

Biographical Sketch: Stephen Russell Carpenter

Stephen Russell (Steve) Carpenter is a leader of whole-ecosystem experiments focused on basic and applied questions about lake ecosystems. Topics include trophic cascades and their effects on production and nutrient cycling, contaminant cycles, recreational fisheries, eutrophication, nonpoint pollution, ecological economics of freshwater, and resilience of ecosystems and social-ecological systems. He is an experienced organizer of collaborations among scientists, managers and the general public to improve ecosystem services of working landscapes and the freshwaters that drain them. Examples include adaptive management workshops, resilience assessments, and scenarios projects.

Carpenter is a Free-Range Scientist at the Center for Limnology of the University of Wisconsin-Madison, where he is the Emeritus Director and Stephen Alfred Forbes Professor Emeritus of Integrative Biology (formerly Zoology). He is a member of the U.S. National Academy of Sciences, a Fellow of the American Academy of Arts and Sciences, a foreign member of the Royal Swedish Academy of Sciences, and served as President of the Ecological Society of America. Carpenter is the 2011 laureate of the Stockholm Water Prize. He received the Margalef Prize (Catalonia) in 2019 and the Blue Planet Prize (Japan) in 2022. Other notable awards include a Pew Fellowship in Conservation and Environment, the G. Evelyn Hutchinson Medal of the American Society of Limnology and Oceanography, the Robert H. MacArthur Award from the Ecological Society of America, the Excellence in Ecology Prize from the Ecology Institute, the Naumann-Thienemann medal of the International Society for Limnology, and the John Martin and A.C. Redfield Awards of the Association for the Sciences of Limnology and Oceanography.

Carpenter is co-Editor in Chief of *Ecosystems*, and a member of the International Science Advisory Council for the Stockholm Resilience Centre. Carpenter is a fellow of the American Association for the Advancement of Science, Ecological Society of America, and founding member and Fellow of the Resilience Alliance. From 2000-2005 he served as co-chair of the Scenarios Working Group of the Millennium Ecosystem Assessment. He led the North Temperate Lakes Long-Term Ecological Research program at U.W.-Madison from 1999-2009. He is a former President of the Ecological Society of America. Carpenter has published 5 books and more than 450 scientific papers, book chapters, reviewed reports and commentaries. He received a B.A. from Amherst College (1974), M.S. from University of Wisconsin-Madison (1976), and Ph.D. from U.W. Madison (1979). From 1979-1989 he served as Assistant and then Associate Professor at the University of Notre Dame. He joined the U.W.-Madison faculty in 1989. A full biographical sketch, publication list and contact information are posted on <https://limnology.wisc.edu/faculty/stephen-r-carpenter/>

Stephen Russell Carpenter: Professional Background

Complete CV is posted at:

<http://limnology.wisc.edu/personnel/carpenter/>

<https://orcid.org/0000-0001-8097-8700>

Address:

Center for Limnology, University of Wisconsin, Madison, WI 53706.
Tel. 608-262-3014. Email: srcarpen@wisc.edu. FAX: 608-265-2340.
Orcid: 0000-0001-8097-8700

Personal:

Born Kansas City, MO, 5 July 1952; U.S. citizen; married Susan G. Carpenter in 1979, two children, Paul born 1982 died 2020, Emily born 1984.

Education:

B.A. *magna cum laude*, 1974, Biology, Amherst College, Amherst, MA.
M.S., 1976, Botany, University of Wisconsin-Madison.
Ph.D., 1979, Botany/Oceanography and Limnology, University of Wisconsin-Madison.

Positions:

Free-Range Scientist, Emeritus Director of the Center for Limnology, and Stephen Alfred Forbes Professor Emeritus of Integrative Biology, University of Wisconsin-Madison, 9/2017 -

Director of the Center for Limnology and Stephen Alfred Forbes Professor of Integrative Biology, University of Wisconsin-Madison, 8/2009 –

Professor, Center for Limnology, and Department of Zoology, University of Wisconsin-Madison, 8/1991-8/2009.

