Alabama Natural Heritage Program[SM]

2013 Annual Report

Staff Directory & Resources

Staff Directory

Jim Godwin
Aquatic Zoologist
jcg0001@auburn.edu
(334) 844-5020

Al Schotz
Botanist/Community Ecologist
ars0002@auburn.edu
(334) 844-5019

Michael Barbour
GIS Analyst
msb0005@auburn.edu
(334) 844-5017

Location

Alabama Natural Heritage Program
1090 South Donahue Drive
Auburn University, AL 36849

Fax: (334) 844-4462

Websites

ALNHP Primary Web Address:
www.alnhp.org

Affiliated Websites

NatureServe
www.natureserve.org

Auburn University Museum of Natural History
aumnh.org

The mission of the Alabama Natural Heritage Program℠ (ALNHP) is to provide the best available scientific information on the biological diversity of Alabama to guide conservation action and promote sound stewardship practices. ALNHP is administered by the Auburn University Muesum of Natural History, Department of Biological Science. Established by The Nature Conservancy in 1989, it is one of a network of such programs across the United States, Canada, and Latin America, collectively known as the Natural Heritage Network (NHN). As a member of the NHN, ALNHP is represented by its membership organization NatureServe. NatureServe works to aggregate data from individual Network Programs and is dedicated to the furtherance of the Network and the application of Heritage data to biodiversity conservation.

Natural Heritage Programs have three broad functions:

- to collect information on the status and distribution of species and natural communities,
- to manage this information in a standardized way, and
- to disseminate this information to a wide array of users.

Natural Heritage Programs use a standardized information management system to track biodiversity data including taxonomy, distribution, population trends, habitat requirements, relative abundance, quality, condition, and viability. ALNHP provides the following services: biodiversity data management, inventory, biological monitoring, site prioritization, conservation planning, Geographic Information System services, and land management expertise.

Affiliations

NatureServe

A Network Connecting Science With Conservation

NatureServe is a non-profit conservation organization that provides the scientific information and tools needed to help guide effective conservation action.

NatureServe represents an international network of biological inventories - known as natural heritage programs or conservation data centers - operating in all 50 U.S. states, Canada, Latin America and the Caribbean. NatureServe and its network of natural heritage programs are the leading source for information about rare and endangered species and threatened ecosystems. Together we not only collect and manage detailed local information on plants, animals, and ecosystems, but develop information products, data management tools, and conservation services to help meet local, national, and global conservation needs. The objective scientific information about species and ecosystems developed by NatureServe is used by all sectors of society - conservation groups, government agencies, corporations, academia, and the public - to make informed decisions about managing our natural resources.

Auburn University Museum of Natural History

The mission of the Auburn University Museum of Natural History is to conduct biodiversity research, preserve and document our region and planet's biodiversity, and to lead and promote activities related to natural history education and outreach for Auburn University and all citizens of the state of Alabama. Our vision is to emerge as the primary repository for all natural history collections currently maintained at Auburn University and to function as a center of excellence for biodiversity research, education, and outreach. We will capitalize on strengths of the biodiversity heritage collections in our care and the vast organismal knowledgebase of the curators and staff to establish a gateway through which all segments of society can come discover the natural sciences and appreciate the relevance of biodiversity to human health and quality of life. We will preserve and document the rich natural heritage of Alabama while concurrently creating opportunities for students and teachers from regional schools, the general public, students at Auburn University, and researchers to explore our planet's biodiversity. We seek to inspire an appreciation of nature and the environment so that we might better conserve it for future generations.

Introduction

The Alabama Natural Heritage Program℠ (ALNHP) has had a productive and successful year. The program staff continue to conduct in-depth surveys for imperiled species in Alabama and to produce quality reports and publications on the state's diverse flora and fauna. The comprehensive database of Alabama's natural heritage continues to grow, and provides a sound foundation for conservation efforts in the state. This report includes summaries of our projects over the past year. Thank you for your interest in and support of ALNHP and our efforts to protect Alabama's rich biodiversity.

Project Summaries

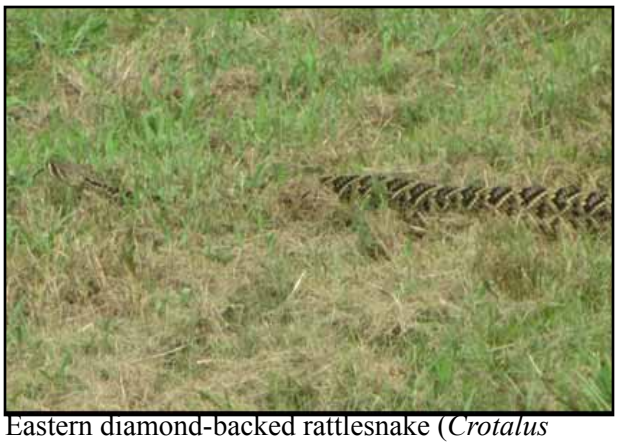
Botany & Community Ecology – General Overview

The botany/community ecology component continues to be actively involved presenting lectures, conducting field surveys, and preparing reports in 2013. A large part of the year was dedicated to preparing botanical and ecological assessments on two military reservations in Alabama and Georgia. In September 2011 the ALNHP entered into agreement with JMR Architecture of Montgomery to institute a comprehensive plant inventory of the Fort McClellan Army National Guard Training Center on Pelham Range near Anniston. This project spanned two growing seasons, with a final report submitted in September 2013. Similarly, ALNHP also worked in conjunction with the Department of Defense to furnish a biological assessment of the Albany Marine Base in Albany, Georgia, documenting and providing management actions for rare species and ecological communities in an effort to better guide conservation strategies. Several smaller projects specific to updating and preparing status surveys for sensitive plant species on behalf of the U.S. Fish and Wildlife Service (USFWS) were also part of the duties performed in 2013.

Biological Inventory of the Marine Corps Logistics Base, Albany, Georgia

ALNHP partnered with the Department of Defense to conduct a base-wide survey of the Marine Corps Logistic Base, Albany (MCLBA) for rare plants and animals and sensitive or rare natural communities. The last extensive biological survey was conducted in 1995 by the Georgia Department of Natural Resources. To prevent impacts to listed species and their habitats, and to reduce or eliminate the impacts of invasive species, an updated survey was needed. The purpose of this project was to provide Marine Corps personnel with data on the location, extent, and condition of rare, threatened, and endangered plant and animal species; natural communities; and invasive species present on the base to address management concerns for rare species and sensitive habitats, and provide management recommendations for the preservation, conservation, and enhancement of species of conservation concern or special interest and

Limesink pond on Marine Corps Logistics Base, Albany.


