

## CURRICULUM VITA

### LAURA MURRAY

#### Horn Point Laboratory

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#### Education

1969: AA Mississippi Junior College, Perkinston, Mississippi  
1971: BS (Marine Science) University of West Florida, Pensacola, Florida  
1973: MST (Biology/Education) University of West Florida, Pensacola, Florida  
1983: Ph.D. (Wetlands Ecology) College of William and Mary, Marine Science Institute, Gloucester Point, Virginia

#### Professional Background

1971-1973 Graduate Assistant. Invertebrate Ecology. A Comparative Study of the Crustacean Fauna of Two Bayous in Northwest Florida. University of West Florida, Pensacola, Florida.

1972 Scientific Russian Language Instructor Aid, University of West Florida, Pensacola, Florida.

1973-1975 High School Biology and Science Teacher. Biology and Earth Science, Woodham High, Pensacola, FL

1975-1979 High School Biology and Science Teacher. Biology, Marine Science, Quantitative Physical Science, Norcum High School, Portsmouth, VA.

1977-1979 Laboratory Specialist in Salt Marsh Ecology. Long term effects oil spills on a temperate salt marsh. College of William and Mary, Marine Science Institute, Gloucester Point, VA.

1981- 1985 Research Assistant/Associate. Tropical seagrass ecosystem community metabolism. Cooperative U.S. - Mexican Scientific Research sponsored by the National Science Foundation. Universial Nacional Autonoma de Mexico, Mexico City, Mexico.

- 1984 Research Investigator. Outer Continental Shelf Mar. Productive. Study. University of Maryland Eastern Shore, Princess Anne, Maryland.
- 1985 Visiting Scientist. Dept. Ecology and Genetics, University of Aarhus; Denmark. Freshwater Biological Laboratory, University of Copenhagen; Denmark.
- 1979-1981 Graduate Assistant (Ph.D. dissertation) in Estuarine Ecology. Seagrass investigations in the lower Chesapeake Bay. College of William and Mary, Marine Science Institute, Gloucester Point, VA.
- 1983-1992 Adjunct Research Scientist. Horn Point Environmental Laboratories, University of Maryland, Cambridge.
- 1982-1990 Assistant Professor of Biology. Salisbury State University, Salisbury, Maryland
- 1990-1993 Associate Professor of Biology, Biology Faculty: Salisbury State University, Salisbury, Maryland
- 1993- Research Associate Professor , Head of Environmental Science Education, Horn Point Environmental Laboratory University of Maryland Cambridge, MD.

## **Research**

### **A. Areas of professional expertise**

Wetland Ecology: Marsh and seagrass ecology, plant responses to ecological variables.

Environmental Science Education: Teaching undergraduate, graduate and educators; administering Environmental Education Program.

Research for Education: Administering Summer Teacher Research Program; Teaching courses for educators, interpreting science for education.

### **B. Peer-Reviewed Publications**

Bender, M.E., A.E. Shearls, L. Murray, R.J. Huggett. 1980. Ecological effects of experimental oil spills in Eastern coastal plain estuaries. *Environ. Internat.*, 3: 121-133.

- Kemp, W.M. and L. Murray. 1986. Oxygen release from the roots of the submersed macrophyte, Potamogeton perfoliatus: Regulating factors and ecological implications. *Aquatic Botany*, 26: 271-283.
- Murray, L. and R.L. Wetzel. 1987. Oxygen production and consumption associated with the major autotrophic groups in two temperate seagrass communities. *Mar. Ecol. Prog. Ser.*38: 231-239.
- Kemp, W.M., L. Murray, J. Borum, K. Sand-Jensen. 1987. Diel growth in eelgrass Zostera marina. *Mar. Ecol. Prog. Ser.* 41, 79-86.
- Borum, Jens, L. Murray and W.M. Kemp. 1989. Aspects of Nitrogen Acquisition and Conservation in Eelgrass Plants. *Aquatic Botany*. 35: 289-300.
- Murray, L., W.C. Dennison, W.M. Kemp. 1993. Nitrogen versus Phosphorus Limitation for growth of an estuarine eelgrass (Zostera marina L.) population. *Aquatic Botany* 44: 83-100.
- Boynton, W. R., L. Murray, J. Hagy, C. Stokes, and W. M. Kemp. 1996 A comparative analysis of eutrophication patterns in a temperate coastal lagoon. *Estuaries*, vol. 19, No. 28,p. 408-421.
- R. B. Sturgis and L. Murray. 1997. Scaling of nutrient inputs to submersed macrophyte mesocosms: Temporal and spatial variations. *Mar Ecol Prog Ser* 152: 89-102.
- Murray, L., R.B. Sturgis, R. Bartleson, W. Severn and W. M. Kemp. 1999. Scaling submersed plant community responses to experimental nutrient enrichment. In *Seagrasses: Monitoring, Ecology, Physiology, and Management*, S. A. Bortone (editor). CRC Press, New York.
- Murray, L. and P. Chambers. 1999. Water quality assessment: coupling science and education. In E. Özhan [ed.], *MEDCOAST 99 B EMECS 99 Joint Conference Proceedings*, Antalya, Turkey; pp 1193-1198. Middle East Technical University, Ankara, Turkey.
- Petersen, J., W. M. Kemp, W. Boynton, C-C Chen, J Cornwell, R. Gardner, D. Hinkle, E. Houde, T. Malone, W. Mowitt, L. Murray, L. Sanford, C. Stevenson, K. Sundberg, S. Suttles. 2003. Multi-scale experiments in coastal ecology: Improving realism and advancing theory. *BioScience*. 53: 1181-1197.
- Murray, L. 2004. Restoring Bay grasses: Bringing research to the field. *Maryland Aquafarmer*. Issue # 2004-01-02.
- Kemp, W. M., R. Batiuk, R. Bartleson, P. Bergstrom, V. Carter, G. Gallegos, W. Hunley, L. Karrh, E. Koch, J. Landwehr, K. Moore, L. Murray, M. Naylor, N. Rybicki, J. C. Stevenson, D. Wilcox. 2004. Habitat requirements for submerged**

**aquatic vegetation in Chesapeake Bay: Water quality, light regime, and physical-chemical factors. *Estuaries*. 27: 363-377.**

### **CD-ROM Publications**

Murray, L., DS Lloyd, J Whitelock. Wetlands: Applications for Education. Maryland Association of Outdoor Educators. Jan 31, 2003.

