



U.S. Fish & Wildlife Service

National Wildlife Refuge System Southeast Region Inventory & Monitoring Branch

*Branch Update
Spring 2016*

Long-term changes in waterfowl phenology at Tennessee National Wildlife Refuge

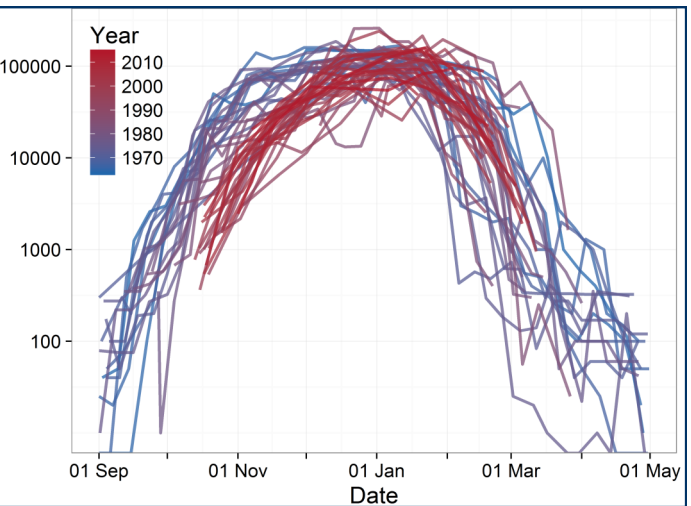
Throughout its 70 year history, Tennessee National Wildlife Refuge (NWR) has actively provided and managed habitat and sanctuary for wintering waterfowl. The resulting diversity of habitat provides food and cover for well over 200,000 ducks and geese during most winters. Likewise, monitoring the use of the refuge by waterfowl has a long history evidenced by filing cabinet drawers full of survey data sheets dating back to the 1950s.

Though the survey methodology has varied over the years, refuge managers collected these data to inform and direct management decisions. Towards this end, the refuge has recently (if 1993 can be considered recent) made the survey protocol more consistent. Prior to 1993, survey methodology varied from year to year, in some cases using surveys from fixed-winged aircraft and counts from the ground in others. Since 1993, the same observer has conducted most surveys from a fixed-winged aircraft, which permits a survey of the entire refuge in about four hours. Aerial counts for each waterfowl species within each habitat management unit (as defined in the refuge's Habitat Management Plan) are conducted bi-monthly during the wintering period, November through March.

Refuge staff has, with a dedicated effort, entered all recent and historical survey data from the mid-1960s into a database. Inconsistency in survey methodologies, particularly among earlier years of the survey, reduces the value of the data to make inferences regarding trends in waterfowl abundance on the refuge. Nonetheless, the historic data have value for exploring long-term trends in the migratory phenology (timing) of some species. The refuge and Southeast Region Inventory & Monitoring Branch staff are collaborating on an analysis of these data to explore and quantify these trends.

From 1964 - 2014, the refuge has conducted 1120 surveys with count data available for the entire refuge. Of these surveys, 901 occurred between September and April, inclusive (i.e., "winter"). Although these surveys have counted many millions of individuals of 31 waterfowl species, the current focus is on six species with adequate data to evaluate changes in phenology over this 50 year period: four dabbling ducks (Mallard, American Black Duck, American Wigeon, and Northern Pintail) and two diving ducks (Ring-necked Duck and Canvasback).

Taking Mallard as our example, the figure illustrates the temporal patterns of refuge-wide counts over the 50 years of surveys. Each winter of surveys is indicated by a different color: early surveys (1960s) are depicted by blue lines transitioning to red lines for more recent surveys. Clearly, Mallard counts on the refuge vary seasonally and this variation may be relatively well described by a quadratic function. We use a hierarchical model to make inferences about changes in (1) the length of time Mallards spend on the refuge each winter (i.e., the width of the parabola) and (2) the peak count date over time (i.e., the vertex of the quadratic function). For Mallard, the width of the seasonal phenology is shrinking. Specifically, in more recent years Mallards are using the refuge over a shorter window than in the past.



Seasonal patterns of Mallard (*Anas platyrhynchos*) counts on Tennessee NWR during the winters of 1964-2014.

Additionally, the date of "peak" Mallard abundance has moved on average about 3 (2.2 - 3.8) days later every decade since 1964.

