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### Academic and Research Experience

Position	Dates	Department	Institution
Professor	July 2003+	Ecology, Evolution, and Organismal Biology	Iowa State University
Professor	July 2002-2003	Botany	Iowa State University
Professor	July 2002	Natural Resources Ecology and Management	Iowa State University
Professor (courtesy appointment)	January 2002	Agricultural Biosystems Technology	Iowa State University
Professor	January 1995+	Animal Ecology	Iowa State University
Research Associate	July 1994-96	Ecology, Evolution & Behavior	University of Minnesota
Adjunct Professor	April 1994-97	Biology	Macalester College
Director, Laurentian Biological Station	April 90-Dec 95	Biological Sci.	University of Montréal
Professor	June 93-95	Biological Sci.	University of Montréal
Associate Professor	June 88-May 93	Biological Sci.	University of Montréal
Adjunct Professor	Jan. 81+	Dept. Biology	McGill University
Assistant Professor	June 87-May 88	Biological Sci.	University of Montréal
Univ. Research Fellow <sup>1</sup>	June 82-May 87	Biological Sci.	University of Montréal
Postdoctoral Fellow	Apr.81-June 82	Biological Sci.	University of Montréal
Postdoctoral Fellow	Apr.80-Apr. 81	Dept. Biology	McGill University
Lecturer	Dec.79-Apr.80	Dept. Biology	McGill University

### Education

Degree/Position	Institution	Dates
Postdoctoral Fellow	University of Montréal, Canada	April 1981-June 1982
Postdoctoral Fellow	McGill University, Montréal, Can.	April 1980-March 1981
Ph.D.(Biol.) with Honors	McGill University, Montréal, Can.	September 1975-Dec. 1979
M.S.(Zool.)	North Dakota State Univ., Fargo, ND	June 1973-July 1975
B.S.(Biol.) with Honors.	Hamline University, St. Paul, MN	September 1969-May 1973

### Honors & Distinctions

Year	Organization	Award/Honor
2005	<i>Elsevier Publishers</i>	Invited co-editor for the <i>Water Encyclopedia</i>
2005	<i>American Society of Limnology and Oceanography</i>	Invited Chair of the Hutchinson Award Committee and the ASLO Awards Committee
2004	<i>North American Nitrogen Center, Cornell Univ.</i>	Invited member of Board of Directors

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<sup>1</sup>The University Research Fellowship program of NSERC funded "a select number of very promising researchers" and carried the beginning rank of assistant professor.

Year	Organization	Award/Honor
2004	<i>Natural Sciences and Engineering Research Council of Canada</i>	Invited panel member for the EWR Steacie Award, Canada's highest scientific honor (deferred due to time constraints)
2004	<i>International Association of Great Lakes Research</i>	Invited plenary speaker for 2004 annual meeting.
2003	<i>Iowa Governor's Office</i>	Appointed by Governor to represent him on the Water Quality working group, preparing for the 2003 Iowa Water Summit
2003	<i>National Center for Ecological Synthesis</i>	Invited Participant; Workshop on Integrating Terrestrial and Aquatic Carbon Cycling
2002	<i>Natural Sciences and Engineering Research Council of Canada</i>	President of the Ecology and Evolution Panel (GSC 18); 2002-2003)
2001	<i>University of Maryland, Center for Environmental Science</i>	Invited Participant: Summit for Finding Common Ground in Controlling Agricultural Nonpoint Sources of Nutrients
2001	<i>North American Benthological Society</i>	Invited Plenary Speaker, Annual Meeting, LaCrosse, Wisconsin
2001	<i>Great Plains Limnologists</i>	Invited Plenary Speaker, Annual Meeting, Iowa Lakeside Lab
2001	<i>Iowa State Water Resources Research Institute</i>	Annual Award for Excellence in Water Research
2000	<i>Sierra Club, Iowa Chapter</i>	Grass Roots Conservationist Award
2000	<i>Natural Sciences and Engineering Research Council of Canada</i>	Invited Member of Evolution and Ecology Panel (2000-2003)
2000	<i>Iowa State Water Resources Research Institute</i>	Elected Chair of Faculty Advisory Committee
2000	<i>American Society of Limnology and Oceanography</i>	Invited Member of Nominating Committee
1999	<i>Ecological Society of America - US Environmental Protection Agency</i>	Invited Member of Organizing Committee for Joint Workshop on Atmospheric Deposition
1999	<i>US National Science Foundation - US Environmental Protection Agency</i>	Invited Panel Member; NSF-EPA Watersheds competition (declined)
1998	<i>Fonds pour la Formation de Chercheurs et L'Aide à la Recherche (FCAR)-Québec</i>	Invited Member of the Biological Sciences Granting Panel
1998	<i>US National Science Foundation - US Environmental Protection Agency</i>	Invited Panel Member; NSF-EPA Watersheds competition (declined)
1997	<i>American Society of Limnology and Oceanography</i>	Invited Co-Chair of ASLO 1999 Aquatic Sciences Meeting
1997	<i>Council on Agricultural Science and Technology</i>	Invited Gulf of Mexico hypoxia Task-Force Chair.
1996	<i>National Center for Ecological Synthesis</i>	Invited Participant; Workshop on Meta-analysis
1996	<i>Canadian Journal of Fisheries and Aquatic Sciences</i>	Invited Editorial Board Member
1996	<i>US National Science Foundation</i>	Invited Panel Member; NSF-EPA Watersheds competition
1995	<i>Hamline University</i>	Elected to the Hamline University "Science Alumni Gallery of Achievement"; one of only 17 such awards in 150 year history of HU
1994	<i>NSERC Ecology &amp; Evolution Panel</i>	Invited member (declined)

Year	Organization	Award/Honor
1993	<i>American Fisheries Society</i>	Designated best article in 1992 volume of <i>Trans. Am. Fish. Soc.</i>
1993	<i>NSERC, Ecology panel</i>	Designated one of Canada's best ecologists (top 15%)
1993	<i>University of Montréal</i>	Accelerated promotion to Full Prof.
1991	<i>NSERC Ecology Panel</i>	Invited member (declined)
1990	<i>University of Montréal</i>	Appointed Director of the Laurentian Biological Station
1990-92	<i>FCAR, granting agency, Ecology panel.</i>	Elected President
1985	<i>Rawson Academy of Aquatic Science.</i>	Invited Fellow
1982	<i>NSERC (Canada's "NSF")</i>	University Research Fellowship
1980	<i>NSERC</i>	Postdoctoral Fellowship
1980	<i>FCAR, Min. Educ. Québec.</i>	Postdoctoral Fellowship (declined)
1980	<i>McGill University</i>	Dean's Honour List (Ph.D.)
1976	<i>McGill University</i>	Carpenter Fellow
1973	<i>Hamline University</i>	Special Dept. Honors for Research
1971	<i>Hamline University</i>	Walter Kenyon Scholar

### Refereed Publications

- Downing, J.A., Y.T. Prairie, J.J. Cole, C.M. Duarte, L.J. Tranvik, R.G. Striegl, W.H. McDowell, P. Kortelainen, N.F. Caraco, J.M. Melack, and J. Middelburg. (in press). The global abundance and size distribution of lakes, ponds, and impoundments. *Limnology and Oceanography*
- Graham, J.L., J.R. Jones, S.B. Jones, J.A. Downing, and T.E. Clevenger. 2004. Nonlinear relationships between environmental variables and microcystin concentration. *Water Research* 38: 4395-4404.
- Egertson, C.J. and J.A. Downing. 2004. Relationship of fish catch and composition to water quality in a suite of agriculturally eutrophic lakes. *Canadian Journal of Fisheries and Aquatic Science* 61: 1784-1796.
- Egertson, C.J., J.A. Kopaska and J.A. Downing. 2004. A century of change in macrophyte abundance and composition in response to agricultural eutrophication. *Hydrobiologia* 524 (1): 145-156.
- Strayer, D.L., J.A. Downing, W.R. Haag, T.L. King, J.B. Layzer, T.J. Newton, and S.J. Nichols. 2004. Changing perspectives on pearly mussels, North America's most imperiled animals. *BioScience* 54 (5): 429-439.
- Schrage, L.J. and J.A. Downing. 2004. Pathways of increased water clarity after benthivorous fish removal from Ventura Marsh; a shallow, eutrophic wetland. *Hydrobiologia* 511: 215-231.
- Arbuckle, K.E. and J.A. Downing. 2004. Recent declines in freshwater mussel species richness in agriculturally impacted streams. *Journal of the North American Benthological Society* 23: 114-125.
- Klatt, J.G., A.P. Mallarino, J.A. Downing, J.A. Kopaska and D.J. Wittry. 2003. Soil phosphorus, management practices, and their relationships to phosphorus delivery in the Iowa Clear Lake agricultural watershed. *Journal of Environmental Quality* 32: 2140-2149.
- Anthony, J.L. and J.A. Downing. 2003. Physical and chemical impacts of wind and boat traffic on Clear Lake, Iowa, USA. *Lake and Reservoir Management*. 19: 1-14.
- Mallarino, A.P., B.M. Stewart, J.L. Baker, J.A. Downing, and J.E. Sawyer. 2002. Phosphorus indexing for cropland: Overview and basic concepts of the Iowa phosphorus index. *Journal of Soil and Water Conservation* 57(6): 440-447.
- Arbuckle, K.E. and J.A. Downing. 2002. Freshwater mussel abundance and species richness: GIS relationships with watershed land use and geology. *Canadian Journal of Fisheries and Aquatic Sciences*. 59: 310-316.
- Downing, J.A., S.B. Watson and E. McCauley. 2001. Predicting Cyanobacteria dominance in lakes. *Canadian Journal of Fisheries and Aquatic Sciences*. 58: 1905-1908.
- Anthony, J.L. and J.A. Downing. 2001. Exploitation trajectory of a declining fauna: a century of freshwater mussel fisheries in North America. *Canadian Journal of Fisheries and Aquatic Sciences*. 58: 2071-2090.

