, K. J. Hitt, and D. R. Helsel. 1997. Risk of nitrate in groundwaters of the United States – A national perspective. *Environ. Sci. Technol.* 31(8):2229-2236.
- Nordin, R. N. 1985. *Water Quality Criteria for Nutrients and Algae (Technical Appendix)*. British Columbia Ministry of the Environment, Victoria, BC. 104 pp.

- Nordin, R. N. 1995. Personal communication. Water Management Branch, British Columbia Ministry of the Environment, Victoria, British Columbia.
- OAR (Oregon Administrative Rules). 2000. Water Quality Program Rules, 340-041-0150, Nuisance Phytoplankton Growth.
- Odum, H. T. 1956. Primary production in flowing waters. *Limnol. Oceanogr.* 1:102-117.
- OECD. 1982. *Eutrophication of Waters: Monitoring, Assessment and Control*. OECD, Paris. 154 pp.
- O'Hearn, M. O. and J. P. Gibb. 1980. *Groundwater Discharge to Illinois Streams*. Illinois Institute of Natural Resources, State Water Survey Division, Groundwater Section, SWS Contract Report 246, Champaign, IL. 31 pp.
- Oliver, B. G. and D. B. Schindler. 1980. Trihalomethanes from the chlorination of aquatic algae. *Environ. Sci. Technol.* 14:1502-1505.
- Olsen, D. S. and J. P. Potyondy (Eds.). 1999. *Wildland Hydrology*. American Water Resources Association. Herndon, VA. TPS-99-3. 536 pp.
- Omernik, J. A. 1977. *Nonpoint Source-Stream Nutrient Level Relationships: A Nationwide Study*. U.S. Environmental Protection Agency, Corvallis, OR. 151 pp. EPA 600/3-77-105. (Map scale 1:7,500,000)
- Omernik, J. A. 1987. Ecoregions of the conterminous United States. *Ann. Assoc. Am. Geographers* 77:118-125.
- Omernik, J. A. 1995. Ecoregions: A spatial framework for environmental management. In: *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Davis, W. S. and P. S. Thomas (eds.). Lewis Publishers, Boca Raton, FL. pp. 49-66.
- Omernik, J. A. 2000. *Draft Aggregations of Level III Ecoregions for the National Nutrient Strategy*. [<http://www.epa.gov/ost/standards/ecomap.html>].
- Omernik, J. M. 1986. Ecoregions of the United States. U.S. Environmental Protection Agency, Corvallis Environmental Research Laboratory. 1 p.
- O'Neill, R. V., D. L. DeAngelis, J. B. Waide, and T. F. H. Allen. 1986. *A Hierarchical Concept of Ecosystems*. Princeton University Press, Princeton, NJ.
- Ott, L. 1988. *An Introduction to Statistical Methods and Data Analysis*. 3rd ed. PWS Publishing Company, Boston, MA.
- Ott, W. R. 1995. *Environmental Statistics and Data Analysis*. Lewis Publishers, Boca Raton, FL.

- Palmer, C. M. 1962. *Algae in Water Supplies*. U.S. Department of Health, Education and Welfare. Washington, DC.
- Pan, Y., R. J. Stevenson, B. H. Hill, A. T. Herlihy, and G. B. Collins. 1996. Using diatoms as indicators of ecological conditions in lotic systems: A regional assessment. *J. N. Am. Benthol. Soc.* 15:481-495.
- Pan, Y., R. J. Stevenson, B. H. Hill, and A. T. Herlihy. (In press). Ecoregions and benthic diatom assemblages in the Mid-Atlantic Highland streams, USA. *J. N. Am. Benthol. Soc.*
- Paulsen, S. G., D. P. Larsen, P. R. Kaufmann, T. R. Whittier, J. R. Baker, D. V. Peck, J. McGue, R. M. Hughes, D. McMullen, D. Stevens, J. L. Stoddard, J. Larzorchak, W. Kinney, A. R. Selle, and R. Hjort. 1991. *Environmental Monitoring and Assessment Program (EMAP) Surface Waters Monitoring and Research Strategy – Fiscal Year 1991*.
- Pearsall, W. H. 1920. The aquatic vegetation of the English Lakes. *J. Ecol.* 8:163-199.
- Perdue, E. M., F. Mantoura, J. Ertel, C. Lee, K. Mopper, G. Peyton, E. Tanoue, P. M. Williams, O. Zafirou, and P. Coble. 1993. Mechanisms subgroup report. *Mar. Chem.* 41:51-60.
