Florida Fish and Wildlife Conservation Commission

Endangered and Threatened Species Management and Conservation Plan

Progress Report

Fiscal Year 2017–18

January 2, 2019

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EXECUTIVE SUMMARY

This report covers Fiscal Year (FY) 2017–18 and constitutes the 40th 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 Endangered and Threatened species in Florida. Federal– and State–designated Endangered and Threatened species, as well as State–designated Species of Special Concern, are collectively referred to as listed species in this report.

The initial plan submitted in March 1978 remains the basic reference document for the annual updates. Subsequent annual reports may be consulted regarding a chronological history of listed species activities and may be obtained at http://www.myfwc.com/about/inside-fwc/legislative-affairs/archive-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 2019–20, 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

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. 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 all contained in a single–category called State–designated Threatened (ST). This single–category is designed to eliminate controversy about what a species is called and instead focus attention on the conservation actions needed to improve the species' status. Florida's Species of Special Concern (SSC) List has been temporarily retained to allow time to assess these species under Florida's listing process to determine whether they should be listed as State– designated Threatened species or removed from the list. In addition, all Florida species listed under the United States Endangered Species Act (ESA) by the United States Department of the Interior's Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Agency's Marine Fisheries Service (NOAA–Fisheries) are now included on 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 species (FXN).

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 State–designated Species of Special Concern List. Currently, FWC lists 133 fish and wildlife species (Exhibit 1) as ST (38), or SSC (6), FE (50), FT (34), FT(S/A) (4), FXN (1). There is no duplication in species listing between lists. Collectively, these 133 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 a complete listing of Florida's listed fish and wildlife species as of June 30, 2018. Changes to the list may occur throughout the year. A compilation of Florida's current listed species is available at http://myfwc.com/media/1515251/threatened-endangered-species.pdf. The 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 regarding federal listings may be located at the following sources:

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

Exhibit 1.
Summary of Florida's Protected Wildlife List as of June 30, 2018

STATUS DESIGNATION	FISH	AMPHIBIANS	REPTILES	BIRDS	MAMMALS	INVERTEBRATES	TOTAL
Federally–designated Endangered (FE)	3(1)	1	3(3)	8	21(5)[2]	14	**50(9)**
Federally–designated Threatened (FT)	2(1)	1	7(2)	6	2(1)	16	**34(4)**
Federally–designated Threatened due to Similarity of Appearance [FT(S/A)]	0	0	1	0	0	3	**4**
Federally–designated Nonessential Experimental Population (FXN)	0	0	0	1	0	0	**1**
State–designated Threatened (FT)	6	2	8	16	4	2	**38**
State–designated Species of Special Concern (SSC)	1	0	1	1	2	1	**6**
TOTAL	**12(2)**	**4**	**20(5)**	**32**	**29(6)**	**36**	**133(13)**

[1] Numbers in the parentheses are the number of species for which the FWC does not have constitutional authority. For example, there are three fish species in the Federally–designated Endangered (FE) category, one of which the FWC does not have constitutional authority.
[2] There is one additional species included in Rule 68A–27.0031, FAC as a species for which the FWC does not have constitutional authority that is not included here because it has been determined to be extinct.

STATUTORY REQUIREMENTS

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 FWC and published in Wildlife Monographs in 1990 (*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, which ranks species based on their biological vulnerability; an action score that ranks species based on the amount of available information and ongoing management actions for a species; and a supplemental score that looks at variables not included in biological or action scores. These scores help identify species most in need of conservation measures and the amount of effort previously expended on them, which then is used to help in prioritizing 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 to these tools, FWC must also consider available funding sources, legislation, court rulings, grant agreements, and approved management plans when setting priorities for allocating resources for the management and conservation of Florida's State–listed species.

Statewide Policies Pertaining to Listed Species

LISTING ACTIONS – In FY 2017–18, Biological Review Groups (BRGs) were convened for the Sherman's fox squirrel, Homosassa shrew, osprey (Monroe County population), and harlequin darter. Staff have revised Species Action Plans and developed Species Conservation Measures and Permitting Guidelines for three species of alligator snapping turtles, Eastern chipmunk, harlequin darter, Homosassa shrew, Osprey, and Southern fox squirrel. Staff will present the draft rule for the final status changes in the fall of 2018.

On June 28, 2018, FWC received a request to evaluate the status of the American flamingo. The species evaluation request is currently under review. Information on all listing actions can be found at: http://myfwc.com/wildlifehabitats/imperiled/listing-actions/

Completed biological status reports, species action plans, and completed management plans are available at http://myfwc.com/wildlifehabitats/imperiled/biological-status/,

http://myfwc.com/wildlifehabitats/imperiled/species-action-plans/, and http://myfwc.com/wildlifehabitats/imperiled/management-plans/, respectively.

IMPERILED SPECIES MANAGEMENT PROGRAM THE LISTING PROCESS, AND MANAGEMENT PLANS – Rules implementing the Imperiled Species Management Program, including a revised listing process, became effective on November 8, 2010. These rules are available at https://www.flrules.org/gateway/ChapterHome.asp?Chapter=68A-27. The Imperiled Species Management Program requires that all species have a management plan before listing status changes can occur. As of June 30, 2018, there were 38 State–designated Threatened species and six State–designated Species of Special Concern. Gopher tortoise management and permitting is proceeding under the revised ten–year management plan, approved in September 2012, and the revised permitting guidelines, effective in January 2017. The Panama City crayfish has a draft management plan (http://myfwc.com/media/3395300/Panama-City-Crayfish-Draft-Management-Plan-February- 2016.pdf) and is currently proposed for federal listing as Threatened. The remaining 42 State–listed species are included in the Imperiled Species Management Plan (http://myfwc.com/media/4133167/Floridas-Imperiled-Species-Management-Plan-2016-2026.pdf), approved in November 2016 and with final rule changes effective February 2017.

Since the final approval of the Imperiled Species Management Plan, staff have been working on the implementation of the six main objectives and the development of Species Conservation Measures and Permitting Guidelines (http://myfwc.com/wildlifehabitats/imperiled/management-plans/) for all 57 species included in the Plan, starting with the 42 that are State–listed. FWC will continue to engage and update stakeholders in implementation of the Plan and continued development of permitting guidelines.

Required Legislation

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

Funding Request

The recommended level of funding for the FWC endangered species programs in FY 2019–20 is $35,690,695 (Exhibit 2). 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 2. FWC Endangered/Threatened Species Budget Request for FY 2019–20.

FUNDING SOURCE	AMOUNT ($)
Federal Grants (FG)	$8,833,606
Florida Panther Research & Management Trust Fund (FPRMTF)	$1,384,403
Grants and Donations Trust Fund	$3,244,246
Land Acquisition Trust Fund (LATF)	$1,790,683
Marine Resources Conservation Trust Fund (MRCTF)	$9,550,559
Nongame Wildlife Trust Fund (NWTF)	$5,230,867
Save The Manatee Trust Fund (STMTF)	$3,496,907
State Game Trust Fund (SGTF)	$2,159,624
TOTAL	**$35,690,695**

PROGRESS REPORT

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 of listed species. Research is also leading 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 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.

MAMMALS

Beach Mice

Several subspecies of the old–field mouse, collectively known as beach mice, inhabit coastal dune habitat along Florida's Atlantic and northwest Gulf Coasts. Beach mice also occur along Alabama's coast. Due to extensive development of their coastal habitat, as well as impacts from hurricanes and non–native predators, all but one of the beach mouse subspecies are listed as Federally Endangered or Threatened by USFWS. In Florida, these include the Choctawhatchee beach mouse, Anastasia Island beach mouse, St. Andrew beach mouse, Perdido Key beach mouse (all Federally–designated Endangered), and the Southeastern beach mouse (Federally–designated Threatened).

GULF COAST CONSERVATION AND POPULATION MONITORING – FWC established beach mouse track tube stations along the coastal dunes from Gulf to Escambia Counties. Each station consists of a polyvinyl chloride (PVC) tube baited with sunflower seeds and lined with paper and an inkpad that records footprints as beach mice enter the tube. At most survey sites, stations are set 328 feet apart in lines parallel to the dunes. The track tube stations provide an indirect method of determining the presence of beach mice from footprints left on the paper inside the tube or in the sand within five feet of the tube. Track tube stations do not provide population estimates, instead they indicate areas occupied by beach mice and FWC uses the tracking data to monitor fluctuations in the distribution of mice over time. For example, tracking data can be used to determine how a hurricane affects local mouse populations. FWC biologists and partners from the Florida Department of Environmental Protection's (FDEP) Florida Park

Service, Gulf Islands National Seashore, the St. Joe Company, and Tyndall Air Force Base (AFB) regularly check the stations for mouse tracks and they continued this long–term monitoring program for beach mice in FY 2017–18 on 13 public lands and at two private sites along the northwest Gulf Coast of Florida (Exhibit 3). For each location monitored, staff show the percentage of track tube stations that detected tracks each sampling period (detection rate). In FY 2017–18, the average detection rate varied from 22.5% at Deer Lake State Park to 95% at Shell Island East (Exhibit 3). Most sites had mean detection rates above 80%, which indicates most of the available dune habitat at these sites is occupied by beach mice. On the contrary, the same four sites (Deer Lake State Park, Grayton Beach State Park, Topsail Hill State Park, and Billy Joe Rish Park) that had the lowest detection rates in FY 2015–16 and FY 2016–17 had the lowest rates again in FY 2017–18. This indicates that populations at these sites merit continued close monitoring and potentially management actions to prevent further decline.

Because Perdido Key beach mice populations have expanded or stabilized in recent years, in FY 2017–18 FWC and Florida Park Service staff reduced the number of track tube stations by half in each of the three large public lands on Perdido Key. The reduced the number of tubes allowed staff to adequately monitor the areas occupied by mice, but at a lower cost. The continued presence of Choctawhatchee beach mice at Grayton Beach State Park is also encouraging. Despite several prior translocations, beach mice were absent here in 2011 and were reintroduced from nearby Topsail Hill Preserve State Park. Beach mice are still present at Grayton Beach State Park seven years after being reintroduced and just over half of the stations (58%) detected beach mice in FY 2017–18. In FY 2017–18, FWC helped staff from USFWS, Florida Park Service, and Tyndall AFB trap mice on the mainland park property of St. Andrews State Park (Bay County) to confirm that mice were still present after being reintroduced to the site in March 2017. FWC also assisted with trapping mice at Gulf Islands National Seashore and Perdido Key State Park in June 2018 and 10 of the captured mice were transferred by USFWS to captive breeding colonies in zoos in Florida. The captive colonies were created when the Perdido Key beach mouse population was extremely small and mice from the colonies have been used to re–establish populations on Perdido Key.

Exhibit 3. Percent of Track Tube Stations with Beach Mice Tracks in FY 2017–18 at 15 Locations on Florida's Gulf Coast.

Location	County	Subspecies	Number of Stations	Percent of Stations with Tracks
Shell Island East	Bay	Choctawhatchee	30	95
Shell Island West	Bay	Choctawhatchee	20	85
St. Andrews State Park	Bay	Choctawhatchee	18	87
West Crooked Island	Bay	Choctawhatchee	30	89
Gulf Islands National Seashore	Escambia	Perdido Key	81	88

Exhibit 3 (*continued*). Percent of Track Tube Stations with Beach Mice Tracks in FY 2017–18 at 15 Locations on Florida's Gulf Coast.

Location	County	Subspecies	Number of Stations	Percent of Stations with Tracks
Gulf State Park	Escambia	Perdido Key	42	94
Perdido Key State Park	Escambia	Perdido Key	81	88
Billy Joe Rish Park	Gulf	St. Andrew	21	78
East Crooked Island	Gulf	St. Andrew	42	84
St. Joseph Peninsula State Park	Gulf	St. Andrew	40	92
Deer Lake State Park	Walton	Choctawhatchee	16	23
Grayton Beach	Walton	Choctawhatchee	45	58
Topsail Hill Preserve	Walton	Choctawhatchee	32	78
Water Color (private site)	Walton	Choctawhatchee	7	18
Water Sound (private site)	Walton	Choctawhatchee	4	65

ATLANTIC COAST BEACH MOUSE CONSERVATION – The Southeastern beach mouse (SEBM) historically occurred from Volusia to Broward counties, and possibly as far south as Miami Beach. The current distribution is likely restricted to Volusia and Brevard counties, and perhaps scattered locations in Indian River County. Suitable habitat in St. Lucie and Martin Counties was surveyed for SEBM in FY 2015–16 using track tubes, but none were detected. Live–trapping was conducted for four nights in February 2018 at Hobe Sound National Wildlife Refuge, St. Lucie Inlet State Park, Ft. Pierce Inlet State Park, and Pepper Beach; however, none were detected. The main population occurs on the Canaveral Complex (i.e., Cape Canaveral Air Force Station, Kennedy Space Center, Merritt Island National Wildlife Refuge, and Canaveral National Seashore). There is also a small relict population in Smyrna Dunes Park, approximately 10 miles north of the Canaveral Complex. Following Hurricane Irma in September 2017, the University of Central Florida conducted live–trapping and reported low numbers along the primary dune. However, capture rates have increased since the hurricane and this population is now stable. In April 2018, FWC conducted track tube surveys at Smyrna Dunes Park to supplement live–trapping (Exhibit 4).

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 2016 and 2017, Hurricanes Matthew and Irma impacted Florida's coastline causing major flooding and erosion along the Atlantic coast. In 2017, FWC used federal Section 6 endangered species grant–in–aid funds for a one–year project to evaluate the impact of Hurricane Matthew on the Anastasia Island beach mouse population. This project, in partnership with FDEP, NPS, and St. Johns County, includes regular monitoring with track tubes,

quarterly live–trapping, and the development of a habitat restoration strategy on public lands (Exhibit 4). FWC conducted the first quarterly live–trapping in June 2018 on Anastasia State Park and Ft. Matanzas National Monument. Trapping occurred opportunistically on county parks to confirm beach mice presence. However, only two mice were captured at Butler Beach Park. Live–trapping will occur again in September 2018 and January 2019 to compare capture and reproductive rates across seasons.

Exhibit 4. Percent of Track Tube Stations with Beach Mice Tracks in FY 2017–18 at four Locations on Florida's Atlantic Coast.

Location	County	Subspecies	Number of Stations	Monitoring Interval	Percent of Stations with Tracks
Anastasia Island State Park	St. Johns	Anastasia	109	2 weeks	72
Fort Matanzas National Monument	St. Johns	Anastasia	22	2 weeks	55
St. Johns County Parks (Crescent Beach, Butler Beach Park, Ocean Hammock, Pier [Pope Rd.])	St. Johns	Anastasia	12	2 weeks	48
Smyrna Dunes Park	Volusia	Southeastern	23	2 weeks	68

Big Cypress Fox Squirrel

The Big Cypress fox squirrel (BCFS) is a State–designated Threatened species that is endemic to southwest Florida and inhabits areas south of the Caloosahatchee River. Threats to BCFS include habitat fragmentation due to urbanization and agriculture, invasive species, disease, changes to hydrology, and habitat degradation due to fire suppression. To understand the effects of these threats, in FY 2016–17 research proposals were solicited through Florida's State Wildlife Grants Program and researchers from the University of Arizona, Tucson, were selected to study where BCFS reside throughout the expected range on public lands. Objectives include identifying the overall extent of occurrence, specific areas of occurrence, and how vegetative structure and composition affects occurrence. To meet the objective, in 2017, non–invasive wildlife cameras and PVC tubes lined with duct tape were used to collect hair samples at random sites on 18 areas of public land throughout southwest Florida. At each site, detailed vegetation surveys were conducted. In 2017, 211 survey plots were established on four areas of public land in Collier County: Big Cypress National Preserve (BCNP), Florida Panther National Wildlife Refuge (FPNWR), Fakahatchee Strand Preserve State Park (FSPSP), and Picayune Strand State Forest (PSSF). Additionally, a post–Hurricane Irma assessment was conducted on established survey plots and randomly selected plots to determine damage to vegetation. In 2018, an additional 123 survey plots were established on remaining areas of public land. Preliminary results indicate that BCFS occupancy is highest in areas with dense bromeliads, a sparse

midstory, adjacent to cypress and hydric pine vegetative communities, larger trees, and a high diversity of understory plants. When comparing lands surveyed, probability of occurrence was highest in BCNP (17 records), followed by FPNWR (3 records), PSSF (1 record), and FSPSP (0 records). Preliminary post–hurricane assessment indicated that South Florida slash pine trees were most prone to severe hurricane damage and midstory vegetation was disproportionally impacted when compared with overstory trees. Data collection will continue through 2019 and final analysis will be complete in 2020. Final products will include a range–wide map of suitable habitat, recognition of unsuitable vegetative conditions that may impede movement, and management recommendations.

Everglades Mink

The Everglades mink is a State–designated Threatened subspecies and is one of four subspecies of Florida mink. The Everglades mink is known to occur in fresh water marshes and wet forests in the Everglades. Historical data describing distribution and habitat needs are limited and largely anecdotal. Previous attempts to detect mink in Florida were unsuccessful, suggesting effective survey methods are lacking. A web site, created for the public to report mink sightings, has been used to guide survey efforts and supplement field data. The web site includes a Google Maps tool for reporting the exact location of each sighting and a comments section for providing sighting details, as well as the opportunity to attach pictures. All information submitted with sighting locations are used to evaluate the validity of the sighting. The web site and its purpose were advertised to the public using local media resources. In July 2014, FWC received a State Wildlife Grant to conduct research and began surveys for Everglades mink. Biologists evaluated camera traps and visual surveys as methods for detecting mink. Camera trap surveys were conducted between July 2014–March 2018 using two camera types: floating camera traps in salt marsh and fresh water swamp habitats and trail cameras attached to trees and focused on small water holes within forested wetlands. Surveys occurred in Fakahatchee Strand Preserve State Park (FSPSP), Picayune Strand State Forest (PSSF), Ten Thousand Islands National Wildlife Refuge, and Big Cypress National Preserve (BCNP). In FY 2017–18, 113 camera traps were used. Since 2014, a total of 725 camera traps have been used to survey for Everglades mink. In addition to camera trap surveys, FWC conducted visual surveys in FSPSP, BCNP, and PSSF along roads and trails between April 2015–March 2018. In FY 2017–18, 22 transects were surveyed. Since 2014, 46 transects, 2–4 nights each, have been surveyed. A single night's survey involves traveling along a predetermined route and scanning for mink along the edges of roads and trails. Half of the surveys were conducted for two hours starting at sunrise and the other half during the two hours either immediately before or after sunset. Mink were detected by their distinctive, yellow eye–shine at night or visually during the day and their location recorded.

Between June 2012–June 2018, 680 sightings were reported on the mink web site. Sightings occurred throughout the state with 32 sightings reported in the Everglades region. Overall, less than 30% of the 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. Everglades mink were detected on one transect during spotlight surveys along Janes Scenic Drive in FSPSP. Everglades mink were also detected on 2 of 725 (< 1%) camera traps, both of which were trail cameras attached to trees. All Everglades mink detections occurred prior to FY 2017–18 and none were detected on floating camera traps. Neither camera traps nor visual surveys were particularly effective in detecting Everglades mink. Future Everglades mink surveys will focus on surveying additional locations on public lands.

Florida Bats

FLORIDA BONNETED BAT – The Florida bonneted bat was Federally–listed as Endangered in October 2013. The Florida bonneted bat is the largest endemic bat species in Florida. Florida bonneted bats occur on Babcock–Webb WMA (Charlotte county). Between 2007–2012, 13 bat houses and one bat condo complex were installed on Babcock–Webb WMA and have been checked to monitor occupancy. In FY 2017–18, eight houses were occupied by bonneted bats for at least one night. FWC conducted evening emergence counts on occupied bat roosts in August 2017 (133 bats in six bat houses and one natural roost), December 2017 (88 bats in four bat houses and one natural roost), and April 2018 (89 bats in three bat houses and one natural roost) on Babcock–Webb WMA. Also, FWC monitored weekly for pups at eight bat houses to determine how bonneted bats use the bat houses for reproduction and how many young were produced. Pups were observed in seven bat houses and reached a peak of 48 pups counted across all occupied houses. In FY 2016–17, pups were observed in nine houses and reached a peak of 45.

FWC continues to partner with UF to study the social structure of bat colonies and to identify factors that influence the roosting activity at Babcock–Webb WMA. A total of 278 bonneted bats were captured at nine bat houses and one natural roost in a tree cavity on Babcock–Webb WMA in FY 2017–18 within a three-night survey period. The number of bats in each occupied roost ranged from a single bat to 38 bats. Of those captured in FY 2017–18, 77 bats (38 male, 39 female) were captured for the first time and marked with Passive Integrated Transponder (PIT) tags. FWC maintained six automatic PIT tag readers on bat houses at Babcock–Webb WMA and installed a seventh PIT tag reader in April 2018. Each reader collects data on when bats enter and exit the bat houses, which will help determine when bats are active relative to local weather and other environmental variables. FWC downloads data several times a month and conducted maintenance as needed and will continue to do so through FY 2018–19. FWC will also continue to conduct capture events during FY 2018–19 to tag unmarked bats and collect biological information on captured bats. The project is ongoing, but initial results were published in FY 2016–17.

Another UF–FWC project studied diet composition and effects of season on insect prey diversity. A UF graduate student collected fecal samples from beneath bonneted bat houses on Babcock–Webb WMA and captured bats at multiple sites to evaluate diet via guano. Data collection occurred between November 2016–October 2017 and data analysis continued in FY 2018–2019. Results will be available in FY 2018–19.

Beginning in FY 2016–17, FWC conducted acoustic surveys for bonneted bats as part of an aquatic restoration project with Babcock–Webb WMA. Two acoustic detectors were deployed in two locations on the Bond Farm (Charlotte county) for 39 survey nights in November and December 2016. Bats were detected at both locations. Supplementary surveys were conducted through July 2017 to determine if any roots were located within the area. Additional surveys are planned for FY 2018–19.

In FY 2017–18, FWC initiated a project to locate, monitor, and study bonneted bat natural roosts through acoustic monitoring, mist–netting, and telemetry. Field research efforts took place across Charlotte, Collier, and Hendry counties. FWC deployed acoustic detectors to identify areas with the highest levels of bonneted bat activity, captured bats with mist nets, affixed radio tags to several captured bonneted bats, and conducted emergence counts and vegetation surveys on active roost trees that were identified by tracking tagged bats. In total, 18 roost trees were located, with six new roosts located in FY 2017–18. The roosts occur in: Avon Park, Babcock–Webb WMA, Florida Panther National Wildlife Refuge, Big Cypress National Preserve, and Fakahatchee Strand Preserve State Park. The roosts included enlarged woodpecker cavities, cavities formed from decay, and spaces under loose bark, and they occur in live and dead long leaf pine, slash pine, royal palm, and cypress trees. Colony sizes ranged from one individual to 80 bats. Of these 18 roost trees, six have since been damaged or destroyed by fire or hurricanes. This information will allow FWC to protect existing roost structures and develop guidelines for conserving or enhancing roosting habitat. Research began in March 2018 and will continue into FY 2018–19. Initial roost findings were published in FY 2015–16 and final results will be published in FY 2018–19.

Stationary acoustic and mist netting surveys were conducted at three and five sites at Babcock–Webb WMA, respectively, from September 2017–June 2018 (Exhibit 5). One acoustic file may have contained a bonneted bat, but other species identified were northern yellow bat, tri–colored bat, evening bat, big brown bat, Seminole bat, and the Brazilian free–tailed bat. FWC has provided USFWS with input on protocols to address problems that may arise if bonneted bats roost in houses or other structures. FWC also provided recommendations for steps that can be taken to reduce problems that may occur and to reduce the time it may take to resolve potential problems, among other issues. FWC and partners hosted the fourth Florida Bonneted Bat Working Group meeting in May 2018 with 31 organizations represented by 85 people to discuss ongoing research, monitoring, and conservation across the species' range. The Working Group meets every 18 months to coordinate conservation activities among partners.

Exhibit 5. Florida Bonneted Bat Surveys Conducted During FY 2017–18.

Location	County	Survey Period	Survey Nights	Bats Detected?
Everglades and Francis S. Taylor WMA	Broward	July 2017 – April 2018	47	Yes
Babcock Ranch Preserve	Charlotte	March 2018	8	Yes
Fred C. Babcock/Cecil M. Wedd WMA	Charlotte	March – April 2018	31	Yes
Yucca Pens Unit WMA	Charlotte, Lee	March 2018	8	Yes
Big Cypress National Preserve	Collier	May – June 2018	27	Yes
Fakahatchee Strand Preserve State Park	Collier	April – June 2018	10	Yes
Florida Panther National Wildlife Refuge	Collier	April – June 2018	18	Yes
Picayune Strand State Forest	Collier	February – June 2018	32	Yes
Okaloacoochee Slough State Forest	Collier, Hendry	February – March 2018	11	Yes
Dinner Island Ranch WMA	Hendry	February – April 2018	15	No
Okaloacoochee Slough WMA	Hendry	February – March 2018	12	No
Spirit of the Wild WMA	Hendry	September 2017 – June 2018	55	Maybe
John Pennekamp Coral Reef Park	Monroe	February 2018	1	No
Holey Land WMA	Palm Beach	March – April 2018	14	Yes
Rotenberger WMA	Palm Beach	March 2018	7	Yes

GRAY BATS – The gray bat is a Federally–designated Endangered species that roosts almost exclusively in caves throughout the south–central U.S. Gray bats occupy different caves in summer and winter based upon temperature and historically some bats migrated out of Florida during winter. Gray bat populations previously suffered severe declines due to human disturbance of roost caves. In Florida, the gray bat is known from only a few caves in Jackson County and the population is declining even though these caves are protected. This decline began prior to the emergence of white–nose syndrome, a disease decimating hibernating bats in eastern North America. White–nose syndrome is not believed to be adversely affecting Florida's gray bats presently. 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 and these hibernating bats could be readily counted. In the most recent winter count on February 19, 2018, FWC found no gray bats in the former primary wintering cave (Old Indian Cave) in Florida Caverns State Park (Jackson County). FWC did not survey the secondary cave adjacent to the park where gray bats previously roosted in some winters. In addition, FWC did not observe bats in any of the other 31 caves in northwest Florida visited in FY 2017–18 as part of a broader study of the use of caves by wintering bats. Although thousands of gray bats previously wintered in Florida's caves, no more than nine have been found hibernating 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. Because the roost caves are protected, factors other than human disturbance are likely responsible for the decline. Interestingly, in other parts of their range, gray bat numbers are increasing, and very large colonies are present in caves in northern Alabama, northern Georgia, Tennessee, and other locations in the Southeast. Because some gray bats in Florida were known to migrate to northern caves each winter to hibernate, it is possible that protection and stabilization of the large summer colonies in northern caves have led to bats no longer migrating to Florida.

Florida Manatee

The Florida manatee (listed by USFWS as the West Indian manatee) is native to Florida's coastal estuaries and riverine waters and is a Federally–designated Threatened species. The manatee is also Federally protected under the Marine Mammal Protection Act. 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 of 1978, the Florida Manatee Management Plan approved by FWC Commissioners in December 2007 (http://myfwc.com/media/415297/manateemgmtplan.pdf), and the USFWS Florida Manatee Recovery Plan of 2001 (http://ecos.fws.gov/docs/recovery_plan/011030.pdf). In 2004, FWC and USFWS established the Manatee Forum, a diverse stakeholder group, with the goal of reducing litigation by establishing areas of common ground, identifying conflicts, developing potential solutions, and accepting differences through increased communication. The Manatee Forum met in November 2017 and in May 2018. At the November meeting, presentation topics focused on the current and future health of Florida springs as well as springs that provide important manatee habitat. In addition, presentations regarding restoration of submerged aquatic vegetation and manatee warm–water habitat were provided. The May meeting included presentations on FWC's Manatee Management program's past and future efforts including the review and implementation of the Manatee Protection Plan (MPP), interagency efforts to reduce conflicts associated with water–control structures, and review of coastal construction projects and manatee protection zones. FWC believes in the importance of having a stakeholder group focused on manatee issues. The opportunity for information exchange and the discussion of ideas is valuable to all parties.

MANAGEMENT ACTIVITIES – FWC and USFWS continue to work closely on manatee issues, particularly human–related threats and habitat conservation and restoration. For more information regarding manatee conservation efforts, please see the Save the Manatee Trust Fund report provided to the President of the Florida Senate and the Speaker of the Florida House of Representatives each year, available at: http://www.myfwc.com/research/manatee/trust-fund/annual-reports, which describe

progress and activities of the Manatee Management Plan. FWC's Manatee Management Program directs management activities and focuses on five program areas: MPP, Manatee Protection Zones, permit reviews, manatee habitat, and outreach. Development of MPPs involve FWC working closely with county governments and USFWS to develop and implement comprehensive county–based MPPs. FWC's Executive Director approves MPPs with concurrence by USFWS. During FY 2017–18, FWC approved an amendment to the existing City of Jacksonville MPP and staff continues to assist Miami–Dade County with informal input, when requested, while their plan is being revised.

PROTECTION ZONES – FWC develops boating speed and safe zones statewide to protect manatees. Extensive work, involving county governments, stakeholder groups, and the public is required to develop and authorize these zones. FWC Commissioners approve the final protection zone rules. During FY 2017–18, FWC continued to work to complete the Collier County rule process that began in 2016. In May 2017, the final rule for Collier County was challenged because FWC did not recommend a manatee protection zone in a specific waterbody. An administrative hearing was held in October 2017 and the Administrative Law Judge ruled in the state's favor in January 2018. The rule was filed for adoption with the Department of State in January 2018 and became effective in February 2018. Subsequently, the Administrative Law Judge's decision was appealed to the District Court of Appeals (DCA), but no decision has been made by the DCA at the time of this report. Due to the uncertainty of the appeal outcome, no action has been taken to update the regulatory markers currently in place and the county remains marked in accordance with the 1997 Collier County rule.

PERMIT REVIEWS – FWC produced 302 final comment or assistance letters for proposed permitting projects reviewed during FY 2017–18. These biological opinions provide recommendations to regulatory agencies on methods to reduce impacts to manatees. Implementation of the boat facility siting portion of FWC–approved MPPs is accomplished during permit reviews and helps expedite the process. Distribution of public information about manatees is also completed through these comments, as facilities are required to post manatee informational signs and distribute written materials to vessel operators. This past year, 10 boat facilities coordinated with FWC for manatee education materials or manatee informational signs for use at their facilities.

MANATEE HABITAT – In FY 2017–18, FWC participated in various intergovernmental groups and task forces regarding minimum flows and levels at springs, invasive aquatic plant control, seagrass monitoring and protection, reducing water control structure–related mortalities, and other habitat–related concerns. In addition, FWC is working with various partners to develop and complete projects to restore and conserve important manatee natural warm–water habitat in Sarasota, Volusia, and Marion Counties.

Staff is also working with Florida Power & Light and Tampa Bay Electric Company to develop plans to monitor and protect manatees during work to upgrade existing power generating units at these facilities.

MORTALITY AND RESCUE – FWC researchers and law enforcement officers respond to statewide reports of manatee carcasses and injured manatees. Staff is strategically located in five coastal field stations to maintain response capabilities statewide. Between July 2017 and June 2018, 645 carcasses were documented in Florida. All but 59 of these were recovered and examined to determine causes of death. A red tide began in fall 2017 along the southwest coast of Florida resulting in elevated manatee mortality. The national Working Group on Marine Mammal Unusual Mortality Events determined that a 'Repeat Mortality Event' involving manatees was occurring concurrent with the red tide. Collision with watercraft accounted for 120 of the 645 cases. Other causes of death are those associated with near–term or newborn (perinatal) issues, cold stress, natural causes, and human influence. An interactive web–based database with manatee mortality information is available at http://research.myfwc.com/manatees/search_summary.asp. FWC and cooperators rescued 119 sick or injured manatees under the Federally–permitted statewide rescue program. Three oceanaria (ZooTampa, Miami Seaquarium, and Sea World in Orlando) participate in the State–funded rehabilitation program for critical care treatment and are partially reimbursed by FWC for their costs. As of June 2018, 64 of the rescued manatees were released back into the wild, 28 died, and 27 are still being treated. FWC contributed to multi–agency efforts to release and track rehabilitated manatees that were rescued due to injury, cold stress, or other problems. As part of that partnership, FWC participated in almost every rescue, transport to rehabilitation facilities, pre–release health assessment, and release of rehabilitated manatees. The information obtained from manatee rescue, rehabilitation, and treatment contributes to conservation efforts by identifying important continuing and emerging threats.

POPULATION ASSESSMENT – FWC uses a variety of methods to assess and monitor the current and future status of Florida's manatee population. Population assessments currently include conducting manatee counts at winter aggregation sites; aerial surveys used to determine regional distribution, abundance, 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 [required annually, weather permitting, by section 379.2431(4)(a), F.S.] was conducted in winter 2018 and 6,131 manatees were counted by multiple teams of observers from 12 organizations. Results from the 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. Therefore, concerted efforts have been made over the past

several years to improve the ability to estimate abundance. More information about synoptic counts is available at, http://myfwc.com/research/manatee/projects/population-monitoring/.

