

# Florida Fish and Wildlife Conservation Commission



## Endangered and Threatened Species Management and Conservation Plan

Progress Report

Fiscal Year 2018-19

November 19, 2019

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## EXECUTIVE SUMMARY

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This report covers Fiscal Year (FY) 2018–19 and constitutes the 41<sup>st</sup> progress report and updated plan submitted by the Florida Fish and Wildlife Conservation Commission (FWC) for the Florida Endangered and Threatened Species Management and Conservation Plan. This report is required by the Florida Endangered and Threatened Species Act of 1977 in section 379.2291(5), *Florida Statutes*. The Act required the preparation of an initial plan for submission to the 1978 Florida Legislature, and the annual preparation of a revised and updated plan for management and conservation of Florida’s Endangered and Threatened species. Federal- and State-designated Endangered and Threatened species, as well as State-designated Species of Special Concern, are referred to as listed species in this report. The initial plan submitted in March 1978 remains the basic reference document for annual updates. Subsequent annual reports may be consulted regarding a chronological history of listed species activities and may be obtained at <https://myfwc.com/wildlifehabitats/wildlife/reports/>.

This report includes a description of FWC’s criteria for research and management priorities, statewide policies pertaining to listed species, a funding request for FY 2020–21, a progress report providing a description of agency actions for listed species, and a description of FWC’s citizen awareness program as it relates to listed species. In addition, it includes progress reports of staff activities relating to listed mammals, birds, amphibians, reptiles, fish and invertebrates; as well as updates on agency actions to provide coordination and assistance, Critical Wildlife Areas (CWA), incentive-based conservation programs, law enforcement activities and permitting for listed species.



## SUMMARY OF PROTECTED WILDLIFE LISTS

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The first Florida Endangered Species List for wildlife was created in 1972 and consisted of 23 species. Listing was expanded in 1973 to include Threatened species, and again in 1979 to include Species of Special Concern (SSC). Updated Threatened species rules approved by FWC Commissioners went into effect on November 8, 2010, creating the Florida Endangered and Threatened Species List. Species listed through FWC's listing process are now in a single-category, State-designated Threatened (ST), which is designed to eliminate controversy on what a species is called and focus on the conservation actions needed to improve the species' status. The SSC List has been temporarily retained to allow time to assess species under FWC's listing process to determine whether they should be listed as ST or removed from the list. All Florida species listed under the Endangered Species Act by the US Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration's Marine Fisheries Service (NOAA-Fisheries) are included in the Florida Endangered and Threatened Species List as Federally-designated Endangered (FE), Federally-designated Threatened (FT), Federally-designated Threatened Due to Similarity of Appearance [FT(S/A)], or Federally-designated Nonessential Experimental Population (FXN) species.

Rules 68A-27.003 and 68A-27.0031, *Florida Administrative Code*, contains the official Florida Endangered and Threatened Species List. Rule 68A-27.005, F.A.C., contains the SSC List. Currently, FWC lists 131 fish and wildlife species (Exhibit 1) as ST (39), SSC (1), FE (50), FT (36), FT(S/A) (4) and FXN (1). There is no duplication between lists. Collectively, these 131 species are referred to as Florida's listed species. FWC did not conduct management or research activities on all listed species this year; therefore, this report does not contain discussion of all listed species. Appendix A contains all of Florida's listed species as of June 30, 2019. Changes to the list may occur throughout the year. A compilation of Florida's currently listed species is available at: <https://myfwc.com/media/1945/threatend-endangered-species.pdf>. Rules noted above are available at: <https://www.flrules.org/gateway/ChapterHome.asp?Chapter=68A-27>.

At the federal level, NOAA-Fisheries is responsible for listing most marine species and the USFWS is responsible for other species. The federal list of animals and plants is administered by USFWS and published in Chapter 50 of the Code of Federal Regulations (CFR): animals in 50 CFR 17 and plants in 50 CFR 23. Additional information on federal listings is available at:

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NOAA-Fisheries Federal Listings	<a href="http://www.nmfs.noaa.gov/pr/species/index.htm">http://www.nmfs.noaa.gov/pr/species/index.htm</a>
USFWS Federal Listings	<a href="http://www.fws.gov/endangered/species/us-species.html">http://www.fws.gov/endangered/species/us-species.html</a>
Florida Department of Agriculture and Consumer Services: Florida Statewide Endangered and Threatened Plant Conservation Program—includes federally-listed plant species	<a href="http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Florida-Statewide-Endangered-and-Threatened-Plant-Conservation-Program">http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Florida-Statewide-Endangered-and-Threatened-Plant-Conservation-Program</a>

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**Exhibit 1.** Summary of Florida's Listed Species List as of June 30, 2019.

STATUS DESIGNATION	MAMMALS	BIRDS	AMPHIBIANS	REPTILES	FISH	INVERTEBRATES	TOTAL
Federally-designated Endangered (FE)	21(5) <sup>2</sup>	8	1	3(3)	3(1) <sup>1</sup>	14	50(9)
Federally-designated Threatened (FT)	2(1)	6	1	7(2)	4(1)	16	36(4)
Federally-designated Threatened due to Similarity of Appearance [FT(S/A)]	0	0	0	1	0	3	4
Federally-designated Nonessential Experimental Population (FXN)	0	1	0	0	0	0	1
State-designated Threatened (ST)	4	16	2	9	6	2	39
State-designated Species of Special Concern (SSC)	0	0	0	0	0	1	1
<b>TOTAL</b>	<b>27(6)</b>	<b>31</b>	<b>4</b>	<b>20(5)</b>	<b>13(2)</b>	<b>36</b>	<b>131(13)</b>

<sup>1</sup> Numbers in the parentheses are the number of species for which FWC does not have constitutional authority. For example, there are three fish species in the Federally-designated Endangered (FE) category, one of which FWC does not have constitutional authority.

<sup>2</sup> There is one additional species included in Rule 68A-27.0031, FAC as a species for which FWC does not have constitutional authority that is not included here because it has been determined to be extinct.





## STATUTORY REQUIREMENTS

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### *Criteria for Research and Management Priorities*

FWC uses a variety of tools to evaluate and prioritize research and management needs for State-listed species. One tool used is the State listing process described in Rule 68A-27.0012, F.A.C. This process uses a quantitative system to identify Florida's most at-risk species and directs the development of a management plan for each species undergoing a state listing action. In addition to the listing process, FWC uses a species ranking process that was developed by the FWC and published in *Wildlife Monographs (Millsap, B. M., J. A. Gore, D. E. Runde, and S. I. Cerulean. 1990. Setting priorities for the conservation of fish and wildlife species in Florida. Wildlife Monographs 111)*. This ranking process provides a biological score that ranks species based on their biological vulnerability; an action score that ranks a species based on the amount of available information and ongoing management actions; and a supplemental score that looks at variables not included in the biological or action scores. These scores help identify species most in need of conservation and the amount of effort previously expended on them, which is used to help prioritize agency resources. FWC also maintains a list of Species of Greatest Conservation Need, which uses a set of scientific core criteria and identifies the broad range of Florida's species that are at-risk or could become at-risk in the future. In addition, FWC also considers available funding sources, legislation, court rulings, grant agreements and approved management plans when setting priorities for allocating resources for managing and conserving Florida's State-listed species.

### *Statewide Policies Pertaining to Listed Species*

**LISTING ACTIONS** - In FY 2018-19, four species were removed from Florida's Endangered and Threatened Species List as State-designated Species of Special Concern: harlequin darter, osprey (Monroe County population), Homosassa shrew and Sherman's fox squirrel. The alligator snapping turtle was taxonomically reclassified into three species. The Suwannee alligator snapping turtle was State-designated as Threatened and the other two species were removed from the list while maintaining prohibitions against take and possession. Two species were Federally-designated as Threatened: giant manta ray and Nassau grouper. Four species had their scientific names changed: short-tailed snake, bluetail mole skink, Florida Keys mole skink and sand skink.

On April 2, 2019, FWC received a request to evaluate the status of the striped newt. The species evaluation request is currently under review. Information on all listing actions can be found at: <https://myfwc.com/wildlifehabitats/wildlife/listing-actions/>.



Completed biological status reports, species action plans and management plans are available at:

<https://myfwc.com/wildlifehabitats/wildlife/biological-status/>,

<https://myfwc.com/wildlifehabitats/wildlife/species-action-plans/> and

<https://myfwc.com/wildlifehabitats/wildlife/management-plans/>, respectively.

*IMPERILED SPECIES MANAGEMENT PROGRAM, THE LISTING PROCESS, AND MANAGEMENT PLANS* - Rules implementing the Imperiled Species Management Program (ISMP), and a revised listing process, became effective on November 8, 2010 (<https://www.flrules.org/gateway/ChapterHome.asp?Chapter=68A-27>). The ISMP (<https://myfwc.com/wildlifehabitats/wildlife/plan/>) requires all species have a management plan before listing status changes can occur. As of June 30, 2019, there were 38 State-designated Threatened species and one State-designated Species of Special Concern. The osprey (Monroe County population), harlequin darter, eastern chipmunk, southern fox squirrel, Homosassa shrew, Apalachicola alligator snapping turtle and alligator snapping turtle were removed from protections under Chapter 68A-27, F.A.C., after Biological Status Reviews determined they no longer meet criteria for state listing. Revised Species Action Plans (<https://myfwc.com/wildlifehabitats/wildlife/species-action-plans/>), updated references in Florida's ISMP, and Species Conservation Measures and Permitting Guidelines (<https://myfwc.com/wildlifehabitats/wildlife/species-guidelines/>) were approved concurrent to the status changes to ensure these species remain conservation priorities.

With stakeholder input, FWC staff developed Guidelines for the little blue heron, roseate spoonbill, tri-colored heron, reddish egret, Sherman's short-tailed shrew, Georgia blind salamander, Florida bog frog, southern tessellated darter and crystal darter and the Commission approved them. Guidelines were subsequently incorporated, by reference, into F.A.C. rule. These Guidelines outline the species' biological background and define activities likely to impair essential behavior. They also provide voluntary conservation measures that may benefit the species and outline options for avoidance, minimization, and mitigation. These Guidelines serve to provide regulatory certainty for activities authorized without a permit and inform potential applicants regarding permit options.

### *Required Legislation*

Currently, the FWC has no requests for legislative changes affecting listed species. Staff will work with the Legislature should any legislation involving listed wildlife species be proposed.



## Funding Request

The recommended level of funding for the FWC endangered species programs in FY 2020–21 is \$27,470,401 (Exhibit 2). This includes funding to maintain and enhance current programs and a continuation of awards from federal grants designed to assist in the development of recovery programs.

**Exhibit 2.** The FWC Endangered/Threatened Species Budget Request for FY 2020–21.

FUNDING SOURCE	AMOUNT (\$)
Federal Grants (FG)	4,275,254
Florida Panther Research and Management Trust Fund (FPRMTF)	879,680
Grants and Donations Trust Fund	3,846,840
Land Acquisition (LATF)	1,343,005
Marine Resources Conservation Trust Fund (MRCTF)	8,190,055
Nongame Wildlife Trust Fund (NWTF)	5,124,908
Save the Manatees Trust Fund (STMTF)	2,068,483
State Game Trust Fund (SGTF)	1,742,176
<b>TOTAL</b>	<b>27,470,401</b>



## PROGRESS REPORT

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FWC's mission is "managing fish and wildlife resources for their long-term well-being and the benefit of people." Management of listed species includes surveying and monitoring of species, habitat improvement and restoration, development and implementation of management plans, conservation planning, agency commenting on potential impacts to species and citizen awareness. Research is a systematic means of generating the scientific information necessary to support and guide management. Research also leads to a better understanding of how wildlife managers may alter populations through management actions, as well as leading to management actions that have aided in species stabilization and conservation. This section briefly describes the progress of ongoing listed species management and research by the FWC. Appendix A contains a complete list of listed species' scientific and common names and Appendix D provides the same information for non-listed species mentioned in this report.

### MAMMALS

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#### *Beach Mice*

Several subspecies of the old-field mouse, collectively known as beach mice, inhabit coastal dunes along Florida's Atlantic and northwest Gulf Coasts. All subspecies, but one, are Federally listed, including the Choctawhatchee beach mouse, Anastasia Island beach mouse, St. Andrew beach mouse, Perdido Key beach mouse (all Endangered) and the Southeastern beach mouse (Threatened).

*GULF COAST BEACH MICE* - FWC established track tube stations along coastal dunes from Gulf to Escambia Counties. Each station consists of a polyvinyl chloride (PVC) tube baited with sunflower seeds and lined with paper and an inkpad recording footprints as mice enter the tube. At most sites, stations are 328-1,640 feet apart in lines parallel to the dunes. FWC and partners from the Florida Park Service, Gulf Islands National Seashore, the St. Joe Company, and Tyndall Air Force Base (AFB) regularly check stations for tracks. This long-term monitoring program continued in FY 2018-19 at 13 sites on public lands and two privately-owned sites. In FY 2018-19, the mean detection rate (percent of stations detecting tracks each sampling period) varied from 0% (Deer Lake State Park) to 95% (Gulf State Park). Most sites had mean detection rates above 80%, indicating beach mice presence on most of the available dune habitat at these sites. Detection rates have declined at Deer Lake State Park over the last few years and mouse tracks (species uncertain) were detected once in FY 2018-19. FWC plans to work with partners to determine if management actions are needed to reestablish mice at this park.

Several sites along the northeast Gulf Coast were severely impacted by Hurricane Michael in October 2018. Beach mouse detections decreased at Tyndall AFB and St. Joseph peninsula in the months



following the storm; however, detections increased in the latter half of FY 2018-19. As part of a genetic study by the University of Florida, FWC and USFWS biologists trapped mice in May and June at several sites impacted by Hurricane Michael. Six mice were captured at St. Joseph Peninsula State Park, nine at Billy Joe Rish Recreational Park and five on Tyndall AFB East Crooked Island. In FY 2018-19, FWC submitted a multi-year project proposal to the USFWS designed to quantify the impacts caused by Hurricane Michael and aide in prioritizing potential restoration efforts. FWC and the USFWS also submitted a multi-year grant proposal to the Florida Gulf Environmental Benefit Fund through the National Fish and Wildlife Foundation. The goal of this project is to restore or enhance the diversity and resilience of the coastal dune ecosystem throughout northwest Florida.

*ATLANTIC COAST BEACH MICE* - The Southeastern beach mouse occurs in Volusia and Brevard counties, and possibly scattered locations in Indian River county. In FY 2018-19, FWC submitted a proposal to the USFWS for a 5-year project titled “Assessing habitat restoration and management activities and benefits for Atlantic Coast beach mouse recovery through long-term monitoring.” In FY 2018-19, work continued for a USFWS funded project investigating the genetic diversity of the Southeastern beach mouse and other beach mouse subspecies. This project is expected to be completed during FY 2019-20.

The Anastasia Island beach mouse historically ranged as far north as the Duval-St. Johns County line but is now found only on Anastasia Island (St. Johns County). In 2017, FWC was allocated Federal Section 6 funds for a project to evaluate the impact of Hurricane Matthew on the population. Track tube stations were deployed at three conservation areas, Anastasia State Park, St. Johns County Parks and Ft. Matanzas National Monument (Exhibit 3). Live-trapping was also conducted to estimate abundance and confirm presence (Exhibit 3). Track tube and trapping data was used to estimate the probability of Anastasia Island beach mouse occurrence in association with different habitat conditions and to develop a habitat restoration strategy addressing storm impacts.

**Exhibit 3.** Anastasia Island beach mouse captures and track tube surveys conducted in FY 2018-19.

Location	Captures	Individuals	Tubes	Surveys	Detections	Detection Rate (%)
Anastasia State Park	127	81	109	26	1,997	72
Fort Matanzas National Monument	68	36	22	29	330	52
St. Johns County	17	14	12	26	137	44

### *Big Cypress Fox Squirrel*

The State-designated Threatened Big Cypress fox squirrel (BCFS) is endemic to southwest Florida. BCFS are threatened by habitat fragmentation, invasive species, disease, changes to natural hydrology and lack of prescribed fire. To understand how these threats may affect BCFS occupancy, FWC awarded a grant to the University of Arizona, Tucson in FY 2016-17. In 2018-19, 123 survey plots



were established on public lands in Collier, Lee and Hendry counties in addition to the original 211 plots in Collier County. Within these plots, six sampling grids were placed in areas where BCFS were known to occur to better understand resource use at a finer-scale. Each grid was composed of five randomly-placed groups of five cameras. In 2018-19, BCFS were detected at nine locations: three in Corkscrew Ecosystem Watershed Wildlife and Environmental Area's Flint Pen Strand unit (Lee and Collier counties), one in Dinner Island Ranch Wildlife Management Area (Hendry County) and five in Lee County preserves. BCFS were also detected on each of the six grids established for the fine-scale resource use analysis. Analyses will be complete in 2020.

### *Everglades Mink*

The State-designated Threatened Everglades mink is one of four subspecies of American mink in Florida. Previous attempts to detect Everglades mink were unsuccessful, suggesting effective survey methods are lacking. FWC evaluated the efficacy of camera traps and spotlighting from 2014-2018, however neither were particularly effective. No additional surveys were conducted in FY 2018-19. A website was created for the public to report mink sightings using a Google Maps tool in the website. Comments, pictures and contact information submitted with the sighting location were used to evaluate the validity of the sighting. Since 2012, 869 sightings were reported. Overall, less than 30% of the sightings were deemed valid. Most sightings were river otter, which are more common than mink but similar in appearance.

### *Florida Bats*

*TRI-COLORED BAT* -The tri-colored bat is a candidate for Federal listing due to severe declines from white-nose syndrome (WNS), a fungal disease that has killed over 6 million hibernating bats in North America since the winter of 2006-07. While WNS has not yet reached Florida, it is present in Georgia and Alabama. Due to this emerging threat, FWC initiated a large-scale study in 2014 to better understand the distribution and abundance of cave bats, determine the susceptibility of caves to WNS and quantify ideal cave roosting habitat. In FY 2018-19, FWC surveyed 27 important caves (10 in northwest Florida and 17 in north central Florida) of 126 identified as tri-colored bat caves and observed 240 bats in 19 caves. While the average number of bats per cave has declined since 2014, the number of bats observed this winter was within 10% of last year's counts at the same caves. FWC swabbed bats at 7 caves and submitted samples to the US Geological Survey's Wildlife Health Center to test for WNS. Results show Florida remains the only state east of the Mississippi River free of WNS.

In October 2018, Hurricane Michael directly impacted Jackson County which has Florida's highest concentration of bat caves. Many of these caves experienced severe flooding, obstruction of entrances by fallen trees, and destruction of fencing that protected roosting bats from human disturbance. Despite



these impacts, the number of tri-colored bats observed hibernating in northwest Florida increased slightly since last winter. Judge's cave was almost completely inaccessible to bats before FWC cleared debris blocking the entrance, but the protective fencing remains badly damaged.

Following anecdotal reports of bats in culverts, FWC began surveying roadway culverts in the winter of 2017-18 to determine their importance to cave-roosting bats. In FY 2018-19, over 200 roadway culverts were surveyed in 40 counties in north Florida. There were 37 tri-colored bats in 14 of the culverts surveyed. Although a small percentage of culverts were occupied, Florida has thousands of roadway culverts which may cumulatively provide roosting habitat for tri-colored bats. However, using culverts may put bats at risk of disturbance, injury, or death from construction, maintenance and flooding. More research is needed to develop adequate management guidelines to protect bats in culverts.

FWC created and initiated the Long-term Bat Monitoring Program (LTBMP) to improve our knowledge of bats in the state and monitor population trends. Protocols were adapted from the North American Bat Monitoring Program so that FWC can address Florida-specific goals while contributing to the national program. Since the start of the LTBMP in September 2018, FWC established 73 stationary points and three mobile routes to record the ultrasonic echolocation calls of bats. FWC has begun analyzing this acoustic data and sharing results with the national bat monitoring program.

**GRAY BAT** - The Federally-designated Endangered gray bat roosts in caves throughout much of the south-central US. Gray bats occupy different caves in summer and winter based on temperature, and historically some gray bats migrated out of Florida during winter. The gray bat is known from only a few caves in Jackson County, and the population is declining despite these caves being protected. This decline began prior to the emergence of WNS and the fungal disease is not believed to be adversely affecting Florida's gray bats at this time. No gray bats have been observed at summer roosts in Florida during survey attempts since 1990. During the FY 2018-19 winter counts, no gray bats were found in Old Indian Cave (former primary wintering cave in Florida Caverns State Park), Dugong Cave (a smaller cave adjacent to the park where gray bats previously roosted some winters), or in any of the other 8 caves in northwest Florida visited as part of a broader study of cave use by wintering bats. Although thousands of gray bats previously wintered in Florida's caves, no more than nine have been found hibernating since 2002. Since some gray bats in Florida were known to migrate out of the state to northern caves to hibernate, it is possible protection and stabilization of the large summer colonies in northern caves led to gray bats no longer migrating to Florida during summer or winter.

**FLORIDA BONNETED BAT** - The Federally-designated Endangered Florida bonneted bat is endemic to Florida. In FY 2018-19, eight of 13 bat houses were occupied for at least one night on Babcock-Webb Wildlife Management Area (WMA; Charlotte County). FWC monitored for pups in 10 houses and pups were



observed in seven houses. In FY 2018-19, FWC captured bats during three emergence counts and capture sessions in August (106 emerged, 68 captured), December (101 emerged, 67 captured) and April (108 emerged, 101 captured). FWC maintained six automatic passive integrated transponder (PIT) tag readers on bat houses and installed a seventh PIT tag reader in April. Each reader collects data on when bats enter and exit bat houses. This project is ongoing, but initial results were published in FY 2016-17 and additional information on activity patterns will be published in FY 2019-20.

A University of Florida-FWC project studied two components of bonneted bat ecology: 1) diet composition and effects of season on prey diversity and 2) nightly movement patterns presumed to be associated with foraging. Data collection occurred in 2015-2017 and final data analysis occurred in FY 2018-19. All samples contained DNA from 355 types of insects from 10 taxonomic orders. Moths were present in every sample analyzed and were the most prevalent and diverse prey. Researchers attached GPS tags to 37 bats, 20 of which collected useable data. Results show bonneted bats are wide-ranging (maximum distance of 24 miles from roosts) and females generally have greater nightly movements than males. Habitat selection analyses revealed use of agricultural areas such as pastures, row crops and tree crops more than would be expected. In FY 2018-19, three additional GPS tags were attached to bats to gather more information on flight altitudes and foraging locations.

In FY 2017-18, FWC initiated a project to locate, monitor and characterize natural roosts and the surrounding habitat, which continued into FY 2018-19. Acoustic detectors were deployed at 46 sites across Charlotte, Collier, Hendry, Highlands and Lee Counties to identify areas with the highest levels of activity. FWC conducted 11 mist net survey nights, captured and attached radio transmitters to two bats and tracked these bats back to roost trees using radio-telemetry. Emergence counts and cavity peeping (if possible) were conducted on all identified roost trees. In total, 19 roost trees have been located, with two new roosts in FY 2018-19. Initial findings were published in FY 2015-16 and further results will be published in FY 2019-20.

