

Scott Howard Ensign

Curriculum Vitae

updated: 3 June 2011

Education

- Bachelor of Arts – Environmental Science, Cum laude, University of North Carolina at Wilmington. 1996.
- Master of Science – Ecology, University of North Carolina at Chapel Hill. 2004.
Advisor: Martin Doyle
- Ph.D. – Ecology, University of North Carolina at Chapel Hill. 2010. Advisors: Michael Piehler and Martin Doyle

Professional Experience (not including research/teaching assistantships)

- February 2011 – Present: Research Ecologist, US Geological Survey, Reston, VA
- June 2004 – August 2005: Research Technician II, University of North Carolina at Chapel Hill, Institute of Marine Science
- November 1997 – June 2002: Research Technician III, Center for Marine Science Research, University of North Carolina at Wilmington

Teaching and Seminars

- Lecturer/Teaching Assistant, 2002-2003, Introduction to Physical Geography, University of North Carolina at Chapel Hill (150-200 students per course; responsible for teaching 2 weeks per semester, grading, leading field trips), Chapel Hill, NC
- Lecturer, 2004, 2006, and 2010, Human Impacts on Estuarine Ecosystems, University of North Carolina at Chapel Hill, Morehead City, NC
- Lecturer, 2010, Environmental Biology, Craven Community College
- Seminar Speaker, April 2010, University of North Carolina at Wilmington Departments of Geography and Geology, Wilmington, NC
- Seminar Speaker, December 2010, University of North Carolina at Chapel Hill Institute of Marine Sciences, Morehead City, NC
- Seminar Speaker, January 2011, Australian Rivers Institute, Griffith University, Brisbane, Australia
- Seminar Speaker, June 2011, USGS National Research Program, Eastern Branch, Reston, VA

Funding Received

- Water Resources Research Institute. 2005. “Effects of tidal flow on riparian zone hydraulics and nitrogen dynamics: implications for nutrient management in coastal creeks.” M. Piehler, M. Doyle, and S. Ensign
- Environmental Protection Agency STAR Graduate Fellowship 2007
- North Carolina Sea Grant Fisheries Resource Grant. 2008. “Zooplankton Assessment Project (ZAP): Reassessing prey availability for river herring in the Chowan River Basin” D. Leech, S. Ensign, M. Piehler
- North Carolina Sea Grant Fisheries Resource Grant. 2009. “Zooplankton Assessment Project (ZAP): Reassessing prey availability for river herring the Chowan River Basin” D. Leech, S. Ensign, M. Piehler
- Dissertation Completion Fellowship, University of North Carolina at Chapel Hill 2010

Peer Reviewer

- *Journal of Applied Geography, Journal of the North American Benthological Society, Environmental Science and Technology, Journal of Geophysical Research – Biogeosciences, Journal of Environmental Quality, Ecological Applications, Hydrobiologia, Ecology, Journal of Environmental Management, Wetlands, Ecosphere, Water Resources Research, Wetlands Ecology and Management*
- NSF, Sea Grant

Professional Service

- Session Organizer and Chair, Hydrology, geomorphology, and ecology of tidal freshwater zones, or What happens in rivers when water flows upstream? American Society of Limnology and Oceanography/North American Benthological Society Joint Meeting, 2010, Santa Fe, NM.
- Session Organizer and Chair, Ecology and biogeochemistry of tidal freshwater ecosystems, Southeastern Estuarine Research Society Meeting, 2006, Savannah, GA.

Awards and Fellowships

- Mendenhall Fellow, US Geological Survey, 2011
- Graduate Research Fellow, University of North Carolina at Chapel Hill 2010
- Future Faculty Fellow, University of North Carolina at Chapel Hill 2010
- US Environmental Protection Agency STAR Graduate Fellow, 2007-2010
- Best Costume Award, A2 Halloween Party, Beaufort, NC, 2008
- Ecological Society of America Biogeosciences Best Paper Award, graduate student category, for Ensign and Doyle 2006, 2007
- International Laser Class Association North America District 12 Champion, 1998

Peer Reviewed Journal Publications

In revision: The effects of tides on river hydraulics and their implications for river geomorphology. Ensign, S.H., M.W. Doyle, M.F. Piehler.

In review: Landscape-scale controls of denitrification in tidal freshwater wetlands. Ensign, S.H., K. Siporin, M. Piehler, M. Piehler, L. Leonard.

In review: The end of the river continuum: Tides and river ecosystems. Ensign, S.H., M.W. Doyle, M.F. Piehler.

