

CHRISTINE LORD BORING

Ecologist II

Ms. Boring is an ecologist specializing in wildlife/fisheries biology, contaminants, and water quality improvements at the watershed level. Her responsibilities at Research Planning, Inc. (RPI) include serving as lead biologist and project manager on several different types of projects and tasks, including: 7 water quality improvement projects in 11 watersheds in South Carolina and 20 Environmental Sensitivity Mapping Projects. She has served as a member of the National Oceanic and Atmospheric Administration (NOAA) Scientific Support Team as a responder to oil/hazardous materials spills. She has taken the lead or been a team member on several additional projects, including: damage assessments related to vessel groundings in coral reef habitats, Environmental Impact Statements, Environmental Assessments, and data syntheses. Ms. Boring's graduate work focused on wildlife as vectors of contaminant distribution and cycling at the Savannah River Site in Aiken, S.C., and she also assisted on a long-term study of wild hog behavior and impacts to vegetation at Congaree Swamp National Park in Hopkins, S.C. She has co-authored several technical publications and reports while at RPI and previously at Rutgers University.

Education

M.S., Ecology and Evolution, Rutgers University, New Brunswick, NJ (1999).

Thesis Title: Mercury in Raccoons: Use as a Bioindicator of Environmental Contamination

B.S., Biology, University of Michigan, Ann Arbor, MI (1996)

Certification in Secondary Education for Biology, Chemistry, and History, University of Michigan (1996)

Honors

Rutgers Graduate Student Summer Research Fellowship, 1998

Professional Experience

1999 to Present: Ecologist, Research Planning, Inc., Columbia, SC

1996 to 1999: Graduate Research Assistant at Rutgers University and University of Georgia's Savannah River Ecology Laboratory (SREL)

Descriptions of Ms. Boring's responsibilities pertaining to six main project/technical support areas as an Ecologist at RPI are outlined separately on the following pages:

- 1) Coastal resource mapping for oil spill contingency planning and response
- 2) Oil and hazardous material spill response
- 3) Technical support to NOAA Abandoned Vessel Program
- 4) EPA non-point source pollution projects
- 5) Technical support in preparation of reports and response planning tools
- 6) Environmental Impact Statements / Environmental Assessments / Data Syntheses

Coastal Resource Mapping for Oil Spill Contingency Planning and Response

1999-Present: Ms. Boring served as lead biologist on the following Environmental Sensitivity Index Mapping Projects used for oil spill contingency planning, response, and coastal zone management:

- Virginia
- Columbia River, Ore. /Wash. (supervisor)
- North Slope, Alaska
- Chukchi Sea, Alaska
- Bristol Bay, Alaska
- Western Alaska
- Northwest Arctic, Alaska
- Guam/CNMI (Project Manager)
- Central California (Project Manager)
- Alabama
- American Samoa
- Hawaii
- Rhode Island
- Connecticut
- New York
- New Jersey
- Gaza Strip
- Maryland
- Northern California
- Southern California

Her role as lead biologist on multiple ESI projects requires extensive correspondence with biological and socio-economic resource experts from several government, university, and private agencies. She also assisted in the biological compilation effort for the Honduras and Nicaragua ESI mapping projects. She has extensive experience in natural resources data collection and interpretation, as well as a working knowledge of Geographic Information Systems (GIS) software, particularly ArcMap.

Oil and Hazardous Materials Spill Response

1999-Present: Ms. Boring has been part of the Scientific Support Team to the U.S. Coast Guard provided by the National Oceanic and Atmospheric Administration (NOAA) for oil and chemical spills for 9 years. She has written and edited hundreds of resources at risk analyses for oil and chemical spills, spill drills, contingency plans, natural disasters (e.g., Hurricane Katrina), and Natural Resource Damage Assessments (NRDA). She has provided on-scene support for the Emergency Response and Assessment and Restoration Divisions of NOAA at incidents in Texas, Louisiana, and Puerto Rico. Recently she lead a Shoreline Cleanup Assessment Team (SCAT) and provided support for the NRDA for a 9000 bbl spill in the Mississippi River in downtown New Orleans, Louisiana (2008). She also served as a member of the Scientific Support Team for a 3-4 million gallon spill in Calcasieu Lake, Louisiana (2006). Following her initial participation during the emergency response phase, she returned on-scene as a team leader during a two-week sediment and biological sampling effort for the NRDA. She also responded on-scene at an incident in Port Arthur, Texas assessing impacts to habitats due to oil released from a tanker/barge collision (2004), and at mystery spill in Puerto Rico (2007).

