

# Florida Fish and Wildlife Conservation Commission



## Endangered and Threatened Species Management and Conservation Plan

Progress Report  
Fiscal Year 2019-20

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## EXECUTIVE SUMMARY

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This report covers Fiscal Year (FY) 2019-20 and constitutes the 42<sup>nd</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 2021-22, 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 U. S. 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, 2020. 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, 2020.

<b>STATUS DESIGNATION</b>	<b>MAMMALS</b>	<b>BIRDS</b>	<b>AMPHIBIANS</b>	<b>REPTILES</b>	<b>FISH</b>	<b>INVERTEBRATES</b>	<b>TOTAL</b>
Federally designated Endangered (FE)	21(5) <sup>2</sup>	8	1	3(3)	3(1) <sup>1</sup>	14	<b>50(9)</b>
Federally designated Threatened (FT)	2(1)	6	1	7(2)	4(1)	16	<b>36(4)</b>
Federally designated Threatened due to Similarity of Appearance [FT(S/A)]	0	0	0	1	0	3	<b>4</b>
Federally designated Nonessential Experimental Population (FXN)	0	1	0	0	0	0	<b>1</b>
State designated Threatened (ST)	4	16	2	9	6	2	<b>39</b>
State Species of Special Concern (SSC)	0	0	0	0	0	1	<b>1</b>
<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, F.A.C 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 serve as one of the multiple tools used to help identify species most in need of conservation and the amount of effort previously expended on them, which can be 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 2019-20, no species were added or removed from the State Threatened species list. One species was Federally-designated as Endangered and added to 68A-27.003(1), F.A.C.: The Bryde's Whale Gulf of Mexico subspecies.

No listing actions were received in FY 2019-20. 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 Species Guidelines*

With stakeholder input, FWC staff developed Species Conservation Measures and Permitting Guidelines for the seven species and the Commission approved them (Exhibit 2). 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 patterns. They also provide voluntary conservation measures that may benefit the species and outline options for avoidance, minimization, and mitigation for State-Threatened species. The Guidelines serve to provide regulatory certainty for activities specifically authorized without a permit and inform potential applicants regarding permit options.

**Exhibit 2.** Species Guidelines approved during FY 2019-20.

Species Name	Status
Sanibel Island Rice Rat	State-Threatened
Short-Tailed Snake	State-Threatened
Bluenose Shiner	State-Threatened
Pine Barrens Treefrog	Not Listed
Lake Eustis Pupfish	Not Listed
White Ibis	Not Listed
Snowy Egret	Not Listed

### *The Florida Endangered and Threatened Species List and State Listing Actions*

In accordance with the listing process outlined in Chapter 68A-27, F.A.C., a Biological Review Group consisting of species experts was approved by the Commission in October 2019 and participating in state-listing process and International Union for Conservation of Nature training in March 2019 in preparation to evaluate the species against state-listing criteria. Biological review groups were appointed and trained to support evaluation of two species (Exhibit 3).

**Exhibit 3.** Biological review groups convened during FY 2019-20.

Species Name
American Flamingo
Striped Newt



## Funding Request

The recommended level of funding for the FWC endangered species programs in FY 2021-22 is \$28,614,402 (Exhibit 4). This includes funding to maintain and enhance current programs and continuation of awards from federal grants designed to assist in development of recovery programs.

**Exhibit 4.** The FWC Endangered/Threatened Species Budget Request for FY 2021-22.

FUNDING SOURCE	AMOUNT (\$)
Federal Grants (FG)	7,548,321
Florida Panther Research and Management Trust Fund (FPRMTF)	818,771
Grants and Donations Trust Fund	3,833,494
Land Acquisition (LATF)	1,363,465
Marine Resources Conservation Trust Fund (MRCTF)	7,842,723
Nongame Wildlife Trust Fund (NWTF)	4,379,152
Save the Manatees Trust Fund (STMTF)	2,023,218
State Game Trust Fund (SGTF)	805,258
<b>TOTAL</b>	<b>28,614,402</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 the Atlantic Coast and northwest Gulf Coast of Florida. 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 the coastal dunes from Gulf to Escambia County. Each station consists of a polyvinyl chloride (PVC) tube baited with sunflower seeds and lined with paper and an inkpad that records footprints as mice enter the tube. At most sites, stations are set 328-1,640 feet apart in lines parallel to the dunes. The stations provide an indirect method of determining the presence of Beach Mice from footprints left on the paper in the tube. Track tube stations do not provide population estimates, instead they indicate areas occupied by Beach Mice and FWC uses the data to monitor fluctuations in distribution over time. FWC biologists and partners from the Florida Department of Environmental Protection's Florida Park Service (FPS), Gulf Islands National Seashore, the St. Joe Company, and Tyndall Air Force Base regularly check the stations for tracks and this long-term monitoring program continued in FY 2019-20 at 13 sites on public lands and at two privately-owned sites. For each location monitored, staff calculate the percentage of stations that detected tracks each sampling period (detection rate). In FY 2019-20, the average detection rate varied from 0% at Deer Lake State Park to 100% at St. Andrews State Park. Many sites had mean detection rates above 80%, indicating Beach Mice were present on most of the available dune habitat at these sites.



Several sites along the northeast Gulf Coast were severely impacted by Hurricane Michael in October 2018. Though sites on Tyndall Airforce Base and the St. Joseph peninsula sustained significant damage, post-storm monitoring in FY 2019-20 showed Beach Mice remain present. Beach Mouse detections at these sites continued to increase or remained relatively steady in the first half of FY 2019-20. As part of an ongoing genetic study by University of Florida (UF), FWC and USFWS biologists trapped mice in November 2019 at Grayton Beach State Park. Biologists captured 12 mice at the main park location; however, there were no captures at the Pine Street location of the State Park revealing a possible need for follow-up Beach Mouse management efforts. While there were no captures at the Pine Street location in November, there is consistent evidence of Beach Mice presence during monthly track tube monitoring.

In the first half of FY 2019-20, the Gulf Coast monitoring locations with the lowest detection rates were Deer Lake and Grayton State Parks and West Crooked Island on Tyndall Air Force Base. The detection rate has declined to 0% at Deer Lake State Park over the last few years. FWC plans to work with partners at USFWS and FPS to determine whether focused management efforts are needed to reestablish Beach Mice at this park. Detection rates at Grayton Beach State Park were slightly lower in the first half of FY 2019-20 than in the previous year. FWC will continue to monitor this site closely and consider potential management actions to prevent further decline. Low detection rates at West Crooked Island are likely related to the loss of dunes and vegetation from Hurricane Michael. Though detection rates were as low as 27% in September 2019, those rates increased to 47% by November. FWC biologists expect detection rates to continue increasing as vegetation grows back and replaced track tubes become reestablished.

In FY 2018-19, FWC received funds from the USFWS for a multi-year project designed to assess Beach Mouse and habitat recovery since Hurricane Michael. A second year of funds was awarded to continue monitoring efforts and prioritizing potential restoration efforts where dune habitat or Beach Mouse populations are not recovering well from hurricane impacts. In FY 2019-20, FWC and USFWS were awarded a multi-year grant from 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. FWC began this project July 1, 2020.

[ATLANTIC COAST BEACH MICE](#) - The Southeastern Beach Mouse occurred from Volusia County to Broward County, and possibly as far south as Miami Beach. Their current distribution is likely restricted to Volusia and Brevard counties with possible scattered locations in Indian River county. The Anastasia Island Beach Mouse historically ranged as far north as the Duval-St. Johns County line but is now only found on Anastasia Island (St. Johns County). In FY 2019-20, FWC began a 5-year project funded by the USFWS Coastal Program titled “Assessing habitat restoration and management activities and benefits for



Atlantic Coast Beach Mouse recovery through long-term monitoring.” Information collected from this project will be used to develop management recommendations, prioritize restoration actions, and support proposed translocations of Beach Mice. In the first year of this project, FWC deployed 111 track tubes throughout the range of the Southeastern Beach Mouse and 79 track tubes throughout the range of the Anastasia Island Beach Mouse. Surveys were conducted every 2 weeks (Exhibit 5). FWC implemented monitoring before and after a prescribed fire at Canaveral National Seashore to determine how management actions influence Beach Mouse distributions. In FY 2019-20, FWC was awarded funding to continue this project which includes funds to improve Beach Mouse habitat on Anastasia Island.

In FY 2019-20, work continued on a USFWS funded project investigating the genetic diversity of the Southeastern Beach Mouse and other subspecies. This project will map and quantify adaptive variation across the range of both Atlantic Coast Beach Mouse subspecies which will help inform and prioritize management and recovery efforts for these species. Analysis is expected to be completed in FY 2020-21

**Exhibit 5.** Anastasia Island beach mouse captures and track tube surveys conducted in FY 2019-20.

Study site	Track tubes	Detections	Total surveys	Percent detections
Southeastern Beach Mouse				
Canaveral National Seashore	28	55	215	25.6
Smyrna Dunes Park (Volusia County)	27	141	326	43.3
Cape Canaveral Air Force Station	56	254	389	65.3
Anastasia Island Beach Mouse				
Anastasia State Park	36	293	391	74.9
St Johns County Properties	20	118	208	56.7
Fort Matanzas National Monument	23	275	358	76.8

### Big Cypress Fox Squirrel

The Big Cypress Fox Squirrel (BCFS) is a State-Threatened species endemic to Southwest Florida. To understand how threats may affect BCFS occupancy, in FY 2016-17 FWC solicited research proposals through Florida’s State Wildlife Grants Program and selected researchers from the University of Arizona, Tucson. The objectives were to study where BCFS reside throughout their expected range on public lands, determine BCFS status and range, identify habitat characteristics associated with BCFS presence, define the effects of habitat fragmentation on movement and dispersal, and develop management recommendations. In FY 2019-20, the research was completed. Researchers surveyed 58,000 ha of public land for BCFS occupancy and detections occurred on 29 of 223 sample plots, with most detections in Big Cypress National Preserve (BCNP). The probability of occupancy was influenced by bromeliad cover, midstory vegetative cover, distance to cypress domes, tree cover, presence of



cocoplum, distance to large scale anthropogenic change, average high summer temperature, and presence of Gray Squirrels. Researchers found low connectivity between areas of occurrence due to low quality habitat within preserves and highly urbanized features and open water between protected areas. It was concluded the largest threats facing BCFS are fragmentation of remaining habitat and projected future degradation of habitat and greenspaces due to climate change. To address this threat, researchers recommend establishing a collaborative relationship between management agencies to develop goals to maintain current populations, increase habitat quality, and establish corridors between areas of known occurrence. Researchers recommend the following actions for management agencies:

1. Reduce midstory cover to 50% or less in current or potential habitat, maintaining some shrubs that are known food sources
2. Restore areas that were dredged and filled for development
3. Create natural corridors within and between preserves to increase landscape permeability to movement
4. Develop and deliver educational materials to residents and visitors using greenspaces or living in areas of known BCFS presence

### *Everglades Mink*

The Everglades Mink is a State-Threatened subspecies. Information on its distribution and habitat needs are lacking, in part due to the absence of an effective survey method. To assist in FWC's goal to evaluate and establish an effective survey method, a web site was created for the public to report mink sightings to guide survey efforts and supplement field data. Between June 2012 and June 2020, 869 sightings were reported on the mink web site. Sightings occurred throughout the state with less than 40 sightings reported in the Everglades region. Less than 30% of sightings were deemed valid based on comments and pictures submitted. Most sightings were River Otter, which are more common than mink but similar in appearance. In FY 2019-20, a list of 210 historical mink records were compiled in the Everglades region. Most reports were collected by staff at Fakahatchee Strand Preserve State Park (FSPSP) during surveys. The remaining reports were collected by the Florida Natural History Museum, FWC biologists, and various sources who turned in road-killed specimens to FSPSP. In FY 2020-21 FWC biologists will test the use of scent dogs to detect mink scat. A trained dog will be used to search areas with recent sightings, and if successful, larger areas will be searched.

### *Florida Bats*

#### *ACOUSTIC MONITORING OF BATS IN FLORIDA THROUGH THE LONG-TERM BAT MONITORING PROGRAM* -

Bats in Florida face numerous threats including climate change, habitat loss and disturbance, and infectious diseases, such as white nose syndrome (WNS), a fungal disease that has killed 6 million





hibernating bats in North America since the winter of 2006-07. To better understand the impact these threats may have, FWC biologists established the Long-term Bat Monitoring Program (LTBMP) to improve our knowledge of bats in Florida and monitor population trends. Protocols were adapted from the North American Bat Monitoring Program so FWC can address Florida-specific goals while contributing to the national program. Since the start of the LTBMP in November 2018, 166 stationary points and six mobile routes have been established by FWC and partners to record the ultrasonic echolocation bat calls. Acoustic monitoring structured through the LTBMP is also being used to complement ongoing cave bat research to better address WNS management issues. Prior work by FWC demonstrates Florida's Tri-colored Bats can be found in man-made structures in winter and corresponding acoustic data show Tri-colored Bats are active in areas without caves in winter. This raises the possibility that caves in Florida may be less important as winter hibernacula for bats than caves farther north. If that is true, then it is possible bats in Florida may be less susceptible to WNS.

**TRI-COLORED BAT** - The Tri-colored Bat was historically one of the most common bats in eastern North America, but it is now a candidate for Federal listing under the Endangered Species Act. Tri-colored Bats have experienced severe declines throughout their range due to WNS. While WNS has not yet reached Florida, the disease is present in Georgia and Alabama placing Florida's Tri-colored Bats at high risk. Due to this threat, a large-scale study was initiated in 2014 to better understand the distribution and abundance of Cave Bats, determine the susceptibility of caves to WNS infection, and quantify ideal cave roosting habitat. In FY 2019-20, FWC biologists resurveyed 29 important caves and 5 newly identified caves and observed 177 Tri-colored Bats in 20 (59%) of the caves surveyed. The average number of bats per cave has declined since the first winter of surveys in 2014. Additionally, FWC biologists swabbed the skin of bats at 5 caves, 2 bridges, and 1 culvert and submitted samples to the United States Geological Survey Wildlife Health Center to test for the fungus that causes WNS. As in previous years, no evidence of the fungus was found, and Florida remains the only state east of the Mississippi River free of WNS.

Following anecdotal reports of Tri-colored Bats in culverts under roads, FWC biologists began surveying roadway culverts in winter 2017-2018 to determine their importance to cave-roosting bat species. In FY 2019-20, FWC biologists surveyed 67 roadway culverts in north Florida. Biologists detected two species (Tri-colored Bat and Southeastern Myotis) and counted 36 Tri-colored Bats in 13 (19%) of the culverts surveyed. Although Tri-colored Bats occupied a small percentage of culverts, Florida has thousands of roadway culverts which may cumulatively provide roosting habitat for many Tri-colored Bats. Despite the potential roosting habitat culverts provide, culverts may put hibernating bats at risk of disturbance, injury, or death from roadway construction, maintenance, and flooding. More research is necessary to develop adequate management guidelines to protect bats in culverts.



**GRAY BAT** - The Gray Bat is a Federally Endangered species that roosts almost exclusively in caves throughout much of the south-central US. Gray Bats occupy different caves in summer and winter based on temperature, and historically some bats migrated out of Florida during winter. In Florida, the Gray Bat is known from only a few caves in Jackson County, and the population has declined even though these caves are protected. This decline began prior to the emergence of WNS so it's not believed to be adversely affecting Florida's Gray Bats at this time. No Gray Bats have been observed or captured at summer roosts in Florida during survey attempts since 1990.

Gray Bats formerly roosted in two Florida caves during winter. During the most recent winter count on February 7, 2020, FWC biologists found no Gray Bats in the former primary wintering cave in Florida Caverns State Park. A smaller cave adjacent to the park where Gray Bats previously roosted in some winters, was not surveyed this year. FWC biologists did not observe Gray Bats in any of the other 7 caves in northwest Florida visited during FY 2019-20 as part of a broader study of the use of caves by wintering bats. No more than nine Gray Bats have been found hibernating in the state since 2002. More frequent or intensive surveys might provide evidence that Gray Bats are still present in Florida, but winter cave surveys are limited to once annually to minimize disturbance to hibernating bats. Currently, the number of Gray Bats in Florida remains critically low, and the species may already be absent from the state. In other parts of their range, Gray Bat numbers are increasing, and very large colonies are present in caves in Alabama, Georgia, Tennessee, and other locations in the Southeast. Because some Gray Bats in Florida were known to migrate to northern caves each winter, it is possible that protection and stabilization of the large summer colonies of Gray Bats in northern caves have led to bats no longer migrating to Florida.

**FLORIDA BONNETED BAT** - The Federally Endangered Florida Bonneted Bat is endemic to Florida. In FY 2019-20, 10 of 13 bat houses were occupied for at least one night on Babcock-Webb Wildlife Management Area (WMA; Charlotte County). FWC observed pups in five houses this FY. In FY 2019-20, FWC conducted two emergence counts and capture sessions in August (133 emerged, 137 bats captured) and December (failed emergence due to cold temperature, 103 bats captured). Of the total bats captured in FY 2019-20, 63 were captured for the first time and marked with passive integrated transponder (PIT) tags. FWC maintained seven automatic PIT tag readers on Florida Bonneted Bat houses in Babcock-Webb WMA. Each reader collects data on when PIT tagged bats enter and exit bat houses. In FY 2019-20, an FWC led article about pelage markings on Florida Bonneted Bats captured at Babcock-Webb WMA was published and a new FWC led manuscript on activity patterns and social structure of Florida Bonneted Bats was submitted and accepted.

Starting in FY2015-2016, a University of Florida-FWC project has investigated two components of Bonneted Bat ecology at Babcock-Webb WMA: 1) seasonal and individual variation in diet composition



assessed with genetic analysis of guano and 2) nightly movement patterns (presumed to be associated with foraging) assessed with Global Positioning System (GPS) tags. Data collection and analysis have been completed for the dietary component and two manuscripts are in preparation for publication. In FY19-20, 6 additional bats were GPS tagged for a total of 46 tags deployed over the duration of the project. These data show the bats flew maximum one-way, straight-line distances of 12 - 22 miles north and east from the bat houses each night, confirming findings from previous GPS deployments that bats roosting on Babcock-Webb WMA travel long distances at night to forage in areas off the WMA. A manuscript summarizing the GPS tag data is being prepared for publication.

Since FY 2015-16, FWC and the University of Florida have been working together to locate, monitor, and characterize natural roosts and the surrounding habitat using acoustic surveys, mist net surveys, and radio-telemetry. In FY 2019-20 both acoustic and mist net surveys were conducted in Picayune Strand State Forest, Fakahatchee Strand Preserve State Park, and Florida Panther National Wildlife Refuge. Mist net surveys were also conducted in Avon Park Air Force Range. Acoustic surveys only were conducted in Collier-Seminole State Park, Ten Thousand Islands National Wildlife Refuge, and Big Cypress National Preserve. FWC captured and attached radio transmitters to five bats and tracked these bats back to three roost trees located in Fakahatchee Strand Preserve State Park using radio-telemetry. Emergence counts were conducted on newly identified and previously identified roost trees in Avon Park Air Force Range, Babcock-Webb WMA, Fakahatchee State Park, and Big Cypress National Preserve.

Acoustic and mist net surveys were conducted at Spirit of the Wild WMA (Hendry County). Acoustic surveys only were conducted at Everglades and Francis S. Taylor WMA (Miami-Dade, Broward, and Palm Beach Counties), Holey Land WMA (Palm Beach County), Rotenberger WMA (Palm Beach County), J.W Corbett WMA (Palm Beach County), John C. Mariana Jones/Hungryland Wildlife and Environmental Area (WEA; Palm Beach County), Corkscrew Regional Ecosystem Watershed WEA (Collier County), Dinner Island Ranch WMA (Hendry County), Fisheating Creek WMA (Hendry County), Florida Keys WEA (Monroe County), Crocodile Lakes National Wildlife Refuge (Monroe County), Fort Zachary Taylor Historic State Park (Monroe County), John Pennekamp Coral Reef State Park (Monroe County), Long Key State Park (Monroe County), and private land on Plantation Key near Florida Keys WEA (Monroe County; Exhibit 6). 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 6.** Florida Bonneted Bat acoustic and mist net surveys conducted in FY 2019-20.

Location	County	Survey Nights	Bats Detected?	Bats Captured?	New Roosts Found?	Roost Occupancy
Fred C. Babcock/Cecil M. Webb WMA - Yucca Pens	Charlotte	-	N/A	-	No	1 occupied
Big Cypress National Preserve	Collier	1	Yes	-	No	1 occupied
Collier-Seminole State Park	Collier	36	Yes	No	No	-
Corkscrew Regional Ecosystem Watershed WEA	Collier	108	No	-	-	-
Fakahatchee Strand Preserve State Park	Collier	396	Yes	Yes	Yes	3 occupied, 4 not occupied
Florida Panther National Wildlife Refuge	Collier	60	Yes	Yes	No	0
Picayune Strand Preserve State Park	Collier	624	Yes	Yes	No	-
Ten Thousand Islands National Wildlife Refuge	Collier	48	Yes	No	No	-
Fisheating Creek WMA	Glades	18	Yes	-	-	-
Dinner Island Ranch WMA	Hendry	36	Yes	-	-	-
Spirit of the Wild WMA	Hendry	195	Yes	-	-	-
Avon Park Air Force Range	Highlands	-	-	Yes	No	1 occupied, 4 not occupied
Everglades and Francis S. Taylor WMA	Miami-Dade, Broward, Palm Beach	418	Yes	-	-	-
Crocodile Lake National Wildlife Refuge	Monroe	27	No	-	-	-
Florida Keys WEA	Monroe	112	No	-	-	-
Fort Zachary Taylor Historic State Park	Monroe	16	No	-	-	-
John Pennenkamp Coral Reef State Park	Monroe	16	No	-	-	-
Long Key State Park	Monroe	16	No	-	-	-
Private lands (Key Deer National Wildlife Refuge)	Monroe	16	No	-	-	-
Holey Land WMA	Palm Beach	64	No	-	-	-
J.W. Corbett WMA	Palm Beach	61	No	-	-	-
John C. Mariana Jones/Hungryland WEA	Palm Beach	38	No	-	-	-
Rotenberger WMA	Palm Beach	8	No	-	-	-
Fort Zachary Taylor Historic State Park	Monroe	16	No	-	-	-
John Pennekamp Coral Reef State Park	Monroe	16	No	-	-	-
Long Key State Park	Monroe	16	No	-	-	-
Private lands (Key Deer National Wildlife Refuge)	Monroe	16	No	-	-	-
Holey Land WMA	Palm Beach	64	No	-	-	-
Rotenberger WMA	Palm Beach	8	No	-	-	-
J.W. Corbett WMA	Palm Beach	61	No	-	-	-



## Florida Manatee

The Federally Threatened Florida Manatee (also known as 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 2019-20, the Manatee Forum, a diverse stakeholder group, met remotely through video and teleconference in November 2019 and in May 2020. Presentation topics in the November meeting focused on the current condition of the Indian River Lagoon, the manatee salvage and necropsy program, the Warm-Water Action Plan, and the Electric Power Research Institute workshop. The May meeting included updates on the FWC water control structure meeting, cold-related manatee mortality, and FWC and USFWS research and management activities.