Associate Professor, Center for Limnology, and Department of Zoology, University of Wisconsin-Madison, 6/1989 - 7/1991.

Associate Professor, Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana. 8/1985 to 5/1989.

Assistant Professor, Department of Biology, University of Notre Dame, 8/1979 to 7/1985.

Honors:

Research awards from the National Science Foundation, Andrew W. Mellon Foundation, James S. MacDonnell Foundation, Rockefeller Foundation, Pew Foundation, Packard Foundation, Winslow Foundation, Wisconsin Sea Grant Institute, Wisconsin Department of Natural

Resources, National Biological Survey, U.S. Geological Survey and Environmental Protection Agency

Bassett Research Professor, University of Wisconsin, 1989-1994

Science Watch Top 10 Research Paper, 1992 (Carpenter et al. 1987 was one of the 10 most frequently cited papers in ecology)

Pew Fellow in Conservation and the Environment, 1995-1998

Per Brinck Award in Limnology, Lund University, Lund, Sweden 1996

Kellett Mid-Career Award, Graduate School, University of Wisconsin-Madison, 1999

G. E. Hutchinson Medal, American Society of Limnology and Oceanography, 1999

Ralf Yorke Society, inducted 1999

R.H. MacArthur Award, Ecological Society of America, 2000

Ecology Institute (ECI) Prize for Excellence in Limnetic Ecology, Oldendorf/Luhe, Germany, 2000

National Academy of Sciences, elected 2001

Most Highly Cited Researcher in Environmental Science, Institute for Scientific Information, 2003

Stephen Alfred Forbes Professorship in Zoology (later Integrative Biology), 2004

Royal Swedish Academy of Sciences, elected as a Foreign Member 2004

Sustainability Science Award, Ecological Society of America, August 2004 (with M. Scheffer, J. Foley, C. Folke and B. Walker, for our paper published in *Nature* in 2001).

Chinese Academy of Sciences, elected as Einstein Professor 2005

American Academy of Arts and Sciences, elected Fellow 2006

Naumann-Thienemann medal for excellence in limnological research, International Society for Limnology, 2007

Stockholm Water Prize, Swedish International Water Institute, 2011

Hilldale Professor, University of Wisconsin-Madison, 2011

Fellow of the Ecological Society of America, elected 2012

Fellow of the Resilience Alliance, elected 2012

John Martin Award, Association for the Sciences of Limnology and Oceanography, 2015, for Carpenter et al. 1985 paper in *BioScience*.

Fellow of the Wisconsin Academy of Sciences, Arts, and Letters, elected 2016

Ramon Margalef Prize in Ecology, 2019

A.C. Redfield Award, Association for the Sciences of Limnology and Oceanography, 2019

Sustainability Science Award, Ecological Society of America, August 2019 (with E.M. Bennett and co-authors of Bennett et al. 2016, listed below in publications)

Fellow, American Association for the Advancement of Science, 2021

Highly Cited Researcher for top 1% of researchers for most cited documents in Environment and Ecology, Thompson Reuters, 2014 – 2021

Teaching Program:

Courses taught at Wisconsin: Ecosystem Analysis; Ecosystem Concepts; Graduate Seminars.

Courses taught at Notre Dame: Advanced Aquatic Ecology; Aquatic Botany; Biostatistics; Practicum in Aquatic Biology; Graduate Seminars.

Research Program:

Research Interests: Limnology; Experimental analysis of ecosystems; Ecological modeling; Adaptive management; Environmental policy and governance.

Professional Societies: American Association for the Advancement of Science, American Society of Limnology and Oceanography; Ecological Society of America; North American Lake Management Society; Sigma Xi; Societas Internationalis Limnologiae.

