Florida Cooperative Fish and Wildlife Research Unit Annual Report for January – December 2007





Carvings by Dr. Reid Goforth



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This year's cover honors Dr. Reid Goforth whose career has included at least being a gun dealer, mink farmer, small college professor, Assistant Unit Leader, Unit Leader, Deputy Chief and Chief of Cooperative Research Units, Research Center Assistant Director and Director, and USFWS Research Coordinator. He also has expressed his artistic side for many years through his wood carvings (see report cover and <u>http://goforthgallery.blogspot.com/</u>). Reid is the epitome of leadership and has been a mentor to many in our profession. I fortuitously placed my first government phone call in June 1973 to the Assistant Director of the Northern Prairie Wildlife Center. The call was quite successful and lasted but a few minutes; the professional and personal connection has continuously remained intact. Goforth has and continues to play a profound part in the lives and research programs of the extant Florida Cooperative Research Unit scientists. (H. Franklin Percival)

I once had the privilege of introducing Dr. Reid Goforth as a distinguished review panel member to a convened workshop of assorted scientists. Naturally, I knew Reid quite well, or thought I did. He had been my supervisor at one time. With just a bit of probing I learned that Reid had served in a number of sordid professions. The following is a list of those I can recall: Race car driver; School teacher/principal; Artisan (wood carver); Blacksmith- or maybe it was mink farming; Unit Scientist; Center Director; Director of the Cooperative Fish and Wildlife Research Unit Program. Reid is certainly a gifted artisan, just check out his carvings, but race car driver? I don't think so. In fact, having known Reid some 20+ years, I have never seen him drive anything. I'm not certain he can.....I had to chauffeur him everywhere anytime he visited our Unit. Scientist (?) - you can check the pubs for yourself. To my surprise some are actually on-line! His forte, by far, is leadership. He has served the Department of Interior in any number of leadership roles. Anyone that has the opportunity to work for Reid would attest to his tireless work ethic, stalwart mentorship, vision, and most of all his imperturbable integrity. I certainly count myself fortunate to have had the opportunity to have served under his guidance and leadership. Thanks Reid. (Wiley M. Kitchens)

I see the carvings that illustrate the cover of this report as an extension of Dr. Reid Goforth's style of management, mentorship, and philosophy. Time after time, in the 16 years I've known him, I've seen Reid take stock of a situation, opportunity, or challenge, and visualize the desired outcome with incredible clarity. His way of finding the carving within a block of raw material mirrors his strategic approach to resolution of issues. To be able to pare away the peripheral stuff and see to what matters is a benchmark for leadership. Reid has had a profound influence on my career, and his continued dedication to excellence in science and resource management, and to the Unit program are inspirations to me. I'm truly thankful for his mentorship and guidance, and want to hear some race car driving stories. Raymond R. Carthy)

COOPERATORS: FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION UNIVERSITY OF FLORIDA U.S. FISH & WILDLIFE SERVICE U.S. GEOLOGICAL SURVEY WILDLIFE MANAGEMENT INSTITUTE













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FLORIDA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT INTRODUCTION



Zach Welch, Florida Unit PhD student – Vegetation monitoring transect in the Everglades Water Conservation Area 3AS. Picture by Christa Zweig

The Florida Cooperative Fish and

Wildlife Research Unit was established in 1979 as one of the first combined units. The purpose of the Florida Unit is to provide for active cooperation in the advancement, organization, and conduct of scholarly research and training in the field of fish and wildlife sciences, principally through graduate education and research at the University of Florida. The Florida Unit has the mission to study wetland ecosystems within the state. Florida is a low relief, sub-tropical peninsula that is ecologically fragile. Though abundant, Florida's water resources are under increasing pressure from a burgeoning human population. Domestic, recreational, and development needs threaten Florida's

water / wetland resources. In following its program directive, the Florida Unit has developed a research program that addresses management issues with approaches spanning species to ecosystem perspectives. Specifically, this Unit conducts detailed investigations of aquatic-terrestrial ecosystem interfaces and their component fish and wildlife resources.

Between 1979 and 2007, over 274 projects totaling more than \$39.2 million were funded through the Unit. These projects covered a wide variety of fish, wildlife, and ecosystem subjects and have involved 49 line, affiliate, and adjunct faculty members as principal and co-principal investigators. Unit staff have their own research projects which accounted for about 1/3 of the total effort. Projects associated with the Unit have resulted in 379 publications, 101 technical reports, 84 theses and dissertations, and 149 presentations. Cooperation has been the Florida Unit's strength. Now, in its new capacity as a Cooperative Unit of the U.S. Geological Survey, it serves as a bridge among the principal cooperators, such as the University of Florida, the Florida Fish and Wildlife Conservation Commission (FFWCC), the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service (FWS) and the community of state and federal conservation agencies and non-governmental organizations. Evidence of this role is the Unit's funding which has included contributions from FFWCC, 12 BRD research labs and centers, 12 offices within the USFWS Southeast Region, the University of Florida, U.S. Army Corps of Engineers, U.S. Navy, U.S. Department of Agriculture, U.S. Air Force, U.S. National Park Service, Environmental Protection Agency, St. Johns River Water Management District, South Florida Water Management District, U.S. AID, World Wildlife Fund, The Nature Conservancy, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, BRD, Florida Wildlife Federation, National Audubon Society, Florida Alligator Farmers' Association, American Alligator Farmers' Association, Florida Fur Trappers' Association, and other private contributions. Many Unit projects involve multiple investigators from several agencies. This cooperative interaction stimulates continuing involvement of funding sources, provides for student contacts with potential employers and agency perspectives, and directs transfer and application of research results

RESEARCH MISSION STATEMENT



"The mission of the Florida Cooperative Fish and Wildlife Research Unit is to conduct detailed investigations of wetlands and their component fish and wildlife resources, emphasizing the linkages with both aquatic and terrestrial ecosystems. This charge will include research at a range of levels including populations, community, and ecosystems, and will emphasize the interaction of biological populations with features of their habitat, both natural and those impacted by human activities. "

COORDINATING COMMITTEE

- Jimmy G. Cheek Vice President for Agriculture and Natural Resources, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.
- Ken D. Haddad Executive Director, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.
- James W. Fleming Southern Supervisor, Cooperative Research Units, U.S. Geological Survey, Biological Resources Division, Atlanta, GA.
- Sam D. Hamilton Regional Director, U.S. Fish and Wildlife Service Southeast Region, Atlanta Georgia.
- **Donald F. McKenzie** Field Representative, Wildlife Management Institute, Ward Arkansas.

BIOGRAPHICAL PROFILES OF UNIT SCIENTIST

- H. Franklin Percival Unit Leader, Courtesy Associate Professor, Department of Wildlife Ecology and Conservation and College of Natural Resources and the Environment at the University of Florida. His research interests lie in wetland wildlife, particularly waterfowl and alligators. He is conducting long term cooperative projects on various aspects of alligator biology. He also is involved in research on development of an unmanned aerial vehicle for wildlife and habitat surveys and adaptive management. He has a special interest in wildlife administration and champions multidisciplinary and interagency research programs.
- **Raymond R. Carthy** Assistant Unit Leader, Courtesy Assistant Professor, Department of Wildlife Ecology and Conservation and College of Natural Resources and the Environment at the University of Florida. His research centers on ecology of endangered species. His research interests involve reproductive ecology and physiology of coastal and wetland herpetofauna, with current focus on marine and freshwater turtles. He is also involved in research on threatened upland species and in conservation management oriented studies.
- Wiley M. Kitchens Research Ecologist, Courtesy Professor, Department of Wildlife Ecology and Conservation, Fisheries and Aquatic Sciences, and College of Natural Resources and the Environment at the University of Florida, and Adjunct Professor with Department of Biology, University of Miami. His research centers on restoration and conservation of wetland ecosystems. The focus involves resolving complex gradients of community structure and function in perturbed wetland ecosystems. He currently is examining habitat relationships and hydrology induced changes in a variety of wetland ecosystems in Georgia and Florida. Simulation modeling in conjunction with GIS techniques from the basic approach of his current studies.

AGENCY PERSONNEL CO-LOCATED WITHIN FLORIDA UNIT

- **Robert M. Dorazio** Research Statistician, Florida Integrated Science Center, USGS and Courtesy Associate Professor, Department of Statistics, University of Florida. He conducts scholarly research in the general areas of quantitative population dynamics, community ecology, and conservation biology. He develops and applies novel sampling designs and novel statistical models in quantitative investigations of exploited or imperiled fauna. He is also responsible for developing both theory and practice of adaptive natural resource management.
- **Fred A. Johnson** Senior Wildlife Biologist, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, and the Florida Caribbean Science Center. His interests include modeling the dynamics of wildlife populations, design of wildlife monitoring programs, and application of decision theory to conservation practices. His principal responsibility is to develop and implement an inter-agency program to promote an adaptive approach to natural resource management particularly for wetlands and associated avifauna.
- Elizabeth Martin NBII Bird Conservation Node Manager, National Biological Information Infrastructure (NBII), U.S. Geological Survey, and PhD student, Department of Wildlife Ecology and Conservation, University of Florida. Her principal responsibility with NBII is management of the NBII Bird Conservation Node and coordination with partners to support development of web-based information products useful in management and conservation of North American birds. Her interests include the application of information technologies to avian conservation, and research on behavioral ecology of birds to understand tradeoffs in resource use.

COOPERATIVE UNIT PERSONNEL

- Joan B. Hill, BA Administrative Assistant, Florida Cooperative Fish and Wildlife Research Unit, Department of Wildlife Ecology and Conservation, University of Florida. Responsible for administrative details of \$3.5M annual research program. Supervises one part-time staff person and two student assistants. Responsibilities include budgets, research work orders, contracts and grants, fiscal reports, travel, purchasing, payables, personnel, website, and other related administrative functions.
- **Christopher Hill** Office Assistant, Florida Cooperative Fish and Wildlife Research Unit. Responsible for tracking and recording of spent funds through the University PeopleSoft Financial system related to grant projects. He maintains the Florida Cooperative portion of the DOI Vroom database for reporting purposes.
- Amanda Burnett Student Assistant, Florida Cooperative Fish and Wildlife Research Unit. Primarily responsible for filing, data entry for State and Federal property inventory records, publications, maintains office supplies, and general office procedures.
- **Tisha Stockton** Student Assistant, Florida Cooperative Fish and Wildlife Research Unit. Primarily responsible for manuscripts, copying, filing, organizing of publications and information entry. Maintains database, and general office procedures.

COOPERATORS

University of Florida:

Michael S. Allen Meghan Brennan Bon A. Dewitt Jeff Hostetler Susan Jacobson Michael Kane Frank Mazzotti William (Bill) Pine J. Perran Ross Julien Martin

Karen A. Bjorndal Mary Christman Peter C. Frederick Peter G. Ifju Steven Johnson Paul A. Klein Martha C Monroe Brett Presnell Scot E. Smith Aaron Higer

Alan B. Bolten Robert M. Cubert Bill Guiliano Elliott R. Jacobson Linda Young Ramon Littel Madan Oil Carlos H. Romero Marilyn G. Spalding

St. Johns Water Management District:

Roxanne Conrow Mike Coveney

Florida Fish and Wildlife Conservation Commission:

Joe Benedict
Larry Campbell
Jim Estes
Richard Kiltie
Tim O'Meara
Lawson Snyder
Arnold Brunnet

U.S. Geological Survey:

Beverly Arnold Paul Conrads Robert M. Dorazio James Hines Suzette Kimball Elizabeth Martin James D. Nichols John Sauer Pamela Telis

Dwayne A. Carbonneau Chris Fonnesbeck Paul Kubilis Stephen W. Rockwood Nick Wiley Janell Brush

Joan Berish

G. Ronnie Best Michael Conroy Russell J. Hall Jeff Keay Lynn W. Lefebvre Kelly McDonald Kenneth G. Rice **Daniel Slone** Kenneth Williams

U.S. Fish and Wildlife Service:

Jon Andrew	Robert Blohm	Laura Brandt
Tylan Dean	Ed Eudaly	Chuck Hunter
Mark D. Koneff	Mike Legare	Fred Martin
Mark Musaus	Lorna Patrick	John Robinette
Russell Webb	Kathy Whaley	Paul Tritaik
Mark Musaus Russell Webb	Lorna Patrick Kathy Whaley	John Robinett Paul Tritaik

Wofford College: Clarence L. Abercrombie

U.S. Air Force: Bruce Hagedorn

Jack Mobley

Harry J. Dutton Tommy C. Hines Henry Norris Scott Sanders Blair Witherington Allan R. Woodward

Tim Breault

Jaime A. Collazo Donald L. DeAngelis Tara Y. Henrichon William Kendall Cynthia S. Loftin Clinton Moore Michael Runge James Williams

Bob Miller

U.S. Parks Service Leonard Pearistine

<u>University of Central Florida:</u> Llewellyn M. Ehrhart

<u>University of West Florida:</u> Phillip C. Darby

<u>Hidden Harbor Marine Environmental Project:</u> Ritchie H. Moretti Sue A. Schaf

Tall Timbers Research Station: William Palmer

<u>University of New Orleans:</u> Julie Whitbeck

U.S. Army Corps of Engineers: William D.Meyer Jonathan Moulding

Dynamac Corp: Eric D. Stolen

OTHER: Howard K. Suzuki Lovett E. Williams John Wooding Ralph Dimmick

RESEARCH PERSONNEL

Post-doctorate Associates

Margaret Lamont Julien Martin Mark Miller J. Hardin Waddle

Paul Wetzel

Ph.D Students

Sadie S. Coberley Christopher Cattau Taewoo Kim Kristen Candelora Sara R. Gonzalez

M.S. Students

- William J. Barichivich Melissa DeSa James J. Berg Lori A. Brinn Christopher Bugbee Kristen Candelora Cameron Carter Michelle Casler
- Kathryn A. Garland Julie A. Heath Joyce L. Merritt Mario Mota Elizabeth Martin
- Melanie A. Craig Martha L. Maglothin Andrea Bowling Linda K. Dance Rachel Hirschman Thea Hotaling Brian M. Jeffery

Fred Johnson Holly J. Johnson Pamela Pannozo Eric D. Stolen Zachariah C. Welch Christa Zweig

Jenny Ketterlin Kristianna Lindgren Aletris Neils John D. Semones Brad Shoger Brian Reichert Russell Scarpino

Biological Scientists and Temporary, Full Time & Part Time Personnel

Burnie Brinn Amanda Burnett Adam Betuel Erin Cantwell Cameron Carter Patty Castillo-Trenn Jonathan Chandler Simon Fitz-William Margaret Lamont Daniel Grant Carolyn Enloe Jonathon Felix Shuntice McBurrows Orlin Merrit Kristin Miller David Coffin Jonathan Saunders Tisha Stockton Sara Stocco Frank Solis Taylor Tidwell Celest Warner Brian Reichert Aimee Reiss Allison Pevler Bradley Shoger Adam Watts

Students and Personnel:

Full Name: Adam Betuel (Field Technician)

Degree Sought: Graduation Date: Research: Data collection on Wildlife Usage and Habitat Development on Spoil Islands in Lake Tohopekaliqa, Florida.

Full Name: Lori Brinn

Degree sought: M.S. Graduation Date: Spring, 2008 Research: Effects of physical properties of sand associated with beach nourishment on nesting loggerhead sea turtles in the Florida panhandle

Full Name: Matthew Brein

Degree sought: Wildlife Biologist (work title) Graduation Date: Research Blurb: Collects morphometric data on the American Crocodile, conducts nesting surveys, and collects data on juvenile growth and survival for the American Crocodile monitoring and assessment program (MAP)

Full Name: Andrea Bowling

Degree sought: M.S. Wildlife, Ecology, and Conservation Graduation Date: December, 2008 Research: Dispersal of juvenile snail kites across an increasingly degraded landscape.

Full Name: Christopher D. Bugbee

Degree sought: M.S. Interdisciplinary Ecology Graduation Date: August, 2007 Research: Research on alligator amphibious behavior as it relates to a variety of physical and environmental variables. Information will help improve the accuracy of alligator surveys in south Florida, providing an index of alligator detectability during these surveys.

Full Name: Amanda S. Burnett

Degree sought: B.A. Wildlife Ecology and Conservation Graduate Date: Spring, 2012 Research: Currently assists in FL Cooperative Unit Office of Administration

Full Name: Jemeema Carrigan

Degree sought: Wildlife Biologist (work title) Graduation Date: Research: Collects morphometric data on the American Crocodile, conducts nesting surveys, and collects data on juvenile growth and survival for the American Crocodile monitoring and assessment program (MAP)

Full Name: Cameron Carter

Degree sought: M.S. Interdisciplinary Ecology Graduation Date: August, 2007 Research: The effect of habitat type, habitat structure, and water level on alligator detection probabilities during night-light counts.

Full Name: Michelle Casler

Degree sought: M.S. Graduation Date: May, 2008 Research: Looking at how hydroperiod and landscape characteristics affect anuran species richness in Big Cypress National Preserve and Everglades National Park.

Full Name: Chris Cattau

Degree sought: PhD Graduation Date: December, 2011 Research: Collecting data on snail kite behavior, energetics, movement, and demography to employ the multiple competing hypotheses approach to the declining snail kite population in Florida.

Full Name: Mike Cherkiss

Degree sought: Work Title – Wildlife Biologist

Graduation Date: (actual)

Research: Project manager for the American crocodile monitoring and assessment program, collects morphometric data on the American Crocodile, conducts nesting surveys, and collects data on juvenile growth and survival (MAP).

Full Name: William deGravelles (Field Technician)

Degree sought:

Graduation Date:

Research: Assists in field sampling and data relevancy to research demography and conservation of snail kites throughout range in Florida. Initiates systematic surveys for population estimates, survival, and movement. Monitor nesting activities including numbers of nests and success. Reporting location information to FWS.

Full Name: Melissa Ann DeSa

Degree sought: M.S. Interdisciplinary Exology

Graduation Date: Spring, 2008

Research: Exam effects of large-scale habitat enhancement project on herpetofauna and fish communities of Lake Tohopekaliga, Florida. In 2004, a major draw-down and scraping event was implemented to remove excess muck and expansive pickerelweed.

Full Name: Lori Drizd (Field Technician)

Degree sought:

Graduation Date:

Research: South Florida vegetation monitoring – collects samples, non-destructive sampling and data entry.

Full Name: Carolyn Marie Enloe

Degree sought: Staff and Project Manager for Lake Tohopekaliga-Spoil Islands project. Graduation Date:

Research: Conducts herptofaunal, vegetation and avian community monitoring projects on large and small lakes throughout Florida.

Full Name: Jonathon Felix (Field Technician)

Degree sought:

Graduation Date:

Research: Lead field technician on the Gant Lake Project studying the herpetofaunal, avian and vegetation community's response to lake-wide habitat enhancement work.

Full Name: Ikuko Fujisaki

Degree sought: Statistician (work title) Graduation Date: Research: Analyzes American Alligator body condition for the American Alligator monitoring and assessment program (MAP).

Full Name: Kathryn Garland

Degree sought: PhD Wildlife Ecology and Conservation- Human Dimensions focus Graduation Date: Spring 2010

Research: Title of Dissertation Research-

A Taste for Turtles: Green Turtle (Chelonia mydas) Consumption in Caribbean Nicaragua and Baja California, Mexico. This study is mostly qualitative social research looking at the conditions behind sea turtle consumptive use in Latin America.

Full Name: Wellington Guzman

Degree sought: Wildlife Biologist (work title) Graduation Date: Research: Collects morphometric data on the American Alligator for the American Alligator monitoring and assessment program (MAP)

Full Name: Rececca Blair Hayman

Degree sought: M.S. Wildlife Ecology and Conservation Graduation Date: December, 2009

Research Blurb: To gauge current opinions, knowledge, and risk perceptions of American alligators. Compare changes in knowledge, attitudes, and variations relative to an earlier survey conducted in 1996. This work is in cooperation with FL FWCC and information gained will shape state management decision regarding alligators.

Full Name: Althea Hotaling

Degree sought: M.S. Graduation Date: August, 2008 Research: Wet Prairie Conversion in Water Conservation Area 3A, Wet Prairie Vegetation monitoring throughout South Florida

Full Name: Brian Jeffrey

Degree sought: MS in Interdisciplinary Ecology Graduation Date: August 2007 Research: Looking at the impact of off-road vehicles on the small mammal populations in Big Cypress National Preserve

Full Name: Fred Allan Johnson

Degree sought: Wildlife Ecology and Conservation Graduation Date: Anticipated graduation date- 2009

Research: Coping with uncertainty in managing the harvests of migratory birds. This research involves identifying key sources of uncertainty in predicting the impacts of harvest, deriving optimal harvest policies in the face of those uncertainties, and using monitoring programs to reduce uncertainty and thus improve future decision making.

Full Name: Margaret Lamont

Degree sought: PhD

Graduation Date: Post-Doctoral Associate with Dr. Carthy Research: My research involves examining how coastal species, such as sea turtles and shorebirds, are affected by natural and anthropogenic dynamics of barrier island systems.

Full Name: Edward Larrivee (Field Technician)

Degree sought: Graduation Date: Research: amphibian visual encounter and vocalization surveys on Lake Apopka.

Full Name: Katherine Leonard (Field Technician)

Degree sought: Graduation Date: Research: Conducts reptile/amphibian trapping, vegetation sampling, and bird surveys.

Full Name: Elizabeth Martin

Degree sought: PhD Wildlife Ecology and Conservation Graduation Date: Anticipated graduation date: December 2008 Research: Predation risk from diurnal raptors and effects on habitat use and foraging behavior of wintering Dunlin (Calidris alpine) at Merritt Island National Wildlife Refuge in Florida.

Full Name: Julien Martin

Degree sought: PhD Wildlife Ecology and Conservation Graduation Date: May 2007 Research: Population ecology and conservation of the Snail Kite

Full Name: Mark Miller

Degree sought: PhD Graduation Date: Research: Analyzes juvenile American Crocodile growth and survival data for the American crocodile monitoring and assessment program (MAP)

Full Name: Mark Parry

Degree sought: Wildlife Biologist (work title) Graduation Date: Research: Collects morphometric data on the American Crocodile, conducts nesting surveys, and collects data on juvenile growth and survival for the American Crocodile monitoring and assessment program (MAP)

Full Name: Danielle Ogurcak

Degree sought: Wildlife Biologist (work title) Graduation Date: Research: Collects vegetative data for the American Alligator hole, distribution, and occupancy project.

Full Name: Jean Olbert (Field Technician)

Degree sought: Graduation Date: Research: Monitoring of snail kite behavior, population survey, and radio telemetry of snail kites.

Full Name: Asley Peele (Field Technician)

Degree sought: Graduation Date: Research: Vegetation sampling and surveys, bird monitoring, herpetofaunal.

Full Name: Brian E. Reichert

Degree sought: M.S. Graduation Date: Fall, 2009 Research: Effects of wetland-specific mechanistic processes on Snail Kite survival.

Full Name: Mike Rochford

Degree sought: Wildlife Biologist (work title) Graduation Date: Research: Collects morphometric data on the American Alligator for the American Alligator monitoring and assessment program (MAP).

Full Name: Amy Schwarzer

Degree sought: M.S. Graduation Date: December, 2010 Research: Assessing the importance of horseshoe crab (Limulus polyphemus) eggs in the diets of migrating red knots (Calidris canutus) and sanderlings (Calidris alba) during refueling stops on selected Florida beaches.

Full Name: Bradley Noal Shoger

Degree sought: M.S. Wildlife Ecology

Graduation Date: December, 2010

Research: Determine use of Spoil Islands by terrestrial vertebrate community on Lake Tohopekaliga, Kissimmee, FL. Conduct small mammal and serpetofaunal trapping, remote photographic, and mark-recapture surveys.

Full Name: Jennifer Solis (Field Technician)

Degree sought:

Graduation Date:

Research: Conducts surveys for sea turtle nests along 8-km stretch of Archie Carr Nat'l Wildlife Refuge. Identifies nest to species and collects data and hatching success. Collects data on beach erosion & oceanographic conditions.

Full Name: Frank Solis (Field Technician)

Degree sought: Graduation Date: Research: Conducts surveys for assessment of coastal habitats and species impacted by hurricanes.

Full Name: Scott L. Stewart

Degree sought: PhD candidate in Environmental Horticulture Graduation Date: August 2007 Research: Scott is conducting research aimed at the development of species-level integrated conservation methods for Florida's native orchids. While his research is focusing on Florida native orchids, the methods being developed are applicable to orchids worldwide.

Full Name: Tisha Stockton

Degree sought: B.S. Health Science Education Graduation date: December, 2008 Research: Currently assists in FL Cooperative Unit Office of Administration

Full Name: Rio Throm (Field Technician)

Degree sought: Graduation Date: Research: Surveys in amphibian visual encounter and vocalization at Lake Apopka, FL

Full Name: Taylor Tidwell (Field Technician)

Degree sought: Graduation Date: Research: Vegetative sampling, sorting, weighing, data entry, report writing, and water well monitoring.

Full Name: Amanda Waddle (Biological Scientist)

Degree sought: Graduation Date: Research:

Full Name: Adam Watts

Degree sought: M.S. Interdisciplinary Ecology; Scientist, UAS Program Coordinator Graduation Date: 2002

Research: The Florida Co-Op Unit, in collaboration with the Department of Mechanical and Aerospace Engineering and the Geomatics Program, has developed an autonomous unmanned aerial vehicle system (UAS) for ecological research and natural resource monitoring. Beginning in 2007, the UF and the USACE will utilize UAS for aerial monitoring of levees in south Florida using a thermal infrared camera, while continuing the development of this on-demand, remote-sensing tool.