18. Doyle, M.W., S.H. **Ensign**. 2009. Views of a river: Alternative reference frames in river system science. *BioScience* 59(6):499-510.

17. Mallin, M.A., V.L. Johnson, S.H. **Ensign**. 2009. Comparative impacts of stormwater runoff on water quality of an urban, a suburban, and a rural stream. *Environmental Monitoring and Assessment* DOI: 10.1007/s10661-008-0644-4.

16. **Ensign**, S.H., M.F. Piehler, M.W. Doyle. 2008. Riparian zone denitrification affects nitrogen flux through a tidal freshwater river. *Biogeochemistry* 91: 133-150.

15. **Ensign**, S.H., H.W. Paerl. 2006. Development of an unattended estuarine nutrient monitoring program using ferries as data-collection platforms. *Limnology and Oceanography: Methods* 4: 399-405.

14. **Ensign**, S.H., M.W. Doyle. 2006. Nutrient spiraling in streams and river networks. *Journal of Geophysical Research – Biogeosciences* 111, G04009.

13. **Ensign**, S.H., S. McMillan, M. Piehler, and S. Thompson. 2006. Nitrogen and phosphorus attenuation within the stream network of a coastal, agricultural watershed. *Journal of Environmental Quality* 35: 1237-1247.

12. Mallin, M.A., J. Johnson, S.H. **Ensign**, T. MacPherson. 2006. Factors contributing to hypoxia in rivers, lakes, and streams. *Limnology and Oceanography*, 51: 690-701.

11. **Ensign**, S.H., M.W. Doyle. 2005. In-channel transient storage and associated nutrient retention: evidence from experimental manipulations. *Limnology and Oceanography*, 50(6): 1740-1751.

10. Cahoon, L.B., S.H. **Ensign**. 2004. Response to commentary by Hardy, Reich, and Tucker. *Nutrient Cycling in Agroecosystems* 70: 323-324.

9. **Ensign**, S.H., J.N. Halls, M.A. Mallin. 2004. Application of digital bathymetry data in an analysis of flushing times of two large estuaries. *Computers and Geosciences* 30(5): 501-511.

8. Cahoon, L.B., S.H. **Ensign**. 2004. Excessive soil phosphorus levels in eastern North Carolina: temporal and spatial distributions and relationships to agriculture and other land uses. *Nutrient Cycling in Agroecosystems* 69: 111-125.

7. Mallin, M.A., M.R. McIver, S.H. **Ensign** and L.B. Cahoon. 2004. Photosynthetic and heterotrophic impacts of nutrient loading to blackwater streams. *Ecological Applications* 14(3): 823-838.
6. Mallin, M.A., M.H. Posey, M.R. McIver, D.C. Parsons, S.H. **Ensign** and T.D. Alphin. 2002. Impacts and recovery from multiple hurricanes in a Piedmont-Coastal Plain river system. *BioScience* 52:999-1010.
5. Mallin, M.A., S.H. **Ensign**, T.L. Wheeler, and D.B. Mayes. 2002. Pollutant removal efficacy of three wet detention ponds. *Journal of Environmental Quality* 31:654-660.
4. Mallin, M.A., L.B. Cahoon, D.C. Parsons, and S.H. **Ensign**. 2001. Effect of nitrogen and phosphorus loading on plankton in coastal plain blackwater streams. *Journal of Freshwater Ecology* 16:455-466.
3. **Ensign**, S.H. and M.A. Mallin. 2001. Stream water quality following timber harvest in a Coastal Plain swamp forest. *Water Research* 35: 3381-3390.
2. Mallin, M.A., S.H. **Ensign**, M.R. McIver, G.C. Shank and P.K. Fowler. 2001. Demographic, landscape, and meteorological factors controlling the microbial pollution of coastal waters. *Hydrobiologia* 460:185-193
1. Mallin, M.A., M.H. Posey, G.C. Shank, M.R. McIver, S.H. **Ensign** and T.D. Alphin. 1999. Hurricane effects on water quality and benthos in the Cape Fear watershed: Natural and anthropogenic impacts. *Ecological Applications* 9:350-362.