- Perrin, C. J., M. L. Bothwell, and P. A. Slaney. 1987. Experimental enrichment of a coastal stream in British Columbia: Effects of organic and inorganic additions on autotrophic periphyton production. *Can. J. Fish. Aquat. Sci.* 44:1247-1256.
- Peterjohn, W. T. and D. L. Correll. 1984. Nutrient dynamics in an agricultural watershed: Observations on the role of a riparian forest. *Ecology* 65(5):1466-1475.
- Peterson, B. J., L. Deegan, J. Helfrich, J. E. Hobbie, M. Hullar, B. Moller, T. E. Ford, A. Hershey, A. Hiltner, G. Kipphut, M. A. Lock, D. M. Fiebig, V. McKinley, M. C. Miller, J. R. Vestal, R. Ventullo, and G. Volk. 1993. Biological responses of a tundra river to fertilization. *Ecology* 74:653-672.
- Peterson, C. G. 1996. Mechanisms of lotic microalgal colonization following space-clearing disturbances at different spatial scales. *Oikos* 77:417-435.
- Pickett, S. T. A., J. J. Kolasa, and S. L. Collins. 1989. The ecological concept of disturbance and its expression at various hierarchical levels. *Oikos* 54:129-136.
- Pielou, E. C. 1975. *Ecological Diversity*. Wiley, New York.
- Pielou, E. C. 1984. *The Interpretation of Ecological Data, A Primer on Classification and Ordination*. John Wiley, New York. 263 pp.

- Pinay, G. and H. Decamps. 1988. The role of riparian woods in regulating nitrogen fluxes between the alluvial aquifer and surface water: A conceptual model. *Regulated Rivers; Research and Management* 2:507-516.
- Pitcairn, E. R. and H. A. Hawkes. 1973. The role of phosphorus in the growth of *Cladophora*. *Water Res.* 7:159-171.
- Poff, N. L. and J. V. Ward. 1989. Implications of streamflow variability and predictability for lotic community structure: A regional analysis of streamflow patterns. *Can. J. Fish. Aquat. Sci.* 46:1805-1818.
- Poole, R. W. 1972. *An Introduction to Quantitative Ecology*. McGraw-Hill, New York.
- Power, M. E. 1990. Effects of fish in river food webs. *Science* 250:811-814.
- Power, M. E. 1992. Hydrologic and trophic controls of seasonal algal blooms in northern California rivers. *Arch. Hydrobiol.* 125:385-410.
- Power, M. E. and A. J. Stewart. 1987. Disturbance and recovery of an algal assemblage following flooding in an Oklahoma stream. *Am. Midland Naturalist* 117:333-345.
- Prairie, Y. T., C. M. Duarte, and J. Kalff. 1989. Unifying nutrient-chlorophyll relations in lakes. *Can. J. Fish. Aquat. Sci.* 46:1176-1182.
- Preston, S. D. and J. W. Brakebill. 1999. *Application of Spatially Referenced Regression Modeling for the Evaluation of Total Nitrogen Loading in the Chesapeake Bay Watershed*. U.S. Geological Survey Water Resources Investigation Report 99-4054. 12 pp.
- Pringle, C. M. and F. J. Triska. 1996. Effects of nutrient enrichment on periphyton. In: *Methods in Stream Ecology*. Hauer, F. R. and G. A. Lamberti (eds.). Academic Press, San Diego. pp. 607-623.
- Puckridge, J. T., F. Sheldon, K. F. Walker, and A. J. Boulton. 1998. Flow variability and the ecology of large rivers. *Marine Freshwater Res.* 49(1):55-72.
- Quinn, J. M. 1991. *Guidelines for the Control of Undesirable Biological Growths in Water*. National Inst. Water and Atmos. Res., Consultancy Report No. 6213/2.
- Quinn, J. M., R. J. Davies-Colley, C. W. Hickey, M. L. Vickers, and P. A. Ryan. 1992. Effects of clay discharges on streams 2. Benthic invertebrates. *Hydrobiologia* 248:235-247.
- Rabalais, N. N., R. E. Turner, Q. Dortch, W. J. Wiseman, Jr., and B. K. S. Gupta. 1996. Nutrient changes in the Mississippi River and system responses on the adjacent continental shelf. *Estuaries* 19(2B):386-407.

