

U.S. GEOLOGICAL SURVEY

RESEARCH SCIENTIST RECORD

1. **Name** Cynthia S. Loftin
Other Names Cynthia R. Smith
2. **Date Prepared** 10 December 2003
3. **Duty Station** Maine Cooperative Fish and Wildlife Research Unit, Orono, Maine
4. **Region** Eastern Region, Cooperative Research Units program
5. **Title, Series, Grade** Research Wildlife Biologist, GS-0486-12-4
6. **Report Date** 21 June 1999 (medical leave of absence May-September 2001)
7. **Date of Last Promotion** n/a
8. **Date of Last Research Grade Panel Review** n/a
9. **Education:** University of Virginia, B.A. Biology, 1984
Auburn University, M.S. Wildlife Management, 1987
Thesis: "Ecology of eastern indigo snakes (*Drymarchon corais couperi*) in North Florida"
University of Florida, Ph.D. Wildlife Ecology and Conservation, 1998
Dissertation: "Assessing patterns and processes of landscape change in Okefenokee Swamp, Georgia"
10. **Technical Training Received:**

Introduction to SAS Graph, SAS Institute, Austin, TX, 40 hours, 1989
Introduction to Imagine Image Processing Software, ERDAS, 24 hours, 1993
Introduction to ArcInfo, ESRI, Charlotte, NC, 40 hours, 1995
Introduction to ArcGRID, ESRI, Vienna, VA, 40 hours, 1995
SWS Workshop, Using aquatic invertebrates in wetland water quality assessment, Rindge, NH, 8 hours, 2003

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11. **Professional Experience:**
A) **Present Assignment**

June 1999 to present (medical leave of absence May-September 2001):

Assistant Unit Leader-Wildlife (AUL-W), Maine Cooperative Fish and Wildlife Research Unit (MECFWRU), USGS-BRD, University of Maine, Orono, Maine. Supervisor: William B. Krohn, Unit Leader. I supervise graduate students (currently 2 MS, 4 PhD), undergraduate research assistants (currently 3), and temporary research technicians (currently 2).

Research Program:

My research interest is aquatic ecology with an emphasis on conservation and restoration of perturbed, freshwater systems. My research program encompasses two concentrations: 1) hydrological influences on aquatic vegetation dynamics and 2) identifying effects of selected human-introduced stressors on Maine's aquatic systems. Total research funding obtained in current position since June 1999: \$721,700 (includes \$542,700 in research funds from USGS-BRD-CRU, USGS-BRD Amphibian Research and Monitoring Initiative, University of Maine-Water Research Institute, University of Maine, Eastern National Park Research Fund, Maine Department of Inland Fisheries and Wildlife, Maine Outdoor Heritage Program, and the Cooperative Forestry Research Unit, and \$179,000 in graduate assistantship support from the University of Maine and National Science Foundation-Graduate Student Fellowship program).

Current Research Projects:

A. *Hydrological Influences on Aquatic Vegetation Dynamics*

1) **Hydrological assessment of Moosehorn National Wildlife Refuge impoundments and vegetation response to impoundment management.**

During 1950-1970 the Moosehorn National Wildlife Refuge in eastern Maine attempted to improve habitat for waterfowl nesting and brood-rearing by creating 52 stream and wetland impoundments. These wetlands have since been managed with water level manipulation, draining, and planting forage crops, with no formal assessment of impoundment vegetation or waterbird response. The current study is identifying changes in vegetation distributions and composition since the mid-1980s when impoundment vegetation was initially mapped, and relating these changes to current and recent hydrological management. I have collaborated with another scientist to resurvey and map the impoundment vegetation. Maps were digitized, georeferenced, and compared to describe changes in vegetation structure and species composition. Water level data were compiled, summarized, and compared with vegetation changes. We have prepared case studies for each of the impoundments, assessing the wetland vegetation change and expected effects on waterbirds, developed databases for the refuge to use to monitor future changes, and have suggested changes to the impoundment management that would encourage waterbird use. This project (initiated in 2001) has been conducted under my direction as principal investigator and supervisor of one M.S. student and 2 undergraduate field assistants, requiring approximately 10% of my time.

2) **Simulating wetland-landscape fire disturbance and succession to demonstrate potential for changes in amphibian presence/absence.**

Okefenokee National Wildlife Refuge (ONWR) is an extensive mosaic of wetland vegetation. Fire suppression, logging, and water impoundment within the ONWR have changed the swamp's natural hydrologic and fire regime. Such changes may be permanently altering swamp vegetation composition and structure, thereby adversely affecting amphibians. This study examines effects of fire and water level management on vegetation spatial distributions, composition, and structure within ONWR, and how those changes might affect amphibian presence. I am directing this project, which includes creation of a land cover map from satellite imagery and development of a spatially explicit vegetation succession model. Change maps have documented trends in vegetation composition and biomass where fires have burned during the past decade. We have combined this information with amphibian survey data (Dr. Lora Smith, Joseph W. Jones Ecological Research Center, Georgia) to describe associations of amphibian distributions with refuge wetland vegetation communities. Currently we are working with Dr. Andrew Fall (Simon Fraser University) to modify SELES (Spatially Explicit Landscape Event Simulator) software to dynamically simulate spatial and temporal effects of fire management on ONWR vegetation composition and structure. This information will assist the refuge by illustrating the potential long-term effects of their fire management actions. I am the principle investigator on this project, initiated in 2001, and supervise one Ph.D. student and one part-time computer programmer, requiring approximately 10% of my time.

3) **Savannah River marsh conversion and spatial vegetation model assessment.**

Savannah National Wildlife Refuge (SNWR) contains freshwater and brackish marshes. Changes in the flows and bathymetry of the Savannah River and adjacent harbor have altered the vegetation communities in the refuge's marshes. This project documented changes occurring after removal of the Savannah River tidal flap gate. I collaborated Dr. Wiley M. Kitchens (USGS-BRD Florida Cooperative Fish and Wildlife Research Unit) to conduct this work. I used a time series of satellite imagery and ground surveys to map the marsh vegetation and determine changes occurring from 1986 (tide gate in operation) to 2001 (tide gate out of operation for a decade). Vegetation maps created from satellite imagery were compared with principal components analysis to identify changes in biomass and type. Comparisons indicated that marsh vegetation distributions and composition have changed since a tide gate was permanently opened. An increase in freshwater species occurred within two years of gate removal to nearly 3/4 of the marsh by 2001. Where salinity remains elevated, the marsh remains a mixture of brackish species. These results and those of Dr. Kitchens' study are currently being used in the refuge's marsh management. This study required 10% of my time and was completed in early 2003; a manuscript is in revision following journal review.

B. Effects of Human-Introduced Stressors on Maine's Aquatic Systems

4) **Effects of landscape heterogeneity and environmental stressors on palustrine and lotic amphibian populations in Acadia National Park**

(This section describes 3 integrated research projects.)

Worldwide amphibian declines and increased reports of amphibian malformations have prompted DOI to initiate the Amphibian Research and Monitoring Initiative (ARMI). Acadia National Park (ANP) is serving as a long-term intensive amphibian monitoring site for the northeastern ARMI. My research is examining distributions and habitat associations of salamander species in ANP and other selected locations in Maine, by defining population densities and within-stream and watershed-scale habitat use of a stream-dwelling salamander in ANP. Mercury contamination is well documented in ANP, but mercury concentrations in the Park's amphibians are unknown. I am developing a watershed-scale analysis of mercury contamination in biota inhabited ANP's aquatic systems. The study examines mercury bioaccumulation in stream salamanders, mercury cycling and transfer in lotic and terrestrial food webs, and cross-region trends in mercury concentrations. Recent expansion of this work includes collaboration with Dr. Aria Amirbahman (Department of Civil and Environmental Engineering) to examine mercury contamination of tadpoles of selected frog species. Many of ANP's wetlands that are near or connected to streams where salamanders were collected have experienced recent amphibian die-offs. The study is analyzing tadpoles, wetland sediments, and water samples for total and methyl mercury concentrations, and will compare those results to the salamander analysis.