Acoustic and mist nest surveys were conducted at Spirit of the Wild WMA (Hendry County), Everglades and Francis S. Taylor WMA (Broward County) Florida Keys Wildlife and Environmental Area (WEA; Monroe County), Crocodile Lakes National Wildlife Refuge (NWR; Monroe County), Corkscrew Regional Ecosystem Watershed WEA (Lee and Collier counties), and private lands in Key Deer NWR (Monroe County; Exhibit 4). No surveys were conducted at Holey Land WMA or Rotenberger WMA (both in Palm Beach County). FWC provided the USFWS with input on critical habitat designation, natural roost characteristics, acoustic survey protocols and protocols to address problems that may arise if bonneted bats roost in houses or other man-made structures.





**Exhibit 4.** Florida bonneted bat acoustic and mist net surveys conducted in FY 2018-19.

Location	County	Survey Nights	Bats Detected?	Bats Captured?	Roosts Found?
Everglades and Francis S. Taylor WMA	Broward	76	Yes	–	–
Babcock Ranch Preserve	Charlotte	11	Yes	No	No
Fred C. Babcock / Cecil M. Webb WMA–Yucca Pens	Charlotte	8	Yes	–	–
Big Cypress National Preserve	Collier	7	Yes	No	No
Fakahatchee Strand Preserve State Park	Collier	9	Yes	–	–
Florida Panther National Wildlife Refuge	Collier	7	Yes	No	No
Okaloacoochee Slough State Forest	Collier, Hendry	21	Maybe	–	–
Fisheating Creek WMA	Glades	24	Yes	–	–
Dinner Island Ranch WMA	Hendry	25	No	–	–
Okaloacoochee Slough WMA	Hendry	16	No	–	–
Spirit of the Wild WMA	Hendry	108	No	No	No
Archbold Biological Station	Highlands	45	Maybe	–	–
Avon Park Air Force Range	Highlands	3	Yes	Yes	Yes
Jack Creek, Henscratch Tracts – Lake Wales Ridge WEA	Highlands	45	No	–	–
Lake Placid Scrub Tract – Lake Wales Ridge WEA	Highlands	45	No	–	–
Royce Ranch Tract – Lake Wales Ridge WEA	Highlands	45	No	–	–
Platt Branch WEA	Highlands	64	Yes	–	–
Prairie Pines Preserve	Highlands	16	No	–	–
Corkscrew Regional Ecosystem Watershed WEA	Lee, Collier	36	Yes		
Hickey Creek WEA	Lee	18	Yes	–	–
Urban Areas (Ft. Myers)	Lee	41	Yes	No	No
Crocodile Lake NWR	Monroe	125	No	–	–
Florida Keys WEA	Monroe	192	No	–	–
Private lands (Key Deer NWR)	Monroe	11	No	–	–

## Florida Manatee

The Federally-designated Threatened Florida manatee (also called the West Indian manatee) occurs in Florida’s coastal estuaries and riverine waters. Florida’s efforts to conserve the manatee are funded primarily by the Save the Manatee Trust Fund that derives approximately one-third of its funds from the sale of specialty license plates. Conservation efforts are guided by the Florida Manatee Sanctuary Act, the Florida Manatee Management Plan (<http://myfwc.com/media/415297/manateemgmtplan.pdf>) and the USFWS Florida Manatee Recovery Plan ([http://ecos.fws.gov/docs/recovery\\_plan/011030.pdf](http://ecos.fws.gov/docs/recovery_plan/011030.pdf)).

**MANATEE FORUM** - In FY 2018-19, the Manatee Forum, a diverse stakeholder group, met in December 2018 and in May 2019. Presentation topics in the December meeting focused on the current condition of the Indian River Lagoon, the ongoing red tide and its effects on manatees, the process of permitting and maintaining Florida waterway markers, recently published research on manatee behavioral response to boats, updates on the most recent manatee abundance survey and plans for reformatting future



meetings, which include one in-person meeting and one meeting using video and teleconference. The May meeting was the first Forum conducted through video and teleconference and included updates on FWC and the USFWS management and research activities, presentations on new aerial manatee distribution surveys of the eastern panhandle region conducted by FWC and The Nature Conservancy, and a report from the Crystal River National Wildlife Refuge on last winters' manatee activity.

**MANAGEMENT ACTIVITIES** - For more information on manatee conservation efforts, please see the Save the Manatee Trust Fund report provided to the President of the Florida Senate and the Speaker of the Florida House of Representatives annually (<http://www.myfwc.com/research/manatee/trust-fund/annual-reports>, which describe progress and activities of the Manatee Management Plan). This report covers programs such as Manatee Protection Plans (MPPs), Manatee Protection Zones, permit reviews, habitat-related concerns, population assessment and behavioral ecology. FWC's Florida Manatee Management Plan directs management activities and focuses on five program areas: MPP, Manatee Protection Zones, permit reviews, habitat-related concerns and outreach.

**MANATEE PROTECTION PLANS AND ZONES** - In FY 2018-19, staff continued to assist Miami-Dade County with informal input, when requested, while they assess revisions to their MPP. In FY 2017-18, FWC continued to finalize the Collier County manatee protection zones rule process that began in 2016. In May 2017, the final rule was challenged because FWC did not recommend a protection zone in a specific waterbody. An administrative hearing was held in October and the Administrative Law Judge ruled in the state's favor in January 2018. The decision was appealed, and no decision has been made at the time of this report. Although the rule was filed for adoption with the Department of State in January 2018, due to the uncertainty of the appeal outcome, no action has been taken to update the regulatory markers and the county remains marked in accordance with the 1997 Collier County rule. Additionally, staff continued to review and monitor available data in several of the county manatee protection zone rules in FY 2018-19. No significant rule amendments are currently being considered.

**PERMIT REVIEWS** - FWC produced 330 final comments or assistance letters for proposed projects reviewed in FY 2018-19. Reported manatee entrapment incidents in culverts, ponds and stormwater drains were investigated for ownership and recommendations were provided for installing grates to preclude future manatee access. Information distribution is also completed through these comments, as facilities are required to post informational signs and distribute written materials to vessel operators.

**MANATEE HABITAT** - In FY 2018-19, FWC participated in various intergovernmental groups and task forces regarding minimum flows and levels at springs, invasive aquatic plant control, seagrass monitoring and protection and other habitat-related concerns. Aerial surveys are being flown in Indian River County and the eastern panhandle to determine if these areas have experienced any significant changes in



manatee distribution. In addition, FWC is working with a variety of partners to develop and complete projects to restore and conserve important natural warm-water habitat in Sarasota and Volusia Counties. Staff is also working with Florida Power & Light and Tampa Bay Electric Company to develop plans to monitor and protect manatees during work to upgrade existing power generating units. The FWC, USFWS and other partner agencies are leading an effort to review and update the Warm Water Action Plan, a long-term planning tool for conserving manatee warm-water habitat.

**RESEARCH ACTIVITIES** - Population assessments include conducting manatee counts at winter aggregation sites; aerial surveys to determine regional distribution and abundance and assess habitat use; and estimating survival, population growth and reproductive rates through photo-identification and the application of genetic markers, a gene or DNA sequence with a known location on a chromosome that can identify individuals or species. With the help of partner organizations, multiple teams of observers counted 5,733 manatees in the annual statewide survey in winter 2019. Surveys provide a minimum number of manatees known to be alive using warm water and winter habitats on a particular survey day. The inability to account for manatees not seen during the fly over (due to weather and water conditions and manatee behavior) results in counts that vary and are of limited utility. Concerted efforts have been made over the past several years to improve the ability to estimate abundance. An innovative approach has been designed, tested and vetted incorporating a double-observer protocol (multiple observers per plane), repeated passes, and detailed diving behavior. The most recent estimate of 8,810 manatees was conducted in FY 2015-16 and published in 2018. More information on these surveys is available at, <http://myfwc.com/research/manatee/projects/population-monitoring/>.

FWC initiated a smaller-scale distributional survey in Indian River County that is flown monthly and will inform seasonal distribution and habitat use over a one-year period. With the U.S. Geological Survey's Sirenia Project and Mote Marine Laboratory in Sarasota, FWC maintains a computerized database for photo-identification. Survival rate information from photo-identification efforts was included in the latest status and threats assessment (<https://pubs.usgs.gov/sir/2017/5030/sir20175030.pdf>). Genetic testing offers an additional means of identification. The genetic-ID database currently includes 2,174 unique individuals identified by skin samples collected from live manatees in southwest Florida with approximately 400 samples pending from 2019 winter sampling.

**BEHAVIORAL ECOLOGY** - Warm-water habitat is of particular interest to FWC and agency partners because the predicted future loss of this habitat is a key, long-term threat to Florida's manatee population. In FY 2018-19, FWC continued to monitor two wintering sites on the west coast that are in the process of restoration (Warm Mineral Springs) or mitigation (Port of the Islands). FWC continued to monitor temperature of warm-water habitat statewide via temperature probes at key sites.



*MORTALITY AND RESUCE* - FWC researchers and law enforcement officers respond to statewide reports of manatee carcasses and injured manatees. In FY 2018-19, 700 carcasses were documented. All but 96 of these carcasses were recovered and examined in order to determine causes of death. During FY 2018-19, a red tide persisted along the southwest coast of Florida (began in early fall of 2017) resulting in elevated manatee mortality. The national Working Group on Marine Mammal Unusual Mortality Events determined that a 'Repeat Mortality Event' involving manatees was occurring concurrent with the red tide bloom. Collision with watercraft accounted for 146 of the 700 cases. Other causes of manatee death are those associated with near-term or newborn (perinatal) issues, cold stress, natural causes and human influence. An interactive searchable web-based database with manatee mortality information is available at <https://myfwc.com/research/manatee/rescue-mortality-response/statistics/>.

FWC and cooperators rescued 104 sick or injured manatees under the Federally-permitted statewide rescue program. Four oceanaria (Jacksonville Zoo, ZooTampa, Miami Seaquarium, and Sea World in Orlando) participate in the State-funded rehabilitation program and are partially reimbursed by FWC for their costs. In FY 2018-19, 60 of these rescued manatees were released back into the wild, 20 died and 24 are still being treated. FWC participated in almost every rescue, transport to rehabilitation facilities, pre-release health assessment and release of rehabilitated manatees in various parts of the State.

## *Florida Panther*

*SURVEYS* - The Federally-designated Endangered Florida panther is a subspecies of the puma (also called cougar or mountain lion). FWC and Big Cypress National Preserve biologists typically capture a sample of panthers annually between November and February and fit them with collars containing radio transmitters. These radiocollared panthers are monitored three times a week and their locations are recorded. Since 1981, 259 panthers have been radiocollared. Radio telemetry data was collected on 17 panthers in FY 2018-19. In addition to monitoring adults by radio telemetry, biologists visit dens of radiocollared female panthers to collect data on and mark newborn kittens with passive integrated transponder (PIT) tags. Since 1992, 497 kittens have been handled at dens. In FY 2018-19, biologists visited three dens and documented seven kittens (three males, four females). In FY 2018-19, 26 wild panthers are known to have died, including four (three males, one female) radiocollared panthers and 22 (14 males, eight females) uncollared panthers. Of the 26, 20 panthers died after being hit by vehicles, four were killed by other panthers, two died from unknown causes.

*COLLABORATIVE RESEARCH ACTIVITIES* - FWC is involved in multiple research projects focusing on population analyses and models; genetic differences between panthers and other puma populations; mortality factors; the efficacy of rehabilitation; benefits of genetic restoration; panther densities on private lands; and spatial interactions between panthers, competitors and prey. In FY 2018-19, FWC



assisted with the completion of several research projects including food habits, introductions of Feline Leukemia and foam viruses, and pneumonia associated infections in panthers.

*HUMAN-PANTHER INTERACTIONS* - FWC verified panthers were responsible for preying upon domestic animals (depredations) in 23 separate events in FY 2018-19. In some cases, multiple animals were killed or injured during a single event. These 23 depredation events occurred in Collier and Hendry Counties; most depredations occurred in Golden Gate Estates (Collier County). During depredation investigations, FWC provides advice to and assists affected residents on how to reduce the risk of panther attacks. FWC, as a member of the Interagency Florida Panther Response Team, also documented one incident (an unexpected direct meeting between a panther and human where the panther displays potentially threatening behavior). The incident occurred when a resident noticed a panther approaching his direction from the edge of the woods in his yard. The panther stopped and crouched as the resident slowly walked backwards towards his house. The resident then picked up metal bars and started banging them together causing the panther to vacate the area.

FWC provided information and reviews of numerous road and development projects throughout southern Florida in FY 2018-19. FWC reviews road projects and development plans to minimize the disruption and loss of panther habitat and corridors, and to provide recommendations to reduce the risk of panther-vehicle collisions and the likelihood of human-panther interactions.

*PANTHER SIGHTINGS* - FWC launched a website in August 2012 where the public can report panther sightings and upload pictures or videos of those sightings (<http://www.myfwc.com/panthersightings>). In FY 2018-19, over 6800 panther sightings were submitted. Most records (75%) did not include evidence that would permit verification by FWC the animal observed was a panther. Of the records containing photographs, FWC verified 43% as panthers and 26% as bobcats. Other purported sightings were determined to be coyotes, dogs, foxes, house cats, otters and a monkey (Rhesus macaque).

*FEDERAL STATUS ASSESSMENT* - FWC made significant contributions in FY 2018-19 to an ongoing project compiling information for a Species Status Assessment (SSA). This SSA will provide the USFWS with a scientifically rigorous characterization of the panther's status focusing on the likelihood the species will persist within its ecological settings along with key uncertainties in that characterization.

## *North Atlantic Right Whale*

*CALVING SEASON* - The North Atlantic right whale is Federally-designated as Endangered. The primary calving grounds are off the Atlantic coast of Florida and Georgia and the calving season is approximately November 15-April 15. During this season, FWC collaborates with various partners to carry out aerial surveys, biopsy sampling, tagging, disentanglement and response to stranding events. Most of these



activities are financially supported by the NOAA-Fisheries. During the 2018-19 calving season, FWC conducted 56 aerial surveys and 13 vessel cruises. Through collaborative efforts with NOAA-Fisheries, the Georgia Department of Natural Resources, the Sea to Shore Alliance and volunteer sighting networks, 22 unique whales were recorded including 7 calves. Six calves were biopsy sampled.

*MORTALITY AND RESCUE* - No carcasses or entanglements were detected in the southeastern US this calving season. FWC observed an increase in commercial blue crab fishing effort during the 2018-19 season. In January, the aerial survey team documented an interaction between a mother-calf pair and commercial blue crab gear off South Ponte Vedra Beach (St. Johns County). The whales were startled after running into a crab trap but did not become entangled. This fishery overlaps with right whale habitat and is subject to compliance with the Atlantic Large Whale Take Reduction Plan measures.

*SURVEYS* - FWC is one of the major contributors to the North Atlantic Right Whale Photographic Database (<http://rwcatalog.neaq.org/Terms.aspx>). Photographs are used to identify individuals based on the callosity (a natural growth of cornified skin) pattern on their head and scars caused by vessel strikes and entanglement in fishing gear. Population demographics, reproductive success, mortality and trends in health and scarring are monitored, in part, through this photo-identification research. FWC has also worked closely with partners to compile years of southeastern US aerial survey data into a geographic information system. Analyses of these spatial data help scientists and managers to evaluate residency patterns and distribution in the calving area in relation to environmental factors such as sea surface temperatures, water depth and human activities. FWC analyzes ship traffic data to help monitor compliance with vessel speed regulations and conduct risk assessments.

### *Sanibel Island Rice Rat*

The State-designated Threatened Sanibel Island rice rat (SIRR) only occurs on Sanibel Island (Lee County), where it primarily occupies open, freshwater marshes. FWC awarded a State Wildlife Grant to the University of Florida for a 4-year project, which began in FY 2015-16, and analyses were completed in FY 2018-19. SIRR were detected in freshwater marsh, saltwater transition and mangrove areas. Game cameras showed similar reliability in detecting SIRR compared to live-trapping. Marsh salinity was not found to influence SIRR presence. Captures in mangrove forests were infrequent but represent the first documented captures in these areas. Vegetation data collected by FWC's Upland Habitat Research team were used to determine the influence of different habitat characteristics on SIRR distribution. Results indicate occurrence increases with the amount of cordgrasses and other herbaceous vegetation but decreases as leather fern coverage increases. These results support efforts to restore open freshwater marsh communities on Sanibel Island.



A 3-year project focusing on restoring freshwater cordgrass marsh habitat on Sanibel Island began in FY 2015-16 and was completed in FY 2018-19. FWC funded this project through the Aquatic Habitat Restoration and Enhancement (AHRE) program. There were 69.5 acres of hardwood brush removed significantly increasing open freshwater marsh habitat available for the SIRR. Hydrology throughout the project area was enhanced by removing berms, restoring elevation and installing culverts allowing movement of water between fragmented marshes. Sand cordgrass was planted in all restored areas. The AHRE program is also funding FWC’s Upland Habitat Research team to conduct vegetation monitoring which is expected to be complete in FY 2019-20.

## BIRDS

### *Audubon’s Crested Caracara*

The Audubon’s crested caracara is a Federally-designated Threatened species. FWC continued annual nest surveys between January-April in FY 2018-19 (Exhibit 5) using FWC’s standard monitoring protocols. No active nests were found at Okaloacoochee Slough (Hendry County) or Dinner Island Ranch (Hendry County) Wildlife Management Areas. FWC plans to continue yearly surveys.

Exhibit 5. Audubon’s crested caracara nest surveys conducted in FY 2018-19.

Location	County	Historical Nests	Historical Active	18/19 Active Nests	Fledged?
Fisheating Creek WMA	Glades	15	1	3	Yes
Dinner Island Ranch WMA	Hendry	8	1	2	Yes
Rotenberger WMA	Palm Beach	1	0	1	Yes

### *Black Rail*

The black rail is a candidate for Federal listing as Threatened. FWC initiated a radio telemetry project to test the feasibility of using telemetry on a larger scale. While a single black rail was captured, a comprehensive project was found to be too challenging. In FY 2018-19, staff deployed acoustic recorders in Guana River Wildlife Management Area (WMA; St. Johns County) and volunteers performed monthly surveys. No black rails were detected in the recordings or in the six survey points. In FY 2018-19, call-back routes were set up at Salt Lake WMA (Brevard County) and a single rail was recorded. Nine survey points were completed with one rail observed. Black rails were opportunistically observed on Three Lakes WMA (Orange County), Rotenberger WMA (Palm Beach County), Holey Land WMA (Palm Beach County) and Everglades and Francis S. Taylor WMA (Broward County).

### *Everglade Snail Kite*

The Everglade snail kite is Federally-designated as Endangered. The most recent population estimate is



roughly 2,300 birds. Management efforts have been focused on increasing nesting success and juvenile survival. FWC works with partners to improve Everglades habitats, lake marshes and watersheds, water regulation schedules and connectivity between large water bodies. Although habitat conditions have improved since the population crash in the 2000s, it is clear some of this improvement is due to an exotic apple snail. The snail kite feeds exclusively on apple snails, both exotic and native. There are risks involved with relying on an exotic species to assist in achieving recovery goals; therefore, FWC and partners continue to conserve and restore native snail habitat. More information is needed on the long-term impact exotic snails may have on snail kite ecology and habitat.

FWC funded the University of Florida (UF) to conduct nest monitoring in FY 2018-19 for all habitat areas except Lake Okeechobee and the Everglades. There were 732 active nests, a significant increase from the previous year. Lake Okeechobee (Okeechobee, Martin, Palm Beach, Hendry and Glades Counties), Rotenberger Wildlife Management Area (WMA; Palm Beach County), Lake Kissimmee (Osceola and Polk Counties) and the Kissimmee River Restoration Area (Osceola and Okeechobee Counties) had the most nests, respectively. Lake Okeechobee and Rotenberger WMA were the most successful. In anticipation of the 2019 East Lake Tohopekaliga (Osceola County) drawdown, FWC funded UF to study juvenile snail kite movement, survival and response to hydrologic fluctuation. GPS tags were used to track three juveniles in 2018. Over the course of their first year, they traveled between 938-2,180 miles, reaching 63-123 miles from their nest site. In 2019, five more juveniles were tagged, and their tracking is ongoing.

### Florida Burrowing Owl

The Florida burrowing owl is State-designated as Threatened. A current population estimate remains unknown due to difficulties surveying the rural population. In 2019, FWC initiated a two-year survey of the rural population. FWC used replicated roadside point-count surveys in Florida Breeding Bird Atlas blocks with recent detections (2011-2018) and produced 1168 potential sites to survey (Exhibit 6). A second replicate survey was conducted at 411 sites as well as 453 opportunistic surveys at sites with historical records (Exhibit 6). This data will be used to generate a minimum population index for the rural population.

**Exhibit 6.** Florida burrowing owl surveys conducted in FY 2018-19.

Survey Type	Replicate 1	Replicate 2	Total
Standard survey points	770	411	1,181
Historic record survey	24	52	76
Opportunistic survey	258	119	377
Points not surveyed	398	272	670
Owls detected	89	35	124





## Florida Grasshopper Sparrow

The Federally-designated Endangered Florida grasshopper sparrow (FGSP) is endemic to Florida dry prairie habitat. To maintain this habitat, in FY 2018-19 FWC chemically treated small oak trees and cabbage palms and burned 4,103 acres, or about half of the total dry prairie habitat at Three Lakes Wildlife Management Area (WMA; Osceola County) FGSPs most frequently use.

DEMOGRAPHIC MONITORING - The seventh season of FGSP demographic research by FWC was conducted in FY 2018-19. This project is a cooperative effort with the USFWS and members of the FGSP Working Group. As part of the continued effort to color-band the entire population, four adult males, one adult female and 40 nestlings were newly captured and color-banded in the 2019 season. Additionally, 31 males and 13 females that were previously banded were resighted in 2019. All known adult males and females in the Three Lakes WMA population have been color-banded.

NEST PROTECTION - FWC located and monitored 24 active nests this season so far. Of these nests, 12 survived to fledge young, three were depredated, three are still active, three were flooded and three were abandoned (two nests abandoned prior to eggs being laid). Nest cameras were placed at 21 nests. Predation was recorded at four nests by red cornsnakes (3) and red-imported fire ants (1). In two cases, mortality of incubating females by snakes was recorded. Snake predations occurred despite predator deflection fences. In 2019, 22 nests were protected using deflection fencing. Fences added an estimated 124 fledglings to the population between 2015-2018, increasing nest survival up to 5.75 times.

DISEASE MONITORING - In 2019, staff continued sampling adult and nestling FGSPs, savannah, eastern grasshopper and Bachman's sparrows for bloodborne and gastrointestinal pathogens. Blood samples were obtained from nine FGSPs, seven eastern grasshopper sparrows and eight Bachman's sparrows. Fecal samples were collected from 23 adult FGSPs, seven adult eastern, five adult savannah sparrows, eight adult Bachman's sparrows and 22 nestling or juvenile FGSPs. Blood samples were sent to researchers at the University of Florida (UF) as part of a two-year research collaboration using Federal Section 6 funds. Preliminary results for wild FGSPs include one detection of microfilaria (*Aproctella* sp.), two cases of haemosporidians (*Plasmodium/Hemoproteus* sp.) and one coccidian (*Isospora* sp.).

