Florida Fish and Wildlife Conservation Commission

Endangered and Threatened Species Management and Conservation Plan

Progress Report

Fiscal Year 2020–21

December 2021

TABLE OF CONTENTS

LIST OF EXHIBITS

EXECUTIVE SUMMARY

This report covers Fiscal Year (FY) 2020-21 and constitutes the 43rd 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 (Act) of 1977 in section 379.2291(5), *Florida Statutes*. The Act required the preparation of an initial plan for submission to the 1978 Florida Legislature, and the annual preparation of a revised and updated plan for management and conservation of Florida's Endangered and Threatened species. Federal– and State–designated Endangered and Threatened species, as well as State–designated Species of Special Concern, are referred to as listed species in this report. The initial plan submitted in March 1978 remains the basic reference document for annual updates. Subsequent annual reports may be consulted regarding a chronological history of listed species activities and may be obtained at https://myfwc.com/wildlifehabitats/wildlife/reports/.

This report includes a description of FWC's criteria for research and management priorities, statewide policies pertaining to listed species, a funding request for FY 2022-23, 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 (SSC). Updated Threatened species rules approved by FWC Commissioners went into effect on November 8, 2010, creating the Florida Endangered and Threatened Species List. Species listed through FWC's listing process are now in a single–category, State-designated Threatened (ST), which is designed to eliminate controversy on what a species is called and focus on the conservation actions needed to improve the species' status. The SSC List was temporarily retained to allow time to assess species under FWC's listing process to determine whether they should be listed as ST or removed from the list. All Florida species listed under the Endangered Species Act by the U. S. Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration's Marine Fisheries Service (NOAA–Fisheries) are included in the Florida Endangered and Threatened Species List as Federally designated-Endangered (FE), Federally-designated Threatened (FT), Federally-designated Threatened Due to Similarity of Appearance [FT(S/A)], or Federally-designated Nonessential Experimental Population (FXN) species.

Rules 68A-27.003 and 68A-27.0031, Florida Administrative Code (F.A.C.), contain the official Florida Endangered and Threatened Species List. Rule 68A–27.005, F.A.C., contains the SSC List. Currently, FWC lists 133 fish and wildlife species (Exhibit 1) as ST (39), SSC (1), FE (50), FT (38), FT(S/A) (4) and FXN (1). There is no duplication 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 all of Florida's listed species as of June 30, 2021. Changes to the list may occur throughout the year. A compiled list of Florida's currently listed species is available at: https://myfwc.com/media/1945/threatened-endangered-species.pdf. Rules noted above are available at: https://www.flrules.org/gateway/ChapterHome.asp?Chapter=68A-27.

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

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 Listed Species List as of June 30, 2021.

STATUS DESIGNATION	MAMMALS	BIRDS	AMPHIBIANS	REPTILES	FISH	INVERTEBRATES	TOTAL
Federally-designated Endangered (FE)	22(5)[2]	8	1	3(3)	3(1)[1]	13	50(9)
Federally-designated Threatened (FT)	2(1)	7	1	7(2)	4(1)	17	38(4)
Federally-designated Threatened due to Similarity of Appearance [FT(S/A)]	0	0	0	1	0	3	4
Federally-designated Nonessential Experimental Population (FXN)	0	1	0	0	0	0	1
State-designated Threatened (ST)	4	16	2	9	6	2	39
State Species of Special Concern (SSC)	0	0	0	0	0	1	1
TOTAL	28(6)	32	4	20(5)	13(2)	36	133(13)

[1] Numbers in the parentheses are the number of species for which FWC does not have constitutional authority. The status in Rule 68A-27.0031, F.A.C. is the Federal status these species had when FWC was created by amendment to the Florida Constitution, adopted in 1998. The status of these species listed in here is their current Federal status as of June 2021.

[2] There is one additional species included in Rule 68A–27.0031, F.A.C as a species for which FWC does not have constitutional authority that is not included here because it has been determined to be extinct.

STATUTORY REQUIREMENTS

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 (*Millsap, B. M., J. A. Gore, D. E. Runde, and S. I. Cerulean. 1990. Setting priorities for the conservation of fish and wildlife species in Florida. Wildlife Monographs 111*). This ranking process provides a biological score that ranks species based on their biological vulnerability; an action score that ranks a species based on the amount of available information and ongoing management actions; and a supplemental score that looks at variables not included in the biological or action scores. These scores serve as one of the multiple tools used to help identify species most in need of conservation and the amount of effort previously expended on them, which can be used to help prioritize agency resources. FWC also maintains a list of Species of Greatest Conservation Need (SGCN), which uses a set of scientific core criteria and identifies the broad range of Florida's species that are at–risk or could become at–risk in the future. In addition, FWC also considers available funding sources, legislation, court rulings, grant agreements and approved management plans when setting priorities for allocating resources for managing and conserving Florida's State listed species.

Statewide Policies Pertaining to Listed Species

LISTING ACTIONS – Pursuant to the listing process outlined in Rule 68A-27.0012, F.A.C., FWC completed listing determinations for two species in FY 2020-21. The American Flamingo was determined not to warrant listing as State Threatened and required no further action. The Striped Newt was determined to warrant listing as State Threatened and was subsequently added to Rule 68A-27.0021, F.A.C., and designated on the State list of Candidate species. Staff will proceed with development of a management plan and Species Conservation Measures and Guidelines for the Striped Newt.

STATUS CHANGES – In accordance with Florida's listing process outlined in Rule 68A-27.0012, F.A.C., species that are reclassified, removed from, or added to the federal Endangered and Threatened Species list are updated in state rule to maintain consistency. In FY 2020-21, three species changed federal status in Florida's Endangered and Threatened Species list (Exhibit 2).

Exhibit 2. Species status changes approved during FY 2020-21:

Species Name	Updated Status
Gulf of Mexico Bryde's Whale	Federally Endangered
Eastern Black Rail	Federally Threatened
American Burying Beetle	Federally Threatened

Imperiled Species Management Program Species Guidelines

With stakeholder input, FWC approved new Species Conservation Measures and Permitting Guidelines (Guidelines) for nine species, and revised Guidelines for two species, (Exhibit 3). Guidelines were subsequently incorporated, by reference, into F.A.C. rule. These Guidelines outline the species' biological background and define activities likely to impair essential behavior patterns. They also provide voluntary conservation measures that may benefit the species and outline options for avoidance, minimization, and mitigation for State-Threatened species. The Guidelines serve to provide regulatory certainty for activities specifically authorized without a permit and inform potential applicants regarding permit options.

Exhibit 3. New Species Guidelines approved during FY 2020-21:

Species Name	New or Revised Guidelines	Status
Florida Mouse	New	Not Listed
Gopher Frog	New	Not listed
Suwannee Cooter	New	Not listed
Mangrove Rivulus	New	Not Listed
Red Rat Snake (Lower Keys Population)	New	Not Listed
Striped Mud Turtle (Lower Keys Population)	New	Not Listed
Peninsula Ribbonsnake (Lower Keys Population)	New	Not Listed
Florida Tree Snail	New	Not Listed
Southeastern American Kestrel	New	State Threatened
Florida Pine Snake	Revised	State Threatened
Gopher Tortoise	Revised	State Threatened

The Florida Endangered and Threatened Species List and State Listing Actions

In FY 2020-21, the Commission received one species evaluation request to list the Florida Reef Gecko on the state-designated Threatened species list. Staff developed a workplan for the species in accordance with Rule 68A-27.0012, F.A.C. to determine if the species warrants listing.

Funding Request

The recommended level of funding for FWC endangered species programs in FY 2022-23 is $35,460,429 (Exhibit 4). This includes funding to maintain and enhance current programs and continuation of awards from federal grants designed to assist in development of recovery programs.

Exhibit 4. FWC Endangered/Threatened Species Budget Request for FY 2022-23.

FUNDING SOURCE	AMOUNT ($)
Federal Grants Trust Fund (FGTF)	12,173,420
Florida Panther Research and Management Trust Fund (FPRMTF)	808,247
Grants and Donations Trust Fund (GDTF)	4,152,308
Land Acquisition (LATF)	1,879,282
Marine Resources Conservation Trust Fund (MRCTF)	8,034,358
Nongame Wildlife Trust Fund (NWTF)	5,169,236
Save the Manatees Trust Fund (STMTF)	2,139,152
State Game Trust Fund (SGTF)	1,104,426
TOTAL	35,460,429

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. Research also leads to a better understanding of how wildlife managers may alter populations through management actions, as well as leading to management actions that have aided in species stabilization and conservation. This section briefly describes the progress of ongoing listed species management and research by FWC. Appendix A contains a complete list of listed species' scientific and common names and Appendix D provides the same information for non–listed species mentioned in this report.

MAMMALS

Beach Mice

Several subspecies of the Old-Field Mouse, collectively known as Beach Mice, inhabit coastal dunes along the Atlantic Coast and Panhandle Gulf Coast of Florida. All subspecies, but one, are federally listed, including the Choctawhatchee Beach Mouse, Anastasia Island Beach Mouse, St. Andrew Beach Mouse, Perdido Key Beach Mouse (all Endangered) and the Southeastern Beach Mouse (Threatened).

GULF COAST BEACH MICE – In FY 2020-21, FWC continued to monitor track tube stations along the coastal dunes from Gulf to Escambia County. Each station consists of a polyvinyl chloride (PVC) tube baited with sunflower seeds, with a strip of paper and an inkpad inserted to record footprints as mice enter the tube. At most sites, stations are spaced either approximately 330 feet or 1,640 feet apart in lines parallel to the dunes. The stations provide a low-impact method of determining the presence of beach mice from footprints left on the paper in the tube. Track tube stations indicate areas occupied by beach mice, and FWC uses the data to monitor fluctuations in distribution over time. FWC biologists, along with partners from the Florida Park Service (FPS), the National Park Service (NPS), the United States Air Force, and some private entities, regularly check the stations for tracks. For FY 2020-21, monitoring continued at 13 sites on public lands and at two sites on privately-owned lands. For each location, staff calculate the percentage of stations that detected beach mouse tracks during each sampling period (detection rate). In FY 2020-21, the average detection rate ranged from 0% at Deer Lake State Park to 91% at Tyndall Air Force Base (AFB). Many sites had average detection rates above 80%, indicating that Beach Mice were present on most of the available beach mouse habitat at these sites.

Several sites along the Gulf Coast of the Florida Panhandle were severely impacted by Hurricane Michael in October 2018. Although sites on Tyndall AFB and the St. Joseph Peninsula sustained significant damage, post-storm monitoring in FY 2019-20 and FY 2020-21 showed that Beach Mice remain present. Beach Mouse detections at these sites continued to increase or remain relatively steady, with average detection rates of 91% and 89% on Tyndall AFB and the St. Joseph Peninsula State Park, respectively. Additional sites along the Panhandle Gulf Coast were impacted by Hurricane Sally when it made landfall in September 2020, Including Gulf Islands National Seashore and Perdido Key State Park. Post-storm monitoring at these sites indicated that Beach Mice remained present with average detections of 88% for both Gulf Islands National Seashore and Perdido Key State Park.

The Gulf Coast monitoring locations with the lowest detection rates were Deer Lake State Park and Water Sound (private). The detection rates at both sites declined to 0% over the last few years, and it is thought to be caused by increased predation pressure from feral/outdoor cats. FWC plans to work with partners at USFWS and FPS to determine whether focused management efforts are needed to reestablish Beach Mice in this area. The average detection rate at nearby Grayton Beach State Park was 66%. These differences provide incentive for FWC to continue monitoring these sites closely and identify potential management actions to prevent any further declines. Detection rates at West Crooked Island on Tyndall AFB increased significantly from November 2019 (47%) to the present (89%). FWC biologists believe that this increase in detection rates was a result of increased vegetation as the area began to recover from damage sustained from Hurricane Michael. Beach Mouse detections at all other sites remained generally consistent from FY 2019-20 to FY 2020-21.

In FY 2018-19, FWC received funds from the USFWS Coastal Program for a multi-year project designed to assess Beach Mouse and habitat recovery on selected sites after Hurricane Michael. A second year of funds was awarded to continue monitoring efforts and prioritize potential restoration efforts where coastal dunes or Beach Mouse populations are not recovering well from hurricane impacts. In FY 2020-21, FWC, in cooperation with the USFWS, began a multi-year project with funding received from the Gulf Environmental Benefit Fund through the National Fish and Wildlife Foundation. The goal of this project is to restore and enhance the diversity as well as the resilience of coastal dune ecosystems throughout the Panhandle Gulf Coast of Florida. As part of this project, in June 2021, FWC established an additional monitoring site with 23 track tubes on Eglin AFB lands on Santa Rosa Island. The detection rate there was 52% by the fourth track tube check. Through this project, monitoring will be established on additional dune ecosystem restoration sites across the Panhandle Gulf Coast through FY 2021-22.

ATLANTIC COAST BEACH MOUSE – The Southeastern Beach Mouse (SEBM) historically occurred from Volusia County south to Broward County, and possibly as far south as Miami Beach. The current distribution of this subspecies is likely restricted to Volusia and Brevard counties and possibly scattered locations in Indian River

County. In FY 2020-21, FWC entered year 2 of a 5-year project funded through the USFWS Coastal Program titled "Assessing habitat restoration and management activities and benefits for Atlantic Coast beach mouse recovery through long-term monitoring." This project benefits the conservation of both the SEBM and the Anastasia Island Beach Mouse subspecies along Florida's Atlantic Coast. The information collected from this project is being used to develop strategic management recommendations, prioritize restoration actions, and support proposed translocations of Beach Mice. In the second year of this project, FWC monitored SEBM using a total of 300 track tubes and supplemental camera traps (Exhibit 5). FWC initiated monitoring at several sites within the Cape Canaveral Space Force Station to study how prescribed fire and other land management actions influence beach mouse distributions. For the SEBM, because personnel are studying the effects of management, monitoring was established in areas of lower quality beach mouse habitat that was in need of management. Therefore, detection rates are lower in these areas compared to what would be expected in areas of high-quality Beach Mouse habitat. In FY 2020-21, FWC was awarded funding to continue the third year of this project, which included additional funding to improve SEBM habitat.

Exhibit 5. Percentage of beach mouse detections at track tube stations deployed at 3 study sites within Southeastern Beach Mouse range for FY 2020-21.

Study site	Track tubes/Cameras	Detections	Total surveys	Percent detections
Canaveral National Seashore	59	230	783	29.4
Smyrna Dunes Park (Volusia County)	38	218	603	35.0
Cape Canaveral Space Force Station	203	464	1039	44.7

In FY 2020-21, work continued on a USFWS funded project investigating the genetic diversity of the SEBM and other Beach Mouse subspecies. This project will determine how genetically different mice are across the range of both Atlantic Coast Beach Mouse subspecies. This will help inform and prioritize management and recovery efforts for these species. Analyses are ongoing and are expected to be completed in early FY 2021-22.

The Anastasia Island Beach Mouse (AIBM) historically ranged as far north as the Duval-St. Johns County line but is now found only on Anastasia Island (St. Johns County). The USFWS Coastal Program project also intends to improve conservation of the AIBM though more effective management. During FY 2020-21, the second year of this project, FWC monitored AIBM using a total of 81 track tubes throughout the range of the AIBM and conducted surveys every 2 weeks (Exhibit 6). One prescribed fire was completed by FPS staff at Anastasia State Park in FY 2019-20, and FWC is continuing to monitor how post-fire changes in habitat influence Beach Mouse distribution. This data will be used to guide land management actions to improve Beach Mouse habitat and provide effective conservation benefits. In FY 2020-21, FWC was awarded funding for the third year of this project, which includes funds to further improve Beach Mouse habitat on Anastasia Island.

Exhibit 6. Percentage of beach mouse detections at track tube stations deployed at 2 study sites within Anastasia Island Beach Mouse range for FY 2020-21.

Study site	Track tubes	Detections	Total surveys	Percent detections
Anastasia State Park	56	540	730	74.0
Fort Matanzas National Monument	25	167	197	80.0

Everglades Mink

DETERMINING THE DISTRIBUTION OF THE EVERGLADES MINK - The Everglades Mink is a State-Threatened subspecies of the American Mink, endemic to South Florida. Historically, the Everglades Mink occurred in the freshwater marshes and swamps of the Everglades, Big Cypress, and Lake Okeechobee. However, recent mink sightings predominately occur in Fakahatchee Strand Preserve State Park (FSPSP) and the surrounding areas. The cause of this range restriction is hypothesized as habitat loss, fragmentation, hydrological changes, and declines in water quality. Effective conservation actions are necessary for the continued persistence of Everglades Mink; however, they are hampered by significant knowledge gaps in distribution, survey method, and life history.

To assist in FWC's goal to determine mink distribution and guide research efforts, a website was created for the public to report mink sightings to guide survey efforts and supplement field data. Between June 2012 and June 2021, 67 credible reports of Everglades Mink were reported. Less than 20% of sightings were deemed valid based on comments and pictures submitted. Most credible reports were concentrated at FSPSP.

In FY 2016-17, FWC biologists began a multiyear study on the Everglades Mink. Despite considerable effort and multiple survey methods (e.g., 772 camera trap sites, 160 track plates, and 119 visual surveys), biologists failed to find a reliable survey method for detecting Everglades Mink. As a result, in FY 2020-21 FWC biologists obtained a trained scat detection dog from J&K Training Academy (Scentworx Inc., Alachua, FL) to detect Everglades Mink. The scat detection dog was also trained to detect Eastern Spotted Skunks and Long-Tailed Weasels for a concurrent project. Between 2 November 2020 and 26 March 2021, biologists conducted 9 surveys at FSPSP, 2 surveys at Big Cypress National Preserve (BCNP), 2 surveys at Florida Panther National Wildlife Refuge, and 4 surveys at Picayune Strand State Forest (PSSF), surveying a total of 64.2 km. During surveys, the dog alerted on mink tracks in 2 locations at FSPSP and 3 scats, 2 in FSPSP and 1 in PSSF. The scat detection dog had the highest rate of detection, detecting Everglades Mink 50 times more frequently than the next most successful survey method (visual surveys). Although this method was comparably more successful, detection rates were still low overall. Further surveys with detection dogs may be able to address knowledge gaps and improve conservation plans.

Florida Bats

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

Gray Bats formerly roosted in two Florida caves during winter. During the most recent winter count on February 10, 2021, FWC biologists again found no Gray Bats in or adjacent to Florida Caverns State Park. FWC biologists did not observe Gray Bats in any of the other 31 caves in northwest Florida visited during FY 2020-21 as part of a broader study of the use of caves by wintering bats. No Gray Bats have been found hibernating in the state since 2011. 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 well already be absent from the state. In other parts of their range, Gray Bat numbers are increasing, and very large colonies are present in caves in 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, it is possible that protection and stabilization of the large summer colonies of Gray Bats in northern caves have led to bats no longer migrating to Florida.

FLORIDA BONNETED BAT - The Federally Endangered Florida Bonneted Bat is endemic to Florida. In FY 2020–21, all 13 bat roosts (1 roost is 1-2 houses) were occupied for at least one night on Babcock-Webb Wildlife Management Area (WMA; Charlotte County). FWC observed pups in five roosts throughout the FY across various survey types—pup counts, occupancy surveys, and after emergence surveys. Due to COVID-19, there were no capture events in FY 2020-21. FWC maintained 13 bat roosts on Babcock-Webb WMA during FY 2020-21, including constructing new bat houses and replacing 12 houses that were in poor condition. FWC maintained seven automatic passive integrated transponder (PIT) tag readers on Florida Bonneted Bat houses in Babcock-Webb WMA and installed a dual PIT tag reader and a mobile PIT tag reader, which were purchased FY 2020-21. Each reader collects data on when PIT tagged bats enter and exit bat houses.

Since FY 2015-16, FWC and University of Florida (UF) have been working together to locate, monitor, and characterize natural roosts and the surrounding habitat using acoustic surveys, mist net surveys, and radio-telemetry. In FY 2020-21, both acoustic and mist net surveys were conducted in PSSF, FSPSP, Florida Panther

National Wildlife Refuge, Collier-Seminole State Park, Ten Thousand Islands National Wildlife Refuge, and BCNP. FWC captured 15 Florida Bonneted Bats and attached radio transmitters to 9 non-reproductive individuals and tracked these bats back to roost trees in FSPSP, Florida Panther National Wildlife Refuge, and BCNP. Emergence counts were conducted on newly and previously identified roost trees to document occupancy and roost use.

Acoustic surveys were conducted at Spirit of the WMA (Hendry County), Dinner Island Ranch WMA (Hendry County), Fisheating Creek WMA (Hendry County), Everglades and Francis S. Taylor WMA (Miami-Dade, Broward, and Palm Beach Counties), J.W Corbett WMA (Palm Beach County), John C. Mariana Jones/Hungryland Wildlife and Environmental Area (WEA; Palm Beach County), Southern Glades WEA (Miami-Dade County), Rocky Glades Public Small Game Hunting Area (Miami-Dade County), Wingate Creek State Park (Manatee County), Moody Branch Wildlife and Environmental Area (Manatee County), South Fork State Park (Manatee County), Alafia River State Park (Manatee County), Little Manatee River State Park (Manatee County), Honey Moon Island SP (Pinellas County), Terra Ceia SP (Manatee County), Gamble Plantation (Manatee County), Myakka River State Park (Sarasota County), Oscar Sherer State Park (Sarasota), and Orange Hammock WMA (Sarasota; Exhibit 7). FWC provided the USFWS with input on critical habitat designation, natural roost characteristics, acoustic survey protocols, and protocols to address problems that may arise if Bonneted Bats roost in houses or other man-made structures.

TRI-COLORED BAT – The Tri-Colored Bat was historically one of the most common bats in eastern North America, but is now a candidate for federal listing under the Endangered Species Act. Tri-Colored Bats have experienced severe declines throughout their range due to WNS. Although WNS has not yet reached Florida, the disease is now present in Georgia and Alabama, which places Florida's Tri-Colored Bats at high risk. Due to this threat, a large-scale study was initiated in 2014 to better understand the distribution and abundance of cave bats, quantify ideal cave roosting habitat, determine the susceptibility of caves to WNS infection, and identify WNS transmission routes. In FY 2020-21, FWC biologists resurveyed 64 important bat caves, 34 in northwest Florida and 30 in north central Florida, and observed 361 tri-colored bats in 53 (83%) of the caves surveyed. FWC biologists swabbed the skin of bats at 5 caves, 2 bridges, and 1 culvert and submitted samples to the United States Geological Survey (USGS) Wildlife Health Center to test for the fungus that causes WNS. As in previous years, no evidence of the fungus was found and Florida remains the only state east of the Mississippi River free of WNS.

Following anecdotal reports of Tri-Colored Bats in culverts under roads, FWC biologists began surveying roadway culverts in winter 2017-2018 to determine their importance to cave-roosting bat species. In FY 2020-21, FWC biologists surveyed 49 roadway culverts in north Florida. Biologists detected two species including the Tri-Colored Bat and the more common Southeastern Myotis and counted 26 Tri-Colored Bats in 9 (18%) of the culverts surveyed. Although Tri-Colored Bats occupied only a small percentage of culverts, Florida has thousands of roadway culverts which may cumulatively provide roosting habitat for many Tri-Colored Bats. Despite the potential roosting

habitat culverts provide, the use of culverts as a winter roost may put hibernating bats at risk of disturbance, injury, or death from roadway construction, maintenance, and flooding. More research is necessary to develop adequate management guidelines to protect bats that roost in culverts.

ACOUSTIC MONITORING OF BATS IN FLORIDA THROUGH THE LONG-TERM BAT MONITORING PROGRAM – Bats in Florida face numerous threats including climate change, habitat loss and disturbance, and emerging infectious diseases, such as WNS, a fungal disease that has killed more than 6 million hibernating bats in North America since its emergence in winter 2006-2007. To better understand the impact these threats may have, FWC biologists have established the Long-term Bat Monitoring Program (LTBMP) to improve our knowledge of bats in the state and to monitor population trends. Protocols were adapted from the North American Bat Monitoring Program so that FWC can address Florida-specific goals while contributing to bat conservation on a national program. Since the start of the LTBMP in November 2018, 166 stationary points and 6 mobile routes have been established by FWC and partners to record the ultrasonic echolocation bat calls. Of the 221,243 acoustic files identified as bat calls, 54,417 (24.6%) files have been automatically identified as Tri-Colored Bats.

Acoustic monitoring structured through the LTBMP is also being used to complement ongoing cave bat research to better address WNS management issues. Prior work by FWC biologists has demonstrated that Florida's Tri-Colored Bats are active in areas without any caves in winter. This raises the possibility that caves in Florida, may be less important as winter hibernacula for bats than caves are farther north. Acoustic monitoring will be used to identify areas outside of karst regions that may be important to Tri-Colored Bats. Additionally, acoustic monitoring can confirm trends of population decline seen in Florida's caves and evaluate changes over a wider geographic scale.