Presentations to Professional Societies and Conferences

54. Noe, G., S. **Ensign**, C. Hupp. 2011. "Tidal freshwater riverine wetlands: a unique system in the river-ocean continuum. International Estuarine Biogeochemistry Symposium, Atlantic Beach, NC.
53. Siporin, K., S. **Ensign**, M. Piehler, M. Doyle, L. Leonard. 2011. "Landscape-scale controls of denitrification in tidal freshwater wetlands". International Estuarine Biogeochemistry Symposium, Atlantic Beach, NC.
52. Leech, D.M., S.H. **Ensign**, M.F. Piehler. 2010. "A missing link: Zooplankton community dynamics in the absence of river herring in a coastal, blackwater river, North Carolina, USA". American Society of Limnology and Oceanography/North American Benthological Society Joint Meeting. Santa Fe, NM.
51. **Ensign**, S.H., M.F. Piehler, and M.W. Doyle. 2010. "The influence of channel geomorphology on riparian shading and primary production in tidal freshwater rivers of the southeastern United States". American Society of Limnology and Oceanography/North American Benthological Society Joint Meeting. Santa Fe, NM.

50. **Ensign**, S.H., M.F. Piehler, and M.W. Doyle. 2010. "Into the light: How geomorphology affects irradiance and primary production in tidal rivers". Benthic Ecology Meeting. Wilmington, NC.
49. Mallin, M.A., V.L. Johnson, and S.H. **Ensign**. 2010. "Landscape impacts on water quality in three oligohaline tidal creeks". Benthic Ecology Meeting. Wilmington, NC.
48. **Ensign**, S., M. Doyle, and M. Piehler. 2009. "The evolution of tidal freshwater river geomorphology: Observations of short-term processes and speculation about long-term feedbacks". Coastal and Estuarine Research Federation Meeting. Portland, OR.
47. Mallin, M., M. McIver, and S. **Ensign**. 2009. "Comparative hypoxia drivers and impacts in adjacent riverine and lagoonal estuaries in North Carolina". Coastal and Estuarine Research Federation Meeting. Portland, OR.
46. **Ensign**, S.H. 2009. "Tidal freshwater rivers: The hydrologic nexus linking nutrient and fishery management". EPA STAR Graduate Fellowship Conference. Washington, DC.
45. Piehler, M., A. Smyth, and S. **Ensign**. 2009. "Habitat specific rates of denitrification within the estuarine continuum". Society of Wetland Scientists Annual Meeting. Madison, WI.
44. **Ensign**, S.H., M. Piehler, and D.M. Leech. 2009. "Caught in the crossfire: Phytoplankton response to nutrient management and anadromous fish restoration". Ecological Society of America Annual Meeting. Albuquerque, NM.
43. Doyle, M.W., and S.H. **Ensign**. 2009. "Alternative reference frames in river system science". North American Benthological Society Annual Meeting, Grand Rapids, MI.
42. Mallin, M.A., M.R. McIver, S.H. **Ensign**, J. Lin. 2009. "Water column hypoxia in adjacent riverine and lagoonal estuaries in North Carolina". Meeting of the Southeastern Estuarine Research Society, Conway, SC (invited presentation).
41. **Ensign**, S.H., M.F. Piehler, M.W. Doyle. 2008. "The ebb and flood of tidal freshwater rivers affect watershed denitrification: A missing link in river basin nitrogen budgets". Ecological Society of America Annual Meeting. Milwaukee, WI.
40. **Ensign**, S.H., M.F. Piehler, M.W. Doyle. 2007. "Nitrogen cycling in the riparian zone of a tidal freshwater river". North American Benthological Society Annual Meeting. Columbia, SC.
39. **Ensign**, S.H., M.F. Piehler, M.W. Doyle. 2007. "Celestial controls on nitrogen cycling in a tidal freshwater river". Southeastern Estuarine Research Society Meeting, Atlantic Beach, NC.
38. Blum, J., S. **Ensign**, S. Slingsby, L. Cahoon. 2007. "El Nino – Southern Oscillation effects on river discharge in the southeast United States: Coupling with the coastal ocean". Southeastern Estuarine Research Society Meeting, Atlantic Beach, NC.