Another aspect of this research includes a survey of four-toed salamanders, a species of concern in New England. Four-toed salamander distributions are believed to have decreased due to land clearing and development, although the distribution and habitat associations of this species in Maine are not well documented. We have developed survey methodology and have surveyed nesting four-toed salamanders in wetlands in Maine and are currently developing and testing predictive models that describe local- and landscape-scale habitat associations. This information will assist state and federal agencies responsible for management of wetlands and the surrounding landscape potentially inhabited by this species.

These projects were initiated in 2001. I am the project PI (collaborating with Dr. Robin Jung, USGS-BRD Patuxent Wildlife Research Center) which requires 30% of my time, and I supervise a Ph.D. and M.S. student and two field research assistants on this research.

**5) Environmental factors associated with unique lake communities in Maine.
(This section describes 2 integrated research projects.)**

Game fish have been introduced into many inland waters of North America to enhance fishing opportunities. In some cases lakes and streams with native fish species were stocked with more "desirable" game fish, whereas in other cases, lakes and streams that were truly fishless were stocked. Naturally fishless water bodies are landscape-level sources of and potential habitats for uniquely structured animal communities. The enumeration and rehabilitation of stocked lakes is now a priority for national park management in North America and for Maine, where many lakes currently with fish are known to have been fishless prior to stocking. The extensive distribution of these habitats in Maine suggests that many fishless ponds likely exist. The ability to predict the likelihood that a particular pond is currently or historically fishless based on its landscape setting and geomorphic features would assist the MDIFW in balancing

recreational management objectives with the responsibility to protect unique wildlife habitats.

This project has two major components: a survey of invertebrates and fish found in fishless and fishfull lake pairs and a paleolimnological study of selected lakes. We have sampled invertebrates and fish in lakes in two biophysical regions of Maine representing two types of fishless lakes. Sample sorting, invertebrate identification, and GIS analyses of lake and landscape characteristics are underway. We are modeling lake characteristics and invertebrate composition to predict whether a selected unsampled lake in Maine is fishless, and will confirm the absence of fish in these ponds to test the models. The paleolimnological techniques we are developing using an invertebrate indicator species will be used to identify changes in invertebrate communities that potentially indicate historical fish introductions into naturally fishless lakes and will be used in confirmation of model predictions of natural fishlessness.

This project, which requires 30% of my time and will be completed by late 2006, was initiated in 2002 in collaboration with Dr. Alex D. Huryn (University of Alabama-Tuscaloosa), and has been conducted under my direction as a PI and supervisor of a Ph.D. and M.S. student and three undergraduate research assistants, and with the field assistance of a University of Maine Research Scientist.

6) **Fish hosts, population structure, and landscape control of the distribution of two rare Atlantic slope freshwater mussels in Maine.**

Many North American freshwater bivalves are threatened with extinction. Stream-side land uses and hydrological modifications may deteriorate watershed quality and contribute to mussel decline. Conservation efforts must recognize the complexity of relationships among these factors and mussel distributions and the multiple scales at which those relationships occur. The tidewater mucket and the yellow lampmussel are state-listed, threatened species in Maine. Given that Maine contains some of the last, significant populations of these species, their conservation may hinge on protection of these populations. I am collaborating with Dr. Judith M. Rhymer (University of Maine) and Dr. Alex D. Huryn (University of Alabama-Tuscaloosa) to identify landscape characteristics that affect distributions of these mussels, examine spatial relationships of mussel population genetic structure and demography, and determine their host fish. I am examining the watershed condition and species distribution associations, using GIS and available spatial databases of mussel and host fish distributions and watershed conditions such as stream connectivity, dam locations, riparian land use, surficial geology, and hydrological condition. I am working with the project Co-PIs to compile the research results in a comprehensive report. Dr. Rhymer and I have recently expanded this project to examine effects of dam removal on these mussel species. The original project, which will be completed in mid-2004, requires 5% of my time.

7) **Using algae to evaluate the condition of Maine's streams and rivers.**

Maine Department of Environmental Protection (MDEP) currently evaluates conditions of Maine's lotic systems by sampling aquatic macroinvertebrates. To increase confidence in the attainment classification of sampled waters, MDEP is interested in adding an additional taxonomic level to their water quality bio-monitoring program. There are relatively few fish

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species in Maine's lotic systems; algae provide a viable biomonitoring alternative given recent research that identifies relationships among landscape conditions, stream disturbance, and algal community composition and abundance. I am collaborating with a Ph.D. student and scientists at MDEP's Bureau of Land and Water Quality to develop bioassessment methods that relate stream algal communities and water quality conditions in Maine. Sites sampled in MDEP's biomonitoring program are included in the sample design to relate the current bioassessment methods to the algal communities. Sampled sites are in drainages affected by various intensities of land uses such as urban, agriculture, and forestry activities. Sample analysis, including algal species identification and quantification are currently underway. Sampling will be repeated during 2004-2005. This project, which requires approximately 5% of my time, is supported by funds contributed to my MDEP collaborators by the US Environmental Protection Agency and will be completed during 2006.

8) **Literature synthesis of the effects of forest management activities on riparian and in-stream biota of New England.**

This recently completed report summarizes research conducted in New England and the adjacent Canadian Provinces that examines effects of forest harvest practices on stream-side and within-stream biota. The western United States, unlike the northeastern region, has a history of research examining responses of wildlife species to riparian forest management. To date most of the published research conducted in the Northeast concerns bird responses to riparian forest manipulations, with reptiles and amphibians being least represented. Few studies have addressed specific forest manipulations but instead are general discussions of stream-side forest disturbance. Effects of buffer widths on birds and clear-cutting effects on invertebrates are the most-studied, taxon-specific responses. The literature synthesis resulted in a Final Report to the sponsor and a digital database of the reviewed references. I was recently approached by the Gulf of Maine Council on the Environment to make the database available as a component of a web-based directory of riparian research for the Gulf of Maine region. The literature review required approximately 20% of my time during 2000-2001 and was a collaborative effort with a former Instructor in the University of Maine Wildlife Ecology Department (Mr. Michael Bank) and scientists from Manomet Center for Conservation Sciences (Dr. John M. Hagan and Ms. Darlene Siegel).

B) Previous Professional Positions

Jan-May 1999 Temporary Research Assistant, Florida Cooperative Fish and Wildlife Research Unit, University of Florida.

I developed (with Dr. Wiley Kitchens, USGS-BRD Florida Cooperative Fish and Wildlife Research Unit) a proposal to study recovery of the Savannah River marshes following removal of a tide gate and prepared manuscripts documenting effects of a dam on Okefenokee Swamp (see dissertation research).

1991-1998 Ph.D. Graduate Research Assistant, Department of Wildlife Ecology and

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**Conservation and Florida Cooperative Fish and Wildlife Research Unit,
University of Florida.**

I identified effects of a dam on Okefenokee Swamp hydrology and relationships among the swamp vegetation associations, system hydrology, fire management, and historical logging activities. The approach was driven by spatially articulated, dynamic hydrology models and vegetation cover models coupled in a Geographical Information System (GIS) over multiple spatial and temporal scales. The refuge used this information in a formal Ecological Assessment of dam management, and I received a national award for this research. During this period I also critically reviewed a Draft Environmental Impact Statement (DEIS) of proposed Savannah River Harbor modifications effects.

**Aug-Dec 1995 Graduate Teaching Assistant, Department of Wildlife Ecology and
Conservation, University of Florida.**

I assisted with instruction of a graduate level population modeling techniques and analysis course, by assisting students with application and interpretation of computer-based modeling exercises.

**1987-1992 Wildlife Biologist, USFWS National Wetlands Research Center, Corpus
Christi, TX, Field Station.**

I assisted with wintering waterfowl habitat studies by collecting and analyzing waterfowl surveys, mapping seagrasses, collecting and analyzing water and sediment samples, managing a network of automated environmental monitoring equipment and data, and developing project summaries and reports.

**1984-1987 Graduate Research Assistant, Department of Zoology and Wildlife and
Alabama Cooperative Fish and Wildlife Research Unit, Auburn University.**

I developed methods to study juvenile eastern indigo snake habitat use, including refining techniques for surgical implantation of radio transmitters, developing methods for nest location, creating models describing habitat use by juvenile and gravid indigo snakes. This information has been used in surveys and developing habitat management plans for this species.

**Jan-June 1987 Graduate Teaching Assistant, Department of Biology, Auburn
University.**

I provided instruction in undergraduate general biology and animal biology laboratory courses.

