APPENDICES

to

Notice of Violations of Endangered Species Act Sections 7 and 9, Clean Water Act Section 404, the National Park Service Organic Act, and Implementing Regulations, Relating to Federal and State Agencies' Actions in Furtherance of the Construction and Operation of a Mass Detention Center in the Everglades and Their Effects on Public Lands, Endangered and Threatened Species, and Clean Water.

Appendix A – Oblique Aerial Photos of Ongoing Construction at Dade Collier T&T Airport

Appendix B – Brief Analysis of Assertion of Pre-Existing Cement Pad Underlying Newly Asphalted Area at Jetport Site

Appendix C – TDF Waste Management Plan Overview

Appendix D – Kautz 2025 - Impacts of the Big Cypress Detention Center on the Florida Panther and Its Habitat

Appendix E – Curriculum Vitae of Randy Kautz

Appendix F – Letter from Robert A. Frakes, Ph.D., to Jason Totoiu, Center for Biological Diversity, Re: opinion on impacts of construction and operation of migrant detention facility on the endangered Florida panther

Appendix G – Curriculum Vitae of Robert A. Frakes, Ph.D.

Appendix H – Report: Strategic searches for Florida bonneted bat (*Eumops floridanus*) roosts in Big Cypress National Preserve (BCNP) (March 19, 2019)