OTHER ACOUSTIC MONITORING AND MISTNETTING FOR BATS - As part of a multi-year project to investigate the effects of large-scale hydrologic restoration of the Everglades on bats (specifically Florida Bonneted Bats), comprehensive acoustic and mist net surveys have been conducted by FWC. In FY 2020-21 acoustic surveys were conducted at 97 sites for four nights twice in the wet season and twice in the dry season across the following sites: PSSF, FSPSP, Florida Panther National Wildlife Refuge, Collier-Seminole State Park, Ten Thousand Islands National Wildlife Refuge and BCNP. Data processing is ongoing and not yet complete, but Tri-Colored Bats were consistently detected across the study area. Bat capture efforts resumed in April 2021 following approved FWC guidelines for handling mammals during the COVID-19 pandemic. FWC conducted mist net surveys in 12 general areas at 45 net sites on 14 nights in the previously listed areas. During these surveys, no Tri-Colored Bats were captured, but the species was captured in some of these same areas in previous years.

Exhibit 7. Florida Bonneted Bat acoustic and mist net surveys conducted in FY 2020-21.

Location	County	Acoustic Survey Nights	Bats Detected?	Mist net survey sites	Bats Captured?	New Roost Found?	Roost Occupancy
Alafia River State Park	Manatee	48	Processing not complete	0	No	No	N/A
Avon Park Air Force Range	Highlands	0	N/A	0	No	No	1 occupied, 4 not occupied or destroyed
Big Cypress National Preserve	Collier	308	Yes	4	Yes	Yes	2 occupied
Collier-Seminole State Park	Collier	48	Yes	4	No	No	N/A
Dinner Island Ranch WMA	Hendry	329	No	0	No	No	N/A
Everglades and Francis S. Taylor WMA	Miami-Dade, Broward, and Palm Beach	671	Yes	0	No	No	N/A
Fakahatchee Strand Preserve State Park	Collier	444	Yes	16	Yes	Yes	9 occupied, 5 not occupied or destroyed
Fisheating Creek WMA	Glades	54	Yes	0	No	No	N/A
Florida Panther National Wildlife Refuge	Collier	92	Yes	8	Yes	Yes	1 occupied, 1 destroyed
Fred C. Babcock/Cecil M. Wedd WMA - Yucca Pens	Charlotte	0	N/A	0	N/A	No	1 occupied, 5 not occupied or destroyed
Gamble Plantation	Manatee	36	Processing not complete	0	No	No	N/A
Honey Moon Island State Park	Pinellas	74	Processing not complete	0	No	No	N/A
John C. Mariana Jones/Hungryland WEA	Palm Beach	68	No	0	No	No	N/A
J.W. Corbett WMA	Palm Beach	47	No	0	No	No	N/A
Little Manatee River State Park	Manatee	44	Processing not complete	0	No	No	N/A
Moody Branch Wildlife and Environmental Area	Manatee	20	Processing not complete	0	No	No	N/A
Myakka River State Park	Sarasota	27	Processing not complete	0	No	No	N/A
Orange Hammock WMA	Sarasota	96	No	0	No	No	N/A
Oscar Sherer State Park	Sarasota	27	Processing not complete	0	No	No	N/A

Exhibit 7. *(continued)*

Location	County	Acoustic Survey Nights	Bats Detected?	Mist net survey sites	Bats Captured?	New Roost Found?	Roost Occupancy
Picayune Strand State Forest	Collier	704	Yes	13	Yes	No	N/A
Picayune Strand State Forest - Belle Meade Tract	Collier	224	Yes	0	No	No	N/A
Rocky Glades PSGHA	Miami-Dade	254	Yes	0	No	No	N/A
South Fork State Park	Manatee	20	Processing not complete	0	No	No	N/A
Southern Glades WEA	Miami-Dade	271	Yes	0	No	No	N/A
Spirit of the Wild WMA	Hendry	178	Yes	0	No	No	N/A
Ten Thousand Islands National Wildlife Refuge	Collier	40	Yes	0	No	No	N/A
Terra Ceia State Park	Manatee	120	Processing not complete	0	No	No	N/A
Wingate Creek State Park	Manatee	36	Processing not complete	0	No	No	N/A

Florida Manatee

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

MORTALITY AND RESCUE – Statewide, causes of Manatee death are those associated with near-term or newborn issues, cold stress, natural causes, watercraft-collisions, and other human influence. FWC researchers and law enforcement officers respond to statewide reports of Manatee carcasses and injured manatees. In FY 2020-21, 1,118 carcasses were documented in Florida. An Unusual Mortality Event (UME) within the Atlantic Management Unit was declared in March 2021. The contingency plan trigger of >7 cases with 72 hours in a localized area was reported in mid-December 2020. Findings to date indicate severe emaciation due to continued seagrass loss within the Indian River Lagoon (IRL), however, consequences for Manatees extend beyond the IRL. There is potential for long term health effects on reproduction and metabolism. The investigation is ongoing. More information can be found at https://myfwc.com/research/manatee/rescue-mortality-response/ume/. An interactive searchable web-based database with Manatee mortality information is available at https://myfwc.com/research/manatee/rescue-mortality-response/statistics/

In FY 2020-21, statewide FWC and cooperators rescued 164 sick or injured Manatees under the federally permitted statewide rescue program. Four oceanaria (Jacksonville Zoo, ZooTampa, Miami Seaquarium, and Sea World in Orlando) participate in the state-funded rehabilitation program and are partially reimbursed by FWC for their costs. In FY 2020-21, 71 of these rescued Manatees were released, 35 died, and 58 are still being treated. FWC participated in almost every rescue, transport to rehabilitation facilities, pre-release health assessment, and release of rehabilitated manatees in various parts of the state.

POPULATION ASSESSMENT – Population assessments include conducting Manatee counts at winter aggregation sites, aerial surveys used to determine regional distribution and abundance of Manatees and to assess habitat use, and estimating survival, population growth, and reproductive rates through photoidentification and genetic markers. The annual statewide Manatee synoptic survey was not conducted in winter 2021 due to weather conditions and pandemic-related issues. Results from the traditional synoptic survey provide a minimum number of Manatees known to be alive using warm water and winter habitats on a particular survey day. The inability to account for Manatees not seen during the fly over (due to weather and water conditions and Manatee behavior)

results in counts that vary widely across surveys and are of limited utility. Concerted effort has been put forth over recent years to improve the ability to estimate Manatee abundance. An innovative approach was designed, tested, and vetted with experts to meet this challenge. This approach uses a random sampling design and combines multiple sources of information including a double-observer protocol, repeated passes, and detailed diving behavior data. The best estimate of statewide abundance for the 2015-2016 period was 8,810 with 95% probability that the real abundance was 7,520 - 10,280 Manatees. In FY 2020-21, preparations were made for the next abundance survey scheduled to begin in December 2021. FWC conducted smaller-scale distributional surveys in the IRL in response to the above-mentioned UME. For more information, please refer to https://myfwc.com/research/manatee/research/populationmonitoring/abundance/ or for more information on synoptic counts, refer to http://myfwc.com/research/manatee/projects/population-monitoring/.

FWC, with the USGS's Sirenia Project and Mote Marine Laboratory in Sarasota, maintains an image-based, computerized database called the Manatee Individual Photo-Identification System. These data assist in estimating important population vital rates and life history information. Survival rate information from photo-identification efforts was recently updated and included in an application of an Integrated Population Model in southwest Florida (https://nature.com/articles/s41598-021-81478-z).

Genetic testing offers an additional means of identifying individual Manatees; its application could greatly enhance existing monitoring and assessment studies. The Manatee genetic-ID database currently includes over 2,500 unique individuals identified by skin samples collected from live manatees in the southwest Florida pilot study area. A manuscript was published that describes application of a modeling approach to estimate survival using genetics capture-recapture information.

MANATEE FORUM - In FY 2020-21, the Manatee Forum, a diverse stakeholder group, met remotely through video and teleconference in October 2020 and in May 2021. Presentation topics in the October meeting focused on Manatee telemetry and tracking studies in the Northern Gulf of Mexico and along the Atlantic Coast north of Florida and changes in recreational boating in western Pinellas County associated with newly-posted Manatee Protection Zones. The May meeting included updates on the manatee UME in the greater Atlantic Region and the recently completed Warm Water Habitat Action Plan and Florida Power & Light workshop updates. Both meetings included updates and discussion on FWC and USFWS research and management activities.

MANAGEMENT ACTIVITIES - For more information on Manatee conservation efforts, see the annual Save the Manatee Trust Fund report provided to the President of the Florida Senate and the Speaker of the Florida House of Representatives (http://www.myfwc.com/research/manatee/trustfund/annual-reports), which describe progress and activities of the Manatee Management Plan. This report covers programs such as Manatee Protection Plans

(MPPs), Manatee Protection Zones, permit reviews, habitat-related concerns, population assessment, and behavioral ecology. FWC's Florida Manatee Management Plan directs management activities and focuses on five program areas: MPP, Manatee Protection Zones, permit reviews, habitat-related concerns, and outreach.

MANATEE PROTECTION PLANS AND ZONES - In FY 2020-21, staff corresponded with Brevard County and provided informal input regarding potential future updates or data collection efforts while they assess revisions to their MPP. In FY 2020-21, staff met regularly with Miami-Dade County to review their MPP and discuss revisions and coordinated with Sarasota County to initiate data collection efforts for future MPP revisions.

In FY 2020-21, staff worked with the FWC Division of Law Enforcement on sign-posting plans for routine maintenance and repair of waterway signs for Palm Beach and Martin counties. Staff continued to review and monitor available data in several of the county Manatee protection zone rules in FY 2020-21. No significant state rule amendments are currently being considered. In FY 2020-21, staff worked with local municipalities in Lee County to review and approve Manatee protection zones through the local ordinance process.

PERMIT REVIEWS – FWC produced 300 final comments or assistance letters for proposed projects reviewed in FY 2020-21. Reported Manatee entrapment incidents in culverts, ponds, and stormwater drains were investigated for ownership and recommendations were provided for installing grates to preclude future Manatee access. Information distribution is also completed through these comments, as facilities are required to post informational signs and distribute written materials to vessel operators.

MANATEE HABITAT - In FY 2020-21, FWC participated in various intergovernmental groups and task forces regarding minimum flows and levels at springs, invasive aquatic plant control, seagrass monitoring and protection, and other habitat-related concerns. FWC is working with partners to develop and complete projects to restore and conserve natural warm-water habitat in Sarasota and Volusia counties. In FY 2020-21, staff began planning for an interagency and partner workshop to discuss aquatic habitat restoration projects geared at improving Manatee forage and habitat in the Atlantic region, including the IRL.

In November 2020, FWC and USFWS staff finalized and distributed the Florida Manatee Warm-Water Habitat Action Plan, a long-term planning tool for manatee warm-water habitat. In coordination with USFWS and Florida Power & Light, staff are working to plan a Warm-Water Habitat Workshop to develop plans to monitor and protect manatees during work to upgrade existing power generating units and implement key management goals outlined in the Action Plan.

BEHAVIORAL ECOLOGY - Warm-water habitat is of interest to FWC and partners because the predicted future loss of this habitat is a key, long-term threat to Manatees. In FY 2020-21, FWC continued to monitor wintering sites on the

Florida west coast undergoing restoration or mitigation. FWC continued to monitor water temperature of Manatee warm-water habitat statewide via deployment of temperature probes at key sites as well as the management and interpretation of these data.

OUTREACH – As in-person outreach events were curtailed in FY 2020-21, staff focused on distributing educational materials through boating education classes. In addition to this outreach, staff worked to improve the visibility of the Wildlife Alert number for members of the public who want to report manatee injuries or deaths and had this information translated to Spanish. Additional publications were updated or created for distribution – "Guidelines for protecting Florida Manatees" (also translated to Spanish), a multi-lingual Waterway sign/manatee awareness laminated card, and a new manatee awareness post card/rack card was created and distributed to Florida's visitor centers.

Florida Panther

SURVEYS - The Federally Endangered Florida Panther is a subspecies of the puma (also called Cougar or Mountain Lion). FWC and BCNP biologists typically capture a sample of panthers annually between November and February and fit them with collars containing radio transmitters. These radio-collared Panthers are monitored three times a week and their locations are recorded. Since 1981, 260 panthers have been radio-collared. Radio telemetry data was collected on eight panthers in FY 2020-21. In addition to monitoring adults by radio telemetry, biologists visit dens of radio-collared female panthers to collect data on and mark newborn kittens with PIT tags. Since 1992, 518 kittens have been handled at dens. In FY 2020-21, biologists visited two dens and documented 5 kittens (4 males, one female). During FY 2020-21, 25 wild Panthers are known to have died, including four (two male, two females) radio-collared Panthers and 21 (11 males, nine females, 1 unknown sex) uncollared Panthers. Of the 25, 20 Panthers died after being hit by vehicles, two died from fights with other panthers, two died from malnutrition, one had an unknown cause of death.

FWC and USFWS maintained 106 unique trail camera locations on public lands north of the Caloosahatchee River in FY 2020-21. A trapping effort of 17,019 trap-days produced 272 independent panther detections. This included 35 adult female detections representing at least 2 unique individuals. Panthers were detected in Charlotte County (Babcock Ranch Preserve), Glades County (Fisheating Creek WMA, Platt Branch WEA), Highlands County (Highlands Hammock State Park, Sun 'n Lake Preserve), and Lee County (Bob Janes Preserve). The females were photographed at Babcock Ranch Preserve and Fisheating Creek WMA. No dependent aged panthers were detected. Females were documented paired with adult males on 2 occasions. Additional photos submitted to the FWC Panther Sightings website or otherwise communicated directly to FWC included 19 additional independent panther detections north of the Caloosahatchee River.

COLLABORATIVE RESEARCH ACTIVITIES - FWC is involved in multiple research projects focusing on population analyses and models; genetic differences between Panthers and other Puma populations; mortality factors; the efficacy of rehabilitation; benefits of genetic restoration; panther densities on private lands; and impacts of varied diseases on the population. In FY 2020-21, FWC assisted with the completion of research projects including: interactions between Panthers, competitors, and prey. Agency staff served as lead or as co-authors on one peer-reviewed publication.

NEUROMUSCULAR DISORDER IN PANTHERS AND BOBCATS - Feline leukomyelopathy (FLM) is a neuromuscular disorder affecting Florida Panthers and Bobcats. The condition causes damage to the spinal cord resulting in weakness and incoordination. This debilitating disease impairs the ability of affected felids to survive in the wild. Since first documented in 2017, FLM has been diagnosed in 54 Panthers and Bobcats. As of June 30, 2021, FWC has confirmed 12 cases (by histology; 3 Panthers, 9 Bobcats) and 42 probable cases (based on remote video; 20 Panthers, 22 Bobcats) of FLM. Cases were in peninsular Florida in Alachua, Broward, Charlotte, Collier, Hendry, Lee, Manatee, Orange, Pasco, Sarasota and St. Johns counties, and appeared to be concentrated in Southwest Florida between Naples and Tampa. In Southwest Florida, cases extend eastward into BCNP and FSPSP.

FLM appears to be primarily a disease of the nerve fibers rather than the nerve sheaths. Florida Panthers appear to be affected at approximately four months of age, and in this species it neither progresses nor improves, while Bobcats appear to be affected at any age or the condition is progressive. There have been no reports of FLM in domestic felids or other wildlife. However, due to concern over this potential, FWC was in contact with regional wildlife rehabilitators, veterinarians, animal shelters, and more to monitor other species.

Numerous camera traps were deployed to monitor for signs and symptoms of FLM. FWC also compiled citizen reports with video that added to the database of probable cases. FWC performed necropsies on road-killed Bobcats, in addition to Panthers, and performed viral, nutritional, bacterial, and fungal testing. Additional testing for toxins, including rodenticides, pesticides, herbicides, and heavy metals were conducted. Despite the extensive testing, a cause has yet to be determined. An international advisory team was assembled with experts from the fields of virology, pathology, toxicology, wildlife conservation medicine, zoo medicine, and other fields. This team was instrumental in developing an investigation plan, discussing results and charting future directions for research. With the assistance of this team, an FLM investigation plan was developed.

HUMAN-PANTHER INTERACTIONS - FWC verified that Panthers were responsible for preying upon domestic animals (depredations) in three separate events in FY 2020-21. One goat was fatal and a goat and a dog were each injured but survived. These events occurred in Collier and Lee Counties. During depredation investigations,

FWC provides advice to and assists affected residents on how to reduce the risk of Panther attacks. These three depredation events are the lowest numbers reported to FWC since FY 2008-09. FWC provided information and reviews of numerous road and development projects throughout southern Florida in FY 2020-21 to minimize the disruption and loss of panther habitat and corridors, and to provide recommendations to reduce the risk of panther-vehicle collisions and the likelihood of human-panther interactions.

PANTHER SIGHTINGS - FWC launched a website in 2012 where the public can report panther sightings and upload pictures or videos of those sightings (http://www.myfwc.com/panthersightings). By the end of FY 2020-21, over 9,000 panther sightings were submitted. Most records (74%) did not include evidence that would permit verification by FWC that the animal observed was a panther. Of the records containing photographs, FWC verified 38% as panthers and 29% as bobcats. Other purported sightings were determined to be house cats, dogs, coyotes, bears, foxes, otters, raccoon, and a monkey (Rhesus macaque).

North Atlantic Right Whale

The North Atlantic Right Whale is a Federally Endangered species in Florida. The primary calving grounds for this species are off the Atlantic coast of Florida and Georgia. The calving season for the North Atlantic Right Whale is approximately November 15 to 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 the NOAA-Fisheries and is aimed at documenting the seasonal presence of right whales, mitigating vessel-whale collisions, and assessing population dynamics. FWC is one of a handful of major contributors to the North Atlantic Right Whale Photographic Database (http://rwcatalog.neaq.org/Terms.aspx). Photographs are used to identify individual whales based on the callosity (a natural growth of cornified skin) pattern on their head 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. During the 2020-21 calving season, FWC conducted 53 aerial surveys and 14 vessel cruises. Through collaborative efforts with NOAA-Fisheries, the Georgia Department of Natural Resources, the Clearwater Marine Aquarium Research Institute, and volunteer sighting networks, 47 unique North Atlantic Right Whales were documented (including 15 newborn calves). Ten Right Whales were biopsy sampled.

FWC has also worked closely with partners to compile years of southeastern U.S. aerial survey data into a geographic information system (GIS). Analyses of these spatial data help scientists and managers to evaluate 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. FWC analyzes ship

traffic data to help monitor compliance with vessel speed regulations and conduct risk assessments. Staff continued work on a recruitment model that takes maternal body condition into account.

Right Whales are part of an ongoing UME declared in 2017 by NOAA Fisheries. The UME declaration results from elevated mortality for this species and, while the investigation is ongoing, vessel strikes and entanglement are the leading causes of death for the Right Whales examined. Two free-swimming entangled Right Whales were observed off Florida during the 2020-2021 season. Despite multi-agency response efforts to both cases, neither whale was able to be disentangled. One whale (#3920) was later found dead off South Carolina and there have been no subsequent sightings of the other whale (#1803). On February 13-14, a necropsy was conducted on a fresh dead Right Whale calf. A 54-foot sportfishing vessel had reported hitting a whale inside the entrance channel to St. Augustine Inlet the previous evening. Fresh cuts on the calf's back and head were indicative of being struck by a vessel propeller and other injuries were consistent with impact trauma, including broken ribs and bruising. The calf's mother (#3230) was observed a few days later with a series of fresh propeller cuts on her left side. The Fish and Wildlife Research Institute (FWRI) also worked with volunteer sighting networks in Florida to determine the species of whales sighted by the public, as well as to mitigate human interaction with whales.

BIRDS

Audubon's Crested Caracara

The Audubon's Crested Caracara is a Federally Threatened species. FWC continued annual Caracara breeding territory surveys during FY 2020-21 on Dinner Island Ranch, Fisheating Creek, and Holey Land and Rotenberger WMAs using FWC's standard monitoring protocol. Okaloacoochee Slough WMA began caracara surveys this FY on a new property that was acquired in 2019. Okaloacoochee Slough State Forest has observed caracaras nesting in the past but did not report it until FY 2020-21. New active nests were found in Rotenberger and Okaloacoochee Slough WMAs. Historical nests were active in Fisheating Creek WMA and Okaloacoochee Slough State Forest. Nesting was not observed at Dinner Island Ranch and Holey Land WMAs; however, the new nest observed at Rotenberger WMA was within a mile of the historic nest found in Holey Land WMA and staff suspect it may be the same pair that moved over to Rotenberger WMA (Exhibit 8). During FY 2021-22, Okaloacoochee Slough WMA staff will conduct breeding territory surveys on another property that FWC acquired in 2020 and will revisit nest sites acquired in the 2019 property acquisition. Florida Forest Service (FFS) staff and Okaloacoochee WMA staff will monitor the nest site on Okaloacoochee Slough State Forest annually.

Exhibit 8. Audubon's Crested Caracara breeding territory surveys conducted in FY 2020-21.

Location	County	Survey Period	Historical Nests	Historical Active	New Active in 20/21	Total Active in 20/21	Fledges
Fisheating Creek WMA	Glades	January- March	17	3	0	3	Yes
Dinner Island Ranch WMA	Hendry	January-April	8	0	0	0	No
Rotenberger WMA	Palm Beach	January -- April	2	0	1	1	Yes
Holey Land WMA	Palm Beach	January	1	0	0	0	N/A
Okaloacoochee Slough WMA	Hendry	January-March	0	0	2	2	Yes
Okaloacoochee Slough State Forest	Hendry	January-March	0	0	1	1	Yes

Eastern Black Rail

Surveys - The Eastern Black Rail is a subspecies that is Federally Threatened. The Black Rail is a secretive marsh bird that inhabits high salt marsh and shallow freshwater marshes throughout Florida. The Eastern subspecies is experiencing rapidly declining numbers and range contraction in portions of its U.S. range. In an effort to understand the habitat selection and the impact of management on Black Rails, FWC researchers initiated a project within the Upper St. Johns River Basin to survey for Black Rails across public lands and collect pre-management data at a habitat restoration site at Canaveral Marshes Conservation Area (CA) in Brevard County. Areas surveyed included FWC lands (Tosohatchee WMA in Orange County and Salt Lake WMA in Brevard County) and St. Johns River Water Management District lands (Seminole CA in Volusia and Brevard counties, Three Forks CA in Brevard County and Ft. Drum CA in Indian River County). Black Rails were only detected on Canaveral Marshes CA.

Surveys were also conducted on J.W. Corbett WMA, John C. and Mariana Jones/Hungryland WEA, and Everglades and Francis S. Taylor WMA. No Eastern Black Rails were detected during the callback surveys on J.W. Corbett WMA, Jones/Hungryland WEA, and Everglades and Francis S. Taylor WMA; however, many King Rails (*Rallus elegans*) were detected at Everglades and Francis S. Taylor WMA. Even though no Eastern Black Rails were detected during surveys on Everglades and Francis S. Taylor WMA, Eastern Black Rails were detected in February and April 2021 via opportunistic observations within the Everglades and Francis S. Taylor WMA outside the survey area. Future work will focus on continuing surveys and monitoring the habitat and bird responses to management activities at the restoration site.

Habitat Management – With over 2,000 acres of basin marsh and previous Black Rail detections, Salt Lake WMA was identified as having an important role in the conservation of Eastern Black Rails. Habitat management on the area during FY 2020-21 included treatment of 330 acres of potential black rail habitat with prescribed fire.

Everglade Snail Kite

The Everglade Snail Kite is a Federally Endangered bird that inhabits freshwater marshes and lakes in Florida. Core Snail Kite habitat includes the Everglades, Lake Okeechobee, the Kissimmee Chain of Lakes, and the upper St. Johns marsh. Since the population crash in the 2000s, the population had been steadily increasing, reaching a post-crash high of roughly 3,100 birds in 2019. However, the 2020 population estimate showed the first significant decrease in the last 10 years to roughly 2,300 birds. The population is still less than half of what it was less than 20 years ago before the population crashed. Snail Kite population decline was primarily caused by low levels of reproduction and too few young surviving to breeding age.

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

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

FWC funded Snail Kite nest monitoring conducted by the University of Florida (UF) in FY 2015-16, FY 2016-17, FY 2018-19, and FY 2019-20 for all areas of Snail Kite habitat, except Lake Okeechobee and the Everglades. There were 184 active Snail Kite nests recorded throughout Florida in 2020, a slight decrease in nests compared to 2019 (275 nests), and it was the lowest recorded number of active nests since 2009 (128 nests). Loxahatchee Slough Natural Area (Palm Beach County), West Lake Tohopekaliga (Osceola County) and Payne's Prairie Preserve State Park (Alachua County) produced the most nests.