- Raschke, R. 1993. Guidelines for assessing and predicting eutrophication status of small southeastern piedmont impoundments. EPA Region IV. Environmental Services Division, Ecological Support Branch, Athens, GA.
- Reckhow, K. H. and S. C. Chapra. 1983. *Data Analysis and Empirical Modeling; Engineering Approaches for Lake Management Volume I*. Butterworths, Boston, MA.
- Remington, R. D. and M. A. Schork. 1985. *Statistics with Applications to the Biological and Health Sciences*. Prentice Hall, Englewood Cliffs, NJ.
- Renberg, I. and T. Hellberg. 1982. The pH history of lakes in Southwestern Sweden, as calculated from the subfossil diatom flora of the sediments. *Ambio* 11:30-33.
- Resh, V. H., M. J. Myers, and M. J. Hannaford. 1996. Macroinvertebrates as biotic indicators of environmental quality. In: *Methods in Stream Ecology*. Hauer, F. R. and G. A. Lamberti (eds.). Academic Press, San Diego. pp. 647-667.
- Resh, V. H. and D. M. Rosenberg (eds.). 1984. *The Ecology of Aquatic Insects*. Praeger Special Studies-Praeger Scientific, New York.
- Rickert, D. A., R. R. Petersen, S. W. McKenzie, W. G. Hines, and S. A. Wille. 1977. Algal conditions and the potential for future algal problems in the Willamette River, Oregon. U.S. Geological Circular 715-G. 39 pp.
- Rodhe, W. 1948. Environmental requirements of freshwater plankton algae. *Experimental Studies in the Ecology of Phytoplankton*. Symbol. Bot. Upsalien 10. 149 pp.
- Rosen, B. H. and R. L. Lowe. 1984. Physiological and ultrastructural responses of *Cyclotella meneghiniana* (Bacillariophyta) to light intensity and nutrient limitation. *J. Phycol.* 20:173-183.
- Rosenfield, J. and J. C. Roff. 1991. Primary production and potential availability of autochthonous carbon in southern Ontario streams. *Hydrobiologia* 224:99-109.
- Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.
- Rosgen, D. 1996. *Applied River Morphology*. Wildland Hydrology, Pagosa Springs, CO. 380 pp.
- Sartory, D. P. and J. U. Grobbelaar. 1984. Extraction of chlorophyll a from freshwater phytoplankton for spectrophotometric analysis. *Hydrobiologia* 114:117-187.
- Schanz, F. and H. Juon. 1983. Two different methods of evaluating nutrient limitations of periphyton bioassays using water from the River Rhine and eight of its tributaries. *Hydrobiologia* 102:187-195.

- Scheckenberger, R. B., and A. S. Kennedy. 1994. The use of HSPF in subwatershed planning. In: *Current Practices in Modelling the Management of Stormwater Impacts*. W. James (ed.). Lewis Publ., Boca Raton, FL. pp. 175-187.
- Schiefele, S. and C. Schreiner. 1991. Use of diatoms for monitoring nutrient enrichment, acidification, and impact of salt in rivers in Germany and Austria. In: *Use of Algae for Monitoring Rivers*. Whitton, B. A., E. Rott, and G. Friedrich (eds.). Institut für Botanik, Universität Innsbruck, Austria. pp. 103-110.
- Schade, J. D. and S. G. Fisher. 1997. The influence of leaf litter on a Sonoran Desert stream ecosystem. *J. N. Am. Benthol. Soc.* 16:612-626.
- Sheath, R. G. and J. M. Burkholder. 1985. Characteristics of soft water streams in Rhode Island. II. Composition and seasonal dynamics of macroalgal communities. *Hydrobiologia* 128:109-118.
- Shelton, L.R. 1994. *Field Guide for Collection and Processing Stream-Water Samples for the National Water Quality Assessment Program*. U.S. Geological Survey Open-File Report 94-455. 42 pp.
- Silvey, J. K. G. and J. T. Watt. 1971. The interrelationship between freshwater bacteria, algae, and actinomycetes in Southwestern reservoirs. In: *The Structure and Function of Freshwater Microbial Communities*. J. Cairns, Jr. (ed.). American Microscopical Society Symposium. Research Division monograph 3. Virginia Polytechnic Institute and State University, Blacksburg, VA.
- Slack, K. V. 1971. Average dissolved oxygen-measurement and water quality significance. *J. Water Pollut. Control Fed.* 43:433-446.