Full Name: Zachariah C. Welch

Degree sought: PhD Graduation Date: Fall, 2009 Research: Modeling tidal freshwater marsh vegetation communities on the Savannah River, GA

Full Name: Paul Wetzel (Field Technician)

Degree sought:

Graduation Date:

Research: Develops and implements a vegetation monitoring program in WCA-3A. Analyzes data generated, report writing.

Full Name: Kate Williams

Degree sought: MS Wildlife Ecology and Conservation Graduation Date: August, 2007 Research: Development of new techniques to estimate breeding population size and other demographic parameters for wading birds in the Everglades.

Full Name: Christa Zweig

Degree sought: PhD Wildlife Ecology and Conservation Graduation Date: Spring, 2009 Research: I am tracking changes in vegetation communities in WCA 3A and creating a model to predict community change under different hydrologic regimes.

2007 Project Descriptions





Cooperative Research





Field Research

Snail Kite Population Studies: Demography, Population Trends, and Dispersal Relative to Environmental Correlates, and Habitat Studies

Principal Investigator: Wiley M Kitchens

Funding Agency: USACE / U.S. Geological Survey *Expected Completion:* 2/28/2008



The snail kite (*Rostrhamus* sociabilis) is an endangered raptor whose distribution in the United States is restricted to the South Florida Ecosystem including watersheds of the Everglades, Lake Okeechobee, Kissimmee River, and Upper St. Johns River. Because snail kites feed almost exclusively on one species of aquatic snail, their survival depends directly on the hydrologic functioning of the wetlands associated with these

watersheds. Although other endangered species occur within this ecosystem, snail kites probably are the only species whose range both encompasses and is exclusively restricted to this ecosystem. Its population viability is therefore directly dependant on the hydrological/ecological condition and functioning of the entire network of wetlands with this ecosystem. Current data indicate the population is again in a steep decline. Estimates indicate the population has decreased by one-half (3400 to 1700 birds) in the past 4 years (since 1999). Aside from the studies that follow, there are currently no other systematic monitoring of snail kites in Florida.

Most researchers suggest declines in kite populations in the past several decades are correlated with changes in hydrology directly or indirectly. These include loss of habitat, both in terms of quality and spatial extent. These include changes in foraging and nesting habitat; effects on reproduction parameters; and adult and juvenile survival of snail kites. Population and survival responses to restoration activities will reflect the success of recovering the quality and spatial extent of the wetland ecosystem to the conditions required to support a viable nail kite population.

The current and future efforts will remain based on mark-re-sighting techniques. In contrast to the annual survey previously used, this technique has a long and solid statistical foundation for estimating survival and population size. However, given the declining numbers of birds banded, it has become critical to augment the mark-resight with radio-telemetry approaches to maintain integrity and robustness of statistical analyses. Given the very low reproductive rate observed in the recent years, the sample size of young birds marked is largely decreasing which is weakening our capacity to provide precise survival estimates. It is consequently essential to increase the probability of detection (by using radio telemetry), in order to compensate for this loss in precision. The following projects involve snail kite research but, funded differently:

Surveys of Snail Kite Breeding and Habitat Use in the Upper St. Johns River Basin

Principal Investigator: Wiley M Kitchens

Funding Agency: St. Johns River Water Management District *Expected Completion:* 2/28/2008 (PJ#60430 and new PJ#71241) *Graduate Students:* Andrea Bowling *Field Technicians:* Sara Stocco, Brian Reichert

Continued Snail Kite Monitoring Studies: Demographic, Population Growth, Extinction and Movement Parameters

Principal Investigator: Wiley M Kitchens

Funding Agency: U.S. Fish and Wildlife Service *Expected Completion:* 12/31/2007 (PJ#57405, #66733) *Graduate Students:* Julien Martin, Chris Cattau, Andrea Bowling *Field Technicians:* Sara Stocco, Brian Reichert

Radio Telemetry and Mark-Recapture Studies of Demographic, Movement and Population Dynamics of the Endangered Snail Kite

Principal Investigator: Wiley M Kitchens

Funding Agency: U.S. Army Corps of Engineers / U.S. Geological Survey *Expected Completion:* 3/31/2007 (PJ#49824, #53729, and #71123) *Graduate Students:* Julien Martin, Chris Cattau, Andrea Bowling *Field Technicians:* Sara Stocco, Brian Reichert



Florida CRU student, Brian Reichert tagging snail kite.

Floral and Faunal Succession Following Alternative Habitat Restoration Techniques in a Large Central Florida Lake

Principal Investigator: Wiley M Kitchens

Funding Agency: Florida Fish and Wildlife Conservation Commission *Expected Completion:* 6/30/2007 *Graduate Students:* Melissa DeSa *Field Technicians:* Carolyn Enloe, Brad Shoger, Amy Schwarzer

To enhance/restore fishery production in Florida lakes with documented declining fishery habitat, the Florida Fish and Wildlife Conservation Commission (FWC) recently embarked on an initiative to identify those resources which would best respond to restorative treatments. The goal of this effort is to recover the habitat quality and fishery production of the littoral reaches of approximately 30 lakes over the next 20 years. The resulting enhancement projects would typically include: extreme drawdowns, organic sediment removal, minimization of cattail and tussock habitats, creation of upland and in-lake spoil deposits, reestablishment of desirable native aquatic vegetation, and aggressive vegetation management.

While the benefits to Florida fishery resources associated with periodic extreme drawdowns have been documented for more than 30 years, it is known that accrued benefits are time-limited, generally less than 10 years. In an attempt to hasten habitat enhancement and extend the time periods between requisite drawdowns, the FWC initiated a program of mechanically removing tussocks and associated organics during planned drawdown periods as well as fortuitous unscheduled natural drawdowns. The apparent success of this combined drawdown and muck removal procedure for fishery habitat enhancement in demonstration projects has made this technique the preferred enhancement alternative. While these projects have unquestionably resulted in immediate and dramatic increases in short-term fish production, impacts on other resources are less well documented. Only cursory or speculative information is available regarding long-term effectiveness or overall impacts of current restoration techniques on wildlife resources. To date, there have been too few experimental trials to properly evaluate various vegetation responses to mechanical bottom scraping. Questions remain regarding the means and degree of removal required. For example, what are the minimal levels of scraping required to provide target enhancement levels while minimizing potential negative impacts to wildlife and other ecological resources? Are there cost effective configurations of scraped areas and nonscraped areas that meet the same criteria as current techniques? Resolution of these concerns is critical to the continued success and public support of the lake restoration program. This large scale, long-term study will help address these and other strategic information needs to sustain the success of large-scale, extreme drawdowns, and muck removal/redeposition projects.

To Document Floral and Faunal Succession Following Alternative Habitat Restoration Techniques in a Large Central Florida Lake

Principal Investigator: Wiley M Kitchens

Funding Agency: Florida Fish and Wildlife Conservation Commission *Expected Completion:* 7/30/2008 (PJ#62910) *Graduate Students:* Melissa DeSa *Field Technicians:* Carolyn Enloe, Brad Shoger, Amy Schwarzer

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Wildlife Usage and Habitat Development on Spoil Islands in Lake Tohopekaliga, Florida



Funding Agency: Florida Fish and Wildlife Conservation Commission

Field Technicians: Melissa DeSa, Carolyn Enloe, Brad Shoger, Amy Schwarzer, Jonathan Chandler, Aimee Reiss, Taylor Tidwell *Photo: Tidwell measuring for nondestructive sample in WCA2B.*

Following the extreme draw-down and muck removal project of 2004 conducted by the Florida Fish and Wildlife Conservation Commission

(FWC) on Lake Tohopekaliga, several in-lake "wildlife islands" were created by stockpiling scraped spoil materials. Although the preferred method of disposal includes moving severed materials outside the lake basin, limited availability of disposal areas in nearby upland settings and cost prohibitive expenses for trucking the materials long distances resulted in in-lake stockpiles of some materials. Artificially created islands such as these have been documented as having some benefits to wildlife (Chaney et al. 1978, Landin and Newling 1987, Yozzo et al. 2004, Hulon et al. 1998). Although much research has been done on coastal islands that offer sea bird refuge, very little is known about the habitat value and wildlife usage of freshwater lake islands such as these. By monitoring and documenting the dynamics of the floral and faunal communities present on these islands, we anticipate being able to relate island characteristics including shape, size, grazing, and proximity to shore with wildlife usage and habitat development through time. The intent is to make inferences on what particular island attributes are attractive to wildlife.

OBJECTIVES:

Document and describe wildlife occurrence and associated activities on select spoil islands in Lake Tohopekaliga. 2) Document and describe vegetation present on select islands and follow succession throughout the study period. 3) Relate wildlife occurrence to various island characteristics and attempt to elucidate associations. Avian, herpetofauanal, small mammal, and vegetation surveys will be conducted on all islands.

YEAR 1: Establish effective protocols during the pilot study phase. Several techniques will be attempted including point counts, dual-observer methods (avian), drift fences and pit-fall traps (herpetofauan), and belt transects (vegetation). After a 3 month pilot phase, we will determine the best techniques for studying these islands and continue with those protocols. YEAR 2: Same as "Objectives of Project"

PROGRESS:

The pilot phase of the project came to an end over the summer 2007. Vegetation was surveyed at each island in July 2007 and avian, herpetofaunal, and small mammal surveying techniques were decided upon and initiated in September 2007. Two new field technicians were hired in August and September respectively. Data is currently being analyzed for the January report.

The protocol for vegetation surveys consists of two perpendicular belt transects bisecting each island. The transects face N-S and E-W respectively and cover the full topography of the island. Transects are marked with 2 inch PVC poles placed at 10m intervals. A 1 meter squared quadrat is used to identify species occurrence along the entire transect. At each 10m interval, a diagonal $\frac{1}{2}$ inch PVC with markings every 5cm is laid across the quadrat to determine percent cover.

The herpetofaunal and small mammal sampling is conducted using a single drift fence array located on the lakeward portion of the island. The array is set up as a Y with two legs on the sloped and littoral portion of the island and one leg jutting into the upland. Each leg consists of 15m of industrial silt fencing and wooden stakes. 3 double-ended funnel traps, made with window screening, are placed along each side of each leg of the fence at 5m intervals thus giving 18 funnel traps per array. In addition, baited Sherman traps are placed on the upland leg in between the funnel traps and either side of the slope legs, above water line, giving 8 Sherman traps per array. The traps are run for 4 days per month and checked daily. All captures are identified to species, counted, and weighed before being released at the site of capture. Different arrangements of small mammal traps are being looked at to better sample the community.

Avian monitoring is conducted bi-monthly by walking transects. This method uses dualdependent observers to record species occurrence, number observed, behavior, and area of the island (habitat) the bird was seen. The transects are timed and dependent on the size of the island surveyed. If a bird is seen but not identified the timed "searching" portion of the survey is stopped and the bird is located and identified, if possible, before resuming the survey. 4 islands are surveyed per day with the last island surveyed on the fourth day. Pairs of islands are surveyed on the same day. The last island is an outlier with no replicate and is 3x larger than most islands, thus it is surveyed alone. The surveys start at dawn and are over by late morning. The data gained should give species occurrence on the islands and relate particular species to specific habitat utilized.

Nest searching will commence with the onset of breeding season in 2008 and will follow the same timed protocol as the regular avian survey. Nests will be marked and identified to species if possible. Discovered nests will be checked upon weekly to determine the outcome of the nesting attempt.

Very little is known about the habitat value and wildlife usage of freshwater lake islands, yet management practices involving scraping and stockpiling materials into spoil islands is a common practice. We hope to elucidate any associations between island types and animal usage in order to guide future management practices

Vegetation Habitat Responses to Hydrologic Regimes in Everglades Water Conservation Area 3A

Principal Investigator: Wiley M Kitchens

Co-Principal Investigator: Christa Zweig Funding Agency: U.S. Army Corps of Engineers Expected Completion: 3/31/2008 (UF53972) Graduate Students: Christa Zweig, Thea Hotaling Post-doctorate: Paul Wetzel Field Technicians: Simon Fitz-Williams

This project is intended to address concerns expressed by the U.S. Fish and Wildlife Service regarding the proposed action of the U.S. Army Corps of Engineers (Corps) to implement Alternative 7R (IOP-Alt.7R) under the Interim Operational Plan for Protection of the Cape Sable Seaside Sparrow, Everglades Nation Park. Specifically, it address the concern the IOP-Alt.7R could adversely affect snail kites and designated habitat in WCA-3A, portions of which are designated critical habitat of the endangered snail kite (Rostrhamus sociabilis). The principle concern is that the carrying capacity (habitat quality) of WCA-3A, the largest and most consistently utilized (as measured by numbers of birds observed during 1970-1994 annual surveys) of the designated critical habitat is currently seriously degraded. Bennets and Kitchens (1997) documented that snail kites have increasingly move their nesting activity to areas of higher elevations in WCA-3A over the past two decades presumably as the traditional nesting regions have been degraded by high water levels sustained by current water management practices. Zaffke (1983), Wood and Tanner (1990), and David (1996) all have documented the conversion of wet prairies (preferred foraging habitat, Kitchens et al. (2002)) to aquatic sloughs in that area along with losses of interspersed herbaceous and woody species essential for nesting habitat. Analysis of hydrological predictions for IOP-Alt.7R indicate that implementing the project could result in excessive ponding and extended hydroperiods of the type that could further degrade nesting and foraging habitat as described by Kitchens et al. (2002).

The principle objective and challenge is to separate plant community responses due to typical seasonal and year-to-year variances from effects due to new and/or predicted hydrologic regimes. The vegetative community structure of these sites is an expression of *both* the recent past and current hydrological conditions. Therefore, it is critically important to determine how the species associations within these communities respond differentially to changes in hydrology through time and over space.

We intend to generate hydroperiods and depth duration data for twenty plots within the study site for the measured (as well as predicted) period of record. The products generated by this task are the pseudotopographic history or characterization for the plant community types comprising each plot. The latter information is vital to determining the differential rate responses for the individual species comprising each plant community type when used in conjunction with species association data through monitoring the current vegetative structure in Indicator Areas.

Assessing the Effects of Coastline Alteration on Sea Turtle Nesting and Faunal Assemblages at Cape San Blas, Florida

Principal Investigator: Raymond R. Carthy

Co-Principal Investigator: Margaret Lamont Funding Agency: U.S. Department of Defense/Eglin Air Force Base Expected Completion: 10/31/2008 (UF59990) Graduate Students: Russell Scarpino Field Technicians: Celeste Warner, Lori Brinn, Burnie Brinn, Scott Warner



The beaches along Eglin Air Force Base property on Cape San Blas, Florida are extremely dynamic; however they also support significant groups of nesting sea turtles and foraging shorebirds. The eastern beach of Cape San Blas undergoes accretion, whereas the western coast experiences some of the greatest erosional rates in Florida. From June 1994 to September 1995, approximately 10 m of sediment was eroded from west beach (Lamont et al. 1997). Frequent hurricanes in this area also caused

severe coastline alteration in a short amount of time thereby forcing coastal species to quickly adapt. In addition to natural erosion, the coast of Cape San Blas is becoming increasingly influenced by man-made changes. Beach nourishment, rock abutments, and sea walls all help protect beach-front homes but also alter sand movement and offshore current patterns, which may greatly affect coastal species, such as nesting sea turtles and foraging shorebirds.

Genetic studies have indicated loggerhead turtles nesting along the northern gulf of Mexico represent a unique stock (Encalada et al., 1998), and the greatest density of loggerhead turtle (Caretta caretta) nesting in this region occurs along 5-km of beach owned by the U.S. Air Force on Cape San Blas. Researchers at the Florida Cooperative Fish and Wildlife Research Unit have been monitoring loggerhead turtle on EAFB along Cape San Blas since 1993. This information has provided valuable information on sea turtle nesting density, population size, species composition, and site fidelity. In addition, it has been suggested that loggerhead turtle nesting numbers throughout Florida are declining.

Continued monitoring of this unique loggerhead turtle nesting group will help determine whether long-term trends are declining and assist in evaluating management plans to reverse these trends.

In addition to supporting nesting sea turtles, Cape San Blas also supports a large number and wide variety of shorebirds, including many threatened and endangered species. Piping plovers (Charadrius melodus) forage along these beaches and snowy plovers (Charadrius alexandrinus)

nest on Cape San Blas. The consistent pattern of erosion and accretion influences the food supply for shorebirds and pressure from human activities alter their nesting substrates. Nesting sea turtles and foraging shorebirds face many natural and man-made threats along EAFB property on Cape San Blas, Florida. The Floria Coop Unit's 14 years of monitoring these species in this area provides a unique opportunity to assess population characteristics that require long-term datasets. Increases in sea level and human activities along coastal regions will greatly impact those species trying to adapt to the ever-changing conditions. Information gathered during this study will help better understand this habitat and the species that rely on it for survival.



Assessment of Beach Compaction and Associated Effects on Loggerhead Sea Turtles (Caretta caretta) Nesting on Natural and Nourished Beaches in Northwest Florida

Principal Investigator: Raymond R. Carthy

Co-Principal Investigator: Lori A. Brinn Funding Agency: U.S. Fish and Wildlife Services Expected Completion: 9/30/2008 (UF#60640) Graduate Student: Lori A. Brinn Field Technicians: Burnie B. Brinn



Beach nourishment is increasing in scope and execution as a response to coastal erosion in Florida. However, if nourished sand has different properties than natural sand, then the beach ecosystem may be altered. Regulatory agencies maintains specifications for nourishment. The reproductive effort of nesting sea turtles requires a suitable incubation environment: the effects of substandard fill material may be immediate (false crawl) or sublethal (poor incubation environment). Our objective was to determine if the physical properties of sand on postnourishment beaches differed from natural beach sand, and whether any differences observed appeared to affect nesting loggerhead (Caretta caretta) sea turtles. Compaction, bulk density, water content, color (chroma and value), and grain

size distribution were analyzed on seven pairs of nourished beaches and natural beaches along the Florida Panhandle in summer 2006. We hypothesized that any differences in these physical properties on nourished versus natural beaches could affect loggerhead sea turtle nesting success. While compaction measurements are often the primary method of evaluating beaches postnourishment, measuring shear resistance may provide a more complete picture of a sea turtle's perception of the beach during nest chamber excavation. In summer 2007, shear resistance measurements were taken alongside compaction readings, using a digital torque wrench attached to a magnified shear vane that was rotated over a 90 degree angle. Data on loggerhead sea turtle nesting (nesting and hatching success) on the study beaches was obtained from the Florida Marine Research Institute and examined for patterns that could be related to sand quality and nourishment status. Information from this study will be used to formulate recommendations in support of resource management practices in northwest Florida. We would like to thank the US Fish and Wildlife Service and the donors and representatives of the 2008 International Sea Turtle Symposium for their financial support.

OBJECTIVES:

Our objective was to determine if compaction and associated physical properties of sand used for nourishment differed from those of natural beach sands, and if any differences observed caused appeared to affect nesting sea turtles and their hatchlings.

PROGRESS:

In summer 2007, 27 core soil samples per beach were taken again on the same 16 beach sites along the Florida Panhandle studied in 2006 (total = 432 samples). Compaction and shear resistance measurements were taken alongside each sampling site. Each core sample was dried for 24 hours at 105°C in a gravity convection oven. Bulk density, gravimetric water content, and volumetric water content of samples were calculated. Samples were transported to Gainesville, FL where they were analyzed on the basis of color (chroma and value) and grain size distribution under laboratory conditions. The 2006 sea turtle nesting data were obtained from the Florida Fish and Wildlife Research Institute, and 2007 data will be obtained when available. In 2008, statistical tests will be completed, and final results will be written up and presented.



Pensacola, Florida

Photo: Lori Brinn

Adaptive Habitat Management for Florida Scrub-Jays at Merritt Island National Wildlife Refuge

Principal Investigator: H. Franklin Percival Co-Principal Investigator: Fred Johnson



Funding Agancy: U.S. Geological Survey Expected Completion: 4/30/08 (UF57425)

Problem Statement: Florida scrub-jays (*Aphelocoma coerulescens*) are threatened with extinction due to loss and degradation of scrub oak (*Quercus* spp.) habitat. This study concerns the development of an adaptive strategy for the restoration and management of oak scrub at MINWR, which contains one of the few remaining core populations of scrub-jays.

Background: Oak scrub is maintained by

frequent fire, but landscape fragmentation and fire

suppression have resulted in many scrub communities that are no longer capable of supporting scrub-jay populations. Prescribed burning has thus become the primary management tool in reserves where the viability of scrub-jays and other scrub species is an important objective. However, questions persist about the most appropriate application of fire at MINWR because of an incomplete understanding of fire dynamics and plant community succession, and because of constraints on burning imposed by Kennedy Space Center. MINWR also contains large areas of long-unburned scrub, which have to be mechanically cut before they can be maintained through prescribed burning. These restoration activities also have been problematic because they tend to accelerate the growth rate of oaks and reduce the flammability of the landscape.

Progress: There are documented differences in the demographic success of jays among discrete classes of scrub height (<120 cm or "short," 120-170 cm or "optimal," >170 cm or "tall," and a combination of optimal and tall or "mixed"), and our objective was to calculate a state-dependent management strategy that would maximize the long-term growth rate of resident jays. We used aerial imagery to estimate annual transition probabilities among the four scrub-height classes under three possible management actions: scrub restoration (mechanical cutting followed by burning), a prescribed burn, or no intervention. A strategy prescribing the optimal management action for observed proportions of scrub-height classes was derived using stochastic dynamic programming. Scrub restoration was optimal only on sites dominated by mixed and tall scrub, and burning tended to be optimal for intermediate levels of short scrub. The optimal action was to do nothing when the amount of short scrub was >30%, because short scrub mostly transitions to optimal height scrub (i.e., that with the highest demographic success) in the absence of intervention. We also examined an alternative model of scrub succession, which posited that restoration increased the growth rate of scrub and reduced the flammability of the landscape. Under this alternative, restoration was never an optimal management action and burning was prescribed even for sites with a relatively large amount of short scrub. We demonstrated how this model uncertainty can be recognized explicitly in the calculation of optimal management strategies. We also demonstrated how the probabilities describing the respective models' predictive capability can be updated over time based on a comparison or predicted and realized system changes. Informative changes in model probabilities can occur as an unplanned byproduct of the management process or by using management actions to help with model discrimination. Currently, we are in the process of working with MINWR staff to develop the operational elements necessary to implement either of these adaptive approaches to management.



Florida Scrub-Jays are at risk of extinction due to loss and degradation of scrub habitat. MINWR contains almost 8800 ha of potential Scrub-Jay habitat, but only about 13% of this was considered in optimal condition in 2000. We propose to conduct a formal decision analysis for the prescribed burning of Scrub-Jay habitat on MINWR. The product of this decision analysis will be a management strategy, which will account for constraints on management actions, for uncontrolled stochastic effects, for key uncertainties in system dynamics, and for imprecision in habitat and population monitoring programs.

Development of Unmanned Aerial Vehicles for Assessment of Wildlife Populations and Habitats: Phase 3

Principal: H. Franklin Percival

Co-Principal Investigator: Peter Ifju, Funding Agency: U.S. Geological Survey Expected Completion: 12/31/09 Biological Scientist: Adam Watts

The purpose of this project is to pursue enhancements to an existing unmanned aerial vehicle (UAV) system to improve its present applicability and future potential for a variety of natural-resource uses. The research is interdisciplinary in nature and includes engineering, ecological, photogrammetric, and remote sensing elements and experts in those disciplines.

OBJECTIVES: Research objectives and major tasks of this three-year project include, but are not limited to, the following:



- 1. Improvements in construction and electronics to enhance the reliability and ease of operation of the aircraft.
- 2. Progress in the development of geographical referencing capability for imagery collected from the aircraft.
- 3. Training of personnel for testing of a complete UAV system for research and management applications.
- 4. Development and testing of thermal infrared (TIR) sensor capability.
- 5. Evaluation of operating and maintaining a UAV system.
- 6. Exploration of future UAV system enhancements for remote-sensing applications.

PROGRESS:

At the end of 2007, FCFWRU/UF has met most of the objectives of the project's 2007 timeline. These objectives included producing an autonomous UAS; training Corps personnel to operate the UAS; and testing the system to determine enhancements that would be needed in the future.

In early 2007, the FAA announced that UAS operations in the National Airspace System would not be allowed except under certain closely-controlled circumstances. These circumstances ran against many of the objectives of the Corps of Engineers' intended uses for the UAS; consequently, much project time was devoted to working through issues of legality. A major breakthrough in this unexpected situation came late in 2007 as the Army's Aviation Engineering Directorate announced that an Airworthiness Release document would be approved for the UFproduced UAS, thus allowing operations by the Corps of the UAS over a range of habitats. At the beginning of 2008, the project awaits official delivery of the UAS to and acceptance by the Corps Jacksonville District. Desired future outcomes by the Corps include increased training and support of UF in beginning UAS operations. The research goals of FCFWRU and the operational objectives of USACE will need to be combined in order to improve the perceived success of this project.

This interdisciplinary project funded by US Army Corps of Engineers will produce an unmanned aircraft system designed specifically for assessing wildlife populations and habitats whereas the vast majority of UASs are for military and para-military uses.