In anticipation of the planned 2019/20 East Lake Tohopekaliga (Osceola County) drawdown, FWC funded a UF study of juvenile Snail Kite movement, survival, and response to hydrologic fluctuation. Global Positioning Satellite (GPS) trackers were used to track 20 juvenile Snail Kites that fledged from nests on West Lake Tohopekaliga, Lake Kissimmee, Lake Parker (Polk County), Payne's Prairie, Loxahatchee Slough, Lake Marian (Osceola County) and Lake Jackson (Osceola County) in 2020. The juveniles spent an average of 44 days near their nest site after fledging. Over the course of their first year, the juveniles traveled as much as 2,865 miles, reaching as much as 259 miles from their nest site. As of June 2021, eight more juvenile Snail Kites were tagged from West Lake Tohopekaliga, East Lake Tohopekaliga, and Lake Kissimmee. Data continues to be collected from the trackers deployed in 2019, 2020, and 2021 and more trackers were deployed throughout the 2021 breeding season. FWC hopes to gain important information on the survival and movements of these juveniles leading up to, during, and after the East Tohopekaliga drawdown. FWC is monitoring Apple Snail populations and movements in East Lake Tohopekaliga to understand how the snails respond and recover from the drawdown. FWC is also partnering with UF to study the Apple Snail and Snail Kite response to habitat management actions on Lake Okeechobee.

Florida Burrowing Owl

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

Florida Grasshopper Sparrow

HABITAT MANAGEMENT AT THREE LAKES WMA — In an effort to restore and maintain the Florida Dry Prairie habitat for Florida Grasshopper Sparrows, Three Lakes WMA staff in Osceola County have performed several management actions. Management includes spraying of small oak trees and cabbage palms with herbicide to prevent encroachment into dry prairie. Florida Grasshopper Sparrows rely on prescribed fire to maintain vertical structure at a minimal height and allow for maintenance of bare ground. A total of 3,311 acres of dry prairie were burned in FY 2020-21, or about half of the total dry prairie that the Florida Grasshopper Sparrow most frequently use. Additionally, WMA staff mechanically treated 141 acres (roller chopped: 120, mowed: 21). These mechanical treatments help improve habitat and control saw palmetto density.

DEMOGRAPHIC MONITORING AND NEST PROTECTION AT THREE LAKES WMA — The ninth season of Florida Grasshopper Sparrow demographic research by FWC was conducted during FY 2020-21 and the beginning of FY 2021-22 (March-August 2021). This project has been a cooperative effort involving staff and support from FWC, USFWS, and members of the Florida Grasshopper Sparrow Working Group. As part of the continued effort to color-band the entire population, two adult males, six adult females, 1 dependent fledgling, and 132 nestlings were newly captured and color-banded in the 2021 season. In addition to these new captures, 56 males and 27 females banded prior to 2021 were resighted in 2021. Together, the number of color-banded individuals observed at least once at Three Lakes WMA in 2021 was 58 adult males, 33 adult females, 1 dependent fledgling, and at least 93 fledged nestlings of unknown sex. All known adult males and females (except two females) in the Three Lakes population have been color-banded in 2021.

In the 2021 season, FWC biologists have located and monitored 55 Florida Grasshopper Sparrow nests. Of these nests, 34 survived to fledge young, 7 were depredated by snakes, 1 failed for unknown reasons but is suspected to have been depredated by a snake, 3 were depredated by mammals, 1 flooded, and 5 failed for unknown reasons. Miniature nest cameras were placed at the entrance of 46 Grasshopper Sparrow nests, helping to identify the predator in many cases. The combined data provided by the nest camera project (2014-2021) have been invaluable to the understanding of the predator community at Three Lakes WMA and will be critical when planning future predation management strategies. In 2021, Florida Grasshopper Sparrow nests (n=47) were protected using predator deflection fencing. Results from previous years (2015-2018) revealed fence installation substantially increases nest survival (up to 5.75 times). It is estimated that 124 additional fledglings were added to the population between 2015 and 2018 because of predator fence installations. While fence installation is labor-intensive and fences only protect the subset of nests located prior to predation, it helps boost local productivity and protect incubating females, thereby providing more time to investigate long-term habitat management solutions.

RELEASE OF CAPTIVE-BRED FLORIDA GRASSHOPPER SPARROWS INTO THE WILD — In 2019, staff began releasing Florida Grasshopper Sparrows that were bred at White Oak Conservation, a conservation breeding facility. Since 2020, birds have also been bred at the Avian Preservation and Education Conservancy and released. The purpose of these releases is to augment the wild sparrow population and to assure the population is genetically diverse. As of August 30, 2021, staff have released 372 Florida Grasshopper Sparrows at Three Lakes WMA in Osceola County, including 108 adults and 264 juveniles. Staff released 147 sparrows in FY 2020-21 (46 adults and 101 juveniles). Releases in 2021 are ongoing.

To monitor the efficacy of the release program, staff uniquely banded all birds. During the 2020 and 2021 breeding seasons, FWC obtained data on survival of released birds via re-sights of their color leg-bands. These data indicate that up to 30% of the released birds, depending on the age class, survive and stay in the population. Many of the released birds have bred successfully in the wild; up to 21% of released sparrows were detected breeding either with a wild partner or another captive-bred bird. In 2020 and 2021, the adult Florida Grasshopper Sparrow population at Three Lakes WMA was composed of about 45% captive-bred and released sparrows. Over 60% of the nests in the wild had at least one captive-bred and released parent and these pairs produced over 65% of the successfully fledged young. These results indicate that the captive-breeding and release program is having a positive impact on the wild Florida Grasshopper Sparrow population.

Florida Sandhill Crane

The Florida Sandhill Crane is State Threatened. In FY 2013-14, FWC began range-wide road surveys and established 12 routes totaling approximately 640 miles through 16 counties. The 2020 breeding season drought index was classified as normal to moderate with water on the landscape in the early months, thus productivity was below average. Staff identified 443 adults and 61 juveniles during the road surveys. Adult numbers were greater than all previous years, but the number of juveniles was slightly less than average. Road survey routes in Osceola and Okeechobee County remain regional strongholds.

To understand habitat use, movements, and survival of cranes in suburban areas and conservation lands, staff began radio-tagging individuals in June 2017. Thus far, 23 adults and 12 juvenile cranes have been tagged in suburban areas and 18 adults have been tagged on conservation lands. Preliminary data suggests some individuals only inhabit suburban or developed areas, while others use suburban areas and rural or conservation lands daily. Staff will continue this project to compare how cranes are surviving and using these different habitats.

Florida Scrub-Jay

The Florida Scrub-Jay is a Federally Threatened species that is endemic to Florida. Three-quarters of remaining scrubby habitats are protected through land under public or private ownership that is dedicated for conservation.

Despite this, Florida Scrub-Jay numbers have continued to decline on conservation lands largely due to habitat degradation caused by decades of fire suppression and inadequate habitat management. Conserving this species requires the efforts of multiple local, state, and federal agencies as well as non-governmental organizations and private landowners. Project staff assist these efforts by facilitating communication among partners through regional scrub working groups and by engaging with the public through outreach.

PUBLIC AND PARTNER ENGAGEMENT - In FY 2020-21, FWC helped organize the 12th Annual Florida Scrub-Jay Festival to raise awareness about the Florida Scrub-Jay and its unique habitat. Due to COVID-19, this year's event was co-hosted virtually by FWC and Jonathan Dickinson State Park. The festival included presentations about scrub-jay research and Audubon's Jay Watch program, as well as educational videos from partners and community organizations. Planning is underway for the next Scrub-Jay Festival in 2022. FWC facilitates communication and information exchange among partners via regional working groups focused on conservation of Scrub-Jays and their habitat. Due to COVID-19, staff organized a virtual statewide meeting of all regional working groups on May 6th, 2021. An update of the Florida Scrub-Jay Conservation website (https://fsjconservation.org/) was completed and technical assistance for stakeholders regarding scrub and Florida Scrub-Jay habitat management, development planning, and general inquiries was provided. Staff also participated in Jay Watch, a citizen-science program organized by Audubon Florida that annually collects information on Scrub-Jay populations on public land and actively educates the public about Scrub-Jays.

TRANSLOCATIONS - In 2017, FWC initiated a partnership with the U.S. Forest Service (USFS), FFS, and FPS to conduct experimental translocations of scrub-jays from Ocala National Forest to other public lands in north-central and southeast Florida. The objectives of this project are to evaluate the effectiveness of different translocation methods and to evaluate the impact of translocation on donor populations. In FY 2020-21, 16 non-breeding "helper" scrub-jays were translocated, including 9 to a newly authorized "Hughes Island Scrub-Jay Management Area" within Ocala National Forest and 7 to Rock Springs Run Reserve State Park. No scrub-jay family groups were translocated during FY 2020-21. Persistence and survival at recipient sites during the past two years have been lower for translocated helpers than for birds translocated with their family groups. However, the project has now reached an important milestone, as translocated birds have bred successfully with resident birds at all three recipient sites outside of Ocala National Forest (Rock Springs Run Reserve State Park; Seminole State Forest in Lake County; and Jonathan Dickinson State Park in Martin County). In addition, FWC and UF have completed a study of the behavior of resident scrub-jays at the donor site after removals for translocation, and results will soon be available.

SURVEYS – Volunteers from the Jay Watch program conduct surveys each summer. Although over 130 jays have been color banded on Half Moon since 2001, banding has been discontinued due to the decline in jay numbers. No juveniles have been found for the past 5 years. There were no Scrub-Jays during the 2020 survey. The last

year a Scrub-Jay was located was 2018. Habitat management is focused on prescribed burning; roller chopping palmetto; and mowing, cutting, or applying herbicide to overgrown oak trees. Half Moon harbors approximately 500 acres of potential jay habitat, which consists of scrubby and mesic flatwoods. Habitat management will continue with palmetto reduction through roller chopping, increasing open ground, and cutting overgrown oaks in and surrounding potential habitat (Exhibit 9).

The Arbuckle and Walk-In-The-Water WMAs are part of the Lake Wales Ridge Sate Forest and encompass nearly 20,000 acres of various habitat types, including scrub and sandhill. In FY 2020-21, the number of groups (22), the total number of birds (75), and the number of juveniles per group (1.1) all increased over the previous year. In FY 2020-21, the total number of groups (6) on Walk-In-The-Water WMA stayed the same as the previous year. Total number of scrub-jays (14) and mean group size (2.3) increased. The number of juveniles per group (0.0) decreased. An ongoing sandhill restoration project included mowing approximately 5 acres of dense, smaller scrub oaks. Additional prescribed fire treatment will follow when conditions are suitable (Exhibit 9).

Lake Wales Ridge WEA consists of 20 tracts with 14 retaining Scrub-Jay groups which are monitored by FWC, Archbold Biological Station, and Jay Watch. Group numbers increased at the Gould Rd, McJunkin, Lake Placid Scrub, Royce, Lake Apthorpe, Highlands Ridge, Sun ‘N Lakes, and Carter Creek tracts. Group numbers remained the same at the Sunray, Silver Lake, Jack Creek, Highlands Park Estates, and Holmes Ave tracts. Group numbers decreased at the Henscratch tract. Prescribed fires occurred on 1,576 acres and 326 acres were mechanically treated (Exhibit 9).

Surveys were also conducted on Salt Lake WEA, Split Oak Forest WEA, and Three Lakes WMA. One group consisting of two banded adults was detected on Salt Lake WEA, which indicated a decline in the number of Scrub-Jay groups in the area. Scrub-jays were not detected on Split Oak Forest WEA or Three Lakes WMA (Exhibit 9).

Annual monitoring of Florida scrub-jays during FY 2020-21 occurred at three mitigation parks in the southwest region. Scrub-jay monitoring at Hickey Creek WEA revealed group numbers remained the same as last fiscal year (2) with a total of 5 birds on the site. One juvenile was confirmed after the nesting season. Additional birds were occasionally observed just off the site in a residential area. Management actions included 5 acres of prescribed burning, 14 acres of mechanical treatment, and 74 acres of chemical treatment. The Platt Branch WEA (Highlands County) was monitored by FWC and both group numbers (10) and number of individuals (27) contracted slightly in FY 2020-21 yet remain above the long-term average. Eight of the Scrub-Jays were juveniles which was up one from the previous year. Management efforts included prescribed burning of 480 acres and 26 acres of mechanical treatment. The Moody Branch WEA is monitored by both FWC staff and Jay Watch volunteers. In FY 2020-21, the number of groups (5) remained unchanged from the previous year with a total population of 26 individuals,

including 10 juveniles. In FY 2020-21, mechanical treatments were conducted on 397 acres, 296 acres were treated chemically, and 163 acres received prescribed burns (Exhibit 9).

Exhibit 9. Florida Scrub-Jay surveys and habitat management conducted in FY 2020-21.

WMA/WEA	County	Number of Groups	Number of Birds	Mean Group Size	Juveniles per Group	Habitat Management (acres)
Arbuckle WMA	Polk	22	75	3.4	1.1	Prescribed Fire
Carter Creek tract	Highlands	22	72	3.3	0.6	Prescribed Fire (612); Mechanical (71)
Gould Road tract	Highlands	12	40	3.3	1	Mechanical (57)
Half Moon WMA	Sumter	0	0	0	0	
Henscratch 27 tract	Highlands	0	0	0	0	N/A
Henscratch tract	Highlands	7	25	3.6	1	Prescribed Fire (34)
Hickey Creek WEA	Lee	2	5	2.5	0.2	Prescribed Fire (5); Mechanical (14); Chemical (74)
Highlands Park Estates tract	Highlands	3	16	5.3	2.3	Prescribed Fire (199); Mechanical (26)
Highlands Ridge	Highlands	9	29	3.2	0.7	N/A
Holmes Ave tract	Highlands	11	32	2.9	0.6	Mechanical (4)
Jack Creek tract	Highlands	1	3	3	0	Prescribed Fire (129)
Lake Apthorpe tract	Highlands	4	9	2.3	0.3	Prescribed Fire (133)
Lake Placid Scrub tract	Highlands	36	105	2.9	0.4	Prescribed Fire (350)
McJunkin tract	Highlands	16	56	3.5	0.1	Prescribed Fire (15)
Moody Branch WEA	Manatee	5	26	5.2	2	Prescribed fire (163); Mechanical (397); Chemical (296)
Platt Branch WEA	Highlands	10	27	2.7	0.8	Prescribed fire (480); Mechanical (26)
Royce Ranch tract	Highlands	9	29	3.2	0.9	Prescribed Fire (53)
Salt Lake WMA	Brevard	1	2	2	0	
Silver Lake tract	Highlands	10	30	3	0.5	Prescribed Fire (51); Mechanical (51)
Split Oak Forest WEA	Orange	0	0	0	0	Prescribed Fire (247)
Sun 'N Lakes tract	Highlands	10	33	3.3	0.4	Mechanical (32)
Sunray	Polk	1	2	2	0	Mechanical (85)
Three Lakes WMA	Osceola	0	0	0	0	
Walk–in–the–Water WMA	Polk	6	14	2.3	0	Prescribed Fire; Mechanical (5)

Red-cockaded Woodpecker

The red-cockaded woodpecker (RCW) is Federally Endangered. Staff helped organize the statewide RCW working group virtual meeting in August. Staff continues to enroll landowners in the statewide RCW Safe Harbor program, which allow landowners to restore or enhance RCW habitat without incurring additional regulatory restrictions on the use of their land. No new agreements were signed in FY 2020-21, but there are 21 properties currently enrolled in the program totaling 100,186 acres of land protected for RCWs. The 2020 breeding season concluded with populations remaining on track to achieve, or in many cases exceed, the 2020 population and metapopulation goals outlined in Florida's RCW Management Plan (https://myfwc.com/media/2046/rcw-plan-only.pdf).

SURVEYS – FWC, in cooperation with the Florida Forest Service (FFS), continued to manage and monitor RCWs on the 50,317-acre Citrus tract of the Withlacoochee State Forest. Habitat management and cavity maintenance were also conducted on the Citrus tract in FY 2020-21 (Exhibit 10). Additionally, staff and volunteers cut and treated encroaching hardwoods with herbicide in at least 15 clusters and protected over 375 cavity trees from fire in 32 clusters by removing and raking fuels. In October 2020, Citrus donated 8 hatch year RCWs for translocation to Babcock Ranch Preserve (BCRP) and 4 hatch year RCWs to Hungryland WEA. FWC continued to manage and monitor RCWs in Goethe State Forest WMA. Habitat management also continued at Goethe WMA in FY 2020-21 (Exhibit 10).

Babcock Ranch Preserve is located in Charlotte County and covers 67,619 acres. In FY 2020-21, staff conducted annual RCW monitoring, cavity maintenance, and habitat management on the Preserve (Exhibit 10). FWC also mowed around cavity trees on BCRP. Platt Branch Mitigation Park WEA (Highlands County) covers 1,971 acres. In FY 2020-21, staff conducted annual RCW monitoring, cavity maintenance, and habitat management (Exhibit 10). In addition to the clusters on the WEA, there are three RCW clusters on adjacent lands.

BCNP spans 729,000 acres of public land (Collier and Monroe counties) in South Florida and supports the southernmost population of RCWs range-wide. This population continues to be cooperatively monitored by the NPS and FWC. One hundred twenty-two known RCW clusters are actively being managed. In FY 2020-21, surveys found 82 active clusters and 17 inactive clusters (Exhibit 10). An additional 23 clusters were not assessed due to time and access constraints. Staff again observed a high rate of initial nest failure and are unsure of the cause, though staff witnessed corn snakes actively consuming nestlings in two sites.

In FY 2020-21, John G. and Susan H. Dupuis, Jr. WEA staff determined the number of active clusters, monitored active clusters for nests, color-banded nestlings and adults, and determined fledging success. Artificial cavities were installed, replaced, and maintained in existing clusters. Sixteen potential breeding groups (PBGs) produced 20 fledglings. Twenty-thousand acres were managed for RCWs. Staff will continue to implement habitat management activities to reduce midstory height and enhance red-cockaded woodpecker habitat.

In FY 2020-21, FWC staff translocated the first pairs of RCWs to John C. and Mariana Jones/Hungryland WEA as part of a reintroduction attempt to further grow the DuPuis/Corbett metapopulation. In Fall 2020, Jones/Hungryland WEA staff received five pairs of RCWs. Jones/Hungryland WEA currently has 2 active clusters, 1 PBG, 1 solitary bird, and 1 nest attempt. Remarkably, staff observed a breeder male from DuPuis WEA and a breeder female from J.W. Corbett WMA successfully hatch one chick, though fledging failed. Staff addressed habitat management needs in FY 2020-21 (Exhibit 10) and will continue to install artificial cavities, translocate subadult RCWs to Jones/Hungryland WEA, and address on-going management and monitoring needs.

In FY 2020-21, FWC staff at J.W. Corbett WMA determined the number of active clusters, monitored active clusters for nests, color-banded nestlings and adults, and determined fledging success. Artificial cavities were installed, replaced, and maintained in existing clusters. Habitat management was also addressed (Exhibit 10). Having met federal recovery standards of 40 PBGs combined with the DuPuis/Corbett metapopulation, J.W. Corbett WMA did not translocate birds this FY.

PSSF is a 72,995-acre WMA (Collier County) in Southwest Florida and is cooperatively managed with the FFS and FWC. FWC began monitoring the RCW population in March 2019. In FY 2020-21, FWC funded the banding training and certification of one biologist to continue to maintain PSSF as a 100% marked population and conduct monitoring surveys (Exhibit 10). In FY 2020-21, FFS completed prescribed burning and exotic vegetation treatments and FWC continued the groundcover reduction project, clearing vegetation around 85 RCW trees, as well as cavity maintenance (Exhibit 10). Habitat management activities will continue in FY 2021-22, including restoration and habitat management plans for future RCW recruitment in the Broken Wing area of Picayune to expand the population closer to PSSF's recovery goal of 25 PBGs.

In FY 2020-21, two new recruitment clusters were installed on Apalachicola River WEA, the first new cluster additions since 2011. The purpose of installing the new clusters was to facilitate population expansion and dispersal between Apalachicola River WEA and adjacent conservation lands, which include Tate's Hell and Apalachicola WMAs. One of the new clusters was successfully occupied by the end of the summer meeting the goal of facilitating population expansion between conservation lands.

In FY 2020-21, staff conducted annual RCW monitoring, cavity maintenance, and habitat management on the Fred C. Babcock/Cecil M. Webb, Herky-Huffman Bull Creek/Triple N Ranch, and Three Lakes WMAs as well (Exhibit 10).

Exhibit 10. Red-Cockaded Woodpecker surveys and habitat management conducted in FY 2020-21.

Location	County	Active Clusters	Potential Breeding Groups	Solitary Birds	Nest Attempts	Bandings	Fledglings	Cavity Maintenance	Habitat Management (acres)
Apalachicola River WEA	Franklin	11	11	0	15 (9 successful)	21	19 (18 confirmed, 1 likely)	Installed 2 new recruitment clusters, augmented 7 existing clusters	Prescribed fire (5,542)
Apalachicola WMA	Franklin, Leon, Wakulla							Installed 50 artificial cavities	
Babcock Ranch Preserve	Charlotte	19	18	1	21 (13 successful)	20	17	1 insert added, 3 replace	Mowed around RCW trees
Babcock/Webb WMA	Charlotte	46	43	3	36 (14 failures, 3 successful re-nests)	37	34	2 inserts added, 2 inserts replaced	Prescribed fire (20,367), roller chopped (1,120), chemical treated (22,623)
Big Cypress National Preserve	Collier, Monroe	82	34	3	31	39	19	0 inserts added	
Citrus WMA	Citrus	94	89	5	87	169	139	22 inserts replaced, 5 inserts cleaned/repaired, and 14 new inserts installed	Prescribed fire (11,893)
Croom WMA	Hernando, Sumter	41	41	0	39 (3 failures)	72 (7 unbanded)	71	10 inserts added/replaced	Prescribed fire (6,449)
Goethe State Forest	Levy	76	64	12		94	75		Prescribed fire (7,000)
Herky-Huffman Bull Creek/Triple N Ranch WMA	Osceola	37	30	2	30	43	37	12 inserts replaced	1,395 acres of RCW habitat burned on Herky Huffman Bull Creek WMA; 2,264 acres of RCW habitat burned on Triple N Ranch WMA.

Exhibit 10 (continued). Red-Cockaded Woodpecker surveys and habitat management conducted in FY 2020-21.

Location	County	Active Clusters	Potential Breeding Groups	Solitary Birds	Nest Attempts	Bandings	Fledglings	Cavity Maintenance	Habitat Management (acres)
John C. and Mariana Jones/Hungryland WEA	Palm Beach, Martin	2	1	1	1		0		Prescribed fire (1,165), mechanical treatment (106), chemical treatment (3,833)
J.W. Corbett WMA	Palm Beach	34	31		23				Prescribed fire (8,428)
Picayune Strand State Forest WMA	Collier	14	13		11 (7 successful; 4 failures, 2 re-nests, 0 successful)	14	11	6 cavities installed	Prescribed fire (38); exotic vegetation treatment (1,274)
Platt Branch WEA	Highlands	6	6	0	4 (1 failure)	8	5	4 inserts added	Prescribed fire (480), mechanical treatment (26)
Tate's Hell WMA	Franklin, Liberty	73	68		68	54	40	Installed 18 cavities; 2 new recruitment clusters; 5 existing clusters augmented; 18 cavities cleaned of debris	Mechanical treatment (38)
Three Lakes WMA	Osceola	55	46	3	44	60	60	3 inserts replaced	Prescribed fire (9,592)

Reddish Egret

The Reddish Egret is state listed as Threatened in Florida due to its small population size, potential recent population declines, and restricted distribution. In FY 2020-21, FWC and partners conducted surveys for Reddish Egrets at the largest colony in Merritt Island National Wildlife Refuge (MINWR) and throughout the lower Florida Keys, which had not been surveyed since 2016, to assess the status of the species. The number of breeding pairs at Mullethead Island in MINWR was slightly greater than what was detected in 2016, which suggests a stable or slightly growing population at the site. The number of breeding pairs in the lower Keys was substantially less in 2021 (66 breeding pairs detected) than in 2016 (95 breeding pairs detected), and six previously occupied sites that were nearly or completely destroyed by Hurricane Irma had not yet recovered and lacked any breeding birds. FWC's survey in the lower Keys was of limited duration, however, and results suggested a high level of interannual movement among sites by nesting adults. As such, it is not clear whether that regional population has declined or largely moved to new breeding sites that were not surveyed in 2021. FWC intends to conduct a comprehensive statewide survey to better understand the status of this species.

Salt Marsh Songbirds

GENETICS STUDY - Scott's seaside sparrow and Wakulla seaside sparrow are non-migratory salt marsh specialists and two of five recognized subspecies of seaside sparrow that breed in Florida (the other three include the MacGillivray's seaside sparrow, the Federally Endangered Cape Sable seaside sparrow, and the Louisiana seaside sparrow). However, questions have been raised about whether the current sub-species designations are valid.