**MANAGEMENT ACTIVITIES** - For more information on manatee conservation efforts, see the annual Save the Manatee Trust Fund report provided to the President of the Florida Senate and the Speaker of the Florida House of Representatives (<http://www.myfwc.com/research/manatee/trustfund/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 2019-20, staff corresponded with Broward and Sarasota counties and provided informal input regarding potential updates or data collection efforts while they assess revisions to their MPP. In FY 2019-20, staff worked with the FWC Division of Law Enforcement on a sign-posting plan and signs installation reflecting the Collier County rule amendments was completed in June of 2020. Staff continued to review and monitor available data in several of the county manatee protection zone rules in FY 2019-20. No significant rule amendments are currently being considered.

**PERMIT REVIEWS** - The FWC produced 360 final comments or assistance letters for proposed projects reviewed in FY 2019-20. 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 2019-20, 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. An aerial survey was completed in Indian River county and there are ongoing surveys in the eastern panhandle to determine if these areas have experienced significant changes in manatee distribution. FWC is working with partners to develop and complete projects to restore and conserve natural warm-water habitat in Sarasota and Volusia counties.

FWC is working with Florida Power & Light, Duke Energy, and Tampa Bay Electric Company to develop plans to monitor and protect manatees during work to upgrade existing power generating units. These monitoring efforts will be useful to FWC and agency partners in developing future warm-water habitat plans. FWC staff, in coordination with the USFWS and other partner agencies, are leading an effort to review and update The Florida Manatee Warm Water Habitat Action Plan, a long-term planning tool for manatee warm-water habitat. An updated version is expected to be published by Fall 2020.

**MORTALITY AND RESCUE** - Statewide, causes of manatee death are those associated with near-term or newborn issues, cold stress, natural causes, watercraft-collisions, and other human influence. FWC researchers and law enforcement officers respond to statewide reports of manatee carcasses and injured manatees. In FY 2019-20, 643 carcasses were documented in Florida. A Repeat Mortality Event associated with a red tide bloom was declared for southwest Florida in the fall and winter of FY 2019-20. There were at least 33 red tide-related mortalities determined through necropsy and 8 red tide-related rescues. At least 84 carcasses were not necropsied on the Gulf coast during the first half of FY 2019-20, and it is likely many of these were also red tide-related. FWC did not perform necropsies during April and May 2020 due to field operation modifications during the COVID-19 pandemic. 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 116 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 2019-20, 61 of these rescued manatees were released, 27 died, and 28 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.

**POPULATION ASSESSMENT** - Population assessments include conducting manatee counts at winter aggregation sites, aerial surveys used to determine regional distribution and abundance of manatees and to assess habitat use, and estimating survival, population growth, and reproductive rates through photo-identification and the recent application of genetic markers. The annual statewide manatee synoptic





survey was not conducted in winter 2020 due to weather conditions. Results from the traditional synoptic survey 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 widely across surveys and are of limited utility. Concerted effort has been put forth over recent years to improve the ability to estimate manatee abundance. An innovative approach was designed, tested, and vetted with experts over recent years to meet this challenge. This approach uses a random sampling design and combines multiple sources of information including a double-observer protocol, repeated passes, and detailed diving behavior data. The best estimate of statewide abundance for the 2015-2016 period was 8,810 with 95% probability that the real abundance was 7,520 - 10,280 manatees. In FY 2019-20, preparations were made for the next abundance survey including map production. FWC conducted smaller-scale distributional surveys in Indian River County between fall 2018 and fall of 2019. For more information please refer to <https://myfwc.com/research/manatee/research/population-monitoring/abundance/> or for more information on synoptic counts, refer to <http://myfwc.com/research/manatee/projects/population-monitoring/>.

FWC, with the U.S. Geological Survey's (USGS) Sirenia Project and Mote Marine Laboratory in Sarasota, maintains an image-based, computerized database called the Manatee Individual Photo-Identification System. These data assist in estimating important population vital rates and life history information. Survival rate information from photo-identification efforts was recently updated and included in the latest status and threats assessment (<https://pubs.usgs.gov/sir/2017/5030/sir20175030.pdf>).

Genetic testing offers an additional means of identifying individual manatees; its application could greatly enhance existing monitoring and assessment studies. The manatee genetic-ID database currently includes 2,474 unique individuals identified by skin samples collected from live manatees in the southwest Florida pilot study area. A manuscript was prepared that describes application of a modeling approach to estimate survival using genetics capture-recapture information.

**BEHAVIORAL ECOLOGY** - Warm-water habitat is of interest to FWC and partners because the predicted future loss of this habitat is a key, long-term threat to manatees. In FY 2019-20, FWC continued to monitor wintering sites on the Florida west coast undergoing restoration or mitigation. FWC continued to monitor water temperature of manatee warm-water habitat statewide via deployment of temperature probes at key sites as well as the management and interpretation of these data.



## Florida Panther

**SURVEYS** - The Federally 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 eight panthers in FY 2019-20. In addition, biologists visit dens of radiocollared female panthers to collect data on and mark newborn kittens with PIT tags. Since 1992, 513 kittens have been handled at dens. In FY 2019-20, biologists visited six dens and documented 16 kittens (11 males, five females). In FY 2019-20, 30 wild panthers died, including three (one male, two females) radiocollared panthers and 27 (11 males, 15 females, 1 unknown sex) uncollared panthers. Of the 30, 26 panthers died after being hit by vehicles, one was killed by a train, one is pending an investigation, one was killed by another panther, and one died from a neurological condition.

FWC and USFWS maintained 112 trail camera locations north of the Caloosahatchee River in FY 2019-20. A trapping effort of 30,679 trap-days produced 290 independent panther detections. This included 51 adult female detections representing at least 2 unique individuals, which were the first records of female panthers north of the River since 2018. Panthers were detected in Babcock Ranch Preserve (Charlotte County), Fisheating Creek WMA, Platt Branch Wildlife Environmental Area (both in Glades County), Avon Park Air Force Range, Highlands Hammock State Park, Sun 'n Lake Preserve (all in Highlands and Polk counties), Bob Janes Preserve, Caloosahatchee Regional Park (Lee County), and Kissimmee Prairie Preserve State Park (Okeechobee County). Additional photos submitted to the FWC Panther Sightings website or otherwise communicated directly to the FWC included 25 additional independent panther detections north of the River.

**COLLABORATIVE RESEARCH ACTIVITIES** - FWC is involved in multiple research projects focusing on population models and analyses; 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 2019-20, the 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. Agency staff served as lead or as co-authors on six peer-reviewed publications.

**NEUROMUSCULAR DISORDER IN PANTHERS AND BOBCATS** - A neuromuscular disorder of unknown cause, termed feline leukomyelopathy (FLM), was first detected in Florida Panthers and Bobcats in May 2018 in South Florida. This disorder is characterized by mild to severe hind limb discoordination





and weakness. A total of 38 FLM cases have been diagnosed, including 9 confirmed cases (based on histology; 2 panthers, 7 Bobcats) and 29 probable cases (based on remote video; 15 panthers, 14 Bobcats). Cases were in peninsular Florida in Alachua, Charlotte, Collier, Hendry, Hillsborough, Lee, Manatee, Sarasota, Orange, Pasco, and St. Johns counties, and appeared to be concentrated in Southwest Florida between Naples and Tampa. In Southwest Florida cases extend eastward into Big Cypress National Preserve and Fakahatchee Strand Preserve State Park.

FLM may have been present since April 2017 or earlier. Samples from affected animals have been examined and they show a degeneration of spinal tissue. Possible causes fall within three categories: infectious (viral, bacterial, other), nutritional, or toxic (anthropogenic or environmental). Numerous infectious diseases, toxins, and other possible causes have been evaluated, but a cause has not been determined. The effect on panther and Bobcat populations is unknown; however, at least one panther and 5 Bobcats were euthanized due to severe FLM. Several panther kittens are presumed to have died as a direct or indirect result of FLM. FLM may have caused the loss of one or more panther litters north of the Caloosahatchee River and presents a threat to the expansion of the panther population. Experts in the field of veterinary and wildlife medicine, as well as adjunct specialties including environmental toxicology, have been consulted and will continue to be consulted in the investigation of this disorder.

**HUMAN-PANTHER INTERACTIONS** - FWC verified panthers were responsible for preying upon domestic animals (depredations) in 6 separate events in FY 2019-20. In some cases, multiple animals were killed or injured in a single event. These events occurred in Collier, Glades, and Lee 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. These six events are the lowest numbers reported to the FWC since FY 2008-09. FWC provided information and reviews of numerous road and development projects in FY 2019-20 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 2012 where the public can report panther sightings and upload pictures or videos of those sightings (<http://www.myfwc.com/panthersightings>). By the end of FY 2019-20, over 7,900 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 40% as panthers and 29% as Bobcats. Other purported sightings were determined to be coyotes, dogs, foxes, house cats, otters, and a monkey (Rhesus macaque).

**FEDERAL STATUS ASSESSMENT** - The FWC made significant contributions in FY 2019-20 to an ongoing project compiling information for a Species Status Assessment (SSA), which provides 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*

The North Atlantic Right Whale is a Federally Endangered species in Florida. The primary calving grounds are off the Atlantic coast of Florida and Georgia. The calving season is approximately November 15 to April 15. During the calving season, FWC collaborates with Federal, State, and non-governmental partners to carry out aerial surveys, biopsy sampling, tagging, disentanglement, and response to stranding events. Most of this work is supported by funds from the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA-Fisheries) and is aimed at documenting the seasonal presence of Right Whales, mitigating vessel-whale collisions, and assessing population dynamics. FWC is one of a handful of major contributors to the North Atlantic Right Whale Photographic Database (<http://rwcatalog.neaq.org/Terms.aspx>). Photographs are used to identify individual whales 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. Over time, population demographics, reproductive success, mortality, and trends in health and scarring are monitored, in part, through this photo-identification research. During the 2019-20 calving season, FWC conducted 59 aerial surveys and 20 vessel cruises. Through collaborative efforts with NOAA-Fisheries, the Georgia Department of Natural Resources, the Clearwater Marine Aquarium Research Institute, and volunteer sighting networks, 35 unique Right Whales were documented, including 10 newborn calves. Eight calves and two juveniles were biopsy sampled.

FWC has also worked closely with partners to compile years of southeastern U.S. aerial survey data into a geographic information system (GIS). Analyses of these spatial data help scientists and managers to evaluate whale residency patterns and distribution in the calving area in relation to environmental factors such as sea surface temperatures and water depth, and human activities such as vessel traffic and fishing activity. FWC analyzes ship traffic data to help monitor compliance with vessel speed regulations and conduct risk assessments. Staff published a paper on Right Whale migration to their wintering grounds in Scientific Reports and a risk assessment was published in the journal *Ecosphere*.

No North Atlantic Right Whale carcasses or entanglements were detected in the southeastern U.S. during this calving season. However, FWC photographed a neonate calf with severe vessel strike injuries. A multi-agency response to the injured calf included remote antibiotic delivery at sea. Despite these efforts, the calf is presumed dead. Additionally, one mother-calf pair made an unusual weeks-long foray into the Gulf of Mexico. The pair was first sighted in the Gulf near Pensacola Pass in early March,



eventually exiting the Gulf near the Dry Tortugas two weeks later. FWC, NOAA Fisheries, and other partners used their social media platforms to request public sighting reports in order to track the whales' movements and discourage harassment during this event.

### *Sanibel Island Rice Rat*

The Sanibel Island Rice Rat (SIRR) was identified as a unique subspecies in 1978 and is listed as State-Threatened. The SIRR only occurs on Sanibel Island (Lee County), where it primarily occupies open, freshwater marsh. Much of this habitat has been lost or degraded through the construction of ditches and the transition from herbaceous species, such as grasses, to areas dominated by woody vegetation. In FY 2014-15 FWC awarded a grant through Florida's State Wildlife Grants Program to the University of Florida for a 4-year project and FWC received the final report in FY 2019-20. SIRR were detected in freshwater marsh, saltwater transition, and mangrove areas. Game cameras showed similar reliability in detecting SIRR compared to live-trapping methods. Researchers found no indication that marsh salinity influenced SIRR presence. Captures of SIRR in mangrove forests were infrequent but represent the first documented captures within these areas. Vegetation data collected by FWC's Upland Habitat Research team were used to determine the influence of different habitat characteristics on the distribution of SIRR. Results indicate SIRR occurrence increases with the amount of sand cordgrass and other herbaceous vegetation but decreases as leather fern increases. These results support the efforts to restore the open freshwater marsh communities on Sanibel Island.

## BIRDS

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### *Audubon's Crested Caracara*

The Audubon's Crested Caracara is a Federally Threatened species. FWC continued annual caracara breeding territory surveys in FY 2019-20 on Dinner Island Ranch (Hendry County), Fisheating Creek (Glades County), and Rotenberger WMAs (Palm Beach County; Exhibit 7). No new active nests were found in these areas, but historical nests were active in Dinner Island Ranch and Fisheating Creek WMAs. While observing caracara activity in Holey Land WMA (Palm Beach County), staff decided to conduct breeding territory surveys and confirmed one new active nest (Exhibit 7). FWC plans to continue annual surveys in these areas. Staff at Okaloacoochee Slough and Spirit of the Wild WMAs (both in Hendry County) will conduct breeding territory surveys on a five-year rotation and complete baseline surveys in Okaloacoochee Slough WMA's newly acquired property.



**Exhibit 7.** Audubon's Crested Caracara breeding territory surveys conducted in FY 2019-20.

WMA	County	Survey Period	Historical Nests	Historical Active	New Active in 19/20	Total Active in 19/20	Fledges
Fisheating Creek	Glades	January - April	17	2	0	2	Yes
Dinner Island Ranch	Hendry	January - March	9	3	0	3	No
Rotenberger	Palm Beach	January - March	2	0	0	0	N/A
Holey Land	Palm Beach	February - June	0	0	1	1	Yes

## Black Rail

**BLACK RAIL TELEMETRY PILOT PROJECT** - The Eastern Black Rail is an at-risk subspecies, recommended for federal listing as Threatened in October 2018. The Black Rail inhabits high salt marsh and shallow freshwater marshes throughout Florida. The Eastern subspecies is experiencing rapidly declining numbers and range contraction in portions of its U.S. range. To understand the habitat selection and movements of Black Rails in Florida, FWC initiated a radio telemetry pilot project to test the feasibility of using the technology on a larger scale. While staff were able to capture a single Black Rail, the difficulties in doing so demonstrated that a comprehensive project would be challenging. Future work will focus on surveys by trained personnel and the use of autonomous recording units, small digital sound recorders which are placed in the marsh and can record bird calls for much longer than a human observer.

**WILDLIFE MANAGEMENT AREA SURVEYS AND OBSERVATIONS** - Given the draft rule listing the subspecies as Threatened, staff started conducting systematic surveys where appropriate and report opportunistic observations. Black Rail-specific surveys on Salt Lake WMA (Brevard County) continued for the third consecutive year and began at John C. and Mariana Jones/Hungryland WEA (Martin County) and J.W. Corbett WMA (Palm Beach County). No Black Rails were found during surveys this year, but Black Rails have been found on all these properties in previous years.

With over 2,000 acres of basin marsh, Salt Lake WMA (Brevard County) was identified as having an important role in the conservation of Black Rails. Annual surveys were implemented in 2017. In FY 2019-20, no Black Rails were detected during the survey. Habitat management on the WMA in FY 2019-20 included treatment of 950 acres of potential Black Rail habitat with prescribed fire.

## Everglade Snail Kite

The Everglade Snail Kite is a Federally Endangered bird that inhabits freshwater marshes and lakes in Florida. Core Snail Kite habitat includes the Everglades, Lake Okeechobee, the Kissimmee Chain of Lakes, and the upper St. Johns marsh. Since the population crash in the 2000s, the population has been steadily increasing, and the most recent population estimate is roughly 3,100 birds. The population is still about half what it was less than 20 years ago. The Snail Kite population decline was primarily caused by low levels of reproduction and too few young surviving to breeding age.



The primary focus of management in the past several years has been to increase nesting success and juvenile survival through a suite of habitat management and conservation activities. Nesting sites in primary lake habitats are managed annually to reduce predator access by isolating nest patches from shorelines and working with water managers to maintain flooded conditions under nests throughout the nesting season. Invasive and exotic plant management is closely coordinated around nesting habitats to eliminate potential disturbances and improve nesting and foraging habitats through proactive plant management. Nesting sites are marked with signs if they occur in areas with high recreational use or near residential areas. Tourism, angling, and hunting activities are coordinated to reduce disturbances.

FWC works closely with partners to improve Everglades habitats, lake marshes and watersheds, water regulation schedules, and to improve connectivity between large water bodies. Although habitat conditions have improved for Snail Kites since their population crash, it is clear at least some of the recent population increase has been due to the presence of an exotic Apple Snail, which reproduces in large numbers and can tolerate a wide range of habitat conditions. 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 Apple Snail habitat, and more information is needed on the long-term impact exotic snails may have on Snail Kites and their habitat. FWC is conducting multiple studies on the impact of habitat management and water level control on the Snail Kite prey populations and nesting.

FWC funded Snail Kite nest monitoring conducted by the UF in FY 2015-16, FY 2016-17, FY 2018-19, and FY 2019-20 for all areas of Snail Kite habitat except Lake Okeechobee and the Everglades. There were 275 active Snail Kite nests recorded throughout Florida in 2019, a significant decrease in nests compared to 2018 (732 nests) and was the lowest recorded number of active nests since 2011 (235 nests). Payne's Prairie (Alachua County), Lake Tohopekaliga and Lake Kissimmee (both Osceola county) produced the most nests and the most successful nests, respectively.

In anticipation of the planned 2019/20 East Lake Tohopekaliga (Osceola County) drawdown, FWC funded UF study juvenile Snail Kite movement, survival, and response to hydrologic fluctuation. GPS trackers were used to track 18 juvenile Snail Kites that fledged from nests on East Lake Toho, West Lake Toho, and Lake Kissimmee in 2019. The juveniles spent 31 - 88 days near their nest site after fledging. Over the course of their first year, the juveniles traveled as much as 1,794 miles, reaching as much as 145 miles from their nest site. As of June 2020, seven more juvenile Snail Kites were tagged from nests on Payne's Prairie, West Lake Tohopekaliga, Lake Kissimmee, and Lake Parker (Polk county) but had not yet had sufficient time to make movements beyond their nest sites. Data continues to be collected from the trackers deployed in 2018, 2019, and 2020 and more trackers will be deployed throughout the 2020 breeding season. FWC hopes to gain important information on the survival and movements of these



juveniles leading up to, during, and after the East Tohopekaliga drawdown. FWC is monitoring Apple Snail populations and movements in East Lake Tohopekaliga to understand how the snails respond and recover from the drawdown. FWC is also partnering with UF to study the Apple Snail and Snail Kite response to habitat management actions on Lake Okeechobee.

### *Florida Burrowing Owl*

The Florida Burrowing Owl is listed as State Threatened, but the population estimate remains unknown. This data gap is driven primarily by difficulties associated with surveying the rural population which is patchily distributed in open habitats across the state. In 2019, FWC initiated a two-year survey of the rural population of Burrowing Owls. In Year 1, FWC used replicated roadside point-count surveys within Florida Breeding Bird Atlas blocks with recent Burrowing Owl detections (2011 - 2018). Records of owls detected in 2019 were used to create a habitat suitability model. The locations with appropriate habitat, based on the suitability model, were then surveyed. This produced a total of approximately 800 potential survey locations. FWC was able to access and survey about half of these (402) locations. A second survey (a replicate survey) was performed at 75% of these (304) locations. More than two (and up to six) replicate surveys were performed at ca. 75 locations to improve the detection probability model. Additionally, 688 surveys were performed opportunistically and at sites with historic records of Burrowing Owls. In total, 1,604 survey events were performed, during which FWC detected owls 258 times (including repeated observations). Where owls were detected, between 1 and 15 owls were observed. Data from Year 1 and 2 will be used to generate a minimum population index for the rural population of Florida Burrowing Owls. Additionally, data from both years will be used to improve the detection probability model. The estimated population size of rural Burrowing Owls will be important when evaluating the relative proportion of rural vs. urban owls and serve as a starting point for assessing population trends through time.

### *Florida Grasshopper Sparrow*

*HABITAT MANAGEMENT AT THREE LAKES WILDLIFE MANAGEMENT AREA* – The Florida Grasshopper Sparrow is a Federally Endangered bird that is endemic to Florida dry prairie habitat. To restore and maintain the dry prairie habitat at Three Lakes WMA (Osceola County), small oak trees and cabbage palms were sprayed with herbicide to prevent re-encroachment into the dry prairie. Florida Grasshopper Sparrows rely on prescribed fire to maintain vertical structure at a minimal height and allow for bare ground. A total of 3,548 acres of dry prairie were burned in FY 2019-20, or about half of the total dry prairie the Florida Grasshopper Sparrow most frequently uses. Additionally, 50 acres were roller-chopped to improve habitat and control saw palmetto density.





*DEMOGRAPHIC MONITORING AND NEST PROTECTION AT THREE LAKES WMA* – The eighth season of Florida Grasshopper Sparrow demographic research by FWC was conducted in FY 2019-20 and the beginning of FY 2020-21. This project has been a cooperative effort involving staff and support from FWC, USFWS, and members of the Florida Grasshopper Sparrow Working Group. As part of the continued effort to color-band the entire population, four adult males, two adult females, 1 independent fledgling, and 79 nestlings were newly captured and color-banded in the 2020 season. In addition to these new captures, 45 males and 17 females banded prior to 2020 were resighted in 2020. Together, the number of color-banded individuals observed at least once at Three Lakes WMA in 2020 was 49 adult males, 19 adult females, 1 independent fledgling, and up to 63 fledged nestlings of unknown sex. All known adult males and females in the Three Lakes population have been color-banded in 2020.

In the 2020 season, FWC biologists located and monitored 34 active Florida Grasshopper Sparrow nests. Of these nests, 23 survived to fledge young, four were depredated, two were flooded, four failed for unknown reasons but two are suspected snake predations. Miniature nest cameras were placed at the entrance of 25 Grasshopper Sparrow nests. Predation events were recorded for two of these nests and the predator in both instances was a Red Cornsnake despite the nests being protected with predator deflection fences. In 2020, Florida Grasshopper Sparrow nests (n=33) were protected using predator deflection fencing. Analysis is pending for 2019-20 data but results from previous years (2015-2018) revealed fence installation substantially increased nest survival (up to 5.75 times). It is estimated that 124 additional fledglings were added to the population between 2015 and 2018 because of predator fence installations. While fence installation is labor-intensive and fences only protect the subset of nests located prior to predation, it helps boost local productivity and protect incubating females providing more time to investigate long-term habitat management solutions.

In FY 2019-20, staff conducted Florida Grasshopper Sparrow point count surveys at 250 stations visiting each point 3 times from March 26, 2020 to May 28, 2020. Sparrows were detected at 52 survey stations. In the first repetition, 44 adult male sparrows were detected, while in the second repetition, 45 adult male sparrows were detected. In the third repetition, 35 adult male sparrows were detected.