Appendix A

Oblique Aerial Photos of Ongoing Construction at Dade Collier T&T Airport

Oblique Aerial Photos of Ongoing Construction at Dade Collier T&T Airport

Photographed 5 July 2025

Photos courtesy of Ralph Arwood

Text by Christopher McVoy

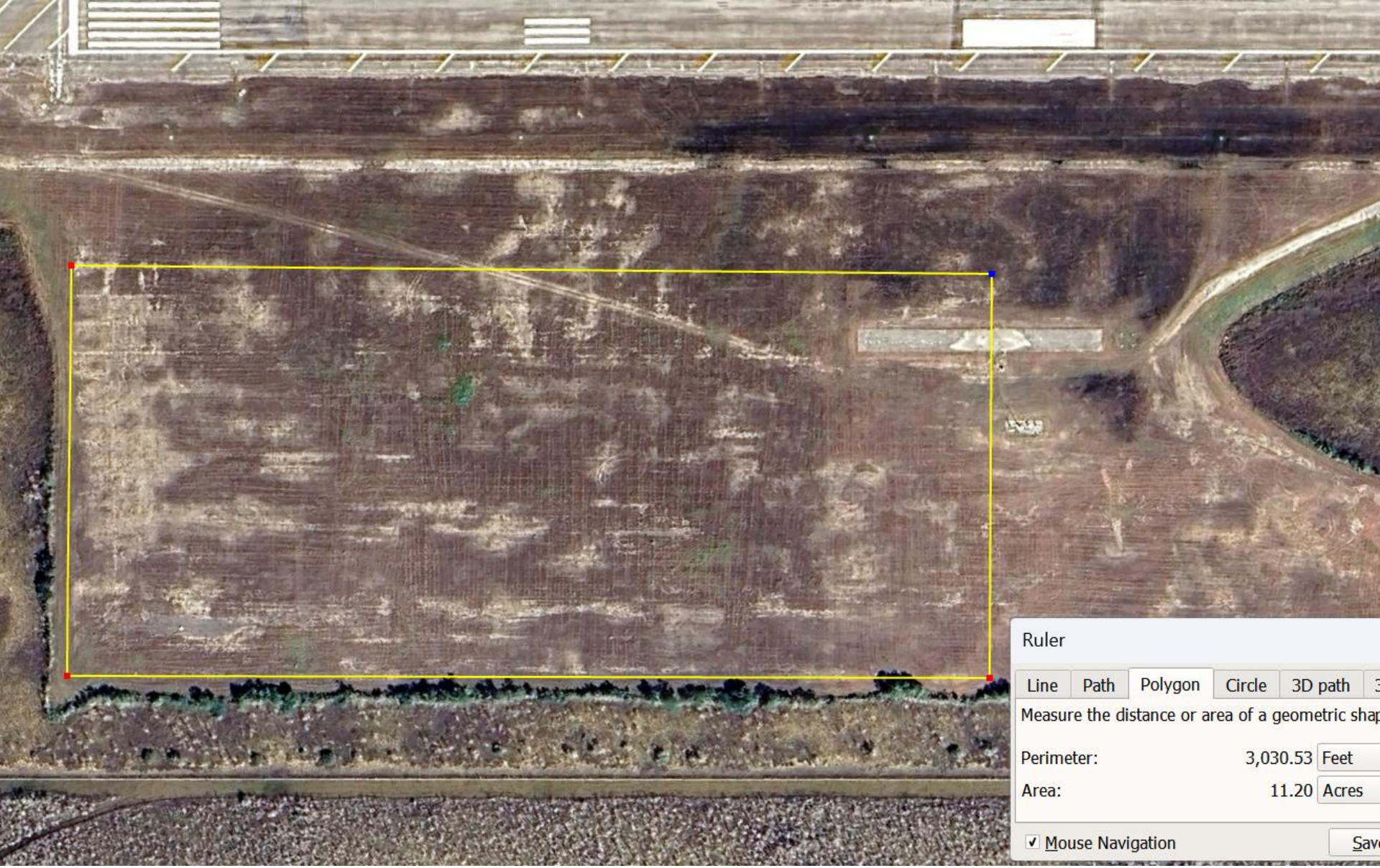
Newly Paved (Asphalted) Area

Photo 23, Looking S.

Dark rectangle is new construction.

Detail of Photo 23.

Dark rectangle is new construction (compare with June 2025 Google Earth satellite imagery). Dark is almost certainly asphalt. Light sandy brown area to east and north of asphalt is newly scrapped area. Red alignment lines were used to estimate extent of assumed paved area (next slide).



Untilted, unrotated Google Earth image used to estimate area of the paved region shown in Photo 23. Alignment lines shown in previous slide were used to locate eastern and northern boundaries; vegetation rows to estimate location of southern and western boundaries. This newly paved area estimated to be 11+ acres.

Photo 11, Looking W.

Dark blue-ish rectangle on L side is the newly asphalted area.

Detail of Photo 11.

Dark, blue-ish rectangle is new construction (can confirm by comparison with June 2025 Google Earth satellite imagery), almost certainly asphalt. Light sandy brown appears to be newly scrapped area.

Detainee Area
(on existing tarmac)

Photo 31, Looking E.

Detention Area (Block of 7 white tents in LRH corner).

Detail of Photo 31.

Detention Area on previously existing tarmac.

According to Incident Commander Dr. Frankie Lumm, the four long tents each hold 250 detainees for a total of 1,000.

Total site capacity as of July 5, 2025 is 1,000 detainees, 2,000 less than the stated goal of 3,000.

Photo 18, Looking N.

Detention Area and portion of employee housing (trailers).

Detail of Pho

Detention A
previously e
tarmac.

The light bro
area S and E
tarmac is ne
leveled/scra

Employee Housing & Services Area
(on existing taxiway tarmac)

Photo 35, Looking E.

The many white structures on taxiway (N strip) are all employee housing and/or services.

Detail of Photo 35.

The many white structures on taxiway (N strip) are all trailers housing employees and/or services.

The right strip is the main runway, which the Incident Commander indicated was being kept unimpeded for use as runway.

Photo 3, Looking W.

Main runway (left) and employee housing (right).

Detail of Photo 3, Looking W.

Employee housing (numerous white blocks) on previously existing taxiway.

Several Areas of New Road Construction/Asphalting

Detail of Photo 3, Looking W. New road, turnaround and asphalting of same at east end of taxiway.

Detail of Photo 11, Looking W. Two areas of new road and asphalting.

Detail of Photo 18, Looking N. White diagonal line on LHS is new road, not yet asphalted.

Detail of Photo 22, looking S. Western portions and “Y” split of newly paved entrance road from main N-S entrance road.

Detail of Photo 23, looking S. Western portion of newly paved entrance road from main N-S entrance road.

Appendix B

Brief Analysis of Assertion of Pre-Existing Cement Pad Underlying Newly Asphalted Area at Jetport Site

Brief Analysis of Assertion of Pre-Existing Cement Pad Underlying Newly Asphalted Area at Jetport Site

July 8, 2025

Christopher McVoy, Ph.D.

In response to questions as to whether any new milling or paving had been authorized and/or had occurred at the Dade Collier Training and Transition Airport, Ms. Stephanie Hartman of the Florida Division of Emergency Management has provided the following statement:

From: Stephanie Hartman <stephanie.hartman@em.myflorida.com>
Sent: Monday, July 7, 2025 7:48 PM
To: Hardesty, Brock <BHardesty@firstcoastnews.com>
Cc: FEMA-R4-NewsDesk@fema.dhs.gov <FEMA-R4-NewsDesk@fema.dhs.gov>; WTLV-NEWS <news@firstcoastnews.com>
Subject: Re: STATEMENT REQUEST - FIRST COAST NEWS

The area referenced consisted of a preexisting cement pad that was installed more than 50 years ago. Over time, a thin layer of dirt and grass had settled on top.