Designing a new method for estimating manatees has been challenging because manatees occur over large landscapes and are often in near shore habitats that make it difficult to apply traditional statistically sound survey methods. To meet this challenge, an innovative approach was designed, tested, and vetted with experts over the past several years. This approach is based on a random sampling design and combines multiple sources of information. A combination of a double–observer protocol (i.e. multiple observers in each plane), repeated passes, and detailed diving behavior data were used to account for imperfect detection of animals. The first published estimate uses data collected from February 28 to March 22, 2011 along Florida's west coast and from March 5 to 13, 2012 along Florida's east coast. The estimate of abundance from this period was 6,350 manatees. In December 2015, an aerial survey to estimate abundance was flown on Florida's west coast from the Alabama – Florida State line to Monroe County. The east coast was flown in December 2016. Analysis to update the estimate of abundance is currently underway and expected to be completed in 2018.

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, used for photo–identification of individual manatees. These data assist scientists in estimating important population vital rates as well as life history information. Survival rate information from photo–identification efforts was recently updated and included in the latest status and threats assessment found at: 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. FWC continues to analyze data and make modifications to the sampling strategy to assess the potential of this technique. The manatee genetic–ID database currently includes 1,850 unique individuals identified by skin samples collected from live manatees in FWC's southwest Florida pilot study area with approximately 342 new individuals pending from 2018 winter sampling.

BEHAVIORAL ECOLOGY – Warm–water habitat is of interest to FWC and agency partners due to the predicted future loss of this habitat as a key long–term threat to manatees. In FY 2017–18, FWC monitored two wintering sites on Florida's west coast that are being restored (Warm Mineral Springs) or mitigated (Port of the Islands). FWC continued to monitor temperatures of warm–water habitat statewide via deployment of temperature probes. Several passive thermal sites (i.e. dredged basins or canals) were investigated for their potential to provide sufficient warmth to sustain manatees through cold winter periods. A study that documented manatee behavioral response to passing boats was published in the

peer–reviewed journal *Marine Mammal Science*. The project used a combination of manatee–borne electronic tags (digital acoustic recording tags and GPS tags) and boat–based observations. The digital acoustic recording tags provided a continuous record of boat noise and other sounds and recorded a suite of behavioral parameters allowing a three–dimensional reconstruction of manatee movements, depth, and orientation underwater.

Florida Panther

The Florida panther is a Federally–designated Endangered subspecies of the puma (also called cougar or mountain lion) that once roamed across eight southeastern states. Unregulated harvest through the mid–1900s along with subsequent habitat loss and fragmentation due to human population growth reduced the size of the population and isolated it from other populations. When FWC began investigations into the status and distribution of panthers in the early 1970s, there were likely fewer than 30 in south Florida. Small population size and geographic isolation from other populations made the Florida panther vulnerable to extinction due to inbreeding. Therefore, in 1995, FWC, with the approval of USFWS, began a genetic restoration plan by temporarily releasing eight females from Texas into the wild in south Florida to increase the genetic diversity of the remnant population. These releases mimicked natural genetic exchange among panthers and other puma subspecies that likely last occurred in the 19th century. The benefits accrued to the population via genetic restoration have played a pivotal role in the subsequent increase in the population size since 1995.

The population estimate currently is between 120–230 adults and subadults in south Florida. FWC and Big Cypress National Preserve (BCNP) continue to monitor the genetics and population parameters of the Florida panther. Biologists typically capture a sample of panthers annually between November and February, fit them with collars containing radio transmitters, monitor them three times a week, and record their locations. Since 1981, 252 panthers have been radio–collared, providing essential data for management and conservation. Biologists collected radio telemetry data on 17 panthers in FY 2017–18. Additionally, FWC and BCNP visit dens of radio–collared females to mark and collect biological samples from newborn kittens. These work–ups include weighing, determining sex, administering de–wormers, marking with Passive Integrated Transponder (PIT) tags, and collecting tissue and fecal samples to assess physical and genetic health. In FY 2017–18, four dens were visited and 10 kittens (five males, five females) documented. Since 1992, 490 kittens have been handled at dens.

During FY 2017–18, 33 wild panthers are known to have died, including six (five males, one female) radiocollared panthers and 27 (16 males, 11 females) uncollared panthers. Of those 33, 28 died after being hit by vehicles, two were killed by other panthers and three died from undetermined causes.

FWC is currently involved in several collaborative research projects focusing on issues related to Florida panther conservation and management. Among these are: a population viability analysis that includes individual–based models; using whole genome sequencing to assess differences between panthers and other populations; determining mortality factors; assessing the efficacy of rehabilitation; analyzing the long–term benefits accrued via genetic restoration; and using camera trap data to assess density on a private ranch. Research projects involving FWC play an integral role on several sub–teams of the USFWS Panther Recovery Implementation Team, improving the science involved with monitoring progress towards recovery. FWC assisted with the completion of several collaborative research projects during FY 2017–18 including peer reviewed publications that focused on: movement patterns and rates determined via GPS collars and surgery on long bone fractures.

FWC investigates human–panther interactions in accordance with the Interagency Florida Panther Response Plan. FWC verified that panthers were responsible for preying upon domestic animals (depredations) in 47 separate events in FY 2017–18. In some cases, multiple animals were killed or injured during a single event. These 47 verified depredations all occurred in Collier, Hendry, or Lee Counties; most occurred in Golden Gate Estates (Collier County). During depredation investigations, FWC aids and advises affected residents on how to reduce the risk of panther attacks on pets and livestock. FWC, as a member of the Interagency Florida Panther Response Team, also documented one incident. An incident is classified as an unexpected direct meeting between a panther and human where the panther displays potentially threatening behavior. The incident occurred in association with a depredation when two people unknowingly approached the cached prey item while the panther was nearby. The panther emerged from the brush as the people got close and vacated the area.

FWC provided information and reviews of numerous road and development projects throughout south Florida in FY 2017–18. Road and urban development projects are reviewed to minimize the disruption and loss of panther habitat and corridors, reduce the likelihood of human–panther interactions, and reduce the risk of panther–vehicle collisions. FWC launched a website in August 2012 where the public can report panther sightings and upload pictures or videos: http://www.myfwc.com/panthersightings. In FY 2017–18, over 5800 records were submitted. Most records (76%) did not include evidence that would permit verification by FWC that the animal observed was a panther. Of the records that included photographs, FWC verified 42% as panthers and 26% as bobcats. Other sightings were determined to be coyotes, dogs, foxes, cats, otters, and a monkey (Rhesus macaque).

FWC made major contributions in FY 2017–18 to an ongoing project compiling information for a Species Status Assessment (SSA). An SSA is a biological risk assessment to aid decision makers who

must use the best available scientific information to make policy decisions. This SSA will provide decision makers with a scientifically rigorous characterization of the panther's population status that focuses on the likelihood that the species will persist within its ecological settings along with key uncertainties in that characterization. The SSA does not result in a direct listing decision but provides the best available scientific information for comparison to policy standards to guide ESA decisions.

Homosassa Shrew

The Homosassa shrew is currently listed in Florida as a State–designated Species of Special Concern, a status that was retained after the 2010 evaluation due to a lack of current information on the status of the subspecies. In FY 2017–18, a Biological Review Group (BRG) was convened again to review the status of the Homosassa shrew. The review included data from a 2014 study that showed the Homosassa shrew occurs at low densities across its range, which was consistent with the results from other recently published studies. The BRG concluded the Homosassa shrew did not meet the criteria to be listed as a State–designated Threatened species. As a result, FWC staff recommended the Homosassa shrew be removed as a Species of Special Concern, and this was approved by the Commission in December 2017. The delisting will be completed in FY 2018–19, following approval of a revised the Homosassa shrew Species Action Plan and Species Conservation Measures and Permitting Guidelines. The Species Action Plan will guide the future conservation and management of the Homosassa shrew.

North Atlantic Right Whale

The North Atlantic right whale is a Federally–designated Endangered species in Florida. The primary calving grounds for are off the Atlantic coast of Florida and Georgia. The calving season for the North Atlantic right whale is November 15–April 15. During the calving season, FWC collaborates with Federal, State, and non–governmental partners to carry out field research, including aerial surveys, biopsy sampling, tagging, disentanglement, and response to stranding events. Most of this work is supported by funds from 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 contributors to the North Atlantic Right Whale Photographic Database (http://rwcatalog.neaq.org/Terms.aspx). Photographs are used to identify individuals based on the callosity pattern on their head as well as 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. 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 right 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. Staff published a characterization of right whale residency patters in the journal of Endangered Species Research. FWC also analyzes ship traffic data to help monitor compliance with vessel speed regulations and conduct risk assessments.

In the 2017–18 calving season, FWC conducted 54 aerial surveys and 13 vessel cruises. In collaboration with NOAA–Fisheries, the Georgia Department of Natural Resources, the Sea Shore Alliance, and volunteer sighting networks, 12 unique North Atlantic right whales were documented. However, for the first time since dedicated surveys began in the 1980's, not a single calf was observed. FWC confirmed sightings of whales reported by the public, including a juvenile that was seen several times in the Gulf of Mexico between Panama City Beach and Naples. Although right whale sightings in the Gulf of Mexico are rare, they're not unheard of. There have been no reports since March 2018, suggesting the whale found its way out of the Gulf. No carcasses were detected in the southeastern U.S. during this calving season.

Sanibel Island Rice Rat

The Sanibel Island rice rat (SIRR) is a State–designated Threatened species that occurs only on Sanibel Island mostly in freshwater and open marshes that form in swales across the island. The freshwater marshes in the swales are extremely important for the existence of SIRRs, but much of that habitat had been lost or degraded through construction of ditches in the past and by invasion of woody brush.

FILLING DATA GAPS TO ADDRESS THE STATUS AND MANAGEMENT OF THE SANIBEL ISLAND RICE RAT – In FY 2014–15, FWC awarded a grant through Florida's State Wildlife Grants Program to UF funding a 4–year project, which began in FY 2015–16. The objectives were to1) determine the current distribution of SIRR; 2) identify habitat features that influence the occurrence, colonization, and extirpation of SIRR; 3) evaluate the effects of habitat management activities on occurrence and activity; and 4) determine the most appropriate methods for a reliable monitoring program. Six survey periods have been completed during three years of field work for this project, from 2015 through 2018. SIRRs have been captured at multiple survey locations in each habitat type: freshwater marsh, saltwater transition, and mangrove. Captures rates have been low in all habitats, but camera traps have been as reliable as standard live–trapping methods when individuals were present. Preliminary results indicate the amount of cordgrass present is significantly positively correlated with the probability that SIRR will occur there. These results support the efforts to restore open freshwater marsh habitat on Sanibel Island. Captures of SIRR in mangrove areas have been infrequent during this study but represent the first documented captures of SIRR in mangrove forests. This expansion of known potential habitat may aid conservation efforts for SIRR in this system that is being impacted by sea–level rise.

RESTORING FRESHWATER SPARTINA MARSH HABITAT – Beginning in FY 2015–16, FWC funded a 3–year project through the Aquatic Habitat Restoration and Enhancement (AHRE) program to restore significant areas of freshwater marsh habitat. The endemic SIRR, and a variety of other wetland species, depend on sand cordgrass marshes, which once dominated Sanibel Island. The AHRE program funds and manages contracts for USFWS's J. N. "Ding" Darling National Wildlife Refuge (Refuge) and the Sanibel–Captiva Conservation Foundation, the organizations that manage a large proportion of habitat potentially occupied by SIRR. The objective is to restore the hydrology and open, freshwater sand cordgrass swales on the island. These swales are the primary habitat used by the SIRR. So far, this project has successfully removed 69.5 acres of hardwood brush species, such as Brazilian pepper, wax myrtle, and green buttonwood, to significantly increase the acreage of open freshwater marsh habitat. The AHRE program is also funding vegetation monitoring by FWC's Fish and Wildlife Research Institute (FWRI) to measure changes in the vegetation community within the project areas. These habitat restoration and monitoring efforts complement the SIRR surveys conducted by UF.

In FY 2017–18, the hydrology restoration component of this project was completed. The objectives for hydrology restoration were to increase groundwater levels and surface–water holding capacity, restore additional sand cordgrass marsh and increase and extend the hydroperiod in those marshes on the Bailey Tract within the Refuge. During the first year of the project, land surveys were done, and hydrologic modeling and engineering plans were started. In FY 2017–18, contractors funded by AHRE, removed two upland berms and brought a man–made pond to surrounding marsh elevation. These berms blocked water flow and were a host to exotic upland plant species. The materials from these berms were placed into a man–made pond on–site to bring the pond up to surrounding marsh elevations. A transitional slope from the new marsh to a small section of open water was retained to increase habitat diversity and potentially enhance shorebird nesting. Historically, the man–made pond had little wildlife value or usage. Part of a trail between the pond and existing marsh was also removed. Sand cordgrass has been planted in all restored areas, creating approximately three acres of new marsh. To help improve the hydrology, eight culverts were placed under existing trails to allow water movement between fragments of marsh.

Sherman's Fox Squirrel

The Sherman's Fox Squirrel is State listed as a Species of Special Concern. The species occurs in multiple land cover types; however, are primarily associated with mature, open, fire–maintained mixed pine–hardwood communities where pine species, mainly longleaf pine, dominate with hardwoods scattered throughout the habitat. Monitoring of Sherman's fox squirrels in Florida is difficult because of their large

home ranges, low population densities, and the difficulty in live–trapping individuals. Although recent research has found Sherman's fox squirrels are more resilient to habitat modification than previously thought, habitat loss, fragmentation, and degradation continue to threaten the species. In FY 2017–18, a Biological Review Group (BRG) was convened to review the status of Sherman's fox squirrel. The BRG review included new data from a multiyear project conducted by FWC and UF. That project included a review of historical and current density estimates, statewide distribution survey, multi–scale occupancy and habitat assessment, and a statewide genetic analysis. Results from the genetic analysis showed no genetic structure among the fox squirrel populations in north and central Florida, indicating the Sherman's fox squirrel is not distinct from the Southern fox squirrel or Bachman's Fox Squirrel. Based on the assessment, the Sherman's fox squirrel did not meet the criteria for listing as a State-designated Threatened species. Thus, FWC staff recommended that the Sherman's fox squirrel be removed as a Species of Special Concern, and this was approved by the Commission in December 2017. Delisting will be completed in 2018–19 following approval of a revised the Sherman's fox squirrel Species Action Plan and Species Conservation Measures and Permitting Guidelines. The Species Action Plan will guide the future conservation and management of Sherman's fox squirrel.

Sherman's Short–tailed Shrew

The Sherman's short–tailed shrew is one of two species of short–tailed shrew that occur in Florida. The Sherman's short–tailed shrew is a State–designated Threatened species. The Sherman's short–tailed shrew is believed to be restricted to a small area in southwest Florida from the vicinity of Royal Palm to just north of Fort Myers. Specimens used to differentiate Sherman's short–tailed shrew from other short–tailed shrew species and delineate its range were collected in 1955. Current data on the species is needed to evaluate its population status and determine if it's still present within its presumed range.

In December 2014–February 2017, FWC surveyed for Sherman's short–tailed shrew on publicly managed lands in Charlotte and Lee counties. FWC established 63 drift–fence arrays, each made of three 30–foot segments of silt fence in a "Y" formation with seven two–gallon buckets placed flush with the ground at the ends and center of each segment. Raised covers were placed over each bucket to protect captured animals from sun and rain. Each array was open for a minimum of 30 days, with most arrays open for 60 days. Each array was checked 2–3 times a week and all captured shrews were identified by species and either tissue samples (i.e. tail tip) or whole carcasses collected for future genetic analysis. In total, 259 least shrews and three short–tailed shrews were captured. The three short–tailed shrews were captured on Corkscrew Regional Ecosystem Watershed Wildlife and Environmental Area (WEA) (Lee County). In FY 2017–18, the Florida Museum of Natural History conducted genetic analysis and found that all three

short–tailed shrews were the Southern short–tailed shrew and not the distinct species (or subspecies) found only in the SW Florida area. Therefore, no Sherman's short–tailed shrews were detected.

BIRDS

Audubon's Crested Caracara

The Audubon's crested caracara is a Federally–designated Threatened species. Annual nest surveys continued in FY 2017–18 using FWC's standard monitoring protocol (Exhibit 6).

Exhibit 6. Audubon's Crested Caracara Wildlife Management Area (WMA) Surveys Conducted During FY 2107–18.

WMA	County	Survey Period	Historical Nests	Historical Active	New Active in 17/18	Total Active in 17/18	Fledges
Fisheating Creek	Glades	January – March	12	1	2	3	Yes
Dinner Island Ranch	Hendry	January – March	8	1	1	2	Yes
Rotenberger	Palm Beach	January – March	0	0	1	1	Yes

Black Rail

The Eastern black rail is an at–risk subspecies, petitioned for Federal listing with the listing decision anticipated in fall 2018. The black rail is a secretive bird that inhabits high salt marsh and shallow freshwater marshes throughout Florida. The Eastern subspecies is currently undergoing review for Federal listing due to rapidly declining numbers and range contraction in portions of its U.S. range. At the request of USFWS, FWC conducted two years of surveys (2016 and 2017) to document black rail occurrence throughout conservation lands in Florida. In FY 2017–18, FWC compiled results from surveys conducted on 27 conservation lands across Florida with either historical records or potentially suitable habitat. The number of birds found was low, but black rails were confirmed on 14 of the 27 conservation lands surveyed. Staff also collected reliable records of detections on five additional properties. Black rails were found in Walton, Franklin, Wakulla, Jefferson, Taylor, Dixie, Levy, Hernando, Pasco, Dade, Broward, Palm Beach, Highlands, Ockechobee, Polk, Osceola, Orange, and Brevard Counties. Surveys were conducted at John C and Mariana Jones/Hungryland WEA (April and May 2018) and J.W. Corbett WMA (February and March 2018) in Martin and Palm Beach following the Arizona Cooperative Fish and Wildlife Research Unit Standardized North American Marsh Bird Monitoring Protocol. A call/playback method was used for black rail, least bittern, king rail, purple gallinule, common moorhen, pied–billed grebe, and limpkin. One black rail was detected at J.W. Corbett WMA. Black rails were not detected at John C and Mariana Jones/Hungryland WEA and many of the marshes were dry making them unsuitable habitat.

Everglades Snail Kite

The Everglades snail kite is a Federally–designated Endangered bird that inhabits freshwater marshes and lakes in Florida. Core habitat includes the Everglades, Lake Okeechobee, the Kissimmee Chain of Lakes, and the upper St. Johns marsh. The Everglades snail kite population crashed in the 2000s, going from over 3,000 birds at the end of the 1990s to approximately 600 by 2008. Since then, the population has been increasing and the most recent population estimate is roughly 2,500 birds (Exhibit 7), but the population is still about half what it was less than 20 years ago. This decline was primarily caused by low levels of reproduction and too few young surviving to breeding age. The primary focus of management efforts has been to increase nesting success and juvenile survival. 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 from management activities and improve nesting and foraging habitats through proactive plant management. Nesting locations are marked with warning signs if they occur in places with high levels of 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 watersheds, water regulation schedules, and improve connectivity between large water bodies. Although habitat conditions have improved for snail kites since their crash, it's also clear that at least some of the recent increase has been a result of the presence of the 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 must continue to conserve and restore native apple snail habitat and more information is needed about the long–term impact that exotic apple snails may have on snail kite ecology and habitat. FWC is conducting multiple studies to assess the impact of habitat management and water level control on the snail kite prey population and nesting effort.

FWC funded UF to conduct snail kite nest monitoring in FY 2015–16 and FY 2016–17 for all areas of snail kite habitat except Lake Okeechobee and the Everglades. There were 225 active snail kite nests documented in 2017, which is a sharp decline compared to 2016 (778 nests). This was likely due to very dry conditions in the late winter and spring of 2017. Lake Okeechobee, Rotenberger WMA (Palm Beach County), and Lake Tohopekaliga (Osceola County) produced the most nests, respectively. Lake Okeechobee and Rotenberger WMA also had the most successful nests. In anticipation of the planned 2019 East Lake Tohopekaliga drawdown, FWC funded UF to study juvenile snail kite movement and

survival and response to hydrologic fluctuation. GPS trackers were placed on nine nestlings just prior to fledging. One tracker was deployed on East Lake Tohopekaliga, five trackers were deployed on West Lake Tohopekaliga, and three trackers were deployed on Lake Kissimmee. Data continues to be collected, which can provide important information about the survival and movements of juveniles leading up to the drawdown. FWC is also monitoring apple snail populations and movements in East Lake Tohopekaliga to understand snail response and recovery from the drawdown.

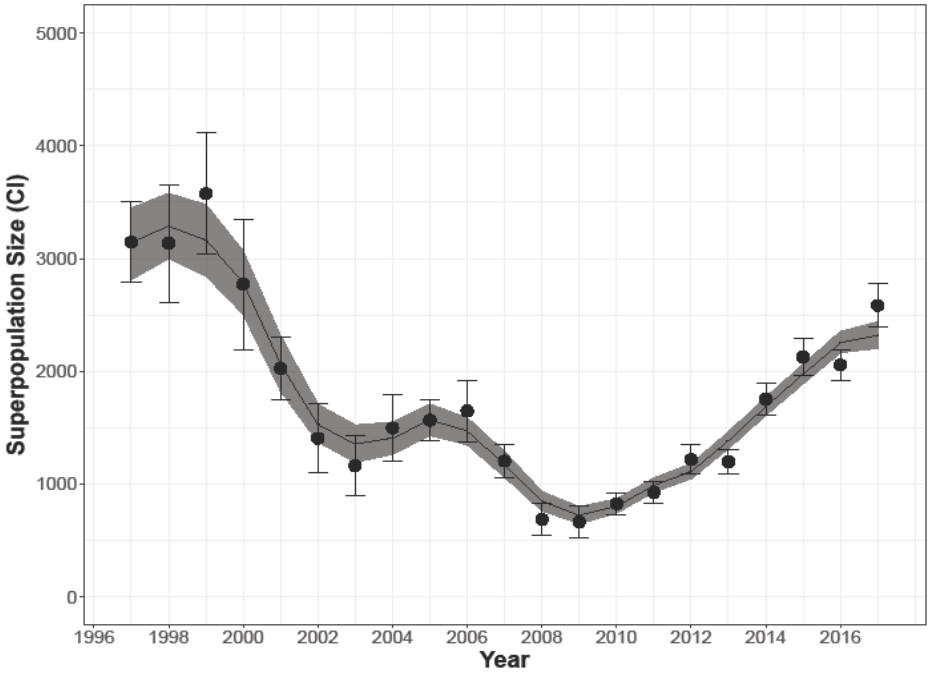


Exhibit 7. Population size of snail kites, 1997–2017. Black dots (and error bars) show population size estimates for each year (and 95% confidence intervals). The black line shows the 3–year running average and gray shaded region shows the uncertainty around the running average (95% confidence interval). Figure taken from the 2018 Annual Snail Kite Demography Report produced by the University of Florida.

Florida Grasshopper Sparrow

The Florida grasshopper sparrow is a Federally–listed Endangered bird endemic to Florida's distinct dry prairie habitat, which is characterized by flat, open expanses dominated by fire–dependent grasses, saw palmetto, and low shrubs. Following an FWC status survey, the grasshopper sparrow became a Federally–designated Endangered species in 1986 due to its low numbers, restricted distribution, and habitat loss. The federal recovery objective is to down–list the species to Federally–Threatened when 10 protected locations contain stable, self–sustaining populations of more than 50 breeding pairs each. Sparrows are not known to exist at more than four locations, including: Three Lakes WMA (Osceola County), Kissimmee Prairie Preserve State Park (Okeechobee County), Avon Park Air Force Range (Highlands and Polk counties), and a privately–owned land parcel (Osceola County). Sparrows on protected public lands are

monitored by annual point count surveys, a standard method used to assess the relative abundance of bird populations. Kissimmee Prairie Preserve State Park and Avon Park Air Force Range populations are near extirpation. The Three Lakes WMA population has also declined, but active reproduction continues. Population levels on other private lands are unknown but are being assessed by FWC and USFWS.

THREE LAKES WILDLIFE MANAGEMENT AREA – Surveys have been conducted at Three Lakes WMA since FY 1990–91 and occur each spring (April–June) and consist of 190 stations spaced 0.25 miles apart. Of the 190 stations, 24 are in unsuitable habitat and not surveyed annually. Each station is surveyed for five minutes three times each spring and all sparrows heard or observed are recorded. During FY 2017–18, surveys estimated at least 16 different males at the main site, which is a substantial decrease from the 22 detected in FY 2016–17. The overall declining trend of detected males across the last several years is of great concern to FWC. Monitoring will continue at Three Lakes WMA in FY 2018–19.

To restore and maintain habitat, oak trees and cabbage palms were mulched on 112 acres of the prairie. Oaks re–sprouting within previous tree removal areas were cut and sprayed with herbicide to prevent re–encroachment into these areas. Oaks outside of historic mesic hammocks were cut down. In addition, USFWS and FWC are conducting intensive research to determine the primary causes for the decline and taking measures to increase survival and productivity.

The sixth season of Florida grasshopper sparrow demographic research by FWC was conducted in FY 2017–18 and the beginning of FY 2018–19 (March–August 2018). This project has been a cooperative effort involving staff and support from FWC, USFWS, and members of the Florida Grasshopper Sparrow Working Group. So far in the 2018 season, the number of color–banded individuals observed at least once at Three Lakes WMA was 26 adult males, 14 adult females, and 36–48 fledged nestlings of unknown sex. Additionally, 25 nests have been discovered and 19 survived to fledge young, two were depredated, two are still active, one was flooded, and one was abandoned. Miniature nest cameras were placed at the entrance of 35 nests (including all 24 Florida grasshopper sparrows, eight Bachman's sparrows, and three Eastern meadowlarks). Predation events were recorded for five nests and predators included snakes (two; red corn snake and yellow rat snake), Eastern spotted skunks (two), and coyote (one). Data provided by the nest camera project (2014–2018) have been invaluable to understanding the predator community at Three Lakes WMA and will be critical when planning future predation management strategies. So far in the 2018 season, 24 Florida grasshopper sparrow nests were protected using predator deflection fencing developed and tested in 2015. All Bachman's sparrow nests (n=17) were left unfenced to serve as a control group. Analysis is pending for 2018 data, but results from previous years (2015–2017) revealed that fence installation substantially increases

nest survival (up to 6.25 times). An additional 36 fledglings were estimated to be added to the 2017 population because of predator fence installations. While fence installation is labor–intensive and only protects the subset of nests located prior to predation, it boosts local productivity and protects incubating females providing more time to study long–term habitat management solutions.

MONITORING DISEASE – In 2018, FWC continued to sample Florida grasshopper and Bachman's sparrows for bloodborne and gastrointestinal pathogens with 22 samples from grasshopper sparrows (including some from migratory Eastern grasshopper sparrows) and 30 from Bachman's sparrows. Fecal samples were also collected from 26 adult grasshopper sparrows, 29 nestling grasshopper sparrows, and 20 adult Bachman's sparrows. Most samples were sent to UF as part of a two–year FWC–UF collaboration through the Section 6 funding program. So far, at least one detection of microfilaria (*Aproctella* sp.) in wild Florida grasshopper sparrows was found. This information is critical for understanding the relative risks associated with releasing captive–raised Florida grasshopper sparrows back to the wild.

Florida Sandhill Crane

MONITORING AND MANAGEMENT PROTOCOL DEVELOPMENT – In FY 2013–14, FWC began range–wide road surveys to measure regional productivity of Florida sandhill cranes. Based on their range and available habitat, FWC established 12 routes totaling about 640 miles through 16 counties and surveyed twice during the fall. An average of 369 adults and 65 juveniles have been observed annually during the last five survey years. The lowest productivity year was 2017, a drought year, when only 31 young were counted (7% of observed cranes). The previous three years had high winter and spring rainfall that likely helped productivity. In 2014, 2015, and 2016, young accounted for 18%, 20%, and 21%, respectively, of cranes observed. Across all years, routes in Osceola and Okeechobee counties were regional strongholds.

SURVIVAL AND PRODUCTIVITY ON CONSERVATION LANDS AND SUBURBAN AREAS – To understand habitat use, movements, and survival of Florida sandhill cranes in suburban areas and conservation lands, FWC began radio–tagging individuals in June 2017. The radio–tags are cellular GPS units that collect location and movement data at 30–minute intervals and data is uploaded daily. In FY 2017–18, 13 cranes were tagged in suburban areas. Preliminary data suggests some individuals solely inhabit suburban or developed areas, while others use suburban, as well as rural or conservation areas. FWC will continue to tag an equal number of cranes in suburban and conservation areas.

Florida Scrub–Jay

The Florida scrub–jay is a Federally–designated Threatened bird that is endemic to Florida. Scrub–jay populations are thought to have declined by as much as 90% since the late 1800s. Declines have been

attributed to many factors, including habitat loss, fire suppression, and population fragmentation and isolation. Typical habitat management efforts include prescribed fire and mechanical treatments, such as roller chopping and cutting of trees that have encroached on scrub–jay habitat. Conservation requires the efforts of local, state, and federal agencies, non–governmental organizations, and private landowners. The Florida Scrub–Jay Conservation Coordination facilitates communication among partners; collects and distributes monitoring and management information; works with partners to establish priority management actions; and develops standards and guidelines for conservation efforts. Since many scrub species have habitat requirements like those of scrub–jays, conservation actions aimed at scrub–jays are likely to benefit other species. Translocation has been considered as a method to increase population sizes and assist scrub–jays in recolonizing restored public lands. In winter 2017, FWC initiated an interagency partnership between FWC, the U.S. Forest Service (USFS), the Florida Forest Service(FFS), and the Florida Park Service to conduct experimental translocations of scrub–jays from Ocala National Forest (ONF) to other public lands. The goal is to 1) evaluate the effectiveness of different translocation methods at recipient sites and 2) evaluate the impact of translocation on the ONF donor population.

In 2017–2018, four intact Florida scrub–jay family groups (comprising nine individuals) were translocated to Seminole State Forest and eight non–breeding "helper" scrub–jays were translocated to Rock Springs Run Reserve State Park. Three of the four family groups settled into vacant habitats and established breeding territories, while the fourth group remained on site but wandered periodically throughout the breeding season. Most of the non–breeding helpers disappeared within the first 48 hours, but at least two remained on site during the season; a two–year–old male and a one–year–old female established a pair bond and a breeding territory. These data, combined with results from the previous year, indicated there was no benefit to housing scrub–jays in acclimation cages before release. Birds translocated with a direct, immediate release (as opposed to a delayed release), were equally or more likely to settle near their release site. Radio–tracking data showed that most family groups ceased exploratory movements after about 10 days and remained within their new territory. FWC is partnering with UF to study the behavior of resident scrub–jays at ONF after removals for translocation. Before a statewide Florida scrub–jay translocation project can be initiated, biologists must understand the potential impacts of translocation on a donor population. This project will provide insight on the relative costs and benefits of removing intact family groups versus removing individual non–breeders for translocation.

CONSERVATION COORDINATION – The objective is to coordinate range–wide conservation efforts for the Florida scrub–jay. Raising public awareness about the scrub–jay and the need to restore and manage its habitat is important for conserving this species. In FY 2017–2018, FWC helped organize the eighth annual Florida Scrub–Jay Festival with the Wildlife Festival at Lyonia Preserve (Volusia County) to raise

awareness about the scrub–jay and its unique habitat. Approximately 600 people of all ages attended. The festival included guided hikes, eco–buggy tours of the preserve, presentations on native wildlife, informational booths, and an interactive obstacle course to simulate the daily life of a Florida scrub–jay. Staff is currently involved in planning the next Scrub–Jay Festival, which will be held on Merritt Island.

In FY 2017–18, FWC continued to facilitate communication among partners via regional working groups focused on conservation of scrub–jays and their habitat. Working group participants included representatives from public land management entities, non–governmental organizations, university staff, and private individuals. Staff updated the Florida scrub–jay website with notes and presentations from the working group meetings. In FY 2017–18, staff organized/assisted in three working group meetings (the Northeast Florida Scrub Working Group, the Southwest Florida Scrub Working Group, and the Southeast Florida Ecosystem Scrub Working Group [which held its meeting jointly with the Lake Wales Ridge Scrub Working Group]). These meetings were well attended and allowed participants to network, share management strategies, and exchange ideas. FWC provided technical assistance to stakeholders regarding scrub or scrub–jay habitat management, development planning, and general inquiries and provided on site visits to discuss land management. FWC participated in Jay Watch, a citizen–science program that annually collects information on scrub–jay populations on public land and educates the public about the scrub–jay, and Audubon with logistics in a two–day Jay Watch training for advanced volunteers.