- Slaney, P. A. and B. R. Ward. 1993. Experimental fertilization of nutrient deficient streams in British Columbia. In: *Le Développement du Saumon Atlantique Au Québec: Connaitre Les Regles du Jeu Pour Reussir*. Shooner G. and S. Asselin (eds.). Colloque international de la Federation quebecoise pour le saumon atlantique, Quebec, Canada.
- Smart, R. M. 1990. *Effects of Water Chemistry on Submersed Aquatic Plants: A Synthesis*. Miscellaneous Paper A-90-4. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Smith, R. A., G. E. Schwarz, and R. B. Alexander. 1997. Regional interpretation of water-quality monitoring data. *Water Res.* 33(12):2781-2798.
- Smith, R. E. H. and J. Kalff. 1981. The effect of phosphorus limitation on algal growth rates: Evidence from alkaline phosphatase. *Can. J. Fish. Aquat. Sci.* 38:1421-1427.
- Smith, V. H. 1982. The nitrogen and phosphorus dependence of algal biomass in lakes: An empirical and theoretical analysis. *Limnol. Oceanogr.* 27:1101-1112.

- Smith, V. H. 1998. Cultural eutrophication of inland, estuarine, and coastal waters. In: *Successes, Limitations and Frontiers in Ecosystem Science*. Pace, M. L. and P. M. Groffman (eds.). Springer-Verlag, New York. pp. 7-49.
- Smith, V. H., G. D. Tilman, and J. C. Nekola. 1999. Eutrophication: Impacts of excess nutrient inputs on freshwater, marine, and terrestrial ecosystems. *Environ. Pollut.* 100:179-196.
- Sneath, P. H. A. and R. R. Sokal. 1973. *UPGMA (Unweighted Pair-Group Method Using Arithmetic averages)*. Numerical Taxonomy. W. H. Freeman, San Francisco, CA.
- Sokal, R. R. and F. J. Rohlf. 1998. *Biometry: The Principles and Practice of Statistics in Biological Research*. W. H. Freeman, New York. 887 pp.
- Sorenson, S. K., S. D. Porter, K. K. B. Akers, M. A. Harris, S. J. Kalkhoff, K. E. Lee, L. R. Roberts, and P. J. Terrio. 1999. *Water Quality and Habitat Conditions in Upper Midwest Streams Relative to Riparian Vegetation and Soil Characteristics, August 1997: Study Design, Methods, and Data*. U.S. Geological Survey Open-File Report 99-202. 53 pp.
- Sosiak, A. J. Personal communication. Long-term response of periphyton and macrophytes to reduced municipal nutrient loading to the Bow River (Alberta, Canada). Alberta Environment Protection, Calgary, Alberta.
- Spence, D. H. N. 1975. Light and plant responses in freshwater. In: *Light as an Ecological Factor*. Evans, G. C., R. Bainbridge, and O. Rackham (eds.). Blackwell Scientific Publishers, Oxford. pp. 93-134.
- Squillace, P. J., J. P. Caldwell, P. M. Schulmeyer, and C. A. Harvey. 1996. *Movement of Agricultural Chemicals Between Surface Water and Ground Water, Lower Cedar River Basin, Iowa*. U.S. Geological Survey Water-Supply Paper 2448. 59 pp.
- Stanley, E. H. 1999. personal communication. Department of Zoology, University of Wisconsin, Madison, WI.
- Stanley, E. H. and A. J. Boulton. 1995. Hyporheic processes during flooding and drying in a Sonoran Desert stream. I. Hydrologic and chemical dynamics. *Arch. Hydrobiol.* 134:1-26.
- Stanley, E. H., S. G. Fisher, and N. B. Grimm. 1997. Ecosystem expansion and contraction in streams. *BioScience* 47:427-436.
- Stanley, E. H. and H. M. Valett. 1992. Interaction between drying and the hyporheic zone of a desert stream ecosystem. In: *Climate Change and Freshwater Ecosystems*. Firth, P. and S. G. Fisher (eds.). Springer-Verlag, New York. pp. 234-249.

- Steinberg, C. and S. Schiefele. 1988. Indication of trophy and pollution in running waters. *Zeitschrift für Wasser-Abwasser Forschung* 21:227-234.
- Steinman, A. D. 1996. Effects of grazers on freshwater benthic algae. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. L. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego, CA. pp. 341-373.
