New Techniques in Wildlife Research & Management

Florida Chapter of The Wildlife Society

2017 Spring Meeting

FLORIDA CHAPTER

05-07 April 2017 **Orlando Hilton Garden Inn - SeaWorld**

President's Message

Welcome to our Spring Meeting!

It feels like a short time ago that we gathered for our 2016 conference in Gainesville, but much change has come to pass in that year. Regardless of our personal political convictions, it is probably safe to say that all of us continue to be concerned about the future of Florida's natural resources. Now more than ever, it is imperative that we do our jobs well, using the best equipment and information available, if we are going to make a difference for conservation.

FLORIDA CHAPTER

This year's theme, "New Techniques in Wildlife Research and Management", will help us expand our tool boxes in many aspects of the work that we do. Whether you are a field biologist, statistician, spend your time in the laboratory, manage lands, teach others, or a combination of that list, I feel confident you will find our line-up of presentations, posters, workshop, and field trips to be quite useful. And, as always, the value of the one-on-one interactions you have with the amazing group of individuals at this conference cannot be over emphasized. Step outside of your box and spend some time during the breaks and social events with people you don't know, especially our students and retirees. You will not be sorry. Also, attending the FLTWS business meeting is a tangible way to join forces with other professionals to influence wildlife protection and management.

A BIG shout-out to the crew that made this meeting happen: Monica Folk, Holly Ober, Samantha Baraoidan, Kristin Nolte, Jodi Slater, Daniel Greene, Jay Exum, Larry Perrin, Mark Ausley, Mike Milleson, Patrick Delaney, Paul Moler, Eric Tillman, and Erin Myers (please forgive me if I left anyone out). It takes a village!

Lastly, thank you to the Executive Board for your hard work and dedication, and to the FLTWS membership for the privilege of leading this fine group. It has been a pleasure, and I look forward to continuing our journey.

Sincerely,

Becky

M. Rebecca Bolt
FLTWS President, 2015-2017

Florida Chapter of The Wildlife Society Executive Board 2015-2017

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2017 Spring Conference Committee

Program: Monica Folk, Daniel Greene, Holly Ober, Becky Bolt, Paul Moler
Workshops/Field Trips: Jay Exum, Maria Zondervan, Ayonga Riddick, Tim Coughlin, Ed Harris
Technical Papers: Paul Moler
Poster Session: Eric Tillman, Paul Moler, Jen Korn
Certification and Continuing Education: Brigham Mason
Audio/Visual/Music: Patrick Delaney, Kyle Mader, Mike Milleson, PhotoSound
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Website: Mike Milleson
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Program Printing: Leesburg Printing Co.
Fundraising/Sponsors: Larry Perrin, Mark Ausley, Samantha Baraoidan, Kristee Booth
Volunteers/Student Coordination: Monica Folk, Samantha Baraoidan

Agenda Summary

Wednesday, April 5

10:15am	Fieldtrip - Behind the Scenes at SeaWorld
11:00am	Registration, Poster setup
Noon	Lunch on your own
1:00pm	Symposium. *Advancing Wildlife Research: Case Studies* (FL Keys Ballroom)
3:40pm	Break (Neptune Room)
4:00pm	Business Meeting (all encouraged to attend—Prizes!!)
5:30pm	Networking Social / Raffle

Thursday, April 6

7:15am	Student-Mentor Breakfast or breakfast on your own
8:30am	Plenary Session. *New Techniques in Wildlife Research & Management* (FL Keys Ballroom)
9:35am	TWS Certification & CEUs
9:50am	Break / Natural History Quiz Contest (Neptune Room)
10:10am	Student Papers
11:50am	Lunch on your own
1:30pm	Concurrent Sessions (Technical Papers)
2:50pm	Break / Natural History Quiz Contest
3:20pm	Concurrent Sessions (Technical Papers)
4:40pm	Break / Natural History Quiz Contest final
5:30pm	Poster Session Social / Silent Auction (Nautilus Room)
7:00pm	Banquet and Awards Ceremony

Friday, April 7

7:00am	Breakfast on your own
8:30am	Workshop on Analyzing Animal Movement Data
8:00am	Fieldtrip – Airboat tour of Lake Toho (Kissimmee) Management
8:00am	Fieldtrip – Fire Ecology of Shingle Creek Conservation Lands
Noon	Adjourn

UF – Elizabeth Braun de Torrez

Advancing Wildlife Research: Case Studies

1:00-1:10 Welcome and Introductions

Holly Ober, President-Elect Florida Chapter of The Wildlife Society

1:10-1:35 HOW MANY FLORIDA PANTHERS ARE THERE? FINDING THE ANSWER TO THE PERPETUAL QUESTION

Dave Onorato

Abstract: Determining the population size of large carnivores is a perpetual problem for wildlife managers given the fact they these animals often persist at low densities in remote areas. The problem is further exacerbated when dealing with endangered species. Estimates of population size often play a pivotal role in assessing the recovery of species protected under the Endangered Species Act, even when it is apparent that deriving said estimates has innate challenges. The Florida panther has been listed as endangered by the Federal Government since 1967. Historically, the size of the panther population has been determined using either expert opinion or information gleaned from minimum count surveys. Aside from the fact that the former has innate biases and weaknesses and the latter is an underestimate of the true population size, neither of these methods can be qualified as a scientific population estimate as they do not incorporate a measure of sampling effort, detection, and precision. Given that current USFWS recovery criteria for the panther include reference to a population size that needs to be achieved as part of the downlisting or delisting process, there is keen interest in developing more scientifically robust population estimation methods.

The Florida Fish and Wildlife Conservation Commission and collaborators have assessed two novel techniques — the motor vehicle mortality (MVM) method and a spatial capture-recapture (SCR) model applied to trail camera data from a partially marked population — that have the potential to provide scientific population estimates of the panther population. In brief, the MVM method uses traffic volume and road density data to estimate the probability of a MVM for radiocollared panthers and uses this information to model the proportion of the uncollared population that is recovered as MVM to provide a rangewide population estimate. The SCR model uses trail camera detections of marked panthers to estimate their encounter rate and movement parameters across the study grid of cameras and applies this information to detections of unmarked panthers to determine population density. I present results of the application of these techniques and highlight several pros and cons.

Bio: Dave Onorato is an Associate Research Scientist in the Fish and Wildlife Research Institute for the Florida Fish and Wildlife Conservation Commission. He is the leader of the research section of the Florida Panther Project. Dave is interested in the conservation

and management of large carnivores and conservation genetics. He obtained his B.S. in Biology from Eckerd College and an M.S. in Biology from the University of Alabama at Birmingham. He earned a Ph.D. in Zoology from Oklahoma State University where he completed his dissertation research on the recolonization of black bears from northern Mexico into the Chisos Mountains of Big Bend National Park.

1:35-2:00 USING DIAGNOSTICS FROM VETERINARY MEDICAL SCIENCES TO UNDERSTAND OVERWINTERING OF A VIRUS IN WHITE-TAILED DEER IN FLORIDA

Katherine A. Sayler

Abstract: Hemorrhagic disease (HD) is a vector-borne disease of ruminants is primarily caused by two viruses: epizootic hemorrhagic disease virus (EHDV) and bluetongue virus (BTV). In terms of losses, HD is the most important viral disease of white-tailed deer in North America. In recent years, HD outbreaks have become more frequent, and HD has become a more global problem but the driving factors are not understood. To explore this problem in northwest Florida, we measured seroconversion to 3 endemic EHDV serotypes in a sentinel herd. We also monitored the herd using reverse-transcriptase quantitative polymerase chain reaction in order to detect all known EHDV serotypes. Simultaneously, we trapped Culicoides using CDC miniature light traps and by aspiration directly off of white-tailed deer enclosed within a 500 acre preserve. From January to March of 2016 seroconversion to EHDV serotypes 1 and 6 occurred across the herd in all age groups of animals. Compared to midge abundance and diversity in the previous season (July-December), few midge species were present in either January of 2016 or 2017. Transmission of these viruses appears to be year-round, even in the absence of documented, competent vectors. By using techniques widely used for understanding disease of veterinary importance, we can expand our arsenal of tools for understanding when and where importance pathogens are found on the landscape.

Bio: Katherine Sayler joined the University of Florida faculty in 2016 in the Department of Wildlife Ecology and Conservation, specializing in wildlife disease ecology. She studied Veterinary Medical Sciences and earned her PhD in 2014. She is interested in diagnostic test development and the molecular ecology of emerging vector-borne zoonotic diseases and animal diseases.

2:00-2:25 OPERATIONAL FORECASTING OF DYNAMIC SPECIES DISTRIBUTION MODELS IN A WETLAND LANDSCAPE

James Beerens

Abstract: The increasing availability of data from real-time sensors that measure environmental properties has been fundamental to furthering understanding of species-habitat relationships in rapidly changing environments. Further, a historical record of these observation networks can guide predictions of managed systems that benefit from forecasts of likely conditions.

The Florida Everglades is a highly managed, rainfall-driven system with an integrated network of water-level gages, interpolation models, and applications that generates daily water-level data and derived hydrologic data across the freshwater part of the greater Everglades landscape. The ecological integrity of Florida's Everglades is driven by water flows, depths, spatial distribution, and quality.

We developed the Everglades Forecasting (EVER4CAST) application that simulates future water levels to help determine optimal outcomes for a suite of ecological models. EVER4CAST creates near-term (up to 6-months) forecasted water levels by repeatedly selecting the closest one-month historical analog to real-time conditions while adjusting for forecasted precipitation (i.e. central tendency). A routine then creates Monte Carlo simulations of near-term forecasted water levels by using historic variation around the central tendency. Simulations are categorized into 4 bins based on high/low water and high/low variability.

For 2017, a central tendency forecast and 100 simulations were generated and run through a set of Everglades species distribution models: wading birds (Great Egret, White Ibis, and Wood Stork), Burmese Python, Cape Sable Seaside Sparrow (CSSS), and aquatic fauna. For each species, simulations were then ranked and scored (1-100) according to the predicted species responses. The Burmese Python model was ranked inversely to represent the negative effect of this invasive species on native Everglades wildlife. The optimal simulation was determined by assigning equal weighting to each species; however, weights can be modified according to desired management objectives. This approach provides water managers with daily, spatially-explicit water level forecasts to develop regional water management targets to maximize landscape-scale benefits and the flexibility to define objectives by weighting species importance.

Bio: James Beerens is an Ecologist at the Wetland and Aquatic Research Center of the U.S. Geological Survey. His research program provides quantitative and spatial decision support tools to aid in the conservation of wildlife communities and ecosystems at the human- and invasive-impacted interface. Short- and long-term management, restoration, and land use decisions require an understanding of species-habitat relationships so that actions promote resiliency to human caused ecological change; now decoupled from the pace of adaptations that happen through natural selection. For these reasons, Beerens' studies species-habitat relationships and physical drivers of habitat change to inform

natural resource management and facilitate resilient responses to rapid change. In his program, the use of species distribution models provides spatial approaches to practical conservation to detect species sensitivity to habitat change. He uses competing hypotheses, guided by behavioral ecology, to drive selection of abiotic and biotic environmental drivers of animal ecology and the latest statistical methods to obtain inference.

2:25-2:50 COMBINING CAMERA AND TELEMETRY DATA TO MONITOR WILDLIFE: NEW METHODS BEING DEVELOPED AS PART OF THE SOUTH FLORIDA DEER STUDY

Elina P. Garrison

Co-authors: Michael J. Cherry, Virginia Tech Institute
L. Mike Conner, Joseph W. Jones Ecological Research Center
Karl V. Miller, Daniel A. Crawford, Brian Kelly, Kristin Engebretsen, University of Georgia
David B. Shindle, USFWS
Cory R. Morea, Florida Fish and Wildlife Conservation Commission
Richard B. Chandler, University of Georgia

Abstract: In southern Florida, the white-tailed deer (*Odocoileus virginianus*, hereafter deer) is an important game species and the primary prey of the endangered Florida panther (*Puma concolor coryi*). Harvest and aerial monitoring data suggest deer have experienced population declines in portions of South Florida, while elsewhere populations appear to be stable or increasing. Recent declines have coincided with changes in the hydrological regime, habitat conditions, and the predator community, however, the specific causes of the declines are unclear. To investigate the potential causes and to gain a better understanding of deer ecology in South Florida, Florida Fish and Wildlife Conservation Commission partnered with University of Georgia and others to launch a large-scale, multi-year deer research project. Along with the increased understanding of survival rates and causes of mortality, one of the main goals of the project is to develop a monitoring method using remote-sensing cameras. Historically, camera surveys designed for deer have relied on baited surveys, which can lead to bias due to varying detection rates between sexes and ages, and can cause problems with non-target species (e.g. hogs, bears). In addition, although camera traps have revolutionized wildlife research in the recent years as noninvasive and cost-effective tool for documenting wildlife presence and abundance, their use to make inferences on population density has been mainly limited to species with natural marking. Since January 2015, we have deployed over 200 GPS collars on deer and monitored 180 un-baited camera sites year-round. We provide an overview of the South Florida Deer Project and discuss a novel method that allows estimates of density and detection parameters even when the vast majority of camera detections are of unmarked individuals. We discuss how these

combined data sets can also be used to draw inferences on other aspect of deer ecology and the potential applications for other wildlife species.