Murray, L., JH Melton, L May, M Parks. Submersed Aquatic Vegetation: Applications for Education. Maryland Association of Outdoor Educators. Jan 31, 2003.

Murray, L., Ma, Xiping, Melton, J. Bringing Ocean Observation System Science to Education. Mid-Atlantic COSEE. July, 2004.

## **2. Technical Reports**

Bender, M.E., A.E. Shearls, L. Murray, C.H. Hershner, R.J. Huggett. 1981. Ecological effect: IN: Fate and effects of experimental oil spills in an eastern coastal plain marsh system. M.E. Bender, J.G. Hudgins and R.A. Jordan (eds.). American Petroleum Institute report, VIMS No. 539440:11-1157.

Wetzel, R.L., P.A. Penhale, M.S. Kowalski, K.L. Webb, L. Murray and R.vanTine. 1981. Primary production, community metabolism and nutrient cycling. IN: Functional ecology of submerged aquatic vegetation in the lower Chesapeake Bay. R.L. Wetzel (ed.). Report to Chesapeake Bay Program.

Wetzel, R.L., L. Murray, R. vanTine, J.W. Day, Jr., C.R. Madden. 1982. Preliminary studies on community metabolism in a tropical seagrass ecosystem, Laguna de Terminos, Campeche, Mexico. College of William and Mary. IN: An ecological program for the laguna de Terminos, Campeche, Mexico, with special reference to fishery resources and the potential impact of man. John W. Day, Project Coordinator. Louisiana State University Cont. No. LSU-CEL. 82-03. Baton Rouge, LA.

Kemp, W.M. and L. Murray. 1986. Nutrient-macrophyte interactions for submersed plant communities in coastal waters. Final Report to Maryland Sea Grant College, College Park (No R/F - 4-PD). UMCEES Tech. Rep Ser. TS-56-86.

Kemp, W.M., J. Neundorfer, L. Murray, W.C Dennison. 1988. Nitrogen versus phosphorus nutrient enrichment effects on submerged aquatic vegetation. Report to State of MD. Chesapeake Bay Trust, Annapolis, MD.

Boynton, W., L. Murray and F. Jacobs. 1993. "Maryland's Coastal Bays: an assessment of aquatic ecosystems, pollutant loadings, and management options." Report to Maryland Department of the Environment, Baltimore, Md.

Murray, L. and B. Sturgis. 1994. "Scaling of nutrient input in submersed aquatic vegetation mesocosms." Report to MEERC,

U.S. Environmental Protection Agency, Washington, D. C.

- Moore, K. A., J. L. Goodman, J. C. Stevenson, L. Murray and K. Sundberg. 1994. Chesapeake Bay nutrients, light and SAV: Relations between variable water quality and SAV in field and mesocosm studies. Report to Chesapeake Bay Program, Environmental Protection Agency, Annapolis, MD. 21401.
- Jones, T. W., L. Murray and J.C. Cornwell. 1994. Relative importance of nutrient inputs to the productivity of an estuarine marsh, Monie Bay NERRS. Report to NOAA National Estuarine Research Reserve System. Washington, D. C.
- Moore, K. A., J. L. Goodman, J. C. Stevenson, L. Murray and K. Sundberg. 1995. Chesapeake Bay nutrients, light and SAV: Relations between variable water quality and SAV in field and mesocosm studies. Final Report to Chesapeake Bay Program, Environmental Protection Agency, Annapolis, MD. 21401.
- Murray, L. and B. Sturgis. 1995. "Scaling of nutrient input in submersed aquatic vegetation mesocosms." Report to MEERC, U.S. Environmental Protection Agency, Washington, D. C.
- Murray, L. and B. Sturgis. 1996. "Trophic scaling in submersed aquatic vegetation mesocosms: Response to nutrient enrichment" Report to MEERC, U.S. Environmental Protection Agency, Washington, D. C.
- Jones, T. W., L. Murray and J.C. Cornwell. 1997. Short-term and long-term sequestering of nitrogen and phosphorus in the Maryland National Estuarine Research Reserve. Report to NOAA National Estuarine Research Reserve System. Washington, D. C.
- Murray, L., B. Sturgis, R. Bartleson, W. Severn. 1997. "Scaling response of SAV community to nutrient loading: Effects of Trophic Complexity. In. Scale-Dependent Relations Governing Extrapolation from Mesocosm to Nature in Coastal Ecosystems. V.S. Kennedy (ed). Report to U. S. Environmental Protection Agency, Washington, D. C.
- Murray, L. R. B. Sturgis, R. Bartleson. 1998. "Scaling response of SAV communities to nutrient loading: Effects of water exchange. In. Scale-Dependent Relations Governing Extrapolation from Mesocosm to Nature in Coastal Ecosystems. V.S. Kennedy (ed). Report to U. S. Environmental Protection Agency, Washington, D. C.
- Murray, L. R. B. Sturgis, R. Bartleson. 1999. "Scaling response of SAV communities to nutrient loading: Coupling open water and seagrass systems. In. Scale-Dependent Relations Governing Extrapolation from Mesocosm to Nature in Coastal Ecosystems. V.S. Kennedy (ed). Report to U. S. Environmental Protection Agency, Washington, D. C.

- Murray, L. P. Chambers, S. Miller, D. Richardson, G. Dendrinis, C. Lea, B. Sturgis. 1999. Water quality assessment using artificial substrates and sediments: Coupling science and education. Report to Maryland Coastal Bays, Department of Natural Resources, Annapolis, MD.
- Murray, L. 1999. Chesapeake Bay as an ecosystem: An experience in estuarine ecology, data interpretation and classroom applications. Report submitted to Maryland Higher Education Commission, Annapolis, MD.
- Kemp, W. M. , Murray, L. , DF Gruber. 1999. Comparative analysis of South Florida estuarine ecosystems: Responses to variations in freshwater inputs. Report to Florida Center for Environmental Studies. Palm Beach Gardens, FL.
- Murray, L. 2000. MEERC Outreach through Education: Sustainable Restoration of Mesohaline SAV. In. Scale-Dependent Relations Governing Extrapolation from Mesocosm to Nature in Coastal Ecosystems. V.S. Kennedy (ed). Report to U. S. Environmental Protection Agency, Washington, D. C.
- Murray, L. 2001. MEERC Outreach through Education: Sustainable Restoration of Mesohaline SAV. In. Scale-Dependent Relations Governing Extrapolation from Mesocosm to Nature in Coastal Ecosystems. V.S. Kennedy (ed). Report to U. S. Environmental Protection Agency, Washington, D. C.
- Murray, L. 2003. Scale-dependent relationships in Submersed Aquatic Vegetation Ecosystems. Multi-scale Experimental Ecosystem Research Center. Report to U. S. Environmental Protection Agency, Washington, D. C.
- Murray, L. 2003. Restoration of Mesohaline SAV. Report to the Chesapeake Bay Trust. Annapolis, MD.
- Murray, L. Establishment of Mid-Atlantic Center for Ocean Science Education Excellence (COSEE). Report to National Science Foundation. (2003)