Southeastern Adaptive Management Group (SEAMG)

Principal Investigator: H. Franklin Percival

Co-Principal Investigators: Robert M. Dorazio, Fred A. Johnson Funding Agencies: Florida Fish & Wildlife Conservation Commission / U.S. Geological Survey / U.S. Fish & Wildlife Service Expected Completion: 12/31/2009 (UF62829)

The Southeastern Adaptive Management Group (SEAMG) was created in 2001 for the purpose of achieving a better science-based approach to wildlife conservation and management. The principal mission of the group is "To better integrate research and management for the purpose of improving how natural resource management decisions are made.? As part of this mission, the SEAMG is responsible for exploring and developing quantitative tools that improve and facilitate the integration of research and management. A distinguishing feature of the SEAMG is that it seeks ways to achieve a heightened level of integration between researchers and managers. At this level of integration, management actions themselves are viewed as opportunities for learning through experimentation, and the selection of management actions generally includes compromises between the (possibly) long-term value of learning and the short-term value of achieving more immediate management objectives. However, practical considerations also are expected to constrain the selection of management actions in most, if not all, resource management problems. A truly integrated program of research and management potentially offers great rewards; however, it is far more difficult and more costly to achieve than the more common situation where research is conducted in support of management without any direct involvement in the selection of alternative management actions. The SEAMG is interested in finding ways to achieve higher levels of integration in the activities researchers and managers to improve the decisions in problems of natural resource management and conservation. Institutional arrangements for establishment and operation of the SEAMG are described in a formal Cooperative Agreement among signatories of the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service (USFWS), and the Florida Fish and Wildlife Conservation Commission (FFWCC). It is guided by a Steering Committee Statistics and the Program for Environmental Statistics at the University of Florida. SEAMG scientists interact closely with scientists and managers of cooperating organizations to solve problems of natural resource management.
American Alligator Distribution, Size, and Hole Occupancy and American Crocodile Juvenile Growth and Survival

Principal Investigator: H. Franklin Percival Co-Principal Investigators: Frank J. Mazzotti Funding Agencies: U.S. Army Corps of Engineers Expected Completion: 6/30/2007 (UF50174-50188-50189)



The Water Resources Development Act (WRDA) of 2000 authorized the Comprehensive Everglades Restoration Plan (CERP) as a framework for modifications and operational changes to the central and southern Florida project needed to restore the south Florida ecosystem. Provisions within WRDA 2000 provide for specific authorization of an adaptive assessment and monitoring program. A Monitoring and Assessment Plan (MAP) has been developed as the primary tool to assess the system-wide performance of the CERP by the Restoration, Coordination, and VERification (RECOVER) program. The MAP presents the monitoring and supporting enhancement of scientific information and technology needed to measure the responses of the South Florida

ecosystem. This project proposes to: 1) design and develop a monitoring program for relative distribution, size (condition), nesting and hole occupancy rates of the American alligator in response to CERP projects as specified in the MAP: 2) monitor changes in alligator populations throughout Greater Everglades ecosystems due to restoration over short (body condition), medium (distribution, hole occupancy) and long (nesting) temporal scales; 3) design and develop a monitoring program for growth and survival of crocodiles in areas that will be affected by CERP projects; and 4) conduct crocodile surveys as expressed in the MAP based on geographic area and including nesting effort and success and juvenile growth and survival.

Progress in 2007

Task 1- was the completion of second round of surveys regarding alligator distribution and condition and captures of alligators were conducted in twelve (12) areas. Task 2 – Alligator nesting ecology, no alligator nesting ecology work was conducted this quarter. Task 3 – No alligator hole mapping and occupancy work was conducted this quarter. Task 4 – Estimate juvenile growth and survival rates of crocodiles in areas affect by CERP projects; the spotlight surveys were performed of accessible coastal and estuarine shoreline from western Everglades National Park around the coast to the mouth of the Miami River, including Key Largo, Barnes and Card Sounds and Biscayne Bay. Plan for first quarter 2008 (Task 1) – to evaluate hydrologic conditions to determine the start of night light surveys. Task 2 & 3, no work scheduled for Alligator Nesting Ecology and Alligator Hole Mapping and Occupancy. Task 4, spotlight surveys will be performed of accessible coastal and estuarine shoreline from Everglades City around the coast to the mouth of the Miami River, including Everglades National Park, Key Largo and Biscayne Bay to estimate juvenile growth and survival rates of crocodiles in areas affect by CERP projects.

Alligator Distribution, Size, and Hole Occupancy and Crocodile Juvenile Growth and Survival (Continued)

Principal Investigator: H. Franklin Percival

Co-Principal Investigators: Frank J. Mazzotti Funding Agencies: U.S. Army Corps of Engineers Expected Completion: 04/01/2008 (UF569014, #69015, #69016)



Responses of crocodilians are directly related to suitability of environmental conditions including hydropattern. Correlations between biological responses and environmental conditions contribute to understanding of species' status and trends over time. Positive or negative trends of this indicator relative to hydrologic changes permit assessment of positive or negative trends in restoration impacts. Restoration success or failure would be evaluated by comparing recent and future trends and status of crocodilian populations with historical population data and model predictions; as stated in the CERP hypotheses related to alligators and crocodiles (CERP MAP section 3.1.2.5 and 3.1.2.6, 2004). Importantly, these data can be used in an analysis designed to distinguish between effects of CERP and non-CERP events such as hurricanes or droughts.

Data from this MAP project will be used to develop, refine, and validate spatially explicit crocodilian population models, which can then be applied in setting interim goals and targets. This project also fills a critical research need (refining crocodile/salinity relationship) identified as part of RECOVER recommendations for setting interim goals and targets.

The objectives and work proposed here follow the recommendations from the MAP, Part 2: 2006 Assessment Strategy for the MAP and the RECOVER GE Trophic Sub-team, to enhance and build upon research and monitoring programs for alligators and crocodiles that have been funded as part of the CESI, Modified Water Deliveries, and RECOVER MAP. This work is designed to satisfy requirements for monitoring changes in alligator and crocodile populations over different time scales as a result of restoration.

OBJECTIVES:

<u>Alligators</u>

1. Finish developing and testing a monitoring program for relative distribution, size (condition), nesting and hole occupancy rates of the American alligator in response to CERP projects as specified in the MAP. The monitoring program and procedures developed will provide the baseline for future comparisons and an effective means for evaluating restoration success for the American alligator in the GE ecosystem.

2. Monitor changes in alligator populations due to restoration over short (body condition), medium (distribution, hole occupancy) and long (nesting) temporal and spatial scales.

Crocodiles

1. Finish developing and testing a monitoring program for nesting, condition, growth and survival of crocodiles in areas that will be affected by CERP projects.

2. Monitor changes in nesting, condition, growth, and survival of crocodiles in response to CERP projects.



Experimental Evaluation of a Habitat Enhancement Project for Fish and Wildlife at Gant Lake, Florida

Principal Investigator: Mike S. Allen, Wiley M. Kitchens, H. Franklin Percival Funding Agencies: Florida Fish and Wildlife Conservation Commission Expected Completion: 12/20/2013 (UF65181)

Many Florida lakes have experienced altered hydrologic regimes due to channelization and water control structures for flood control, agriculture, and water supply activities. Altered hydrology has resulted in stabilized water levels compared to historical regimes and modified temporal (i.e., within and among year) patterns in water levels. Stabilized water levels allow dense emergent plants to flourish in the narrow zone of lake fluctuation, which leads to excessive deposition of organic matter and eventual loss of littoral habitat for fish, including recreationally important sport fish (Moyer et al. 1995; Allen and Tugend 2002). These degraded vegetation communities have been characterized as dense (percent-area coverages of 90-100%), with extremely high plant biomass (> 50 kg/m2) and poor habitat for fish (e.g., low dissolved oxygen) (Moyer et al. 1995; Allen and Tugend 2002).

To mitigate the influence of altered hydrology on fish habitat, The Florida Fish and Wildlife Conservation Commission (FWC) has conducted some of the world's largest lake habitat enhancement projects. Enhancement efforts have focused on lake drawdowns and muck (i.e., organic plant material and sediment) removals, with the goal of improving sport fish populations, angler access, and fishing quality. Although habitat enhancements improve fish habitat in the treated areas (Allen and Tugend 2002), these efforts do not always cause significant lake-wide increases in the population abundance and angler catch rates of sport fish such as largemouth bass Micropterus salmoides (Allen et al. 2003).

Minns et al. (1996) argued that freshwater habitat enhancement efforts should focus on ecosystem and multi-species benefits rather than benefits to a single species or group. Lake habitat enhancement projects have the potential to benefit all components of lake ecosystems including wildlife (e.g., amphibians, reptiles, birds) and fisheries resources. However, work is needed to understand the collective wildlife and fish community responses and processes, which can then be used to maximize the benefits of habitat enhancement efforts on lake ecosystems. Our proposal to evaluate the wildlife and fish community responses to a habitat enhancement project at Gant Lake, Florida has begun and is finishing the first year of field research. Our research approach will measure habitat characteristics and fish and wildlife community composition and abundance at Gant Lake and two control lakes before and after the habitat enhancement effort.

OBJECTIVES

This project is evaluating the wildlife and fish community responses to a habitat enhancement project at Gant Lake, Florida. The objectives of this study are to:

1) characterize aquatic vegetation communities including defining the environmental variables structuring these communities temporally and spatially within the littoral reaches of the lake.

2) quantify habitat composition including substrate type, water depth, and aquatic plant abundance and community composition before and after the habitat enhancement at Gant Lake with comparison to two reference systems, and

3) quantify fish and wildlife community composition and abundance before and after the habitat enhancement with comparison to two reference systems.

PROGRESS:

The protocol for characterizing the aquatic vegetation communities in the littoral reaches of the lake were taken from previous research done on Lake Tohopekaliga in central Florida. Thus far, habitat sampling occurred at Gant Lake, Johnson Lake and Lake Lindsey in June 2007 and December 2007, at the peak and end of the growing seasons.

Vegetation sampling involves cutting the stems of all plants within a 0.25m² area plot at the sediment surface at 24 randomly-selected locations on each lake during each sampling period. Plants are separated by species and the number of stems are counted and weighed in the field. There are eight vegetation sample locations in each of the three vegetation strata at Gant Lake, and 12 vegetation sample locations in each of the two strata at Johnson Lake and Lake Lindsey.

The vegetation data collected thus far in the first sample of the peak and the end of the growing season will be coupled with the vegetation sampling of the coming project year to gain insight into the habitat communities of Gant Lake. The data will be used to develop a multivariate statistically based regression tree modeling capability, CART and/or MRT. This modeling will provide managers both a descriptive and predictive capability defining plant community structure and responses to the habitat manipulation. Thus far no analysis has taken place but will for the June 2008 annual report to FWC.

The herpetofaunal community of Gant Lake has been sampled by littoral vegetation strata three times this year in April and October 2007 and January 2008. Because of the extended drought during the summer we were not able to sample during July 2007. However, in following years the lake will be sample four times a year. The two reference lakes were each sampled four times because of sufficient water levels.

Each sample occasion consisted of six consecutive trapping days per lake. Fifteen permanent trapping transects were randomly placed at each lake. Each transect of Gant Lake has three individual trap locations, one in each of the three vegetation stratum at the approximate midpoint of each stratum. One crayfish trap and one minnow trap, each constructed of ½-inch vinyl coated hardware cloth, are used at each trap location. During the sampling period, each trap is checked every 24 hours and its contents are identified, counted, weighed, and measured depending on the species captured. The animals are then released at the trap site. After the initial 48-hour sampling period, the traps are moved 10 meters to the left or right for 48 hours, then in the other direction for another 48 hours. This sampling design results in a total of 45 trap locations per stratum per sample period.

Effects of Environmental Mercury Exposure on Development and Reproduction in White Ibises

Principal Investigator: Peter Frederick

Funding Agency: U.S. Army Corps of Engineers *Expected Completion:* 9/30/2008 (UF58961) *Graduate Students:* Nilmini Jayasena, Evan Adams *Bird Keepers:* Leslie Straub, Bobbie Jo Sampson

The South Florida environment has been highly contaminated with methylated mercury, but the effects on this contamination on animals at top trophic levels is impossible to project from existing information. The role of mercury in determining reproduction and survival of fish eating birds is of particular importance, since these parameters are also considered to be key to achieving a restored Everglades. This project is designed to understand the potential effects of environmentally relevant methylmercury exposure on the development, behavior, reproduction, health and endocrine function of a representative long-legged wadding bird, the White Ibis. Birds will be raised from a young age in a large free-flight aviary, and maintained on diets with 0, 0.05, 0.1 and 0.3 mg methylmercury/kg food. Effects will be examined by measuring growth parameters, health parameters, behavior, fecal hormone levels, and reproduction.

OBJECTIVES:

- Establish a captive population of ibises and develop methods to maintain them on predetermined levels of dietary mercury.
- Examine the effect of methylmercury in a controlled environment on behavior, endocrine function, health, growth and reproduction.
- Relate any effects to the wild state by modeling effects at the population level.

Monitoring of Wading Bird Reproduction in WCAS 1, 2, and 3 of the Everglades

Principal Investigator: Peter Frederick Funding Agency: U.S. Army Corps of Engineers Expected Completion: 3/30/2009 (UF54346) Graduate Students: Rena Borkhataria, Kate Williams Research Coordinator: John Simon Field Technicians: Sam Edmonds, Andrew Spees, Becky Smith, Elizabeth Kreakie

The proposed work is to continue a long-term monitoring project that annually measures responses of breeding wading birds to hydrological conditions in the water conservation areas of the Everglades. This project is compatible and integrated with a larger effort designed to monitor reproductive responses of wading birds to Everglades water management and restoration activities, from Lake Okeechobee to Florida Bay. Responses monitored will be numbers of nesting pairs of 8 species (nesting effort) and reproductive success and productivity of selected species (White Ibises, Wood Storks, Great Egrets, Snowy Egrets) in large and regionally significant colonies.

OBJECTIVES:

- Annually document numbers of nesting pairs in WCAs 1, 2, and 3 of the Everglades through the use of aerial and ground survey techniques.
- Develop new methods for estimating numbers of nests, particularly in large colonies.

Wading bird nesting responses (timing, location, numbers of nests) are an important variable in evaluating the success of the Comprehensive Everglades Restoration Plan (CERP). Although records of nesting wading birds go back to the late 1800's and the coverage has been thorough in some parts of the Everglades for a decade, there are several parts of the south Florida ecosystem that have not been surveyed at all, or have not been surveyed regularly or systematically. The purpose of this CERP-funded MAP project is to expand coverage of the surveys to give a comprehensive picture of nesting in the south Florida ecosystem, including Lake Okeechobee, the Water Conservation Areas, Big Cypress National Preserve, Holey Land and Rotenberger, Everglades National Park and Florida Bay. Not all species of wading birds are considered of equal importance in monitoring the success of CERP, and the focus is now on large white species, especially Wood Storks, White Ibises, Snowy Egrets, and Roseate Spoonbills. Four entities were involved in the systematic surveys – University of Florida (BICY and WCAs), Florida International University (Lake Okeechobee), National Audubon Society (Florida Bay) and Everglades National Park (ENP).

During this reporting period, we were engaged in analysis of the data and reporting. Between September and December 2007, we:

- Tallied numbers of nesting birds, checked data and collated information on numbers of birds detected in monthly aerial and ground surveys in the Everglades.
- Performed analysis of photos collected during 2007 to estimate nesting attempts that may be missed either because of vegetation or because of asynchronous nesting. This technique produces estimates of turnover that can be in a super population analysis. We have completed about 75% of this work to date for the 2007 nesting season.
- Hired three technicians and located field housing for the 2008 field season.

This project allows for the estimation of wading bird nesting effort and success in the Everglades. This information is annually used to assess progress of the Comprehensive Everglades Restoration Program, and to increase understanding of wading bird management and ecological interactions

Wading Bird Colony Location, Size, Timing and Wood Stork Nesting Success

Principal Investigator: Peter Frederick

Funding Agency: U.S. Army Corps of Engineers *Expected Completion:* 10/30/2009 (UF68415) *Research Staff:* John Simon, Kate Williams

The proposed work is to continue a long-term monitoring project that annually monitors responses of breeding wading birds to hydrological conditions in the water conservation areas of the Everglades, and to monitor reactions of Wood Storks (*Mycteria americana*) to hydrological change. While this work continues the work carried out over the past decade, this project expands the area covered to include nesting in Big Cypress National Preserve and Everglades National Park, and to facilitate and standardize surveys occurring in Florida Bay and Lake Okeechobee.

This work is to continue a long-term monitoring project that annually documents responses of breeding wading birds to hydrological conditions and restoration efforts, and to expand the coverage of these surveys to include Everglades National Park and Big Cypress National Preserve. In addition, we hope to document specific responses of Wood Storks to restoration activities. A final goal is to ensure coordination and standardization of breeding wading bird surveys in the entire watershed, from Lake Okeechobee to Florida Bay. This will greatly enhance our ability to detect both system-wide responses, and to compare responses in different parts of the ecosystem.

At the close of 2007 we had:

- tallied numbers of nesting birds, checked data and collated information on numbers of birds detected in monthly aerial and ground surveys in the Everglades.
- Performed analysis of photos collected during 2007 to estimate nesting attempts that may be missed either because of vegetation or because of asynchronous nesting. This technique produces estimates of turnover that can be in a superpopulation analysis. We have completed about 75% of this work to date for the 2007 nesting season.
- Coordinated the collation of data and narrative for the 2007 annual report due in late December 2007.
- Finished the Plan of Work for this project.

This research and monitoring project is designed to enhance restoration of Everglades wading bird populations through understanding of the mechanisms by which wading birds reproduce, particularly in relation to hydrological manipulations. In addition, this project is also aimed at gathering key information that will allow defensible projections of the demographics of endangered Wood Storks.

Historic Pond Restoration in the Florida Panther National Wildlife Refuge

Principal Investigator: Carrie Reinhardt Adams

Co-Principal Investigator: Michael Kane Funding Agency: U.S. Fish and Wildlife Service Expected Completion: 5/1/2008 (UF63308) Graduate Students: Scott Stewart, Danielle Watts Research Staff: Nancy Steigerwalt, Christine Wiese, Stacy McCauley

In the Comprehensive Conservation Plan for Florida Panther National Wildlife Refuge, the U.S. Fish and Wildlife Service (USFWS) identifies the restoration of the historical ponds and wetlands on the refuge as critical for development of wading bird and epiphytic orchid habitats, and ensuring ecological diversity. As a consequence of both natural and man-made impacts on hydrological regimes, many ponds and wetlands found in the Refuge have experienced deterioration in both their function and biodiversity. This is especially important since 26% of the plants and 45% of the animals listed as threatened or endangered are directly or indirectly dependent on these habitat types for survival. To mitigate further degredation, the USFWS have developed the following priorities:

- Protect, restore and manage candidate, threatened and endangered species and their habitats.
- Protect, restore and manage migratory birds and protect, restore and manage their habitats.
- Protect, restore and manage wetlands and other freshwater habitats.
- Protect, restore and manage for biodiversity.

Excavation

Several of the pond sites will be excavated to historic depths (approx. 3-4 ft.). Over the past 50+ years, alterations in hydroperiod and fire regime have allowed ponds to fill in with unnatural vegetation and to preclude the existence of open water habitat and associated aquatic plants and animals. These ponds will, by design, be incorporated within suitable surrounding excavation to provide water storage, fish habitat and a littoral zone. This habitat will support aquatic and wetland plants.

Floristic List Development and Traditional Plant Propagation

A floristic list of the native aquatic and emergent wetland and other plant species common to the pond habitats will be compiled. Propagules of selected species, including seed (when available), above ground stem and rhizome cuttings, will be collected onsite and transported to the University of Florida, Gainesville. When available, seed will be germinated in plug trays in a controlled environment glasshouse. Stem cuttings and/or rhizome cuttings will be propagated in plug trays and placed under intermittent mist until shoot development and rooting is achieved. For some species, the propagation method called micropropagation will be used (see below). Regardless of propagation method, plantlets will be hardened off under reduced misting and increased light. Prior to pond revegetation, plugs will be transported to Florida Panther National Wildlife Refuge for further growth and acclimatization in the greenhouse facility.

Plant Micropropagation Procedures

Micropropagation is defined as the rapid clonal production of plants on a sterile culture medium under conditions of light and temperature. The technology has been applied to the commercial production of horticultural crops for more than 50 years. With respect to habitat restoration, the

technology provides the opportunity to select, store and mass produce many aquatic/wetland plant genotypes for pond/wetland restoration. Production of multiple clones of different genotypes of the same species also allows for the selection of genotypes with phenotypic characteristics which enhance restoration. The plant culture facility at the Florida Panther National Wildlife Refuge will be used to maintain some of the aquatic/wetland plant cultures. The ultimate product will be acclimatized plants in plug trays. Prior to use in the pond restoration projects, plug trays will be further acclimated in the Florida Panther National Wildlife Refuge greenhouse.

Historic Pond Restoration

Studies will be conducted in degraded ponds that have been excavated and contoured to provide littoral planting shelves of various sizes and slopes. Plant species will be planted in littoral zones similar to those observed in existing ponds. For each species, the effects of plant genotype, planting density and water depth on plant establishment, growth and cover will be examined over multiple growing seasons. Effects of different planting designs on requirements for post-planting maintenance will be assessed.

OBJECTIVES:

The overall goal of the proposed research is to develop best management practices for efficient and ecologically-sound pond restoration procedures which will ensure re-establishment of habitats critical to threatened and endangered flora and fauna. The specific objectives of the project are to:

- Excavate a minimum of three historic ponds on the Refuge;
- Develop a floristic list of the aquatic/wetland species associated with the historic ponds on the Refuge
- Collect aquatic and wetland plant propagules (seed, stem and rhizome cuttings) from numerous on-site genotypes for propagation by greenhouse seed/cutting propagation and micropropagation;
- Provide ecologically focused input into the elevation and contour design and resultant hydrologic regime of the excavated ponds which will ensure long-term sustainability and decreased post-planting maintenance;
- Evaluate effects of genotype, planting density and elevation on establishment of propagated aquatic and wetland species over numerous growing seasons;
- Evaluate post-planning maintenance practices which promote long-term sustainability of the plant community in the restored ponds.

Directing Succession Through Adaptive Management in National Wildlife Refuges: Reed Canary Grass Control & Transition to Wetland Forests & Meadows

Principal Investigator: Carrie Reinhardt Adams

Funding Agency: Department of Interior / U.S. Geological Survey Expected Completion: 10/31/2010 (PJ#66026) Graduate Students: Research Staff:

Invasive species present a challenge to the efforts of National Wildlife Refuges (NWRs) to preserve appropriate plant community habitat. Reed canary grass (*Phalaris arundinacea*, RCG) is an invasive plant species that presents such a challenge. This species has partially or heavily infested approximately 37,400 acres of NWRs located in U.S. Fish and Wildlife Service Region 3 (Midwest Region) and Region 6 (Mountain-Prairie Region). To improve management of RCG and assist in the recovery of degraded wet meadow and floodplain forest ecosystems within these NWRs, an adaptive management (AM) framework will be utilized. Through AM, the goal of this project is to generate the information needed for refuge managers to *make good and defensible decisions about when, where, and how to treat RCG for purposes of maintaining or restoring target communities and the wildlife they support* (from RCG Workshop Problem Statement, July 2006, Williams et al. 2007).

OBJECTIVES:

- Conduct initial coordination meeting and annual coordination meeting
- Conduct visits by the science team to the participating refuges to facilitate the selection of experiment sites
- Launch project website
- Design experiments and select sites
- Create a study plan and field protocols
- Train participants and collect initial vegetation monitoring data, seed bank samples and soil samples
 - YEAR 2: Implement experiments and collect pre-treatment and response data
- Collect pre-treatment vegetation data
- Implement herbicide treatments at selected sites
- Conduct visits by the science team to participating refuges
- Collect response data
- Conduct annual coordination meeting
- Implement re-vegetation treatments
- YEAR 3: Continue treatments and data collection
- Implement follow-up herbicide treatments
- Collect response data
- Conduct visits by the science team to participating refuges
- Conduct annual coordination meeting
- YEAR 4: Finish data collection and create final report
- Collect response data and write final report

Rapid Delineation of Provenance for Florida Sea Oats Used for Beach and Dune Stabilization

Principal Investigator: Michael Kane

Funding Agencies: U.S. Department of the Interior

Expected Completion: 6/30/2008 (UF#53823) Research Staff: Nancy Philman, Pete Sleszynski, Scott Stewart, Daniela Dutra

Florida's coastal dune system not only provides unique wildlife habitats, it also serves as a natural defense system against erosion resulting from hurricanes and human activity. The extremely active 2004 and 2005 hurricane seasons has resulted in 365 of the 825 miles of Florida's sandy beach shoreline e now been assessed as critically eroded. Beach and dune restoration typically involves beach renourishment followed by planting of native species for stabilization. The most effective species planted for dune stabilization and building are perennial grasses including Sea oats (*Uniola paniculata*). Nursery-grown sea oats propagated from seed as liners or containerized plants have planting sites. One major ecological concern is the planting of non-adapted sea oats genotypes geographic source of sea oats plants. The overall goal of the project is to develop a reliable genetic database used to delineate and determine the source of sea oats to ensure ecologically sound beach and dune restoration. Ultimately, plant micropropagation technology and cryopreservation will be used to create a germplasm library of multiple genotypes from each major sea oats population. This both ensures a long-term reserve of population specific genotypes for beach and dune restoration.