CAPTIVE-BREEDING - In 2015, a captive breeding program was initiated with White Oak Conservation, a captive breeding facility, to augment wild populations of FGSPs and assure maintenance of genetic diversity. In 2019, there were enough FGSPs to start releases. In total, 70-80 FGSPs will be added to the Three Lakes population in 2019 including seven adults and 65-80 juveniles. This addition of juvenile birds represents about a 200% increase in the number of young fledged this year (a projected 70 juvenile releases and 32 fledglings from wild nests). To monitor the program's efficacy, birds were uniquely



color-banded and 40% were fitted with radio transmitters to date. Released birds have been observed behaving normally. Birds can perform long-distance exploratory movements post-release, and staff have detected movements of up to one mile in a single day. However, longer distances may occur and go undetected due to the large area that needs to be searched. The long-term success of this program will be evaluated by determining how many released birds survive and breed in subsequent years.

### *Florida Sandhill Crane*

The Florida sandhill crane is State-designated as Threatened. In FY 2013-14, FWC began range-wide road surveys and established 12 routes totaling approximately 640 miles through 16 counties. The 2018 breeding season drought index was normal, yet only 8% of cranes observed were young-of-the-year. Nests were likely flooded and failed due to an extremely wet month of May. Road survey routes in Osceola and Okeechobee County remain regional strongholds. To understand habitat use, movements and survival of cranes in suburban areas and conservation lands, staff began radio-tagging individuals in June 2017 and 27 cranes have been tagged since. Preliminary data suggests some individuals only inhabit suburban or developed areas, while others use suburban areas daily and rural or conservation lands. Staff will continue this project to compare how cranes are surviving and using these different habitats.

### *Florida Scrub-Jay*

The Federally-designated Threatened Florida scrub-jay is endemic to Florida. In FY 2018-2019, FWC helped organize the ninth annual Florida Scrub-Jay Festival at Merritt Island National Wildlife Refuge to raise awareness about the scrub-jay and its unique habitat with over 400 attendees. The festival was co-hosted by Titusville during an annual bike ride. Staff are involved in planning the next festival, which will be at Oscar Scherer State Park in January 2020. In FY 2018-19, staff organized three working group meetings (the Northeast Florida Scrub Working Group, Southwest Florida Scrub Working Group and the Southeast Florida Ecosystem Working Group) and attended the Lake Wales Ridge Scrub Working Group. Staff updated the scrub-jay website with notes and presentations from working group meetings. FWC approved updated Scrub Management Guidelines for Peninsular Florida and Florida Scrub-Jay Banding Guidelines, which were presented at working group meetings. Staff continued to provide technical assistance for stakeholders regarding habitat management, development planning and general inquiries.

*TRANSLOCATIONS* - In 2017, FWC initiated a partnership with the US Forest Service, Florida Forest Service and Florida Park Service to conduct experimental translocations of scrub-jays from Ocala National Forest (Marion County) to other public lands. The objectives of this collaborative project were to evaluate the effectiveness of different translocation methods and evaluate the impact of translocation on donor populations. In FY 2018-19, two scrub-jay family groups comprising five



individuals and eight non-breeding “helper” scrub-jays were translocated to Seminole State Forest (Lake County) and six non-breeding “helper” scrub-jays were translocated to Rock Springs Run Reserve State Park (Orange and Seminole Counties). At Seminole State Forest, one of the two family groups established a breeding territory in vacant habitat, while five of the eight helpers established new territories or joined family groups on existing territories. At Rock Springs Run Reserve State Park, five of the six helpers established new territories or joined family groups on existing territories. Birds translocated with an immediate release (as opposed to a delayed release with an acclimation period), were equally or more likely to settle near their release site. Radio-tracking data showed most family groups ceased exploratory movements after about 10 days and remained in their new territory. FWC is also partnering with the University of Florida to study the behavior of resident scrub-jays at the donor site after removals for translocation. A statewide translocation project is planned.

SURVEYS - FWC began scrub-jay surveys as part of the Jay Watch program in 2009. In FY 2018-19, surveys and habitat management were conducted on Salt Lake Wildlife Management Area (WMA; Brevard County), Arbuckle WMA and Walk-In-The-Water WMA (both in Polk County; Exhibit 7). Surveys are not conducted at Split Oak Forest Wildlife and Environmental Area (WEA; Osceola and Orange Counties), but two adults were observed opportunistically, and management actions were performed (Exhibit 7). In FY 2018-19, no scrub-jays were observed at Half Moon WMA (Sumter County) or Fisheating Creek WMA (Glades County). No juveniles have been seen at Half Moon in five years.

Lake Wales Ridge WEA (Highlands and Polk Counties) has of 20 tracts and 13 retain scrub-jay groups (Exhibit 7). Monitoring is performed by FWC, Archbold Research Station and Jay Watch. Group numbers increased at Holmes Ave, Royce Ranch, Silver Lake, Sun ‘N Lakes, Cater Creek, Highlands Ridge and Sunray tracts. Group numbers remained the same at Clements, Highlands Park Estates and Henscratch tracts. Group numbers decreased at Gould Road, McJunkin and Lake Placid tracts. No scrub-jays were observed at Henscratch 27 or Jack Creek tracts. About 1,200 acres were burned, and 110 acres were mechanically treated in FY 2018-19 (Exhibit 7).

Mitigation parks provide an off-site alternative for resolving certain wildlife resource conflicts and are designated by FWC as WEAs. Surveys and habitat management were conducted at the following Mitigation Parks in FY 2018-19: Hickey Creek WEA (Lee County), Platt Branch WEA (Highlands County), and Moody Branch WEA (Manatee County; Exhibit 7). This was the fourth year Jay Watch was used to monitor Hickey Creek. Group numbers increased by one from 2018 and additional birds were observed off-site in a residential area. Group numbers at Platt Branch decreased from 2018 as one group appeared to capture another’s territory. Group numbers at Moody Branch remained consistent with 2018.



Exhibit 7. Florida scrub-jay surveys and habitat management conducted in FY 2018-19.

Location	County	Groups	Birds	Mean Group Size	Juveniles per Group	Habitat Management (acres)
Salt Lake WMA	Brevard	2	5	2.5	0	Roller-chopping and Prescribed fire (10)
Carter Creek Tract	Highlands	13	40	3.1	0.23	Prescribed fire; Hardwood reduction; Sand pine reduction
Clements Tract	Highlands	3	6	2	0	N/A
Gould Road Tract	Highlands	8	30	3.8	1.4	N/A
Henscratch Tract	Highlands	6	21	3.5	1.33	Prescribed fire; Sand pine reduction
Henscratch 27 Tract	Highlands	0	0	0	0	N/A
Highlands Park Estates Tract	Highlands	4	19	4.8	1.3	Prescribed fire
Holmes Ave Tract	Highlands	10	31	3.1	0.7	N/A
Jack Creek Tract	Highlands	0	0	0	0	Prescribed fire
Lake Placid Tract	Highlands	31	100	3.3	0.4	N/A
McJunkin Tract	Highlands	13	37	3.8	1.4	N/A
Platt Branch WEA	Highlands	8	23	N/A	N/A	Prescribed fire (469); Mechanical treatment (126)
Royce Ranch Tract	Highlands	10	30	2.7	0.1	Prescribed fire
Silver Lake Tract	Highlands	10	24	2.4	0.3	N/A
Sun 'N Lakes Tract	Highlands	10	32	3.2	0.5	Sand pine reduction
Hickey Creek WEA	Lee	3	7	N/A	N/A	Prescribed fire (42); Mechanical treatment (58); Chemical treatment (40)
Moody Branch WEA	Manatee	5	19	N/A	N/A	Chemical treatment (247); Mechanical treatment (248)
Split Oak Forest	Orange	N/A	2	N/A	N/A	Roller-chopping (44.8); Prescribed fire (66)
Arbuckle WMA	Polk	19	75	3.9	1.4	Prescribed fire
Sunray Tract	Polk	1	3	3	0	Sand pine reduction
Walk-In-The-Water WMA	Polk	7	19	2.7	0.6	Prescribed fire and mechanical treatment (32)

### Red-cockaded Woodpecker

The red-cockaded woodpecker (RCW) is Federally-designated as Endangered. Staff helped organize the statewide RCW working group in August. Staff continues to enroll landowners in the statewide RCW Safe Harbor program, which allow landowners to restore or enhance RCW habitat without incurring additional regulatory restrictions on the use of their land. No new agreements were signed in FY 2018-19, but there are 17 properties currently enrolled in the program totaling 100,186 acres of land protected for RCWs. The 2018 breeding season concluded with populations remaining on a track to achieve, or in many cases exceed, 2020 population and metapopulation goals outlined in Florida's RCW Management Plan (<https://myfwc.com/media/2046/rcw-plan-only.pdf>).



SURVEYS - All clusters are checked for activity and cavity maintenance is completed prior to March on Babcock/Cecil M. Webb Wildlife Management Area (WMA; Charlotte County). In mid-April, active clusters are checked once a week for nests and nests are monitored weekly (Exhibit 8). Habitat management was also conducted at Babcock/Cecil M. Webb WMA in FY 2018-19 (Exhibit 8). Surveys and habitat management were also performed at Babcock Ranch Preserve (Charlotte County; Exhibit 8).

The number of active clusters on Platt Branch Wildlife and Environmental Area (WEA; Highlands County) in FY 2018-19 remained consistent with 2018 (Exhibit 8). Habitat management actions were conducted on Platt Branch WEA (Exhibit 8). With the Florida Forest Service, FWC managed for and monitored RCWs on Citrus WMA (Citrus County; Exhibit 8). Eight RCWs were translocated from Citrus WMA to John G. and Susan H. DuPois Jr. WEA (Palm Beach and Martin counties) and four to Platt Branch WEA. Of the birds translocated to Dupuis WEA, two were found during the 2019 breeding season. Surveys and habitat management on Corbett WMA, Dupuis WEA, Picayune Strand State Forest WMA (Collier County), Three Lakes WMA (Osceola County) Herky-Huffman Bull Creek WMA, and Triple-N-Ranch WMA (both in Osceola County) were conducted in FY 2018-19 (Exhibit 8). Federal recovery goals have been met on Herky-Huffman Bull Creek WMA, Triple-N-Ranch WMA and the Dupois/Corbett metapopulation.

Big Cypress National Preserve (BCNP; Collier and Monroe Counties) supports the southernmost population of RCWs range-wide. The total number of known clusters in BCNP is 121, with 118 actively managed and three having been previously deleted. Nine clusters will be proposed to the USFWS for deletion based on long term inactivity and unsuitable habitat conditions. BCNP and FWC biologists surveyed and conducted habitat management on BCNP for RCWs in FY 2018-19 (Exhibit 8). One cluster was newly discovered on a helicopter survey and has yet to be surveyed from the ground. Two subadult RCWs were translocated to the smaller sub population of Lostman's Pines in BCNP in 2018 to augment breeding pairs. Both translocated birds were later determined to be breeders, which increased the number of potential breeding groups in Lostman's Pines from four to five.



**Exhibit 8.** Red-cockaded woodpecker surveys and habitat management conducted in FY 2018-19. Stars indicate data are from a subsample of monitored groups and do not represent the whole population in the location listed.

Location	County	Active Clusters	Potential Breeding Groups	Solitary Birds	Nest Attempts	Bandings	Fledglings	Cavity Maintenance	Habitat Management (acres)
Babcock Ranch Preserve	Charlotte	14	14	2	15	13 chicks; 7 adults	14	5 replaced; 21 installed	Mechanical treatment, Prescribed fire (282)
Babcock/Webb WMA - Yucca Pens	Charlotte, Lee	43	35	8	32 (14 failed, 7 re-attempts, 3 successful)	33	34	20 replaced; 15 installed	Prescribed fire (22,702); Roller-chopping (500); Chemical Treatment (14,512)
Citrus WMA	Citrus	90	82	-	76	132	122	8 replaced; 18 installed; 8 maintained	Mechanical treatment, Prescribed fire (15,376)
Picayune Strand State Forest WMA	Collier	14	12	1	10	13	13	N/A	Mulching (83); Mid-story treatment (106) Melaleuca treatment (1,225)
Big Cypress National Preserve	Collier, Monroe	86	32*	3*	29*	28*	23*	25 installed	Prescribed fire (15,798)
Apalachicola River WEA	Franklin	10	10	0	13 (4 failed)	24	18	5 replaced; 6 installed	Mechanical treatment (2.6)
Tate's Hell WMA	Franklin, Liberty	64	54	6	54	28	13	21 installed; 6 clusters augmented; 3 clusters created	Prescribed fire (2,916); Mechanical treatment (60)
Apalachicola WMA	Franklin, Leon, Wakulla	N/A	N/A	N/A	N/A	N/A	N/A	200 installed	N/A
Croom WMA	Hernando, Sumter	39	37	2	34 (4 failed)	65	57	8 replaced/installed	Prescribed fire (4,584)
Platt Branch WEA	Highlands	6	5	1	4	6	5	4 installed	Prescribed fire (469); Mechanical treatment (126)
Three Lakes WMA	Orange	50	48	0	46	60	50	33 replaced; 4 installed; 1 maintained	Prescribed fire (11,823)



**Exhibit 8 (continued).** Red-cockaded woodpecker surveys and habitat management conducted in FY 2018-19. Stars indicate data are from a subsample of monitored groups and do not represent the whole population in the location listed.

Location	County	Active Clusters	Potential Breeding Groups	Solitary Birds	Nest Attempts	Bandings	Fledglings	Cavity Maintenance	Habitat Management (acres)
Herky-Huffman Bull Creek WMA	Osceola	8	7	0	9	7	6	13 maintained	Prescribed fire (2,045)
Triple-N-Ranch WMA	Osceola	24	23	0	17	26	22	4 replaced; 34 installed; 24 maintained	Prescribed fire (2,151)
J.W. Corbett WMA	Palm Beach	30	28	2	36	31	24	N/A	Prescribed fire (12,000)
John G. and Susan H. Dupuis Jr. WMA	Palm Beach, Martin	17	15	1	16	18	14	N/A	Prescribed fire (3,000)



## *Salt Marsh Songbirds*

There are five subspecies of non-migratory seaside sparrows that occur in Florida: Scotts, Wakulla (both State-designated Threatened), Cape Sable (Federally-designated Endangered), MacGillivray's and Louisiana seaside sparrows. Surveys were conducted at Box-R and Tate's Hell (both in Franklin and Liberty Counties) Wildlife Management Areas for the State-designated Threatened Marian's marsh wren in FY 2018-19. At Box-R, wrens were observed at two of the seven survey points. At Tate's Hell, wrens were observed at 12 of the 16 survey points.

*GENETICS* - In FY 2015-16, FWC initiated a study to re-examine the subspecies relationships of seaside sparrows. Over 364 samples from 14 sites have been collected and processed and an additional 45 samples from neighboring states. The USFWS, National Park Service, Florida Department of Environmental Protection and Southwest and Northwest Florida Water Management Districts also provided assistance. In FY 2018-19, FWC and researchers at the University of Florida began evaluating data and preliminary results suggest the Scott's and Wakulla seaside sparrows should be merged into a single species, but the Louisiana and MacGillivray's seaside sparrows are genetically distinct.

*CAPE SABLE SEASIDE SPARROW* - The Cape Sable seaside sparrow occurs mostly in Everglades National Park. Sparrow habitat must be flooded long enough to maintain the unique characteristics of the marl prairie but dry during the breeding season for successful reproduction. Recent progress with the Comprehensive Everglades Restoration Plan should help maintain and restore sparrow subpopulations by reducing water flow to areas that are too wet and increasing flows to areas that are too dry. The 2019 population estimate was 2,688 birds, a decline of 496 birds from 2018 mostly due to fewer detections in the largest subpopulation. Translocations are being discussed to boost smaller subpopulations.

## *Shorebirds and Seabirds*

Twenty species of shorebirds (migratory and forage along the shore) and seabirds (spend most of their life at sea) breed in Florida, four are State-designated as Threatened (American oystercatcher, black skimmer, least tern and snowy plover) and one is Federally-designated as Threatened (roseate tern). Over 40 species of shorebirds and seabirds winter in Florida, two are Federally-listed, red knot (Threatened) and piping plover (Endangered).

*SHOREBIRD PROGRAM* - FWC inaugurated a dedicated Shorebird Program to implement the Florida Beach-nesting Bird Plan (<http://flshorebirdalliance.org/media/1007/floridabeachnestingbirdplan.pdf>). The program is supported by a grant through the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund. FWC, and its key partner Audubon Florida, continues to recover shorebird populations by reducing human disturbance, managing habitat and predation, informing management and tracking





outcomes, and improving regulatory coordination. The 4-year project represents Phase 1 of a larger vision and will conclude with a focused review of program activities to assess programmatic efficacy.

[FLORIDA SHOREBIRD ALLIANCE](#) - FWC leads a unique partnership effort through the Florida Shorebird Alliance (FSA; [www.FLShorebirdAlliance.org](http://www.FLShorebirdAlliance.org)), a network of 12 regional partnerships working to ensure shorebird and seabird sites are surveyed, monitored, posted and stewarded as well as provide and share information. In the 2018 nesting season, FSA partners collectively monitored 894 miles of coastline and protected 6,624 seabird nests and 710 shorebird nests with posting. Through the FSA, FWC coordinates protocol training and data quality control for the statewide shorebird-monitoring program. The FSA publishes a monthly e-newsletter (the Wrack Line) with over 30,000 subscribers.

[FLORIDA SHOREBIRD DATABASE](#) - The Florida Shorebird Database ([www.flshorebirddbatabase.org](http://www.flshorebirddbatabase.org)) serves as the central repository for data collected on shorebirds and seabirds in Florida. Over 1,167 monitoring partners throughout the state have registered accounts in the Database and many of these partners collect and report breeding data. During the 2018 nesting season, partners entered 10,667 data records in the Database. Monitoring data are available online to anyone with an account, thereby allowing researchers, managers, conservationists, and permit reviewers to use information to help manage and conserve shorebirds and seabirds. The Shorebird Program published an annual monitoring report, "Florida Shorebird Alliance Monitoring Data at Work" summarizing monitoring data in the Database ([http://flshorebirdalliance.org/media/1205/fsa\\_monitoringdataatwork\\_2019\\_final.pdf](http://flshorebirdalliance.org/media/1205/fsa_monitoringdataatwork_2019_final.pdf)).

[ROSEATE TERN](#) - Roseate terns are found in extreme South Florida. After the 2005 hurricane season, the main nesting island, Pelican Shoal Critical Wildlife Area (CWA), was submerged and no longer available for nesting. The island re-emerged in Spring 2018 but was too small and low to support nesting and disappeared by the end of Summer. In 2019, the island returned and was higher, larger and no longer prone to complete over wash. At least 6 nests were recorded, and chicks were also present. The total Florida population in 2019 is estimated to be about 50 nesting pairs. In 2019, none of the historic sites had nesting terns. Productivity was difficult to assess at the CWA due to the time and date of the visit.

### *Southeastern American Kestrel*

The Southeastern American kestrel is a State-designated Threatened non-migratory falcon. The population size is estimated to be 1,350-1,500 breeding pairs. In 2018, FWC initiated a collaboration with the University of Florida to develop habitat management recommendations for scrub species and assess the kestrel population at Ocala National Forest. Point counts revealed kestrels prefer scrub patches less than six years post disturbance (burning or mechanical treatment). FWC staff and volunteers maintain kestrel boxes each December and monitor boxes in April-June (Exhibit 9). Late



nesting attempts will be monitored through July. In May, FWC visited Jennings State Forest Wildlife Management Area (Clay and Duval Counties) and recommended retiring 20 boxes in unsuitable habitat.

**Exhibit 9.** Southeastern American Kestrel next box surveys conducted in FY 2018-19.

Location	County	Boxes Managed	Boxes Occupied	Other Species in Boxes
Watermelon Pond WEA	Alachua	7	1	N/A
Potts Preserve WMA	Citrus	2	0	Eastern bluebird
Camp Blanding WMA	Clay	56	22	Southern flying squirrel, Eastern gray squirrel, great-crested flycatcher, Eastern bluebird, Eastern screech owl
Jennings State Forest WMA	Clay, Duval	26	0	Southern flying squirrel, Eastern gray squirrel, Southern fox squirrel, great-crested flycatcher, Eastern bluebird, Eastern screech owl
Bell Ridge WEA	Gilchrist	4	3	Great-crested flycatcher, Eastern screech owl
Fort White	Gilchrist	9	0	Southern flying squirrel, great-crested flycatcher, eastern screech owl, corn snake
Utility Rights-of-Way or private property	Hernando	4	3	N/A
Chassahowitzka WMA	Hernando	9	4	Eastern screech owl, great-crested flycatcher, Northern flicker
Chinsegut WEA	Hernando	2	0	Eastern screech owl
Janet Butterfield Brooks WEA	Hernando	1	1	N/A
Perry Oldenburg WEA	Hernando	3	2	Eastern bluebird, great-crested flycatcher
Lake Wales Ridge WEA	Highlands, Polk	13	2	Eastern screech owl, great-crested flycatcher, bees
Platt Branch WEA	Highlands	4	0	Eastern screech owl
Moody Branch WMA	Manatee	2	0	Eastern screech owl, great-crested flycatcher
Utility Rights-of-Way / private property	Marion	42	33	N/A
Blackwater WMA	Okaloosa, Santa Rosa	23	5	Eastern screech owl, Eastern bluebird, great-crested flycatcher, Northern flicker
Three Lakes WMA	Orange	8	0	Eastern screech owl, great-crested flycatcher
Crooked Lake WMA	Polk	3	0	Eastern screech owl, great-crested flycatcher
Hilochee WMA	Polk	8	0	Eastern screech owl, great-crested flycatcher, red-bellied woodpecker
Tenroc WMA	Polk	1	0	N/A
Caravelle Ranch WMA	Putnam	3	0	Eastern bluebird
Lake Panasoffkee WMA	Sumter	3	1	Eastern bluebird, great-crested flycatcher

### Wading Birds

Numerous wading bird species breed and forage in Florida including the wood stork (Federally-designated Threatened), little blue heron, roseate spoonbill, tricolored heron (all State-designated



Threatened), white ibis, great egret, snowy egret, cattle egret, glossy ibis, great blue heron, black-crowned night heron, American white pelican, double-crested cormorant and anhinga. FWC conducts annual surveys from a helicopter flown at 500-1,000 feet above ground level in January-June.

**SURVEYS** - FWC conducts surveys in and around Corkscrew Regional Ecosystem Watershed Wildlife and Environmental Area (WEA) and National Audubon’s Corkscrew Swamp Sanctuary (both in Lee and Collier Counties). In FY 2018-19, six nesting colonies, 63 foraging aggregations with 4,831 individuals and 41 roosting colonies with 1,262 individuals were observed (Exhibit 10). Peak nesting effort decreased by 63% and a decline in species diversity of nesting birds from 2018 was observed. Aerial surveys flown over Fisheating Creek Wildlife Management Area (Glades County) recorded many species foraging, but no rookeries (Exhibit 10). No surveys were flown over John C. and Mariana Jones/Hungryland WEA (Martin and Palm Beach Counties).

**WOOD STORK** - FWC surveys 34 colonies annually from late April to early May (Exhibit 10). In 2019, staff counted 1,069 total nests in 16 active colonies. Little Gator Creek WEA (Pasco County) has a ten-acre nesting colony with wood storks. FWC uses water control structures and pumps to manage water levels, which maintains suitable conditions for nesting and allows the colony to persist, even in drought years.