- Silva, M., M. Brimacombe and J.A. Downing 2001. Effects of body mass, climate, geography and census are on population density of terrestrial mammals. *Global Ecology and Biogeography* 10: 469-485.
- Anthony, J.L., D.H. Kesler, W.L. Downing, and J.A. Downing. 2001. Length-specific growth rates in freshwater mussels (Bivalvia: Unionidae): extreme longevity or generalized growth cessation? *Freshwater Biology*. 46: 1349-1359.
- Arbuckle, K.E. and J.A. Downing. 2001. The influence of watershed land use on lake N:P in a predominantly agricultural landscape. *Limnology and Oceanography* 46: 970-975.
- Downing, J.A., H. Van Leeuwen, and L.A. Di Paolo. 2000. Substratum patch selection in the lacustrine mussels *Elliptio complanata* and *Pyganodon grandis grandis*. *Freshwater Biology*. 44: 641-648.
- Tang, M., Boisclair, D., Ménard, C., and Downing J.A. 2000. The influence of body weight, swimming characteristics, and water temperature on the net cost of spontaneous swimming of juvenile brook trout. *Canadian Journal of Fisheries and Aquatic Sciences*. 57: 1482-1488.
- Straka, J.R. and J.A. Downing. 2000. Correlation of the distribution and abundance of three freshwater mussel species (Bivalvia: Unionidae) with physical habitat characteristics in an Iowa reservoir. *Journal of the Iowa Academy of Science*. 107:25-33.
- Downing, J. A., M. McClain, R. Twilley, J. M Melack, J. Elser, N. N. Rabalais, W. M. Lewis, Jr., R. E. Turner, J. Corredor, D. Soto, A. Yanez-Arancibia, J. Kopaska and R. W. Howarth. 1999. The impact of accelerating land-use change on the N-cycle of tropical aquatic ecosystems: current conditions and projected changes. *Biogeochemistry* 46: 109-148.
- Downing, J. A., M. McClain, R. Twilley, J. M Melack, J. Elser, N. N. Rabalais, W. M. Lewis, Jr., R. E. Turner, J. Corredor, D. Soto, A. Yanez-Arancibia, J. Kopaska and R. W. Howarth. 1999. The impact of accelerating land-use change on the N-cycle of tropical aquatic ecosystems: current conditions and projected changes. In: A.R. Townsend (ed.), *New perspectives on nitrogen cycling in the temperate and tropical Americas*. Kluwer Academic Publishers, Dordrecht. 260 p. (reprinted from *Biogeochemistry*)
- Downing, J.A., N.N. Rabalais, R.J. Diaz, R.J. Zimmerman, J.L. Baker, and T. Prato. 1999. *Gulf of Mexico Hypoxia: Land and Sea Interactions*. Council for Agricultural Science and Technology, Task Force Report. Ames, IA (ISBN 1-887383-16-6) (credited referees)
- Downing, J.A., C.W. Osenberg, and O. Sarnelle. 1999. Meta-analysis of marine nutrient-enrichment experiments: variation in the magnitude of nutrient enrichment. *Ecology* 80:1157-1167.
- Amyot, J.-P. and J.A. Downing. 1998. Locomotion in *Elliptio complanata* (Mollusca: Unionidae): a reproductive function? *Freshwater Biology* 39: 351-358.
- Megard, R.O., M.M. Kuns, M.C. Whiteside and J.A. Downing. 1997. Spatial distributions of zooplankton during coastal upwelling in western Lake Superior. *Limnology and Oceanography* 42: 827-840.
- Watson, S., E. McCauley and J. Downing. 1997. Patterns in phytoplankton taxonomic composition across temperate lakes of differing nutrient status. *Limnology and Oceanography* 42: 487-495.
- Cyr, H., R.H. Peters, and J.A. Downing. 1997. Population density and community size structure: comparison of aquatic and terrestrial systems. *Oikos*. 80: 139-149.
- Cyr, H., J.A. Downing, and R.H. Peters. 1997. Density-body size relationships in local aquatic communities. *Oikos* 79: 333-346.
- Downing, J.A. 1997. In memorium: Robert Henry Peters (1946-1996). *ASLO Bulletin* 6: 25-27.
- Downing, J.A. 1997. Marine nitrogen:phosphorus stoichiometry and the global N:P cycle. *Biogeochemistry* 37: 237-252..
- Kesler, D.H. and J.A. Downing. 1997. Internal annuli yield inaccurate growth estimates in *Elliptio complanata* and *Lampsilis radiata*. *Freshwater Biology* 37: 325-332.
- Silva, M., J.H. Brown and J.A. Downing. 1997. Differences in population density and energy use between birds and mammals: a macroecological approach. *Journal of Animal Ecology* 66: 327-340.
- Amyot, J.-P. and J.A. Downing. 1997. Seasonal variation in vertical and horizontal movement of the freshwater bivalve *Elliptio complanata* (Mollusca: Unionidae). *Freshwater Biology* 37: 345-354.
- Howarth, R.W., G. Billen, D. Swaney, A. Townsend, N. Jaworski, K. Lajtha, J.A. Downing, R. Elmgren, N. Caracao, T. Jordan, F. Berendse, J. Freney, V. Kudeyarov, P. Murdoch and Zhu Zhao-liang. 1996. Regional nitrogen budgets and riverine N and P fluxes for the drainages to the North Atlantic Ocean: natural and human influences. *Biogeochemistry* 35:75-139.
- Tilman, D. And J.A. Downing. 1996. Biodiversity and stability in grasslands. P. 3-7 in F.B. Samson and F.L. Knopf (eds.), *Ecosystem Management*. Springer-Verlag, NY. 462 p.
- Silva, M.B. and J.A. Downing. 1995. The allometric scaling of density and body mass: a non-linear relationship for terrestrial mammals. *Am. Nat.* 145: 704-727.

- Silva, M.B. and J.A. Downing 1995. CRC handbook of mammalian body masses. CRC Press. 359 p.
- Tumbiolo, M.L. and J.A. Downing. 1994. An empirical model for the prediction of the secondary production of marine benthic invertebrates. *Mar. Ecol. Prog. Ser.* 114: 165-174.
- Silva, M. and J.A. Downing 1994. Allometric scaling of minimal mammal densities. *Conservation Biology* 8: 732-743.
- Tilman, D., J.A. Downing and D.A. Wedin. 1994. Does diversity beget stability? - Reply. *Nature (London)* 371: 114.
- Aboul-Hosn, W. and J.A. Downing. 1994. The influence of macrophyte cover on the spatial distribution of littoral zone fishes. *Can. J. Fish. Aquat. Sci.* 51: 1832-1838.
- Tilman, D. and J.A. Downing. 1994. Biodiversity and stability in grasslands. *Nature (London)*: 367: 363-365.
- Downing, W.L. and J.A. Downing. 1993. Molluscan shell growth and loss. *Nature (London)*: 362: 506.
- Downing, J.A. and C. Plante. 1993. The production of fish populations in lakes. *Can. J. Fish. Aquat. Sci.* 50: 110-120.
- Pace, M.L., S.B. Baines, H. Cyr, and J.A. Downing. 1993. Relationships among early life history stages of *Morone americana* and *Morone saxatilis* from long term monitoring of the Hudson River Estuary. *Can. J. Fish. Aquat. Sci.* 50: 1976-1985.
- Plante, C. and J. Downing. 1993. Relationship of salmonine production to lake trophic status and temperature. *Can. J. Fish. Aquat. Sci.* 50: 1324-1328.
- Downing, J.A., Y. Rochon, M. Pérusse, and H. Harvey. 1993. Spatial aggregation, body size, and reproductive success in the freshwater mussel *Elliptio complanata*. *J. N. Am. Benthol. Soc.* 12: 148-156.
- Watson, S., E. McCauley and J.A. Downing. 1992. Sigmoid relationships between phosphorus, algal biomass and algal community structure. *Can. J. Fish. Aquat. Sci.* 49: 2605-2610.
- Downing, W.L., J. Shostell and J.A. Downing. 1992. Non-annual annuli in the freshwater mussels *Anodonta grandis grandis* and *Lampsilis radiata siliquoidea*. *Freshwater Biology* 28: 309-317.
- Cyr, H., J.A. Downing, S. Lalonde, S. Baines, and M.L. Pace. 1992. Sampling larval fish populations: choice of sampler and sample number and size. *Trans. Am. Fish. Soc.* 121: 356-358.
- Downing, J.A. and E. McCauley. 1992. The nitrogen:phosphorus relationship in lakes. *Limnol. Oceanogr.* 37: 936-945.
- Lalonde, S., and J.A. Downing. 1992. Phytofauna of eleven macrophyte beds of differing trophic status, depth and composition. *Can. J. Fish. Aquat. Sci.* 49: 992-1000.
- Downing, J.A., and W.L. Downing. 1992. Spatial aggregation, precision and power in surveys of freshwater mussel populations. *Can. J. Fish. Aquat. Sci.* 49: 985-991.
- McCauley, E., and J.A. Downing. 1991. Different effects of phosphorus and nitrogen on chlorophyll concentration in oligotrophic and eutrophic lakes: reply to Seip. *Can. J. Fish. Aquat. Sci.* 48: 2552-2553.
- Lalonde, S., and J.A. Downing. 1991. Periphyton biomass is related to lake trophic status, depth and macrophyte architecture. *Can. J. Fish. Aquat. Sci.* 48: 2285-2291.
- Downing, J.A. 1991. Biological and physical heterogeneity in lakes. p. 160-180 In: J. Kolasa and S. Pickett (eds.), *Ecological heterogeneity*. Springer-Verlag, New York.
- Downing, J.A. 1991. Comparing apples and oranges: methodological problems in comparative ecosystem analysis. p. 24-45 In: J.J. Cole (ed.), *Comparative analyses of ecosystems: patterns, mechanisms, and theories*. Springer-Verlag, New York.
- Downing, J.A. 1991. The effect of habitat structure on the spatial distribution of freshwater invertebrate populations. p. 87-106 In: S.S. Bell, E.D. McCoy and H. Mushinsky (eds.) *Habitat structure: the physical arrangement of objects in space*. Chapman and Hall, London.
- Amyot, J.-P., and J.A. Downing. 1991. Endo- and epibenthic distribution of the unionid mollusc *Elliptio complanata*. *J. N. Am. Benthol. Soc.* 10: 280- 285.
- Downing, J.A., C. Plante, and S. Lalonde. 1990. Fish production is correlated with primary productivity, not the morphoedaphic index. *Can. J. Fish. Aquat. Sci.* 47: 1929-1036.
- Plante, C., and J.A. Downing. 1990. Empirical evidence for differences among secondary production calculation methods. *J. N. Am. Benthol. Soc.* 9: 9- 16.
- Downing, J.A. 1989. Precision of the mean and the design of benthos sampling programmes: caution revised. *Marine Biology* 103: 231-234.
- McCauley, E., J.A. Downing and S. Watson. 1989. Sigmoid relationships between nutrients and chlorophyll among lakes. *Can. J. Fish. Aquat. Sci.* 46: 1171-1175.