Bio: Elina is originally from northern Finland, but has called Florida home for over 20 years. She earned a BS in Wildlife Ecology and Conservation from the University of Florida (UF) in 1998. Elina first joined Florida Fish and Wildlife Conservation Commission (FWC) as a volunteer in 1997, followed by working as technician on various FWC projects, before returning to UF for her master's research on black bears. She received her MS degree in 2004, same year that she began in her current position as the FWC's deer research biologist in the division of Fish and Wildlife Research Institute. Her recent work has focused on deer breeding chronology, population surveys and ecology and management of deer in South Florida. In her free time, she enjoys running, kayaking, cooking, and spending lots of time outdoors with her family.

2:50-3:15 PUTATIVE BIOMARKERS OF AVIAN SUPER-SPREADERS AND PESTS

"Marty" Lynn B. Martin

Abstract: Control of problems originating from or exacerbated by human activities, such as the emergence of zoonotic diseases and the spread of non-native species, is expensive and laborious. The earlier that incipient problems are identified, the more often and more cost-effectively we can control them. In biomedicine, biomarkers are routinely used to implicate individuals requiring medication or other forms of health care. Partly for these reasons, my lab has been exploring whether particular physiological factors can serve as biomarkers for the risk of disease and non-native host spread. In particular, we have asked whether circulating factors of the endocrine and immune systems predict the propensity of individual birds to generate new infections (i.e., host competence). We have found that corticosterone, an avian stress steroid, and interleukin-10, and anti-inflammatory cytokine, predict the extent to which two passerine species can transmit West Nile virus. We have also asked whether some of the same factors are regulated differently depending on where an individual bird occurs in its non-native range. In two recent African range expansions, we have found that house sparrows (*Passer domestics*) caught near a range-edge regulate a stress hormone differently than birds caught from the original site of introduction. These patterns warrant investigation in other disease/pest systems, and we are just starting to explore their utility in non-native reptiles in Florida. We advocate that strong consideration be given to the possibility that regulation of these and other physiological factors could influence the current and future distributions of threats to wildlife communities and human health.

Bio: Lynn B. Martin received a BS in Biology in 1996 and an MS in Biology in 1999 from Virginia Commonwealth University. In 2004, he received a PhD in Ecology and Evolutionary Biology from Princeton University, and completed his training as a postdoc

in Psychology and Neuroscience at The Ohio State University in 2007. Since then, he has been part of the Department of Integrative Biology at the University of South Florida, where he now serves as an Associate Professor.

3:15-3:40 USING DRONES TO ASSESS FERAL SWINE DAMAGE ON A FLORIDA RANGELAND

Raoul K. Boughton

Co-authors: Wesley M. Anderson, Bethany R. Wight, University of Florida

Abstract*:* Drones or Unmanned Aerial Vehicles are rapidly changing how data are collected. For example, drones are becoming an advanced tool to help crop growers apply fertilizer in a spatially explicit rate application, increase precision of population counts, and decrease biases caused by access limitations. One application is the ability to conduct environmental damage assessments across large areas. Invasive feral swine cause extensive damage through their rooting behavior. Rooting decreases productivity of grassland forage species, changes wetland hydrology, and can negatively impact species composition and biodiversity. We utilize a drone and a 12mp camera to assess the rooting damage area caused by feral swine across Florida grasslands and seasonal wetlands. We survey 36 seasonal wetlands (1.0-3.2acres) and 24 pastures (40acres) flying at a height of 50m with 70-75% image overlap to capture 2-3cm ground resolution and conduct image analyses for rooting assessment. In our data pipeline we use an online service to mosaic the georeferenced flight images per sample site; align repeat mosaics through the use of deployed ground control points; and process each mosaic within ArcGIS using image classification tools. To classify each image pixel as rooted, non-rooted or non-classified we train a subset of pixels using the three visible color bands contained within each image, and then apply these trained populations to all other pixels using Maximum Likelihood Classification. The subsequent classified pixels are then grouped and areas of rooting calculated. In this case study we show how manageable spatial data processing has become, explain the methods, the limitations of these methods, the set-up and data costs, and the results from some of our rooting flights. These methods can be used to identify whole pasture and whole crop damage caused by invasive and pest species, allowing informed decision making, and accurate ROI calculations if control and management is initiated.

Bio: Dr. Raoul Boughton is a wildlife ecologist and physiologist, with interests in population regulation and identifying individual physiological phenotypes and life history tradeoffs in the field of ecological immunology, as well as the interaction of wildlife with domestic cattle and subsequent disease risk. Raoul completed his PhD at the University of Memphis in 2007, and was then awarded two post-doctoral fellowships, one funded from NSF to investigate a high mortality event in the endangered Florida Scrub-Jay and

the occurrence of Eastern Equine Encephalitis, the second from the Morris Animal Foundation to understand the influence of habitat and fragmentation on the prevalence of EEE, WNV and SLV, in 40 populations of jays. After which he continued investigations into avian malaria and filarial nematodes and their influences on reproduction and population regulation as the Director of the Disease Ecology Program at the Archbold Biological Station. During this time Dr. Boughton became interested in the ecology of several domestic cattle diseases observed at the MacArthur Agro-Ecology Research Center, and has for example lead projects on understanding the persistence of the venereal parasite *Tritrichomonas feotus*, exposure rates of cattle to *anaplasmosis*, and the relationship of *E.coli* strains among wildlife, cattle and the environment. Recently, Dr, Boughton has studied ecosystem management in subtropical brood cow operations and in a collaborative project with University of Florida, USDA NWRC and Archbold Biological Station, studies the impact and cost of feral swine to cattle operations. In 2014 Raoul moved to the University of Florida as the Rangeland Scientist at the IFAS Range Cattle Research and Education Center. Here he continues to study the interactions of wildlife and domestic cattle including, disease, habitat management, conflict species (coyotes and feral swine) and conservation of endangered species; and through extension activities imparts his findings to the ranching community.

The University of Florida Unmanned Aircraft Systems Program

New Techniques in Wildlife Research & Management

8:30-8:40 Welcome Address – President Becky Bolt

8:40-9:10 Florida Fish and Wildlife Conservation Commission: Innovative Approaches to Wildlife Monitoring and Research

Gil McRae

Abstract: Wildlife conservation in Florida is particularly challenging due to the diversity of wildlife species and the habitats they occupy. The dynamics in this ecological landscape play out in a context of rapidly growing human population and concomitant development. These pressures have created an ever-increasing demand for timely information on distribution and abundance of protected, harvested and nongame species as well as fine scale resolution of ecological relationships among species and habitats.

Increasingly, traditional field and analytical techniques are being augmented or replaced by new approaches that rely on technological advances in remote image capture, telemetry, telematics and genetics. These field techniques are generating data that lend themselves to advanced modelling techniques such as spatially-explicit capture recapture (SECR) analysis which in turn are made practical by the wide availability of high speed computing power. Specific examples from Florida are discussed involving the Florida Panther, Florida Black Bear, Florida Manatee and other game and nongame species.

Bio: Gil McRae is currently the Director of the Florida Fish and Wildlife Conservation Commission's (FWC) Fish and Wildlife Research Institute (FWRI). FWRI is the research division within FWC consisting of approximately 700 staff housed at more than 30 locations statewide. FWRI conducts monitoring and research associated with Florida's freshwater and marine fisheries, wildlife and habitats throughout the state in partnership with dozens of state and federal agencies, universities, non-profit organizations, and private industry partners. He has more than 25 years experience as a research scientist and administrator for natural resource organizations at the state, federal and international level.

9:10-9:40 Integrating Ecological Studies and a Novel Hydrologic Monitoring Network to Understand How Hydrologic Fluctuations Control Wading Bird Populations in the Everglades

Dale E. Gawlik

Abstract: The response of wading birds to hydrologic variability has been studied for over 50 years in the Florida Everglades and globally. Collectively, these studies illustrate a variety of mechanisms through which hydrologic variability affects nesting and foraging, and how this variability can be represented in ecological models that have application to wetland restoration and management. The development by the U.S. Geological Survey of the Everglades Depth Estimation Network (EDEN) and its modeled daily water surface overcame the severe limitation of having a vast wetland with water depth data at only a few gage locations. Prior to EDEN, there was no practical way to know the water depths that were available to wading birds across the landscape, which changed daily in this dynamic wetland. EDEN allowed investigators for the first time to ask questions about habitat selection and to develop predictive models of wading bird distributions and habitat quality. Collaborations with fish ecologists built on their substantial understanding of how hydrologic parameters regulate the prey species on which wading birds depend, leading to new hypotheses about wading bird food limitations and diet partitioning. For example, although small heron foraging may seem to be restricted by their specialization on marsh fishes, their short nesting cycles allows for the phenological flexibility to delay nesting within a dry season until foraging conditions are optimal. Conversely, wood storks with longer nesting cycles are more temporally constrained, but appear to have greater flexibility in prey species, foraging range, and foraging habitat. An increase in the proportion of exotic species in the diets of storks suggests that storks, more so than small herons, are exploiting and may be affected by, the changing species composition of aquatic fauna in South Florida.

Bio: Dale Gawlik is Director of Florida Atlantic University's Environmental Science Program and a Professor in the Department of Biological Sciences. His research focuses on waterbird ecology and conservation, wetland and intertidal ecosystems, restoration ecology, and the use of birds in aquatic ecosystem management. He has published over 70 papers, many focused on how hydrologic processes control wading bird populations in the Everglades of Florida. He and his students have developed heron, stork, and ibis habitat models that link bird populations to the hydrologic management and restoration of the Everglades. Dale serves on the Steering Committee for the IUCN Heron Specialists Group, and he is a member of the IUCN Stork, Ibis, and Spoonbill Specialist Group and of the U.S. Fish and Wildlife Service's Wood Stork Working Group. Dale is currently the Secretary of the Association of Field Ornithologists and is a Councilor for the Wilson Ornithological Society and for the Waterbird Society. Dale has been a member of The Wildlife Society since 1982, serving on several committees, including Chair of the Aldo Leopold Memorial Award Committee. Dale has a special fondness for the Florida Chapter of The Wildlife Society, of which he has been a member since 1995, and held nearly every position on the Board, including President from 2011-2013.

TWS Certification and CEUs

Steps Toward Becoming a CWB® and Committee Updates

Thursday, 9:35-10:00 TWS Certification Process and Updates

Brigham Mason, CWB®

Abstract: The Wildlife Society (TWS) has a defined Certification Program that its members can participate in. The program requirements for education, professional experience, and continuing education will be outlined. Recent updates to TWS' certification process will be shared and newly certified CWBs will describe their experience with becoming certified and how it has benefited them. Tips to help students and professionals complete the application process, as well as information about how the FLTWS Certification Committee can assist them with planning, application, and renewal will be shared.

Bio: Brigham Mason came to Florida in 1999, after receiving his degree in Wildlife Science from Texas A&M University-Kingsville. He is a manager at Lykes Brothers Ranch where he oversees their wildlife management program and gopher tortoise recipient sites, among other responsibilities. His previous experience has included time with the FWC's Land Use Planning program, and employment with another large landowner where here he oversaw management of the wildlife resources on their properties in Florida, three other states, and Canada. Brigham is currently serving FLTWS as the Certification Committee Chair and has been a TWS member since 1995. Over the years since becoming a TWS member, he was actively involved at the student chapter level, serving as treasurer and helping to earn the Student Chapter of the Year Award; has maintained membership at the state chapter and national levels throughout that time; and has been a Certified Wildlife Biologist since 2007. He has also authored and been a peer reviewer of scientific publications and served as a committee chair and member in hosting regional wildlife meetings. In addition to his involvement in TWS, he has additionally served as an officer in local conservation associations, and as a stakeholder representative on the FWC's Deer Management, Gopher Tortoise, and Wildlife BMP Technical Assistance Groups.