### **3. Invited Book chapters:**

- Kemp, W.M., L. Murray, W.R Boynton, C. Madden, R.L. Wetzel, F. Vera Herrera. 1988. Light relations for the seagrass, *Thalassia testudinum*, and its epiphytic algae in a tropical estuarine environment. Chap. 11:193-206 In: A Yanez-Arancibia and J.W. Day (eds.) Ecology of Coastal Ecosystems in the Southern Gulf of Mexico: The Terminos Lagoon Region. Inst. Cienc. del MAR Y Limnol. UNFM. Coast Ecol. Inst. LSU Editorial Universitaria, Mexico, D.F.
- Kemp, W.M., L. Murray, and C.P. McRoy. 1988. Primary Production. In:R. Phillips and C.P. McRoy (ed). Seagrass Research Methods. UNESCO Publ., Paris, France.

### **4. Other Publications**

**MA COSEE. Taking the Pulse of our Changing Planet. Course Curriculum for Observing Systems Education. 2004.**

**C. Grants and Contracts:**

**1. Awarded (active)**

**a. Scientific**

**Kemp, WM, L Murray and J Cornwell. Scales of Sediment Biogeochemistry in Seagrass Beds: Implications for Restoration and Sustainability. Maryland Sea Grant. February, 2002-4 (\$134,769)**

**North, E, Boicourt, WC, Chou, SY, Roman, MR. and Murray, L. Collaborative Research: Larval transport in a coupled-estuary-shelf system: a modeling study. National Science Foundation.**

**b. Educational**

**Murray, L. Establishment of Mid-Atlantic Center for Ocean Science Education Excellence (COSEE). Sub-contract. National Science Foundation. (2004-5) (\$96,314).**

**Kramer, J., L. Murray, J. Takacs, A. Frederick, C. Stylinski. Chesapeake Bay Education Initiative. National Oceanic and Atmospheric Administration. (2005) (\$120,428).**

**Murray, L. Restoration of Mesohaline Submerged Aquatic Vegetation through Community-based Projects in Chesapeake Bay (Nanticoke River). National Fish and Wildlife Foundation. (\$50,000).**

**Murray, L. Restoration of Mesohaline Submerged Aquatic Vegetation through Community-based Projects in Chesapeake Bay (Chester River). NOAA. (\$36,086).**

**Murray, L. Chesapeake Bay Ecology Course. Chesapeake Bay Foundation. (\$8000).**

**Pending Support**

**Murray, L. Chesapeake Bay and Its Watershed: Coupling science and education. Proposal submitted to NOAA Chesapeake Bay Program Office, B-WET Program. (2006) (\$39,556).**

**Murray, L and W. M. Kemp. Production and field planting of vegetative tubers for restoration of redhead grass (*Potamogeton perfoliatus*) and sago pondweed (*Stuckenia pectinata*) in Chesapeake Bay. Proposal submitted to Army Corps of Engineers, Vicksburg, MS.**

**Murray, L. Restoration of Mesohaline Submerged Aquatic Vegetation through Community-based Projects in Chesapeake Bay. Proposal submitted to NOAA.**

**Listed as the Educator on the following science proposals:**

**Funded:**

**Elizabeth North, William Boicourt, Shenn-Yu Chao, Charles Epifanio, Michael Roman. Senior Investigator: Laura Murray. Larval transport in a coupled-estuary-shelf system: a modeling study. NSF.**

**Not Funded:**

**Koch, EM. "Linking Sea Level Rise, Shoreline Retreat and Loss of Seagrass Habitat" NSF.**

**Hood, R et al. Collaborative Research: Quantifying OMZ and denitrification variability in the Eastern Tropical North Pacific. NSF.**

**Edward Carpenter, Douglas Capone, Ronald Seifert, Ajit Subramaniam, Victoria Coles, Raleigh Hood, Rebecca Shipe, Sergio Sanudo-Wilhelmy. Biocomplexity: Measuring and Modelling African Microbial Biocomplexity in the Ocean. NSF.**

**Raleigh Hood Victoria Coles, Louis Codispoti, Al Devol, Benjamin Van Mooy Quantifying OMZ and denitrification variability in the Eastern Tropical North Pacific. NSF.**

**Stoecker, D. and Zhang, X. Top Down control & trophic cascades: Effects of size structure of dinoflagellate populations on bloom regulation. NSF.**

**Crump, B.C., Apple, J. Microbial community metabolism and phylogeny as integrative indices of ecosystem health and function. Sea Grant.**

**2. Awarded (expired)**

**Kramer, J. J. Greer, L. Murray, J. Takacs, A. Frederick, C. Stylinski. Chesapeake Bay Education Initiative. National Oceanic and Atmospheric Administration. (2002) (\$250,000)**

**Murray, L. Submersed Aquatic Vegetation Studies. Subcontract from Multiscale Experimental Ecosystem Research Center Center for Environmental and Estuarine Studies, Univ. of Maryland. Funded by Environmental Protection Agency. 1993.(\$34,586). 1994 (\$210,060), 1995 (\$168,028),1996 (\$158,000), 1997 (\$82,000), 1998 (\$60,000), 1999 (\$60,000) 2000 (\$60,000) 2001 (60,000), 2002**

**Murray, L. and J Greer. Research Fellowship Program. NOAA, Chesapeake Bay Program. (\$88,500).**

Stylinski, C. and L. Murray. Learning with GIS: Integrating scientific tools into the classroom. Proposal submitted to Eisenhower Professional Development Foundation. January 30, 2002. (\$92,000)

Murray, L. Science Seminar Series. NOAA, Chesapeake Bay Program. January, 2002. (\$5000).