Eastern diamond-backed rattlesnake (*Crotalus adamanteus* on MCLBA.

control of invasive species. Rare plant species documented from the Base include giant orchid (*Pteroglossaspis ecristata*), woodland poppy-mallow (*Callirhoe papaver*), and incised grove-bur (*Agrimonia incisa*) and good examples of two significant natural community types, limesink ponds and clayhill longleaf woodlands. Target animal species documented from the Base were eastern tiger salamander (*Ambystoma tigrinum*), eastern diamond-backed rattlesnake (*Crotalus adamanteus*), gopher tortoise (*Gopherus polyphemus*), Yellow-crowned Night-heron (*Nyctanassa violacea*), Wood Stork (*Mycteria americana*), Northern Bobwhite (*Colinus virginianus*), Loggerhead Shrike (*Lanius ludovicianus*), and Bachman's Sparrow (*Peucaea aestivalis*). A final report highlighting the results of the project was submitted in December 2013.

Black Warrior Waterdog (*Necturus alabamensis*) and Flattened Musk Turtle (*Sternotherus depressus*)

The Black Warrior River basin, above the Fall Line, is an area of aquatic endemism in Alabama; two of these species are the Black Warrior waterdog (*Necturus alabamensis*) and the flattened musk turtle (*Sternotherus depressus*). Both species are state protected while the flattened musk turtle is federally threatened and the Black Warrior waterdog a US Fish and Wildlife Service candidate species. The waterdog and musk turtle each inhabit, ideally, clear streams and rivers with permanent flow, reduced sedimentation, and a substrate of underwater rocks, crevices, and ledges, although degraded water quality is thought to have impacted populations of these animals. Their ranges overlay to a very large extent and they occupy similar sites and habitats. Studies at sites within the Bankhead National Forest where these species are known to co-occur have revealed interesting seasonal patterns between these species. The Black Warrior waterdog is active during the winter months but as waters warm the salamander "disappears", to be seemingly replaced by the flattened musk turtle from late spring through early fall.

Status Survey for the Black Warrior Waterdog (Necturus alabamensis)

The Black Warrior waterdog (*Necturus alabamensis*) is a rare, aquatic, neotenic, salamander endemic to the Black Warrior River basin known to inhabit clean, clear, rocky streams of the watershed above the Fall Line. The most recent surveys and habitat analysis are over 10 years old. During the last survey the waterdog was reported at only 14 of 112 sites and of 11 sites examined regarding habitat quality three were ranked good to excellent, four moderate, two poor to unsuitable, and two impounded and undetermined. The present survey, using standard collection techniques of dip netting leaf beds and setting of baited minnow traps, as well as make qualitative


Black Warrior waterdog (*Necturus alabamensis*)

flattened musk turtle (*Sternotheurs depressus*)

habitat assessments is to update this information for the U.S. Fish and Wildlife Service. Black Warrior waterdogs were documented at two localities on the Sipsey Fork in Bankhead National Forest; Black Warrior waterdogs were not documented at other historical localities. Final report was completed and submitted to the USFWS in August. The Black Warrior waterdog is under consideration for listing as threatened by the USFWS and information gathered during this survey will be used in making a determination to list or not. This study was funded by the U.S. Fish and Wildlife Service.

Black Warrior Waterdog and Flattened Musk Turtle Status Survey using Environmental DNA (eDNA)

Black Warrior waterdog is thought to have experienced a precipitous decline in range as the most recent surveys have documented the species from only 14 localities. The flattened musk turtle is known from more localities, approximately 60, yet a large percentage (>50%) of its occupied habitat is thought to have lost due to habitat fragmentation. Based on known localities of both species and their shared habitat these species are considered to have very similar, if not nearly identical, distributions. In comparing known localities of the waterdog and musk turtle, six sites have both species, eight sites waterdog only, and approximately 50 sites with musk turtle only. Typical sampling techniques for Black Warrior waterdog include dip netting leaf packs, setting baited minnow traps, and occasionally electroshocking. Flattened musk turtles are collected with the setting of baited traps. Drawbacks to waterdog and musk turtle sampling include limitations of dip netting and electroshocking to chest deep water, and for dip netting a dependence upon the persistence of leaf packs. High water conditions preclude dip netting and may wash out leaf packs and inhibit the setting of minnow traps and baited turtle traps. Baited minnow traps and turtle traps must be checked regularly, at least once every 24 hours, and turtle traps must be set to avoid drowning of turtles, or checked more frequently than 24 hours.

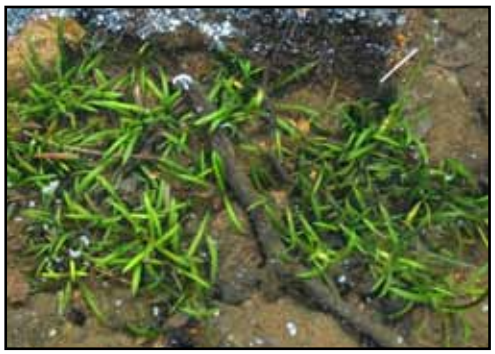
Individuals, as they interact with their environment, shed tissue that contains species specific DNA segments. Techniques have recently been developed to capture the DNA from water, analyze the samples, and identify species-specific DNA segments. The use of environmental DNA (eDNA) in presence/absence studies has proven to be quite effective, and has the utility of providing an qualitative estimate of abundance. The use of the eDNA technique is being used in this study for both the Black Warrior waterdog and the flattened musk turtle as a methodology to reassess the status and refine the distribution of both species.

Sipsey Fork

Twenty-six sites were chosen based on past collections of one or both species with sites distributed across the known range of both the Black Warrior waterdog and flattened musk turtle. Water samples were taken by grab samples with a decontaminated 1-L Nalgene bottle. Three samples per site per season (winter and summer) were taken, for a total of six per site. From each water sample approximately 1,000 ml of water was filtered through a cellulose nitrate filter with a pore size of 0.45µm. Upon completion of filtering the filter was removed and placed in a vial containing 95% ETOH. Filtered samples were stored in a -200C freezer prior to lab analysis. DNA was extracted from 327 filtered samples using a Qiagen kit. Tissues from Necturus alabamensis and Sternotherus depressus were used for PCR amplification and DNA sequencing to confirm target genetic sequence for each species. The genetic sequences for N. alabamensis and S. depressus are being used to design species-specific primers for eDNA analysis in software program PrimerHunter. PrimerHunter identified 112 candidate primers as potential eDNA primers for N. alabamensis and seven were selected based on known genetic sequence of N. alabamensis. Lab analysis of filtered water samples is to be completed in 2014.

This project is funded by the Alabama Department of Conservation and Natural Resources through Section 6 and is in collaboration with Dr. Lesley de Souza, Shedd Aquarium, Chicago, IL.

Alabama streak sorus fern (Thelypteris burksiorum)



Kral's water plantain (*Sagitaria secundifolia*)

Black Warrior Waterdog, Flattened Musk Turtle, Streak Sorus Fern, and Kral's Water Plantain Studies in the Bankhead National Forest, Alabama

The drainage area of the upper Black Warrior River basin is an estimated 3,095,559 acres and encompasses the 348,989 acre Bankhead National Forest, thus, the Bankhead National Forest totals ~11% of the total of the upper Black Warrior River basin. Considering that the ranges of the Black Warrior waterdog and flattened musk closely correspond to the upper Black Warrior River basin, and then the Bankhead National Forest contains approximately 11% of the range of these species. As many streams within the river basin are degraded, management of Forest Service lands to promote high water quality will be critical to the long-term survival of these rare aquatic species.