- Plante, C. and J.A. Downing. 1989. Production of freshwater invertebrate populations in lakes. *Can. J. Fish. Aquat. Sci.* 46: 1489-1498.
- Downing, J.A., J.-P. Amyot, M. Pérusse and Y. Rochon. 1989. Visceral sex, hermaphroditism, and protandry in a population of the freshwater bivalve *Elliptio complanata*. *J. N. Am. Benthol. Soc.* 8: 92-99.
- Cyr, H. and J.A. Downing. 1988. The abundance of phytophilous invertebrates on different species of submerged macrophytes. *Freshwater Biol.* 20: 365-374.
- Pinel-Alloul, B., J.A. Downing, M. Pérusse and G. Codin-Blumer. 1988. Spatial heterogeneity in freshwater zooplankton: effect of body-size, scale, depth, season and taxon. *Ecology* 69: 1393-1400.
- Cyr, H. and J.A. Downing. 1988. Empirical relationships of phytomacrofaunal abundance to plant biomass and macrophyte bed characteristics. *Can. J. Fish. Aquat. Sci.* 45: 976-984.
- Doyon, J.-F., J.A. Downing and E. Magnin. 1988. Predictable variation in the condition of Northern Pike, *Esox lucius*. *Can. J. Fish. Aquat. Sci.* 45: 479-483.
- Rasmussen, J. and J.A. Downing. 1988. The spatial response of chironomid larvae to the predatory leech *Nepheleopsis obscura*. *Am. Naturalist* 131:14-21.
- Downing, J.A. and L.C. Rath. 1988. Spatial patchiness in the lacustrine sedimentary environment. *Limnol. Oceanogr.* 33: 447-458.
- Downing, J.A., M. Pérusse and Y. Frenette. 1987. Effect of inter-replicate variance on zooplankton sampling design and data analysis. *Limnol. Oceanogr.* 32: 673-680.
- Downing, J.A. 1986a. Spatial heterogeneity: evolved behaviour or mathematical artefact? *Nature* 323: 255-257.
- Downing, J.A. 1986b. A regression technique for the estimation of epiphytic invertebrate populations. *Freshwater Biology* 16: 161-173.
- Downing, J.A. 1985. How to buy a smart multichannel counter and get a free micro-computer. *Bull. N. Am. Benthol. Soc.* 2: 56-57.
- Downing, J.A. and M.R. Anderson. 1985. Estimating the standing biomass of aquatic macrophytes. *Can. J. Fish. Aquat. Sci.* 42: 1860-1869.
- Downing, J.A. and H. Cyr. 1985. The quantitative estimation of epiphytic invertebrate populations. *Can. J. Fish. Aquat. Sci.* 42: 1570-1579.
- Kalff, J., J.A. Downing, and T.T. Smith. 1985. Rainfall, agriculture, livestock and human density in the dry regions of Kenya. *J. Arid Environments* 9: 173-183.
- McCauley, E. and J.A. Downing. 1985. The prediction of cladoceran grazing rate spectra. *Limnol. Oceanogr.* 30: 202-212.
- Downing, J.A. and L.A. Weber. 1984. The prediction of forest production from inventory and climatic data. *Ecological Modelling* 23: 227-241.
- Peters, R.H. and J.A. Downing. 1984. Empirical analysis of zooplankton filtering and feeding rates. *Limnol. Oceanogr.* 29: 763-784.
- Downing, J.A. and F.H. Rigler (eds.). 1984. *A Manual on Methods for the Assessment of Secondary Productivity in Fresh Waters*. Blackwell Scientific Publications, Oxford, England.
- Downing, J.A. 1984. Assessment of secondary production: the first step. Chapter 1 In: J.A. Downing and F.H. Rigler (eds.), *A Manual on Methods for the Assessment of Secondary Productivity in Fresh Waters*. Blackwell Scientific Publications, Oxford, England.
- Rigler, F.H. and J.A. Downing. 1984. The calculation of secondary productivity. Chapter 2 In: J.A. Downing and F.H. Rigler (eds.), *A Manual on Methods for the Assessment of Secondary Productivity in Fresh Waters*. Blackwell Scientific Publications, Oxford, England.
- Downing, J.A. 1984. Sampling the benthos of standing waters. Chapter 4 In: J.A. Downing and F.H. Rigler (eds.), *A Manual on Methods for the Assessment of Secondary Productivity in Fresh Waters*. Blackwell Scientific Publications, Oxford, England.
- Downing, J.A. 1981. How well does the fourth-root transformation work? *Can. J. Fish. Aquat. Sci.* 38: 126-129.
- Downing, J.A. 1981. In situ foraging responses of three species of littoral cladocerans. *Ecol. Monogr.* 51: 85-103.
- Downing, J.A. 1980. Inhibition of cladoceran feeding by staining with acridine orange. *Trans. Am. Micros. Soc.* 99: 398-403.
- Downing, J.A. 1980. Precision vs. generality: a reply. *Can. J. Fish. Aquat. Sci.* 37: 1329-1330.
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- Downing, J.A., and J.J. Peterka. 1978. Relationship between rainfall and lake groundwater seepage. *Limnol. Oceanogr.* 23: 821-825.

### **Journal Book Reviews**

- Downing, J.A. 2002. Review of: Rabalais, N.N. and R.E. Turner (eds.) 2001. Coastal hypoxia: consequences for living resources and ecosystems. Coastal and Estuarine Studies, 58. American Geophysical Union, Washington, D.C. vii + 463 p, Limnology and Oceanography

### **Articles submitted or in preparation**

- Prairie, Y.T., N.F. Caraco, W.H. McDowell, L.J. Tranvik, R.G. Striegl, C.M. Duarte, P. Kortelainen, J.J. Cole, and J.A. Downing. (in revision) Plumbing the carbon cycle: integrating inland waters into the terrestrial carbon budget. *Frontiers in Ecology*
- Cherrier, C.T. and J.A. Downing. (in revision) Predicting Cyanobacteria dominance in nutrient-rich lakes. *Limnology and Oceanography*
- Downing, J.A. and C.T. Cherrier. (in revision) Role of agriculture and impoundment in altering coastal Si:DIN stoichiometry. *Nature*
- Arbuckle, K.E. and J.A. Downing. (in revision) Influence of stream reach characteristics on freshwater mussel populations in a predominantly agricultural landscape. *Freshwater Biology*
- Forget, S., D.C. Adams, B.J. Danielson and J.A. Downing. (in revision) The biological production of mammal populations. *American Naturalist*
- Downing, J.A. and P. Van Meter. (completed pending submission) Suspects and evidence: a critical review of the causes of local extinction. *Conservation Biology*
- Graham, J. L., J. R. Jones, and J. A. Downing. Landscape influences on the nutrient content of midwestern lakes and reservoirs.
- Anthony, J.L. and J.A. Downing. Compensatory vs. depensatory dynamics in exploited populations: Can conventional management theory be applied to freshwater mussels (Bivalvia: Unionidae)?
- DiPaolo, L.A. and J.A. Downing. A comparative analysis of mussel (Bivalvia: Unionidae) recruitment, density, and mortality in a lake region experiencing mass mortality.
- Lalonde, S., J.A. Downing and H. Harvey. The influence of isolation and environmental conditions on sexual allocation in seven populations of *Elliptio complanata*.
- Mousseau, B. and J.A. Downing. A global analysis of reproductive allometry in mammal populations.

### **Laboratory Manuals and Pedagogical Resources**

- Downing, J.A. 1995-2005. Field and laboratory exercises in aquatic ecology. Autopublished. 240 p.

### **Recent Unrefereed Publications**

- Downing, J. A., J. Li, G. Antoniou, D., Kendall, C. Kling, J. Herriges, R. Castro, P. Van Meter, D. Woolnough, K. Egan, Y. Jeon, R. Andrews, S. Conrad, and L. Boatwright. 2005. Iowa Lakes Classification for Restoration. Iowa Department of Natural Resources, Des Moines, IA. 126 p.
- Downing, J.A., G.J. Antoniou, J.-Y. Li, D. Kendall, S. Conrad, and L. Boatwright. 2005. Iowa Lakes Survey, summer 2004 data summary. Iowa Geological Services Bureau, Iowa City, IA. (also found at [limnology.eeob.iastate.edu](http://limnology.eeob.iastate.edu))
- Downing, J.A., G.J. Antoniou, J.-Y. Li, D. Kendall, K. Koshatka, D. Stipp-Bethune. 2004. Iowa Lakes Survey, summer 2003 data summary. Iowa Geological Services Bureau, Iowa City, IA. 264 p. (also found at [limnology.eeob.iastate.edu](http://limnology.eeob.iastate.edu))
- Downing, J.A. 2003. Looking into Earth's eye: a watershed view of clear lakes. Iowa Natural Heritage. Fall 2003: 8-11.

- Downing, J.A., J. Ramstack, K. Haapa-aho, and K. Lee. 2003. The limnology of Iowa lakes: 2002. Iowa Geological Services Bureau, Iowa City, IA. 394 p.
- Downing, J.A., J. Kopaska, and D. Bonneau. 2002. Lake of Three Fires diagnostic/feasibility study. Iowa Department of Natural Resources, Des Moines, IA.
- Downing, J.A., C.T. Cherrier, and B. Dodd. 2002. Iowa Lakes Survey Summer 2000 biological report. Iowa Department of Natural Resources, Des Moines, IA.
- Downing, J.A. and J. Kopaska. 2002. Ames Quarry Lakes diagnostic study. City of Ames, IA.
- Downing, J.A. and J. Ramstack. 2002. The limnology of Iowa lakes: 2001. Iowa Geological Services Bureau, Iowa City, IA. 435 p.
- Downing, J.A. and J. Ramstack. 2001. The limnology of Iowa lakes: 2000. Iowa Geological Services Bureau, Iowa City, IA. 310 p.
- Downing, J. Kopaska et al. 2001 Diagnostic study of Clear Lake and its watershed: recommendations for remediation. Iowa Department of Natural Resources, Des Moines, IA.
- Downing, J.A. and J. Kopaska. 2000. Diagnostic study of Crystal Lake and its watershed: recommendations for remediation. Iowa Department of Natural Resources, Des Moines, IA. 232 p.
- Arbuckle, K.E. and J.A. Downing. 2000. Iowa's inland freshwater mussels. Iowa Department of Natural Resources, Des Moines, IA. 145 p.
- Downing, J.A. and J. Kopaska. 2000. Diagnostic study of Rock Creek Lake and its watershed: recommendations for remediation. Iowa Department of Natural Resources, Des Moines, IA. 241 p.

### **Public WWW resources**

Iowa lakes information system and other resources are maintained at:

- <http://limnology.eeob.iastate.edu>  
<http://limnology.eeob.iastate.edu/lakereport/>  
<http://limnoweb.eeob.iastate.edu/limnoinformatics/>  
<http://limnology.eeob.iastate.edu/lakereport/fishhome.aspx>

Economic information from my lakes research is found at:

- <http://www.card.iastate.edu/environment/items/IowaLakesReport.pdf>

### **Books in preparation**

- Likens, G.E., J.A. Downing (invited), and others. *Water encyclopedia*. Elsevier.
- Peters, R.H. and J.A. Downing. *Predictive ecology*.
- Downing, J.A. *Global budgeting: an introduction to resource ecology*.
- Downing, J.A. *Mapping aquatic habitats*.

### **Theses and dissertations from my lab**

- Goewert, A. 2005. Isotope sclerochronology of *Lampsilis cardium* (Unionidae): deciphering ontogenetic history. M.S. Thesis, Iowa State University.
- Leopold, R. 2005. Ecological considerations of transgenic plants used in open field production. Non-thesis M.S., co-directed with James Pease.
- Anderson, K. 2004. Spatial and temporal patterns in precipitation and dryfall deposition of nutrients in Iowa, U.S.A. M.S. Thesis, Iowa State University.
- Cherrier, C.T. 2003. The control of Cyanobacteria dominance in Iowa lakes. M.Sc. Thesis, Iowa State University.
- Egertson, C. 2003. The impact of fish and wind on the ecology of lakes in an agricultural landscape. M.Sc. Thesis, Iowa State University.
- Schrage, L.J. 2001. The role of trophic cascading in the degradation of water quality by benthivorous fish. M.Sc. Thesis, Iowa State University.
- Arbuckle, K.E. 2000. Statewide assessment of freshwater mussels in Iowa streams. M.Sc. Thesis, Iowa State University.
- Anthony, J.L. 2000. Growth and longevity of freshwater mussels (Bivalvia: Unionidae) with application to their commercial fisheries. M.Sc. Thesis, Iowa State University. (winner 2001 Distinguished Master's Thesis Award, Midwestern Association of Graduate Schools).

- Amyot, J.-P. 1998. Locomotion and spatial distribution of the freshwater bivalve *Elliptio complanata* (Locomotion et répartition spatiale chez le bivalve d'eau douce *Elliptio complanata*). Ph.D. Thesis, Université de Montréal.
- Di Paolo, A. L. 1997. Factors contributing to the local extinction of mussels: a comparative analysis of population density, recruitment and mortality. M.Sc. Thesis, Iowa State University.
- Tuxbury, K.A. 1997. Development of DNA markers and the genetic analysis of seven populations of the freshwater mussel *Lampsilis radiata siliquoidea* (Bivalvia: Unionidae) in north central Minnesota. M.Sc. Thesis, Iowa State University.
- Wissing-Taunt, K.D. 1997. Freshwater mussel filter feeding: unionid and zebra mussel particle selectivity. M.Sc. Thesis, Iowa State University.
- Straka, J. 1997. Effects of slope, depth, fetch and sediment organic matter content on the distribution and abundance of mussels (Bivalvia: Unionidae) in a reservoir lake in Central Iowa. M.Sc. Thesis, Iowa State University.
- Silva, M. 1996. Patterns of variation in the population density of terrestrial mammals. Ph.D. thesis, Université de Montréal.
- Aboul-Hosn, W. 1993. The influence of cover on the spatial distribution of littoral zone fishes. M.Sc. thesis, University of Montréal.
- Mousseau, B. 1992. Analyse globale de l'allométrie reproductive chez les populations de mammifères. M.Sc. thesis, University of Montréal.
- Forget, S. 1992. L'effet de divers facteurs écologiques sur la productivité des populations de mammifères. M.Sc. thesis, University of Montréal.
- Ménard, C. 1991. Utilisation de la vidéo pour mesurer les poissons *in situ*. M.Sc. thesis, University of Montréal, 92 + xi p.
- Lalonde, S. 1988. Influence des producteurs primaires sur la biomasse des invertébrés phytophiles en divers milieux lacustres. M.Sc. thesis, University of Montréal, 164 p.
- Plante, C. 1987. Prédiction de la production secondaire en milieu aquatique. M.Sc. thesis, University of Montréal, 119 p.
- Cyr, H. 1987. Facteurs reliés à l'abondance des invertébrés phytophiles dans les herbiers submergés lacustres. M.Sc. thesis, University of Montréal, 165 p.
- Rath, L.R. 1986. Le rapport entre l'hétérogénéité du benthos et les sédiments lacustres dans les zones profondes et sublittorales. M.Sc. thesis, University of Montréal, 131 p.