OBJECTIVES:

- To establish a germplasm library of sea oats genotypes from all major populations along Florida's Atlantic and Gulf coasts.
- To determine the genetic diversity and distance of seedlings collected from the major sea oats populations along the Florida Gulf and Atlantic coasts using AFLP fingerprinting procedures.
- To evaluate use of the sea oats diversity genetic database as a tool to delineate sea oats provenance distance along Florida's Atlantic and Gulf coasts.

PROGRESS:

All immediate objectives have been accomplished. Sea oats seed was harvested from sixteen Florida State Parks or Recreation Areas: Perido Key, Navarre Beach, Henderson Beach, St. Andrews, St. George, Little Talbot Island, Anastasia, Gamble Rogers, Honeymoon Island, Sebastian Inlet, John D. MacArthur, Don Pedro Island, Delnor-Wiggins Pass, John U. Lloyd, and Bill Braggs Cape Florida. Park managers and biologists were consulted to assure that seed was only harvested from areas that had not been replanted. Seed production varied significantly between populations. Seed was surfaced sterilized in a three-step process and germinated *in vitro* on Murashige & Skoog Medium in 150 X 25 mm glass culture tubes. We found that germination could be significantly enhanced by maintaining the culture tubes on a heating mat at about 37 C (Figure 1a). In vitro germination rates and seedling growth varied considerable between the sea oats populations and genotypes (Figure 1b). We have now completed establishment of seed cultures from all sea oats the populations sampled. These data are being analyzed to determine if there are any population specific differences in germination and initial seedling growth. To establish clonal lines, unbranched 7-week old seedlings were transferred to sea oats shoot multiplication medium.

Status, Ecology, and Conservation of Rare and Endangered Florida Orchidaceae-Bletia purpurea

Principal Investigator: Michael Kane

Funding Agencies: U.S. Fish and Wildlife Service Expected Completion: 8/2007 Research Staff: Scott Stewart, Tim Johnson, Daniela Dutra, Philip Kauth

The continuing loss of native orchid habitat throughout the world has lead to an increased emphasis on species-level orchid conservation through comprehensive methods. Orchids cannot be considered independent organisms within their habitats- they are integrally connected to their habitats through mycorrhizae, pollination specialization, and a host of other biotic factors. An integrated view of conservation is critical if orchid species are to be conserved within their natural habitats. The current project will demonstrate the effectiveness of an integrated conservation approach to species-level conservation of the Florida terrestrial orchid Bletia purpurea. In its first phase, this study will examine aspects of both the asymbiotic and symbiotic seed germination of *B. purpurea*. A preliminary asymbiotic seed germination protocol has been determined and will be used to further examine biotic and abiotic factors effecting the growth and development of this native orchid species. The determination of a symbiotic seed germination protocol for *B. purpurea* is currently being planned and will examine not only the physiological role of a mycobiont during germination, but will also explore the role of photoperiod during symbiotic germination. All propagation studies will lead to the greenhouse establishment of plants of *B. purpurea*. These greenhouse plants will eventually be used in translocation and reintroduction studies at the Florida Panther National Wildlife Refuge.

OBJECTIVES:

- Collect and store naturally-pollinated mature seeds of *B. purpurea* for use in later seed germination experiments
- Isolate and identify mycobionts of *B. purpurea* from southwest Florida, and store these mycobionts for use in later experiments
- Determine the asymbiotic and symbiotic seed germination requirements for *B. purpurea*, examining seed germination rates and *in vitro* development
- Develop greenhouse acclimatization procedures for both asymbiotic and symbiotic seedlings of *B. purpurea*
- Suggest an integrated conservation and recovery plan for *B. purpurea* based on the results of the aforementioned studies

Conservation, Ecology and Propagation of Florida Orchidaceae-Eulophia alta and Cyrtopodium punctatum

Principal Investigator: Michael Kane

Co-Principal Investigator: Scott Stewart

Funding Agencies: U.S. Fish and Wildlife Service Expected Completion: 2/2007 Research Staff: Tim Johnson, Daniela Dutra

Continuing loss of native orchid habitat has lead to an increased emphasis on orchid conservation. Classic views of independent species acting in only superficial interactions within a particular ecosystem or landscape are no longer applicable to the conservation of either individual species or entire landscapes. An integrated view of conservation is critical, especially on the species level. The current project will demonstrate the effectiveness of an integrated conservation approach in the species-level conservation of two Florida native orchids- Eulophia alta and Cyrtopodium punctatum. Aspects ob both the asymbiotic and symbiotic seed germination of *E. alta* are being studied. Preliminary asymbiotic seed germination experiments have been successfully completed and refined experiments examining the roles of photoperiod and medium mineral nutrition are in progress. Eleven fungal mycobionts have been isolated from the roots of *E. alta*, and have been used in successful preliminary symbiotic seed germination studies. The pollination and reproductive biology of this species is also being studied. Preliminary observations indicate that both induced autogamy and artificial geitonogamy are possible pollination mechanisms for *E. alta*. Field studies on the pollination mechanism of his species are currently being conducted. An epiphytic orchid reintroduction method has been developed and is currently being tested in preliminary plant reintroductions (C. *punctatum*) within the Florida Panther National Wildlife Refuge. More widespread and comprehensive reintroduction studies using C. punctatum are currently being planned.

OBJECTIVES:

- Collect and store mature seeds of *E. alta*
- Isolate and identify fungal mycobionts of *E. alta*
- Determine the symbiotic and asymbiotic seed germination requirements for *E. alta*
- Produce seedlings of C. punctatum
- Develop plant translocation method for *C. punctatum*
- Develop reliable AFLP technique applicable to Florida native Orchidaceae
- Refine integrated conservation methods for Florida native Orchidaceae

Techniques for Field Establishment and Reintroduction of Calopogon tuberosus Var. tuberosus

Principal Investigator: Michael E. Kane

Co-Principal Investigator: Philip J Kauth

Funding Agencies: U.S. Department of Interior, FWS Expected Completion: 8/30/08 (UF#69941)



While much of the literature regarding orchids focuses on propagation techniques, little information exists on reintroduction, translocation, and field transplanting. Habitat destruction or degradation is responsible for loss of orchid habitat and orchid populations. Reintroduction of seedlings into natural habitats is becoming a popular technique for conservation, but field-establishment often fails. Much of the information regarding re-establishment focuses on seedlings. A major obstacle to field establishment is initial survival. Only a few articles discuss techniques for increasing survival of orchid seedlings. One technique used to increase survival is planting dormant storage organs such as tubers or corms.

Calopogon tuberosus var. tuberosus is a corm forming species found throughout eastern North America including southwest Florida. In south Florida, this species has up to ten magenta flowers that open in succession. The flowering season begins in April and continues through the end of May in south Florida. Seed capsules are fully ripe approximately 6-8 weeks after pollination. Reintroduction of *Calopogon tuberosus* to suitable habitats is the next logical step in a propagation experiment. We have successfully germinated seeds of *C. tuberosus* to the seedling stage, and have successfully grown seedlings from other populations under greenhouse conditions.

OBJECTIVES:

• Reintroduce *Calopogon tuberosus* seedlings and corms to the Florida Panther National Wildlife Refuge (FPNWR).

- Compare survival of seedlings and corms of *C. tuberosus* following field reintroduction.
- Determine the time of year that ensures the highest survival of *C. tuberosus* propagules.
- Establish permanent field transplant plots.
- Determine if mycorrhizal fungi colonize roots of reintroduced propagules.

TASKS

- Germinate seed of *C. tuberosus* in vitro and acclimatize at least 200 seedlings to greenhouse conditions.
- Survey planting sites at the FPNWR for reintroduvction experiments.
- Develop planting/treatment transect grids and plant seedlings at selected planting sites at the FPNWR.
- Complete *C. tuberosum* mycorrhizal symbiont isolation and identification from outplatnted seedlings.

Conservation of South Florida's Orchids—Developing Reintroduction Methods for Eight Native Species Including the State Endangered Ghost Orchid (Dendrophylax lindenii)

Principal Investigator: Michael Kane

Funding Agencies: U.S. Department of the Interior Expected Completion: 8/30/2008 (UF69944) Research Staff:



North America possesses approximately 250 unique species of both epiphytic and terrestrial orchids, with Florida having 118 of those species (56 state endangered, 17 state threatened; Coile and Garland, 2003). Florida native orchids are faced with continual habitat loss due to land conversion to agricultural uses, habitat urbanization, exotic plant invasion, poaching, and habitat mismanagement. While no Florida native orchid is federally-listed as endangered or threatened, many of the state's orchid species face the immediate possibility of extinction if conservation and recovery plans are not developed and implemented.

Given the current rate of ecosystem degradation, fragmentation, and destruction of Florida ecosystems, the stability of Florida's native orchid populations seems uncertain at best. Because of these threats, *in situ* habitat protection may not be enough to protect Florida's native orchids from extinction. Therefore *ex situ* germplasm conservation combined with scientifically sound reintroduction methods should be used to help insure the continued existence of orchids in Florida. This project addresses the current need to develop reintroduction methods for subtropical epiphytic and terrestrial orchids in Florida. In addition, the information gained by using a number of orchid species to test hypotheses about the reintroduction of orchid plants may prove useful in developing effective management and reintroduction plans for orchid taxa throughout North America.

OBJECTIVES:

- Assess the use of various *in situ* reintroduction methods and the effect of substrate on the survival and growth of epiphytic orchids native to south Florida in intact and hydrologically altered habitats.
- Assess the impact of various reintroduction methods on the survival, growth, and recruitment of terrestrial orchids native to south Florida.
- Determine whether home-site advantage improves reintroduction success of *Bletia purpurea* seedlings at various sites within the Florida Panther National Wildlife Refuge.
- Incorporate findings into existing management plans for the study species.

PROGRESS:

Reintroduction methods for epiphytic Florida orchids -

Five epiphytic orchid species (*C. punctatum*, *D. lindenii*, *E. tampensis*, *E. nocturnum*, and *P. cochleata* var. *triandra*) will be used to examine how reintroduction method, substrate, aspect, hydrology, and elevation affect plant survival and growth within the confines of the FPNWR. Seedlings generated using asymbiotic orchid procedures, will be secured to various tree substrates (i.e. *Annona glabra*, *Fraxinis caroliniana*) at various heights with one of three methods: adhesive, monofilament line, or plastic gutter mesh. Preliminary studies have indicated the usefulness of using plastic gutter mesh in the reintroduction of *P. cochleata* var. *triandra* (S. Stewart and L. Richardson, pers. com.) and *E. nocturnum*. In December 2007, a visit was made to the Florida Panther National Refuge to begin surveying

potential sites. The exact number of replications/sites will be determined after a more thorough field site assessment. No fewer than five replicates, each consisting of 10 seedlings, will be performed at as many as five reintroduction sites at the FPNWR. Plants will be introduced both at sites where orchids are currently found, as well as sites where orchids are not found. In this way, seedlings will be used as bioassays for suitable habitat. This may be helpful in identifying key factors that limit the establishment of orchid populations in south Florida. *Reintroduction methods for terrestrial Florida orchids* Two terrestrial orchid species (*E. alta* and *H. odontopetala*) will be used to examine the effect of reintroduction method on survival, growth, and recruitment. Seedlings will be introduced into plots that have been cleared of vegetation mechanically, mowed, burned, or tilled. Unaltered plots will be used as control treatment.

A randomized block design will be used for these experiments. The exact number of replications/site will be determined after a thorough field site assessment. No fewer than three replicates, each consisting of 20 seedlings, will be performed at as many as five reintroduction sites at the FPNWR.

Assessing the importance of home-site advantage on Bletia purpurea reintroduction success Home-site advantage, the result of localized selection pressure, may be a significant factor in dictating the successful introduction or reintroduction of a species. For this study, *B. purpurea* seedlings originating from four locations in the FPNWR will be used in a reciprocal planting to determine whether provenance effects survival and growth. Additionally, seedlings will be planted at sites that do not currently support this species, but which resemble suitable habitat for *B. purpurea* based on dominant vegetation, disturbance regime, and soil composition A randomized block design will be used for this experiment. Each 1 m × 5 m block will contain five treatments consisting of seedlings from five different populations (each occupying a 1 m² plot). Each replicate will contain up to 50 seedlings. A minimum of three blocks will be established at each site.

Data collection and analysis:

For each species of study data will be collected every two months for 12 months. Experimental treatments will be compared to each other and to control treatments by collecting data on seedling survivorship, root growth (number and length), and plant size (height, width, number of shoots, flowering/nonflowering) over the course of the study.

Seed Ecology, Habitat Characterization, and Reintroduction Methods of Rare and Endangered Florida Orchidaceae—Bletia purpurea and Eulophia alta

Principal Investigator: Michael Kane

Funding Agencies: U.S. Department of the Interior Expected Completion: 8/30/2008 (UF64295) Biological Scientist: Nancy Philman Research Staff: Tim Johnson, Daniel Dutra, Philip Kauth,

The continuing loss of native orchid habitat throughout the world has lead to an increased emphasis on species-level orchid conservation through comprehensive methods. Orchids can not be considered independent organisms within their habitats—they are integrally connected to their

habitats through mycorrhizae, pollination specialization, and a host of other biotic factors. An integrated view of conservation is critical if orchid species are to be conserved within their natural habitats. The current project will demonstrate the effectiveness of an integrated conservation approach to species-level conservation of the Florida terrestrial orchid *Bletia purpurea*. In its first phase, this study will examine aspects of both the asymbiotic and symbiotic seed germination of *B. purpurea*. A asymbiotic seed germination protocol has been determined and has been used to further examine biotic and abiotic factors effecting the growth and development of this native orchid species. The determination of a symbiotic seed germination protocol for *B. purpurea* is currently being planned and will examine not only the physiological role of a mycobiont during germination, but also explore the role of photoperiod during symbiotic germination. All propagation studies will lead to the greenhouse establishment of plants of *B. purpurea*. These greenhouse plants are to be eventually used in translocation and reintroduction studies at the Florida Panther National Wildlife Refuge.



OBJECTIVES YR2: a) Collect and store naturally-pollinated mature seed of B. purpurea for use in later seed germination experiments. b) Isolate and identify mycobionts of *B. purpurea* from southwest Florida, and store these mycobnionts for use in later experiments. c) Determine the asymbitoic and symbiotic seed germination requirements for B. purpurea, examining seed germination rates and in vitro development. D) Develop greenhouse acclimatization procedures for both asymbitoic seedlings of *B. purpurea* 3) Suggest an integrated conservation and recovery plan for *B. purpurea* based on the results of the aforementioned studies.

PROGRESS: Mature seed (flowering year 2006) of *B. purpurea* had been collected from sites within the Florida Panther National Wildlife Refuge (FPNWR, Collier Co.) in southwest Florida. All seed was

stored according to standard practices in the cold-storage collection housed at the Kane lab (University of Florida-Gainesville).

During this period, procedures for optimum asymbiotic seed germination and seedling acclimatization were developed for *Bletia purpurea*. Six asymbiotic orchid seed germination media Knudson C, *Phyto*Technology Orchid Seed Sowing Medium, Malmgren Modified Terrestrial Orchid Medium, Vacin & Went Modified Orchid Medium, ¹/₂-strengh Murashige & Skoog, and BM-1 Terrestrial Orchid Medium were examined for their effectiveness in promoting seed germination and protocorm development of *B. purpurea* in either complete darkness or 16/8 h L/D photoperiod. Germination occurred regardless of photoperiod or germination medium. However, advanced seedling development (Stage 6) only occurred on Vacin and Went under the 16/8 h L/D photoperiod. Further effects of photoperiod on *in vitro* seedling development from seed germinated on Vacin & Went medium were also examined. Shoot length, leaf width, root

number, root length, fresh weight and dry weight measurements were all significantly different for 16/8 h L/D photoperiod when compared to 8/16 h and 12/12 L/D photoperiods. *In vitro* seedlings readily acclimatized to greenhouse conditions. Seedlings acclimatized on Fafard 2 developed more roots and a greater average fresh weight. However, seedlings grown in Fafard 4 potting mix displayed a significantly greater leaf production, longer shoots and roots. Corm formation occurred regardless of the potting media. A referred paper describing these results has been submitted for publication (see below).

An experiment to determine a symbiotic seed germination protocol is being planned. In addition, an experiment examining the effects of photoperiod during symbiotic seed germination of *B*. *purpurea* is also being prepared.

Mycobionts were isolated from the roots of *B. purpurea* collected from within the FPNWR (Collier Co.). The identification and characterization of these isolates indicated that one mycobiont was *Fusarium oxysporum*, an ascomycete not typically associated with endophytic, root inhabiting orchid mycorrhizzae. The other mycobiont was an unidentified member of the Basidiomycotina. Clearly more research is required for the isolation and identification of mycobionts of *B. purpurea*.



Factors A

obwhite

(Colinus virginianus) on Babcock/Webb Wildlife Management Area, Charlotte County, Florida

Principal Investigator: Ralph W. Dimmick

Co-Principal Investigator: Madan Oli Funding Agency: Florida Fish and Wildlife Conservation Commission Expected Completion: 6/30/2009 (PJ#62565) Research Staff: Susan Dimmick, Steven Brinkley, Jeff Hostetler Field Technicians: Gerald Coker, Amy Brinkley, Chris Jones Babcock/Webb WMA has been an important recreational resource in south Florida since at least the early 1940's, with quail hunting being a particularly significant activity on the area for more than a half-century. Bobwhite populations have varied widely over time, as have the annual harvest and hunting pressure. Since 1981, the annual harvest has declined to a persistently low level, and the population has not produced summer gains comparable to those experienced prior to 1981. Hunting effort remained relatively constant at less than 2000 hunter-days until 1988. Following that season, hunting pressure increased markedly, peaking at 4000 hunter-days in 1992. A decline in harvest and productivity preceded the increase in hunting pressure by 7 or 8 years. Available data suggest that neither harvest nor hunting pressure may be the dominant factor suppressing population recovery, but neither do the data imply that hunting pressure and/or harvest may not be contributing factors.

Other environmental and demographic factors may be interacting to influence population behavior. Such factors may include non-hunting mortality of adults and chicks, nesting effort and success rates, habitat quality and availability, and catastrophic events such as hurricanes or extended drought.

The basic hypotheses to be tested are that neither harvest nor hunting pressure influences bobwhite population demographics significantly on Babcock/Webb WMA. Three levels of hunting pressure and harvest have been established by regulation on the WMA. Zones A-D permit hunting 4 days per week for 6 consecutive weeks beginning in November. Zones A and B each admit 10 hunters per day, providing a hunting opportunity for 240 hunter-days and a potential seasonal harvest of 1440 birds in each zone. Zones C and D allow unlimited hunter access with equivalent daily bag limits, but a potential harvest limited only by the total number of hunters who choose to hunt there.

The Field Trial Course permits 2 days hunting for 25 hunters in January with a potential harvest of 600 bobwhites.

Other data to be obtained and evaluated will include spring call counts of territorial males, fall covey counts, and survival rates, nest success rates, home range size, and habitat use as determined by radio-telemetry techniques. Weather information from regional weather stations will be evaluated to detect patterns or unusual events that may impact elements of bobwhite survival or ecology on the WMA.

OBJECTIVES:

- To determine if annual survival rates of bobwhites on the three experimental hunt units are related to hunting pressure.
- To determine if survival rates are related to annual harvest.
- To determine if productivity is influenced by harvest and /or hunting pressure.
- To delineate nest success rates and factors influencing nest success including predation and weather.
- To identify and quantify non-hunting mortality factors affecting bobwhite survival.
- To identify habitats utilized and preferred by bobwhites seasonally.
- To delineate home range size and movement patterns related to habitat, disturbance, and weather events.

• To chronicle hunter perceptions and behavior related to hunter access and harvest regulations.

PROGRESS:

- For the period 10 Oct 2002 to 23 Dec 2007, 1841 bobwhites were captured and 1730 were radio-tagged.
- Currently, 81 quail are being radio-tracked.
- During 2007, from April 1 to October 11, 50 bobwhite nests were located. Of these nests, 26 hatched (52%), 21 were destroyed, and 3 were abandoned.
- 32 of 77 females that were alive on 4/01/2007 were known to incubate a nest. These females incubated a total of 46 nests, an average of 1.4 nests per nesting female.
- The cohort of 77 females alive on 4/01 produced 24 successful nests (1 successful nest per 3.2 hens).
- 18 of the 77 females survived until the end of the nesting season (October 11).
- 4 of 69 males alive on 4/01/2007 incubated 4 nests.2 hatched, 1 was destroyed, and 1 was abandoned.
- 25 of the 69 males survived until the end of nesting season (October 11).
- Quail hunters logged 876 hunter-days during the 2007 quail hunting season, harvesting 937 bobwhites (1.1 birds/hunter-day). The mortality rate due to hunting (retrieved birds and non-retrieved cripples) was estimated to be 39.3%.
- The number of hunter-days was slightly higher than the targeted number (848), but the measured harvest was markedly lower than the projected harvest. Including an estimated crippling loss of 12.2%, the total harvest was 1051 quail. The projected harvest was assumed to be 1402 quail for the measured 867 hunter-days, based on a projected harvest of 1.5 quail per hunter-day. The actual harvest in 2007, including retrieved quail and estimated crippling loss was 1051 birds. This was a harvest of 351 birds fewer than projected. This difference reflected lower hunting success than anticipated (1.1 birds/hunter day vs. 1.6).

Evaluating Decomposition dynamics, Community Composition, and Ridge-Top Senescence in the Ridge-Slough Mosaic in Response to Climate Change and Water Management.

Principal Investigator: Mark W. Clark

Co-Principal Investigator: Todd Osborne *Funding Agency:* Department of Interior / U.S. Geological Survey *Expected Completion:* 03/31/2010 (PJ#65362) *Research Staff: Field Technicians:*



The proposed work will build on the findings of Clark et al. (2003, 2004), Lewis (2005 and Jorczak (2006) Previous research was conducted under a CESI funded project titled: Spatial Variability and Modeling of Soil Accretion in Shark River *Slough*. That study evaluated ridge and slough vegetative characteristics, accretion rates and mechanisms of formation. Findings from

that study indicate that although soil surface elevation varied between ridge and slough communities, underlying bedrock surface elevation did not significantly vary and did not vary in any pattern similar to surface soil characteristics. This suggests that mechanisms regulating differences in surface soil topography are mostly independent of bedrock geomorphologic factors and instead driven by the interaction of biologically mediated organic and inorganic matter deposition with environmental forcing functions such as fire, hydrology and nutrient regime. Differences in standing biomass production within ridge and slough communities indicate a large difference in potential organic matter input to these systems. Investigation of the quality (nutrient content and tissue fiber recalcitrants) indicated that species most commonly found in ridges (C. jamaicense) have three times greater amounts of residual fiber (lignin) than species found in wet prairie or slough communities. In addition, C:N ratios indicate that ridge biomass has a greater limitation for nitrogen than that of slough biomass suggesting a reduced decomposition rate. Therefore, based on tissue recalcitrants and C:N ratio, tissue being produced in ridges indicates a slower decomposition rate potential than that of sloughs. This combined with increased biomass production rates in ridges suggest that Ridges have a greater soil accretion rate potential than slough habitat. To corroborate these findings a decomposition study was preformed using litter bags. C. jamaicense tissue (representing ridge biomass) and Eleocharis spp. (representing slough biomass) were deployed in ridge and slough environments. Findings suggest that tissue characteristic is the primary regulator of litter decomposition (Eleocharis spp. decomposed faster than C. jamaicense) followed by environmental conditions (ridge decomposition faster than slough decomposition rate) although both factors had significant effects. Lastly it was found that a lowering of water level 15cm below the soil surface was sufficient to double the carbon dioxide respiration rate in ridge and slough communities suggesting a significant influence of hydrologic management on the rate of litter decomposition.

MAP funding of this research will provide for investigations that directly address the concerns for maintenance of the ridge slough mosaic as described in the Greater Everglades Wetlands Module section 3.1.4.4 by targeting two priority components, vegetation communities and peat soils, as defined by CERP. Because the sustainability of the unique landscape found in the ridge slough mosaic is both a restoration target and a performance measure for CERP activities, this research targets the determination of adequate hydrologic parameters to maintain the integrity of unimpacted ridge slough areas and restore impacted ridge slough systems. The proposed research design will enhance our understanding of the relationships between factors driving the ridge-slough system by providing a means to evaluate the different environmental and ecological modulators of the ridge-slough mosaic and investigate the extent and magnitude of current threats to the sustainability of this system.

OBJECTIVES:

YEAR 1: Meetings for finalizing workplan, locate field sites, initiate mesocsom experiments, intitate ramet transplant study

YEAR 2: Continue field research on mesocosm and ramet transplant

YEAR 3: Conclude filed rasearch and data analysis, prepare final reports, and participate in AT Committee final report process.