WILDLIFE MANAGEMENT AREA AND WILDLIFE AND ENVIRONMENTAL AREA SURVEYS – FWC began scrub–jay surveys as part of the Jay Watch program in 2009. Surveys occur June 15–July 15 each year. FY 2017–18 data for WMAs and WEAs surveyed is found in Exhibit 8. Surveys conducted in FY 2017–18 indicated increases in the number of groups, number of birds, mean group size, and number of juveniles in Arbuckle WMA from last year. Walk–in–the–Water WMA experienced a decrease in number of groups, but increases in the number of birds, mean group size, and number of juveniles per group from last year. The Lake Wales Ridge WEA (LWRWEA) in Highlands and Polk counties consists of 20 tracts and data for each tract is included in Exhibit 8. At LWRWEA, prescribed fires were conducted on 3,278 acres and 194 acres of habitat was enhanced through mechanical treatments (Exhibit 8).

MITIGATION PARKS – The goal of the FWC mitigation park program is to provide an off–site alternative for resolving certain wildlife resource conflicts. Lands acquired through the program are designated as WEAs and managed by FWC. These parks are managed to enhance listed species populations, particularly those animals for which State and Federal approvals are required prior to their being impacted by new land development. In FY 2017–18, three mitigation parks were monitored and managed (Exhibit 8).

Exhibit 8. Florida Scrub–Jay Wildlife Management Area (WMA)/Wildlife and Environmental Area (WEA) Surveys Conducted During FY 2017–18.

WMA/WEA	County	Number of Groups	Number of Birds	Mean Group Size	Juveniles per Group	Habitat Management (acres)
Carter Creek tract	Highlands	5	20	4	1.6	Prescribed fire, sand pine reduction
Henscratch tract	Highlands	6	23	3.8	0.7	Prescribed fire, wildfire, sand pine reduction
Henscratch 27 tract	Highlands	0	0	0	0	N/A
Jack Creek tract	Highlands	0	0	0	0	Prescribed fire, wildfire, sand pine reduction
Platt Branch	Highlands	9	25	N/A	N/A	Mechanically treated (91)
Lake Placid Scrub tract	Highlands, Polk	33	121	3.7	1.4	Prescribed fire
Clements tract	Highlands, Polk	3	10	3.3	1	N/A
Gould Road tract	Highlands, Polk	9	35	3.9	1.22	Sand pine reduction
Highlands Park Estates tract	Highlands, Polk	4	13	3.3	0.75	N/A
Holmes Ave tract	Highlands, Polk	9	36	4	1.44	Sand pine reduction
McJunkin tract	Highlands, Polk	20	62	3.1	0.8	N/A
Royce Ranch tract	Highlands, Polk	5	18	3.6	1	Prescribed fire
Silver Lake tract	Highlands, Polk	8	30	3.8	0.75	Prescribed fire
Sun–n–Lakes tract	Highlands, Polk	5	25	5	1.8	Prescribed fire
Hickey Creek	Lee	1	3	N/A	N/A	Mechanically treated (48), chemically treated (36)
Moody Branch	Manatee	5	19	N/A	N/A	Prescribed fire (165), chemically treated (160), mechanically treated (239)
Arbuckle	Polk	19	82	4.3	1.16	Prescribed fire
Walk–in–the–Water	Polk	6	26	4.3	2.5	N/A
Half Moon	Sumter	2	5	2.5	N/A	Mechanically treated, prescribed fire (25.5)

Marsh Birds

Worthington's marsh wren (wren) and MacGillivray's seaside sparrow (sparrow) are two subspecies of salt marsh songbirds in northeast Florida. The wren is a State–designated Threatened subspecies, while the sparrow is currently undergoing review for Federal listing, with a decision anticipated in fall 2018. Historically, both subspecies occurred from Nassau County to Volusia County, but have undergone considerable range contractions in the last 50 years. Now they only occur in northern Duval and Nassau

counties. Their narrow coastal distribution makes them especially vulnerable to habitat loss and fragmentation. Both birds overlap in their habitat requirements and can be surveyed together. Studies examining the habitat needs of both birds began in 2014. Staff conducted counts throughout the marsh and examined nest survival and young wren survival up to 21 days after leaving the nest. In FY 2017–18, FWC completed fieldwork (Exhibit 9) and analyses from 966 wren nests, 123 sparrow nests, and 50 young wrens. Survival rates for both subspecies were among the lowest reported for songbirds across North America. Young wren survival was also low compared to other songbirds. Thus, they are likely under stress in Florida. Despite the low rates, both birds appear to benefit from tall, dense vegetation away from uplands, preferably in smooth cordgrass. Hence, there is a need to protect and create saltmarsh habitat with a high proportion of tall, dense grass away from uplands, of sufficient elevation to protect nests from high tide events and resilient in the face of future trends.

Exhibit 9. Marian's Marsh Wren Wildlife Management Area (WMA)/Wildlife and Environmental Area (WEA) Surveys Conducted During FY 2017–18.

WMA/WEA	County	Survey Points	Survey Points with Wrens
Apalachicola River	Gulf, Franklin	20	14
Box – R	Gulf, Franklin	7	2
Tate's Hell	Liberty, Franklin	16	N/A

Osprey

The osprey (Monroe County population) is a State–designated Species of Special Concern and was believed to be one of two distinct subpopulations in Florida. One (primarily in Monroe County) is a declining, winter–nesting, and non–migratory. The other is stable or increasing, late–winter or spring–nesting, and migratory. Genetic analysis completed in 2016 indicated the two subpopulations do not appear to be distinct. In April 2017, based on these results, staff population did not meet the criteria for listing as a Threatened species. FWC staff recommended the osprey (Monroe County population) be removed from the state list, and this was approved by the Commission in December 2017. Final Listing actions will take place in FY 2018–19 when the revised Species Action Plan and Species Conservation Measures and Permitting Guidelines are approved. The conservation and management actions identified in the species' action plan will benefit osprey in southern Florida and the rest of the state.

Red–cockaded Woodpecker

The red–cockaded woodpecker (RCW) is a Federally–designated Endangered bird. Fire suppression, reliance on dormant season prescribed fire, and low availability of old growth pines remain the greatest

threats to RCW recovery in Florida. In FY 2017–18, FWC continued conducting habitat management activities (Exhibit 10). At the end of the 2017 breeding season, populations were on track to achieve, and in many cases, exceed 2020 population and metapopulation goals.

WILDLIFE MANAGEMENT AREA AND WILDLIFE AND ENVIRONMENTAL AREA SURVEYS – Data on all WMAs and WEAs surveyed is included in Exhibit 10. Clusters are monitored for activity during the breeding season and revisited to confirm fledglings. In September 2017, Hurricane Irma impacted colonies on WMAs in Collier, Monroe, Charlotte, and Lee counties. The hurricane caused widespread cavity tree loss, impacting 96 trees and killing 83 of those. Of the trees lost, 15 were active roosting cavities and one had been a nest earlier in the year. No RCWs were translocated due to the extensive flooding caused by record rainfall. However, fall 2018 translocation plans are in place. The population at Croom WMA is stable, which allowed for six young birds to be caught and translocated to a new area in summer 2017. J.W. Corbett WMA received five pairs from Ocala National Forest in the fall of 2017. In October 2017, 10 individuals were translocated to Triple N Ranch and Herky Huffman/Bull Creek WMAs. Five of the translocated individuals remain in the area and four attempted to nest (two as a pair). Two were observed as a pair at Three Lakes WMA.

Exhibit 10. Red–cockaded Woodpecker Surveys Conducted During FY 2017–18.

Location	County	Active Clusters	Potential Breeding Groups	Solitary Birds	Nest Attempts	Bandings	Fledglings	Cavity Maintenance; Habitat Management (acres)
Babcock Ranch Preserve	Charlotte	14	14	0	13	13 chicks, 4 adults	17	Cavities mowed around, prescribed fire (7,618), roller chopped (236)
Babcock/Webb and Yucca Pens Unit WMA	Charlotte, Lee	45	42	3	42 (16 failed, 6 re–attempts, 1 successful)	34	25	15 inserts replaced in 9 clusters; Prescribed fire (22,702), Roller chopped (376), chemically treated (15,633)
Citrus WMA	Citrus	84	80	N/A	70 (56 successful)	109	96	13 new inserts, 12 replaced, 7 cleaned/repaired; Prescribed fire (16,735), hardwood control in 25 clusters
Camp Blanding WMA	Clay	34	33	1	31 (5 failed, 2 renests)	64	46	35 clusters mowed, 11 clusters fire treated
Big Cypress National Preserve	Collier, Monroe	76	34	1	30 (28 successful. 6 renests, 5 successful)	41	28	1 cavity repaired; Prescribed fire (24,177), wildfire (87,389)
Croom WMA	Hernando, Sumter	38	37	0	36 (5 failed)	67	60	6 inserts installed/replaced; Prescribed fire (7,528)
Platt Branch Mitigation Park WEA	Highlands	6	5	1	5	9	7	4 cavities added; Prescribed fire (357), mechanically treated (91)
Apalachicola River WEA	Franklin	9	9	1	12	18	17	12 cavities installed, 10 cavity–limited clusters augmented; Prescribed fire (1,100)8 clusters mowed around to reduce fuel, mechanically treated (380)
Tate's Hell WMA	Franklin, Liberty	61	51	0	51 with eggs. 47 with nestlings, 4 failed attempts	99	64	20 cavities installed, 4 cavity–limited clusters augmented, 1 cluster created; Mechanically treated (57), prescribed fire (9,660)
Apalachicola WMA	Franklin, Leon, Wakulla	N/A	N/A	N/A	N/A	N/A	N/A	114 cavities installed; Mechanically treated (95)

Exhibit 10 (*continued*) Red–cockaded Woodpecker Surveys conducted in FY 2017 – 18.

Location	County	Active Clusters	Potential Breeding Groups	Solitary Birds	Nest Attempts	Bandings	Fledglings	Cavity Maintenance; Habitat Management (acres)
Goethe State Forest	Levy	66	55	11	N/A	77	32	Prescribed fire (7,085) Mowed around clusters (297)
Three Lakes WMA	Osceola	49	46	2	49 (31 successful)	62	52	7 inserts replaced, 25 inserts cleaned, 1 insert installed; Prescribed fire (25,677)
Triple N Ranch and Herky Huffman/Bull Creek WMA	Osceola	26	22		22 (16 successful)	29	25	10 inserts replaced, 50 inserts cleaned, 32 inserts installed; Prescribed fire (11,777) mechanically treated (434), chemically treated (10,344)
John G. and Susan H. Dupuis, Jr. WMA	Palm Beach, Martin	16	13	2	14	19	12	6 inserts added in 3 clusters; Prescribed fire (13,371)
J.W. Corbett WMA	Palm Beach	30	27	3	28	25	17+	3 clusters installed, 6 inserts, 11 natural excavations found; Prescribed fire (11,411), treated for exotics (29,000)

Roseate Tern

The roseate tern is a Federally–designated Threatened seabird. In Florida, this species is only found in extreme South Florida and in a limited number of colonies. After the 2005 hurricane season, the roseate tern's main nesting island, Pelican Shoal Critical Wildlife Area (CWA) was submerged under one–two feet of water and no longer available for nesting. In spring 2006, FWC attempted to provide an alternative nesting area. In cooperation with NPS, plastic tern decoys and a sound system and speakers broadcasting tern calls were placed on Long Key at Dry Tortugas National Park. These techniques, known as "social attraction," have been used worldwide to attract colonially nesting birds to nesting areas and restore colonies. Decoys and call broadcasting equipment were not deployed after 2010 to determine if terns would nest at Dry Tortugas on their own. In 2011, 12 nests were recorded, no nest counts were conducted in 2012, 63 nests were recorded in 2013, and seven nests in 2014. FWC estimates Florida population in 2018 was 30 pairs based on peak nest numbers during the first wave of nests. Of those pairs, 11 nested on the ground, 17 on two roofs, and two on an abandoned bridge at Bahia Honda State Park. Productivity was low and difficult to assess at most sites. The highest estimate of fledglings was three. FWC assisted a graduate student from Louisiana State University with collecting genetic samples from terns at Dry Tortugas and the Florida Keys. Hopefully, this study will be able to determine how closely related the Florida population is with the rest of the Caribbean population.

Shorebirds

There are 20 species of shorebirds and seabirds that breed in Florida, four of which are listed as State–designated Threatened (American oystercatcher, black skimmer, least tern, and snowy plover) and one of which is Federally–designated Threatened (roseate tern). In addition, over 40 species of shorebirds and seabirds winter in Florida. The red knot is Federally–listed as Threatened and the piping plover is Federally–listed as Endangered. A species action plan for listed shorebirds was established in November 2013 (http://myfwc.com/media/2720106/Imperiled-Beach-Nesting-Birds-Species-Action-Plan-Final-Draft.pdf), which aims to improve the status of State–listed birds so that they can be removed from the Florida Endangered and Threatened Species List and not again need to be listed. To build upon this plan, in 2016 FWC and partners formed the Florida Beach–nesting Bird Plan that includes population goals, metrics, timelines, funding needs, and a conceptual framework consistent with national recovery plans (http://www.flshorebirdalliance.org/media/55868/Florida_beach_nesting_bird_plan_FINAL.pdf). To implement the Beach–nesting Bird Plan, in 2017 FWC inaugurated a dedicated Shorebird Program.

The program expands upon foundational shorebird conservation work and is supported by a grant through the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund. FWC and its key partner,

Audubon Florida, continue 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 various habitats used by breeding, wintering, and migrating shorebirds including: rooftops, beaches/dunes, emergent flats, dredge spoil islands, marine and freshwater sand bars, oyster reefs, freshwater/estuarine wetlands, and upland construction and industrial sites. The 4–year project represents Phase 1 of a larger vision and will conclude with a focused review of all activities to assess 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. During the 2017 nesting season, FSA partners collectively monitored 858 miles of coastline, posted 156 seabird colonies, and 806 shorebird nests. The FSA publishes a monthly e–newsletter (the Wrack Line) that reaches over 26,000 subscribers. Through FSA, FWC also coordinates breeding bird protocol training and data quality control for the statewide shorebird–monitoring program. Additionally, FWC manages the Alliance website (www.FLShorebirdAlliance.org). This website 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 exchange between regional partnerships.

Florida Shorebird Database – The Florida Shorebird Database (www.flshorebirddatabase.org) was launched in spring 2011 to serve as the central repository for data collected on shorebirds and seabirds in Florida. Over 1,137 monitoring partners throughout the state have registered accounts in the Database and many of these partners collect and report breeding data. During the 2017 nesting season, partners entered 15,403 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.

Seaside Sparrows

Five recognized subspecies of non-migratory seaside sparrow breed in salt marsh habitat in Florida: the State-designated Threatened Scotts seaside sparrow and the Wakulla seaside sparrow, the Federally-designated Endangered Cape Sable seaside sparrow, and the unlisted MacGillivray's seaside sparrow and Louisiana seaside sparrow, all of which were included in FWC's draft Saltmarsh Songbird Species Action Plan in 2013. In FY 2015–16, FWC initiated a study to re–examine the subspecies relationships of seaside sparrows in Florida as outlined in the Species Action Plan for salt marsh songbirds. To date, FWC has

collected and processed over 300 genetic samples across 14 sites in Florida and an additional 45 samples from neighboring states. Phenotypic data including morphometrics, audio recordings of vocalizations, and detailed photographs were also collected to supplement data obtained from genetic material. USFWS, National Park Service, Florida Department of Environmental Protection, and Southwest and Northwest Florida Water Management Districts have also contributed to the project by providing access to their lands, housing, and assistance with sample collection. FWC and collaborators at UF are using ddRADseq, a next–generation sequencing technique, to determine the relatedness of sparrows in these populations. Results from this project will be used to refine taxonomic designations of seaside sparrow which may affect listing status and future conservation and management priorities.

Southeastern American Kestrel

The southeastern American kestrel is a State–designated 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. Its current population size is estimated to be 1,350–1,500 breeding pairs. In July 2008, a regional southeastern American kestrel conservation partnership began to develop within and across agencies by, 1) Identifying suitable but unoccupied habitat; 2) Establishing population targets on FWC's WMAs and other public lands; 3) Building and installing new nest boxes and repairing old nest boxes; 4) Providing standardized data collection protocols to monitor kestrels and establishing a database to manage annual monitoring data on public lands; 5) Monitoring nest boxes during the breeding season; 6) Educating biologists, land managers, birdwatchers, and others through talks, websites, and printed media; and 7) Conducting additional research on breeding habitat requirements. FWC staff are working with UF to fill important data gaps by assessing population size and productivity in Florida scrub and developing recommendations for habitat management guidelines. In addition, this project will provide a current baseline population estimate and subsequent monitoring protocol for Ocala National Forest (ONF), which supports one of the two largest breeding populations of southeastern American kestrels in Florida. Kestrel occurrence and productivity is being studied across a range of habitats subject to different management activities, including clearcutting, mechanical disturbance, prescribed burning, and wildfire.

Data collection (point counts and kestrel nest monitoring) began in March 2018 with inventories of the bird community at 112 point counts dispersed across Ocala National Forest. Point count stands were stratified based on treatment type (clear cut, prescribed burn, or wildfire), time since treatment, and stand size. All accessible prescribed burn and wildfire stands were surveyed. Preliminary results indicate that kestrels are frequently in stands with red–headed woodpeckers and/or northern flickers. There were

34 nests located and monitored. Clutch size, number of nestlings and/or fledglings, and parental behavior were recorded at each nest check. Of the 34 nests, 68% produced at least one fledgling, which is typical nest success reported elsewhere. Habitat characteristics were measured at each nest and point count location, including average shrub height, pine understory cover, snag density, and percent bare ground. These data suggest stands containing larger (>10 inch diameter) snags and short (0–3 feet high) vegetation are more likely to have kestrels. Data analysis will begin in the first quarter of this FY and the second season of field work will begin in the third quarter (spring 2019). Results will help produce habitat management guidelines kestrel populations in Florida.

Nest box installation is a high priority identified in the Species Action Plan. In FY 2017–18, FWC organized a volunteer day and built 46 boxes, which were needed in many areas due to hurricane effects on old boxes. In addition, 20 boxes were identified and replaced/repaired in Marion County that have successfully fledged kestrels. Staff completed a pamphlet that provides information on ideal box placement, monitoring protocol, and technical assistance applicable to both public land managers and private individuals interested in installing new nest boxes. Staff developed a site assessment form to evaluate the suitability of habitat surrounding nest boxes, which will optimize management and monitoring effort. Data from surveys at WMAs and WEAs is included in Exhibit 11.

Exhibit 11. Southeastern American Kestrel Wildlife Management Areas (WMA)/Wildlife and Environmental Area (WEA) Surveys Conducted During FY 2017–18.

WMA/WEA	County	Boxes Managed	Boxes Utilized	Nest Success	Other Species Found in Boxes
Watermelon Pond	Alachua	7	1	No	None
Camp Blanding	Clay	59	28	Yes)	Southern flying squirrel, eastern gray squirrel, Sherman's fox squirrel, great–created flycatchers, eastern screech owl, eastern bluebird
Jennings State Forest	Clay, Duval	26	0	No	Southern flying squirrel, eastern gray squirrel, Sherman's fox squirrel, great–crested flycatcher, eastern screech owl, eastern bluebird
Bell Ridge Longleaf	Gilchrist	4	4	No	Eastern screech owl
Fort White	Gilchrist	9	0	No	Southern flying squirrel, great–crested flycatcher, eastern screech owl
Platt Branch	Highlands	4	0	No	Eastern screech owl
Lake Wales Ridge	Highlands, Polk	13	3	Yes	Eastern screech owl, great–crested flycatcher, eastern bluebird
Chassahowitzka	Hernando	9	5	Yes	Red–headed woodpecker, eastern screech owl
Chinsegut	Hernando	2	0	No	Eastern screech owl, great–crested flycatcher

Exhibit 11 (*continued*). Southeastern American Kestrel Wildlife Management Areas (WMA)/Wildlife and Environmental Area (WEA) Surveys Conducted During FY 2017–18.

WMA/WEA	County	Boxes Managed	Boxes Utilized	Nest Success	Other Species Found in Boxes
Perry Oldenburg	Hernando	3	3	Yes	Eastern screech owl, eastern bluebird
Twin Rivers State Forest	Madison	11	3	Yes	Tufted titmouse, great–crested flycatcher
Moody Branch	Manatee	2	0	No	Eastern screech owl, great–crested flycatcher
Blackwater	Okaloosa, Santa Rosa	23	5	Yes	Eastern screech owl, eastern bluebird, great–crested flycatcher, northern flicker
Crooked Lake	Polk	3	0	No	Eastern screech owl, great–crested flycatcher
Hilochee WMA	Polk	8	0	No	Eastern screech owl, great–crested flycatcher, red–bellied woodpecker
Big Bend	Taylor	28	0	No	Eastern screech owl, eastern bluebird, great–crested flycatcher, southern flying squirrel

Wading Birds and Wood Stork

There are over 15 species of wading birds that breed and winter in Florida, including the State–designated Threatened little blue heron, tricolored heron, reddish egret, and roseate spoonbill and the Federally–designated Threatened wood stork. FWC conducts nesting, foraging, and roosting surveys at many WMAs and WEAs across the state. Survey methods include monthly aerial transects flown at 500–800 feet above the ground over colonies for 3–6 months. Photos may be taken of each colony/aggregation to assist with counting and identifying birds. In FY 2017–18, aggregations of foraging, roosting, and breeding were observed for several listed and non–listed birds (Exhibit 12). At Corkscrew WEA, species diversity increased from previous fiscal years. In 2008, FWC began aerial monitoring at two Central and South Florida wood stork colonies. FWC now surveys 34 colonies annually, with several occurring on WMAs or WEAs (Exhibit 12). Colonies can be found in cypress swamps, on islands in lakes, borrow pits, rivers, lagoons, and bays in eight counties. Surveys occur in late April to early May from a fixed–wing aircraft, 600–1,000 feet above ground. In recent years (2011–2017), FWC counted 1,601–2935 nests statewide, an estimated 14–35% of the U.S. nesting population. In April and May 2018, staff counted 1,664 total nests in 17 active colonies.

Exhibit 12. Wading Bird Wildlife Management Areas (WMA)/Wildlife and Environmental Area (WEA) Surveys Conducted During FY 2017–18.

WMA/WEA	County	Historical rookeries	FY 17/18 Rookeries	Roosting Sites	Foraging Aggregations	Species
Big Bend	Dixie, Taylor	N/A	3	N/A	N/A	Little blue heron, tricolored heron
Fisheating Creek	Glades	0	2 (2 new)	4	25	Wood stork, roseate spoonbill, little blue heron, tricolored heron
Apalachicola River, Box – R, Tate's Hell	Gulf, Franklin, Liberty	N/A	5	N/A	N/A	Wood stork, little blue heron
Aucilla	Jefferson, Taylor	6	35	N/A	N/A	Little blue heron, tricolored heron, wood stork
Corkscrew Regional Ecosystem Watershed	Lee, Collier	N/A	7	51	112 (11, 948 individuals)	Wood stork, little blue heron, tricolored heron, roseate spoonbill
L. Kirk Edwards	Leon	1	0	N/A	N/A	Wood stork
Ocholocknee North (private land)	Leon	1	0	N/A	N/A	Wood stork
Ocholocknee North (private land)	Leon	1	170	N/A	N/A	Wood stork
John C. and Mariana Jones/Hungryland	Martin, Palm Beach	N/A	7 (1 new)	0	0	Great blue heron, great egret
J.W. Corbett	Palm Beach	5	1	N/A	N/A	Littler blue heron, tricolored heron
Little Gator Creek	Pasco	1	0	N/A	N/A	Wood stork
Econfina Creek	Washington	1	0	N/A	N/A	Little blue heron, tricolored heron

White–crowned Pigeon

The white–crowned pigeon, a State–designated Threatened bird, nests on mangrove islands and forages in deciduous forests in Monroe and Miami–Dade counties. Tropical hardwood hammock and pine rockland forests have been reduced and fragmented and remain under threat. Most known nesting islands are protected in the Keys Refuge Complex in the Lower Florida Keys, Everglades National Park in Florida Bay, and Biscayne National Park. An island survey after Hurricane Irma found many were almost entirely defoliated. Extensive mangrove mortality is expected and will be checked in the fall of 2018. Impacts to the nesting population may remain unknown for some time. Identifying key foraging areas is crucial for conserving this species. In FY 2015–16, FWC tested a distance–based method to survey foraging pigeons in isolated patches of hardwood hammock in Miami–Dade County. None were found likely due to spatial and temporal variation in fruit availability. In FY 2016–17, the survey was refined and began in Monroe County

at six state parks, two private parcels, and throughout Florida Keys WEA. Analyses completed in FY 2017–18 indicate that pigeons are more easily observed with two observers from roadside transects and when trees are fruiting. Abundance increased with patch size, but a minimum area requirement could not be determined. A range–wide survey is recommended to better identify core foraging areas and estimate population size. The refined survey will be used annually to monitor foraging in Florida Keys WEA.

Whooping Crane

NON–MIGRATORY POPULATION – Whooping cranes were released in Florida from 1993–2004, with the goal of establishing a non–migratory population. Due to low productivity, a self–sustaining population was not established. FWC ended intensive monitoring of the remaining 18 non–migratory birds in June 2012. In 2017, USFWS proposed moving reproductively–viable non–migratory cranes to the Louisiana non–migratory population. Five cranes may be moved in 2019.

EASTERN MIGRATORY POPULATION – A reintroduction of whooping cranes is taking place in the Eastern U.S. These 100 birds breed and are released in Wisconsin and migrate to the Southeast (including Florida) in the winter. Like the non–migratory flock, this flock experiences reproductive challenges and research is underway to identify the limiting factors. FWC's involvement consists of occasional field monitoring.

AMPHIBIANS

Flatwoods Salamanders

The frosted and reticulated flatwoods salamanders are closely related species native to north Florida and range from South Carolina to southwestern Alabama. The reticulated flatwoods salamander occurs in the western Florida panhandle and is a Federally–designated Endangered species. The frosted flatwoods salamander occurs east of the Apalachicola River and is a Federally–designated Threatened species. Both are in decline throughout their range, although Florida has the largest remaining populations.

FLATWOODS SALAMANDER HEADSTARTING – In FY 2017–18, FWC continued a headstarting program in the Apalachicola National Forest. This program raises eggs/ larvae in cattle tanks to ensure their survival to metamorphosis. Due to drought conditions, 34 breeding ponds were surveyed, and 1,375 eggs were taken from 13 ponds. Of these, 1,003 eggs hatched and were raised in large plastic "cattle tank" mesocosms and 350 eggs were sent to a captive assurance colony at The Amphibian Foundation in Atlanta, Georgia. An additional 45 larvae were rescued from drying ponds. Of the 958 healthy larvae raised in mesocosms,881 survived to metamorphosis and were released back to their breeding ponds.

FLATWOODS SALAMANDER SURVEYS – In FY 2017–18, FWC was unable to conduct dipnet surveys for frosted flatwoods salamanders due to dry winter conditions in most breeding ponds. Larvae were detected at four breeding sites in Apalachicola National Forest where water levels were high enough to inundate nesting habitat. Two of these sites held water long enough to allow larvae to survive to metamorphosis. Minnow traps were used to survey for frosted flatwoods salamanders in Osceola WMA (Baker and Columbia counties). Historically, one pond is surveyed, but in FY 2017–18, eight ponds were surveyed with none being active. Surveys for reticulated flatwood salamanders were conducted via dipnet at Escribano Point WMA (Santa Rosa County). Historically, 10 breeding ponds are surveyed, but in FY 2017 – 18, 24 ponds were surveyed with four being active. No new ponds or adult salamanders were found. Management activities on WMAs and WEAs continued (Exhibit 13).

Exhibit 13. Management Activities Conducted on Wildlife Management Areas (WMA)/Wildlife and Environmental Areas (WEA) to Enhance Flatwood Salamander Habitat.

WMA/WEA	County	Management Activities (acres)
Apalachicola River	Gulf, Franklin	Upland habitat surrounding ephemeral wetlands mowed/chopped (565); upland habitat including 3 pond basins prescribe burned (1,560)
Apalachicola	Franklin, Leon, Wakulla	Previously treated sites with 18 ponds were retreated to control re–sprouting hardwood vegetation (23.6), habitat surrounding 10 ponds received initial treatment (12.98)
Tate's Hell	Franklin, Liberty	Previously treated habitat including 10 ponds were treated again to control re–sprouting hardwood vegetation (5.9)
Aucilla	Jefferson	Mechanical removal of upland shrubs (3.3); upland management with fire, timber thinning; herbicide treatment (17)
Escribano Point	Santa Rosa	Removal of woody midstory vegetation on land surrounding 4 ponds followed by herbicide treatment (11)
Flint Rock	Wakulla, Jefferson	Removal of shrubby growth (9.6); mechanical removal of shrub layer in upland habitat (91)

MULTISTATE WETLANDS ECOLOGICAL RESTORATION PROJECT – This project aims to evaluate the effectiveness of different wetland restoration methods while enhancing wetland quality on public lands within the range of rare and imperiled amphibians in Florida and Georgia. Poor habitat quality due to fire exclusion is a major cause of amphibian declines. In FY 2017–18, FWC and USFS conducted pre–restoration amphibian and vegetation surveys in wetlands selected for restoration in the Apalachicola National Forest. Post–restoration surveys will be used to compare amphibian and vegetation responses to light and heavy mechanical restoration methods.

FLATWOODS SALMANDER HABITAT MANAGEMENT GROUP – On 11 January 2018, FWC organized a habitat management workshop for various agencies responsible for managing flatwoods salamander

habitat. More than 15 properties were represented. The purpose of the workshop was to communicate habitat management efforts, strategies, and techniques and to collectively identify obstacles for proper management. This workshop will be held annually so that additional solutions can be identified and implemented. Obstacles were grouped into four categories: fire management and restoration tools, non–fire management and restoration tools, economic/funding and permitting/social. There were 15 obstacles to fire management and restoration tools identified, five non–fire management and restoration obstacles, eight economic/funding, and 13 permitting/social obstacles. In some cases, obstacles were represented within multiple categories. Workshop attendees then assigned the obstacles into three groups: high, medium, and low priorities. Potential solutions were then identified for the obstacles.

Florida Bog Frog

Since 2009, FWC has conducted surveys for the Florida bog frog along three creeks (Garnier, Julian Mill, and Burnt Grocery) on Yellow River WMA in Santa Rosa and Okaloosa counties. Staff documented bog frogs at the Julian Mill Creek powerline right of way in 2014 and 2016 and at Garnier Creek right of way every year since 2009. In FY 2017–18, surveys were conducted in May, June, and July with up to four frogs detected at Garnier Creek. Habitat restoration has been ongoing along Garnier Creek right of way since FY 2012–13. To date, 7.4 acres have been treated, with an additional 6.4 acres scheduled for FY 2018–19. To evaluate past and guide future restoration efforts, surveys will continue at restored plots and untreated plots using call surveys and bioacoustic recorders.

Gopher Frog

The gopher frog was delisted as a state–designated Species of Special Concern in January 2017, however it remains 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.

TAXONOMY STUDY – This project examines adult and tadpole morphological and mating call differences throughout their range with an emphasis on Florida populations. Recent genetic studies have suggested populations in peninsular Florida may be genetically distinct from those in the Florida panhandle. This study will provide an interpretation of taxonomy and determine if multiple species/subspecies exist in the state, which could affect future species management. FWC is in the process of contracting the UF Museum of Natural History to conduct analyses. Although FWC collected frog call recordings across Florida this FY, most analyses will be conducted on existing specimens.

TRANSLOCATION STUDY – Until recently, translocation of gopher frogs and other inhabitants of tortoise burrows was allowed as part of gopher tortoise permitting for lands slated for development,

which require gopher tortoise relocations. Concerns about potential disease transmission and other negative impacts led to an interim policy in 2012 that limited translocation to on–site movements. FWC is conducting a pilot study to assess the effects of translocation on gopher frog survivorship and behavior using radio–telemetry to track movements and survival of translocated and non–translocated animals. This study will provide valuable information on whether translocation from development sites is feasible and allow FWC to determine if a large–scale study is feasible. To date, 20 translocated frogs have been monitored. At the end of the project, the movement and survival of translocated animals will be compared with that of non–translocated frogs. Analysis was completed in FY 2017–18.

MONITORING PROJECT – This project tracks the status of gopher frogs in 100 wetlands over time and examines habitat use. As time allows, additional surveys are done to locate new breeding wetlands and continue tracking in known breeding ponds. In FY 2017–18, 114 ponds in 22 counties on 29 public or conservation lands were surveyed using dipnets (Exhibit 15). One previously unknown breeding pond was found and breeding in some previously known ponds was observed for the first time in decades.