Exhibit 10. Wading bird surveys conducted in FY 2018-19.

Location	County	Historical Rookeries	18/19 Rookeries (nests)	Roosting Sites	Foraging Aggregations	Species
Fisheating Creek WMA	Glades	2	0	8	9	Wood stork, little blue heron, great blue heron, white ibis, great egret, cattle egret
Apalachicola River WEA, Box-R WMA, Tate’s Hell WMA	Gulf, Franklin, Liberty	N/A	7 (59)	N/A	N/A	Wood stork, little blue heron
Aucilla WMA	Jefferson, Taylor	N/A	6 (23)	N/A	N/A	Little blue heron, tricolored heron
Corkscrew Regional Ecosystem Watershed WEA	Lee, Collier	N/A	6 (204)	41	63	Great egret, wood stork, cattle egret, little blue heron, snowy egret, tricolored heron, glossy ibis, roseate spoonbills
L. Kirk Edwards WEA	Leon	1	0	N/A	N/A	Wood stork
Ochlockonee WMA North (private land)	Leon	1	0	N/A	N/A	Wood stork
Ochlockonee WMA South (private land)	Leon	1	1 (275)	N/A	N/A	Wood stork
Little Gator Creek WMA	Pasco	1	1	1	N/A	Wood stork
Econfina Creek WMA	Washington	1	0	N/A	N/A	Little blue heron, tricolored heron



## *White-crowned Pigeon*

The State-designated Threatened white-crowned pigeon is endemic to Monroe and Miami-Dade Counties. Most known nesting islands are protected in the Lower Florida Keys, Everglades National Park and Biscayne National Park. Although nests were found in FY 2018-19, impacts from Hurricane Irma may remain unknown for some time. In FY 2018-19, a range-wide foraging survey was completed where 42 birds were documented in the Upper and Lower Keys. Nine pigeons were detected in January-June 2019 via opportunistic observations. During these opportunistic observations, a nest site was found in Windley Key and another potential nest was found in the Florida Keys Wildlife and Environmental Area.

## AMPHIBIANS

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### *Flatwoods Salamanders*

COORDINATING POLICY APPROACHES - FWC assisted with the development of the Flatwoods Salamander Species Survival Assessments for both the frosted (Federally-designated as Endangered) and the reticulated (Federally-designated as Threatened) flatwoods salamander species and peer reviewed of those documents. FWC met with the USFWS, Department of Defense (DOD), US Forest Service (USFS), and others to discuss long-term needs for species survival and their ultimate recovery.

FROSTED FLATWOODS SALAMANDER - The frosted flatwoods salamander primarily exists in the eastern Florida panhandle, but remaining populations are small and vulnerable to extinction. FWC started augmenting wild populations at Apalachicola National Forest (ANF; Franklin, Leon, Liberty and Wakulla Counties) in 2016 via headstarting, where eggs or larvae are removed from the wild, raised to maturity in a controlled environment and released back to their original breeding pond. In FY 2018-19, 197 eggs and 268 larvae were collected from seven ponds. Of these, 452 survived to be returned to ANF. In total, over 1,730 salamanders have been released and over 450 were donated to a zoo-maintained captive assurance colony. Two ponds are monitored to determine how many headstarts survive and breed. In 2019, FWC and the USFS surveyed 335 active, historic, or potential breeding ponds in ANF and 12 had larvae, three of which were previously unknown to hold salamanders.

RETICULATED FLATWOODS SALAMANDER - The reticulated flatwoods salamander primarily exists in the western Florida panhandle. In 2019, FWC surveyed for larvae in three historic breeding ponds in Santa Rosa and Okaloosa Counties, but none were detected. In 2018, a five-year recovery project was initiated at Escribano Point Wildlife Management Area (Santa Rosa County) where 33 wetlands were surveyed and eight had salamanders. The project is a cooperative agreement among FWC, the USFWS, DOD and The Longleaf Alliance with funds from the DOD Readiness and Environmental Protection



Integration Program. This funding enabled the implementation of a headstarting program. In FY 2018-19, 264 larvae were collected from eight wetlands and 246 were released into nine wetlands. Habitat management was conducted for both species in FY 2018-19 (Exhibit 11).

**Exhibit 11.** Habitat management conducted in FY 2018-19 for flatwoods salamanders.

Location	County	Species	Management Activities (acres)
Apalachicola River WEA	Gulf, Franklin	Frosted	Hardwood removal (10.2); Prescribed fire (2,200)
Apalachicola WMA	Franklin, Leon, Wakulla	Frosted	Chemical treatment (6.42); Hardwood removal (9.15)
Tate's Hell WMA	Franklin, Liberty	Frosted	Chemical treatment (2.66)
Aucilla WMA	Jefferson	Frosted	Chemical treatment (17)
Eglin WMA	Santa Rosa, Okaloosa	Reticulated	Mechanical and chemical treatment (6.6)
Escribano Point WMA	Santa Rosa	Reticulated	Mechanical and chemical treatment (10.45)
Flint Rock WMA	Wakulla, Jefferson	Frosted	Mechanical treatment (278)

### Florida Bog Frog

In FY 2018-19, FWC conducted surveys for the State-designated Threatened Florida bog frog along three creeks (Garnier, Julian Mill and Burnt Grocery) on Yellow River Wildlife Management Area (Santa Rosa and Okaloosa Counties). New survey points were added: nine on Garnier Creek and six on Julian Mill Creek. On Garnier Creek, seven frogs were documented at the powerline Right-of-Way and three frogs at the restoration plot closest to the Right-of-Way. On Julian Mill, one frog was detected upstream of the Right-of-Way. In FY 2018-19, 6.4 acres at Garnier Creek were treated with hand clearing to reduce the canopy and mid-story. Herbicide was used to reduce hardwoods and six acres of wetlands were treated with mulching and scattering of debris left behind from previous restoration efforts.

### Gopher Frog

**FEDERAL STATUS ASSESSMENT** - The gopher frog is under evaluation for Federal listing. Staff attended a multi-day structured decision-making workshop with species experts from other states to inform a future Species Status Assessment. After the workshop, data were compiled for 126 Florida metapopulations to determine population persistence on the landscape.

**TAXONOMY STUDY** - Recent studies suggest gopher frog populations in peninsular Florida may be distinct from those in the panhandle and elsewhere. FWC utilized Federal Section 6 funds to contract the University of Florida Museum of Natural History to analyze differences in adult and tadpole morphology and calls range-wide, emphasizing on Florida. FWC collected 28 tadpoles from four Florida counties and frog call recordings from populations statewide. Morphological analyses of adults in museum collections have not detected consistent differences, but tadpole morphology and calls have yet to be analyzed.

**SURVEYS** - FWC tracks gopher frog status in 100 wetlands over time to better understand wetlands use.



Additional wetlands were surveyed to locate new ponds and monitor known breeding ponds. In FY 2018-19, 133 ponds were surveyed in 26 counties on public and private lands (Exhibit 12). FWC is collaborating with the University of Georgia to conduct occupancy modeling analyses. In FY 2018-19, FWC completed acoustic surveys. FWC is working with NASA's Kennedy Space Center to develop a call recognizer to more easily and quickly analyze acoustic recordings.

**Exhibit 12.** Gopher frog surveys conducted in FY 2018-19.

Location	County	Ponds Surveyed	Gopher Frog Ponds
Longleaf Flatwoods Reserve	Alachua	1	0
Morningside Nature Center	Alachua	7	0
Watermelon Pond – Metzger Tract	Alachua	1	0
St. Sebastian River Preserve State Park	Brevard, Indian River	2	1
Camp Blanding Military Reservation	Clay	7	1
Jennings State Forest	Clay	5	0
Cary State Forest	Duval	1	0
Fort White WEA	Gilchrist	10	3
Chassahowitzka WMA	Hernando	1	0
Croom WMA	Hernando	4	2
Archbold Biological Station	Highlands	2	0
Avon Park Air Force Range	Highlands	2	2
McDill Air Force Base	Hillsborough	1	0
Private land (Dixie Plantation)	Jefferson	5	0
Ocala National Forest	Lake, Marion, Putnam	18	2
Seminole State Forest	Lake	2	1
Apalachicola National Forest	Leon, Liberty	13	9
Goethe State Forest	Levy	4	0
Eglin Air Force Base	Okaloosa, Santa Rosa, Walton	13	3
Charles H. Bronson State Forest	Orange	1	1
Conner Preserve	Pasco	1	0
Green Swamp West	Pasco	1	0
Starkey Wilderness Preserve	Pasco	1	0
Catfish Creek Preserve State Park	Polk	3	1
Lake Wales Ridge State Forest -	Polk	4	0
Etoniah Creek State Forest	Putnam	3	0
Ordway-Swisher Biological Station	Putnam	2	0
Private land	Putnam	4	0
Welaka State Forest	Putnam	1	0
Guana River WMA	St. Johns	6	0
Blackwater River State Forest	Santa Rosa	2	0
Little Big Econ State Forest	Seminole	1	1
Lake Panasoffkee	Sumter	1	0
Big Bend WMA - Spring Creek Unit	Taylor	3	1



## *Striped Newt*

The striped newt is endemic to northern Florida and southern Georgia, where it has been extirpated from many parts of its range. It was a candidate for Federal listing as Threatened, but in 2018 was found to not warrant listing under the Endangered Species Act. Consequently, FWC was requested to evaluate the striped newt, initiating the biological review process. FWC organized a Striped Newt Working Group Meeting hosted by the Central Florida Zoo in Sanford that was attended by over 50 people. At this meeting, the striped newt's distribution, status and captive breeding programs were discussed as well as steps that can be taken to increase conservation throughout the species' range.

*GENETICS STUDY* - FWC collaborated with the University of Central Florida to determine the amount of gene flow and degree of genetic diversity within and among newt populations using next generation sequencing techniques (ddRADSeq) to acquire single nucleotide polymorphisms (SNPs) for individual samples. Researchers genotyped 245 samples from 20 localities on 15 properties. After filtering SNPs, the final dataset had 172 samples from 15 localities on 11 properties characterized by 12,720 SNPs. This SNP data is consistent with previous mitochondrial DNA data suggesting genetic differentiation between eastern and western sites. Strongholds (multiple ponds) exhibited significantly higher genetic diversity than isolated sites confirming little gene flow occurs between isolated sites. In contrast, stronghold populations exhibit evidence of gene flow between ponds and, in some cases, between strongholds (Jennings State Forest in Clay County and Ordway-Swisher Biological Station in Putnam County).

*REPATRIATION PROJECT* - FWC continued assisting an ongoing reintroduction program in the Munson Sandhills of the Apalachicola National Forest (ANF). The program is led by the Coastal Plains Institute with the U.S. Forest Service and involves releasing zoo-raised striped newts into former breeding ponds where they no longer occur. FWC marked newts before their release and conducted surveys to estimate survival. In January, 262 newts were marked from three zoos and released into two ponds. Monthly recapture rates of marked adults within the ponds was low (0-5%), but reproduction was documented through the capture of young larvae in June. Drift fencing was complicated by flooding and high water, but eight marked adults were captured leaving the ponds during the spring and early summer. In 2019, FWC received funding through the "Conserve Wildlife" specialty license plate fund to continue supporting striped newt repatriation by financially supporting the Coastal Plains Institute, Amphibian Foundation and Jacksonville zoo in FY 2019-20.

*SURVEYS* - FWC surveyed 26 ponds in ANF (Leon and Liberty County), Guana River Wildlife Management Area (WMA; St. Johns County), privately-owned Dixie Plantation (Jefferson County), Seminole State Forest (Lake County) and 70 potential ponds on 17 properties. One new breeding pond was discovered on Dixie Plantation and one in Ocala National Forest. The new pond in Ocala National Forest was an



isolated marsh surrounded by unsuitable upland habitat. This represents the 14<sup>th</sup> breeding pond identified in Ocala National Forest and a new population. A total of 18 ponds had striped newts of the 96 ponds surveyed range wide in Florida in FY 2018-19 (Exhibit 13).

**Exhibit 13.** Striped newt surveys conducted in FY 2018-19.

Location	County	Ponds Surveyed	Striped Newt Ponds
Longleaf Flatwoods Reserve	Alachua	1	0
Morningside Nature Center	Alachua	7	0
Watermelon Pond – Metzger Tract	Alachua	1	0
Camp Blanding Military Reservation	Clay	7	0
Jennings State Forest	Clay	5	3
Cary State Forest	Duval	1	0
Fort White WEA	Gilchrist	10	0
Private land (Dixie Plantation)	Jefferson	5	4
Ocala National Forest	Lake, Marion, Putnam	18	5
Seminole State Forest	Lake	2	0
Apalachicola National Forest	Leon, Liberty	13	1
Goethe State Forest	Levy	4	0
Charles H. Bronson State Forest	Orange	1	0
Etoniah Creek State Forest	Putnam	3	0
Ordway-Swisher Biological Station	Putnam	2	1
Private land	Putnam	4	0
Welaka State Forest	Putnam	1	0
Guana River WMA	St. Johns	6	2
Little Big Econ State Forest	Seminole	1	0
Lake Panasoffkee	Sumter	1	0
Big Bend WMA - Spring Creek Unit	Taylor	3	2

## REPTILES

### *American Crocodile*

The American crocodile is Federally-designated as Threatened. The population has experienced tremendous growth with sightings as far north as Cocoa Beach (Brevard County) on the east coast and Lake Tarpon (Pinellas County) on the west coast. With this increasing population (estimated 1,160-2,800 non-hatchlings), a commensurate increase in crocodile-human conflicts has been documented. In FY 2018-19, FWC received 179 complaints regarding crocodiles with most being resolved through education. A total of 15 crocodiles were captured by FWC crocodile response agents in FY 2018-19 with 11 being translocated. Of the translocated animals, seven were fitted with GPS tags as part of FWC’s translocation study, which began in October 2018. Captured animals averaged 7.6 feet in length. An additional 10 non-translocated reference crocodiles were fitted with GPS tags. The movements and





habitat use of translocated and non-translocated crocodiles will be used to evaluate factors influencing the effectiveness of translocation as a method for reducing human-crocodile conflict. In FY 2018-19, FWC was involved in recovering eight carcasses (three males, four females and one unknown) averaging 4.4 feet in length. The cause of death of five were attributed to wounds inflicted by automobiles. One female (3.9 feet) was poached and died despite efforts to rescue her. One hatchling died due to a birth defect. The remaining carcass was too decomposed to determine a cause of death.

### *Eastern Indigo Snake*

The Eastern indigo snake is Federally-designated as Threatened. In FY 2018-19, staff published a natural history note on three indigo snakes (one dead) found entangled in plastic mesh of erosion mats installed along a bike trail in Etoniah Creek State Forest, Putnam County. Staff reviewed the Species Status Assessment for the USFWS and continued adding sightings to a shared database with the USFWS. FWC is part of the Eastern indigo snake reintroduction committee (EISRC), a group of experts from numerous governing agencies and NGOs that provide guidance on conservation activities. In FY 2018-19, FWC submitted a proposal for Federal Section 6 funds to study genetics of captive broodstock indigo snakes.

[REPATRIATION IN FLORIDA PANHANDLE](#) - FWC is working with the EISRC to support repatriation at the Apalachicola Bluffs and Ravines Preserve, a multi-year project. FWC is overseeing a project funded by the "Conserve Wildlife" specialty license plate fund that monitors repatriated snakes and samples for a disease among native snakes. In FY 2018-19, FWC submitted a Competitive-State Wildlife Grant to the USFWS with The Nature Conservancy and the Orianne Center for Indigo Conservation to support three years of repatriation efforts through habitat management, captive husbandry and monitoring.

### *Florida Pine Snake*

The Florida pine snake is State-designated as Threatened and is under evaluation for Federal listing. Studies suggest Florida pine snakes require large tracts of suitable habitat to sustain viable populations; however, few FWC-managed areas contain adequate acreage of suitable habitat. A project began in FY 2016-17 is nearing completion to assess pine snake habitat use, survival and movements on conservation lands smaller than 7,400 acres and adjacent private lands. Trapping events from summer 2017 to summer 2019 resulted in a total of 24 captures at Fort White (Gilchrist County) and Suwannee Ridge (Hamilton County) Wildlife and Environmental Areas. Each snake was tracked for up to one year using radio-telemetry. Home ranges were found to differ between sites, sex and seasons. Most snakes largely remained on conservation lands, rather than utilizing adjacent private lands. Trapping was conducted at three new locations in Blackwater Wildlife Management Area (WMA; Santa Rosa County) in FY 2018-19. FWC captured 196 individuals comprising of 11 species, including 21 Florida pine snakes. Trapping will



continue in Blackwater WMA in FY 2019-20 at new locations with sites changing on a regular basis to determine distribution of pine snakes.

### *Florida Scrub Lizard*

The Florida scrub lizard was petitioned for Federal listing as Threatened in 2012. In February-March 2019, FWC staff and volunteers collected 100 scrub lizards from two state parks in southern Martin County with robust populations and released them in Hypoluxo Scrub Natural Area in central Palm Beach County, extending the occupied range for the lizard 23 miles south. Suitable habitat remains in this scrub preserve; predation by feral cats may have been responsible for extirpating the population circa 2005. This population will be monitored every two months for two years. The first hatchlings were observed in June. Genetic samples collected from each released lizard were collected and can be used in the future to determine the number of founder animals contributing to the established population and their relatedness. A video on this project can be found here, <https://youtu.be/tENf2P80FFU>.

### *Gopher Tortoise*

MANAGEMENT ACTIVITIES - The State-designated Threatened gopher tortoise is a keystone species as their burrows are home to over 350 other commensal species. The Gopher Tortoise Management Plan (<https://myfwc.com/media/1819/gt-management-plan.pdf>) guides tortoise conservation through habitat management, landowner incentives and commensal species conservation. FWC continues to coordinate with the Gopher Tortoise Technical Assistance Group (GTTAG). FWC also utilized student interns from Florida State University, who contributed about 808 hours in FY 2018-19.

RESEARCH ACTIVITIES - FWC continued an ongoing study to assess the impacts of temporary exclusion on gopher tortoises from the Sabal Trail Natural Gas Pipeline project in Central Florida. This study is being conducted with the Southwest Florida Water Management District to determine how readily tortoises repatriate restored habitat along a pipeline Right-of-Way following temporary exclusion.

GOPHER TORTOISE APP - FWC recruits citizen scientists to assist in conservation efforts by having them submit photos of gopher tortoise sightings to FWC using the "Florida Gopher Tortoise" smartphone app (<https://myfwc.com/wildlifehabitats/wildlife/gopher-tortoise/app/>). The goal of this app is to increase public awareness of gopher tortoises and citizen participation in conservation locally. Since launching in 2014, FWC has received photos for over 3,454 locations, 927 of which were submitted in FY 2018-19.

MORTALITY - Mortality data (deceased, ill, or injured tortoise) is submitted to FWC by citizens via an online form (<https://public.myfwc.com/HSC/GopherTortoise/Default.aspx>) or the Florida Gopher Tortoise smartphone app. In FY 2018-19, 154 tortoises were reported online, and vehicles were the



leading cause of mortality. Citizens that reported an injured or ill tortoise were provided contact information for a nearby licensed wildlife rehabilitator to provide the tortoise with medical attention.

**INCIDENTIAL TAKE PERMITS** - The Incidental Take Permit (ITP) gopher tortoise volunteer relocation program mobilizes volunteers to conduct burrow surveys at development sites previously permitted under the former incidental take process and transport tortoises from the site to an approved recipient site. The recipient site program is a voluntary program for landowners to receive tortoises on their lands with suitable habitat from development sites. Since the implementation of the recipient site program in 2008, about 21,872 acres of habitat have been protected through easements. Under these permits, landowners can accept tortoises from development sites and assess a monetary charge to the developer for accepting the tortoise(s). In exchange, the recipient site landowners agree to manage and protect the habitat for gopher tortoises in perpetuity. Currently, 37 long-term recipient sites (14 have multiple units) with capacity for about 9,300 tortoises are permitted. An additional five applications are under review with potential capacity for 8,678 tortoises on 6,151 acres. In FY 2018-19, 8,449 tortoises were relocated, and three new volunteers were trained to transport tortoises from Meadowridge (Lake County) to Live Oak (Suwannee County), totaling 24.75 volunteer hours.

To humanely relocate tortoises from ITP development sites and restock tortoises on conservation lands where populations have been depleted, FWC has approved ITP recipient sites on several properties including Nokuse Plantation (Walton County), Avalon Plantation (Jefferson County), and Eglin Air Force Base (AFB; Okaloosa County). Each recipient site meets the criteria for a viable population (at least 250 adult tortoises, at least 0.16 tortoises/acre and at least 250 acres of continuous habitat). In FY 2018-19, 1,032 tortoises were relocated to Eglin AFB and 54 tortoises to Avalon Plantation.

**WAIF TORTOISES** - Waifs are tortoises that have been removed from the wild and whose origin cannot be determined. One solution includes identifying willing landowners to care for waifs on their property, designating it as a "waif tortoise recipient site." Two new waif sites were established in FY 2018-19: The Bay Pines STEM Center (Pinellas County), which has capacity for 10 tortoises, and Marie Acres, which has capacity for 99 tortoises total. Marie Acres received 1 waif in FY 2018-19. In FY 2018-19 established waif sites received: 32 tortoises at Circle B Bar Reserve (Polk County; 14 males, 13 females, 5 unknown), 40 tortoises at Winding Waters (Palm Beach County; 9 males, 20 females, 11 unknown) and 1 male tortoise at Nixon Smiley Pineland Preserve (Miami-Dade County). FWC is working to develop additional waif sites in Sarasota County and expand the existing Sabal Bluff Preserve waif site (Lake County), which is at capacity. FWC is also working with wildlife rehabilitators to have waifs placed at designated recipient sites or have them released back to their origin, if known.

Under a Memorandum of Agreement (MOA) with the South Carolina Department of Natural Resources,



there is an ongoing effort to restock depleted tortoise populations on public lands in South Carolina through FWC’s waif program. Since 2012, 130 tortoises have been relocated to South Carolina including eight in FY 2018-19. The Department of Military Affairs entered an MOA to establish a 312.3-acre recipient site in the Upchurch property of the Camp Blanding Joint Training Center (Clay County) to receive tortoises from development projects on Camp Blanding. The Florida Park Service entered an MOA to establish a 303-acre recipient site in Deer Lake State Park (Walton County) to accept tortoises from development projects on State Parks in North Florida and restock Deer Lake.

**SURVEYS** - In FY 2018-19, FWC contracted Florida Natural Areas Inventory to survey eight conservation lands while FWC surveyed one conservation land following Line Transect Distance Sampling protocols (<https://fwcc.sharepoint.com/:w:/r/sites/WHM/WCPR/StandardMonitoringProtocols/>). Of the nine sites monitored, six met the criteria for a viable population (Exhibit 14).

Exhibit 14. Gopher tortoise surveys conducted in FY 2018-19.