Publication list is available below and as a separate document from my web site <http://limnology.wisc.edu/personnel/carpenter/>

Trainees:**Masters Graduates:**

Darren Bade (M.S. 2002)
David Christensen (M.S. 1994)
Ben Greenfield (M.S. 2000)
Mary Jaynes (M.S. 1985)
Owen Langman (M.S. 2008)
Zach Lawson (M.S. 2014)
Kathleen McTigue (M.S. 1992)
Nate Nibbelink (M.S. 1996)
Amanda Stone (M.S. 2012)
Luke Winslow (M.S. 2012)

Doctoral Graduates:

Darren Bade (Ph.D. 2004)
Ryan Batt (Ph.D. 2014)
T. Douglas Beard (Ph.D. 2002)
Elena Bennett (Ph.D. 2002)
Ann Bergquist (Ph.D. 1985)
Reinette (Oonsie) Biggs (Ph.D. 2008)
Kathryn Cottingham (Ph.D. 1996)
Michael Dini (Ph.D. 1989)
Jereme Gaeta (Ph.D. 2012)

Paul Hanson (Ph.D. 2003)
 Jeffrey Houser (Ph.D. 2001)
 Pieter Johnson (Ph.D. 2006)
 Amy Kamarainen (Ph.D. 2009)
 Richard Lathrop (Ph.D. 1998)
 Peter Leavitt (Ph.D. 1989)
 Nancy McCreary (Ph.D. 1985)
 Nicholas Preston (Ph.D. 2009)
 Tara Reed-Andersen (Ph.D. 1998)
 Ann St. Amand (Ph.D. 1990)
 Patricia Soranno (Ph.D. 1995)
 Anett Trebitz (Ph.D. 1995)
 Matthew Van de Bogert (Ph.D. 2012)
 Paul West (Ph.D. 2010)

Former Postdoctoral Trainees:

Steven Baines
 Beatrix Beisner
 Elena Bennett
 Ishi Buffam
 Jeff Cardille
 Graeme Cumming
 Lisa Dent
 Sarig Gafny
 Gretchen Hansen
 Lars-Anders Hansson
 Jane Horlings
 Lee Jackson
 Susan Knight
 Conrad Lamon
 Charles Madenjian
 Thomas Martin
 Mark Olson
 Garry Peterson
 Lars Rudstam
 Greg Sass
 Craig Stow

Professional Activities:

Executive Board, *American Midland Naturalist*, 1982-1989.

Scientific Advisory Committee, Northern Highland Lakes Long-Term Ecological Research Site, 1986-1989.

Editorial Board, *Limnology and Oceanography*, 1986-1989.

Oversight Committee, Ecology Program, N.S.F. 1987.

Member, Working Group on Biological Systems and Dynamics, Committee on Global Change, U.S. N.A.S., 1988.

Member, Advisory Panel for Land-Margin Ecosystem Research, N.S.F., 1988.

Member, Steering Committee, Conference on "Global System Dynamics: Comparison of Terrestrial and Marine Systems", 1988-1989.

Member, Advisory Panel for Ecosystem Studies Program, N.S.F., 1989-1992

Editorial Board, *Ecological Applications*, 1989-1994.

Member, Technical Advisory Committee, Dane County, WI, Lake and Watershed Commission, 1989-1992

Member, Committee on Restoration of Aquatic Systems: Science, Technology, and Public Policy. National Research Council. 1989-1991.

Member, Committee on Research Agenda for the 1990s, Ecological Society of America, 1989-1990.

Member, Steering Committee, Lake Michigan Roundtable on An Ecosystem Approach for Remediation of Toxics, Great Lakes Fisheries Commission, 1990.

Member, Working Group on Ecosystem Effects, Committee on Global Change, U.S. N.A.S. 1990-1991.

Member, Academic Advisory Board, Graduate Center in Ecological and Environmental Sciences, Central European University, Budapest, Hungary. 1990-1993.

Member, Steering Committee, "Conference on Evolutionary, Population, and Community Responses to Global Change", 1991.