37. **Ensign**, S.H. and M.F. Piehler. 2006. "Transformations of carbon within the tidal freshwater zone of estuaries". Southeastern Estuarine Research Society Meeting, Savannah, GA. [Best Graduate Student Poster award]
36. Piehler, M.F., S.H. **Ensign**, and S. Thompson. 2006. "Phytoplankton-nutrient relationships in the tidal freshwater zone of the Newport River, North Carolina". Southeastern Estuarine Research Society Meeting, Savannah, GA.
35. Smyth, A., D. Velinsky, S. **Ensign**, M. Piehler, M. Vile. 2006. "Two marshes, one problem: the effects of sea level rise on tidal freshwater marshes". Southeastern Estuarine Research Society Meeting, Savannah, GA.
34. **Ensign**, S.H., and M.W. Doyle. 2006. "Nutrient spiraling through stream networks: a quantitative synthesis of 25 years of nutrient biogeochemical research". North American Benthological Society Annual Meeting, Anchorage, AK.
33. **Ensign**, S.H., M.F. Piehler, K.G. Fisher, and M.W. Doyle. 2006. "Linking forested wetlands to estuaries: Nutrient dynamics and aquatic-terrestrial linkages in tidal freshwater streams of the Croatan National Forest drainage system". International Conference on Hydrology and Management of Forested Wetlands, New Bern, NC.
32. **Ensign**, S.H., M.F. Piehler, and M.W. Doyle. 2006. "Effect of tidal hydrology on denitrification in a coastal freshwater stream". North Carolina Water Resources Research Institute Annual Conference, Raleigh, NC.
31. **Ensign**, S.H. and H.W. Paerl. 2006. "Development of an unattended water quality monitoring system (FerryMon) for the Neuse River Estuary". North Carolina Water Resources Research Institute Annual Conference, Raleigh, NC.
30. **Ensign**, S.H. and M.W. Doyle. 2004. "Quantifying controls on transient storage and nutrient retention using channel manipulations". American Society of Limnology and Oceanography, Savannah, GA.
29. Mallin, M.A., V.L. Johnson, T.A. MacPherson, S.H. **Ensign**. 2004. "Biochemical oxygen demand variability in rural and urban southeastern streams". American Society of Limnology and Oceanography, Savannah, GA.
28. Mallin, M.A., M.R. McIver, S.H. **Ensign**, J.M. Burkholder and P.A. Rublee. 2002. "Eutrophication and the distribution of *Pfiesteria* in urbanized tidal creeks." Tenth International Conference on Harmful Algae, St. Petersburg, Fla.
27. **Ensign**, S.H., J.N. Halls, and M.A. Mallin. 2002. "Flushing times of the Cape Fear River and New River estuaries, North Carolina". Duke University Marine Lab Graduate Student Mini-Symposium, Beaufort, NC.

26. **Ensign**, S.H. and M.A. Mallin. 2002. "Nitrogen dynamics of the Cape Fear and New River estuaries". Meeting of the Southeastern Estuarine Research Society, Savannah, SC.
25. Cahoon, L.B. and S.H. **Ensign**. 2001. "Assessing risks to water quality: variation in soil phosphorus levels in eastern North Carolina with time and land use". Annual Meeting of the North Carolina Academy of Science, Raleigh, NC.
24. **Ensign**, S.H., J.N. Halls, and M.A. Mallin. 2001. "Flushing time of the Cape Fear River Estuary". Meeting of the Southeastern Estuarine Research Society, Charleston, SC.
23. Mallin, M.A., L.B. Cahoon, M.R. McIver, D.C. Parsons and S.H. **Ensign**. 2001. "Impacts of industrial swine and poultry production on nutrient loading to Coastal Plain rivers. North American Benthological Society Meeting, LaCrosse, WI.
22. Mallin, M.A., L.B. Cahoon, M.R. McIver and S.H. **Ensign**. 2001. "Seeking science-based ambient nutrient standards for blackwater systems". Annual North Carolina Water Resources Research Conference, Raleigh, NC.
21. Mallin, M.A., M.R. McIver, S.H. **Ensign** and L.B. Cahoon. 2001. "Co-occurrence of phytoplankton N-limitation and heterotrophic P-limitation in blackwater streams". Annual Meeting of the American Society for Limnology and Oceanography, Albuquerque, NM.
20. Mallin, M.A., M.R. McIver, D.C. Parsons, S.H. **Ensign**, G.C. Shank, V.L. Johnson and H.A. CoVan. 2001. "Preliminary impacts of sewage diversion on the New River Estuary". Meeting of the Southeastern Estuarine Research Society, Charleston, SC.
19. Cahoon, L.B., M.A. Mallin and S.H. **Ensign**. 2000. "Environmental effects of geographic concentrations of confined animal feeding operations in the Black and Northeast Cape Fear River basins". Annual Meeting of the American Fisheries Society, St. Louis, MS.
18. Mallin, M.A., L.B. Cahoon, S.H. **Ensign** and V.L. Johnson. 2000. "Domesticated animals as major sources of nutrient loading to the North Carolina Coastal Plain". Meeting of the Southeastern Estuarine Research Society, Tampa, FL.
17. Mallin, M.A., L.B. Cahoon, S.H. **Ensign**, M.R. McIver. 2000. "Algal, bacterial, and BOD responses to nutrient gradients in coastal plain watersheds". UNC Water Resources Research Institute Seminar Series, Raleigh, NC.
16. Mallin, M.A., S.H. **Ensign**, M.R. McIver, and G.C. Shank. 2000. "Land use, runoff, and microbial pollution of river and estuaries". Annual North Carolina Water Resources Research Conference, Raleigh, N.C.
15. Mallin, M.A., M.R. McIver, S.H. **Ensign** and D.C. Parsons. 2000. "Ecological damage and fish kills resulting from hurricanes in the Cape Fear River and Estuary". Annual Meeting of the North Carolina Chapter of the American Fisheries Society, New Hill, NC.