TWS Continuing Education Opportunities

How to obtain CEUs (Contact Hours) during the FLTWS Spring Conference:

1. Attend Meeting Sessions that have been approved by TWS for Contact Hours (see below).
2. Record the actual time spent attending sessions, workshops, etc. in your Personal Activity Record (at the end of the conference, round the overall number to the nearest half).
3. Sessions missed, workshops not attended, etc. may not be recorded as Contact Hours.

AGENDA

Wednesday, April 5		CEU's Available
10:15am	Fieldtrip - Behind the Scenes at SeaWorld	0.5
11:00am	Registration, Poster setup	
Noon	Lunch on your own	
1:00pm	Symposium. *Advancing Wildlife Research: Case Studies*	2.5
3:40pm	Break	
4:00pm	Business Meeting (all encouraged to attend—Prizes!!)	1.5
5:30pm	Networking Social / Raffle	

Thursday, April 6		
7:15am	Student-Mentor Breakfast or breakfast on your own	
8:30am	Plenary Session. *New Techniques in Wildlife Research & Management*	1.5
9:35am	TWS Certification & CEUs	
9:50am	Break / Natural History Quiz Contest	
10:10am	Student Papers	1.5
11:50am	Lunch on your own	
1:30pm	Concurrent Sessions (Technical Papers)	1.5
2:50pm	Break / Natural History Quiz Contest	
3:20pm	Concurrent Sessions (Technical Papers)	1.5
4:40pm	Break / Natural History Quiz Contest final	
5:30pm	Poster Session Social / Silent Auction	
7:00pm	Banquet and Awards Ceremony	

Friday, April 7		
7:00am	Breakfast on your own	
8:30am	Workshop on Analyzing Animal Movement Data	*3.0
8:00am	Fieldtrip – Airboat tour of Lake Toho (Kissimmee) Management	*1.5
8:00am	Fieldtrip – Fire Ecology of Shingle Creek Conservation Lands	*1.5
Noon	Adjourn	

The conference has a maximum of 13.5 Category I Contact Hours available.

*An attendee can only earn Contact Hours on either the workshop or one of the post-meeting field trips, as they are simultaneous.

Technical Sessions

Session I: 10:10-11:50 (Student) – *Florida Keys Ballroom*

Abstracts – pages 22-25

10:10-10:30 Assessment of prey fish in the littoral zone of golf course ponds in Hillsborough County, Florida. *S. M. Hoffman, L. K. Solinger, and T. L. Crisman*

10:30-10:50 A model of wading bird nest numbers on Lake Okeechobee, Florida. *D. A. Essian and D. E. Gawlik*

10:50-11:10 Oak hammock restoration on a disturbed site adjacent to Payne's Prairie (Gainesville, FL). *R. Guggenheim*

11:10-11:30 Do golf course ponds provide suitable waterbird habitat in an urban landscape? *S. M. Hoffman and T. L. Crisman*

11:30-11:50 Quantifying spatial patterns and contact networks among coyotes, cattle, and feral swine on Florida rangelands. *S. Baraoidan and R. K. Boughton*

Session II A: 1:30-2:50 (Student and Nonstudent) – *Triton Room*

Abstracts – pages 25-28

1:30-1:50 A switch in tracks: The impact and management of railways for gopher tortoises. *R.M. Rautsaw, S. A. Martin, B. A. Vincent, K. Lanctot, M. R. Bolt, R. A. Seigel, and C. L. Parkinson* (STUDENT)

1:50-2:10 Bird use of wetlands in the northern Indian River Lagoon System – preliminary results. *M. B. Epstein*

2:10-2:30 Active management of bird housing by citizen scientists: a critical component for the persistence of the eastern purple martin. *D. U. Greene, D. Raleigh, J. D. Ray, J. Siegrist, and B. A. Grisham*

2:30-2:50 Habitat enhancement and avian usage of spoil islands and northwest marsh of Lake Okeechobee. *T. Beck and A. Jordan*

Session II B: 1:30-2:50 (Nonstudent) – *Poseidon Room*

Abstracts – pages 28-31

1:30-1:50 Ranching, trophic structure, and human-wildlife conflict in the Pantanal, Brazil. *S. H. Markwith, J. C. de Souza, R. M. da Silva, M. P. R. Gonçalves, and R. J. D. Jardin*

1:50-2:10 Abundance and density of black bears in 5 subpopulations in Florida. *J. Humm, J. W. McCown, B. K. Scheick, and J. D. Clark*

2:10-2:30 Implications to bat communities of intensified biomass production for bioenergy. *H. K. Ober, R. J. Fletcher, S. A. Johnson, and I. G. W. Gottlieb*

2:30-2:50 Establishing pre-WNS numbers of cave-roosting bats and the potential for caves to support *Pseudogymnoascus destructans* (*Pd*) in Florida. *L. M. Smith, T. Doonan, and J. A. Gore*

Session III A: 3:20-5:00 (Nonstudent) – *Triton Room*

Abstracts – pages 31-33

3:20-3:40 Palm Beach County: Preserving the South Florida ecosystem mosaic. *J. E. Chastant*

3:40-4:00 Treating wildlife data like the stock market. *E. H. Leone*

4:00-4:20 The role of private lands in Florida panther recovery. *E. P. Myers*

4:20-4:40 What are Floridians willing to pay for wildlife habitat management? *S. A. Johnson, D. C. Adams, and H. K. Ober*

Session III B: 3:20-5:00 (Nonstudent) – *Poseidon Room*

Abstracts – pages 34-36

3:20-3:40 An epizootic of New World screwworm infestation in the endangered Key deer. *M. W. Cunningham, S. Gibbs, L. Cusack, R. Shuman, K. G. Watts, M. P. Milleson, and D. W. Clark*

3:40-4:00 Florida Fish and Wildlife Conservation Commission's Crocodile Response Program: Program history and observed trends of *Crocodylus acutus* from 2005-2016. *A. L. West, B. M. Tornwall, and K. Mader*

4:00-4:20 Use of low-cost GPS loggers in Florida. *B. Wight and R. Boughton*

4:20-4:40 Introduction to some of Florida's charismatic microfauna. *P. E. Moler*

Poster Session

Thursday 5:30-6:30pm – *Nautilus room*

Abstracts – pages 37-46

Effects of anthropogenic activity traffic on wild turkey and bobcat road use. *A. Almond, B. Carpenter, M. Hallett, and H. T. Pittman* (STUDENT)

Vegetative change on a barrier island: implications for Sanibel Island's mammalian inhabitants. *W. Boone IV, H. Innocent, M. Celestin, D. Filho, B. Sumner, and R. McCleery* (STUDENT)

Identifying genotypes of *Acropora cervicornis* that are resilient to white band disease. *A. L. Boyles and E. M. Muller* (STUDENT)

Florida scrub-jay translocations from Ocala National Forest: winter 2017 update. *A. C. Cardas, K. E. Miller, J. Garcia, R. Risch, J. Bishop, and D. Brewer*

An innovative approach to managing for beach-nesting birds on private property in Fort Myers Beach, Florida. *A. M. Clifton, N. J. Douglass, and K. Harris*

Turbulent waters: Resolving the evolutionary history of the Atlantic salt marsh snake, *Nerodia clarkii taeniata. M. A. DiMeo, L. Arick, J. Hickson, A. J. Mason, K. Mercier, R. M. Rautsaw, J. L. Strickland, G. P. Territo, and C. L. Parkinson* (STUDENT)

Population genetics of seaside sparrows (*Ammodramus maritimus*) in Florida. *C. M. Enloe and R. T. Kimball* (STUDENT)

Differentiating tracks of sympatric rodents in coastal dunes. *D. U. Greene, J. A. Gore, E. Evans, D. M. Oddy, M. N. Gillikin, S. L. Gann, and E. H. Leone*

Forest owner willingness to protect imperiled wildlife species on private lands in Florida. *M. M. Kreye, D. C. Adams, and H. K. Ober*

Northern bobwhite winter forage production from different management practices. *H. T. Pittman*

Modeling environmental and wildlife drivers that affect Beehive Fences in agricultural landscapes impacted by elephants. *M. Rudolph* (STUDENT)

Manmade water bodies vs. natural water bodies on UCF campus for waterbirds. *H. Smith, M. Clarke, and G. Watts* (STUDENT)

An ongoing study of the striped mud turtle (*Kinosternon baurii*) at Circle B Bar Reserve in Central Florida. *L. R. Stemle, K. M. Martinet, and G. J. Langford* (STUDENT)

Field Trip I: Pre-Meeting

Wednesday 10:30-Noon – shuttle from hotel/walking tour

SeaWorld Behind-the-Scenes

Led by SeaWorld Education Staff

Behind-the-scenes at SeaWorld's animal rescue center: Although the theme park has been exposed to a lot of controversy in the last few years, they also do great work on the rescue and rehabilitation of sea turtles and marine mammals. All conference attendees welcome, but must pre-register.

SeaWorld

Field Trip II

Friday 8:00-Noon – carpool from hotel/walking tour

Shingle Creek Conservation Areas

Led by Ayonga Riddick South Florida Water Management District

Land management in a fragmented, urban setting: This field trip will provide an overview of land management activities including prescribed fire and exotic species management on lands owned by the South Florida Water Management District (SFWMD) adjacent to Shingle Creek. This creek is often referred to as the headwaters of the Everglades as it emerges from downtown Orlando and traverses to Lake Toho in Kissimmee. Longleaf pine flatwoods, freshwater marshes, cypress domes and strands, mesic hammocks and floodplain forest are all components of the natural lands managed by the SFWMD in the basin.

Field Trip III

Friday 8:00-Noon – carpool from hotel/airboat tour

Lake Tohopekaliga Management

Led by Tim Coughlin and Ed Harris (Florida Fish and Wildlife Conservation Commission)

Managing conflicting resources on Lake Toho – This field trip will traverse Lake Tohopekaliga via 17-passenger airboats from Kissimmee. We will stop at strategic areas and learn about Lake Toho and management opportunities and conflicts related to the invasion of Island (giant) apple snails, the pros and cons of an abundant biomass of the invasive aquatic *Hydrilla*, and the complications of lake management on snail kites, wood storks and migratory waterfowl.

Friday 8:30-Noon – *Poseidon Room*

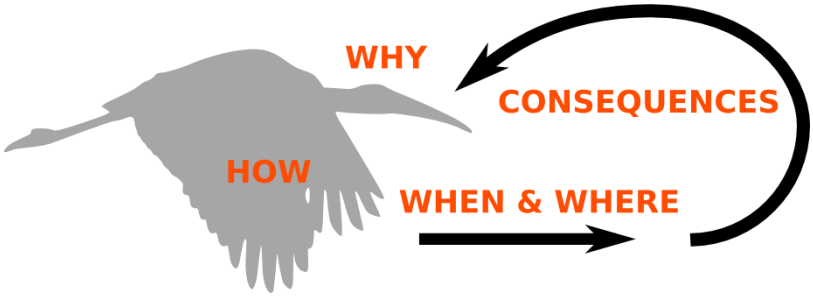
PostGIS workshop: Next Generation Data Management in Movement Ecology

Instructed by: *Mathieu Basille*

Recent technological progress has allowed ecologists to obtain a huge amount and diversity of animal movement data sets of increasing spatial and temporal re solution and size, together with complex associated information related to the environmental context, such as habitat types based on remote sensing, population density, and weather. Based on several years of experience on multiple species, this workshop is designed to introduce participants to handle, manage, store and retrieve movement data in a spatial database, and how to eventually feed them to analysis tools.

Participants will be exposed to basics of spatial databases for wildlife tracking data, using PostgreSQL/PostGIS, the reference free and open-source database system, and the integration of environmental data in the process.

The specifics of movement data will then be addressed, while showcasing how to connect the database to clients such as QGIS for visualization and the R statistical environment for analysis. Step by step, using reproducible, hands-on exercises, we will demonstrate a complete and seamless procedure from raw data to final analysis that will enable participants to fully manage and integrate complex animal movement data sets.