*MONITORING DISEASE PRESENCE AND PREVALENCE IN DRY PRAIRIE SPARROWS* – In 2019, staff continued to sample Florida Grasshopper, Eastern Grasshopper, and Savannah Sparrows for bloodborne and gastrointestinal pathogens. Whole blood samples were obtained from 3 Florida Grasshopper Sparrows and 1 Savannah Sparrow. Blood-spot samples were collected from 3 Florida Grasshopper Sparrows and 1 Eastern Grasshopper Sparrow. Fecal samples were collected from 1 adult, 5 nestlings, and 22 nests (samples of several nestlings at a nest are pooled together) for Florida Grasshopper Sparrows, and 1 adult Savannah Sparrow. Preliminary findings for wild Florida Grasshopper Sparrows include at least one



detection of microfilaria (*Aproctella* sp.), two cases of haemosporidians (*Plasmodium/Hemoproteus* sp.) and one coccidian (*Isoospora* sp.). This understanding of diseases found in wild birds is critical for understanding the relative risks associated with releasing captive-raised Florida Grasshopper Sparrows into the wild.

**RELEASE OF CAPTIVE-BRED FLORIDA GRASSHOPPER SPARROWS INTO THE WILD** – In 2019 staff began releasing Florida Grasshopper Sparrows that were bred at White Oak Conservation, a captive breeding facility. These releases augment the wild population and assure maintenance of genetic diversity. The captive breeding program was initiated in 2015 and in 2019 there were enough birds to start releases. As of August 31, 2020, staff have released 231 Florida Grasshopper Sparrows at Three Lakes WMA; 105 birds in the summer of 2019, 45 in the winter of 2020, and 81 so far in the summer of 2020, including 62 adults and 169 juveniles. Releases will continue through September and it is projected 20 more juveniles will be released in 2020. The aim of this work is to increase the number of birds that may breed in 2020. To monitor the efficacy of the release program, staff uniquely color-banded all birds and fitted very high frequency (VHF) radio transmitters to 40 birds released to date (27%). Transmitters were used to monitor short-term survival and results indicated released birds were foraging and behaving normally. In the 2020 breeding season, FWC obtained data on the survival of released birds via their color leg-bands. Staff visually detected 31 color-banded individuals released prior to the breeding season (20% of birds released pre-breeding season). Many of these birds have bred successfully; 18 of these 31 birds (58%) were detected breeding with a wild partner or another captive-bred bird. Of the 18 birds breeding, 16 (88%) were released as juveniles, while the other two were released as adults. Nests with at least one parent bred in captivity represented 62% of all nests found and fledged 66% of the young recorded in 2020, while the rest were produced by pairs of wild parents. About 45% of the adult population recorded at Three Lakes WMA in 2020 were captive-reared and released Florida Grasshopper Sparrows.

### **Florida Sandhill Crane**

The Florida Sandhill Crane is State Threatened. The 2019 breeding season drought index was classified as normal with plenty of water on the landscape for nesting, thus productivity was good. Staff identified 370 adults and 72 juveniles during road surveys. Adult numbers were comparable to those counted in previous years, but the number of juveniles was nearly double those recorded in the previous two years. Road survey routes in Osceola and Okeechobee counties remain regional strongholds.

To understand habitat use, movements, and survival of cranes in suburban areas and conservation lands, staff began radio-tagging individuals in 2017. On suburban lands, 23 adult cranes have been tagged and 17 on conservation lands thus far. 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 Florida Scrub-Jay is a Federally Threatened species that is endemic to Florida. Three-quarters of remaining scrubby habitats are protected through land under public or private ownership that is dedicated for conservation. Despite this, Florida Scrub-Jay numbers have continued to decline on conservation lands largely due to habitat degradation caused by decades of fire suppression and inadequate habitat management. Conserving this species requires the efforts of multiple local, State, and Federal agencies and non-governmental organizations and private landowners. Staff assist these efforts by facilitating communication among partners through regional scrub working groups and by engaging with the public through outreach.

*PUBLIC AND PARTNER ENGAGEMENT* - In FY 2019-2020, FWC staff helped organize the tenth annual Florida Scrub-Jay Festival to raise awareness about the Florida Scrub-Jay and its unique habitat. Oscar Scherer State Park hosted the event in January, coupling it with a 5K run. Approximately 540 people attended. Staff are currently involved in planning the next Scrub-Jay Festival, which will be held at Jonathon Dickinson State Park in 2021. Staff usually facilitate communication and information exchange among partners via regional working groups focused on conservation of Scrub-Jays and their habitat. Although three scrub working groups were organized for March - May, all were canceled due to COVID-19. Staff continued to provide technical assistance for stakeholders regarding habitat management, development planning, and general inquiries. Staff also participated in Jay Watch, a citizen-science program organized by Audubon Florida that collects information annually on Scrub-Jays on public lands and educates the public about Scrub-Jays.

*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 project are to evaluate the effectiveness of different translocation methods and evaluate the impact of translocation on donor populations. In FY 2019-20, two Scrub-Jay family groups comprising five individuals were translocated to Jonathan Dickinson State Park (Martin County). Eight non-breeding “helper” Scrub-Jays and four non-breeding “helper” Scrub-Jays were translocated to Rock Springs Run Reserve State Park (Orange and Seminole counties) and Seminole State Forest (Lake County), respectively. Persistence and survival at recipient sites in the past two years have been lower for translocated helpers than for birds translocated with their family groups. One of the four birds translocated to Seminole State Forest in January 2020 moved to Rock Springs Run Reserve State Park. Birds translocated with an immediate release (opposed



to a delayed release with an acclimation period), were equally or more likely to settle near their release site. 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 - Volunteers from the Jay Watch Program conduct surveys each summer. Although over 130 jays have been color banded on Half Moon WMA (Sumter County) since 2001, banding has been discontinued due to the decline in jay numbers. No juveniles have been found for the past 5 years. There were no Scrub-Jays during the 2020 survey. The last year a Scrub-Jay was located is 2018. Habitat management is focused on prescribed burning, roller chopping palmetto; and mowing, cutting, or applying herbicide to overgrown oak trees. Half Moon WMA harbors approximately 500 acres of potential jay habitat, consisting of scrubby and mesic flatwoods. Habitat management will continue with palmetto reduction through roller chopping, increasing open ground, and cutting overgrown oaks in and surrounding potential habitat.

The Arbuckle WMA and the Walk-In-The-Water WMA (both in Polk County) are part of the Lake Wales Ridge State Forest and encompass nearly 20,000 acres of various habitat types, including scrub and sandhill. In FY 2019-20, the number of groups (21) increased, but the total number of birds (72), mean group size (3.4) and the number of juveniles per group (0.8) all decreased over the previous year in Arbuckle WMA (Exhibit 8). In FY 2019-20, the total number of groups (6), total number of Scrub-Jays (12), the mean group size (2.0) and the number of juveniles per group (0.3) all decreased from the previous year in Walk-In-The-Water WMA (Exhibit 8). The lead management agency, Florida Department of Agriculture and Consumer Services, conducted habitat management on both WMAs, including prescribed fire on Arbuckle WMA and 75 acres of mechanical treatment on Walk-In-The-Water WMA (Exhibit 8).

Lake Wales Ridge WEA (Highlands and Polk counties) consist of 20 tracts with 14 retaining Scrub-Jay groups, which are monitored by FWC, Archbold Biological Station, and Jay Watch. Group numbers increased at the Lake Placid Scrub, McJunkin, Holmes Ave, Carter Creek, Jack Creek, Henscratch, and Gould Rd tracts (Exhibit 8). Group numbers remained the same at the Silver Lake tract (Exhibit 8). The Sunray tract was not surveyed (Exhibit 8). Group numbers decreased at the Royce Ranch, Lake Apthorpe, Sun 'N Lakes, Highlands Ridge, and Highlands Park Estates tracts (Exhibit 8). Controlled burns occurred on 2,066 acres and 255 acres were mechanically treated (Exhibit 8).

In FY 2019-20, surveys were conducted at Fisheating Creek WMA (Glades County) over 3 days with four jays observed (Exhibit 8). At least five jays were observed foraging on December 27, 2019 while staff were conducting reptile and amphibian coverboard surveys. Surveys at Salt Lake WMA (Brevard County) indicated a decline in the number of Scrub-Jay groups. In FY19-20 a survey was conducted where one



group was recorded consisting of two banded adults (Exhibit 8). In FY19-20, a Spring Scrub-Jay survey was conducted documenting one Scrub-Jay at Split Oak Forest WEA (Orange County; Exhibit 8). Staff conducted management in potential Scrub-Jay habitat, including 176 acres of prescribed fire (Exhibit 8). In FY19-20, a Spring Scrub-Jay survey was conducted at Three Lakes WMA (Osceola County), but no Scrub-Jays were detected during the survey (Exhibit 8).

Annual monitoring of Florida Scrub-Jays in FY 2019-20 occurred at three mitigation parks in the southwest region. Scrub-Jay monitoring at Hickey Creek WEA (Lee County) was down one group from FY 2018-19 as the newly formed territory did not persist (Exhibit 8). No juvenile was confirmed after the nesting season. Additional birds were occasionally observed just off the site in a residential area. Management actions included 37 acres of prescribed burning, 94 acres of mechanical treatment, and 67 acres of chemical treatment (Exhibit 8). The Platt Branch WEA (Highlands County) was monitored by FWC and both group numbers and individuals expanded in FY 2019-20 (Exhibit 8). Management efforts included burning 580 acres and mechanically treating 49 acres to improve habitat (Exhibit 8). The Moody Branch WEA (Manatee County) is monitored by both FWC staff and JayWatch volunteers. The group number was consistent with the previous year (Exhibit 8) and in FY 2019-20 mechanical treatments were conducted on 299 acres and 228 acres were chemically treated (Exhibit 8).



**Exhibit 8.** Florida Scrub-Jay surveys and habitat management conducted in FY 2019-20.

Location	County	Groups	Birds	Mean Group Size	Juveniles per Group	Habitat Management (acres)
Half Moon WMA	Sumter	0	0	0	0	N/A
Cedar Key Scrub WMA	Levy	0	0	0	0	N/A
Fisheating Creek WMA	Glades	N/A	4	N/A	1	N/A
Carter Creek tract	Highlands	16	59	3.7	1.3	Prescribed Fire (670); Mechanical (32)
Henscratch tract	Highlands	8	34	4.3	2	Prescribed Fire (37); Mechanical (60)
Henscratch 27 tract	Highlands	0	0	0	0	N/A
Jack Creek tract	Highlands	1	3	3	0	Prescribed Fire (64); Mechanical (163)
Platt Branch WEA	Highlands	11	32	2.9	0.6	Prescribed fire (580); Mechanical (49)
Lake Placid Scrub tract	Highlands	35	103	2.9	0.8	Prescribed Fire (341)
Lake Apthorpe tract	Highlands	2	6	3	1.5	Prescribed Fire (13)
Gould Road tract	Highlands	10	34	3.4	1	N/A
Highlands Park Estates tract	Highlands	3	11	3.7	1	Prescribed Fire (280)
Highlands Ridge	Highlands	9	27	3	0.9	N/A
Holmes Ave tract	Highlands	11	42	3.8	1.3	N/A
McJunkin tract	Highlands	15	61	4.1	1.9	N/A
Royce Ranch tract	Highlands	7	23	3.3	1.1	Prescribed Fire (579)
Silver Lake tract	Highlands	10	29	2.9	0.7	Prescribed Fire (69)
Sun 'N Lakes tract	Highlands	7	26	3.7	1.4	Prescribed Fire (13)
Sunray	Polk	N/A	N/A	N/A	N/A	N/A
Hickey Creek WEA	Lee	2	6	3	0	Prescribed Fire (38); Mechanical 94
Moody Branch WEA	Manatee	5	27	5.4	2	Mechanical (299); Chemical (228)
Arbuckle WMA	Polk	21	72	3.4	0.8	Prescribed Fire
Walk-in-the-Water WMA	Polk	6	12	2	0.3	Mechanical (75)
Salt Lake WMA	Brevard	1	2		0	N/A
Split Oak Forest WEA	Orange	N/A	1	N/A	0	176 acres of potential Scrub- Jay habitat burned.
Three Lakes WMA	Osceola	0	0	0	0	N/A



### *Marian's Marsh Wren*

Marian's Marsh Wren is State-designated Threatened. There is little information on the distribution and abundance of this species. FWC staff have recorded observations of Marian's Marsh Wrens while conducting annual marsh bird surveys according to the Standardized North American Protocol since 2015 on Apalachicola River WEA (Gulf and Franklin counties) and 2017 on Box-R and Tate's Hell WMAs (Franklin county). In FY 2019-20, staff documented Marian's Marsh Wrens at 5 of 13 stations on Apalachicola River WEA, 0 of 7 stations on Box-R WMA, and 11 of 16 stations on Tate's Hell WMA.

### *Red-cockaded Woodpecker*

The Red-Cockaded Woodpecker (RCW) is Federally Endangered. Staff helped organize the statewide RCW working group virtual meeting in August. Staff continue enrolling landowners in the 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 2019-20, but there are 17 properties enrolled in the program totaling 100,186 acres. The 2019 breeding season concluded with populations tracking to achieve, or in many cases exceed, the 2020 population and metapopulation goals outlined in Florida's RCW Management Plan (<https://myfwc.com/media/2046/rcw-plan-only.pdf>).

*SURVEYS* - FWC, in cooperation with the Florida Forest Service (FFS), continued to manage and monitor RCWs on the 49,317-acre Citrus tract of the Withlacoochee State Forest (Citrus County; Exhibit 9). Habitat management and cavity maintenance were also conducted on the Citrus tract in FY 2019-20 (Exhibit 9). Additionally, staff and volunteers cut and treated with herbicide encroaching hardwoods in at least 20 clusters and protected over 400 cavity trees from fire in 42 clusters by removing and raking fuels. In October 2019, Citrus donated 6 hatch year RCWs for translocation to St. Sebastian River Preserve State Park. FWC continued to manage and monitor RCWs in Goethe State Forest WMA (Levy County; Exhibit 9). Habitat management also continued at Goethe WMA in FY 2019-20 (Exhibit 9).

Staff continued to monitor the Bull Creek/Triple N Ranch WMAs (both in Osceola County) RCW population and completed habitat management on both WMAs in FY 2019-20 (Exhibit 9). Staff also replaced 25 inserts and installed 24 inserts. Despite reaching the area goal of 30 potential breeding groups, the population received 8 birds from a donor population through translocation in FY 2019-20. Staff continued to monitor the Three Lakes WMA (Osceola County) RCW population and the cavity tree resources in FY 2019-20 (Exhibit 9). Staff also replaced 17 inserts and installed 25 inserts. Staff treated 5,287 acres with prescribed fire.

Fred C. Babcock/Cecil M. Webb WMA (Charlotte County) covers approximately 65,758 acres. The annual tree cavity surveys, habitat management, and cavity maintenance were conducted in FY 2019-20 (Exhibit



9). Babcock Ranch Preserve (Charlotte County) covers 67,619 acres and is under FFS management. In FY2019-20, staff conducted annual RCW monitoring, cavity maintenance, and habitat management on the Preserve (Exhibit 9). FWC also mowed around cavity trees on the Preserve. Platt Branch WEA (Highlands County) covers 1,971 acres. In FY 2019-20, staff conducted RCW monitoring, cavity maintenance, and habitat management (Exhibit 9). In addition to the clusters on the WEA, there are three RCW clusters on adjacent lands, however their nesting success and habitat management are not included in Exhibit 9.

BCNP (Collier and Monroe counties) spans 729,000 acres and supports the southernmost population of RCWs range wide, which is monitored cooperatively by the National Park Service (NPS) and FWC. The total number of known and actively managed RCW clusters in BCNP is 120. Two clusters were discovered on helicopter surveys and have yet to be surveyed from the ground. Thirty-nine active clusters were chosen as a subsample for intensive breeding season monitoring (Exhibit 9). In FY 2019-20, NPS and FWC conducted cavity maintenance, but no prescribed burns occurred in RCW habitat on BCNP this year (Exhibit 9). Additionally, 29 natural cavity trees were discovered. Two subadult RCWs were translocated to the smaller sub population of Lostman's Pines (within BCNP) on October 2019 to augment breeding pairs. Both birds were later determined to be breeders, however the number of potential breeding groups decreased from five to four, likely due to these new birds. The total number of active clusters increased from six to eight.

In FY 2019-20, staff conducted annual RCW monitoring and habitat management maintaining a three-year burn rotation on J.W. Corbett WMA (Palm Beach County; Exhibit 9). In FY 2019-20, annual RCW monitoring, cavity maintenance, and habitat management occurred on John G. and Susan H. DuPuis Jr. WEA (Martin and Palm Beach counties; Exhibit 9). Having met federal recovery standards of 40 potential breeding groups in the combined DuPuis/Corbett metapopulation, birds were not translocated from Corbett WMA or DuPuis WEA in FY 2019-20. Picayune Strand State Forest (PSSF; Collier County) is a 72,995-acre WMA that is cooperatively managed with the FFS and FWC. In FY 2019-20, staff conducted RCW monitoring, cavity maintenance, and habitat management (Exhibit 9). In May 2020, an 8,663-acre wildfire began outside of PSSF and jumped into Picayune WMA, burning 1,164-acres total with 790-acres affecting two of the northern most RCW clusters. All RCWs and their trees survived due to FWC-contracting groundcover reduction around 82 RCW trees in the winter. Other management activities completed by FFS included exotic vegetation treatments (24.80-acres) and aerial sapling melaleuca treatments (196.10-acres). Additionally, staff discovered suitable habitat for future RCW recruitment in the Broken Sound area of Picayune WMA, which will require some restoration and habitat management, which will be implemented in future planned management actions.



**Exhibit 9.** Red-Cockaded Woodpecker surveys and habitat management conducted in FY 2019-20. 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)
Citrus WMA	Citrus	93	85	8	84	160	138	8 inserts replaced, 5 inserts cleaned/repared, 15 inserts installed	Prescribe fire (12,793)
Goethe State Forest, Levy County	Levy	76	64	12		94	75		Prescribe fire (15,500); Mowing (85)
Apalachicola River WEA	Franklin	10	10	0	18 (11 failures)	21	20 (18 confirmed, 2 likely)	n/a	Prescribed fire (1,222)
Tate's Hell WMA	Franklin, Liberty	70	59	9	59	34	25	22 cavities installed; 2 clusters added; 6 clusters augmented	Mechanically treat (47)
Apalachicola WMA	Franklin, Leon, Wakulla							60 cavities installed	
Babcock Ranch Preserve	Charlotte	19	17	2	21 (6 failed)	18 (1 adult)	18	9 inserts added, 5 replaced	Prescribed fire (5,733), roller chop (265)
Babcock/Webb and Yucca Pens Unit WMA	Charlotte, Lee	44	39	5	43 (9 failed, 9 re-attempts, 2 successful)	41	35	5 inserts replaced	Prescribed fire (17,966), roller chop (3,502), chemically treat (20,818)
Croom WMA	Hernando, Sumter	42	40	2	45 (12 failed)	70 (5 unbanded)	63	5 inserts added/replaced	Prescribed fire (1,683)
Platt Branch WEA	Highlands	6	5	1	5 (1 failed)	7	6	3 inserts installed	Prescribed fire (580), mechanically treat (49)
Big Cypress National Preserve	Collier, Monroe	92	35*	4*	32* (15 failed, 7 re-nested, and two re-nests were successful)	22	15	3 cavities installed, 2 cavities replaced; understory cleared around 260 cavity trees,	





**Exhibit 9 (continued).** Red-Cockaded Woodpecker surveys and habitat management conducted in FY 2019-20. 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)
John G. and Susan H. Dupuis, Jr. WEA	Palm Beach, Martin	16	14	1	14	19	19	2 cavities installed	Prescribed fire (2,000)
J.W. Corbett WMA	Palm Beach	30	28	2	29	39	30		Prescribed fire (8,273)
Picayune Strand State Forest WMA	Collier	14	12	1	15 nest attempts: 8 successful, 5 failed, 4 re-nests (2 successful)	15	10	4 cavities installed; Understory cleared around 82 cavity trees	Prescribed fire (4.74), Wildfire (790 acres), Exotics treated (24.79), Sapling melaleuca treatment (196.10).
Herky-Huffman Bull Creek/Triple N Ranch WMAs	Osceola	39	33	3	38	46	36		Prescribed fire (1,680) on HH Bull Creek WMA; Prescribed fire (1,448) on Triple N Ranch WMA.
Three Lakes WMA	Osceola	53	49	3	50	70	57		Prescribed fire (5,287)





## Salt Marsh Songbirds

GENETICS STUDY - Biological status reviews conducted by FWC recommend the Scott's Seaside Sparrow and Wakulla Seaside Sparrow be listed as state imperiled subspecies and they were included in FWC's draft Saltmarsh Songbird Species Action Plan. These non-migratory salt marsh specialists are two of five subspecies of Seaside Sparrow that breed in Florida (the other three include the MacGillivray's Seaside Sparrow, the Federally Endangered Cape Sable Seaside Sparrow, and the Louisiana Seaside Sparrow). Questions have been raised about whether the current sub-species designations are valid.

FWC and collaborators at the University of Florida examined population structure in Seaside Sparrows along Florida's coastline using multiple approaches and modern genetic methods to determine the relatedness of sparrows in these populations. Genetic analysis showed support for three distinct genetic groups (in addition to the interior population of Cape Sable Seaside Sparrow which was not included in this study). FWC identified three clusters that correspond to three geographic regions in Florida: Atlantic coast, Gulf coast peninsula, and the western panhandle. Genetic analysis does not support the idea that the state-listed Wakulla Seaside Sparrow is a distinct subspecies but might be genetically split between the Scott's and Louisiana subspecies. However, other factors than genetics are used when distinguishing subspecies, and analysis of song and body measurement data is underway. The genetic and physical results will be used to refine taxonomic designations of Seaside Sparrow which may affect listing status, and future conservation and management priorities.

SURVEYS - FWC staff conducted surveys of the Salt Marsh Songbird populations in Nassau and Duval Counties. These surveys are part of a regular monitoring effort at 5-year intervals recommended after surveys in 2014-2015 in order to monitor populations of state-listed Salt Marsh Songbirds in the area. Data will be used to track population trends and help guide future management actions. Species surveyed included Worthington's Marsh Wren and MacGillivray's Seaside Sparrow.

## 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 Threatened (American Oystercatcher, Black Skimmer, Least Tern, and Snowy Plover) and one is Federally 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 - To build upon the existing species action plan completed in 2013 (<http://flshorebirdalliance.org/media/1013/imperiled-beach-nesting-birds-species-action-plan.pdf>), in 2016 FWC and partners completed the Florida Beach-nesting Bird Plan that includes specific population



goals, metrics, timelines, funding needs, and a conceptual framework consistent with national shorebird recovery plans (<http://flshorebirdalliance.org/media/1007/floridabeachnestingbirdplan.pdf>). To implement the Beach-nesting Bird Plan, FWC inaugurated a dedicated Shorebird Program that expands upon foundational shorebird conservation work and is supported by a grant through the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund. Working with its key partner, Audubon Florida, FWC continues to recover shorebird populations using five strategies: reduce human disturbance, manage habitat, manage predation, inform management and track outcomes, and improve regulatory coordination. The project area encompasses a variety of habitats used by breeding, wintering, and migrating shorebirds. The 4-year project represents Phase 1 of a larger vision and will conclude with a focused review of all program activities to assess programmatic efficacy.