Stephanie Hartman
Deputy Director of Communications
Florida Division of Emergency Management
Stephanie.Hartman@em.myflorida.com

Response from Dr. Christopher McVoy, (soil science):

While the above statement by Ms. Stephanie Hartman might possibly be true, I can find no evidence to support it. Instead, all historical imagery I found suggests that the area was cleared of vegetation, and perhaps also leveled, probably at the same time that the runway was constructed (ca. 1968-70). Patterns in the historical imagery suggest systematic traversing of the area by equipment, likely by large mowers or brush hogs. A “thin layer of dirt and grass” on top of a cement pad would be unlikely to need mowing and would be very unlikely to produce the patterns seen. Additionally, the high rainfall intensity of South Florida thunderstorms would likely prevent the accumulation of anything more than a few millimeters of unconsolidated sediments on a cement pad. A layer that thin would not support sufficient growth to require mowing.

The more probable explanation of the imagery from this location is an area of original soil, cleared of brush and trees around 1970, and subsequently kept to low vegetation by periodic mowing. While there might well have been an original intent to cover with a cement pad, there is no indication that such a pad was ever installed.

The following slides identify the location in question, show multiple years of historical satellite images, and an oblique aerial photograph from 1970, taken during the time of initial construction.

Photo 23, Looking S.

Dark rectangle is new construction (asphalt pad).

Detail of Photo 23. Dark rectangle is new construction (compare with June 2025 Google Earth satellite imagery). Dark is almost certainly asphalt paving. Light sandy brown area to east and north of asphalt is newly scrapped area. Red alignment lines were used to estimate extent of assumed paved area (next slide).

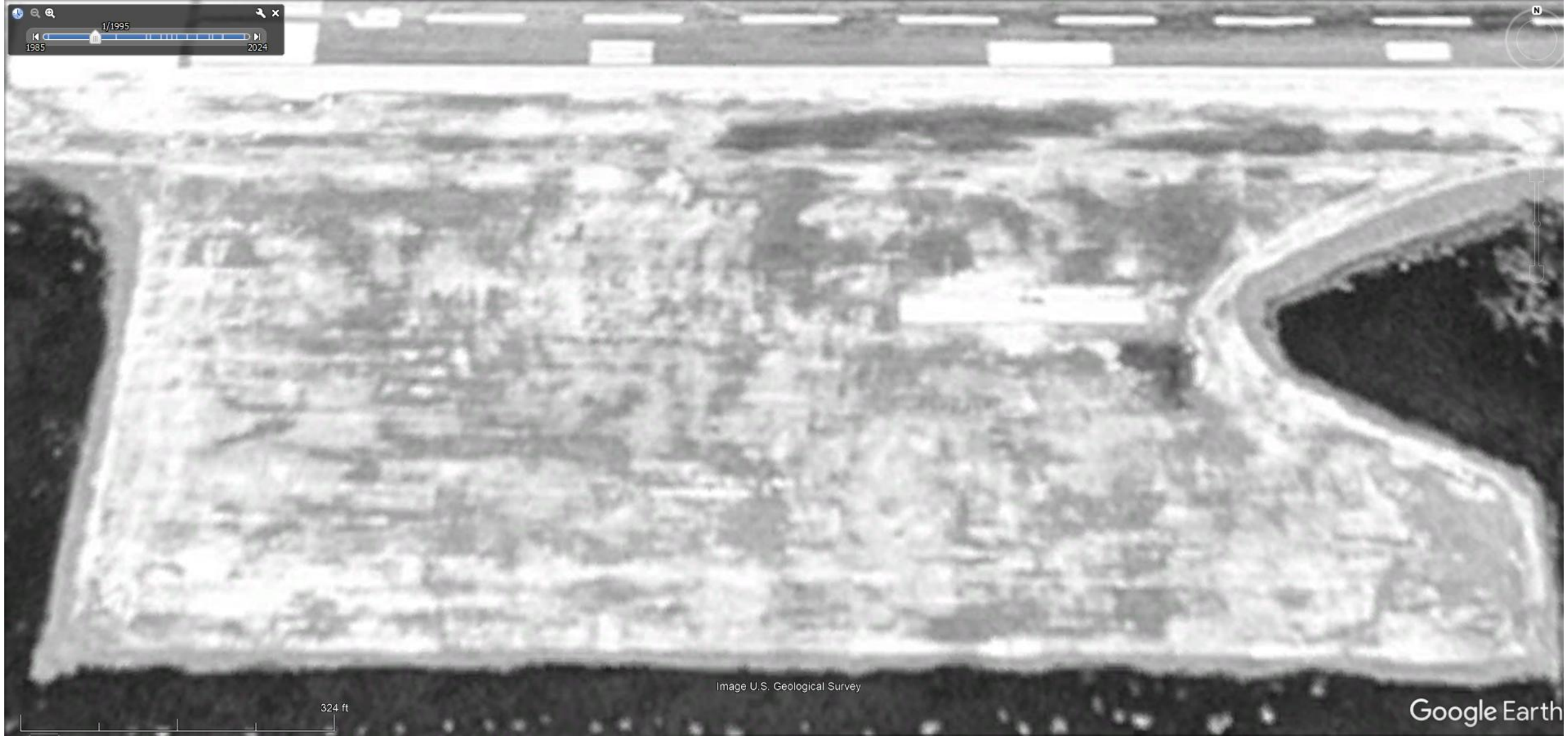
Note that the light sandy brown area (i.e., unasphalted area) gives no indication of being “a thin layer of dirt” on a pre-existing cement pad.