The Alabama streak sorus fern (*Thelypteris burksiorum*) is a federally listed species endemic to the Sipsey Fork of the Black Warrior River in Bankhead National Forest. Given the low number of individuals combined with an extremely limited distribution prompted the U.S. Fish and Wildlife Service to list the species as threatened under the Endangered Species Act on July 8, 1992. It was during this time that a comprehensive status assessment was prepared to obtain census data, to qualify habitat preferences, and to identify apparent disturbances and potential long-term threats to

the species. Since the initial assessment of the species in the early 1990s, field inspections have not been implemented to evaluate population trends and to identify disturbances and apparent threats. Because of outdated census data and the absence of recent systematic survey efforts, inspections of existing populations and inventories for new localities are proposed. In addition to survey efforts, permanent monitoring plots are also proposed, in an effort to further assess the long-term effects of natural and human-derived disturbances.

Kral's water plantain (*Sagitaria secundifolia*) is a federally threatened submerged aquatic plant that occupies cracks in exposed bedrock, and crevices between rocky slabs. Surveys for the distribution and status of this species will be conducted alongside surveys for other species.

Over the next five years studies will be done within the Bankhead National Forest to: 1) determine the distribution of the Black Warrior waterdog, flattened musk turtle, streak sorus fern, and Kral's water plantain in the Sipsey Fork and Brushy Creek; 2) determine the status of these species in the Sipsey Fork and Brushy Creek; 3) collect data on the seasonal movements and nesting of the flattened musk turtle; and 4) provide streamside management recommendations to the U.S. Forest Service pertaining to these species. This 5 year project is being funded by the U.S. Forest Service.

Flattened musk turtle studies began summer 2013 with in-stream and riparian habitat data collection along Sipsey Fork and Brushy Creek. Data collected using plots for in-stream points includes substrate type (rock, sand, silt, wood, algae) and presence/absence of snails, Corbicula, and mussels. Riparian data, also collected with plots, include substrate type (rock, gravel, sand, leaf litter, wood), and open or shaded. In-stream and riparian data points are either random or turtle. Random points were generated through GIS while turtle points represent a location occupied by a turtle, and derived from tracking turtles using radio-telemetry. Results, thus far, indicate that turtles use crevices and rocks more than other submerged structures. Riparian movements of turtles are related to nesting activity; only two nests were confirmed in 2013.

Distribution, Abundance, and Health Assessment of the Gopher Tortoise (*Gopherus polyphemus*) in Alabama

As the keystone species of the Southeast US coastal plain, the gopher tortoise (*Gopherus polyphemus*) has experienced population declines across its range. Currently, populations of the gopher tortoise, range-wide, are being studied with the goal of providing information to the US Fish and Wildlife Service regarding a final decision on federal listing. Due to a lack of basic information on the status of the gopher tortoise in Alabama, on public and private lands, this effort will be to conduct an in-depth study on the distribution, abundance, movement patterns, and health of gopher tortoises in Alabama. Additionally, because a potentially life-threatening emerging infectious disease, upper respiratory tract disease (URTD), has been observed in tortoises across North America, an additional study will be done to further understand the mechanism that may be causing gopher tortoise mortality in Alabama, and how land management might help conserve this species. Over a four year

Gopher tortoise (*Gopherus polyphemus*)

timeline, basic data related to the current distribution and abundance of gopher tortoises in the state will be acquired to determine their status on public and private property.

Tortoises were sampled from several populations within Conecuh National Forest during the summer, and preliminary data indicate a robust population of healthy Gopher Tortoises. Stress hormones assays have indicated low levels of baseline stress in this population, which is supported by blood smears indicating low heterophil: lymphocyte ratios in the free-living tortoises. However, while very few animals were encountered which displayed outward symptoms of URTD, the survey of seroprevalance to URTD antibodies has indicated that this population has been exposed to Mycoplasma agassizi (the pathogen that causes URTD). Nasal lavage samples are still being cultured to test for the actual presence M. agassizii within the tortoise respiratory tract (the specific pathogen is slow growing, thus cultures take several months to grow before presence is confirmed). Experimental manipulations investigating behavioral fever and context-dependent mechanisms of disease susceptibility are being performed with tortoises trapped from within the Conecuh National Forest system (although the specific population currently under study was on the property of Solon Dixon Forestry Education Center).

Gopher tortoise (*Gopherus polyphemus*) burrow

Preliminary data indicate major physiological changes in response to bacterial infection. Additionally, preliminary data from these tortoises suggest that URTD symptoms may become exacerbated during seasonal change from summer acclimation to winter acclimation.

Line Transect Distance Sampling (LTDS) pilot surveys were done at Conecuh National Forest, Geneva State Forest, and Perdido Wildlife Management Area. Pilot surveys are necessary to collect data on occupied burrow numbers for the development of the LTDS study design. In September the GPS equipment, a complete LTDS survey was initiated at the Nellie Pond site in Conecuh National Forest. Additional SWG funding has been secured to extend the study and include private lands.

This 4-year study is being funded by a State Wildlife Grant through the Alabama Department of Conservation and Natural Resources and is in collaboration with Dr. Mary Mendonca and Jeff Goessling (Department of Biology, Auburn University), and Dr. Robert Gitzen and Helen Tripp of the Department of Forestry and Wildlife.

Historical changes to amphibian and reptile faunas in five key Alabama streams

Amphibians and some reptiles are important sentinel species in conservation planning because of their ties to both terrestrial and aquatic habitats. Because amphibian populations can be adversely affected by change to either environment, they are particularly sensitive to factors such as global climate change. Alabama's rich amphibian and reptile faunas contain several species of conservation concern because they require habitat features that do not persist in landscapes altered by human activities. For example, the Hellbender, largest of Alabama's salamander, is documented from Alabama by a series of museum specimens, but no known populations remain in the state. This species likely had breeding habitat severely


Alligator snapping turtle (*Macrochelys temminckii*)

diminished as a result of impoundment of the Tennessee River and associated changes to water temperature, water flow, and rates of sedimentation. Using historical and contemporary data for selected streams to encompass Alabama's physiographic variation, patterns of faunal persistence will be investigated. Streams selected for study include systems with extensive historical data and representing upland and coastal plain physiography. In addition, the streams proposed for study have recently been designated as Strategic Habitat and River Reach units for aquatic species of conservation concern in Alabama: Bear Creek (Tennessee River drainage), Cypress Creek (Tennessee River drainage), Shoal Creek (Coosa River drainage), Five Runs Creek (Yellow River drainage) and Uphapee Creek (Tallapoosa River drainage). Finally, the data from this study will provide current information on the distributional status, relative abundance and habitat use of amphibians and reptiles of conservation concern in these systems.