Bell, W., M Schwamm, L. Murray, R. Gabreys. Earth Tech. Using Technology to teach earth and environmental sciences. Carnegie Foundation. June 2002. (\$64500).

Murray, L. Summer Internships for Dorchester County Students. Waddell Foundation. Cambridge, MD. 1994- 2001 (\$8,000/yr).

Murray, L. Wetland Teacher Workshop. Waterfowl Festival. Easton, MD. 2001. (\$10,000)

Murray, L. Sustainable restoration of mesohaline SAV. Chesapeake Bay Trust. 2000-01. (\$42,000).

Murray, L. and J. Melton. SAV habitat restoration in the lower Nanticoke River watershed. National Fish and Wildlife Foundation. (\$47,320)

Murray, L. and J. Powers. SAV Restoration Project. Mid-Shore Community Foundation. Easton, MD. 2001-2002 (\$10,000).

Murray, L. Career Connections in Environmental Science. University System of Maryland Headquarters. College Park. Md. (1999-2001) \$10,000.

Murray, L. and Anne Willey. Remote Access to MEES Courses VISION Funds. Horn Point Laboratory. (\$5200)

Fisher, T. and Laura Murray. Use of GIS and Remote Sensing as a tool for teaching Earth Science and Geography in Local Schools. VISION Funds (\$8900).

Kemp, W. M. and L. Murray. Seagrass-Eutrophication Interactions: Role of Spatial Pattern. Funded by Maryland Sea Grant. (1999-2001) (\$60,000).

Murray, L. and J. C. Stevenson. Chesapeake Bay nutrients, light and SAV: Relations between variable water quality and SAV in mesocosm studies. Environmental Protection Agency. May 25,1993.(\$33,315)

Jones, T. W., L. Murray and J. Cornwell. A two-year study of the short-term and long-term sequestering of nitrogen and phosphorus in the Maryland National Estuarine Research Reserve. National Oceanic and Atmospheric Administration. June 1, 1993 (\$146,389)

Murray, L. Sea Grant Environmental Education Intern. Maryland Sea Grant, College Park, MD. 1995-6, (\$35,000), 1997 (\$10,000).

Murray, L. Wetland Teacher Workshop. Waterfowl Festival. Easton, MD. 1994. (\$7,500), 1996 (\$8200), 1997 (\$7500)

Murray, L. Summer Internships for Dorchester County Students. Waddell Foundation. Cambridge, MD. 1994. (\$8,000), 1995 (\$8200), 1996 (\$9,000), 1997 (\$7000)

Mackiernan, G. M. Leffler, L. Murray. NSF Research Experiences for Undergraduates Program. National Science Foundation, Washington, D.C. (\$221,400).

Murray, L., C. Baptist, D. Lloyd. Maryland summer center for gifted and talented students. Maryland State Department of Education. Annapolis, MD. 1994 (\$72,000).

Murray, L. and C. Baptist. Marsh and trail resotation for Horn Point Environmental Education Center. Chesapeake Bay Trust. (\$6,000).

Lupis, J. L, Murray, C. Baptist. Teacher Training Workshops for the HPEL Environmental Education Center. Chesapeake Bay Trust. (\$20,070).

Murray, L., C. Baptist, D. Lloyd. Maryland summer center for gifted and talented students. Maryland State Department of Education. Annapolis, MD. 1994 \$72,000.

Murray, L. Chesapeake Bay as an Ecosystem: An Experience in Estuarine Ecology. Chesapeake Bay Trust. 1994 \$7,800.

Murray, L. Summer Internships for Dorchester County Students. Waddell Foundation. Cambridge, MD. 1994. \$8,000.

Bell, W.H, L. Murray, et al. "A Relative Comparison of Marine Productivity Among the Outer Continental Shelf Planning Area." Federal OCS Oil and Gas Activities. Minerals Management Service. Washington, D.C. Jan 1984 -Dec 1984.

Kemp, W.M. and L. Murray. "Seagrass nutrient interactions" NOAA, MD. Sea Grant College, June 1984 - June 1985. (\$5,000)

Kemp, W.M. and L. Murray. "Seagrass-nutrient interactions" NOAA, Sea Grant College. Jan 1985 - Dec 1985 (\$10,500)

Kemp, W.M., W.C. Dennison, and L. Murray. "Resurgence of submerged aquatic vegetation in Chesapeake Bay (1985-1988): A natural experiment to test eutrophication effects." Maryland Water Resources Research Center, Univ. of MD., College Park, MD. May 1989 - April 1990. (\$30,000).

Kemp, W.M., W.C., Dennison, L. Murray. "Eutrophication effects of growth and survival of submerged aquatic vegetation in Chesapeake Bay: An ecosystem

simulation model. Maryland Water Resources Research Center, Univ. of Md. College Park, MD. Dec. 1989 - Dec. 1990. (\$18,000).

Murray, L. and T.W. Jones. "A Comparison of Two Marsh Creek Systems in the Monie Bay National Estuarine Research Reserve." Maryland Department of Natural Resources, May 1991-October 1991. (\$5,000)

Murray, L. "Maryland's Coastal Bays: An assessment of aquatic ecosystems, pollutant loadings, and management options." Sub-contract from Environmental Protection Agency through the Center of Environmental and Estuarine Studies, Univ of Maryland, Oct 1991- Dec 1992. (\$43,000).

Murray, L. Submersed Aquatic Vegetation Studies. Subcontract from Multiscale Experimental Ecosystem Research Center Center for Environmental and Estuarine Studies, Univ. of Maryland. Funded by Environmental Protection Agency. June, 1993.(\$40,000).

Murray, L. 1998. Internet Resource Center: Linkages with Math-Science Education. Maryland Space Grant, Baltimore, MD. \$13,525. (1998)

Murray, L. Chesapeake Bay as an Ecosystem: An Experience in Estuarine Ecology. Eisenhower Professional Development Program, MD Higher Education Commission. 1998 (\$30,300)

Murray, L. USM Program for Minority Recruitment in Life Sciences. University of Maryland System. 1998-1999 (\$15, 700)

Murray, L. Correlation of Nutrient Enrichment with Submersed Aquatic Vegetation Growth: Coupling Research and Education. Maryland Department of Natural Resources. 1998 (\$10,000).