### Postdocs and International Scientists Trained

- Jennifer Fraterrigo. 2005-2007. Influence of landscape-weather interactions on biological water quality in agricultural watersheds.
- Yvonne Vadeboncoeur. 2003-2004. Postdoc in lake classification.
- Miriam Perozo Mur. 2003. Catalonia, Spain. GIS of Iowa lake basins.
- Ricard Cots. 2002. Catalonia, Spain. GIS of Iowa lake watersheds.
- Jordi Morell. 2001. Catalonia, Spain. Predicting the impacts of wind exposure on sediment mixing and nutrient regeneration in shallow lakes.
- Raquel Canet. 2001. Catalonia, Spain. Recreational park design for watershed change and nutrient retention.
- Jean-Pierre Amyot. 1995. Montreal, Quebec. Mussel behavior and growth comparisons.
- Maria Linda Tumbiolo. 1993. Palermo, Italy. Secondary production in marine ecosystems.

### Current Graduate Students

Name	Degree	Thesis title	Projected completion
Daelyn Woolnough	Ph.D.	Landscape ecology of freshwater mussels in the Mississippi River	Summer 2006
Tim Blake	M.Sc.	Influence on atmospheric nutrients on lake water quality	Spring 2006
Zsolt Gamesi	M.Sc.	The influence of watershed land use and land use configuration on nutrient concentrations in Iowa lakes	Summer 2006

### Training of Other Highly Qualified Personnel

I am lucky enough to employ and train a large number of people in the technical aspects of ecology, aquatic sciences, project management, and technical data display. Following is a list of these trainees since 1998. Many of these students use the technical training they received in my lab to advance to technical or scientific jobs or more advanced study.

*The list is currently missing about a dozen undergraduate students trained in 2005.*

<b>Name</b>	<b>Start Year</b>	<b>End Year</b>	<b>Trained as....</b>	<b>Current or Last-known Location</b>
Conrad, Sara	2004	Present	Research Assoc. II, Lab and Field	Employee, ISU Limnology Lab
Antoniou, George	2003	Present	Assistant Scientist I	Employee, ISU Limnology Lab
Kendall, Dan	2003	Present	Research Assoc. I, Plankton	Employee, ISU Limnology Lab
Li, Jingyang	2003	Present	Systems Analyst I	Employee, ISU Limnology Lab
Hoermann, Amber	2002	Present	Lab Assistant, Chemistry	BS Student, ISU
Boatwright, Lori	2004	2005	Research Assoc. I, Lab and Field	Employee, ISU Limnology Lab
Castro, Ryan	1999	2005	Research Assoc. I, Computer	Employee, ISU Limnology Lab
Carlson, Elizabeth	2002	2005	Lab Assistant, Plankton	BS Student, ISU
Heathcote, Adam	2003	2005	Lab Assistant, Plankton	BS Student, ISU
Van Meter, Patty	2001	2005	Research Assistant	BS Student, ISU
Stipp-Bethune, Desiree'	2003	2004	Research Assoc. I, Chemistry	Stay-at-home Mom
Burgess, Jennifer	2003	2004	Lab Assistant, Plankton	BS Student, ISU
Eidsmo, Theresa	2003	2004	Lab Assistant, Plankton	Technician, University of MN
Koshatka, Kelli	2002	2004	Research Assoc. I, Chemistry	Assistant Scientist, ISU
Parkhurst, Jessica	2003	2004	Graduate Assistant, GIS	BS Student, ISU
Garcia-Mestres, Lluís	2004	2004	International Intern	MS degree program in Spain
Brustkern, Sarah	2004	2004	Field Assistant	MS Student, Univ. of WA
Burgess, Jennifer	2003	2004	Lab Assistant, Plankton	BS Student, ISU
Engels, Shawn	2004	2004	Field Assistant	BS Student, ISU
Fisher, Ellen	2004	2004	Lab Assistant	BS Student, ISU
Gelner, Christopher	2004	2004	Field Assistant	BS Student, ISU
Johnson, Brent	2004	2004	Lab Assistant	Fort Dodge, IA
Petr, Michael	2004	2004	Lab Assistant	BS Student, ISU
Rees, Jennifer	2004	2004	Lab Assistant	BS Student, ISU
Raich, Caity	2003	2004	Lab Assistant	Education, Grinnell
Kopaska, Jeff	1997	2003	Assistant Scientist I	Fish. Scientist, IDNR, Boone
Shamblen, Victoria	2002	2003	Data Assistant	BS Student, ISU
Lee, Jason	2002	2003	Field Assistant	BS Student, U of Oklahoma
Rosauer, Dan	2003	2003	Field Assistant	BS Student, ISU
Steffen, Chris	2003	2004	Field Assistant	BS Student, ISU

<b>Name</b>	<b>Start Year</b>	<b>End Year</b>	<b>Trained as....</b>	<b>Current or Last-known Location</b>
TeRonde, Sarah	2003	2003	Field Assistant	BS Student, Central College
Mur, Miriam	2003	2003	GIS Intern	MS Student, Spain
Millman, Melissa	2001	2003	Lab Assistant, Chemisrty	MS Student, Tulane
Crandall, Jeremy	2002	2003	Lab Assistant, Chemistry	BS Student, ISU
Ng, Phoebe	2003	2003	Lab Assistant, Chemistry	BS Student, ISU
O' Leary, Nathan	2003	2003	Lab Assistant, Chemistry	BS Student, ISU
Cherrier, Christy	2001	2003	Lab Assistant, Plankton	Research Tech., University of Oregon
Haapa-aho, Kristian	2001	2003	Research Assoc. I, Chemistry	MS Student, Lakehead University, Canada
Lee, Kendra	2001	2003	Research Assoc. I, Chemistry	Asst. Scientist I, ISU
Conrad, Cam	2002	2003	Research Assoc. I, Computer	GIS Specialist, Iowa DNR
Cameron, Lisa	2002	2002	Data Assistant	Home Economics Teacher
Haas, Julia	2002	2002	Data Assistant	BS Student, ISU
Luo, Li	2002	2002	Data Assistant	MS Student, ISU
Rickleff, Adam	2002	2002	Data Assistant	BS Student, ISU
Cummings, Mike	2000	2002	Field / Lab Assistant	Environmental Law, U of Iowa
Dodd, Ben	1999	2002	Field / Lab Assistant	MS Student, Univ. Missouri
Bruton, Tom	2002	2002	Field Assistant	BS Student, ISU
Knoll, David	1999	2002	Field Assistant, GIS	Env. Proj. Mgr., NRCS, Clear Lake
Farre', Daniel	2002	2002	GIS Intern	MS Student, Spain
Brown, Emily	2001	2002	Lab Assistant	BS Student
Curler, Greg	2001	2002	Lab Assistant	BS Student, ISU
Murray, Jill	2002	2002	Lab Assistant	Wisconsin DNR
Townsend, Jacqueline	2002	2002	Lab Assistant, Plankton	BS Student, ISU
Huck, Jacob	2001	2001	Field Assistant	BS Student, ISU
Hucka, Ben	2001	2001	Field Assistant	BS Student, ISU
Schelling, David	2001	2001	Field Assistant	BS Student, ISU
Schlesser, Nick	2001	2001	Field Assistant	MS Student, Univ. MN
Cots, Ricard	2001	2001	GIS Intern	Env. Scientist, Spain
Leckwa, Amy	2001	2001	Lab Assistant	BS Student, ISU
Ready, Polly	2001	2001	Lab Assistant	BS Student, ISU
Simmons, Doris	2001	2001	Research Assistant	unknown
Dornbush, Jen	2001	2001	Research Assistant	BS Student, Buena Vista
Frjelijch, Victoria	2001	2001	Research Assistant	BS Student, ISU
Schmidt, Laura	2001	2001	Research Assistant	unknown
Johnson, Hilary	2000	2000	Lab Assistant	BS Student, ISU
Schrage, Laura	1999	2001	Lab Assistant, Plankton	Technician, Grand Canyon Nat'l Park
Cordes, Rebecca	1998	2001	Research Assoc. I	Environmental Consultant
Eckles, Nicole	1998	2001	Research Assoc. I	Veternary Assistant
James, Anthony	1997	2001	Research Assoc. I	Ph.D. Student

## Current Research Projects

Biogeochemistry & Chemical Limnology: I have been working with questions of nutrient stoichiometry for several years. Over the past decade, I have been working with several scientists around the US to determine how run-off from terrestrial systems influences the nutrient stoichiometry of freshwater systems and the sea. This biogeochemical research is of special interest for two reasons, (1) because the Midwest is the source of a large fraction of the elements that become nutrients in the sea, and (2) because landscape disturbance can have large impacts on aquatic ecosystems through nutrient flux. I have leveraged substantial IDNR funding to examine the biogeochemistry of several of Iowa's watersheds. These large, full-watershed studies are the most intense biogeochemical studies that have been made on lake watersheds in agriculturally dominated landscapes and are thus lending valuable insights into the impacts of agriculture on the biota of freshwater and marine ecosystems. Further, as a service to the state of Iowa, I have performed routine monitoring of 132 of Iowa's most important lakes from 2000-2006. This has yielded an unprecedented level of information on some of the most "non-point" impacted lakes in the world. A few of the important scientific products that are deriving from these projects are:

- Analyses of aeolian transport and loading of N, P and Si. Atmospheric transport and deposition is one of the most important, rapidly emerging areas of biogeochemistry with implications for agriculture, limnology and marine science.
- Analyses of N, P, and Si budgets of natural lakes and reservoirs in an agricultural region. These analyses are critical to understanding coastal eutrophication and the development of harmful algal blooms in freshwater and marine environments. My studies are some of the only budgets of their kind.
- Determinations, through GIS of watersheds, of the links between fine-scale land use, nutrient export rates, and the quality of freshwater environments.
- One of the first analyses of P transport that bridges the gap between field P concentrations and application rates and P delivery to a natural lake.
- Some of the most detailed analyses ever performed on groundwater nutrient flux to an agriculturally impacted lake.
- Some of the most detailed analyses available on the spatial distribution and transport of coliform and potentially pathogenic bacteria.
- A fully documented analysis of the biological impacts of "top-down" manipulation of fish populations through a large-scale carp manipulation in a 300 acre lake/wetland.
- Extensive comparative analyses of the ecology of lakes in a highly agricultural region.
- Multidisciplinary studies determining the economic effects of environmental change.

In addition to these important products, these studies will help us to better manage water resources. An important aspect of all of these studies is the management component. I have made several recommendations concerning the restoration of some of these waters, which demands a very high level of understanding of their function.