Untilted, unrotated Google Earth image used to estimate area of the paved region shown in Photo 23. Alignment lines shown in previous slide were used to locate eastern and northern boundaries; vegetation rows to estimate location of southern and western boundaries. This newly paved area estimated to be 11+ acres.

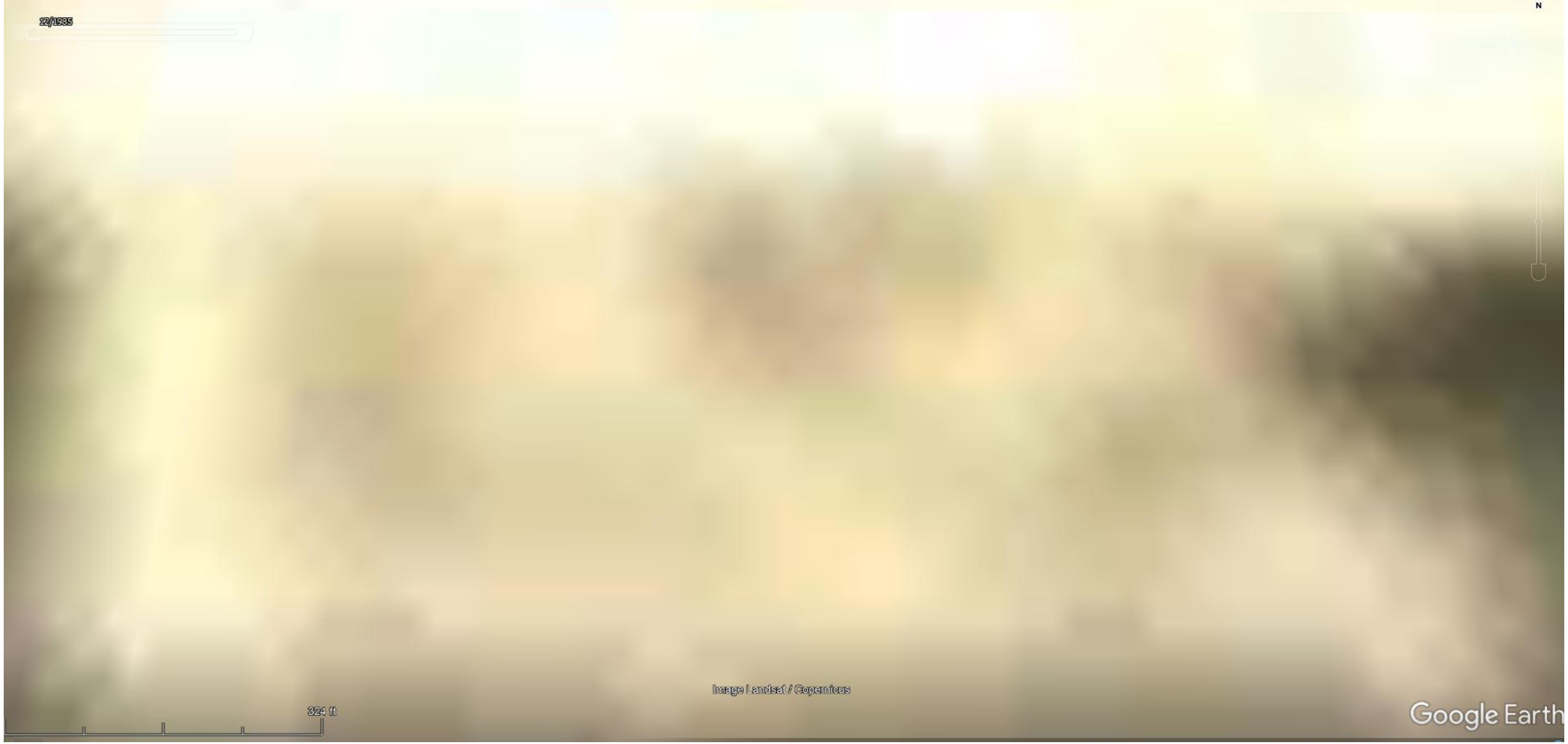
Google Earth Imagery, 2025 (prior to any detention center construction). Note the N-S and E-W patterning, which is likely from equipment such as mowers or brush hogs criss-crossing this area. Vegetation that needed mowing would not grow on top of cement.