Co-Chair, Local Arrangements Committee for 1993 Annual Meeting, Ecological Society of America

Co-Chair, ESA/AERC Steering Committee on the Center for Ecological Synthesis and Analysis, 1992-1994

Member, U.S. National Committee for SCOPE, National Research Council, 1993 -1995

Member, Committee on Ecosystem Management, Ecological Society of America, 1993-1995

Chair, Research Needs Committee, Ecological Society of America, 1993-1995

Member, Peer Advisory Committee, Institute of Ecosystem Studies, Millbrook, N.Y., 1993 - ;
Chair 1995 - 1996

Editorial Board, Annual Review of Ecology and Systematics, 1993-1994.

Advisory Editor, Ecological Studies Series, Springer-Verlag Publishers.

Chair, Freshwater Committee, ICSU/SCOPE Global Biodiversity Assessment, 1993 -1995.

Member, Advisory Panel for the National Center for Ecological Analysis and Synthesis, National Science Foundation, 1994.

Science Advisory Board, National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara 1995 - 1998 (Chair 1995-1997).

Editorial Board, *Ecological Issues*, Ecological Society of America, 1995-

Editorial Board, *Conservation Ecology*, Ecological Society of America and Resilience Alliance, 1995-

Member of the Science Council, Conservation Ecology Program to Link Leaders in Ecology, Business and Policy, Beijer Institute of Ecological Economics, Stockholm, 1996-1998

Co-Editor-in-Chief, *Ecosystems*, 1997-

Member, Executive Committee, Resilience Alliance, 1998-

Member, Awards Committee, Ecological Society of America, 1998-1999

President-Elect, Ecological Society of America, 1999; President 2000-2001, Immediate Past-President 2001-2002

Member, Assessment Panel, Millennium Assessment of World's Ecosystems, 2000-2005

Co-Chair, International Program on Ecosystem Change, co-sponsored by ICSU/SCOPE and the Millennium Assessment of World Ecosystems, 2000-2005

Co-Chair, Working Group on Scenarios, Millennium Ecosystem Assessment, 2000-2005

Chair, Science Advisory Board, Resilience Alliance (publishers of *Ecology and Society*), 1999-

Member, Steering Committee, Cary Conference IX, Institute of Ecosystem Studies, Millbrook, NY, 2000-2001

Chair, Graduate Program in Limnology and Marine Science, University of Wisconsin-Madison, 2000-2002

Member, Advisory Board, Robustness Program, Santa Fe Institute, Santa Fe New Mexico, 2001-2002

Member, MacArthur Award Committee, Ecological Society of America, 2003-2005

Member, Board of Directors, Beijer Institute of Ecological Economics, 2003-2014; Chair 2003-2008

Member, Board of Directors, Sand County Foundation, 2002 - 2004

Member, Editorial Board, *Frontiers in Ecology and Environment*, 2002 - 2006

Member, Board of Trustees, Institute of Ecosystem Studies, Millbrook, New York, 2003-2009 ; Chair 2008

Member, Editorial Board, *Proceedings of the National Academy of Sciences*, 2003-2006

Member, Review Panel on Long-Term Ecological Research, National Science Foundation, 2004

Member, Review Panel on Network Office for Long-Term Ecological Research, National Science Foundation, 2005

Member, Search Committee for Director of the Beijer Institute of Ecological Economics, Royal Swedish Academy of Sciences, 2006

Vice-Chair, Search Committee for the President, Institute of Ecosystem Studies, Millbrook, New York, 2006.

Jury for the ECI and IRPE prizes, Ecology Institute, Oldendorf/Luhe, Germany, 2006.

Nominations Committee, Ecological Society of America, 2007-2008

Member, Review Committee for Moorea Coral Reef Long-Term Ecological Research Program, 2007

Science Advisory Board, South American Institute for Resilience and Sustainability (SARAS), 2007-

Member, Editorial Board, *Trends in Ecology and Evolution*, 2009-

Chair, Program on Ecosystem Change and Society, International Council of Science, Paris, France, 2009-2018.

Member, Sustainability Roundtable, U.S. National Academy of Sciences, 2010-present.