Murray, L. Wetland Teacher Workshop. Waterfowl Festival. Easton, MD. 1998 (\$8,200)

Murray, L. Water Quality Assessment Using Artificial Substrates and Sediments: Coupling Science and Education. Maryland Department of Natural Resources. 1999 (\$10,200).

Murray, L. Environmental Education for Dorchester County. Waterfowl Festival. Easton, MD. 1999 (\$8,200)

#### **Seminars and Presentations:**

**L. Murray, J. McDonnell, L. Hotaling, M. Newman, D. Gibson, and M. DeLuca**  
**Use of observing systems in science education: A course for teachers. American**  
**Society of Limnology and Oceanography. Savannah, GA. 2004**

**Murray, L. Teachers working with your research team: Meeting the “Broader Impacts” criteria. American Geophysical Union. December, 2004. San Francisco, CA.**

**Stylinski C.D., J.A. Frederick, L. Murray and J. Takacs. 2004. Partnering Teachers with Scientists in a Watershed-wide Fellowship Program. Ecological Society of America Conference, August 1-5 2004, Portland, OR**

**Murray, L. How is COSEE addressing the broader impact statement? NSF Town Meeting. American Society of Limnology and Oceanography. Savannah, GA. 2004**

**Murray, L, M. DeLuca, J. McDonnel, L. Hotaling, M. Newman and D. Gibson. Use of Observing Systems in Science Education: A Pilot Course for Teachers. Poster presentation. ORION conference. Jan 2004. San Juan, Puerto Rico.**

**Murray, L. C. Stylinski, A Ferderick, J. Takacs. The ESEP Teacher Research Fellowship. Maryland Association of Outdoor Educators. January 2004.**

**Murray, L. Environmental Science Education at Horn Point. Presentation to the Superintendents of the Eastern Shore, CA, Cambridge, MD. May 2004.**

**Murray, L. Nutrients in Chesapeake Bay. Presentation to Chesapeake Bay Foundation, Tilghman Island, MD. February, 2004**

**Murray, L. Environmental Education. Presentation to UMCES External Review Team. UMCES. Cambridge, MD. May, 2004.**

Murray, L. J. Melton, M. Parks, S. Stockham. Correlating environmental parameters with site selection for submersed aquatic vegetation restoration: Applications to education. Southeast Coastal Ocean Science Conference. Charleston, SC. January 2003.

Murray, L. Reduction of nutrients from sewage treatment plants: Effects on Chesapeake Bay waters. Seminar presented to the Chesapeake Bay Foundation. Port Isobelle, VA. February 2003.

Murray, L., DS Lloyd, J Whitelock. Wetlands: Applications for Education. Maryland Association of Outdoor Educators. Jan 31, 2003.

Murray, L., JH Melton, L May, M Parks. Submersed Aquatic Vegetation: Applications for Education. Maryland Association of Outdoor Educators. Jan 31, 2003.

Murray, L. and D. Lloyd. UMCES Environmental Science Education Program. Poster presentation. Maryland Association of Outdoor Educators. January 2002.

- Murray, L. SAV Ecology and Restoration. Presentation to the Issac Walton League, Easton MD. February 2003.
- Murray, L. and J. Melton. Combining science education and SAV restoration in mesohaline regions of Chesapeake Bay. Seagrass Restoration Conference. Baltimore, MD. Sept 2003.
- Kelley, A. and L. Murray. The effect of sediment type, irradiance, and bed persistence on growth of *Pomatogeton perfoliatus* (Redhead grass). Presentation to NOAA BEWET Conference, Baltimore, MD, July 2003.
- Bunnell, J. and L. Murray. Effects of SAV bed age, density, and persistence on the survivorship and growth of transplanted *Pomatogeton perfoliatus* (Redhead grass). Presentation to NOAA BEWET Conference, Baltimore, MD, July 2003.
- Murray, L. Research and Education at HPL. Presentation at the Faculty Retreat. December 2003.
- Murray, L. Bay Grasses. Seminar presented to the Chesapeake Bay Foundation. Port Isobelle, VA. February 2002.
- Murray, L. Ecology of Submersed Aquatic Vegetation. Workshop for SAV restoration. Horn Point Laboratory. February 2002.
- Murray, L. Bringing research to education. Horn Point Laboratory Seminar Series. February 2002
- Murray, L. Panel on education. UMCES Convocation. April 2002.
- Murray, L. Horn Point Education. Presentation to the UMCES Board of Visitors. October 2002.
- Schulte, K.E., L. Murray, and W.M. Kemp. 2001. The relationship of seagrass bed patchiness to primary production and bed "health". Poster. 16<sup>th</sup> Biennial Conference of the Estuarine Research Federation. Nov. 4-8 2001.
- Murray, L. and J. Melton. Sustainable restoration of mesohaline SAV. Presentation to the Choptank River Strategy Team, Easton, MD. Feb. 2001
- Murray, L. How can environmental research enhance science education? Maryland Association of Science Teachers Conference. Salisbury, MD. March 2001.
- Murray, L. SAV Ecology and Restoration. Workshop presented to teachers/citizens. Horn Point Environmental Science Education Center. Cambridge, MD. April- May 2001.
- Murray, L. and J. Melton. Mesohaline SAV restoration. Poster presentation. Chesapeake Bay Trust Annual meeting, Kent Island, MD. April 2001.

Murray, L. Wetlands Ecology. Presentation to the Environthon, Dorchester County Soil Conservation Service. Horn Point, Cambridge MD. April, 2001.

Murray, L. Horn Point Environmental Science Education Center. Presentation to Eastern Shore Public School Superintendents. Horn Point, Cambridge, MD. May 2001.

Murray, L. Horn Point Environmental Science Education Center. Presentation to Shore Leadership. Horn Point, Cambridge, MD. May 2001.

Murray, L. Nitrogen in the Chesapeake Bay. Presentation to Chesapeake Bay Foundation Educators and staff. Annapolis, MD. June, 2001.

Murray, L. Ecology of freshwater tidal wetlands. Maryland Native Plant Society. Easton, MD. Sept. 2001.