This research is intrinsically multidisciplinary. For example, the Clear Lake project was a team effort of limnologists, agronomists, geologists, economists, and social scientists. This work is now bridging the gap between traditional studies of water quality and human valuation of the environment. Such studies have been broadened into a full-scale study of the economics of water quality.

My biogeochemical interests and these studies in the most key area of the Mississippi River basin have helped forge connections with scientists across the full spectrum of disciplines from agronomy to marine ecology. I have ongoing collaborations with marine scientists and several other geochemical ecologists across the important Mississippi River / Gulf of Mexico interface. The practical implications of this work are wide-ranging. For example, I am helping the EPA set nutrient criteria across EPA region 7, and have helped the NRCS create a phosphorus index to help limit agricultural impacts on Iowa's waters. I enjoy these links between my research and public policy.

Integrating Terrestrial and Aquatic Carbon Cycles: The traditional compartmentalized approaches to the inventories of carbon pools and fluxes in the biosphere have generated gaps in the form of key components, particularly freshwater and wetland ecosystems, that have either been ignored or assumed

negligible. We hypothesize, based on a preliminary assessment of the easily available data, that these key components are critical for a reliable estimation of carbon movements. This research, catalyzed by NSF-NCEAS funding, aims at synthesizing existing information on carbon fluxes and pools in both terrestrial and aquatic systems to yield an improved representation of carbon cycling in the biosphere, explicitly considering the exchanges and interactions between components, conducive to a more realistic assessment of the carbon budget of the biosphere. On a more local scale, I am examining the role of eutrophic lakes and impoundments in carbon evasion and sequestration. These ecosystems are turning out to be some of the most carbon-active systems in the world.

**Freshwater Mussels:** My long-term research program on freshwater mussels has turned from studying lacustrine populations in Quebec, Rhode Island and Minnesota toward: (1) the evaluation of the condition of Iowa's "inland" mussel populations, (2) the examination of the age and growth of mussels in lakes, rivers and streams, (3) determination of the factors linked to local extinction and mass die-offs of mussels and (4) the analysis of mussel populations in large rivers (i.e., the Mississippi) using GIS and historical data. I also maintain collaboration with Dr. Bonnie Bowen of ISU. We hope to eventually examine potential small population phenomena in isolated and declining mussel populations.

### Recent Research Grants

<u>Members' Names</u>	<u>Funding Agency, Type of Support, Title</u>	<u>Amount</u>	<u>Status</u>	<u>Years</u>
<u>Downing, J.A., and J.M. Fraterrigo</u>	NSF-LTREB: Lakes in intensively managed watersheds as sensors of climate: influence of precipitation intensity on aquatic community composition	\$426,769	Applied for	2006-2011
<u>Downing, J.A., J.M. Fraterrigo, and J.R. Jones</u>	EPA, Nonlinear Responses to Global Change in Linked Aquatic and Terrestrial Systems: When to landscapes break down? The synergy of changes in land use and weather intensity on aquatic ecosystem function	\$837,420	Applied for	2006-2009
<u>Soranno, P., J. A. Downing, et al.</u>	EPA-NLAPP program: The hydrogeomorphic lake classification (HGLC) for lake assessment	\$285,208	Held	2005-2006
<u>Downing, J.A.</u>	Iowa DNR: DNR Fisheries Lake Data Management	\$24,357	Held	2005-2006
<u>Fraterrigo, J.M and J.A. Downing</u>	USDA-NRI: Influence of Landscape-Weather Interactions on Biological Water Quality in Agricultural Watersheds	\$115,000	Held	2005-2007
<u>Kling, C.L., J. Zhao, J. Herriges, &amp; J.A. Downing</u>	EPA STAR: Estimating the value of water quality in Iowa's lakes	\$444,782	Held	2003-2006
<u>Cole, J.J., Y. Prairie, C. Duarte, J.A. Downing, et al.</u>	NCEAS-NSF Working Group Grant: Integrating the terrestrial and aquatic components of the global carbon budget	\$50,000	Held	2003-2005
<u>Downing, J.A. &amp; T. Newton</u>	USGS: A multi-scale analysis of selected factors influencing the distribution of freshwater mussels in the Upper Mississippi River Basin	\$64,960	Held	2001-2006

<u>Members' Names</u>	<u>Funding Agency, Type of Support, Title</u>	<u>Amount</u>	<u>Status</u>	<u>Years</u>
<u>Downing, J.A.</u>	Diagnostic / feasibility study for maintaining water quality in the the Ada Hayden Lakes.	\$25,000/y	Held	2001-2006
<u>Downing, J.A.</u>	Iowa DNR: Iowa Lakes Survey 2000-2006	\$2,094,340	Held	2000-2006
<u>Andrews, R. and J.A. Downing</u>	Carver Trust Grant: Acquisition of antibiotic resistance in fresh water mussels.	\$25,000	Held	2003-2004
<u>Downing, J.A.</u>	ISWRRRI: Spatial and temporal patterns in precipitation and dry-fall deposition of Nitrogen and Phosphorus in Iowa.	\$21,600	Held	2003
<u>Baker, J.L., J.A. Downing, et al.</u>	Six-states consortium on animal waste management: Assessment of the impact of manure applications on soil phosphorus and water quality	\$205,676	Held	1999-2003
<u>R.S. Kanwar, J.L. Baker, J.A. Downing, et al.</u>	Leopold Center: Impact of manure applications on phosphorus, NO <sub>3</sub> -N and bacteria concentrations in surface runoff and subsurface drainage water.	\$26,000	Held	2000-2003
<u>J.Downing</u>	EPA 319 funds : State Lakes Classification, Assessment and Assistance Program	\$313,844	Held	2001-2005
<u>J.A. Downing</u>	IA-DNR: Amendment to Clear Lake Diagnostic Feasibility Study to permit soil P analysis	\$14,040	Held	1999-2001
<u>J.A. Downing</u>	IA-DNR and US EPA: Clear Lake Diagnostic Feasibility Study	\$601,397	Held	1999-2001
<u>J.A. Downing</u>	IA-DNR: Lake of Three Fires Diagnostic Feasibility Study	\$102,710	Held	1999-2001
<u>J.A. Downing</u>	Lake Rathbun Water Alliance:	\$96,294	Held	1999-2002
<u>J.A. Downing</u>	ISU Facilities Planning and Management: <i>Continued Assessment of Lake Laverne</i>	\$3,500	Held	1999-2000
<u>J.A. Downing and Joseph Morris</u>	Experiment Station: <i>Manipulating Nutrients to Enhance Pond Productivity</i>	\$7,000	Held	1999-2000
<u>J.A. Downing</u>	City of Clear Lake Iowa: Assessment of Fecal Bacteria and Sources in Clear Lake, Iowa	\$35,391	Held	1998-1999
<u>Jaime Fernando, J.A. Downing et al.</u>	CNPQ Brazil: Center for Excellence in Aquaculture (my name was used on this proposal but I have no material involvement in the grant)	\$1,333,000	Held	1997-2000
<u>J.A. Downing</u>	IA DNR: Rock Creek Lake Diagnostic Feasibility Study	\$65,340	Held	1997-2000
<u>J.A. Downing</u>	IA-DNR: Assessment of Iowa's Inland Mussel Population	\$69,104	Held	1998-2000
<u>J.A. Downing</u>	IA-DNR: Clear Lake Nutrient Budget Study	\$150,023	Held	1998-2000
<u>J.A. Downing</u>	IA-DNR: Crystal Lake Diagnostic Feasibility Study	\$57,168	Held	1998-2000

**Teaching History**

<u>Course</u>	<u>Institution</u>	<u>Dates</u>
Identification of Freshwater Organisms (On-line e-course)	Iowa State University	2004 to present
Aquatic Ecology	Iowa State University	1995 to present
Aquatic Ecology Lab & Field Course	Iowa State University	1995 to present
Ecological Resource Management	Iowa State University	1996 to present
Ecological Terminology (self guided)	Iowa State University	1998 to 2004
Freshwater Invertebrate Ecology	Iowa State University	1997-2003
Precision Agriculture (team taught)	Iowa State University	1996
Vertebrate Biology (team taught)	Iowa State University	1996
Fisheries and Limnological Techniques	Iowa State University	1995
The history of ecology.	University of Montréal	1985-1994
Natural resource ecology.	University of Montréal	1984-1994
Limnology/freshwater ecology.	University of Montréal	1983-1985
Limnology field course.	University of Montréal	1983-1984
Environmental impact assessment	University of Montréal	1983-1984
Resource biology (fisheries)	McGill University	1979-1980
Limnology (2-3 lectures)	McGill University	1977-1979
Ecology field course	McGill University	1975-1977
General ecology (lab)	McGill University	1975-1976
Ichthyology (lab)	McGill University	1975-1976
Physiological ecology (2-3 lectures)	McGill University	1977-1979
Physiological ecology (lab)	McGill University	1976-1979
Fisheries management (lab)	North Dakota State Univ.	1973-1975
Ichthyology laboratory	North Dakota State Univ.	1973-1975

**Current Teaching**

Below are descriptions of my four principal courses that I teach regularly at Iowa State University. I use modern techniques, including specific outcomes assessment (including identified knowledge, understanding and skills), learner-centered educational methods, course web-pages, WebCT testing and information, PowerPoint presentations, and a variety of ongoing assessment tools. My teaching evaluations are always among the best in the department. I have been a long-time member of the College of Agriculture's Outcomes Assessment Committee, and have involved myself in learning new techniques for educating students for the changing employment landscape they face.

Use of these approaches has had many benefits, including:

- Making my courses more interesting, enjoyable, efficient, and enriching for students.
- Making my courses more interesting for me and efficient of my time.
- Creating a "learning" rather than a "teaching" atmosphere.

**AQUATIC ECOLOGY**

**Course description:** Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on the comparative analysis of aquatic ecosystems, examining lakes, ponds, wetlands, streams, rivers, and estuaries. Lectures will acquaint students with the current state of knowledge in the aquatic sciences.

**Intended outcomes**

*Students will:*

- learn the major types of water bodies and water courses, know how they are formed and evolved, and understand their place in the hydrologic and geochemical cycles.
- learn to quantify, model and predict the physical aspects of aquatic environments (e.g., movement, heat, light).

- understand the importance, measurement, dynamics and cycling of major chemical species in aquatic environments (e.g., alkalinity, phosphorus, nitrogen, oxygen).
- learn how the functioning of aquatic ecosystems is influenced by the geologic and geographic setting of its watershed.
- know the major organisms present in aquatic ecosystems and understand the basics of their ecology.
- learn to quantify, model and predict the biological cycling of energy in aquatic environments and the relationship of biological production to management goals.
- recognize the factors responsible for the zonation of aquatic environments and organisms.
- understand the major aquatic ecosystem management methods and models.

## AQUATIC ECOLOGY LABORATORY

**Course description:** Field trips and laboratory exercises to accompany Aquatic Ecology. Field trips and laboratory exercises will give students hands-on experience with aquatic research and monitoring techniques and concepts.

### Intended outcomes

*Students will:*

- learn to quantify, model and predict the physical aspects of aquatic environments (e.g., movement, heat, light).
- understand the importance, measurement, dynamics and cycling of major chemical species in aquatic environments (e.g., alkalinity, phosphorus, nitrogen, oxygen).
- learn to quantify, model and predict the biological cycling of energy in aquatic environments and the relationship of biological production to management goals.
- recognize the factors responsible for the zonation of aquatic environments and organisms.
- understand the major aquatic ecosystem management methods and models.
- learn to recognize the principal plants and animals inhabiting aquatic ecosystems and understand their trophic relationships.
- be familiar with the principal tools of aquatic ecology and how they are applied, including field and laboratory methods.
- obtain practical experience in solving complex ecological problems.