Bio: Mathieu Basille is an Assistant Professor in Landscape Ecology at the University of Florida's Fort Lauderdale Research and Education Center. His primarily interested in the determinism of the spatial distributions of animal species, from fine (movement models) to large scale (distribution in the landscape) in relation to environmental features (e.g. climate change) and other species. His work lies on a strong theoretical and methodological basis using the concept of ecological niche, leading to applications for animal population management, as well as basic developments at the intersection of evolutionary ecology and behavioral ecology. His main study species are large vertebrates, such as lynx in Norway, caribou in Québec, and wood stork, raccoons and sea turtles in Florida.

Technical Session I: 10:10-11:50

ASSESSMENT OF PREY FISH IN THE LITTORAL ZONE OF GOLF COURSE PONDS IN HILLSBOROUGH COUNTY, FLORIDA

S. MICHELLE HOFFMAN, University of South Florida (USF)
LAURA K. SOLINGER, Humboldt University
THOMAS L. CRISMAN, USF

Golf courses have long drawn interest for the potential refuge they offer displaced aquatic fauna in urban and suburban areas. Golf course ponds, in particular, tend to be more actively managed than ponds in other areas for water level, water quality, shoreline vegetation, and overall aesthetics. Small forage fish are an important component of small ponds, as they offer a connection between primary production and higher trophic levels. This study examined fish community composition differences between ponds situated within golf courses and adjacent residential areas. In the spring and summer of 2015, fish were captured from 11 small (0.48±0.13 ha) ponds (ngolf = 5 and nres = 6) within a highly urbanized sector of Hillsborough County, Florida. Species and total body length (to the nearest 0.5 cm) were determined and used to compare community composition and diversity among and between golf course and residential ponds. Over 2,600 individuals from eight species were collected. Species overlap in urban residential and golf course ponds was 87.5%. Golf courses had significantly higher abundance than urban residential ponds ($p=0.09$, $\alpha=0.10$), but mean diversity and evenness were not significantly different between pond types. Similarly, mean length of individuals did not differ significantly between pond types, but adults were significantly more abundant in golf course ponds than residential ponds ($p=0.08$, $\alpha=0.10$). These findings suggest that golf course ponds not only sustain a higher abundance of forage fish than residential ponds, but also that these ponds are productive enough to facilitate survival of juvenile fish to adult.

A MODEL OF WADING BIRD NEST NUMBERS ON LAKE OKEECHOBEE, FLORIDA

DAVID A. ESSIAN, Florida Atlantic University (FAU)
DALE E. GAWLIK, FAU

Hydrological variation drives prey production in freshwater wetlands. Wading birds are focal species for wetland monitoring programs because they are top-level predators, and therefore provide insight about the productivity of lower trophic levels under different hydrologic conditions. Lake Okeechobee is a highly productive system, therefore the response of wading birds to hydrological variation may differ when compared to the rest of the Everglades, which has low secondary productivity. We compared nest numbers of Great Egrets (*Ardea alba*), Snowy Egrets (*Egretta thula*), and White Ibis (*Eudocimus albus*), on Lake Okeechobee during four periods with distinct water management regimes (1972 -2016) that differed by target water levels. The highest nest numbers occurred when target water levels were low (3.6-5.3 m), and lowest nest numbers occurred when

target water levels were high (4.7-5.6 m). Furthermore, we modelled the response of nest numbers to measured water levels and water recession rates using 30 years of data collected from aerial surveys of wading birds. The variables that best explained variation in nest numbers were mean water levels during the peak nesting month, and water levels during the two years preceding the nest year. The effect of these variables differed by species. These models support other ecological studies that suggest that a water management regime aiming to keep lake levels between 3.6 m and 4.6 m, with occasional extreme drying events that reduce lake levels below 3.9 m will benefit the ecosystem by promoting the concentration of wading bird prey and by allowing for willow regeneration.

OAK HAMMOCK RESTORATION ON A DISTURBED SITE ADJACENT TO PAYNE'S PRAIRIE (GAINESVILLE, FL)

ROBERT GUGGENHEIM, Florida Fish and Wildlife Conservation Commission (FWC)

In a case study preformed at the Wildlife Research Lab in Gainesville, an invasive removal and revegetation effort was begun due to the prevalence of exotic and invasive plant species located throughout the property. Attempts were made to preserve natives while spraying herbicide mixtures, and to do so in partial plots. Mixtures for best application were determined, methods were decided on, and the study was begun by the summer of 2015. The effort being made was to allow native plant species to rebound in these partial plots through passive revegetation, active revegetation, and to continue monitoring and spraying the plots over time. The passive revegetation on the sprayed plots was met by seeding from native plants in unsprayed portions, as well as those plants avoided in the sprayed portions. The final spraying was completed in summer 2016, and passive revegetation has been recorded; along with each spray treatment. To help in the recovery of natives, active revegetation was utilized by planting donated natives from Payne's Prairie State Preserve. Continued inspections and spot treatments were recorded, as well as methods of spraying. The outcome was promising, yet we must stay diligent in order to stay on top of the invasive removal. The project has been handed over to Payne's Prairie staff and contractors to continue monitoring and treatment using the data presented from this effort. At the current time *Ardisia*, *Tradescantia*, *Lantana*, chinaberry, and one tallow have all been located, mapped, and treated on our 9 acre compound.

DO GOLF COURSE PONDS PROVIDE SUITABLE WATERBIRD HABITAT IN AN URBAN LANDSCAPE?

S. MICHELLE HOFFMAN, USF
THOMAS L. CRISMAN, USF

Many taxa have greater species richness and abundance on golf courses than surrounding areas. Habitat, landscape, and waterbird data were collected for golf courses in Collier County, Florida, an area with the second highest number of golf holes per capita in the United States, in order to assess both the evolution of course design and the value of courses to waterbirds in urbanized landscapes. Course age, size, and number and size of ponds were determined for 72 courses. Four courses from each of the past six decades (n=24) were selected for analysis of golf course design using remote sensing techniques. Land cover within and up to 500m beyond these courses was assigned to one of five cover classes: GOLF, WATER, MARSH, GREENSPACE, and FORESTED. During the second week of March 2014, waterbirds using golf course ponds (n=144) were counted, identified to species, and classified by feeding guild (wading stalkers, dabblers, divers, and other shorebirds). Mean course area has doubled since the 1950s. Older courses (> 40 yrs old) are more compact and surrounded by denser development than newer courses. Although mean pond density has remained relatively unchanged, the number of ponds per course increased noticeably after 1980, while the ratio of surface water to course area has increased greatly since the 1950s. Thirty-five species were identified. Dominant families included Anatidae and Ardeidae; dabblers and wading stalkers were equally dominant feeding guilds. Species richness and abundance were positively correlated ($p<0.01$; $R2=0.29$ and 0.45, respectively) with course age; however, course age covaried with distance from the coast. Surface divers were typically more abundant as total pond area per course increased and shoreline length decreased, whereas the opposite was found for dabblers. Wading stalker abundance increased with the number of ponds per course, but not with pond density and shoreline length as expected. And not only was richness and pond area positively correlated, but richness was also greater on these created golf course ponds than natural lakes of similar size. These findings suggest that golf courses, and golf course ponds in particular, have value as foraging habitat for waterbirds in urbanized landscapes.

QUANTIFYING SPATIAL PATTERNS AND CONTACT NETWORKS AMONG COYOTES, CATTLE, AND FERAL SWINE ON FLORIDA RANGELANDS

SAM BARAOIDAN, University of Florida (UF)
RAOUL K. BOUGHTON, UF

Florida has over 2 million hectares of land in cattle production, providing large tracts of habitat for many species of wildlife (NASS 2014). Two potentially problematic species for rangeland managers are coyotes (*Canis latrans*) and feral swine (*Sus scrofa*). The primary reasons for concern are a) the coyotes' ability to prey on calves and b) the swine's

capacity to degrade habitat and forage quality through extensive rooting. Beyond these known impacts, there are a variety of potential interactions among coyotes, cattle, and swine, including predation, competition, and disease transmission. However, the frequency and patterns of these interactions are largely unknown. Before specific types of interactions can be understood, the rate and pattern of contacts between these species must be determined. We are implementing a study to estimate the frequency and spatiotemporal distributions of interactions between both coyotes and cattle and coyotes and feral swine on Florida rangelands. We will also analyze movement patterns of each species and compare multiple methodologies for estimating contact rates.

Technical Session II A: 1:30-2:50

A SWITCH IN TRACKS: THE IMPACT AND MANAGEMENT OF RAILWAYS FOR GOPHER TORTOISES

RHETT M. RAUTSAW, University of Central Florida (UCF)
SCOTT A. MARTIN, The Ohio State University
BRIDGET A. VINCENT, UCF
KATELYN LANCTOT, UCF
M. REBECCA BOLT, Integrated Mission Support Services, NASA Ecological Program
RICHARD A. SEIGEL, Towson University
CHRISTOPHER L. PARKINSON, UCF

Habitat fragmentation is one of the leading causes of biodiversity decline and most commonly results from urbanization and construction of transportation infrastructure. Roads are known to negatively impact species, but railways often cause similar effects. Certain taxa are more vulnerable to railways than others due to limitations in mobility. Here we used gopher tortoises (*Gopherus polyphemus*) as a model system to study the impacts of railways on turtle movement and behavior. First, we used radio-telemetry to determine the frequency of railway crossings and compared this to correlated random walk (CRW) simulations. Second, we measured behavior for one hour to determine tortoise crossing ability and tested for behavioral differences associated with the familiarity of the railways using principal component analysis. Lastly, we tested trenches dug underneath the rails as a management strategy to alleviate the impact of railways on tortoises. We found that railways impacted the movement of gopher tortoises. Gopher tortoises crossed the railway less often than what would be expected by unhindered movement and, during behavioral trials, no tortoise was capable of crossing the rails due to the rails being too tall. Using game cameras, we demonstrated that trenches dug underneath the rails and between the ties was an effective management strategy. For minimal financial cost, it allowed tortoise movement across the railway, maintained full rail functionality, and created an escape route for individuals that were trapped between the rails. We suggest trenches be dug to alleviate the impact of railways on turtle movement and mortality.

BIRD USE OF WETLANDS IN THE NORTHERN INDIAN RIVER LAGOON SYSTEM – PRELIMINARY RESULTS

MARC B. EPSTEIN, USFWS

Baseline data on bird use of estuarine wetlands were collected at the Merritt Island National Wildlife Refuge from 1999 to 2006 on a 1,998-ha impoundment complex comprising 13 impoundments under four different wetland management regimes. Data were pooled and analyzed for all sites to determine abundances, seasonal patterns, diversity, and frequency of occurrence by year and month for all species. During the study, 2,705 surveys resulted in 1,172,421 bird sightings among 187 species ($\bar{x}$ = 146,553 birds/year and 433 birds/survey). Species were grouped into guilds and bird counts summarized including Rails (30.5%), Shorebirds (25.5%), Waterfowl (18.9%), Wading Birds (11.7%), Diving Birds (7.9%), and Landbirds (5.5%). Species richness varied annually, seasonally, and by guild including Shorebirds (34), Waterfowl (22), Wading Birds (16), Diving Birds (28), Rails (6), and Landbirds (81; includes raptors). Species accumulation curves suggested lower sampling frequencies over a broader range may be sufficient for some monitoring programs. Some species with low frequency of occurrence suggested incidental observations, whereas a core group of species used the wetlands seasonally, including Landbirds associated with upland dikes. Twelve waterbird species of concern were identified. Hierarchal cluster analysis identified Spring-Summer and Fall-Winter species-clusters with significantly higher bird counts during the Fall-Winter season. Fewer birds were counted during drought conditions (1999-2002). Some waterbird species gravitated towards specific wetlands, and the relationship between bird use and wetland management techniques is discussed. The study engaged “citizen scientists” to assist in the monitoring program. Based on the project oversight by refuge biologists, including data analysis, birds were consistently surveyed over the eight-year period. Very dynamic patterns of diversity by migratory and resident birds were documented among the wetland impoundments. The monitoring program successfully provided a long-term dataset and was effective for documenting species richness, species at risk, seasonal use patterns, and data important for conservation planning and comparison of future avian use.