Similar models will be fit for the other five duck species. The refuge also hopes to use these data to assess the impacts of foraging habitat changes that may occur as a result of management changes, and there is an interest in exploring the importance of "inviolable" sanctuary (i.e., very limited public disturbance) as compared to sanctuary where waterfowl hunting is the only restricted public use. Updates can be found at <http://tiny.cc/TNWRducks>. For more information, please contact [Robert Wheat](#) or [Adam Smith](#).

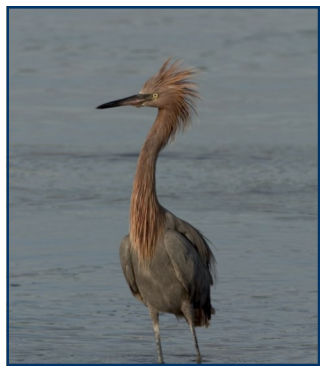
Species Highlight

Species: Reddish egret
(*Egretta rufescens*)

Image Credit: USFWS

Location: J.N. Ding Darling NWR

Habitat: Coastal tidal flats, salt marshes, red mangrove swamps, lagoons, and arid coastal islands



Establishing a SET Network in Florida Coastal Wetlands

Due to Florida's variable soil types, tidal ranges, and dominant vegetation, understanding long-term changes in wetland elevation change requires study over many sites and years. Further, the ability of wetlands to transition from marsh to mangrove at the temperate/subtropical boundary with the pace of sea level rise is entirely unknown. Surface elevation tables (SETs) are commonly used to assess how sea level rise will affect coastal ecosystems across broad latitudinal ranges. In coastal Florida, however, large gaps exist in the distribution of SETs. To address these data gaps, a more regional scale approach is needed and is now being realized.

Through collaborations with the U.S. Geological Survey (USGS), Florida refuges, Southeast Region I&M, and Service's Science Applications Program, a network of SETs and marker horizon sites are being established on Florida refuges to systematically measure landscape-scale changes in surface elevation and vegetation community structure in relation to sea level rise. Jeremy Conrad, Ding Darling NWR wildlife biologist, is leading this effort and is currently visiting Florida refuges to explore mangrove habitats and perform site selections for SET installations. In the coming months, the USGS, I&M, and refuge staff will install 40+ SET benchmarks within priority mangrove habitats. This will establish a USFWS SET network that will contribute to a larger state and national network, which includes SET sites from National Oceanic and Atmospheric Administration, the USGS, the National Park Service, and a host of state agencies.



Red Mangrove (*Rhizophora mangle*) Swamp at J.N. Ding Darling NWR.

The long-term information provided from this project will help managers identify critical areas where coastal wetlands are not keeping pace with sea level rise and are at-risk of being lost to inundation. Additionally, this information will be used to refine predictive models to more accurately forecast outcomes of various sea level rise scenarios as well as to design decision support tools to aid managers in planning and prioritizing conservation needs at the landscapes scale. For more information, please contact [Jeremy Conrad](#) or [Nicole Rankin](#).

Accelerated Survey Prioritization for IMPs

The Southeast Region I&M Branch has proposed and is piloting potential improvements to the current process for developing refuge Inventory & Monitoring Plans (IMPs). IMP development currently proceeds on a "one at a time," refuge-by-refuge basis, with survey prioritization workshops between refuge staff and an I&M ecologist followed by the construction of the IMP narrative by the I&M ecologist and, typically, initial survey instructions (ISIs) as an interim step towards site-specific protocols.

In an effort to bring protocols to refuges more quickly, and to generate a more standardized and cohesive monitoring approach across multiple refuges conducting similar surveys with similar objectives, we have proposed to complete survey prioritization for groups of ecologically-similar refuges prior to IMP development. We expect this approach will have several benefits including:

- 1) Completed survey prioritization tables (IMP Table 1) for all involved refuges to focus efforts on highest priority surveys;
- 2) Improved efficiency in identifying priority regional and site-specific surveys for protocol development;
- 3) Fully-developed protocols get into refuge hands sooner, which means more consistent, rigorous data collection starts sooner across multiple refuges; and
- 4) Increased cross-refuge communication and cooperation

A group survey prioritization approach has been piloted successfully for several North Carolina refuges. Moreover, I&M will initiate a "proof of concept" test of the proposed approach with Gulf Coastal Plain refuges in 2016. For more information, please contact [David Richardson](#) and [Tim Fotinos](#).