Google Earth historical imagery, 2014. Note the E-W patterning, which is likely from mowing equipment. Vegetation that needed mowing would not grow on top of cement.

Google Earth historical imagery, 2009. Note the E-W patterning, which is likely from mowing equipment. Vegetation that needed mowing would not grow on top of cement.



Google Earth historical imagery, 1995. Note the E-W patterning, which is likely from mowing equipment. Vegetation that needed mowing would not grow on top of cement.



Google Earth historical imagery, 1985 (from Landsat). Resolution too coarse to be of use

https://pbase.com/donboyd/image/165484225

1970 - aerial view of the Dade County Training & Transition Airport under construction

https://pbase.com/donboyd/image/165484225

“1970 - aerial view of the Dade County Training & Transition Airport under construction.”

Red oval is area of new (2025) paving. It does not at all look covered with cement in 1970, the year construction was halted.

Appendix C

TDF Waste Management Plan Overview

TDF Waste Management Plan Overview

Overview

This plan if for the initial waste management of the temporary detention facility and will be expanded as site build out allows for more comprehensive permanent solutions to be implemented. The goal of the Division and contracted vendors is to ensure a robust, proactive logistics and installation plan that fully eliminates the potential for environmental issues related to waste production, solid waste management, recycling, construction and demolition debris, and potable water management for all on-site restroom, shower, and laundry trailers by integrating high-capacity containment, secure plumbing, secondary spill containment, solid waste management, recycling, construction and demolition debris handling, and robust monitoring, this plan addresses and eliminates environmental risks, ensuring compliance and safe conditions for site occupants.

Monitoring, Evaluation and Compliance

On-site personnel will monitor biowaste and solid waste storage, potable water systems, dumpster, recycling, and C&D debris areas for leaks, spills, overflow, or contamination. Preventive maintenance schedules will be followed, including pump-outs of frac tanks and timely waste, recycling, and debris hauling. All procedures will comply with federal, state, and local environmental regulations.

Wastewater and Potable Water

Wastewater

Shower, restroom, and laundry units, as well as administrative and billeting trailers produce graywater, blackwater, and lint waste. Each waste-producing trailer will be hard-plumbed directly to designated 22,000-gallon frac tanks, reducing frequency of tank exchanges and minimizing transfer points. Frac tanks will be maintained at less than 50% of capacity. To secure connection points, all waste discharge lines will utilize 2-inch camlock connections. All connection points, hoses, and storage tanks will be within containment trays for spill protection. A trained team will inspect all plumbing and containment systems daily to maintain zero environmental impact.

Potable Water

Potable water will be delivered by 2,000-gallon and 6,000-gallon tanker trucks and transferred via secure plumbing to ensure safe transport and storage. To provide sealed connections, all potable water hookups will use 2-inch camlock fittings for a closed system. Water tanks will be sanitized, flushed, and water quality tested regularly.

Solid Waste

Appropriately sized roll-off dumpsters will be strategically placed throughout the site to handle all solid waste generated by operations and personnel. All dumpsters will be equipped with lids or tarps to prevent littering, wind dispersal, and animal intrusion. Dumpsters will be placed on stable ground with adequate clearance for truck access. A daily swap schedule for removal and replacement will be maintained to prevent overflow and ensure site cleanliness. Waste haulers will be responsible for safe transport and disposal at permitted facilities.