Location	County	Population Estimate	Density (tortoises/acre)	Suitable Habitat (acres)
Fort Clinch State Park	Nassau	426	1.29	331
Halpata Tastanaki Preserve State Park / Pruitt Tract – Marjorie Harris Carr Cross Florida Greenway State Recreation and Conservation Area	Marion	1,966	0.44	4,441
Indian Lake State Forest	Marion	622	0.18	3,496
Lake Placid, McJunkin Tracts – Lake Wales Ridge WEA	Highlands	456	0.25	1,822
Silver Lake Tract – Lake Wales Ridge WEA	Highlands	132	0.45	294
Little River Conservation Area	Suwannee	606	0.52	1,175
Oscar Scherer State Park	Sarasota	564	0.57	986
Seabranck Preserve State Park	Martin	228	0.40	570
Triple N. Ranch WMA / Bull Creek WMA	Osceola	1,264	0.15	8,626

**HABITAT MANAGEMENT** - The Lake Wales Ridge Wildlife and Environmental Area (WEA; Highlands and Polk Counties) consists of 20 tracts and tortoises have been observed on all tracts. In FY 2018-19, FWC and volunteers continued work on 35 acres of former agricultural lands. Volunteers propagated and maintained 300 scrub oaks that were grown from acorns collected in the previous year. FWC also continued monitoring restoration efforts from past projects in Jennings Forest Wildlife Management Area (Clay and Duval counties). Photo points were established prior to management activities and monitoring is conducted at each photo point. Mitigation parks provide an off-site alternative for resolving certain wildlife resource conflicts and are designated by FWC as WEAs. In FY 2018-19, habitat management was conducted on several public lands for the gopher tortoise (Exhibit 15). In FY 2018-19, the Habitat Management Assistance Funding (HMAF) program provided funds to assist local governments with habitat management on over 565 acres. No new ITP recipient sites were funded through HMAF in FY 2018-19.



Exhibit 15. Habitat management conducted in FY 2018-19 for the gopher tortoise.

Location	County	Prescribed Fire Acreage	Mechanical Treatment Acreage	Chemical Treatment Acreage
Watermelon Pond WEA	Alachua	270	115	0
Pine Log WMA	Bay, Washington	1,332	0	331
Branan Field WEA	Clay, Duval	0	0	0.1
Apalachicola WMA	Franklin, Liberty, Leon, Wakulla	0	0	173
Bell Ridge WEA	Gilchrist	528	3	0
Fort White WEA	Gilchrist	365	73	94
Suwannee Ridge WEA	Hamilton	569	87	0.1
Lake Wales Ridge WEA	Highlands, Polk	1,200	110	101
Platt Branch WEA	Highlands	469	192	126
Bull Frog Creek WEA	Hillsborough	0	168	213
Aucilla WMA	Jefferson	0	0	13
Lafayette Forest WEA	Lafayette	519	0.2	0
Hickey Creek WEA	Lee	42	58	40
L. Kirk Edwards WEA	Leon	155	0	90
Moddy Branch WEA	Manatee	0	248	247
Crooked Lake WEA	Polk	129	247	204

**OUTREACH** - FWC hosted and/or participated in 44 outreach events in FY 2018-19. Additionally, staff presented at four training events for FWC Law Enforcement Officers and two trainings for FWC Law Enforcement Recruits. Gopher Tortoise Day outreach in FY 2018-19 resulted in the adoption of 12 resolutions proclaiming April 10th as Gopher Tortoise Day in counties and municipalities statewide. A resolution was also adopted by the Friends of Split Oak Forest. There were 32 Gopher Tortoise Day events statewide at parks, preserves, schools and nature centers in FY 2018-19. FWC frequently distributes fact sheets, brochures, posters, children’s publications and decals to increase knowledge of gopher tortoises and promote conservation (Exhibit 16). All publications are available at FWC’s Regional Offices and electronic versions are available for download at [www.MyFWC.com/GopherTortoise](http://www.MyFWC.com/GopherTortoise).

Exhibit 16. Summary of gopher tortoise publications distributed in FY 2018-19.

Publication	Distributions	Primary Audience
Living with Gopher Tortoises	3,406	Local governments, schools, nature centers, Florida residents
Before you Build	505	Florida landowners
Get the Facts about Gopher Tortoises	877	Local governments, schools, nature centers, Florida residents
Got Gophers, Get Permits (poster)	40	Planning councils, City/County building departments, local permitting offices
Safe Roads for People and Gopher Tortoises	4,399	Visitor centers, State/local parks, Highway rest stops
Gopher Tortoise Decals	7,128	Florida residents
Gopher Tortoise Day Temporary Tattoos	2,195	Florida residents, Children's camps
Children's Publications	1,156	Florida residents, Children's camps



## Marine Turtles

FWC continues to maintain management and research programs fostering the recovery of the five marine turtle species that occur along Florida's coasts: leatherback, hawksbill and Kemp's ridley (all Federally-designated Endangered) and green and loggerhead (both Federally-designated Threatened). FWC works with various stakeholders in State and Federal agencies, local governments, conservation organizations, citizens and academic programs to conserve marine turtles and their habitat. FWC served on multiple committees, boards and working groups in FY 2018-19 in Florida, the USA and internationally.

**STRANDING NETWORK** - FWC coordinated the Florida portion of the Sea Turtle Stranding and Salvage Network (Network), an 18-state program administered by the NOAA-Fisheries. The Network is responsible for gathering data on dead, sick, or injured marine turtles. In FY 2018-19, 2,405 dead or debilitated turtles were documented (742 loggerheads, 1,166 greens, 445 Kemp's ridleys, 8 hawksbills, 5 leatherbacks and 38 unidentified). FWC responded to 2,475 reports (primarily reports of dead, sick, or injured turtles), transported 148 sick or injured turtles to rehabilitation facilities and conducted necropsies on 150 carcasses. Twenty-one training workshops, involving 691 participants, provided training on how to document strandings. Real-time Florida stranding data were readily available at <http://ocean.floridamarine.org/SeaTurtle/flstssn/> for use by various entities, such as NOAA-Fisheries, FWC law enforcement and protected species management personnel.

**NESTING AND HATCHLING PROGRAMS** - In FY 2018-19, six workshops were presented to 1,106 participants providing training on how to conduct nest surveys using two monitoring programs, the Statewide Nesting Beach Survey (SNBS) and the Index Nesting Beach Survey (INBS). The SNBS Program began in 1979 and acquires data on nest numbers, distribution and seasonality for nearly all nesting beaches. In 2018, 224 areas (828 miles) were surveyed recording 91,451 loggerhead nests, 4,545 green nests, 949 leatherback nests and 10 Kemp's ridley nests. A Statewide Atlas of Sea Turtle Nesting Occurrence and Density (<http://myfwc.com/research/wildlife/sea-turtles/nesting/nesting-atlas/>) provides summary of nest distribution and density and species occurrence. The INBS Program began in 1989 and collects more detailed data from a subset of beaches. Since 1989, loggerhead nest counts have varied greatly due to a complex nesting pattern. Green nest counts have increased exponentially by eightyfold. Leatherback nest counts have also increased but have been declining since 2014.

The Hatchling Orientation Index Program provides data on how accurately hatchlings crawl toward the ocean after emerging from nests. In 2018, data was collected from 587 nests (553 loggerheads, 27 greens, 6 leatherbacks and 1 Kemp's ridleys) on 14 beaches.

**IN WATER RESEARCH** - FWC studies the abundance, distribution, behavior and diet of hatchlings and



small juveniles in open-ocean habitat off Florida's coasts. In FY 2018-19, researchers sampled Gulf of Mexico waters offshore of Pensacola and Marco Island. A miniature, solar-powered satellite transmitter was placed on one of three observed green turtles (captured offshore of Pensacola).

FWC studies where adult female loggerheads reside and forage when they are not nesting on Florida beaches. Preliminary results indicate most females forage within the US Economic Exclusive Zone and are concentrated in the Florida Keys, the Southwest Florida continental shelf, the waters off east-central Florida and the continental shelf between Delaware and North Carolina. The Great Bahama Bank (especially the continental shelf south of Andros) is the main foraging area outside of US jurisdiction. FWC maintains an electronic inventory of in-water research and monitoring projects in collaboration with the marine turtle research community. For more information on the Sea Turtle Research Program, see <http://myfwc.com/research/wildlife/sea-turtles/>.

**ENVIRONMENTAL COMMENTING (INCLUDING LIGHTING)** - FWC participated in the development of the Florida Statewide Beaches Habitat Conservation Plan. This Plan will provide flexibility to local governments and beachfront property owners for conduct of FDEP coastal construction control line permitted activities while ensuring impacts to coastal species and their habitat are minimized and mitigated. In FY 2018-19, FWC reviewed 355 applications and provided final comments for 281 projects ensuring marine turtles and their habitat remain protected.

In FY 2018-19, staff reviewed and approved 53 lighting plans for beachfront construction and conducted post-construction site inspections for 31 projects, eight of which were compliant. Staff also responded to requests from local governments for assistance by conducting lighting surveys with local government staff, reviewing protection ordinances, or general technical assistance.

**MARINE TURTLE PERMITS (INCLUDING REHABILITATION)** - FWC issued 135 authorizations for nest surveys and 35 authorizations to hold turtles for rehabilitation, educational display, or research. FWC reviewed and approved 49 permit requests for new or modified research. Approximately 130 one-time consent permits were issued for filming, transfer of specimens into or out of Florida for research and transport of turtles into Florida for release following out of state rehabilitation. Seven new or amended Loan Agreements were issued to hold or use specimens for research, teaching, or education. There were 24 permits or amendments processed authorizing educational marine turtle walks.

FWC assisted in the recovery, processing, transport and release of approximately 136 cold-stunned turtles that stranded in New England and were transferred to Florida for rehabilitation. FWC conducted inspections of five Florida facilities to ensure turtles were held in appropriate conditions. FWC placed five non-releasable turtles in educational facilities within and outside of Florida.



*ANNUAL PERMIT HOLDER MEETING* - In February 2019, FWC hosted the 22<sup>nd</sup> Annual Marine Turtle Permit Holder Workshop in Orlando, Florida with the Sea Turtle Conservancy and Sea World of Florida. Over 400 permit holders, volunteer and staff from local government, State and Federal agencies attended. Topics included updates on State and Federal marine turtle programs, as well as research, conservation and education projects funded by the Sea Turtle License Plate Grants Program. In addition, FWC conducted two workshops on stranding and how to use the new disorientation reporting app.

*WILDLIFE LIGHTING* - FWC assessed approximately 331 fixtures and bulbs from 53 manufacturers from five countries and certified 183 as FWC Wildlife Lighting Certified, which are listed on FWC's website. FWC and FDEP continued work to offset impacts in northwest Florida from the Deep-Water Horizon Event. FWC also worked with Escambia, Santa Rosa, Okaloosa, Bay, Gulf, and Franklin Counties, the University of Florida Institute of Food and Agricultural Science (UF/IFAS), Sea Grant and Gulf Power on lighting beachfront properties while minimizing impacts to marine turtles. Franklin and Escambia Counties utilized grant funds to enhance compliance with their local ordinances by hiring staff to focus on education and compliance or providing information and appropriate lighting for beachfront properties. FWC worked with Okaloosa County to retrofit County-owned parking lot lights at Fort Walton Beach and Destin. Using grant funds, UF/IFAS was contracted to work with local businesses, condominiums and property owners in Franklin, Gulf and Bay Counties to retrofit lights on properties surrounding conservation lands. In FY 2018-19, 89 properties were retrofitted resulting in resolution of 733-point sources of light and installation of 599 turtle friendly fixtures. For more information on the Sea Turtle Management Program, see <http://myfwc.com/wildlifehabitats/managed/sea-turtles/>.

## *Spotted Turtle*

The spotted turtle has been petitioned for Federal listing due to populations declines from habitat loss and collection for the pet trade. In 2014, FWC began using radio-telemetry and mark-recapture techniques to gather information on home range, movement, seasonal phenology and population dynamics at two sites in North Florida. As of June 2019, 79 turtles have been captured, with 30 of those fitted with radio-transmitters and relocated 1-2 times per week. This research suggests spotted turtles are uncommon and cryptic, rarely basking or spending time upland. Shallow water and abundance of woody debris within complex, forested wetlands appear to be the most reliable habitat characteristics for predicting presence. Adult home range size varied between sites and turtles with an average of 16 acres. Both sexes remain active year-round, with males moving greater distances and using larger areas than females. FWC has partnered with a multi-state "Maine-to-Florida" initiative to address spotted turtle status and conservation across the species' range.





## *Suwannee Alligator Snapping Turtle*

In December 2018, the Suwannee alligator snapping turtle was listed as State-designated Threatened, and the Species Conservation Measures and Permitting Guidelines and revised Species Action Plan were approved. FWC participated in the Federal Species Status Assessment of alligator snapping turtles. In FY 2018-19, 36 streams from the Aucilla to the Perdido Rivers and two ponds on Dog Island (Franklin County) were trapped for 547 nights. Eighty-eight turtles were captured, including the first records for Bear Creek (Bay County), Cypress Creek (Calhoun County), Dry Creek (Jackson County), and Wetappo Creek (Gulf County). This survey corroborated previous studies that showed alligator snapping turtle densities are low in the Choctawhatchee drainage.

## FISH

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### *Freshwater Fish*

FWC collects standardized fisheries independent data to characterize freshwater fish populations and communities and inform management decisions. In FY 2018-19, sampling was conducted in the Escambia, Yellow, Shoal, Apalachicola, Ocklawaha, Santa Fe, Upper and Lower St. John's and Suwannee Rivers.

*BLACKMOUTH SHINER* - The blackmouth shiner is State-designated as Threatened. In FY 2018-19, 37 individuals were collected from the Blackwater River watershed (Santa Rosa County), but none were collected from Shoal River (Okaloosa County). Staff plan to continue monitoring and surveying in Blackwater and Shoal Rivers and assess the genetic diversity and population structure range-wide.

*BLUENOSE SHINER* - The bluenose shiner is State-designated as Threatened. In FY 2018-19, 13 individuals were collected from Rock Springs Run (Orange County) and one from Wekiva River (Lake, Orange and Seminole Counties). Genetic analyses are ongoing to determine the evolutionary distinction between the St. Johns drainage population and those in western Florida, Alabama, Mississippi and Louisiana.

*CRYSTAL DARTER* - The crystal darter is State-designated as Threatened. In FY 2018-19, benthic trawl surveys were conducted within the upper Escambia River (Escambia and Santa Rosa Counties) and two were collected. Research is ongoing to assess the population status and trends of the species.

*SALTMARSH TOPMINNOW* - The saltmarsh topminnow is State-designated as Threatened. In FY 2018-19, 33 sites were surveyed across Perdido, Escambia, Blackwater and East Bays and 142 individuals were collected from Escambia and Santa Rosa counties and two were collected from Blackwater Bay (Santa Rosa County). None were collected from Choctawhatchee or Apalachicola Bays.



*SOUTHERN TESSELLATED DARTER* - The Southern tessellated darter is State-designated as Threatened and is only known to occur in the Ocklawaha River watershed (Lake County). There was no sampling in FY 2018-19. Prior studies suggest Southern tessellated darters have low genetic diversity and a small population size due to hundreds of generations of isolation from other populations. Future work will involve identifying appropriate listing status and conservation actions for the species.

### *Smalltooth Sawfish*

Smalltooth sawfish are Federally-designated as Endangered and they are now only found from Charlotte Harbor (Charlotte County) to the Keys (Monroe County). In FY 2018-19, Charlotte Harbor estuarine system in upper Charlotte Harbor and the Caloosahatchee River was sampled using a multi-gear approach. There were 65 individuals captured, including 5 recaptures. For more information on FWC's smalltooth sawfish research program, see <https://MyFWC.com/research/saltwater/fish/sawfish>.

### *Sturgeon*

*ATLANTIC STURGEON* - The Atlantic Sturgeon is Federally-designated as Endangered. The USFWS, NOAA-Fisheries and US Geological Survey (USGS) perform most of the monitoring and management. FWC did not collect any Atlantic Sturgeon and no carcasses were reported to FWC in FY 2018-19. All future collections will be provided to the Atlantic Sturgeon Salvage Network and Atlantic States Marine Fisheries Commission to assist with monitoring and management.

*GULF STURGEON* - The Gulf Sturgeon is Federally-designated as Threatened. Monitoring and management is primarily conducted by USFWS, NOAA-Fisheries and USGS. In FY 2018-19, FWC continued to examine survival, movement and habitat use of juveniles in the Yellow and Escambia Rivers (Escambia and Santa Rosa Counties). A total of 55 individuals were captured from Yellow River and 41 from Escambia River. Many adult mortalities were reported following red-tide outbreaks and post Hurricane Michael from Choctawhatchee (Holmes, Walton and Washington Counties) and Apalachicola Rivers (Jackson, Gadsden, Calhoun, Liberty, Gulf and Franklin Counties).

## INVERTEBRATES

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### *Crayfish*

*BLACK CREEK CRAYFISH* - The Black Creek crayfish is State-designated as Threatened and is under evaluation for Federal Listing. Black Creek crayfish are endemic to northeast Florida and much of the known range is in the Black Creek drainage. All documented occurrences have been within the lower St. Johns River watershed basin (St. Johns, Duval, Clay and Putnam Counties). In FY 2018-19, FWC provided



comments on a pending St. Johns River Water Management District project to pump water from Black Creek to recharge the aquifer in Keystone Heights (Clay County) and conducted baseline surveys to document potential impacts to the crayfish. Surveys revealed sites historically occupied by Black Creek crayfish were instead occupied by another species, the white-tubercled crayfish. Though native to North Florida, white-tubercled crayfish have replaced Black Creek crayfish at many sites. Staff are assisting the USFWS and its contractor, Texas A & M University, in drafting a Species Status Assessment.

CYPRESS CRAYFISH - The cypress crayfish is under evaluation for Federal listing. In 2017, FWC was awarded Federal Section 6 funds to survey for the crayfish. In FY 2018-19, FWC surveyed appropriate habitats in Escambia and Santa Rosa Counties and new locations were found including three sites along a tributary creek and two sites near Highway 4. In April 2019, diseased specimens of the cypress crayfish and the ribbon crayfish (a larger, not closely related species) were collected. The pathogens were identified by a University of Florida researcher as a new species of microsporidia, fungal parasites.

MIAMI CAVE CRAYFISH - The Miami cave crayfish is under evaluation for Federal listing. It inhabits subterranean waters in Miami-Dade County and has been collected from 12 wells that draw on the subsurface aquifer. In 2017, FWC was awarded Federal Section 6 funds to survey for the crayfish. In FY 2018-19, a contracted biologist began surveys using specially designed traps down wells. Six specimens were captured from four sites and samples were collected for later genetic analysis.

PANAMA CITY CRAYFISH - The Panama City crayfish (PCC) is a Species of Special Concern and is under evaluation for Federal listing. FWC received Federal Section 6 funds to study PCC and develop and implement a translocation and monitoring plan to remediate the low genetic diversity caused by habitat loss and fragmentation. Biologists sampled 33 sites for 1,698 nights and captured 446 crayfish. Of those captured, 388 PCC were marked with fluorescent elastomer dye, a liquid that cures into a pliable solid. Nine marked PCC were recaptured at three sites. A previously unknown population was documented during occurrence surveys. Though preliminary population estimates vary, populations are smaller than previously assumed. Further analysis of existing genetic data will likely be employed into the translocation and monitoring plan currently under development by FWC and partners.

Hurricane Michael resulted in substantial changes to the entire species' range where of downed trees continue to present a challenge to PCC conservation. Undeveloped areas in the eastern portion of the range experienced significant timber damage, including parcels within a proposed Critical Conservation Area that have since been degraded by rapid salvage of damaged timber stands under exceptionally wet conditions. Further damage to PCC habitat occurred from extensive reconstruction in powerline Right-of-Ways where many populations are concentrated. In the more developed areas of the species' range,



ditches known to support PCC were heavily damaged after being used to stage large quantities of hurricane related debris. These sites received large quantities of runoff from heavy rains and direct discharges from overflowing wastewater collection systems. Several conservation lands managed by FWC for PCC are impaired by fallen trees and excessive water stalling management activities. FWC has received funds from the USFWS Partners for Wildlife program to initiate restoration on these properties.

*SANTA FE CRAYFISH* - The Santa Fe cave crayfish is State-designated as Threatened and is under evaluation for Federal listing. The Santa Fe cave crayfish inhabits subterranean waters in Suwannee and Columbia Counties and is only known from several caves and sinkholes in the Santa Fe/Suwannee River basin. In 2017, FWC was awarded Federal Section 6 funds to survey for the crayfish. In FY 2018-19, specimens were trapped from one new site, Sims Sink (Suwannee County) and captured from a known site, Saylor Sink (Columbia County). In addition, specimens of the closely related Alachua light-fleeing cave crayfish were captured in Skull Sink (Levy County) and Herzog Sink (Alachua County). Samples from both species will be used by a University of Florida researcher for genetic and comparison analyses.

### *Freshwater Mussels*

FWC tracks changes in mussel communities and habitat measures by collecting standardized independent data from freshwater ecosystems. Larval mussels are parasites to fish, attaching to the gills and fins. Some mussels are generalists and parasitize many species, whereas some are specialists and require one or two species. FWC submitted a proposal for Federal Section 6 funds to re-open and maintain the Malacological Applied Research Laboratory at the Blackwater hatchery to identify host fishes for eight Federally petitioned mussels as well as the Federally-designated Threatened Chipola slabshell and the Federally-designated Endangered Choctaw bean. In FY 2018-19, FWC performed 81 surveys across 14 river basins (Exhibit 17) and habitat parameters were assessed at six of these sites.

*CHIPOLA SLABSHELL* - The Federally-designated Threatened Chipola slabshell is found in the Apalachicola River drainage. It is a short-term brooder and is gravid from June-July. As observed in laboratory trials, potential host fish are Bluegill and Redbreast Sunfish. In FY 2018-19, FWC performed 19 surveys for this species (Exhibit 17). Of those checked for brooding larvae, 35% of captured mussels were brooding and all were found on the mainstem Chipola River.

*CHOCTAW BEAN* - The Federally-designated Endangered Choctaw Bean is found in the Escambia, Yellow, and Choctawhatchee River basins. Fish hosts are unknown, but it is believed to be a host specialist due to known hosts for closely related species. The Choctaw Bean broods from late summer to the following spring. In FY 2018-19, FWC performed 50 surveys for this species (Exhibit 17). Of those checked for brooding, one mussel was gravid. It was collected from the Yellow River.



*FAT THREERIDGE* - The Federally-designated Endangered fat threeridge is only found in Apalachicola and Chipola Rivers. It broods from May-June and is a generalist parasitizing five fish species. In FY 2018-19, FWC conducted 19 surveys range-wide (Exhibit 17). Although recent studies suggest reproduction to be strong, no brooding individuals were found, which was most likely caused by the timing of the surveys.

*FUZZY PIGTOE* - The Federally-designated Threatened fuzzy pigtoe is found in the Escambia, Yellow and Choctawhatchee River basins. This bivalve broods from March-June, although it has been observed brooding in July and August. This mussel is a specialist and can only parasitize the Blacktail Shiner. In FY 2018-19, FWC performed 50 surveys for this species (Exhibit 17) and of those checked, 11 were gravid: four from the Escambia River and seven from the Choctawhatchee River.