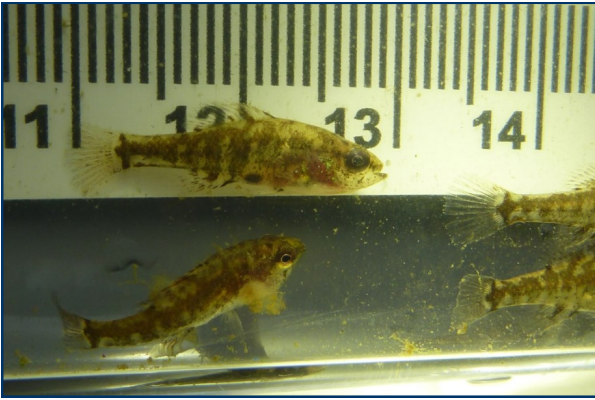
Modeling the Occurrence of SAV

Michelle Moorman (Mattamuskeet NWR biologist), John Stanton (Region 4 Migratory Birds biologist) and Adam Smith (I&M quantitative ecologist) are collaborating to model the occurrence of submerged aquatic vegetation (SAV) at Lake Mattamuskeet through time. Mattamuskeet NWR provides habitat for over 250,000 wintering waterfowl and other migratory birds and the SAV in the lake provide an important food resource for waterfowl and habitat for migratory and game fish. Refuge monitoring of SAV over the past 25 years indicates a significant decline in SAV, most likely attributed to declines in water clarity.

The team is compiling historic SAV data and will model changes in the distribution of SAV in Lake Mattamuskeet and explore associations between SAV and relevant environmental variables to improve our understanding of the SAV decline. For more information about the project, contact [Michelle Moorman](#) or [Adam Smith](#); you can also follow the project [here](#).



Snail Survey Yields Discovery of Rare Fish at Wheeler NWR



Adult Spring Pygmy Sunfish *Elassosoma alabamae* in their full, 2-cm glory collected from Beaverdam Creek, Wheeler NWR.

Recent efforts by researchers conducting an I&M funded snail survey at Wheeler NWR yielded a serendipitous and interesting find. While sampling for aquatic snails within one of Wheeler's spring-fed water impoundments (Blackwell Swamp), a small fish was captured and tentatively identified as a "pygmy sunfish," although no specimen was collected. However, the potentially noteworthy capture was shared with refuge and I&M staff, who conducted follow-up sampling that yielded multiple specimens subsequently confirmed as Spring Pygmy Sunfish, *Elassosoma alabamae*.

Elassosoma alabamae is a federally listed (threatened) species known only to occur in a few locations within the Beaverdam Creek watershed in Northern Alabama. Prior to the Blackwell Swamp discovery, records of *E. alabamae* in waters within Wheeler NWR boundaries were limited. Periodic sampling on the refuge over the past 10 years had yielded no specimens. Thus, this discovery provides a significant opportunity to ensure and promote the conservation and recovery of the species.

At this time, sampling suggests that Wheeler NWR supports a healthy and viable *E. alabamae* population. The Alabama Ecological Services Field Office is considering efforts to describe the habitat and identify similar areas on the refuge relevant to critical habitat designation for the species. For more information, please contact [Rob Hurt](#) or [Lee Holt](#).

Continuous Water Quality Monitoring at Mattamuskeet NWR

Lake Mattamuskeet comprises 41,084 acres of the 50,180 acre Mattamuskeet NWR, so a primary project objective of the refuge is long-term monitoring of key limnological variables to inform lake management decisions. The Service has partnered with the U.S. Geological Survey (USGS) to operate two automated water-quality monitoring stations at Lake Mattamuskeet. Stations measure physical, chemical and biological parameters important to understanding lake health. The data help inform management and assist cooperative assessments of the lake and its living resources.

Lake conditions are available in near real-time via the USGS's National Water Information System website. The stations make measurements every 15-minutes, and data are transmitted to the GOES satellite and uploaded to the website every hour. Data can be viewed by the public, refuge management, and cooperators via the web:

[Mattamuskeet West](#)

[Mattamuskeet East](#)

Results from the first year (September 2012-September 2013) of monitoring are available in the 2013 Water-Data Reports: [Mattamuskeet West](#) and [Mattamuskeet East](#). Second and third year results are in review and compilation phases. Now entering its fourth year, the project's success includes additional partners (NC Wildlife Resources Commission, USFWS Natural Resource Program Center, and Southeast Region I&M), use of data in management and research planning, and expansion of the list of monitored parameters. For example, water-quality data are being used to understand declines in submerged aquatic vegetation (SAV) and lake impairment attributable to nutrients and sediment. Moving forward, water-quality data will be used to assess potential SAV restoration strategies. For more information, please contact [Michelle Moorman](#) or [Wendy Stanton](#).