**June-August 1984 Biological Animal Technician, USFWS-Denver Wildlife Research
Center, Sandusky Ohio Field Station.**

I assisted with field and aviary studies of bird damage to grain crops, including captive colony maintenance, exposure experiments, mist-net capture and field surveys of blackbird colonies, bird decoy trap maintenance for banding purposes, and cowbird stomach content analysis.

12. Significant Research Accomplishments:

a. Recent Accomplishments (within past 5 years)
Effects of the Suwannee River Sill on the Hydrology of Okefenokee Swamp (1991-1998) (*Peer-Reviewed Publ. #5-9, 11; Report #4*)

This research project provided information the Okefenokee National Wildlife Refuge (ONWR) used in development of an Ecological Assessment (EA) to determine future management of the Suwannee River sill. Ultimately, the sill was dismantled to repair swamp hydrological modifications. I received an award of appreciation from the ONWR, the 1999 USFWS Region 4 “National Wetland Conservation Award to the Private Sector”, recognition as the University of Florida Department of Wildlife Ecology and Conservation Graduate Student of the Year in 1998, and a letter of commendation from the University of Florida Institute of Food and Agricultural Sciences for this work. I examined interactions of the swamp hydrology and fire management, logging history, and vegetation response to these manipulations to isolate the effects of the Suwannee River sill. I developed an instrumentation network to monitor the swamp hydrological environment, a topographic surface of the swamp’s peat, and a spatially articulate, dynamic grid-cell based hydrology model to describe flow and water level fluctuations in the 160,000 ha ONWR. I identified weather-driven hydrological trends locally differentiated by topographical gradients. The sill’s effects, such as increased water depths and extended hydroperiods, extended to about 1% of the swamp during drought conditions when it was intended to provide maximum fire protection. During maximum water depth this area expanded to 10-15% of the swamp. This information was combined with an analysis of fire history (cause, distribution, frequency, and intensity) before and after sill construction indicated that the sill was not providing intended fire protection.

Given the sill’s limited effect I wanted to identify other processes that might be driving swamp vegetation dynamics. I developed georeferenced maps of swamp vegetation at several times to overlay in a GIS to track vegetation change and compare with known distributions of fires, historic logging, and regions of the sill’s effects determined with my spatial hydrology model. Trend analysis indicated that the vegetation cover was approaching the overall structure that occurred prior to logging in the late 19th century, but that the species composition was shifting to a more fire intolerant associations. The sill was not prohibiting fire or altering the vegetation composition in the swamp; fire management through fire suppression appeared to be driving vegetation change. To better understand wetland plant sensitivities to hydrological conditions and how that might affect plant species distributions in the swamp, I developed a greenhouse experiment to expose seed bank samples collected at locations with known hydrological histories and standing vegetation compositions (established using the instrumentation network and hydrology model I had developed) to modified hydroperiods. A noteworthy development of this effort was the implementation of a modified GLM procedure to provide a predicted response surface for each of the dominant species found in the swamp. These regression-derived response surfaces characterized the hydrological environments where these species were found throughout the swamp and indicated limits to their occurrence in the available environments. These data are currently being integrated into a GIS-based model (see **Current Research Project #2**) to describe how long-term swamp landscape-scale vegetation

dynamics are affected by swamp fire management.

There were many public and private interest groups involved in the EA review; the fact that an agreement of the preferred alternative was reached with complete acceptance of the EA is testament to the acceptance of this results of this study. Closure to this process was achieved when the sill was breached in 2001.

Savannah River marsh conversion and spatial vegetation model assessment (1999-2003)
(Report # 10)

This recently completed project was in collaboration with the Florida Cooperative Fish and Wildlife Research Unit (FCFWRU). The FCFWRU documented that a tidal flap gate contributed to loss of Savannah River tidal freshwater marsh, which eventually led to removal of the gate with expectation of tidal marsh recovery. Recovery was threatened in the late 1990s when harbor deepening was proposed, and a Draft Environmental Impact Statement (DEIS) concluded that no loss of tidal marsh would occur because no recovery had been documented. I participated in critical review of the DEIS vegetation analysis and identified conflicting conclusions between the DEIS and observations that by 1994 the marsh was reverting to a tidal freshwater system. This project was subsequently developed to examine the spatial distribution and temporal dynamics of Savannah River marsh vegetation associations. My collaborator (Dr. Wiley Kitchens, FCFWRU) developed a fine-scale classification system of marsh vegetation associations, and I developed a classification system that integrated the site-based information with marsh-scale information to document current vegetation distributions, distributions occurring during the decade following tide gate removal, and spatial change vectors that could be attributed to the removal of the tide gate. This was a significant undertaking, because the marsh vegetation composition became increasingly complex in transition from brackish to freshwater; the increasing diversity and biomass occurring with this conversion were detectable with principle components analysis and satellite imagery classification, enabling identification of timing, composition, and location of marsh change. The Savannah National Wildlife Refuge will use this documentation of marsh recovery following tide gate removal in future negotiations of harbor development with the Savannah Ports Authority. One manuscript describing this research has been prepared, reviewed (*Wetlands*), and is currently in revision.

Multivariate assessment of wetland habitat conditions in Moosehorn National Wildlife Refuge, Maine (2000-2003) (Report #11)

Impoundments at the Moosehorn National Wildlife Refuge (MNWR) were created to provide enhanced habitat for waterbirds. Prior to this study, MNWR had not formally assessed vegetation responses to impoundment management. This project provided a formal assessment of vegetation change following 20 years of water level management and related these changes to waterbird wetland use documented in literature. We mapped 52 impoundments in 2002 that were mapped in 1984-85 by Mr. Jerry Longcore (USGS-PWRC). Paper maps were converted to digital form and georeferenced to temporally and spatially compare vegetation composition and structure (e.g., patchiness, heterogeneity). Mahalanobis distance analysis described wetland vegetation and suitability trends for selected waterbird species, and indicated which wetlands were improving or declining in quality. We developed water management suggestions to improve impoundment conditions for waterbirds. The digital databases (maps, water levels,

dominant plant species) were developed for the refuge to use in impoundment management. The final report of this project is currently being reformatted for publication.

B. Other Career Accomplishments

Ecology of eastern indigo snakes (*Drymarchon corais couperi*) in North Florida (1984-1987) (Peer-Reviewed Publ. #2-4)

The eastern indigo snake is a threatened species that historically occurred throughout the Gulf Coast coastal plain, particularly in longleaf pine communities. This species, which frequently was found with gopher tortoises and eastern diamondback rattlesnakes in gopher tortoise burrows, was extirpated throughout much of its range by collection for the pet trade and as a casualty of eastern diamondback rattlesnake collection. In the early 1980s a program of captive propagation and reintroduction of the species was undertaken by Dr. Daniel W. Speake at the Alabama Cooperative Fish and Wildlife Research Unit in an attempt to repopulate the snake's historic range in Alabama, Georgia, and North Florida. Captive breeding was successful, and relocation of released adults was facilitated by their use of gopher tortoise burrows, but few hatchling snakes were found after release, suggesting that population re-establishment was not successful. My M.S. degree research examined hatchling and juvenile eastern indigo snake spring and summer habitat use in North Florida to determine why these groups were not found following previous release efforts, and to identify habitats that should be protected for their use. I collaborated with veterinarians at Auburn University to develop and refine methods for surgical implantation of transmitters in young snakes and in the oviduct of gravid adults. I determined that juvenile eastern indigos were found infrequently in uplands in gopher tortoise burrows commonly used by adults, and were most often found in stumps, pine straw, and leaf litter around ponds where they were found swimming, and traveling under and on top of litter where they were found consuming other snake species. Gravid females were sedentary until after egg-laying in gopher tortoise burrows or stumps, at which time they traveled extensive distances in the surrounding uplands and flatwoods. Improved survey methods for nests and young of this species, released captive animals, and wild reproducing populations, and improved surgical methods for transmitter implantation in snakes resulted from this study.