14. Mallin, M.A., M.R. McIver, S.H. **Ensign**, D.C. Parsons, M.H. Posey and T.D. Alphin. 2000. "Acute impacts of swine and poultry wastes on stream fish habitat". Annual Meeting of the American Fisheries Society, St. Louis, MS.
13. Parsons, D.C., M.A. Mallin, S.H. **Ensign**, M.R. McIver, J. Cook, V.L. Johnson. 2000. "Effects of physical parameters on fecal coliform abundance in five tidal creeks in New Hanover County, North Carolina". SEERS/AERS/Benthic Ecology Meeting, Wilmington, NC.
12. **Ensign**, S.H. and M.A. Mallin. 1999. "Effects of Timber Harvesting on Water Quality of the Goshen Swamp". UNC Water Resource Research Institute Annual Conference, Raleigh, NC.
11. Mallin, M.A., M.R. McIver, S.H. **Ensign** and G.C. Shank. 1999. "Anthropogenic and meteorological factors influencing microbial pollution of coastal streams and estuaries". Meeting of the Southeastern Estuarine Research Society, Jacksonville, FL.
10. Mallin, M.A., M.R. McIver, G.C. Shank, S.H. **Ensign** and D.C. Parsons. 1999. "Comparative effects of Hurricanes Fran and Bonnie on the Cape Fear Watershed". Annual North Carolina Water Resources Research Conference, Raleigh, NC.
9. Wheeler, T.W., M.A. Mallin, D.C. Parsons and S.H. **Ensign**. 1999. "Pollutant removal efficacy of three coastal plain wet detention ponds". Annual North Carolina Water Resources Research Conference, Raleigh, NC.
8. Mallin, M.A., L.B. Cahoon, D.C. Parsons and S.H. **Ensign**. 1998. "Nutrient limitation of photosynthetic and heterotrophic plankton in blackwater rivers". Annual Meeting of the American Society for Limnology and Oceanography, St. Louis, MS.
7. Mallin, M.A., S.H. **Ensign**, M.R. McIver, D.C. Parsons, C.A. Preziosi, G.C. Shank and T.L. Wheeler. 1998. "Environmental impacts of Hurricane Bonnie in the Cape Fear Watershed". Meeting of the Southeastern Estuarine Research Society, Georgetown, SC.
6. Mallin, M.A., M.R. McIver, G.C. Shank, D.C. Parsons and S.H. **Ensign**. 1998. "Geography and biological responses of North Carolina estuaries". Meeting of the Southeastern Estuarine Research Society Meeting, Athens, GA. (Invited).
5. McIver, M.R., S.H. **Ensign**, M.A. Mallin, D.P. Parsons, T.L. Wheeler, A.R. Skeen. 1998. "Nutrient and algal dynamics in the New River estuary, North Carolina". Annual Meeting of the Southeastern Estuarine Research Society, Georgetown, SC.
4. Parsons, D.C., M.A. Mallin, T.L. Wheeler, S.H. **Ensign**, M.R. McIver. 1998. "Spatial and temporal water quality patterns in five tidal creeks in southeastern North Carolina". Annual Meeting of the Southeastern Estuarine Research Society, Athens, GA.
3. Mallin, M.A., L.B. Cahoon, D.C. Parsons and S.H. **Ensign**. 1997. "Effect of swine waste on blackwater systems: Field and experimental data". North Carolina Water Resources Research Institute Seminar Series, Raleigh, NC.