Five Runs Creek, of the five target watersheds, has been sampled intensively. Trap effort totals 439 trap-nights, distributed across six aquatic habitats. Forty-five of the 54 historical species have been documented. Species encountered have been through trap effort and in-stream and riparian surveys. Two species previously unknown from the watershed have been added, the spiny softshell (*Apalone spinifer*) and alligator snapping turtle (*Macrochelys temminckii*). Priority species documented this year include gopher frog (*Rana* (now *Lithobates*) *capito*) and alligator snapping turtle. Priority species not documented include flatwoods salamander (*Ambystoma cingulatum* (now *A. bishopi*)), southern dusky salamander (*Desmognathus auriculatus*), Pine Barrens treefrog (*Hyla andersonii*), river frog (*Rana* (now *Lithobates*) *hecksheri*), and rainbow snake (*Farancia erytrogramma*).

This 3-year study is being funded by a State Wildlife Grant through the Alabama Department of Conservation and Natural Resources.

Inventory, Classification, and Assessment of Alabama's Geographically Isolated Wetlands

In October 2011, we initiated a 3-year EPA-funded wetland mapping project to identify, classify, and assess geographically isolated wetlands in Alabama. After completing the Quality Assurance Project Plan, we starting mapping wetlands in the northern third of the state using National Wetlands Inventory (NWI)


cypress pond in Conecuh National Forest


Mohr's Barbara-buttons (*Marshallia mohrii*)

data, GIS-based wetland models, and object based image analysis (OBIA) of 2011 National Imagery Program (NAIP). OBIA of 2011 NAIP imagery was conducted by constructing algorithms that delineate open waters using Definiens eCognition Developer., with the objects identified exported into georeferenced shapefiles. NWI data for Alabama was used to construct a NWI wetland model, with all of the wetland polygons within the NWI dataset imported into the model, regardless of the NWI classification of wetland type. A hydric soils wetland model was constructed from Soil Survey Geographic (SSURGO) data. For the hydric soils model (HSM), we selected map units that were rated all hydric (consisting entirely of hydric soils) or were identified as water, swamp, or tidal marsh by map unit name. Expanding the methodology introduced by Tiner (2003), we created a GIS model that identifies geographically isolated wetlands from each of the wetland models based on the USGS National Hydrography Dataset (NHD) high resolution line and polygon data and Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) database. Field work is ongoing to visit selected wetlands identified as geographically isolated from the models for field verification and to conduct an ecological classification and assessment. This project is being done in collaboration with Luke Marzen, Tyler Jones, and Samriddhi Shakya (Auburn University Department of Geology and Geography) and the AU Water Resources Center.

Mohr's Barbara-buttons Status Survey

A status survey on Mohr's Barbara-buttons (*Marshallia mohrii*) in Alabama and Georgia, funded by the U.S. Fish and Wildlife Service, began in May 2012. The purpose of the survey is to furnish an updated, range-wide assessment of the species to systematically analyze population dynamics, to characterize general habitat requirements, and to ascertain apparent disturbances and potential threats. Known only from Alabama and Georgia, this relative of the daisy and dandelion is currently represented by a small number of widely distributed populations across the central and northern portions of Alabama and adjacent Georgia. The species inhabits limestone glades, prairies, and gravelly stream margins, having now become globally imperiled due to a combination of residential development, incompatible timber harvesting, quarrying, trash disposal, and other modifications of its habitat.

Price's Potato-bean Status Assessment

A status assessment of the Price's potato-bean (*Apios priceana*) started in 2012 to update baseline information on all documented occurrences of the species throughout Alabama and Mississippi. This data will better enable the U.S. Fish and Wildlife Service to determine the proper conservation needs and protection of the species at the federal level. The species is


Price's potato-bean (*Apios priceana*)

currently listed under the Endangered Species Act as threatened, a designation it has held since receiving federal protection in 1989. At the time of listing A. priceana was represented by 15 extant occurrences, several containing only a few plants, warranting the USFWS to pursue federal protection. Presently, the species is known from 15 sites in Alabama and 3 Mississippi, many of which occur on conservation lands. Price's potato-bean is closely related to a smaller, more common species, A. americana, where the two species can be separated by the size and color of flowers, size of the fruit, and the size and number of tubers.

Range-wide Status Assessment of Big-leaf Witch Hazel

The big-leaf witch hazel (*Hamamelis ovalis*) is an attractive winter-blooming shrub that produces red to occasionally yellowish-orange flowers from late December to early February. The species was originally described by Steve Leonard from specimens gathered on the Camp Shelby training site in Perry County, Mississippi, in 2006. Subsequently, the species was discovered in Alabama in 2009, by Wayne Webb, from Clarke County. The species has since been found in five more counties in the southwestern portion of the state, where it prefers well-drained soils of forested slopes and ridges. This study of H. ovalis will furnish an overall assessment on the abundance of the species, habitat preferences, apparent disturbances and potential threats, and management needs for the species. A final report will be submitted to the U.S. Fish and Wildlife Service in 2015.

Red Hills Salamander (*Phaeognathus hubrichti)*

Informing Management of Endemic Habitat Specialists: Multi-scale Habitat Selection of the Red Hills Salamander, Phaeognathus hubrichti

ALNHP conducted a study on the Red Hills salamander between 2008-11 funded with a State

Red Hills salamander (*Phaeognathus hubrichti*)

Wildlife Grant through the Alabama Department of Conservation and Natural Resources. During the course of the study a body of data was collected on Red Hills salamander burrow densities and distribution, topographical features of Red Hills salamander habitat, and woody vegetation associated with Red Hills salamander localities. In 2001-12 the Alabama Department of Conservation and Natural Resources, through Section 6, provided funding to re-analyze this data on several landscape levels. Red Hills salamander habitat is characterized by steep slopes with a native hardwood forest cover and mid-story shrub layer. From this study management recommendations put forth are to focus on sites occupied by the salamander and restore or enhance the native shrubby vegetation and hardwood forest cover, plus occupied ravines should be surrounded by a minimum 250 m2 of deciduous forest. These habitat characters are within the realm of management whereas characteristic geological features, such as steep slopes, are not. This study was in collaboration with Dr. David Steen (Virginia Tech, Blacksburg, VA) and Dr. Christopher McClure (Boise State University, Boise, ID).

2013 update. The results of this Section 6 grant have been rewritten, submitted, and accepted by the Journal of Wildlife Management for publication in 2014. Steen,

D.A, J.C. Godwin, C.J.W. McClure, and M. Barbour. 2014. Informing management of endemic habitat specialists: multiscale habitat selection by the Red Hills salamander. The Journal of Wildlife Management 9999:1-8.