13. Scientific Leadership

I have had opportunities in my current position and in my previous graduate positions to demonstrate scientific leadership in several ways. In my current position as AUL-W at the MECFWRU, I am responsible for securing 100% of the funds required to support graduate students (research assistantship and tuition) and operating funds to accomplish the research projects. The research program that I have been developing during my 4 years in this position has at its core the assessment of effects of human-caused degradation to aquatic system health and development of methods to restore those systems. Aquatic environments are physically and biologically complex, and the responses of their inhabitants to human-caused perturbations reflect this complexity. Recognizing this complexity, I have collaborated with several scientists who share my interests and have complementary skills. I have been principle author or have coauthored with an aquatic entomologist, toxicologist, limnologist, environmental engineer,

geneticist, groundwater hydrologist, wetland ecologist, avian ecologist, herpetologist, and forest ecologist approximately 25 proposals during this period, and roughly half of these proposals have been funded. In nearly every case I approached these scientists (university faculty, state agency biologists, USGS scientists) to work collaboratively with them because our complementary expertise provided greater opportunity to tackle the complexity of the salient questions than could be accomplished independently. As a result of these collaborations, I am now frequently approached by others in the University community and state agencies to collaboratively develop research projects with a restoration ecology theme. These interactions have also led to invitations to participate on Maine's Aquatic Biodiversity Assessment Project steering committee and membership on the project's scientific advisory panel, the University of Maine's Wetland Ecology Working Group, and the University's Aquatic Research in Acadia National Park advisory group. I was also invited to participate on the University of Maine's College of Forestry and Agriculture's GIS program steering committee because of my spatial modeling experience and knowledge of GIS tools and applications in natural resources management.

During my graduate research program at the University of Florida, I co-authored the proposal to the USFWS that funded my doctoral research that eventually led to my recognition as the principal ecological expert for the Okefenokee Ecosystem by both the refuge staff and the interested scientific community. I consider this to be a particularly important achievement given the Okefenokee Swamp's prior designation as a National Science Foundation Long-term Ecological Research Site and the area's rich history of scientific investigation. I provided guidance and information in the preparation and presentation of the Ecological Assessment of the Suwannee River sill, and have frequently presented my research results by invitation from landowners, other Okefenokee research scientists, the regional scientific and management community, and paper industry representatives. I continue to provide guidance to the refuge regarding the swamp's vegetation, fire, and hydrological management. By invitation during 2001, I participated as the swamp hydrology and wetland vegetation expert on the panel to advise the refuge in development of their 15-year fire management plan, and during 2001-2002 I was selected by 2 publishing companies to critically review drafts of 2 books on Okefenokee Swamp ecology. I also collaborated with Dr. Wiley Kitchens (FLCFWRU) to provide critical review of the vegetation change assessment section of the 1997 Draft Environmental Impact Statement for the Savannah Harbor deepening project. The result of this review was development of the collaborative research project with Dr. Kitchens to determine recovery of the Savannah River marsh to tide gate removal (see **Current Research Projects** and **Significant Accomplishments**).

14. Scientific and Public Service

A. Professional Memberships

Society of Wetland Scientists
Ecological Society of America
Society for Conservation Biology

Phi Kappa Phi Honor Society
Association of Southeastern Biologists (inactive)
International Association of Landscape Ecologists (inactive)
Gamma Sigma Delta Agricultural Honor Society (inactive)

B. Technical Presentations and Posters

1. Speake, D.W., D. McGlinchy, and C.R. **Smith**. 1987. Captive breeding and experimental reintroduction of the eastern indigo snake. Presented at the 3rd Southeastern Nongame and Endangered Species Symposium, Athens, GA. August 8-10. Speake presented.
2. **Smith**, C.R. 1987. The ecology of juvenile and gravid eastern indigo snakes in North Florida. Presentation of M.S. thesis research to Department of Zoology and Wildlife, Auburn University, Auburn, AL. October 12. PRESENTED
3. **Loftin**, C.S. and M.L. Quammen. 1989. An evaluation of the habitat suitability index model for northern pintails wintering in the Gulf of Mexico region. Presented to the USFWS HSI Model Assessment Workshop, Estes Park, CO. March. INVITED, PRESENTED
4. **Loftin**, C.S., N. Ansay, and W.M. Kitchens. 1996. Modeling effects of the Suwannee River sill on the hydrology of Okefenokee Swamp. Presented at the Annual meeting of the Ecological Society of America, Providence, RI. August 10-14. Abstract: Bulletin of the Ecological Society of America 77:270. PRESENTED
5. **Loftin**, C.S. , N. Ansay, and W.M. Kitchens. 1997. Assessing changes in Okefenokee Swamp hydrology with a grid-cell model. Presented at the 12th Annual Symposium of the International Association for Landscape Ecology, Duke University, Durham, NC. March 16-19. Abstract; PRESENTED
6. **Loftin**, C.S. 1997. The hydrology of Okefenokee Swamp. Presented at the 1997 Georgia Water Resources Conference, The University of Georgia, Athens, GA. March 20-22. Paper; INVITED, PRESENTED
7. **Loftin**, C.S. 1997. The hydrology of Okefenokee Swamp. Dissertation Research Seminar presented to the University of Florida Department of Wildlife Ecology and Conservation, Gainesville, FL. March. PRESENTED
8. **Loftin**, C.S., J. Aufmuth, N. Ansay, and W. M. Kitchens. 1997. Changes in vegetation distributions in the Okefenokee Swamp, GA, relative to effects of the Suwannee River sill on swamp hydrology. Presented at the 18th Annual Meeting of the Society of Wetland Scientists, Bozeman, MT. June 1-6. Abstract; PRESENTED

9. **Loftin, C.S., and W.M. Kitchens.** 1997. Effects of the Suwannee River Sill on Okefenokee Hydrology. Research Project Summary presented to the USFWS Region 4 directorate and Okefenokee National Wildlife Refuge Staff, Okefenokee National Wildlife Refuge, Folkston, GA. June. INVITED, PRESENTED
10. **Loftin, C.S., and W.M. Kitchens.** 1997. Effects of the Suwannee River sill on Okefenokee Hydrology and fire management. Research Project Summary presented to the Greater Okefenokee Association of Landowners and Okefenokee National Wildlife Refuge Staff, Okefenokee National Wildlife Refuge, Fargo, GA. October. INVITED, PRESENTED
11. **Loftin, C.S., and W.M.Kitchens.** 1998. Effects of the Suwannee River sill on Okefenokee Hydrology and fire management. Briefing for public meeting to receive comments on Draft Ecological Assessment of Future Management of the Suwannee River Sill. Folkston, GA. May 19. INVITED, PRESENTED
12. **Loftin, C.S., and W.M.Kitchens.** 1998. Effects of the Suwannee River sill on Okefenokee Hydrology and fire management. Briefing for public meeting to receive comments on Draft Ecological Assessment of Future Management of the Suwannee River Sill. Fargo, GA. May 21. INVITED, PRESENTED
13. **Loftin, C.S., and W.M. Kitchens.** 1998. Effects of hydrology and fire management on the Okefenokee Swamp landscape. Poster presented at the Natural Resources Forum 1998: Linkages in Ecosystem Science, Management, and Restoration. University of Florida, Gainesville, FL. June 9-10. Abstract; PRESENTED
14. **Loftin, C.S., and W.M. Kitchens.** 1998. Effects of hydrology and fire management on the Okefenokee Swamp landscape. Presented at the 19th Annual Meeting of the Society of Wetland Scientists, Anchorage, AK. June 8-12. Abstract; Kitchens presented.
15. **Loftin, C.S., and W. M. Kitchens.** 1998. Wetland seedbank composition and recent hydrologic environment of Okefenokee Swamp, GA. Presented at the 19th Annual Meeting of the Society of Wetland Scientists, Anchorage, AK. June 8-12. Abstract; Kitchens presented.
16. **Loftin, C.S., and W. M. Kitchens.** 1999. Assessing patterns and processes of landscape change in Okefenokee Swamp, Georgia. Presentation to the Department of Wildlife Ecology, University of Maine, Orono, ME. February. INVITED, PRESENTED
17. **Loftin, C.S., S.B. Aicher, and W.M. Kitchens.** 1999. Effects of the Suwannee River sill on the hydrology of Okefenokee Swamp: Application of research results in the