ACTIVE MANAGEMENT OF BIRD HOUSING BY CITIZEN SCIENTISTS: A CRITICAL COMPONENT FOR THE PERSISTENCE OF THE EASTERN PURPLE MARTIN

DANIEL U. GREENE, Texas Tech University (TTU)
DANIEL RALEIGH, TTU
BLAKE A. GRISHAM, TTU
JAMES D. RAY, Consolidated Nuclear Security, LLC, U.S. Department of Energy/National Nuclear Security Administration
JOE SIEGRIST, Purple Martin Conservation Association

The continental population of the purple martin (*Progne subis*) is entrenched in a consistent, long-term decline. This is especially true for the subspecies east of the Rocky Mountains (*P. s. subis*) in the United States and most Canadian provinces, which today nests almost exclusively in provisioned housing (e.g., birdhouses and hollow gourds) provided by citizen scientists. One indirect benefit of provisioned housing is reduced nest site competition with nonnative European starlings and house sparrows. Increased competition for nest sites and subsequent lower productivity is speculated to be a primary factor of their long-term declines. To assess if poor nest survival is contributing to the long-term declines of the eastern purple martin, we analyzed nest-check records from an 18-year (1995–2013) database provided by Project MartinWatch, a citizen science program of the Purple Martin Conservation Association. We compared nest ecology metrics and nest survival among housing and entrance hole type from 72,627 nests across 8 regions to evaluate if specific provisioned housing or entrance hole type increased clutch sizes or number of chicks successfully fledged. Our major findings were: 1) nest survival was > 85% in the Eastern United States and Canada; 2) clutch sizes and number of fledglings produced were slightly larger in natural and artificial gourds with entrances designed to exclude European starlings, but; 3) housing and entrance hole types were not important predictors of nest survival and clutch size had a small, inverse relationship with daily nest survival (β = -0.002, 95% CIs: -0.0003 – - 0.009). Our results suggest poor nest survival is not the cause of declines for the eastern purple martin. Additionally, our findings encourage the use of artificial and natural gourds with European starling-resistant entrance holes, but promotion of managed artificial housing of any type in North America will benefit the eastern purple martin.

HABITAT ENHANCEMENT AND AVIAN USAGE OF SPOIL ISLANDS AND NORTHWEST MARSH OF LAKE OKEECHOBEE

ALYSSA JORDAN, FWC
TYLER BECK, FWC

Six spoil islands were created in the northwest marsh of Lake Okeechobee in 2001 to remove a ridge of organic sediment (muck) that had formed during a period of high water, effectively blocking the flow of water into the interior marsh. Material was also added in 2008 from a similar sediment removal project. FWC has been working to “rehabilitate” these spoil islands, planting roughly 9,000 trees and shrubs from over forty-five species. These created islands range in size from 2.3 to 5.5 acres and are in various stages of planting, with some islands being completed, while others have few desirable plants. Native tree and shrub plantings prevent erosion of the spoil islands and result in vertical structure that provides nesting and foraging opportunities for various wildlife, such as birds, alligators, rabbits, raccoons, bobcats, deer, snakes, amphibians, and turtles. This mosaic of naturally fragmented forest patches imbedded in expansive herbaceous marshes has produced a landscape that supports both forest and marsh birds. One project captured and banded thirty-five bird species and documented another thirty-four species over two years on one island alone. Multiple birds, including two migratory

species, have been recaptured more than one year after initial banding, suggesting the island contains desirable habitat conditions for many birds. In addition to the islands, a bald cypress (*Taxodium distichum*) fringe is being re-established. In the early 1900's, there were records of a band of bald cypress in the northwest marsh, but due to logging, wildfires, hydrologic changes, and cattle grazing, those cypress trees had disappeared. Since 2015, over 4,300 15-gallon bald cypress trees and over 1,600 7-gallon trees from twelve different wetland species have been planted in this area. Due to the slightly higher elevation compared to the surrounding marsh, this fringe should be ideal for foraging and nesting during times of high lake levels. This area may also be used for nesting by the endangered Everglade snail kite (*Rostrhamus sociabilis*). Through this work, we have shown that targeted plantings within a wetland system can prove beneficial to a wide range of wildlife, but especially birds.

Technical Session II B: 1:30-2:50

RANCHING, TROPHIC STRUCTURE, AND HUMAN-WILDLIFE CONFLICT IN THE PANTANAL, BRAZIL

SCOTT H. MARKWITH, FAU
JULIUS CAESAR DE SOUZA, Universidade Federal de Mato Grosso do Sul (UFMS)
ROSANA MOREIRA DA SILVA, UFMS
MARCOS PAULO REZENDE GONÇALVES, Universidade Estadual do Sudoeste da Bahia
RODRIGO JOSE DELGADO JARDIM, Fazenda Bodoquena

Large-scale deforestation and conversion of tropical lands, including and typified by conversion for livestock production, has simplified and homogenized ecosystems to the point they often cannot support complex functions and diversity. Tropical livestock systems are subject to substantial human-wildlife conflict because of the distinct vulnerability of domestic herbivores to depredation. When humans and carnivores compete for resources and habitat is lost and/or fragmented, wild carnivores specializing in ungulates may begin to prey upon domesticated species, which may result in predator extermination without regard to their ecosystem role or conservation status. The objective of this project was to examine spatial and temporal variation in the presence, composition, and diversity of wild fauna, including predators and their prey base, in a well-established tropical livestock system. The study was conducted on a ~140,000 ha ranch in the Cerrado-Pantanal transition zone in Brazil, where habitat conversion for improved pasture has resulted in a landscape with large areas with intensive habitat loss bounded directly by vast blocks of intact montane forests in the Cerrado and seasonally flooded lowland habitat in the Pantanal. The project sampled wildlife with camera traps distributed across the land use gradient and obtained rancher depredation observations. Depredation accounted for the loss of 0.9% of the total herd in the sampling year, and the number of depredation events was greater closer to intact forest and distant from the ranch headquarters. Mammal diversity was greatest adjacent to intact forest and supported

complete representation of the native trophic structure, including large predators such as jaguar, puma, and maned wolf and a diverse and abundant prey base. Sites progressively distant from intact forest and with more intensive conversion and development supported smaller subsets of the diversity and composition, and no large predators. In addition to assessment and suggestions for livestock management practices on the ranch to reduce the economic impact of depredation on cattle, suggestions were also made concerning the potential for diversity enhancement and landscape management to facilitate movement of large mammals between intact forest blocks.

ABUNDANCE AND DENSITY OF BLACK BEARS IN THE 5 MAJOR SUBPOPULATIONS IN FLORIDA USING SPATIALLY-EXPLICIT CAPTURE-MARK-RECAPTURE MODELS

JACOB HUMM, University of Tennessee
J. WALTER McCOWN, FWC
BRIAN K. SCHEICK, FWC
JOSEPH D. CLARK, USGS

We estimated abundance and density of the 5 major black bear (*Ursus americanus*) subpopulations (i.e., Eglin, Apalachicola, Osceola, Ocala/St. Johns, and Big Cypress) in Florida based on spatially explicit capture-mark-recapture modeling (SCR). During 2014 and 2015, bear DNA was extracted from hair samples collected at barbed-wire hair sampling sites spaced 2 km apart within a 3 × 3 cluster. We arranged the clusters to be 16 km apart (center to center) within each of the 5 study areas encompassing a combined 38,960 km2. Several landscape variables, most associated with forest cover, helped refine density estimates for the 5 subpopulations we sampled. Detection probabilities were affected by site-specific behavioral responses coupled with sex effects. Model-averaged bear population estimates ranged from 119.6 (95% CI = 59.4 – 276.2) bears or 0.025 bears/km2 (95% CI = 0.011 – 0.44) for the Eglin subpopulation to 1,192.6 bears (95% CI = 950.8 – 1,519.5) or 0.127 bears/km2 (95% CI = 0.101 – 0.161) for the Ocala/St. Johns subpopulation. The total population estimate for our 5 study areas was 3,908.8 bears (95% CI = 2,916.2 – 5,425.8). The cluster sampling method was efficient and allowed us to estimate abundance across extensive areas that would not have been possible otherwise.

IMPLICATIONS TO BAT COMMUNITIES OF INTENSIFIED BIOMASS PRODUCTION FOR BIOENERGY

HOLLY K. OBER, UF
ROBERT J. FLETCHER, UF
SHELLY A. JOHNSON, UF
ISABEL G. W. GOTTLIEB, UF

A desire to increase domestic production of fuels in the U.S. has generated great interest in identifying sustainable options for creating bioenergy from renewable resources. One option receiving strong consideration is intensified production of biomass to be converted to biofuels. Due to the favorable growing conditions in the Southeast, this region is expected to contribute heavily to such biomass production. Thus, it is important to understand how changes in land use resulting from market pressures to produce biomass for biofuels may impact wildlife in the Southeast. Two commodities well suited to serve as feedstocks for biofuels are already produced across the region: corn and pine. To compare likely impacts of alternative bioenergy production pathways to wildlife, we conducted repeated acoustic surveys for bats over 336 nights at 84 sites in AL, GA, and FL during 2013-2015 as part of a multi-taxa study involving bats, birds, bees, and reptiles. We compared the impacts to bat communities of (1) production of corn, and intensified production of pine biomass via (2) short rotation pine plantations, (3) removal of residual debris from clearcuts following pine logging operations, and (4) mid-rotation thinning of pine stands. We found that shortening the length of pine stand rotations was most detrimental to bats, resulting in decreased occupancy rates. Removal of logging residues from pine clearcuts had equivocal effects on occupancy rates, as did production of corn. In contrast, thinning of pine stands led to increased occupancy rates. Species-specific patterns generally followed predictions expected due to foraging adaptations resulting from differential wingloading and aspect ratios. If pressures to produce biomass for biofuels increase as expected, we recommend use of mid-rotation thinning of pine stands as a source of materials, and caution against the adoption of short rotations, particularly when combined with removal of logging residuals after clear-cut harvesting.

ESTABLISHING PRE-WNS NUMBERS OF CAVE-ROOSTING BATS AND THE POTENTIAL FOR CAVES TO SUPPORT *PSEUDOGYMNOASCUS DESTRUCTANS* (*Pd*) IN FLORIDA

LISA M. SMITH, FWC
TERRY DOONAN, FWC
JEFFERY A. GORE, FWC

White-nose syndrome (WNS), the fungal disease caused by *Pseudogymnoascus destructans* (*Pd*), has killed millions of hibernating bats across eastern North America. *Pd* has expanded into Alabama and Georgia, thereby increasing the threat to Florida's two winter cave roosting species: the tricolored bat (*Perimyotis subflavus*) and southeastern

myotis (*Myotis austroriparius*). During three winters (January-March) of 2014-2016, we surveyed 144 caves 1-3 times in Florida's two primary karst regions in the panhandle (northwest; n = 74) and the peninsula (north central; n = 70). We detected a total of 2147 tricolored bats in 112 caves (77.8%), with numbers ranging from 1-220 per cave (mean = 8.3, *SE* = 1.61). Tricolored bat numbers remained fairly constant between years. Most tricolored bats were found in colder panhandle caves and only two caves sheltered over 100 tricolored bats. Southeastern myotis were detected in 26 caves (18.1%), and their numbers fluctuated dramatically from year to year, with 1117 bats in 2015 and 49,551 bats in 2016. We placed HOBO© temperature loggers near roosts in 50 caves to evaluate susceptibility of Florida's caves to *Pd.* In winter 2015 and 2016, 37.0% and 42.4% of caves, respectively, had average temperatures within the optimum *Pd* growth range (12.5-15.8 ºC). In summer 2015, 63.9% of caves had average temperatures higher than the maximum critical temperature for growth of *Pd* (19.0-19.8 ºC). Peninsular caves had warmer average annual temperatures (20.1 ºC) than panhandle caves (17.6 ºC) and are likely to experience slower growth of *Pd.* Although *Pd* has not been detected in Florida, tricolored bats remain potentially vulnerable to WNS since more than 50% of these bats hibernate in only 5 caves, 4 of which are in the panhandle where ambient cave temperatures are cooler and in winter are suitable to growth of *Pd.*

Technical Session III A: 3:20-5:00

PRESERVING THE SOUTH FLORIDA ECOSYSTEM MOSAIC: PALM BEACH COUNTY NATURAL AREAS WITH EMPHASIS ON ACREAGE PINES NATURAL AREA