Chair, Ecosystem Services Conference, Keck Futures Initiative, U.S. National Academy of Sciences, US National Academy of Engineering, U.S. Institute of Medicine, 2010-2012

Hilldale Professor, University of Wisconsin-Madison 2011-

Fellow, Synergy Program for Analyzing Resilience and Critical Transitions, 2012-

Member, Advisory Group for the Gulf Research Program, U.S. National Academy of Sciences, 2013-2014

Member of the Board, Stockholm Resilience Centre, Stockholm, Sweden 2014-2018

Chair, International Science Advisory Council, Stockholm Resilience Centre, Stockholm, Sweden 2019-2021

Bibliography of Stephen Russell Carpenter

(updated 21 June, 2022)

Up-to-date bibliography is posted at:
<http://limnology.wisc.edu/personnel/carpenter/>

Books

1. Carpenter, S.R., ed. 1988. *Complex Interactions in Lake Communities*. Springer-Verlag, NY.
2. Carpenter, S.R. and J.F. Kitchell (eds.). 1993. *The Trophic Cascade in Lakes*. Cambridge University Press, Cambridge, England.
3. Carpenter, S.R. 2003. *Regime Shifts in Lake Ecosystems: Pattern and Variation*. Volume 15 in the Excellence in Ecology Series, Ecology Institute, Oldendorf/Luhe, Germany.
4. Bennett, E.M., S.R. Carpenter, P. Pingali and M. Zurek (eds.). 2005. *Ecosystems and Human Well-Being: Scenarios*. Island Press, Washington, D.C.
5. Levin, S.A., S.R. Carpenter, C.J. Godfray, A.P. Kinzig, M. Loreau, J.P. Losos, B. Walker and D.S. Wilcove (eds.). 2009. *Princeton Guide to Ecology*. Princeton University Press, Princeton, N.J.

Papers and Book Chapters

1. Fisher, S.G. and S.R. Carpenter. 1976. Ecosystem and macrophyte primary production of the Fort River, Massachusetts. *Hydrobiologia* 47: 175-187.
2. Carpenter, S.R. and M.S. Adams. 1977. The macrophyte tissue nutrient pool of a hardwater eutrophic lake: Implications for macrophyte harvesting. *Aquatic Botany* 3: 239-255.
3. Carpenter, S.R. and A. Gasith. 1978. Mechanical cutting of macrophytes: Immediate effects on littoral water chemistry and metabolism. *Water Research* 12: 55-57.
4. Carpenter, S.R. and M.S. Adams. 1978. Macrophyte control by harvesting and herbicides: Implications for phosphorus cycling in Lake Wingra, Wisconsin. *Journal of Aquatic Plant Management* 16: 20-23.
5. Carpenter, S.R. and M.S. Adams. 1979. Effects of nutrients and temperature on decomposition of *Myriophyllum spicatum* L. in a hardwater eutrophic lake. *Limnology and Oceanography* 24: 520-528.
6. Carpenter, S.R., A. Gurevitch, and M.S. Adams. 1979. Factors causing elevated biological oxygen demand in the littoral zone of Lake Wingra, Wisconsin. *Hydrobiologia* 67: 3-9.