**FLORIDA SHOREBIRD ALLIANCE** - To achieve the goals of the Beach-nesting Bird Plan and the Shorebird Program, FWC leads a unique statewide partnership effort through the Florida Shorebird Alliance (FSA). The FSA is a network of 12 regional partnerships that work locally to ensure important shorebird and seabird sites are surveyed, monitored, posted, and stewarded. In the 2019 nesting season, FSA partners collectively monitored 897 miles of coastline, and protected 5595 focal species seabird nests and 687 focal species shorebird nests with posting. The FSA publishes a monthly e-newsletter (the Wrack Line) that reaches over 33,000 subscribers. Through the FSA, FWC coordinates breeding bird protocol training and data quality control for the statewide shorebird-monitoring program. Additionally, FWC manages the Alliance website ([www.FLShorebirdAlliance.org](http://www.FLShorebirdAlliance.org)), which functions as a principal online resource for information and materials on Florida's shorebirds and seabirds, and as a tool to improve coordination and information sharing between regional partnerships.

**FLORIDA SHOREBIRD DATABASE** - The Florida Shorebird Database ([www.flshorebirddatabase.org](http://www.flshorebirddatabase.org)) was launched in 2011 to serve as the central repository for data collected on shorebirds and seabirds in Florida. Over 1,400 monitoring partners throughout the state have registered accounts in the Database and many of these collect and report breeding data. In the 2019 nesting season, partners entered 14,579 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 entered into the Database. [https://flshorebirdalliance.org/media/1219/2020\\_fsa\\_monitoringdataatwork\\_final.pdf](https://flshorebirdalliance.org/media/1219/2020_fsa_monitoringdataatwork_final.pdf)

**ROSEATE TERN** - The Roseate Tern is only found in extreme South Florida and in a limited number of colonies. In FY 2019-2020, Pelican Shoal Critical Wildlife Area re-emerged after being submerged in 2005 from hurricanes. FWC staff immediately closed the island with CWA signs. The island has increased in



size since it first re-emerged in early 2019. Unfortunately, early season tropical lows and storms caused some over wash of the island and prevented Roseate Terns from nesting on the island. Two nesting platforms have been placed on Big Pine Key to attract Roseate Terns. Unfortunately, Roseate Terns did not use the platforms but were used by Least Terns. This past season, Roseate Terns only nested at three sites in the Florida Keys, which were all on historical nesting sites on roofs. Based on the nest counts, FWC estimates the total Roseate Tern population for Florida in 2020 was approximately 102 nesting pairs. The number of chicks produced were a minimum of 70. None of the other historic sites on roofs or the abandoned Bahia Honda bridge contained nesting Roseate Terns in 2020.

### *Southeastern American Kestrel*

The Southeastern American Kestrel is a State Threatened non-migratory falcon closely tied to sandhills, scrub, pasture, and prairies in the Southeastern U.S. This subspecies has undergone a range reduction and population decline throughout its range in recent decades. The current population size is estimated to be approximately 1,350-1,500 breeding pairs. Staff and volunteers performed annual maintenance on Kestrel boxes in December and monitored boxes from April to June (Exhibit 10). Late nesting attempts are monitored through July. Staff worked with Ocala City Parks to recommend locations for 6 new Kestrel nest boxes, which will be installed prior to the 2021 nesting season. Staff also completed site evaluations on nest boxes at Ross Prairie State Forest (Marion County) and retired 7 boxes due to unsuitable habitat.

**OCALA NATIONAL FOREST** - FWC is collaborating with the University of Florida to develop habitat management recommendations for scrub species and assess the Kestrel population at Ocala National Forest (Marion, Lake, Putnam, and Seminole counties). The Kestrel population in Ocala National Forest is estimated to be ca. 452 birds; likely the largest remaining population anywhere. Point counts revealed Kestrels prefer scrub patches less than six years post disturbance (burning or mechanical treatment).

**SURVEYS** - On Jennings State Forest WMA (Clay and Duval counties) staff cleaned and maintained 6 nest boxes and conducted three visits during nesting season, however no Kestrels nested in boxes this year (Exhibit 10). On Camp Blanding WMA (Clay county) staff cleaned and maintained 56 nest boxes and conducted four visits during nesting season (Exhibit 10). Staff observed 101 eggs that produced 72 chicks. Other species utilizing 20 boxes on Camp Blanding WMA were flying squirrels, Gray Squirrels, Great-Crested Flycatchers, blue birds, and SouthEastern Screech Owls. Four boxes were unused and remained vacant. Eight boxes were retired in June, thus bringing the number of boxes down to 48. On Bell Ridge Longleaf WEA (Gilchrist County) staff cleaned and maintained 4 nest boxes and conducted 4 visits during nesting season (Exhibit 10). Kestrels nested in 3 boxes. There were 10 eggs, but no chicks were observed.



On Fort White WEA (Gilchrist County) staff cleaned and maintained 9 nest boxes and conducted four visits during nesting season (Exhibit 10). No Kestrels nested in the boxes. On Watermelon Pond WEA (Alachua County) staff cleaned and maintained 7 nest boxes and conducted four visits during nesting season (Exhibit 10). No Kestrels nested in boxes although Kestrels were observed using natural cavities. Big Bend WMA (Taylor and Dixie counties) staff surveyed and maintained 28 Kestrel nest boxes during the nesting season (Exhibit 10). None of the boxes were successful. FY 2019-20 activities to enhance the survival of the Kestrel on Twin Rivers WMA (Madison county) consisted of providing and maintaining nest boxes and conducting surveys. Staff checked 9 nest boxes (Exhibit 10) One nest was a late nest with birds hatched in July. It is unknown if the pair was a re-nest or a new pair.

**Exhibit 10.** Southeastern American Kestrel next box surveys conducted in FY 2019-20.

Location	County	Boxes Managed	Boxes Occupied	Nest Success	Other Species in Boxes
Bell Ridge Longleaf WEA	Gilchrist	4	0	no	Great-Crested Flycatcher, Eastern Screech Owl
Big Bend WMA	Taylor	28	0	no	Great-Crested Flycatcher, Eastern Screech Owl
Camp Blanding WMA	Clay	56	24	Yes, 72 chicks	Gray Squirrel, Southern Flying Squirrel, Great-Crested Flycatcher, Eastern Screech Owl, and Eastern Bluebird
Fort White WEA	Gilchrist	9	0	no	Southern Flying Squirrel, Great-Crested Flycatcher, Eastern Screech Owl, and Gray Squirrel
Jennings State Forest WMA	Clay, Duval	6	0	no	Southern Flying Squirrel, Great-Crested Flycatcher
Twin Rivers State Forest WMA	Madison	9	3	Yes, 8 chicks	Tufted Titmice, Great Crested Flycatcher, Southern Flying Squirrels
Watermelon Pond WEA	Alachua	7	0	no	none reported
Platt Branch WEA	Highlands	4	1	No	Eastern Screech Owl, Great-Crested Flycatcher
Lake Wales Ridge WEA	Highlands, Polk	13	3	Yes	Eastern Screech Owl, bees
Chassahowitzka WMA	Hernando	9	4	Yes	Eastern Screech Owl, Great-Crested Flycatcher
Chinsegut WEA	Hernando	2	0	No	Eastern Bluebird, Eastern Screech Owl
Perry Oldenburg WEA	Hernando	3	2	Yes	Great-Crested Flycatcher
Moody Branch WEA	Manatee	2	0	No	Eastern Screech Owl
Crooked Lake WEA	Polk	3	0	No	Eastern Screech Owl
Janet Butterfield Brooks WEA	Hernando	1	1	Yes	N/A
Tenoroc Public Use Area	Polk	1	1	No	N/A
Hilochee WMA	Polk	8	0	No	Eastern Screech Owl, Great-Crested Flycatcher, Red-bellied Woodpecker
Caravelle Ranch WMA	Putnam	3	0	0	Eastern Bluebird
Utility Rights-of-Way/private property	Marion	42	21	Yes, 13 chicks	Eastern Screech Owl, Great-Crested Flycatcher, Eastern Bluebird, Southern Flying Squirrel
Utility Rights-of-Way/private property	Hernando	4	3*	Yes, 2 chicks*	Eastern Screech Owl, Eastern Bluebird

\*One box utilized and fledged July 2019



## Wading Birds

FWC has conducted nesting, foraging, and roosting surveys in the CREW WEA and National Audubon's Corkscrew Swamp Sanctuary (Lee and Collier counties) for eight consecutive years. No Rookeries were observed in FY 2019-20, but only one flight was conducted. All other flights were canceled due to Covid-19. J.W. Corbett WMA (Palm beach County) conducted ground surveys and found one rookery (Exhibit 11). Holey Land WMA (Palm Beach County) staff in collaboration with the South Florida Water Management District observed two rookeries with at the same locations as previous years (Exhibit 11). Little Gator Creek WEA (Pasco County) has a ten-acre Wood Stork and wading bird nesting colony. FWC uses water control structures and pumps to manage water levels in the basin marsh that contains the colony. This maintains suitable conditions for nesting, and allows the colony to persist, even during drought years. FWC conducted site visits in FY 2019-20, but no Wood Storks were observed nesting in the colony (Exhibit 11).

**Exhibit 11.** Wading bird surveys conducted in FY 2019-20.

Location	County	Historical rookeries	FY 19/20 Rookeries (nests)	Roosting Sites	Foraging Aggregations	Species
Big Bend WMA	Dixie and Taylor	6	221			Little Blue Heron, Tricolored Heron
Lafayette Forest WEA	Lafayette	0	unknown			Little Blue Heron
Apalachicola River WEA, Box- R WMA, Tate's Hell WMA	Gulf, Franklin, Liberty	N/A	1 Wood Stork (12)	N/A	10 adult Little Blue Heron at a rookery but no nests	Wood Stork, Little Blue Heron
Aucilla WMA	Jefferson, Taylor	N/A	2 Little Blue Heron (16)			Little Blue Heron, Tricolored Heron
L. Kirk Edwards WEA	Leon	1	0		2 Wood Storks	Wood Stork
Ochlocknee North (private land)	Leon	1	0			Wood Stork
Ochlocknee South (private land)	Leon	1	175			Wood Stork
Little Gator Creek WEA	Pasco	1	0	0	N/A	Wood Stork
Holey Land WMA	Palm Beach	2	2 (25)	N/A	N/A	Little Blue Heron, Tricolored Heron
J.W. Corbett WMA	Palm Beach	5	1 (3)	1	1	Wood Stork, Cattle Egret, Great Blue Heron, Little Blue Heron, Tricolored Heron, Snowy Egret, Great Egret, Black-crowned Night Heron, Roseate Spoonbill
Corkscrew Regional Ecosystem Watershed WEA	Lee, Collier	N/A	0	3	11	Wood Stork, Little Blue Heron, Tricolored Heron, Roseate Spoonbill



## White-crowned Pigeon

The State Threatened White-crowned Pigeon is endemic to Monroe and Miami-Dade Counties. Most known nesting islands are protected in the Florida Keys, Everglades National Park, and Biscayne National Park. In FY 2019-20 staff scouted multiple sites for potential nesting locations. The Florida Keys Wildlife and Environmental Area (Monroe County) staff will use the information gathered in FY 2019-20 to conduct standard nesting surveys in FY 2020-21.

## AMPHIBIANS

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### Flatwoods Salamanders

FLATWOODS SALAMANDER RECOVERY COORDINATION - FWC continues to participate in the Flatwoods Salamander Recovery Team. The annual meeting took place in November in Gainesville with members from FWC, Virginia Tech, the US Geological Survey, the Florida Forest Service, Coastal Plains Institute, Amphibian Foundation, and others. It was recognized that remaining animals are significantly inbred due to population isolation since wetlands are often not connected with intact uplands anymore. Additionally, meeting participants set recovery criteria and developed a schedule to review and edit USFWS documents (SSA, Recovery Plan, and Recovery Implementation Strategy).

RETICULATED FLATWOODS SALAMANDER - Beginning in November 2018, a five-year reticulated Flatwoods Salamander recovery project was initiated on Escribano Point WMA (Santa Rosa county). The project is a cooperative agreement among FWC, Department of Defense (DOD), USFWS, and The Longleaf Alliance (LLA) utilizing funds from the DOD Readiness and Environmental Protection Integration Program. This funding significantly enabled implementation of a headstarting program to further aid in species recovery. In FY 2019-20, LLA and FWC staff collected 268 eggs from 5 wetlands, with 242 of those being released. In addition, LLA and FWC monitored numerous wetlands using a standardized dip netting protocol to determine larval occupancy in 13 of 40 targeted wetlands. LLA installed and monitored two drift fences at two separate wetlands capturing adults and metamorphs at both wetlands. Staff documented salamanders in 14 wetlands in FY 2019-20, with one previously occupied wetland having no documented use. A total of 649 tissue samples were collected from captured individuals for genetic analysis. In FY 2019-20, staff conducted habitat management activities to enhance reticulated and Frosted Flatwood Salamander habitat (Exhibit 12).





**Exhibit 12.** Habitat management conducted in FY 2019-20 for Flatwoods Salamanders.

Location	County	Species	Management Activities (acres)
Apalachicola National Forest	Liberty, Wakulla, Leon, Franklin	Frosted	Hand clearing/herbicide hardwood removal (9.05)
Apalachicola River WEA	Gulf, Franklin	Frosted	Prescribed fire (1,222); mechanical and chemical treatments (0.94);
Apalachicola WMA	Franklin, Leon, Wakulla	Frosted	Chemical treatments (3.92)
Eglin Air Force Base	Okaloosa	Reticulated	Hand clearing/herbicide hardwood removal (8.56)
Escribano Point WMA	Santa Rosa	Reticulated	Mechanical and chemical treatments (26)

### Florida Bog Frog

In FY 2019-20, FWC conducted surveys for the Florida Bog Frog along two creeks on Yellow River WMA (Santa Rosa and Okaloosa counties). Surveys were conducted monthly from May to August at points established in FY 2018-19: 10 on Garnier Creek and seven on Julian Mill Creek. Staff established an additional survey point on Julian Mill Creek at a site being considered for habitat restoration. On Garnier Creek, staff detected a maximum of five frogs at the powerline Right-of-Way (ROW) and a maximum of five frogs at three survey points downstream from the ROW that had received previous restoration treatments. On Julian Mill, staff detected one frog upstream of the ROW and one frog on the ROW. As only one frog was detected on any survey at Julian Mill Creek, it is possible the same frog was detected at the two survey points.

In FY 2019-20, 7 acres at Garnier Creek were treated with herbicide to control woody regrowth and 1.2 acres in the surrounding uplands were mulched to reduce debris piles from previous restoration efforts. Future restoration efforts on Garnier Creek will include selective thinning of remaining hardwoods, treatment with herbicide where needed in previously restored areas, and restoration of 4 acres further downstream. Staff are identifying restoration sites on Julian Mill Creek for FY 2020-21.

### Gopher Frog

The Gopher Frog is under evaluation for federal listing. Florida represents a stronghold for the Gopher Frog, which has experienced serious declines throughout its range outside of the state. FWC drafted Species Conservation and Permitting Guidelines for the Gopher Frog in coordination with revisions to the Gopher Tortoise Permitting Guidelines, Florida Pine Snake Species Conservation Measures and Permitting Guidelines, and creation of Florida Mouse Species Conservation Measures and Permitting Guidelines. These guidelines will be brought to the Commissioners in FY 2020-21. The guidelines describe management and conservation actions that will benefit the species.

**MONITORING** - A project to develop a call recognizer for Gopher Frog calls to more easily and quickly analyze the acoustic recordings was terminated when the collaborating physicist at the National Aeronautics and Space Administration’s Kennedy Space Center passed. Data from a monitoring project





of 100 Gopher Frog breeding ponds conducted by FWC staff using dipnetting surveys and automated recording units were provided to University of Georgia (UGA) researchers to conduct occupancy modeling analyses. In FY 2019-20, dipnet surveys of 44 ponds for Striped Newts in Ocala National Forest (Lake, Marion, and Putnam counties) detected Gopher Frog tadpoles in 19 ponds, including seven new ponds. Dipnet surveys in Rock Springs Run State Reserve (Lake and Orange counties) found tadpoles in three of six ponds, including one new pond. FWC staff surveyed the privately-owned Putnam Lakes Preserve (Clay County) and found tadpoles in four of 10 ponds.

In May, FWC staff detected Gopher Frog tadpoles in two ponds on Blackwater WMA (Okaloosa and Santa Rosa counties) while conducting dipnet surveys. The last known record at the WMA was an audio recording from Goose Ponds in 2001 and there were prior records from Goose Ponds in 1985. Tadpoles collected from each pond were retained and allowed to metamorphose, and subsequently vouchered with photographs at the Florida Museum of Natural History. The two ponds where the frogs were detected are over 11 miles apart and likely represent two distinct populations. The frogs are likely distinct from the previously known population at Goose Ponds, which is 8 miles away. Management efforts at the ponds will focus on prescribed fire in the uplands with emphasis on burning when the ponds are dry to allow fire to carry into the pond basins.

**TAXONOMY STUDY** - Recent genetic studies have suggested Gopher Frog populations in peninsular Florida may be genetically distinct from those in the Florida panhandle and elsewhere. FWC contracted the UF Museum of Natural History to conduct analyses of differences in adult and tadpole morphology and mating calls throughout the species' range but with an emphasis on Florida. If morphological or call differences correspond with the observed genetic break, multiple species or subspecies may be present in Florida, which could affect future management. According to the final report, consistent differences in morphology and calls were not found between peninsular and panhandle populations.

**TRANSLOCATION** - FWC staff experimentally translocated Gopher Frogs to assess the potential value of translocation as a conservation approach. Survival of translocated frogs was only slightly lower (59%) than that of non-translocated frogs (66%). Mortality was higher for translocated frogs because many dispersed from their release burrows and made extensive movements through the landscape, where they were vulnerable to predation and roadkill, but surviving frogs eventually settled into burrows where survival was high. Results provide preliminary support translocation as a conservation measure.

## Striped Newt

The Striped Newt is endemic to north Florida and south Georgia, where it has been extirpated from



many parts of its range. It was a candidate for Federal listing as Threatened but 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. A Biological Review Group met in June to evaluate the species and a Biological Status Review report will be published in FY 2020-21.

**SURVEYS** - FWC staff dipnetted all known Striped Newt breeding ponds that had water in Ocala National Forest (Lake, Marion, and Putnam counties). Larval and/or paedomorphic (gilled adult) newts were detected in 21 of 44 ponds, including two new ponds. Surveys of six ponds in Rock Springs Run State Reserve (Lake and Orange counties) and three ponds in Jennings State Forest (Clay County) failed to detect newts. Striped Newts were detected in one pond on Dixie Plantation (Jefferson County). The other four known occupied ponds were dry during the survey period. Planned surveys of known breeding ponds on other conservation lands could not be conducted because most were dry. Striped Newts have been previously detected in 3 breeding ponds on Guana River WMA (St. Johns County). In FY19-20, staff conducted prescribed burns on 116 acres of upland habitat with breeding ponds and potential habitat. Striped Newts have been previously detected in 9 breeding ponds on Triple N Ranch WMA (Osceola County). In FY19-20, staff conducted prescribed burns on 640 acres of upland habitat with breeding ponds. A paper was published on the Striped Newt population at Triple N Ranch WMA (Osceola County). An occupancy modeling study was initiated in 21 known ponds in Ocala National Forest and five ponds in Jennings State Forest to determine detection probability. Each pond was dipnetted for 30 minutes by three observers; however, the study was terminated due to COVID-19.

**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 FY 2019-20, 666 Striped Newts were produced by 4 zoos and were released into 4 ponds. This is the second highest annual production of newts by zoos in the project's 8-year history. Monthly recapture rates of marked adults within the ponds was low (0-5%), but reproduction was documented through the capture of young larvae in May. Throughout the year, 14 previously marked newts were found entering or emerging from release ponds. FWC received funds through the Conserve Wildlife specialty license plate fund to continue supporting Striped Newt repatriation by financially supporting the Coastal Plains Institute, the Amphibian Foundation, and the Jacksonville Zoo in FY 2019-20.



## REPTILES

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### *American Crocodile*

The American Crocodile is a Federally Threatened species in Florida and has been documented as far north as Brevard County on the east coast and Pinellas County on the west coast. With the increasing crocodile population (estimated between 1,160 and 2,800 non-hatchlings), a commensurate increase in crocodile-human conflicts has been documented. FWC manages these conflicts on a case-by-case basis with human safety being the highest priority, while also recognizing the needs of a recovering species. In FY 2019-20, FWC received 176 complaints regarding the crocodile. Most complaints were resolved by educating the public through telephone calls and site visits.

FWC has crocodile response agents who respond to crocodile calls, some of which require capture of the crocodile. A total of 7 individual crocodiles were captured by FWC in FY 2019-20. Captured animals ranged from 7.2 to 9.4 feet in length (average of 8.0 feet). Three were captured and removed from human-interaction situations and released near their capture sites. Five were captured and translocated to a site deemed suitable by FWC. One crocodile was moved twice in FY 2019-20 and was placed into the aversive conditioning study during the second move. Fish and Wildlife Research Institute (FWRI) staff monitored the movements of crocodiles as a part of a study on the effectiveness of translocation as a method for reducing human-crocodile conflicts. Of the 17 crocodiles that were fitted with GPS transmitters, only one still has a functioning transmitter. Data collected from all crocodiles are being analyzed for a report that will be completed in the coming months. GPS transmitters were attached to three additional crocodiles subjected to aversive conditioning prior to relocation; these animals were captured and relocated in response to public complaints. The data gathered on these three individuals may help inform whether aversive conditioning is an effective management tool for conditioning crocodiles to avoid certain areas.

FWC was involved in the recovery of 2 American Crocodile carcasses (one male and one female) in FY 2019-20. The animals measured 5.1 feet (female) and 9.7 feet (male) in length. The cause of death for both animals was attributed to wounds inflicted by automobile strikes.

### *Barbour's Map Turtle*

Staff of Apalachicola River WEA (Gulf and Franklin counties) conduct surveys for basking Barbour's Map Turtles in the fall of each year. Survey routes cover approximately 36 miles along sections of the Apalachicola, Brothers, and Chipola rivers. FWC completed the fall 2019 surveys and counted 950 turtles across 4 survey dates, fewer than in the previous survey conducted in 2017 and slightly lower than the



10-year mean number observed. The 17-mile long Chipola River section continues to have the most turtle observations with 727 recorded in 2019, followed by the 10.5-mile Brothers River section with 116 turtles; the 9-mile Apalachicola River section had the fewest turtles observed in 2019 where staff counted 107 turtles. Environmental factors including the river's water height and the difference between air and water temperature likely influence the number of turtles basking and thus FWC's ability to detect them.

### *Eastern Indigo Snake*

To assist the USFWS with implementing the federal recovery plan, FWC staff added the Indigo Snake in May 2020 to a rare upland snake webpage that allows the public to report observations. The USFWS will periodically be provided with verified Indigo Snake sightings that are submitted to this webpage. FWC established a collaboration with the South Florida Water Management District to collect wild Indigo Snakes in construction areas and transfer them to the breeding population maintained at the Orianne Center for Indigo Conservation (OCIC), Central Florida Zoo; snakes at this facility produce offspring for formal reintroduction efforts in the Florida panhandle and southern Alabama. A search effort at the C-43 reservoir (Hendry County) in February produced one adult male snake. FWC staff served on the thesis committee for an Auburn University graduate student monitoring Indigo Snakes released in the Florida panhandle and attended a meeting of the Eastern Indigo Snake Reintroduction Committee in January.