- Steinman, A. D. and G. A. Lamberti. 1996. Biomass and pigments of benthic algae. In: *Methods in Stream Ecology*. Hauer, F. R. and G. A. Lamberti (eds.). Academic Press, San Diego, CA. pp. 295-313.
- Steinman, A. D. and P. J. Mulholland. 1996. Phosphorus limitation, uptake, and turnover in stream algae. In: *Methods in Stream Ecology*. Hauer, F. R. and G. A. Lamberti (eds.). Academic Press, San Diego, CA. pp. 161-189.
- Stevenson, J. Personal communication. Michigan State University, East Lansing, MI.
- Stevenson, R. J. 1984. Epilithic and epipelic diatoms in the Sandusky River, with emphasis on species diversity and water quality. *Hydrobiologia* 114:161-175.
- Stevenson, R. J. 1996. An introduction to algal ecology in freshwater benthic habitats. In: *Algal Ecology: Freshwater Benthic Ecosystems*. Stevenson, R. J., M. Bothwell, and R. L. Lowe (eds.). Academic Press, San Diego, CA. pp. 3-30.
- Stevenson, R. J. 1997. Scale dependent determinants and consequences of benthic algal heterogeneity. *J. N. Am. Benthol. Soc.* 16(1):248-262.
- Stevenson, R. J. 1998. Diatom indicators of stream and wetland stressors in a risk management framework. *Environ. Monitor. Assess.* 51:107-118.
- Stevenson, R. J. (In press). Using algae to assess wetlands with multivariate statistics, multimetric indices, and an ecological risk assessment framework. In: *Biomonitoring and Management of North American Freshwater Wetlands*. Batzger, D., R. Rader, and S. Wissinger (eds.). John Wiley, New York.
- Stevenson, R. J. and L. L. Bahls. 1999. Periphyton protocols. In: *Revision to Rapid Bioassessment Protocols for Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish*. Barbour, M. T., J. Gerritsen, and B. D. Snyder (eds.). U.S. Environmental Protection Agency, Washington, DC.
- Stevenson, R. J. and Y. Pan. 1999. Assessing ecological conditions in rivers and streams with diatoms. In: *The Diatoms: Applications to the Environmental and Earth Sciences*. Stoermer, E. F. and J. P. Smol (eds.). Cambridge University Press, Cambridge, UK. pp. 11-40.

- Stevenson, R. J. and J. P. Smol. (In press). Use of algae in environmental assessment. In: *Freshwater Algae in North America: Classification and Ecology*. Wehr, J. D. and R. G. Sheath (eds.). Academic Press, San Diego, CA.
- Stockner, J. G. and K. R. S. Shortreed. 1976. Autotrophic production in Carnation Creek, a coastal rainforest stream on Vancouver Island, British Columbia. *J. Fish. Res. Board Can.* 33:1553-1563.
- Stoermer, E. F. and J. P. Smol (eds.). 1999. *The Diatoms: Applications for the Environmental and Earth Sciences*. Cambridge University Press, Cambridge. 484 pp.
- Storr, J. F. and R. A. Sweeney. 1971. Development of a theoretical seasonal growth response curve of *Cladophora glomerata* to temperature and photoperiod. *Proc. 14th Conf. Gt. Lakes Res.* 14:119-127.
- Strahler, A. N. 1964. Quantitative geomorphology of drainage basins and channel networks. In Chow, V. T. (ed.). *Handbook of Applied Hydrology*. McGraw-Hill, New York. pp. 439-476.
- Strayer, D. L., N. F. Caraco, J. J. Cole, S. Findlay, and M. L. Pace. 1999. Transformation of freshwater ecosystems by bivalves. *Bioscience* 49(1):19-27.
- Stromberg, J. C., D. T. Patten, and B. D. Richter. 1991. Flood flows and dynamics of Sonoran riparian forests. *Rivers* 2(3):221-235.
- Stumm, W. G. and J. J. Morgan. 1981. *Aquatic Chemistry*. John Wiley, New York.
- Suess, M. J. 1981. Health aspects of eutrophication. *Water Qual. Bull.* 6:63-64.
- Tate, C. M. 1990. Patterns and controls of nitrogen in tallgrass prairie streams. *Ecology* 71:2007-2018.
- Taylor, W. D., L. R. Williams, S. C. Hern, V. W. Lambou, C. L. Howard, F. A. Morris, and M. K. Morris. 1981. *Phytoplankton Water Quality Relationships in U.S. Lakes, Part VIII: Algae Associated with or Responsible for Water Quality Problems*. Environmental Protection Agency, Las Vegas, NV. Report EPA-600/S3-80-100 or NTIS PB-81-156831.