Exhibit 14. Gopher Frog Surveys Conducted During FY 2017 – 18.

Location	County	Ponds Visited	Ponds Surveyed	Occupied Ponds
Longleaf Flatwoods Reserve	Alachua	3	3	1
Watermelon Pond – Metzger Tract	Alachua	1	1	0
St. Sebastian River Preserve State Park	Brevard, Indian River	2	2	1
Camp Blanding Military Reservation	Clay	7	7	6
Jennings State Forest	Clay	5	5	5
Cary State Forest	Duval	1	1	1
Chassahowitzka WMA	Hernando	5	5	4
Withlacoochee State Forest	Hernando, Sumter	5	5	5
Archbold Biological Station	Highlands	3	3	1
Avon Park Air Force Range	Highlands, Polk	4	4	1
Lake Wales Ridge WEA	Highlands, Polk	7	7	4
Seminole State Forest	Lake	5	5	1
Apalachicola National Forest	Leon, Liberty	11	11	3
Goethe State Forest	Levy	5	5	4
Ocala National Forest	Marion, Putnam, Lake	16	15	13
Charles H. Bronson State Forest	Orange	1	1	1
Conner Preserve	Pasco	1	1	0

Exhibit 14 (*continued*). Gopher Frog Surveys Conducted During FY 2017 – 18.

Location	County	Ponds Visited	Ponds Surveyed	Occupied Ponds
Green Swamp West	Pasco	1	1	0
Starkey Wilderness Preserve	Pasco	1	1	1
Allen David Broussard Catfish Creek Preserve State Park	Polk	3	3	3
Etoniah Creek State Park	Putnam	3	3	2
Ordway – Swisher Biological Station	Putnam	2	2	2
Welaka State Forest	Putnam	2	2	2
Blackwater River State Forest	Santa Rosa	1	1	0
Eglin Air Force Base	Santa Rosa, Okaloosa, Walton	14	13	7
Little Big Econ State Forest	Seminole	1	1	1
Lake Panasoffkee	Sumter	3	3	2
Big Bend WMA	Taylor	3	3	2

Striped Newt

The striped newt is a candidate for federal listing under the Endangered Species Act but is not protected in Florida. It is only found in northern Florida and southern Georgia. This species has disappeared from most of its former range, but few scattered populations remain. FWC commented on the USFWS species status assessment in early 2018 with the final listing decision anticipated in fall 2018.

GENETICS – In FY 2017–18, FWC collaborated with the University of Central Florida, the University of Georgia, and UF on projects assessing the genetic health of striped newt populations and connectivity between populations. These studies will help FWC understand the management needs and health of remaining populations. A state–funded genetics study was completed in December 2017 and found little migration between ponds, except between adjacent ponds, suggesting translocations may be necessary to repopulate extirpated populations. It also found Florida peninsular populations had greater genetic diversity than Georgia populations, suggesting they may have better genetic health and resilience. FWC is currently working with these collaborators on another federally–funded genetics study using a more modern analysis of these samples.

REPATRIATION – FWC continued assisting an ongoing reintroduction program for striped newts in the Munson Sandhills of the Apalachicola National forest. The program, which is led by the Coastal Plains Institute with U.S. Forest Service, involves releasing zoo–raised newts into former breeding ponds where they no longer occur. Since January 2016, FWC has assisted the effort by individually marking

newts before their release and conducting regular surveys to estimate their survival over time. In June 2018, staff marked 259 newts from four zoos and released them into four ponds.

SURVEYS – FWC did not survey for this species in FY 2017–18; however, 55 wetlands suitable for striped newts on 12 public lands and one private land were surveyed for other amphibians. Larvae/ adults were found in 14 ponds, one of which was a previously unknown breeding pond (Exhibit 16).

Exhibit 15. Dipnet Surveys of Ponds Containing Striped Newts During FY 2017–18.

Location	County	Ponds Visited	Ponds Surveyed	Occupied Ponds
Watermelon Pond – Metzger Tract	Alachua	1	1	0
Camp Blanding Military Reservation	Clay	7	7	1
Jennings State Forest	Clay	5	5	4
Cary State Forest	Duval	1	1	0
Ocala National Forest	Lake, Marion, Putnam	16	15	4
Private Land	Jefferson	1	1	1
Seminole State Forest	Lake	5	5	1
Apalachicola National Forest	Leon	8	8	1
Goethe State Forest – Watermelon Pond Tract	Levy	2	2	0
Etoniah Creek State Forest	Putnam	3	3	0
Ordway – Swisher Biological Station	Putnam	2	2	1
Welaka State Forest	Putnam	2	2	0
Big Bend WMA	Taylor	3	3	1

REPTILES

Alligator Snapping Turtles

The alligator snapping turtle is a State–designated Species of Special Concern. Recent research divided the alligator snapping turtle into 3 distinct species, and each was evaluated for state listing. In December 2018, staff recommended, and the Commission approved, the Suwannee alligator snapping turtle to be listed as State–designated Threatened, while the other species would no longer be listed. FWC revised the Species Action Plan and developed the Species Conservation Measures and Permitting Guidelines for the three species in FY 2017–18. Final approval of these guidelines and the revised Species Action Plan summary during fall 2018 will complete the listing changes.

APALACHICOLA RIVER WILDLIFE AND ENVIRONMENTAL AREA –Monitoring took place in two tributaries

of the Apalachicola River (Gulf and Franklin counties) from July–October 2017 where three unmarked turtles were captured from three locations. Since 2008, 43 turtles have been captured, 18 males (41.8%), 21 females (48.8%), one juvenile (2.32%), and three unknowns (6.98%). Since 2014, four individuals have been recaptured.

American Crocodile

The American crocodile is a Federally–designated Threatened species in Florida. The population has experienced tremendous growth since 1975, when the species was listed as Federally–designated Endangered. Sightings have been documented as far north as Cocoa Beach (Brevard County) on the east coast and Lake Tarpon (Pinellas County) on the west coast. With the increasing population (estimated between 1,500–2,000 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 of highest priority, while also recognizing the needs of a recovering species.

In FY 2017–18, FWC received 240 complaints regarding crocodiles. Most were resolved by educating the public through telephone calls and site visits. FWC has response agents who respond to crocodile calls, some of which require capture of the crocodile. A total of 12 individuals were captured by FWC in FY 2017–18. Two (females) were captured and translocated to a site deemed suitable by FWC. Ten others were captured and removed from human–interaction situations near their capture sites. Success of translocation and removal efforts varies. One of these (a female measuring 8.5 feet in length) was captured and relocated from human–interaction situations multiple times in FY 2017–18. Unfortunately, this female was struck and killed by a car on 4/6/2018 22 miles south of her last release site. Captured animals ranged from 5.9–10.5 feet in length. In FY 2017–18, FWC was involved in recovering six crocodile carcasses (one male, three females, and two of unknown sex). The animals ranged from 1.0–8.5 feet in length. The cause of death for three of the animals was attributed to wounds inflicted by vehicular traffic. One was struck by a golf cart. A hatchling died due to flooding from Hurricane Irma. The remaining carcass was too decomposed to determine a cause of death.

Barbour's Map Turtle

The Barbour's Map Turtle is a State–designated Threatened species. The Species Conservation Measures and Permitting Guidelines were approved by the Commission in February 2018. The guidelines are designed to inform users about voluntary conservation measures that can benefit species, clarify rule requirements related to permitting, and provide a biological context for understanding take.

APALACHICOLA RIVER WILDLIFE AND ENVIRONMENTAL AREA – Apalachicola River WEA staff (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 conducted surveys from October 24th, 2017–November 2nd, 2017. A total of 1,245 turtles were counted during this period, more than in the 2016 survey and greater than the overall average since the survey began in 2009. Like previous years, the Chipola River section had the most turtles (974), followed by the Apalachicola River (158), and the Brothers River (113). Environmental factors including the river's water level and the difference between air and water temperature likely influence the number of turtles basking and FWC's ability to detect them.

Eastern Indigo Snake

The Eastern indigo snake is a Federally–designated Threatened species. FWC staff are part of the Eastern Indigo Snake Reintroduction Committee (EISRC), participating in regular phone calls, emails, and biannual meetings. In FY 2017–18, FWC collaborated with partners to release 12 indigo snakes at the Apalachicola Bluffs and Ravines Preserve (ABRP, owned by The Nature Conservancy) as part of the second year of reintroductions at that site. Staff secured funding through a Conserve Wildlife Tag grant for FY 2018–19 to continue monitoring the repatriation efforts and to establish disease surveillance among snakes that share the same habitat at ABRP.

Florida Keys Reptiles

RESPONSE AND HABITAT INVENTORY AFTER HURRICANE IRMA – FWC coordinated with USFWS after Hurricane Irma passed over the Florida Keys (Monroe County) in September 2017 to assess habitat conditions for Keys reptiles. Due to their cryptic nature, staff determined that the Florida Keys mole skink, a State–designated Threatened species, was the only species that could be reliably surveyed and only in one location (Long Beach on Key Deer National Wildlife Refuge). USFWS agreed to survey the area, although staff turnover may prohibit forward movement toward that effort. In December 2017, FWC examined the Keys habitats firsthand. The hurricane brought extensive damage to the Middle and Lower Keys, with areas on the Atlantic facing side experiencing the most damage. Sites that were previously known to be occupied by mole skink appeared so damaged that it was referred as being "obliterated". Long Beach, Southeast Point–Big Pine Key had the best–known habitat for finding mole skinks before the hurricane (Exhibit 17). Currently, the damage left the beach berm scoured with the elevation lowered by several feet. Since the hurricane, the following imperiled species have been detected at low levels: State–designated Threated Key ringneck snakes and Florida Keys mole skinks and recently delisted striped mud turtles and red ratsnakes.

Exhibit 16. Long Beach, Big Pine Key after Hurricane Irma where Florida Keys mole skinks were found.

Florida Pine Snake

The Florida pine snake is a State–designated Threatened species. The Species Conservation Measures and Permitting Guidelines for the Florida pine snake were approved by the Commission in February 2018 and are currently in effect. The guidelines are designed to inform users about voluntary conservation measures that can benefit species, clarify how rule requirements relate to permitting, and provide a biological context for understanding take.

FORT WHITE AND SUWANNEE RIDGE WILDLIFE AND ENVIRONMENTAL AREAS – Studies predict Florida pine snakes require large tracts of suitable habitat to sustain viable populations; however, few FWC-managed areas contain adequate acreage of suitable habitat. A project began in FY 2016–17 is still underway to assess habitat use, survival, and movements of Florida pine snakes on conservation lands smaller than 7,400 acres and on adjacent lands. Trapping began in summer 2017 and ended summer 2018 with 24 captures. After capture, each snake will be tracked for one year using radio–telemetry.

BLACKWATER AND YELLOW RIVER WILDLIFE MANAGEMENT AREAS – Trapping for at–risk snake species continued in FY 2017–18 at three new locations in Blackwater and Yellow River WMAs in Santa Rosa and Okaloosa counties from September–November 2017 and February–June 2018. FWC captured 161 individuals comprising 13 snake species, including nine Florida pine snakes and five southern copperheads. Trapping will continue in Blackwater WMA in FY 2018–19 at new locations with trap sites changing on a regular basis to determine distribution of target species.

Florida Scrub Lizard

FLORIDA SCRUB LIZARD STATUS SURVEY – In 2012, the Florida scrub lizard was petitioned for federal listing under the Endangered Species Act. In 2015, the USFWS provided funds to FWC to conduct a two–year population status survey. This study replicates an earlier survey conducted in 1986 to provide a picture of the species' current distribution and status. In April–November 2016–2017, FWC conducted repeated walking surveys in 205 previously known scrub lizard sites and 482 new sites with suitable habitat. Scrub lizards were detected in 52% of 402 interior ridge sites, 24.1% of 224 Atlantic coast sites, and none of the 14 Gulf coast sites (Exhibit 18). This study suggests that the species is extirpated from historically occupied (prior to 1980) southwestern localities in Lee and Collier counties and major declines have occurred on sand ridges along the Atlantic Coast. The range of the scrub lizard along the Atlantic coast has contracted 48 miles northward in the past 30 years. Scrub lizard populations appear to be secure on the Lake Wales and Bombing Range ridges in Highlands and Polk counties, but not on the Winter Haven and Mount Dora ridges in Polk and Lake counties (except in Ocala National Forest). The primary causes of decline are habitat loss from land clearing and habitat degradation from fire exclusion, harmful land management practices, or exotic vegetation invasion.

Exhibit 17. Florida Scrub Lizards Surveys During FY 2017—18.

County	Historical Sites Surveyed	Historical Sites Occupied	New Sites Surveyed	New Sites Occupied
Brevard	9	1	50	5
Broward	4	0	10	0
Collier	1	0	9	0
Glades	0	0	2	0
Highlands	89	44	133	80
Indian River	4	2	17	4
Lake	2	2	32	2
Lee	0	0	5	0
Martin	11	6	32	9
Orange	4	0	20	1
Osceola	1	1	14	4
Palm Beach	16	1	32	1
Polk	52	31	101	54
Saint Lucie	12	7	25	10

Gopher Tortoise

The gopher tortoise is a State–designated Threatened species in Florida. Gopher tortoises are keystone species as their burrows are home to over 350 other species. To conserve the species and its habitat, FWC published its first Gopher Tortoise Management Plan in 2007 and revised it in 2012 (http://myfwc.com/media/2286685/GT-Management-Plan.pdf). The plan is intended to guide conservation of the gopher tortoise in Florida through 2022. 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 (GTTAG) on gopher tortoise conservation issues. The continued participation of stakeholders is vital to the long–term conservation of the species.

Efforts are ongoing to engage Florida residents in gopher tortoise conservation. Opportunities include submission of tortoise sightings in Florida, mortality data collection, waif tortoise (tortoises of unknown origin) transportation, silt fence installation, and burrow surveys on recipient sites for humane relocation of tortoises associated with incidental take permits. FWC is recruiting citizen scientists to assist in conservation efforts by submitting photos of gopher tortoise sightings to FWC using the "Florida Gopher Tortoise" smartphone app (http://myfwc.com/wildlifehabitats/managed/gopher-tortoise/app/). The goal of this app is to increase public awareness of gopher tortoises and citizen participation in conservation at the local level. Citizens can use the app to learn more about the life history of the species, report potential wildlife violations, and test their knowledge with a quiz. Citizens can view an interactive map online and on mobile devices that display where tortoises have been documented by citizen scientists in Florida. A new interactive map was released in FY 2017–18; citizens can now search by submitter name, location, and keyword to find their favorite photo submissions in Florida. To date, FWC has received photos for over 2,527 locations, 744 of which were submitted during FY 2017–18.

The mortality data collection program engages Florida residents in conservation efforts by asking citizens to notify FWC if they encounter a deceased or injured gopher tortoise. Mortality data is submitted to FWC online at https://public.myfwc.com/HSC/GopherTortoise/GTMortality.aspx or via the Florida Gopher Tortoise app. This allows FWC to determine mortality "hotspots" throughout the state. During FY 2017–18, 171 gopher tortoises were reported online, 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.

The Incidental Take Permit (ITP) gopher tortoise volunteer relocation program mobilizes volunteers to conduct burrow surveys at development sites permitted for incidental take. In FY 2017–18, FWC trained

18 new volunteers and utilized six existing volunteers for the ITP relocation program, totaling 222 volunteer hours. FWC volunteers conducted surveys on properties with active ITPs in Plantation Palms (Hernando County) and Oakleaf Plantation (Clay County). A total of 61 acres were surveyed and 214 burrows were recorded across the two properties. The use of volunteers helps reduce the cost of relocation, recognizing that the developer has previously paid mitigation, and is not required to relocate tortoises under the formerly–issued permits. The Gopher Tortoise program has utilized student interns from Florida State University since 2011, who contributed approximately 768.50 hours in FY 2017–18 to help implement conservation actions. Many of these actions may not have otherwise been accomplished, and the program also benefits interns by providing professional experience in wildlife conservation and work in a government agency. Examples of projects completed by interns during FY 2017–18 include: creation of spatial data files from the digitization of conservation easements granted to the FWC through land donations associated with ITPs; outreach to public land managers and wildlife rehabbers intended to minimize the unauthorized release of tortoises and spread of disease on public lands throughout Florida; development of a volunteer eLearning course designed to educate those interested in conducting gopher tortoise outreach on behalf of FWC; creation of a summary report compiling survey results that collected information on local government development permitting processes throughout Florida; and continued outreach for "Gopher Tortoise Day" and the associated website (http://gophertortoisedayfl.com). Gopher Tortoise Day outreach in FY 2017–18 resulted in the adoption of 21 resolutions proclaiming April 10th as Gopher Tortoise Day in counties and municipalities throughout Florida. A resolution was also adopted by the Central Florida Zoo & Gardens and Governor Rick Scott extended greetings and best wishes to all observing April 10, 2018 as Florida Gopher Tortoise Day.

FWC frequently distributes fact sheets and brochures to increase knowledge of gopher tortoises in Florida. Approximately 9,752 gopher tortoise brochures and fact sheets have been distributed, including 4,672 *A Guide to Living with Gopher Tortoises* brochures that were distributed to local governments, schools, nature centers, and Florida residents. The poster *Got Gophers, Get Permits* is continuously distributed to planning councils, county and city building departments, and local permitting offices. More than 1,628 *Safe Roads for People and Tortoises* placards have been distributed and are available at Florida visitor centers, State and local parks, and highway rest stops. Additionally, 2,306 children's publications have been distributed and15,379 *Slow Down for Gopher Tortoise, Keep Gopher Tortoises Wild* decals and *Gopher Tortoise Day* tattoos were distributed at various events. All publications are also available at each of FWC's regional offices, and electronic versions are available for download at www.MyFWC.com/GopherTortoise. FWC hosted and/or participated in 43 outreach events in FY 2017–18 including: five local government workshops; several Gopher Tortoise Day Proclamation events; two

county 4–H events; festivals including the Wakulla Wildlife Festival, St. Marks Stone Crab Festival, and Taloofa Fest; and World Turtle Day event at Marineland St. Augustine. Additionally, program staff presented at two training events for FWC law enforcement officer recruits. This training helps officers address wildlife complaints related to gopher tortoises in an effective and consistent manner statewide.

The recipient site program is a voluntary program in which landowners may use their lands with suitable habitat to receive gopher tortoises from development sites. Since its implementation in 2008, approximately 19,975 acres of gopher 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. Currently, 42 recipient sites with an available capacity of 12,624 tortoises are permitted and 8 recipient site permit applications are under review with potential available capacity for 3,629 tortoises on 2,887 acres of habitat. In FY 2017–18, 6,985 tortoises were relocated under FWC–issued permits.

To humanely relocate tortoises from ITP development sites and restock tortoises on conservation lands where populations have been depleted, FWC has approved ITP recipient sites on several properties in northern Florida. FWC has partnered with Nokuse Plantation (Walton County), Avalon Plantation (Jefferson), and Eglin Air Force Base (AFB) (Okaloosa County) to approve ITP recipient sites on each of these three sites. 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 2017–18, 369 tortoises were relocated to Eglin AFB, 73 to Nokuse Plantation, and 40 to Avalon Plantation.

During FY 2017–18, FWC continued efforts to identify solutions for waifs. Waifs are gopher tortoises that have been removed from the wild (either unauthorized or due to injury) 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.” One new waif site was established on private lands in Clewiston, Palm Beach County, FL, and has capacity for 8 tortoises. Previously–permitted waif recipient sites received the following: Perico Preserve (Manatee County) received five waifs, Circle B Bar Reserve (Polk County) received 14, Panama City Beach (Bay County) received two, and Winding Waters (Palm Beach County) received 30. FWC is currently in the process of developing additional waif sites by working with landowners to establish sites in Pinellas County and Northeast Florida. FWC is also working with wildlife rehabilitators to place waifs at designated recipient sites or releasing them back to their origin if known. FWC also works closely with public agencies, non–profit organizations, and private landowners to identify and provide incentives for gopher tortoise conservation on private lands. To

address special situations with more flexibility and furthers the objectives of the gopher tortoise management plan, FWC has entered into two MOA's. An MOA between FFS and FWC established a 53.9–acre recipient site within the Croom Tract of the Withlacoochee State Forest (Hernando County). The public conservation land recipient site was established to receive gopher tortoises from the adjacent Good Neighbor–Phase 4 public recreational trail project site, thereby maintaining the resident gopher tortoise population on public lands. An MOA with St. Lucie County established a 232.5–acre recipient site within the Indrio Savannahs Preserve site. This public conservation land recipient site was established to receive gopher tortoises from any project that is located on a property owned or managed by St. Lucie County, thereby maintaining the regional gopher tortoise population in St. Lucie County.

Research provides information needed to help achieve conservation goals of the Gopher Tortoise Management Plan. In FY 2017–18, a study developed and funded in part by FWC was completed by the University of Central Florida. The goal was to assess the impacts of temporary relocation on gopher tortoises from the Sabal Trail Natural Gas Pipeline project area in Central Florida. Results indicate relocated males are more likely to return to their original locations than females and there were no negative impacts on health, disease prevalence, or immune response of relocated tortoises. FWC is currently continuing research, with the Southwest Florida Water Management District, to determine how readily tortoises repatriate restored habitat along a pipeline right–of–way following relocation.

In FY 2017–18, FWC contracted Florida Natural Areas Inventory (FNAI) to conduct a series of surveys at selected WMAs/WEAs following the protocol for Line Transect Distance Sampling (LTDS). The intent of these surveys has generated area–specific population estimates, and the protocol is available at: (https://fwcc.sharepoint.com/:w:/r/sites/WHM/WCPR/StandardMonitoringProtocols/). FNAI surveyed 2 WMAs, Chassahowitzka WMA (Hernando County), and Apalachee WMA (Jackson County). FNAI conducted these surveys from August–November 2017 to avoid any periods when burrows may be flooded, or area staff may be conducting prescribed fire. From August–November 2017, FNAI contractors surveyed 158 km of full–frame transects and scoped 532 burrows, in which 196 tortoises were encountered. Tortoise density estimates ranged from 0.70 tortoises/ha at Chassahowitzka WMA to 1.72 tortoises/ha at Apalachee WMA. Based on these results, Apalachee can support a viable population of gopher tortoises.

To better understand population distribution and health, as well as monitor trends, five public conservation lands were surveyed in FY 2017–18 under a three–year contract with FNAI. Among those five sites, were Ralph E. Simmons State Forest (Nassau County), which had the highest population density (1.5 tortoises/acre) and Twin Rivers State Forest Blue Springs Tract (Hamilton County) had the largest population estimate (2,498 tortoises) Two additional conservation lands, Rainbow Springs State Park

(Marion County) and Withlacoochee West Conservation Area Quail Farms Tract (Hamilton County) were surveyed between January–May 2018 by FWC. Staff input survey data into a GIS database to identify, monitor, and track potential viable and supporting populations. Of the seven sites monitored in FY 2017–18, five 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 gopher tortoise habitat). Future monitoring will focus on surveying additional public conservation lands to locate viable populations, as well as locate populations that may become viable with increased management.

GOPHER TORTOISE MITIGATION PARKS IN THE SOUTHWEST REGION – The goal of FWC's mitigation park program is to provide an off–site alternative for resolving certain wildlife resource conflicts. Most mitigation park facilities are developed in cooperation with other local, State, and Federal agencies, usually following the signing and execution of an MOU. The MOU's function is to establish an orderly process for administering monetary transactions and to provide a process for land acquisition and management. The responsibility for the management of lands acquired through the mitigation park program rests with FWC and are designated as WEAs. These parks are managed primarily to enhance listed species populations, particularly those animals for which State and Federal approvals are required prior to their being impacted by new land development. Gopher tortoise mitigation parks are monitored every 5 years (Exhibit 19). In FY 2017–18, FWC surveyed on Janet Butterfield Brooks WEA with 133 burrows identified with 103 being potentially occupied.

WILFLIFE MANAGEMENT AREA AND WILDLIFE AND ENVIRONMENTAL AREA SURVEYS – In FY 2017–18, FWC continued a multi–year comprehensive burrow survey designed to evaluate Blackwater WMA (Okaloosa and Santa Rosa counties) (200,000 acres). To date, over 91,000 acres of habitat have been surveyed with 4,245 burrows located and approximately 14.5% of these being classified as abandoned. Once all suitable habitat has been surveyed, subsamples of populations and habitats will be monitored to assess whether forest management efforts have influenced population sizes, distributions, and recruitment. Burrow surveys and habitat management efforts can be found in Exhibit 19. Camera scopes were used on L. Kirk Edwards WEA (Leon County) and Aucilla WMA (Jefferson County) to determine occupancy. On L. Kirk Edwards WEA24 adults, four subadults, and six juvenile tortoises were documented. On Aucilla WMA, 10 adults, six subadults, and one juvenile were documented. The Lake Wales Ridge WEA (LWRWEA) consists of 20 tracts (Highlands and Polk counties). All tracts contain suitable habitat and gopher tortoises have been observed on all LWRWEA tracts

Exhibit 18. Management Activities and Burrow Surveys Conducted to Enhance Gopher Tortoise Habitat in FY 2017–18.

WEA/WMA	County	Burrows Documented	Acres Planted	Acres Burned	Acres Mechanically Treated	Acres Chemically Treated
Watermelon Pond	Alachua	NA	N/A	804	51	451
Pine Log	Bay, Washington	NA	N/A	N/A	N/A	194.6
Branan Field	Clay, Duval	NA	N/A	282	N/A	N/A
Apalachicola	Franklin, Liberty, Leon, Wakulla	NA	N/A	N/A	N/A	325
Bell Ridge Longleaf	Gilchrist	NA	N/A	544	3	N/A
Fort White	Gilchrist	NA	N/A	1,298	N/A	N/A
Suwannee Ridge	Hamilton	NA	N/A	701	26	0.1
Perry Oldenburg	Hernando	NA	N/A	252	85	318
Janet Butterfield Brooks	Hernando	NA	N/A	115	N/A	180
Platt Branch	Highlands	NA	N/A	357	91	205
Lake Wales Ridge	Highlands and Polk	NA	0	895	235	105
Bullfrog Creek	Hillsborough	NA	N/A	115	85	55
Aucilla	Jefferson	72 (29 active, 16 inactive, 27 abandoned)	N/A	8	N/A	N/A
Lafayette Forest	Lafayette	NA	N/A	767	60	1.4
Hickey Creek	Lee	NA	N/A	0	48	36
L. Kirk Edwards	Leon	97 (50 active, 38 inactive, 9 abandoned)	14	115	14	33
Moody Branch	Manatee	NA	N/A	165	239	160
Crooked Lake	Polk	NA	N/A	252	301	535

FWC staff and volunteers from FWC's Ridge Ranger volunteer program continued additional habitat restoration activities on two project areas covering 60 acres of degraded scrub and 35 acres of former agricultural lands. Volunteers rescued 100 wiregrass plants from future firelines and maintained 400 scrub oaks that were grown from acorns collected in previous years. Ridge Rangers implemented a simple irrigation system in the degraded scrub and planted these 500 native plants in May and June 2017. The irrigation system supplied water through dry periods and a plant survival survey by the Ridge Rangers in June 2018 showed this to be very successful. Continued management are planned for FY 2018–19 to promote habitat suitability and increase and maintain tortoise densities.

In FY 2017–18, the Habitat Management Assistance Funding (HMAF) program provided $97,639 in funding to assist local governments with gopher tortoise habitat management activities on more than 450 acres of their conservation lands. The HMAF program continues to offer a reimbursement for the installation of silt fencing, intended for the soft release of gopher 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 2017–18. Some habitat management and improvement activities conducted through the HMAF program included fire line management, prescribed burns, selective tree reduction, mowing and grinding, roller chopping, mulching, the control of exotic and invasive plants via the utilization of herbicide applications, and the planting of herbaceous groundcover.

Sea Turtles

FWC maintains management and research programs to foster the recovery of five species of sea turtles that occur along Florida's coast: the Federally–designated Endangered leatherback, hawksbill, Kemp's ridley, and the Federally–designated Threatened green and loggerhead. FWC interacts frequently with state and federal agencies, local governments, conservation organizations, citizens, and academic programs, including working with the Florida Department of Environmental Protection (FDEP), Water Management Districts, USFWS, and the U.S. Army Corps of Engineers during environmental commenting. FWC served on several scientific advisory committees, governing boards, working groups, and committees in FY 2017–18, including: Florida Sea Turtle License Plate Grants Committee; steering committee and working group for FDEP's Beaches Habitat Conservation Plan; Green Turtle Fibropapillomatosis Working Group; expert working group for the Ocean Conservancy's Integrated Gulf of Mexico Restoration Sea Turtle Case Study; working group to assess the status of the Northwestern Atlantic leatherback population for NOAA–Fisheries; working group to develop Gulf Spill Restoration Strategic Frameworks for sea turtles; and the International Union for the Conservation of Nature's Marine Turtle Specialist Group.

MANAGEMENT – In FY 2017–18, FWC worked with the federal government, state regulatory agencies, volunteer conservation groups, and local governments to implement the state's responsibilities in accordance with the Marine Turtle Protection Act and the USFWS' Recovery Plans for five species of sea turtle in Florida. In February 2018, FWC hosted the 21ST Annual Marine Turtle Permit Holder Workshop in Gainesville, Florida. Approximately 360 permit holders and volunteers along with local government, state, and federal agency staff attended this meeting, which was co–hosted by the Sea Turtle Conservancy. Topics presented at the meeting included FWC updates on sea turtle nest and stranding numbers, the Florida Beaches Habitat Conservation Plan, FWC's shorebird program, and management activities. Sea turtle biologists with USFWS and NOAA provided updates on federal sea turtle programs.

There was also a session highlighting marine turtle research, conservation, and education projects funded from the Sea Turtle License Plate Grants Program.

FWC worked with 65 light manufacturers from various countries to identify fixtures and lamps appropriate to use adjacent to ecologically sensitive areas, such as sea turtle nesting beaches and bird migratory corridors. FWC assessed an estimated 250 fixtures and bulbs and certified 210 as FWC Wildlife Lighting Certified. The certified fixtures and bulbs are listed on FWC's website so that beachfront property owners, local governments, and beach businesses have access to beach lighting options that limit impacts to nesting and hatchling sea turtles.

In FY 2017–18, FWC and FDEP worked together to implement an early restoration project, "Restoring the Night Sky," to offset impacts to sea turtle nesting habitat due to response injury that occurred during the Deepwater Horizon Event. This project includes reducing light sources on and around northwest Florida's conservation lands and assisting local governments in their efforts to reduce the impact of beachfront lighting on sea turtles, their nests, and nesting beaches. FWC worked in partnership with local governments and Gulf Power on lighting appropriate to minimize impacts to sea turtles on adjacent nesting beaches while safely lighting beachfront county and private properties.

Franklin and Escambia counties utilized grant funds to enhance compliance with local lighting ordinances by hiring additional staff to focus on education and compliance or by providing information and appropriate bulbs and fixtures to beachfront properties. FWC worked with Okaloosa County to retrofit county–owned parking lot lights in Fort Walton Beach. Using grant funds, FWC and FDEP contracted with UF's Institute of Food and Agricultural Sciences program to work with local businesses, condominium associations, and private property owners (Franklin, Gulf, and Bay counties) to retrofit lights on properties surrounding conservation lands. Lighting retrofits were completed at 10 of the identified properties in FY 2017–18.

FWC is working with agency programmers in the Center for Biostatistics and Modeling and the Office of Information Technology on a Gulf Environmental Benefit Fund project to improve reporting of sea turtles impacted by lights on northwest Florida beaches. In FY 2017–18, development of a web–based reporting system was completed and is now being beta–tested with a subset of FWC volunteers in the field. Staff continues to work on a web–based dashboard that will be available to local governments and interested public to view updated information on lighting impacts to sea turtle nests.

In FY 2017–18, FWC reviewed 582 applications as requested by FDEP, water management districts, and the State Clearing House to ensure consistency of approved activities with Florida statutes requiring

protection of sea turtles, their nests, and nesting habitat. Projects reviewed included coastal construction control line applications, environmental resource permit applications, joint coastal permit applications, and federal documents submitted to the State Clearing House. FWC participated in the development of the Florida Statewide Beaches Habitat Conservation Plan (in cooperation with FDEP). This Plan will provide flexibility to local governments and beachfront property owners for conducting FDEP coastal construction control line permitted activities in nesting habitat while ensuring impacts to sea turtles and their habitat are appropriately minimized and mitigated. FWC review of permit applications includes review of lighting plans for buildings along Florida's sea turtle nesting beaches and recommendation of fixtures and bulbs that will meet all state building codes, provide for public safety, and minimize the potential for impacts to nesting and hatchling marine turtles. In FY 2017–18, FWC staff reviewed and approved 60 lighting plans for beachfront construction and conducted post–construction site inspections of 30 of these projects. Nine of these projects were determined to be compliant with the pre–approved lighting plan. Staff also responded to requests from local governments for assistance with review of lighting in their communities by conducting lighting surveys with local government staffs, reviewing language for sea turtle protection ordinances, or general technical assistance.