FWC and collaborators at UF examined population structure in seaside sparrows along Florida's coastline using multiple approaches and modern genetic methods to determine the relatedness of sparrows in these populations. Genetic analysis showed support for three distinct genetic groups (in addition to the interior population of Cape Sable seaside sparrow which was not included in this study) along Florida's coastline. FWC identified three clusters that correspond to three geographic regions in Florida: Atlantic coast, Gulf coast peninsula, and the western panhandle. Genetic analysis did not support the distinctiveness of state listed Wakulla seaside sparrow. However, analysis of genetic structure along Florida's coastline support Scott's and Louisiana as distinct genetic units. Analysis of morphological data did not suggest that Wakulla seaside sparrow is distinguishable from other Florida subspecies using body measurements. Analysis of song data is currently underway. The combined results will be used to refine taxonomic designations of seaside sparrow which may affect listing status and, therefore, future conservation and management priorities.

SURVEYS – FWC staff conducted surveys of the salt marsh songbird populations at Lower Suwannee National Wildlife Refuge in Dixie and Levy counties and at Big Bend WMA in Taylor and Dixie counties as part of FWC's Imperiled Species Management Plan, Species Action Plan and Wildlife Conservation, and Prioritization and Recovery objectives. These surveys are part of a regular 5-year interval monitoring effort of state listed salt marsh songbirds in the state. Data will be used to track population trends for the species and help guide future management actions. Species surveyed included Marian's marsh wren and Scott's/Wakulla seaside sparrow.

PRESCRIBED FIRE AND SALT MARSH ANIMAL COMMUNITIES – In FY 2020-21, FWC staff started a project intended to examine the effects of prescribed fire on salt marsh bird and mammal species. Staff conducted surveys, nest searching and camera trapping to document the avian and mammal populations at St. Marks National Wildlife Refuge in Wakulla, Jefferson, and Taylor counties and Apalachicola River WEA in Franklin and Gulf counties. This project will last until 2023 and analysis is on-going. Data will be used to help guide future prescribed fire practices. Salt marsh songbird species surveyed included Marian's marsh wren and Scott's/Wakulla seaside sparrow.

Shorebirds and Seabirds

Twenty species of shorebirds and seabirds breed in Florida, four are State Threatened (American Oystercatcher, Black Skimmer, Least Tern, and Snowy Plover) and one is Federally Threatened (Roseate Tern). Over 40 species of shorebirds and seabirds winter in Florida, two are federally listed, Red Knot (Threatened) and Piping Plover (Endangered).

SHOREBIRD PROGRAM – To build upon the existing species action plan completed in November 2013 (https://myfwc.com/wildlifehabitats/wildlife/species-action-plans/), in 2016 FWC and partners completed the Florida Beach-nesting Bird Plan that includes specific population goals, metrics, timelines, funding needs, and a conceptual framework consistent with national shorebird recovery plans (http://flshorebirdalliance.org/media/1007/floridabeachnestingbirdplan.pdf). To implement the Beach-nesting Bird Plan, FWC inaugurated a dedicated Shorebird Program that expands upon foundational shorebird conservation work and is supported by a grant through the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund. Working with its key partner, Audubon Florida, FWC continues to recover shorebird populations using five strategies: reduce human disturbance, manage habitat, manage predation, inform management and track outcomes, and improve regulatory coordination. The project area encompasses a variety of habitats used by breeding, wintering, and migrating shorebirds. The 4-year Phase I project is now complete and Phase II has begun.

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 2020 nesting season, FSA partners collectively monitored 969 miles of coastline and protected 6,127 State-Threatened seabird nests and 487 State-Threatened shorebird nests with posting. The FSA publishes a monthly e-newsletter (the Wrack Line) that reaches over 33,000 subscribers. Through the 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), which functions as a principal online resource for information and materials on Florida's shorebirds and seabirds, and as a tool to improve coordination and information sharing between regional partnerships.

FLORIDA SHOREBIRD DATABASE - The Florida Shorebird Database (www.flshorebirddatabase.org) was launched in spring 2011 to serve as the central repository for data collected on shorebirds and seabirds in Florida. Over 1,400 monitoring partners throughout the state have registered accounts in the Database and many of these partners collect and report breeding data. During the 2020 nesting season, partners entered 14,896 data records in the Database. Monitoring data are available online to anyone with an account, thereby allowing researchers, managers, conservationists, and permit reviewers to use information to help manage and conserve shorebirds and seabirds. The Shorebird Program published an annual monitoring report, "Florida Shorebird Alliance Monitoring Data at Work" summarizing monitoring data entered into the Database (https://flshorebirdalliance.org/media/1267/2021fsamonitoringdataatwork.pdf).

ABUNDANCE ESTIMATES – In FY 2020-21, Shorebird Program staff used data in the Florida Shorebird Database to finalize methods to estimate the abundance for each State-Threatened shorebird and seabird species. Data from 2019 were used to develop the baseline abundance estimates for breeding adults in Florida. Estimates will be updated annually and used to measure progress toward meeting species population recovery goals. Trends in abundance will continue to guide conservation actions and inform adaptive management strategies.

ROSEATE TERN - The Roseate Tern is a Federally Threatened seabird and is only found in extreme South Florida in a limited number of colonies. In FY 2019-20, Pelican Shoal Critical Wildlife Area re-emerged after being submerged in 2005 from hurricanes. FWC staff immediately closed the island with CWA signs. The island has increased in size since it first re-emerged in early 2019. Unfortunately, early season tropical lows and storms caused some over wash of the island and prevented Roseate Terns from nesting on the island. Pelican Shoal was once again too small and low for roseate tern nesting in 2021. Two nesting platforms have been placed on Big Pine Key to attract Roseate Terns. Unfortunately, Roseate Terns did not use the platforms and they were instead used by Least Terns. This past season, Roseate Terns only nested at three sites in the Florida Keys, which were all on historical nesting sites on roofs. Based on the nest counts, FWC estimates the total roseate tern population for Florida in 2021 was approximately 44 nesting pairs. The number of chicks that were produced were a minimum of 40. None of the other historic sites on roofs or the abandoned Bahia Honda bridge contained nesting Roseate Terns in 2021.

Southeastern American Kestrel

The Southeastern American Kestrel is a State Threatened non-migratory falcon closely tied to sandhills, scrub, pasture, and prairies in the Southeastern U.S. This subspecies has undergone a range reduction and population decline throughout its range in recent decades. The current population size is estimated to be approximately 1,350-1,500 breeding pairs. Staff and volunteers performed annual maintenance on Kestrel boxes in December and monitored boxes from April to June (Exhibit 11). Late nesting attempts are monitored through July. Staff also did site evaluations on nest boxes installed in Utility Rights-of-Way in Levy County to determine maintenance needs.

SURVEYS - On Jennings State Forest WMA (Clay and Duval counties) staff cleaned and maintained 6 nest boxes and conducted four visits during nesting season however, no Kestrel activity was noted. On Camp Blanding WMA staff cleaned and maintained 50 nest boxes and conducted four visits during nesting season. Staff observed 136 eggs that produced 91 chicks. Three boxes were not used and remained vacant. On Bell Ridge Longleaf WEA staff cleaned and maintained 4 nest boxes and conducted four visits during nesting season. Staff observed 6 eggs and 7 chicks. On Fort White WEA staff cleaned and maintained 9 nest boxes and conducted four visits during nesting season, however, no Kestrel activity was noted. On Watermelon Pond WEA staff cleaned and maintained 6 nest boxes and conducted four visits during nesting season and observed two nesting attempts with one fledging 4 chicks. On Twin Rivers WMA staff cleaned and maintained 8 nest boxes and conducted four visits during nesting season. Staff observed 5 hatched chicks that all fledged. No mortality was observed. On Caravelle Ranch WMA (Putnam County) staff cleaned and monitored 3 kestrel nest boxes and conducted two visits during the nesting season however, no Kestrel activity was noted. On Three Lakes WMA (Osceola County) staff maintained and monitored 8 kestrel nest boxes on the area and conducted visits three times during the nesting season, however, no Kestrel activity was observed. During Kestrel surveys, several other species were observed utilizing nest boxes including the Eastern Screech Owl, Great Crested Flycatcher, Southern Flying Squirrels, Eastern Gray Squirrels, Eastern Blue Birds, and Tufted Titmice.

Exhibit 11. Southeastern American Kestrel next box surveys conducted in FY 2020-21.

Location	County	Boxes Managed	Boxes Occupied	Nest Success	Other Species in Boxes
Blackwater WMA	Okaloosa, Santa Rosa	25	6	Yes	Eastern Screech Owl, Eastern Bluebird, Great-Crested Flycatcher
Bell Ridge Longleaf WEA	Gilchrist County	4	2	Yes, 7 chicks	Southern Flying Squirrel, Great-Crested Flycatcher, Eastern Screech Owl, Tufted Titmice
Camp Blanding WMA	Clay County	50	31	Yes, 91 chicks	Gray Squirrel, Southern Flying Squirrel, Great-Crested Flycatcher, Eastern Screech Owl, and Eastern Bluebird
Caravelle Ranch WMA	Putnam	3	0	0	Eastern Bluebird, Great Crested Flycatcher
Chassahowitzka WMA	Hernando	9	6	Yes, 20 chicks	Eastern Screech Owl
Chinsegut WEA	Hernando	2	0	No	Eastern Bluebird, Eastern Screech Owl, Great Crested Flycatcher
Crooked Lake	Polk	3	N/A	N/A	N/A
Fort White WEA	Gilchrist County	9	0	No	Southern Flying Squirrel, Great-Crested Flycatcher
Hilochee WMA	Polk	7	0	No	Eastern Screech Owl, Great Crested Flycatcher, Red-bellied Woodpecker
Janet Butterfield Brooks WEA	Hernando	1	0	No	Red-bellied Woodpecker
Jennings State Forest WMA	Clay and Duval Counties	6	0	No	Southern Fox Squirrel, Great-Crested Flycatcher
Lake Wales Ridge WEA	Highlands, Polk	13	2	Yes, 7 chicks	Eastern Bluebird, Eastern Screech Owl
Moody Branch WEA	Manatee	2	0	No	Eastern Screech Owl
Perry Oldenburg WEA	Hernando	3	2	Yes, 7 chicks	Eastern Bluebird, Great Crested Flycatcher
Platt Branch WEA	Highlands	4	0	No	Eastern Screech Owl, Great Crested Flycatcher
Tenoroc Public Use Area	Polk	1	Yes	Yes, 2 chicks	N/A
Three Lakes WMA	Osceola	8	0	0	Eastern Screech Owl, Great Crested Flycatcher
Twin Rivers State Forest WMA	Madison County	8	3	Yes, 5 chicks	Eastern Screech Owl, Southern Flying Squirrels
Watermelon Pond WEA	Alachua County	6	2	yes, 4 chicks	N/A

Wading Birds

J.W. Corbett WMA staff conducted ground wading bird surveys in place of the previously conducted aerial wading bird surveys. No nests were observed due to vegetation blocking staff's line of sight to the nests. One black crowned night heron, one tricolored heron, and approximately twenty little blue heron nestlings were observed during the

surveys. South Florida Water Management District staff observed two rookeries in Holey Land WMA that have been active in previous years. There were multiple strong wind events this past spring. The more northern rookery appeared to gain nesters after that wind event. There were a few nests that persisted in the southern rookery (approximately 3-4 tricolored heron nests and 5-8 little blue heron nests). The more northern rookery had much more robust numbers with 8-9 tricolored heron nests and 20-25 little blue heron nests. Corkscrew Regional Ecosystem Watershed WEA did not conduct wading bird surveys during FY 2020-21 (Exhibit 12).

Exhibit 12. Wading bird surveys conducted in FY 2020-21.

Location	County	Historical rookeries	FY 20/21 Rookeries (nests)	Roosting Sites	Foraging Aggregations	Species
Apalachicola River WEA, Box- R WMA, Tate's Hell WMA	Gulf, Franklin, Liberty	N/A	1 (15)	N/A	Little Blue Herons observed but no active nests found	Wood Stork
Aucilla WMA	Jefferson, Taylor	N/A	2 (6)			Little Blue Heron
Holey Land	Palm Beach	2	2 (36-46)	N/A	N/A	Little Blue Heron (25-33 nests), Tricolored Heron (11-13)
J.W. Corbett	Palm Beach	5	1(N/A)	N/A	N/A	Approximately twenty Little Blue Heron nestlings
Lafayette Forest WEA	Lafayette	1	Unknown		Lower water levels and less activity observed. Roseate Spoonbills observed feeding, but nesting not confirmed	Little Blue Heron
Little Gator Creek WEA	Pasco	1	0	0	N/A	Wood Stork
L. Kirk Edwards WEA	Leon	1	1(40)			Wood Stork
Ocholocknee South (private land)	Leon	1	1(150+)			Wood Stork

White–crowned Pigeon

The State Threatened White–Crowned Pigeon is endemic to Monroe and Miami–Dade Counties. Most known nesting islands are protected in the Florida Keys, Everglades National Park, and Biscayne National Park. In FY 2018-19, range–wide foraging surveys were completed, and Florida Keys WEA staff spent FY 2019-20 scouting multiple sites in the Florida Keys for potential nesting locations. At the end of FY 2020-21, Florida Keys WEA staff began

conducting flight-line count surveys in order to confirm and find new nesting locations throughout the Florida Keys. Surveys are continuing through August 2021. Preliminary results from scouting and flight-line count surveys have reported nesting in the upper, middle, and lower keys at multiple locations that were previously unknown. Final results will be presented in next year's report.

AMPHIBIANS

Flatwoods Salamanders

FROSTED FLATWOODS SALAMANDER – FWC staff gave Frosted Flatwoods Salamanders a headstart in the Apalachicola National Forest (ANF) for the fifth consecutive breeding season by removing 1,521 eggs from 10 breeding ponds, resulting in 1,268 healthy hatchling larvae surviving to be released back to the wild. An additional 47 were rescued from a prematurely drying pond and 47 survived to release. Ongoing drift fence monitoring of two breeding ponds resulted in the capture of only 5 adult salamanders at a single pond (3 males, 1 female, 1 unknown), representing a 62% population decline in 4 years. All adults were recaptured headstarts released in the previous two years. To determine landscape-level occupancy of frosted flatwoods salamanders, FWC staff and USFS partner conducted larval dipnet surveys of 258 ponds in the ANF, including all 89 historically or currently occupied breeding sites. Larvae were captured at 18 sites and eggs were collected at an additional 3 ponds, but no larvae were subsequently detected.

RETICULATED FLATWOODS SALAMANDER - Beginning in November 2018, a five-year Reticulated Flatwoods Salamander recovery project was initiated on Escribano Point WMA, Santa Rosa County. The project is a cooperative agreement among FWC, Department of Defense (DOD), USFWS, and the Longleaf Alliance (LLA), utilizing funds from the DOD Readiness and Environmental Protection Integration Program. This funding enabled implementation of a headstarting program to further aid in species recovery. In FY 2020-21, LLA staff, with assistance from FWC, collected 401 eggs from 6 wetlands, with 224 of those being released. In addition, LLA and FWC monitored numerous wetlands using a standardized dip netting protocol to determined larval occupancy in 10 of 29 targeted wetlands. LLA also monitored two drift fences at two separate wetlands capturing adults at one wetland. Staff documented Reticulated Flatwoods Salamanders in 10 wetlands in FY 2020-21, all of which had previously been occupied. FWC staff also dipnetted for Reticulated Flatwoods Salamanders at known breeding sites on Yellow River Marsh State Preserve, Yellow River WMA, and Garcon Point WMA, however, no larvae were detected. In FY 2020-21, staff conducted habitat management activities to enhance Reticulated and Frosted Flatwoods Salamander habitat (Exhibit 13).

Exhibit 13. Habitat management conducted in FY 2020-21 for Flatwoods Salamanders.

Location	County	Species	Management Activities (acres)
Apalachicola WMA	Franklin, Leon, Wakulla	Frosted	Chemical treatments (18.65)
Escribano Point WMA	Santa Rosa	Reticulated	Prescribed fire (2,794) mechanical and chemical treatments (23.5)

Florida Bog Frog

In FY 2020-21, FWC conducted surveys for the Florida Bog Frog along two creeks on Yellow River WMA (Santa Rosa County). Surveys were conducted monthly from May to August at points established in FY 2018-19: 10 on Garnier Creek and 8 on Julian Mill Creek. On Garnier Creek, staff detected a maximum of three frogs at the powerline Right-of-Way (ROW) and a maximum of four frogs at four survey points downstream from the ROW that had received previous restoration treatments. Staff detected Bog Frogs further downstream on Garnier Creek than previous years, confirming that habitat restoration efforts are increasing the amount of suitable habitat available. On Julian Mill, staff detected one frog upstream of the ROW and one frog on the ROW. As only one frog was detected during any survey repetition on Julian Mill Creek, it is possible the same frog was detected at the two survey points.

In FY 2020-21, approximately 5.1 acres received restoration treatments on Garnier Creek. Completion of this restoration project in March 2021 brings the total acreage of improved habitat to 18.9 acres since 2012. Habitat maintenance was conducted using herbicide and hand cutting by the LLA Wetland Ecosystem Support Team in cooperation with FWC. Restoration of approximately 0.26 acres was conducted by the LLA and FWC at two locations on Julian Mill Creek as well. Staff will be monitoring bog frog response to restoration on Julian Mill Creek. Future restoration will focus on expanding the previously treated areas.

Gopher Frog

Florida represents a stronghold for the Gopher Frog, which has experienced serious declines throughout its range outside of the state. The Gopher Frog is under evaluation for federal listing. FWC staff attended three conference calls organized by the University of Georgia (UGA) to determine appropriate conservation and management actions for metapopulations in each state. This information was used in the final report to the USFWS entitled "Strategic conservation management for Gopher Frogs at site-specific to range-wide scales." FWC drafted Species Conservation and Permitting Guidelines for the Gopher Frog and presented the guidelines to the Commission in FY 2020-21. The guidelines describe management and conservation actions that will benefit the species.

SURVEYS – In FY 2020-21, Gopher Frog tadpoles were detected during dipnet surveys for Striped Newts in 10 ponds at three sites, including two new breeding ponds (borrow pits) at Camp Blanding Military Reservation. FWC staff also detected Gopher Frog tadpoles in two ponds on Blackwater WMA while conducting dipnet surveys. Prior to these records, Gopher Frogs had not been detected on Blackwater WMA since 2001. In addition to dipnet

surveys, FWC staff provided UGA with candidate ponds, primarily on private land, in the panhandle to survey for Gopher Frogs using eDNA (Deoxyribonucleic acid). FWC staff collaborated on two manuscripts on Gopher Frog abundance in gopher tortoise burrows that were submitted to the Journal of Fish and Wildlife Management (one manuscript has been published online early).

Striped Newt

The Striped Newt is endemic to north Florida and South Georgia, where it has been extirpated from many parts of its range. It was a candidate for federal listing as Threatened but was found to not warrant listing under the Endangered Species Act. Consequently, FWC was requested to evaluate the Striped Newt, initiating the biological review process. FWC staff completed the Biological Status Review report which recommended that the species be listed as State Threatened. FWC staff presented the recommendation to the Commission in May 2021. The recommendation was accepted and the species was placed on the Candidate Species list. Staff are developing a Species Action Plan which will undergo public review in FY 2021-22. Staff plan to present the draft management plant to the Commission in FY 2021-22; if approved, the species will be added to the Florida Endangered and Threatened Species List as State Threatened.

REPATRIATION PROJECT – In FY 2020-21, FWC continued assisting an ongoing reintroduction program in the Munson Sandhills of the ANF. The program is led by the Coastal Plains Institute with the USFS and involves releasing zoo-raised Striped Newts into former breeding ponds where they no longer occur. FWC marked newts before their release and assisted in surveys to estimate their survival. In FY 2020-21, 789 Striped Newts were released into 5 wetlands, the largest number so far in the project. The newts were produced by 4 zoos, and 2 additional zoos are expected to contribute captive raised newts in FY 2021-22.

SURVEYS - In FY 2020-21, FWC staff performed several dipnet surveys for Striped Newts across the state (Exhibit 14). On Camp Blanding WMA, FWC staff initiated a project to restore ephemeral wetlands habitat on three ponds. Ponds selected for restoration were near known Striped Newt ponds to provide additional habitat. The project consisted of removing brush and trees from the pond margins that inhibit the use of prescribed fire to manage vegetation within the pond basin. Eleven ponds totaling 19.5 acres received treatment this year and planning is ongoing to treat ponds in the future as funding allows. FWC staff continued habitat management on the several areas to enhance upland and wetland habitat for Striped Newt conservation (Exhibit 14).

Exhibit 14. Habitat management conducted in FY 2020-21 for Striped Newts.

Location	County	Historical breeding ponds	Ponds Surveyed	Active Breeding Ponds	New Ponds Identified	Management
Camp Blanding Joint Military Training Center	Clay		10	4	0	Habitat restoration to improve the effectiveness of prescribed fire operations initiated on 11 ponds totaling 19.5 acres.
Guana River WMA	St. Johns		7	4	1	Prescribed fire applied to 113 acres of upland habitat with Striped Newt breeding ponds
Triple N Ranch WMA	Osceola	9				Prescribed fire applied to 487 acres of upland habitat with Striped Newt breeding ponds
Watermelon Pond WEA	Alachua		2	0		Growing season prescribed fires applied to approximately 250 acres of basin marsh

REPTILES

American Crocodile

The American crocodile is currently a Federally Threatened species in Florida and has been documented as far north as Brevard County on the east coast and Pinellas County on the west coast. With the increasing crocodile population (estimated between 1,160 and 2,800 non-hatchlings), a commensurate increase in crocodile-human conflicts has been documented. FWC manages these conflicts on a case-by-case basis with human safety being the highest priority, while also recognizing the needs of a recovering species. In FY 2020-21, FWC received 209 complaints regarding the American crocodile. Most of these complaints were resolved by educating the public through telephone calls and site visits.

FWC has crocodile response agents (CRAs) who respond to crocodile calls, some of which require capture of the crocodile. A total of seven individual crocodiles were captured by FWC in FY 2020-21. Captured animals ranged from 6.6 to 11.3 feet in length (average of 8.5 feet). Three were captured and removed from human-interaction situations and released near their capture sites. Five crocodiles were captured and relocated to a site deemed suitable by FWC. One crocodile was inadvertently captured during a routine trapping of a nuisance alligator in the keys and was subsequently relocated. Another crocodile was fitted with a GPS transmitter prior to relocation. The data staff gather on this individual as well as the three animals from FY 2019-20, may help inform whether aversive conditioning is an effective management tool for crocodiles.

In FY 2020-21, CRAs excavated one nest due to the female nesting in the complainant's yard. Eggs were excavated and placed in an incubator. Hatching is expected by mid to late August 2021 with plans to release hatchlings into suitable habitat. Additionally, trapping efforts for the female crocodile that laid the nest are underway so that she may be relocated.

FWC was involved in the recovery of six American crocodile carcasses (three males and three females) during FY 2020-21. The males ranged from 3.6 to 13.0 feet and females ranged from 6.9 to 8.2 feet in length. Four mortalities were caused by vehicle strikes, one was believed to be caused by natural causes, and one mortality had an unknown cause.

In FY 2020-21, FWC staff focused on providing updated, quality outreach materials through the MyFWC website. Specifically, staff developed a Living with Crocodiles video to provide real-world guidance on safely living with crocodiles (https://myfwc.com/wildlifehabitats/wildlife/american-crocodile/). Staff are currently working to develop a Spanish-language version of this video. Additionally, staff finalized an updated distribution map that shows a more accurate representation of the specie's range along the coast as well as a more northernly expansion from the previous map (https://myfwc.com/wildlifehabitats/profiles/reptiles/american-crocodile/). Finally, staff updated the message and imagery on crocodile awareness metal signs so that its content is more aligned with contemporary management needs. FWC provides these signs at no cost to stakeholders.

Eastern Indigo Snake

Eastern Indigo Snakes are Federally Threatened snakes that have historically occurred throughout Florida. It is thought that the snake is extirpated in the Florida Panhandle and FWC is working closely with collaborators to reintroduce the species to a portion of its historic range.

MONITORING & CONSERVATION – To assist USFWS in addressing an action identified in the federal recovery plan of establishing a centralized range-wide GIS database, FWC staff added the Indigo Snake in May 2020 to a rare upland snake webpage that allows the public to report observations. The webpage received 24 verified indigo snake reports that were provided to the USFWS, along with sightings from other sources. Upon request, Florida Natural Areas Inventory (FNAI) was provided the database of Indigo Snake records. FWC staff gave a presentation on Indigo Snake conservation to UF's Wildlife of Florida class and resumed working on a manuscript comparing the indigo snake and Eastern Diamondback Rattlesnake in terms of modeled potential habitat and future distribution based on projected development trends.