- ter Braak, C. J. F. and H. van Dam. 1989. Inferring pH from diatoms: A comparison of old and new calibration methods. *Hydrobiologia* 178:209-223.
- Thoms, M. C. and F. Sheldon. 1996. The importance of channel complexity for ecosystem processing: An example of the Barwon-Darling River. In: *Stream Management in Australia*. Rutherford, I. (ed.). CRC for Catchment Hydrology, Melbourne, Australia. pp. 111-118.
- TNDEC (Tennessee Department of Environment and Conservation). 1996. *Standard Operating Procedure for Modified Clean Technique Sampling Protocol*. Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Nashville, TN.

- Turner, R. E. and N. N. Rabalais. 1991. Changes in Mississippi River water quality this century: Implications for coastal food webs. *Bioscience* 41(3):140-147.
- Turner, R. E. and N. N. Rabalais. 1994. Coastal eutrophication near the Mississippi River delta. *Nature* 368:619-621.
- USEPA. 1971. *Algal Assay Procedure: Bottle Test*. National Eutrophication Research Program, Corvallis, OR.
- USEPA. 1973. *Water Quality Criteria - 1972*. Tech. Adv. Comm., Nat. Acad. Sci. Engr. U.S. Government Printing Office.
- USEPA. 1986. *Quality Criteria for Water - 1986*. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA 440/5-86-001.
- USEPA. 1993a. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA 840-B-92-002.
- USEPA. 1993b. *Clark Fork-Pend Oreille Basin Water Quality Study*. EPA 910/R-93-006.
- USEPA. 1994. *Water Quality Standards Handbook*. 2nd ed. Office of Water, U.S. Environmental Protection Agency. EPA 823-B-94-005a.
- USEPA. 1995. Drinking water regulations and health advisories. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA 822-R-95-001.
- USEPA. 1996. *National Water Quality Inventory 1996 Report to Congress*. Office of Water, U.S. Environmental Protection Agency. EPA 841-R-97-008.
- USEPA. 1998a. *National Strategy for the Development of Regional Nutrient Criteria*. Office of Water, U.S. Environmental Protection Agency. EPA 822-R-98-002.
- USEPA. 1998b. *Guidance for Quality Assurance Project Plans*. Office of Research and Development, U.S. Environmental Protection Agency. EPA/600/R-98/018.
- USEPA. 1999. *Protocol for Developing Nutrient TMDLs*. Office of Water (4503F), U.S. Environmental Protection Agency. EPA 841-B-99-007.
- UK Environment Agency. 1998. *Aquatic Eutrophication in England and Wales*. Environmental Issues Series Consultative Report.
- Valett, H. M., S. G. Fisher, and E. H. Stanley. 1990. Physical and chemical characteristics of the hyporheic zone of a Sonoran Desert stream. *J. N. Am. Benthol. Soc.* 9:201-215.

- Valett, H. M., S. G. Fisher, N. B. Grimm, and P. Camill. 1994. Vertical hydrologic exchange and ecological stability of a desert stream ecosystem. *Ecology* 75:548-560.
- Van Dam, H., A. Mertenes, and J. Sinkeldam. 1994. A coded checklist and ecological indicator values of freshwater diatoms from the Netherlands. *Netherlands J. Aquat. Ecol.* 28:117-133.
- Van Nieuwenhuysse, E. E. and J. R. Jones. 1996. Phosphorus-chlorophyll relationship in temperate streams and its variation with stream catchment area. *Can. J. Fish. Aquat. Sci.* 53:99-105.
- Vannote, R. L., G. W. Minshall, K. W. Cummins, J. R. Sedell, and C. E. Cushing. 1980. The river continuum concept. *Can. J. Fish. Aquat. Sci.* 37:130-137.
- Vitousek, P. M., J. D. Aber, R. W. Howarth, G. E. Likens, P. A. Matson, D. W. Schindler, W. H. Schlesinger, and D. G. Tilman. 1997. Human alteration of the global nitrogen cycle: Sources and consequences. *Ecol. Appl.* 7(3):737-750.
- Wallace, J. B. and J. R. Webster. 1996. The role of macroinvertebrates in stream ecosystem function. *Ann. Rev. Entomol.* 41:115-139.