In FY 2017–18, FWC reviewed and approved approximately 375 renewals, new applications, and amendment requests for conservation activities with sea turtles. FWC issued 29 authorizations to hold sea turtles for rehabilitation, educational display, or research. FWC coordinated the review and approval of requests for monitoring associated with FDEP–authorized activities and oversaw review and approval of 50 permit requests for new or modified research involving Threatened and Endangered sea turtles for 44 distinct research projects. Approximately 140 one–time consent permits (i.e., letter of authorization) were issued authorizing activities such as filming, transfer of specimens into or out of Florida for research and transport of turtles into Florida for release following rehabilitation in other states. Eleven new or amended Loan Agreements were issued authorizing the possession and use of preserved specimens for research, teaching or educational outreach activities. Twenty–two permits or amendments were processed to authorize educational turtle walks, allowing the public to observe nesting loggerhead sea turtles during June and July on the central east, southeast and the southwest Florida coasts.

FWC coordinated transfer and release of sea turtles undergoing rehabilitation and assisted with coordinating sea turtle releases. These activities included assisting in the recovery, processing, transport, and release of approximately 1,300 cold–stunned turtles recovered from nearshore shallow waters including St. Joe Bay and approximately 1,500 post–hatchling turtles that were washed back to shore by strong winds associated with Hurricanes Irma and Maria. This also included 50 sea turtles that stranded in New England during a cold–stunning event and were then transferred to Florida for rehabilitation. FWC

conducted 4 inspections of facilities within Florida to ensure sea turtles were held in appropriate conditions. FWC placed two non–releasable turtles in educational facilities within Florida, extending sea turtle conservation messaging to important audiences and increasing capacity for rehabilitation efforts. FWC oversaw storm preparation and response activities associated with facilities housing sea turtles, including post–storm wellness confirmations, coordination with FWC Law Enforcement to assess status and needs of sea turtle facilities in the Florida Keys following Hurricane Irma, and working with partners to facilitate replacement of essential equipment. More information on FWC's Sea Turtle Management Program at: http://myfwc.com/wildlifehabitats/managed/sea-turtles/.

RESEARCH – FWC coordinated the Florida portion of the Sea Turtle Stranding and Salvage Network (Network), an 18–state program administered by NOAA–Fisheries. The Network is responsible for gathering data on dead, sick, or injured (i.e. stranded) sea turtles. During FY 2017–18, 2,080 dead or debilitated sea turtles were documented (704 loggerheads, 1130 green turtles, 196 Kemp's ridleys, 18 hawksbills, 10 leatherbacks, and 28 sea turtles not identified by species). FWC responded to 2,258 reports regarding sea turtle concerns (primarily reports of dead, sick, or injured sea turtles), transported 108 sick or injured sea turtles to rehabilitation facilities, and conducted necropsies on 126 carcasses. There were 24 training workshops, involving 565 participants, held around the state to teach volunteers how to document stranded turtles. Real–time Florida sea turtle stranding data were readily available on a dedicated website (http://ocean.floridamarine.org/SeaTurtle/flstssn/) for use by various entities such as NOAA–Fisheries, FWC law enforcement, and protected species management personnel.

Approximately 90% of the world's largest loggerhead nesting population occurs in Florida and green and leatherback nesting populations are of regional significance. Assessments of nesting abundance and reproductive output are coordinated through a network of state, federal, and volunteer permit holders who monitor reproduction on Florida's beaches. FWC establishes scientifically sound monitoring designs, provides training, resolves data collection problems, assess data collection error rates, analyzes data trends, and serves as a clearinghouse for information on sea turtle populations and habitats. In FY 2017–18 six workshops were presented statewide to 1,191 participants providing nest survey trainings.

Two monitoring programs, the Statewide Nesting Beach Survey Program (initiated in 1979) and the Index Nesting Beach Survey Program (initiated in 1989), have different objectives. The Statewide Nesting Beach Survey Program provides nearly complete survey coverage of the state's nesting beaches to acquire data on total nest numbers, nest geographic distribution, and nesting seasonality for each species. Managers use results to minimize human impacts to sea turtles and nesting beach habitats, and to identify important areas for land acquisition or enhanced protection. In 2017, 224 survey areas were monitored,

comprising 828 miles of beaches. In 2017, the program documented 96,912 loggerhead nests, 53,102 green turtle nests, 663 leatherback nests, two hawksbill nests, and 11 Kemp's ridley nests. A Statewide Atlas of Sea Turtle Nesting Occurrence and Density is available at http://myfwc.com/research/wildlife/sea-turtles/nesting/nesting-atlas/. This resource provides a summary of the geographic distribution of sea turtle nest occurrence and density statewide in the last five years, and occurrence data for all species of sea turtles since 1979.

The Index Nesting Beach Survey Program collects more detailed data from a smaller set of beaches. Surveyors identify each track to species, identify the tracks as a nest or abandoned attempt, and locate nests within an approximate half–mile beach zone. Nests and nesting attempts have been monitored for 28 years at 517 index beach zones, surveyed daily during each 109–day nesting season (May–August). The program provides a reliable way to detect changes in Florida sea turtle abundance. Observed loggerhead nest count on Florida's 27 core index beaches has varied greatly since the beginning of the program and is characterized by a complex nesting pattern and ample wide fluctuations. During the same period (1989–2017), green turtle nest counts have increased exponentially by eightyfold. Leatherback nest numbers have also been increasing exponentially (1989–2014) but have been declining since 2014.

The Hatchling Orientation Index Program provides data on how accurately hatchlings crawl toward the ocean after emerging from the nest. Hatchlings typically move towards the brightest and most open horizon. On a natural beach at night, this leads them to the water. Unfortunately, artificial lighting overrides other orientation cues and strongly attracts them to move away from the water, increasing the time it takes them to reach the water (wasting energy and exposing them for a longer period to predators on the beach) or leading them to their deaths (going into parking lots or roadways or dying from dehydration). The Program objectively assesses conditions on nesting beaches related to the effects of artificial lighting on hatchlings, identifies problem areas, and allows for evaluations of efforts to reduce the problem of artificial lighting. In FY 2017–18, data were collected from hatchling emergences at 596 nest sites on 15 beaches. Project participants (about 350) included university students/professors, federal/state government employees, non–government organization employees, and volunteers.

In June 2018, 82 loggerheads and two Kemp's ridleys were captured during an annual eight–day sampling session in Florida Bay. This work was conducted as part of a study of sea turtles in Florida Bay. The primary elements of this study include assessments of relative and absolute abundances, health assessments and monitoring of fibropapillomatosis (a disease specific to sea turtles), studies of growth, determinations of sex ratios and genetic identities, and studies of residency and movements. All captured turtles were measured and tagged. More than half of the loggerheads (64.6%) had been previously

tagged, providing data on growth and residency in Florida Bay. All turtles were released shortly after capture. This project has been conducted continuously since 1990. Some individuals have now been captured numerous times over periods spanning 21 years.

FWC studies the abundance, distribution, behavior, and diet of hatchlings and small juveniles in open–ocean habitat off Florida's coasts. These turtles live in surface waters and represent a pelagic stage in their development. One objective includes determining threats to turtles in this stage, such as ingestion of plastics and tar. In FY 2017–18, FWC sampled waters offshore of Pensacola, Apalachicola, and St. Petersburg. FWC observed 20 Kemp's ridleys and 11 green turtles. Miniature, solar–powered satellite transmitters were deployed on one green captured offshore of Pensacola, two greens captured offshore of Apalachicola, and one green captured offshore of St. Petersburg.

In addition to capturing live animals at sea and monitoring trends in nest numbers and hatchling production on the nesting beach, FWC is studying where adult female loggerheads reside and forage when they are not nesting on Florida beaches. Understanding the link between nesting and foraging areas is critical to the development of appropriate management and conservation strategies for sea turtles. FWC uses a combination of satellite telemetry and tissues collected on nesting beaches to identify foraging areas used by Florida loggerheads. The tissues are analyzed for isotopes in foraging are, a method that has been validated and is much cheaper than satellite telemetry, allowing increased sample size and better representation of the nesting population. The project aims to identify foraging hotspots and determine the relative importance of foraging areas to the Florida nesting aggregation and how it changes among years. The project relies on the established Florida permit–holder system and involves the collection of non–viable unhatched eggs from a subsample of loggerhead nests inventoried for the FWC hatchling production program. More than 200 nests have been sampled annually across Florida since 2013. The results of the first three years of the study indicate that most females forage within the U.S. Economic Exclusive Zone and are concentrated in the Florida Keys, on the Southwest Florida continental shelf, the waters off east–central Florida, and on the continental shelf between Delaware and North Carolina. The Great Bahama Bank (specifically the continental shelf South of Andros) is the main foraging area used by loggerheads nesting in Florida outside of U.S. Results indicate a considerable variability in relative importance of foraging areas to the Florida nesting aggregation. FWC also maintains an electronic inventory of in–water research and monitoring projects. FWC maintains this database in close collaboration with the sea turtle research community. The database currently serves state and federal conservation managers by providing information on in–water sea turtle research and a connection to the researchers responsible for conducting the work. More information on the Sea Turtle Research Program is at: http://myfwc.com/research/wildlife/sea-turtles/.

Spotted Turtle

The spotted turtle has been petitioned for federal listing due to declining populations from habitat loss and collection for the pet trade. The distribution and life history of this species is poorly understood in Florida. In 2014, FWC began using radio–telemetry and mark–recapture techniques to gather information on movements, behavior, and population dynamics of spotted turtles at two sites in Alachua and Putnam counties. As of June 2018, 70 individuals have been captured, with 28 of those fitted with radio–transmitters and tracked 1–2 times per week. Results from this work have shown that spotted turtles in Florida are highly aquatic preferring shallow water areas within vast wetland complexes. These turtles are very cryptic (i.e., rarely bask), and can be active year–round. Individual home ranges are quite variable, as are day–to–day movements, but overall, males move greater distances and have double the home range as females (spotted turtle home ranges were between 0.5 and 116 acres, with an average of 11.5 acres). FWC is continuing to build on this work and has partnered with a multi–state "Maine–to–Florida" initiative to address spotted turtle status and conservation across the species' entire range. Objectives include 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.

FISH

Freshwater Fish

LONG TERM MONITORING OF FLORIDA RIVERS – FWC collects standardized fisheries independent data from select rivers to characterize fish populations and communities and assist with informing management decisions. While sampling is not directed toward threatened and endangered species, these species are occasionally encountered. Sampling was conducted from the Chipola, Escambia, Ocklawaha, Yellow, Santa Fe, Suwannee, and St. Johns rivers during FY 2017–18. FWC had several ongoing species directed projects on state and federally listed fishes during FY 2017–18, including status assessments on the harlequin darter, saltmarsh topminnow, and crystal darter. A National Fish and Wildlife Foundation (NFWF) grant is currently examining habitat use, movement, and survival of juvenile Gulf of Mexico sturgeon from the Pensacola Bay watershed (Escambia, Okaloosa, and Santa Rosa counties). Two State Wildlife Grants are determining the status of crystal darter and saltmarsh topminnow. The saltmarsh topminnow grant was amended to include a genetic component allowing for the development of a genetic monitoring program for the saltmarsh topminnow, as well as the blackmouth shiner in upcoming years.

BLUENOSE SHINER – The bluenose shiner is currently listed as State–designated Threatened and occurs in several watersheds throughout Florida. During FY 2017–18, seven bluenose shiners were collected from the Escambia River (Escambia County). Genetic analysis to determine evolutionary distinction between the bluenose shiner population in the St. Johns drainage (eastern Florida) and populations in western Florida, Alabama, Mississippi, and Louisiana is ongoing.

CRYSTAL DARTER – The crystal darter is currently listed as State–designated Threatened. It is only known to occur in the upper section of the Escambia River near Century, Florida, in Escambia and Santa Rosa counties. During FY 2017–18, 122 trawl surveys were conducted across the upper Escambia River and 12 crystal darters were collected. A total of 23 crystal darters were collected during the same study in FY 2016–17. Prior to FY 2016–17, only 11 had ever been collected in Florida using traditional sampling methods (boat electrofishing and seining). Now that effective sampling techniques have been identified, current goals are to assess the status of the population.

HARLEQUIN DARTER – The harlequin darter is currently listed as a State–designated Species of Special Concern. While restricted in range (only the Escambia River in Escambia county), the species is regularly collected from tributaries and the mainstream Escambia River when suitable habitats (submerged woody debris) are present. In FY 2017–18, 175 harlequin darters were collected from the mainstream using a trawl, but none were collected using boat electrofishing in the mainstream. In FY 2017–18. 168 individuals were captured using small dip nets while snorkeling during a study in two tributaries of the Escambia River. Work to estimate the population size in the Escambia River watershed was completed in FY 2017–18. A Biological Review Group (BRG) was convened to review the status of the harlequin darter. The review included data from the recently completed study. The BRG concluded the harlequin darter did not meet the criteria to be listed as a State-designated Threatened species. As a result, FWC staff recommended the harlequin darter be removed as a Species of Special Concern, and this was approved by the Commission in December 2017. The delisting will be completed in FY 2018–19, following approval of a revised the harlequin darter Species Action Plan and Species Conservation Measures and Permitting Guidelines. The Species Action Plan will guide the future conservation and management of the harlequin darter.

SALTMARSH TOPMINNOW – The saltmarsh topminnow is currently as State–designated Threatened. Saltmarsh topminnows occur in the estuarine reaches of western Panhandle Rivers from the Perdido Bay to the Yellow River in Sana Rosa and Okaloosa counties. During FY 2017–18, 35 sites were surveyed across the Perdido, Escambia, Blackwater, and East Bays using minnow traps and Breder traps. A total of 165 saltmarsh topminnows were collected. An additional 12 saltmarsh topminnows were collected

during FWC fisheries independent monitoring sampling in Escambia Bay. None were collected in the Choctawhatchee or Apalachicola Bays during FY 2017–18.

SOUTHERN TESSELLATED DARTER – The southern tessellated darter is listed as State–designated Threatened and are only known to occur in the Ocklawaha River watershed (a tributary to the St. Johns River) in Levy, Alachua, Putnam, Marion, Lake, Orange, and Polk counties. No sampling was conducted in FY 2017–18. Prior genetic analyses suggest southern tessellated darters in the Ocklawaha River watershed have low genetic diversity and a small population size due to long–term (hundreds of generations) isolation from other populations. Future work will determine appropriate listing status and conservation actions needed for this species.

Smalltooth Sawfish

The smalltooth sawfish is a Federally–designated Endangered species that was once common in the coastal and estuarine waters of the southeastern U.S. In the 20th Century, it became rare throughout its North American range. FWC attributes this decline to two main factors: 1) bycatch in commercial and recreational fisheries and 2) life history parameters including late maturity and low offspring production. Smalltooth sawfish in Florida are primarily found from Charlotte to Monroe counties. FWC began studying juveniles in 2004 in the Charlotte Harbor estuarine system (Charlotte and Lee counties) on the southwest Gulf Coast and one of the only remaining nursery's in the world. Data collected from this program have been instrumental in addressing priorities in NOAA's Smalltooth Sawfish Recovery Plan. In FY 2017–18, FWC published seven scientific papers and made strides in research on subjects such as parasites, reproduction, movement, diet, stress physiology, and habitat use. In addition, FWC is working on sawfish environmental DNA, long term movements in larger juveniles, and fine scale movements within the juvenile nursery hotspots. FWC conducts monthly random and directed sampling in the Charlotte Harbor estuarine system using a multi–gear approach (i.e. gill nets, drum lines, hook and line) between March and September. A variety of data are collected on all captured sawfish (i.e. lengths, rostral tooth counts) and each new animal is tagged and released. These tags include a colored tag embossed with FWC's tagging hotline phone number, a PIT tag, an acoustic tag, and were released at the site of capture. Researchers use acoustic tags to track movements using hydrophones and listen for acoustic tags at moored stations. In FY 2017–18, FWC captured and released 50 smalltooth sawfish, including one recapture. Total lengths ranged from approximately 2.5–11 feet. For more information on FWC's Smalltooth Sawfish Research and Monitoring, including access to publications on specific topics, please visit http://research.MyFWC.com/sawfish.

Sturgeon

ATLANTIC STURGEON – The Atlantic sturgeon is a Federally–designated Endangered species. USFWS, NOAA–Fisheries, and USGS conduct most of the monitoring and management for this species. FWC did not collect any Atlantic sturgeon in FY 2017–18. However, a carcass, presumed to be an Atlantic sturgeon, was reported to FWC by Jacksonville Port. FWC coordinated with NOAA–Fisheries and USFWS coordinators to salvage the carcass, scan for tags, collect samples on length, age, and genetics, and send the information to researchers from other states for further analysis. All information gathered was provided to the Atlantic Sturgeon Salvage Network, managed by NOAA–Fisheries, as well as to the Atlantic States Marine Fisheries Commission, to assist with population monitoring and management.

GULF STURGEON – The gulf sturgeon is a Federally–designated Threatened fish. Monitoring has been primarily led by USFWS, NOAA–Fisheries, and U.S. Geological Survey. In FY 2017–18, FWC completed the second year of a study examining survival, movement, and habitat use of juveniles in Yellow and Blackwater rivers (Santa Rosa and Okaloosa counties). A total of 77 individuals (15 juveniles and 62 adults) were caught in 464 hours of gill netting. In a separate study on Yellow River, four gulf sturgeon (one adult, one juvenile, and two young–of–the–year) were caught using a mini trawl.

INVERTEBRATES

Crayfish

BLACK CREEK CRAYFISH – The Black Creek crayfish is a State–designated Threatened invertebrate and inhabits streams with cool, unpolluted water with a constant flow and high oxygen content and is endemic to northeast Florida, where much of its known range is in the Black Creek drainage. All documented occurrences have been within the lower St. Johns River watershed basin (St. Johns, Duval, Clay, and Putnam counties). In FY 2017–18, Species Conservation Measures and Permitting Guidelines for the Black Creek crayfish (http://myfwc.com/media/4381182/BlackCreekCrayfishGuidelines-2018.pdf) were finalized and approved. FWC also worked with Florida's Department of Military Affairs, FFS, and the St. Johns River Water Management District to stabilize stream crossings in Black Creek tributaries to maintain water quality essential to persistence of the species. FWC reviewed several proposed projects to determine potential impacts to Black Creek crayfish and provided avoidance and minimization guidance. A St. Johns River Water Management District project to pump water from Black Creek via pipeline to recharge the aquifer in the Keystone Heights area (Clay County) has involved FWC in planning discussions and surveys to document impacts to Black Creek crayfish.

CYPRESS CRAYFISH – The cypress crayfish was originally collected in 1942 near Oak Grove (Escambia County) but was not described until 1980. This exact location has not been found and was likely destroyed by land use changes. The species is currently known from one location – a ponded area in the Escambia River floodplain. Its habitat requirements are not understood and access to survey potentially occupied areas often depends on appropriate site-specific water levels. USFWS has been petitioned to evaluate the cypress crayfish for possible listing, giving it the designation of a federal "at risk" species. In August 2017, FWC received a "Multispecies Surveys and Research" award from USFWS for several "at risk" species, including the cypress crayfish. To fulfill the award, FWC will: (1) survey appropriate habitats in Escambia and Santa Rosa counties, recording GPS points for each negative and positive surveyed locality; (2) collect one voucher Form I male from each newly documented site to be preserved and used for future reference and morphological analysis; (3) collect samples to be used for future genetic analysis; and (4) record number of crayfish caught per sampling period, habitat and water depth data, and data on other crayfish and aquatic species captured at occupied sites. To date, several sites in the Escambia River floodplain have been surveyed. The closely related Cajun dwarf crayfish was found at two sites in Escambia County, but no new sites for cypress crayfish were found.

MIAMI CAVE CRAYFISH – The Miami cave crayfish inhabits subterranean water sources in Miami–Dade County and has been collected from 12 wells that draw on the subsurface aquifer. USFWS has been petitioned to evaluate the Miami cave crayfish for possible listing, giving it the designation of a federal at-risk species. In August 2017, FWC received a "Multispecies Surveys and Research" award from USFWS for several at-risk species, including the Miami cave crayfish. To fulfill the award, FWC and associates will: (1) survey Miami–Dade County wells (using specially designed traps) to collect data on the species' current range and abundance; (2) collect concurrent water quality data for sites surveyed; (3) collect samples (non–lethal collection of a leg or chela) from captured individuals for genetic analysis; and (4) determine the amount of genetic diversity and connectivity among sites. Progress to date includes contracting a biologist to conduct trapping surveys and drafting a contract for genetic analysis.

PANAMA CITY CRAYFISH – The Panama City crayfish is a small freshwater crustacean found exclusively within an estimated 51–square–mile portion of Bay County. Historically, the species thrived in wet pine flatwoods with an open, vegetative understory. Development and incompatible silviculture practices resulted in habitat loss and degradation. This species is a State–designated Species of Special Concern. In FY 2017–18, FWC worked to complete conservation tasks outlined in the State's Draft Management Plan for the Panama City Crayfish (http://myfwc.com/wildlifehabitats/imperiled/listing-actions/panama-city-crayfish/), including: 1) Attempting to secure at least 2,000 acres of occupied habitat throughout the

species' range in conservation easements that are managed in perpetuity; and 2) Closing data gaps on what constitutes a viable population and other basic crayfish demographic information.

In FY 2017–18, FWC continued to provide expertise and information to USFWS. FWC gave feedback on best management practices for crayfish sustainability and provided subject matter expertise for development, construction, and other land–use conversion and maintenance activities with the potential to impact crayfish. FWC consulted with the Florida Department of Transportation, USFWS, Bay County, City of Lynn Haven, environmental consultants, and public and private landowners to provide guidance on proposed projects and prevent unauthorized take of Panama City crayfish. FWC annually surveys on Panama City crayfish management areas along with other existing or potential conservation easements. These surveys assess species response to habitat restoration efforts and fluctuating groundwater levels. In April 2018, FWC was awarded a Section 6 grant from USFWS to hire a crayfish–specific biologist for one year to perform additional surveys, fill in data gaps regarding basic biology, and to conduct a mark–recapture study to determine population sizes and habitat use. Visible Implant Elastomer tags are being used to mark individuals to determine population sizes and to track movements (Exhibit 21).

Exhibit 19. Close–up view of Visible Implant Elastomer tag in a crayfish. Literature reviews predict this tag will last at least three molting cycles, or approximately one year.

Maintaining herbaceous wet flatwoods is vital for this species to move toward recovery goals proposed in the draft management plan. Sites were targeted for management to expand the area of occupancy and improve species resiliency. To date, four management areas have been established: Talkington Preserve, Marjorie's Magical Marsh/Symone's Sanctimonious Swamp, City of Lynn Haven, and D&H/Deer Point; each have undergone varying levels of restoration (Exhibit 22). Due to the urban matrix surrounding these

areas, it is difficult to implement prescribed fire to maintain ideal vegetation composition. Additional acres are contracted to be mowed at Deer Point once the landscape dries enough to avoid ground disturbance from equipment. USFWS will conduct mowing on the remaining acres at Talkington, Marjorie's Magical Marsh, and City of Lynn Haven in FY 2018–9.

Exhibit 20. Panama City Crayfish Properties and Management Activities During FY 2017–18.

Location	County	Management Activities (Acres)
City of Lynn Haven	Bay	Two experimental plots were hand cleared for crayfish translocation experiments (0.4)
Deer Point	Bay	Contracted mowing (8.7)
Marjorie's Magical Marsh/Symone's Sanctimonious Swamp	Bay	Volunteer led hand clearing (6)
Talkington Preserve	Bay	Contracted mowing (4)

SANTA FE CRAYFISH – The Santa Fe cave crayfish is a State–designated Threatened species that inhabits subterranean water sources in southern Suwannee and Columbia counties. It is only known from several caves and sinkholes in the Santa Fe/Suwannee River basin. In FY 2017–18, Species Conservation Measures and Permitting Guidelines for the Santa Fe cave crayfish (http://myfwc.com/media/4381197/SantaFeCaveCrayfishGuidelines-2018.pdf) were finalized and approved. In August 2017, FWC received a "Multispecies Survey and Research" award from USFWS for several at-risk species, including the Santa Fe cave crayfish. To fulfill the award, FWC and associates will: (1) conduct a status assessment for Santa Fe cave crayfish at historic sites and new sites, if such are discovered; (2) collect 8–10 tissue samples (non–lethal collection of a leg or chela) from each site to be used for genetic analysis; (3) if available, collect one voucher Form I male from each newly documented site to be preserved and used for morphological analysis; (4) determine effective population sizes and degree of isolation and connectivity of the sites; and (5) provide an interpretation of intraspecific diversity based on evidence from genetics, morphology, and distribution. Progress to date includes contracting a professional cave diver, drafting a contract for genetic analysis, and investigating the use of LIDAR images to identify potential sink holes to be surveyed for presence of Santa Fe cave crayfish.

Freshwater Mussels

FWC tracks changes in mussel communities by collecting standardized independent data from Florida's freshwater ecosystems. Freshwater mussels are the most imperiled species group in North America with 71% of species considered endangered, threatened, or of special concern. In Florida, there are 16 species of mussels listed as either Federally–designated Endangered or Threatened. Establishing the status of mussel communities, abundances, densities, distributions, and habitats provides historical

data that can be used as a comparative baseline for future studies and as a tool to inform management decisions. Protocols used allow for detection of changes in freshwater environments and how changes affect other ecologically significant species and the entire system. Habitat measures are collected, highlighting the close linkage of water quality, depth, and flow to the abundance and distribution of mussels. Coverage of most of Florida's rivers is a long–term goal of this project. Larval mussels are parasites of freshwater fish, attaching to the gills and fins. This allows mussels to be carried into new habitats and provides nutrients for growing juveniles. Some species are generalists, and parasitize many fish species, whereas some are specialists, and require one or two fish species to reproduce. As a result, fish communities and abundances are important for the reproduction of mussels. Reproductive strategies and life history details for most species are largely unknown. In FY 2017–18, FWC performed 184 surveys across 7 major river basins (Exhibit 20). Habitat parameters were assessed at 73 of these sites. General databases have been created and updated to collect life history data, museum specimen data, and collection data. A specimen reference collection has been maintained at the Gainesville FWC location and another collection has been created at the Garcon Point Aquatic Research Center containing over half of the Florida species. Temperature loggers have been set in most major river basins to collect temperature readings every 2 hours. FWC will provide data for Species Status Assessments and 5–year reviews regarding listed freshwater mussels.

CHOCTAW BEAN – The Choctaw bean (Federally–designated Endangered) is found within the Escambia, Yellow, and Choctawhatchee River basins. This species prefers large creeks and rivers with slow to moderate current and is relatively small, only reaching 1.7 inches in Florida Rivers. This species reaches maturity at 1 to three years and has a life span ranging from 8–30 years. Fish hosts for this mussel are currently unknown, but it is believed to be a host specialist due to known hosts for closely related species. The Choctaw bean holds larvae from late summer to the following spring, when they are released onto a host fish. The Choctaw bean is extant in its current range in Florida but is considered uncommon. Habitat deterioration and poor water quality resulting from sedimentation and environmental contaminants have extirpated this species from portions of its historical range. During FY 2017–18, FWC performed surveys within the range of the Choctaw bean (Exhibit 20). Larval brooding was checked in all individuals collected. Only three were found to be gravid. Future directions include more comprehensive surveys in the Yellow River, as well as the lower reaches of the Choctawhatchee River. Host determination as well as understanding other life history characteristics would inform management decisions concerning this species.

FAT THREERIDGE – The fat threeridge (Federally–designated Endangered) is only found in the Apalachicola and Chipola Rivers in Florida. Currently, this species is present throughout its native range

and abundant in the middle and lower reaches of the Apalachicola River and the lower reaches of the Chipola River. This species prefers large rivers and floodplain distributaries with slow to moderate flow. The fat threeridge can reach a size of 4.5 inches, reaches maturity at three years, and has a life span of over 25 years. This species broods its larvae from early May to June, when water warms to above 75°F. This mussel is a generalist and parasitizes five species of fish, including 3 sunfish species. Preferred habitat includes banks and side channels that are often impacted by flow regimes, exposing these mussels during periods of low flow and resulting in large population declines. Population estimates performed by USFWS have estimated ~8.8 million individuals within the Apalachicola basin. During FY 2017–2018, FWC performed surveys within the species range (Exhibit 20). Although recent studies have found reproduction to be strong in all populations, no brooding individuals were located. This was most likely caused by the time of year the surveys were completed. The program is continuing regular sampling of the Apalachicola and Chipola Rivers as an objective of the Long–Term Monitoring program to continually gather data on population sizes and dynamics of this species.

FUZZY PIGTOE – The fuzzy pigtoe (Federally–designated Endangered) was described from the Escambia River in 1898, and is currently found within the Escambia, Yellow, and Choctawhatchee River basins. This bivalve reaches sizes of 2.4 inches in Florida, reaches maturity at three years, and has an estimated life span of over 25 years. It prefers medium sized creeks and rivers with slow to moderate flow. The fuzzy pigtoe broods its larvae from mid–March to May/June, although FWC has observed brooding individuals in July and August. This mussel is a host specialist and can likely only parasitize the blacktail shiner. This mussel is considered uncommon throughout its native range, except in the Yellow River where it is considered rare. During FY 2017–2018, FWC performed surveys within the species' native range (Exhibit 20). Future directions include more comprehensive surveys in the Yellow River, as well as the lower reaches of the Choctawhatchee River. The program is continuing regular sampling of the native range of this species as an objective of the Long–Term Monitoring program to continually gather data on population sizes and dynamics of this species.

GULF MOCCASINSHELL – The gulf moccasinshell (Federally–designated Endangered) is found in upper tributaries of the Chipola River and Econfina Creek. Currently, this species' distribution in Florida is only within the upper Chipola River and its small tributaries as well as Econfina Creek, but it is considered uncommon. This mussel reaches a size of 2 inches, reaches maturity at 1 to 3 years of age, and has a life span of 8–30 years. It prefers small creeks and rivers with slow to moderate currents. The gulf moccasinshell broods its larvae from March to late summer or early fall. However, data suggests there may be a longer brooding period. This species is considered a host specialist parasitizing only three species of darters. Fossils have been found within the main stem of Apalachicola, suggesting it was once

common in large river systems before the implementation of channel maintenance activities associated with Jim Woodruff Lock and Dam. In FY 2017–18, FWC performed surveys in the range of this species (Exhibit 20). Of the six females found, none were brooding larvae. The program is continuing regular sampling of the Apalachicola and Chipola Rivers as an objective of the Long–Term Monitoring program to continually gather data on population sizes and dynamics of this species. Considering this species' preference for small creeks, canoe protocols have been implemented to allow access to smaller tributaries and locate possible remote populations.

NARROW PIGTOE – The narrow pigtoe (Federally–designated Threatened) is found in the Escambia and Yellow rivers. This bivalve reaches 2.9 inches in Florida, reaches maturity at three years of age, and has an estimated life span of over 25 years. It prefers large creeks with slow to moderately fast current. The narrow pigtoe broods its larvae from mid–March to May/June although FWC has observed brooding in July. The host fish include several species of minnows, but the blacktail shiner is the primary host species. Narrow pigtoe occurrence within the Florida portions of the Escambia and Yellow rivers is considered sporadic and at most localities, uncommon; however, it can be locally abundant in the right habitat. In FY 2017–18, FWC performed surveys within the species' range (Exhibit 20). While none of the Yellow River specimens were brooding larvae, there were 10 brooding specimens collected from the Escambia River. Future directions include more comprehensive surveys in the Yellow River. The program is continuing regular sampling of the native range of this species as an objective of the Long–Term Monitoring program to continually gather data on population sizes and dynamics.

OCHOLOCKONEE MOCCASINSHELL – The Ocholockonee moccasinshell (Federally–designated Endangered) is restricted to the Ocholockonee River in Florida. This bivalve reaches sizes of 2.2 inches, reaches maturity at 1–3 years of age, and has a life span of 8–30 years. It prefers large creeks to rivers with slow to moderate current and stable sand mixed with gravel. The Ocholockonee moccasinshell has been found to brood larvae from January to March, although it has been observed brooding by FWC in October. The host fish for this species is unknown. Other species in the genus are host specialists that parasitize darter species. This mussel has been considered extremely rare for decades. This species is historically known from nine sites upstream of Lake Talquin, but habitat degradation due to sedimentation has resulted in large population declines, if not extirpation from upstream reaches. Until 2014, there had not been a specimen of this species collected since 1995. FWC discovered a population of Ocholockonee moccasinshell in a 11.2–mile reach of the Ocholockonee River downstream of Jackson Bluff Dam. This discovery confirmed that the species still exists in the Ocholockonee River and extended it's known range by close to 62 river miles. In FY 2017–2018, FWC surveyed the Ocholockonee River (Exhibit 20). Of the four females collected, two were reported to be brooding in

October. FWC plans to continue regular sampling of the Ocholockonee River, focusing on under sampled lower reaches where the novel population was discovered. Host determination as well as understanding other life history characteristics would inform management decisions concerning this species.