*GULF MOCCASINSHELL* - The Federally-designated Endangered Gulf moccasinshell is found in upper tributaries of the Chipola River and Econfina Creek. This mussel broods from March to late summer or early fall, but observations suggest the brooding period may be longer. This species is a specialist, parasitizing three darter species. In FY 2018-19 no individuals were found despite FWC's 17 surveys (Exhibit 17). Since 2013, eight individuals have been sampled at one site on Baker Creek.

*NARROW PIGTOE* - The Federally-designated Threatened narrow pigtoe is found in the Escambia and Yellow rivers. This bivalve broods from March-June although it has been observed brooding in July. The host fish for this species is unknown, however, FWRI has performed host fish trials and results will be published in FY 2019-20. Other mussels in the same genus are specialists that parasitize Shiner species. In FY 2018-19, FWC performed 39 surveys for this species (Exhibit 17). While none of the Yellow River specimens were brooding, of the those checked, 12 were brooding in the Escambia River.

*OCHLOCKONEE MOCCASINSHELL* - The Federally-designated Endangered Ochlockonee moccasinshell is restricted to the Ochlockonee River. This bivalve has been observed to brood larvae from January-March, although it has also been observed brooding in October. The host fish is unknown, but other species in the same genus are specialists parasitizing darter species. FWC did not perform surveys in the Ochlockonee River in FY 2018-19. FWC received the "Conserve Wildlife" specialty license plate fund to increase surveys range-wide to provide more fine resolution data on population trends.

*OVAL PIGTOE* - The Federally-designated Endangered oval pigtoe is found in Econfina Creek, Apalachicola, Ochlockonee and Suwannee River basins. It has been found to brood from March-July, although brooding in January has also been observed. This mussel only parasitizes Sailfin Shiners and Eastern Mosquitofish. In FY 2018-19, FWC performed 22 surveys for oval pigtoes (Exhibit 17).

*PURPLE BANKCLIMBER* - The Federally-designated Threatened purple bankclimber is found in the Apalachicola, Lower Chipola and Ochlockonee River basins. This bivalve broods from February-April,



although it has been observed brooding in May. This species parasitizes two fish species, the Federally-designated Threatened Gulf Sturgeon and Blackbanded Darter. In FY 2018-19, FWC performed 19 surveys and did not locate any individuals (Exhibit 17). The last observation occurred in October 2017 and 64 surveys have been conducted in the Apalachicola and Ochlockonee Rivers since.

*ROUND EBONYSHELL* - The Federally-designated Endangered round ebonyshell is endemic to the Escambia River basin. This mussel broods from April-August. The fish host is unknown, but it is hypothesized to parasitize migratory shad species due to this fish being the host fish for a related species. In FY 2018-19, FWC performed seven surveys and did not locate any individuals (Exhibit 17).

*SHINYRAYED POCKETBOOK* - The Federally-designated Endangered shinyrayed pocketbook is found in Econfinia Creek, Apalachicola, Chipola and Ochlockonee River basins. This bivalve broods from December to August and parasitizes Spotted Bass. In FY 2018-19, FWC performed 19 surveys for shinyrayed pocketbooks (Exhibit 17). FWC is investigating the occupancy of this mussel by modeling parameters explaining the variation in the presence or absence in two river basins.

*SOUTHERN KIDNEYSHELL* - The Federally-designated Endangered Southern kidneyshell is restricted to the Choctawhatchee River basin. This bivalve broods from September- May and the fish host is unknown but is hypothesized to utilize darters like other species of the same genus. In FY 2018-19, FWC performed 11 surveys, but did not locate any individuals (Exhibit 17).

*SOUTHERN SANDSHELL* - The Federally-designated Endangered Southern sandshell is restricted to the Yellow and Choctawhatchee River basins. This bivalve broods from May-August, although brooding has been observed in April, as well as September to November. The fish host is unknown, but it is hypothesized to utilize various bass species like the shinyrayed pocketbook. In FY 2018-2019, FWC performed 43 surveys for the Southern sandshell (Exhibit 17).

*SUWANNEE MOCCASINSHELL* - The Federally-designated Threatened Suwannee moccasinshell is a rare endemic to the Suwannee River basin. This bivalve broods from January-March, although it has been observed brooding in April, October and December. The fish host is unknown but is hypothesized to utilize darters like related species. In FY 2018-19, FWC performed two surveys and did not locate any individuals (Exhibit 17). The Suwannee Moccasinshell was last observed in November 2017.

*TAPERED PIGTOE* - The Federally-designated Threatened tapered pigtoe is restricted to the Choctawhatchee River basin. This bivalve broods from March- June and is a specialist only parasitizing the Blacktail Shiner. In FY 2018-19, FWC performed 11 surveys for tapered pigtoe (Exhibit 17). Of those checked, seven were brooding larvae.



**Exhibit 17.** Freshwater mussel surveys conducted in FY 2018-19. Dashes indicate the species does not occur in the basin. No surveys were conducted for the Ochlockonee moccasinshell, therefore it is not included here.

Species	Alafia (1)	Apalachicola (19)	Charlotte Harbor (1)	Choctawhatchee (11)	Escambia (7)	Hillsborough (1)	Manatee (2)
Chipola Slabshell	-	14	-	-	-	-	-
Choctaw Bean	-	-	-	17	7	-	-
Fat Threeridge	-	151	-	-	-	-	-
Fuzzy pigtoe	-	-	-	17	21	-	-
Gulf moccasinshell	-	0	-	-	-	-	-
Narrow pigtoe	-	-	-	-	129	-	-
Purple bankclimber	-	0	-	-	-	-	-
Oval pigtoe	-	24	-	-	-	-	-
Round ebonyshell	-	-	-	-	0	-	-
Shinyrayed pocketbook	-	21	-	-	-	-	-
Southern kidneyshell	-	-	-	0	-	-	-
Southern sandshell	-	-	-	0	0	-	-
Suwannee moccasinshell	-	-	-	-	-	-	-
Tapered pigtoe	-	-	-	28	-	-	-



**Exhibit 17 (continued).** Freshwater mussel surveys conducted in FY 2018-19. Dashes indicate the species does not occur in the basin. No surveys were conducted for the Ochlockonee moccasinshell, therefore it is not included here.

Species	Myakka (1)	Ochlockonee South (1)	Peace (1)	Suwannee (6)	Waccasassa (1)	Withlacoochee South (1)	Yellow (32)
Chipola Slabshell	-	-	-	-	-	-	-
Choctaw Bean	-	-	-	-	-	-	2
Fat Threeridge	-	-	-	-	-	-	-
Fuzzy pigtoe	-	-	-	-	-	-	0
Gulf moccasinshell	-	-	-	-	-	-	-
Narrow pigtoe	-	-	-	-	-	-	2
Purple bankclimber	-	-	-	-	-	-	-
Oval pigtoe	-	-	-	0	-	-	-
Round ebonyshell	-	-	-	-	-	-	-
Shinyrayed pocketbook	-	-	-	-	-	-	-
Southern kidneyshell	-	-	-	-	-	-	-
Southern sandshell	-	-	-	-	-	-	-
Suwannee moccasinshell	-	-	-	0	-	-	-
Tapered pigtoe	-	-	-	-	-	-	-





## Miami Tiger Beetle

The Federally-designated as Endangered Miami tiger beetle is only known from critically rare pine rockland habitat in Miami-Dade County. In 2015, FWC with staff from Miami-Dade County Parks, Recreation and Open Spaces began surveys at known and potential sites in South Florida. As of June 2019, 23 sites have been surveyed multiple times, but beetles have only been detected at five sites (University of Miami CSTARS, Larry and Penny Thompson Park, Nixon-Smilely Pineland Preserve, U.S. Coast Guard Communication Station and Zoo Miami). Apart from Nixon-Smilely, the other sites likely represent a single population. The total area of occupied habitat is less than 7.5 acres. No new sites were discovered in FY 2018-19, but new patches were located at Zoo Miami. Future work will determine habitat requirements, quantify detection rates and monitor occupancy and population trends.

## OTHER WORK

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### Citizen Awareness Program

Section 379.2291(5), Florida Statutes, requires FWC to provide a revised and updated plan for management and conservation of listed species, including a description of relevant educational programs. FWC regularly provides information to and interacts with the public about listed species by conducting citizen awareness programs. FWC engaged in major efforts promoting citizen awareness of listed or at-risk species and their habitats in FY 2018-19.

MEDIA RELATIONS – FWC press releases reach substantial regional and statewide audiences, with some national media reach as well. A total of 373 press releases were sent via email to individual reporters, editors, and producers at daily and weekly newspapers, magazines, online publications, radio and TV stations who have signed up to receive FWC press releases (Exhibit 18). Regional media receive regional-only news and information. FWC press releases are also posted online at [www.myfwc.com/news](http://www.myfwc.com/news).

Exhibit 18. Number of reporters sent FWC press releases in FY 2018-19.

FWC Region	Number of Reporters
Northwest	84
North Central	54
Northeast	73
Southwest	44
South	118

SOCIAL MEDIA – FWC’s social media accounts are growing in popularity every day (Exhibit 19). They are meant to be exciting, educational and get audiences interested in Florida wildlife.



**Exhibit 19.** Total interactions with each FWC social media account obtained in FY 2018-19.

Social Media Platform	Quantity of Interactions
@MyFWC Facebook	186,000 Likes
@MyFWC Twitter	45,000 Followers
@MyFWC Instagram	65,000 Followers
@MyFWC Media Flickr	21.5 Million Views
@MyFWC YouTube	3.9 Million Views
@Florida Birding Trail Facebook	17,500 Likes
@FWC Research Facebook	53,300 Likes

**GOVDELIVERY AND WEBSITES** - GovDelivery allows FWC to connect with thousands of stakeholders instantly with important information on topics they care about, such as Florida’s listed species and their habitat. Exhibit 20 provides examples of topics members of the public subscribed to in FY 2018-19.

**Exhibit 20.** Number of subscribers in FY 2018-19 for select GovDelivery topics.

Topic	Quantity of Subscribers
Imperiled Species Management Plan	41,400
Florida Panther	43,000
Manatee	43,000
Sea Turtles	44,000
Landowner Assistance Program	28,500
Coral Reefs	30,500
Gopher Tortoises	41,600

**PUBLICATIONS, EXHIBITS AND SIGNS** - FWC’s graphics team developed 22 new signs, publications and other materials sharing stories and critical information about Florida’s wildlife. New materials included a fact sheet on Everglades restoration, signs to prevent the disturbance of beach nesting shorebirds, an educational sign about Eastern indigo snakes at Camp Blanding Wildlife Management Area and promotional materials for the “living shorelines” program. During summer 2018, two imperiled species displays were set up back to back in one library in Leon County for a month at a time. Over the winter months, staff assisted with an FWC Backyards & Beyond City Nature Challenge promotion and created displays that were placed in all Leon County libraries with display cabinets from February to April.

**VOLUNTEER OPPORTUNITIES** - FWC’s volunteer coordinators work to develop and sustain projects on listed species conservation that meet strategic objectives and involve all aspects of volunteer management. FY 2018-19 activities included monitoring shorebirds, Florida scrub-jays and Southeastern American Kestrels; building bat houses for Florida bonneted bats; coastal cleanups; and public outreach.

**FAIRS, FESTIVALS AND EVENTS** - FWC attends places where kids, families, retirees and tourists are having fun to share the excitement and importance of conserving Florida wildlife, including listed species. In FY 2018-2019, staff attended a wide variety of such events, including:



- A new addition to outreach programs in the north Florida community was the Edward Ball Wakulla Springs State Park's "Hu-Manatee Mini-Festival" held in November at the park's waterfront area. The event space was small but well attended throughout the day.
- The Sarasota County Fire Fest teaches the public about the benefits of prescribed fire. Staff distributed information on the Red-cockaded woodpecker.

*COMMUNITY MEETINGS, WORKSHOPS AND PRESENTATIONS* - FWC interacts with homeowners, private landowners, businesses and stakeholders on numerous issues regarding living with listed species.

- Wildlife Assistance Biologists provide guidance to individuals and groups on how to avoid conflicts with wildlife. In FY 2018-19, over 20 site visits were conducted to assist individuals regarding listed species such as sandhill cranes and staff gave a presentation on living with panthers.
- The Southeastern Bat Diversity Network and Mammal Colloquium discussed a variety of bat research and monitoring projects throughout the Southeastern US, including projects conducted on the Florida bonneted bat.

*SCHOOL-BASED PROGRAMS AND PRESENTATIONS* - FWC partners with educators to reach young people and create fun and interactive programs for wildlife viewing.

- The Wings Over Florida birding and butterfly listing recognition program aims to increase the number of diverse wildlife viewers and conservationists. In FY 2018-19, over 135 participants were awarded with certificates recognizing their bird watching achievements.
- Project WILD connects with teachers to provide educational materials related to Florida wildlife, including listed species. These lessons reached an estimated 229,000 youth in FY 2018-19.
- FWC's manatee mascot represented the agency at six events statewide. The highlight event of the year: The mascot was used as a guest "performer" at a local neighborhood outdoor environmental-themed "Puppet Show". The South Region also created a new outfit for the mascot—a "Super Manatee" eye mask, emblem and sequined cape ensemble.

### *Coastal Wildlife Conservation Initiative*

The Coastal Wildlife Conservation Initiative (CWCI) is an FWC-led, multi-partner (Florida Department of Environmental Protection, the USFWS and the University of Florida's (UF) Institute of Food and Agriculture Sciences) strategy that aims to facilitate a statewide, cooperative process to provide greater consistency and coordination in protecting coastal wildlife, conserving and managing coastal ecosystems and balancing these efforts with human use of coastal areas. In FY 2018-19, CWCI and partners continued a 3-year study comparing the ecological benefits of four different shoreline stabilization methods: a



mangrove living shoreline, an oyster shell living shoreline, a modification to an existing seawall resembling mangrove prop roots and an existing standard seawall. Staff developed a curriculum for a living shorelines training course to be provided to marine contractors. CWCI is also developing outreach materials to provide guidance to coastal managers and local planners on reducing beach wildlife disturbance by dogs. In FY 2018-19, CWCI began an internship program with students from UF. Staff conducted several outreach activities covering topics including shorebird and seabird conservation, marine debris and living shorelines. CWCI continued to publish a quarterly newsletter to keep partners and others aware of coastal wildlife issues. A new website was developed to share information about ongoing CWCI projects and priority issues for the program.

### *Coordination and Assistance*

REVIEWS AND ASSISTANCE FOR TRANSPORTATION PROJECTS - FWC performed 171 reviews of highway projects in FY 2018-19, including projects reviewed through the Florida Department of Transportation's Efficient Transportation Decision Making (ETDM) Process and assistance letters outside of the ETDM Process. Each review included a biological assessment of direct and indirect effects of the project on listed species and their habitats. Recommendations were provided on how to avoid, minimize, or mitigate effects on listed species. Recommendations were related to road design, locations and design of wildlife underpasses, species occurrence information and field survey methodologies, wetland and upland habitat restoration strategies and techniques and suitability evaluations of a moderate number of land parcels for mitigation through public land acquisition.

LAND USE PLANNING ACTIVITIES - In FY 2018-19, FWC reviewed 1,219 projects and provided written assistance on 518 of those projects for public and private land and water use planning activities with potential to impact listed species and their habitats. These projects included: developments and projects of regional impact, county comprehensive plan evaluation and appraisal reports, proposed amendments and sector plans, various permit applications, environmental assessments and impact statements and ten-year plan reviews. Consultations were based on established best management practices, species management guideline, and GIS analysis. FWC also contributed to the development of comprehensive habitat-based management plans, and coordinated landscape-level planning with local, State and Federal agencies to benefit species and habitats of greatest conservation need.

LANDOWNER ASSISTANCE PROGRAM - Florida's Landowner Assistance Program (LAP), in cooperation with the USFWS, is a voluntary program designed to provide wildlife-related assistance with land-use planning and habitat management to private landowners, as well as financial support to those interested in improving habitat conditions on their property for listed species. In FY 2018-19, LAP assisted over 590 private landowners, including providing written evaluations of effects from proposed agricultural



practices to listed species on 86 projects. Many of the landowners received financial assistance through State or Federal cost-share or easement programs such as the US Department of Agriculture Farm Bill and the USFWS Partners for Fish and Wildlife Programs. LAP also worked with various State, Federal, academic and other conservation organizations to assist private landowners. While private landowners represent the majority assisted by LAP, public conservation land managers including the US Department of Defense, water management districts and county governments received assistance with development or review of management plans for their conservation lands.

LAP participated in seven festivals, 16 workshops and provided 10 presentations on internal programs, prescribed fire, invasive plants, hurricane recovery, multi-use management and best management practices. Staff also provided technical assistance to private landowners on or secured funding for management actions conducted on 38,897 acres statewide. These actions included prescribed fire, tree planting, invasive plant and herbaceous weed control, rotational grazing, forest stand improvement and upland wildlife habitat management. In total, LAP delivered 1,234 assists to 599 landowners on 265,840 acres. For more information, see <https://myfwc.com/conservation/special-initiatives/lap/>.

*CENTER FOR BIOSTATISTICS AND MODELING* - FWRI's Center for Biostatistics and Modeling provided statistical and data management support for numerous projects focused on listed species. Staff performed population trend analyses, estimated species occurrence, examined human-animal interactions and prepared and developed monitoring plans and databases for the following species:

- American Alligators *Alligator mississippiensis*
- American Crocodiles *Crocodylus acutus*
- American Oystercatcher *Haematopus lexandri*
- Beach Mice *Peromyscus polionotus* sp.
- Black Rail *Laterallus jamaicensis*
- Black Skimmer *Rynchops niger*
- Chipola slabshell *Elliptio chipolaensis*
- Elkhorn coral *Acropora palmate*
- Fat threeridge *Amblema neislerii*
- Florida black bear *Ursus americanus floridanus*
- Florida bonneted bat *Eumpos floridanus*
- Florida burrowing owl *Athene cunicularia*
- Florida grasshopper sparrow *Ammodramus svannarum floridanus*
- Florida Panther *Puma concolor coryi*
- Florida Manatee *Trichechus manatus latirostris*



- Florida Sandhill Crane *Grus canadensis pratensis*
- Florida Scrub jay *Aphelocoma coerulescens*
- Florida Scrub lizard *Sceloporus woodi*
- Fuzzy pigtoe *Pleurobema strodeanum*
- Gopher Frog *Rana capito aesopus*
- Gopher Tortoise *Gopherus polyphemus*
- Gray bat *Myotis grisescens*
- Green sea turtle *Chelonia mydas*
- Gulf moccasinshell *Medionidus penicillatus*
- Gulf sturgeon *Acipenser oxyrhynchus desotoi*
- Harlequin Darter *Etheostoma histrio*
- Hawksbill sea turtle *Eretmochelys imbricata*
- Kemp's Ridley Sea Turtle *Lepidochelys kempii*
- Least Tern *Sternula antillarum*
- Leatherback sea turtle *Dermochelys coriacea*
- Little Blue Heron *Egretta caerulea*
- Loggerhead Turtle *Caretta caretta*
- Ochlockonee moccasinshell *Medionidus simpsonianus*
- Osprey *Pandion haliaetus*
- Oval pigtoe *Pleurobema pyriforme*
- Piping Plover *Charadrius melodus*
- Pine Barrens Treefrog *Hyla andersonii*
- Purple bankclimber *Elliptoideus sloatianus*
- Reddish Egret *Egretta rufescens*
- Roseate Spoonbill *Ajaja ajaja*
- Smalltooth Sawfish *Pristis alexandri*
- Snowy Plover *Charadrius alexandrinus*
- Southern kidneyshell *Ptychobranhus jonesi*
- Southern sandshell *Hamiota australis*
- Suwannee Moccasinshell *Medionidus walkeri*
- Tricolored Heron *Egretta tricolor*
- White-crowned pigeon *Patagioenas leucocephala*
- Wood stork *Mycteria americana*
- Worthington's Marsh Wren *Cistothorus palustris*



## *Critical Wildlife Areas*

Critical Wildlife Areas (CWA) are established by the Commission to protect concentrations of wildlife from human disturbance during essential life activities, such as breeding, roosting and migratory stopover. FWC evaluates the need for potential CWAs, produces or revises establishment orders and coordinates management and monitoring activities with multiple partners including other State agencies, local governments and nongovernmental organizations. There are 32 CWAs statewide and all were monitored in FY 2018-19 (Exhibit 21).

In FY 2018-19, in-water markers were installed at five CWAs, which were funded by the “Conserve Wildlife” specialty license plate fund. The total peak nest count for CWAs supporting nesting birds was 24,613, an increase from the previous year. Brown pelican and white ibis nesting was especially successful. Total nest counts for imperiled birds was 1,870, a decrease from the previous year. Staff use various methods to identify factors impeding nesting, including cameras or traps to identify predators and implement predator management protocols. Habitat management is conducted at each CWA outside the breeding season, including vegetation management, trash removal and storm debris cleanup.

Six site-specific educational panels were designed and installed at boat ramps and kayak launch points near CWAs, with funding provided by the Campbell Family and the Fish & Wildlife Foundation of Florida. News releases about marker installations and closure periods were issued in Collier, Volusia and Nassau Counties, and educational handouts were developed and distributed in Lee, Nassau and Sarasota Counties. Staff participated in a successful Facebook Live event at Fort George Inlet CWA (Duval County) to highlight the importance of this site for colonial beach-nesting birds. Staff work closely with FWC Law Enforcement Officers to provide training and coordinate patrol needs and priorities. Staff also provide presentations to recruits at the Training Academy and to participants in Officer Specialist Training.



**Exhibit 21.** Critical Wildlife Areas (CWA) monitored in FY 2018-19. Listed species are bolded, and nest numbers are listed in the same order as the species.