## ECOLOGICAL RESOURCE MANAGEMENT

Ecological and economical management of sustainable biological resources. Unifying current management concepts and models in wildlife, fisheries, water quality, forestry, recreation and agriculture. Research problem.

**Course Plan:** Two one-hour lectures or discussions each week. Students prepare for class discussion by assigned reading. The balance of class time each week will be a laboratory used for individual analysis. Students present their results orally during the last class periods. A written research report will be prepared by each student.

### Intended outcomes

*Students will:*

- learn mass balance concepts as they apply to resource management goals
- identify components of mass balance equations in diverse management models
- understand the role of population dynamic concepts in resource management
- learn the concepts of equilibrium yield, sustainable yield, and optimal yield
- identify population characteristics impinging upon resource yields
- learn the role of models in resource management
- understand strengths and weaknesses of resource management model types
- explore models used in the management of fisheries, wildlife, forests, recreational areas, water quality and agriculture, and learn to apply them
- learn a global approach to resource management
- learn to use ecological theories and models to resolve resource management issues

- get hands-on experience in using comparative data to solve resource management problems
- understand the role of economics in altering management scenarios

## **IDENTIFICATION OF FRESHWATER ORGANISMS (Web Course; taught within WebCT)**

**Course description:** On line taxonomic and identification exercises to accompany “Aquatic Ecology”. Instruction and practice in the identification of algae, aquatic macrophytes, zooplankton and benthos.

**General course approach:** Students will guide their own learning through the use of taxonomic keys, on-line lessons and self-paced assessments. Readings and practice will be provided by the recommended keys. These keys are meant to provide the learner with concrete learning tools as well as useful reference volumes for future use. Learning modules and lessons will cover the taxa considered to be the most important or common. Although students will be expected to learn to use the keys and understand the terms used in identification, students will only be expected to identify the taxa presented in the on-line lessons.

### **Intended outcomes**

*Students will:*

- learn to recognize and distinguish the major groups of organisms inhabiting fresh waters
- learn the key characteristics used to differentiate the organisms of fresh waters
- be able to recognize the most important genera of aquatic organisms by sight

### **Administrative and Management Experience**

**Leader of the Limnology Lab in the Department of Animal Ecology (1995-present).** I have built and currently administer a large research group in the environmental sciences at ISU. I direct 4-7 full-time employees, 3-5 graduate students, and 3-4 part-time employees in the winter, increasing by another 10 or more fulltime employees in the summer. This team has worked all over the State of Iowa, running several trucks, several boats and a small plane to >130 field sites, performing a broad spectrum of analyses. In addition to these, I have helped to coordinate interdisciplinary team research that involves several other laboratories in geology, agronomy, economics, agricultural biosystems engineering, the National Swine Center, and sociology and landscape architecture.

**Director of the Laurentian Biological Station (1990-1995).** This was my greatest challenge and greatest success as an administrator. When I accepted the directorship of the Station de Biologie des Laurentides (Laurentian Biological Station), one of Canada’s largest and oldest field research and teaching institutions, it was at the point of closure due to decreased productivity and activity. Within two years, I had turned decay to growth, and brought this research and teaching resource to a level of productivity and activity that had never before been seen. I did this by revamping budgeting and accounting, dealing with long-standing personnel issues, rebuilding infrastructure, streamlining procedures, adopting a forward-looking strategic plan, seeking outside funding sources for some improvements, creating a motivating environment that was open to innovation and initiative, and advocating strongly and substantially for the Station and its scientists at all levels of the university administration. I lowered user fees, yet turned previously constant budget over-runs to near profit-making cash flow within my tenure as Director. I directed five full-time staff, a large physical plant, and coordinated the research needs of dozens of scientists and students, as well as a large technical staff (especially in summer). Most of my work in this capacity was in French which is my second language.

**Owner and Director of Environmetrix, Enr., of Montreal, Canada (1985-1995).** I ran this small consulting firm for a decade. Its principal product was submarine cartography. My daughters and I started this small business again in 2005, principally as a means of supporting their graduate and undergraduate studies. It operates under the dba of Digital Bathymetrics.

### **Recent scientific conferences**

*I have only listed scientific meetings or invited presentations here (invitation marked with a \*).*

- \*Downing, J.A. 2005. The global size distribution and abundance of lakes, ponds, and impoundments. American Society of Limnology and Oceanography, Santiago de Compostella, Spain.
- \*Downing, J.A. 2005. Notes from the upper edge of the nutrient spectrum: The ecology of waters in agricultural watershed. *Kremer Memorial Water Lecture*, University of Nebraska, Lincoln.
- \*Daelyn A. Woolnough, J. A. Downing and Teresa Newton. Fish Mediated Movement of Unionids: Neutral Model of Fish Communities in the Upper Mississippi River. Freshwater Mussel Conservation Society Annual Meeting, St. Paul, MN.
- \*Daelyn A. Woolnough, J. A. Downing and Teresa Newton. Metapopulation models of unionid fish hosts: Landscape ecology theory applied in the Upper Mississippi River. North American Benthological Society, New Orleans, LA.
- Downing, J.A. 2005. Role of agriculture and impoundment in altering coastal Si:DIN stoichiometry. American Society of Limnology and Oceanography, Salt Lake City, Utah.
- \*Downing, J.A. 2005. Plumbing agricultural landscapes for water quality improvement: coexistence of intensive agriculture and good water quality. EPA Region 7 and Iowa State University College of Agriculture joint conference.
- \*Downing, J.A. 2005. Iowa lake water quality: value, risk and emerging issues. Iowa State Water Monitoring Conference.
- \*Downing, J.A. 2005. CLEAR project update. Iowa State University Crop Advantage Program.
- \*Downing, J.A. 2005. Phosphorus as a pollutant. Iowa State University Crop Advantage Program.
- \*Downing, J.A. 2004. Water quality and restoration in agricultural watersheds. Department of Civil and Environmental Engineering, University of Iowa.
- \*Downing, J.A. and L. Schrage. 2004. Water quality and habitat restoration in Ventura Marsh following benthivorous fish removal. American Fisheries Society Annual Meeting, Madison, Wisconsin.
- \*Egertson, C. and J.A. Downing. 2004. Relationship of fish catch and composition to water quality in a suite of shallow, agriculturally eutrophic lakes. American Fisheries Society Annual Meeting, Madison, Wisconsin.
- Bonneau, D. and J.A. Downing. Iowa State lake habitat classification system. American Fisheries Society Annual Meeting, Madison, Wisconsin.
- \*Downing, J.A. 2004. Notes from the upper edge of the nutrient spectrum: the ecology of waters in agricultural watersheds. International Association of Great Lakes Research, Annual Meeting Plenary Talk. Waterloo, Ontario.
- \*Egan, K., J. Herriges, C. Kling, and J.A. Downing. 2004. Valuing water quality in Midwestern lake ecosystems (invited poster). US Environmental Protection Agency Science Forum, Washington, DC. This poster won the first place award in its division and was named best poster of the entire forum.
- Woolnough, D.A., J.A. Downing, and T. Newton. 2004. Metapopulation characteristics of unionid communities in the upper Mississippi River. Annual Meeting of the North American Benthological Society, Vancouver, BC.
- \*Downing, J.A. 2004. Notes from the upper edge of the nutrient spectrum: the ecology of waters in agricultural watersheds. Institute of Ecosystem Studies, Millbrook, NY.
- Graham, J. L., J. R. Jones, S. B. Jones, J. A. Downing and T. E. Clevenger. 2004. Nonlinear relationships between environmental variables and microcystin concentration. Sixth International Conference on Toxic Cyanobacteria, Bergen, Norway.
- \*Downing, J.A. 2003. Global carbon flux through groundwater. NCEAS Workshop on Integrating Terrestrial and Aquatic Carbon Budgets. Santa Barbara, CA.
- \*Downing, J.A. 2003. Phosphorus dynamics in the Clear Lake watershed: a case study. Agriculture and the Environment Conference: 2003. Ames, IA.
- \*Downing, J.A. and J. Ramstack. 2003. The water quality of Iowa lakes: 2002. Iowa water quality monitoring conference, Ames, IA.
- Woolnough, D., J.A. Downing and T. Newton. 2003. Demographic characteristics of fish hosts and unionid communities at multiple spatial scales in the upper Mississippi River. Freshwater Mussel Conservation Society Annual Meeting.
- Graham, J. L., J. R. Jones, S. B. Jones, J. A. Downing and T. E. Clevenger. Environmental factors influencing microcystin distribution and concentration in four midwestern states in the U.S.A. American Society of Limnology and Oceanography Annual Meeting, Salt Lake City, UT.
- Cherrier, C. and J.A. Downing. 2003. Predicting Cyanobacteria abundance in nutrient-rich lakes. American Society of Limnology and Oceanography Annual Meeting, Salt Lake City, Utah.

- \*Downing, J.A. 2002. A slow and lingering death? Notes on a century of decline in North America's mussel fauna. Invited seminar. University of Calgary, Alberta, Canada.
- \*Downing, J.A. 2002. Lake management in agriculturally impacted landscapes. Invited seminar. Alberta Lake Management Society. Red Deer, Alberta, Canada.
- \*Downing, J.A. 2002. Key problems in mussel ecology. Invited seminar. United States Geological Survey, Upper Mississippi Environmental Sciences Center. Lacrosse, WI.
- \*Downing, J.A. 2002. A slow and lingering death? Notes on a century of decline in North America's mussel fauna. Invited seminar. University of Minnesota, Duluth, MN.
- \*Downing, J.A. 2003. Phosphorus dynamics in the Clear Lake watershed: a case study. Agriculture and the Environment Conference: 2003. Ames, IA.
- \*Downing, J.A. and J. Ramstack. 2003. The water quality of Iowa lakes: 2002. Iowa water quality monitoring conference, Ames, IA.
- Woolnough, D., J.A. Downing and T. Newton. 2003. Demographic characteristics of fish hosts and unionid communities at multiple spatial scales in the upper Mississippi River. Freshwater Mussel Conservation Society Annual Meeting.
- Cherrier, C. and J.A. Downing. 2003. Predicting Cyanobacteria abundance in nutrient-rich lakes. American Society of Limnology and Oceanography Annual Meeting, Salt Lake City, Utah.
- \*Downing, J.A. 2001. Limnology of Clear Lake, Iowa. Midwest Fish and Wildlife Conference. Des Moines, IA.
- \*Kopaska, J., D. Knoll, and J.A. Downing. 2001. The Use of GIS-Linked AGNPS Watershed Modeling to Target Watershed Management for Water Quality Restoration. Midwest Fish and Wildlife Conference. Des Moines, IA.
- \*Egertson, C.J., J.A. Kopaska, and J.A. Downing. 2001. Historical Changes in Aquatic Macrophyte Species Composition and Water Clarity in a Shallow Prairie Lake. Midwest Fish and Wildlife Conference. Des Moines, IA.
- \*Knoll, D., J.A. Kopaska, and J.A. Downing. 2001. Watershed Influences and Nutrient Loading to Clear Lake, Iowa. Midwest Fish and Wildlife Conference. Des Moines, IA.
- \*Downing, J.A. 2001. Geographical distribution of non-point source pollution in agricultural watersheds. Summit for Finding Common Ground in Controlling Agricultural Nonpoint Sources of Nutrients, *University of Maryland, Center for Environmental Science*.
- Schrage, L. and J.A. Downing. 2001. Pathways leading to increased water clarity following benthivorous fish removal from a shallow wetland in an agricultural basin. North American Lake Management Society, Madison WI.
- Kopaska, J., D. Knoll, and J.A. Downing. 2001. The Use of GIS-Linked AGNPS Watershed Modeling To Target Watershed Management for Water Quality Restoration. North American Lake Management Society, Madison WI.
- Downing, J.A. and J. Kopaska. 2001. Sources of Impact and Watershed Remediation in Clear Lake, Iowa, USA, Annual Meeting, North American Lake Management Society, Madison WI.
- Azevedo, C., J. Herriges, C. Kling and J.A. Downing. 2001. Valuing Preservation and Improvements of Water Quality in Clear Lake, Iowa (USA). Annual Meeting, North American Lake Management Society, Madison WI.
- Anthony, J.L., J. Morrell Farré and J.A. Downing. 2001. Physical Impacts of Wind and Boat Traffic on Clear Lake (Iowa, USA), a Shallow, Eutrophic Lake in an Intensively Agricultural Region. Annual Meeting, North American Lake Management Society, Madison WI.
- Klatt, J.G., A.P. Mallarino, J.A. Downing and J.A. Kopaska. 2001. Soil P, management practices and P delivery to water bodies: Iowa Clear Lake watershed. American Society of Agronomy Annual Meeting. (Poster Presentation).
- Mallarino, A.P., B.M. Stewart, J.L. Baker, J.A. Downing, T.E. Fenton, J.E. Sawyer, G.A. Miller, J.L. Kovar, T.J. Sauer, and R.D. Voss. 2001. Phosphorus indexing in cropland: the Iowa P Index., Soil and Water Conservation Society Annual Meeting, South Carolina (Poster Presentation)
- \*Downing, J.A. 2001. Landscapes' reflections in the water: agricultural land use changes from biogeochemistry to conservation. Annual Meeting of the North American Benthological Society. LaCrosse, WI. Invited Plenary Presentation.
- Egertson, C.J., J.A. Kopaska, J.A. Downing. 2001. A century of change in aquatic macrophyte species composition and water clarity in a eutrophic prairie lake. Annual Meeting of the North American Benthological Society. LaCrosse, WI.