*EASTERN INDIGO SNAKE RECOVERY IN THE FLORIDA PANHANDLE* - FWC continues to participate in the Eastern Indigo Snake Reintroduction Committee. The annual meeting took place in January at the Jones Center in Newton, Georgia. Members of the Committee include FWC, OCIC, The Nature Conservancy, Orianne Society, Auburn University, and Jones Center. High-level outcomes were finalization of the 2019 reintroduction plan in Florida, identification of research needs to inform management decisions, and identification of husbandry needs at OCIC.

FWC completed work funded by the Conserve Wildlife specialty license plate fund that monitored repatriated snakes by telemetry and sampled for the *Cryptosporidium serpentis* disease among free-ranging native snakes. To date, 69 Indigo Snakes have been repatriated at Apalachicola Bluffs and Ravines Preserve (ABRP), with 22 non-telemetry equipped snakes being released in 2020. Over the past year, 8 telemetry-equipped snakes were tracked, and 5 snakes successfully had transmitters removed. No free-ranging snakes at ABRP were found to have *Cryptosporidium serpentis* infections, although one wild Indigo Snake captured in south Florida as peripheral monitoring efforts tested positive, indicating the disease occurs in Florida. FWC hired a contracted employee and held Indigo Snake search days in central Florida to attempt to capture Indigo Snakes to add to the broodstock colony managed by OCIC. This attempt was unsuccessful highlighting how rare these snakes are in the wild.



In FY 2019-20 FWC and partners were awarded a Competitive-State Wildlife Grant to continue repatriation efforts at ABRP. This grant includes funds to expand captive breeding at OCIC, manage habitat at ABRP, and start three monitoring projects at the release site. In FY 2019-20, FWC and partners were awarded a Traditional Section 6 grant to study the genetics of captive Broodstock Eastern Indigo Snakes. This grant will inform opportunities to expand captive breeding opportunities at OCIC.

### *Florida Pine Snake*

The Florida Pine Snake is State Threatened and is under evaluation for Federal listing. FWC revised the Florida Pine Snake Species Conservation and Permitting Guidelines in coordination with revisions to the Gopher Tortoise Permitting Guidelines and creation of Gopher Frog and Florida Mouse Species Conservation Measures and Permitting Guidelines. These guidelines will be brought to the Commissioners in FY 2020-21. The guidelines describe management and conservation actions that benefit the species.

*MOVEMENT AND HABITAT USE IN NORTHERN FLORIDA* - 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 to assess Pine Snake habitat use, survival and movements on conservation lands smaller than 7,400 acres and adjacent private lands was completed this year. A total of 24 captures at Fort White (Gilchrist County) and Suwannee Ridge (Hamilton County) WEAs. Each snake was tracked for up to one year using radio-telemetry. Home ranges were found to differ between sex and seasons, as well as differing widely by site. Most snakes largely remained on conservation lands, rather than utilizing adjacent private lands. Videos on this project are available at [https://www.youtube.com/watch?v=U85pCZELo\\_c](https://www.youtube.com/watch?v=U85pCZELo_c), <https://www.youtube.com/watch?v=l23nRJl2UZg>.

*SURVEYS* - Trapping for at-risk snake species continued in FY 2019-20 at three new locations in Blackwater WMA (Santa Rosa County) from March-June 2020. FWC captured 145 individuals comprising 11 snake species, including 11 Florida Pine Snake captures of 10 individuals. Trapping will continue in the Coldwater Management Unit of the WMA in the fall of 2020. The traps will be relocated to three new locations in the winter of 2020-21 where they will be located for one spring and one fall trapping season. Snake trapping will continue on Blackwater WMA at new locations each year to determine the distribution of Pine Snakes and other at-risk snake species (i.e. Eastern Copperhead, Eastern Diamond-backed Rattlesnake, Eastern Indigo Snake, and Southern Hog-nosed Snake) and identify possible areas for management activities.

In April 2020, staff constructed eight semi-permanent box-funnel arrays to update upland snake surveying and monitoring efforts at the Fitzhugh Carter Tract of Econfina Creek WMA (Washington and



Bay counties). The upland snake survey ran from April - June with traps set for four days each week yielding 67 trap nights. All snakes captured were recorded by location and species, and morphometric data was collected. Each snake was photographed to begin to develop a database of individuals, with special consideration to Florida Pine Snakes. Staff captured three Pine Snakes and opportunistically documented two crossing roadways.

### *Florida Scrub Lizard*

The Florida Scrub Lizard is being evaluated for federal listing as Threatened. FWC completed a status survey in FY 2017-18 that showed the range along the Atlantic coast has contracted 48 miles northward in the past 30 years. In 2019, FWC staff and volunteers collected 100 Scrub Lizards from two state parks in Martin County with robust populations and released them at Hypoluxo Scrub Natural Area (Palm Beach County) extending the occupied range 23 miles south. This introduced population has been monitored every two months; 31 adults and 23 juveniles were observed in September 2019. Genetic samples collected from each released lizard can be used in the future to determine the number of founder animals contributing to the established population and their relatedness.

### *Gopher Tortoise*

**MANAGEMENT** - The Gopher Tortoise is listed as a Threatened species in Florida and are a keystone species as their burrows are home to over 350 other species. The Gopher Tortoise Management Plan (<http://myfwc.com/media/2286685/GT-Management-Plan.pdf>) is intended to guide the continued conservation of the Gopher Tortoise in Florida. The plan places an emphasis on landowner incentives, habitat management, and maintaining the Gopher Tortoise as a keystone species through commensal species conservation. FWC continues to coordinate with the stakeholder Gopher Tortoise Technical Assistance Group on Gopher Tortoise conservation issues. The continued participation of stakeholders is vital to the long-term conservation of the species.

In FY 2019-20 student interns from the Florida State University contributed approximately 286 hours to help implement Gopher Tortoise conservation actions. Many of these actions may not have otherwise been accomplished with existing staff resources, and benefit interns by providing professional experience in wildlife conservation and work in a government agency. Each intern project (Exhibit 13) completed addresses one or more objectives of the Gopher Tortoise Management Plan.





**Exhibit 13.** *Summary of projects completed by student interns during FY 2019-20.*

Project Title	Semester(s)
Fact Sheet: Gopher Tortoises and Dog Safety	Summer 2019
Burrow or Structure Protection Permit Integration	Summer 2019
Local Government Webinar Creation: Recipient Site Permitting & Habitat Management Incentives	Fall 2019
Local Government Website Creation	Spring 2020
Gopher Tortoise Day Outreach	Spring 2020
Gopher Tortoise Permitted Wildlife Rehabilitator Update	Spring 2020
Education & Outreach Coordination	Summer 2019, Fall 2019, Spring 2020
Volunteer Program Coordination	Summer 2019, Fall 2019, Spring 2020
Florida Gopher Tortoise Smartphone App Submission Review	Summer 2019, Fall 2019, Summer 2020

**INCIDENTAL TAKE PERMITS** - The Incidental Take Permit (ITP) Gopher Tortoise volunteer relocation program mobilizes volunteers to conduct burrow surveys at development sites permitted for incidental take and to transport tortoises from the development site to the approved recipient site. Each recipient site contains at least 250 acres of suitable tortoise habitat and can accept at least 250 adult Gopher Tortoises, criteria required to establish a viable population. In FY 2019-20, FWC staff did not train any new volunteers to conduct surveys or transport tortoises from ITP project sites. Using volunteers helps reduce relocation costs, recognizing the developer has previously paid mitigation and is not required to relocate the tortoises under these formerly issued permits. The number of tortoises relocated from ITP development sites significantly decreased this fiscal year due to Covid-19 and other factors.

Since implementation of the recipient site permit program in 2008, approximately 25,776 acres of tortoise habitat have been protected through permanent conservation easements. Under these permits, private landowners can accept tortoises relocated 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. As of June 30, 2020, 48 recipient sites have been permitted with a current available capacity of 9,786 tortoises. An additional 7 recipient site permit applications are under review with potential available capacity for 11,713 tortoises on 6,948 acres of habitat. In FY 2019-20, 10,698 tortoises were relocated under FWC-issued permits.

To humanely relocate tortoises from incidental take permitted development sites, and restock tortoises on conservation lands where populations have been depleted, FWC has approved ITP recipient sites on several properties in northern Florida. FWC has partnered with Nokuse Plantation (Walton County), Avalon Plantation (Jefferson County), and Eglin Air Force Base (AFB; Walton County) to approve ITP recipient sites on each of these three sites. In FY 2019-20, 467 tortoises were relocated to Eglin AFB.





**WAIF TORTOISES** - In FY 2019-20, FWC continued to identify solutions for waif tortoises (tortoises that have been removed from the wild by unauthorized means or due to injury and whose origin cannot be determined). One solution includes identifying willing landowners to care for waifs on their property, designating the land as a “waif tortoise recipient site.” A new waif recipient site was established in FY 2019-20, Lemon Bay Park (Sarasota County), and was permitted to receive up to 7 tortoises. Sarasota County will consider expanding the site to receive additional waif tortoises once the site has reached the initial capacity of 7 Gopher Tortoises. FWC is in the process of expanding the existing Sabal Bluff Preserve waif site (Lake County), which is at capacity. FWC also works with wildlife rehabilitators to have waifs placed at designated recipient sites or to release them back to their origin, if location information is known. In FY 2019-20, waif tortoises were received at waif recipient sites (Exhibit 14).

**Exhibit 14.** Summary of waif Gopher Tortoise placements for FY 2019-20.

Waif Site	County	Tortoises Received	Male Female	Juvenile Unknown	Placements Available
Lemon Bay Park	Sarasota	1	0.1	0.0	6
Bay Pines STEM Center	Pinellas	6	3.3	0.0	4
Marie Acres	Hernando	3	1.1	1.0	96
Winding Waters	Palm Beach	25	11.6	6.2	22
Circle B Bar Reserve	Polk	17	9.6	0.1	157
Nixon Smiley Pineland Preserve	Miami-Dade	0	0.0	0.0	199

Under a Memorandum of Agreement (MOA) with the South Carolina Department of Natural Resources, there is an ongoing effort to restock depleted Gopher Tortoise populations on public lands in South Carolina through the FWC waif program. In FY 2019-20, 10 tortoises were relocated to Aiken Gopher Tortoise Heritage Preserve in South Carolina. The FWC also works closely with public agencies, non-profit organizations, and private landowners to identify and provide incentives for tortoise conservation on private lands. To address special situations that provide more flexibility and furthers the objectives of the Gopher Tortoise Management Plan, FWC has entered into a MOA. The US Department of Defense entered into a MOA with FWC to establish an 849.0-acre recipient site in the Eglin AFB. The public conservation lands recipient site was established to receive tortoises from renewable energy projects that occur in Florida and to restock lands on Eglin AFB.

**HABITAT MANAGEMENT** - In FY 2019-20, the Habitat Management Assistance Funding (HMAF) program provided \$83,683 in funding to assist local governments with tortoise habitat management on over 381 acres of their conservation lands (Exhibit 15). The HMAF program continues to offer a reimbursement for the installation of silt fencing, intended for the soft release of tortoises on public lands that have agreed to receive tortoises from previously-permitted ITP development sites, however no new ITP recipient sites were funded through HMAF in FY 2019-20. In FY 2019-20, FWC began providing assistance funding for the installation of silt fencing for the soft release of Gopher Tortoises at waif recipient sites, pending a



previously submitted or concurrent waif recipient site permit application. One new waif recipient site in Sarasota County (Lemon Bay Park) was permitted through this HMAF incentive effort.

**Exhibit 15. Summary of Habitat Management Assistance Funding program results for FY 2019-20.**

Property Name	Local Government	Amount Received	Acres	Management Activities
Lake Townsen Preserve	Hernando County	\$15,000.00	100	Herbicide treatment of FLEPPC Cat I and Cat II plants and sprouted stumps
Cypress Bend Community Preserve	Indian River County	\$7,750.00	25	Biological control of invasive plant species
Duette Preserve	Manatee County	\$15,000.00	58.6	Mechanical removal of oak and sand pine by 3rd party contractor
Key Vista Nature Park	Pasco County	\$4,000.00	8	Rollerchopping, mulching, and shredding of hardwood/coniferous mixed forest
Lemon Bay Park	Sarasota County	\$14,995.30	74.4	Exotic vegetation treatment and pine thinning with snag removal by 3rd party. 1,800 linear feet of filter fabric fencing installation for translocation of waif Gopher Tortoises.
Chuluota Wilderness Area	Seminole County	\$15,000.00	83	Mowing of scrubby flatwoods, sandhill, and rosemary scrub
Oakland Nature Preserve	Town of Oakland	\$11,938.25	32	Tree canopy thinning, native planting, and mechanical/chemical treatment

FWC staff continued to monitor Gopher Tortoise site restoration efforts from past enhancement activities on seven different areas within Jennings State Forest WMA (Clay and Duval counties). Photo points were established prior to management activities. Monitoring at each photo point is conducted at least once a year, preferably in the summer months. Habitat management activities were also conducted at various other WMAs and WEAs statewide (Exhibit 16).

**Exhibit 16. Habitat management activities conducted in FY 2019-20 to enhance Gopher Tortoise habitat.**

Location	County	Management Activities (acres)
Branan Field WEA	Clay, Duval	Prescribed fire (267)
Fort White WEA	Gilchrist	Prescribed fire (969); Mechanical treatment (15.6); Chemical herbicide (94)
Bell Ridge Longleaf WEA	Gilchrist	Prescribed fire (182); Mechanical treatment (1.2)
Lafayette Forest WEA	Lafayette	Prescribed fire (820); Mechanical treatment (158); Chemical herbicide (69)
Suwannee Ridge WEA	Hamilton	Prescribed fire (569); Brush cutting (87); Chemical herbicide (0.1)
Watermelon Pond WEA	Alachua	Chemical herbicide (123); Planted longleaf pine (202); Mechanical treatment (1.7); Prescribed fire (1,024)
Lake Wales Ridge WEA	Highlands, Polk	Prescribed fire (2,000); Reduced canopy height and density (255); Chemical herbicide (150)
Hickey Creek WEA	Lee	Prescribed fire (38); Mechanical treatment (94); Chemical treatment (67)
Platt Branch WEA	Highlands	Prescribed fire (580); Chemical herbicide (137); Mechanical treatment (49)
Bull Frog WEA	Hillsborough	Mechanical treatment (328); Chemical treatment (127)
Moody Branch WEA	Manatee	Mechanical treatment (299); Chemical treatment (228)
Crooked Lake WEA	Polk	Mechanical treatment (426); Prescribed fire (233); Chemical treatment (380)
Perry Oldenburg WEA	Hernando	Prescribed fire (122); Sand pine reduction (36); Chemical treatment (368)



Janet Butterfield WEA	Hernando	Prescribed fire (66); Mechanical treatment (3); Chemical treatment (171)
Pine Log WMA	Bay, Washington	Prescribed fire (1,399)
Point Washington WMA	Walton	Prescribed fire (1,615)
Escribano Point WMA	Franklin, Liberty, Leon, Wakulla	Prescribed fire (36)
Aucilla WMA	Jefferson	Prescribed fire (26)
L. Kirkland Edwards WEA	Leon	Prescribe fire (77); Chemical treatment (34)

**OUTREACH -** FWC offers several opportunities for Florida residents to get involved in tortoise conservation through mortality data collection, waif tortoise (tortoises of unknown origin) transportation, silt fence installation, and conducting burrow surveys on recipient sites for the humane relocation of tortoises associated with incidental take permits. FWC also recruits citizen scientists to assist in conservation efforts by submitting photos of their tortoise sightings to FWC using the “Florida Gopher Tortoise” smartphone app (<https://myfwc.com/wildlifehabitats/wildlife/gopher-tortoise/app/>). In FY 2019-20, 1,076 Gopher Tortoise locations were submitted to the app.

The mortality data collection program engages Florida residents in conservation efforts by asking citizens to notify FWC if they encounter a deceased Gopher Tortoise. These data allow FWC to determine tortoise mortality “hotspots” throughout the state. In FY 2019-20, 196 Gopher Tortoises were reported to the web form, and vehicles were the leading cause of mortality. Citizens that reported an injured or ill tortoise were provided with contact information for a nearby licensed wildlife rehabilitator to provide the tortoise with prompt medical attention. FWC staff are working to merge the Florida Gopher Tortoise smartphone app with this mortality webform to provide citizens with a centralized location to submit all tortoise sightings. This new web-based application will be available in FY 2020-21.

FWC distributes fact sheets and brochures to increase knowledge of tortoises in Florida. Approximately 14,278 publications were distributed in FY 2019-20 (Exhibit 16), All publications are available at each FWC regional office, and electronic versions are available for download at [www.MyFWC.com/GopherTortoise](http://www.MyFWC.com/GopherTortoise).



**Exhibit 17.** Summary of Gopher Tortoise publications distributed during FY 2019-20.

Publication Name	Number Distributed	Primary Audience
Living with Gopher Tortoises	2,948	Local governments, schools, nature centers, Florida residents
Before You Build	1,473	Florida landowners
Get the Facts about Gopher Tortoises	2,180	Local governments, schools, nature centers, Florida residents
Got Gophers, Get Permits poster	54	Planning councils, city/county building departments, local permitting offices
Safe Roads for People and Gopher Tortoises	1,329	Florida Visitor Centers, state/local parks, highway rest stops
Gopher Tortoise Decals	3,056	Florida residents
Gopher Tortoise Day Temporary Tattoos	1,066	Florida residents, children's camps
Children's Publications	1,251	Florida residents, children's camps

The FWC Gopher Tortoise Program hosted or participated in 39 outreach events in FY 2019-20 (Exhibit 17). Outreach this FY included five training events for FWC law enforcement, to help officers address wildlife complaints related to tortoises in an effective and consistent manner statewide. Staff also participated in three training events for the Florida Department of Transportation, two local government workshops, two homebuilder presentations, and many presentations to stakeholders and children.

**Exhibit 18.** Summary of Gopher Tortoise Conservation Program outreach events by County for FY 2019-20.

Outreach Event	County
Landscape Conservation Team Fire Regime Workshop	Alachua
Regional Law Enforcement Training	Alachua
Homebuilder Gopher Tortoise Presentation	Brevard
Hundred Acre Hollows Outreach Presentation	Brevard
FDOT District 4 Presentation	Broward
Fort White WCPR Workshop	Columbia
City of Jacksonville Local Government Workshop	Duval
Mitigation Banking Conference Presentation	Duval
FWC Law Enforcement Cadet Training (April)	Gadsden
FWC Law Enforcement Cadet Training (July)	Gadsden
Glades County Audubon Presentation	Glades
Homebuilder Gopher Tortoise Presentation	Hillsborough
Jefferson County 4-H Presentation	Jefferson
FDACS Health, Safety and Wellness Fair	Leon
FDOT Presentation	Leon
FSU Environmental Service Program Presentation	Leon
Red Hills Fire Festival	Leon
Red Hills Horse Trials	Leon
Tallahassee Science Festival	Leon
Waterworks Science Salon	Leon
4 <sup>th</sup> Annual Mammal Conclave	Marion
Fire Fest 2019	Martin
Earth Day Presentation	Palm Beach



FWC Law Enforcement Training (July 16)	Palm Beach
LE Career Development Training	Palm Beach
Withlacoochee River Park Presentation	Pasco
Reptilepalooza	Pinellas
FDOT Presentation	Polk
Ridge Audubon Society Presentation	Polk
SW Region WCPR Workshop	Polk
City of North Port Local Government Workshop	Sarasota
UF Master Naturalist Training Session	Sarasota
Taylor County 4-H Ag Day	Taylor
Florida Forestry Association Presentation	Virtual
Guana River WMA WCPR Workshop	Virtual
Law Enforcement Presentation	Wakulla
Project Learning Tree at Crawfordville Elementary	Wakulla
Project Learning Tree at Riversink Elementary	Wakulla
St. Marks National Wildlife Refuge Presentation	Wakulla

**RESEARCH** - A research study funded by FWC was completed by researchers at The Jones Center at Ichauway in Newton, Georgia and Archbold Biological Station. The objective was to assess the differences in burrow detectability between all-terrain vehicles (ATV) and pedestrian surveyors. Results were inconclusive, and a subsequent study is being conducted in partnership with FWRI. Results will help inform and improve future revisions to FWC’s Gopher Tortoise Permitting Guidelines.

**SURVEYS** -In FY 2019-20, FWC contracted Florida Natural Areas Inventory (FNAI) to conduct a series of surveys at selected state conservation lands following protocol for Line Transect Distance Sampling (<https://fwcc.sharepoint.com/:w:/r/sites/WHM/WCPR/StandardMonitoringProtocols/>). FNAI surveyed nine conservation lands (Exhibit 18), seven of which met the criteria for a viable population (at least 250 adult tortoises, at least 0.16 tortoises/acre, and at least 250 acres of continuous tortoise habitat). Future monitoring will focus on surveying additional public conservation lands to locate viable populations and locate populations that may become viable with increased management.



**Exhibit 19.** Summary of Gopher Tortoise population survey results for FY 2019-20.

Survey Location	County	Population Estimate	Density (tortoises/acre)	Suitable Habitat (acres)
Bullfrog Creek WEA	Hillsborough	430	1.06	404
Dunns Creek State Park	Putnam	566	0.31	1,835
Lake Kissimmee State Park	Polk	163	0.12	1,332
Lake Wales Ridge State Forest – Walk-in-Water Tract	Polk	672	0.28	2,403
Moody Branch WEA	Manatee	188	0.41	456
Rock Springs Run State Reserve/Wekiwa Springs State Park	Lake/Orange /Seminole	3,436	1.06	3,249
Split Oak Forest WEA	Orange/Osceola	290	0.40	731
Starkey Wilderness Preserve	Pasco	1,156	0.43	2,698
Watermelon Pond WEA	Alachua	395	0.91	435

### Keys Reptiles

FWC assisted with the development and review of USFWS SSAs for the Rim Rock Crowned Snake and Key Ringneck Snake. Both species are State Threatened and candidates for federal listing under the Endangered Species Act.

### Marine Turtles

The FWC maintains 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 Endangered) and Green and Loggerhead (both Federally Threatened). The FWC works with various partners in State and Federal agencies, local governments, stakeholders, conservation organizations, citizens and academic programs to conserve marine turtles and their habitat. The FWC served on multiple committees, boards and working groups in FY 2019-20 in Florida, the USA, and internationally.

**STRANDING NETWORK** - The 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 2019-20, 2,027 dead or debilitated turtles were documented (600 Loggerheads, 1,184 Greens, 208 Kemp’s Ridelys, 12 Hawksbills, 2 Leatherbacks, and 21 unidentified). The FWC responded to 2,504 reports (primarily reports of dead, sick, or injured turtles), transported 46 sick or injured turtles to rehabilitation facilities, and conducted necropsies on 171 carcasses. Eight workshops, involving 223 participants, provided training on how to document strandings. Real-time Florida stranding data is 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 2019-20, six workshops were presented to 1,272 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 2019, 229 areas (846 miles) were surveyed recording 106,656 Loggerhead nests, 53,015 Green nests, 1,105 Leatherback nests, and 11 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 information 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 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 2019, data was collected from 163 nests (104 Loggerheads, 58 Greens, and 1 Leatherback) on two beaches.