- environmental assessment procedure. Presentation to the 1999 National Wilderness Science in a Time of Change Conference, USDA Forest Service Rocky Mountain Research Station, Missoula, MT. May 23-27. Paper; Kitchens presented.
18. **Loftin, C.S.** 1999. A review of the effects of forest management on riparian biota and spatial assessment of forested riparian landscapes in Maine. Invited Pre-proposal Presentation to the Cooperative Forest Research Unit, University of Maine. Quarterly Meeting, Bartlett Experimental Forest, New Hampshire, October 12. INVITED, PRESENTED
 19. **Loftin, C.S.** 1999. Assessment of factors that have shaped the Okefenokee Swamp landscape. Presentation of research background to the Maine Department of Inland Fisheries and Wildlife, Wildlife Division Quarterly Meeting, Bangor, ME. October. INVITED, PRESENTED
 20. **Loftin, C.S.** 2000. Assessing effects of forest practices on headwater streams in Maine: literature synthesis, location of streams using DEM data, and spatial assessment of forested riparian landscapes in Maine. Proposal Presentation to the Cooperative Forest Research Unit, University of Maine. Quarterly Meeting, Wells Conference Center, Orono, ME. February 2. INVITED, PRESENTED
 21. **Loftin, C.S.** 2000. Detecting ecological impacts: applications of the environmental impact assessment process. Presentation to the University of Maine Student Chapter of The Wildlife Society, Orono, ME. March 6. INVITED, PRESENTED
 22. **Loftin, C.S.** 2000. Applications of GIS in management of public lands. Guest Lecture Presentation to the Wildlife Habitat Relationships class, Department of Wildlife Ecology, University of Maine, Orono, ME April 24, 26. INVITED, PRESENTED
 23. **Loftin, C.S.** 2000. Effects of forest management practices on riparian and in-stream animal biota of New England: an annotated bibliography and literature synthesis. Presentation to the Cooperative Forest Research Unit, University of Maine. Quarterly Meeting, Wells Conference Center, Orono, ME. May 17. INVITED, PRESENTED
 24. **Loftin, C.S., M.S. Bank, J. Hagan, and D. Siegal.** 2000. Wildlife use of forested riparian areas in New England. Poster presented at the University of Maine Cooperative Forestry Research Unit Forestry and the Riparian Zone Conference, University of Maine, Orono, ME. October 26. Abstract.
 25. **Loftin, C.S., M.S. Bank, J.Hagan, and D. Siegel.** 2001. Literature synthesis of the effects of forest management activities on riparian and in-stream biota of New England. Presentation to the University of Maine Cooperative Forestry Research Unit, Orono, ME.

January 24. INVITED, PRESENTED

26. **Loftin**, C.S., M.S. Bank, J.M Hagan, and D. Seigel. 2001. Literature synthesis of the effects of forest management activities on riparian and in-stream biota of Northeastern North America. Presentation to the Society of American Foresters and Maine Chapter of The Wildlife Society Joint Conference, Portland, ME. March 15. INVITED, PRESENTED
27. **Loftin**, C.S., M.S. Bank, and R. Jung. 2001. DOI Amphibian research and monitoring initiative: Effects of landscape heterogeneity and environmental stressors on palustrine and lotic amphibian populations in Acadia National Park. Presentation to the Aquatic Research In Acadia Conference, College of the Atlantic, Bar Harbor, ME. March 26 INVITED, PRESENTED
28. Bank, M.S., T.A. Haines, and C.S. **Loftin**. 2001. Preliminary estimates of habitat use and mercury content of two-lined salamanders in Acadia National Park. Presentation to the Aquatic Research In Acadia Conference, College of the Atlantic, Bar Harbor, ME. 26 March. INVITED, Bank presented.
29. **Loftin**, C.S. 2001. Applications of GIS in management of public lands. Lecture Presentation to the Wildlife Habitat Relationships class, Department of Wildlife Ecology, University of Maine, Orono, ME. April 2, 4. INVITED, PRESENTED
30. **Loftin**, C.S., and W.M. Kitchens. 2001. The hydrology of Okefenokee Swamp. Presentation to the Research in the Suwanee River Basin Conference, Live Oak, FL. April 11-12. Abstract; INVITED, Kitchens presented.
31. Bank, M.S., T.A. Haines, and C.S. **Loftin**. 2001. Preliminary estimates of habitat use and mercury content of two-lined salamanders in Acadia National Park. Presentation to the Maine Chapter of The Wildlife Society, Brewer, ME. April 19. Bank presented.
32. Bank, M.S., T.A. Haines, and C.S. **Loftin**. 2001. Preliminary estimates of habitat use and mercury content of two-lined salamanders in Acadia National Park. Presentation at the Maine Water Conference, Augusta, ME. May 3. Abstract; Bank presented.
33. **Loftin**, C.S., and M.S. Bank. 2001. Literature synthesis of the effects of forest management activities on riparian and in-stream biota of Northeastern North America. Poster presentation, Maine Water Conference, Augusta, ME. May 3. Abstract.
34. Henrichon, T.Y., and C.S. **Loftin**. 2001. Using RGB-NDVI techniques to examine dynamics of Savannah River marsh vegetation. Poster presentation at the Annual Meeting of the Society of Wetland Scientists, Chicago, IL. May 27-June 1. Abstract.

35. **Loftin, C.S.** 2002. Workshop on employment opportunities in the field of Wildlife Ecology. Presented at the Expanding Your Horizons Conference, University of Maine, Orono, ME. March. INVITED, PRESENTED
36. Bank, M.S., T.A. Haines, C.S. **Loftin**, and R.E. Jung. 2002. Relative density and mercury contamination of two-lined salamanders from Acadia National Park, Maine. Presented at the 58th Annual Northeast Fish and Wildlife Conference, Portland, ME. April 21-24. Abstract; Bank presented.
37. Chalmers, R., and C.S. **Loftin**. 2002. Characterization of nest sites of four-toed salamanders at Acadia National Park, Maine. Poster presented at the 58th Annual Northeast Fish and Wildlife Conference, Portland, ME. April 21-24. Abstract.
38. Henrichon, T.Y., and C.S. **Loftin**. 2002. GIS and remote sensing methods to monitor wetland change. Poster presented at the 58th Annual Northeast Fish and Wildlife Conference, Portland, ME. April 21-24. Abstract.
39. Bank, M.S., T.A. Haines, C.S. **Loftin**, and R.E. Jung. 2002. Relative density and mercury contamination of two-lined salamanders from Acadia National Park, Maine. Presented at the Maine Water Conference, Augusta, ME. May 9. Abstract; INVITED, Bank presented.
40. Henrichon, T.Y., and C.S. **Loftin**. 2002. Documentation of Savannah River marsh conversion and modification of a spatial vegetation succession model. Presented at the Annual meeting of the American Water Resources Association, New Orleans, LA. May 13-15. Abstract; PRESENTED
41. Henrichon, T.Y., and C.S. **Loftin**. 2002. Determining long-term extent of marsh type conversion, using satellite imagery, digital aerial photography, and GIS. Presented at the Annual meeting of the Society of Wetland Scientists, Lake Placid, NY. June 3-6. Abstract; Henrichon presented.
42. McCloskey, J., and C.S. **Loftin**. 2002. Using image differencing and post-classification comparison to monitor vegetation succession in the Okefenokee Swamp, Georgia. Poster presented at the Annual Meeting of the Society of Wetland Scientists, Lake Placid, NY. June 3-6. Abstract. .
43. Bank, M.S., T.A. Haines, C.S. **Loftin**, and R.E. Jung. 2002. Evaluating the use of two-lined salamanders as eco-indicators of mercury loadings in headwater stream ecosystems: a regional perspective. Poster presentation at the National Park Service Air Quality Summit 2002 "Responding to Change", Estes Park, CO. October 21-24. (Poster