Falkenberry Hill Activity and Fine-scale Genetics Study

In 2008 a study on a population of Red Hills salamanders (*Phaeognathus hubrichti*) in Monroe County was initiated in which all burrows were identified and mapped, with a significant number of Red Hills salamanders being captured, measured, weighed, sexed, implanted with a PIT tag, and returned to their respective burrows. With completion of this short-term study the essential elements of a long-term study were in place, thus beginning in January 2010 monthly trips have been made to the site to collect activity and movement data on the PIT tagged salamanders. Using a PIT tag reader and antenna capable of detecting a tag as deep as 30 cm underground an entire year of data, taken once a month, has been gathered on activity and movements of Red Hills salamanders. This Red Hills salamander activity study continued through September 2012 with funding from the USFWS. A second component of the study is a fine-scale genetics assessment of the population with comparison to two other sites, one contiguous and one separated by an anthropogenic barrier. We have collected much of the tissue samples needed and genetics analysis is underway. Completion of this study is scheduled for summer 2013.

A final report on the results of this study was submitted to the U.S. Fish and Wildlife Service in early summer 2013. Data on survivorship, detectability, and fine-scale genetics is being analyzed for peer-review publication.

This project has been in collaboration with Dr. Kristin Bakkegard of Samford University, and Drs. Rulon Clark and Shannon Hoss of San Diego State University, and Dr. Robert Gitzen of Auburn Unversity.

Red-cockaded Woodpecker Safe Harbor Agreement

In order to encourage landowners with existing or potential RCW habitat to manage their lands in order to conserve RCW populations, the U.S. Fish and Wildlife Service (USFWS) and the Alabama Department of Conservation and Natural Resources (ADCNR) has implemented a Red-cockaded Woodpecker Safe Agreement in Alabama. Under a Safe Harbor Agreement, the landowner agrees to carry out activities expected to benefit red-cockaded woodpeckers, but no added federal restrictions will be imposed should the numbers (or occurrences) of the species expand beyond a "baseline" level when the agreement is entered into.

ALNHP is working with ADCNR and USFWS to encourage forest landowners to enroll property in the Safe Harbor program. Copies of the brochure describing the Safe Harbor Agreement have continued to be distributed to interested individuals. Numerous property owners have been contacted and given information regarding the program (brochures, e-mail messages, and verbal communications).

red-cockaded woodpecker (*Picoides borealis*)
(Photo by Jim Hanula)

A total of nine properties have been enrolled in the Safe Harbor program. However, one property was sold in 2013, and efforts to contact the new landowner to determine if he wants to keep the property enrolled have so far been unsuccessful. Therefore, there are currently only eight properties enrolled in the program. Annual monitoring reports were submitted for seven of these eight properties.

Two of the agreements were amended in 2013. Agreement #0003 was amended to transfer the original certificate of inclusion for the agreement from the original owner to LeMay Land Company, LLC due his passing. LeMay Land Company is the limited liability company formed by his two sons to take ownership of the property.

The other amendment was for the Enon-Sehoy Plantation agreement (Agreement #0001). At the time the original agreement was signed, the baseline was set higher than the number of birds that were actually on the property with the understanding that they would manage the property to increase the population. Therefore, the original agreement did not specifically designate the clusters considered to be the baseline on the property. The designation was delayed until a future date when the population had reached the required number of 10 potential breeding groups and the Cooperators agreed upon a designation. With the management activities they have completed, the population now exceeds the baseline on the property covered under the original agreement. The agreement was amended 2 May 2013 to designate those 10 PBGs as required, with all 10 clusters being designated as baseline occurring on the Sehoy side of the property.


eastern indigo snake (*Drymarchon couperi*)

Reintroduction of the Eastern Indigo Snake onto Conecuh National Forest

The fourth release of juvenile eastern indigo snakes (*Drymarchon couperi*) took place May 2012 with a total of 17 snakes. This brings the total number of snakes released in Conecuh National Forest to 95.

In 2013, radio telemetry studies on the reintroduced indigo snakes were completed. The year started with 13 snakes being tracked. In January, one snake lost radio contact likely from transmitter failure. February 2-3, 6 snakes were recaptured to remove radio transmitters before the batteries expired. Six snakes, with larger radios not set to expire until spring 2014, remained in the field. During February another snake disappeared likely due to transmitter failure. Of the remaining five snakes one never moved from its overwinter burrow so it either excreted its transmitter or died underground; it was last seen outside its burrow on 24 March. On 18 April the last male snake being followed was found depredated. The remained 3 snakes continued to be tracked and were followed until 31 August when one snake was recaptured to remove an exposed radio. During the tracking the snakes tended to use home ranges established in 2012, with the exception of one female F11 which ventured to a new burrow approximately 1.1 km from where it spent most of the summer. She remained here about two weeks before returning to the normal home range.

On 6 April, the 5 snakes that survived transmitter removal were released back into their burrows where they were captured. On 9

eastern indigo snake (*Drymarchon couperi*)

May 17 snakes reared from the 2011 clutches were released along with two young that produced from eggs laid by snakes brought in for transmitter replacement in 2012. These two snakes were released in the burrows where the mothers were captured. None of the snakes released in 2013 were implanted with radio transmitters. Only one of these snakes has been located post release. A male, T5, was found DOR on Hwy 137 just south of CR 24 having traveled about 3.3 km from the release site.

On 3 February, a snake released in 2010 A8 was recaptured outside of a gopher tortoise burrow that had been previously used by a male released in 2011 and a female released 2013. It measured 1830 mm and weighed 2266 grams. She was visibly gravid and was re-released at the same burrow. A web camera maintained by the Conecuh National Forest was placed to view the burrow entrance. The snake was observed several times before it left the burrow in late March-early April. It is unclear if she laid her eggs inside the burrow. Attempts to use a burrow camera to locate eggs if they were laid were unsuccessful in part by a tortoise that was occupying the burrow with A8.

Two master's-level studies through the Department of Biology and under the direction of Dr. Craig Guyer have been completed 1) Jimmy Stiles: Evaluating the Use of Enclosures to Reintroduce Eastern Indigo Snakes, and 2) Sierra Stiles: Seasonal Habitat and Shelter Selection by Reintroduced Eastern Indigo Snakes in Conecuh National Forest, Alabama.

Collaboration continues to be the key to this endeavor involving Auburn University (ALNHP/Environmental Institute & Department of Biology), Alabama Department of Conservation and Natural Resources (ADCNR), The Orianne Society, U.S. Forest Service, U.S. Fish and Wildlife Service, Georgia Department of Natural Resources, Zoo Atlanta, and Ft. Stewart (US Army). Funding for the project has been through a State Wildlife Grants administered by ADCNR with The Orianne Society providing matching funds.

Funding for this project has been with State Wildlife Grants administered through the Alabama Department of Conservation and Natural Resources. Team members on this project include Dr. Craig Guyer of the Department of Biology, Auburn University, and his students, Jimmy Stiles, Sierra Stiles, and Mike Wines.

Status of the Endangered Alabama Red-bellied Turtle (*Pseudemys alabamensis*) In the Bon Secour and Fowl Rivers

Sampling for the Alabama red-bellied turtle (*Pseudemys alabamensis*) to collect samples for genetic studies and data on the status of the species was focused on the Bon Secour and Fowl rivers during the 2013 field season.