RECOVERY – FWC continued a partnership with the South Florida Water Management District to obtain indigo snakes from Hendry County and add them to the breeding colony at the Orianne Center for Indigo Conservation

(OCIC). Staff began data review, preliminary analysis and development of the manuscripts assessing 1) survival of reintroduced Indigo Snakes, 2) space use of reintroduced Indigo Snakes and 3) growth rates of Indigo Snakes. Staff also initiated the development of a project with OCIC to evaluate ways to reduce prevalence of egg-binding of reproductive females in the breeding colony. In FY 2020-21, 12 Eastern Indigo Snakes were released at the repatriation site, Apalachicola Bluffs, and Ravines Preserve (ABRP; Liberty County). The total number of snakes released at the site is 81. FWC continues to collaborate with the Nature Conservancy and the OCIC on a Competitive State Wildlife Grant (SWG) aimed at reintroducing the species into the wild in the Florida Panhandle. A manuscript examining disease prevalence at ABRP is nearing completion. FWC staff produced a monitoring protocol for Indigo Snakes released at the ABRP. Finally, FWC staff continued to partner with Auburn University on a Traditional Section 6 Grant to study the genetics of captive broodstock Eastern Indigo Snakes.

Florida Keys Mole Skink

FWC staff reviewed the Florida Keys Mole Skink USFWS Species Status Assessment (SSA) Version 1.2. The original SSA was published in 2017 and the USFWS found that the species did not warrant federal listing at that time. An updated federal listing determination decision is expected in the near future.

Florida Pine Snake

The Florida Pine Snake is State Threatened and is under evaluation for federal listing. FWC staff provided locations and photographs for the federal SSA. Fifty-eight verified observations were reported on the Florida rare snake webpage. FWC staff provided genetic samples to a Clemson University graduate student. A manuscript on the status and distribution of the Florida Pine Snake and two other imperiled upland snake species is nearing completion. FWC Commissioners approved revisions to Species Conservation and Permitting Guidelines for the Florida Pine in FY 2020-21.

SURVEYS – Trapping for at-risk snake species continued in FY 2020-21 at six locations in Blackwater WMA (Santa Rosa County). FWC captured 212 individuals comprising 14 snake species, including 11 Florida Pine Snakes. Trapping will continue at new locations each year to determine the distribution of Florida Pine Snakes and other at-risk snake species and prioritize areas for management activities. In Econfina Creek WMA (Washington and Bay Counties), the upland snake surveys captured one Florida Pine Snake in the traps. There were no recaptures from last year's trapping efforts.

Florida Reef Gecko

In FY 2020-21, FWC received a species evaluation request for the Florida Reef Gecko. The authors of the request calculated a biological score of 29.7 for the species; staff calculated a biological score of 26.7. A workplan to evaluate

the species was developed.

Florida Scrub Lizard

In 2012, the Florida Scrub Lizard was petitioned for federal listing as Threatened, and FWC completed a status survey in FY 2017-18 that showed its range along the Atlantic coast had contracted 48 miles northward in the past 30 years. A manuscript on the status and distribution of the Florida Scrub Lizard was accepted by Herpetological Conservation and Biology. In March 2021, FWC staff met with Palm Beach County staff to survey Hypoluxo Scrub Natural Area, where 100 Scrub Lizards were reintroduced two years ago, extending the occupied range 23 miles south. Surveys for lizards were conducted here bimonthly in FY 2020-21. Nineteen Scrub Lizards were observed, and 11 were captured for genetic samples (toe clips). The population has dispersed at least 360 m south in Hypoluxo Scrub Natural Area.

Gopher Tortoise

MANAGMENT - The gopher tortoise is listed as a State Threatened species in Florida and are considered a keystone species as their burrows are home to over 350 other species. The Gopher Tortoise Management Plan (https://myfwc.com/media/1819/gt-management-plan.pdf) is intended to guide the continued conservation of the Gopher Tortoise in Florida. The plan places an emphasis on landowner incentives, habitat management, and maintaining the Gopher Tortoise as a keystone species through commensal species conservation. FWC continues to coordinate with the stakeholder Gopher Tortoise Technical Assistance Group on Gopher Tortoise conservation issues. The continued participation of stakeholders is vital to the long-term conservation of the species.

In FY 2020-21, student interns from Florida State University contributed approximately 165 hours to help implement Gopher Tortoise conservation actions. The internship was recently renamed the Wildlife Conservation and Management Internship and expanded to include conservation actions that benefit SGCN. Due to concerns related to COVID-19, students did not participate in the internship program during the summer and fall 2020 semesters. Many of the actions completed by spring 2021 interns may not have otherwise been accomplished with existing staff resources and benefited interns by providing professional experience in wildlife conservation and in a government agency. FY 2020-21 projects continued to primarily address the objectives of the Gopher Tortoise Management Plan (2012; Exhibit 15).

Exhibit 15. Summary of projects completed by student interns during FY 2020-21.

Project Title	Semester
Gopher Tortoise Day Outreach	Spring 2021
Gopher Tortoise Permitted Wildlife Rehabilitator Update	Spring 2021
Education & Outreach Coordination	Spring 2021
Volunteer Program Coordination	Spring 2021
Florida Gopher Tortoise Smartphone App Submission Review	Spring 2021

INCIDENTAL TAKE PERMITS - The Incidental Take Permit (ITP) Gopher Tortoise volunteer relocation program mobilizes volunteers to conduct burrow surveys at development sites permitted for incidental take and to transport Gopher Tortoises from the development site to the approved recipient site.During FY 2020-21, FWC staff did not train any new volunteers to conduct Gopher Tortoise surveys or to transport tortoises from ITP project sites. The use of volunteers helps reduce the cost of Gopher Tortoise relocation, recognizing that the developer has previously paid mitigation and is not required to relocate the tortoises under these formerly-issued permits. Volunteer usage on ITP development sites significantly decreased because of COVID-19 and other restrictions.

Since implementation of the recipient site permit program in 2008, approximately 27,499 acres of gopher tortoise habitat have been protected through permanent conservation easements. Under these permits, private landowners can accept gopher 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, 52 recipient sites with an available capacity of 13,354 tortoises are permitted. During FY 2020-21, 10,641 tortoises were relocated under FWC-issued permits.

To humanely relocate tortoises from incidental take permitted development sites, and restock tortoises on conservation lands where tortoise populations have been depleted, FWC has approved ITP recipient sites on several properties in northern Florida. FWC has partnered with Nokuse Plantation, Avalon Plantation and most recently Eglin AFB 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, fulfilling the criteria required to establish a viable population. In FY 2020-21, 722 tortoises were relocated to Eglin AFB.

WAIF TORTOISES - In FY 2020-21, FWC continued to identify solutions for waif tortoises (tortoises that have been removed from the wild by unauthorized means or due to injury and whose origin cannot be determined). One solution includes identifying willing landowners to care for waifs on their property, designating the land as a “waif tortoise recipient site.” No new waif recipient sites were established in FY 2020-21, however one previously permitted site that has not yet been available to receive tortoises, Nixon Smiley Pinelands Preserve in Miami-Dade

County, is now capable of receiving up to 199 Gopher Tortoises. in FY 2020-21, 32 waif gopher tortoises were received at waif recipient sites (Exhibit 16).

Exhibit 16. Summary of waif gopher tortoise placements for FY 2020-21.

Waif Site	County	Tortoises Received	Male.Female	Juvenile.Unknown	Placements Available
Lemon Bay Park	Sarasota	4	3.1	0.0	2
Bay Pines STEM Center	Pinellas	2	0.1	0.1	2
Marie Acres	Hernando	6	0.0	0.6	90
Winding Waters	Palm Beach	2	1.1	0.0	20
Circle B Bar Reserve	Polk	16	1.6	0.9	141
Nixon Smiley Pineland Preserve	Miami-Dade	0	0.0	0.0	199
Totals		32	5.9	0.16	454

Under a Memorandum of Agreement (MOA) with the South Carolina Department of Natural Resources, there is also an ongoing effort to restock depleted Gopher Tortoise populations on public lands in South Carolina through the FWC waif program. In FY 2020-21, 21 tortoises were relocated to Aiken Gopher Tortoise Heritage Preserve in South Carolina. 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 that provide more flexibility and further the objectives of the Gopher Tortoise Management Plan, FWC has entered into MOAs. The DOD and FWC added 896 acres of Gopher Tortoise habitat for a total of 1,745 acres to their previously permitted recipient site within the Eglin AFB. The public conservation lands recipient site was established to receive gopher tortoises from renewable energy projects that occur in Florida and to restock lands on Eglin AFB.

HABITAT MANAGEMENT - In FY 2020-21, the Habitat Management Assistance Funding (HMAF) program provided nearly $128,000 in funding to assist local governments with Gopher Tortoise habitat management activities on more than 520 acres of their conservation lands (Exhibit 17). The HMAF program continues to offer a reimbursement for the installation of silt fencing on prospective waif Gopher Tortoise recipient sites, and sites 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 recipient sites were funded through HMAF in FY 2020-21.

Exhibit 17. Summary of Habitat Management Assistance Funding program results for FY 2020-21.

Property Name	Local Government	Amount Received ($)	Acres Managed	Management Activities
Gulfside City Park	City of Sanibel	10,000	37.2	Hand trimming of woody vegetation and planting of native forage plants
Lake Townsen Preserve	Hernando County	15,000	100	Chemical treatment of woody under/mid story vegetation
Chinsegut Hill	Hernando County	15,000	30	Mechanical treatment via forestry mulcher (including invasive camphor/arrow bamboo)
Grassy Lake Scrub	Highlands County	7,000	10	Mechanical treatment over 10 acres of scrub using skid steer, fecon head, and loader
Telegraph Creek Preserve	Lee County	6,450	43	Mechanical treatment over 43 acres of scrubby flatwoods via rollerchopper
Duette Preserve	Manatee County	15,000	78.7	Mechanical treatment of 78.7 acres of scrub via chainsaw crew
Isle of Pines Preserve	Orange County	275	1	1 mile fireline maintenance
Upper Pithlachascotee River Preserve	Pasco County	7,000	8	Mechanical fuel reduction of 8 acres
GTH Unit 1A	Pinellas County	14,850	55	Selective hardwood tree removal with herbicidal stump treatment over 55 acres
GTH Unit 1B	Pinellas County	14850	55	Selective hardwood tree removal with herbicidal stump treatment over 55 acres
Shamrock Park	Sarasota County	8662	31.5	Chemical treatment for exotic vegetation over 31.5 acres
Lake Proctor Wilderness Area	Seminole County	1500	25	Mechanical treatment via mulching of 25 acres of upland mixed hardwood/coniferous forest
Boyd Hill Nature Preserve	City of St. Petersburg	12000	48	Selective hand removal and mechanical treatment of exotics over 27 acres. Mechanical treatment of sabal palms and chemical exotic control of 21 acres of pine scrub

FWC staff continued habitat management activities at various other WMAs and WEAs statewide (Exhibit 18).

Exhibit 18. Habitat management activities conducted in FY 2019-20 to enhance Gopher Tortoise habitat.

Location	County	Management Activities (acres)
Fort White WEA	Gilchrist	Prescribed fire (294); Mechanical treatment (21.2); Chemical herbicide (43)
Bell Ridge Longleaf WEA	Gilchrist	Prescribed fire (518); Mechanical treatment (17)
Lafayette Forest WEA	Lafayette	Prescribed fire (947); Mechanical treatment (36); Chemical herbicide (0.3)
Suwannee Ridge WEA	Hamilton	Prescribed fire (341); Mechanical treatment (4); Chemical herbicide (0.1)
Hickey Creek WEA	Lee	Prescribed fire (5); Mechanical treatment (14); Chemical treatment (74)
Platt Branch WEA	Highlands	Prescribed fire (480); Chemical herbicide (217); Mechanical treatment (26)
Bull Frog WEA	Hillsborough	Mechanical treatment (359); Chemical treatment (122)
Moody Branch WEA	Manatee	Prescribed fire (163); Mechanical treatment (397); Chemical treatment (296)
Crooked Lake WEA	Polk	Mechanical treatment (490); Prescribed fire (238); Chemical treatment (411); Planted longleaf pine (49)
Perry Oldenburg WEA	Hernando	Prescribed fire (269); Planted longleaf pine (64); Chemical treatment (368)

OUTREACH - FWC offers a number of opportunities for Florida residents to get involved and help conserve the Gopher Tortoise. These opportunities include submission of tortoise sightings in Florida, mortality data collection, waif tortoise (tortoises of unknown origin) transportation, silt fence installation, and conducting burrow surveys on recipient sites for the humane relocation of tortoises associated with incidental take permits. FWC launched a new web-based Gopher Tortoise Sighting platform (https://public.myfwc.com/HSC/GopherTortoise/) that acts as a one-stop reporting system for community scientists to document tortoise sightings and burrow locations, as well as sick, injured, or dead tortoises. It is intended to provide biologists with more detailed and reliable data while also promoting community involvement in conservation efforts. The new system replaced the Gopher Tortoise Mortality webpage and the Florida Gopher Tortoise smartphone app, decommissioned in September 2020. FWC has collected Gopher Tortoise sighting data since 2014 and has received over 9,884 citizen submissions, of which 4,040 were submitted during FY 2020-21. This 120% increase in submissions and citizen involvement only further illustrates the overall success and accessibility of the new platform. The collected data allows FWC to determine Gopher Tortoise mortality "hotspots" throughout the state. In FY 2020-21, 211 mortalities were reported to the web form, and vehicles were the leading cause of death. Citizens that reported an injured or ill tortoise were provided with contact information for a nearby licensed wildlife rehabilitator to provide the tortoise with prompt medical attention.

FWC distributes fact sheets, brochures, and other educational materials to increase knowledge of Gopher Tortoises in Florida. Approximately 3,615 publications were distributed in FY 2020-21 (Exhibit 19). All publications are also available at each of FWC's regional offices, and electronic versions are available for download at www.MyFWC.com/GopherTortoise.

Exhibit 19. Summary of gopher tortoise publications distributed during FY 2020-21.

Publication Name	Number Distributed	Primary Audience
Living with Gopher Tortoises	982	Local governments, schools, nature centers, Florida residents
Before You Build	240	Florida landowners
Get the Facts about Gopher Tortoises (various topics)	499	Local governments, schools, nature centers, Florida residents
Safe Roads for People and Gopher Tortoises	355	Florida Visitor Centers, state/local parks, highway rest stops
Gopher Tortoise Decals	452	Florida residents
Gopher Tortoise Day Temporary Tattoos	250	Florida residents, children's camps
Children's Publications	670	Florida residents, children's camps

Gopher Tortoise outreach was limited in FY 2020-21 due to COVID-19, however virtual events were incorporated in lieu of in-person events, where appropriate (Exhibit 20). The FWC Gopher Tortoise Conservation Program hosted or

participated in 16 outreach events in FY 2020-21. Outreach for the fiscal year included five training events for FWC law enforcement, one training event for the Florida Department of Environmental Protection (FDEP), and several presentations to stakeholders and children.

Exhibit 20. Summary of Gopher Tortoise Conservation Program outreach events & presentations for FY 2020-21.

Outreach Event	County
Passionflower Native Plant Society Presentation	Virtual/Lake
Gopher Tortoise Council Presentation	Virtual/Rangewide
Polk County Schools Careers in Nature	Virtual/Polk
Gopher Tortoise CCA Meeting Presentation	Virtual/Rangewide
Wallwood Longleaf Challenge Presentation	Virtual/Leon & Gadsden
Starkey Wilderness Park Gopher Tortoise Day Event	Pasco
Starkey Wilderness Summer Camp Presentation	Pasco
Webster Elementary School Presentation	Virtual/Sumter
Challenger Learning Center Presentation	Virtual/Leon
Gopher Tortoise Subject Matter Expert Panel	Virtual/Statewide
Florida DEP Gopher Tortoise Management & Relocation Training	Virtual/Leon
SW Region Law Enforcement Specialist Training	Hillsborough
NC Region Law Enforcement Specialist Training	Alachua
NE Region Law Enforcement Specialist Training	Orange
HSC LE Academy Training Day	Virtual/Gadsden
NE Region Duty Officer Presentation	Virtual/Marion

RESEARCH - In FY 2020-21, FWC started a program that funds scientific research annually through Gopher Tortoise mitigation contributions. This program aims to promote actionable science by funding research projects that provide the information needed to achieve the conservation goals of the Gopher Tortoise Management Plan. In the first year, four research proposals were selected, and FWC's financial support is estimated to be over $75,000. The selected research proposals aim to examine barrier island tortoises' genetic connectivity, evaluate the survival and reproduction of translocated tortoises, and determine natural tortoise densities on various landcover types. These projects will help fill knowledge gaps and inform Gopher Tortoise policies and practices.

SURVEYS - In FY 2020-21, FWC contracted with FNAI to conduct a series of surveys at selected state conservation lands following protocol for Line Transect Distance Sampling (Exhibit 21). All sites 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).

Additional surveys were conducted by FWC and FFS staff at PSSF, Blackwater WMA, Corkscrew Regional Ecosystem Watershed WEA, and Jennings State Forest WMA. A population estimate was not determined at PSSF or Blackwater WMA. The others were found to have population estimates of 20and 331 tortoises, respectively. 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.

Exhibit 21. Summary of gopher tortoise population survey results for FY 2020-21.

Survey Location	County	Population Estimate	Density (tortoises/acre)	Suitable Habitat (acres)
Bell Ridge Longleaf WEA	Gilchrist	732	1.06	688
Connor Preserve	Pasco	1286	1.09	1,179
Fort White WEA	Gilchrist	932	0.96	969
Half Moon WMA	Sumter	473	0.24	1,951
Lake Louisa State Park	Lake	1072	0.73	1,458
Perry Oldenburg WEA	Hernando	424	1.34	316
Ross Prairie State Forest & a Section of the Marjorie Harris Carr Cross Florida Greenway State Recreation and Conservation Area	Marion	1831	0.47	3,934

Marine Turtles

FWC maintains management and research programs fostering the recovery of the five marine turtle species that occur along Florida's coasts: Leatherback, Hawksbill, and Kemp's Ridley (all Federally Endangered) and Green and Loggerhead (both Federally Threatened). FWC staff works with various stakeholders in state and federal agencies, local governments, conservation organizations, citizens, and academic programs to conserve marine turtles and their habitat. FWC staff served on multiple committees, boards, and working groups in FY 2020-21 in Florida, the USA, and internationally.

STRANDING NETWORK – FWC coordinated the Florida portion of the Sea Turtle Stranding and Salvage Network (Network), an 18-state program administered by the NOAA-Fisheries. The Network is responsible for gathering data on dead, sick, or injured marine turtles. In FY 2020-21, 2,390 dead or debilitated turtles were documented (644 Loggerheads, 1,560 Green Turtles, 160 Kemp's Ridleys, 12 Hawksbills, 10 Leatherbacks, and 4 not identified to species). FWC responded to 2,303 reported incidents (primarily reports of dead, sick, or injured turtles), transported 110 sick or injured turtles to rehabilitation facilities, and conducted necropsies on 261 carcasses. Five online workshops, involving 862 participants, provided training on how to document strandings. Real-time Florida stranding data is readily available at http://ocean.floridamarine.org/SeaTurtle/flstssn/ for use by various entities,

such as NOAA-Fisheries, FWC law enforcement, and protected species management personnel.

NESTING AND HATCHLING PROGRAMS – In FY 2020-21, three webinars were presented to 1,275 Marine Turtle Permit Holders and volunteers to provide training on how to conduct nest surveys using two monitoring programs, the Statewide Nesting Beach Survey (SNBS), and the Index Nesting Beach Survey (INBS). The SNBS Program began in 1979 and acquires data on nest numbers, distribution, and seasonality for nearly all nesting beaches. In 2020, 225 areas (828 miles) were surveyed recording 105,164 Loggerhead nests, 26,656 Green Turtle nests, 1,652 Leatherback nests, and 11 Kemp's Ridley nests. A Statewide Atlas of Sea Turtle Nesting Occurrence and Density (http://myfwc.com/research/wildlife/sea-turtles/nesting/nesting-atlas/) provides summary information of nest distribution and density and species occurrence. The INBS Program began in 1989 and collects more detailed data from a subset of beaches. Since 1989, Loggerhead nest counts have varied greatly due to a complex nesting pattern. Green Turtle nest counts have increased exponentially by eightyfold. Leatherback nest counts increased exponentially until 2014 but have been oscillating widely in more recent years.

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

ENVIRONMENTAL COMMENTING - In FY 2020-21, FWC reviewed 170 applications and provided final comments for 116 projects ensuring marine turtles and their habitat remain protected. FWC continued to work with FDEP and the USFWS to develop the Florida Statewide Beaches Habitat Conservation Plan. This Plan will provide flexibility to local governments and beachfront property owners to conduct FDEP coastal construction control line permitted activities while ensuring impacts to coastal species and their habitat are minimized and mitigated.

In FY 2020-21, FWC reviewed and approved 44 lighting plans for beachfront construction and conducted site visits or post-construction site inspections for 12 projects. Three projects were determined to be compliant with pre-approved or modified lighting plans. Staff also responded to requests from local governments for assistance by conducting lighting surveys with local government staff, reviewing protection ordinances, or general technical assistance. (http://myfwc.com/wildlifehabitats/managed/sea-turtles/).

MARINE TURTLE PERMITS – FWC issued 139 authorizations for nesting beach surveys and 29 authorizations to hold turtles for rehabilitation, educational display, or research. FWC reviewed 57 permit requests for new or modified

research. Approximately 114 one-time consent permits were issued for filming, transfer of specimens into or out of Florida for research, and transport of turtles into Florida for release following out-of-state rehabilitation. Four new or amended Loan Agreements were issued to hold or use specimens for research, teaching, or education. There were 25 permits or amendments processed that authorized educational marine turtle walks.

FWC assisted in the placement, transport, and release of stranded marine turtles, including facility inspection and approval. Approximately 251 cold-stunned turtles that stranded in New England were transferred to Florida for rehabilitation and release. FWC inspected one Florida facility to ensure turtles were held in appropriate conditions. FWC placed two non-releasable turtles in educational facilities within and outside of Florida.

ANNUAL PERMIT HOLDER MEETING – In February 2021, FWC hosted the 24th Annual Marine Turtle Permit Holder Meeting virtually, using the Microsoft Teams Live platform, with the Wildlife Alert Reward Association. Over 700 permit holders, volunteers, and staff from local government and state and federal agencies attended. Topics included updates on state and federal marine turtle programs as well as research, conservation, and education projects funded by the Sea Turtle License Plate Grants Program. In addition, FWC conducted two workshops on stranding and how to use the Survey123 disorientation reporting app.

WILDLIFE LIGHTING –The Wildlife Lighting Certification program was inactive during FY 2020-21 due to the challenges of conducting the program while working remotely. Staff received a Davis Productivity Award for the work done under this program in previous years. FWC staff continued to work with local government and federal and state agency stakeholders on marine turtle lighting. In FY 2020-21, staff coordinated with FDEP during the update of chapter 62B-55, Florida Administrative Code, the Model Lighting Ordinance. This assistance included providing recommendations on appropriate lighting to include in the rule and participating in public workshops. Staff also assisted Florida Department of Transportation staff to develop lighting criteria for coastal roadways in environmentally sensitive areas such as roads bordering marine turtle nesting habitat.

Sand Skink

FWC staff served on the Sand Skink expert team for the federal SSA by participating on phone calls and reviewing natural history information, habitat and soil classification, and geographic distribution.

Short-tailed Kingsnake

FWC staff served on the Short-tailed Kingsnake expert team for the federal SSA by participating on phone calls, providing locations, and reviewing natural history information. Twelve verified observations were reported on the Florida rare snake webpage or via email. A manuscript on the status and distribution of the Short-tailed Kingsnake and two other imperiled upland snake species is nearing completion.

Spotted Turtle

The Spotted Turtle is being evaluated for federal listing and has been documented in 15 counties in Florida, but records mostly consist of single individuals crossing roads in spring. Little information exists on the life history or demographics of southern populations. In 2014, FWC began using radio-telemetry and mark-recapture techniques to gather information on home range, movement, seasonal phenology, and population dynamics at two sites in North Florida. As of June 2021, 82 individual Spotted Turtles have been captured at the two sites, with 30 of those turtles fitted with radio-transmitters and relocated 1-2 times per week: 20 turtles marked and 16 tracked at Site 1 and 62 turtles marked and 14 tracked at Site 2.