Supporting Regional At-Risk Species Effort

Regional refuge biologist Chuck Hunter is leading USFWS biologists and refuge managers, state non-game biologists, and other non-governmental organization subject matter experts in a regional review of At-Risk species and species of concern. Review of these At-Risk species stems from a lawsuit filed by the Center for Biological Diversity in 2010. A series of workshops held around the region centered on species focal areas. The workshops were used to assess population status, past/present research, management recommendations, and public lands that do or could play an important role in the conservation of these species. Phase I focused on National Wildlife Refuges ([report](#)). Phase II is underway and focuses on other public lands around the region such as those managed by the UDSA Forest Service, Department of Defense, National Park Service, and state and non-governmental natural resource agencies.

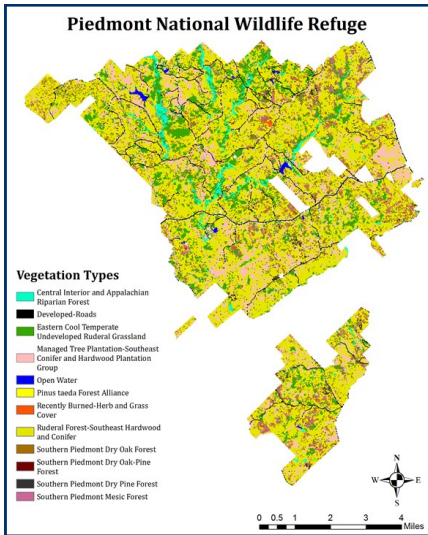
The Southeast Region I&M Branch and individual refuges throughout R4 have played a pivotal role in Phase I by providing technical, material, and subject matter expert support to the review. The I&M Branch is providing further support for the effort through the FY16 RFP funding. These funds will enable refuges to conduct projects that focus on the baseline inventories and monitoring of At-Risk species identified from Phase I. Together we are doing our part for the regional At-Risk Species effort! For more information, please contact [Mike Chouinard](#) or [Chuck Hunter](#).



Hartwrightia floridana growing in the ecotone between the flatwood and the cypress stringer at Okefenokee NWR.

Project Updates

Region-wide Refuge Habitat Mapping



The Southeast Region I&M Branch has identified habitat mapping for refuges as an outstanding information need and has undertaken an effort to contribute data and expertise to the upcoming [LANDFIRE](#) remap in hopes that this will be a valuable data resource that can be used by refuges region wide. The Southeast Region Habitat Mapping Working Group has so far contributed data from over 1000 vegetation plots from refuges across the southeast. These data will be used to test and validate the models that generate the LANDFIRE habitat map, thus improving its accuracy and their reliability as a standardized method to map refuge habitats throughout the region. Members of the Working Group are now developing short summary reports for each refuge that provide LANDFIRE with feedback on their past habitat map. These reports identify large-scale, systematic misclassifications so they can be avoided in the future. Our effort will continue for a few months, after which LANDFIRE will be working intensively on the national remap which is expected to be released and available for use in 2019. For more information, please contact [Forbes Boyle](#) or [Tim Fotinos](#).

The Existing Vegetation Types data layer for Piedmont NWR. Existing vegetation layers from LANDFIRE use classification types primarily from NatureServe’s Ecological Systems, but also include some US National Vegetation Classification - Alliances, and the National Land Cover Database types to create a continuous landscape coverage.

Coastal Wetland Elevation Monitoring in the South Atlantic

The Coastal Wetland Elevation Monitoring (CWEM) project is entering its fourth year of data collection on surface elevation table (SET) benchmarks.

This summer, a Directorate Resource Assistant Fellow (DFP) will be working with I&M and refuge staff to conduct vegetation monitoring at previously established Carolina Vegetation Survey plots at each CWEM site. In 2013, 18 refuges within the South Atlantic geography collected baseline vegetation data on the 20 CWEM sites with assistance from I&M staff. This information was used to provide a baseline condition of vegetation species and community composition at each site. In order to determine status and trends of vegetation composition and structure over time, these plots are scheduled to be monitored every three years. By tracking species composition and structure trends, managers will be able to make more ecologically-informed decisions with regards to the conservation and status of habitat condition on NWR.

In addition, the DFP will perform field GPS occupations of SET benchmarks at CWEM sites that were not surveyed in summer 2015. For more information, please contact [Nicole Rankin](#) or [Forbes Boyle](#).



Forbes Boyle, I&M Botanist, establishing a CVS plot at Pinckney Island NWR.

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Southeast Region Inventory & Monitoring Network

<http://www.fws.gov/southeast/IMnetwork/>

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