7. Prentki, R.T., M.S. Adams, S.R. Carpenter, A. Gasith, C.S. Smith, and P.R. Weiler. 1979. Role of submersed weed beds in internal loading and interception of allochthonous materials in Lake Wingra, Wisconsin. *Archiv fur Hydrobiologie (Supplement)* 57: 221-250.
8. Carpenter, S.R. 1980. The decline of *Myriophyllum spicatum* in a eutrophic Wisconsin lake. *Canadian Journal of Botany* 58: 527-535.
9. Carpenter, S.R. 1980. Estimating net shoot production by a hierarchical cohort method of herbaceous plants subject to high mortality. *American Midland Naturalist* 104: 163-175.
10. Carpenter, S.R. 1980. Enrichment of Lake Wingra, Wisconsin by submersed macrophyte decay. *Ecology* 61: 1145-1155.
11. Carpenter, S.R. 1981. Decay of heterogeneous detritus: A general model. *Journal of Theoretical Biology* 89: 539-547.
12. Carpenter, S.R. 1981. Submersed vegetation: An internal factor in lake ecosystem succession. *The American Naturalist* 118: 372-383.
13. Carpenter, S.R. and J.K. Greenlee. 1981. Lake deoxygenation after herbicide use: A simulation model analysis. *Aquatic Botany* 11: 173-186.
14. Kimbel, J.C. and S.R. Carpenter. 1981. Effects of mechanical harvesting on *Myriophyllum spicatum* regrowth and carbohydrate allocation. *Aquatic Botany* 11: 121-127.
15. Carpenter, S.R. 1981. Effects of control measures on pest populations subject to regulation by parasites and pathogens. *Journal of Theoretical Biology* 92: 181-184.
16. Fish, D. and S.R. Carpenter. 1982. Leaf litter and larval mosquito dynamics in tree-hole ecosystems. *Ecology* 63: 283-288.
17. Sullivan, P.F. and S.R. Carpenter. 1982. Evaluation of 14 trophic state indices for phytoplankton of Indiana lakes and reservoirs. *Environmental Pollution (Series A)* 27: 143-153.
18. Carpenter, S.R. 1982. Stemflow chemistry: Effects on population dynamics of detritivorous mosquitoes in tree-hole ecosystems. *Oecologia* 53: 1-6.
19. Carpenter, S.R. 1982. Comparisons of equations for decay of particulate detritus in tree-hole ecosystems. *Oikos* 39: 17-23.
20. Carpenter, S.R. 1983. Resource limitation of larval tree-hole mosquitoes subsisting on beech detritus. *Ecology* 64: 219-223.
21. Carpenter, S.R. 1983. Submersed macrophyte community structure and internal loading: Relationship to lake ecosystem productivity and succession. *Lake and Reservoir Management* 2: 105-111.

22. Carpenter, S.R. and J.E. Chaney. 1983. Scale of spatial pattern: Four methods compared. *Vegetatio* 53: 153-160.
23. McCreary, N.J., S.R. Carpenter, and J.E. Chaney. 1983. Coexistence and interference in two submersed freshwater perennial plants. *Oecologia* 59: 393-396.
24. Carpenter, S.R. 1983. Lake geometry: Implications for production and sediment accretion rates. *Journal of Theoretical Biology* 105: 273-286.
25. Carpenter, S.R., J.J. Elser, and K.M. Olson. 1983. Effects of roots of Myriophyllum verticillatum on sediment redox conditions. *Aquatic Botany* 17: 243-249.
26. Carpenter, S.R. 1984. Experimental test of the pupation window model for development of detritivorous insects. *Ecological Modelling* 23: 257-264.
27. Carpenter, S.R. and J.F. Kitchell. 1984. Plankton community structure and limnetic primary production. *The American Naturalist* 124: 159-172.
28. Carpenter, S.R. 1984. First-order error analysis for aquatic plant production estimates. pp. 36-45 in: W.M. Dennis and B.G. Isom, eds. *Ecological Assessment of Macrophyton*. American Society for Testing and Materials (STP 843), Philadelphia.
29. Carpenter, S.R. and J.E. Titus. 1984. Composition and spatial heterogeneity of submersed vegetation in a softwater lake. *Vegetatio* 57: 153-165.
30. Carpenter, S.R. and A.M. Bergquist. 1985. Experimental tests of grazing indicators based on chlorophyll a degradation products. *Archiv fur Hydrobiologie* 102: 303-317.
31. Jaynes, M.L. and S.R. Carpenter. 1985. Effects of submersed macrophytes on phosphorus cycling in surface sediment. *Lake and Reservoir Management* 4: 370-374.
32. Carpenter, S.R. and N.J. McCreary. 1985. Effects of fish nests on pattern and diversity of submersed vegetation in a softwater lake. *Aquatic Botany* 22: 21-32.
33. Bergquist, A.M., S.R. Carpenter, and J.C. Latino. 1985. Shifts in phytoplankton size structure and community composition during grazing by contrasting zooplankton assemblages. *Limnology and Oceanography* 30: 1037-1045.
34. Carpenter, S.R., J.F. Kitchell, and J.R. Hodgson. 1985. Cascading trophic interactions and lake productivity. *BioScience* 35: 634-639.
35. Carpenter, S.R., M.M. Elser, and J.J. Elser. 1986. Chlorophyll production, degradation, and sedimentation: Implications for paleolimnology. *Limnology and Oceanography* 31: 112-124.