- presented by Bob Breen – Acadia NP). Abstract; INVITED
44. Bank, M. S., T.A. Haines, and C.S. **Loftin**. 2002. Evaluating the use of two-lined salamanders as eco-indicators of mercury loadings in headwater stream ecosystems. Poster presentation at the American Fisheries Society-Environmental Protection Agency National Forum on Fish Contamination, Burlington, VT. October 20-22. Abstract.
 45. Bank, M.S., C.S. **Loftin**, T.A. Haines, and R.E. Jung. 2003. Mercury, salamanders, and streamscapes. Presentation to the University of South Florida, Department of Environmental Science and Policy 2003 Spring Seminar Series, Tampa Bay, FL. March 20. INVITED
 46. Bank, M.S., C.S. **Loftin**, T.A. Haines, and R.E. Jung. 2003. Evaluating the use of two-lined salamanders as indicators of mercury loadings in headwater stream ecosystems in Acadia and Shenandoah National Parks: Implications for regional biomonitoring. Presentation to the 2003 George Wright Society Conference, San Diego, CA. April 14-18. Abstract; INVITED, Bank presented.
 47. Chalmers, R., and C.S. **Loftin**. 2003. Characterizing four-toed salamander nesting habitat. Poster presentation at the Northeast Biological Graduate Student Conference, University of Prince Edward Island, Canada. February 28-March 2. Abstract.
 48. Chalmers, R. and C. S. **Loftin**. 2003. Characterizing four-toed salamander nesting habitat. Poster presentation at the Graduate Research Exposition, University of Maine, Orono, Maine, April 21, 2003. Abstract.
 49. Schilling, E.G., C.S. **Loftin**, and A.D. Huryn. 2003. Abundance, distribution, and attributes of invertebrate communities of fishless lakes in Maine. Presentation to the Maine State Chapter of The Wildlife Society, Brewer, ME. April 24. INVITED, Schilling presented.
 50. **Loftin**, C.S., J.T. McCloskey, W.M. Kitchens, and M.Dusek. 2003. Changes in vegetation distributions in the lower Savannah River tidal marsh following removal of a tidal flap gate. Presentation at the 88th Annual Meeting of the Ecological Society of America, Savannah, GA. August 3-8. Abstract; PRESENTED
 51. **Loftin**, C.S., E.G. Schilling, and A. Huryn. 2003. Landscape attributes and invertebrate communities of fishless lakes in Maine: an investigation of a unique aquatic habitat. Presented to the Maine Department of Inland Fisheries and Wildlife Fisheries Division organizational meeting, Orono, ME. September 3. INVITED, PRESENTED
 52. Bank, M. S., C. S. **Loftin**, T. A. Haines, and R. E Jung. 2003. Effects of watershed

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heterogeneity on mercury bioavailability in lotic ecosystems. Presentation to the 24th Annual Society of Environmental Toxicology and Chemistry Annual Meeting. Science Without Borders: Developing Solutions for Global Environmental Challenges. Austin, TX. November 9-13. INVITED, Bank presented.

53. Bank, M. S., C. S. **Loftin**, T. A. Haines, and R. E Jung. 2003. Mercury, salamanders and watershed condition. Presentation to the Fall 2003 Harvard University Forest Ecology Seminar Series, Harvard Forest, Petersham, Massachusetts. November 14. INVITED, Bank presented.
54. Bank, M.S., C.S. **Loftin**, A. Amirbahman, J. Peckenham, and T.A. Haines. 2003. Mercury bioaccumulation in lotic and lentic amphibians: regional conservation implications for aquatic ecosystems in the northeastern United States. Presentation to the USDA Northern Research Station, Northern States Research Cooperative Mercury Research Workshop, Portland, Maine. December 2-3. INVITED, Bank presented.
55. Bank, M.S., C.S. **Loftin**, T.A. Haines, A. Amirbahman, and R.E. Jung. 2004. Mercury bioaccumulation in biota from lotic and lentic ecosystems. Presentation to the Gulf of Maine Research Institute Ecology Seminar, Portland, Maine. January 12. INVITED, Bank presented.

c. Rendering Scientific Judgment

Management Plan Review: Since the completion of my dissertation research program, I have had several opportunities to provide critical review of National Wildlife Refuge management documents. During 1997-1998 I served as an expert consultant to the Okefenokee National Wildlife Refuge during development of the Environmental Assessment of the future management of the Suwannee River Sill, and I edited portions of the compiled document. During 1996-1997 I provided critical review of portions of the Savannah Harbor Modification Draft Environmental Impact Statement for USFWS Savannah National Wildlife Refuge and Dr. Wiley Kitchens (University of Florida). During 2001 I was invited to participate in a workshop for preliminary development of the Moosehorn National Wildlife Refuge 15-year Management Plan. I was also invited during 2001 to participate as an expert consultant in the formal review of forestry and wildland fire programs at Okefenokee National Wildlife Refuge as the wetland vegetation fire and hydrology expert. In this effort I collaborated with a team of fire ecologists from the USDA Forest Service, USFWS, Georgia Forestry Commission, and International Paper Corporation to develop the program review final report which will be used by the refuge to develop their 15-year management plan.

Reviewer for Journals: During the past 4 years I have reviewed manuscripts (5) from *Wetlands*, *Journal of the American Water Resources Association*, and *Conservation Ecology*, and I have reviewed 2 books on the Okefenokee Swamp. Beginning in Spring 2004, I will serve as an

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Associate Editor for the *Journal of Wildlife Management*.

Science Advisory Committee: I have served during the past 4 years as a member of the Directing Committee and the Scientific Advisory Committees of the Maine Aquatic Biodiversity Project. This project is an effort to compile the existing databases (paper and electronic) on the aquatic biota of Maine into a spatially referenced relational database to eventually be available for use by the academic, management, and general public via the web. My role on this committee has been to provide guidance in the GIS development and usability of the data (e.g., format, content, presentation, completeness, integrity) for the scientific community.

Other: Primary Reviewer of 2 Scientists and Panel Member, USGS RGE Panel April 2002, Portland, ME.

d. **Lectureships and Other Academic Service**

Graduate Faculty Appointment:

1999-present Assistant Professor, Department of Wildlife Ecology, University of Maine, Orono, ME.

As part of my appointment to the graduate faculty at the University of Maine through the MECFWRU, I provide graduate instruction in the form of formal courses, directing student independent study of selected topics (GIS applications, aquatic community ecology), and graduate student committee participation as degree program advisor, co-advisor, or committee member. I develop proposals to secure research funds, select and hire graduate research assistants to conduct the research projects under my advisement, and work with the students to conduct and complete data analysis and thesis or dissertation preparation. In general, manuscripts that result from these efforts are co-authored by the graduate student (1st author) and me as 2nd author, with committee members or collaborating scientists included as additional co-authors depending on their involvement in the project.

Courses Taught at University of Maine:

Waterbird and Wetland Ecology, 2000, 2002 (2 credit graduate course, team-taught with Dr. William Krohn; 9 students; instructor and course rating were excellent)

Applications of GIS in Natural Resources Management, 2001 (3 credit graduate course, team-taught with Dr. Jeff Heppinstall and Dr. Steve Sader; 23 students; instructor and course rating were very good)

Guest Lecturer in University of Maine courses:

Lectures in Landscape Limnology, Wildlife Habitat Relationships, Introductory Wildlife Ecology, GIS Applications

Graduate Student Committee Chair or Co-Chair:

Thomas J. Danielson, Ph.D. student, Using algae to evaluate the condition of Maine's streams

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and rivers. (2003-present); chair

Jon T. McCloskey, Ph.D. student, Simulating wetland-landscape fire disturbance and succession to demonstrate potential for changes in amphibian presence/absence (2001-present); chair

Michael S. Bank, Ph.D. student, Effects of trophic and watershed complexity on mercury contamination in two-lined salamanders (2001-present); chair

Emily G. Schilling, Ph.D. student (co-advised with Dr. Alex Huryn, currently University of Alabama-Tuscaloosa), Abundance, distribution, and attributes of invertebrate communities of Maine's fishless lakes (June 2002-present); chair

Rebecca J. Chalmers, M.S. student, Characterization of wetlands and nest sites used by Four-toed salamanders in Maine (Sept 2000-present); chair

Katie E. DeGoosh, M.S. student (co-advised with Dr. Katherine Webster, University of Maine), Development of paleolimnological indicators of fish absence in Maine's lakes (Sept 2003-present); co-chair

Temporary Graduate Research Assistants:

Philip C. Wick, M.S. Student Department of Biological Sciences; currently assisting with GIS analysis of freshwater mussel distributions and watershed characteristics in Maine (2003-present).

Lauren Hierl, M.P.P./M.E.M student Duke University; assisted with GIS analysis of wetland vegetation change in Moosehorn National Wildlife Refuge impoundments (June – Dec 2003).