This research suggests Spotted Turtles in Florida are uncommon and cryptic, rarely basking or spending time upland. Shallow water and an abundance of woody debris within complex, forested wetlands appear to be the most reliable habitat characteristics for predicting Spotted Turtle presence in Florida, with roads/high traffic volume negatively impacting populations and restricting movement and dispersal. Adult home range size varied between sites and individuals, from 0.25 to 106 acres, with an average of 16 acres. Spotted Turtles remain active year-round, with males moving greater distances and utilizing larger areas than females.

FWC continues to build on this work and in 2018 partnered with a multi-state "Maine-to-Florida" initiative to address Spotted Turtle status and conservation across the species' entire range. Through this partnership FWC is 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. Protection of large-scale wetland complexes and preserving connectivity will be necessary for the long-term conservation of this rare and secretive species.

Suwannee Alligator Snapping Turtle

The Suwannee Alligator Snapping Turtle was described as a distinct species in 2014, and Florida listed it as a Threatened species in November 2018. The USFWS completed the draft SSA in 2020 and issued a 12-month finding in April 2021 that the species warrants federal listing as Threatened. FWC staff participated on calls with the USFWS regarding the SSA and threats to the species posed by bush hooks, trotlines, and deadhead logging. Genetic samples were provided to aid in forensic identification of confiscated alligator snappers.

SURVEYS – FWC staff trapped for Suwannee Alligator Snapping Turtle on the Alapaha River, Alapahoochee River, Hunter Creek, New River, and Olustee Creek as part of a distributional survey and documented the first Florida record from the Alapaha River and the first records from Olustee Creek. A long-term monitoring study at three sites in different sections of the Suwannee River was initiated in collaboration with a UF researcher, and each site was trapped three times in FY 2020-21. FWC staff collaborated on a manuscript on the distribution and

relative abundance of the Suwannee Alligator Snapping Turtle that was accepted by Chelonian Conservation and Biology and published a note on Suwannee alligator snapper reproduction. Three other manuscripts on population status, variation in relative abundance and population structure, and home range and habitat selection of alligator snappers in the Suwannee River are near completion.

FISH

Freshwater Fish

BLUENOSE SHINER - The Bluenose Shiner is State Threatened. In FY 2020-21, 11 individuals were collected from the Escambia River during Long-Term Monitoring, 70 individuals were collected in Rock Springs Run, and 18 were collected in Alexander Springs Creek. Genetic analyses are ongoing to determine the evolutionary distinction between the St. Johns drainage population and those in western Florida, Alabama, Mississippi, and Louisiana. Future research, in partnership with state water management districts, will focus on addressing the quality and quantity of Bluenose Shiner habitat to identify data gaps and population status.

CRYSTAL DARTER - The Crystal Darter is State Threatened. Crystal Darters are found in the upper portions of the Escambia River over gravel habitat. No sampling for Crystal Darters was conducted in FY 2020-21. A population status of Florida's SGCN from the Yellow, Choctawhatchee, and Escambia Watershed was completed in FY 2018-19. Staff plan to continue monitoring and surveying in the Escambia River to assess the population status and trends of the species.

BLACKMOUTH SHINER - The Blackmouth Shiner is a small fish that inhabits backwater pools in the Blackwater River in Florida. Blackmouth Shiners are State Threatened due to their restricted range, sever population fragmentation, and general decline in extent and quality in habitat. A genetic monitoring protocol for Blackmouth Shiners was conducted between 2016 and 2020 and was completed in FY 2020-21. Two hundred and three Blackmouth Shiners were successfully genotyped, and 2 distinct populations were identified between the lower and upper stretches of the Blackwater River. Results from this study have aided in the development of a genetic monitoring protocol that can be used to track trends in Blackmouth Shiner populations in the future.

SALTMARSH TOPMINNOW - The Saltmarsh Topminnow is a small-bodied fish that is found within low salinity salt marshes along the Gulf Coast. Saltmarsh Topminnows are State Threatened and are candidates for federal listing pending a final decision from the USFWS. A population trend assessment of Saltmarsh Topminnows was conducted between 2016 and 2020 and was completed in FY 2020-21. Between 2016 and 2020, 39 sites were surveyed across Escambia, Perdido, and Blackwater Bays using minnow traps and Breder traps. A total of 1,203 Saltmarsh

Topminnows were collected. Sixty-nine sites were sampled in Apalachicola Bay and 80 in the Choctawhatchee Bay during this time. No Saltmarsh Topminnows were detected during these sampling events. Two hundred sixty-six Saltmarsh Topminnows were successfully genotyped over the course of the study and different populations of Saltmarsh Topminnows were identified within the Pensacola Bay complex.

Smalltooth Sawfish

Smalltooth sawfish are Federally Endangered and are now found primarily from Charlotte Harbor (Charlotte County) to the Keys (Monroe County). In FY 2020–21, the Charlotte Harbor estuarine system was sampled using a multi-gear approach. There were 74 individuals captured, including 8 recaptures. For more information on FWC's Sawfish Research Program, see https://MyFWC.com/research/saltwater/fish/sawfish.

Sturgeon

ATLANTIC STURGEON ACTIVITIES - The Atlantic Sturgeon is listed as Federally Endangered. The USFWS, NOAA-Fisheries, and the USGS conduct most of the monitoring and management of this species. FWC did not incidentally collect any Atlantic Sturgeon in FY 2020-21. Additionally, no Atlantic Sturgeon carcasses were reported to FWC. FWC will provide any future collections and any associated information to the Atlantic Sturgeon Salvage Network, managed by NOAA-Fisheries, as well as to the Atlantic States Marine Fisheries Commission, in order to assist with population monitoring and management of this species.

GULF STURGEON ACTIVITIES - The Gulf Sturgeon is listed as Federally Threatened by the USFWS and NOAA. Monitoring and management is primarily conducted by NOAA-Fisheries, USGS, and USFWS. FWC is currently conducting research on population dynamics of juvenile Gulf Sturgeon from the Pensacola Bay watershed. This project is funded by a multi-state Cooperative agreement to assess juvenile population dynamics simultaneously throughout its range. In FY 2020-21, FWC collected 12 sturgeon from freshwater portions of the Yellow River, 43 sturgeon from the Blackwater River, and 23 sturgeon from the Escambia River. This project is now in the 2nd year of a 4-year project.

INVERTEBRATES

Coral

FLORIDA CORAL RESCUE – In response to stony coral tissue loss disease (SCTLD), FWC and NOAA Fisheries co-lead the Florida Coral Rescue effort. The goal is to collect both healthy corals from ahead of the disease boundary and surviving corals that remain in the endemic zone, and hold (gene-bank) the corals in land-based facilities to prevent them from becoming infected. These corals are being used in captive breeding and propagation programs to aid in the restoration of Florida's Coral Reef. In FY 2020-21, FWC led three rescue collections from the endemic zone. Out of the 20 species targeted for rescue, 5 are Federally Threatened (Exhibit 22). FWC built the Coral Rescue Data Portal where holders can now enter data, photos and observations, and export summaries and reports.

Exhibit 22. Florida Coral Rescue FY 2020-21 Federally listed coral species rescued and currently in holding.

Common Name	Scientific Name	Status	Number of Coral Colonies Rescued	Number of Colonies in Holding
Boulder Star Coral	*Orbicella franksi*	FT	37	36
Lobed Star Coral	*Orbicella annularis*	FT	27	20
Mountainous Star Coral	*Orbicella faveolata*	FT	124 (22 rescued in FY 20/21)	107
Rough Cactus Coral	*Mycetophyllia ferox*	FT	15	9
Rough cactus coral	*Mycetophyllia ferox*	FT	572 (1 rescued in FY 20/21)	366

As part of this rescue effort, FWC is addressing coral genetic data gaps using single nucleotide polymorphism (SNP) genetic discovery panels to develop markers for five of the Federally Threatened corals. Most of these coral species had microsatellite markers developed but no SNP genetic information which improves the resolution at which coral colonies can be identified as genetically distinct individuals. SNP markers were completed for Staghorn Coral and Elkhorn Coral and FWC is involved in genotyping the remaining wild population of elkhorn coral in Florida using the SNP markers. The goal is to genotype all colonies of these seven species that are collected as part of the Coral Rescue Project and other NOAA-led species recovery programs and catalogue them in FWC's new genet registry database.

INVESTIGATING THE CAUSE OF SCTLD – In FY 2020-21, FWC and partners continued the investigation of SCTLD. FWC partnered with Mote Marine Laboratory and George Mason University in a SCTLD induction and lesion progression study under controlled laboratory conditions. This study showed that apparently healthy (AH) tissue directly adjacent to lesions on both Great Star Coral and Mountainous Star Coral species can exhibit tissue loss and induce the disease in other AH coral fragments. Histologically, tissue-loss lesions in both species exhibited characteristic lytic necrosis. Pathological changes were also noticed by USGS in the zooxanthellae using samples collected by FWC during fiscal year 2018. Through collaboration work on transmission electron microscopy studies, zooxanthellae

infected with RNA viruses of plants were found in five coral species (Great Star Coral, Mountainous Star Coral, Boulder Brain Coral, Symmetrical Brain Coral, and Massive Starlet Coral).

CHARACTERIZATION OF THE MICROBIOME OF CORALS WITH SCTLD THROUGH SPACE AND TIME – FWC and partners are investigating how SCTLD alters the microbiome (associated bacteria and archaea) of corals. The goals of this project include identifying the potential causes of the disease and investigating the efficacy of probiotics which may be used to treat corals affected by the disease. Corals are sampled by scraping surface tissue, sequencing and identifying the microbial DNA of these samples, and comparing the differences in these microbes between healthy and diseased corals. In FY 2020-21, FWC collected samples from 6 species of corals, including the Federally Threatened Mountainous Star Coral, at reefs where SCTLD had waned; 30 colonies of Mountainous Star Coral were sampled.

CORAL REEF EVALUATION AND MONITORING PROJECT – The Coral Reef Evaluation and Monitoring Project (CREMP) has monitored coral reef and hardbottom habitat conditions at fixed locations annually in the Florida Keys since 1996 and the Dry Tortugas since 1999. In FY 2020-21, FWC surveyed 51 sites in the Florida Keys National Marine Sanctuary and the Dry Tortugas National Park (Monroe County). CREMP follows a repeated measures survey design, surveying the same location annually to study temporal changes in resource conditions through time. This sampling effort included 199 photographic camera transects to estimate benthic cover, 199 stony coral density and condition surveys, 119 octocoral density and condition surveys, and 22 giant barrel sponge demographic surveys combined for the two regions. CREMP collects information on Federally Threatened coral species located at each site

SOUTHEAST CORAL REEF EVALUATION AND MONITORING PROJECT – The Southeast CREMP (SECREMP) is an extension of CREMP along Florida's southeast coast. It was initiated in 2003 and uses the same sampling protocols as CREMP. FWRI provides planning and surveying assistance and manages the SECREMP datasets while in situ surveys are conducted by Nova Southeastern University. In FY 2020-21, SECREMP surveyed 22 sites in Martin, Palm Beach, Broward and Miami-Dade counties. SECREMP collects information on Federally Threatened corals at each site.

DISTURBANCE RESPONSE MONITORING – FWC coordinates the Florida Reef Resilience Program's Disturbance Response Monitoring (DRM) program. DRM is a multi-partner effort to monitor shallow reef systems from Martin County to the Dry Tortugas to better understand how rising sea temperatures and disease affect Florida's coral reefs. In FY 2020-21, 389 surveys were completed and 150 were conducted by FWC. Belt transects collect information for all coral species and record the abundance of 5 of the 7 Federally Threatened coral species (Exhibit 23). No Elkhorn Coral or Pillar Coral were recorded this FY. Results indicate 2020 was a mild bleaching year and

overall coral disease prevalence was low except in the Marquesas, where SCTLD was recorded at high prevalence values. Stony coral tissue loss disease was not observed in the Dry Tortugas during the DRM survey event (Exhibit 24). The 2020 DRM Quick Look Report is available online at http://ocean.floridamarine.org/FRRP/Home/About.

Exhibit 23. Abundance values of Federally listed coral species recorded along belt transects in FY 2020-21.

Common Name	Scientific Name	County / Subregion	Total Abundance
Staghorn coral	*Acropora cervicornis*	Broward-Miami	18
		Biscayne	1
		Upper Keys	6
		Middle Keys	2
		Lower Keys	4
		Marquesas	5
		Dry Tortugas	16
Rough cactus coral	*Mycetophyllia ferox*	Dry Tortugas	1
Lobed star coral	*Orbicella annularis*	Broward-Miami	2
		Upper Keys	2
		Lower Keys	29
		Dry Tortugas	6
Mountainous star coral	*Orbicella faveolata*	Broward-Miami	13
		Biscayne	9
		Upper Keys	29
		Middle Keys	44
		Lower Keys	128
		Marquesas	62
		Dry Tortugas	130
Boulder star coral	*Orbicella franksi*	Broward-Miami	2
		Biscayne	3
		Upper Keys	5
		Middle Keys	2
		Lower Keys	3
		Marquesas	11
		Dry Tortugas	69

Exhibit 24. Number of Federally Threatened coral species recorded with disease resulting in tissue loss in FY 2020-21.

Common Name	Scientific Name	County/Subregion	Stony Coral Tissue Loss Disease	Unknown Coral Disease	White Plague	Rapid Tissue Loss
Staghorn coral	*Acropora cervicornis*	Lower Keys	0	0	0	1
		Dry Tortugas	0	0	0	1
Lobed star coral	*Orbicella annularis*	Lower Keys	0	1	0	0
Mountainous star coral	*Orbicella faveolata*	Broward-Miami	1	1	0	0
		Middle Keys	0	1	0	0
		Lower Keys	8	3	0	0
		Marquesas	6	0	3	0
		Dry Tortugas	0	0	3	0
Boulder star coral	*Orbicella franksi*	Marquesas	3	0	0	0

SPECIAL ACTIVITY LICENSES – In FY 2020-21, FWC issued ten Marine Special Activity Licenses to conduct scientific research and restoration activities for coral species. The Federally Threatened Mountainous Star Coral, Elkhorn Coral, and Staghorn Coral were included in these issued licenses.

CORAL NURSERY AND OUTPLANTING OPERATIONS – FWC operates two *in situ* coral nurseries located in the middle Florida Keys in which three Federally Threatened coral species are maintained: Mountainous Star Coral, Elkhorn Coral, and Staghorn Coral. Reef Renewal, LLC maintains two additional coral nurseries, one off Tavernier Key in the upper Florida Keys and one near Looe Key in the lower Florida Keys, and stocks them with all seven Federally Threatened species: Boulder Star Coral, Lobed Star Coral, Mountainous Star Coral, Rough Cactus Coral, Elkhorn Coral, Staghorn Coral, and Pillar Coral. Exhibit 25 summarizes the number of colonies of each species that were present within each of the four nurseries at the end of FY 2020-21. In FY 2020-21, FWC conducted two experimental coral outplanting projects. One project outplanted Staghorn Coral to evaluate how enhanced habitat affects the survival and site fidelity of long-spined urchins. The second project outplanted Mountainous Star Coral as part of a reef-wide multi-partner effort to assess the efficacy of outplanting under persistence SCTLD. A total of 2,835 coral colonies were outplanted by the FWC for these two projects and Reef Renewal, LLC during FY 2020-21 (Exhibit 26).

Exhibit 25. Number of coral colonies present in FWC's *in situ* coral nurseries (1) and two nurseries maintained by Reef Renewal, LLC under contract to the FWC (2), June 2021.

Common Name	Scientific Name	Status	Number of Coral Colonies				
			Marathon Mid-channel Nursery[1]	Marathon Offshore Nursery[1]	Tavernier Nursery[2]	Looe Key Nursery[2]	Total
Boulder star coral	*Orbicella franksi*	FT	0	0	1,290	0	1,290
Lobed star coral	*Orbicella annularis*	FT	0	12	4,900	1,500	6,412
Mountainous star coral	*Orbicella faveolata*	FT	251	69	4,960	836	6,116
Rough cactus coral	*Mycetophyllia ferox*	FT	0	0	12	0	12
Elkhorn coral	*Acropora palmata*	FT	115	220	3,256	734	4,325
Staghorn coral	*Acropora cervicornis*	FT	2,140	150	2,055	1,040	5,235
Pillar coral	*Dendrogyra cylindrus*	FT	0	0	44	0	44

Exhibit 26. Number of coral colonies outplanted in FY 2020-21 by the FWC(1) and by Reef Renewal LLC(2) under contract from the FWC.

Common Name	Scientific Name	Reef	Number of Colonies Outplanted
Mountainous star coral	*Orbicella faveolata*	W. Turtle Shoal (1)	140
		Samantha's Ledge (1)	140
		East Washerwoman Shoal (1)	120
		Sombrero Reef (1)	130
Elkhorn coral	*Acropora palmata*	Conch Reef2 (2)	242
		Looe Key2 (2)	75
		Elbow (2)	16
		Elbow Patch (2)	60
		Phillips Reef (2)	33
Lobed star coral	*Orbicella annularis*	Conch Reef (2)	210
		Looe Key (2)	60
Staghorn coral	*Acropora cervicornis*	Delta Shoal E (1)	200
		Delta Shoal W (1)	200
		Yellow Rocks (1)	200
		Pickles Patch (2)	220
		Tavernier Patch Reef1 (2)	110
		Pickles Patch with Frames (2)	232
		South Carysfort (2)	143
		Triangles (2)	154
		Looe Key (2)	150

In FY 2020-21, a total of 108 Vertical Rope Nurseries (VRNs) were installed at 12 reef sites by Reef Renewal, LLC. The VRNs are an intermediate stage between the coral nurseries and outplanting, where acroporid corals are installed in ropes and grown at outplant sites. Reef Renewal, LLC is experimenting with using biodegradable ropes so that VRNs

may be outplanted directly onto reefs by wedging them into crevices or rugose areas on reefs.

ELKHORN CORAL – The Elkhorn Coral is Federally Threatened and is not susceptible to SCTLD, though it is highly susceptible to other coral diseases. FWC began monitoring Elkhorn Coral in 2010 at eight sites between Biscayne National Park and the Lower Keys (Miami-Dade and Monroe counties). Across all sites, there has been an 82% reduction in colony abundance and 79% reduction in live tissue over the last 10 years. At the onset of the study, 421 colonies were assessed. In FY 2020-21, the total number of colonies distributed across all sites was down to 87.

PILLAR CORAL – The Pillar Coral is Federally Threatened and is highly susceptible to SCTLD. In FY 2020-21, the SCTLD disease boundary progressed from the Marquesas into the Dry Tortugas National Park boundary, where FWC monitors ten colonies of Pillar Coral. At the end of June 2021, none of the colonies showed signs of the disease. Since FWC began monitoring, however, the colonies have undergone annual summer bleaching resulting in minor tissue loss (<3%) and full recovery by the winter surveys.

Crayfish

BLACK CREEK CRAYFISH – The Black Creek Crayfish is State Threatened and is endemic to northeast Florida, where much of its known range is in the Black Creek drainage. It inhabits streams with cool, unpolluted water with constant flow and high oxygen content. All documented occurrences have been within the lower St. Johns River watershed basin (St. Johns, Duval, Clay, and Putnam counties). The USFWS has been petitioned to evaluate the Black Creek crayfish for possible listing. Surveys conducted in 2019 suggested White-tubercled Crayfish are replacing Black Creek Crayfish in historically occupied sites. In FY 2020-21, FWC used federal Section 6 funding to partner with UF to further investigate this ongoing threat. Of the 52 sites surveyed between October 2020 and February 2021, Black Creek Crayfish were detected at 20 sites and the White-tubercled Crayfish at 32 sites. The two species occurred together at 13 sites; Black Creek Crayfish occurred without White-tubercled Crayfish at only 7 sites. This initial survey project is being followed by another Section 6-funded project to, 1) conduct controlled experiments to measure aggressive interactions and competition between the two species to assess possible competitive differences, and 2) intensively trap White-tubercled Crayfish out of 1-km of a stream run and monitor Black Creek Crayfish response to assess feasibility of removal as a conservation technique.

PANAMA CITY CRAYFISH – The Panama City Crayfish (PCC) is a Species of Special Concern and is under evaluation for federal listing. Utilizing funds received through a federal Section 6 Grant, FWC and partners are continuing efforts to develop a scientifically sound translocation plan and a genetic assessment tool. These products will be used to remediate low genetic diversity caused by habitat loss and fragmentation, and to help monitor the success of future translocations. Additional conservation efforts include providing technical assistance to landowners seeking to avoid impacts to PCC and collaborating with local government efforts to create and

maintain effective mitigation measures for unavoidable impacts. Importantly, FWC has worked closely with local and federal partners to identify and prioritize PCC habitats for conservation to meet defined recovery goals.

SANTA FE CAVE CRAYFISH – The Santa Fe Cave Crayfish is a State Threatened species that inhabits subterranean water sources in southern Suwannee and Columbia counties. In FY 2020-21, FWC staff reviewed a proposal to build a solar farm in Suwannee County within the known range of the species. Following FWC comments, the applicant hosted a visit to the site in March 2021, during which several karst features were inspected and a Suwannee Cave Crayfish was observed, documenting a seventh known occurrence locality. FWC staff discussed ways to minimize impacts to the karst features and to the crayfish if the project moves forward.

Freshwater Mussels

ALABAMA MOCCASINSHELL – The Federally Endangered Alabama Moccasinshell is known from the Mobile basin to the west and from the Escambia, Yellow, and Choctawhatchee River basins in Florida. Host fishes for this species include the Blackspotted Topminnow, Naked Sand Darter, Southern Sand Darter, and other darter species. This species has not been collected in the state since 1933 and is thought to be extirpated from Floridan drainages.

CHIPOLA SLABSHELL - The Federally Threatened Chipola Slabshell is found in the Apalachicola River basin. It is a short-term brooder and is gravid from June–July and potential host fish are Bluegill and Redbreast Sunfish. In FY 2020-21, FWC performed 15 surveys for this species and found 3 individuals (Exhibit 27). Of these, 1 individual was brooding larvae.

CHOCTAW BEAN - The Federally Endangered Choctaw Bean is found in the Escambia, Yellow, and Choctawhatchee River basins. Fish hosts are unknown, but it is believed to be a host specialist due to known hosts for closely related species. The Choctaw Bean broods from late summer to the following spring. In FY 2020-21, FWC performed 18 surveys for this species and found 9 individuals (Exhibit 27); 5 were checked for larvae, and 1 of them was brooding.

FAT THREERIDGE - The Federally Endangered Fat Threeridge is found only in the Apalachicola and Chipola Rivers. It broods from May-June and is a generalist parasitizing five fish species. In FY 2020-21, FWC conducted 15 surveys and found 1,021 individuals (Exhibit 27). Although recent studies suggest reproduction to be strong, of the 15 checked, no brooding individuals were found, which was most likely caused by the timing of the surveys.

FUZZY PIGTOE - The Federally Threatened Fuzzy Pigtoe is found in the Escambia, Yellow, and Choctawhatchee River basins. This bivalve broods from March–June, although it has been observed brooding in July and August. This mussel is a specialist and can only parasitize the Blacktail Shiner. In FY 2020-21, FWC performed 18 surveys for this species and found 3 individuals. Of those 3, none were brooding larvae (Exhibit 27).

GULF MOCCASINSHELL - The Federally Endangered Gulf Moccasinshell is found in upper tributaries of the Chipola River and Econfina Creek. This mussel broods from March to late summer or early fall, but observations suggest the brooding period may be longer. This species is a specialist, parasitizing three darter species. In FY 2020-21, no individuals were found despite FWC's 15 surveys in this species' range (Exhibit 27). Since 2013, 8 individuals have been sampled at one site on Baker Creek.

NARROW PIGTOE - The Federally Threatened Narrow Pigtoe is found in the Escambia and Yellow Rivers. This bivalve broods from March–June although it has been observed brooding in July. The host fishes for this species, Blacktail and Weed Shiners, were identified by FWC biologists (Holcomb et al., 2020). In FY 2020-21, FWC performed 7 surveys for this species and found 5 individuals (Exhibit 27). All were checked for larvae, and none were brooding.

OVAL PIGTOE - The Federally Endangered Oval Pigtoe is found in Econfina Creek, Apalachicola, Ochlockonee, and Suwannee River basins. It has been found to brood from March–July, although brooding in January has also been observed. This mussel only parasitizes Sailfin Shiners and Eastern Mosquitofish. In FY 2020-21, FWC performed 16 surveys for Oval Pigtoe and found 2 individuals (Exhibit 27). Both were checked, and 1 was found to be brooding larvae.

OCHLOCKONEE MOCCASINSHELL - The Federally Endangered Ochlockonee Moccasinshell is found only in the lower reaches of the Ochlockonee River. This species broods larvae in June, July, and October. Host fish species are unknown for this species but are thought to be darters due to the host use of related species. Ochlockonee Moccasinshell specimens had not been located since 2017, before Hurricane Michael affected the area; however, during FY 2020-21, FWC located 2 individuals, 1 of which was brooding larvae.