**IN-WATER RESEARCH** - The FWC studies the abundance, distribution, behavior, and diet of hatchlings and small juveniles in open-ocean habitat off Florida's coasts. In FY 2019-20, researchers sampled Gulf of Mexico waters offshore of Apalachicola and St. Petersburg. A miniature, solar-powered satellite transmitter was placed on eight of 17 observed turtles (six Green turtles and two Kemp's Ridelys).

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 U.S. 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** - In FY 2019-20, FWC reviewed 259 applications and provided final comments for 157 projects ensuring marine turtles and their habitat remain protected. FWC continued to work with the Florida Department of Environmental Protection (FDEP) and the USFWS to develop the Florida Statewide Beaches Habitat Conservation Plan (HCP). This Plan will provide flexibility to local governments and beachfront property owners to conduct FDEP coastal construction control line permitted activities while ensuring impacts to coastal species and their habitat are





minimized and mitigated. FWC also worked with the USFWS and the City of Fort Lauderdale to develop an HCP for special events in marine turtle nesting habitat during nesting season.

In FY 2019-20, staff reviewed and approved 62 lighting plans for beachfront construction and conducted site visits or post-construction site inspections for 41 projects. Nineteen projects were determined to be compliant with pre-approved or modified lighting plans. 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. FWC assessed approximately 380 fixtures and bulbs from 56 manufacturers from five countries and certified 287 as FWC Wildlife Lighting Certified (<http://myfwc.com/wildlifehabitats/managed/sea-turtles/>).

**MARINE TURTLE PERMITS** - FWC issued 124 authorizations for nest surveys and 29 authorizations to hold turtles for rehabilitation, educational display, or research. FWC reviewed and approved 46 permit requests for new or modified research. Approximately 132 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. There were 24 permits or amendments processed authorizing educational marine turtle walks.

FWC assisted in the placement, transport, and release of stranded marine turtles, including facility inspection and approval. Approximately 66 cold-stunned turtles that stranded in New England were transferred to Florida for rehabilitation and released. FWC inspected two Florida facilities to ensure turtles were held in appropriate conditions. FWC placed two non-releasable turtles in educational facilities within and outside of Florida.

**ANNUAL PERMIT HOLDER MEETING** - In January, FWC hosted the 23<sup>rd</sup> Annual Marine Turtle Permit Holder Workshop in Panama City Beach, Florida with the Sea Turtle Conservancy and Wildlife Alert. Over 400 permit holders, volunteers, 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, the FWC conducted two workshops on stranding and how to use the new disorientation reporting app.

## Spotted Turtle

The Spotted Turtle is being evaluated for Federal listing and has been documented from 15 counties in Florida, but records mostly consist of single individuals crossing roads in spring. Little information exists on the life history or demographics of southern populations. 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 2020, 81 Spotted Turtles have been



captured, with 30 of those turtles fitted with radio-transmitters and relocated 1-2 times per week: 20 turtles marked and 16 tracked at Site 1 and 61 turtles marked and 14 tracked at Site 2.

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 Spotted Turtle presence in Florida, with roads/high traffic volume restricting movement and dispersal. Adult home range size varied between sites and individuals, from 0.25 to 106 acres (average of 16 acres). Both sexes remain active year-round, with males moving greater distances and utilizing larger areas than females.

FWC continues to build on this work and in 2018 partnered with a multi-state “Maine-to-Florida” initiative to address Spotted Turtle status and conservation across the species’ entire range. Through this partnership we’re developing a status summary, conducting a coordinated population assessment across representative states, ecoregions, and watershed basins, and identifying priority populations. Results from this work will provide information on Spotted Turtle populations, seasonal movements, and habitat use, which is necessary for the long-term conservation and proper management of the species.

### *Suwannee Alligator Snapping Turtle*

FWC staff participated in the federal SSA by providing the USFWS with locality records and literature and attending a conference call. To collect additional data for a manuscript on the status and distribution of the species, FWC staff helped trap the Alapaha, Alapahoochee, Withlacoochee, and upper Suwannee rivers plus Rocky Creek, which yielded the first records from Rocky Creek and the Florida portion of the Alapaha River. Genetic samples were provided to the University of Southern Mississippi to determine which molecular primers worked for this species.



## FISH

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### *Freshwater Fish*

FWC collects standardized fisheries independent data from select rivers to characterize fish populations and communities to help inform management decisions. While sampling is not directed toward collecting threatened and endangered species, these species are occasionally encountered. Sampling was conducted on the Perdido, Escambia, Yellow, Apalachicola, Chipola, Ocklawaha, Upper and Lower St. John's, and Withlacoochee (South) rivers in FY 2019-20. FWC has several ongoing species directed projects on both state and federally listed fishes. These projects include State Wildlife Grant (SWG) funded projects to conduct status and trend assessments on the Saltmarsh Topminnow, and Blackmouth Shiner. A SWG funded project investigating the Crystal Darter trends concluded in FY 2019-20. A National Fish and Wildlife Foundation recently concluded examining habitat use, movement, and survival of juvenile Gulf of Mexico Sturgeon from the Pensacola Bay watershed in Florida. This project is now being funded by Cooperative Agreement between FWC and USFWS for an additional three years.

**BLUENOSE SHINER** - The Bluenose Shiner is State Threatened. In FY 2019-20, 18 individuals were collected from Rock Springs Run (Orange County). 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 Threatened. In FY 2019-20, 24 benthic trawl surveys were conducted in the Upper Escambia River (Escambia and Santa Rosa Counties) and no Crystal Darters were collected. Research is ongoing to assess the population status and trends of the species.

**BLACKMOUTH SHINER** - The Blackmouth Shiner is State Threatened and is only known to occur in the Blackwater River and Yellow River watersheds (Okaloosa County) in Florida. Although recent research suggests the species may be extirpated from the Yellow River watershed. There was no sampling in FY 2019-20. Staff plan to continue monitoring and surveying in Blackwater River and Shoal River and assess the genetic diversity and population structure range wide.

**SALTMARSH TOPMINNOW** - The Saltmarsh Topminnow is State Threatened. In FY 2019-20, thirty sites were surveyed across Escambia, Perdido and Blackwater Bays using minnow traps and Breder traps. A total of 325 Saltmarsh Topminnows were collected. Thirty sites were sampled in Apalachicola Bay and 15 in the Choctawhatchee. No Saltmarsh Topminnows were detected during these events.

**SOUTHERN TESSELLATED DARTER** - The Southern Tessellated Darter is State Threatened. Southern Tessellated Darters are only known to occur in the Ocklawaha River watershed. No sampling for



Southern Tessellated Darters was conducted in FY 2019-20. Prior genetic analyses suggest the Southern Tessellated darters in the Ocklawaha River watershed have low genetic diversity and a small population size due to a long (hundreds of generations) isolation from other populations. Future work will involve determining appropriate listing status and conservation actions needed for this species.

### *Smalltooth Sawfish*

Smalltooth sawfish are Federally Endangered and they are now only found primarily from Charlotte Harbor (Charlotte County) to the Keys (Monroe County). In FY 2019-20, the Charlotte Harbor estuarine system was sampled using a multi-gear approach. There were 63 individuals captured, including 9 recaptures. For more information on FWC's Smalltooth Sawfish research program, see <https://MyFWC.com/research/saltwater/fish/sawfish>.

### *Sturgeon*

**ATLANTIC STURGEON ACTIVITIES** - The Atlantic Sturgeon is Federally-listed as Endangered. The USFWS, NOAA-Fisheries, and the USGS conduct most of the monitoring and management of this species. FWC did not incidentally collect any Atlantic Sturgeon in FY 2019-20. Additionally, no Atlantic Sturgeon carcasses were reported to FWC. FWC will provide any future collections and any associated information to the Atlantic Sturgeon Salvage Network, managed by NOAA-Fisheries, as well as to the Atlantic States Marine Fisheries Commission, in order to assist with population monitoring and management of this species.

**GULF STURGEON ACTIVITIES** - The Gulf Sturgeon is Federally Threatened. Monitoring and management is primarily conducted by NOAA-Fisheries, USGS, and USFWS. In FY 2019-20, FWC completed the final year of a study examining survival, movement, and habitat use of juveniles in the Yellow and Escambia rivers (Escambia and Santa Rosa counties). A total of 43 Gulf Sturgeon (6 juveniles and 37 adults) were captured from the Escambia River. Additional observations of the species were noted from the Suwannee River during un-related sampling. In FY 2019-20, FWC signed a National Resource Defense Administration funded cooperative agreement with USFWS to continue monitoring juvenile Gulf Sturgeon from the Pensacola Bay watershed (Escambia, and Yellow) for three more years.

## INVERTEBRATES

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### *Coral*

**FLORIDA CORAL RESCUE** - In response to stony coral tissue loss disease (SCTLD), FWC and NOAA-Fisheries co-lead the Florida Coral Rescue effort. The goal is to collect both healthy corals from ahead of the



disease boundary and survivor corals that remain in the endemic zone, hold (gene-bank) the corals in land-based facilities to prevent them from becoming infected; preserve genetic diversity; genotype rescued corals and store the information in FWC’s genet registry database; and propagate them for restoration of Florida’s Coral Reef. In FY 2019-20, FWC led 5 rescue cruises. Of the 19 species targeted for rescue, 4 are Federally Threatened (Exhibit 19). FWC is also addressing coral genetic data gaps by using single nucleotide polymorphism genetic discovery panels to develop markers for all 19 species, including those listed in Exhibit 19 and the Federally Threatened Pillar Coral. All species have little or no previous genetic information. FWC built the Coral Monitoring Dashboard to provide summary information about the rescue effort (<https://myfwc.com/research/habitat/coral/disease/dashboard/>).

**Exhibit 20.** Florida Coral Rescue FY 2019-20 collection of Federally listed coral species.

Common Name	Scientific Name	Status	Number of Coral Colonies Rescued FY 2019-20
Boulder Star Coral	<i>Orbicella franksi</i>	FT	37
Lobed Star Coral	<i>Orbicella annularis</i>	FT	15
Mountainous Star Coral	<i>Orbicella faveolata</i>	FT	43
Rough Cactus Coral	<i>Mycetophyllia ferox</i>	FT	14

**INVESTIGATING THE CAUSE OF SCTLD** - In FY 2019-20 FWC and partners, including the Department of Environmental Protection, continued the investigation of SCTLD. FWC processed samples from 8 coral species collected from sites distributed across Florida’s Coral Reef, including 2 Federally Threatened coral species - Mountainous Star Coral and Pillar Coral, for histopathology, molecular analyses, and transmission electron microscopy. Staff documented potential pathogens or pathological conditions, finding the presence of several unidentified parasites and opportunistic bacteria, as well as gastrodermal liquefactive necrosis (i.e., dead tissue appears as if dissolved), which may be a hallmark of SCTLD.

**CHARACTERIZATION OF THE MICROBIOME OF CORALS WITH SCTLD THROUGH SPACE AND TIME** - FWC and partners are investigating how SCTLD alters the microbiome (associated bacteria and archaea) of corals. The goals of this project include identifying the potential causes of the disease and probiotics which may be used to treat corals affected by the disease. Corals are sampled by scraping surface tissue, the microbial DNA of these samples are sequenced and identified, and differences in these microbes between healthy and diseased corals are compared. In FY 2019-20, FWC collected samples from six species of corals, including the Federally Threatened Mountainous Star Coral, at reefs with active SCTLD; 17 colonies of Mountainous Star Coral were sampled.

**CORAL REEF EVALUATION AND MONITORING PROJECT** - The Coral Reef Evaluation and Monitoring Project (CREMP) has monitored coral reef and hardbottom habitat conditions annually in the Florida Keys since 1996 and the Dry Tortugas since 2004. In FY 2019-20, FWC surveyed 40 sites in the Florida Keys National Marine Sanctuary (Monroe County). This sampling effort included 160 photographic camera transects to estimate benthic cover, 160 stony coral density and condition surveys, 80 octocoral density



and condition surveys, and 60 giant barrel sponge demographic surveys. In the Dry Tortugas National Park (Monroe County), FWC surveyed 11 sites. CREMP collects information on Federally Threatened coral species located at each site.

*SOUTHEAST CORAL REEF EVALUATION AND MONITORING PROJECT* - The Southeast CREMP (SECREMP) is an extension of CREMP along Florida's southeast coast (Miami-Dade, Broward, Palm Beach, and Martin Counties). It was initiated in 2003 and utilizes the same sampling protocols as CREMP. The 22 sites are surveyed by Nova Southeastern University. Through funding provided by the Department of Environmental Protection, in FY 2019-20, FWC reviewed, compiled, and analyzed the data for SECREMP Year 17 Final Report (<https://floridadep.gov/rcp/coral/content/sefcri-project-reports-and-products>). SECREMP collects information on Federally Threatened corals at each site.

*DISTURBANCE RESPONSE MONITORING* - FWC coordinates the Florida Reef Resilience Program's Disturbance Response Monitoring (DRM) program. DRM is a multi-partner effort to monitor shallow reef systems from Martin County to the Dry Tortugas (Monroe County) to better understand how rising sea temperatures and disease affect Florida's coral reefs. In FY 2019-20, 285 surveys were completed and 94 were conducted by FWC. Belt transects collect information for all coral species and record the abundance of 6 of the 7 Federally Threatened corals (Exhibit 20). Specially designed roving diver surveys target the presence of 7 highly susceptible SCTL species, including the Federally Threatened Mountainous Star Coral (Exhibit 21). Results indicate 2019 was a mild bleaching year and the overall prevalence of coral disease was low except for in the Lower Keys, which also had the highest number of corals recorded with SCTL. The 2019 DRM Quick Report is available online at <http://ocean.floridamarine.org/FRRP/Home/About>.



**Exhibit 21.** Abundance values of Federally-listed coral species recorded along the belt transects in 2019.

Common Name	Scientific Name	County/Region	2019 Abundance
Boulder Star Coral	<i>Orbicella franksi</i>	Upper Keys	1
		Middle Keys	4
		Lower Keys	10
		Marquesas	8
		Dry Tortugas National Park	107
Lobed Star Coral	<i>Orbicella annularis</i>	Biscayne National Park	8
		Upper Keys	24
		Lower Keys	58
Mountainous Star Coral	<i>Orbicella faveolata</i>	Broward-Miami	12
		Biscayne National Park	18
		Upper Keys	49
		Middle Keys	23
		Lower Keys	104
		Marquesas	57
		Dry Tortugas National Park	108
Rough Cactus Coral	<i>Mycetophyllia ferox</i>	Lower Keys	1
Elkhorn Coral	<i>Acropora palmata</i>	Upper Keys	1
Staghorn Coral	<i>Acropora cervicornis</i>	Broward-Miami	4
		Biscayne National Park	9
		Upper Keys	9
		Middle Keys	1
		Lower Keys	1
		Dry Tortugas National Park	37

**Exhibit 22.** Tallies of healthy and diseased Mountainous Star Coral (*Orbicella faveolata*) colonies observed during the roving diver surveys in 2019.

County/Region	Tally of Healthy Colonies	Tally of Diseased Colonies
Palm Beach	0	0
Broward-Miami	42	9
Biscayne National Park	58	2
Upper Keys	153	7
Middle Keys	75	6
Lower Keys	305	135
Marquesas	154	2
Dry Tortugas National Park	470	6

**SPECIAL ACTIVITY LICENSES** - In FY 2019-20, FWC issued 22 Marine Special Activity Licenses to conduct research, restoration, and relocation activities for corals. The following Federally Threatened species were included in 21 of the 22 licenses issued: Boulder Star Coral, Lobed Star Coral, Mountainous Star Coral, Elkhorn Coral, Staghorn Coral, and Pillar Coral. FWC staff also reviewed Florida Keys National Marine Sanctuary (Monroe County) permit requests for work proposed within sanctuary boundaries.

**CORAL NURSERY AND OUTPLANTING OPERATIONS** - FWC operates one *in situ* coral nursery in the middle Florida Keys in which three Federally Threatened coral species are maintained: Mountainous Star Coral, Elkhorn Coral, and Staghorn Coral; and 2 non-listed species: Great Star Coral and Knobby Brain





Coral. Reef Renewal, LLC maintains two additional nurseries, one off Tavernier Key in the upper Florida Keys and one near Looe Key in the Lower Keys, and stocks them with seven Federally Threatened species: Boulder Star Coral, Lobed Star Coral, Mountainous Brain Coral, Rough Cactus Coral, Elkhorn Coral, Staghorn Coral, and Pillar Coral. Exhibit 22 summarizes the number of colonies of each species that were present in each of the three nurseries at the end of FY 2019-20. In FY 2019-20, FWC conducted two experimental coral outplanting projects. One project outplanted Staghorn Coral at varying depths along the middle Florida Keys and monitored survival and growth. The second project outplanted 60 colonies each of Mountainous Star Coral, Great Star Coral, and Knobby Brain Coral and began monitoring them to assess the efficacy of outplanting under the chronic persistence of SCTLD. Exhibit 23 includes the total number of coral species outplanted by FWC for these two projects and additional coral colonies outplanted by Reef Renewal, LLC in FY 2019-20.

**Exhibit 23.** Number of coral colonies present in FWC's *in situ* coral nursery<sup>(1)</sup> and two nurseries maintained by Reef Renewal, LLC under contract to the FWC<sup>(2)</sup>, June 2020.

Common Name	Scientific Name	Status	Marathon Nursery <sup>1</sup>	Tavernier Nursery <sup>2</sup>	Looe Key Nursery <sup>2</sup>	Total
Boulder Star Coral	<i>Orbicella franksi</i>	FT	0	210	1,310	1,520
Lobed Star Coral	<i>Orbicella annularis</i>	FT	0	611	310	921
Mountainous Star Coral	<i>Orbicella faveolata</i>	FT	100	580	251	931
Rough Cactus Coral	<i>Mycetophyllia ferox</i>	FT	0	15	0	15
Elkhorn Coral	<i>Acropora palmata</i>	FT	150	1,484	380	2,014
Staghorn Coral	<i>Acropora cervicornis</i>	FT	2,400	1,300	653	4,353
Pillar Coral	<i>Dendrogyra cylindrus</i>	FT	0	69	0	69
Great Star Coral	<i>Montastraea cavernosa</i>	n/a	360	0	0	360
Knobby Brain Coral	<i>Pseudodiploria clivosa</i>	n/a	540	0	0	540

**Exhibit 24.** Number of coral colonies outplanted in FY 2019-20 by the FWC(1) and by Reef Renewal LLC(2) under contract from the FWC. A total of 1,615 Federally listed coral colonies were outplanted in FY 2019-20.

Common Name	Scientific Name	Reef	Number of Colonies Outplanted
Mountainous Star Coral	<i>Orbicella faveolata</i>	Delta Shoal <sup>1</sup>	60
		Pickles Reef <sup>1</sup>	60
		Tennessee Reef <sup>1</sup>	60
Elkhorn Coral	<i>Acropora palmata</i>	Conch Reef <sup>2</sup>	30
		Looe Key <sup>2</sup>	35
Staghorn Coral	<i>Acropora cervicornis</i>	Delta Shoal <sup>1</sup>	300
		Yellow Rocks <sup>1</sup>	300
		Carysfort Reef <sup>2</sup>	337
		Pickles Reef <sup>2</sup>	357
		Tavernier Patch Reef <sup>2</sup>	76
Great Star Coral*	<i>Montastraea cavernosa</i>	Delta Shoal <sup>1</sup>	60
		Pickles Reef <sup>1</sup>	60
		Tennessee Reef <sup>1</sup>	60
Knobby Brain Coral*	<i>Pseudodiploria clivosa</i>	Delta Shoal <sup>1</sup>	60
		Pickles Reef <sup>1</sup>	60
		Tennessee Reef <sup>1</sup>	60



\*not Federally listed

**ELKHORN CORAL** - The Elkhorn Coral is Federally Threatened and is not susceptible to SCTL. FWC began monitoring Elkhorn Coral in 2010 at eight sites between Biscayne National Park and the Dry Tortugas (Miami-Dade and Monroe counties). Colony abundance dropped from 2010 to 2017, leaving 23% of the original 507 fate-tracked colonies still alive. Following Hurricane Irma in 2017, the number of colonies remaining dropped by another half. In FY 2019-20, FWC surveyed all eight sites. Recovery of live tissue on remaining colonies has been minimal but with an overall increase in the absence of major stressors like bleaching and hurricanes.

**PILLAR CORAL** - The Pillar Coral is Federally Threatened and is highly susceptible to SCTL. In FY 2019-20, FWC continued monitoring 10 colonies of Pillar Coral in the Dry Tortugas National Park boundary. While all colonies experienced severe bleaching in September 2019, all colonies made a full recovery and have only demonstrated paling in September 2020.

## Crayfish

**BLACK CREEK CRAYFISH** - The Black Creek Crayfish is State Threatened and is endemic to northeast Florida, where much of its known range is in the Black Creek drainage. It inhabits streams with cool, unpolluted water with constant flow and high oxygen content. All documented occurrences have been within the lower St. Johns River watershed basin (St. Johns, Duval, Clay, and Putnam counties). The USFWS has been petitioned to evaluate the Black Creek Crayfish for possible listing. In FY 2019-20, FWC staff assisted USFWS and its contractor, Texas A&M University, in the drafting of a SSA for the Black Creek Crayfish, which will assist USFWS in making its listing decision. Following surveys conducted in May - September 2019 that indicated White-tubercled Crayfish are replacing Black Creek Crayfish in historically occupied sites, FWC staff met with USFWS staff to discuss the ongoing threat. FWC has now secured federal Section 6 funding to further investigate this issue. In FY 2019-20, FWC staff collected tissue samples from 73 individual Black Creek Crayfish from 8 stream drainages. Tissues have been archived for future assessment of genetic diversity within and among drainages. In addition, a diseased individual Black Creek Crayfish was collected in February 2020 and submitted to the University of Florida for microsporidia identification.

**CYPRESS CRAYFISH** - The Cypress Crayfish is under evaluation for federal listing and is known from Escambia and Santa Rosa counties. Its habitat requirements are not understood and access to survey potentially occupied areas often depends on appropriate site-specific water levels. In 2017, FWC received a “Multispecies Surveys and Research” award from USFWS to support surveys for the Cypress Crayfish. In FY 2019-20, FWC surveyed appropriate habitats and located Cypress Crayfish at one new site



in Escambia County and two new sites in Santa Rosa County. Surveys to locate additional sites for the crayfish and better describe its habitat requirements will continue.

*MIAMI CAVE CRAYFISH* - The Miami cave crayfish inhabits subterranean waters in Miami-Dade County. USFWS has been petitioned to evaluate the Miami cave crayfish for possible listing. In August 2017, FWC received a “Multispecies Surveys and Research” award from USFWS to support surveys for the Miami cave crayfish. In FY 2019-20, a contracted biologist continued surveys by lowering specially designed traps down wells. Samples taken from specimens collected are awaiting future genetic analysis. Work will continue to gain access to wells on additional sites across Miami-Dade County to trap for additional specimens and ascertain the current status and distribution of this poorly known species.