2. Shank, G.C., M.A. Mallin, M.H. Posey, M.R. McIver, S.H. **Ensign** and T.D. Alphin. 1997. "The effects of Hurricane Fran on water quality and benthos in the Cape Fear River, North Carolina". Biannual Meeting of the Estuarine Research Federation, Providence, RI.

1. Mallin, M.A., G.C. Shank, M.R. McIver and S.E. **Ensign**. 1996. "Hurricane effects on water quality of the Cape Fear Estuary". Annual Meeting of the Southeastern Estuarine Research Society, Atlantic Beach, NC.

Technical Reports and Reviewed Theses

12. Mallin, M.A., S.H. **Ensign**, M.R. McIver. 2006. A water quality assessment of the upper Town Creek watershed, North Carolina. A report prepared for the North Carolina Coastal Land Trust by Aquatic Analysis and Consulting, Wilmington, NC.

11. AquACo. 2006. Evaluation of sediment curtain efficacy and water quality during dredging at Oceana Marina, Carolina Beach, North Carolina. Aquatic Analysis and Consulting, Wilmington, NC.

10. Ensign, S.H. 2004. Nutrient dynamics in coastal North Carolina: spatial/temporal variation and processes influencing nitrogen and phosphorus uptake. M.S. thesis, University of North Carolina at Chapel Hill.

9. Mallin, M.A., L.B. Cahoon, M.R. McIver and S.H. Ensign. 2002. Seeking science-based nutrient standards for coastal blackwater stream systems. Report No. 341. Water Resources Research Institute of the University of North Carolina, Raleigh, N.C.

8. Mallin, M.A., M.H. Posey, T.E. Lankford, M.R. McIver, S.H. **Ensign**, T.D. Alphin, M.S. Williams, M.L. Moser, and J.F. Merritt. 2001. Environmental Assessment of the Lower Cape Fear River System, 2000-2001. CMS Report No. 01-01. Center for Marine Science, University of North Carolina at Wilmington, NC.

7. Mallin, M.A., M.H. Posey, M.R. McIver, S.H. **Ensign**, T.D. Alphin, M.S. Williams, M.L. Moser, and J.F. Merritt. 2000. Environmental Assessment of the Lower Cape Fear River System, 1999-2000. CMS Report No. 00-01. Center for Marine Science, University of North Carolina at Wilmington, N.C.

6. Mallin, M.A., L.B. Cahoon, S.H. **Ensign**, D.C. Parsons, V.L. Johnson and J.F. Merritt. 2000. Environmental Quality of Wilmington and New Hanover County Watersheds, 1999-2000. CMS Report 00-02, Center for Marine Science, University of North Carolina at Wilmington, Wilmington, NC.

5. Mallin, M.A., M.H. Posey, M.L. Moser, L.A. Leonard, T.D. Alphin, S.H. **Ensign**, M.R. McIver, G.C. Shank, and J.F. Merritt. 1999. Environmental Assessment of the Lower Cape Fear

River System, 1998-1999. CMSR Report No. 99-01. Center for Marine Science Research, University of North Carolina at Wilmington, NC.

4. Mallin, M.A., S.H. **Ensign**, D.C. Parsons, and J.F. Merritt. 1999. Environmental Quality of Wilmington and New Hanover County Watersheds, 1998 – 1999. CMSR Report 99-02. Center for Marine Science Research, University of North Carolina at Wilmington, Wilmington, NC.

3. Mallin, M.A., M.H. Posey, M.L. Moser, G.C. Shank, M.R. McIver, T.D. Alphin, S.H. **Ensign** and J.F. Merritt. 1998. Environmental Assessment of the Lower Cape Fear River System, 1997-1998. CMSR Report No. 98-02. Center for Marine Science Research, University of North Carolina at Wilmington, Wilmington, NC.

2. Mallin, M.A., L.B. Cahoon, D.C. Parsons and S.H. Ensign. 1998. Effects of organic and inorganic nutrient loading on photosynthetic and heterotrophic plankton communities in blackwater rivers. Report No. 315. Water Resource Research Institute of the University of North Carolina, Raleigh, N.C.

1. Mallin, M.A., M.H. Posey, M.L. Moser, G.C. Shank, M.R. McIver, T.D. Alphin, S.H. **Ensign** and J.F. Merritt. 1997. Environmental Assessment of the Lower Cape Fear River System, 1996-1997. CMSR Report No. 97-01. Center for Marine Science Research, University of North Carolina at Wilmington, Wilmington, NC.