CWA by Region	County	Closure Period	Breeding Species	Nests <sup>1</sup>
<b>NORTHWEST</b>				
Tyndall <sup>2</sup>	Bay	Year-round	<b>Black skimmer, least tern, snowy plover, American oystercatcher</b> , gull-billed tern, Wilson's plover, willet	<b>10, 122, 19, 1, 3,</b> 18, 2
Flag Island <sup>2</sup>	Franklin	Year-round	<b>Black skimmer, American oystercatcher</b> , gull-billed tern	<b>47, 2, 3</b>
St. George Causeway	Franklin	1 Mar – 30 Sept	<b>Black skimmer, American oystercatcher</b> , brown pelican, Caspian tern, gull-billed tern, royal tern, sandwich tern, sooty tern, laughing gull	<b>60, 4, 737, 85, 6,</b> 1907, 665, 1, 560
Lanark Reef <sup>2</sup>	Franklin	Year-round	<b>Black skimmer, American oystercatcher</b> , brown pelican, gull-billed tern, laughing gull, willet	<b>44, 9, 450, 16, 200,</b> 1
Alligator Point	Franklin	15 Feb – 31 Aug	<b>Black skimmer, least tern, American oystercatcher, snowy plover</b> , gull-billed tern, Wilson's plover, willet	<b>12, 41, 3, 2, 1, 6, 2</b>
<b>NORTH CENTRAL</b>				
Amelia Island	Nassau	1 Mar – 1 Sept	<b>Least tern, Wilson's plover, willet</b>	<b>41, 18, 2</b>
Nassau Sound Islands <sup>2</sup>	Duval	Year-round	<b>Black skimmer, least tern, American oystercatcher</b> , gull-billed tern, Wilson's plover, willet	<b>30, 99, 4, 21, 4, 2</b>
Fort George Inlet	Duval	1 May – 31 Aug	<b>American oystercatcher</b> , brown pelican, royal tern, sandwich tern, laughing gull, Wilson's plover	<b>2, 100, 3000, 10,</b> 2900, 3
Withlacoochee Caves	Citrus	15 Apr – 15 Aug; 15 Dec – 15 Mar	Southeastern myotis, tricolored bat	28 bats breeding; 53, 126 wintering
<b>NORTHEAST</b>				
Port Orange	Volusia	1 Jan – 31 Aug	<b>American oystercatcher</b> , brown pelican, great egret	<b>1, 127, 23</b>
Matanzas Inlet	St. Johns	1 Apr – 15 Aug	<i>No nesting this year</i>	<i>N/A</i>
BC49	Brevard	1 Jan – 31 Aug	<b>Wood stork, roseate spoonbill, little blue heron, tricolored heron</b> , brown pelican, great blue heron, great egret, snowy egret, cattle egret, white ibis, anhinga, double-crested cormorant	<b>45, 1, 1, 17, 50, 2,</b> 2, 2, 99, 32, 13, 22
Stick Marsh	Brevard	1 Jan – 31 Aug	<b>Roseate spoonbill, tricolored heron</b> , great egret, snowy egret, cattle egret, anhinga	<b>43, 48, 46, 90, 95,</b> 66
<b>SOUTHWEST</b>				
Alafia Banks	Hillsborough	Year-round	<b>Roseate spoonbill, reddish egret, little blue heron, tricolored heron, American oystercatcher</b> , brown pelican, great blue heron, great egret, cattle egret, white ibis, glossy ibis, black-crowned night heron, yellow-crowned night heron, double-crested cormorant	<b>190, 2, 15, 40, 3,</b> 579, 30, 55, 15, 10, 8500, 110, 30, 30, 44
Dot Dash Dit	Manatee	1 Jan – 31 Aug	<b>Wood stork, roseate spoonbill, little blue heron, tricolored heron</b> , great blue heron, great egret, snowy egret, cattle egret, black-crowned night heron, yellow-crowned night heron, anhinga, double-crested cormorant	<b>124, 16, 3, 15, 28,</b> 53, 10, 45, 6, 1, 13





**Exhibit 21 (continued).** Critical Wildlife Areas (CWA) monitored in FY 2018-19. Listed species are bolded, and nest numbers are listed in the same order as the species.

CWA by Region	County	Closure Period	Breeding Species	Nests <sup>1</sup>
<b>SOUTHWEST</b>				
Roberts Bay	Sarasota	Year-round	<b>Roseate spoonbill, reddish egret, little blue heron, tricolored heron,</b> brown pelican, great blue heron, great egret, snowy egret, black-crowned night heron, anhinga, double-crested cormorant	7, 1, 1, 2, 71, 60, 126, 3, 4, 1, 36
Myakka River	Sarasota	1 Jan – 31 Aug	<b>Wood stork,</b> great blue heron, great egret, anhinga	97, 2, 31, 12
Broken Islands	Lee	1 Mar – 31 Aug	<b>Reddish egret, little blue heron, tricolored heron,</b> brown pelican, great blue heron, snowy egret, white ibis, black-crowned night heron, anhinga, double-crested cormorant	5, 4, 16, 155, 2, 3, 42, 1, 4, 102
Hemp Key	Lee	Year-round	<b>Reddish egret, tricolored heron,</b> brown pelican, great blue heron, great egret, black-crowned night heron, double-crested cormorant	2, 1, 146, 9, 13, 2, 160
Matanzas Pass Island	Lee	Year-round	<b>Reddish egret, little blue heron, tricolored heron,</b> brown pelican, great blue heron, great egret, snowy egret, black-crowned heron, yellow-crowned heron, double-crested cormorant	8, 5, 28, 100, 13, 5, 3, 1, 1, 14
Coconut Point	Lee	Year-round	<b>Roseate spoonbill, little blue heron, tricolored heron,</b> brown pelican, great blue heron, great egret, snowy egret, anhinga, double-crested cormorant	2, 2, 2, 69, 19, 7, 1, 16
Big Carlos Pass	Lee	Year-round	<b>Reddish egret, tricolored heron,</b> brown pelican, great egret, snowy egret, black-crowned heron, double-crested cormorant	2, 17, 58, 20, 7, 2, 3
Little Estero Island	Lee	1 Apr – 31 Aug	<b>Least tern, Wilson's plover, killdeer</b>	10, 14, 1
<b>SOUTH</b>				
Bird Island	Martin	Year-round	<b>Wood stork, roseate spoonbill, tricolored heron, American oystercatcher,</b> brown pelican, great blue heron, great egret, double-crested cormorant	11, 2, 1, 1, 40, 1, 4, 10
Deerfield Island	Broward	Year-round	<b>Gopher tortoise</b>	22 individuals
Bill Sadowski <sup>2</sup>	Dade	Year-round	Supports foraging and roosting shorebirds and wading birds	~1000 individuals
Rookery Islands	Collier	Year-round	Great egret	13
Caxambas Pass	Collier	1 Apr – 31 Aug	<i>No nesting this year</i>	N/A
Big Marco Pass <sup>2</sup>	Collier	Year-round	<b>Least tern, black skimmer, Wilson's plover</b>	2, 340, 15
ABC Islands	Collier	Year-round	<b>Reddish egret, little blue heron, tricolored heron,</b> brown pelican, great egret, snowy egret, cattle egret, anhinga, double-crested cormorant	2, 1, 9, 117, 12, 2,83, 11, 1, 1, 1, 28
Second Chance	Collier	1 Mar – 31 Aug	<b>Least tern, black skimmer, Wilson's plover</b>	150, 18, 6
Pelican Shoal	Monroe	1 Apr – 31 Aug	<b>Roseate tern</b>	50

<sup>1</sup> Count or estimate of peak nest numbers, unless otherwise noted, per breeding species at each site during the closure period in FY 2018-19.

<sup>2</sup> Site also supports migrating and wintering species, such as the piping plover and red knot (both Federally-designated Threatened).



## Law Enforcement

FWC's Division of Law Enforcement continued enforcement activities to protect listed species in FY 2018-19, including:

- Over 8,300 patrol hours focused on protecting panthers, their prey and providing public safety. Continued partnership with other governmental and citizen groups concerning panthers.
- Multi-agency task force enforcing the Key deer speed zone on Big Pine Key (Monroe County).
- Patrol efforts focusing on marine turtle nesting areas to reduce nest destruction and take.
- Patrol efforts to reduce nest disturbance and take at shorebird and seabird nesting areas.
- 671 vessel patrol hours focused on turtle excluder device enforcement resulting in 98 inspections and 41 documented violations.
- Internet Crimes Unit investigations targeting unlawful sale and possession of protected species.
- 76,160 water patrol hours focused on manatee enforcement resulting in 4,514 citations and 2,110 warnings. Enforcement also included camera surveillance technology.
- 46 citations and 92 warnings issued involving listed species separate from manatee citations.
- Assisted with increasing public awareness of protected and listed species.
- 280 deployments resulting in 48 citations issued by five investigative teams each consisting of an investigator and a K-9 team targeting illegal shipments of fish and wildlife arriving in and departing from Florida's ports and common carrier facilities.
- A draft rule prohibiting the use, placement, possession and transport of bird traps without a permit, unless otherwise exempted, was presented in February 2019. After receiving public comments and Commissioner review, the final rule will be presented in July 2019.

## Permitting

FWC provides science-based and regulatory guidance to issue permits that ensures requested wildlife related activities would result in a net conservation benefit or prove to not be detrimental for the species. In FY 2018-19, the FWC issued the following permits: 152 intentional take, 143 incidental take, 3 special purpose, 10 non-Florida resident falconry, 6 peregrine falconry and 3 critical wildlife area entry in FY 2018-19. In FY 2018-19, FWC provided governmental agencies, environmental consultants and regional and local regulatory authorities with assistance regarding projects impacting listed species on managed Federal, State and private lands, and lands slated for development. These entities and



others used this assistance when applying for and/or reviewing scientific collecting, captive possession, wildlife relocation and incidental take permits. For more information on species guidelines, policies and permit applications, see <http://myfwc.com/license/wildlife/protected-wildlife/>.

Assistance for developers, environmental consultants and regulatory agencies usually consisted of any combination of the following: comments on species management plans submitted for review; development of management plans or guidelines; and site visits to determine management needs. Generally, the public was provided information regarding listed species such as life history and other biological information; locality and occurrence data; listing status; and solutions to nuisance situations. Some permits require permit holders to carry out an approved site or species-specific management plan, while others require permit holders to follow FWC approved species guidelines, policies, or management plans. Scientific permits are generally conditioned on an approved research proposal.

### *Wildlife Conservation, Prioritization, and Recovery*

The FWC takes a pro-active, science-based approach to evaluate management needs of at-risk species on FWC-managed lands through the Wildlife Conservation Prioritization and Recovery Program. FWC integrates landscape level assessments with area-specific and expert knowledge to produce species management strategies. Strategies are particular to each Wildlife Management Area (WMA) and Wildlife and Environmental Area (WEA) and contain measurable objectives for managing species and their habitat, actions needed to achieve the objectives and provisions for monitoring to verify progress towards meeting the objectives. In FY 2018-19, five workshops were completed for Aucilla WMA (Jefferson County), Half Moon WMA (Sumter County), Salt Lake WMA (Putnam County), Chassahowitzka WMA (Hernando/Citrus County) and Jones/Hungryland WEA (Martin County). Strategies were completed for Aucilla WMA, Half Moon WMA and Salt Lake WMA. Strategies for Chassahowitzka WMA and Jones/Hungryland WEA will be complete in FY 2019-20. FWC plans to update Strategies on a regular basis in conjunction with required updates to each area's management plan.



## APPENDIX A FLORIDA'S LISTED WILDLIFE SPECIES AS OF JUNE 30, 2019

Exhibits A-1 through A-9 contain all of Florida's listed species as of June 30, 2019, including their status: Federally-designated Endangered (FE), Federally-designated Threatened (FT), Federally-designated Threatened Due to Similarity of Appearance [FT(S/A)], Federally-designated Nonessential Experimental species (FXN), State-designated Threatened (ST), or Species of Special Concern (SSC).

### EXHIBIT A-1: Listed Mammals in Florida as of June 30, 2019.

Common Name	Scientific Name	Status
Anastasia Island beach mouse	<i>Peromyscus polionotus phasma</i>	FE
Big Cypress fox squirrel	<i>Sciurus niger avicennia</i>	ST
Choctawhatchee beach mouse	<i>Peromyscus polionotus allophrys</i>	FE
Everglades mink	<i>Neovison vison evergladensis</i>	ST
Finback whale	<i>Balaenoptera physalus</i>	FE <sup>1</sup>
Florida bonneted bat	<i>Eumpos floridanus</i>	FE
Florida panther	<i>Puma concolor coryi</i>	FE
Florida salt marsh vole	<i>Microtus pennsylvanicus dukecampbelli</i>	FE
Gray bat	<i>Myotis grisescens</i>	FE
Gray wolf	<i>Canis lupus</i>	FE <sup>2</sup>
Humpback whale	<i>Megaptera novaeangliae</i>	FE <sup>1</sup>
Indiana bat	<i>Myotis sodalist</i>	FE
Key deer	<i>Odocoileus virginianus clavium</i>	FE
Key Largo cotton mouse	<i>Peromyscus gossypinus allapaticola</i>	FE
Key Largo woodrat	<i>Neotoma floridana smalli</i>	FE
Lower Keys rabbit	<i>Sylvilagus palustris hefneri</i>	FE
North Atlantic right whale	<i>Eubalaena glacialis</i>	FE <sup>1</sup>
Perdido Key beach mouse	<i>Peromyscus polionotus trissyllepsis</i>	FE
Red wolf	<i>Canis rufus</i>	FE
Sanibel Island rice rat	<i>Oryzomys palustris sanibeli</i>	ST
Sei whale	<i>Balaenoptera borealis</i>	FE <sup>1</sup>
Sherman's short-tailed shrew	<i>Blarina shermani</i>	ST
Silver rice rat	<i>Oryzomys palustris natator</i>	FE <sup>3</sup>
Southeastern beach mouse	<i>Peromyscus polionotus niveiventris</i>	FT
Sperm whale	<i>Physeter catodon [=macrocephalus]</i>	FE <sup>1</sup>
St. Andrew's beach mouse	<i>Peromyscus polionotus peninsularis</i>	FE
West Indian manatee (Florida manatee)	<i>Trichechus manatus (Trichechus manatus latirostris)</i>	FT

<sup>1</sup> A species for which the FWC does not have constitutional authority.

<sup>2</sup> Not documented in Florida.

<sup>3</sup> Lower keys population only.



**EXHIBIT A-2: Listed Birds in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
American osytercatcher	<i>Haematopus palliatus</i>	ST
Audobon's crested caracara	<i>Polyborus plancus audubonii</i>	FT
Bachman's wood warbler	<i>Vermivora bachmanii</i>	FE
Black skimmer	<i>Rynchops niger</i>	ST
Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>	FE
Eskimo curlew	<i>Numenius borealis</i>	FE
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	FE
Florida burrowing owl	<i>Athene cunicularia floridana</i>	ST
Florida grasshopper sparrow	<i>Ammodramus svannarum floridanus</i>	FE
Florida sandhill crane	<i>Antigone canadensis pratensis</i>	ST
Florida scrub-jay	<i>Aphelocoma coerulescens</i>	FT
Ivory-billed woodpecker	<i>Campephilus principalis</i>	FE
Kirtland's warbler (Kirkland's wood warbler)	<i>Setophaga kirtlandii (Dendroica kirtlandii)</i>	FE
Least tern	<i>Sternula antillarum</i>	ST
Little blue heron	<i>Egretta caerulea</i>	ST
Marian's marsh wren	<i>Cistothorus palustris marianae</i>	ST
Piping plover	<i>Charadrius melodus</i>	FT
Red-cockaded woodpecker	<i>Picoides borealis</i>	FE
Reddish egret	<i>Egretta rufescens</i>	ST
Roseate spoonbill	<i>Platalea ajaja</i>	ST
Roseate tern	<i>Sterna dougallii dougallii</i>	FT
Rufa red knot	<i>Calidris canutus rufa</i>	FT
Scott's seaside sparrow	<i>Ammodramus maritimus peninsulae</i>	ST
Snowy plover	<i>Charadrius nivosus</i>	ST
Southeastern American kestrel	<i>Falco sparverius paulus</i>	ST
Tricolored heron	<i>Egretta tricolor</i>	ST
Wakulla seaside sparrow	<i>Ammodramus maritimus juncicola</i>	ST
White-crowned pigeon	<i>Patagioenas leucocephala</i>	ST
Whooping crane	<i>Grus americana</i>	FXN
Worthington's marsh wren	<i>Cistothorus palustris griseus</i>	ST
Wood stork	<i>Mycteria americana</i>	FT



**EXHIBIT A-3: Listed Amphibians in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
Florida bog frog	<i>Lithobates okaloosae</i>	ST
Frosted flatwoods salamander	<i>Ambystoma cingulatum</i>	FT
Georgia blind salamander	<i>Eurycea wallacei</i>	ST
Reticulated flatwoods salamander	<i>Ambystoma bishopi</i>	FE

**EXHIBIT A-4: Listed Reptiles in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
American alligator	<i>Alligator mississippiensis</i>	FT (S/A)
American crocodile	<i>Crocodylus acutus</i>	FT
Atlantic salt marsh snake	<i>Nerodia clarkii taeniata</i>	FT
Barbour's map turtle	<i>Graptemys barbouri</i>	ST
Bluetail mole skink	<i>Plestiodon egregius lividus</i>	FT
Eastern indigo snake	<i>Drymarchon couperi</i>	FT
Florida brown snake	<i>Storeria victa</i>	ST
Florida Keys mole skink	<i>Plestiodon egregius egregious</i>	ST
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	ST
Gopher tortoise	<i>Gopherus polyphemus</i>	ST
Green sea turtle	<i>Chelonia mydas</i>	FT <sup>1</sup>
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	FE <sup>1</sup>
Kemp's Ridley sea turtle	<i>Lepidochelys kempii</i>	FE <sup>1</sup>
Key ringneck snake	<i>Diadophis punctatus acricus</i>	ST
Leatherback sea turtle	<i>Dermochelys coriacea</i>	FE <sup>1</sup>
Loggerhead sea turtle	<i>Caretta</i>	FT <sup>1</sup>
Rim rock crowned snake	<i>Tantilla oolitica</i>	ST
Sand skink	<i>Plestiodon reynoldsi</i>	FT
Short-tailed snake	<i>Lampropeltis extenuatua</i>	ST
Suwannee Alligator Snapping Turtle	<i>Macrochelys suwanniensis</i>	ST

<sup>1</sup> A species for which the FWC does not have constitutional authority.



**EXHIBIT A-5: Listed Fish in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	FE
Blackmouth shiner	<i>Notropis melanostomus</i>	ST
Bluenose shiner	<i>Pteronotropis welaka</i>	ST
Crystal darter	<i>Crystallaria asprella</i>	ST
Giant Manta Ray	<i>Manta birostris</i>	FT
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	FT <sup>1</sup>
Key silverside	<i>Menidia conchorum</i>	ST
Nassau Grouper	<i>Epinephelus striatus</i>	FT
Okaloosa darter	<i>Etheostoma okalossae</i>	FT
Saltmarsh topminnow	<i>Fundulus jenkinsi</i>	ST
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	FE <sup>1</sup>
Smalltooth sawfish	<i>Pristis pectinata</i>	FE
Southern tessellated darter	<i>Etheostoma olmstedii maculaticeps</i>	ST

<sup>1</sup> A species for which the FWC does not have constitutional authority.

**EXHIBIT A-6: Listed Corals in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
Boulder star coral	<i>Orbicella franksi</i>	FT
Elkhorn coral	<i>Acropora palmata</i>	FT
Lobed star coral	<i>Orbicella annularis</i>	FT
Mountainous star coral	<i>Orbicella faveolata</i>	FT
Pillar coral	<i>Dendrogyra cylindricus</i>	FT
Rough cactus coral	<i>Mycetophyllia ferox</i>	FT
Staghorn coral	<i>Acropora cervicornis</i>	FT

**EXHIBIT A-7: Listed Crustaceans in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
Black Creek crayfish	<i>Procambarus pictus</i>	ST
Panama City crayfish	<i>Procambarus econfinae</i>	SSC
Santa Fe [cave] crayfish	<i>Procambarus erythropros</i>	ST
Squirrel Chimney Cave shrimp	<i>Palaemonetes cummingi</i>	FT



**EXHIBIT A-8: Listed Insects in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
American burying beetle	<i>Nicrophorus americanus</i>	FE
Bartram's scrub-haristreak	<i>Strymon acis bartrami</i>	FE
Cassius blue butterfly	<i>Leptotes cassius theonus</i>	FT (S/A)
Ceraunus blue butterfly	<i>Hemiargus ceraunus antibubastus</i>	FT (S/A)
Florida leafwing butterfly	<i>Anaea troglodyta floridalis</i>	FE
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>	FE
Miami tiger beetle	<i>Cicindelidia floridana</i>	FE
Nickerbean blue butterfly	<i>Cyclargus ammon</i>	FT (S/A)
Schaus swallowtail butterfly	<i>Heraclides aristodemus ponceanus</i>	FE

**EXHIBIT A-9: Listed Mollusks in Florida as of June 30, 2019.**

Common Name	Scientific Name	Status
Chipola slabshell (mussel)	<i>Elliptio chipolaensis</i>	FT
Choctaw bean (mussel)	<i>Villosa choctawensis</i>	FE
Fat threeridge (mussel)	<i>Amblema neislerii</i>	FE
Fuzzy pigtoe (mussel)	<i>Pleurobema strodeanum</i>	FT
Gulf moccasinshell (mussel)	<i>Medionidus penicillatus</i>	FE
Narrow pigtoe (mussel)	<i>Fusconaia escambia</i>	FT
Ochlockonee moccasinshell (mussel)	<i>Medionidus simpsonianus</i>	FE
Oval pigtoe (mussel)	<i>Pleurobema pyriforme</i>	FE
Purple bankclimber (mussel)	<i>Elliptoideus sloatianus</i>	FT
Round ebonyshell (mussel)	<i>Fusconaia rotulata</i>	FE
Shinyrayed pocketbook (mussel)	<i>Lampsilis subangulata</i>	FE
Southern kidneyshell (mussel)	<i>Ptychobranthus jonesi</i>	FE
Southern sandshell (mussel)	<i>Hamiota australis</i>	FT
Stock Island tree snail	<i>Orthalicus reses [not incl. nesodryas]</i>	FT
Suwannee moccasinshell (mussel)	<i>Medionidus walkeri</i>	FT
Tapered pigtoe (mussel)	<i>Fusconaia burki</i>	FT





## APPENDIX B

### LIST OF ACRONYMS USED IN THIS REPORT

Acronym	Term
ABRP	Apalachicola Bluffs and Ravines Preserve
AFB	Air Force Base
AHRE	Aquatic Habitat Restoration and Enhancement program
ANF	Apalachicola National Forest
BCFS	Big Cypress Fox Squirrel
BCNP	Big Cypress National Preserve
CFR	Code of Federal Regulations
CWA	Critical Wildlife Area
CWCI	Coastal Wildlife Conservation Initiative
DNA	Deoxyribonucleic acid
DOD	Department of Defense
EISRC	Eastern Indigo Snake Reintroduction Committee
EDTM	Efficient Transportation Decision Making
FDEP	Florida Department of Environmental Protection
FSA	Florida Shorebird Alliance
FY	Fiscal Year
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GIS	Geographic Information System
GPS	Global Positioning Satellite
GTTAG	Gopher Tortoise Technical Assistance Group
HMAF	Habitat Management Assistance Funding
ISMP	Imperiled Species Management Plan
ITP	Incidental Take Permit
INBS	Index Nesting Beach Survey
LAP	Landowner Assistance Program
LTBMP	Long Term Bat Monitoring Program
MPP	Manatee Protection Plan
MOA	Memorandum of Agreement
NASA	National Aeronautics and Space Administration
NOAA – Fisheries	National Oceanic and Atmospheric Administration Marine Fisheries Service
NWR	National Wildlife Refuge
PCC	Panama City crayfish
PIT	Passive Integrated Transponder
PVC	Polyvinyl chloride
RCW	Red – cockaded Woodpecker
SIRR	Sanibel Island Rice Rat
SNBS	Statewide Nesting Beach Survey



## APPENDIX B (*continued*)

Acronym	Term
SNP	Single Nucleotide Polymorphism
SSA	Species Status Assessment
STEM	Science Technology Engineering Math
UF/IFAS	University of Florida Institute of Food and Agricultural Science
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WNS	White Nose Syndrome
WEA	Wildlife and Environmental Area
WMA	Wildlife Management Area



## APPENDIX C

### FWC'S FISH AND WILDLIFE RESEARCH INSTITUTE'S PUBLICATIONS DURING FY 2018-19

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FWC strives to produce high-quality publications and has been doing so since the Florida State Board of Conservation's first publication in 1948. Since then, over 1,000 publications have documented FWRI findings. These contributions have appeared in various scientific journals or as publications of FWRI. While supplies last, FWRI sends printed single copies, at no cost, to individuals who request them. Many publications are available at <http://myfwc.com/research/publications/scientific/new/>.