36. Jaynes, M.L. and S.R. Carpenter. 1986. Effects of vascular and nonvascular macrophytes on sediment redox and solute dynamics. *Ecology* 67: 875-882.
37. Bergquist, A.M. and S.R. Carpenter. 1986. Limnetic herbivory: Effects on phytoplankton populations and primary production. *Ecology* 67: 1351-1360.
38. Elser, J.J., M.M. Elser, and S.R. Carpenter. 1986. Size fractionation of algal chlorophyll, carbon fixation, and phosphatase activity: Relationships with species-specific size distributions and zooplankton community structure. *Journal of Plankton Research* 8: 365-383.
39. Elser, M.M., J.J. Elser, and S.R. Carpenter. 1986. Paul and Peter lakes: A liming experiment revisited. *American Midland Naturalist* 116: 282-295.
40. Carpenter, S.R. and D.M. Lodge. 1986. Effects of submersed macrophytes on ecosystem processes. *Aquatic Botany* 26: 341-370.
41. Kitchell, J.F. and S.R. Carpenter. 1987. Piscivores, planktivores, fossils, and phorbins. pp. 132-146 in: C. Kerfoot and A. Sih, eds. *Predation: Direct and Indirect Impacts on Aquatic Communities*. University Press of New England, Hanover, NH.
42. Carpenter, S.R. and J.F. Kitchell. 1987. The temporal scale of variance in limnetic primary production. *The American Naturalist* 129: 417-433.
43. McCreary, N.J. and S.R. Carpenter. 1987. Density-dependent interactions of two co-occurring aquatic plants. *Aquatic Botany* 27: 229-242.
44. Carpenter, S.R., J.F. Kitchell, J.R. Hodgson, P.A. Cochran, J.J. Elser, M.M. Elser, D.M. Lodge, D. Kretchmer, X. He, and C.N. von Ende. 1987. Regulation of lake primary productivity by food web structure. *Ecology* 68: 1863-1876.
45. Dini, M.L., J. O'Donnell, S.R. Carpenter, M.M. Elser, J.J. Elser, and A.M. Bergquist. 1987. Daphnia size structure, vertical migration, and phosphorus redistribution. *Hydrobiologia*: 185-191.
46. Elser, J.J., N.C. Goff, N.A. MacKay, A.L. St. Amand, M.M. Elser, and S.R. Carpenter. 1987. Species-specific algal responses to zooplankton: Experimental and field observations in three nutrient-limited lakes. *Journal of Plankton Research* 9: 699-717.
47. Elser, M.M., C.N. von Ende, P. Soranno, and S.R. Carpenter. 1987. Chaoborus populations: Response to food web manipulations and potential effects on zooplankton communities. *Canadian Journal of Zoology* 65: 2846-2852.
48. Bartell, S.M., A.L. Brenkert, and S.R. Carpenter. 1988. Parameter uncertainty and the behavior of a size-dependent plankton model. *Ecological Modelling* 40: 85-95.