Regional Distribution of Soil Nutrients - Hierarchical Soil Nutrient Mapping for Improved Ecosystem Change Detection

Principal Investigator: Todd Z. Osborne

Co-Principal Investigator: Matthew J. Cohen *Funding Agency:* Department of Interior / U.S. Geological Survey *Expected Completion:* 03/31/2009 (PJ#65365)

The proposed research enhances and builds-upon previous work funded by the South Florida Water Management District (SFWMD) for mapping soil nutrients throughout the Greater Everglades. The Everglades Soil Mapping (ESM: K.R. Reddy - Principle Investigator [PI], S. Newman – Co-PI) was intended to provide a regional benchmark for restoration assessment (Bruland et al. 2006, Corstanje et al. 2006). Soil nutrients and other chemical and physical

attributes integrate environmental condition; monitoring soils as performance measures of ecological restoration progress requires a regional benchmark. The scope of ESM was comprehensive: samples were obtained via helicopter from over 1300 locations throughout Everglades National Park (ENP), Big Cypress National Preserve (BCNP), the Water Conservation Areas (WCAs) and various other parcels comprising the Greater Everglades. Samples, collected during 2003-2004, were analyzed for a suite of key biogeochemical indicators that have been used to both improve understanding of regional ecological dynamics and also to specify a comprehensive benchmark for future studies. Our proposed MAP activities interface directly with the ESM project and will be implemented by the personnel responsible for much of the ESM work. In particular, this project focuses on change detection. Future iterations of the comprehensive sampling protocol developed in the ESM project will provide maps of key variables that can be compared with 2004 conditions. The key problem will be determining whether observed differences arise from natural variability, which is known to be substantial even over short distances in the Everglades, or from regional ecosystem responses to restoration efforts. In order to effectively evaluate change, additional data are required on small-scale variability, spatial patterns of local ecosystem-driven variability and signal detection; the MAP activities that we propose will assist in this regard, greatly enhancing the interpretive value of additional soil monitoring efforts, which have a high probability of being implemented as soon as 2008.

A second project funded by the Department of Interior (DOI) as part of the Critical Ecosystems Studies Initiative (CESI) [Cohen, M.J., PI] focused on novel techniques for soil analysis (see Cohen et al. 2005 for technique). That project has demonstrated potential for optical sensing technologies to provide accurate and low-cost (~\$1 per sample for a full analyte suite) soil property estimation (see Table 1 for optical sensing prediction efficiency). Efficacy for Everglades systems means that future efforts for regional soil nutrient mapping can dramatically enhance spatial resolution with no increase in sample analytical costs. The MAP activities described herein will increase our understanding of the appropriate spatial resolution and methodology for monitoring efforts given the constraints on interpretation described above, cost, temporal sampling frequency and analytical properties.

OBJECTIVES:

Mapping soil quality (nutrients, carbon quality, process dynamics) has recently been undertaken as part of an effort to characterize baseline conditions for performance assessment of Everglades recovery activities. While large scale maps are useful for characterization of spatial pattern, several layers of uncertainty limit use as measures of performance and restoration progress. In particular, large scale maps (Greater Everglades) make specific assumptions about short range variability that are not well quantified. Nugget variance (variability in space over short separation distances) directly confounds use of baseline map products because future spatial sampling will not, in practicality, be at identical locations. If nugget variability is high, then significant uncertainty about ecosystem change arises from not knowing if observed differences arise from intrinsic ecosystem processes or from responses to human management. *Our primary objective is to determine the extent to which spatial variability and sampling uncertainty confound ecological change detection*. We will use hierarchically nested sampling of soils to establish nugget variability so that change through time can be assigned as observational uncertainty or management response.

YEAR 1: Meetings for work plan and finilazation of work plan, literature review, determine field sites, field sampling, initiate laboratory anlaysis, reporting. YEAR 2: Conclude laboratory anlaysis, semi-variogram development, metrics of change analysis, variance partitioning, reporting

Lake Apopka North Shore Restoration Area Alligator Monitoring Study

Principal Investigator: H. Franklin Percival Co-Principal Investigator: Raymond R. Carthy Funding Agency: Fish and Wildlife Service Expected Completion: 02/01/08 (PJ#70779) Research Staff: Amanda Waddle Field Technicians: Rio Throm, Edward Larrivee

The restoration of Lake Apopka greatly depends on the ability to restore the structure and function of approximately 20,000 acres (8,100 ha) of wetlands along its north shore, the North Shore Restoration Area (NSRA). The north shore marsh was drained and farmed for several decades. The impoundment and succeeding non-point pollution caused eutrophication and

contributed to the impairment of Lake Apopka. In the late 1990s, the St. Johns River Water Management District (SJRWMD) and Natural Resources Conservation Service (NRCS) began efforts to restore the north shore marsh for the restoration of Lake Apopka. Restoration of the north shore has been hindered because levels of residual organochlorine pesticides (OCPs) in soils from historic agricultural applications in certain flooding blocks may pose a threat to wildlife, including migratory birds and threatened and endangered species.

American alligators (*Alligator mississippiensis*), top order predators, have been shown to accumulate OCPs, and considerable data exist for the species on Lake Apopka (Campbell 2003). Because adult females have a limited home range, consume a variety of prey items, and have easily identifiable nests; monitoring their level of exposure, hatching success, and habitat use can provide some measure of ecosystem health and trends in specific areas of the NSRA ecosystem. Monitoring OCP levels and hatch rates in alligators may aid in evaluating remediation efforts and trends in OCP accumulation in a top level, oviparous predator.



OBJECTIVES:

Task 1: Determine alligator nesting distribution and density

Aerial surveys will be conducted to determine alligator nesting distribution and density on Lake Apopka proper and on the NSRA. These aerial surveys will also aid in the location of alligator nests and the collection of the alligator eggs.

Task 2: Collect and incubate alligator egg clutches We will collect 30 alligator egg clutches from Lake Apopka and 30 alligator egg clutches from the NSRA. These clutches of eggs will be transported to the Florida Fish and Wildlife Conservation Commission's Research Lab, 4005 South Main Street, Gainesville, Fl. 32611. The clutches will be artificially incubated in a specially designed incubator that will be kept at a constant temperature and humidity level appropriate for egg incubation and development.

Task 3: Collect yolk samples for contaminant analyses

We will collect yolk from 2 eggs per clutch, one from a viable and one from an unviable egg. These samples will be placed in a small labeled container and placed in an ultra cold freezer. Once all samples are collected they will be sent to Pace Lab for analyses.

Task 4: Viability analyses on alligator clutches

Number of alligators successfully hatching and living ≥ 1 day will be recorded and used to analyze and compare clutch viability among study sites. This will give us an idea if contaminant levels affect alligator clutch viability.

Task 5: Release hatchling alligators

All hatchling alligators will be weighed, measured, and tagged. These alligators will then be released at nest site.

Lake Apopka North Shore Restoration Area Amphibian Monitoring Study

Principal Investigator: Raymond R. Carthy Co-Principal Investigator: H. Franklin Percival Funding Agency: Fish and Wildlife Service Expected Completion: 02/01/08 (PJ#68282) Research Staff: Field Technicians

The restoration of Lake Apopka greatly depends on the ability to restore the structure and function of approximately 20,000 acres (8,100 ha) of wetlands along its north shore, the North Shore Restoration Area (NSRA). The north shore marsh was drained and farmed for several decades. The impoundment and succeeding non-point pollution caused eutrophication and contributed to the impairment of Lake Apopka. In the late 1990s, the St. Johns River Water Management District (SJRWMD) and Natural Resources Conservation Service (NRCS) began efforts to restore the north shore marsh for the restoration of Lake Apopka. Restoration of the north shore has been hindered because levels of residual organochlorine pesticides (OCPs) in soils from historic agricultural applications in certain flooding blocks may pose a threat to wildlife, including migratory birds and threatened and endangered species.

Amphibian populations, especially anurans (frogs and toads), may serve as a great indicator of overall ecosystem health (Dale and Beyeler 2001) in the Lake Apopka marsh. Amphibians can readily absorb environmental contaminants through their integument, as well as through their gastrointestinal tract, with contaminants being one of many hypothesized causes for global amphibian declines (Collins and Storfer 2003). Recent research has demonstrated that amphibians can transmit contaminants to their offspring through eggs (Hopkins et al. 2006) and that endocrine disruption and other sub-lethal effects of pesticides have the potential to reduce survival and reproduction of amphibian populations (Hayes et al. 2006).

In this study, we plan to combine population level data with existing data on the spacial distribution of OCP contaminants and this will allow for an examination of the relationships between OCPs and the distribution of anuran species. This would allow testing of the hypothesis that higher levels of contaminants result in lower occupancy (or probability of occurrence) of anurans on a species-by-species basis. This type of sampling and analysis would address an

important ecological question, and provide the framework for a monitoring program that would be well suited to an adaptive management program for the restoration and management of the north shore marsh.

The scope of work, project timeline, and budget are described below. The results of this project will be used to assess the usefulness of examining and comparing amphibian populations with OCP to determine if these areas with residual pesticide concentrations affect wildlife.

OBJECTIVES:

Task 1: Anuran site-occupancy estimations

Anuran population sampling will be conducted using a standardized visual encounter survey approach (Crump and Scott 1994). During these surveys anurans observed will be captured, identified to species, and measured snout-to-urostyle length (SUL). In addition, all species of anurans heard vocalizing will be noted. Environmental data will also be collected. Anuran data will be analyzed in the site occupancy framework described in Mackenzie et al. (2006).

Task 2: Pig Frog captures for contaminant analysis

Pig frogs will be captured at night and euthanized by rubbing Benzocaine in the form of Orajel brand dental analgesic on the ventral surface. These frogs will be wrapped in tin foil and placed in a zip lock bag on ice until they are taken to a freezer. Pig frogs will be captured from 4 areas for a comparison of pesticide levels. Once all samples are collected they will be sent to Pace Lab for analysis.

Science Fellowship for Assessment of Coastal Habitats and Listed Species

Principal Investigator: Raymond R. Carthy, PhD. Co-Principal Investigator: Margaret Lamont, PhD. Funding Agency: Fish and Wildlife Service Expected Completion: 02/01/08 (PJ#61306) Research Staff:

The eye-wall of Hurricane Frances, a Category 2 hurricane, and Hurricane Jeanne, a Category 3 hurricane, passed through Archie Carr National Wildlife Refuge on September 5 and September 25, respectively, in 2004. Hurricane force winds swept over the area impacting coastal beach and dune communities. The severity of wind and wave damage to private homes along the beach was compounded by the threat of further erosion caused by the loss of dunes from the hurricanes. This prompted emergency actions to restore sand on the beach and rebuild dunes to protect

private property before the 2005 sea turtle nesting season. Sand was trucked in from upland sources with varying degrees of quality and beach compatibility. Roughly 75% of the area within the Refuge's acquisition boundary received emergency dune reconstruction as part of the hurricane recovery response by FEMA in coordination with Brevard and Indian River Counties. In some cases, armoring in the form of seawalls and geotextile sand tubes were permitted to be constructed to protect homes within the Refuge's acquisition boundary. The beach and dunes on Refuge property, though altered by nature, was left unaltered by man. This can serve as a control when assessing impacts from the different responses. These alterations, by both nature and man, impacted sea turtle nesting in 2005. Further beach restoration activities are planned to be implemented prior to the 2006 sea turtle nesting season. This presents a unique opportunity to investigate how different emergency responses to protect property along the beach affects three listed species of sea turtles, Caretta caretta (loggerhead), Chelonia mydas (green), and Dermochelys coriacea (leatherback). The effects on a guild of other beach dune obligate and facultative species will also be investigated and will have important implications for refuge management. The effects of beach alterations on sea turtles and other species can also have wider management and policy implications locally and statewide. It is important to provide a nonbiased evaluation of the varving responses to hurricane damage in order to properly plan for future hurricane response and recovery activities, which are sure to occur.

Ecology and Conservation of Snowy Plovers In The Florida Panhandle

Principal Investigator: Steven Johnson

Co-Principal Investigator: N/A Funding Agency: U.S. Geological Survey Expected Completion: 06/30/09 (PJ#65109) Research Staff: Field Technicians

In Florida, recent statewide surveys have shown that Snowy Plovers nest along sandy Gulf beaches in two main regions: the Panhandle from Escambia County east to Franklin Co. and Southwestern Florida from Pasco Co. south to Collier Co.. The panhandle region supports the majority of breeding pairs in Florida. Threats to Snowy Plovers include development of beachfront property, disturbance by people and pets, predation, and potential habitat loss or degradation due to coastal engineering activities for shoreline protection such as beach

nourishment, armoring, and/or inlet management. Florida's panhandle has been severely impacted by hurricanes over the past few years. The resulting engineering response with a large number of projects designed to renourish beaches, armor shorelines, and reestablish dunes have the potential to cause major impacts to Snowy Plovers, though little is known about how such projects will specifically affect Snowy Plover nesting, foraging, roosting, and brood rearing ecology. In order to minimize impacts from state or federally sponsored and permitted projects on Snowy Plovers and their habitat (e.g., projects conducted by the Florida Department of Transportation, the Florida Department of Environmental Protection, or the US Army Corps of Engineers), basic ecological research is needed. Such research will form the basis for sound management actions targeted at preventing the species from being federally listed.

The ultimate goal of this proposed project is to collect such data and make management recommendations for Snowy Plovers in Florida. The proposed project will occur over the course of two breeding seasons—Feb.-Aug. 2007 and 2008. It will occur in an area of some of the most densely-nested barrier islands in the panhandle, namely Crooked Island and St. Joseph Peninsula in Bay and Gulf Counties. This is collaborative project among the USFWS, FWC, American Bird Conservancy, and the University of Florida.

OBJECTIVES:

The specific objectives of this project will be developed over the next several months (see project schedule) through a collaborative effort of the project partners and a Snowy Plover Working group. Likely objectives include, but are not limited to the following:

- 1) Determine nest and brood success for two breeding seasons
- 2) Identify sources of nest and brood failure (e.g. predators, disturbance)
- 3) Identify important habitat features of nest sites
- 4) Identify and quantify important brood foraging habitats
- 5) Test the hypothesis that brood success is tied to habitat quality

6) Develop protocols to compare site quality among locations that could be used to evaluate the effects of engineering projects on foraging and/or brood rearing habitat.

Structured Decision Making, Ecological Thresholds and The Establishment of Management Trigger Points

Principal Investigator: Wiley M. Kitchens

Co-Principal Investigator: N/A Funding Agency: U.S. Department of Interior / U.S. Geological Survey Expected Completion: 08/31/2009 (PJ#68409) Research Staff: Julien Martin

Discussions of "ecological thresholds", "acceptable variation" and "management trigger points" occur frequently in discussions of ecological monitoring programs (e.g., Noon 2003). However, these discussions tend to be vague and rambling, with some agreement on the general need for thinking about such issues, but little detail about how to proceed to actually define these concepts either generally or for specific problems (e.g., specific monitored systems). This recognition appears to have motivated the Request for Proposals on this topic as part of the USGS National Park Monitoring Program.

The concepts of "ecological thresholds", "acceptable variation" and "management trigger points" all refer (explicitly or implicitly) to values of system state variables that should prompt specific management actions. In the simple case where a management decision is to perform a single management action or not, the threshold or trigger point simply divides the state space into two regions where management is or is not recommended. For example, if the state variable was population size of an indicator species or species of special interest, then we might seek a population size such that management was recommended if population size declined below this value, but not if population size exceeded the value.

Some discussions about defining such thresholds or trigger points have viewed the problem as one of statistical hypothesis testing (e.g., Skalski 1995, Noon 2003). This framework invites discussion about type I and II error rates and the relative risks associated with these different kinds of errors (e.g., Schrader-Frechette and McCoy 1993). Decisions are then made about what error rates are most likely to yield good decisions with respect to the true objectives of management.

We prefer an approach to decision making that focuses directly on the objectives of management, with an aim to provide decisions that are optimal with respect to those objectives, given existing knowledge (and lack of knowledge) about system behavior. Such an approach clearly distinguishes the components of the decision process that are inherently subjective (objectives, available management actions) from those that are more objective (models of system behavior, estimates of system state). We believe that issues about ecological thresholds, acceptable variation and management trigger points are most usefully considered to be problems in structured decision making rather than as problems in statistical hypothesis testing (Yoccoz et al. 2001, Williams et al. 2002, Nichols and Williams 2006).

Structured decision making is an approach to conservation and management that has been specifically identified by the U.S. Geological Survey and the U.S. Fish and Wildlife Service as an approach meriting increased collaboration between scientists and managers of the two agencies. The U.S. Department of Interior guidance on adaptive management similarly recognizes this specific approach to structured decision making as an approach to be emphasized. In addition to this institutional support, structured decision making, both in general and specifically as a means of integrating monitoring and conservation, has strong scientific support (Walters 1986, Kendall 2001, Yoccoz et al. 2001, Williams et al. 2002, Burgman 2005, Nichols and Williams 2006).

As a final motivation, we note that the approach of structured decision making naturally requires a basis for making predictions about responses of state variable(s) to management decisions (actions or no action); i.e., the approach requires one or more models of system behavior. Thus, the approach naturally involves the integration of models of park systems into the decision making process, the "secondary theme" listed in this request for proposals. We will thus show how models of park systems are used as components of the overall process of making wise management decisions and selecting optimal thresholds for action.

OBJECTIVES:

• We will first provide a conceptual framework for thinking about the concepts of thresholds, acceptable variation and trigger points in terms of a structured decision process. In particular, we

will demonstrate that structured decision making provides a natural framework for such concepts and leads to clear thinking about the nature of such concepts and means of defining them.

- We will provide a step by step procedure that leads to a decision matrix for optimal decisions. Decision matrices specify what management action to take for each possible set of values of the state variable(s) of interest and thus explicitly provide thresholds and trigger points that are optimal with respect to objectives.
- We will work with National Park personnel from one or more parks to implement the approach with one or more example issues. Specifically, we will begin with the development of objectives and available management actions, move to model(s) development, consider the kind of monitoring program(s) available to estimate system state and then develop decision matrices that are optimal with respect to the objectives.

PROGRESS:

Subtask 1: Conceptual publication describing framework for developing thresholds. We have completed an extensive search of the literature concerning the use of the concept of thresholds for conservation. We found that discussions about thresholds often confuse ecological and management thresholds. We also found that successful applications of the concept of thresholds to conservation and management remain limited. Part of the problem may be that the decision process that leads to management actions often lacks a clear conceptual framework. We have initiated a publication that advocates a conceptual framework for thinking about the concept of thresholds in terms of a structured decision process. The essay will present a straightforward procedure that leads to a decision matrix for optimal decisions. Decision matrices specify what management action to take for each possible set of values of the state variables of interest and thus explicitly provide thresholds and trigger points that are optimal with respect to the objectives. This approach will help conservationists think more clearly about thresholds. In particular, it will show how models of system behavior can be used as components of the overall process of making wise management decisions and selecting optimal decision.

<u>Subtask 2</u>: Application to selected National Park

Between September 5th and September 6th 2007 we met with personnel from Denali National Park. The objective of the selected case study is to minimize restrictions on recreational activities in Denali National Park while maintaining a specified proportion of Golden Eagle territories occupied. We identified four management options: (1) no restrictions on hikers and air traffic, (2) a proportion of eagles territories will be closed to hiking, (3) a proportion of flight paths (for recreational activities) will be closed, (4) both hiking and flying in the park will be restricted. We discussed an approach to establish decision thresholds for the Golden Eagle project at Denali. The following steps will include estimation of parameters for modeling the behavior of the system and the use of optimization algorithms to establish decisions thresholds. To accomplish this goal we will first need to compile and format the data on demography and patch occupancy of Golden Eagles in Denali National Park.

A Proposal to Document Floral and Faunal Succession Following Alternative Habitat Usage and Habitat Development

Principal Investigator: Wiley M. Kitchens

Co-Principal Investigator: N/A Funding Agency: Florida Fish and Wildlife Conservation Commission Expected Completion: 07/01/2007 (PJ#68576) Research Staff: Ashley Peele, Melissa Desa, Bradley Shoger

To enhance/restore fishery production in Florida lakes with documented declining fishery habitat, the Florida Fish and Wildlife Conservation Commission (FWC) recently embarked on an initiative to identify those resources which would best respond to restorative treatments. The goal of this effort is to recover the habitat quality and fishery production of the littoral reaches of approximately 30 lakes over the next 20 years. The resulting enhancement projects would typically include: extreme drawdowns, organic sediment removal, minimization of cattail and tussock habitats, creation of upland and in-lake spoil deposits, reestablishment of desirable native aquatic vegetation, and aggressive vegetation management.

While the benefits to Florida fishery resources associated with periodic extreme drawdowns have been documented for more than 30 years, it is known that accrued benefits are time-limited, generally less than 10 years. In an attempt to hasten habitat enhancement and extend the time periods between requisite drawdowns, the FWC initiated a program of mechanically removing tussocks and associated organics during planned drawdown periods as well as fortuitous unscheduled natural drawdowns. The apparent success of this combined drawdown and muck removal procedure for fishery habitat enhancement in demonstration projects has made this technique the preferred enhancement alternative. While these projects have unquestionably resulted in immediate and dramatic increases in short-term fish production, impacts on other resources are less well documented. Only cursory or speculative information is available regarding long-term effectiveness or overall impacts of current restoration techniques on wildlife resources. To date, there have been too few experimental trials to properly evaluate various vegetation responses to mechanical bottom scraping. Questions remain regarding the means and degree of removal required. For example, what are the minimal levels of scraping required to provide target enhancement levels while minimizing potential negative impacts to wildlife and other ecological resources? Are there cost effective configurations of scraped areas and nonscraped areas that meet the same criteria as current techniques? Resolution of these concerns is critical to the continued success and public support for the lake restoration program. The following proposed scope of work is intended to help address these and other strategic information needs to sustain the success of large-scale, extreme drawdowns, and muck removal/redeposition projects.

We propose to provide assessments of usage and habitat quality of the littoral habitats for selected wildlife species and/or guilds along with vegetation surveys and intensive studies of vegetation dynamics of a targeted major lake before, during, and after enhancement activity. This proposal describes one year of a multi-year project, conducted in association with the FWC's habitat enhancement project on Lake Tohopekaliga (Toho). This project was initiated in January 2004 and resulted in the removal and redistribution of approximately 9 million cubic yards of tussock/muck from the lake bottom. This material was subsequently re-deposited in 40+ in-lake sites and approximately 20 upland sites.

Our study was initiated in 2002, prior to the Lake Toho habitat enhancement project, and has been conducted in several phases, including 2 years of pre-enhancement data collection and sampling technique testing and implementation. *This proposal is for year 3 of the post-enhancement monitoring period.*

Vegetation Dynamics and Wildlife Usage Studies.

This project was initiated in Autumn 2004 (post enhancement), and will be 3 years in duration. Specifically we will:

1) Examine post-habitat enhancement vegetation dynamics

2) Asses wildlife use of experimental control and treatment sites* and

3) Continue whole-lake monitoring of wildlife use of the littoral zone (for comparison with prehabitat enhancement conditions).

*Three experimental control and treatment study sites have been established and monitored intensively for the past two years.
An Assessment of Gulf Sturgeon Population Status in the Gulf of Mexico

Principal Investigator: William (Bill) Pine. Funding Agency: Fish and Wildlife Service Expected Completion: 12/31/09 (PJ#69001) Research Staff: H. Jared Flowers



Gulf sturgeon are a Federally listed threatened species endemic to the Gulf of Mexico from approximately Tampa Bay to Texas. A variety of life history, feeding ecology, habitat selection, and population viability studies have been conducted in the last 30 years. However, no stock assessment has been conducted to evaluate the overall status of this species in support of the recovery plan adopted in 1995. A comprehensive stock assessment can be performed using data from a variety of researchers throughout the Gulf of Mexico. This project funded by US Army Corps of Engineers defines critical population parameters for the endangered Snail kite relative to hydrological dynamics within its range. This project funded by the National Marine Fisheries Services will determine the population status of threatened Gulf sturgeon in the Gulf of Mexico as part of ESA mandated Recovery Criteria.

OBJECTIVES: This project will conduct a series of workshops to compile historical data and conduct a stock assessment to assess the current status of Gulf sturgeon and identify areas for future research to fill knowledge gaps identified by the stock assessment.

PROGRESS: Two presentations related to this project were made to cooperators at the 2007 Gulf Sturgeon Science and Management Meeting in Mobile, AL. At this meeting a preliminary workshop schedule for 2008 was set (slides attached). A website (http://floridarivers.ifas.ufl.edu/sturgeon.htm) and email listserve have been created for informing and communicating with collaborators. We have also been working closely with the Florida Fish and Wildlife Conservation Commission (FWC) in developing a web-based database framework that will be used to store and access data shared by cooperators through this project.

Technical Assistance For Continuing Development of Content For Focal Species Website and Bird Conservation Node Website

Principal Investigator: H. Franklin Percival

Funding Agency: U.S. DOI / U.S. Geological Survey *Expected Completion:* 07/30/08 (PJ#69949) *Research Staff:* Elizabeth Martin, Amy Schwarzer

The National Biological Information Infrastructure (NBII) is a broad, collaborative program managed by the U.S. Geological Survey (USGS) whose aim it to provide access to a vast array of biological and natural resources data and information products that support and enhance science-based decision-making. The Bird Conservation Node of the NBII maintains a series of websites and online tools that increase access to existing data and information used to support bird conservation in North America. One of those websites is the Focal Species website (http://focalbirds.nbii.gov), which was developed to support the Focal Species Strategy being implemented by the Migratory Bird Program of the U.S. Fish and Wildlife Service. One hundred and thirty-nine focal species were selected as candidate species for focused conservation action. Campaigns for development and implementation of species action plans for 11 of those species were initiated in 2005, and more will be undertaken in future years to progressively address the rest of focal species. The focal species website maintained by NBII provides a common site to

the

post species action plans as they become available, and in addition it provides general species information and links to existing web resources for those species. This project secures research services from the Florida Cooperative Fish & Wildlife Research Unit of the University of Florida for content development and identification of suitable online resources to populate new focal species pages to be developed by NBII in 2007 and 2008.