Alabama red-bellied turtle (*Pseudemys alabamensis*)

This large herbivorous turtle occupies only eight drainage basins in coastal Alabama and Mississippi. Locations of Alabama red-bellied turtle population centers sampled in Alabama included Fish and Magnolia rivers of Weeks Bay, Bon Secour River, Dog River, and Fowl River. The Mississippi sampling site was the lower Pascagoula River. Samples from the Mobile-Tensaw Delta were available from previous studies thus the only drainage remaining to be sampled is the lower Biloxi River in Mississippi. The objective is to provide baseline data on the population of the Alabama red-bellied turtle in the Bon Secour and Fowl rivers of Mobile Bay, and provide an assessment of the status of this species in these rivers. The Bon Secour River, in the extreme southeastern corner of Mobile Bay, contains a substantial population of turtles of the genus Pseudemys of species other than the Alabama red-bellied turtle. In 2012 approximately 200 Pseudemys were captured, of these six were Alabama red-bellied turtles. In 2013, about 220 Pseudemys were captured, yet none were Alabama red-bellied turtles. Trapping was also conducted in the Fowl River, which is on the west side of Mobile Bay. Fewer turtles were captured, a total of 32 cooters (*Pseudemys* sp.), as compared to the Bon Secour River, but a total of 21 Alabama red-bellied turtles were captured. Both river systems support sizable populations of the alligator snapping turtle (*Macrochelys temminckii*).

Graptemys barbouri x *G. ernsti*

The on-going surveys have been funded through the Alabama Department of Conservation and Natural Resources.

Taxonomic Assessment of Map Turtles (*Graptemys*) of the Choctawhatchee and Pea Rivers, Alabama and Florida

In the late 1990s map turtles (genus *Graptemys*) were discovered in the Choctawhatchee and Pea rivers in southeast Alabama. At that time this finding was significant because the Choctawhatchee River drainage was a gap in the distribution of this group of turtles. Map turtles exhibit a pattern of drainage-specific endemism, that is, only one species of broad-headed, or only one species of narrow-headed is found in any river system, although a broad-headed and narrow-headed form may co-exist. Thus the questions surrounding the map turtles in the Choctawhatchee were: 1) is this an unknown taxon; 2) is this a range extension of a known species. Subsequent collecting only hinted at answers as individuals identifiable to both Barbour's map turtles and Escambia map turtles were captured, along with seemingly intermediate forms. To resolve this taxonomic conundrum turtles were collected in spring and summer of 2012, with morphological and genetic data being obtained from each individual. For comparative purposes we collected Escambia map turtles from the Conecuh and Yellow rivers, and Barbour's map turtles from the Flint River. Results of genetic and morphological data indicate that in the Pea River Barbour's map turtles and Escambia map turtles are in a state of hybridization. In the Choctawhatchee River downstream of the confluence of the Pea River forms more akin to Barbour's map turtle are dominant, showing little influence of the Escamabia map turtle. The results of this study raise further questions pertaining to the zoogeography of the coastal plain rivers of the southeastern US, the ecological interactions of these two species, and how and why pre- and post-zygotic isolating mechanisms

have broken down allowing these species to interbreed. Collaborators on this study were Dr. Jeffrey Lovich (US Geological Survey, Flagstaff, AZ), Dr. Joshua Ennen (University of Tennessee, Knoxville, TN), Dr. Brian Kreiser (University of Southern Mississippi, Hattiesburg, MS), Brian Folt (Auburn University) and, and Chris Lechowicz (Sanibel Captiva Conservation Foundation, Sanibel, FL).

Results of this study have been prepared for publication and submitted to Copeia; the paper "Hybridization of Two Megacephalic Map Turtles (Testudines: Emydidae: Graptemys) in the Choctawhatchee River Drainage of Alabama and Florida" is currently under revision.

U.S. Geological Survey Protected Area Database–Updating Alabama Data in PAD-US

The Alabama Department of Conservation and Natural Resources, State Lands Division partnered with ALNHP to update the data for Alabama within the U.S. Geological Survey Protected Area Database (PAD-US). Prior to this update, the data for Alabama in PAD-US was based on the Alabama Gap Analysis Program's stewardship layer which was created in 2007. Therefore, PAD-US did not include any of the state lands acquired since. State Lands Division manages all ADCNR GIS data, including high-quality GIS data of the Forever Wild tracts, tracts owned or leased by the Department, State Parks, and Wildlife Management Areas so they took on responsibility to be the state steward for PAD-US data and updated state lands data to reflect current state ownership. ALNHP was contracted to work on adding Alabama local government lands to PAD-US. Local government data was obtained from 5 counties (Baldwin, DeKalb, Madison, Mobile, and Shelby) and from 2 cities (Auburn and Gadsden) outside of these counties. In addition, private conservation land data was acquired from two private non-profit organizations (the Alabama Wildlife Federation and Ruffner Mountain Nature Coalition) whose property was not currently included in PAD-US. The update to the Alabama data contained within PAD-US resulted in the addition of 88,116 acres of state-owned tracts, 14,864 acres of local government-owned tracts and 4,085 acres of tribal government-owned tracts.

Vascular Plant Inventory of the Fort McClellan Army National Guard Training Center on Pelham Range

In September 2011 ALNHP entered into an agreement with JMR Architecture of Montgomery to conduct a base-wide inventory of vascular flora and sensitive or rare ecological communities of Pelham Range, a study spanning two growing seasons beginning in March 2012. The project had three primary objectives:

1. to catalog all vascular plant species on Pelham Range;

2. to update existing records and document new occurrences of rare plant taxa monitored by ALNHP; and

3. to document and describe rare and noteworthy occurrences of ecological communities.

Located along the outer margin of the Ridge and Valley physiographic province in the mountainous region of Calhoun County in central Alabama, Pelham Range's 22,245 acres extend some 7.7 miles westward from the city limits of Anniston and span 5.3 miles north to south at its maximum. A component of the Fort McClellan Army National Guard Training Center, the area is characterized by rolling terrain dissected by numerous brownwater streams and tributaries, all within the watershed of the Coosa River. The largest watercourse is Cane Creek, which runs east to west through the central portion of the base. It is notable for having rocky shoals and cutting deeply into Cambrian and Pennsylvanian sand and clays, creating steep banks interspersed with a well-developed floodplain.