*PANAMA CITY CRAYFISH* - The Panama City Crayfish (PCC) is a Species of Special Concern and is under evaluation for Federal listing. Utilizing funds received through a Federal Section 6 Grant, FWC is continuing efforts to develop a scientifically sound translocation plan that will be implemented to remediate low genetic diversity caused by habitat loss and fragmentation. FWC and partners are working to develop a genetic assessment tool to help monitor the success of future translocations. The removal of timber blown down by Hurricane Michael was a significant focus of PCC habitat management efforts. FWC contracted the removal of downed timber from two of the most affected PCC conservation areas. Further habitat management included mowing to maintain early successional habitats.

*SANTA FE CAVE CRAYFISH* - The Santa Fe Cave Crayfish is a State Threatened species that inhabits subterranean water sources in southern Suwannee and Columbia counties. In FY 2019-20, under a “Multispecies Survey and Research” award from USFWS, the University of Florida contract for a genetic analysis study using specimens provided by FWC staff was completed. The study concluded geographically proximate sites (within 5 km) of Santa Fe Cave Crayfish are separate populations but are not genetically isolated - indicating there is gene flow between them. There is an opportunity to conduct additional dives to identify new potential target sites occupied by Santa Fe Cave Crayfish or related troglobitic species.

## *Freshwater Mussels*

FWC tracks changes in mussel communities by collecting data from Florida’s fresh water ecosystems. Larval mussels are parasites to fish, attaching to the gills and fins. Some mussels are generalists, while others are specialists and require one or two fish species. FWC received 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 and the Federally Threatened Chipola Slabshell and the Federally Endangered Choctaw Bean. In FY 2019-2020, FWC performed 58 surveys



across 13 river basins (Exhibit 24) and habitat parameters were assessed at 8 of these sites.

**CHIPOLA SLABSHELL** - The Federally Threatened Chipola Slabshell is found in the Apalachicola River drainage. It is a short-term brooder, is gravid from June to July, potential host fish include Bluegill and Redbreast Sunfish. In FY 2019-20, FWC performed 8 surveys for the Chipola Slabshell and 24 individuals were found (Exhibit 24). Of the 10 individuals checked, none were brooding larvae.

**CHOCTAW BEAN** - The Federally Endangered Choctaw Bean is found in the Escambia, Yellow, and Choctawhatchee River basins. Fish hosts are unknown, but it is believed to be a specialist due to known hosts for closely related species. The Choctaw Bean broods from late summer to the following spring. In FY 2019-20, FWC performed 24 surveys and found 6 individuals (Exhibit 24), 3 were checked and none were brooding.

**FAT THREERIDGE** - The Federally Endangered Fat Threeridge is found only in the Apalachicola and Chipola Rivers. It broods from May to June and is a generalist parasitizing five fish species. In FY 2019-20, FWC conducted 8 surveys and found 599 individuals (Exhibit 24). Although recent studies suggest reproduction is strong, of the 34 checked, none were brooding, which was likely due to survey timing.

**FUZZY PIGTOE** - The Federally Threatened Fuzzy Pigtoe is found in the Escambia, Yellow, and Choctawhatchee River basins. This bivalve broods from March to June, although it has been observed brooding in July and August. This mussel is a specialist parasitizing the Blacktail Shiner. In FY 2019-20, FWC performed 24 surveys and found 54 individuals. Of those 33 checked, 11 were brooding (Exhibit 24).

**GULF MOCCASINSHELL** - The Federally 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 2019-2020, no individuals were found despite FWC's 14 surveys (Exhibit 24).

**NARROW PIGTOE** - The Federally Threatened Narrow Pigtoe is found in the Escambia and Yellow Rivers. It broods from March to June and has been observed brooding in July. The host fish is unknown, although mussels of the same genus are specialists parasitizing Shiner species. In FY 2019-20, FWC performed 18 surveys and found 30 individuals (Exhibit 24). All 10 mussels checked in the Escambia River were gravid.

**OVAL PIGTOE** - The Federally Endangered Oval Pigtoe is found in Econfina Creek, Apalachicola, Ochlockonee and Suwannee River basins. It broods from March to July, although brooding in January has also been observed. This mussel only parasitizes Sailfin Shiners and Eastern Mosquitofish. In FY 2019-20, FWC performed 23 surveys and found 6 individuals (Exhibit 24). All 6 were checked and 1 was brooding.

**PURPLE BANKCLIMBER** - The Federally Threatened Purple Bankclimber is found in the Apalachicola,



Lower Chipola and Ochlockonee River Basins. This bivalve broods from February to April, although it has been observed brooding in May. This species parasitizes two fish species, the Federally Threatened Gulf Sturgeon and the Blackbanded Darter. In FY 2019-20, FWC performed 18 surveys but no individuals were found (Exhibit 24). The last observation occurred in 2017 and 75 surveys have been conducted since.

[ROUND EBONYSHELL](#) - The Federally Endangered Round Ebonyshell is endemic to the Escambia River basin. This mussel broods from April TO August. The fish host is unknown but is hypothesized to be migratory shad species due to this fish being the host for a related species. In FY 2019-20, FWC performed 8 surveys but did not locate any individuals (Exhibit 24).

[SHINYRAYED POCKETBOOK](#) - The Federally Endangered Shinyrayed Pocketbook is found in Econfina Creek, Apalachicola, Chipola, and Ochlockonee River basins in Florida. This bivalve broods from December to August and parasitizes Spotted Bass. In FY 2019-20, FWC performed 17 surveys for the Shinyrayed pocketbook but did not find any individuals (Exhibit 24).

[SOUTHERN KIDNEYSHELL](#) - The Federally Endangered Southern Kidneyshell is restricted to the Choctawhatchee River basin in Florida. It broods from September to May and the fish host is unknown but is hypothesized to be darters like other mussels of the same genus. In FY 2019-20, FWC performed 6 surveys but did not find any individuals (Exhibit 24).

[SOUTHERN SANDSHELL](#) - The Federally Endangered Southern Sandshell is restricted to the Yellow and Choctawhatchee River Basins. This bivalve broods from May to August, although brooding has been observed in April and from September to November. The fish host is unknown but is hypothesized to be various bass species like the Shinyrayed Pocketbook. In FY 2019-20, FWC performed 16 surveys and found 3 individuals (Exhibit 24). Only 1 individual was checked, and it was not brooding.

[SUWANNEE MOCCASINSHELL](#) - The Federally Threatened Suwannee Moccasinshell is endemic to the Suwannee River basin. This bivalve broods from January to March, though it has been observed brooding in April, October, and December. The fish host is unknown, but it is hypothesized to utilize darters like related species. In FY 2019-20, FWC performed 6 surveys but did not find any individuals (Exhibit 24).

[TAPERED PIGTOE](#) - The Federally Threatened Tapered Pigtoe only occurs in the Choctawhatchee River basin. It broods from March to June and is a specialist parasitizing the Blacktail Shiner. In FY 2019-20, FWC conducted 6 surveys, locating 71 individuals (Exhibit 24). Of the 13 mussels checked, 1 was gravid.



**Exhibit 25.** Freshwater mussel surveys conducted in FY 2019-20. Number of surveys is in parentheses after the basin name. Dashes indicate the species does not occur in the basin.

Species	Apalachicola (8)	Choctawhatchee (6)	Econfina Creek (6)	Escambia (8)	Hillsborough (1)	Myakka (1)
Chipola Slabshell	24	-	-	-	-	-
Choctaw Bean	-	3	-	3	-	-
Fat Threeridge	599	-	-	-	-	-
Fuzzy Pigtoe	-	39	-	15	-	-
Gulf Moccasinshell	0	-	0	-	-	-
Narrow Pigtoe	-	-	-	30	-	-
Oval Pigtoe	0	-	6	-	-	-
Purple Bankclimber	0	-	-	-	-	-
Round Ebonyshell	-	-	-	0	-	-
Shinyrayed Pocketbook	0	-	0	-	-	-
Southern Kidneyshell	-	0	-	-	-	-
Southern Sandshell	-	0	-	-	-	-
Suwannee Moccasinshell	-	-	-	-	-	-
Tapered Pigtoe	-	71	-	-	-	-



**Exhibit 25 (continued).** Freshwater mussel surveys conducted in FY 2019-20. Number of surveys is in parentheses after the basin name. Dashes indicate the species does not occur in the basin.

Species	Ochlockonee (3)	Okeechobee North (3)	Okeechobee South (4)	Peace (1)	Suwannee (6)	Waccasassa (1)	Yellow (10)
Chipola Slabshell	-	-	-	-	-	-	-
Choctaw Bean	-	-	-	-	-	-	0
Fat Threeridge	-	-	-	-	-	-	-
Fuzzy Pigtoe	-	-	-	-	-	-	0
Gulf Moccasinshell	-	-	-	-	-	-	-
Narrow Pigtoe	-	-	-	-	-	-	0
Ochlockonee Moccasinshell	0	-	-	-	-	-	-
Oval Pigtoe	0	-	-	-	0	-	-
Purple Bankclimber	0	0	0	-	-	-	-
Round Ebonyshell	-	-	-	-	-	-	-
Shinyrayed Pocketbook	0	-	-	-	-	-	-
Southern Kidneyshell	-	-	-	-	-	-	-
Southern Sandshell	-	-	-	-	-	-	3
Suwannee Moccasinshell	-	-	-	-	0	-	-
Tapered Pigtoe	-	-	-	-	-	-	-





## *Miami Tiger Beetle*

The Federally Endangered Miami Tiger Beetle is known only from open, sandy, patches in critically rare pine rockland habitats in Miami-Dade County. In 2015, FWC with staff from Miami-Dade County Parks, Recreation, and Open Spaces (MDPR) began surveys at known and potential sites to determine the distribution of the beetle, monitor fluctuations in abundance, and study the beetle's biology including flight time, activity patterns, reproduction, and habitat.

As of June 2020, 23 pine rockland sites have been surveyed multiple times, but Miami Tiger Beetles have only been detected at 5 sites: Nixon-Smilely Pineland Preserve, Zoo Miami, U.S. Coast Guard Communication Station, University of Miami Center for Southeastern Tropical Advanced Remote Sensing, and Larry and Penny Thompson Park. Apart from Nixon-Smilely, the other 4 sites are contiguous and likely represent a single population. The total area of occupied habitat within these 5 sites is less than 7.5 acres. No new sites were discovered in FY 2019-20. A wildfire burned a significant portion of habitat at Nixon-Smilely in July and a successful prescribed fire was conducted in winter of 2020 at Zoo Miami by MDPR, both of which are expected to improve amount of habitat and increase the population. Future planned work will determine habitat/microhabitat requirements of the Miami Tiger Beetle, quantify detection rates, and monitor 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 staff regularly provide information to and interact with the public about listed species by conducting citizen awareness programs to fulfill the statutory requirement. FWC engaged in major efforts promoting citizen awareness of listed or at-risk species and their habitats in FY 2019-20.

**MEDIA RELATIONS** - FWC press releases reach substantial regional and statewide audiences, with some national media reach as well. They are 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 26). Regional media receive regional-only news and information as well as statewide releases. In FY 2019-20, FWC issued many press releases on listed species. FWC press releases are posted online at [MyFWC.com/News](http://MyFWC.com/News).



**Exhibit 26.** Number of reporters sent FWC press releases in FY 2019-20.

FWC Region	Number of Reporters
Northwest	83
North Central	49
Northeast	72
Southwest	43
South	73
Statewide Total	320

**SOCIAL MEDIA** - FWC’s social media accounts are growing in popularity every day, enabling the agency to reach a wider audience and a diverse group of stakeholders (Exhibit 27). FWC’s social media is meant to be exciting and educational to get audiences interested in Florida wildlife and conservation.

**Exhibit 27.** Total interactions with each FWC social media account obtained in FY 2019-20.

Social Media Platform	Quantity
@MyFWC Facebook	240,000 Likes
@MyFWC Twitter	32,700 Followers
@MyFWC Instagram	80,000 Followers
MyFWCMedia Flickr	24.9 Million Views
@MyFWC Youtube	4.4 Million Views
@FloridaBirdingTrail Facebook	20,000 Likes
@FWCResearch Facebook	62,000 Likes

**GOVDELIVERY AND WEBSITES** - In today’s world, the public turns to email and the internet for instant information on Florida’s listed species and their habitats. GovDelivery allows us to directly and instantly connect with thousands of stakeholders with important information on topics they care about. Exhibit 28 shows some examples of topics that the public can subscribe to. GovDelivery also gives the public the opportunity to subscribe to several newsletters related to listed species.

**Exhibit 28.** Number of subscribers in FY 2019-20 for select GovDelivery topics.

Topic	Subscribers
Imperiled Species Management Plan	45,200
Florida Panther	47,700
Manatee	48,000
Sea Turtles	48,000
Landowner Assistance Program	31,000
Coral Reefs	33,200
Gopher Tortoises	45,500

**FAIRS, FESTIVALS, AND EVENTS** -FWC staff attend a wide variety of events where they engage with the public and share the importance of conserving Florida wildlife, including listed species. In the first part of FY 2019-2020, staff attended a wide variety of such events. Unfortunately, the COVID-19 pandemic resulted in the cancellation of many events staff had planned to attend in the later part of this period.

**VOLUNTEER OPPORTUNITIES** - FWC volunteers contribute greatly to the success of the state’s conservation of listed species. The agency’s Regional Volunteer Program Biologists and the Ridge Ranger Coordinator work with staff and partners to develop and sustain projects that meet strategic objectives



and involve all aspects of volunteer management. Listed species conservation is one of the focal issues for the regional program. Volunteer activities in FY 2019-20 included monitoring of imperiled shorebirds, imperiled wading birds, Florida Scrub-Jays, and Southeastern American Kestrels. Additionally, volunteers assisted with growing sandhill milkweed to benefit Monarch Butterflies, construction of bat houses to benefit Bonneted Bats, construction and installation of artificial burrows for the Florida Burrowing Owl, cutting and painting shorebird decoys to attract nesting pairs to a specific area, and posting shorebird and seabird nesting areas to protect the nests, eggs, chicks and habitat from disturbances. Volunteer involvement also included reviewing footage from game cameras distributed throughout certain Wildlife Management Areas to identify wildlife species, working with partners to maintain Red-Cockaded Woodpecker nest sites, managing invasive exotic vegetation from scrub habitats, coastal cleanups to benefit wildlife, and assisting with public outreach.

*COMMUNITY MEETINGS, WORKSHOPS, AND PRESENTATIONS* - FWC interacts with homeowners, private landowners, businesses, and stakeholders on various issues involving living with Florida's listed species. FWC's Wildlife Assistance Biologists provide help and guidance to individuals and groups throughout the state on how to avoid conflicts with wildlife. In FY 2019-2020, they conducted more than 10 site visits to assist individuals with concerns regarding listed species and gave presentations on living with wildlife.

*OTHER EDUCATIONAL AND OUTREACH PROGRAMS AND PRESENTATIONS* - FWC works to engage the public in learning about listed species in a variety of ways, including partnering with educators to reach young people and creating fun and interactive incentives programs for wildlife viewing. Project WILD connects with teachers to provide educational materials in a variety of subject matter relating to Florida wildlife, including listed species. These lessons reached an estimated 200,000 youths in FY 2019-20.

The Wings Over Florida birding and butterfly listing recognition program aims to increase the number of diverse Floridians and visitors who are wildlife viewers and conservationists. In FY 19-20, the Wings Over Florida program awarded 425 certificates to program participants, recognizing their bird and butterfly listing achievements, including their sightings of listed species.

Staff distributed letters and flyers to over 350 eco-tour and watersport vendors in Florida that may promote viewing, or interactions with, manatees near warm-water sites. This campaign was designed to spread awareness about the potential harms associated with harassment of manatees.

### *Coastal Wildlife Conservation Initiative*

The Coastal Wildlife Conservation Initiative (CWCI) is an FWC-led, multi-partner (e.g., Florida Department of Environmental Protection, USFWS, and the University of Florida's 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 populations, conserving and managing coastal ecosystems, and achieving balance between these efforts and human use of coastal areas. In FY 2019-20, the CWCI and partners made significant progress on projects to conserve coastal wildlife, including listed species. One of these was the completion of a curriculum for a living shorelines training course for marine contractors. Living shorelines (using plants, oysters, and other natural structural materials) are softer, greener alternatives to traditional seawalls used to stabilize shorelines from erosion, sea level rise, and other damage. The first course was held in October 2019, with instructors from multiple partner organizations. The CWCI presented about the results of this course at the 25<sup>th</sup> Biennial Conference of the Coastal and Estuarine Research Federation.

In addition to the training course, the CWCI participated in a working group of multiple partners to produce a Florida Living Shorelines Resource Catalog and a short film to communicate benefits of living shorelines from a contractor's perspective. Another effort completed in FY 2019-20 was a white paper titled, "Managing the Impacts of Dogs on Beach Wildlife," which provides guidance for coastal managers and planners on the reduction of wildlife disturbance by dogs on beaches. The CWCI also presented on the vulnerability of beach-dependent species to climate change and ways to increase their resilience at the Resilient Florida Workshop. A new effort for the CWCI in FY 2019-20 was working with other FWC staff on development of the Florida Coral Crew, a group of volunteers interested in coral conservation, a subset of which were recruited to assist with sponge restoration activities. The CWCI coordinated spring break volunteers to help prepare for shorebird nesting season at a Critical Wildlife Area.

The CWCI conducted outreach activities in FY 2019-20 covering coastal wildlife topics including shorebird, seabird, and marine turtle conservation, marine debris prevention, living shorelines, and more. Audiences reached included college students and members of the public at events such as the International Coastal Cleanup and local special events. The CWCI also worked with other FWC staff to create media posts on coastal dunes, stashing the trash, and seabird entanglement. The CWCI continued to publish a quarterly newsletter to keep partners and others abreast of coastal wildlife issues.

### *Coordination and Assistance*

*REVIEWS AND ASSISTANCE FOR TRANSPORTATION PROJECTS* - FWC reviewed 173 highway projects in FY 2019-20, which included projects reviewed through the Florida Department of Transportation's Efficient Transportation Decision Making (ETDM) Process, and assistance letters outside of the ETDM Process, including 93 written letters. Each review included a biological assessment of the direct and indirect effects of the transportation project on listed species and their habitats. Recommendations were provided to the Florida Department of Transportation's seven districts and the Turnpike Enterprise on methods to avoid, minimize, or mitigate effects on listed species. Recommendations were related to



road design issues, 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 – FWC provided a review of 1,236 projects and provided written assistance on 744 of those projects for public and private land and water use planning activities that had the potential to impact listed fish and wildlife species and their habitats during FY 2019-20. FWC provided a review of 1,236 projects and written assistance on 744 of those projects for public and private land and water use planning activities with potential to impact listed species and their habitats in FY 2019-20. The types of projects reviewed and commented on included: developments of regional impact, county comprehensive plan evaluation and appraisal reports, proposed amendments and sector plans, regional visioning projects, various state and federal permit applications, environmental assessments, environmental impact statements, power plant site applications, and ten-year plan reviews. The content of consultations was based on established best management practices, species management guidelines, and GIS analysis. FWC assisted in developing 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, promotes stewardship on private lands while playing a role in the conservation of listed species. Florida's LAP 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 to benefit listed species. LAP's emphasis is on priority habitats located primarily in focal areas, thus ensuring federal dollars are targeted in the most efficient and equitable manner to properties with the greatest potential benefits for listed species.

In FY 2019-20, FWC's LAP assisted more than 721 private landowners, including providing written evaluations of effects from proposed agricultural practices to listed species on 247 projects. Many of the landowners received financial assistance through state or federal cost-share or easement programs such as the U. S. Department of Agriculture (USDA) Farm Bill and USFWS Partners for Fish and Wildlife Programs. LAP worked in cooperation with the USDA's Natural Resources Conservation Service, USFWS, Florida Department of Agriculture and Consumer Services, the University of Florida's Institute of Food and Agriculture Sciences, Florida Natural Areas Inventory, and other conservation organizations to assist Florida's private landowners. While private landowners represent the majority assisted by LAP in FY 2019-20, public conservation land managers including the U. S. Department of Defense, water management districts, and county governments received assistance with development or review of



management plans. LAP biologists delivered 1,128 assists to 662 landowners on 226,645 acres. For more information, visit the LAP Website at <http://myfwc.com/conservation/special-initiatives/lap/>.

*CENTER FOR BIOSTATISTICS AND MODELING* - Staff from 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, prepared monitoring plans, and developed monitoring databases for the following species:

- American Alligators *Alligator mississippiensis*
- American Crocodiles *Crocodylus acutus*
- American Oystercatcher *Haematopus palliatus*
- Black Skimmer *Rynchops niger*
- Boulder Star Coral *Orbicella franksi*
- Chipola Slabshell *Elliptio chiplolaensis*
- Diamond Back Terrapin *Malaclemys terrapin*
- 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*
- Frosted Flatwoods Salamander *Ambystoma cingulatum*
- 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*



- 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*
- Lobed Star Coral *Orbicella annularis*
- Loggerhead Turtle *Caretta caretta*
- Mountainous Star Coral *Orbicella faveolata*
- Narrow Pigtoe *Fusconai escambia*
- Ochlockonee Moccasinshell *Medionidus simpsonianus*
- Oval Pigtoe *Pleurobema pyriforme*
- Pillar Coral *Dendrogyra cylindricus*
- Piping Plover *Charadrius melodus*
- Reddish Egret *Egretta rufescens*
- Roseate Spoonbill *Ajaja ajaja*
- Roseate Tern *Sterna dougallii dougallii*
- Rough Cactus Coral *Mycetophyllia ferox*
- Snowy Plover *Charadrius alexandrinus*
- Southern Kidneyshell *Ptychobranthus jonesi*
- Southern Sandshell *Hamiota australis*
- Staghorn Coral *Acropora cervicornis*
- Striped Newt *Notophthalmus perstriatus*
- Suwannee Moccasinshell *Medionidus walkeri*
- Tapered Pigtoe *Fusconaia burki*
- Tricolored Heron *Egretta tricolor*
- Wood Stork *Mycteria American*

### Critical Wildlife Areas

Critical Wildlife Areas are established under rules 68A-14.001 and 68A-19.004, F.A.C. to protect important concentrations of wildlife from human disturbance during essential life activities, such as breeding, roosting and migratory stopover. For each CWA, the boundaries and time period when areas





may be posted as closed to public access are approved by the Commission and defined in the CWA establishment order. FWC evaluates the need for potential CWAs, produces or revises establishment orders, and coordinates necessary management and monitoring activities for these areas each year. Management and monitoring activities are conducted with the participation of FWC staff and multiple partners including other state agencies, local governments and nongovernmental organizations. There are 32 CWAs established in Florida: 16 support wading and diving birds, 14 support beach (or ground) nesting birds, one supports Gopher Tortoises, and one supports bats. In FY 2019-20, 27 of the CWAs provided breeding habitat for federally or state listed imperiled species (Exhibit 29).