PURPLE BANKCLIMBER - The Federally Threatened Purple Bankclimber is found in the Apalachicola, Lower Chipola, and Ochlockonee River basins. This bivalve broods from February–April, although it has been observed brooding in May. This species parasitizes two fish species, the Federally Threatened Gulf Sturgeon and the Blackbanded Darter. In FY 2020-21, FWC performed 16 surveys and located 15 individuals (Exhibit 27). All but 1 juvenile were checked for larvae, and only 1 from the Ochlockonee was found to be brooding larvae.

ROUND EBONYSHELL - The Federally Endangered Round Ebonyshell is endemic to the Escambia River basin. This mussel broods from April–August. The fish host is unknown, but it is hypothesized to parasitize migratory shad species due to this fish being the host for a related species. In FY 2020-21, FWC performed 3 surveys but did not locate any individuals (Exhibit 27).

SHINYRAYED POCKETBOOK - The Federally Endangered Shinyrayed Pocketbook is found in the Econfina Creek, Apalachicola, and Ochlockonee River basins in Florida. This bivalve broods from December–August and

parasitizes Spotted Bass. In FY 2020-21, FWC performed 16 surveys for the Shinyrayed Pocketbook and found 1 individual that was brooding larvae (Exhibit 27).

SOUTHERN KIDNEYSHELL - The Federally Endangered Southern Kidneyshell is restricted to the Choctawhatchee River basin in Florida. This bivalve broods from September–May and the fish host is unknown but is hypothesized to utilize darters like other species of the same genus. In FY 2020-21, FWC performed 11 surveys but did not find any individuals (Exhibit 27).

SOUTHERN SANDSHELL - The Federally Endangered Southern Sandshell is restricted to the Yellow and Choctawhatchee River Basins. This bivalve broods from May–August, although brooding has been observed in April as well as September-November. The fish host is unknown, but it is hypothesized to utilize various bass species like the Shinyrayed Pocketbook. In FY 2020–21, FWC performed 15 surveys for the Southern Sandshell and found 12 individuals (Exhibit 27). Two individuals were found to be brooding larvae.

SUWANNEE MOCCASINSHELL - The Federally Threatened Suwannee Moccasinshell is a rare mussel endemic to the Suwannee River basin. This bivalve broods from January–March, though it has been observed brooding in April, October, and December. The fish host is unknown, but it is hypothesized to utilize darters like related species. In FY 2020–21, FWC did not find any individuals (Exhibit 27).

TAPERED PIGTOE - The Federally Threatened Tapered Pigtoe is restricted to the Choctawhatchee River basin. This bivalve broods from March–June and is a specialist only parasitizing the Blacktail Shiner. In FY 2020–21, FWC performed 11 surveys for Tapered Pigtoe and located 7 individuals (Exhibit 27). Of the 7 individuals, none were brooding larvae.

Exhibit 27. Freshwater mussel surveys conducted in FY 2020-21. Number of surveys is in parentheses after the basin name. Dashes indicate the species does not occur in the basin.

Species	Apalachicola (15)	Choctawhatchee (11)	Escambia (3)	Econfina Creek (0)	Ochlockonee (1)	Suwannee (0)	Yellow (4)	Total (51)
Alabama Moccasinshell	-	0	0	-	-	-	0	0
Chipola Slabshell	3	-	-	-	-	-	-	3
Choctaw Bean	-	5	4	-	-	-	0	9
Fat Threeridge	1,021	-	-	-	-	-	-	1,021
Fuzzy Pigtoe	-	1	2	-	-	-	0	3
Gulf Moccasinshell	0	-	-	0	-	-	-	0
Narrow Pigtoe	-	-	5	-	-	-	0	5
Ochlockonee Moccasinshell	-	-	-	-	2	-	-	2
Oval Pigtoe	2	-	-	-	0	0	-	2
Purple Bankclimber	2	-	-	-	13	-	-	15
Round Ebonyshell	-	-	0	-	-	-	-	0
Shinyrayed Pocketbook	1	-	-	0	0	-	-	1
Southern Kidneyshell	-	0	-	-	-	-	-	0
Southern Sandshell	-	10	-	-	-	-	2	12
Suwannee Moccasinshell	-	-	-	-	-	0	-	0
Tapered Pigtoe	-	7	-	-	-	-	-	7
Totals	1,029	23	11	0	15	0	2	1,080

Miami Tiger Beetle

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

As of June 2021, 23 pine rockland sites have been surveyed multiple times, but Miami Tiger Beetles have only been detected at 5 sites, all within the greater Richmond Pine Rockland area. Four of the 5 sites are contiguous and likely represent a single population. The total area of occupied habitat within these 5 sites is less than 15 acres, and no new sites have been added since 2015. Ongoing research seeks to determine habitat/microhabitat requirements of the Miami Tiger Beetle, quantify detection rates, and monitor population trends. Prescribed fire is the primary mechanism utilized in healthy habitat management within the pine rockland ecosystem. However, fire is a challenging endeavor within an urban landscape, therefore other mechanical and manual options are being explored to maintain habitat for the endangered beetle.

OTHER WORK

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 2020-21.

MEDIA RELATIONS – FWC press releases reach substantial regional and statewide audiences, with some national media reach as well. They are sent via email to individual reporters, editors, and producers at daily and weekly newspapers, magazines, online publications, and radio and TV stations who have signed up to receive FWC press releases (Exhibit 28). Regional media receive regional-only news and information as well as statewide releases. In FY 2020–21, FWC issued many press releases on listed species. FWC press releases are posted online at MyFWC.com/News.

Exhibit 28. Number of reporters sent FWC press releases in FY 2020-21.

FWC Region	Number of Reporters
Northwest	78
North Central	46
Northeast	26
Southwest	41
South	71
Statewide Total	262

SOCIAL MEDIA – FWC's social media accounts are growing in popularity every day, enabling the agency to reach a wider audience and a diverse group of stakeholders (Exhibit 29). FWC's social media is meant to be exciting and engaging as well as educational to get audiences interested in stories about Florida wildlife and conservation.

Exhibit 29. Total interactions with each FWC social media account obtained in FY 2020-21.

Social Media Platform	Quantity
@MyFWC Facebook	289,500 Likes
@MyFWC Twitter	34,400 Followers
@MyFWC Instagram	89,000 Followers
MyFWCMedia Flickr	3 Million Views
@MyFWC Youtube	794,000 Views
@FloridaBirdingTrail Facebook	21,600 Likes
@FWCResearch Facebook	79,230 Likes
@FWCvolunteers	1,700 Likes

GOVDELIVERY AND WEBSITES – In today's world, the public turns to email and the internet for instant information on Florida's listed species and their habitats. GovDelivery allows us to directly and instantly connect with thousands of stakeholders with important information on topics they care about. Exhibit 30 shows some examples of topics that members of the public can subscribe to. GovDelivery also gives the public the opportunity to subscribe to several newsletters related to listed species.

Exhibit 30. Number of subscribers in FY 2020-21 for select GovDelivery topics.

Topic	Subscribers
Imperiled Species Management Plan	44,900
Florida Panther	47,400
Manatee	47,600
Sea Turtles	47,900
Landowner Assistance Program	30,700
Coral Reefs	32,900
Gopher Tortoises	45,300
Volunteer Programs	40,600

FAIRS, FESTIVALS AND EVENTS – Unfortunately, the COVID-19 pandemic resulted in the cancellation of many events during 2020 and into 2021. Some events were rescheduled and others were held virtually.

VOLUNTEER OPPORTUNITIES – FWC volunteers contribute greatly to the success of the state's conservation of listed species. The agency's Regional Volunteer Program Biologists and the Ridge Ranger Coordinator work with staff and partners to develop and sustain projects that meet strategic objectives and involve all aspects of volunteer management. Listed species conservation is one of the focal issues for the regional program. Volunteer activities were limited in FY 2020–21 however, long-term volunteers assisted with monitoring imperiled shorebirds, imperiled wading birds, near threatened Scrub Lizards, Florida Scrub-Jays, and southeastern American Kestrels. Additionally, volunteers assisted with the construction of chick shelters and chick fence installation to benefit Least Terns, husbandry needs for a pair of relocated Florida Burrowing Owls, cutting and painting shorebird decoys to attract nesting pairs to a specific area, and posting shorebird and seabird nesting areas to protect the nests, eggs, chicks and habitat from disturbances. Volunteer involvement also included growing sandhill milkweed to benefit monarch butterflies, managing invasive exotic vegetation from scrub habitats, harvesting berries from the endangered Florida jujube, restoration planting of the endangered scrub lupine, reviewing footage from game cameras distributed throughout certain Wildlife Management Areas to identify wildlife species, working with partners to maintain red-cockaded woodpecker nest sites, coastal cleanups to benefit wildlife, as well as some public outreach.

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. FWC's Wildlife Assistance Biologists provide help and guidance to individuals and groups throughout the state on how to avoid conflicts with wildlife. In FY 2020-21, they conducted two site visits to assist individuals with concerns regarding threatened species including Sandhill Cranes and Southeastern American Kestrel.

OTHER EDUCATIONAL AND OUTREACH PROGRAMS AND PRESENTATIONS – FWC works to engage members of the public in learning about listed species in a variety of ways, including partnering with educators to reach young people and creating fun and interactive incentives programs for wildlife viewing. Project WILD connects with teachers and other educators to provide educational materials in a wide variety of subject matter relating to Florida wildlife, including threatened and endangered species. These lessons reached an estimated 180,000 youth in FY 2020-21.

The Wings Over Florida birding and butterfly listing recognition program aims to increase the number of diverse Floridians and visitors who are wildlife viewers and conservationists. In FY 2020-21, the Wings Over Florida program awarded 355 certificates to program participants, recognizing their bird and butterfly listing achievements, including their sightings of endangered and threatened species.

Coastal Wildlife Conservation Initiative

The Coastal Wildlife Conservation Initiative (CWCI) is an FWC-led, multi-partner (e.g., FDEP, USFWS, and UF's Institute of Food and Agriculture Sciences) strategy that aims to facilitate a statewide, cooperative process to provide greater consistency and coordination in protecting coastal wildlife populations, conserving and managing coastal ecosystems, and achieving balance between these efforts and human use of coastal areas. In FY 2020-21, the CWCI and partners made significant progress on projects to conserve coastal wildlife, including listed species. One of these was offering virtual and hybrid versions of a living shorelines training course for marine contractors. Living shorelines (using plants, oysters, and other natural structural materials) are softer, greener alternatives to traditional seawalls used to stabilize shorelines from erosion, sea level rise, and other damage. The hybrid course was offered in Pensacola during April 2021, with instructors from multiple partner organizations. Virtual courses had participants statewide. The CWCI presented about this course at the 2020 National Coastal and Estuarine Virtual Summit.

Another effort by the CWCI during FY 2020-21 to conserve coastal wildlife was formation of a Hooked Pelican Working Group, which coordinates multiple stakeholder groups for streamlined conservation effort of brown pelicans, an at-risk species. One of the goals of this working group is to integrate the distinct issues of feeding (direct or indirect), entanglement, wildlife protections, landscape-level effect, and pelican behavior/habituation. The CWCI addressed climate change, an urgent threat to coastal wildlife, by contributing to a video about this topic, which focuses on sea level rise, temperature changes, and rainfall changes, along with the Climate Adaptation Explorer tool created by FWC. The CWCI also presented on climate adaptation and resiliency at Florida A&M University. Another video created by the CWCI educates children on the importance of 3 types of beach habitat that are home to several listed species--primary dunes in the Panhandle, back-beach lagoons in Southwest Florida, and the beach wrack line

in South Florida. A new product created by the CWCI in FY 2020-21 was a map showing local dog ordinances in coastal counties around the state. This will help dog owners know which beaches they should take their dogs to and which they should avoid, thereby reducing the impacts of dog disturbance on beaches with more threatened wildlife.

The CWCI conducted outreach activities in FY 2020-21 covering coastal wildlife topics including listed species conservation (focusing mostly on shorebirds, seabirds, beach mice, and marine turtles), marine debris prevention, living shorelines, and more. Audiences were mostly reached via on-line events, due to COVID restrictions. The CWCI also worked with other FWC staff to create media posts on beach-nesting birds, marine turtle nesting, avoiding seabird entanglement, and how to go on a beach scavenger hunt.

Coordination and Assistance

REVIEWS AND ASSISTANCE FOR TRANSPORTATION PROJECTS - FWC performed 124 reviews of highway projects in FY 2020-21, which included projects reviewed through the Florida Department of Transportation's Efficient Transportation Decision Making (ETDM) Process, and assistance letters outside of the ETDM Process, including 46 written letters. Each review included a biological assessment of the direct and indirect effects of the transportation project on listed bird, mammal, amphibian, and reptile 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 these 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 fish and wildlife species.

LAND USE PLANNING ACTIVITIES - FWC provided a review of 1,820 projects and provided written assistance on 803 of those projects for public and private land and water use planning activities that had the potential to impact listed fish and wildlife species and their habitats in FY 2020-21. The types of projects reviewed and commented on included: proposed county comprehensive plan amendments and sector plans, regional visioning projects, various state and federal permit applications, environmental assessments, environmental impact statements, power plant siting applications, and ten-year site 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.

LANDOWNER ASSISTANCE PROGRAM – Florida's Landowner Assistance Program (LAP), in cooperation with the USFWS, promotes stewardship on private lands while also playing a fundamental role in the conservation of listed species. Florida's LAP is a voluntary program designed to provide wildlife-related assistance with land-use planning and habitat management to private landowners, as well as financial support to those interested in improving habitat conditions on their property 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 2020-21, FWC's LAP assisted more than 736 private landowners, including providing written evaluations of effects from proposed agricultural practices to listed species on 234 projects. Many of the landowners also received financial assistance through state or federal cost-share or easement programs such as the USDA Farm Bill and USFWS Partners for Fish and Wildlife Programs. LAP worked in cooperation with the U.S. Department of Agriculture's Natural Resources Conservation Service, USFWS, Florida Department of Agriculture and Consumer Services, the 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 2020-21, public conservation land managers including the DOD, water management districts, and county governments received assistance with development or review of management plans for their conservation lands. In total, LAP biologists delivered 1,202 assists to more than 760 landowners on 385,257 acres. For more information, visit the LAP Website at: https://myfwc.com/conservation/special-initiatives/lap/.

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

American Alligators	*Alligator mississippiensis*
American Crocodiles	*Crocodylus acutus*
American Oystercatcher	*Haematopus palliatus*
Black Skimmer	*Rynchops niger*
Boulder Star Coral	*Orbicella franksi*
Chipola Slabshell	*Elliptio chiplolaensis*
Diamond Back Terrapin	*Malaclemys terrapin*
Fat Threeridge	*Amblema neislerii*

Florida Black Bear	*Ursus americanus floridanus*
Florida Bonneted Bat	*Eumpos floridanus*
Florida Burrowing Owl	*Athene cunicularia*
Florida Grasshopper Sparrow	*Ammodramus svannarum floridanus*
Florida Panther	*Puma concolor coryi*
Florida Manatee	*Trichechus manatus latirostris*
Florida Sandhill Crane	*Grus canadensis pratensis*
Florida Scrub-Jay	*Aphelocoma coerulescens*
Frosted Flatwoods Salamander	*Ambystoma cingulatum*
Fuzzy Pigtoe	*Pleurobema strodeanum*
Gopher Frog	*Rana capito aesopus*
Gopher Tortoise	*Gopherus polyphemus*
Gray Bat	*Myotis grisescens*
Green Sea Turtle	*Chelonia mydas*
Gulf Moccasinshell	*Medionidus penicillatus*
Gulf Sturgeon	*Acipenser oxyrhynchus desotoi*
Hawksbill Sea Turtle	*Eretmochelys imbricata*
Kemp's Ridley Sea Turtle	*Lepidochelys kempi*
Least Tern	*Sternula antillarum*
Leatherback Sea Turtle	*Dermochelys coriacea*
Little Blue Heron	*Egretta caerulea*
Lobed Star Coral	*Orbicella annularis*
Loggerhead Turtle	*Caretta caretta*
Mountainous Star Coral	*Orbicella faveolata*
Narrow Pigtoe	*Fusconai escambia*
Ochlockonee Moccasinshell	*Medionidus simpsonianus*
Oval Pigtoe	*Pleurobema pyriforme*
Piping Plover	*Charadrius melodus*
Reddish Egret	*Egretta rufescens*

Roseate Spoonbill	*Ajaja ajaja*
Roseate Tern	*Sterna dougallii dougallii*
Snowy Plover	*Charadrius alexandrinus*
Southern Kidneyshell	*Ptychobranchus jonesi*
Southern Sandshell	*Hamiota australis*
Striped Newt	*Notophthalmus perstriatus*
Suwannee Moccasinshell	*Medionidus walkeri*
Tapered Pigtoe	*Fusconaia burki*
Tricolored Heron	*Egretta tricolor*
Whooping Crane	*Grus americana*
Wood Stork	*Mycteria American*

Critical Wildlife Areas

CWAs are established by the Commission under rules 68A-14.001 and 68A-19.004, F.A.C., to protect important concentrations of wildlife from human disturbance during essential life activities, such as breeding, roosting and migratory stopover. For each CWA, the boundaries and time period when areas may be posted as closed to public access are approved by the 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 these areas each year. Management and monitoring activities are conducted with the participation of FWC staff and multiple partners including other state agencies, local governments, and nongovernmental organizations. Thirty-two CWAs are established around the state: 16 support wading and diving birds, 14 support beach (or ground) nesting birds, one supports gopher tortoises, and one is established for the protection of bats. Twenty-six of the CWAs provided breeding habitat for federally- or state-listed imperiled species in FY 2020-21 (Exhibit 31).

All CWAs were monitored for use in FY 2020-21 by FWC staff or management partners. The total peak nest count for all CWAs that support nesting birds was 15,009 in FY 2020-21, as compared to 16,896 in FY 2019-20, 24,614 in FY 2018-19, and 14,102 in FY 2017-18. For state or federally listed imperiled species, the peak nest count for all CWAs combined in FY 2020-21 was 2,442 nests. Factors besides human disturbance that can impede nesting include habitat impacts due to storms and erosion, reduced prey availability, or the presence of predators. Staff use a variety of techniques to identify site-specific factors impeding nesting. For example, game cameras or traps are deployed to identify predators at CWAs and implement predation management protocols. Habitat management is

conducted at CWAs outside the breeding season, including vegetation management, trash removal and storm debris cleanup. In 2020, BC49 CWA in Brevard County was awarded a SWG grant to support the planting of over 110 mangroves around the perimeter of the island, an effort to counteract mangrove losses that occurred following Hurricane Irma.

Exhibit 31. Critical Wildlife Areas In Florida During FY 2020-21.

CWA BY REGION	COUNTY	CLOSURE PERIOD	BREEDING SPECIES *(Imperiled Species In Bold)*	STATUS[a]	MANAGED AREA
NORTHWEST REGION (5 CWAs)					
Tyndall[b]	Bay	Year-round	**Black skimmer**, **least tern**, **snowy plover**, **American oystercatcher**, gull-billed tern, Wilson's plover, willet	**35**, **183**, **18**, **1**, 34, 21, 2 nests	200 ac
Flag Island[b]	Franklin	Year-round	**Black skimmer**, **least tern**, **American oystercatcher**, Caspian tern, gull-billed tern, royal tern, sandwich tern	**218**, **128**, **2**, **18**, 4, 116, 87 nests	80 ac
St. George Causeway	Franklin	1 Mar to 30 Sept	**American oystercatcher**, brown pelican, Caspian tern, gull-billed tern, royal tern, sandwich tern, laughing gull	**4**, 897, 61, 2, 621, 436, 1200 nests	32 ac
Lanark Reef[b]	Franklin	Year-round	**Black skimmer**, **American oystercatcher**, brown pelican, gull-billed tern, laughing gull, willet	**52**, **11**, 120, 6, 600, 2 nests	65 ac
Alligator Point	Franklin	15 Feb to 31 Aug	**Black skimmer**, **least tern**, **American oystercatcher**, **snowy plover**, Wilson's plover	**18**, **13**, **2**, **1**, 5 nests	66 ac
NORTH CENTRAL REGION (4 CWAs)					
Amelia Island	Nassau	1 Mar to 1 Sept	**Least tern**, Wilson's plover, willet	**109**, 15, 2 nests	250 ac
Nassau Sound Islands[b]	Duval	Year-round	**Black skimmer**, **least tern**, **American oystercatcher**, gull-billed tern, Wilson's plover, willet	**30**, **45**, **6**, **2**, 18, 2 nests	18 ac
Fort George Inlet	Duval	1 May - 31 Aug	**Black skimmer**, **least tern**, **American oystercatcher**, brown pelican, royal tern, laughing gull, Wilson's plover	**37**, **5**, **4**, **51**, 3340, 2441, 22 nests	82 ac
Withlacoochee Caves	Citrus	15 Apr - 15 Aug and 15 Dec - 15 Mar	Southern myotis, tricolored bat	375, 41 individuals (wintering)	3 ac
NORTHEAST REGION (4 CWAs)					
Port Orange	Volusia	1 Jan - 31 Aug	**Least tern**, **American oystercatcher**	**23**, 2 nests	4 ac
Matanzas Inlet	St. Johns	1 Apr - 15 Aug	*No nesting occurred within the CWA boundary this year.*		28 ac
BC49	Brevard	1 Jan - 31 Aug	**Wood stork**, **roseate spoonbill**, **little blue heron**, **tricolored heron**, brown pelican, great blue heron, great egret, cattle egret, white ibis, glossy ibis, black-crowned night heron, anhinga, double-crested cormorant	**135**, **14**, **7**, **10**, 43, 2, 10, 104, 31, 1, 1, 7, 21 nests	6 ac
Stick Marsh	Brevard	1 Jan - 31 Jul	**Roseate spoonbill**, **tricolored heron**, great egret, snowy egret, cattle egret, anhinga	**43**, **10**, 131, 33, 61, 51 nests	2 ac

SOUTHWEST REGION (10 CWAs)					
Alafia Banks	Hillsborough	Year-round	Roseate spoonbill, reddish egret, little blue heron, tricolored heron, American oystercatcher, brown pelican, great blue heron, great egret, snowy egret, white ibis, glossy ibis, black-crowned night heron, yellow-crowned night heron, double-crested cormorant	75, 3, 5, 15, 3, 317, 30, 45, 10, 50, 30, 15, 15, 71 nests	93 ac
Dot Dash Dit	Manatee	1 Jan - 31 Aug	Wood stork, roseate spoonbill, little blue heron, tricolored heron, great blue heron, great egret, snowy egret, cattle egret, black-crowned night heron, anhinga, double-crested cormorant	93, 11, 4, 3, 11, 44, 6, 7, 5, 17, 12 nests	5 ac
Roberts Bay	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	20, 1, 5, 4, 78, 14, 48, 8, 3, 11, 59 nests	5 ac
Myakka River	Sarasota	1 Jan - 31 Aug	Wood stork, great blue heron, great egret, snowy egret, cattle egret, anhinga	53, 3, 30, 4, 1, 9 nests	1 ac
Broken Islands	Lee	1 Mar - 31 Aug	Roseate spoonbill, reddish egret, little blue heron, tricolored heron, brown pelican, great blue heron, snowy egret, cattle egret, white ibis, anhinga, double-crested cormorant	2, 1, 2, 26, 144, 3, 3, 9, 48, 7, 88 nests	31 ac
Hemp Key	Lee	Year-round	Reddish egret, brown pelican, great blue heron, great egret, black-crowned night heron, yellow-crowned night heron, double-crested cormorant	3, 115, 21, 29, 1, 1, 167 nests	10 ac
Matanzas Pass Island	Lee	Year-round	Reddish egret, little blue heron, tricolored heron, brown pelican, great blue heron, great egret, snowy egret, black-crowned night heron, double-crested cormorant	5, 1, 456, 29, 14, 7, 6, 2, 18 nests	4 ac
Coconut Point	Lee	Year-round	Roseate spoonbill, reddish egret, tricolored heron, brown pelican, great blue heron, great egret, snowy egret, black-crowned night heron, double-crested cormorant	7, 1, 1, 32, 3, 17, 3, 1, 10 nests	4 ac
Big Carlos Pass	Lee	Year-round	Reddish egret, brown pelican, great blue heron, great egret, snowy egret	1, 4, 2, 17, 1 nests	2 ac
Little Estero Island	Lee	1 Apr - 31 Aug	Least tern, snowy plover, Wilson's plover, killdeer	14, 1, 12, 2 nests	6 ac
SOUTH REGION (9 CWAs)					
Bird Island	Martin	Year-round	Wood stork, roseate spoonbill, American oystercatcher, brown pelican, great blue heron, great egret, snowy egret, anhinga, double-crested cormorant	109, 8, 1, 29, 1, 29, 2, 1, 9 nests	8 ac
Deerfield Island	Broward	Year-round	Gopher tortoise	22 individuals	56 ac

Bill Sadowski[b]	Dade	Year-round	Supports foraging and roosting shorebirds and wading birds	~1000 individuals	700 ac
Rookery Islands	Collier	Year-round	Great egret	5 nests	1 ac
Caxambas Pass	Collier	1 Apr - 31 Aug	*No nesting occurred within the CWA boundary this year.*		1 ac
Big Marco Pass[b]	Collier	Year-round	Black skimmer, Wilson's plover	544, 7 nests	30 ac
ABC Islands	Collier	Year-round	Reddish egret, little blue heron, tricolored heron, brown pelican, great blue heron, great egret, snowy egret, anhinga, double-crested cormorant	2, 1, 1, 27, 6, 23, 2, 1, 4 nests	75 ac
Second Chance	Collier	1 Mar - 31 Aug	Least tern, black skimmer, Wilson's plover	191, 72, 4 nests	3 ac
Pelican Shoal	Monroe	1 Apr - 31 Aug	*No nesting occurred within the CWA boundary this year.*		1 ac
[a]Count or estimate of peak number of nests per breeding species at each site during the closure period in FY 2020-21. Numbers correspond in order of species listed in previous column.					
[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 statewide enforcement activities to protect specific Endangered and Threatened species in FY 2020-21. These activities included:

• Regular patrols of the Florida Panther reduced-speed zones. Officers statewide documented over 5,309 patrol hours towards the protection of the Florida Panther and its prey species and to provide public safety within the Panther speed zones.