Upon completion of the project, a total of 740 vascular plant taxa (681 species) representing 405 genera and 127 families were documented from Pelham Range. Asteraceae was the largest family with 102 species. Poaceae, Fabaceae, and Cyperaceae were the next largest families with 77, 53, and 45 taxa, respectively. Carex represented the largest genus with 25 species. Flowering plants comprised 97% of the flora with dicots making up 72% and monocots comprising 25%. Ferns and fern allies constituted approximately 4%, and conifers followed with about 1% of the total number of taxa sampled. Eighty-four species (11% of the flora) were determined to be non-native members of the flora. Nine (1% of the flora) taxa are currently monitored as rare and endangered species by ALNHP. In addition, three natural communities deemed globally rare have been documented from the Range during this project: the *Pinus palustris – Pinus echinata – (Pinus virginiana) / Quercus marilandica – (Quercus montana) / Vaccinium pallidum* Woodland (Montane Longleaf Pine Woodland), the *Platanus occidentalis – Celtis laevigata – Liriodendron tulipifera / Lindera benzoin / Arundinaria gigantea – Amphicarpaea bracteata* Forest (Rich Levee Mixed Hardwood Bottomland Forest), and the Nyssa biflora / Cephalanthus occidentalis – Lyonia lucida Sagpond Forest (Sagpond). Historically, the longleaf pine woodland likely spanned a vast landscape of gently rolling terrain that now encompasses the present day Pelham Range and adjacent central Alabama, but has largely disappeared or been greatly modified as a result of agriculture, timber production, and fire suppression. Despite these impacts, vestiges of good quality examples offering a glimpse of how the region's uplands may have appeared in the past are present on the Range and elsewhere in the region.

Wood Stork Post-breeding Survey

Although not known to breed in Alabama, Wood Storks (*Mycteria americana*) regularly occur in Alabama in summer and early fall. Surveys were conducted to identify important foraging sites for post-breeding wood storks in Alabama. Potential foraging wetlands were identified using past sightings, aerial photos, topographic maps, National Wetlands Inventory data, Alabama Gap Analysis Program Land Cover Map of Ecological Systems, and other GIS data. Wood Stork surveys were conducted by visual search of sites identified as potential foraging areas. All Wood Storks observed were counted using binoculars or a spotting scope and GPS coordinates of the location were collected. Sightings of Wood Storks by the birding community in Alabama were included by extracting sightings reported on the Alabama Ornithological Society (AOS) ALBIRDS forum or posted on eBird.

Wood Storks are highly mobile, and appear to be transient in their use of foraging areas in Alabama. Wood Stork use of a particular site varies between days and years, but they are consistently observed in several areas of the state. Wood Storks were most common and occurred in the highest concentrations around the catfish farms and farm ponds of the Black Belt in southern Hale and Perry counties and Greene County (Fig. 1-2). This was the only area

Wood Stork (*Mysteria americana*)

of the state in which very large groups of Wood Storks were observed at a single site. Storks also used shallow water marshes, swamps, and oxbows between and along the Tombigbee and Cahaba rivers in this area, but group size tended to be small and much lower than the large groups observed on the catfish farms.

Wood Stork sightings were also observed at several sites in the area around Montgomery. However, Storks were less abundant and occurred in smaller numbers and groups than found in the western Black Belt. No Stork sightings were reported north of the Black Belt this year.

State lands which provide the best opportunity for managing to provide Wood Stork foraging habitat are David K. Nelson (Demopolis) Wildlife Management Area and M. Barnett Lawley Forever Wild Field Trial Area in Hale County. Two Alabama Department of Transportation mitigation bank properties also provide good opportunities for management to provide Wood Stork foraging habitat; Big Prairie Creek (prop) Mitigation Bank in Hale County and Catoma Creek (Trotman) Mitigation Bank in Montgomery County. Other state lands which provide Wood Stork foraging habitat are Lakepoint Resort State Park, Barbour Wildlife Management Area (and adjacent Wehle Tract), the Marion Fish Hatchery and Alabama Biodiversity Aquatics Center in Perry County, lands in the Mobile-Tensaw Delta, and Fort Toulouse in Elmore County. Federal lands in Alabama that provide the best Wood Stork foraging habitat management opportunities are Choctaw National Wildlife Refuge and Eufaula National Wildlife Refuge.

Information Systems & Technology

Biodiversity Database

ALNHP maintains a comprehensive database on the location and conservation status of species and ecological communities in Alabama. The Biotics database is supported by funding through our inventory and conservation planning projects. Although building and improving the database has always been a primary goal of the program, securing funding to support this important program area remains a challenge. ALNHP is currently tracking 1,469 rare plant and animal taxon (Fig. 1) + 93 natural communities. There are 7,209 individual occurrences of these species and natural communities documented in Biotics, with the majority of the Element Occurrences (EO) being for vascular plants or aquatic species (Fig. 2).

Following the conversion of our database to Biotics in March 2008, we have been working on improving our database compliance with the Benchmark Data Content Standards (BDCS) for natural heritage data. This past year's efforts focused on redigitizing data imported from BCD to improve the spatial representation. We will continue working to improve the database with the goal of meeting all BDCS goals. The focus in the coming year will be redigitizing data imported from BCD to improve the spatial representation and improving EO Rank completeness and quality.

One of the important tasks each heritage program performs is the regular compilation of a Rare Species Inventory List for the state that ranks each element tracked by the program based on the number and quality of occurrences. Our revised Alabama Inventory List was published October 2013, with the list distributed to cooperators and other interested parties and posted to the ALNHP website.

Data Requests

Over the past year, ALNHP has responded to 22 paid data requests; 43 requests from academia, conservation non-profits, government agencies, NatureServe, other Heritage Network members, or cooperating partners; and 17 requests for an environmental review. The number of requests was similar to past years.

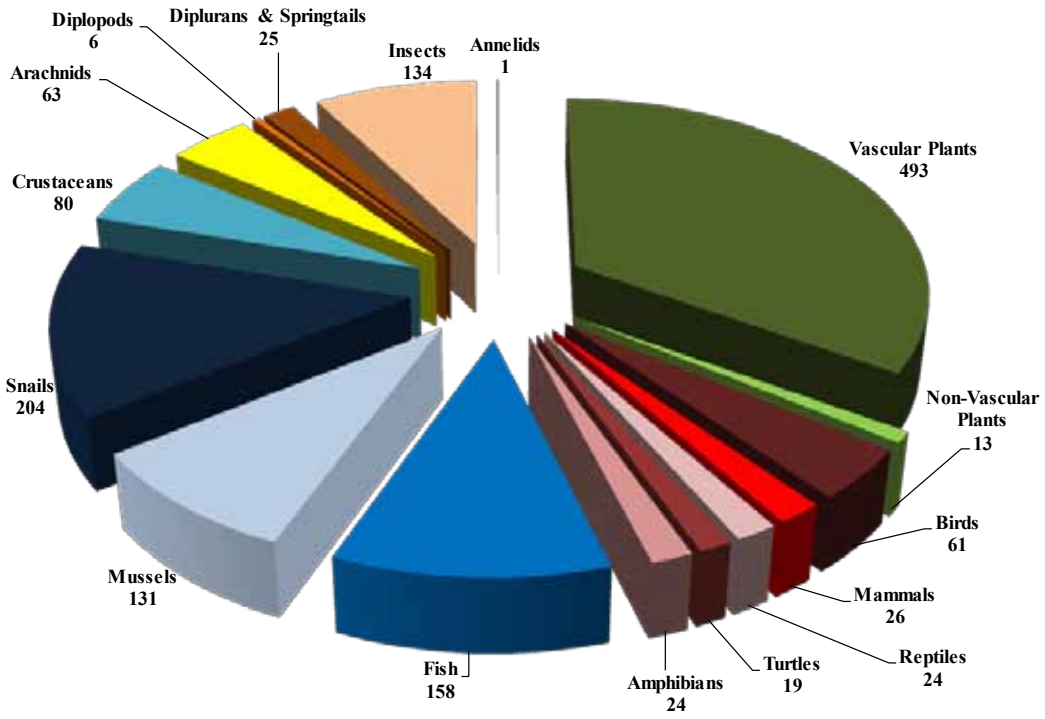


Figure 1. Number of rare plant and animal species track by ALNHP (total 1,453).