Chambers, P. , Murray, L. G. Dendrinis, and. From environmental science to the classroom: Studies of seagrass habitats and water quality. EMECS. Japan, Nov. 2001.

Bartleson, R. L. Walstad, L. Sanford, W. M. Kemp, C. Stevenson. 2001. Effects of seagrass bed size and flow regime on local water quality: Preliminary model study and field corroboration. ASLO, Albuquerque, NM (Feb).

Bartleson, R.D., W. M. Kemp, L. Walstad, L. Murray, and L. P. Sanford. 2000. Effects of seagrass bed size on local water quality: preliminary model study and field corroboration. Benthic Ecol. Meet., UNC., Wilmington, NC (Mar).

Murray, L. G. Dendrinis, and P. Chambers. From environmental science to the classroom: Studies of seagrass habitats and water quality. Estuarine Research Federation, New Orleans. Spet. 1999.

Murray, L. G. Dendrinis, and P. Chambers. From environmental science to the classroom: Studies of seagrass habitats and water quality. EMECS, Turkey. Nov. 1999. FIRST PLACE POSTER.

Murray, L. , DF Gruber and WM Kemp. Comparative analysis of South Florida estuarine ecosystems: Responses to variations in freshwater inputs. Poster presentation to Florida Bay Conference. Key Largo, FL. Nov 1999.

Bartleson, R.D. , L. Murray, W.M. Kemp and R.B. Sturgis 1999. Use of numerical ecosystem simulation to aid in the design of SAV nutrient enrichment mesocosm experiments. Estuar. Research Federation, New Orleans (Sep).

Murray, L., R. B. Sturgis, and R. Bartleson, Scaling effects on seagrass community responses to nutrient enrichment. Subtropical and Tropical Seagrass Management Ecology. Ft. Myers, Fl. Oct. 1998.

- Murray, L. Sturgis, R.B., W. Severn, R. Bartleson. Scaling trophic complexity and nutrient enrichment in submersed macrophyte mesocosms. Estuarine Research Federation, Rhode Island, Oct. 1997.
- Horn Point Environmental Education, Poster Presentation, Maryland Association of Science Teachers, Solomons, MD. Nov 1997
- Murray, L., R. B. Sturgis, R. Bartleson. Effects of variations in nutrient loading on submersed plant communities: Experiments in mesocosms and models.ERFECSA Sumposium, Middelburg, The Netherlands. 1996.
- Murray, L. and R. B. Sturgis. Nutrient Loading effects on submersed plant communities: Importance of frequency, form and timing of delivery. Hillerod, Denmark. 1996.
- Murray, L. and R. B. Sturgis. Temporal Scaling of nutrient inputs to experimental estuarine ecosystems containing submersed macrophytes. Presented at the Ecological Society of America conference in Snowbird Utah. 1995.
- Murray, L. Nutrient dynamics of mesohaline marsh vegetation: A comparison of two systems within the Monie Bay NERS. Presented to the Chesapeake Bay NERS Conference, Jug Bay, MD. April 1995.
- Murray, L. Seasonal timing of nutrient inputs to SAV mesocosms. Presented to the Living Resources Committee, Chesapeake Bay Program, Annapolis, MD. March 1995.
- Murray, L. and R. B. Sturgis. Trophic dynamics in SAV Mesocosms. Presented to the Scientific Advisory Committee, MEERC, Horn Point Environmental Laboratory, Cambridge MD. I. June, 1995; II. Nov. 1995,
- Murray, L. and R. B. Sturgis. Scaling of nutrient inputs in experimental mesocosms containing submersed aquatic vegetation. Presented to the Scientific Advisory Committee, MEERC, Horn Point Environmental Laboratory, Cambridge MD. I. April, 1994; II. Sept. 1994,
- Murray, L. "A comparison of vegetation and nutrient dynamics from two marsh-creek systems within the Monie Bay NERS."Chesapeake Research Conference, Norfolk, Va. 1994.
- Murray, L. and R. B. Sturgis. Nutrient loading effects on submersed plant communities: Importance of frequency, form and timing of delivery. Presented at the International Wetlands Conference, Key Largo, Fl. 1994.(Invited Paper).
- Murray, L, W.Boynton, C. Stokes, J. Hagy, W. M. Kemp. "Eutrophication of a temperate Coastal Lagoon: A comparative analysis". Presented at Estuarine Research Federation,Hilton Head SC. 1993.

Murray, L. A Comparison of Two Marsh-Creek Systems in the Monie Bay National Estuarine Research Reserve System. Presented at Estuarine Research Federation, San Francisco, CA. 1991.

Effects of sediment N and P enrichment on growth, biomass and tissue composition of seagrass, Zostera marina. Presented at Estuarine Research Federation, Baltimore, MD. 1989.

Light relations for the seagrass, Thalassia testudinum, and its epiphytic algae in a tropical lagoon. Presented at Estuarine Research Federation. New Orleans, LA. 1987.

Seagrass Growth and Photosynthesis: Diel cycles and light/nutrient interactions. Presented at the American Society of Limnology and Oceanography, New Orleans, LA. 1986.

Downward transport of oxygen through the vascular system of a submerged estuarine plant. Atlantic Estuarine Research Society. Salisbury, MD. 1984.

Influence of nutrient enrichment and light reduction on the epiphytic growth on Zostera marina. Presented at the Atlantic Estuarine Research Society, Baltimore, MD. 1982.

Production partitioning in a temperate seagrass ecosystem. Presented at the American Society of Limnology and Oceanography, Chapel Hill, North Carolina. 1982.

#### **E. Membership in Professional Societies:**

- \* **North American Association for Environmental Education**
- \* **Maryland Association of Science Teachers**
- \* **Estuarine Research Federation**
- \* **National Marine Educators Association**

#### **F. Other Professional Recognition**

CEES and MEES Faculty member  
Board of Directors, Maryland Space Grant  
**National COSEE Council**

#### **G. International Activities**

Visiting Scientist, University of Copenhagen. June-Aug 1985.  
Universidad Nacional Autonoma de Mexico, Tropical Seagrass Research,  
Member Mexico-USA Research Team. International Sea Grant, Campeche,  
Mexico (1981-1985).

#### **H. Educational Programs/Activities**

Horn Point Summer Internship Program  
Coordinate REU Program for Sea Grant

Developed partnership with the skipjack Nathan of Dorchester for high school education programs.