Recycling

Clearly marked recycling containers will be placed next to general waste dumpsters and throughout common areas to encourage source separation of recyclable materials. Materials such as cardboard, plastic, metal, and paper will be collected separately to reduce contamination and maximize recycling efficiency. A dedicated recycling hauler will collect and transport recyclable materials to an approved recycling facility on a routine schedule.

C&D Debris Management

Dedicated roll-off containers will be provided specifically for construction and demolition debris to avoid mixing with general waste and recyclables. Materials such as wood, metal, concrete, and drywall will be separated where practical to facilitate recycling and reuse opportunities. All C&D debris will be removed by licensed haulers and transported to permitted disposal or recycling facilities in compliance with local regulations.

Biowaste

Health and Medical vendor will ensure biohazard waste management involves proper containment, labeling, segregation, and disposal to prevent the spread of infection and environmental contamination. This includes using designated leak-proof, puncture-resistant containers, ensuring proper labeling with the biohazard symbol, and following specific disposal protocols for different types of biohazardous materials, such as sharps and liquid waste.

Containment

Biohazard waste will be placed in sturdy, leak-proof containers that are resistant to punctures. Sharps will be disposed of in designated sharps containers.

Labeling

All containers must be clearly labeled with the universal biohazard symbol and appropriate warnings, such as "Biohazardous Waste" or "Infectious Waste".

Segregation

Different types of biohazardous waste (e.g., sharps, liquid waste, pathological waste) will be segregated into separate containers to minimize risks and facilitate proper treatment.

Disposal

Biohazard waste from the site will be picked up by a certified and registered Biohazard disposal company and disposed of in accordance with Florida regulations.

Appendix D

Kautz 2025 - Impacts of the Big Cypress Detention Center on the Florida Panther and Its Habitat

Impacts of the Big Cypress Detention Center on the Florida Panther and Its Habitat

July 10, 2025

Randy S. Kautz

Randy Kautz Consulting LLC
2625 Neuchatel Drive
Tallahassee, FL 32303

Impacts of the Big Cypress Detention Center on the Florida Panther and Its Habitat

Randy S. Kautz,
Randy Kautz Consulting LLC
2625 Neuchatel Drive, Tallahassee, FL 32303
July 10, 2025

INTRODUCTION

The Big Cypress Detention Center is a mass immigration detention facility that is being constructed on the Dade-Collier Training and Transition Airport site inside Big Cypress National Preserve near Ochopee, Florida. The project site originally was intended to become the largest airport in the world with six runways covering 39 square miles. Construction began in 1968 but was halted in 1970 due to environmental concerns after completion of just one 10,500-foot runway. The site has since seen limited use as a training facility for commercial aircraft.

The Big Cypress Detention Center is designed to provide temporary housing for up to 3,000 detainees and accommodate a staff of 1,000 that would include over 400 security guards plus legal advisors, medical personnel, clergy, laundry and maintenance workers, and administrative support. Infrastructure installed on the site includes air-conditioned tents to house detainees, housing and offices for guards and administrative staff, generators, portable toilets, fencing, night lighting, and other necessary features. Development of the site has included placing fill dirt in several locations as a base for new infrastructure and the construction of new access roads.

The project site is within the Primary Zone of the Panther Focus Area (PFA) (Figure 1). The PFA is an area identified by the U.S. Fish and Wildlife Service (USFWS) as habitats used by the endangered Florida panther (*Puma concolor coryi*), and it defines the geographic limits of the USFWS consultation area for projects that potentially affect panthers and their habitats. The Primary Zone is a region of suitable habitats occupied by Florida panthers, and it supports the only known breeding population of panthers in the world. Lands within the Primary Zone are important to the long-term viability and persistence of panthers in the wild (Kautz et al. 2006). Proposed projects in the PFA are typically reviewed by USFWS to assess potential impacts on panthers and their habitats and to determine mitigation requirements, if any. The purpose of this report is to review the development plans for the Big Cypress Detention Center and to assess panther habitat impacts of the project.

PANTHER STATUS AND BIOLOGY

Panther Legal Status: The Florida panther is a wide-ranging predator listed as endangered under the U.S. Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA). The ESA

defines endangered as any species that is in danger of extinction throughout all or a significant portion of its range. The ESA protects endangered species and their habitats by prohibiting the "take" of listed animals except under a Federal permit. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The Florida Fish and Wildlife Conservation Commission [FFWCC] lists the Florida panther as a Federally-designated Endangered Species (68A-27.003, *Florida Administrative Code*), which is defined by the State of Florida as "species of fish or wild animal life, subspecies or isolated populations of species or subspecies, whether vertebrate or invertebrate, that are native to Florida and classified as Endangered and Threatened under Commission rule by virtue of designation by the United States Departments of Interior or Commerce as endangered or threatened under the Federal Endangered Species Act, 16 U.S.C. § 1532 et seq. and rules thereto..." (68A-27.001(2) *Florida Administrative Code*). State rules pertaining to take are similar to those defined in the ESA.