Technical Support to NOAA Abandoned Vessel Program

2002-present: Ms. Boring worked with the NOAA Abandoned Vessel Program in order to assess potential threats to corals, seagrasses, and mangroves caused by derelict vessels in the Caribbean (Virgin Islands and Puerto Rico) and the Pacific (Guam, Commonwealth of the Northern Mariana's (CNMI), and Hawaii). In 2002 and 2003 she conducted field surveys of 69 abandoned vessels in the Virgin Islands and 73 vessels in the Pacific, co-authored two reports

and a peer-reviewed journal article on the survey findings, and generated underwater video and underwater still photography deliverables. In 2006-2007, Ms. Boring completed a review of state legislature on abandoned vessel issues, helped coordinate a 3-day meeting on issues related to vessel groundings in the Northwest Hawaiian Islands and annexing the Hawaii Area Contingency Plan, and edited several reports on coral protocols, underwater GPS technology, etc. In 2008 Ms. Boring wrote a comprehensive report detailing the response, restoration, and monitoring associated with the grounding and removal of 9 longliners in Pago Pago Harbor, American Samoa.

Lecturer and Instructor for ESI Mapping and Shoreline Cleanup Assessment Trainings

2003-Present: In 2008 Ms. Boring participated in ESI training workshops in Mobile, Alabama and Honolulu, Hawaii. She led classes of 30+ students through the history and creation of the ESI Atlas and databases, as well as exercises using ESI maps for decision making. Ms. Boring also lead ESI training courses and/or lectured at Shoreline Cleanup Assessment Team training workshops in Anchorage, Alaska (2003 and 2004), Charleston, South Carolina (2003), and Honolulu, Hawaii (2008).

EPA and S.C. Department of Health and Environmental Control (DHEC) Non-Point Source Pollution Projects

2000-Present: Ms. Boring acted as Project Manager on 7 non-point source pollution projects in 11 South Carolina watersheds to identify and mitigate fecal coliform loading and turbidity and to implement Total Maximum Daily Loads (TMDL). These projects require an ability to generate partnerships with local community members to encourage landowners to implement Best Management Practices (BMPs) on their properties in order to reduce non-point source pollution into their watersheds. Ms. Boring provides guidance on land-use practices (e.g., fencing cattle out of streams with adequate vegetative buffers, installing creek crossings) that benefit water quality on agricultural and rural lands, and collected and analyzed water quality data. She is also actively involved in water quality outreach in local communities. In addition, she co-authored four in-depth final reports and is generating digital deliverables and extensive photo-documentation of the project results for the current projects. Her work has been recognized through one of the participating landowners receiving the County Conservationist of the Year Award (the landowner was nominated for a national award in 2007), and by DHEC for measurable improvements in water quality in two watersheds (Rocky Creek and Big Wateree Creek).

Environmental Impact Statements / Environmental Assessments / Alternative Energy Data Synthesis

2001-2007: In 2006-2007 Ms. Boring worked with a team of RPI and outside experts on a synthesis of worldwide literature on alternative energy for the Minerals Management Service (MMS). Her focus was on impacts of offshore wind power and other cutting edge energy technologies on avifauna. In addition, Ms. Boring worked with several firms on a Programmatic Environmental Impact Statement for the U.S. Coast Guard rulemaking that requires the inclusion of *in situ* burning and dispersant capability in vessel and facility oil spill response plans in 2004. Under this project, she evaluated the impacts of the use of *in situ* burning and dispersants versus mechanical response only on marine birds, marine mammals, subsistence use, and intertidal

habitats. She also co-authored an Environmental Assessment regarding a US Navy proposed action to remove oil from a sunken WWII vessel in the Federated States of Micronesia in 2002.

Technical Support in Preparation of Reports and Response/ Planning Tools

1999-2002: Ms. Boring co-authored two guidance documents for the NOAA Office of Response and Restoration:

- Managing Seafood Safety after an Oil Spill (2002)
- Environmental Sensitivity Index Guidelines Version 3.0 (2002)

She has also gathered information and written reports on *in situ* burning and other spill-response options for a variety of habitat types and species for the USEPA Region IV Inland Area Contingency Plan for South Florida. In addition, she assisted on the Department of Transportation's Unusually Sensitive Areas (USAs) nationwide mapping project. This required collecting and analyzing data from the Natural Heritage Programs for threatened and endangered species, depleted marine mammals, and shorebird and waterfowl concentration areas.

Publications

Boring, C.L. and I.J. Zelo. 2008. Abandoned small vessels: state perspectives on a nationwide issue. Proc. 2008 International Oil Spill Conference, API Publication, American Petroleum Institute, Wash., D.C., pp.

Lord-Boring, C., I.J. Zelo, Z.J. Nixon. 2004. Abandoned vessels: impacts to coral reefs, seagrass, and mangroves in the U.S. Caribbean and Pacific territories with implications for removal. Marine Technology Society Journal 38(3): 25-34.

Lord, C.G. and J. Michel. 2003. Conceptual models for assessing the risk of seafood tainting during oil spills. Proc. 2003 International Oil Spill Conference, API Publication, American Petroleum Institute, Wash., D.C., 6 pp.

Plank, C., Z. Nixon, and C.G. Lord. 2003. Hawaii Environmental Sensitivity Index (ESI) maps and the spatial accuracy of ESI mapping methodology. Proc. 2003 International Oil Spill Conference, API Publication, American Petroleum Institute, Wash., D.C., 6 pp.