Developed Science/Research workshops for teachers, HPEEC

Developed Summer Environmental Education Program for Kids, HPEEC

Directed Science Workshops: 8/00 Jellyfish Ecology; 11/00 Land Use and Water Quality

Directed High School Career Day: 4/00 and 11/00

Featured in Maryland Public Television documentary "Splendor in the Grass" (April 2000)

## **Teaching and Student Training:**

### **2004 courses taught:**

**Observatory System Science and Education (COSEE). (July 2004)**

**Chesapeake Bay and Watershed Research: Teacher Fellowships (June 2004)**

**Chesapeake Bay Ecology (August 2004)**

**Wetlands Ecology and Management (selected lectures October 2004)**

#### **1. Existing Courses**

Biology 101

Biological Principles & Processes (121)

Cell Biology (201)

Human Anatomy & Physiology (Biol 215-lab)

Plant Taxonomy (Biol 312)

#### **2. Newly Developed Courses/ Workshops**

Wetlands Ecology (Biol 401)

Marine Science (Biol 490-501)

Aquatic Pollution (Biol 490-501)

Ecology/Evolution (Biol 225)

Tropical Marine Ecology (Biol 490-501)

Science Enhancement Seminar

Learning with GIS: Incorporating local science into the classroom

Murray, L. SAV Ecology and Restoration

#### **3. Regional Environmental Courses**

Wetland Ecology for Teachers (1999,2000,2001,2002)

Submersed Aquatic Vegetation Workshop for Teachers

Chesapeake Bay Ecology for Teachers (Biol 502, MEES 498,1989, 1991, 1994, 1998, 2001)

Ecology of the Chesapeake Bay Watershed (MEES 698, 1995)

Environmental Education for High School Teachers (CEES)

Wetland Plant Ecology, SSU

## **B. Undergraduate Research Students Directed**

1991 Stokes, C. A Comparison of Macrophyte Biomass and

Species Composition in Two Marsh Creek Systems in Monie Bay, Md.

1991 A. Sullivan. A Comparison of Macrophyte Tissue Nutrient Concentrations in Two Marsh Creek Systems in Monie Bay , MD.

1991 K. Whipp and J. Cotton. Primary Production of a Northern Cypress Swamp.

1992. B. Sturgis. The Effect of Elevated Sulfide and Reduced Light on the Primary Productivity of Eelgrass (*Zostera marina*)

1992. K. Schisler. Nitrogen and Phosphorus Characterization of Two Marsh Systems in Monie Bay, Md.

1992, K. Whipp. A Model of the Primary Production in a Northern Cypress Swamp.

1992. L. Madgeburger. The Effect of Fertilization on Macrophyte Growth and Tissue Nutrient Concentrations in Two Marsh Systems in Monie Bay, MD.

1992. A. Seth. Sediment Nutrient Composition and CO<sub>2</sub> Fluxes in the Monie Bay Marsh System.

1993. W. Severn. The Effects of Nutrient Delivery Modes on the growth of the submersed angiosperm, *Potamogeton perfoliatus*.

1994. B. Strugis, Salisbury State University, Salisbury, MD. The Effects of Nutrient Delivery Modes on the growth of the submersed angiosperm, *Potamogeton perfoliatus*.

1994 C. Fellows, Univ of MD. College Park, MD Nutrient removal by SAV systems.

1995 J. Bryner, Salisbury State Univ. Salisbury, MD. Nutrient monitoring the SAV mesocosms

1995 L. Taylor, UMD, College Park, MD . Amphipod grazing in SAV systems.

1996 J. Bryner, Salisbury State Univ. Salisbury, MD. Nutrient removal by SAV mesocosms.

1996 J. Krut, Salisbury State Univ. Salisbury, MD. Energetics of grazers in SAV systems.

1996 S. Simmons, Md. Collaborative Teacher Program, Salisbury State Univ. Salisbury, MD.

1997 Odette Thomas. Univ of Md. Eastern Shore, Princess Anne, MD. Effects of exchange rate on nutrient removal in SAV mesocosms.

1997 Micha Tinkler. Salisbury State University, Salisbury, MD. Epiphyte accumulation in SAV systems subject to varying exchange rates.

1998. Georgia Dendrinis. Use of SAV systems to characterize water quality: signatures in the sediments

1999. Georgia Dendrinis. Effects of SAV density on water quality.

2001 Zeb Schonerd. Use of artificial substrates to predict habitat suitability for SAV restoration.

2001 Clohessy, Ryan Comparisons of growth and morphology of lab propagated and wild SAV.

2002. Shannon Stockham. Effects of temperature and salinity on growth of *Potamogeton perfoliatus*.

2003. Sarah Turner. Artificial substrates as indicators of water quality.

2003. Sarah Henson (co-advisor). Scales of sediment biogeochemistry in seagrass beds.

### **Teacher Research Fellows**

- 1995 J. Bailey, Martin Meritta Teacher Scholar. Nitrogen and phosphorus enrichment in mesohaline marshes.
- 1998 Pat Chambers. Use of SAV systems to characterize water quality: The plants
- 1998 Stephanie Miller. Use of SAV systems to characterize water quality: Artificial substrates
- 1999 Pat Chambers. Use of artificial substrates to assess water quality.
- 2000 Pat Chambers. Use of artificial substrates to assess water quality.
- 2002 Myra Parks. Effects of substrate on growth of *Potamogeton perfoliatus*.
- 2003 Angela Kelley. Effects of sediment biogeochemistry on the growth of *Potamogeton perfoliatus*: A mesocosm experiment.
- 2003 Jean Bunnell. . Effects of sediment biogeochemistry on the growth of *Potamogeton perfoliatus*: A field experiment.
- John Sandkuler. Reproduction strategies in *Ruppia maritima*.**

### **D. Graduate Students and Committees:**

**Angela Hengst, Advisor**

**Jess Davis, Committee member**

#### **Past Committees:**

- J. Melton, Advisor. (2003)
- B. Sturgis, Advisor (2000)
- W. Severn, Advisor (2001)
- K. Schultzy, Co-Advisor (2003)
- J. Bryner, committee member (graduated 2000)
- Udy, James, Review Committee for Ph. D. U. of Queensland, Australia
- Meridith Bartley. Committee member
- W. Severn. Advisor. Physiological Response of submersed aquatic vegetation to trophic complexity: Vertical Scaling Issues. Graduated, Dec. 1998.
- R. Brian Sturgis. Advisor. Temporal scaling of nutrient inputs in submersed aquatic vegetation mesocosms.
- K. Splain 6/96. Mixing in SAV Mesocosms.
- K. Moore 4/96. "Chesapeake Bay Nutrients, Light and SAV: Relationships between water quality and SAV growth in field and mesocosm studies."
- J. Neundorfer. MEES/MS 12/90 "Effects of N versus P additions to waters overlying estuarine populations of two submersed vascular plants".
- L. Alves. MEES/Ph.D.. 12/93. "The fate of stream water nitrate entering littoral area of an Amazonian floodplain lake: The role of plankton, periphyton, inundated forest soils and littoral sediments."
- W. Kuhn. MEES/MS 8/92. "Interacting effects of light and sediment sulfide on eelgrass growth".