Panther Distribution: The range of the Florida panther includes all counties of peninsular Florida south of I-4 plus Flagler, St. Johns, and Putnam counties along the northeast coast based on Very High Frequency (VHF) and Global Positioning System (GPS) telemetry records, mortality records, verified sightings, and wildlife camera detections. Most panthers are members of a single breeding population located in southern Florida, and they comprise the only breeding population of pumas east of the Mississippi River (Kautz et al. 2006, USFWS 2008, Frakes et al. 2015). Until recently, panthers that had been documented north of the Caloosahatchee River had been dispersing adult and sub-adult males. However, two adult female panthers, one with kittens, were confirmed north of the Caloosahatchee River in 2017, one on Babcock Ranch Preserve (BRP) (Charlotte County) and one on Platt Branch Wildlife and Environmental Area (Highlands County). These were the first times that females had been confirmed north of the Caloosahatchee River since a female was captured in Glades County in 1973 (Nowak and McBride 1973, FFWCC 2017). While the absence of the original female at BRP has been confirmed, wildlife cameras detected a new female in eastern BRP, another female was photographed at Fisheating Creek (FEC) in Glades County, and a dependent-aged panther was confirmed at Bob Janes Preserve in Lee County (Kelly and Onorato 2021). Males were photographed in the company of the females in spring 2020, a likely indication of reproduction. If current levels of panther activity are sustained and recruitment can be documented at BRP and FEC, it would suggest that eastern Charlotte County and western Glades County may support a reproductively viable portion of the panther population (Kelly and Onorato 2021).

Population Size: The current panther population consists of 120 to 230 adults and subadults (FFWCC 2024). Panthers were widely distributed throughout the southeastern United States prior to European colonization. However, by the late 1980s and early 1990s, the Florida panther population had been reduced to 20-30 animals south of the Caloosahatchee River following two centuries of persecution, bounty hunting, and habitat loss (Onorato et al. 2010). Fearing that the small and inbred panther population was in imminent danger of extinction, 8 female pumas from Texas were introduced into the south Florida population in 1995 to restore the genetic viability of the panther population. The project has been deemed a success as evidenced by restored genetic

vigor and the increasing size of the panther population (Johnson et al. 2010, Hostetler et al. 2013, van de Kerk et al. 2019, Onorato et al. 2024).

Population Viability: Recent population viability analysis (PVA) models assessed the likelihood that the current population of panthers could survive for the next 100 years (Hostetler et al. 2013, van de Kerk et al. 2019). Both models indicated that (1) the panther population is characterized by a positive growth rate, (2) population growth rate is most sensitive to survival, especially kitten survival, and (3) probability of quasi-extinction in the next 100 years was 7.2% (Hostetler et al. 2013) and 1.4% (van de Kerk et al. 2019) when demographic factors alone are considered. However, quasi-extinction rose to 17% in the next 100 years when incorporating the impacts of genetic erosion (van de Kerk et al. 2019). Quasi-extinction occurs when the modeled population reaches a critical size below which recovery is so unlikely that the population will eventually go extinct. The critical population size for quasi-extinction in the PVA models was set at 10 individuals. Releasing 5-10 female western pumas into the Florida population every 20-40 years was found to be the most cost-effective means to combat the effects of inbreeding depression (van de Kerk et al. 2019). Both models assumed that current conditions remain stable in the future and neither accounted for risks associated with loss of habitat.

The van de Kerk et al. (2019) PVA models used a starting population of 146 panthers. The population was projected to increase to 182 adults and subadults after 9 years; the population grew to a projected size of 187 adults and subadults (142–218, 95% CI) with a cumulative probability of quasi-extinction (PQE) (N = 10 panthers) of 0.72 percent (0–0.31 5^{th} and 95^{th} percentiles) by 2070; and the population remained stable at a projected 188 adults and subadults after 200 years. These results can be interpreted as showing that the current population would grow by approximately 28% in 10 years and would persist with a very low PQE for the next 50 (2070) years and beyond, should conditions remain constant. A panther population of 146-187 adults and subadults should have a high probability of persistence per the results of van de Kerk et al. (2019) assuming no further loss of habitat or the occurrence of catastrophic events (e.g., disease).