Lord, C. G., K. F. Gaines, C. S. Boring, I. L. Brisbin, Jr., M. Gochfeld, J. Burger. 2002. Raccoon (*Procyon lotor*) as a bioindicator of mercury contamination at the U.S. Department of Energy's Savannah River Site. Archives of Environmental Contamination and Toxicology 43:356-363

Gaines, K. F., C. S. Romanek, C. S. Boring, C.G. Lord, M. Gochfeld, and J. Burger. 2002. Using raccoons as an indicator species for metal accumulation across trophic levels: a stable isotope approach. Journal of Wildlife Management 66(3): 808-818.

Burger, J., C.S. Boring, C. Dixon, C.G. Lord, M. McMahon, R. Ramos, S. Shukla, and M. Gochfeld. 2002. Exposure of South Carolinians to commercial meats and fish within their meat and fish diet. Science of the Total Environment 287:71-81.

- Burger, J. K.F. Gaines, C. G. Lord, I.L. Brisbin, Jr., S. Shukla, and M. Gochfeld. 2001. Metal levels in raccoon tissues: differences on and off the Department of Energy's Savannah River Site in South Carolina. *Environmental Monitoring and Assessment* 74:67-84.
- Gaines, K.F., C.G. Lord, C.S. Boring, I.L. Brisbin, Jr., M. Gochfeld, and J. Burger. 2000. Raccoons as potential vectors of radionuclide contamination to human food chains from a nuclear industrial site. *Journal of Wildlife Management* 64 (1) 199-208.
- Burger, J., C. G. Lord, L. McGrath, K. F. Gaines, I. L. Brisbin Jr., M. Gochfeld, and E. J Yurkow. 2000. Metals and metallothionein in the liver of raccoons: utility for environmental assessment and monitoring. *Journal of Toxicology and Environmental Health* 60:243-261.
- Burger, J., J. Sanchez, J., W. Gibbons, T. Benson, J. Ondrof, R. Ramos, M. J. McMahon, K.F. Gaines, C.G. Lord, M. Fulmer, and M. Gochfeld. 1999. Attitudes and perceptions about ecological resources and hazards of people living around the Savannah River Site. *Environmental Monitoring and Assessment* 57: 195-211.
- Burger, J. J. Sanchez, M. McMahon, J. Leonard, C.G. Lord, R. Ramos, and M. Gochfeld. 1999. Resources and estuarine health: perceptions of elected officials and recreational fishers. *Journal of Toxicology & Environmental Health* 58:245-260.
- Burger, J., O. Meyers, C.S. Boring, C. Dixon, J. Leonard, C.G. Lord, M. McMahon, R. Ramos, S. Shukla, and M. Gochfeld. Environmental health, future land use, restoration, and stewardship: proximity reflects the public's ratings. Submitted to *Environmental Management*.
- Burger, J., O. Meyers, C.S. Boring, C. Dixon, C. G. Lord, M. McMahon, R. Ramos, S. Shukla, and M. Gochfeld. Perceptions of environmental problems, future land use and concerns regarding the Los Alamos National Laboratory: Hispanics are more concerned. Submitted to *Environmental Management*.

Presentations

Gulf Coast Hurricane Preparedness, Response, Recovery & Rebuilding Conference; November 2008, Mobile, Alabama

- Environmental Sensitivity Index (ESI) Maps: Tools for Preparedness, Planning, and Response

South Carolina Water Resources Conference; October 2008, North Charleston, South Carolina

- Fecal coliform TMDL implementation – success stories in two SC watersheds

International Oil Spill Conference; May 2008, Savannah, Georgia

- Abandoned small vessels: state perspectives on a nationwide issue

International Oil Spill Conference; April 2003, Vancouver, British Columbia

- Conceptual models for assessing the risk of seafood tainting during oil spills
- Hawaii Environmental Sensitivity Index (ESI) maps and the spatial accuracy of ESI mapping methodology

Alaska Forum on the Environment; February 2003 and 2004, Anchorage, Alaska

- Environmental Sensitivity Index Maps: tools for oil spill and coastal zone management

Rutgers University Faculty and Student Seminar; October 1998, New Brunswick, New Jersey

- Tissue concentration differences of radiocesium, mercury, and heavy metals among raccoon populations within and near the Department of Energy's Savannah River Site

78th Annual American Society of Mammalogists Meeting; June 1998, Blacksburg, Virginia

- Tissue concentration differences of radiocesium among raccoon populations within and near the Department of Energy's Savannah River Site

Poster Sessions

19th Annual Nonpoint Source Pollution Conference, May 2008, Groton, Connecticut

- Fecal coliform TMDL implementation – success stories in two SC watersheds

Annual Women in Science Symposium at EOHSI: Environmental and Occupational Health Sciences Institute; November 1998, Piscataway, New Jersey

- Radiocesium in raccoons: population differences and potential human risks

CRESP: Consortium for Risk Evaluation with Stakeholder Participation East-West Annual Conference; June 1998, Dingman's Ferry, Pennsylvania

- Using raccoons as bioindicators of mercury contamination
- Gene expression as a biomarker of mercury exposure in raccoons from the Savannah River Site