### **Service**

- **Advisory capacity and committees**

**Chesapeake Bay Program Living Resources Subcommittee. SAV Taskgroup.**  
**Chesapeake Bay Program Education and Communications Subcommittee.**  
**Restoration Ecology Institute**  
**National COSEE Advisory Council**  
**Trappe Landing Farm. Wetland restoration project.**  
**Forestry Plan. Mimi Wright**  
 Alliance for Chesapeake Bay, Environmental Education advisory panel  
 Gifted and Talented Program at Horn Point. Science Projects  
 Day School. Bay Studies Advisory Panel.  
 Waterfowl Festival of Easton, Board Member  
 Adkins Arboretum, Scientific Advisory Board  
 Queen Anne's County Ecotourism Committee  
 SAV Monitoring Program, Assateague Island National Park Service,  
 Scientific Advisory Panel, Assateague Island National Park Service, Berlin, MD.  
 Maryland House of Delegates, HPL Visit, August 1997  
 Chestertown Rotary Club , HPL Visit Oct. 1997  
 Talbot County Garden Club. Oct. 1995.  
 Land-Water Connection. Panel. Environmental Education Center, HPEL. July,  
 1995  
 Girl Scout Presentation on Marsh Ecology. July, 1995  
 Sea Grant Review Panel for REU students. April, 1995.  
 Environmental Education Advisory Board, HPEL. 1995.  
 NOAA Greenbackville Facility. Advisor.  
 STAC. Chesapeake Bay Program. Annapolis, MD.  
 Nanticoke River Project with Chesapeake Bay Foundation. Advisor.  
 Chesapeake Bay and Center for Environmental and Estuarine Studies Joint  
 Planning Committee. April. 1994  
 NOAA Greenbackville Facility. Advisor

## **B. Presentations**

Wetlands: What are they and why protect them? Seminar at the Waterfowl  
 Festival of Easton. Nov 1999.  
 Environmental Education at Horn Point. Shore Leadership. Oct. 1999.  
 SAV and water quality: Why Restoration? Gifted and Talented Program, HP  
 EE Center, Aug 1999.  
 Wetlands Ecology, Florida Bay and the Everglades, MEES 648. Fall 1998.  
 Marsh Ecology in the Field, Fifth Grade, The County School, Easton, MD  
 State of the Bay: Water Quality, Chesapeake Bay Foundation Education  
 Conference, Tilghman Island, MD. Feb 1997.  
 Horn Point TGIF: Mexico Then and Now April, 1997  
 Careers in Marine Science. Saints Peter and Paul High School, Easton, MD.  
 Everglades: River of Grass. Talbot County Public Library. Oct. 1997  
 Wetlands and non-tidal wetland issues. Leadership Maryland. Salisbury MD.  
 October. 1995, 1997  
 Horn Point Outreach Program, Worcester County Public Schools, Snow Hill, MD.  
 Spring 1997

Status of Chesapeake Bay SAV, Contribution to CES Annual Report. Fall 1997  
Chesapeake Bay Observing System Presentation for Teachers. HPEL. July 1995.  
Environmental Education at Horn Point Laboratory. Presentation to the Kent  
County Board of Education. Feb. 1995.  
"Status of HPEL Environmental Education facility usage." Presentation to the  
Environmental Education Advisory Board, Horn Point Environmental Laboratory.  
April, 1994  
The Biology major and graduate school. Salisbury State University. October. 1994  
Wetlands and non-tidal wetland issues. Leadership Maryland. Salisbury  
MD. October. 1994, 1996, 1997  
SAV decline in Chesapeake Bay. Heron Point Citizens Committee.  
Chestertown. MD. May, 1994.  
SAV resurgence. WBOC TV. Salisbury, MD. July. 1994.

## **I. Committees/ Meetings**

### **Committees/HPL Service:**

Chair. Landscaping Committee  
UMCES Environmental Science Education Council  
Board of Regents visit  
Space Grant Board of Directors  
Open House Committee  
Appalachian Laboratory Search Committee for Environmental Science Educator,  
faculty position  
Chair. UMCES Environmental Science Education Council  
Chair. Landscaping Committee  
Chesapeake Bay Teacher Training advisory panel  
Board of Regents visit  
Faculty Retreat Committee  
Chair. Horn Point Open House Committee

### **Community Service:**

Waterfowl Festival of Easton, Board Member, Easton, MD  
The Country School, Easton. Ecology Deck Co-Coordinator.  
Waterfowl Festival of Easton, Board Member, Easton, MD  
Chair. Conservation in Action exhibit. Waterfowl Festival of Easton  
Chair. Maryland Native Plant Society speakers committee.  
Upper Shore Manufacturing and Business Council, Career Connections  
Chesapeake Bay Program Education Summit, Front Royal, VA Sept 1999  
Appalachian Laboratory Search Committee Faculty Position  
Horn Point Environmental Education Specialist Search Committee,  
Chair  
Horn Point Education Committee  
Horn Point Open House Committee  
Horn Point EE Center Advisory Board, Chair  
EPA Bay Program Technical Synthesis/SAV Committee

Sea Grant selection committee for summer intern program  
Cooperative Education Program Meeting, Chesapeake College  
Wetlands and SAV STAC Committees  
Assateague Island National Park Service Advisory Committee  
Plant Ecologist Search Committee, Salisbury State University.  
Wetlands and SAV STAC Committee