• Regular patrols in Monroe County as part of a multi-agency task force enforcing the Key deer speed zone on Big Pine Key.

• Patrol efforts targeting coastal nesting areas of sea turtles to reduce nest destruction and unlawful egg removal or theft.

• Patrol efforts directed toward the enforcement of specific gear requirements [i.e., Turtle Excluder Devices (TED)] to protect sea turtles from becoming entrapped in shrimp trawl nets. A total of 540 vessel patrol hours were focused on TED enforcement during the year resulting in 110 TED inspections and 45 documented TED violations.

• Patrol efforts targeting coastal nesting areas of protected shore birds to reduce nest disturbance, nest destruction, and incidental take.

• Investigations by the Internet Crimes Unit targeting the unlawful sale and possession of protected species on the internet.

• Enhanced statewide enforcement efforts directed towards utilizing radar and the manatee cam surveillance technology to ensure compliance with boat speed zones in order to prevent manatee vessel strikes and manatee harassment. Additionally, 74,351 water patrol hours were dedicated to manatee zone enforcement, resulting in 2,022 citations and 3,675 warnings.

• In addition, 60 citations and 137 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 through issues concerning the Florida Panther in southwest Florida.

• Assisting with increasing public awareness of gopher tortoises, Perdido Key beach mice, sea turtles, and other species.

• FWC currently has five investigative teams that target illegal shipments of wildlife, marine life, and freshwater

aquatic life in and out of our air and seaports and many common carrier facilities. The teams are comprised of an investigator and a specially trained Port K-9 team. The Port K-9 teams are trained to detect certain turtle, snake, and other potentially concealed Endangered/Threatened species as they arrive in or depart from Florida's ports. The five teams completed 231 proactive deployments resulting in 19 arrest citations.

Protected Species Permitting and Technical Assistance

The FWC provides science-based and regulatory guidance to issue permits that ensure requested wildlife-related activities will either result in a net conservation benefit or prove not to be detrimental for the involved non-listed and listed species. In FY 2020-2021, the FWC provided federal agencies, other state agencies, environmental consultants, and regional and local regulatory authorities with guidance regarding projects that impact listed wildlife on managed federal, state, and private lands, and lands slated for development. Many of these entities, as well as researchers, landowners, and educational facilities, utilized this guidance to apply for scientific collecting (capture, sample, release, and/or collection of wildlife), captive possession, nuisance wildlife, human safety, and incidental take permits.

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

Some permit holders are required to carry out an approved site or species-specific management plan, while others require permit holders to follow FWC-approved species rules, guidelines, policies, or management plans. Scientific permits are generally conditioned on an approved research proposal or educational use plan. The permit review process usually involves coordination between FWC, researchers, wildlife educational outreach facilities, and may include external subject matter experts as well.

The above assistance and guidance led to the FWC issuing 124 scientific collecting (intentional take), 263 incidental take, 18 special purpose, and 7 Peregrine falconry permits that resulted in a net conservation benefit or proved not to be detrimental for the species. More information on species guidelines, policies, and permit applications is available at http://myfwc.com/license/wildlife/protected-wildlife/.

Wildlife Conservation, Prioritization, and Recovery

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

Strategies are particular to each WMA/WEA and outline the role of the area(s) in wildlife conservation. Each strategy contains actions 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 these actions. Implementing this program ensures FWC is efficiently meeting the needs of Florida's at-risk species on lands managed by the agency.

In FY 2020-21, FWC completed five workshops covering three WMAs and five WEAs. The areas covered by a workshop included: Suwannee Ridge WEA (Hamilton County), Box-R WMA (Gulf County), Corbett WMA (Palm Beach County), Caravelle Ranch WMA (Putnam County), Little Gator Creek WEA (Pasco County), Perry-Oldenberg WEA (Hernando County), Chinsegut WEA (Hernando County), and Janet Butterfield-Brooks WEA (Hernando County). FWC initiated the drafting of strategies that are the output from these workshops, and all of them will be complete before the end of FY 2021-22. In FY 2020-21, FWC finalized seven strategies covering five WMAs and two WEAs; Hilochee WMA (Lake and Polk Counties), Apalachicola WEA (Gulf and Franklin Counties), Spirit of the Wild WMA (Hendry County), Suwannee Ridge WEA (Hamilton County), Guana River WMA (St Johns County), Okaloacoochee Slough WMA (Hendry County) and Dinner Island Ranch WMA (Hendry County). The Program 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.

APPENDIX A. FLORIDA'S LISTED WILDLIFE SPECIES AS OF JUNE 30, 2021

Exhibits A–1 through A–9 contain all of Florida's listed species as of June 30, 2021, including their status: Federally–designated Endangered (FE), Federally–designated Threatened(FT), Federally–designated Threatened Due to Similarity of Appearance [FT(S/A)], Federally–designated Nonessential Experimental species (FXN), State-designated Threatened (ST), or Species of Special Concern (SSC).

EXHIBIT A-1: Listed Mammals in Florida as of June 30, 2021.

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[2]
Bryde's Whale (Gulf of Mexico subspecies)	*Balaenoptera edeni [unnamed subspecies]*	FE
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[3]
Sanibel Island Rice Rat	*Oryzomys palustris sanibeli*	ST
Sei Whale	*Balaenoptera borealis*	FE[1]
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]

EXHIBIT A–2: Listed Birds in Florida as of June 30, 2021.

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
Eastern Black Rail	*Laterallus jamaicensis jamaicensis*	FT
Eskimo Curlew	*Numenius borealis*	FE
Everglade Snail Kite	*Rostrhamus sociabilis plumbeus*	FE
Florida Burrowing Owl	*Athene cunicularia floridana*	ST
Florida Grasshopper Sparrow	*Ammodramus svannarum floridanus*	FE
Florida Sandhill Crane	*Antigone canadensis pratensis*	ST
Florida Scrub–jay	*Aphelocoma coerulescens*	FT
Ivory–billed Woodpecker	*Campephilus principales*	FE
Kirtland'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
Piping Plover	*Charadrius melodus*	FT
Red–cockaded Woodpecker	*Picoides borealis*	FE
Reddish Egret	*Egretta rufescens*	ST
Roseate Spoonbill	*Platalea ajaja*	ST
Roseate Tern	*Sterna dougallii dougallii*	FT
Rufa Red Knot	*Calidris canutus rufa*	FT
Scott's Seaside Sparrow	*Ammodramus maritimus peninsulae*	ST
Snowy Plover	*Charadrius nivosus*	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

EXHIBIT A–3: Listed Amphibians in Florida as of June 30, 2021.

Common Name	Scientific Name	Status
Florida Bog Frog	*Lithobates okaloosae*	ST
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	FT
Georgia Blind Salamander	*Eurycea wallacei*	ST
Reticulated Flatwoods Salamander	*Ambystoma bishopi*	FE

EXHIBIT A–4: Listed Reptiles in Florida as of June 30, 2021.

Common Name	Scientific Name	Status
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 barbouri*	ST
Bluetail Mole Skink	*Plestiodon egregius lividus*	FT
Eastern Indigo Snake	*Drymarchon couperi*	FT
Florida Brown Snake	*Storeria victa*	ST[3]
Florida Keys Mole Skink	*Plestiodon 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 kempii*	FE[1]
Key Ringneck Snake	*Diadophis punctatus acricus*	ST
Leatherback Sea Turtle	*Dermochelys coriacea*	FE[1]
Loggerhead Sea Turtle	*Caretta*	FT[1]
Rim Rock Crowned Snake	*Tantilla oolitica*	ST
Sand Skink	*Plestiodon reynoldsi*	FT
Short–tailed Snake	*Lampropeltis extenuatua*	ST
Suwannee Alligator Snapping Turtle	*Macrochelys suwanniensis*	ST

EXHIBIT A–5: Listed Fish in Florida as of June 30, 2021.

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
Giant Manta Ray	*Manta birostris*	FT
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	FT[1]
Key Silverside	*Menidia conchorum*	ST
Nassau Grouper	*Epinephelus striatus*	FT
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

EXHIBIT A–6: Listed Corals in Florida as of June 30, 2021.

Common Name	Scientific Name	Status
Boulder Star Coral	*Orbicella franksi*	FT
Elkhorn Coral	*Acropora palmata*	FT
Lobed Star Coral	*Orbicella annularis*	FT
Mountainous Star Coral	*Orbicella faveolata*	FT
Pillar Coral	*Dendrogyra cylindrus*	FT
Rough Cactus Coral	*Mycetophyllia ferox*	FT
Staghorn Coral	*Acropora cervicornis*	FT

EXHIBIT A–7: Listed Crustaceans in Florida as of June 30, 2021.

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

EXHIBIT A–8: Listed Insects in Florida as of June 30, 2021.

Common Name	Scientific Name	Status
American Burying Beetle	*Nicrophorus americanus*	FE
Bartram's Scrub–haristreak	*Strymon acis bartrami*	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 Butterfly	*Heraclides aristodemus ponceanus*	FE

EXHIBIT A–9: Listed Mollusks in Florida as of June 30, 2021.

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)	*Fusconaia escambia*	FT
Ochlockonee 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

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

2 Not documented in Florida.

3 Lower keys population only.

APPENDIX B. LIST OF ACRONYMS USED IN THIS REPORT

Acronym	Term
ABRP	Apalachicola Bluffs and Ravines Preserve
AFB	Air Force Base
AH	Apparently healthy
AIBM	Anastasia Island Beach Mouse
ANF	Apalachicola National Forest
BCNP	Big Cypress National Preserve
CA	Conservation Area
CFR	Code of Federal Regulations
CRA	Crocodile Response Agent
CREMP	Coral Reef Evaluation and Monitoring Project
CWA	Critical Wildlife Area
CWCI	Coastal Wildlife Conservation Initiative
DNA	Deoxyribonucleic acid
DOD	Department of Defense
DRM	Disturbance Response Monitoring
ETDM	Efficient Transportation Decision Making
FDEP	Florida Department of Environmental Protection
FE	Federally-designated endangered
FFS	Florida Forest Service
FLM	Feline Leukomyelopathy
FNAI	Florida Natural Areas Inventory
FPS	Florida Park Service
FSA	Florida Shorebird Alliance
FSPSP	Fakahatchee Strand Preserve State Park
FT	Federally-designated threatened
FT(S/A)	Federally-designated threatened due to similarity of appearance
FY	Fiscal Year
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
FXN	Federally-designated nonessential experimental population
GIS	Geographic Information System
GPS	Global Positioning Satellite
HMAF	Habitat Management Assistance Funding
IRL	Indian River Lagoon
ITP	Incidental Take Permit
INBS	Index Nesting Beach Survey
LAP	Landowner Assistance Program
LLA	Longleaf Alliance
LTBMP	Long Term Bat Monitoring Program
MINWR	Merritt Island National Wildlife Refuge

APPENDIX B (*continued*)

MPP	Manatee Protection Plan
MOA	Memorandum of Agreement
NOAA – Fisheries	National Oceanic and Atmospheric Administration Marine Fisheries Service
NPS	National Park Service
OCIC	Orianne Center for Indigo Conservation
PBG	Potential breeding group
PCC	Panama City Crayfish
PIT	Passive Integrated Transponder
PSSF	Picayune Strand State Forest
PVC	Polyvinyl chloride
RCW	Red–cockaded Woodpecker
ROW	Right-of-Way
SCC	Species of Special Concern
SCTLD	Stony Coral Tissue Loss Disease
SEBM	Southeastern Beach Mouse
SECREMP	Southeast Coral Reef Evaluation and Monitoring Project
SGCN	Species of Greatest Conservation Need
SNBS	Statewide Nesting Beach Survey
SNP	Single Nucleotide Polymorphism
SSA	Species Status Assessment
ST	State-designated threatened
SWG	State Wildlife Grant
TED	Turtle Excluder Devices
UF	University of Florida
UGA	University of Georgia
UME	Unusual Mortality Event
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey
VRN	Vertical Rope Nursery
WEA	Wildlife and Environmental Area
WMA	Wildlife Management Area
WNS	White nose syndrome

APPENDIX C. FWC'S FISH AND WILDLIFE RESEARCH INSTITUTE'S PUBLICATIONS DURING FY 2020-21

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

Avens L., M. D. Ramirez, L. R. Goshe, J. M. Clark, A. B. Meylan, W. Teas, D. J. Shaver, M. H. Godfrey, L. Howell. 2021. Hawksbill sea turtle life-state durations, somatic growth patterns, and age at maturation. Endangered Species Research 45:127-145.

Bassett BL, JA Hostetler, E Leone, CP Shea, BD Barbeau, GL Lonati AL Panike, A Honaker, and LI Ward-Geiger. 2020. Quantifying sublethal Florida manatee watercraft interactions by examining scars on manatee carcasses. Endangered Species Research 43, 395-408.

Braun de Torrez, E. C., J. A. Gore, and H. K. Ober. 2020. Evidence of resource-defense polygyny in an endangered subtropical bat, *Eumops floridanus*. Global Ecology and Conservation 24: e01289.

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Cunningham, M.W., Onorato, D.P., Sayler, K.A., Leone, E.H., Conley, K.J., Mead, D.G., Crum Bradley, J.A., Maes, R.K. Kiupel, M. Shindle, D.B., Wisely, S.M., Subramaniam, K., Wise, A.G., Clemons, B.C., Cusack, L.M. Jansen, D., Schueller, P., Hernández, F.A., and Waltzek, T.B. 2021. Pseudorabies (Aujesky's disease) is a significant mortality factor in the Florida Panther (Puma concolor coryi). Journal of Wildlife Diseases. Hirama, Shigetomo, et al. "Environmental factors predicting the orientation of sea turtle hatchlings on a naturally lighted beach: A baseline for light-management goals." Journal of Experimental Marine Biology and Ecology 541 (2021): 151568.

Crum, N.J., L. C. Neyman, and T.A. Gowan. 2021. Abundance estimation for line transect sampling: A comparison of distance sampling and spatial capture-recapture models(plos.org).

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Enge, K. M., and J. R. Murray. 2021. *Macrochelys suwanniensis* (Suwannee alligator snapping turtle). Reproduction. Herpetological Review 52:392-393.

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

Common Name	Scientific Name
MAMMALS	
Bobcat	*Lynx rufus*
Coyote	*Canis latranus*
Eastern Gray Squirrel	Sciurus carolinensis
Eastern Spotted Skunk	*Spilogale putorius*
Long-tailed Weasel	*Mustela frenata*
Old-field Mouse	*Peromyscus polionotus*
Rhesus Monkey	*Rhesus macaque*
River Otter	*Lontra canadensis*
Southern Flying Squirrel	*Glaucomys volans*
Southeastern Myotis	*Myotis austroriparius*
Tri-colored Bat	*Peromyotis subflavus*
BIRDS	
American Flamingo	*Phoenicopterus ruber*
Anhinga	*Anhinga Anhinga*
Black – crowned Night Heron	*Nycticorax nycticorax*
Brown Pelican	*Pelecanus occidentalis*
Caspian Tern	*Hydroprogne caspia*
Cattle Egret	*Bubulcus ibis*
Double–crested Cormorant	*Phalacrocorax auritus*
Eastern Bluebird	*Sialia sialis*
Eastern Screech Owl	*Megascops asio*
Glossy Ibis	*Plegadis falcinellus*
Great Blue Heron	*Ardea herodias*
Great Crested Flycatcher	*Myiarchus crinitus*
Great Egret	*Ardea alba*
Gull–billed tern	*Gelochelidon nilotica*
Killdeer	*Charadrius vociferus*
Laughing Gull	*Larus atricilla*
Tufted Titmouse	*Baeolophus bicolor*
White Ibis	*Eudocimus albus*

Appendix D (*continued*)

Common Name	Scientific Name
BIRDS	
Louisiana Seaside Sparrow	*Ammospiza maritima fisheri*
MacGillivary's Seaside Sparrow	*Ammodramus maritimus macgillivraii*
Red–bellied Woodpecker	*Melanerpes carolinus*
Royal Tern	*Thalasseus maxima*
Sandwich Tern	*Thalasseus sandvicensis*
Snowy Egret	*Egretta thula*
Sooty Tern	*Onychoprion fuscatus*
White Ibis	*Eudocimus albus*
Willet	*Tringa semipalmata*
Wilson's Plover	*Charadrius wilsonia*
Yellow-crowned Night Heron	*Nycticorax violacea*
AMPHIBIANS	
Gopher Frog	*Lithobates capito*
Striped Newt	*Notophthalmus perstriatus*
REPTILES	
Eastern Diamondback Rattlesnake	*Crotalus adamanteus*
Florida Scrub Lizard	*Sceloporus woodi*
Spotted Turtle	*Clemmys guttata*
FISH	
Blacktail Shiner	*Cyprinella venusta*
Blackbanded Darter	*Percina nigrofasciata*
Bluegill	*Lepomis macrochirus*
Eastern Mosquitofish	*Gambusia holbrooki*
Redbreast Sunfish	*Lepomis auratus*
Sailfin Shiner	*Pteronotropis hypselopterus*
Spotted Bass	*Micropterus punctulatus*
INVERTEBRATES	
Giant Barrel Sponge	*Xestospongia muta*
Great Star Coral	*Montastraea cavernosa*
Knobby Brain Coral	*Pseudodiploria clivosa*
Long-spined Urchin	*Diadema antillarum*
White-tubercled Crayfish	*Procambarus spiculifer*

APPENDIX E. GLOSSARY OF TERMS

Candidate – Plants and animal species for which the USFWS has sufficient information on the biological status and threats to propose the species as endangered or threatened under the Endangered Species Act, but development of proposed listing is precluded by higher priority listing activities.
Cavity – A hollow or hole occupied by an organism.
Cluster – The aggregation of cavity trees previously and currently used and defended by a group of woodpeckers.
Coastal Construction Control Line - A Florida Department of Environmental Protection program that regulates structures and activities which can cause beach erosion, destabilize dunes, damage upland properties, and interfere with public access.
Cold-stun - When a sea turtle becomes hypothermic due to water temperatures becoming too cold.
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.
Critical Habitat - A legally designated space that is directly or indirectly necessary for the conservation of a Federally listed species.
Depredation – When wildlife preys upon livestock or pets.
Economic Exclusive Zone - A sea zone extending 200 nautical miles from the coast of a state giving that state special rights over the area regarding exploration and use of marine resources.
Endemic – Restricted or peculiar to a certain area or region.
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.
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.
Gene Flow - The transfer of genes from one population to another.

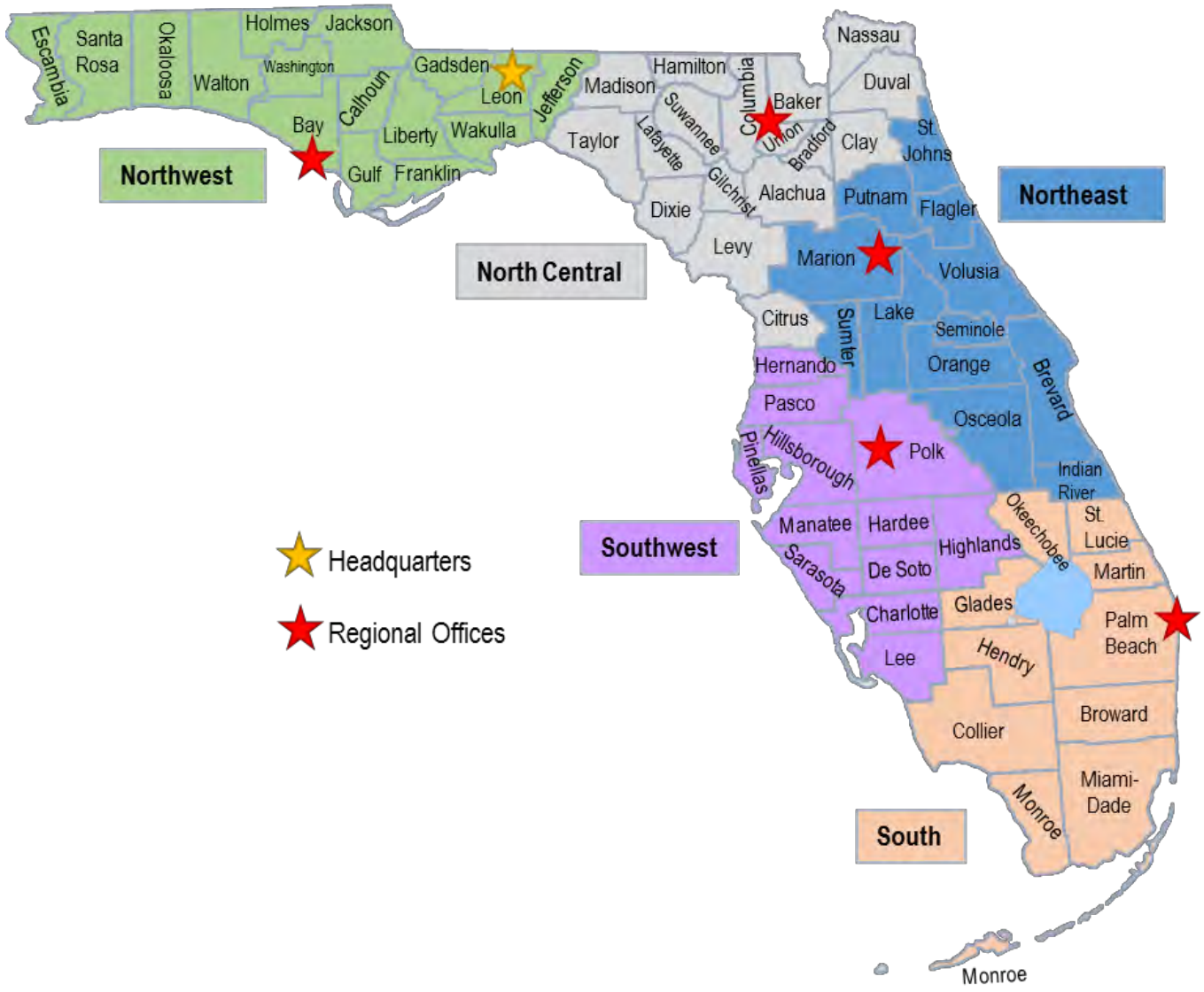
APPENDIX E (*continued*)

Genetic Diversity - The total number of genetic characteristics in a genetic makeup of a species.
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.
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.
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.
Mid-story - The layer of vegetation in a forest between the tallest and smallest trees.
Morphology - The identification, analysis, and description of the physical characteristics of a species.
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.
Passive Integrated Transponder (PIT) Tags – a chip placed below the skin to identify individuals.
Productivity – The ability to produce; fertility.
Recruitment – The addition of individuals into a breeding population through reproduction and/or immigration and attainment of breeding position.
Red tide - A higher-than-normal concentration of microscopic plantlike organisms.
Rookery – A colony of breeding animals.
Roosts – A place where species can sleep or reside.

APPENDIX E (*continued*)

Single Nucleotide Polymorphism - A variation in a single base pair in a DNA sequence.
Species Status Assessment - An analytical approach developed by the US Fish and Wildlife Service to deliver foundational science for informing all Endangered Species Act decisions. A focused, repeatable, and rigorous scientific assessment.
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.
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.

APPENDIX F. MAP OF FWC REGIONS



APPENDIX G. MAP OF FWC MANAGED AREAS