University of Maine Advisory Committee Membership (not in chair or co-chair role):

Dustin Perkins, Ph.D., Wildlife Ecology (2000-present)

Shane Heath, M.S., Wildlife Ecology (2002-present)

Morgan Kelly, M.S., Wildlife Ecology (2003-present)

Sean Bloomquist, Ph.D. Wildlife Ecology (2003-present)

Stephen Kneeling, M.S. Wildlife Ecology (2003-present)

Medea Steinman, M.S. Wildlife Ecology (2003-present)

Dianna Queheillalt, Ph.D. Wildlife Ecology (2003-present)

Jesse Cunningham, M.S. Ecology and Environmental Sciences (2001-2003)

Sara Nelson, Ph.D. Ecology and Environmental Sciences (2003-present)

Kirsten Ness, M.S. Ecology and Environmental Sciences (2003-present)

Adrian Jordaan, Ph.D., Ecology and Environmental Sciences (2003-present)

Senior Thesis Committee or Senior Project Advisor:

Jackie Bertman, B.S. Wildlife Ecology (Senior thesis: Forest practices effects on vernal pool

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amphibians) (2003-present)

Jason Everett, B.S. Wildlife Ecology (Special Project: Literature review of the effects of introductions of predators to lakes and ponds) (2003-present)

Carolyn Currier (Special Project: Analysis of Moosehorn National Wildlife Refuge impoundment water levels during 1980-2002) (2002-2003)

Other University Service:

Department of Wildlife Ecology representative on the University of Maine Institutional Animal Care and Use Committee (IACUC), June 2001-present

Chair, IACUC, June 2003-present

Department of Wildlife Ecology representative on the University of Maine Graduate Board June 2000-June 2003

Department of Wildlife Ecology representative on the College of Natural Sciences, Forestry, and Agriculture GIS committee September 2001-present

Search Committee Member for technical positions (GIS remote sensing specialist, GIS scientist; 2001) and University of Maine faculty (Limnologist; 2001)

e. Technical Training Provided None to report other than that outlined in section **d**.

f. Special Assignments None to report.

g. Other Technical Activities

Organized and chaired a workshop "Employment Opportunities in the Natural Resources Field" at the 58th Annual Northeast Fish and Wildlife Conference, April 22 2002, Portland, Maine. The workshop introduced graduate and undergraduate students to representatives of several regional and national natural resources agencies to learn about the kinds of work they do, general employment requirements, and how to find out about employment opportunities and application procedures. The presentations were followed by a discussion session about "what employers are looking for today in prospective employees". There were 6 presenters and approximately 30 students in attendance.

Assisted with organization and administration of a workshop to bring together aquatic scientists and resource managers to discuss the Maine Aquatic Biodiversity Project design, objectives, and anticipated projects. The workshop was sponsored by The Nature Conservancy, Maine Departments of Inland Fisheries and Wildlife and Environmental Protection, the University of Maine, and USGS-MECFWRU, and involved several hundred participants from around the state. October 2000, University of Maine, Orono, ME.

15. Outreach and Information Transfer:

One of my responsibilities as the Maine AUL-W is collaborating with biologists at the Maine Department of Inland Fisheries and Wildlife (MDIFW) and the local office of the USFWS. I have periodically met with the MDIFW Non-game and Endangered Species biologists during the

past 4 years; although until recently I was not working on projects supported by their funding, I did meet with them frequently to advise them of the status and findings of research conducting by my graduate students. A recently funded project (Current Research Project #5) and expansion of another (Current Research Project #6) have evolved from those meetings. I am currently working with Dr. Fred Servello (University of Maine Department of Wildlife Ecology) and Mr. Tom Hodgman (MDIFW) to develop a proposal to study selected waterbird species that are of special concern to MDIFW. I have also periodically met with USFWS personnel (Sunhaze and Moosehorn National Wildlife Refuges and the local Ecological Services Office), National Park Service biologists, and National Forest Service representatives to advise them of current research projects and seek permission to conduct research on their lands, and I have provided them with results of research conducted on their lands.

16. Inventions, Patents: None to report.

17. Honors, Awards, Recognition, Elected Memberships:

Gamma Sigma Delta Agricultural Honor Society, Auburn University, 1985

Special Achievement Award (cash), USFWS, 1988, 1989, 1990

Award of Appreciation, Okefenokee National Wildlife Refuge, USGS 1998 (for voluntary assistance with preparation and presentation of the Suwannee River Sill Ecological Assessment)

Department of Wildlife Ecology and Conservation, University of Florida Graduate Student of the Year, 1998

University of Florida Institute of Food and Agricultural Sciences letter of commendation for dissertation research, 1998

National Wetlands Conservation Award to the Private Sector, Region Four-USFWS, 1999

Phi Kappa Phi National Honor Society, 1998

18. Bibliography:

A. Published Reports (Peer-Reviewed)

1. Dolbeer, R. A., and C.R. **Smith**. 1985. Sex-specific feeding habits of brown-headed cowbirds in northern Ohio in January. *Ohio Journal of Science* 85(3): 104-107.
2. Speake, D.W., D. McGlincy, and C.R. **Smith**. 1987. Captive breeding and experimental reintroduction of the eastern indigo snake. Pages 84-90 *in* W.R. Odum, K.A. Riddleberger, and J.C. Ozier, eds., *Proceedings of the 3rd Southeastern Nongame and Endangered Species Symposium*, Athens, GA.
3. **Smith**, C.R. 1987. Ecology of juvenile and gravid eastern indigo snakes in North Florida. M.S. thesis, Auburn University, AL. 129 pp.

4. **Smith**, C.R., R.E. Cartee, J.T. Hathcock, and D.W. Speake. 1989. Radiographic and ultrasonographic scanning of gravid eastern indigo snakes. *Journal of Herpetology* 27:426-429.
5. Williges, K.T., and C.S. **Loftin**. 1995. Noteworthy plant species from the Okefenokee Swamp, Georgia. *SIDA* 16:775-780.
6. **Loftin**, C.S. 1997. The hydrology of Okefenokee Swamp. Pages 266-269 in K.J. Hatcher, ed., *Proceedings of the 1997 Georgia Water Conference*, Athens, Georgia. INVITED paper.
7. **Loftin**, C.S. 1998. Assessing patterns and processes of landscape change in Okefenokee Swamp, Georgia. Ph.D. Dissertation, University of Florida, Gainesville, FL. 835 pp.
8. **Loftin**, C.S., S.B. Aicher, and W.M. Kitchens. 2000. Effects of the Suwannee River sill on the hydrology of Okefenokee Swamp: Application of research results in the environmental assessment procedure. Pages 102-110 in S.F. McCool, D.N. Cole, W.T. Borrie, and J. O'Loughlin, eds., *Proceedings of the 1999 National Wilderness Research Conference*, USDA Forest Service, Rocky Mountain Research Station, Ogden, UT. OMRS-P-15-Vol 3.
9. **Loftin**, C.S., W. Rasberry, and W.M. Kitchens. 2000. Development of a grid-cell topographic surface for Okefenokee Swamp, Georgia. *Wetlands* 20:487-499.
10. Bissonette, J.A., C.S. **Loftin**, D. M. Leslie Jr., L. A. Nordstrom, and W.J. Fleming. 2000. The cooperative research unit program and wildlife education: historic development, future challenges. *Wildlife Society Bulletin* 28:534-541.
11. **Loftin**, C.S., N. Ansay, and W.M. Kitchens. 2001. Development and application of a spatial hydrology model of Okefenokee Swamp, Georgia. *Journal of the American Water Resources Association*, 37(4):935-956.
12. Bank, M.S., J.R. Burgess, D.C. Evers, and C.S. **Loftin**. In Press. Mercury contamination of biota from Acadia National Park, Maine: a review and synthesis. Special Issue, Establishing paired gauged watersheds at Acadia National Park for long-term research on acidic deposition, *Environmental Monitoring and Management* X:XX-XX. INVITED paper.

In revision or in journal review:

13. **Loftin**, C.S., J.T. McCloskey, W.M. Kitchens, and M.L. Dusek. In revision. Changes in

vegetation distributions in the lower Savannah River tidal marsh following removal of a tidal flap gate. Submitted to *Wetlands*; in revision.