OBJECTIVES:

The purpose of this project is to secure technical assistance with content development for new focal species web pages. The following activities will be conducted on selected focal species: (1) research and development of brief summaries of information on why selected focal species are species of concern.

(2) discovery and prioritization of relevant online information resources for focal species and Bird Conservation Node websites, and

(3) identification of species images for use in focal species website.

It is expected that content for 10-15 new focal species will be developed by this project.

PROGRESS:

Five focal species were identified by the U.S. Fish and Wildlife Service in 2007 for development of action plans. Amy Schwarzer, a graduate student at the University of Florida, provided technical assistance to this project during the fall semester of 2007. Amy researched and developed summary paragraphs for the selected five focal species, contacted focal species working group coordinators to solicit input on descriptions and recommended online resources, solicited electronic images for use in the website, and searched for other appropriate online resources relevant to the biology and conservation of the selected focal species. Amy provided to the Bird Conservation Node manager a list of online resources, descriptive paragraphs, and potential images for each selected focal species, as well as photographer permissions to use potential images in the focal species website. Amy also communicated with the focal species website page **developer** during review of existing online resources.

Evaluating Endocrine Disruption in Fish Exposed to Waters at Turkey Creek

Principal Investigator: Nancy Denslow

Co-Principle Investigator: Nancy Sazbo Funding Agency: U.S. DOI / U.S. Geological Survey Expected Completion: 07/30/08 (RWO 247 - PJ#69949) Research Staff: Elizabeth Martin, Amy Schwarzer

Okaloosa darter populations that live in streams subjected to municipal effluent sprayfields are depressed and reproduce with minimal success. This study is designed to support a holistic evaluation of the chemical stressors that are impeding the recovery of darter populations. Although the initial goal is identification, the eventual objective is reduction or elimination of the stressors. To model contaminant exposures



experienced by the Okaloosa darter, adult male fathead minnows (FHM)

L to R, Roxana Weil, Dr. Iris Knoebl, Dr. Nancy Szabo, Dr. Nancy Denslow will be caged at three Turkey Creek sites and two reference sites for 48 hr. At the end of the exposure, the fish will be sacrificed and tissues will be collected for RNA expression using the FHM microarray (15,000 genes) and contaminant (Priority Pollutant Metals) assay. Semipermeable membrane devices (SPMD) and POCIS (polar organic chemical integrative samplers) will be deployed for a minimum of one week in the waters at the three exposure sites and at one of the reference sites as a means of evaluating average contaminant levels (chlorinated hydrocarbons and estrogenic hormones).

OBJECTIVES:

1) Expose caged fathead minnows in 3 Turkey Creek and 2 reference sites for 48 hr to model contaminant exposure experienced by the Okaloosa darter.

2) Measure changes in gene expression in the liver and the gonad of FHM from all sites to determine pathways that are affected by the exposures.

3) Validate the changes by real time RT-PCR for 6 genes of interest

4) characterize contaminants present at the Turkey Creek site by measuring levels of priority pollutant metals in the carcasses of caged fathead minnows and levels of organochlorine pesticides (OCP), total polyaromatic hydrocarbons (TPAH), total polychlorinated biphenyls (TPCB), and estrogenic hormones in water extracts from the Turkey Creek sites and from one reference site. This project provides a holistic evaluation of chemical stressors in Okaloosa darter streams subjected to municipal effluent sprayfields using the fathead minnow as a model. In addition to evaluating the minnows using microarray for comparison of gene activity among fish from the Turkey Creek and reference sites, we will also monitor priority pollutant metals, chlorinated hydrocarbons, and estrogenic compounds from impacted and reference site.

COMPLETED PROJECTS of Florida Unit....

WINTERING FEEDING ECOLOGY OF BLACK SKIMMERS ON THE FLORIDA GULF COAST

Investigator: Personnel: Completion Date: L.D. Harris B. Black 1981

WINTER FOOD HABITS AND FACTORS INFLUENCING THE WINTER DIET OF RIVER OTTER IN NORTH FLORIDA

Investigator: Completion Date:

L. Cooley 1983

FEEDING ECOLOGY OF THE COMMON MOORHEN (GALLINULA CHLOROPUS) AND PURPLE GALLINULE (PORPHYRULA MARTINICA) ON ORANGE LAKE, FLORIDA

Investigator:	W. Gregory
Personnel:	R. Conrow
Completion Date:	December 1984

NEST SITE SELECTION AND HABITAT USE BY LARGEMOUTH BASS

Investigator:	R.W. Gregory
Personnel:	N.A. Bruno
Completion Date:	December 1984

SITE-SPECIFIC REDUCTION OF MANATEE BOAT/BARGE MORTALITIES IN FLORIDA

Investigators:	H.F. Percival
	R.W. Gregory
Personnel:	M.F. Kinnaird
Completion Date:	May 1984

Investigator: R. Mulholland Completion Date: 1983

MONITORING RIVER OTTER POPULATION: SCENT STATIONS VS. SIGN INDICES

Investigator: Completion Date: M. Robson 1983

ASPECTS OF THE THERMAL BIOLOGY AND ECOLOGICAL CONSIDERATIONS OF THE BLUE TILAPIA

Investigator:J.A. McCannPersonnel:A.V. ZaleCompletion Date:December 1984

WINTER FOOD HABITS AND FACTORS MANAGEMENT

INFLUENCING THE WINTER DIET OF RIVER OTTER IN NORTH FLORIDA

Investigator: Personnel: H.F. Percival L.S. Cooley

HABITAT PREFERENCE OF EARLY LIFE STAGES OF FISHES IN ORANGE LAKE, FLORIDA WITH AN EVALUATION OF EVALUATION OF ALLIGATOR SAMPLING METHODS WINTER ECOLOGY OF RING-NECKED DUCKS IN NORTH-CENTRAL FLORIDA Investigators: H.F. Percival

J. Thul Personnel: C.W. Jeske Completeion Date: August 1985

REPRODUCTIVE BEHAVIOR AND FLORIDA WILD TURKEY (MELEAGRIS GALLOPAVO OSCEOLA) NESTING

Investigator: Completion Date: L. Williams 1985

EVALUATION OF ALLIGATOR HATCHLINGS REMOVAL FROM WILD POPULATIONS IN FLORIDA

Investigator:H.F. PercivalPersonnel:M.L. JenningsCompletion Date:March 1986

MITIGATION OF FISH AND WILDLIFE VALUES IN ROCK-MINED AREAS OF SOUTH FLORIDA

Investigators: R.W. Gregory H.F. Percival Personnel: R.W. Repenning Completion Date: August 1984

WILDLIFE VALUES OF SOUTHEASTERN BOTTOMLAND FORESTS

Investigator: L.D. Harris Completion Date: September 1984

THE STATE OF KNOWLEDGE OF GRAY FOX HARVEST

Investigators:	R.F. Labisky
	S.R. Humphrey
	H.F. Percival
Personnel:	J.A. Hovis
Completion Date:	January 1984

EGG VIABILITY FROM FOUR WETLANDS IN FLORIDA

Investigators:	H.F. Percival
	A.R. Woodward
Personnel:	M.L. Jennings
Completeion Date:	April 1988

PREFORMANCE OF THE FEMALE

HABITAT USE, MOVEMENTS,MIGRATION PATTERNS, ANDSURVIVAL RATES OF SUB-ADULT BALD EGLES IN FLORIDAInvestigators:M.W. CollopyPersonnel:P.B. Wood

Completion Date: December 1991

EFFECTIVENESS OF WILDLIFE CROSSING STRUCTURES ON ALLIGATOR ALLEY (1-75) FOR REDUCING ANIMAL/AUTO

BIOMETRICAL SUPPORT FOR GFC'S GAINESVILLE RESEARCH LABORATORY

Investigator: Personnel:

Completion Date:

H.F. Percival C.L. Abercrombie T. O'Brien June 1985

EVALUATION OF CAPTIVE BREEDING AND REINTRODUCTION OF THE FLORIDA PANTHER

Investigator: J.F. Eisenbert Completion Date: June 1985

MOVEMENT AND SURVIVAL OF CAPTIVE-REARED GHARIALS IN THE NARAYANI RIVER, NEPAL

Investigator:H.F. PercivalPersonnel:T.M. MaskeyCompletion Date:December 1988

BLACK BEAR HABITAT VARIABLES

Investigator: L.H. Harris D. Maehr Personnel: C.W. Jeske Completion Date: July 1985

COLLISIONS

Investigators:S.R. HumphreyPersonnel:M.L. FosterCompletion Date:December 1991

USE OF CORTICAL BONE STRATIFICATION TO DETERMINE AGE IN AMERICAN ALLIGATORS

Investigators: A.R. Woodward C. Woodard Completion Date: June 1991

RESEARCH/MANGEMENT PLAN FOR THE CRYSTAL RIVER WEST INDIAN MANATEE POPULATION

LEVY & CITRUS COUNTIES, FL (RW01 Investigator: R.W. Gregory H.F. Percival

Completion Date: December 1983

POPULATION INDEX AND MARK/ RECAPTURE METHODOLOGY FOR THE WEST INDIAN MANATEE IN FLORIDA

Investigators: Completion Date:

H.F. Percival August 1985

FORAGING HABITAT REOUIREMENTS **OF THE RED-COCKADED WOODPECKER IN PINE HABITATS OF NORTH FLORIDA**

Investigator: Personnel: Completion Date:

R.F. Labisky M.L. Porter September 1984

HABITAT SUITABILTY INDEX MODELS FOR GULF OF MEXICO COASTAL HABITATS

Investigators:	R.W. Gregory
-	H.F. Percival
Personnel:	R. Mulholland
Completion Date:	November 1984

EFFECT OF NUTRIENT LEACHING ON FISH SPAWINING & NURSERY HABITAT IN GREAT LAKES NEARSHORE WATER

Investigators:	R.W. Gregory
-	H.F. Percival
Personnel:	L.C. Brasel
Completion Date:	November 1984

STATUS SURVEY OF THE FLORIDA GRASSHOPPER SPARROW

Investigators:	M.L. Delany
-	H.F. Percival
Personnel:	J. Cox
Completion Date:	March 1985

STATUS SURVEY OF FIVE MAMMALS SHERMAN'S SHORT-TAILED SHREW PINE ISLAND RICE RAT, SANIBEL **ISLAND RICE RAT, CHADWICK BEACH COTTON MOUSE, AND HOMOSASSA SHREW**

Investigators: Personnel: Completion Date: S.R. Humphrey R.W. Repenning January 1986

STATUS SURVEY OF THE SCHAUS' SWALLOWTAIL IN FLORIDA

Investigators:	T.C. Emmel
Completion Date:	March 1985

EFFECTS OF LOW ALTITUDE TRAINING FLIGHTS ON FLORIDA'S BROWN PELICAN

AND WADING BIRD COLONIES Investigators: M.W. Collopy Personnel: B.B. Black P.G. Bohall Completion Date: January 1985

HABITAT USE & MANAGEMENT

OF SHERMAN'S FOX SOUIRREL (Sciurus niger shermani) Investigators: S.R. Humphrey Personnel: A.T. Kantola Completion Date: June 1986

DEVELOPMENT OF HYBRID GRASS CARP PRODUCTION TECHNIOUES

Investigators: J.V. Shireman Completion Date: September 1984

STUDIES OF GRASS CARP IN **AOUATIC WEED CONTROL**

Investigator: J.V. Shireman Completion Date: October 1984

CONCEPTUAL MODEL OF SALT MARSH MANAGEMENT ON MERRITT ISLAND, FLORIDA

Investigators: C.L. Montague H.F. Percival Personnel: A.V. Zale Completion: December 1984

PANCREATIC NECROSIS VIRUS **AS A PATHOGEN OF STRIPED** BASS

Investigators:	R.W. Gregory
	W.M. Kitchens
	J.V. Shireman
Personnel:	S. Wechsler
Completion:	May 1987

ECOLOGY AND MANAGEMENT OF IMPOUNDED COASTAL WETLANDS OF THE GEORGIA BIGHT (RWO 19)

Investigators: Personnel: Completion Date: C.L. Montague H.F. Percival A.V. Zale June 1985

FACTORS AFFECTING REPRODUCTIVE SUCCESS OF SEA TURTLES ON CAPE CANAVERAL AIR FORCE BASE (RWO 20 & 25) Investigators: R.F. Labisky

Completion Date: September 1984

STATUS SURVEY OF THE ROSEMARY WOLF SPIDER IN FLORIDA (RWO21)

Investigators: J. Reiskind Completion Date: April 1985

DTERMINATION OF THE FOOD HABITS OF MANATEES (RWO 22)

Investigators:	G.B. Rathbun
	H.F. Percival
Prsonnel:	L.A. Hurst
Completion Date;	August 1985

POPULATION ANALYSIS AND ROOSTING AND FEEDING FLOCK BEHAVIOR OF BLACKBIRDS DAMAGING SPROUTING RICE IN SOUTHWESTERN LOUISIANA (RWO23)

Investigators: R.F. Labisky N.R. Holler Personnel: K. Brugger Completion Date: September 1989

THE ECOLOGY AND MANAGEMENT OF HYDRIC HAMMOCKS (RWO 24)

Investigators: Personnel: Completion Date: S.R. Humphrey S. Vince Julyu 1988

PRODUCTION, STERILITY, AND FOOD HABITS OF BIGHEAD CARP (RWO26)

Investigators: J Completion Date: J

J.V. Shireman July 1987

EVALUATION OF POPULATION PARAMETERS OF BLACK DUCK (RWO27)

Investigators: H.F. Percival M.J. Conroy M. Haramis Personnel: D.G. Krementz B.R. Charest Completed: July 1987

STATUS OF THE CAPE SABLE SEASIDE SPARROW IN EAST EVERGLADES

Investigators: W.R. Marion Personnel: T. O'Meara Completed: September 1987

EVALUATION OF ELECTRO-FISHING SYSTEMS FOR QUANT-ITATIVE SAMPLING OF BLUE

TILAPIA (RWO29)

Investigators: H. Schramm Completed: May 1986

A COMPARISON OF PASSERINE FEEDING HABITS IN TWO TIDAL MARSH COMMUNITIES (RWO30)

Investigators: G.W. Tanner W.M. Kitchens Personnel: L. Peterson Completed: January 1989

EVALUATION AND CONTROL

OF BIRD DAMAGE TO RICE (RWO31)

Investigators: M. Avery H.F. Percival P. Lefebvre

Personnel: D. Daneke Completed: December 1987

THE ECOLOGY & MANAGEMENT OF IMPOUNDED COASTAL WETLANDS OF THE GEORGIA BIGHT: WORKSHOP (RWO33)

Investigators:	C.L. Montague
	H.F. Percival
Personnel:	A.V. Zale
Completed:	September 1987

IMPACT ASSESSMENT OF GRASS DELIVERY PROGRAM ON WADING CARP (RWO34)

Investigator: J.V. Shireman W.M. Kitchens Completion Date: September 1989

STATUS SURVEY OF THREE FLORIDA LIZARDS (RWO35)

Investigators:	P. Moler
	H.F. Percival
	R.F. Labisky
Personnel:	K. Enge
Completion Date:	October 1986

VEGETATION MANAGEMENT FOR KEY DEER (RWO36)

Investigators: S.R. Humphrey G.W. Tanner D. Holle Personnel: J. Wood P. Carlson December 1989 Completion Date:

STATUS SURVEY OF SEVEN FLORIDA MAMMALS: MICRO COTTONTAIL RABBIT, MICRO COTTON RAT, SE BEACH MOUSE, GOFF'S POCKET GOPHER, ANASTASIA ISLAND COTTON MOUSE, ANASTASIA ISLAND BEACH MOUSE (RWO37)

Investigators: Completion Date: S.R. Humphrey M. Bentzien July 1987

RELATIVE ABUNDANCE, SIZE CLASS COMPOSITION, AND GROWTH PATTERNS OF WILD GREEN TURTLES AT THE CULEBRA ARCHIPELAGO, **PUERTO RICO (RWO38)** J.A. Collazo

Investigators:

Completion Date

Personnel:

H.F. Percival T. Tallevast December 1989

EFFECTS OF MODIFIED WATER BIRD NESTING SUCCESS & FORAGING DISPERSION IN WATER **CONSERVATION**

Investigator:	M.W. Collopy
Personnel:	P.D. Frederick
Completed:	April 1988

EFFECTS OF THE MODIFIED WATER DELIVERY PROGRAM ON NEST SITE SELECTION & NESTING SUCCESS OF SNAIL KITES IN WATER CONSERVATION AREA 3a (RWO40) Investigators: M.W. Collopy S. Beissinger Personnel: R. Bennetts

Completed: February 1988 **COMPARATIVE GRAMINOID COMMUNITY COMPOSITION AND** STRUCTURE WITHIN THE NORTH-**ERN PORTION OF EVERGLADES** NAT'L PARK, NE SHARK RIVER

SLOUGH, WATER CONSERVATION AREA 3A & 3B (RWO41)

Investigators:	G.W. Tanner
Personnel:	J.M. Wood
Completed:	November 1986

HUMAN/WILDLIFE INTERACTION J.N. "DING" DARLING NAT'L WILDLIFE REFUGE (RWO42)

S.R. Humphrey
H.F. Percival
M.V. Klein
June 1989

STATUS SURVEY OF TWO FLORIDA **SEASIDE SPARROWS (RWO43)**

Investigators:	K. McNab
	V. MacDonald
Completed:	October 1988

SOIL/PLANT CORRELATION STUDIES **IN FLORIDA (RWO46)**

Investigators: G.R. Best Completed:

W.M. Kitchens March 1987

REPRODUCTIVE CYCLES IN STRIPED BASS MAINTAINED IN RECIRCULA-TION SILOS: HISTOLOGICAL ANALYSIS (RWO44)

Investigators:L.J. Guillette, Jr.Personnel:C.A. GoudieCompletion Date:October 1986

AQUATIC PLANT MANAGEMENT TECHNOLOGY IMPROVEMENT (RWO47)

J.C. Joyce
W.T. Haller
V. Ramey
T. Willard
April 1988

FACTORS AFFECTING PRODUCTIVITY & HABITAT USE OF FLORIDA SAND-HILL CRANES: AN EVALUATION OF THREE AREAS IN CENTRAL FLORIDA AS POTENTIAL REINTRODUCTION SITES FOR A MONMIGRATORY POPU-LATION OF WHOOPING CRANES (RWO49)

Investigators: Personnel: Completion Date; M.W. Collopy M. Bishop October 1988

EFFECTS OF GROUND WATER LEVELS UPON REPRODUCTION SUCCESS OF AMERICAN CROCODILES IN EVER-GLADES NAT'L PARK (RWO50) Investigator: F.J. Mazzotti Completion Date; April 1989

MANATEE PROTECTION PROJECT: SURVEY OF BOAT USAGE PATTERNS (RWO51)

Investigators:	J.W. Hutchinson
	J.W. Alba
Completion Date:	September 1988

AN EVALUATION OF MANATEE DISTRIBUTION PATTERNS IN RESPONSE TO PUBLIC USE ACTIVITIES, CRYSTAL RIVER, FLORIA (RWO52)

Investigator: W. Completion Date: Dee

W.M. Kitchens December 1989

AN EVALUATION OF CUMULATIVE IMPACTS TO THE HABITAT OF THE WEST INDIAN MANATEE, CRYSTAL RIVER NAT'L WILDLIFE REFUGE (RW053)

Investigators:W.M. KitchensPersonnel:L.G. PearlstineCompletion Date:December 1989

STATUS SURVEY OF THE FLORIDA SALTMARSH VOLE (RWO54)

Investigators:	C.A. Woods
Personnel:	L. Hay-Smith
Completion Date:	September 1988

IMPACT OF MOSQUITO CONTROL PESTICIDES ON THE ENDANGERED SCHAUS SWALLOWTAIL AND RELATED INSECTS IN THE FLORIDA KEYS (RWO56)

Investigators:	T.C. Emmel
Personnel:	P. Eliazar
Completion Date:	January 1989

EFFECTS OF MOSQUITO CONTROL PESTICIDES ON NON-TARGET ORGANISMS IN THE FLORIDA KEYS (RWO57)

Investigators:	D.H. Habeck
Personnel:	M. Hennessey
Completion Date:	October 1989

DEVELOPMENT OF GUIDANCE MANUAL FOR MONITORING WATER QUALITY & VEGETATIVE CHANGES ON NAT'L WILDLIFE REFUGES (RWO58)

Investigators: W.M. Kitchens Completion Date: December 1988

APPLICABILITY & COMPARISON OF SATELLITE IMAGE DATA TO DELIN-EATION OF COVER TYPE IN THE LOWER SUWANNEE RIVER REGION (RWO60)

Investigators: W.M. Kitchens Completion Date: December 1988

DISBRIBUTION & POPULATION STRUCTURE OF SEA TURTLES INHABITING THE CAPE CANAVERAL ENTRANCE CHANNEL (RWO62) Investigators: A.B. Bolten

Completion Date:

A.B. Bolten K.A. Bjorndal December 1991

DETERMINEATION OF THE CAUSES OF LOW RESPONSE WITH THE WATER-FOWL HUNTER QUESTIONNAIRE & ESTIMATION OF THE RESULTANT BIASES (RWO76)

Investigators:	H.F. Percival
Personnel:	R.J. Barker
	P.H. Geissler
	B.A. Hoover
Completion Date:	September 1990

THE ECOLOGY OF MANATEES IN GEORGIA WITH EMPHASIS ON CUMBERLAND SOUND (RWO65)

Investigators:	H.F. Percival
Personnel:	B.J. Zoodsma
	L.W. Lefebvre
Completion Date:	December 1990

SCIENTIFIC REVIEW OF ALLIGATOR EXPORT PROPOSALS TO USFWS (RWO 69)

Investigators:H.F. PercivalPersonnel:P.N. GrayF. Nunez-GarciaCompletion Date:July 1990

FISH COMMUNITY STRUCTURE IN NATURALLY ACID FLORIDA LAKES (RW073)

Investigators: Personnel:

W.M. Kitchens C.A. Jennings D.E. Canfield, Jr. D.E. Colle July 1990

Completion Date:

DEVELOPMENT & APPLICATION OF A HABITAT SUCCESSION MODEL FOR THE WETLAND COMPLEX OF THE SAVANNAH RIVER NAT'L WILDLIFE REFUGE (RWO30)

Investigators: Personnel:

W.M. Kitchens L.G. Pearistine P. Latham L. Peterson

Completion Date:

L. Peterson G. Tanner December 1990

PLANT SPECIES ASSOCIATION CHANGES & INTERACTIONS ACROSS A GRADIENT OF FRESH, OLIGOHA-LINE, & MESOHALINE TIDAL, MARSH OF THE LOWER SAVANNAH RIVER (RWO30)

Investigators:	W.M. Kitchens
Personnel:	P.J. Latham
Completion Date:	December 1990

BIOLOGY OF FLORIDA'S MOTTLED DUCK

Investigators:	H.F. Percival
Personnel:	P.N. Gray
Completion Date:	May 1992

MODELING WATERFOWL HARVEST & THE EFFECTS OF QUESTIONNAIRE NONRESPONSE ON HARVEST ESTIMATE (RWO83)

Investigators:	H. F. Percival
Personnel:	R.J. Barker
	J.D. Nichols
Completion Date:	May 1992

ENVIRONMENTAL INFLUENCES ON REPRODUCTIVE POTENTIAL AND CLUTCH VIABILITY OF THE AMERICAN ALLIGATOR FROM SEVEN STUDY SITES IN FLORIDA.