All CWAs were monitored in FY 2019-20 by FWC and partners, except the Withlacoochee Caves CWA. Due to COVID-19 guidance, monitoring for bat use could not be conducted during maternity season. The total peak nest count for all CWAs supporting nesting birds was 16,745 in FY 2019-20, compared to 24,614 in FY 2018-19 and 14,088 in FY 2017-18. Total nest counts for imperiled birds on CWAs was 2,545 in FY 2019-20, an increase from 1,870 in FY 2018-19 and 2,488 in FY 2017-18. Factors besides human disturbance that can impede nesting include habitat loss from storms and erosion, reduced prey availability, or the presence of predators. Staff use a variety of techniques to identify factors impeding nesting. For example, game cameras or traps are deployed to identify predators at CWAs and inform implementation of predator management protocols. Habitat management is conducted at CWAs outside the breeding season and include vegetation management, trash removal, and storm debris cleanup.



**Exhibit 29.** Critical Wildlife Areas (CWAs) In Florida During FY 2019-20. Listed species are bolded, and nest number are listed in the same order as the species.

CWA BY REGION	COUNTY	CLOSURE PERIOD	BREEDING SPECIES (Imperiled Species In Bold)	STATUS <sup>a</sup>	MANAGED AREA
<b>NORTHWEST REGION (5 CWAs)</b>					
Tyndall <sup>b</sup>	Bay	Year-round	<b>Black Skimmer, Least Tern, Snowy Plover, American Oystercatcher</b> , Gull-billed Tern, Wilson's Plover, Willet	<b>13, 250, 20, 1, 2, 20,</b> 2 nests	200 ac
Flag Island <sup>b</sup>	Franklin	Year-round	<b>Black Skimmer, Least Tern, American Oystercatcher</b> , Gull-billed Tern	<b>33, 2, 1,</b> 23 nests	80 ac
St. George Causeway	Franklin	1 Mar to 30 Sept	<b>Black Skimmer, American Oystercatcher</b> , Brown Pelican, Caspian Tern, Gull-billed Tern, Royal Tern, Sandwich Tern, Laughing Gull	<b>15, 6, 1300, 55, 12,</b> 500, 400, 1500 nests	32 ac
Lanark Reef <sup>b</sup>	Franklin	Year-round	<b>Black Skimmer, American Oystercatcher</b> , Brown Pelican, Gull-billed Tern, Laughing Gull, Willet	<b>22, 9, 400, 2, 500, 2</b> nests	65 ac
Alligator Point	Franklin	15 Feb to 31 Aug	<b>Black Skimmer, Least Tern, American Oystercatcher</b> , Gull-billed Tern, Wilson's Plover, Willet	<b>8, 35, 4, 1, 2, 1</b> nests	66 ac
<b>NORTH CENTRAL REGION (4 CWAs)</b>					
Amelia Island	Nassau	1 Mar to 1 Sept	<b>Least Tern, Willet</b>	<b>115,</b> 2 nests	250 ac
Nassau Sound Islands <sup>b</sup>	Duval	Year-round	<b>Black Skimmer, Least Tern, American Oystercatcher</b> , Gull-billed Tern, Wilson's Plover	<b>70, 12, 3,</b> 44, 2 nests	18 ac
Fort George Inlet	Duval	1 May - 31 Aug	<b>Least Tern, American Oystercatcher</b> , Brown Pelican, Royal Tern, Sandwich Tern, Laughing Gull, Wilson's Plover	<b>20, 3, 124, 4335, 2,</b> 2250, 11 nests	82 ac
Withlacoochee Caves	Citrus	15 Apr - 15 Aug and 15 Dec - 15 Mar	Southern Myotis, Tri-colored Bat	<i>COVID-19 prevented monitoring.</i>	3 ac
<b>NORTHEAST REGION (4 CWAs)</b>					
Port Orange	Volusia	1 Jan - 31 Aug	<b>American Oystercatcher</b> , Brown Pelican	<b>1,</b> 41 nests	4 ac
Matanzas Inlet	St. Johns	1 Apr - 15 Aug	<i>No nesting occurred within the CWA boundary this year.</i>		28 ac
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, Black-crowned Night Heron, Anhinga, Double-crested Cormorant	<b>51, 9, 1, 25, 45, 3, 4,</b> 8, 87, 19, 2, 12, 20 nests	6 ac



**Exhibit 29 (continued).** Critical Wildlife Areas (CWAs) In Florida During FY 2019-20. Listed species are bolded, and nest number are listed in the same order as the species.

CWA BY REGION	COUNTY	CLOSURE PERIOD	BREEDING SPECIES ( <i>Imperiled Species In Bold</i> )	STATUS <sup>a</sup>	MANAGED AREA
Stick Marsh	Brevard	1 Jan - 31 Jul	<b>Roseate Spoonbill, Little Blue Heron, Tricolored Heron,</b> Great Egret, Snowy Egret, Cattle Egret, Anhinga	<b>83, 1, 14,</b> 52, 16, 75, 19 nests	2 ac
SOUTHWEST REGION (10 CWAs)					
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, Snowy Egret, Cattle Egret, White Ibis, Glossy Ibis, Black-crowned Night Heron, Yellow-crowned Night Heron, Double-crested Cormorant	<b>100, 3, 20, 30, 3,</b> 200, 25, 40, 50, 5, 400, 60, 15, 25, 75 nests	93 ac
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, Anhinga, Double-crested Cormorant	<b>101, 25, 2, 8,</b> 20, 55, 25, 35, 3, 2, 16 nests	5 ac
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	<b>8, 2, 10, 9,</b> 160, 70, 86, 40, 5, 6, 80 nests	5 ac
Myakka River	Sarasota	1 Jan - 31 Aug	<b>Wood Stork,</b> Great Blue Heron, Great Egret, Snowy Egret, Cattle Egret, Anhinga	<b>63,</b> 2, 29, 1, 2, 6 nests	1 ac
Broken Islands	Lee	1 Mar - 31 Aug	<b>Reddish Egret, Little Blue Heron, Tricolored Heron,</b> Brown Pelican, Great Blue Heron, Great Egret, Snowy Egret, Cattle Egret, White Ibis, Anhinga, Double-crested Cormorant	<b>2, 4, 21,</b> 116, 2, 1, 8, 9, 71, 3, 101 nests	31 ac
Hemp Key	Lee	Year-round	<b>Reddish Egret,</b> Brown Pelican, Great Blue Heron, Great Egret, Snowy Egret, Black-crowned Night Heron, Double-crested Cormorant	<b>1,</b> 86, 11, 15, 1, 2, 149 nests	10 ac
Matanzas Pass Island	Lee	Year-round	<b>Reddish Egret, Little Blue Heron, Tricolored Heron,</b> Brown Pelican, Great Blue Heron, Great Egret, Snowy Egret, Cattle Egret, White Ibis, Yellow-crowned Night Heron, Double-crested Cormorant	<b>6, 1, 45,</b> 37, 13, 3, 16, 2, 4, 2, 21 nests	4 ac



**Exhibit 29 (continued).** Critical Wildlife Areas (CWAs) In Florida During FY 2019-20. Listed species are bolded, and nest number are listed in the same order as the species.

CWA BY REGION	COUNTY	CLOSURE PERIOD	BREEDING SPECIES ( <i>Imperiled Species In Bold</i> )	STATUS <sup>a</sup>	MANAGED AREA
Coconut Point	Lee	Year-round	<b>Roseate Spoonbill, Little Blue Heron, Tricolored Heron,</b> Brown Pelican, Great Blue Heron, Great Egret, Snowy Egret, Yellow-crowned Night Heron, Anhinga, Double-crested Cormorant	<b>2, 1, 3,</b> 40, 4, 13, 4, 1, 1, 12 nests	4 ac
Big Carlos Pass	Lee	Year-round	<b>Reddish Egret, Tricolored Heron,</b> Brown Pelican, Great Blue Heron, Great Egret, Snowy Egret, Black-crowned Night Heron, Double-crested Cormorant	<b>2, 7,</b> 27, 3, 31, 3, 1, 3 nests	2 ac
Little Estero Island	Lee	1 Apr - 31 Aug	<b>Least Tern,</b> Wilson's Plover, Killdeer	<b>12,</b> 15, 2 nests	6 ac
SOUTH REGION (9 CWAs)					
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	<b>78, 6, 1, 1,</b> 19, 1, 43, 6 nests	8 ac
Deerfield Island	Broward	Year-round	<b>Gopher Tortoise</b>	<b>22</b> individuals	56 ac
Bill Sadowski <sup>b</sup>	Dade	Year-round	Supports foraging and roosting shorebirds and wading birds	~1000 individuals	700 ac
Rookery Islands	Collier	Year-round	Great Egret	3 nests	1 ac
Caxambas Pass	Collier	1 Apr - 31 Aug	<b>Black Skimmer</b>	<b>39</b> nests	1 ac
Big Marco Pass <sup>b</sup>	Collier	Year-round	<b>Least Tern, Black Skimmer,</b> Wilson's Plover, Killdeer	<b>4, 675,</b> 15, 2 nests	30 ac
ABC Islands	Collier	Year-round	<b>Reddish Egret, Tricolored Heron,</b> Brown Pelican, Great Blue Heron, Great Egret, Snowy Egret, Anhinga, Double-crested Cormorant	<b>3, 3,</b> 21, 13, 24, 3, 1, 5 nests	75 ac
Second Chance	Collier	1 Mar - 31 Aug	<b>Least Tern, Black Skimmer,</b> Wilson's Plover	<b>140, 50,</b> 5 nests	3 ac
Pelican Shoal	Monroe	1 Apr - 31 Aug	<i>No nesting occurred within the CWA boundary this year.</i>		1 ac

<sup>a</sup>Count or estimate of peak number of nests per breeding species at each site during the closure period in FY 2019-20. Numbers correspond in order of species listed in previous column.

<sup>b</sup>Site also supports migrating and wintering species such as the federally listed Piping Plover and Red Knot.



## Law Enforcement

FWC's Division of Law Enforcement continued statewide enforcement activities to protect specific listed species in FY 2019-20. These activities included:

- Regular patrols of the Florida Panther reduced-speed zones. Officers documented over 6,360 patrol hours towards the protection of the Florida Panther and its prey species and to provide public safety
- Regular patrols in Monroe County as part of a multi-agency task force enforcing the Key deer speed zone on Big Pine Key
- Patrol efforts targeting coastal nesting areas of sea turtles to reduce nest destruction and unlawful egg removal or theft
- Patrol efforts directed toward enforcing specific gear requirements [i.e., Turtle Excluder Devices (TED)] to protect sea turtles from becoming entrapped in shrimp trawl nets. A total of 530 patrol hours were focused on TED enforcement resulting in 90 inspections and 38 documented violations
- Patrol efforts targeting coastal nesting areas of protected shore birds to reduce nest disturbance, nest destruction, and incidental take
- Investigations by the Internet Crimes Unit targeting the unlawful sale and possession of protected species on the internet
- Enhanced statewide enforcement efforts directed towards utilizing radar and the manatee cam surveillance technology to ensure compliance with boat speed zones to prevent manatee vessel strikes and harassment; 81,744 patrol hours were dedicated to manatee enforcement, resulting in 2,911 citations and 3,761 warnings
- 49 citations and 166 warnings were issued involving listed species, separate from manatee citations
- Continued partnering with other governmental agencies and citizen groups to work through issues concerning the Florida Panther
- Increase public awareness of Florida's wildlife (i.e., Gopher Tortoises, beach mice, sea turtles)
- The Commission currently has five investigative teams targeting illegal shipments of wildlife in and out of our air and seaports and many common carrier facilities. The teams are comprised of an investigator and a specially trained K-9 team. The K-9 teams are trained to detect certain turtle, snake, and other potentially listed species as they arrive in or depart from Florida's ports. The five teams completed 291 proactive deployments resulting in 12 citations.



### *Protected Species Permitting and Technical Assistance*

FWC provides science-based and regulatory guidance to issue permits that ensured requested wildlife related activities would either result in a net conservation benefit or prove not to be detrimental for the involved non-listed and listed species. In FY 2019-2020, FWC provided Federal agencies, other State agencies, environmental consultants, and regional and local regulatory authorities with assistance and guidance regarding projects that impact listed wildlife on managed Federal, State, and private lands, and lands slated for development. Many of these entities, as well as researchers, landowners, and educational facilities, utilized this assistance and guidance when applying for scientific collecting, captive possession, wildlife relocation, and incidental take permits for listed species.

Assistance for developers, environmental consultants, and regulatory agencies usually consisted of any combination of the following: 1) comments on species management plans submitted for review; 2) development of species management plans or guidelines; and 3) on-site visits to determine management needs. The public was provided information on listed species such as: 1) life history and other biological information; 2) locality and occurrence data; 3) listing status; and 4) solutions to nuisance situations (i.e., education on species behavior and habitat requirements and suggestions for coexistence).

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. The permit review process usually involves coordination between FWC, environmental consultants, other State agencies, Federal agencies, and regional and local regulatory entities.

FWC provided science-based and regulatory guidance to ensure the 120 intentional take, 103 incidental take, 20 special purpose, and 6 Peregrine falconry permits issued would result in a net conservation benefit or prove not to be detrimental for the species. More information on species guidelines, policies, and permit applications is available at <http://myfwc.com/license/wildlife/protected-wildlife/>.

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

FWC is taking a pro-active, science-based approach to evaluating management needs of at-risk species on FWC-managed lands. FWC is implementing this approach through the Wildlife Conservation Prioritization and Recovery Program. Using input from our Imperiled Species Management Plan, Species Action Plans, Subject Matter Experts input, and previous Strategy's findings, FWC determines where focal species conservation can be affected on each WMA or WEA. FWC integrates the outcome of the landscape level assessment with area-specific and expert knowledge to produce species management strategies.



Strategies are particular to each WMA/WEA and outline the role of the area(s) in wildlife conservation. Each strategy contains measurable objectives for managing priority species and their habitat, a list of actions necessary to achieve these objectives, and provisions for monitoring to verify progress towards meeting the objectives. Implementing this program ensures FWC is efficiently meeting the needs of Florida's at-risk species on lands managed by the agency. In FY 2019-20, FWC completed five workshops covering five WMAs and three WEAs: Apalachicola River WEA (Franklin and Gulf Counties), Bell Ridge WEA (Gilchrist County), Dinner Island Ranch WMA (Hendry County), Fort White WEA (Gilchrist County), Guana River WMA (St. Johns County), Hilochee WMA (Lake and Polk Counties), Okaloachooche Slough WMA (Hendry County), Spirit of the Wild WMA (Hendry County). FWC initiated draft strategies developed during these workshops and will complete the strategies in FY 2020/2021.

In FY 2019-2020, FWC finalized five strategies covering two WMAs and three WEAs: Bell Ridge WEA (Gilchrist County), Fort White WEA (Gilchrist County), Jones/Hungryland WEA (Martin and Palm Beach Counties), Chassahowitzka WMA (Hernando County), and Salt Lake WMA (Brevard County). The Program will continue assessing the changing needs of wildlife statewide. 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, 2020

Exhibits A-1 through A-9 contain all of Florida’s listed species as of June 30, 2020, 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, 2020.**

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, 2020.**

Common Name	Scientific Name	Status
American Osytercatcher	<i>Haematopus palliates</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 principales</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, 2020.**

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, 2020.**

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, 2020.**

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 maculatiiceps</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, 2020.**

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 cylindrus</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, 2020.**

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 erythrops</i>	ST
Squirrel Chimney Cave Shrimp	<i>Palaemonetes cummingi</i>	FT



**EXHIBIT A-8: Listed Insects in Florida as of June 30, 2020.**

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, 2020.**

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
ANF	Apalachicola National Forest
ATV	All-terrain vehicle
BCFS	Big Cypress Fox Squirrel
BCNP	Big Cypress National Preserve
CFR	Code of Federal Regulations
CREMP	Coral Reef Evaluation and Monitoring Project
CWA	Critical Wildlife Area
CWCI	Coastal Wildlife Conservation Initiative
DNA	Deoxyribonucleic acid
DOD	Department of Defense
DRM	Disturbance Response Monitoring
ETDM	Efficient Transportation Decision Making
FDEP	Florida Department of Environmental Protection
FE	Federally designated endangered
FFS	Florida Forest Service
FLM	Feline Leukomyelopathy
FNAI	Florida Natural Areas Inventory
FPS	Florida Park Service
FSA	Florida Shorebird Alliance
FSPSP	Fakahatchee Strand Preserve State Park
FT(S/A)	Federally designated threatened due to similarity of appearance
FY	Fiscal Year
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
FXN	Federally designated nonessential experimental population
GIS	Geographic Information System
GPS	Global Positioning Satellite
HCP	Habitat Conservation Plan
HMAF	Habitat Management Assistance Funding
ITP	Incidental Take Permit
INBS	Index Nesting Beach Survey
LAP	Landowner Assistance Program
LLA	Longleaf Alliance
LTBMP	Long Term Bat Monitoring Program
MPP	Manatee Protection Plan
MOA	Memorandum of Agreement



## APPENDIX B (continued)

NOAA – Fisheries	National Oceanic and Atmospheric Administration Marine Fisheries Service
NPS	National Park Service
PCC	Panama City Crayfish
PIT	Passive Integrated Transponder
PSSF	Picayune Strand State Forest
PVC	Polyvinyl chloride
RCW	Red-cockaded Woodpecker
SCC	Species of Special Concern
SCTLD	Stony Coral Tissue Loss Disease
SECREMP	Southeast Coral Reef Evaluation and Monitoring Project
SIRR	Sanibel Island Rice Rat
SNBS	Statewide Nesting Beach Survey
SSA	Species Status Assessment
ST	State designated threatened
SWG	State Wildlife Grant
TED	Turtle Excluder Devices
UF	University of Florida
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WEA	Wildlife and Environmental Area
WMA	Wildlife Management Area
WNS	White nose syndrome





## APPENDIX C. FWC'S FISH AND WILDLIFE RESEARCH INSTITUTE'S PUBLICATIONS DURING FY 2019-20

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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/>.

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

Common Name	Scientific Name
<b>MAMMALS</b>	
Atlantic Salt Marsh Mink	<i>Neovison vison lutensis</i>
Bobcat	<i>Lynx rufus</i>
Coyote	<i>Canis latrans</i>
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>
Gulf Salt Marsh Mink	<i>Neovison vison halilimnetes</i>
Rhesus Monkey	<i>Rhesus macaque</i>
Old-field Mouse	<i>Peromyscus polionotus</i>
River Otter	<i>Lontra canadensis</i>
Southern Flying Squirrel	<i>Glaucomys volans</i>
Southeastern Myotis	<i>Myotis austroriparius</i>
Tri-colored Bat	<i>Peromyotis subflavus</i>
<b>BIRDS</b>	
American Flamingo	<i>Phoenicopterus ruber</i>
Anhinga	<i>Anhinga Anhinga</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 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>



**Appendix D (continued)**

Common Name	Scientific Name
<b>BIRDS</b>	
Louisiana Seaside Sparrow	<i>Ammospiza maritima fisheri</i>
MacGillivray's Seaside Sparrow	<i>Ammodramus maritimus macgillivrayi</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Royal Tern	<i>Thalasseus maxima</i>
Sandwich Tern	<i>Thalasseus sandvicensis</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>
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>INVERTEBRATES</b>	
Cypress Crayfish	<i>Cambarellus blacki</i>
Giant Barrel Sponge	<i>Xestospongia muta</i>
Great Star Coral	<i>Montastraea cavernosa</i>
Knobby Brain Coral	<i>Pseudodiploria clivosa</i>
Miami Cave Crayfish	<i>Procambarus milleri</i>
White-tubercled Crayfish	<i>Procambarus spiculifer</i>



## APPENDIX E. GLOSSARY OF TERMS

<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>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>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>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>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.

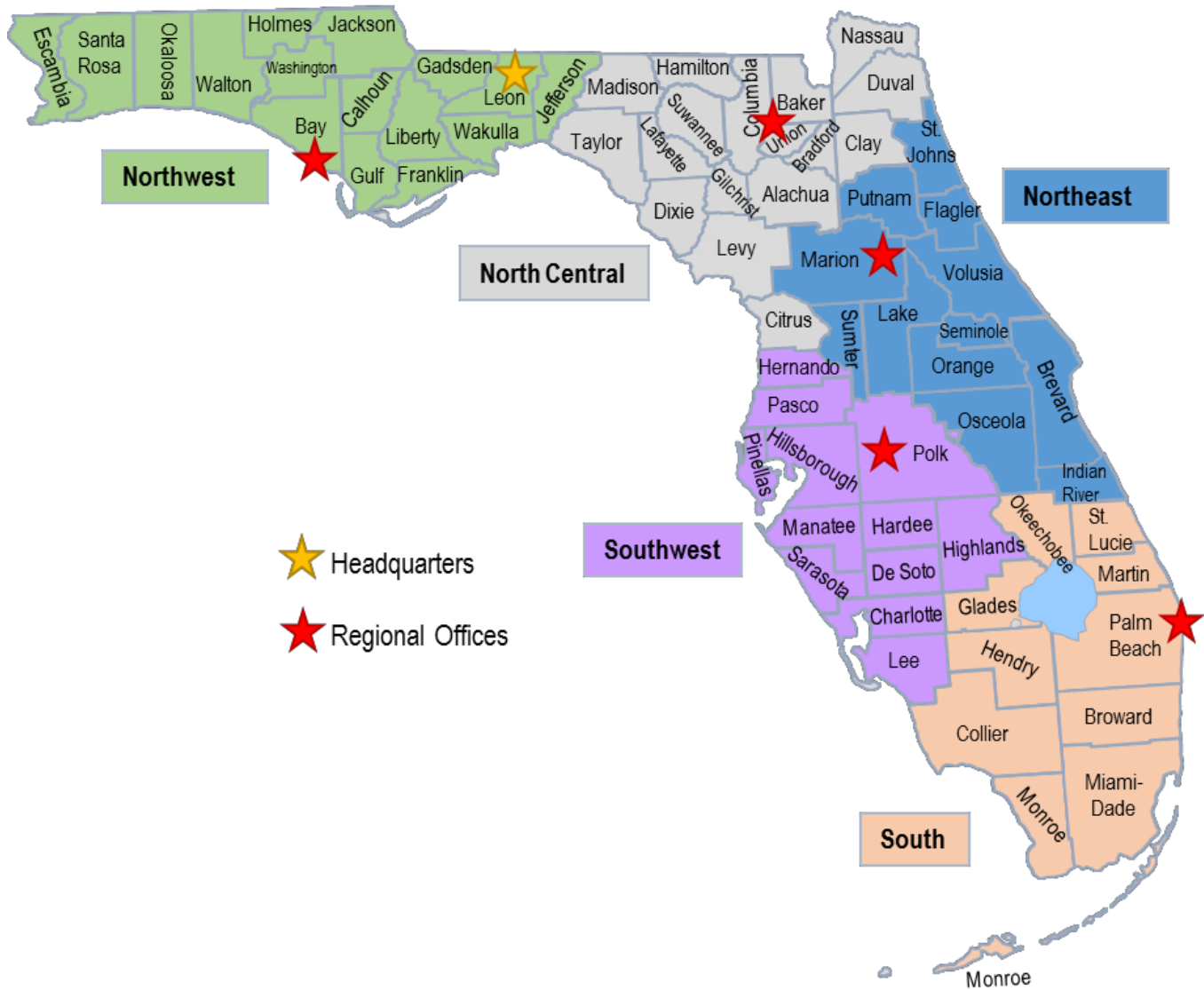


## APPENDIX E (*continued*)

<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