- Walton, S. P., E. B. Welch, and R. R. Horner. 1995. Stream periphyton response to grazing and changes in phosphorus concentration. *Hydrobiologia* 302:31-46.
- Walton, W. C. 1965. *Ground Water Recharge and Runoff in Illinois*. Report of Investigation 48, Illinois State Water Survey, Urbana, IL. 55 pp.
- Ward, M. H., S. D. Mark, K. P. Cantor, D. D. Weisenburger, A. Correa-Vilasenor, and S. H. Zahm. 1996. Drinking water nitrate and the risk of non-Hodgkin's lymphoma. *Epidemiology* 7(5):465-471.
- Warren, C. E., J. H. Wales, G. E. Davis, and P. Douderoff. 1964. Trout production in an experimental stream enriched with sucrose. *J. Wildlife Manage.* 28:617-660.
- Watershed Management Institute, Inc. 1998. Operation, maintenance, and management of stormwater management systems. Technical report with USEPA. (<http://www.epa.gov/OWOW/NPS/wmi/wmi.html>)
- Watson, V. J. 1989a. Dissolved oxygen levels in the middle Clark Fork River, summer 1987. *Proc. Mont. Acad. Sci.* 49:147-156.
- Watson, V. J. 1989b. Dissolved oxygen levels in the upper Clark Fork River, summer 1987. *Proc. Mont. Acad. Sci.* 49:157-162.
- Watson, V. J. and B. Gestring. 1996. Monitoring algae levels in the Clark Fork River. *Intermountain J. Sci.* 2:17-26.

- Watson, V. J., P. Perlind, and L. Bahls. 1990. Control of algal standing crop by P and N in the Clark Fork River. Proc. Clark Fork River Symposium, Montana Academy of Sci., Missoula, MT.
- Weber, C. I. 1973. Recent developments in the measurement of the response of plankton and periphyton to changes in their environment. In: *Bioassay Techniques and Environmental Chemistry*. Glass, G. (ed.). Ann Arbor Science Publishers, Ann Arbor, MI. pp. 119-138.
- Wehr, J. D. and J. P. Descy. 1998. Use of phytoplankton in large river management. *J. Phycol.* 34:741-749.
- Welch, E. B. 1992. *Ecological Effects of Wastewater*. Chapman and Hall, London.
- Welch, E. B., R. R. Horner, and C. R. Patmont. 1989. Prediction of nuisance periphytic biomass: A management approach. *Water Res.* 23:401-405.
- Welch, E. B., J. M. Jacoby, R. R. Horner and M. R. Seeley. 1987. Nuisance biomass levels of periphytic algae in streams. *Hydrobiologia* 157:161-168.
- Welch E. B., J. M. Jacoby, and C. W. May. 1998. Stream quality. In: *River Ecology and Management: Lessons from the Pacific Coastal Ecoregion*. Naiman, R. J. and R. E. Bilby (eds.). Springer-Verlag. pp. 69-94.
- Welch, E. B., C. L. May, and J. M. Jacoby. (In press). Stream quality. In: *River Ecology and Management: Lessons from the Pacific Coastal Ecoregion*. Bilby, R. E. and R. J. Naiman (eds.). Springer-Verlag.
- Welch, E. B., J. M. Quinn, and C. W. Hickey. 1992. Periphyton biomass related to point-source enrichment in seven New Zealand streams. *Water Res.* 26:669-675.
- Welschmeyer, N. A. 1994. Fluorometric analysis of chlorophyll *a* in the presence of chlorophyll *b* and phaeopigments. *Limnol. Oceanogr.* 39:1985-1992.
- Wetzel, R. G. 1983. *Limnology*. 2nd ed. Saunders College Publishing, Philadelphia. 860 pp.
- Wetzel, R. G. 1992. Clean water: A fading resource. *Hydrobiologia* 243/244:21-30.
- Wetzel, R. G. and G. E. Likens. 1991. *Limnological Analyses*. 2nd ed. Springer-Verlag, New York.
- Wetzel, R. G. and A. K. Ward. 1992. Primary production. In: *Rivers Handbook*. P. Calow and G. E. Petts (eds.). Blackwell Scientific Publications, Oxford, England. pp. 354-369.
- Whitmore, T. J. 1989. Florida diatom assemblages as indicators of trophic state and pH. *Limnol. Oceanogr.* 34:882-895.
- Whittaker, R. H. 1952. A study of summer foliage insect communities in the Great Smoky Mountains. *Ecol. Monogr.* 22:1-44.