OVAL PIGTOE – The oval pigtoe (Federally–designated Endangered) reaches 1.9 inches in size, reaches maturity at three years of age, and has an estimated life span of 25 years. It prefers creeks and rivers with slow to moderate current. It has been found to brood larvae from March to July, although it has been observed brooding in January by USGS. This species is considered a host specialist and parasitizes sailfin shiners and eastern mosquitofish. Historically, oval pigtoes were found in the main stream of the Apalachicola, Ocholockonee, and Suwannee Rivers. Current occurrence in Florida has been restricted to specific reaches of Econfina Creek, Chipola River and its tributaries, and the Santa Fe, New, and Suwannee Rivers in the Suwannee drainage. It is considered uncommon and is becoming increasingly rare. It has not been found in Ocholockonee River in decades. In FY 2017–18, FWC performed surveys in the historical range of the species (Exhibit 20). There were 24 individuals observed brooding larvae in May, June, and August. Future directions include surveys covering Econfina Creek, as well as continuing regular sampling of the native range of this species as an objective of the Long–Term Monitoring program to continually gather data on population sizes and dynamics of this species.

PURPLE BANKCLIMBER – The purple bankclimber (Federally–designated Threatened) is found in the Apalachicola, Lower Chipola, and Ocholockonee River basins in Florida. This bivalve reaches 8.5 inches and prefers medium and large rivers with moderate to fast current. An age study by USFWS found individuals 3.1 and 7.2 inches in length to be 3 and 15 years of age, respectively. The purple bankclimber broods larvae from late February to April, although brooding has been observed in May by FWC. This species only parasitizes two fish species in Florida, the gulf sturgeon and the blackbanded darter. This is the first record of a federally protected species parasitizing and depending on another federally protected species. Fossils have been found at Troy Spring in the Suwannee River basin and in archaeological material collected from the Apalachicola River, suggesting a more widespread historical distribution, as well as the use of this species as food by Native Americans. Today, the purple bankclimber occurs within its Florida range, but is considered uncommon at most localities. There has been little evidence of reproduction within the Ocholockonee River. In FY 2017–18, FWC surveyed the Ocholockonee River (Exhibit 20). None of collected individuals were observed to be brooding larvae, consistent with current concerns that reproduction is being impeded in the Ocholockonee River. FWC plans to continue regular sampling of the Ocholockonee River, focusing on under sampled lower reaches.

ROUND EBONYSHELL – The round ebonyshell (Federally–designated Endangered) is restricted to the

Escambia River basin in Florida. This mussel reaches sizes of 3 inches and occurs in rivers with slow to moderate current. The round ebonyshell broods larvae from April to August. The fish host is currently unknown but is hypothesized to parasitize migratory shad species. The round ebonyshell is the only mussel species endemic to the Escambia River in Florida. Currently, this species occurs within its range but is considered extremely rare. In FY 2017–18, FWC performed surveys in the Escambia River and did not locate any new individuals of this species (Exhibit 20). Two specimens had been located 2016 and were tagged and transplanted from Mystic Springs to Molino. FWC returned in May 2018 to see if either of these specimens were brooding larvae for potential future propagation studies. One of the two individuals was deceased and the other was returned as no larval brooding was observed. The life history characteristics and preferred habitat of this species require unique sampling protocols for detection. Of the specimens located, all were among thick beds of elephantear mussels. Future directions include SCUBA surveys of the Escambia River as well as continuing regular sampling of the native range of this species as an objective of the Long–Term Monitoring Program.

SOUTHERN KIDNEYSHELL – The southern kidneyshell (Federally–designated Endangered) is restricted to the Choctawhatchee River basin in Florida. This bivalve is typically 2.2 inches in size, reaches maturity at three years of age, and has a life span of 25 years. This species inhabits large creeks and rivers with slow to moderate current. The southern kidneyshell broods larvae from September to May. The fish hosts are blackbanded darter, brown darter, and swamp darter. There has only been one recent collection of this species in Florida, from Holmes Creek in the Choctawhatchee River basin, where it is exceedingly rare. Silt and sand being transported from Alabama by the Pea and Choctawhatchee Rivers has most likely contributed to the decline of this species. In FY 2017–18, FWC performed surveys in the Choctawhatchee River basin, but did not locate any specimens of the southern kidneyshell (Exhibit 20). The program plans to continue regular sampling of the Choctawhatchee River basin and provide coverage for under sampled lower reaches, possibly utilizing newly set canoe protocols to locate remote populations in tributaries of the Choctawhatchee.

SHINYRAYED POCKETBOOK – The shinyrayed pocketbook (Federally–designated Endangered) is found in Econfina Creek, Apalachicola, Chipola, and Ocholockonee River basins in Florida. This bivalve is typically 3.3 inches in size, reaches maturity at 1–3 years of age, and has a life span of 8–30 years. It inhabits medium creeks and rivers with slow to moderate current. The shinyrayed pocketbook broods larvae from December to August. It parasitizes spotted bass and largemouth bass. The shinyrayed pocketbook still exists in its native range in small, isolated populations within the Chipola River and Econfina Creek. It has not been detected in the Ocholockonee River in over 20 years. Fossil evidence suggests it was present throughout the Apalachicola River prior to channel entrenchment following the

construction of Jim Woodruff Lock and Dam. In FY 2017–18, FWC performed surveys within the range of the species (Exhibit 20). Larval brooding was observed in 39 specimens from 15 sites. FWC plans to continue regular sampling of drainages in the range of this species including the Ocholockonee River, focusing on under sampled lower reaches.

SOUTHERN SANDSHELL – The southern sandshell (Federally–designated Endangered) is restricted to the Yellow and Choctawhatchee River basins in Florida. This bivalve is typically 3.3 inches in size, reaches maturity at 1–3 years of age, and has a life span of 8–30 years. This species inhabits medium creeks and rivers with slow to moderate current. The southern sandshell reportedly broods larvae from May to early August, although FWC has observed brooding individuals in April, as well as September to November. The fish host is currently unknown, but this species probably utilizes bass species to reproduce similar to the shinyrayed pocketbook. The southern sandshell does not occur in the Escambia River in Florida but has been reported from upstream tributaries. It is possible that its historical range included the Escambia River basin. This species can be found in small, isolated populations throughout its Florida range and is considered uncommon. In FY 2017–2018, FWC performed surveys in the Yellow and Choctawhatchee River basins (Exhibit 20). The records from Big Creek represent a new locality. Seven mussels were observed brooding larvae. FWC plans to continue regular sampling of both river basins in which this mussel is found and provide coverage for under sampled lower reaches of the Choctawhatchee River and better coverage for the Yellow River system.

SUWANNEE MOCCASINSHELL – The Suwannee moccasinshell (Federally–designated Threatened) is restricted to the Suwannee River basin in Florida. This bivalve is typically 2.1 inches in size, reaches maturity at 1–3 years of age, and has a life span of 8–30 years. It inhabits small creeks and rivers with slow to moderate current. The Suwannee moccasinshell reportedly broods larvae from January to March, although FWC has observed brooding individuals in April and USGS has observed brooding in October and December. The primary fish host is the blackbanded darter and the secondary host is brown darter. This species is extremely rare and endemic to the Suwannee River basin. Prior to 2012, there was a 16–year period in which no individuals were found. Three live individuals were found in 2012 and USFWS began the process of listing this species. In FY 2017–18, FWC performed surveys in the Suwannee River basin (Exhibit 20). One individual was observed to be brooding larvae. FWC plans to continue regular sampling of the Suwannee River basin to continue the Long–Term Monitoring Program.

TAPERED PIGTOE – The tapered pigtoe (Federally–designated Threatened) is restricted to the Choctawhatchee River basin in Florida. It reaches 3.1 inches in size, reaches maturity at 3 years of age, has a life span of 25 years, and inhabits medium to large creeks and rivers with slow to

moderate current. This species broods larvae from March to June. It is considered a minnow specialist and likely only parasitizes the blacktail shiner. This species is considered uncommon throughout its range. In FY 2017–18, FWC surveyed the Choctawhatchee River basin (Exhibit 20). None of the collected mussels were brooding larvae. FWC plans to continue regular sampling of the Choctawhatchee River basin to continue the Long–Term Monitoring Program.

Exhibit 21. Freshwater Mussel Surveys Conducted During FY 2017–18. Number of Surveys at Each Basin is in Parentheses and Dashes Indicate No Occurrence.

Species	Apalachicola (60)	Choctawhatchee (17)	Escambia (19)	Kissimmee–Oke (4)	Ocholockonee (30)	Suwannee (34)	Yellow (20)
Choctaw Bean	–	4	26	–	–	–	4
Fat Threeridge	802	–	–	–	–	–	–
Fuzzy pigtoe	–	2	42	–	–	–	0
Gulf Moccasinshell	8	–	–	–	–	–	–
Narrow pigtoe	–	–	135	–	–	–	3
Ocholockonee Moccasinshell	–	–	–	–	7	–	–
Oval Pigtoe	198	–	–	–	0	0	–
Purple Bankclimber	N/A	–	–	–	24	–	–
Round Ebonyshell	–	–	0	–	–	–	–
Shinyrayed Pocketbook	125	–	–	–	0	–	–
Southern Sandshell	–	17	0	–	–	–	19
Southern Kidneyshell	–	0	–	–	–	–	–
Suwanee Moccasinshell	–	–	–	–	–	4	–
Tapered Pigtoe	–	12	–	–	–	–	–

Miami Tiger Beetle

The Miami Tiger Beetle was feared to be extinct until its recent rediscovery in 2007. In 2016, it was federally–listed as Endangered by USFWS. These beetles are only known from sandy pockets within critically rare pine rockland habitats in Miami–Dade County. Beginning in 2015, FWC with staff from

Miami–Dade County Parks, Recreation, and Open Spaces began surveying for the Miami tiger beetle at known and potential sites throughout South Florida to better understand its distribution, status, and life history. As of June 2018, 18 pine rockland sites have been surveyed multiple times, but beetles have only been detected at four of these, all within the Richmond Pine Rockland. In addition, three of the four inhabited sites share a property boundary and thus likely represent a single population. The beetles are currently known to inhabit a total area of less than 7.5 acres in the state.

OTHER WORK

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 (WCPR). The program integrates conservation planning, Population Viability Analysis results, and geospatial analytical techniques to model potential habitat on FWC–lead areas. Using this information, FWC determines where focal species conservation can be affected on each WMA/WEA. FWC integrates the outcome of the landscape level assessment with area–specific and expert knowledge to produce species management strategies. Strategies are unique to each WMA/WEA and outline the role of the area(s) in 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. As every FWC–lead WMA has received a WCPR Strategy, the Program has assessed its outreach efforts and concluded that it should update assessments and prioritizations on WMAs at approximately 10–year intervals. Hence, WCPR will restart the workshop and strategy cycle within the next two years. WCPR will continue to assess the changing needs of wildlife at the statewide level. FWC plans to update Strategies on a regular basis in conjunction with required updates to each area's management plan

Coordination and Assistance

Listed species coordination in FY 2017 – 18 included overseeing, monitoring, facilitating, and otherwise organizing activities associated with listed species. It also included ensuring adherence to federal and state reporting and documentation requirements and guidelines; implementing or facilitating protection through coordination of assistance, regulatory measures, and permit review; providing or facilitating consultation and assistance to private interests; and interacting with state and federal agencies, conservation organizations, and others regarding a wide range of listed species matters. Assistance on

listed species was provided to state and federal agencies, environmental-related consulting firms, private individuals, and local authorities through telephone calls, emails, written correspondence, and agency commenting. USFWS and NOAA – Fisheries jointly provided funding for coordination on federally listed or petitioned species through Section 6 of the Federal ESA of 1973. Section 6 provides funding to States and Territories with cooperative agreements, for species and habitat conservation actions on non-federal lands. Section 6 Cooperative Agreements with USFWS and NOAA Fisheries were administered, including emergency handling reports, preparing and executing Section 6 grants, and developing the renewal packets for the Cooperative Agreements. State funding was provided through Florida's Nongame Wildlife Trust Fund and the Florida Panther Research and Management Trust Fund. FWC's Listed Species Website, http://myfwc.com/wildlifehabitats/imperiled/, includes copies of previous legislative reports, the current list of listed species, information on listed species permits, and listed species management plans.

LANDOWNER ASSISTANCE PROGRAM – In cooperation with USFWS, Florida's Landowner Assistant Program (LAP) promotes stewardship on private lands while also playing a fundamental role in the conservation of listed species. 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 for the benefit of listed species. LAP's emphasis is on priority habitats located primarily in focal areas, thus ensuring that federal dollars are being targeted in the most efficient and equitable manner to properties with the greatest potential benefits for listed species.

In FY 2017–18, LAP assisted over 675 private landowners, including providing written evaluations of effects from proposed agricultural practices to listed species on 67 projects. Many of the landowners also received financial assistance through state or federal cost–share or easement programs, such as the U.S. Farm Bill and USFWS Partners for Fish and Wildlife Programs. LAP worked with the U.S. Department of Agriculture's Natural Resources Conservation Service, USFWS, FDACS, UF's Institute of Food and Agriculture Sciences, FNAI, and various other conservation organizations, to assist Florida's private landowners. While private landowners represent the majority assisted by LAP in FY 2017–18, 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 for their conservation lands. In total, LAP biologists delivered 1,745 assists to 725 landowners on 109,987 acres. For more information, please visit 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 threatened and endangered species. Population trend analyses were performed, species occurrences were estimated, human–animal interactions were examined, monitoring plans were prepared, and long-term monitoring databases were developed for the species listed below.

- American alligator *Alligator mississippiensis*
- American oystercatcher *Haematopus palliates*
- Black rail *Laterallus jamaicensis*
- Black skimmer *Rynchops niger*
- Chipola slabshell *Elliptio chipolaensis*
- Elkhorn coral *Acropora palmate*
- Fat threeridge *Amblema neislerii*
- Florida black bear *Ursus americanus floridanus*
- Florida bonneted bat *Eumpos floridanus*
- Florida burrowing owl *Athene cunicularia*
- Florida grasshopper sparrow *Ammodramus syannarum floridanus*
- Florida panther *Puma concolor coryi*
- Florida manatee *Trichechus manatus latirostris*
- Florida sandhill crane *Grus canadensis pratensis*
- Florida scrub-jay *Aphelocoma coerulescens*
- Florida scrub lizard *Sceloporus woodi*
- Fuzzy pigtoe *Pleurobema strodeanum*
- Gopher frog *Rana capito aesopus*
- Gopher tortoise *Gopherus polyphemus*
- Gray bat *Myotis grisescens*
- Green sea turtle *Chelonia mydas*
- Gulf moccasinshell *Medionidus penicillatus*
- Gulf sturgeon *Acipenser oxyrhynchus desotoi*
- Harlequin darter *Etheostoma histrio*
- Hawksbill sea turtle *Eretmochelys imbricata*
- Kemp's ridley sea turtle *Lepidochelys kempi*

- Least tern *Sternula antillarum*
- Leatherback sea turtle *Dermochelys coriacea*
- Little blue heron *Egretta caerulea*
- Loggerhead sea turtle *Caretta caretta*
- Ocholockonee moccasinshell *Medionidus simpsonianus*
- Osprey *Pandion haliaetus*
- Oval pigtoe *Pleurobema pyriforme*
- Piping plover *Charadrius melodus*
- Pine barrens treefrog *Hyla andersonii*
- Purple bankclimber *Elliptoideus sloatianus*
- Reddish egret *Egretta rufescens*
- Roseate spoonbill *Ajaja ajaja*
- Smalltooth sawfish *Pristis pectinata*
- Snowy plover *Charadrius alexandrinus*
- Southern kidneyshell *Ptychobranchus jonesi*
- Southern sandshell *Hamiota australis*
- Suwannee moccasinshell *Medionidus walkeri*
- Tricolored heron *Egretta tricolor*
- White–crowned pigeon *Patagioenas leucocephala*
- Wood stork *Mycteria americana*
- Worthington's marsh wren *Cistothorus palustris*

REVIEWS AND ASSISTANCE FOR TRANSPORTATION PROJECTS – FWC performed 114 reviews of highway projects in FY 2017–18, which included projects reviewed through the Florida Department of Transportation's Efficient Transportation Decision Making Process and assistance letters outside the Process, including 58 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 Florida black bear and Florida panther wildlife underpasses, wildlife 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. This assistance was designed to reduce the adverse effects of specific highway projects on listed species.

LAND USE PLANNING ACTIVITIES – FWC provided a review of 1,227 projects and provided written assistance on 465 of those projects for public and private land and water use planning activities that had the potential to impact listed species and their habitats during FY 2017–18. 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 10–year plan reviews. The content of consultations was based on established best management practices, species management guidelines, and GIS analysis. In addition, FWC contributed to the development of comprehensive habitat–based management plans and coordinated landscape–level planning with local, state, and federal agencies to provide benefits to species and habitats of greatest conservation need.

Critical Wildlife Areas

Critical Wildlife Areas (CWAs) are established by the Commission under rule 68A–14.001 and 68A–19.005 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 for when areas may be posted as closed to entry are approved by the Commissioners 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 the wildlife populations using those areas each year. Management and monitoring activities are conducted with the participation of FWC and multiple partners including other state agencies, local governments, and nongovernmental organizations. In December 2017, the Commission approved an updated proposal for establishment of the Port Orange CWA (Volusia County), bringing the total to 32 CWAs. In FY 2017–18, in–water markers were installed at 10 CWAs. These are CWAs that were newly established or re–established with modified buffers or closure seasons in the previous fiscal year. Staff from the Species Conservation Planning (SCP) Section in the Division of Habitat and Species Conservation and the Boating and Waterways Section in the Division of Law Enforcement (DLE) continue to work on permits and contracts for five additional CWAs, with work expected to be completed by the end of 2018. Financial support for these markers was provided by the Fish & Wildlife Foundation of Florida, Inc. through the Conserve Wildlife Tag grant program. In site–specific CWA educational signs and handouts to improve awareness of local beachgoers, paddlers, boaters, and others recreating in areas near CWAs. Examples include new brochures about the

Withlacoochee Caves, handouts for boaters in Collier County (Rookery Islands, ABC Islands, Big Macro Pass, Caxambas Pass and Second Chance CWAs) and Volusia County (Port Orange CWA), and educational signs at beaches with portions designated as CWAs. Other outreach efforts included four news releases about new in–water marker installations at CWAs in Franklin, Brevard, Lee, and Hillsborough–Manatee–Sarasota Counties. Staff participated in a successful Facebook Live event at Stick Marsh CWA (Brevard County) to highlight the importance of the site for nesting wading birds, contributed short articles about CWAs to two newsletters (Into the Weeds by SCP Section, and Living on the Edge by the Coastal Wildlife Conservation Initiative), and participated in interviews for two featured articles about the CWA program, one in Florida Sportsmen magazine and the other in the Port Orange Observer.

Following Hurricane Irma in September 2017 and Tropical Storm Alberto in June 2018, staff worked to assess impacts at every CWA, remove marine debris, and repair any damaged or missing signs. Two previously submerged CWAs, Caxambas Pass (Collier County) and Pelican Shoal (Monroe County), re–emerged following storms while Second Chance CWA (Collier County) suffered severe erosion and loss of habitat. All CWAs were monitored for use in FY 2017–18 by FWC and management partners and 28 of the 32 CWAs supported federally– or state–listed imperiled species (Exhibit 23). SCP staff, in collaboration with avian researchers at FWC's FWRI, continue to evaluate and refine monitoring protocols, especially for sites supporting wading birds as these species present unique challenges due to nesting habits. Staff's objective is to determine the best monitoring protocol at each CWA for both accuracy of data collected and determination of trends over time. Staff installed nest cameras at two CWAs, Nassau Sound Islands CWA (Nassau County) and Lanark Reef CWA (Franklin County), to confirm predator impacts to state–listed beach–nesting birds and appropriate response.

SCP staff worked closely with DLE to provide information on CWAs, the importance of minimizing human disturbances, provide updates on posting status, and coordinate on patrol needs and priorities. CWA presentations were provided at two classes (July 2017 and April 2018) of new recruits at DLE Training Academy. SCP also presented information about CWAs to DLE regional and squad meetings in the Northwest, North Central, Northeast, and Southwest Regions, at the West Coast Inland Marine Patrol meeting in Sarasota County (all Marine Patrol units, including FWC, City, and County) and assisted with DLE investigations at two CWAs (Tyndall CWA in Franklin County and BC49 CWA in Brevard County). SCP and DLE continue to collaborate on a Patrol Protocol program to set targets for CWA DLE patrols, ensure ongoing communication between DLE and biological staff, and accurately capture patrol efforts. FWC continues to provide species expertise, assistance, and available management and educational materials while partnering with other groups. CWAs are proven to be an important and effective conservation tool for many species and their habitats. This project is expected to be an ongoing priority for FWC.

Exhibit 22. Critical Wildlife Areas (CWAs) in Florida in FY 2017 – 18. Imperiled Breeding Species Are Bolded.

CWA (Managed acres)	County	Closure Period	Breeding Species	Status [a]
NORTHWEST REGION				
Tyndall [b] (200)	Bay	Year–round	**Least tern, snowy plover**, Wilson's plover, willet	**22**, **26**, 19, 13 nests
Flag Island [b] (80)	Franklin	Year–round	**Black skimmer, American oystercatcher**, brown pelican, Caspian tern, gull–billed tern, royal tern, sandwich tern, laughing gull	**261**, **4**, 57,71, 21, 1034, 208 34, nests
St. George Causeway (32)	Franklin	Mar 1 – Sept 30	**American oystercatcher**, brown pelican, Caspian tern, royal tern, sandwich tern, sooty tern, laughing gull	**3**, 780, 1, 385, 92, 1, 336, nests
Lanark Reef [b] (65)	Franklin	Year–round	**Black skimmer**, **American oystercatcher**, brown pelican, gull–billed tern, laughing gull, willet	**12**, **9**, 234, 7, 153, 1 nests
Alligator Point (66)	Franklin	Feb 15 – Aug 31	**Least tern**, **American oystercatcher**, **snowy plover**, Wilson's plover, willet	**6**, **3**, **1**, 7, 1 nests
NORTH CENTRAL REGION				
Amelia Island (250)	Nassau	Mar 1 – Sept 1	**Least tern**, Wilson's plover, willet	**41**, 18, 2 nests
Nassau Sound Islands [b] (18)	Duval	Year–round	**Black skimmer**, **least tern**, **American oystercatcher**, gull–billed tern, Wilson's plover, willet	**4**, **53**, **3**, 3, 2, 2 nests
Fort George Inlet (82)	Duval	May 1 – Aug 31	**American oystercatcher**, brown pelican, royal tern, sandwich tern, laughing gull, Wilson's plover	**7**, 44, 1380, 2, 2263, 11 nests
Withlacoochee Caves (3)	Citrus	Apr 15 – Aug 15, Dec 15 – Mar 15	Southeastern myotis, tricolored heron	66, 0 (individuals); 43, 42 (wintering individuals)
NORTHEAST REGION				
Port Orange (4)	Volusia	Jan 1 – Aug 31	**American oystercatcher**, brown pelican, great egret, double–crested cormorant	**1**, 109, 76, 5 nests
Matanzas Inlet (28)	St. Johns	Apr 1 – Aug 15	Wilson's plover	1 nest
BC49 (6)	Brevard	Jan 1 – Aug 31	**Wood stork**, **roseate spoonbill**, **tricolored heron**, brown pelican, great blue heron, great egret, snowy egret, cattle egret, white ibis, black–crowned night heron, double–crested cormorant	**96**, **6**, **11**, 23, 4, 14, 1, 69, 63, 1, 6, 16 nests
Stick Marsh (2)	Brevard	Jan 1 – Jul 31	**Roseate spoonbill**, **little blue heron**, **tricolored heron**, great heron, snowy egret, anhinga	**188**, **1**, **26**, 157, 48, 28 nests
SOUTHWEST REGION				
Alafia Banks (93)	Hillsborough	Year–round	**Roseate spoonbill**, **reddish egret**, **little blue heron**, **tricolored heron**, **American oystercatcher**¸ brown pelican, great blue heron, great egret, snowy egret, cattle egret, white ibis, glossy ibis, black–crowned night heron, yellow–colored night heron, double–crested cormorant	**145**, **3**, **5**, **55**, **3**, 326, 30, 40, 25, 15, 1200, 110, 40, 15, 100 nests
Dot Dash Dit (5)	Manatee	Jan 1 – Aug 31	**Wood stork**, **roseate spoonbill**, **tricolored heron**, great blue heron, great egret, snowy egret, cattle egret, black–crowned night heron, anhinga	**151**, **18**, **10**, 33, 50, 30, 90, 4, 4, 18 nests
Roberts Bay (5)	Sarasota	Year–round	**Roseate spoonbill**, **reddish egret**, **little blue heron**, **tricolored heron**, brown pelican, great blue heron, great egret, snowy egret, black–crowned night heron, anhinga, double–crested cormorant	**6**, **1**, **1**, **10**, 67, 29, 150, 6, 4, 10, 121 nests

Exhibit 22 (*continued*). Critical Wildlife Areas (CWAs) in Florida in FY 2017 – 18. Imperiled Breeding Species Are Bolded.

CWA (Managed acres)	County	Closure Period	Breeding Species	Status [a]
SOUTHWEST REGION				
Myakka River (1)	Sarasota	Jan 1 – Aug 31	**Wood stork**, great blue heron, great egret, snowy egret, black–crowned nigh heron, anhinga	**90**, 3, 35, 1, 1, 9 nests
Broken Islands (31)	Lee	Mar 1 – Aug 31	**Reddish egret**, **little blue heron**, **tricolored heron**, brown pelican, great blue heron, snowy egret, cattle egret, white ibis, green heron, anhinga, double–crested cormorant	**2**, **1**, **16**, 91, 2, 2, 3, 27, 2, 3, 110 nests
Hemp Key (10)	Lee	Year–round	**Tricolored heron**, brown pelican, great blue heron, great egret, black–crowned night heron, yellow–colored night heron, double–crested cormorant	**1**, 94, 12, 18, 1, 1, 132 nests
Matanzas Pass Island (4)	Lee	Year–round	**Reddish egret**, **little blue heron**, **tricolored heron**, brown pelican, great blue heron, great egret, snowy egret, cattle egret, double–crested cormorant	**4**, **6**, **21**, 77, 12, 19, 21, 3, 7, 21 nests
Coconut Point (4)	Lee	Year–round	**Reddish egret**, **tricolored heron**, brown pelican, great blue heron, great egret, snowy egret, black–crowned nigh heron, anhinga, double–crested cormorant	**1**, **1**, 16, 1, 21, 5, 2, 1, 22 nests
Big Carlos Pass (2)	Lee	Year–round	**Reddish egret**, **tricolored heron**, brown pelican, great blue heron, great egret, snowy egret, cattle egret, black–crowned night heron, double–crested cormorant	**2**, **5**, 52, 2, 51, 5, 1, 10, 11 nests
Little Estero Island (6)	Lee	Apr 1 – Aug 31	**Least tern**, Wilson's plover	**16**, 12 nests
SOUTH REGION				
Bird Island (8)	Martin	Year–round	**Wood stork**, **roseate spoonbill**, **tricolored heron**, **American oystercatcher**, brown pelican, great egret, snowy egret, double–crested cormorant	**123**, **6**, **1**, **1**, 41, 47, 8, 9 nests
Deerfield Island (56)	Broward	Year–round	**Gopher tortoise**	**22** individuals
Bill Sadowski [b] (700)	Dade	Year–round	Supports foraging and roosting shorebirds and wading birds	~ 1000 individuals
Rookery Islands (1)	Collier	Year–round	Great egret	2 nests
Caxambas Pass (1)	Collier	Apr 1 – Aug 31	**Least tern**, **black skimmer**	**57**, **77** nests
Big Marco Pass [b] (30)	Collier	Year–round	**Least tern**, **black skimmer**, Wilson's plover	**296**, **544**, 9 nests
ABC Islands (75)	Collier	Year–round	**Reddish egret¸ little blue heron**, **tricolored heron**, brown pelican, great blue heron, great egret, snowy egret, cattle egret, anhinga, double–crested cormorant	**4**, **1**, **13**, 91, 10, 63, 13, 2, 4, 37 nests
Second Chance (3)	Collier	Mar 1 – Aug 31	**Least tern**, **black skimmer**, Wilson's plover	**9**, **12**, 4 nests
Pelican Shoal (1)	Monroe	Apr 1 – Aug 31	Site has re–emerged, but no nesting	N/A

a Count or estimate of peak number of nests per breeding species at each site during the closure period of FY 2017 – 18.
[b] 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 enforcement activities to protect specific listed species in FY 2017 – 18, which include:

- Regular patrols of the Florida Panther reduced speed zones. Officers statewide documented over 8000 patrol hours to the protection of the Panther and its prey species 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 sea turtle nesting areas to reduce nest destruction and egg removal;
- Patrol efforts directed toward enforcement of specific gear requirements (i.e. Turtle Excluder Device (TED)) to protect sea turtles from becoming trapped in shrimp trawl nets. A total of 440 vessel patrol hours were focused on TED enforcement resulting in 110 inspections and 46 documented violations;
- Patrol efforts targeting coastal nesting areas of protected shorebirds 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 zone to prevent manatee vessel strikes and manatee harassment; more than 71,200 water patrol hours were dedicated to manatee enforcement, resulting in 2,864 citations and 1,259 warnings;
- In addition, 38 citations and 91 warnings were issued separate from manatee citations, involving Endangered species, Threatened species, and Species of Special Concern;
- Continued partnering with other governmental agencies and citizen groups to work though issues concerning the Florida panther in southwest Florida;
- Assisting with public awareness of gopher tortoises, Perdido Key beach mice, sea turtles, and other species; and
- Two new Port Inspection K–9 teams were added to the K–9 program bringing the total to five inspection teams working within Florida's airports and seaports. These teams are training to detect certain turtle, snake, and other potentially Endangered/Threatened species as they arrive or depart Florida's ports. The five teams totaled 298 deployments resulting in 48 citations.

Permitting

FWC provided science–based and regulatory guidance to issue permits that ensured requested wildlife related activities would result in a conservation benefit or prove not to be detrimental for involved species. In FY 2017–18, FWC provided Federal and other State agencies, environmental consultants, and regional and local regulatory authorities with guidance for projects impacting listed species 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 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 individual species management plans or guidelines; and 3) site visits to determine management needs. The public was provided information regarding 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 behavior and habitat requirements and suggestions for coexisting).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, Federal and other State agencies, and regional and local regulatory entities.

Overall, FWC provided science–based and regulatory guidance to ensure that the 193 intentional take, 169 incidental take, 15 special purpose, 6 Peregrine falconry and 1 critical wildlife area entry permits issued would either result in a conservation benefit or prove not to be detrimental for the involved species. Additional information regarding species guidelines, policies, and permit applications may be accessed at http://myfwc.com/license/wildlife/protected-wildlife/.

Coastal Wildlife Conservation Initiative

The Coastal Wildlife Conservation Initiative (CWCI) is an FWC–led, multi–partner (i.e. FDEP, USFWS, and UF's Institute of Food and Agriculture Sciences) strategy that began in May 2007. The goal is to facilitate a statewide, cooperative process providing 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 2017–18, CWCI and partners began new projects to conserve coastal wildlife, including endangered and threatened species and built upon previous years'

efforts. One new project is a 3–year study comparing the ecological benefits of four different shoreline stabilization methods: a mangrove living shoreline, an oyster shell living shoreline, a modification to an existing seawall resembling mangrove prop roots, and the existing standard seawall. Living shorelines are softer, greener alternatives to traditional seawalls used to stabilize shorelines from erosion, sea level rise, and other damage. The objective is to understand how wildlife, especially Species of Greatest Conservation Need, may be affected by the alteration of shorelines and evaluate the ecological benefits of different stabilization methods. Another effort was planning a pilot project to assess the effectiveness of using a mechanical macerator for fish carcass disposal as an alternative to discarding them in the water where they present a danger for seabirds and other marine wildlife. Ongoing efforts in FY 2017–18 included development of a course for marine contractors on the installation of living shorelines. The course will be ready for debut in FY 2018–19 and its development has included participation from multiple partner organizations. CWCI expanded efforts to promote leaving wrack on beaches to provide food and habitat for wildlife by completing a position paper to inform partners titled, "Maintaining wildlife value of beaches: the importance of wrack and compatible beach cleaning." CWCI also continued efforts to minimize injury from seabird entanglement with completion of an app which allows smartphone users to rapidly find a local seabird rehabilitator or transporter.