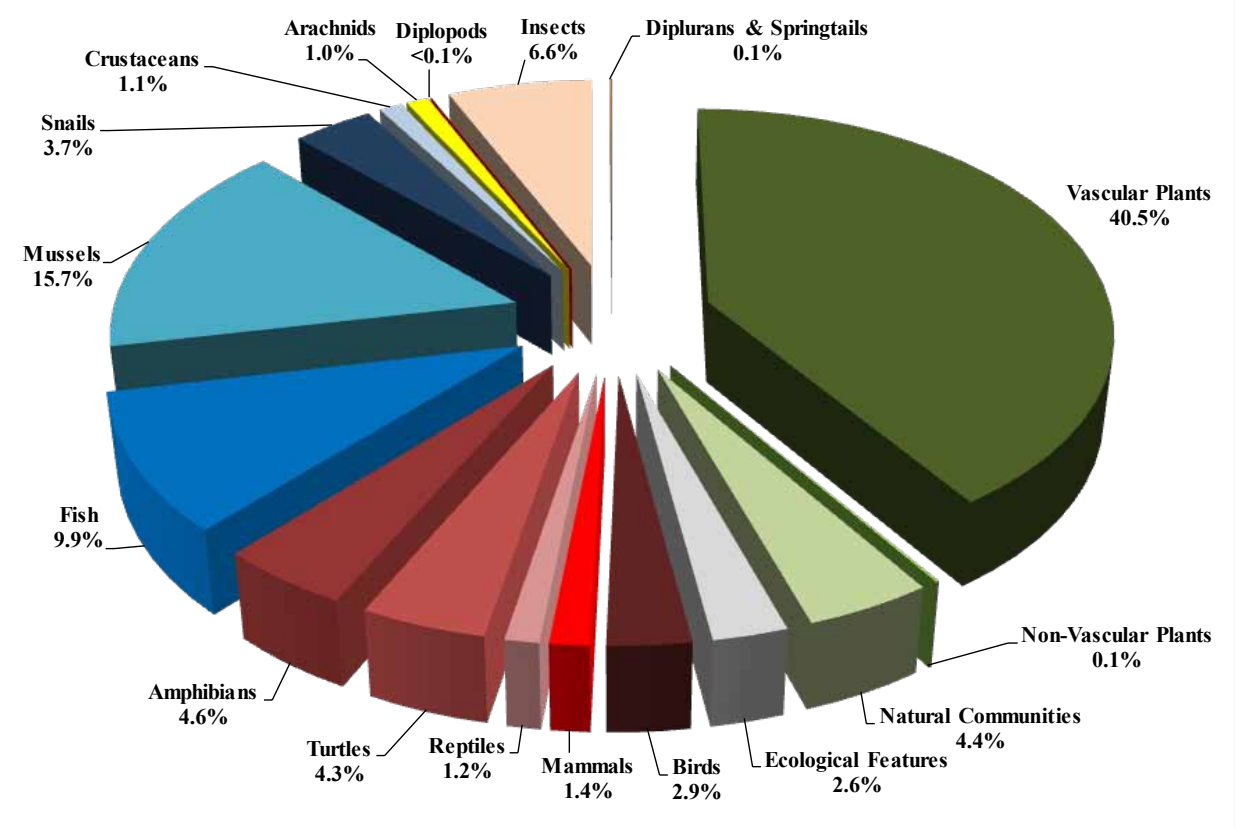


Figure 2. Percentage of 7,199 Element Occurrences in Biotics by major taxonomic group.

Publications

Published Articles:

Folt, B. and J.C. Godwin. 2013. Status of the alligator snapping turtle (Macrochelys temminckii) in south Alabama with comments on its distribution. Chelonian Conservation and Biology 12:211-217.

Unpublished Project Reports:

Barbour, Michael. 2013. Safe harbor plan for Red-cockaded Woodpecker. Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Montgomery, Alabama. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 9 pages.

Barbour, Michael. 2013. Wood Stork post-breeding survey. Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Montgomery, Alabama. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 16 pages.

Barbour, Michael, Alfred Schotz, Sharon Hermann, and John Kush. 2013. Marine Corps Logistic Base Albany, Georgia biological survey. Unpublished report submitted to Marine Corps Logistic Base Albany, Albany, Georgia. Alabama Natural Heritage Program[SM], Auburn Department of Biological Sciences, and Auburn School of Forestry and Wildlife Sciences; Auburn University, Alabama. 129 pages.

Barbour, Michael, Alfred Schotz, Tyler Jones, Luke Marzen, and Samuel Fowler. 2013. Inventory, classification, and assessment of Alabama's geographically isolated wetlands - 2013 annual report. Unpublished report submitted to U.S. Environmental Protection Agency, Atlanta, Georgia. Alabama Natural Heritage Program[SM], Auburn University Department of Geology and Geography, and Auburn University Water Resources Center; Auburn University, Alabama. 15 pages.

Godwin, Jim. 2013. Status of the endangered Alabama red-bellied turtle (*Pseudemys alabamensis*) in the Bon Secour and Fowl rivers. Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Montgomery, Alabama. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 28 pages.

Godwin, Jim. Black warrior waterdog (*Necturus alabamensis*) and flattened musk turtle (*Sternotherus depressus*) status survey using environmental DNA (eDNA). Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Montgomery, Alabama. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 13 pages.

Godwin, James, Shannon Hoss, Kristin Bakkegard, Rulon Clark, and Robert Gitzen. 2013. Movement monitoring of Red Hills salamanders (*Phaeognathus hubrichti*) and fine-scale genetics of a fragmented population. Unpublished report submitted to the U.S. Fish and Wildlife Service, Daphne, Alabama. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 36 pages.

Schotz, Alfred. 2013. Range-wide status assessments of two orchids: *Spiranthes brevilabris* (Texas ladies'-tresses) and *Spiranthes floridana* (Florida ladies'-tresses). Unpublished report submitted to the U.S. Fish and Wildlife Service, Jackson, Mississippi. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 47 pages.

Schotz, Alfred. 2013. Vascular flora of Pelham Range – Fort McClellan Army National Guard Training Center, Calhoun County,

Alabama. Unpublished report prepared for JMR Architecture, Montgomery, Alabama. Alabama Natural Heritage Program[SM], Auburn University, Alabama. 97 pages.