JENNIFER E. CHASTANT, Palm Beach County Department of Environmental Resources Management

In the early 1980s, concerns over rapid urbanization in Palm Beach County led 14 environmental groups to form the Coalition for Wilderness Islands. In May 1984, the Coalition proposed a program to the Board of County Commissioners (the Board) for the establishment of "wilderness islands" to preserve examples of the best remaining native ecosystems in the County. The Board supported this recommendation, and an inventory of native ecosystems in Palm Beach County was conducted in 1987 and 1988. The inventory identified 38 eco-sites as suitable for acquisition. Using state and local funds, the County has acquired and preserved over 31,000 acres of land as natural areas. The natural areas are open for passive recreational activities such as hiking, bird watching, nature study, photography, environmental education, and scientific research. Acreage Pines Natural Area is located in an unincorporated portion of west-central Palm Beach County. This 124-acre natural area was purchased by the County in 2001 with the primary goal of preserving important remnants of the greater Loxahatchee Slough eco-site. Restoration efforts have focused on removing invasive nonnative vegetation, introducing prescribed burns, and restoring hydrology to historic wetland levels. Site restoration and enhancement projects to date include the mechanical removal of 18-acres of melaleuca

(*Melaleuca quinquenervia*) monoculture, herbicide treatment of torpedo grass (*Panicum repens*) and Old World climbing fern (*Lygodium microphyllum*), and construction of water-control structures to retain water on site. Photo monitoring stations and vegetation transects were established to document the elimination of exotic vegetation as well as the recovery and re-growth of native vegetation. Following mechanical removal of melaleuca, percent coverage of native vegetation in the depressional wetlands almost doubled and percent coverage in the hydric pine ecosystem nearly tripled in the first year. By the third year of the study, the project success criteria of >80% native vegetation coverage had been met and <1% of the vegetation observed within the quadrats was nonnative. The County takes an aggressive approach to invasive nonnative vegetation removal and the success documented at Acreage Pines Natural Area is just one example of the County's many restoration achievements.

TREATING WILDLIFE DATA LIKE THE STOCK MARKET

ERIN H. LEONE, FWC

Autoregressive Integrated Moving Average (ARIMA) models have been used for decades to model underlying trends and predict future patterns in the stock market. These highly flexible models are powerful tools for analyzing time series data. They can model long-term trends and seasonal deviations as a product of time as well as additional covariates, all the while accounting for autocorrelation present in the data. Autocorrelation is often present in time series data because observations taken close together are not independent of one another. While ARIMA models are commonly applied in economic settings, they are not often employed in wildlife research. An innumerable number of wildlife data streams consist of equally-spaced data points collected over time. Some examples include temperatures collected from loggers, stream and river flow rates collected from gauges, and of course daily, monthly, or yearly counts of animal populations. Researchers often need to account for underlying autocorrelation while attempting to model changes over time, usually in response to environmental conditions, and ARIMA models are an excellent analysis option. This paper will provide a brief introduction to ARIMA models, applied to wildlife data relevant to researchers and biologists, as well as some practical pointers for implementation.

THE ROLE OF PRIVATE LANDS IN FLORIDA PANTHER RECOVERY

ERIN P. MYERS, USFWS

Over the past 20 years, the Florida panther population has increased significantly in southwest Florida from an estimated 30 panthers in 1995 to approximately 120 - 230 today. This success is due to many factors, including genetic restoration, habitat management and protection on public lands, and habitat restoration/management on

private lands. As a result, panthers have been expanding their range on both public and private lands, leading to increased interactions between humans and panthers as well as livestock and panthers. Verified livestock losses to panthers have been increasing to a current estimation of 0.5% to 5.3% per year in Southwest Florida (based on Main and Jacobs study in 2014). Unfortunately, there are many more livestock losses never verified due to the dense habitat on ranches as well as the covert hunting habits of the panther. These overall losses have an extreme emotional and financial impact to the ranchers who live and work in the 29% of occupied panther range on private lands. It is apparent that recovery of the Florida panther is dependent on cooperation with working lands in South and South-Central Florida, and the US Fish and Wildlife Service is diligently working to create and fund programs that benefit ranchers and their working lands. These programs offer financial assistance for habitat management and livestock losses, with the intent to offset the impacts panther recovery has on ranching operations in South Florida. This is an opportunity to learn about the positive impacts ranching has to Florida panther recovery and about programs that can help keep working ranches working in panther occupied range.

WHAT ARE FLORIDIANS WILLING TO PAY FOR WILDLIFE HABITAT MANAGEMENT?

SHELLY A. JOHNSON, UF
DAMIAN C. ADAMS, UF
HOLLY K. OBER, UF

In a market-driven economy, quantifying how the public values wildlife is essential for building support for management actions designed to promote wildlife habitat conservation. We quantified the public's preferences for habitat management within the native range of the longleaf ecosystem. We asked 1164 Florida residents how much they would be willing to contribute to a State-managed fund, dedicated to habitat improvements, assuming this payment would be added to their household utility bill each month. Ten wildlife species of conservation interest in Florida forests were included in the survey. We employed a double-bounded dichotomous choice model and each participant was queried on three of the ten species, including one highly-preferred and one least-preferred. For each species, the participant was initially presented with one of five bid options, ranging from $0.80/month to $6.70/month. Data were analyzed with a logit model in the DCchoice package in R. The average willingness-to-pay of all 10 wildlife species combined was $1.61/month. While charismatic and familiar species had a higher value (e.g., southeastern bald eagle $3.36/month), even generally disliked species had a positive value overall (e.g., eastern diamondback rattlesnake $0.37/month). With over 7 million households in Florida, an extrapolated value would equate to over $156 million per year, demonstrating substantial financial support by the public for wildlife habitat improvements. While there is sometimes controversy over the monetization of wildlife habitat, examples such as this cannot be overlooked given their potential impact on policy development and building support for wildlife habitat conservation in regions of conflicting land use.

Technical Session III B: 3:20-5:00

AN EPIZOOTIC OF NEW WORLD SCREWWORM INFESTATION IN THE ENDANGERED KEY DEER

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The New World screwworm (*Cochliomyia hominivorax,* NWS) is the cause of NWS myasis, a foreign animal disease in the United States. Female NWS deposit eggs in wounds or the body openings of warm-blooded animals. The emerging larvae are obligate parasites and consume living flesh, resulting in substantial tissue damage, inflammation, and secondary bacterial infections. This tissue damage and discharge attracts additional flies, leading to progressively worsening wounds, and can lead to death of the host in days to weeks. Historically, the NWS was endemic in the North American Southwest, and was introduced into the Southeast in 1933. NWS had a severe impact on white-tailed deer, other wildlife, and domestic animals before their eradication from the Southeast in 1959 and the remainder of the United States in 1966. Reproducing populations of NWS were absent from the Southeast for almost 60 years before a NWS infestation was documented in a Key deer (*Odocoileus virginianus clavium*) on Big Pine Key, Florida, in September 2016. By January 2017 at least 135 deer had died with NWS infestations. Infestations were also documented in domestic animals and a raccoon (*Procyon lotor*). Management to control the outbreak included the release of sterile male NWS flies combined with efforts to decrease numbers of fertile NWS flies. The latter included euthanasia of severely affected deer, topical and oral administration of antiparasistics to free-ranging deer, and immobilization and treatment of deer with mild to moderate infestations. Together these management practices contributed to a significant decline in the presence of NWS, with the last documented case in a Key deer occurring 7 January 2017.

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION'S CROCODILE RESPONSE PROGRAM: PROGRAM HISTORY AND OBSERVED TRENDS OF *CROCODYLUS ACUTUS* FROM 2005-2016

AMANDA L WEST, FWC
BRETT M TORNWALL, FWC
KYLE MADER, FWC

The Florida Fish and Wildlife Conservation Commission (FWCC), in partnership with United States Fish and Wildlife Service, the National Park Service, and the University of

Florida, created the Crocodile Response Program in 2005 in response to an increase of American crocodile (*Crocodylus acutus*) interactions with humans. Since inception, the program has developed and adapted with the increased presence of *C. acutus* near and within Florida communities. FWCC is responsible for receiving and responding to crocodile complaints and sightings from the public. The Crocodile Response Plan outlines categories of human-crocodile interactions into Sightings, Encounters, Depredation, Incident, Defensive Bite, and Attack. Education of how to safely coexist with American crocodiles is the first tool utilized when a crocodile sighting is reported. Crocodile translocation is only attempted when crocodiles are in artificial habitat, there is concern for the animals' safety, or if depredation has occurred. Crocodiles are removed from the wild if they display threatening behavior to humans, a bite incident has occurred, if the animal was west of US 1, or if the animal returns to the same nuisance capture location after 2 translocation efforts. FWCC also processes any crocodile carcasses reported. Using sightings and complaints reported to the Statewide Nuisance Alligator Hotline (SNAP), an average of 129 *C. acutus* sightings were reported annually to FWCC with a peak in 2012 and 2013. Eighty-five % of these sightings came from Monroe and Miami-Dade counties. Since 2005, there have been 117 handling events of nuisance crocodiles. One hundred seven crocodiles were translocated (92%), 5 were removed to captivity (4%), and 5 died during capture effort (4%). After translocation, 25 of 79 crocodiles were recaptured, for a recapture rate of 31%. Males were more likely to be recaptured than females ($p=0.052$). Of the animals handled, 64% were adults (over 182 cm). Crocodile carcasses recovered were more likely to be adults (69%) and male ($p<0.01$). There has been 1 recorded *C. acutus* bite on humans in Florida. Today, the program continues their efforts to promote public safety while recognizing the needs of a recovering species.

THE USE OF LOW-COST GPS LOGGERS FOR WILDLIFE STUDIES: DEVELOPMENT AND DEPLOYMENT ON FERAL SWINE IN CENTRAL FLORIDA

BETHANY WIGHT, UF
RAOUL BOUGHTON, UF

Global positioning system (GPS) loggers are used to collect location data to examine ecological and biological phenomena of wildlife. Recent developments of low-cost GPS loggers used for vehicle and pet tracking have high potential to be used on wildlife. Low-cost units would allow large sample sizes needed to answer difficult ecological questions. A good example is investigating dispersal distances and trajectories. Often, for dispersal many young need to be sampled as high death rates are common and relatively few dispersal events end up being recorded when only a few individuals are sampled. Several studies have tested the performance and accuracy of low-cost GPS data loggers and deemed them suitable for use in wildlife studies. We tested two low-cost GPS data loggers and deployed these units on feral swine in central Florida. The low-cost GPS loggers, iGOTu and Catlog, were compared to pre-built GPS Lotek collars in open and closed canopies to examine fix rate success, reported error, and true location error prior to deployment. All units had high fix success rates regardless of habitat (>99%) and, as

expected, slightly higher location error rates in closed canopies. The iGOTu loggers had the highest location error at 13.4 m (SD=44, n=964). Location error for Catlog loggers was 7.6 m (SD=9, n=958), similar to Lotek loggers at 6.4 m (SD=7, n=960). We deployed low-cost GPS units on feral swine, recovered them, and captured effective large datasets. To date over 82,000 location points from 22 unique animal deployments have been collected. Wildlife tracking companies still offer some advantages in collars, enclosures, and other tools to deploy units on a wide variety of animals, as they have gone through decades of trial and error. Our biggest future challenges in the development of low cost units will be refining robust water tight enclosures to protect electronics and batteries. We plan to continue the development, assessment, and deployment of low-cost GPS units, especially GSM or satellite, to reduce costs for wildlife studies in order to answer more biological and ecological questions.

INTRODUCTION TO SOME OF FLORIDA'S CHARISMATIC MICROFAUNA

PAUL E. MOLER, FWC

Although the vast majority of Florida's wildlife species are invertebrates, most receive little attention from wildlife managers. The important roles played by bees and butterflies are generally well known, but many other species toil away anonymously providing important ecosystem functions. Still others may not be major players but are nonetheless behaviorally or morphologically fascinating ("cool"). I will introduce a select few invertebrate species that have struck my fancy.