Citizen Awareness Program

Section 379.2291(5), Florida Statutes, requires FWC to provide a revised and updated plan for management and conservation of Endangered and Threatened 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 2017–18. Highlights include:

OVER 1.2 MILLION PEOPLE WERE REACHED BY AN APRIL 18, 2018 MYFWC FACEBOOK POST ANNOUNCING A REWARD FOR INFORMATION ON A GOPHER TORTOISE FOUND COVERED IN RED SPRAY PAINT AND CONCRETE. This resulted in the second highest number of views of any MyFWC Facebook post during FY 2017–18. The post was about a gopher tortoise spotted by two good Samaritans and taken to a wildlife rehabber. The public was informed it is illegal and harmful to the health of gopher tortoises to apply man–made substances to any part of their body or shell. People with information about who may have applied the paint and concrete to the tortoise were asked to call the Wildlife Alert Hotline at888–404–FWCC (3922), #FWC or *FWC on a cellphone, or text/email Tip@MyFWC.com. They were told anyone contacting Wildlife Alert can remain anonymous and may be eligible for a reward.

COLD–STUNNED SEA TURTLES MADE A BIG SPLASH. This Jan. 4, 2018 live event on MyFWC Facebook about the rescue of cold–stunned sea turtles by FWC staff and partners reached over 582,000 people, the largest audience to date for an FWC live social media event.

FLORIDANATURETRACKERS.COM IS A NEW WEBSITE GIVING PEOPLE THE OPPORTUNITY TO BECOME CITIZEN SCIENTISTS ENGAGED WITH IDENTIFYING IMPERILED SPECIES. The FloridaNatureTrackers.com website connects them with iNaturalist, where they can document and identify wildlife and plant life found throughout Florida, especially in WMAs. It won first–place in the website category at this year's Association of Conservation Information (ACI) conference in Springfield, Missouri. ACI is a non–profit organization of natural resources communicators. The Florida Nature Trackers program was created so more people can help fill the gaps on Florida's wildlife data, engage with FWC, and visit conservation areas. Citizen scientists using FloridaNatureTrackers.com have reported when and where they sighted 62 listed bird species, 10 listed mammal species, 39 listed reptile species, and nine listed amphibian species, as well as numerous listed butterflies, plants, and mollusks. Website visitors can join numerous species–related projects. Project pages focus on taxonomic categories, such as birds, mammals, reptiles and amphibians (herps), as well as WMAs. A new instructional video has been posted on how to set up a Nature Trackers project in their own backyard: https://vimeo.com/261328855. This will support the agency's new initiative, Backyards and Beyond, which aims to connect more Floridians to nature.

GOVERNOR SCOTT PROCLAIMS FLORIDA GOPHER TORTOISE DAY ON APRIL 10, 2018. Gov. Scott's proclamation extended greetings to all who observe Florida Gopher Tortoise Day. His support for this day promoting conservation and awareness of this threatened species was highlighted on the Florida Gopher Tortoise Day website, http://gophertortoisedayfl.com/ and on MyFWC Facebook, including live social media. The proclamation cites cooperation among many public and private entities, including military bases and private landowners, as vital to conserving gopher tortoises and says organizations and individuals must continue working together for the long–term survival of the gopher tortoise. His action affirms the state is a stronghold for gopher tortoise conservation among southeastern states and that it is important for Floridians to understand their role in conserving this iconic species. FWC thanked the many participants, including Gov. Scott, and the 22 local governments and organizations that also adopted proclamations recognizing Florida Gopher Tortoise Day on April 10, 2018. FWC also recognized Megan Lee, a high school senior whose hard work and dedication prompted the adoption of 16 proclamations throughout Brevard County and earned her a Girl Scout Gold Award. Gopher Tortoise Day events also were hosted at Koreshan State Park (Lee County), Gumbo Limbo Nature Center in Boca Raton, the Tallahassee Museum and Owl's Nest Sanctuary for Wildlife that serves the Tampa Bay area.

ENHANCING MANATEE OUTREACH TO STUDENTS, TEACHERS AND BOATERS. The popular Manatee Activity Workbook (geared toward grades 3–7) was updated to include more information about FWC, manatee rescues, career opportunities, and links to manatee–related web pages. FWC staff reviewed and updated content to make this publication a valuable education and outreach resource for the manatee program. Booklets continue to be distributed to teachers, environmental centers, Project WILD leaders, and various parks around Florida. Manatee awareness information also was printed on waterproof vinyl stickers and distributed to boaters. Designed for placement on boat consoles, the stickers are a reminder about what to do when boating in or near manatee habitat. Because they are both free and targeted to boaters, stickers are different than the annual produced decals. Manatee outreach staff also served as a "member–at–large" on the Community Classroom Consortium board. Board participation gets FWC involved with teachers in the community and linked with other agencies or businesses providing educational programs or events. The summer passport program provided exposure to FWC's Manatee Cultural Art Treasure Quest. The Welcome Back Teachers and Teacher Refresh events also provided exposure about Manatee Treasure Boxes, available for loan to teachers, and were instrumental in distributing information about other FWC programs related to listed species.

FIRST RELEASE OF PANTHER FAMILY BACK INTO THE WILD. A female panther and her two kittens are back in the wild, after spending months in captivity. In April 2018, the FWC panther team released the panther family in Picayune Strand State Forest (Collier County). This is the first time FWC has rescued, rehabilitated, and released a family of panthers. A press release (http://myfwc.com/news/news-releases/2018/april/12/panther-release/) and social media shared this milestone with the public. The story highlighted the work of FWC's panther biologists, and the many partners involved, in reuniting and releasing this family. FWC biologists rescued the adult female in December 2017 after she was struck by a vehicle in Naples. She was taken to the Animal Specialty Hospital of Florida, where veterinarians determined she had a broken hind leg. Following a successful surgery, FWC's panther veterinarian took the panther to White Oak Conservation Foundation for rehabilitation. Because the female had a litter in June, biologists suspected the kittens were near where their mother was injured. They set up cameras to locate the young panthers and two kittens were captured. Biologists brought the two male kittens to White Oak Conservation Foundation where they were reunited with their mother before being released.

DON'T CUT THE LINE CAMPAIGN ADDS ONLINE ACCESS TO SEABIRD REHABBERS. The Don't Cut the Line campaign focuses on how to safely unhook a seabird and provides information on how to prevent seabird entanglement. In FY 2017–18, CWCI created the Seabird Rehabilitators and Transporters tool to help someone with an injured seabird quickly find a wildlife rehabber nearby. The new web–based application

is optimized for smartphones and allows boaters, anglers, and others to find the nearest seabird rehabilitator or locate an authorized transporter to take the bird to a rehabilitator.

MEDIA RELATIONS – FWC press releases reach substantial regional and statewide audiences, with some national media reach as well (Exhibit 12). 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. Regional media receive regional-only news and information.

Exhibit 23. Number of Media Outlets Reached Through Press Releases Across FWC Regions.

MEDIA	NUMBER REACHED
Northwest Region	124
North Central Region	78
Northeast Region	146
Southwest Region	65
South Region	104
STATEWIDE TOTAL	**12,870**

During FY 2017–18, the FWC issued many press releases on Endangered and Threatened species. FWC press releases are posted online at MyFWC.com/News. Examples include:

- ✓ FWC workshop in St. Lucie County encourages local governments to conserve gopher tortoises. July 17, 2017: http://myfwc.com/news/news-releases/2017/july/17/stlucie-workshop/
- ✓ Stick on a decal to show support for Florida's manatees, sea turtles, July 19, 2017: http://myfwc.com/news/news-releases/2017/july/19/decals/
- ✓ Help hatchlings home by leaving them alone, Aug. 22, 2017: http://myfwc.com/news/news-releases/2017/august/22/hatchlings/
- ✓ Florida manatees on the move, public stewardship on the water makes a difference. Nov. 1, 2017: http://myfwc.com/news/news-releases/2017/november/?p=2&
- ✓ FWC holds public meetings on proposed conservation measures, permitting guidelines for burrowing owls, Nov. 7, 2017: http://myfwc.com/news/news-releases/2017/november/07/owl-meetings/
- ✓ Gov. Scott & FWC: Green sea turtle nest numbers hit record, Nov. 17, 2017: http://myfwc.com/news/news-releases/2017/november/17/green-turtle/
- ✓ Public invited to Tosohatchee WMA to have fun, explore Florida's 75–year legacy of conserving wildlife, Nov. 29, 2017: http://myfwc.com/news/news-releases/2017/november/29/tosohatchee-event/

- ✓ FWC approves new Critical Wildlife Area in Volusia County, Dec. 6, 2017: http://myfwc.com/news/news-releases/2017/december/06/port-orange-cwa/
- ✓ FWC endorses national strategy aimed at conserving fish, wildlife, Dec. 18, 2017: http://myfwc.com/news/news-releases/2017/december/18/recovering-america%E2%80%99s-wildlife-act/FWC monitoring sea turtles, manatees during cold weather, Jan. 3, 2018: http://myfwc.com/news/news-releases/2018/january/03/cold/
- ✓ Explore the outdoors! Tosohatchee Wildlife Management Area celebrates 75 years of Florida WMAs, Jan. 18, 2017: http://myfwc.com/news/news-releases/2018/january/18/toso-event/
- ✓ Florida scrub-jays play starring role at Feb. 3 festival. Jan. 29, 2018: http://myfwc.com/news/news-releases/2018/january/29/scrubjay-fest/
- ✓ New Critical Wildlife Area in–water markers to be installed in Lee County, Feb. 1, 2018: http://myfwc.com/news/news-releases/2018/february/01/cwa-lee/
- ✓ You're invited! More people explore nature, engage in outdoors activities at Florida WMAs, Feb. 7, 2018: http://myfwc.com/news/news-releases/2018/february/07/wma/
- ✓ FWC approves guidelines for conserving 8 imperiled species, Feb. 7, 2018: http://myfwc.com/news/news-releases/2018/february/07/imperiled-guidelines/
- ✓ FWC recognizes landowner George C. Owens for outstanding stewardship efforts, Feb. 7, 2018: http://myfwc.com/news/news-releases/2018/february/07/landowner-award/
- ✓ Report fish and wildlife sightings with FWC's new app, Feb. 19, 2018: http://myfwc.com/news/news-releases/2018/february/19/sighting-app/
- ✓ Help nesting sea turtles by keeping beaches dark and free of obstacles at night, March 1, 2018: http://myfwc.com/news/news-releases/2018/march/?p=2&
- ✓ Look out for manatees when boating, March 15, 2018: http://myfwc.com/news/news-releases/2018/march/15/manatees-boats/
- ✓ April 15 marks start of Florida's bat maternity season, March 19, 2018: http://myfwc.com/news/news-releases/2018/march/19/bat-maternity/
- ✓ Get involved! Be an FWC volunteer! April 3, 2018: http://myfwc.com/news/news-releases/2018/april/03/volunteer/
- ✓ Gopher tortoises more active in spring, just in time for Florida Gopher Tortoise Day, April 4, 2018: http://myfwc.com/news/news-releases/2018/april/04/gopher-day/
- ✓ FWC returns panther family back to the wild, April 12, 2018: http://myfwc.com/news/news-releases/2018/april/12/panther-release/
- ✓ Give nesting waterbirds space to help keep them safe, April 19 2018: http://myfwc.com/news/news-releases/2018/april/19/waterbird-cma/

- ✓ Sea turtle nesting begins in May on many beaches, May 9, 2018: http://myfwc.com/news/news-releases/2018/may/09/seaturtle-nesting/
- ✓ Critical Wildlife Area signs go up in southwest Florida, May 15, 2018: http://myfwc.com/news/news-releases/2018/may/15/cwa-sw/
- ✓ Critical Wildlife Area signs go up in Brevard County, May 15, 2018: http://myfwc.com/news/news-releases/2018/may/15/cwa-ne/

SOCIAL MEDIA – FWC's @MyFWC Facebook site reached a new peak of 154,000 "Likes" as of June 30, 2018. The FWRI Facebook site now has 45,584 "Likes." The Great Florida Birding and Wildlife Trail Facebook site also has just over 17,000 "Likes." FWC's use of social media goes beyond Facebook and all the agency's social media audiences grew during FY 2017–18. FWC uses two Twitter, two YouTube and two Flickr accounts to highlight imperiled species, so numbers were combined.

- @MyFWC Instagram hit 49,000 followers and is currently the agency's fastest growing social media platform. The Fish and Wildlife Research Institute's Instagram account now has 14,700 followers.
- @MyFWC media Flickr photo views reached 18 million
- YouTube video views reached 2.4 million
- Twitter followers grew to more than 35,000
- Instagram followers reached more than 36,000

FWC's social media is meant to be exciting as well as educational to get audiences interested and involved in stories about Florida wildlife. In FY 2017–18, several live social media events also provided opportunities for people to look and listen in real time to an event involving imperiled species. Examples of regular and live posts include:

FWC ASKS THE PUBLIC TO REPORT STRANDED MARINE MAMMALS IMMEDIATELY: DON'T PUSH THEM BACK! June 22, 2018, FWRI FACEBOOK. Keep a safe distance and call the FWC Wildlife Alert Hotline: 888–404–FWCC (3922), press "7" to speak with an operator. Stranded marine mammals can be sick or injured, pushing an animal back to sea delays and may hinder the chance for experienced rescue teams to assess and provide treatment. Marine mammals are federally protected and should not be touched or harassed and may be capable of powerful and unpredictable moves.

RESCUING AN INJURED SEABIRD/JUNE 7, 2018, FACEBOOK. How can you help a pelican or other seabird that has become entangled in fishing line, swallowed a fishing hook, or is severely injured? Now you can easily find a seabird rehabilitator to care for the bird. Presenting the new Seabird Rehabilitators and Transporters web–based tool, which lets you share your location and find the nearest rehabber or

transporter near you! Please stay with the bird until help arrives. Thank you to all the boaters, bird watchers, anglers, and others who are looking out for Florida's seabirds!

SOLVED: PAINTED GOPHER TORTISE CASE/May 18, 2018, FACEBOOK. We asked for information about who may have applied red paint and concrete to the limbs, face, and shell of a gopher tortoise rescued by good Samaritans in Montverde, Florida. This case generated a lot of support, so we want to share that an arrest has been made and multiple charges have been filed in relation to this crime. A recent update indicates that the gopher tortoise is recovering well. Thank you for your involvement! We work diligently to address wildlife violations throughout the state.

BE KIND TO NESTING SEA TURTLES/MAY 9, 2018, FACEBOOK. Sea turtles are starting to nest this month on many of our beaches. You can help by taking these sea turtle–friendly steps: Remember to turn off or shield lights to reduce disturbance to nesting and hatchling activity that happens after dark; avoid taking flash photos or using flashlights when strolling the beach at night; clear the way at the end of the day by removing chairs, toys and boats that become obstacles to the turtles' movements; and never disturb or harm sea turtles, their nests or hatchlings. Thank you for respecting and conserving our state's sea turtles!

TIP SAVES MANATEE CALF/April 10, 2018, FACEBOOK. When a family on vacation observed a little lone manatee calf in shallow water, they called our Wildlife Alert Hotline and stayed with the manatee until rescuers arrived. The very young manatee calf had not nursed in several days and was very dehydrated. Thanks to this caring family from Ohio, the male calf was rescued and is now being bottle–fed around the clock at the Miami Seaquarium. It is rare to have a manatee at this young age survive, but we hope he is on the road to growth and recovery.

TIME TO SHELL–EBRATE! APRIL 10, 2018 LIVE ON FACEBOOK. Join us LIVE as we scope a gopher tortoise burrow in celebration of Gopher Tortoise Day. Tune in to learn more about this keystone species!

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.

ABOUT 2 MILLION PEOPLE REGULARLY RECEIVE EMAILS FROM THE FWC, INCLUDING NEWS AND UPDATES ON ENDANGERED AND THREATENED SPECIES. GovDelivery, which FWC began using in 2013, lets the public sign up for emails or text messages on topics they choose. MyFWC.com visitors just click on the Sign up for FWC news updates link to get started. GovDelivery helps increase citizen awareness of listed species.

LAST YEAR, 2,139 MESSAGES – AND A TOTAL OF 132,684,811 EMAILS – WERE SENT TO MORE THAN 2 MILLION GOVDELIVERY SUBSCRIBERS. These messages averaged an engagement rate of 45%, which is the percentage of recipients who opened the bulletin or clicked on a link. There were 2,083,023 FWC GovDelivery subscribers as of June 30, 2018.

KITE TAILS NEWSLETTER HIGHLIGHTS BIRDING TRAIL SITES. The monthly *Kite Tales* newsletter, which has over 33,000 subscribers on GovDelivery, highlights Great Florida Birding and Wildlife Trail spots in each region and special stories from the field. Its goal is to inspire and encourage wildlife watchers to get out and explore some of the 510 Great Florida Birding and Wildlife Trail sites in Florida.

LIVING ON THE EDGE NEWSLETTER FOCUSES ON COASTAL COSERVATION. CWCI publishes Living on the Edge, a quarterly newsletter focusing on coastal issues, which is delivered online via GovDelivery. This past year, it covered topics relevant to endangered and threatened species, such as oyster reef habitat restoration, the Florida Beaches Habitat Conservation Plan, CWAs, efforts to recover endangered beach mice, and sea turtle friendly lighting. Newsletter readership grew to over 13,000 during FY 2017–18.

ARTICLES FEATURING FLORIDA HABITAT AND WILDLIFE, INCLUDING ENDANGERED AND THREATENED SPECIES, WERE SHARED WITH INTERESTED AUDIENCES OF ABOUT 59,000 ON GOVDELIVERY:

APALACHICOLA MAGIC, Oct. 27, 2017, featured the Apalachicola River WEA and highlighted Florida torreya and yew trees, the extinct ivory–billed woodpecker, and torreya trapdoor spider. https://admin.govdelivery.com/abe/bulletins/1215551/copy?render=edit

EXTINGUISHING FIRE FEARS, Sept. 22, 2017, featured Three Lakes and Triple N Ranch WMA and highlighted the red–cockaded woodpecker and gopher tortoise.

FAIRS, FESTIVALS AND EVENTS – FWC attends places where kids, families, retirees, and tourists are having fun to share the excitement and importance of conserving Florida wildlife, including listed species.

23rd ANNUAL MARINEQUEST ATTRACTS OVER 9,600 VISITORS. FWC's FWRI held its 23rd annual open house from October 19–21, 2017. More than 1,500 students in grades 4–8 and their teachers attended, as well over 8,100 additional visitors. Students toured lab stations managed by FWC scientists. Hands–on displays and activities drew students into the world of marine science and the fascinating things that scientists discover. Displays spotlighted listed species such as manatees, panthers, North Atlantic right whales, sea turtles, and corals. Visitors participated in the simulated rescue of a manatee.

FLORIDA PANTHER FESTIVAL HELD AT NAPLES ZOO. The Naples Zoo at Caribbean Gardens hosted the Florida Panther Festival on Nov. 4, 2017, with about 2,500 guests attending. The festival was held in conjunction with the zoo's free admission day for Collier County residents, which occurs on the first Saturday of each month. Attendees enjoyed several outdoor exhibits by area conservation partners and gained valuable information from talks about living with wildlife presented by subject matterexperts. They learned about Florida panther research and management activities from FWC panther biologists at their booth set up near "Uno," the zoo's resident Florida panther.

FLORIDA SCRUB–JAYS PLAYED STARRING ROLE AT FLORIDA SCRUB–JAY FESTIVAL. This free festival on Feb. 3, 2018 at the Lyonia Preserve in Deltona (Volusia County) offered an 8 a.m. early–bird hike and continued from 10 a.m. to 4 p.m. with eco–buggy rides, guided hikes, wildlife exhibits and presentations, and activities for kids. Florida scrub–jays, a federally threatened species, are the only bird species that lives exclusively in this state. FWC promoted the festival with a press release (http://myfwc.com/news/news-releases/2018/january/29/scrubjay-fest/) and social media.

WATERMELON POND WILDLIFE AND ENVIRONMENTAL AREA BIOBLITZ TURNS CITIZENS INTO AMATEUR SCIENTISTS. Anyone who came to this bioblitz could become a citizen–scientist by helping FWC locate and identify imperiled species. At the Sept. 23, 2017 Watermelon Pond WEA bioblitz, participants encountered gopher tortoises and several rare plants including coontie. During the 75th anniverary celebration of Florida's WMAs, bioblitzes happened around the state for the first time, guided by FWC biologists. FWC encourages participants to upload photos of the plants and animals they encounter in WMAs into the iNaturalist app, using a cellphone or other digital device. Biologists with iNaturalist identify the species – sometimes within minutes or hours, though it may take a day or longer. Sightings of Florida species are gathered on the newly created iNaturalist platform known as Florida Nature Trackers.

COASTAL WILDLIFE CONSERVATION INITIATIVE HOSTS BOOTHS AT VARIOUS EVENTS. CWCI hosted educational booths at MarineQuest, Earth Day, Sarasota Police Department's Kickoff to a Safe and Sustainable Summer, the Florida Marine Contractors Association Annual Expo, and other events. Several important coastal issues were highlighted, including marine debris, beach wrack, living shorelines, and conservation of endangered and threatened species.

PUBLICATIONS, EXHIBITS AND SIGNS – Sharing compelling stories and critical information about Florida wildlife in writing and pictures is an inviting challenge.

STICK ON A DECAL TO SHOW SUPPORT FOR FLORIDA'S MANATEES, SEA TURTLES. There are more manatees and sea turtles in Florida than in any other state. More than 6,000 manatees swim in Florida's

coastal waters, rivers, and freshwater springs and thousands of sea turtles nest and hatch on the state's Atlantic and Gulf coast beaches. It's easy to show support for these iconic Florida species by sticking on a decal. Every July, FWC introduces new manatee and sea turtle decals available with a $5 donation that generate funding for research, rescue and management efforts.

- ✓ "Look out for manatees" was the message on the FY 2017–18 manatee decal, which shows boaters in the distance as a manatee mother and calf swim along with only her back above water. When boating or using a personal watercraft in Florida waters, it is important to look out for manatees. Mature manatees grow to 1,000 pounds or more, but can be difficult to see when they're swimming, grazing or resting underwater. Wear polarized sunglasses, and then watch and listen carefully to detect the signs of manatees nearby. Look for circles on the water's surface indicating their underwater movement and snouts sticking out of the water as they surface to breathe. You may also hear huffing noises when they come up for air.
- ✓ "Helping sea turtles survive" was the message on the FY 2017–18 new sea turtle decal, which shows a green sea turtle. Green sea turtles nest on Florida's Atlantic and Gulf coast beaches and until recently were classified as endangered. After years of conservation efforts, the number of nesting green turtles has increased substantially. This species has been reclassified as threatened under the federal ESA. That is a major step in "green" recovery. Remember, "Hands off" is the best policy for beachgoers encountering any species of nesting or hatchling sea turtles. Watch from a distance, do not disturb them, and never use a cellphone or camera to shoot flash photos.

NEW DECALS PROMOTE GOPHER TORTOISE CONSERVATION. Two colorful new decals, designed by an FWC graphic artist and produced for the first time in spring 2018, encourage the public to "Keep Gopher Tortoises Wild" and "Slow Down for Gopher Tortoises." The green–bordered "Keep Gopher Tortoises Wild" includes information on the back on how to help if a gopher tortoise is encountered in the wild. The orange–bordered "Slow Down for Gopher Tortoises" has information on the back on the importance of being aware and watching for slow–moving gopher tortoises when driving and how to safely help a tortoise crossing a road. Both decals encouarge people to report injured tortoises to FWC's Wildlife Alert Hotline and to use the Florida Gopher Tortoise app to submit a photo of a tortoise encounter.

VISITORS TO SEVERAL WILDLIFE MANAGEMENT AREAS ENCOUNTER NEW MATERIALS HIGHLIGHTING SPECIES AND HOW THEY ARE BEING CONSERVED. Interpretive materials are developed for WMAs with information about the importance of each WMA to native species, including endangered and threatened species. In FY2017–18, interpretive signs were produced highlighting:

- Welcome To Crooked Lake Wildlife and Environmental Area, featuring the Florida scrub lizard.

- Welcome to the Everglades and Francis S. Taylor Wildlife Management Area, featuring the snail kite, short–tailed hawk and Florida manatee.
- Explore The Florida Trail, featuring the red–cockaded woodpecker.
- Welcome to Triple N Ranch Wildlife Management Area, featuring the gopher frog.
- Many Habitats, Many Opportunties, featuring the least tern, snowy plover, and loggerhead sea turtle.

WINGS OVER FLORIDA RECOGNIZES BIRD AND BUTTERFLY WATCHERS. 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 2017, the Wings Over Florida program awarded over 170 participants with certificates recognizing their bird and butterfly listing achievements, including their sightings of endangered and threatened species.

VOLUNTEER OPPORTUNITIES – FWC volunteers contribute greatly to the success of the state's conservation of endangered and threatened species. The agency's regional volunteer coordinators work with staff and partners to develop and sustain projects that meet strategic objectives and involve all aspects of volunteer management. Endangered and threatened species conservation is one of the focal issues for volunteer coordinators. Examples of volunteer efforts in FY 2017–18 include:

VOLUNTEERS ASSIST WITH SURVEYING FLORIDA SCRUB–JAYS. Florida scrub–jay surveys were conducted with partners on public and private lands for Jay Watch, an Audubon Florida program. Volunteers surveyed six properties in Citrus, Marion, Sumter, and Lake counties to determine the number of family groups, family group sizes, and habitat use, while also identifying banded scrub–jays. There were 29 volunteers who completed nearly 1,400 hours of scrub–jay surveys, nest searching, trap–training, and banding in FWC's northeast region. Volunteers also participated in scrub–jay surveys at the Moody Branch Mitigation Park (Manatee County) in FWC's southwest region.

SOUTHEASTERN AMERICAN KESTREL BENEFITS FROM NEST BOX PROGRAM. The southeastern American kestrel, Florida's smallest falcon and a cavity nester, has been impacted by loss of habitat. An FWRI project involves placing and monitoring kestrel nest boxes. In December 2017, FWC volunteers in the northeast and southwest regions spent over 200 hours constructing 46 new kestrel nest boxes in time for the 2018 breeding season. In FWC's northeast, north central, and southwest regions, volunteers helped by monitoring kestrel nest boxes.

VOLUNTEERS SURVEY WHITE–CROWNED PIGEON POPULATIONS. White–crowned pigeons depend on mangrove islands for breeding and tropical hardwood hammocks for foraging. The hammocks habitat is

degraded and fragmented. Surveys in the Florida Keys WEA were conducted between June–August 2017 to identify core foraging areas and an FWC volunteer helped survey two locations in the Upper Keys.

VOLUNTEERS HELP LOCATE GOPHER TORTOISE BURROWS, ASSIST WITH GOPHER TORTOISE HABITAT MANAGEMENT. FWC volunteers helped conduct gopher tortoise surveys on private properties with active incidental take permits in Clay and Hernando counties. Volunteers were trained onsite to identify the location of burrows. All burrows were marked using flagging tape with their locations noted using GPS. A total of 61 acres were surveyed with 319 gopher tortoise burrows recorded. Volunteers also removed invasive plants from a park in Palm Beach County to improve gopher tortoise habitat there.

VOLUNTEERS AID WATER BIRD MONITORING AND STEWARDING EFFORTS. Volunteers monitored beaches and rooftops for shorebird and seabird activity in Nassau, Duval, St. Johns, Brevard, Volusia, Walton, St. Lucie, Palm Beach, Broward, Collier, and Monroe counties. Volunteers also acted as beach stewards, conserving least terns, black skimmers, American oystercatchers, and Wilson's plovers by protecting them from disturbance and predation. Their efforts included:

- ✓ Thirty–four volunteers engaging over 1,000 beach–goers in the northeast and south regions.
- ✓ Six volunteers constructing shelters for least tern and black skimmer chicks to escape predation and high temperatures in the northwest region.
- ✓ Two volunteers assisting FWC and Audubon Florida staff install shorebird posting in Little Estero Critical Wildlife Area in Fort Myers to protect Wilson's plovers, snowy plovers, and black skimmers nesting areas.

  Two volunteers in Pinellas County helping FWC and Audubon Florida staff install a rooftop chick fence which aims to prevent nesting chicks from falling off the rooftops.
- ✓ One volunteer in the south region assisting FWC staff install shorebird posting on Jupiter Island in Martin County to protect least terns.

VOLUNTEERS ASSIST WITH FLORIDA BURROWING OWL HABITAT. Installation of artificial burrows for burrowing owls was done in collaboration with Project Perch, a project of the South Florida Audubon Society. Three volunteers helped install four artificial burrows in Palm Beach County. Volunteers also assisted with trapping 48 nonnative black spiny tailed iguanas and green iguanas, which can invade burrowing owl burrows, in Palm Beach, Broward and Hendry counties.

VOLUNTEERS HELP RESTORE CRITICAL WILDLIFE AREAS. Efforts to restore ad conserve CWAs included:

- ✓ Martin County's Bird Island CWA (also known as MC2) in the Indian River Lagoon, where two volunteers removed balsam apple vine, conducted bird surveys and baited, set up and collected rat traps around the spoil island.

- ✓ Big Marco Pass and ABC Islands CWAs in Collier County, where three volunteers assisted FWC staff in posting nesting areas and monitoring birds.
- ✓ Lanark Reef CWA in Franklin County where a volunteer assisted FWC staff in a cleanup and debris removal effort prior to shorebird nesting season.

VOLUNTEERS HELP RESTORE PANANA CITY CRAYFISH HABITAT. Bay County, Florida is home to the Panama City crayfish, a species that has seen extensive habitat loss over the years from development and fire suppression. Seven volunteers (24 hours) have assisted in hand–clearing and removing hardwood and overstory vegetation from a 9.8–acre restoration site. Four additional volunteers assist in photo–documenting the sites on a regular basis.

VOLUNTEERS ANALYZE FLORIDA BOG FROG RECORDINGS. Four volunteers identified Florida bog frog calls in habitat restoration areas in Santa Rosa County to determine habitat use and population estimates.

INTERNATIONAL COASTAL CLEANUP COLLECTED LOTS OF OCEAN TRASH. The FWC's Coastal Wildlife Conservation Initiative partnered with the Ocean Conservancy and local organizers on the International Coastal Cleanup on Sept. 16, 2017, helping educate volunteers who participated. Though many Florida cleanups were cancelled or postponed due to Hurricane Irma, volunteers still showed up to collect trash from beaches and oceans. Overall, over 21,000 Florida volunteers collected 173,552 pounds of ocean plastics and other debris as part of this worldwide event, according to the Ocean Conservancy. The CWCI also used this event as an opportunity to raise awareness about coastal wildlife disturbance.

COMMUNITY MEETINGS, WORKSHOPS AND PRESENTATIONS. FWC interacts with homeowners, private landowners, businesses, and stakeholders on an array of issues involving living with Florida's listed species.

FLORIDA PANTHER OUTREACH CONNECTS WITH OVER 12,000 PEOPLE. The panther outreach specialist presents panther education programs to varied audiences of all ages. One of the major goals is to reduce conflicts between humans and panthers through education and community–wide efforts to secure wildlife attractants. These efforts are primarily focused in southwest Florida, where a continuous influx of new residents shares the environment with much of the Florida panther population. In FY 2017–18, the panther outreach specialist attended 13 festival and events and reached nearly 9,300 people. Additional panther outreach efforts at events such as the Panther Festival, Burrowing Owl Festival, Ding Darling Days, and Earth Day at the Conservancy involved 54 presentations to nearly 3,000 people.

21th ANNUAL MARINE TURTLE PERMIT HOLDER MEETING HELD FEB. 2–4, 2018 IN ST. AUGUSTINE. FWC presented updates on sea turtle nesting and stranding numbers, sea turtles and lights, and sea turtle

management activities. Sea turtle biologists with USFWS and NOAA – Fisheries provided updates on federal sea turtle programs. There was a session highlighting marine turtle research, conservation, and education projects funded from the Sea Turtle License Plate Grants Program.

SEA TURTLES AND LIGHTS WORKSHOPS WITH LOCAL GOVERNMENTS. FWC was invited to hold nine workshops for local governments by code enforcement and conservation organizations around the state. FWC conducted beach–based training as requested by government and conservation organizations. The training focused on identifying lights that could impact sea turtles and appropriate options to ensure sufficient lighting for public safety, while minimizing potential impacts to sea turtles. FWC were invited to present on sea turtles and lights at the Foreman Biodiversity Lecture Series, Stetson Law School.

LIVING SHORELINES TRAINING FOR MARINE CONTRACTORS. CWCI continues development of a course for marine contractors on installing Florida Living Shorelines. Living shorelines use vegetation alone or with some type of harder shoreline structure such as oyster reefs or rock sills to maintain continuity of the natural interface of land and water. This reduces erosion while providing habitat for wildlife and enhancing coastal resilience. The course is being designed with input from partner organizations.