- Kopaska, J.A. B.W. Menzel, J.A. Downing. 2001. Land use effects on nutrient export from midwestern US agricultural watersheds. Annual Meeting of the North American Benthological Society. LaCrosse, WI
- \*Downing, J.A. 2001. Statewide status of Iowa lakes and linkages to agriculture. Great Plains Limnology, 28<sup>th</sup> Annual Meeting, Iowa Lakeside Laboratory. Invited Plenary Seminar.
- \*Downing, J.A. 2000. *A Slow and Lingering Death? Notes on a Century of Decline in North America's Mussel Fauna*. Invited Seminar, McMaster University, Hamilton, Ontario, Canada.
- \*Downing, J.A. 2000. *A Slow and Lingering Death? National and Midwestern Decline of North America's Mussel Fauna*. Invited Seminar, Great Plains Limnology Meeting, Lawrence, KS.
- \*Downing, J.A. 2000. L'Écologie et la Conservation des Moules d'Eau Douce dans le Mid Ouest Américain. Invited Seminar, Université de Montréal, Montréal, Québec, Canada. In French.
- \*Downing, J.A., C.W. Osenberg and O. Sarnelle. 1999. Marine phytoplankton growth limitation varies with N:P stoichiometry: a meta-analysis of nutrient enrichment experiments. Invited presentation in the Special Session on Ecological stoichiometry in aquatic ecosystems: New directions for navigating the food web in the next century. ASLO 50<sup>th</sup> Anniversary Conference.
- Kopaska, J.A., B.W. Menzel and J.A. Downing. 1999. Land use effects on nutrient export from Midwestern U.S. Agricultural Watersheds. Contributed presentation at the ASLO 50<sup>th</sup> Anniversary Conference.
- Arbuckle, K.E. and J.A. Downing. 1999. The influence of landuse on lake N:P in a predominantly agricultural landscape. Contributed presentation at the ASLO 50<sup>th</sup> Anniversary Conference.
- Anthony, J.L. and J.A. Downing. 1999. Extreme longevity in freshwater mussels (family Unionidae) inferred from mark-recapture growth data. Contributed presentation at the ASLO 50<sup>th</sup> Anniversary Conference.
- \*Downing, J.A. 1999. N and P dynamics in agricultural landscapes: potential impacts on marine nutrient limitation. Invited Seminar at McGill University.
- \*Downing, J.A. 1999. Phosphorus mobility and control in agricultural landscapes. Invited presentation at EPA Region 7, 7<sup>th</sup> Annual Nonpoint Source Conference & Iowa State University Conference on Global Water Issues (Conference title: From the Heartland to the World: The Importance of Clean Water).
- Bowen, B.S., J.A. Downing and K.A. Tuxbury. 1999. Genetic variation in lake populations of *Lampsilis radiata siliquoidea* in Minnesota. Presentation at the Chattanooga Mussel Meeting, Chattanooga, TN. This is the largest national meeting on mussel ecology and biology.
- \*Downing, J.A. 1999. Lakes in agricultural watersheds. Invited presentation at the Iowa Lakeside Laboratory, Lake Okoboji.
- \*Downing, J.A. 1999. Deposition on the Mississippi Watershed and Transportation to the Gulf. Invited presentation at a joint EPA / ESA conference on atmospheric deposition.
- Downing, J.A. 1999. Recruitment in Minnesota lacustrine mussel populations. Presentation at the ISU "Clam Jam", Ames, IA.
- \*Downing, J.A. 1999. Rediscovering Midwestern Lakes: Observations by a Prodigal Limnologist. Invited Plenary Speaker at the Great Plains Limnology meeting in Columbia, MO.
- \*Downing, J.A. 1999. Lakes in Agricultural Landscapes. Invited presentation to Sigma Xi at the University of Northern Iowa.
- \*Downing, J.A. 1998. Lake LaVerne and Iowa Lake Management. Invited talk at AFS-NC 1998 Meeting in Ames IA.
- \*Downing, J.A. 1997. Science and Limnology: Rob Peters' Quest for the Soluble. Invited seminar at ASLO 1997 Aquatic Sciences Meeting.
- \*Downing, J.A. 1994. The ecological importance of biodiversity. Keynote address, Association of Quebec Biologists, Quebec City, Quebec, Canada.
- Downing, J.A. 1994. The global N:P cycle. American Society of Limnology and Oceanography, Miami, Florida.
- \*Downing, J.A. 1994. Nutrient losses from Canadian landscapes. SCOPE Workshop, Block Island, Rhode Island.
- Aboul-Hosn, W. and J.A. Downing. 1992. The influence of cover on the spatial distribution of littoral fishes. American Fisheries Society, Rapid City, South Dakota.
- Downing, J.A. and W.L. Downing. 1992. Non-annual external annuli in the freshwater mussels *Anodonta grandis grandis* and *Lampsilis radiata siliquoidea*. North American Benthological Society, Louisville, Kentucky.

- Downing, J.A. 1990. The use of normative variance functions in the planning of benthos sampling surveys. North American Benthological Society, Blacksburg, Virginia.
- Amyot, J.-P. and J.A. Downing. 1990. The endo- and epibenthic distribution of the unionid mollusc *Elliptio complanata*. North American Benthological Society, Blacksburg, Virginia.
- Forget, S. and J.A. Downing. 1990. The relationship between P/B, body size, climate, trophic level, and mode of reproduction in 84 natural mammal populations. American Society of Mammalogists, Frostburg, Maryland.
- Silva, M. and J.A. Downing. 1990. Prediction of the spatial density of terrestrial mammal populations. American Society of Mammalogists, Frostburg, Maryland.

### Extension Activities

I have no true extension appointment but believe that a natural part of the land grant mission is for all professors to teach in the broadest sense and use their expertise to the benefit of the society in which they live. It is exciting to use basic knowledge for practical goals. I enjoy this a great deal.

- I present regular programs to citizens across the state on the ecology and management of aquatic ecosystems.
- I present regular programs on the impact of agricultural phosphorus on aquatic systems.
- I give regular presentations and advice on lake water quality guiding the City of Ames in discussions surrounding the Hallett's Quarry lakes (now Ada Hayden Heritage Park).

### OTHER EXTENSION ACCOMPLISHMENTS:

Probably one of my greatest extension time-commitments over the past years has been my work in helping to develop the *Iowa Phosphorus Index*. This was a collaborative effort across many units within the College of Agriculture. This work has been unique in the nation, has raised the standard for these indices, and differs from other states' efforts in several important ways:

1. It is the first P index in the nation that creates the index levels from scientifically based calculations that are closely correlated with actual levels of P loss from fields. Thus, the index values roughly approximate loss rates in kg/ha or lbs/acre. This was my idea, a prerequisite to my working on the index, and allowed us to make sure the index is performing its intended function.
2. The Iowa P index correctly predicts that P loss will be more closely correlated with sediment transport than fertilizer application. Therefore the index encourages farmers to engage in better land use management while allowing reasonable levels of fertilization. This "innovation" (not rocket science!) comes, in part, from my research on Rock Creek Lake watershed.
3. The Iowa P index correctly calculates that around 80% of ALL erosional and run-off P will become available to aquatic organisms. This was another contribution that I made to this index.

Although the Iowa Phosphorus Index is likely to have national impact as others use it as a starting point in state-by-state P index creation, its prime importance is the fact that it will be applied to all lands in the state receiving any form of federal subsidy. I am very happy to have been involved in this effort.

Explanation of the index is found at:

<http://www.ia.nrcs.usda.gov/technical/Phosphorus/phosphorusstandard.html>

We have published a peer-reviewed manuscript on this index and its approach.

### Recent Public Presentations and Other Programs Presented (partial list)

**March 2005:** Iowa's draft lake classification system. DNR, NRCS, IGSB, IDALS lake classification committee.

**February 2005:** Rathbun lake water quality: 2003-2004. Rathbun Land and Water Alliance, Cenerville, Iowa.

**January 2005:** Update on Iowa lake water quality and classification. DNR, NRCS, IGSB, IDALS lake classification committee.

**September 2004:** Water quality in Lake Rathbun. Rathbun Land and Water Alliance Annual Meeting, Millerton, IA.

**July 2004:** Water Quality in Itasca County Lakes. John Latimer's "Phenologies" program, KAXE Radio, Grand Rapids, MN.

**March 2004:** Phosphorus and the aquatic environment. Butler County Soil and Water Conservation program, Allison, Iowa.

**May 2004:** At the request of the City of Ames, I gave Governor Vilsack a tour of the water quality enhancing features of the Ada Hayden Heritage Park.

**November 2003:** Water quality in Lake Rathbun, 2002. Rathbun Land and Water Alliance, Rathbun Regional Water Authority. Centerville, IA.

**October 2003:** Summary of Iowa lake remediation needs and approaches. Public meeting preparing for the 2003 Iowa Water Summit, Mason City, IA.

**October 2003:** Summary of Iowa lake remediation needs and approaches. Public meeting preparing for the 2003 Iowa Water Summit, Ankeny, IA.

**September 2003:** Summary of Iowa lake remediation needs and approaches. Governor's Working Group on Water Quality Remediation.

**July 2003:** Discussion leader on environmental initiatives in agriculturally impacted ecosystems. ISU discussion of NSF-ERE program.

**April 2003:** Lake restoration options for agriculturally impacted watersheds. Iowa Natural Heritage Foundation Annual Meeting, Clear Lake, IA.

**March 2003:** The Iowa Lake Information System. Iowa DNR Statewide annual meeting.

**January 2003:** The Iowa Lake Information System. Iowa Lakeshore Owners' Association (first meeting).

**March 2002:** Agricultural phosphorus: impacts on aquatic systems. Northeast Iowa Research Farm Annual Meeting. Nashua, Iowa.