Investigators:	H.F. Percival
Personnel:	G.R. Masson
Completion Date:	July 1992

NESTING BIOLOGY OF THE AMERICAN ALLIGATOR IN FLORIDA

H.F. Percival
K.G. Rice
G.R. Masson
September 1992

ALLIGATOR EGG VIABILITY & POPULATION TRENDS ON LAKE APOPKA, FLORIDA

H.F. Percival
L.J. Guillette, Jr.
G.R. Masson
K.G. Rice
June 1993

ALLIGATOR NEST PRODUCTION ESTIMATION IN FLORIDA

Investigators:	H.F. Percival
Personnel:	K.G. Rice
	A.R. Woodward
Completion Date:	August 1992

HABITAT USE BY MIGRATORY SHOREBIRDS AT THE CABO ROJO SALT FLATS, PUERTO RICO (RWO78)

Investigators:	J.A. Collazo
-	H.F. Percival
Personnel:	J.S. Grear
Completion Date:	August 1992

WADING BIRD USE OF WASTEWATER TREATMENT WETLANDS IN CENTRAL FLORIDA (RWO83)

Investigators:P.C. FrederickCompletion Date:December 1992

EVALUATING THE REGIONAL EFFECTS OF CITRUS DEVELOPMENT ON THE ECOLOGICAL INTEGRITY OF SOUTHWEST FLORIDA Investigators: F.J. Mazzotti

Personnel:

Completion Date:

F.J. Mazzotti W.M. Kitchens L.A. Brandt L.G. Perlstine T.A. Obreza C.E. Arnold May 1992

WORKSHOP IN FLORIDA MANATEE (TRICHECHUS MANATUS) POPULATION BIOLOGY (RWO88)

Investigators:	T.J. O'Shea
-	H.F. Percival
Personnel:	B.B. Ackerman
Completion Date:	October 1993

ISSUES AND OPTIONS RELATED TO MANAGEMENT OF SILVER SPRINGS RHESUS MACAQUES

Investigators:	C.L. Montague
	S.V. Colwell
	H.F. Percival
Personnel:	J.F. Gottgens
Completion Date:	December 1993

SEA TURTLES INHABITATING THE KINGS BAY, ST. MARY'S ENTRANCE CHANNEL: DISTRIBUTION AND POPULATION STRUCTURE (RWO72) Investigators: K & Biorndal

investigators.	K.A. Djornuar
	A.B. Bolten
Completion Date:	September 1983

WADING BIRD NESTING SUCCESS STUDIES IN THE EVERGLADES (RWO110)

Investigators: P.C. Frederick Completion Date: December 1993

CAPTIVE PROPAGATION AND RESTORATION ECOLOGY OF THE ENDANGERED STOCK ISLAND TREE SNAIL (RWO94)

Investigators: T.C. Emmel Completion Date: October 1993

STATUS MONITORING AND EXPERIMENTAL REINTRODUCTION OF THE ENDANGERED SCHAUS SWALLOWTAIL (RWO84)

Investigators:	T.C. Emmel
	P.J. Eliazar
	M.C. Minno
	J.C. Daniels
	J.A. Sarvis
Completion Date:	September 1993

CONSERVATION STATUS OF THE FRESHWATER MUSSELS OF THE APALACHICOLA RIVER BASIN (RW086)

Investigators: Personnel: Completion Date:

J.D. Williams J.C. Brim-Box October 1993

STATISTICAL ASPECTS OF LINE **TRANSECT SAMPLING (RWO68)**

Investigators: Completion Date:

K.M. Portier June 1993

A GEOGRAPHIC INFORMATION SYSTEM MODEL OF FIRE DAMAGE **AND VEGETATION RECOVERY IN** THE LOXAHATCHEE NATIONAL WILDLIFE REFUGE

Investigators:	W.M. Kitchens
Prsonnel:	J.E. Silveira
	J.R. Richardson
Completion Date:	December 1993

MERCURY CONCENTRATIONS IN BLOOD AND FEATHERS OF NESTLING BALD EAGLES (RWO108)

Investigators: Personnel:

Completion Date:

P.B. Wood J.H. White A.Steffer J.M.Wood H.F. Percival December 1994

EFFECTS OF ARTIFICIAL LIGHTING ON NESTING ADULT AND HATCHLING SEA TURTLES (RWO-75)

Investigators:	K. A. Bjorndal
	A. B. Bolton
Personnel:	B. E. Witherrington
Completion Date:	September 1994

SUMMARY REPORT OF AIR **OUALITY STUDIES DONE AT** CHASSAHOWITZKA NATIONAL WILDLIFE REFUGE (RWO-102)

E. R. Allen Investigators: Completion Date: June 1994

EVALUATIONS OF THE EFFICACY OF EXOTICS AS AQUACULTURE AND MANAGEMENT SPECIES IN FLORIDA (RWO-109)

Investigators: Personnel:

Completion Date:

J. V. Shireman J. E. Weaver K Opusbynski February 1994

ASSESSING THE IMPACT OF VEHICULAR TRAFFIC ON BEACH HABITAT AND WILDLIFE, CAPE SAN BLAS (RWO-121)

Investigators:	H. F. Percival
Personnel:	J. H. Cox, Jr.
	S. V. Colwell
Completion Date:	June 1994

EARLY LIFE HISTORY AND **RELATIVE ABUNDANCE OF STURGEON IN THE SUWANNEE RIVER (RWO-61)**

Investigators:	J. V. Shireman
Personnel:	J. P. Clugston
	A. M. Foster
Completion Date:	October 1994

DISTRIBUTION, POPULATION STRUCTURE AND EXPLOTATION OF SEA TURTLES IN THE BAHAMAS (RWO-67)

Investigators:	K. A, Bjordnal
	A. B. Bolton
Completion Date:	September 1994

SEA TURTLE POPULATIONS IN THE **EASTERN GULF OF MEXICO: BIOLOGY, DISTRIBUTION AND POPULATION STRUCTURE (RWO-77)**

Investigators: Personnel: Completion Date:

K. A. Bjordnal A. B. Bolten J. R. Schmid September 1994

DISTRIBUTIONAND STATUS OF THE RED-COCKADED WOODPECKER ON THE EGLIN AIR FORCE BASE, FLORIDA (RWO-80)

Investigators:	H. F. Percival
Personnel:	Ruthie J. Smith
	Jeffrey L. Hardesty
Completion Date:	March 1994

FACTORS AFFECTING ABUNDANCE OF SPOTTED SEATROUT AND YEAR-CLASS STRENGTH (RWO-81)

Investigators:	N.a. Funicelli
Personnel:	J. V. Shireman
	J. P. Clugston
	S.A. Zengel
	H.F. Percival
Completion Date:	June 1994

RE-ESTABLISHMENT OF THE ANASTASIA ISLAND BEACH MOUSE (PEROMYSCUS POLIONOTUS PHASMA) (RWO-100)

Investigators:	S. Humphrey
Personnel:	P. A. Frank
Completion Date:	January 1994

CAPTIVE PROPAGATION AND HABITAT REINTRODUCTION FOR THE SCHAUS SWALLOWTAIL FOLLOWING HURRICANE ANDREW (RWO-113)

Investigators: Personnel:

Completion Date:

T. C. Emmel J. C. Daniels A.Sourakov P. J. Eliazar M. C. Minno S. D. Larson L. L. Groce J. A. Fletcher J. L. Nation, Jr. R. A. Worth K. A. Schwarz September 1994

DEVELOPMENT ABNORMALITIES OF THE REPRODUCTIVE SYSTEM OF ALLIGATORS (*ALLIGATOR MISSISSIPPIENSIS*) FROM CONTAMINATED AND CONTROL LAKES IN FLORIDA

Investigators: H.F. Percival Completion Date: May 1994

LAND MANAGEMENT PRACTICES IN THE MOUNTAIN REGION OF PUERTO RICO: MONITORING BIRD REPRODUCTIVITY IN CARITE STATE FOREST (RWO-71) Investigators: H.F. Percival J. A. Collazo

	J. A. Collazo
Personnel:	F. Nunez-Garcia
Completion Date:	December 1995

METHODS FOR DETERMINING CHANGE IN WETLAND HABITATS IN FLORIDA (RWO-95)

Investigators:	W. M. Kitchens
Personnel:	J. Silviera
	W. Bryant
Completion Date:	September 1995

POPULATION ECOLOGY OF BARTRAM'S IXIA (*Calydorea coelestina*) (Bartr.) (RWO-101)

investigators:	G. W. Tanner
Personnel:	A. Miller
Completion Date:	October 1995

MAINTENANCE, PROPAGATION AND RESTORATION OF THE ENDANGERED STOCK ISLAND TREE SNAIL, FOLLOWING HURRICANE ANDREW (RWO-106)

Investigators:	T. C. Emmel
Personnel:	P. J. Eliazar
	J. C. Daniels
	N. D. Eliazar
	R. A. Worth
	K. A. Schwarz
Completion Date:	October 1995

CHANGES IN SALINITY AND VEGETATION FOLLOWING RE-ESTABLISHMENT OF NATURAL HYDROLOGY ON THE LOWER SAVANNAH RIVER (RWO-117)

Investigators: Personnel: W. M. Kitchens P. J. Latham L. P. Peterson B. Mace March 1995

Completion Date:

FOLLOW-UP OF A 14 YEAR OLD CRESTED WETLAND/UPLAND LANDSCAPE ON PHOSPHATE-MINED LAND IN CENTRAL FLORIDA (RWO-120)

Investigators: G. R. Best W. M. Kitchens Completion Date: March 1995

TRENDS, STATUS AND ASPECTS OF DEMOGRAPHY OF THE RED-COCKADED WOODPECKER IN THE SANDHILLS OF FLORIDA'S PANHANDLE (RWO124)

Investigators: Personnel: H.F. Percival J.L. Hardesty R.J.Smith K.E. Gault M.E.Gatlin L.F.Phillips March 1995

STATUS AND DISTRIBUTION OF THE FLORIDA SCRUB JAY (APHELOCOMA COERULESCENS) ON CAPE CANAVERAL, FLORIDA (RWO127)

Investigator: Personnel:

Completion Date:

Completion Date:

H.F. Percival J.L. Hardesty D.B. McDonald May 1995

MERCURY CONTAMINATION IN GREAT EGRETS IN SOUTHERN FLORIDA (RWO132)

Investigator:	P.G. Frederick
Personnel:	M.G. Spaulding
	M.S. Sepulveda
	G.E.Williams
	K. Golden
	C. Gill
Completion Date:	September 1995

THE ACUTE TOXICITY OF MALATHION TO GLOCHIDIA AND FRESHWATER MUSSELS (RWO133)

Investigators:	E.J. Phlips
Personnel:	A.E. Keller
Completion Date:	March 1995

THE ROLE OF ENVIRONMENTAL CONTAMINANTS IN THE PREVALENCE OF FISH INFECTED WITH A WADING BIRD PARASITE (RWO134)

D.J. Forrester
M.G. Spaulding
D. Morrison
D.F. Coyner
T.M. Miller
September 1995

DEVELOPMENT OF AN ECOLOGICALLY STABLE COST EFFICIENT BIOLOGICAL WATER TREATMENT SYSTEM AND TECHNOLOGY TRANSFER SYSTEM (RWO135)

Investigators:	J.V. Shireman
Personnel:	N.A. Furnicelli
Completion Date:	September 1995

STATUS AND DISTRIBUTION OF THE FLORIDA SCRUB JAY ON CAPE CANAVERAL, FLORIDA 9RWO136)

H.F. Precival
D.B. McDonald
J.L. Hardesty
October 1995

DISRUPTION OF ENDOCRINE FUNCTION & REPRODUCTIVE POTENTIAL BY ENVIRONMENTAL CONTAMINANTS ON LAKE APOPKA'S ALLIGATORS AND OTHER TAXA (RWO137)

Investigators: Personnel: H.F. Percival L.J. Guillette T.S. Gross K.G. Rice C.L. Abercrombie A.R. Woodward October 1995

Completion Date:

THE EPIDEMIOLOGY OF UPPER RESPIRATORY TRACT DISEASE IN DESERT TORTOISES AT THREE SITES IN THE CALIFORNIA DESERTS (RWO138)

Investigator: Personnel: M. Brown I.M. Schumacher P.A. Klein D. Dukes B. Crenshaw K. Berry April 1995

Completion Date:

THE RELATIONSIPS BETWEEN HOST PLANT & HABITAT FOR THE DISTRIBUTION OF THREE POTENTIALLY ENDANGERED SOUTH FLORIDA BUTTERFLY SPECIES (RWO145)

Investigators: T.C. Emmel Personnel: R.A. Worth K.A. Schwarz Completion Date: September 1995

SNAIL KITE CENSUS

Investigators:	W.M. Kitchens
-	R.E. Bennetts
Completion Date:	December 1995

REFINEMENT OF POPULATION ESTIMATION TECHNIQUES FOR WILDD TURKEYS-YEAR 3

Investigators: Completion Date: G.W. Tanner June 1995

EGG VIABILITY, SEXUAL DEVELOPMENT, HATCHLING VIABILITY & GROWTH IN ALLIGATORS FROM LAKE APOPKA & LAKE BEAUCHAIR

Investigators: Personnel:

H.F. Percival C.L. Abercrombie A.R. Woodward K.G. Rice T.S. Gross July 1995

Completion Date: Ju

REFINEMENT OF POPULATION ESTIMATION TECHNIQUES FOR WILD TURKEYS-YEAR 3

Investigators:	G.W. Tanner
Personnel:	J.L. Kalso
Completion Date:	June 1995

MINERAL INTERACTIONS BETWEEN EMBRYO, EGGSHELL & SUBTRATE IN DEVELOPING SEA TURTLES (RWO92)

Investigators:	K.A. Bjorndal
Personnel:	A.B. Bolten
	R.R. Carthy
Completion Date:	August 1996

ECOLOGICAL CORRELATES OF RED-COCKADED WOODPECKER FORAGING PREFERENCE, HABITAT USE, AND HOME RANGE AREA ON EGLIN AIR FORCE BASE, FLORIDA (RWO99)

Investigators:	H.F. Percival
Personnel:	J.L. Hardesty
	R.J. Smith
	P.R. Gault
	J. Cartwright
Completion Date:	march 1996

UNDERSTORY RESPONSE TO LONGLEAF PINE-SANDHILL RESTORATION TECHNIQUES (RWO111)

Investigators:	G.W. Tanner
Personnel:	J.L. Hardesty
Completion Date:	March 1996

HABITAT ASSOCIATIONS, REPRODUCTION, & FORAGING ECOLOGY OF AUDUBON'S CRESTED CARACARA IN SOUTH-CENTRAL FLORIDA (RWO114)

Investigators: Personnel: S.R. Humphrey J.L. Morrison S.M. McGehee L.D. Todd May 1996

Completion Date:

LANDSCAPE DYNAMICS OF SCRUB LIZARD ON AVON PARK AIR FORCE RANGE (RWO122)

Investigators: L Personnel: D B Completion Date: S

Lyn C. Branch D.G. Hokit B.M. Stith September 1996

POST HURRICANE DENSITY AND RECOVERY STATUS OF THE KEY LARGO WOODRAT & COTTON MOUSE (RWO123)

Investigators: Personnel: Completion Date: H.F. Percival K. Miller B.W. Keith August 1996

EVALUATION OF SAMPLING & ANALYTICAL PROTOCOLS FOR MANATEE CAPTURE-RECAPTURE AND TELEMETRY DATA (RWO125) Investigators: H.F. Percival

Personnel:

H.F. Percival L.W. Lefebvre C.J. Deutsch July 1996

Completion Date:

COMMUNITY RESPONSE TO RESTORATION TECHNIQUES IN DEGRADED FLORIDA SANDHILL SYSTEMS (RWO128, 147,162)

Investigators:	G.W. Tanner
Personnel:	D.R. Gordon
	H.F. Percival
Completion Date:	March 1996

MARINE TURTLE NESTING BIOLOGY & ASSESSMENT OF ANTHROPOGENIC DISTURBANCES TO HATCHLING ORIENTATION AT EGLIN AIR FORCE BASE ON SANTA ROSA ISLAND & CAPE SAN BLAS (RWO129)

Investigators: Personnel: Completion Date: H.F. Percival L.G. Perlstine S.V. Colwell April 1996

NECROPSIES OF ILL AND DYING DESERT TORTOISES FROM CALIFORNIA AND ELSEWHERE IN THE SOUTHWESTERN UNITED STATES (RWO131)

Investigators:	B.L. Homer
Personnel:	E.R. Jacobson
	K.H. Berry
Completion Date:	March 1996

POTENTIAL EFFECTS OF ENDOCRINE-DISTUPTING CONTAMINANTS (RWO140)

Investigator:	T.S. Gross
Personnel:	H.F. Percival
	K.G. Rice
	A.R. Woodward
	C.L. Abercrombie
Completion Date:	June 1996

INTERACTIONS AMONG CAVITY-DEPENDENT SPECIES IN LONGLEAF PINE FORESTS: THE ROLES OF SNAGS AND RED-COCKADED WOODPECKER CAVITIES (RWO143)

Investigators:	J.D. Harris
Personnel:	R. Costa
	J.J. Kappes, Jr.
Completion Date:	August 1996

HABITAT ASSESSMENT IN ALANDSCAPE CONTEXT: ANALYSIS OFTHE FACTORS AFFECTING THEDISTRIBUTION & ABUNDANCE OFFLORIDA SCRUB LIZARD (RW0156)Investigators:L.C. BranchPersonnel:D.G. HokitCompletion Date:April 1996

ESTIMATION AND ENVIRONMENTAL CORRELATES OF SURVIVAL AND DISPERSAL OF SNAIL KITES IN FLORIDA

Investigators: Personnel:

Completion Date:

Completion Date:

W.M. Kitchens P.C. Darby P.V. Darby February 1996

July 1996

EGG VIABILITY AND POPULATION TRENDS OF LAKE APOPKA ALLIGATORS: RELATIONSHIPS AMONG POPULATIONS AND BIOGRAPHICAL PARAMETERS Investigators: H.F. Percival Personnel: K.G. Rice

EVALUATION OF S.R.46 WILDLIFE CROSSING

Investigators:	H.F. Percival
Personnel:	J.C. Roof
	J.B. Wooding
Completion Date:	May 1996

AN ECOSYSTEM APPROACH TO PUBLIC EDUCATION AND INFORMATION AT EGLIN AIR FORCE BASE (RWO107)

Investigator:	S.K. Jacobson
Personnel:	S.B. Marynowski
Completion Date:	September 1997

GENETIC ANALYSIS OF SEA TURTLE POPULATIONS IN THE WESTERN ATLANTIC OCEAN WITH EMPHASIS ON THE SOUTHEAST UNITED STATES (RWO115)

Investigators:	B.W. Bowen
	A.B. Bolten
	K.A. Bjorndal
Completion Date:	June 1997

CAPE SAN BLAS ECOLOGICAL STUDY (RWO126)

Investigator:	W.M. 1
	H.F. Pe
	R.R. C
Completion Date:	August

W.M. Kitchens H.F. Percival R.R. Carthy August 1997

ENHANCEMENT AND EVALUATION OF A DESIGNATED WATCHABLE WILDLIFE SITE (RWO130)

Investigator:	J.M. Schaefer
	S.K. Jacobson
Completion Date:	January 1997

RESEARCH OBJECTIVES TO SUPPORT THE SOUTH FLORIDA ECOSYSTEM INITIATIVE-WATER CONSERVATION AREAS, LAKE OKEECHOBEE & THE EAST-WEST WATERWAYS (RWO139) Investigators: W.M. Kitchens Completion Date: September 1997

TRENDS, STATUS, & ASPECTS OF DEMOGRAPHY OF THE RED-COCKADED WOODPECKER IN THE SANDHILLS OF FLORIDA'S PANHANDLE, PART ii (RW0146)

Investigators:	H.F. Percival
-	J.L. Hardesty
Personnel:	K.E. Gault
	L.F. Phillips
	J.B. Jensen
	J. Tomcho
Completion Date:	March 1997

USE OF UNIONID MUSSELS AS BIOINDICATORS OF WATER QUALITY IN ESCAMBIA CONECUH RIVER SYSTEM (RWO149)

Investigators:	E. Philps
Personnel:	A. Keller
Completion Date:	June 1997

CAPTIVE PROPAGATION & EXPERIMENTAL REINTRODUCTION OF FLORIDA'S SCHAUS SWALLOWTAIL (RWO151)

Investigators:	T.C. Emmel
Personnel:	J.C. Daniels
	V. Kroutov
J.P. Hall	A. Sourakov
K.M. Wilmott	P.J. Eliazar
S.D. Schlachta	J.B. Schlachta
Completion Date:	December 1997

TESTING & IMPLEMENTATION OF SELECTED AQUATIC ECOSYSTEM INDICATORS IN THE MISSISSIPPI RIVER SYSTEM, 1995: POTENTIAL EFFECTS OF ENDOCRINE-DISRUPTING CONTAMINANTS (RWO153)

Investigators: Completion Date:

T.S. Gross September 1997

WADING BIRD POPULATION MONITORING, ENVIRONMENTAL CORRELATES OF ADULT FORAGING SUCCESS, & MEASUREMENT OF NESTING ENERGETIC NEEDS IN THE EVERGLADES: PART I (RW0158)

Investigators: Personnel: P.C Frederick J. Surkick J. Salatas J. Burm

C. Schaadt

April 1997

Completion Date:

MARINE TURTLE CONSERVATION ON THE CARIBBEAN COAST OF NICARAGUA (RWO171)

Investigators: Personnel:

Completion Date:

L.J. Guillette, Jr. C.L. Campbell C.J. Lagueux December 1997

EVALUATING THE ECOLOGICAL ROLE OF ALLIGATOR HOLES IN THE EVERCLADES LANDSCAPES

THE EVENGLAD	LO LANDOCAI LO
Investigators:	E.J. Mazzotti
	H.F. Percival
Personnel:	L.A. Brandt
Completion Date:	December 1997

TWO GIS AND LAND USE ANALYSIS OF FRESHWATER MUSSELS IN THE APALACHICOLA RIVER DRAINAGE (RWO 164)

Investigator: Personnel: Completion Date:

J. Mossa J. Howard July 1997

EGG VIABILITY AND POPULATION TRENDS OF LAKE APOPKA ALLIGATORS

Investigator:	H.F. Percival
Personnel:	K.G. Rice
	G. Davidson
Completion Date:	Julv 1997

EFFECT OF MARINE POLUTION ON JUVENILE PELAGIC SEA TURTLES (RWO-66) AND BIOLOGY OF PELAGIC SEA TURTLES: EFFECTS IF MARINE DEBRIS (RWO-118)(RWO-118 is a continuation of RWO-66) Investigator: K.A. Biorndal

estigator: K.A. Bjornd A.B. Bolten

Completion Date: (RWO-66) June 1995 (RWO-118) June 1998

ENHANCEMENT OF NATURAL DUNE BUILDING AND REVEGETATION PROCESSES ON SANTA ROSA ISLAND (RWO-159)

Investigator:	D.L. Miller
-	Mack Thetford
Completion Date:	August 1998

PATHOGENIC, MOLECULAR AND IMMUNOLOGICAL PROPERTIES OD A HERPERSVIRUS ASSOCIATED WITH GREEM TURTLE FIBROPAPILLOMATOSSIS. PHASE I VIRUS ISOLATION AND TRANSMISSION (RWO-161)

Investigator: P.A. Klein E. Jacobson Completion Date: June 1998

MIGRATIONS AND HABITAT USE OF SEA TURTLES IN THE BAHAMAS (RWO-166)

Investigator: K A Completion Date: S

K. A. Bjornal A.A. Bolten September 1998

POPULATION GENETIC STRUCTURE OF MARINE TURTLES, *Eretmochelya Imbricata* AND *Caretta caretta*, IN THE SOUTHEASTERN UNITED STATS AND ADJACENT CARIBBEAN REGION (RWO 167)

Investigators: Completion Date: B. W. Bowen A. L. Bass June 1998

DISTRIBUTION AND ABUNDANCE OF SENSITIVE WILDLIFE AT AVON PARK AIR FORCE RANGE (RWO 169) Investigator: R. Franz Completion Date: December 1998

RED-COCKADED WOODPECKERCAVITIES AND SNAGS INLONGLEAF PINE FORESTS:CAVITYNESTER USE AND NESTINGSUCCESS (RWO-170)Investigator:K.E. SievingCompletion Date:September 1998

PLANT AND INVERTEBRATE COMMUNITY RESPONSES TO RESTORATION TECHNIQUES IN DEGRADED FLORIDA SANDHILLS: THIRD YEAR POSTTREATMENT (RWO-174)

Investigator: G. W. Tanner D.R. Gordon Completion Date: July 1998

DEMOGRAPHICS, GENETIC RELATIONSHIPS AND IMPACTS FROM RED IMPORTED FIRE ANTS ON THE FLORIDA GRASSHOPPER SPARROW (RWO-175a)

Investigator: Completion Date: H. F. Percival March 1998

RED IMPORTED FIRE ANTS ON THE ENDANGERED FLORIDA GRASSHOPPER SPARROW (RWO-175b)

Investigator: H Completion Date: Ju

H. F. Percival June 1998 WADING BIRD POPULATION MONITORING, ENVIRONMENTAL, CORRELATES OF ADULT FORAGING SUCCESS AND MEASUREMENTS OF NESTLING ENERGETIC NEEDS IN THE EVERGLADES – PHASE II (RWO-176) Investigator: P. C. Frederick Completion Date: April 1998

POPULATION CHARACTERIZATION OF KEMP'S RIDLEY SEA TURTLES IN THE BIG BEND AREA, GULF OF MEXICO, FLORIDA (MONITOR, ASSESS AND PREDICT STATUS OF AND IMPACTS TO PROTECTED SPECIES AND THEIR ECOSYSTEMS (RWO-177)

Investigator:	Raymond R. Carthy
Completion Date:	September 1998

BREEDING AND REINTRODUCTION OF THE ENDANGERED SCHAUS SWALLOWTAIL (RWO-179)

Investigator: T. C. Emmel Completion Date: March 1998

ESTIMATING SURVIVAL AND MOVEMENTS IN SNAIL KITE POPULATION (RWO-183)

Investigator:	W. M, Kitchens
	R. E. Bennetts
Completion Date:	July 1998

TREE ISLAND BIOLOGICAL INVENTORY: LANDSCAPE LEVEL ASSESSMENT AND DETERMINATION OF TREE ISLAND AREAM SHAPE AND VEGETATION ZONES (RWO-184)

Investigator:	W. M. Kitchens
	L. A. Brandt
Completion Date:	September 1998

BIOLOGICAL DIVERSITY IN FLORIDA: AND EVALUATION OF POTENTIAL SPECIES IN RELATION TO HABITAT AND EXISTING RESERVES (RWO-98)

Investigator:

W. M. Kitchens L.G. Pearlstines S.E. Smith J.L. Hardy September 1998

Completion Date:

IMPROVING SURVEY METHODS AND ASSESSING IMPOUNDMENT EFFECTS ON WATERFOWL ECOLOGY AT THE MERRITT ISLAND NATIONAL WILDLIFE REFUGE (RWO-186) Investigator: Raymond R, Carthy Completion Date: June 1999

EFFECTS OF PRSCRIBED FIRE ON SOIL NUTRIENTS, FORAGE QUALITY AND PLANT COMMUNITY COMPOSITION AND ON BREEDING BIRD COMMUNITIES ON THE FLORIDA PANTHER NWR (RWO-168)

Investigator: Completion Date: Martin B. Main July 1999

FLORIDA GAP ANALYSIS (RWO-187)

Investigator:	L. G. Pearlstine
	Scot E. Smith
Completion Date:	December 1999

MODELING AND SIMULATION SUPPORT FOR ATLSS (RWO-154a)

Investigator:Paul A. FishwickCompletion Date:December 1999

THE EFFECT OF EVERGLADES FOOD ITEMS (PREY) ON CROCODILIAN GROWTH DEVELOPMENT AND FERTILITY (RWO-154b)

Investigator:P. T. CardielhacCompletion Date:December 1999

AMERCIAN ALLIGATOR DISTRIBUTION, THERMOREGULATION AND BIOTIC POTENTIAL RELATIVE TO HYDROPERIOD IN THE EVERGLADES NATIONAL PARK (RWO-154c)

Investigator:H. F. Percival
Kenneth G. RiceCompletion Date:December 1999

NESTING, GROWTH AND SURVIVAL OF AMERICAN CROCODILES IN NORTHEASTERN FLORIDA BAY, EVERGLADES NATIONAL PARK-PHASE I (RWO-178)

Investigator: Frank J. Mazzotti Laura A. Brandt Completion Date: April 2000

CREATION OF UPLAND COVER MAP OF FLORIDA

Investigator:	L. G. Pearlstine
	W. M. Kitchens
Completion Date:	August 1999

ORIENTATION OF DIGITAL AERIAL IMAGES AND PROTOCOL DEVELOPMENT

Investigator:	L. G. Pearlstine
-	Scot E. Smith
Completion Date:	April 1999

PRODUCE A MANUAL OF SEA TURTLE RESEARCH AND CONVERSATION TECHNIQUES (RWO-172)

Investigator: Karen A. Bjorndal Alan B. Bolten Completion Date: July 1999

WILDLIFE REFUGE WATERFOWL SURVEY DATABASE (RWO-202)

Investigator: R. R. Carthy Erin McMichael R. Subramaniya Completion Date: December 2000

MOVEMENTS, SPATIAL USE PATTERNS AND HABITAT UTILIZATION OF RADIO-TAGGED WEST INDIAN MANATEES (*TRICHECHUS MANATUS*) ALONG THE ATLANTIC COAST OF FLORIDA AND GEORGIA (RWO-163)

Investigator:

H. F. Percival B. J. Deutsch Lynn W. Lefebvre July 2000

Completion Date:

PATHOGENIC, MOLECULAR AND IMMUNIOLOGICAL PROPERTIES OF A VIRUS ASSOCIATED WITH SEA TURTLE FIBROPAPILLOMATOSIS, PHASE II: VIRAL PATHOGENESIS AND DEVELOPMENT OF DIAGNOSTIC ASSAYS (RWO-180)

Investigator:

Completion Date:

AYS (RWO-180) Paul A. Klein E. R. Jacobson Daniel R. Brown S. S. Coberly Dean Bagley June 2000

DRY DOWN TOLERANCE OF FLORIDA APPLE SNAIL (*POMACEA PALUDOSA*): EFFECTS OF AGE AND SEASON (RWO-182)

Investigator: H. Franklin Percival Phillip C. Darby Z. C. Welch August 2000

EFFECTS OF COASTAL EROSION ON NESTING SEA TURTLES ALONG THE FLORIDA PANHANDLE (RWO-185)

Investigator: Completion Date: R. R. Carthy M. M. Lamont May 2000

A COMPARISON BETWEEN THE POPULATION OF THE POTENTIAL TUMOR-PROMOTING DINOFLAGELLATE, PROROCENTRUM SPP AND THE INCIDENCE OF

FIBROPAPILLOMATOSIS IN GREEN TURTLES (*CHELONIA MYDAS*) IN FLORIDA AND HAWAII (RWO-192)

Investigator: R. R. Carthy Y. C. Anderson Completion Date: December 1999

INCUBATION TEMPERATURES AND SEX RATIOS OF LOGGERHEAD SEA TURTLES (*CARETTA CARETTA*) HATCHED ON NORTHWEST FLORIDA BEACHES (RWO-197a) Investigator: R. R. Carthy

M. L. Maglothin Completion Date: August 2000

BIOLOGY OF NESTING SEA TURTLES ALONG THE FLORIDA PANHANDLE (RWO-197b)

Investigator:	R. R. Carthy
	M. M. Lamont
Completion Date:	August 2000

A COMPARISON BETWEEN HAWAII AND FLORIDA: THE POTENTIAL LINK BETWENN THE TUMOR-PROMOTING DINOFLAGELLATE, PROROCENTRUM SPP AND THE PREVALENCE OF FIBROPAPILLOMATOSIS IN GREEN TURTLES (RWO-210) Investigator: R. R. Carthy

Investigator.IC. R. CathlyY. C. AndersonCompletion Date:December 2000

FEEDING ECOLOGY AND HABITAT AND HABITAT AFFINITIES OF KEMP'S RIDLEY SEA TURTLES IN THE BIG BEND, FLORIDA (RWO-189)

Investigator: R. R. Carthy J. S. Staiger Completion Date: August 2001

TIME LAPSE LANDSCAPE ECOLOGY: MERRITT ISLAND NATIOANL WILDLIFE REFUGE (MINWR) (RWO-198)

Investigator:	R. R. Carthy
	J. B. Wooding
	W. J. Barichivich
Completion Date:	December 2001

APPLICATION OF THE SPECIES AT RISK CONSERVATION FOR THE FLORIDA ARMY NATIONAL GUARD AT CAMP BLANDING TRAINING SITE, CLAY COUNTY, FLORIDA (RWO-201)

Investigator: Personnel: R. R. Carthy C. J. Gregory A. J. Gruschke L. G. Pearlstine August 2001

Completion Date:

HYDROLOGICAL CHARACTERIZATION OF THE WHITE RIVER BASIN (RWO-203)

Investigator:	W. M. Kitchens
Personnel:	M. A. Craig
	M. R. Wise
Completion Date:	September 200

A MULTIMODEL IMPLEMENTATION SUPPORTING ATLSS: ACROSS TROPHIC LEVEL SYSTEM SIMULATION (RWO-204)

Investigator: Personnel:

Completion Date:

P. A. Fishwick R. M. Cubert L. K. Dance December 2001

RELATIONS OF ENVIRONMENTAL CONTAMINANTS, ALGAL TOXINS AND DIET WITH THE REPRODUCTIVE SUCCESS OF AMERICAN ALLIGATORS ON FLORIDA LAKES (RWO-193) Investigator: H. F. Percival

Investigator:	H. F. Perciva
	T. S. Gross
Personnel:	B. Bradford
Completion Date:	August 2001

FURTHER STRATEGIES FOR EVALUATING THE ETIOLOGICAL ROLE OF A TUMOR-ASSOCIATED HERPESVIRUS IN MARINE TURTLE FIBROPAPILLOMATOSIS (RWO-194)

Investigator:E. R. Jacobson
P. A. KleinPersonnel:D. A. Bagley
S. S. Coberly
R. HirschmanCompletion Date:September 2001

EVALUATION OF DESERT TORTOISES IN AND AROUND FORT IRWIN FOR EXPOSURE TO A TORTOISEE HEDDESVIDUS (DWO 196)

HERPESVIKUS (I	XWU 190)
Investigators:	E.R. Jacobsen
	P.A. Klein
Personnel:	F.C. Origgi
	S. Tucker
Completion Date:	April 2001

RESPONSE OF NESTING SEA TURTLES AND FORAGING SHOREBIRDS TO BARRIER ISLAND DYNAMICS (RWO 206)

(,
Investigator:	P.C. Frederick
Personnel:	J.D. Semones
	R.A. Hylton
	G.A. Babbitt
	J.A. Heath
Completion Date:	April 2002

ECOLOGICAL INVENTORY OF MOODY AIR FORCE BASE AND SURROUNDING PROPERTIES (Z-038)

Investigator: Wiley M Personnel: C.J. Gre M.t M. Completion Date: March 2

Wiley M. Kitchens C.J. Gregory M.t M. Lamont March 2003

ECOLOGICAL INVENTORY OF MOODY AIR FORCE BASE AND SURROUNDING PROPERTIES (Z-039)

Investigator:	
Personnel:	
Completion Date:	

Raymond Carthy C.J. Gregory March 2003

LARGE SCALE HABITAT MONITORING FOR MIGRATORY BIRDS: DIGITAL VIDEO MOSAICS IN MULTI-LEVEL IMAGES (RWO-215) Investigator: Bon D. Dewitt

Personnel:

Completion Date:

Bon D. Dewitt L.G. Pearlstine Grady Trull Sarah R. Gonzales G.P. Jones, IV August 2003

INVENTORY AND MONITORING OF THE AMPHIBIANS OF EVERGLADES NATIONAL PARK, BIG CYPRESS NATIONAL PRESERVE AND VIRGIN ISLANDS NATIONAL PARK (RWO-208)

Investigator:	H. Franklin Percival
C	Kenneth G. Rice
	Raymond R. Carty
	James D. Nichols
Personnel:	C.D. Bugbee
	M.E. Crockett
	Amber D. Dove
	Brian Jeffrey
	Andrew J. Maskell
	J. Hardie Waddle
Completion Date:	December 2003

AMERICAN ALLIGATOR DISTRIBUTION, THERMOREGULATIONS AND BIOTIC PTENTIAL RELATIVE TO HYDROPERIOD IN THE EVERGLADES (RWO-199)

Investigator:	H. Franklin Percival
	Kenneth G. Rice
Personnel:	Matthew D. Chopp
	Adam G. Finger
	Phillip George
	Brian Jeffrey
	Michael T. Tuten
Completion Date:	December 2003
-	

SEREOPIDEMIOLOGICAL STUDIES OF HERPESVIRUS-ASSOCITED DISEASES OF MARINE TURTLES:

FIBRPAPILLOMATOSIS AND LUNG-EYE-TRACHEA DISESE (RWO-213)

Investigator:	Raymond Carthy
	Paul A. Klein
	Elliot R. Jacobsen
Personnel:	Dean A. Bagley
	S.S. Coberly (Curry)
	Rachel Hirschman
Completion Date:	December 2003

AN ESTIMATE OF POPULATION AGE STRUCTURE FOR GULF OF MEXICO STURGEON, ACIPENSER O. DESOTOI, ON THE YELLOW RIVER (RWO-214) Investigator: Michael S. Allen Personnel: James Berg

Completion Date:	December 2003
CONTAINMENT	SCREENING TO

CONTAINMENT SCREENING TO INVESTIGATE WILDLIFE MORTALITY ON LAKES ON CENTRAL FLORIDA (RWO-196)

Investigator:	H. Franklin Percival
	J. Perran Ross
Personnel:	Y. Temsiripong
Completion Date:	April 2003

HIBERNATION VS MIGRATION OVERWINTERING STRATEGIES OF JUVENILE SEA TURTLES IN THE FLORIDA PANHANDLE (UF Project #00037385)

Investigator:	Raymond R. Carthy
	Erin McMichael
Personnel:	Russell Scarpino
Completion Date:	August 2004

ESTIMATION OF CRITICAL DEMOGRAPHIC PARAMETERS OF THE FLORIDA SNAIL KITE DURING AND AFTER DROUGHT CONDITIONS (RWO-216)

Investigator:	Wiley M. Kitchens
Personnel:	Julien Martin
	Christopher Cattau
	Christine Rich
	Derek Piotrowicz
Completion Date:	December 2004

DEMOGRAPHIC MOVEMENT AND HABITAT STUDIES OF THE **ENDANGERED SNAIL KITE IN RESPONSE TO HYRDROLOGICAL** CHANGES (RWO-207)

Investigator: Personnel:

Wiley M. Kitchens Julien Martin Christopher Cattau Andrea Bowling Dan Huser Melinda Conners March 2005

Completion Date:

MONITORING OF WADING BIRDS NESTING ACTIVITY IN WCAS I. II AND III OF THE EVERGLADES AND **STUDY OF WOOD STORK SURVIVAL** AND MOVEMENTS (RWO 218)

Investigator:	P.C. Frederick
Personnel:	Rebecca Hylton
	John David Sermones
	Matthew Bokach
	Julie Heath
	John Simon
	Kate Williams
Completion Date:	March 2005
-	

EVALUATION OF SEA TURTLE HATCHLING DISORIENTATION AND **ASSESSMENTR OF TECHNIQUES** FOR MINIMIZING LIGHTING **IMPACTS AT TYNDALL AFB, BAY COUNTY FLORIDA (RWO-217)**

Investigator: Personnel: Completion Date: Raymond R. Carthy **Russell Scarpino** March 2005

PARTNERSHIP IN CASE STUDIES FOR TRAINING AND OUTREACH (UF Project #00050944)

Investigator:	H. Franklin Percival
	Martha Monroe
Personnel:	Kristy Bender
Completion Date:	August 2005

CONTINUED VEGETATION MONITORING OF THE SAVANNAH RIVER TIDALLY INFLUENCED MARSHES

Investigator:	Wiley M. Kitchens
Personnel:	Kristianna Lindgren
	Zachariah Welch
Completion Date:	December 2005

GEOMORPHIC ASSESSMENT OF CHANNEL CHANGES ALONG A MODIFIED FLOODPLAIN PASCAGOULA BASIN, MISSISSIPPI

Investigator:	Joann Mossa
Personnel:	David Coley
	Jim Rasmussen
	Robert Godfrey
	Alexis Villegas
Completion Date:	December 2005

GEOMORPHIC ASSESSMENT OF CHANNEL CHANGES ALONG A **MODIFIED FLOODPLAIN** PASCAGOULA BASIN, MISSISSIPPI

Investigator:	Joann Mossa
Personnel:	James Williams
Completion Date:	June 2006

FACTORS AFFECTING POPULATION **DENSITY AND HARVEST OF NORTHERN BOBWHITE (COLINUS** VIRGINIANUS) ON BABCOCK/WEBB WILDLIFE MANAGEMENTAREA. **CHARLOTTE COUNTY, FLORIDA** al

Investigator:	Franklin Perciva
	Ralph Dimmick
	Madan Oli
Personnel:	Susan Dimmick
Personnel:	Steven Brinkley
	Jeff Hostetler
	Gerald Coker
	Amy Brinkley
	Chris Jones
Completion Date:	June 2006

COST AND ACCURACY OF ANALYSIS OF GOPHER TORTOISE POPULATION ESTIMATION TECHNIQUES

Investigator:

Completion Date:

Personnel:

Raymond R. Carthy Madan Oli Esther Langan John Wooding Saif Nomani Erin Cantwell Kristina Miller Meana Voight July 2006

DEVELOPMENT OF UNMANNED AERIAL VEHICLES FOR ASSESSMENT OF WILDLIFE POPULATIONS AND HABITATS PHASE 2

Investigator: Personnel:

Completion Date:

H. Franklin Percival Bon Dewitt Peter Ifju Leonard Pearlstine Jamie Duberstein Daniel Grant December 2006

SURVEYS OF SNAIL KITE BREDDING AND HABITAT USE IN THE UPPER ST. JOHNS RIOVER BASIN

Investigator:	Wiley Kitchens
Personnel:	Julien Martin
	Chris Cattau
	Andrea Bowling
	Sara Stocco
	Brian Reichert
Completion Date:	February 2006

QUATITATIVE ANALYSIS SUPPORTING REPTILE AND AMPHIBIAN RESEARCH IN FLORIDA'S EVERGLADES

Investigator: H F Personnel: M Completion Date: A

H. Franklin Percival Frank Mazzotti Mark Miller August 2006

SEA TURTKE HABITAT USE AND INTERACTIONS WITH HUMANS IN THE COASTAL ZONE

Investigator:	Raymond R. Carthy
Personnel:	Russell Scarpino
Completion Date:	August 2006

SOUTHEASTERN ADAPTIVE MANAGEMENT GROUP (SEAMG)

Investigator:	H. Franklin Percival
	Robert Dorazio
	Fred Johnson
Completion Date:	June 2006

TOHO V-A PROPOSAL TO DOCUMENT FLORAL AND FAUNAL SUCCESSION FOLLOWING ALTERNATIVE HABITAT IN A LARGE CENTRAL FLORIDA LAKE

LINGL CLITTIL	
Investigator:	Wiley M. Kitchens
Personnel:	Janell Brush
	Melissa DeSa
	Carolyn Enloe
	James Reyes
Completion Date:	June 2006

POPULATION STRUCTURE OF ALOGGERHEAD TURTLE (CARETACARETA) NESTING COLONY INNORTHWESTERN FLORIDA ASDETERMINED THROUGHMITOCHONDRIAL DNA ANALYSISInvestigator:Raymond R. CarthyPersonnel:Russell ScarpinoCompletion Date:April 2006

CONSERVATION, ECOLOGY AND PROPAGATION OF FLORIDA ORCHIDACEAE EULOPHIA ALTA (LINNAEUS) FA WCETT AND RENDLE

Investigator: Completion Date: Michael Kane December 2006

RAPID DELINEATION OF PROVENANCE FOR FLORIDA SEA OATS USED FOR BEACH AND DUNE STABILIZATION

Investigator:	Michael Kane
Personnel:	Nancy Philman
	Pete Sleszynski
	Scott Stewart
	Daniela Dutra
Completion Date:	September 2006

RADIO TELEMETRY AND MARK RECAPTURE STUDIES OF DEMOGRAPHIC, MOVEMENT AND POPULATION DYNAMICS OF ENDANGERD SNAIL KITES (RWO221) Investigator: Wiley M. Kitchens Personnel: Completion Date: March 2006

WADING BIRD COLONY LOCAL, SIZING, TIMING, & WOOD STORK NESTING SUCCESS

Investigators: Peter Frederick COST AND ACCURACY ANALYSIS OF Completion Date: October 2006

DEVELOPMENT OF UNMANNED AERIAL VEHICLES FOR ASSESSMENT OF WILD-LIFE POPULATION & HABITAT PHASE 2.

vestigators:	H.F. Percival	
rsonnel:	Adam Watts	
	Scott Bowman	
mpletion Date;	December 2006	
rsonnel: mpletion Date;	Adam Watts Scott Bowman December 2006	

ASSESSING BELOWGROUND CONSE-QUENCES OF FOREST DIEBACK AND CLIMATE CHANGE IN COASTAL CYPRESS SWAMPS

Investigators: H.F. Percival Completion Date: July 2006

VEGETATIVE HABITAT RESPONSES TO HYDROLOGIC REGIMES IN EVERGLADES WATER CONSERVATION AREA 3A.

Investigators:	W. Kitchens
Personnel:	Christa Zweigh
	Erik Powers
	Thea Hotaling
	Simon Fitz-Williams
Completion Date:	September 2006

GOPHER TORTOISE POPULATION ESTIMATION TECHNIQUES

Investigators: Personnel: Completion Date: Raymond R. Carthy Esther Langan John Wooding Saif Nomani May, 2006

2007 Theses and Dissertations

- Candelora, K. 2007. Infectious bursal disease in Whooping Cranes in Florida. Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL. M.S. Thesis.
- Scarpino, R. 2007. Assessment and mitigation of lighting mis-orientation of sea turtles in the Florida Panhandle. University of Florida, Gainesville, FL. M.S. Thesis.
- Cattau, Christopher 2007. Effects of the Invasive Exotic Apple Snail (Pomacea insularum) on the Snail Kite (Rostrhamus sociabilis plumbeus) in Florida, USA.

2007 – Publications

- Conrads, P.A., E. A. Roehl, R.C. Daamen, W. Kitchens. 2007. Simulation of salinity in the tidal marshes in the vicinity of the Savannah National Wildlife Refuge using artificial neural networks. Proceedings of the 2007 Georgia Water Resources Conference. Athens, GA.
- Conrads, P.A., E. Roehl, R. Daamen, and W.M. Kitchens. 2007. Using artificial neural network models to integrate hydrological and ecologic studies of the snail kite in the Everglades, USA. Proceedings 7th International Conference on Hydroinformatics. Nice, France.
- Daamen, R.C., E.A. Roehl, P.A. Conrads, W.M. Kitchens. 2007. Integrating 3D hydrodynamic transport and ecological plant models of the Savannah River estuary using artificial neural network models. Proceedings 7th International Conference on Hydroinformatics. Nice, France.
- Duberstein, J. and W.M. Kitchens. 2007. Community composition of select areas of freshwater tidal forest along the Savannah River. In: Conner, W.H., T.W.
 Doyle, and K.W. Krauss, eds. *Ecology of Tidal Freshwater Swamps of the Southeastern* United States. Springer: 321-348.
- Fugisaki, I., K.G. Rice, A.R. Woodward, and H.F. Percival. 2007. Possible generational effects of lake degradation on alligator reproduction. Journal of Wildlife Management 71: 2284-2289.
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- Martin, J., W.M. Kitchens, J.E. Hines. 2007. Importance of well-designed monitoring programs for the conservation of endangered species: Case study of the snail kite. Conservation Biology 21(2): 472-481.

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- Rice, K.G., J.H. Waddle, M.E. Crockett, C.D. Bugbee, B.M. Jeffery, and
 H.F. Percival. 2007. Herpetofaunal inventories of the National Parks of South Florida and the Caribbean: Volume IV. Biscayne National
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- Stolen, Eric D., J.A. Collazo, and H.F. Percival. 2007. Scale-dependent habitat selection of nesting great egrets and snowy egrets. Waterbirds 30(3): 384-393
- Wetzel, P.R., and W.M. Kitchens. 2007. Vegetation change from chronic stress events: Detection of the effects of the tide gate removal and long-term drought on a tidal marsh. Journal of Vegetation Science 18: 431-442.

2007 – Presentations

- Bowling, Andrea. 2007. Home range of snail kites. Wildlife Society Conference, St. Petersburg, FL, April 12, 2007.
- Bowman, W.S., A.C. Watts, H.F. Percival, and P.G. Ifju. Aircraft capability demonstration of University of Florida UAS, 26 July 2007, US Army Corps of Engineers Construction-Operations Division, Jacksonville, FL.
- Brush, J. 2007. Wetland avifauna response to extreme habitat modification in Lake Tohopekaliga, Florida. National Conference on Ecosystem Restoration, Kansas City, MO.
- Carthy, R.R., S.Z. Nomani and M.K. Oli. 2007. Counting holes: an assessment of gopher tortoise population assessment techniques. Invited talk, Program for Environmental Statistics, University of Florida, November 11, 2006.
- Cattau, Chris. Is Lake Tohopekaliga functioning as an ecological trap for snail kites in Florida? FL Chapter of the Wildlife Society Annual Conference, St. Petersburg, FL. April 12, 2007.

- Desa, Melissa. 2007. Extreme habitat modification on Lake Tohopekaliga, FL and its effects on herpetofauna. Herpetology Conference.
- Desa, Melissa, B. Shoger, and W.M. Kitchens. 2007. Extreme habitat modification on Lake Tohopekaliga, FL and its effects on herpetofaunal and fish communities. National Conference on Ecosystem Restoration.

Garland, K and R.R. Carthy. 2007. A taste for turtles: Chelonia mydas consumption in Pearl Lagoon, Nicaragua. *In* International Sea Turtle Symposium.

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- Watts, A.C., W.S. Bowman, A. Abd-Elrahman, B.A. Dewitt, P.G. Ifju, A. Mohamed,
 K. Lee, L.G. Pearlstine, H.F. Percival, and S.E. Smith. Unmanned aircraft systems for natural resource monitoring and ecological research. Plenary Presentaion, Association for Unmanned Vehicle Systems International, 6-9 August 2007, Washington, D.C.
- Watts, A.C., W.S. Bowman, A. Abd-Elrahman, B.A. Dewitt, P.G. Ifju, A. Mohamed, K. Lee, L.G. Pearlstine, H.F. Percival, and S.E. Smith. Unmanned aircraft systems for natural resources monitoring and ecological research. Poster, National Conference on Ecological Restoration, 23-27. April 2007, Kansas City, MO.
- Welch, Z.C. and W.M. Kitchens. 2007. Predicting freshwater and oligohaline tidal marsh vegetation communities in the vicinity of the Savannah National Wildlife Refuge. Georgia Water Resources Conference, University of Georgia, Athens, GA.
- Zweig, CL and W.M Kitchens. 2007. Habitat use of the endangered Florida snail kite during Everglades restoration. Second Annual National Conference on Ecosystem Restoration, Kansas City, MO.
- Zweig, CL and W.M. Kitchens. 2007. Landscape scale fragmentation of Cladium jamaicense in an impounded Everglades wetland. Society of Wetland Scientists International Conference, Sacramento, CA.

2007 - Technical Reports

Martin, E., Percival, H.F. and J.A. Collazo. 2007. RPP Project Final Report: Assessing the role of avian predators on shorebird foraging efficiency and impoundment use at Merritt Island National Wildlife Refuge. Florida Cooperative Fish and Wildlife Research Unit, University of Florida, Gainesville, Florida.