GOPHER TORTOISE WORKSHOPS FOR LOCAL GOVERNMENTS. FWC held regional workshops in July and August 2017 with the goal of identifying ways cities and counties could participate in protecting gopher tortoises. Partnerships with cities, counties. and FWC have led to important projects to help conserve gopher tortoises and their extensive burrows, which shelter many other native wildlife species. This was the ninth year of workshops. They were held in Brevard, Lake, Nassau, Polk, and St. Lucie counties.

SCHOOL–BASED PROGRAMS AND PRESENTATIONS. FWC reaches out to teachers who can get school–aged children energized about Florida's wildlife and what they can do to help conserve native species.

PROJECT WILD IS AN INTERDISCLIPLINARY CONSERVATION AND ENVIRONMENTAL EDUCATION PROGRAM EMPHASIZING WILDLIFE. The goal is to assist learners of any age in developing awareness, knowledge, skills, and commitment resulting in informed decisions, responsible behavior, and constructive actions concerning wildlife and the environment. Project WILD offers free to low–cost professional development workshops for formal and non–formal educators. This hands–on approach to learning engages students in investigating the wildlife world around them, connecting them to conservation careers, and participating in STEM activities. In FY 2017–18, 1,155 educators were trained in using Project WILD, resulting in an estimated youth outreach of 124,000. More on Project WILD: www.projectwild.org.

APPENDIX A
LISTED WILDLIFE SPECIES IN FLORIDA AS OF JUNE 30, 2018

Exhibits A–1 through A–9 contain all listed species in Florida as of June 30, 2018, including each species scientific name and status: Federally–designated Endangered (FE), Federally–designated Threatened (FT), Federally–designated Threatened Due to Similarity of Appearance [FT(S/A)], or Federally–designated Nonessential Experimental species (FXN).

Vertebrates

Fish

Exhibit A–1
Listed Fish in Florida as of June 30, 2018

Common Name	Scientific Name	Status
Atlantic sturgeon	*Acipenser oxyrinchus*	FE
Blackmouth shiner	*Notropis melanostomus*	ST
Bluenose shiner	*Pteronotropis welaka*	ST
Crystal darter	*Crystallaria asprella*	ST
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	FT[1]
Harlequin darter	*Etheostoma histrio*	SSC
Key silverside	*Menidia conchorum*	ST
Okaloosa darter	*Etheostoma okalossae*	FT
Saltmarsh topminnow	*Fundulus jenkinsi*	ST
Shortnose sturgeon	*Acipenser brevirostrum*	FE[1]
Smalltooth sawfish	*Pristis pectinata*	FE
Southern tessellated darter	*Etheostoma olmstedi maculaticeps*	ST

1 A species for which the FWC does not have constitutional authority.

Amphibians

Exhibit A–2
Listed Amphibians in Florida as of June 30, 2018

Common Name	Scientific Name	Status
Florida bog frog	*Lithobates okaloosae*	ST
Frosted flatwoods salamander	*Ambystoma cingulatum*	FT
Georgia blind salamander	*Haideotriton wallacei*	ST
Reticulated flatwoods salamander	*Ambystoma bishopi*	FE

Reptiles

Exhibit A–3
Listed Reptiles in Florida as of June 30, 2018

Common Name	Scientific Name	Status
Alligator snapping turtle	*Macrochelys temminckii*	SSC
American alligator	*Alligator mississippiensis*	FT (S/A)
American crocodile	*Crocodylus acutus*	FT
Atlantic salt marsh snake	*Nerodia clarkii taeniata*	FT
Barbour's map turtle	*Graptemys barbourin*	ST
Bluetail mole skink	*Eumeces egregius lividus*	FT
Eastern indigo snake	*Drymarchon corais couperi*	FT
Florida brown snake	*Storeria victa*	ST
Florida Keys mole skink	*Eumeces egregius egregious*	ST
Florida pine snake	*Pituophis melanoleucus mugitus*	ST
Gopher tortoise	*Gopherus polyphemus*	ST
Green sea turtle	*Chelonia mydas*	FT[1]
Hawksbill sea turtle	*Eretmochelys imbricata*	FE[1]
Kemp's Ridley sea turtle	*Lepidochelys kempi*	FE[1]
Key ringneck snake	*Diadophis punctatus acricus*	ST
Leatherback sea turtle	*Dermochelys coriacea*	FE[1]
Loggerhead sea turtle	*Caretta caretta*	FT[1]
Rim rock crowned snake	*Tantilla oolitica*	ST
Sand skink	*Neoseps reynoldsi*	FT
Short–tailed snake	*Stilosoma extenuatum*	ST

1 A species for which the FWC does not have constitutional authority.

Birds

Exhibit A–4
Listed Birds in Florida as of June 30, 2018

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

Mammals

Exhibit A–5
Listed Mammals in Florida as of June 30, 2018

Common Name	Scientific Name	Status
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	FE
Big Cypress fox squirrel	*Scirus niger avicennia*	ST
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	FE
Everglades mink	*Neovison vison evergladensis*	ST
Finback whale	*Balaenoptera physalus*	FE[1]
Florida bonneted bat	*Eumpos floridanus*	FE
Florida panther	*Puma concolor coryi*	FE
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	FE
Gray bat	*Myotis grisescens*	FE
Gray wolf	*Canis lupus*	FE[3]
Homosassa shrew	*Sorex longirostris eionis*	SSC
Humpback whale	*Megaptera novaeangliae*	FE[1]
Indiana bat	*Myotis sodalist*	FE
Key deer	*Odocoileus virginianus clavium*	FE
Key Largo cotton mouse	*Peromyscus gossypinus allapaticola*	FE
Key Largo woodrat	*Neotoma floridana smalli*	FE
Lower Keys rabbit	*Sylvilagus palustris hefneri*	FE
North Atlantic right whale	*Eubalaena glacialis*	FE[1]
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	FE
Red wolf	*Canis rufus*	FE
Rice rat	*Oryzomys palustris natator*	FE[4]
Sanibel Island rice rat	*Oryzomys palustris sanibeli*	ST
Sei whale	*Balaenoptera borealis*	FE[1]
Sherman's fox squirrel	*Sciurus niger shermani*	SSC
Sherman's short–tailed shrew	*Blarina shermani*	ST
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	FT
Sperm whale	*Physeter catodon [=macrocephalus]*	FE[1]
St. Andrew's beach mouse	*Peromyscus polionotus peninsularis*	FE
West Indian manatee (Florida manatee)	*Trichecus manatus (Trichechus manatus latirostris)*	FT

1 A species for which the FWC does not have constitutional authority.
2 Monroe County population only.
3 Not documented in Florida.
4 Lower keys population only.

Invertebrates

Corals

Exhibit A–6
Listed Corals in Florida as of June 30, 2018

Common Name	Scientific Name	Status
Boulder star coral	*Orbicella franksi*	FT
Elkhorn coral	*Acropora palmate*	FT
Lobed star coral	*Orbicella annularis*	FT
Mountainous star coral	*Orbicella faveolata*	FT
Pillar coral	*Dendrogyra cylindricus*	FT
Rough cactus coral	*Mycetophyllia ferox*	FT
Staghorn coral	*Acropora cervicornis*	FT

Crustaceans

Exhibit A–7
Listed Crustaceans in Florida as of June 30, 2018

Common Name	Scientific Name	Status
Black Creek crayfish	*Procambarus pictus*	ST
Panama City crayfish	*Procambarus econfinae*	SSC
Santa Fe [cave] crayfish	*Procambarus erythrops*	ST
Squirrel Chimney Cave shrimp	Palaemonetes cummingi	FT

Insects

Exhibit A–8
Listed Insects in Florida as of June 30, 2018

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

Mollusks

Exhibit A–9
Listed Mollusks in Florida as of June 30, 2018

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

APPENDIX B
LIST OF ACRONYMS USED IN THIS REPORT

Acronym	Term
ABRP	Apalachicola Bluffs and Ravines Preserve
ACI	Association of Conservation Information
AFB	Air Force Base
AHRE	Aquatic Habitat Restoration and Enhancement program
BCFS	Big Cypress Fox Squirrel
BCNP	Big Cypress National Preserve
BRG	Biological Review Group
CFR	Code of Federal Regulations
CWA	Critical Wildlife Area
CWCI	Coastal Wildlife Conservation Initiative
DCA	District Court of Appeals
DLE	Division of Law Enforcement
DNA	Deoxyribonucleic acid
EISRC	Eastern Indigo Snake Reintroduction Committee
ESA	Endangered Species Act
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FFS	Florida Forest Service
FNAI	Florida Natural Areas Inventory
FPNWR	Florida Panther National Wildlife Refuge
FSA	Florida Shorebird Alliance
FSPSP	Fakahatchee Strand Preserve State Park
FY	Fiscal Year
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GIS	Geographic Information System
GPS	Global Positioning Satellite
GTTAG	Gopher Tortoise Technical Assistance Group
ha	hectare
HMAF	Habitat Management Assistance Funding
ITP	Incidental Take Permit
LAP	Landowner Assistance Program
LTDS	Line Transect Distance Sampling
LWRWEA	Lake Wales Ridge Wildlife and Environmental Area
MPP	Manatee Protection Plan
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NFWF	National Fisheries and Wildlife Foundation

APPENDIX B (*continued*)

Acronym	Term
NPS	National Park Service
nm	Nautical miles
NOAA – Fisheries	National Oceanic and Atmospheric Administration Marine Fisheries Service
ONF	Ocala National Forest
PIT	Passive Integrated Transponder
PSSF	Picayune Strand State Forest
PVC	Polyvinyl chloride
RCW	Red – cockaded Woodpecker
SCDNR	South Carolina Department of Natural Resources
SCP	Species Conservation Planning
SEBM	Southeastern Beach mouse
SIRR	Sanibel Island Rice Rat
SSA	Species Status Assessment
SWG	State – wide Grant
TED	Turtle Excluder Device
UF	University of Florida
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCPR	Wildlife Conservation Prioritization and Recovery
WEA	Wildlife and Environmental Area
WMA	Wildlife Management Area

APPENDIX C
FWC'S FISH AND WILDLIFE RESEARCH INSTITUTE'S PUBLICATIONS DURING FY 2017–18

FWC strives to produce high–quality publications and has been doing so since the Florida State Board of Conservation's first publication in 1948. This paper was part of an Education Series and dealt with red tide, still a topic of research at the Fish and Wildlife Research Institute (FWRI). Since then, over 1,000 publications have documented FWRI findings. These contributions have appeared in various scientific journals or as publications of FWRI. The publications and reprint issues are exchanged with libraries worldwide. 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/.

Bailey, A. M., R. A. McCleery, H. K. Ober, and W. E. Pine. 2017. First demographic estimates for endangered Florida bonneted bats suggest year-round recruitment and low apparent survival. Journal of Mammalogy 98:551-559.

Bailey, A. M., H. K. Ober, A. R. Sovie, and R. A. McCleery. 2017. Impact of land use and climate on the distribution of the endangered Florida bonneted bat. Journal of Mammalogy 98:1586-1593.

Bakenhaster M. D., S. A. Bullard, S. S. Curran, D. C. Kritsky, E. H. Leone, L. K. Partridge, C. F. Ruiz, R. M. Scharer, and G. R. Poulakis. 2018. Parasite component community of smalltooth sawfish off Florida: diversity, conservation concerns, and research applications. Endangered Species Research 35:47–58. Doi.org/10.3354/esr00863

Braun de Torrez, E. C., S. Samoray, M. Gumbert, M. A. Wallrichs, K. Silas, H. K. Ober, and R. A. McCleery. 2017. Acoustic lure allows for capture of a high-flying, endangered bat. Wildlife Society Bulletin 41:322-328.

Braun de Torrez, E. C., H. K. Ober, and R. A. McCleery. 2018. Activity of an endangered bat increases immediately following prescribed fire. Journal of Wildlife Management 82:1115-1123.

Braun de Torrez, E. C., H. K. Ober, and R. A. McCleery. In press. Restoring historical fire regimes increases activity of endangered bats. Journal of Fire Ecology.

Castellón, T.D., B.B. Rothermel, and J.M. Bauder. 2018. Gopher tortoise burrow use, home range, seasonality, and habitat fidelity in scrub and mesic flatwoods of southern Florida. Herpetologica 74:8–21.

Ceriani, S. A., J. F. Weishampel, L. M. Ehrhart, K. L. Mansfield, M. B. Wunder. 2017. Foraging and recruitment hotspot dynamics for the largest Atlantic loggerhead turtle rookery. Scientific Reports 7:16894.

Criffield, M., van de Kerk, M., Leone, E., Cunningham, M., Lotz, M., Oli, M.K., Onorato, D. P. 2018. Assessing impacts of intrinsic and extrinsic factors on Florida panther movement. Journal of Mammalogy, 99 (3) 701-712.

Enge, K. M., B. Tornwall, and W. Kruger. In press. *Drymarchon couperi* (eastern indigo snake). Mortality/entanglement in plastic mesh. Herpetological Review.

Farmer, A.L., K.M. Enge, J.B. Jensen, D.J. Stevenson, and L.L. Smith. 2017. A range-wide assessment of the status and distribution of the striped newt (*Notophthalmus perstriatus*). Herpetological Conservation and Biology 12(3):585–598.

Farmer, A.L., E. Hoffman, S.A. Johnson, S. Lance, and K.M. Enge. March 2018. Genetic assessment of striped newt populations. Final report for Conserve Wildlife Tag (CWT) Grant Project No. CWT 1516-05.

Farmer, A.L., K. Williges, J. Mott, J. Jensen, J.C. Maerz. March 2018. Multistate Wetlands Ecological Restoration Project: Florida & Georgia. Semi-annual report to U.S Fish and Wildlife Service State Wildlife Grant (SWG) Program. Grant Award: FL-U2-F17AP00754.

Feldheim, K. A., A. T. Fields, D. D. Chapman, R. M. Scharer, and G. R. Poulakis. 2017. Insights into reproduction and behavior of the smalltooth sawfish *Pristis pectinata*. Endangered Species Research 34:463–471. Doi: 10.3354/esr00868

Goldberg, N., and T.B. Castellón. 2017. Experiential learning in an undergraduate ecology course: a case study with gopher tortoise (*Gopherus polyphemus* Daudin). Florida Scientist 80:117.

Holcomb, J.M., Shea, C.P., Johnson, N.A. 2018. Cumulative spring discharge and survey effort influence occupancy and detection of a threatened freshwater mussel, the Suwanee moccasinshell. Journal of Fish and Wildlife Management, 9: 95 – 105.

Huston, C. A., P. W. Stevens, R. M. Blaxton, S. G. Tolley, R. M. Scharer, B. M. Tornwall, and G. R. Poulakis. 2017. Diel movements of juvenile smalltooth sawfish: implications for defining the size of a nursery hotspot. Endangered Species Research 34:311–322. Doi:10.3354/esr00851

Kristy, D. C., S. A. Bullard, M. D. Bakenhaster, R. M. Scharer, and G. P. Poulakis. 2017. Resurrection of *Mycteronastes* (Monogenoidea: Monocotylidae), with Description of *Mycteronastes caalusi* n. sp. from olfactory sacs of the smalltooth sawfish, *Pristis pectinata* (Pristiformes: Pristidae), in the Gulf of Mexico off Florida. Journal of Parasitology 103:477–485. Doi: 10.1645/17-40

Ober, H. K., E. C. Braun de Torrez , R. A. McCleery, A. M. Bailey , and J. A. Gore. 2017. Sexual dimorphism in the endangered Florida bonneted bat, Eumops floridanus (Chiroptera: Molossidae). Florida Scientist 80:38-48.

Poulakis, G. R., H. Urakawa, P. W. Stevens, J. A. DeAngelo, A. A. Timmers, R. D. Grubbs, A. T. Fisk, and J. A. Olin. 2017. Sympatric elasmobranchs and fecal samples provide insight into trophic ecology of the smalltooth sawfish. Endangered Species Research 32:491–506. Doi: 10.3354/esr00824.

Prohaska B.K., D. M. Bethea, G.R. Poulakis, R.M. Scharer, R. Knotek, J. K. Carlson, and R. D. Grubbs. 2018. Physiological stress in the smalltooth sawfish: effects of ontogeny, capture method, and habitat quality. Endangered Species Research 36:121–135. Doi: 10.3354/esr00892

Rycyk.A.M., Deutsch, C.J., Barlas, M.E., Hardy, S.K., Frisch, K., Leone, E.H., Nowacek, D.P. 2018. Manatee behavioral response to boats. Marine Mammal Science. doi 10.1111/mms.124

Stacy, B. A., P. A. Chapman, A. M. Foley, E. C. Greiner, L. H. Herbst, A. B. Bolten, P. A. Klein, C. A., Manire, E. R. Jacobson. 2018. Evidence of diversity, site and host specificity of sea turtle blood flukes (Digenea: Schistosomatoidea: "spirorchiidae"): a molecular prospecting study. Journal of Parasitology 103(6):756–767.

Stacy, B. A., A. M. Foley, T. M. Work, T. M. Norton. 2017. Mortality Investigation. Pages 933–944 in C. A. Manire, T. M. Norton, B. Stacy, C. A. Harms, and C. J. Innis, editors. Sea Turtle Health and Rehabilitation, J. Ross Publishing, Plantation, Florida.

Scharer, R. M., P. W. Stevens, C.P. Shea, and G. R. Poulakis. 2017. All nurseries are not created equal: large-scale habitat use patterns in two smalltooth sawfish nurseries. Endangered Species Research 34:473–492. Doi 10.3554esr00871

Stevenson, D. J., K. M. Enge, W. S. Kellner, T. W. Hentges, T. Daly-Crews, and C. Pirtle. In press. Heterodon simus (southern hog-nosed snake). Use of pocket gopher mounds and gopher tortoise burrows. Herpetological Review.

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

Invertebrates, Fish, Amphibians, and Reptiles

Common Name	Scientific Name
Invertebrates	
Cajun dwarf crayfish	*Cambarellus shufeldtii*
Cypress crayfish	*Cambarellus blacki*
Elephantear mussel	*Elliptio crassidens*
Miami cave crayfish	*Procamrus milleri*
Fish	
Black banded darter	*Percina nigrofasciata*
Black tail shiner	*Cyprinella venusta*
Brown darter	*Etheostoma edwini*
Largemouth bass	*Micropterus salmoides*
Spotted bass	*Micropterus punctulatus*
Swamp darter	*Etheostoma fusiforme*
Amphibians	
Gopher frog	*Lithobates capito*
Spotted turtle	*Clemmys guttata*
Striped newt	*Notophthalmus peristriatus*
Reptiles	
Florida scrub lizard	*Sceloporus woodi*
Red rat snake (or red corn sake)	*Pantherophis guttatus*
Southern copperhead	*Agkistrodon contortrix*
Spotted turtle	*Clemmys guttata*
Striped mud turtle	*Kinosternon baurii*
Suwannee alligator snapping turtle	*Macrochelys suwanniensis*
Yellow rat snake	*Elaphe obsolete quadrivittata*

Appendix D (*continued*) – Birds, Mammals, and Plants

Common Name	Scientific Name
Birds	
American flamingo	*Phoenicopterus ruber*
Anhinga	*Anhinga anhinga*
Bachman's sparrow	*Aimophila aestivalis*
Black rail	*Laterallus jamaicensis*
Black – crowned night heron	*Nycticorax nycticorax*
Brown pelican	*Pelecanus occidentalis*
Caspian tern	*Sterna caspia*
Cattle egret	*Bubulcus ibis*
Common moorhen	*Gallinula chloropus*
Double – crested cormorant	*Phalacrocorax auritus*
Eastern bluebird	*Sialia sialis*
Eastern grasshopper sparrow	*Ammodramus savannarum pratensis*
Eastern screech owl	*Megascops asio*
Eastern meadowlark	*Sturnella magna*
Glossy ibis	*Plegadis falcinellus*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Green heron	*Butorides virescens*
Gull – billed tern	*Sterna nilotica*
King rail	*Rallus elegans*
Laughing gull	*Larus atricilla*
Least bittern	*Ixobrychus exilis*
Limpkin	*Aramus guarauna*
Louisiana seaside sparrow	*Ammodramus maritimus fisheri*
MacGillivary's seaside sparrow	*Ammodramus maritimus macgillivraii*
Northern flicker	*Colaptes auratus*
Pied – billed grebe	*Podilymbus podiceps*
Purple gallinule	*Porphyrula martinica*
Red – bellied woodpecker	*Melanerpes carolinus*
Red – headed woodpecker	*Melanerpes erythrocephalus*
Royal tern	*Sterna maxima*
Sandwich tern	*Sterna sandvicensis*
Snowy egret	*Egretta thula*
Southeastern myotis	*Myotis austroroparius*

Appendix D (*continued*) – Birds, Mammals, and Plants

Common Name	Scientific Name
Birds	
Tufted titmouse	*Baeolophus bicolor*
White ibis	*Eudocimus albus*
Willet	*Tringa semipalmata*
Wilson's plover	*Charadrius wilsonia*
Yellow – crowned night heron	*Nycticorax violacea*
Mammals	
Atlantic salt marsh mink	*Neovison vison lutensis*
Bachman's fox squirrel	*Sciurus niger bachman*
Big brown bat	*Eptesicus fuscus*
Brazilian free–tailed bat	*Tadarida braziliensis*
Coyote	*Canis latranus*
Easter gray squirrel	*Sciurus carolinensis*
Eastern spotted skunk	*Spilogale putorius*
Evening bat	*Nycticeius humeralis*
Gulf salt marsh mink	*Neovison vison halilimnetes*
Least shrew	*Cryptotis parva*
Northern yellow bat	*Lasiurus intermedius*
River otter	*Lontra canadensis*
Seminole bat	*Lasiurus seminolus*
Short–tailed shrew	*Blarina carolinensis peninsulae*
Southern flying squirrel	*Glaucomys volans*
Southern fox squirrel	*Sciurus niger*
Tri – colored bat	*Perimyotis subflavus*
Plants	
Brazilian pepper	*Schinus teribinthifolius*
Cabbage palm	*Sabal palmetto*
Green buttonwood	*Conocarpus erectus*
Longleaf pine	*Pinus palustris*
Royal palm	*Roystonea regia*
Sand cordgrass	*Spartina bakerii*
Smooth cordgrass	*Spartina alterniflora*
South Florida slash pine	*Pinus Elliotti densa*
Wax myrtle	*Myrica cerifera*

APPENDIX E
GLOSSARY OF TERMS

Area of Occupancy – The area within its 'extent of occurrence', which is occupied by a species, excluding cases of vagrancy. In some cases, it is the smallest area essential at any stage to the survival of existing populations of a species.
Bioacoustics – Sound production, dispersion, and reception in wildlife.
Bromeliads – a plant native to tropical and subtropical America, typically having short stems with rosettes of stiff, usually spiny leaves.
Cavity – A hollow or hole occupied by an organism.
Cavity insert – A premade box with a hole built in to mimic natural cavities.
Cluster – The aggregation of cavity trees previously and currently used and defended by a group of woodpeckers.
Colony – A distinguishable localized population within a species.
Commensal – 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.
Depredation – When wildlife preys upon livestock or pets.
Endemic – Restricted or peculiar to a certain area or region.
Ephemeral – Lasting a very short time.
Extent of Occurrence – The area contained within the shortest contiguous imaginary boundary, which can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a species, excluding cases of vagrancy.
Extirpation – Cease to exist in a given area.
Federally–designated Endangered Species – 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.
Federally–designated Threatened Species – 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.
Fibropapillomatosis – A disease specific to sea turtles.
Fledge – To raise a young bird until it is capable of flight.
Fledged – To leave a nest.
Fledgling – A young bird that has recently developed flight feathers and is capable of flight.
FWC Commissioners – 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.

APPENDIX E (*continued*)

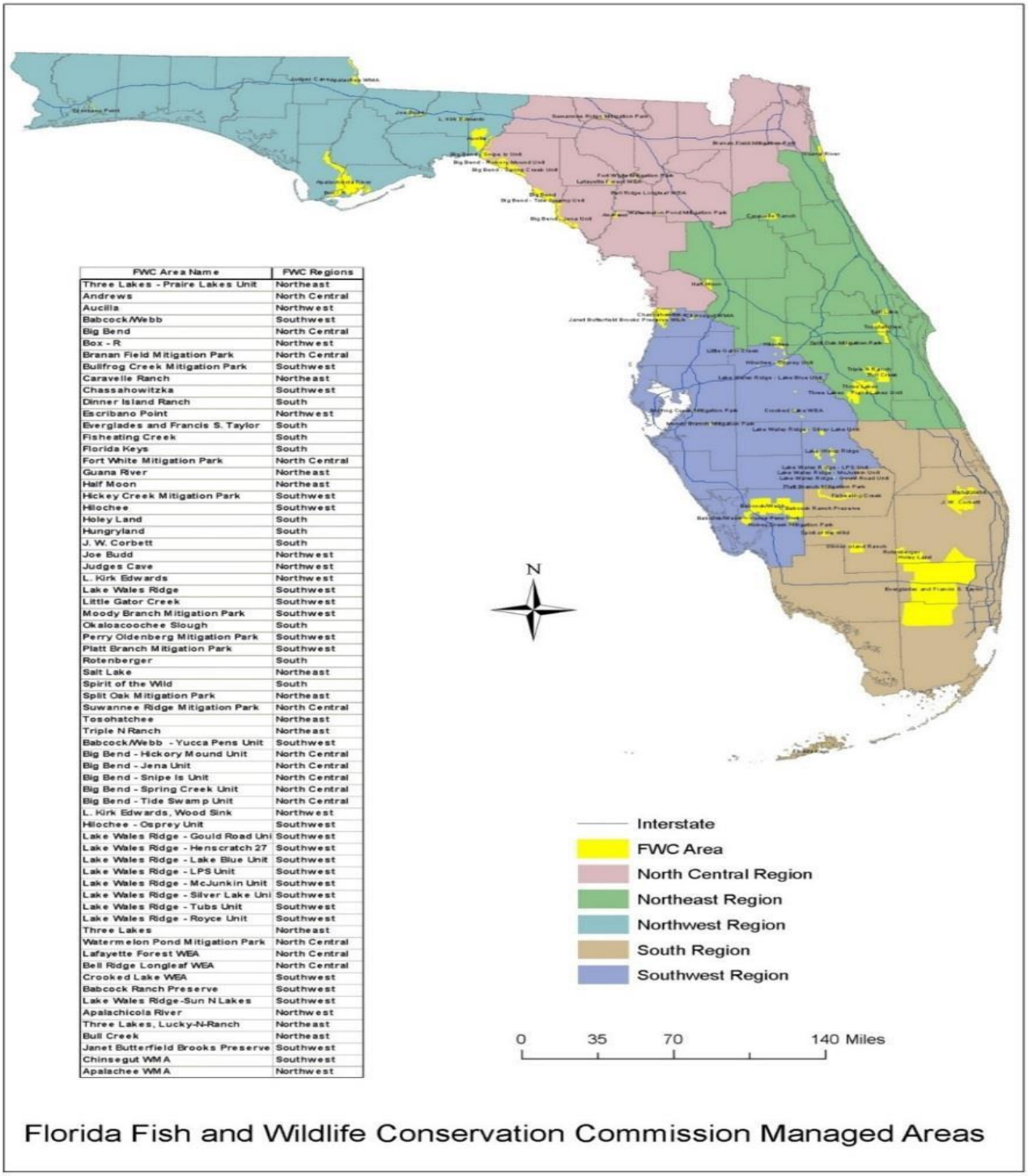
Geographic Information Systems (GIS) – Captures, stores, analyzes, manages, and presents data that is linked to a location.
Habitat – A natural environment where a species lives and grows.
Helper Bird – Usually a previous male offspring of either the breeding male or both breeders. Helpers participate in territory defense, constructing and maintaining nests and cavities, incubating eggs, feeding and brooding nestlings, removing fecal sacs from the cavity, and feeding fledglings.
Hydric pine – flat land with sandy substrate, seasonally inundated, subtropical or temperate, with annual or frequent fire, and vegetation characterized by slash or pond pine and/or cabbage palm with mixed grasses and herbs (FNAI 1989).
Hydroperiod – Cyclical changes in the amount or stage of water in a wet habitat.
Hydrophone – underwater listening devices that determine short–term, fine–scale movements.
Keystone Species – 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.
LIDAR – Surveying technology that measures distance by illuminating a target with a laser light.
Life History – All changes experienced by a species from birth to death.
Listed Species – 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.
Metamorphosis – Transition from a larval to a terrestrial juvenile stage.
Metapopulation – A group of spatially separated populations of the same species that interact at some level.
Microsatellite – A tract of DNA consisting of very short nucleotide sequences repeated multiple times.
Midstory – the layer of canopy in a forest that consists of those trees whose height is between the heights of the smallest and tallest trees.
Necropsy – The examination of a body after death.
Nestling – A young bird that has not abandoned the nest.
Nonessential Experimental Population – 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.
Overstory – the layer of foliage in a forest canopy
Passive Integrated Transponder (PIT) Tags – a chip placed below the skin to identify individuals.
Pelagic – Deep open ocean water.
Productivity – The ability to produce; fertility.

APPENDIX E (*continued*)

Recruitment – The addition of individuals into a breeding population through reproduction and/or immigration and attainment of breeding position.
Recruitment Cluster – A cluster of artificial cavities in suitable natural habitat, located close to existing clusters.
Rookery – A colony of breeding animals.
Roosts – A place where species can sleep or reside.
Safe Haven – An area of water that manatees may rest, feed, reproduce, give birth, or nurse while remaining undisturbed by human activity.
State–designated Species of Special Concern – 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.
State–designated Threatened Species – 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.
Stock – A group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature.
Swales – long, narrow, usually shallow, trough–like depressions in the ground that formed naturally
Taxonomy – Scientific classification of a species.
Translocation – Movement of an individual from one location to another.
Telemetry – Transmission of data through technology, such as radio collars, from a species to an observer.
Understory – a layer of vegetation beneath the main canopy of a forest

APPENDIX F
MAP OF FWC REGIONS

APPENDIX G
MAP OF FWC MANAGED AREAS



FWC Area Name	FWC Regions
Three Lakes - Praire Lakes Unit	Northeast
Andrews	North Central
Aucilla	Northwest
Babcock/Webb	Southwest
Big Bend	North Central
Box - R	Northwest
Branan Field Mitigation Park	North Central
Bullfrog Creek Mitigation Park	Southwest
Caravelle Ranch	Northeast
Chassahowitzka	Southwest
Dinner Island Ranch	South
Escribano Point	Northwest
Everglades and Francis S. Taylor	South
Fisheating Creek	South
Florida Keys	South
Fort White Mitigation Park	North Central
Guana River	Northeast
Half Moon	Northeast
Hickey Creek Mitigation Park	Southwest
Hilochee	Southwest
Holey Land	South
Hungryland	South
J. W. Corbett	South
Joe Budd	Northwest
Judges Cave	Northwest
L. Kirk Edwards	Northwest
Lake Wales Ridge	Southwest
Little Gator Creek	Southwest
Moody Branch Mitigation Park	Southwest
Okaloacoochee Slough	South
Perry Oldenberg Mitigation Park	Southwest
Platt Branch Mitigation Park	Southwest
Rotenberger	South
Salt Lake	Northeast
Spirit of the Wild	South
Split Oak Mitigation Park	Northeast
Suwannee Ridge Mitigation Park	North Central
Tosohatchee	Northeast
Triple N Ranch	Northeast
Babcock/Webb - Yucca Pens Unit	Southwest
Big Bend - Hickory Mound Unit	North Central
Big Bend - Jena Unit	North Central
Big Bend - Snipe Is Unit	North Central
Big Bend - Spring Creek Unit	North Central
Big Bend - Tide Swamp Unit	North Central
L. Kirk Edwards, Wood Sink	Northwest
Hilochee - Osprey Unit	Southwest
Lake Wales Ridge - Gould Road Uni	Southwest
Lake Wales Ridge - Henscratch 27	Southwest
Lake Wales Ridge - Lake Blue Unit	Southwest
Lake Wales Ridge - LPS Unit	Southwest
Lake Wales Ridge - McJunkin Unit	Southwest
Lake Wales Ridge - Silver Lake Uni	Southwest
Lake Wales Ridge - Tubs Unit	Southwest
Lake Wales Ridge - Royce Unit	Southwest
Three Lakes	Northeast
Watermelon Pond Mitigation Park	North Central
Lafayette Forest WEA	North Central
Bell Ridge Longleaf WEA	North Central
Crooked Lake WEA	Southwest
Babcock Ranch Preserve	Southwest
Lake Wales Ridge-Sun N Lakes	Southwest
Apalachicola River	Northwest
Three Lakes, Lucky-N-Ranch	Northeast
Bull Creek	Northeast
Janet Butterfield Brooks Preserve	Southwest
Chinsegut WMA	Southwest
Apalachee WMA	Northwest