**April 2002:** What's happening with nutrients in Iowa waters?. National Water Summit, Waterkeeper Alliance. Held in Clear Lake, IA.

**April 2002:** Impacts of agriculture on the coastal marine environment. Marine Biology Club, ISU.

**June 2002:** Lake of Three Fires draft diagnostic / feasibility study. Lake of Three Fires, Iowa.

**September 2002:** Lake restoration options. IDNR Environmental Protection Commission. Program offered at Clear Lake, IA.

**October 2002:** Iowa lake water quality. Ames, Iowa, Noon Rotary Club.

**November 2002:** Lake of Three Fires Restoration Implementation. Bedford, IA.

**February 2001:** Presented information to Clear Lake Chamber of Commerce on water quality restoration in the Clear Lake Watershed.

**March 2001:** Presented three seminars on water quality issues at the ISU Water Quality Conference.

- Iowa lake monitoring program.
- Relieving water quality problems in Iowa lakes.
- The Iowa Phosphorus Index.

**March 2001:** Public presentation on the Iowa Lake Water Quality Monitoring Program at IDNR's annual water quality conference.

**April 2001:** Presented preliminary results of Clear Lake Diagnostic/Feasibility study to two COA deans (Wintersteen & Miller).

**April 2001:** Presented an assembly for all grade 7 science classes at Clear Lake Middle School on *Water Quality in Clear Lake: Questions and Answers*.

**April 2001:** Organized a press conference and granted numerous media interviews on the Clear Lake Project.

**April 2001:** Presented draft "Clear Lake Diagnostic Study" to a public meeting in Clear Lake Iowa.

**April 2001:** Presented a lunch-time seminar on water quality in commemoration of Earth Day, Clear Lake, IA.

**May 2001:** Presentation to Clear Lake Association on potential remedial measures in the Clear Lake Feasibility study.

**May 2001:** Joint presentation, with DNR, of remedial measures to community leaders from the Clear Lake area.

**July 2001:** Presentation of Feasibility options to DNR and others from the Clear Lake area.

**August 2001:** Presented a keynote talk at the annual picnic of Clear Lake Preservation, an amalgam of environmental organizations working on the protection and improvement of Clear Lake.

**August 2001:** Gave numerous media interviews on the imperilment of Iowa's freshwater mussels, following a COA and DNR press release.

**August 2001:** Assisted IDNR at public meeting on Feasibility of Restoration of Clear Lake, Clear Lake, IA.

**August 2001:** At request of Assoc. Dean Wintersteen, met with NHEERL of EPA and gave a brief presentation on water quality questions and ISU/EPA joint ventures.

**September 2001:** Gave a presentation at the Lake Rathbun Regional Water Authority on water quality in the Rathbun watershed.

**September 2001:** Presented preliminary water quality report to the City of Ames concerning water quality in the Hallett's Quarry lakes.

**October 2001:** Presented water quality information on the Hallett's Quarry lakes to the Ames *Tribune* Editorial Board.

**October 2001:** Gave public, televised program on water quality in the Hallett's Quarry lakes to the Ames League of Women Voters.

**February 2000:** Collaborated in the production of a “web adventure” called “Rolling Down the River” with Evergreen Productions ([www.evergreenproject.com](http://www.evergreenproject.com)). This educational tool explains the connections between nutrients and Gulf of Mexico Hypoxia. This is geared toward education at the K-12 audience.

**March 2000:** Presented overview of the ecology of Mississippi River mussels to the DNR / NRCS Iowa Musel Committee.

**March 2000:** Presented an overview of the conclusions of the Rock Creek Lake watershed study to scientists at the Iowa Cattlemen’s Association.

**March 2000:** Presented information on lake water quality in Iowa to EPA task force on nutrient standards.

**April 2000:** Presented an assembly for all grade 7 science classes at Clear Lake Middle School on *Water Quality in Clear Lake: Questions and Answers*. As a preamble to this talk, I received questions from dozens of students by e-mail.

**April 2000:** Presented a public talk on *Clear Lake Water Quality* to a citywide “lunch and learn” session for Earth Day.

**May 2000:** Presentation to Ames City Council on Maintenance of Water Quality in Hallett’s Quarry Lakes.

**June 2000:** Gave numerous media interviews on the fish manipulation of Ventura Marsh.

**July 2000:** Co-wrote a “Nutrient Management Minute” with John Cresswell for the Agriculture Extension Service.

**August 2000:** Presented a keynote talk at the annual picnic of Clear Lake Preservation, an amalgam of environmental organizations working on the protection and improvement of Clear Lake.

**August 2000:** Presentation on Iowa’s Inland Mussels to the Iowa Mussel Committee in Cedar Rapids.

**September 2000:** Presentation of Iowa’s Phosphorus Index to the Iowa Phosphorus Stakeholders group.

**September 2000:** Agricultural P and Water Quality presentation to Iowa Field Crop Specialists through the Agricultural Extension Service.

**October 2000:** Presented the Iowa Phosphorus Index to a state-wide stakeholders meeting sponsored by NRCS.

**November 2000:** Presented Agricultural Phosphorus and Water Quality to the 2000 Integrated Crop Management Conference at ISU, sponsored by ISU Extension.

**November 2000:** Water Quality and Restoration of Crystal Lake, Iowa. Crystal Lake High School, Crystal Lake, Iowa.

**February 1999:** Presented an overview of Clear Lake Limnology, general water quality issues, and the components of diagnostic / feasibility studies to a group of Iowa Legislators.

**February 1999:** Overview of Clear Lake Study and components of diagnostic / feasibility study to a Clear Lake City town meeting.

**March 1999:** Presented a program on phosphorus losses from agriculture at the joint EPA/ISU 7<sup>th</sup> annual Nonpoint Source Conference/Global Water Issues conference (March 24-26, 1999).

**April 1999:** Presented a water quality program at the Clear Lake Community Building.

**June 1999:** Invited presentation at the Iowa Lakeside Lab. *Lakes in agricultural watersheds.*

**August 1999:** Presented a program on Clear Lake water quality at the Clear Lake Associations' joint annual picnic.

**December 1999:** Presentation to the City of Ames Planning and Zoning Commission on the limnology of the Hallett's Quarry lakes in the context of proposed dense residential development.

**December 1999:** Presentation to the Ames City Council on the limnology of the Hallett's Quarry lakes in the context of proposed dense residential development.

**Recent Technical Assistance to Business, Industry, Government Agencies or Individuals (past 3 years).**

- I was invited by Director Jeff Vonk to participate in the Iowa DNR's Comprehensive Fish and Wildlife Planning Workshop.
- I was appointed as Governor Vilsack's representative on the Iowa Working Group for Water Quality Remediation, in preparation for the 2003 Iowa Water Summit.
- I have been an invited member of the Technical Advisory Committee to help IDNR create Governor Vilsack's Water Quality Monitoring Program.
- Through telephone conversations from Senator Harkins' office, I furnished information to the US Senate on TMDLs.
- Participated in the IDNR's workshop on Endangered Species
- Attended the so-called "Clear Lake Association's Past President's" meeting to discuss water quality issues with Clear Lake region and Iowa State leaders.
- Advised EPA/ESA as a member of the planning committee for a conference on atmospheric nutrient loading of the Gulf of Mexico.
- I have served as a volunteer to help the City of Ames assess the water quality issues surrounding the potential development of Hallett's Quarry.
- I have advised the City of Clear Lake concerning their storm drain system and helped them to find professional engineers to improve this system.
- I have worked with Story County conservation on assessing water quality problems in McFarland Lake.
- Advised the IDNR on the means of developing TMDL protocols for Iowa waters.
- Invited member of the EPA Region 7 advisory committee on nutrient standards.
- I am an invited member of Iowa's Phosphorus task force.
- I was an active member of the Friends of Hallett's Quarry Park committee.
- I have been an active invited member of the Iowa Mussel Committee.
- During 1999, I helped a College of Agriculture task force draft Governor Vilsack's response to the CENR (White House) report on Gulf of Mexico Hypoxia. I was chair of the "Chapter 4" (*Effects of reducing nutrient loads to surface waters*) working group. Much of my work on this was eventually overruled by agricultural interests.
- Worked with the Clear Lake Chamber of Commerce and their PR firm to advise them on a program to raise environmental awareness in the Clear Lake watershed.
- Worked with representatives of the City of Clear Lake to help them understand bacteria flux and improve storm water transport systems.
- Collaborated with Advanced Analytical Technologies, Inc. (AATI; a PappaJohn Center company at the research park) to test their rapid methodology for determining fecal coliform and other specific bacteria abundance in freshwater.
- I have worked with Story County conservation on assessing water quality problems in Dakins Lake and McFarland Lake.

**Recent Committees and Other Services**

**Departmental**

EEOB Executive Committee (Chair)  
EEOB Governance Document Committee (Chair)  
Computer Facilities Committee  
Strategic Planning Steering Committee  
Strategic Planning Learning Subcommittee (Chair)  
Aquaculture Option Subcommittee  
Ecology Option Subcommittee  
Outcomes Assessment Committee (Chair)  
Awards Committee (Chair)

**College**

NCT-167 (now NCR 195) Committee on Hypoxia in the Gulf of Mexico (invited to Chair, declined).  
Dean's Faculty Research Advisory Committee  
Outcomes assessment standing committee  
College of Agriculture Special Research Initiation Grant Faculty Review Committee  
College of Agriculture Awards Committee (Chair)  
College of Agriculture Phosphorus Task Force  
College of Agriculture NRCS Phosphorus Index Committee  
Precision Agriculture Education Working Group

**University**

Biological Reorganization Committee.  
Ecology and Evolutionary Biology Graduate Program, Supervisory Committee  
W. Robert Parks and Ellen Sorge Parks Senior Scholarship and President's Leadership Awards Committees.  
Ad Hoc Lake Laverne restoration committee.

**Outside the University**

*North American Nitrogen Center*, Cornell University, Invited Board Member.  
*American Society of Limnology and Oceanography*, Nominations Committee member. Chair of Awards Committee. Chair of Hutchinson Award Committee. *EPA Region 7* invited member of the Phosphorus Standards Working Committee.  
*State of Iowa* invited member of the TMDL advisory committee and stakeholders group.  
*State of Iowa* invited member of the Water Quality Monitoring committee.  
*American Society of Limnology and Oceanography*, 1999 Annual Meeting Committee member and co-Chair

**Personal Commitment to Conservation**

My family and I own and maintain a 59 acre parcel of unspoiled forest land adjacent to Chippewa National Forest in northern Minnesota as a wildlife and forestry conservation area. This land includes nearly a full mile of undeveloped shoreline on an oligotrophic lake that is of unique ecological importance. We currently manage this land for hardwood production, water quality conservation, and wildlife enhancement. We will soon be a certified tree farm under the American Tree Farm System. Our conserved forestland includes several wetlands and some very old growth hardwood forest. We have preserved this land and shoreline for over a century, and do so at great personal cost and without government subsidy or support. My family and I believe that commitment to conservation must start at home.

**Hobbies and Other Activities**

- Snorkeling and SCUBA diving (certified diver since age 9y)
- Canoeing and camping
- Anything having to do with boats
- Wood-canvas canoe restoration
- Cooking
- Cross-country skiing
- Reading French novels (I like Simenon; keeps my vocabulary up)

- Music (I was a professional musician for years; I played the Surf Ballroom in Clear Lake, IA twice; once as a percussionist, once as a limnologist)
- Keeping old lake cottages from falling down
- Archaeology (an interest ever since I excavated a pre-Columbian pot from our land at age 10 with help from the late Prof. Leland Cooper)
- History of the North American fur trade.