14. Bank, M.S., C.S. **Loftin**, T. A. Haines, and R. E. Jung. In journal review. Effects of watershed heterogeneity on mercury bioaccumulation in lotic salamanders. Submitted to *Ecological Applications*; in review.

B. Other Publications/Reports

1. **Smith**, C.R., and R.A. Dolbeer. 1984. Feeding response of domestic ducks and mallards to DMA-treated poultry feed crumbles. Denver Wildlife Research Center, Bird Damage Research Report No. 135, Project No. 893. 6 pp.
2. **Loftin**, C.S., and M.L. Quammen. 1989. An evaluation of the habitat suitability index model for northern pintails wintering in the Gulf of Mexico region. National Wetlands Research Center, USFWS Final Project Report, 34 pp.
3. **Loftin**, C.S., and N. Ansay. 1995. GIS component of the BEST pilot project for Okefenokee National Wildlife Refuge: maps and hydrological, logging, and fire history summaries. USFWS Final Project Report.
4. **Loftin**, C.S., and W.M. Kitchens. 1998. Effects of the Suwannee River Sill on the hydrology of Okefenokee Swamp, Georgia. Technical Report No. 60, Florida Cooperative Fish and Wildlife Research Unit.
5. **Loftin**, C.S., M. Bank, J. Hagan, and D. Siegel. 2001. Literature synthesis of the effects of forest management activities on riparian and in-stream biota of New England. University of Maine CFRU Research Report 01-01 and Maine Agricultural and Forest Experiment Station Misc Report 425. 78 pp. (Report and CD-ROM database)
6. **Loftin**, C.S., and M. Bank. 2001. Literature synthesis of the effects of forest management activities on riparian biota of Northeastern North America. CFRU Research Note 01-01:1-4.
7. Krohn, W.B., and C.S. **Loftin** (eds.). 2002. Department of Wildlife Ecology and Maine Cooperative Fish and Wildlife Research Unit 2002 annual report to unit cooperators.
8. Peckenham, J.M., S.J. Nelson, K.B. Johnson, J.S. Kahl, M.S. Bank, and C.S. **Loftin**. 2003. Hydrological, chemical, and landscape controls on mercury in streams on Mount Desert Island. Pages 143-152 in J.S. Kahl, et al., eds., Establishing paired gauged watersheds at Acadia National Park for long-term research on acidic deposition, nitrogen saturation, forest health, and mercury biogeochemistry (1998-2002). PrimeNet Final

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Integrated Report, Acadia National Park.

9. Bank, M.S., C.S. **Loftin**, T.A. Haines, and R.E. Jung. 2003. Effects of fire history, trophic dynamics, and watershed complexity on mercury bioaccumulation and biomagnification in two-lined salamanders (*Eurycea bislineata*) from Acadia and Shenandoah National Parks. Final Technical Report for the Declining Amphibian Population Task Force. 4 pp.
10. **Loftin**, C.S., J.T. McCloskey, W.M. Kitchens, and M.Dusek. 2003. Changes in vegetation distributions in the lower Savannah River tidal marsh following removal of a tidal flap gate. Final Project Report for RWO 41 Savannah River marsh conversion and spatial vegetation succession model assessment, 42 pp.
11. Hierl, L., and C.S. **Loftin**. 2003. A multivariate assessment of wetland habitat conditions in Moosehorn National Wildlife Refuge, Maine. Final project report for RWO 43 Hydrological assessment of Moosehorn National Wildlife Refuge Impoundments, 132 pp.

19. Key Publications or Research Products:

I have attached the following 4 research products:

Loftin, C.S., N. Ansay, and W.M. Kitchens. 2001. Development and application of a spatial hydrology model of Okefenokee Swamp, Georgia. *Journal of the American Water Resources Association*, 37(4):935-956.

This manuscript summarizes the grid-cell based spatially explicit, dynamic hydrology model that I developed in my dissertation and that was also integral to the Ecological Assessment process that eventually lead to dismantling the Suwannee River Sill at Okefenokee National Wildlife Refuge. The manuscript describes development and application of the model which confirmed the existence of various controls on the swamp hydrology that were independent of the effects of the Suwannee River sill. The model manipulations provided an estimation of hydrological responses to simulated sill removal, enabling the refuge to better understand the sill's function in the swamp's current and recent hydrological environment. The model results also suggested that vegetation changes in the swamp were resulting from processes other than hydrological influences, such as fire management and historical logging. These conclusions have been incorporated in the refuge's current wetland vegetation management activities through their fire and water management plans. The data compiled in this effort are also regularly reviewed to relate to current conditions to assess burn potential throughout the refuge.

Loftin, C.S., W. Rasberry, and W.M. Kitchens. 2000. Development of a grid-cell topographic surface for Okefenokee Swamp, Georgia. *Wetlands* 20:487-499.

This manuscript describes the development of the digital topographic surface created in the

initial steps of developing the Okefenokee Swamp spatial hydrology model. The digital topography data available for the swamp prior to my effort were inaccurate for flooded areas of the swamp, which were of particular importance in modeling the swamp hydrology. Therefore, I coordinated with the USFWS Surveying Office to use survey-grade GPS to create a database of elevations of permanent benchmarks which we had installed in the swamp interior and around the swamp perimeter. The survey of these points provided estimates of the peat and sand surface elevation above mean sea level, which enabled me to spatially relate elevations and water levels throughout the swamp. These points were interpolated to create a digital map of the swamp topography, which was an integral part of the hydrology model described in the manuscript listed above and is used by the refuge today to assist in fire management and understand swamp hydrology during periods of active wildfires.

Loftin, C.S., S.B. Aicher, and W.M. Kitchens. 2000. Effects of the Suwannee River sill on the hydrology of Okefenokee Swamp: Application of research results in the environmental assessment procedure. Pages 102-110 *in* S.F. McCool, D.N. Cole, W.T. Borrie, and J. O'Loughlin, eds., Proceedings of the 1999 National Wilderness Research Conference, USDA Forest Service, Rocky Mountain Research Station, Ogden, UT. OMRS-P-15-Vol 3.

This paper describes use of results from the study Okefenokee Swamp hydrology and vegetation dynamics in the Ecological Assessment (EA) of the future management of the Suwannee River sill. The questions to address in the EA were complex because of the vastness of the swamp, the historic manipulations of the vegetation and hydrology, the intense public interest in protecting the Okefenokee Wilderness area, and the concerns of potential catastrophic damage caused by wildfires ignited during drought. The proposal to modify, repair, or remove the sill was presented as the research project was nearing completion. The extensive data bases, analysis, and compilation of the research results to identify the complex relationships among the vegetation, hydrological conditions, fire dynamics, and logging history provided a timely comprehensive analysis that facilitated the EA review process. The manuscript describes that consensus building process that concluded with the successful implementation of the preferred alternative, the phased breaching of the sill and removal of the dam's gates to facilitate restoration of more natural hydrological conditions in the impounded region of the swamp.

Loftin, C.S. Assessing patterns and processes of landscape change in Okefenokee Swamp, Georgia. 1998. Ph.D. Dissertation, University of Florida, Gainesville, FL. 835 pp.

I have included selected sections (Abstract, Introduction, and final summary chapter) of this document because it comprehensively summarizes the systems ecology approach I took in my dissertation research to identify the effects of the Suwannee River sill on the hydrological environments of Okefenokee Swamp. Although I have published 6 manuscripts (Peer-reviewed publ. #5-9, 11) describing portions of this work, I have not yet published a paper that describes the integrated examination of the various manipulations (hydrological, fire, and logging) and the vegetation responses (at landscape and local scales) to these stressors that is presented in my dissertation. The published manuscripts summarizing information learned from the hydrology model development and analysis aided the development of the Ecological Assessment of Future

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Sill Management and current hydrological management of the refuge; the remainder of the document summarizes the analysis of fire and logging effects on swamp vegetation and the sensitivities of the predominant wetland vegetation species to hydrological conditions. The refuge is using this information in developing and carrying out its management plan and determining future management directions for the swamp. This work as a whole is also noteworthy in that it exemplifies the ideas of presented by C.S. Holling and others of system response and reorganization following human manipulations of formative forces that shape natural systems at multiple scales.

20. Position Description Updated position description is attached.