UF – Elizabeth Braun de Torrez

Poster Session

EFFECTS OF ANTHROPOGENIC ACTIVITY ON WILD TURKEY AND BOBCAT ROAD USE

AMY ALMOND, FWC
BOBBI CARPENTER, UF
MATTHEW HALLETT, UF
H. TYLER PITTMAN, FWC

Camera trapping is a commonly used method for monitoring wildlife in a specific area. It has proven useful for the documentation of behavior and abundance of bobcats (*Lynx rufus*), but such techniques have not yet been used for species like the wild turkey (*Meleagris gallopavo*). In addition, camera surveys using roads or trails may introduce biases to behavior analyses because the anthropogenic activity typically associated with roads or trails may alter the behavior of wildlife. We began our study to determine the effect of anthropogenic activity on the use of roadways by wild turkeys (*Meleagris gallopavo)* and bobcats (*Lynx rufus*) using a remote infrared camera grid established on three study areas in central Florida. The study areas consisted predominately of a mixture of upland pine, bottomland hardwood, and depressional marshes that total approximately 3,171 ha in eastern Alachua County, Florida. We distributed 70 motion-activated infra-red cameras based on a 700m grid. We placed 50 of the cameras along the road or trail closest to each grid point, and selected a sub-sample of 20 of these locations to place a paired camera 300m away from the road or trail. These cameras collected photos during November and December (62 days), producing a total of 4,340 trap nights. We analyzed the photos to determine the number of instances captured on camera of wild turkey, bobcat, human traffic by foot, and human traffic by motorized vehicle. We conducted a multiple correlation analysis of the number of incidences of each species and traffic category. We captured 204 turkey photos, 98 bobcat photos, 206 human foot traffic photos, and 585 vehicle traffic photos, at a rate of 0.137, 0.066, 0.138, and 0.393 photos per trap night, respectively. We determined that camera sites with more human activity had a positive correlation with both wild turkey and bobcat activity ($\rho \geq 0.32$). This correlation is likely because wild turkeys and bobcats, like humans, can more easily move using open areas like road ways. In conclusion, it does not appear that human traffic, either by foot or by motorized vehicle, deter the use of roadways by wildlife.

VEGETATIVE CHANGE ON A BARRIER ISLAND: IMPLICATIONS FOR SANIBEL ISLAND'S MAMMILIAN INHABITANTS

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HANNA INNOCENT, UF
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BRITTANY SUMNER, University of Georgia Cooperative Extension
ROBERT MCCLEERY, UF

Shrub encroachment of grassland systems is a global phenomenon known to influence wildlife occurrence. We investigated the effect of vegetation on marsh rabbit (*Sylvilagus palustris*), raccoon (*Procyon lotor*), and armadillo (*Dasypus novemcinctus*) occurrence on Sanibel Island in southwest Florida. We placed camera-traps at 2 points on each of 36 grids; half in shrub encroached areas and half in grasslands. We camera-trapped June-August of 2015 and December 2015-February 2016, yielding 1,772 photos of mammals. We measured the percentage of groundcover, sand cordgrass (*Spartina bakeri*), and giant leather fern (*Acrostichum danaeifolium*) within ½ m plots on each grid. We also measured the percent coverage of buttonwood (*Conocarpus erectus*) and cabbage palm (*Sabal palmetto*), 2 species associated with shrub encroachment, in the canopy of each grid at a 4-m scale. We developed 5 *a priori* single-variable occupancy models using the aforementioned vegetation variables, which were selected because of their perceived importance to wildlife. We tested these models on each wildlife species. We evaluated candidate models using Program Presence and inferred statistical significance for variables with 95% confidence intervals not crossing zero. We found that groundcover and cordgrass percent cover best accounted for the variation in occurrence of raccoons on our grids. Increases in groundcover were significantly correlated with decreases in raccoon occurrence. Similarly, increases in cordgrass coverage were negatively associated with raccoon occurrence, although not significantly. We did not find any influence of vegetative variables on marsh rabbit or armadillo occurrence. Models investigating detection did not converge for any species. These findings reveal a potential shift in the mammalian community resulting from shrub encroachment that could negatively influence other wildlife species. Particularly, the tendency of raccoons to raid the nests of sea turtles (594 *Caretta caretta* nesting events occurred on Sanibel Island in 2016) and diamondback terrapins (*Malaclemys terrapin*; native to Sanibel's mangrove estuaries) is of concern due to the close proximity of Sanibel's grasslands to coastal and estuarine systems.

IDENTIFYING GENOTYPES OF *ACROPORA CERVICORNIS* THAT ARE RESILIENT TO WHITE BAND DISEASE

ALANA L. BOYLES, University of Tampa
ERIN M. MULLER, Mote Marine Laboratory

White band disease in the Caribbean, which targets framework-building stony corals like *Acropora cervicornis* (staghorn coral), has become commonplace on reefs in the Florida Keys. This increase in white band disease has resulted in significant loss of *Acropora* species. To combat this rapid decline, *A. cervicornis* is grown in nurseries *in situ* and transplanted onto affected reefs. In order for transplanting efforts to be most successful, the transplanted corals should be resilient to disease outbreaks. To propagate resilient corals in nurseries, scientists should first determine whether varying genotypes differ in disease susceptibility. An experimental laboratory manipulation was conducted to test whether nine genotypes from an *in situ* nursery on Summerland Key varied in disease susceptibility. The corals were arranged in three distances from a diseased individual to test for genotypic resilience to white band disease. Though evidence suggests there is variation among genotypic susceptibility, the data were not significant. However, the B/O genotype was able to withstand contracting white band disease in all but one individual, suggesting this genotype may be more resilient than others. There was also no difference in susceptibility among distances from the diseased coral, although there was a trend of higher rates of disease infection at the closest distance. These results suggest that there may indeed be differences in susceptibility among genotypes of *A. cervicornis*, although further study with higher replication is needed.

FLORIDA SCRUB-JAY TRANSLOCATIONS FROM OCALA NATIONAL FOREST: WINTER 2017 UPDATE

ALEXIS C. CARDAS, FWC
KARL E. MILLER, FWC
JAY GARCIA, USDA Forest Service
RALPH RISCH, Florida Forest Service
JOSEPH BISHOP, Florida Forest Service
DUSTIN BREWER, FWC

Translocation of the threatened Florida scrub-jay (*Aphelocoma coerulescens;* hereafter FLSJ) has been proposed as a strategy to maintain landscape connectivity, to assist populations in growing and recolonizing suitable habitat, and to preserve genetic diversity. The few translocations that have occurred to date have mostly involved small, nonviable populations located on private lands with federal incidental take permits. We initiated a pilot project to study the feasibility of using Ocala National Forest, which supports the largest remaining population in the state, as a donor site for FLSJ translocation. These are the first translocations of FLSJs from a stable population on any conservation land. Intensive monitoring pre- and post-translocation will assist in determining the impacts of

the manipulations on both the donor and recipient populations. As of February 2017, four family groups, totaling nine individuals, have been translocated from Ocala National Forest to Seminole State Forest. Soft release, which consists of housing the birds in an acclimation cage overnight at their respective recipient sites, was used on two family groups. This technique provides them with food, water, and shelter, and provides biologists an opportunity to monitor the birds after they have been fitted with VHF telemetry. Direct release, also referred to as hard release, was used on two family groups, and consists of immediately releasing the birds upon arrival at the recipient site. Plans for the next translocation season are to continue moving FLSJ family groups to recipient sites that are currently under carrying capacity, and also begin translocations of juvenile FLSJs to unoccupied recipient sites. This project addresses critical information needed before establishing an interagency partnership to implement a statewide translocation program for FLSJs.

AN INNOVATIVE APPROACH TO MANAGING FOR BEACH-NESTING BIRDS ON PRIVATE PROPERTY IN FORT MYERS BEACH, FLORIDA

AMY M. CLIFTON, FWC
NANCY DOUGLASS, FWC
KATHERYN HARRIS, FWC

Carlos Point is an area of highly accreted, privately-owned beach at the south end of Ft. Myers Beach. Mechanical beach raking maintains this unusually wide stretch of beach free of vegetation and creates conditions highly attractive to beach-nesting birds. The most imperiled birds that nest at the site are snowy plovers (*Charadrius alexandrinus tenuirostris*), least terns (*Sterna antillarum*), American oystercatchers (*Haematopus palliatus*) and black skimmers (*Rynchops niger*). These species are currently listed by FWC as threatened. The U.S. Fish and Wildlife Service lists the snowy plover as “under review” for listing under the Endangered Species Act. This species is extremely imperiled in Florida, with an estimated 220 breeding pairs remaining in the State. This site, in recent years, has supported one of the largest least tern and black skimmer colonies in southwest Florida. Posting the area with signs and symbolic barriers and halting mechanical cleaning during the nesting season reduces disturbance to the birds and greatly increases their chances of successful nesting. Thus, landowner cooperation and support are critical to ensuring nesting success at these locations. Halting mechanical cleaning may result in vegetation growth during the months that birds are nesting (shorebird and seabird nesting can occur between Feb. 15th and Aug. 31st). In order to secure annual landowner cooperation for protecting this large nesting colony, FWC has negotiated a conditional agreement that addresses landowner concerns while ensuring beach-nesting birds have adequate habitat and protections. FWC staff treat nuisance vegetation with herbicide and hand removing sandspur plants so that the area can be mechanically cleaned again. In 2017, FWC plans to contract out the tilling of the beach habitat to return it to pre-posting conditions. FWC is also seeking incentives to encourage continued landowner cooperation in managing for beach-nesting birds.

TURBULENT WATERS: RESOLVING THE EVOLUTIONARY HISTORY OF THE ATLANTIC SALT MARSH SNAKE, *NERODIA CLARKII TAENIATA*

MARK A. DIMEO, UCF
LINDSEY ARICK, UCF
JASON HICKSON, UCF
ANDREW J. MASON, UCF
KATHRYN MERCIER, UCF
RHETT M. RAUTSHAW, UCF
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GREG P. TERRITO, UCF
CHRISTOPHER L. PARKINSON, UCF

Taxonomy is often expected to reflect the species' evolutionary history, or phylogeny. Conservation decisions may be based on this taxonomy, but if it does not reflect evolutionary history, then there is a potential for misuse of conservation and financial resources. Historically, morphological and ecological data were used to describe a species, but today we also incorporate genetic data to better estimate relationships. In 1977 U.S. Fish and Wildlife Service listed Atlantic salt marsh snakes (ASMS, *Nerodia clarkii taeniata*) as threatened. However, ASMS was described primarily through morphological studies and since the listing of ASMS, the taxonomy and nomenclature has not been investigated using genetic data. There is a current lack of knowledge regarding species boundaries within *Nerodia clarkii* and its most closely related taxon, *Nerodia fasciata*. Very few studies have examined Florida *Nerodia* utilizing genetic data, thus our goal is to assess the validity of the classification of ASMS by using a combined morphological and genetics approach. We improved upon historical morphological studies by using a larger sample size with additional phenotypic characters. Tissue samples from all subspecies of *N. fasciata* and *clarkii* were collected throughout their Florida range. Additionally, in combination with the morphological data, we sequenced a total of three mitochondrial and four nuclear genes from 74 specimens to reconstruct the phylogeny of ASMS in a Bayesian framework. This multi-gene approach will lead to a more robust estimate of the relationships within these species. From our morphological data, we have found no evidence of significant difference between subspecies. Preliminary phylogenetic analyses do not support the monophyly of ASMS. So far, the concordance between both data sets makes a strong case for reconsidering both the taxonomy and listing of ASMS. We hope this work will inform U.S Fish and Wildlife Service management practices. This study provides evidence that we must be cautious in assuming an organism's taxonomy conveys accurate information for conservation management.

POPULATION GENETICS OF SEASIDE SPARROW (*AMMODRAMUS MARITIMUS*) IN FLORIDA

CAROLYN ENLOE, FWC
REBECCA KIMBALL, UF

In 2016, FWC initiated a study to re-examine the subspecies relationships of seaside sparrows in Florida. To date, FWC has collected 171 genetic samples across 14 sites. Phenotypic data including morphometrics, audio recordings of vocalizations, and detailed photographs are being collected to supplement data obtained from genetic material. FWC and collaborators at University of Florida are using double digest RADseq method to determine the relatedness of sparrows in these populations. Final results from this project will be used to refine taxonomic designations of seaside sparrows, which may affect listing status and, therefore, future conservation and management priorities.

DIFFERENTIATING TRACKS OF SYMPATRIC RODENTS IN COASTAL DUNES: IMPLICATIONS FOR THREATENED AND ENDANGERED BEACH MICE (*PEROMYSCUS POLIONOTUS* SPP.)