49. Kitchell, J.F. and S.R. Carpenter. 1988. Food web manipulation in experimental lakes. *Internationale Vereinigung für Theoretische und Angewandte Limnologie, Verhandlungen* 23: 351-358.
50. Elser, J.J., M.M. Elser, N.A. MacKay, and S.R. Carpenter. 1988. Zooplankton-mediated transitions between N and P limited algal growth. *Limnology and Oceanography* 33: 1-14.
51. Carpenter, S.R. 1988. Transmission of variance through lake food webs. pp. 119-138 in: S.R. Carpenter, ed. *Complex Interactions in Lake Communities*. Springer-Verlag, NY.
52. Kitchell, J.F., S.M. Bartell, S.R. Carpenter, D.J. Hall, D.J. McQueen, W.E. Neill, D. Scavia, and E.E. Werner. 1988. Epistemology, experiments, and pragmatism. pp. 263-280 in: S.R. Carpenter, ed. *Complex Interactions in Lake Communities*. Springer-Verlag, NY.
53. Carpenter, S.R., P.R. Leavitt, J.J. Elser, and M.M. Elser. 1988. Chlorophyll budgets: response to food web manipulation. *Biogeochemistry* 6: 79-90.
54. Dini, M.L. and S.R. Carpenter. 1988. Variability in Daphnia behavior following fish community manipulations. *Journal of Plankton Research* 10: 621-635.
55. Elser, J.J. and S.R. Carpenter. 1988. Predation-driven dynamics of zooplankton and phytoplankton communities in a whole-lake experiment. *Oecologia* 76: 148-154.
56. Carpenter, S.R. and J.F. Kitchell. 1988. Consumer control of lake productivity. *BioScience* 38: 764-769.
57. Carpenter, S.R. 1989. Replication and treatment strength in whole-lake experiments. *Ecology* 70: 453-463.
58. Carpenter, S.R., T.M. Frost, D. Heisey, and T.K. Kratz. 1989. Randomized intervention analysis and the interpretation of whole ecosystem experiments. *Ecology* 70: 1142-1152.
59. Leavitt, P.R. and S.R. Carpenter. 1989. Effects of sediment mixing and benthic algal production on fossil pigment stratigraphies. *Journal of Paleolimnology* 2: 147-158.
60. Leavitt, P.R., S.R. Carpenter, and J.F. Kitchell. 1989. Whole lake experiments: The annual record of fossil pigments and zooplankton. *Limnology and Oceanography* 34: 700-717.
61. Hodgson, J.R., S.R. Carpenter, and A.P. Gripentrog. 1989. The effect of sampling frequency on intersample variance and food consumption estimates of largemouth bass. *Transactions of the American Fisheries Society* 118: 11-19.
62. St. Amand, A.L., P.A. Soranno, S.R. Carpenter, and J.J. Elser. 1989. Algal nutrient deficiency: growth bioassays versus physiological indicators. *Lake and Reservoir Management* 5: 27-35.

63. Carpenter, S.R. 1989. Temporal variance in lake communities: Blue-green algae and the trophic cascade. *Landscape Ecology* 3: 175-184.
64. Leavitt, P.R. and S.R. Carpenter. 1990. Aphotic pigment degradation in the hypolimnion: implications for sedimentation studies and paleolimnology. *Limnology and Oceanography* 35: 520-535.
65. Leavitt, P.R. and S.R. Carpenter. 1990. Regulation of pigment sedimentation by photo-oxidation and herbivore grazing. *Canadian Journal of Fisheries and Aquatic Sciences* 47: 1166-1176.
66. MacKay, N.A., S.R. Carpenter, P.A. Soranno, and M.J. Vanni. 1990. The impact of two Chaoborus species on a zooplankton community. *Canadian Journal of Zoology* 68: 981-985.
67. Barko, J.W., D. Gunnison and S.R. Carpenter. 1991. Sediment interactions with submersed macrophyte growth and community dynamics. *Aquatic Botany* 41: 41-66.
68. Carpenter, S.R., T.M. Frost, J.F. Kitchell, T.K. Kratz, D.W. Schindler, J. Shearer, W.G. Sprules, M.J. Vanni, and A.P. Zimmerman. 1991. Patterns of primary production and herbivory in 25 North American lake ecosystems. pp. 67-96 in: J. Cole, S. Findlay, and G. Lovett, eds. *Comparative Analyses of Ecosystems: Patterns, Mechanisms, and Theories*. Springer-Verlag, NY.
69. Carpenter, S.R. and P.R. Leavitt. 1991. Temporal variation in a paleolimnological record arising from a trophic cascade. *Ecology* 72: 277-285.
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