- Amaya O., R. Quintanilla, B. A. Stacy, M-Y. D. Bottein, L. Flewelling, R. Hardy, C. Dueñas, G. Ruiz. 2018. Large-scale sea turtle mortality events in El Salvador attributed to paralytic shellfish toxin-producing algae blooms. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2018.00411>
- Bakenhaster, M. D., S. A. Bullard, S. S. Curran, D. C. Kritsky, E. H. Leone, L. K. Partridge, C. F. Ruiz, R. M. Scharer, and G. R. Poulakis. 2018. Parasite component community of smalltooth sawfish off Florida: diversity, conservation concerns, and research applications. *Endangered Species Research* 35:47-58. <https://doi.org/10.3354/esr00863>
- Bradley J. U., J. Martin, R. J. Fletcher Jr., M. Bonneau, H. H. Edwards, T. A. Gowan, ... C. J. Deustch (2019). Integrating encounter theory with decision analysis to evaluate collision risk and determine optimal protection zones for wildlife. *Journal of Applied Ecology* 56:5 1050-1062. <https://doi.org/10.1111/1365-2664.13290>
- Brame, A. B., T. R. Wiley, J. K. Carlson, S. V. Fordham, R. D. Grubbs, J. Osborne, R. M. Scharer, D. M. Bethea, and G. R. Poulakis. 2019. Biology, ecology, and status of the smalltooth sawfish *Pristis pectinata* in the USA. *Endangered Species Research* 39:9-23. <https://doi.org/10.3354/esr00952>
- Casale P., S. A. Ceriani. 2019. Satellite surveys: a novel approach for assessing sea turtle nesting activity and distribution. *Marine Biology*. doi: 10.1007/s00227-019-3494-4.
- Caudill, G., Onorato, D. P., Cunningham, M. W., Caudill, D., Leone, E. H., Smith, L. M., & Jansen, D. (2019). Temporal trends in Florida panther food habits. *Human-Wildlife Interactions*, 13(1), 13.
- Chabot R. M., S. A. Ceriani, J. A. Seminoff, K. A. Mills, K. L. Mansfield. 2019. Characterizing stable isotope relationships between green turtle (*Chelonia mydas*) skin and unhatched eggs. *Rapid Communications in Mass Spectrometry* 33(15):1277–1285. <https://doi.org/10.1002/rcm.8467>.
- Crum N., T. Gowan, a. Krzystan, J. Martin (2019). Quantifying risk of whale-vessel collisions across space, time, and management policies. *Ecosphere* 10:4 e02713 <https://doi.org/10.1002/ecs2.2713>
- Enge, K. M., B. Tornwall, W. Kruger, and R. E. Dews. 2018. *Drymarchon couperi* (eastern indigo snake). Mortality / entanglement in plastic mesh. *Herpetological Review* 49:751–752.
- Foley A. M., B. A. Stacy, P. Schueller, L. J. Flewelling, B. Schroeder, K. Minch, D. A. Fauquier, J. J. Foote, C. A. Manire, K. E. Atwood, A. A. Granholm, J. H. Landsberg. 2019. Assessing *Karenia brevis* red tide as a mortality factor of sea turtles in Florida, USA. *Diseases of Aquatic Organisms* 132(109):109–124. <https://doi.org/10.3354/dao03308>



- Foley A. M., B. A. Stacy, R. F. Hardy, C. P. Shea, K. E. Minch, B. A. Schroeder. 2019. Characterizing watercraft-related mortality of sea turtles in Florida. *Journal of Wildlife Management* 83(5):1057–1072. doi: 10.1002/jwmg.21665.
- Fuentes M. M. P. B., A. J. Gillis, S. A. Ceriani, T. L. Guttridge, M. P. M. Van Zinnicq Bergmann, M. Smukall, S. H. Gruber, N. Wildermann. 2019. Informing marine protected areas in Bimini, Bahamas by considering hotspots for green turtles (*Chelonia mydas*). *Biodiversity and Conservation* 28:197–211. doi: 10.1007/s10531-018-1647
- Gillis A. J., S. A. Ceriani, J. A. Seminoff, M. M. P. B. Fuentes. 2018. Foraging ecology and diet selection of juvenile green turtles in the Bahamas: insights from stable isotope analysis and prey mapping. *Marine Ecology Progress Series* 599:225–238 doi 10.3354/meps12635
- Greene, D. U., Oddy, D. M., Gore, J. A., Gillikin, M. N., Evans, E., Gann, S. L., & Leone, E. H. (2018). Differentiating Footprints of Sympatric Rodents in Coastal Dune Communities: Implications for Imperiled Beach Mice. *Journal of Fish and Wildlife Management*, 9(2), 593-601. DOI: 10.3996/062018-JFWM-055
- Gowan T.A., J. G. Ortega-Ortiz, J.A. Hostetler, P.K. Hamilton, A. R. Knowlton, K. A. Jackson, R. C. ... & P. J. Naessig (2019). Temporal and Demographic variation in partial migration of the North Atlantic right whale. *Scientific Reports* 9:353 DOI: 10.1068/s41598-018-36723-3
- Hardy, R. F., C. M. Hu, B. Witherington, B. Lapointe, A. Meylan, E. Peebles, L. Meirose, S. Hiram. 2018. Characterizing a sea turtle developmental habitat using Landsat observations of surface-pelagic drift communities within the eastern Gulf of Mexico. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 11(10):3646–3659.
- Harvey J. W., K. E. Harr, D. Murphy, M. T. Walsh, M. de Witt, C. J. Deutsch, R. K. Bonde (2018). Serum proteins in healthy and diseased Florida manatees (*Trichechus manatus latirostris*) *Comparative Clinical Pathology* 27:6 1707-1716 <https://doi.org/10.1007/s00580>
- Hostetler J.A., H. M. Edwards, J. Martin, P. Schueller (2018). Updated statewide abundance estimates for the Florida manatee. Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute Technical Report No. 23.
- Kryzstan A. M., T. A. Gowan, L. W. Kendall, J. Martin, J. G. Ortega-Ortiz, K. Jackson, ... & C. R. Taylor (2018). Characterizing residence patterns of North Atlantic right whales in the southeastern USA with a multistate open robust design model. *Endangered Species Research* 36: 279-295 <https://doi.org/10.3354/esr00902>
- Lonati, G. L., Howell, A. R., Hostetler, J. A., Schueller, P., de Wit, M., Bassett, B. L., ... & Ward-Geiger, L. I. (2019). Accuracy, precision, and error in age estimation of Florida manatees using growth layer groups in earbones. *Journal of Mammalogy*.
- Martony M, Hernandez JA, de Wit M, St Leger J, Erlacher-Reid C, Vandenberg J, Stacy NI (2019) Clinicopathological prognostic indicators of survival and pathological findings in cold-stressed Florida manatees *Trichechus manatus latirostris*. *Diseases of Aquatic Organisms* 132:85-97. <https://doi.org/10.3354/dao03306>
- Montero N, S. A. Ceriani, K. Graham, M. M. P. B. Fuentes. 2018. Influences of the local climate on loggerhead hatchling production in north Florida: implications from climate change. *Frontiers in Marine Science* 5:262. doi: 10.3389/fmars.2018.00262
- Poulakis, G. R. and R. D. Grubbs. 2019. Biology and ecology of sawfishes: global status of research and future outlook. *Endangered Species Research* 39:77-90. <https://doi.org/10.3354/esr00955>



- Prohaska, B. K., D. M. Bethea, G. R. Poulakis, R. M. Scharer, R. Knotek, J. K. Carlson, and R. D. Grubbs. 2018. Physiological stress in the smalltooth sawfish: effects of ontogeny, capture method, and habitat quality. *Endangered Species Research* 36:121-135. <https://doi.org/10.3354/esr00892>
- Shamblin B. M., B. E. Witherington, S. Hirama, R. F. Hardy, C. J. Nairn. 2018. Mixed stock analyses indicate population-scale connectivity effects of active dispersal by surface-pelagic green turtles. *Marine Ecology Progress Series* 601:215–226. DOI: 10.3354/meps12693
- Stacy, B. A., A. M. Foley, T. M. Work, S. K. Hargrove, A. M. Lauritsen, B. A. Schroeder, J. L. Keene. 2018. Report of the Technical Expert Workshop: Developing Guidelines for Field Response, Captive Management, and Rehabilitation of Sea Turtles with Fibropapillomatosis. U.S. Department of Commerce, National Marine Fisheries Service, NOAA Technical Memorandum NMFS OPR-60, 56 p.
- Von Holle, B, J. L. Irish, A. Spivy, J. F. Weishampel, A. Meylan, M. H. Godfrey, M. Dodd, S. H. Schweitzer, T. Keyes, F. Sanders, M. K. Chaplin, N. R. Taylor. 2019. Effects of future sea level rise on coastal habitat. *Journal of Wildlife Management* 83(3):694–704. <https://doi.org/10.1002/jwmg.21633>



## APPENDIX D COMMON AND SCIENTIFIC NAMES OF NON-LISTED SPECIES MENTIONED BY COMMON NAME IN THIS REPORT

Common Name	Scientific Name
<b>MAMMALS</b>	
American mink	<i>Neovison vison</i>
Bobcat	<i>Lynx rufus</i>
Coyote	<i>Canis latrans</i>
Eastern gray squirrel	<i>Sciurus carolinensis</i>
Rhesus monkey	<i>Rhesus macaque</i>
Old-field mouse	<i>Peromyscus polionotus</i>
River otter	<i>Lontra canadensis</i>
Short-tailed shrew	<i>Blarina carolinensis peninsulae</i>
Southern flying squirrel	<i>Glaucomys volans</i>
Southern fox squirrel	<i>Sciurus niger</i>
Southeastern myotis	<i>Myotis austroriparius</i>
Tri-colored bat	<i>Peromyotis subflavus</i>
<b>BIRDS</b>	
American flamingo	<i>Phoenicopterus ruber</i>
American white pelican	<i>Pelecanus erythrorhynchos</i>
Anhinga	<i>Anhinga anhinga</i>
Bachman's sparrow	<i>Peucaea aestivalis</i>
Black rail	<i>Laterallus jamaicensis</i>
Black – crowned night heron	<i>Nycticorax nycticorax</i>
Brown pelican	<i>Pelecanus occidentalis</i>
Caspian tern	<i>Hydroprogne caspia</i>
Cattle egret	<i>Bubulcus ibis</i>
Double – crested cormorant	<i>Phalacrocorax auritus</i>
Eastern bluebird	<i>Sialia sialis</i>
Eastern grasshopper sparrow	<i>Ammodramus savannarum pratensis</i>
Eastern screech owl	<i>Megascops asio</i>
Glossy ibis	<i>Plegadis falcinellus</i>
Great blue heron	<i>Ardea herodias</i>
Great crested flycatcher	<i>Myiarchus crinitus</i>
Great egret	<i>Ardea alba</i>
Gull – billed tern	<i>Gelochelidon nilotica</i>
Killdeer	<i>Charadrius vociferus</i>
Laughing gull	<i>Larus atricilla</i>
Louisiana seaside sparrow	<i>Ammodramus maritimus fisheri</i>



Appendix D (continued)

Common Name	Scientific Name
<b>BIRDS</b>	
MacGillivray's seaside sparrow	<i>Ammodramus maritimus macgillivraii</i>
Northern flicker	<i>Colaptes auratus</i>
Red – bellied woodpecker	<i>Melanerpes carolinus</i>
Royal tern	<i>Thalasseus maxima</i>
Sandwich tern	<i>Thalasseus sandwicensis</i>
Savannah sparrow	<i>Passerculus sandwichensis</i>
Snowy egret	<i>Egretta thula</i>
Sooty tern	<i>Onychoprion fuscatus</i>
White ibis	<i>Eudocimus albus</i>
Willet	<i>Tringa semipalmata</i>
Wilson's plover	<i>Charadrius wilsonia</i>
Yellow crowned night heron	<i>Nycticorax violacea</i>
<b>AMPHIBIANS</b>	
Gopher frog	<i>Lithobates capito</i>
Striped newt	<i>Notophthalmus perstriatus</i>
<b>REPTILES</b>	
Florida scrub lizard	<i>Sceloporus woodi</i>
Red rat snake (or red corn sake)	<i>Pantherophis guttatus</i>
Spotted turtle	<i>Clemmys guttata</i>
<b>FISH</b>	
Blacktail shiner	<i>Cyprinella venusta</i>
Blackbanded darter	<i>Percina nigrofasciata</i>
Bluegill	<i>Lepomis macrochirus</i>
Eastern mosquitofish	<i>Gambusia holbrooki</i>
Redbreast Sunfish	<i>Lepomis auratus</i>
Sailfin Shiner	<i>Pteronotropis hypselopterus</i>
Spotted bass	<i>Micropterus punctulatus</i>
<b>CRUSTACEANS</b>	
Alachua light-fleeing cave crayfish	<i>Procambarus lucifugus</i>
Cypress crayfish	<i>Cambarellus blacki</i>
Miami cave crayfish	<i>Procambarus milleri</i>
Ribbon crayfish	<i>Procambarus bivittatus</i>
White-tubercled crayfish	<i>Procambarus spiculifer</i>
<b>PLANTS</b>	
Cabbage palm	<i>Sabal palmetto</i>



## APPENDIX E

### GLOSSARY OF TERMS

<b>Bioacoustics</b> – Sound production, dispersion, and reception in wildlife.
<b>Candidate</b> – Plants and animal species for which the USFWS has sufficient information on the biological status and threats to propose the species as endangered or threatened under the Endangered Species Act, but development of proposed listing is precluded by higher priority listing activities.
<b>Cavity</b> – A hollow or hole occupied by an organism.
<b>Cavity insert</b> – A premade box with a hole built in to mimic natural cavities.
<b>Cluster</b> – The aggregation of cavity trees previously and currently used and defended by a group of woodpeckers.
<b>Coastal Construction Control Line</b> - A Florida Department of Environmental Protection program that regulates structures and activities which can cause beach erosion, destabilize dunes, damage upland properties, and interfere with public access.
<b>Cold-stun</b> - When a sea turtle becomes hypothermic due to water temperatures becoming too cold.
<b>Colony</b> – A distinguishable localized population within a species.
<b>Commensal</b> – A species that has a symbiotic relationship with another species where benefits are experienced by one (i.e. nutrients, shelter, etc.), but the other is unharmed.
<b>Critical Habitat</b> - A legally designated space that is directly or indirectly necessary for the conservation of a Federally-listed species.
<b>Depredation</b> – When wildlife preys upon livestock or pets.
<b>Economic Exclusive Zone</b> - A sea zone extending 200 nautical miles from the coast of a state giving that state special rights over the area regarding exploration and use of marine resources.
<b>Endemic</b> – Restricted or peculiar to a certain area or region.
<b>Extirpation</b> – Cease to exist in a given area.
<b>Federally-designated Endangered Species</b> – Species, subspecies, or isolated populations of species or subspecies that are native to Florida and classified as Endangered under FWC Commission rule by virtue of designation by the U.S. Department of Interior or Commerce as Endangered under the Federal Endangered Species Act.
<b>Federally-designated Threatened Species</b> – Species, subspecies, or isolated populations of species or subspecies that are native to Florida and classified as Threatened under FWC Commission rule by virtue of designation by the U.S. Department of Interior or Commerce as Threatened under the Federal Endangered Species Act.
<b>Fledge</b> – To raise a young bird until it is capable of flight.
<b>Fledged</b> – To leave a nest.
<b>Fledgling</b> – A young bird that has recently developed flight feathers and is capable of flight.
<b>FWC Commissioners</b> – The seven-member board of FWC that meet five times each year to hear staff reports, consider rule proposals, and conduct other FWC Commission business.
<b>Gene Flow</b> - The transfer of genes from one population to another.





## APPENDIX E (continued)

<b>Genetic Diversity</b> - The total number of genetic characteristics in a genetic makeup of a species.
<b>Geographic Information Systems (GIS)</b> – Captures, stores, analyzes, manages, and presents data that is linked to a location.
<b>Habitat</b> – A natural environment where a species lives and grows.
<b>Helper Bird</b> – Usually a previous male offspring of either the breeding male or both breeders. Helpers participate in territory defense, constructing and maintaining nests and cavities, incubating eggs, feeding and brooding nestlings, removing fecal sacs from the cavity, and feeding fledglings.
<b>Hibernate</b> - The dormant state some species take during the winter.
<b>Keystone Species</b> – A species that plays a unique and critical role in the structure of an ecosystem and the way it functions. Without this species, the ecosystem would be dramatically different or cease to exist.
<b>Life History</b> – All changes experienced by a species from birth to death.
<b>Listed Species</b> – Species included on the Florida Endangered and Threatened Species list or the Species of Special Concern list. Prior to November 10, 2010, listed species were species designated as Endangered, Threatened, or Species of Special Concern.
<b>Metamorphosis</b> – Transition from a larval to a terrestrial juvenile stage.
<b>Metapopulation</b> – A group of spatially separated populations of the same species that interact at some level.
<b>Mid-story</b> - The layer of vegetation in a forest between the tallest and smallest trees.
<b>Morphology</b> - The identification, analysis, and description of the physical characteristics of a species.
<b>Necropsy</b> – The examination of a body after death.
<b>Nestling</b> – A young bird that has not abandoned the nest.
<b>Nonessential Experimental Population</b> – A population of a species that is designated under the Endangered Species Act to restore a species outside the species' current range, but within its historical range is not essential to the survival of the species. A population designated as experimental is treated as Federally – designated Threatened regardless of the species' designation elsewhere in its range.
<b>Passive Integrated Transponder (PIT) Tags</b> – a chip placed below the skin to identify individuals.
<b>Pelagic</b> – Deep open ocean water.
<b>Productivity</b> – The ability to produce; fertility.
<b>Recruitment</b> – The addition of individuals into a breeding population through reproduction and/or immigration and attainment of breeding position.
<b>Recruitment Cluster</b> – A cluster of artificial cavities in suitable natural habitat, located close to existing clusters.
<b>Red tide</b> - A higher-than-normal concentration of microscopic plantlike organisms.
<b>Rookery</b> – A colony of breeding animals.
<b>Roosts</b> – A place where species can sleep or reside.

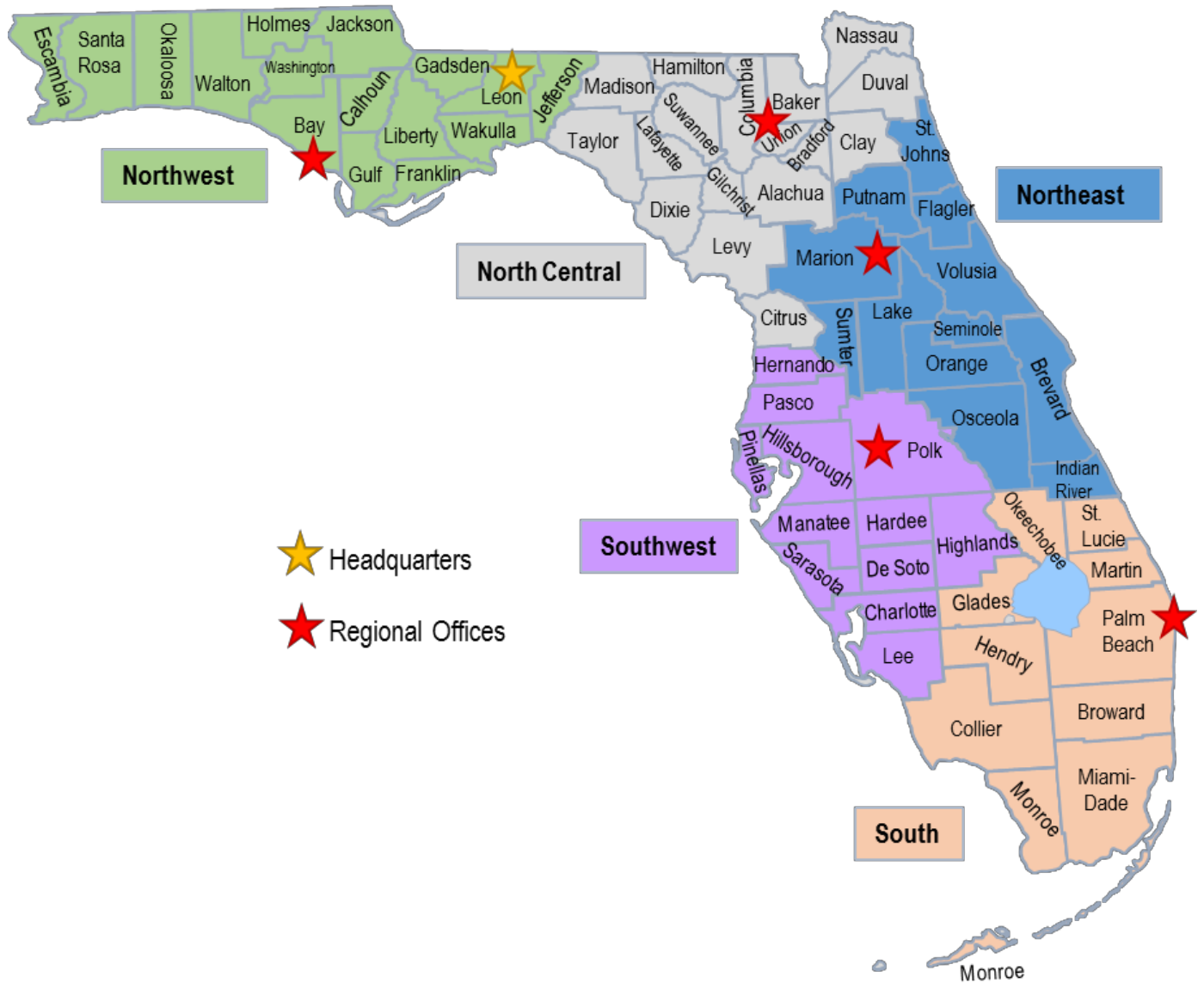


## APPENDIX E (continued)

<b>Single Nucleotide Polymorphism</b> - A variation in a single base pair in a DNA sequence.
<b>Species Status Assessment</b> - An analytical approach developed by the US Fish and Wildlife Service to deliver foundational science for informing all Endangered Species Act decisions. A focused, repeatable, and rigorous scientific assessment.
<b>State-designated Species of Special Concern</b> – As designated by FWC Commissioners, a species, subspecies, or isolated population of a species or subspecies which is facing a moderate risk of extinction or extirpation from Florida in the future.
<b>State-designated Threatened Species</b> – As designated by FWC Commissioners, a species, subspecies, or isolated population of a species or subspecies that are native to Florida and are classified as Threatened due to a reduction in population size, a severely fragmented and/or declined geographic range, a population fewer than 10, 000 mature individuals, a small and/or restricted population, and/or a quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.
<b>Taxonomy</b> – Scientific classification of a species.
<b>Translocation</b> – Movement of an individual from one location to another.
<b>Telemetry</b> – Transmission of data through technology, such as radio collars, from a species to an observer.



## APPENDIX F MAP OF FWC REGIONS



## APPENDIX G MAP OF FWC MANAGED AREAS