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EMILY EVANS, FWC
DONNA M. ODDY, Integrated Mission Support Services, NASA Ecological Program
MICHAEL GILLIKIN, FWC
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Identifying techniques to conduct frequent, effective, and inexpensive monitoring of wildlife can be challenging. Traditional approaches such as live-trapping can be laborious, expensive, detrimental to animal health, and ineffective. Passive approaches such as tracking have been shown to lessen these burdens, but a major problem with tracking, particularly for small mammals, is the reliability of species identification from footprints. As a result, tracking remains an uncommon method of monitoring small mammal populations. To address the need for a more accurate method for identifying small mammal tracks, we collected footprints from live-captured animals and developed a classification tree to distinguish between species by footprint widths. We live-trapped rodents within and near the coastal dunes of Florida with a focus on areas occupied by threatened and endangered beach mice (*Peromyscus polionotus* spp.), whose populations warrant regular monitoring but whose tracks are not easily distinguished from some sympatric species. In total, we collected front and hind footprints for 542 individuals and eight species. The overall accuracy of our classification tree was 80.3% and was achieved using only the front footprint width. We were most successful in identifying beach mice: approximately 94% of individual beach mice were correctly identified, whereas < 6% were misclassified as house mice (*Mus musculus*) and < 1% as cotton

mice (*Peromyscus gossypinus*). Our study demonstrates that sympatric rodent species in coastal dune communities can be identified accurately from tracks using quantitative classification based on footprint widths. Accurate identification of beach mice or other imperiled species from tracks has important management implications. Not only can the presence of a species at any location be determined accurately, but populations can be monitored regularly with less effort, thereby reducing the need for live-trapping. Although our study was specific to coastal dune communities, our methods could be adapted to create a classification tree for identifying tracks from other suites of species in other areas.

FOREST OWNER WILLINGNESS TO PROTECT IMPERILED WILDLIFE SPECIES ON PRIVATE LANDS IN FLORIDA

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DAMIAN C. ADAMS, UF
HOLLY K. OBER, UF

Private forest lands in Florida cover over 16 million acres and are considered beneficial to a growing number of state listed imperiled wildlife species. Wildlife conservation is understood to be an important public good, however, the costs of managing wildlife habitat is often placed on forest owners. It is not uncommon for landowners to support policies that provide financial assistance and express concerns about the government's use of regulatory tools to protect imperiled wildlife species on private lands. In this study, we examined forest owner response to several types of incentives including a new type of regulatory assurance, provided through the Florida Wildlife Best Management Practices Program (FWBMP), and financial compensation in the form of a traditional cost-share. We also examine how forest owner values about forest management and their opinions about government interventions on private lands influence their willingness to adopt FWBMPs. The study was conducted using a web/mail survey that contained a choice experiment and was distributed to 1000+ forest owners in Florida in December 2015. We found forest owners were generally not interested in the regulatory assurance provided by the FWBMP program, and many were willing to assume the costs of protecting state listed wildlife species on their lands. The rejection of the regulatory assurance was primarily based on landowner's belief that their forest uses and management practices would not cause harm to state listed species. Rejection of the cost-share incentive may be because landowners are discriminating of how and when they receive financial assistance (because of the contractual obligation associated with a monetary exchange). We conclude that the cultural values held by many forest landowners in Florida help support the protection of imperiled wildlife species, but also make them cautious about being compelled through government interventions. We expect study outcomes will help broaden our understanding of how forest owners react to policies that regulate and/or empower landowners to protect imperiled wildlife species on private lands.

NORTHERN BOBWHITE WINTER FORAGE PRODUCTION FROM DIFFERENT MANAGEMENT PRACTICES

H. TYLER PITTMAN, FWC

Wildlife plantings, also known as food plots, are a popular practice of wildlife managers that target harvested species with their management. Managers at Fred C. Babcock-Cecil Webb Wildlife Management Area (Webb) in Charlotte County, Florida, use plantings in combination with other management practices to target northern bobwhite (*Colinus virginianus*). Webb uses three common management practices, plantings, roller chopping, and prescribed fire, to provide winter forage for bobwhite. We initiated our study to determine the quantity of winter forage production produced by each of these management practices using two representative forage species, *Sesbania sp.* and *Scleria sp.* We placed 80 1-m^2 wire-fence wildlife exclosures among the three management types. We placed 20 exclosures in areas that had been roller-chopped the previous year, 40 in plantings that were planted the previous year, and 20 at random locations. In fall, we collected all *Sesbania sp.* and *Scleria sp.* stems from a 0.5-m^2 area within each exclosure. We then air dried the 80 vegetation samples for a minimum of 30 days and separated all seeds from other plant materials by species. We dried seeds at 65°C for a minimum of 8 hours to reduce the water content. We then massed each sample of seeds to calculate production estimates. We determined exclosures in chopped areas, plantings, and fire only all contained S*cleria sp.* stems at average densities of 130, 11.8, and 26.5 stems/m^2, respectively, while only plantings contained S*esbania sp.* stems at an average density of 49.2 stems/m^2. *Sesbania sp.* in plantings produced on average 53 g/m^2 of winter forage for bobwhite. *Scleria sp.* production has been difficult to quantify as *Scleria sp.* produces seed year-round, and many stems within each exclosure lacked seeds for production estimates. In conclusion, *Scleria sp*. is present throughout the study area, produces seed year-round, and increases in density in areas of recent soil disturbance (i.e., roller chopping and disking for plantings). In contrast, *Sesbania* sp. produces seed only once each fall and only in areas where it has previously been planted. Although direct comparison of production has proven difficult thus far, each species may benefit bobwhite differently.

MODELING ENVIRONMENTAL AND WILDLIFE DRIVERS THAT AFFECT BEEHIVE FENCES IN AGRICULTURAL LANDSCAPES IMPACTED BY ELEPHANTS

MATTHEW RUDOLPH, UCF

African elephant (*Loxodonta africana*) is a keystone species in Kenya's Tsavo East National Park. Through foraging and trampling, they also function as ecosystem engineers, causing specific disturbances in agricultural systems adjacent to the park. One method to reduce human-elephant conflicts in neighboring farmland involves using Beehive Fences. The effectiveness of the fences to repel elephants and reduce disturbances varies, as hives are prone to fluctuation in bee occupation due to

environmental conditions and depredation. This research analyzes time series data to model the relationships between rainfall events, honey badger (*Mellivora capensis*) raids, and honey bee (*Apis mellifera*) occupation on these elephant-deterring Beehive Fences. Multivariate autoregressive modeling of a two-year data set of 150 beehives from twelve farms were used to identify temporal correlations between honey badger raids on a multimetric scale. The models provide quantitative results on how rainfall influences bee occupation and honey badger attacks. Created models provide effect correlation for one, two, seven, and fourteen day past/future periods. Tools such as this can be useful to conservation managers to assess how environmental conditions correspond to beehive effectiveness and the likelihood of honey badger depredation. This may enable them to focus limited resources at critical times to protect the livelihood of the farmers.

MANMADE WATER BODIES VS. NATURAL WATER BODIES ON UCF CAMPUS FOR WATERBIRDS

HANNAH SMITH, UCF
MICHELLE CLARKE, UCF
GABRIEL WATTS, UCF

Many migratory and resident birds of Florida rely on a variety of water bodies as habitat and foraging sites. As human population and urban sprawl increase, the number of natural water bodies decreases. In order to create proper habitat for the species that use these locations, many developers decide to add man-made water bodies. Our study will investigate if these artificial bodies of water are sufficient habitat for waterbirds and compare species abundance and diversity with that of the natural lake. We will survey from several points on each of our selected water bodies on UCF campus (Lake Claire, H-2, and H-2 Extension) morning and evening three times per week and catalog the bird species seen, in addition to current weather conditions. We will also do a preliminary survey of plant species diversity for each site. Our hypothesis is that there will be more species richness and diversity of birds at the natural waterbody. We expect the results from the different water bodies to have a difference due to more abundant/dense and diverse natural vegetation surrounding the natural water body, compared to sparse trees planted around the perimeter of the artificial water bodies. If there is no significant difference that could be due to the prevalence of human activity on the natural water body.

AN ONGOING STUDY OF THE STRIPED MUD TURTLE (*KINOSTERNON BAURII*) AT CIRCLE B BAR RESERVE IN CENTRAL FLORIDA

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The roles that Testudines play in their environments make them vital to protect and conserve as members of Florida's native fauna. Little is known about the natural history and ecology of the striped mud turtle (*Kinosternon baurii*), although previous work in Florida suggests that these aquatic turtles are highly terrestrial and nest primarily in the fall. We are currently conducting a population and spatial ecology project on the striped mud turtle using radio telemetry at Circle B Bar Reserve, a restored former cattle ranch adjacent to Lake Hancock, Polk County, Florida. To date, we are tracking six striped mud turtles, and we are collecting standard natural history data on morphology and reproduction. In addition, we have implemented a continuous mark and recapture study for this population. Our data indicate that these mud turtles have a fairly small home range (no single movement more than 75m), with males generally moving more often and greater distances than females. The health of captured turtles is generally good, although feral pigs and human interactions (especially after national news events) appear to represent the greatest threats to the turtles. The population at Circle B does not appear to be dense, as we recapture many of the same turtles. However, after almost 2 years of sampling, we are still capturing unmarked turtles and the population is represented by multiple size classes, from small juveniles to large females. Overall, the data we have collected are helping Circle B Bar Reserve understand more about their striped mud turtle population and expand their knowledge of the wildlife they protect. With specific knowledge on the population size and habitat use, Circle B and other reserves/parks in central Florida can better accommodate small, often overlooked aquatic turtles into their management plans.


FWC – Mitch Petoskey

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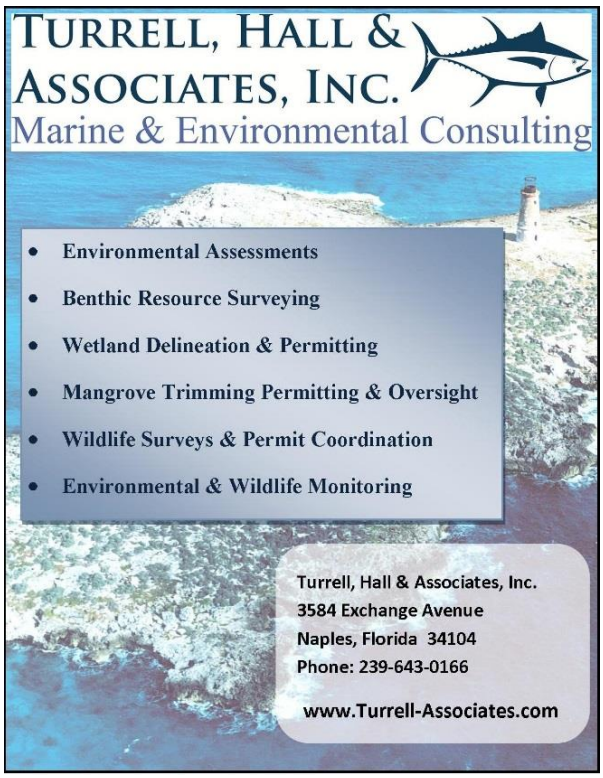

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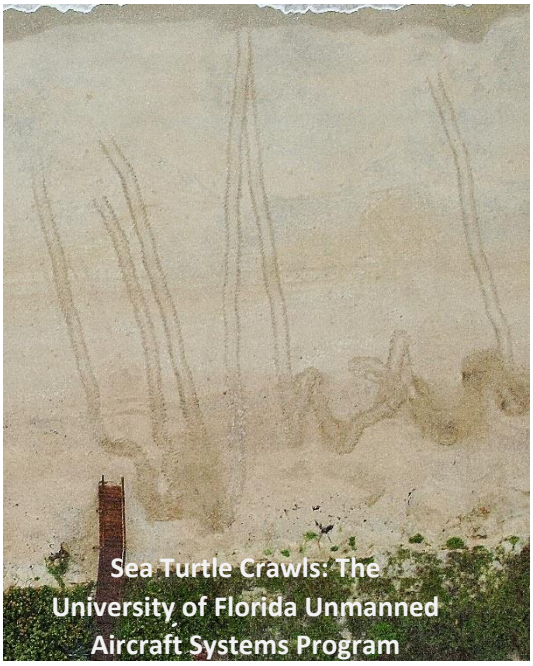

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