Although these PVA models present a favorable picture for the future of the panther in South Florida, recent real-world evidence suggests that there are reasons to be concerned. In response to the effort to restore genetic diversity, the panther population increased steadily from 1995 to 2016. However, the population peaked in 2016, and panther numbers declined between 2016 and 2020 (Onorato et a. 2024).

Cover Types Used by Panthers: All types of upland and wetland forest comprise the primary land cover type used by panthers (Belden et al. 1988, Maehr and Cox 1995, Comiskey et al. 2002, Cox et al. 2006, Kautz et al. 2006, Land et al. 2008, Onorato et al. 2011). Florida panthers use forest patches of all sizes regardless of type (Kautz et al. 2006, Onorato et al. 2011). Panthers may use the edge of forested habitat as stalking cover to ambush white-tailed deer (*Odocoileus virginianus*) or feral hogs (*Sus scrofa*) feeding in open areas and then drag the kill into forests or other types of dense cover to feed (Onorato et al. 2011). Non-forest but densely vegetated habitats also provide sufficient cover for panthers (Onorato et al. 2011). Examples of these cover types range from thick patches of tall sawgrass (*Cladium jamaicense*) to expanses of mature saw palmetto (*Serenoa*

repens) adjacent to pine (*Pinus* spp.) or oak (*Quercus* spp.) forests (McBride 2001, Onorato et al. 2011).

In addition to forested habitats, panthers selected dense vegetative cover types including herbaceous wetlands, shrub swamp wetlands, and prairie grassland habitats based on GPS telemetry data (Onorato et al. 2011). Panthers also used agricultural and other habitats in proportion to their availability (Onorato et al. 2011).

Distance Metrics: GPS telemetry data revealed that 41 percent of panther locations occurred outside of forest cover; 74 percent of locations were within 100 m of forest cover; and 85 percent of locations were within 200 m (Onorato et al. 2011). The mean spatial error of VHF telemetry locations was 123.9 m (SE = 13.9, *n* = 45, range = 9.1–363.4) (Land et al. 2008). Pumas in California dragged carcasses of large mammals 0–80 m from kill sites to cover to feed, and in one case a puma dragged a carcass 350 m before feeding (Beier et al. 1995). Pumas in Alberta, Canada, demonstrated strong avoidance for habitat <270 m from buildings during the day, but at night pumas avoided areas <210 m from buildings (Knopff et a. 2014). Building developments where the distance between buildings is <210 m will likely restrict puma use of the area (Knopff et al. 2014). Mean daily travel distances for Florida panthers ranged from 2.62–6.70 km depending on gender and season (Criffield et al. 2018).

Landscape Used by Panthers in South Florida: A large landscape south of the Caloosahatchee River covering approximately 12,588 km^2 (3.11 million acres) was identified by Kautz et al. (2006) as regionally significant panther habitats (Figure 1). This region included three specific areas: (1) a Primary Zone defined as occupied high-quality panther habitats covering 9189 km^2 (2.27 million acres); (2) a Secondary Zone of lower quality landscapes occasionally used by transient animals (3287 km^2 [0.81 million acres]); and (3) a Dispersal Zone, a wildlife corridor of 113 km^2 (27,880 acres) leading into Central Florida. Kautz et al. (2006) recommended that assessments of potential impacts of proposed developments within the Primary Zone should strive to achieve no net loss of landscape function or carrying capacity for panthers within the Primary Zone and that the total areal extent of the Primary Zone should be maintained. A smaller area that functions as the core range of breeding-age adult panthers comprises approximately 5579 km^2 (1.38 million acres), most of which is within the Primary Zone south of the Caloosahatchee River (Figure 2) (Frakes et al. 2015).

Threats to Panther Survival: Habitat loss associated with an expanding human population has been identified as a key factor affecting the long-term survival and recovery of the Florida panther (Maehr 1992, USFWS 2008, Onorato et al. 2010, van de Kerk et al. 2019). Specific types of habitat loss frequently mentioned include conversion of natural lands, particularly forest cover, to agriculture or urban development, road construction, dredging of artificial surface water drainage systems, and mining. These types of human activities not only destroy panther habitats, but they also degrade the quality of remaining habitats, or they fragment and isolate remining patches such that they are smaller, farther apart, and isolated from areas panthers may use. Other factors that threaten the continued existence of the panther include collisions with motor vehicles; removal from the wild of panthers that prey on hobby animals, livestock, or domestic pets; panther-human

conflicts and human intolerance due to public safety concerns; diseases and environmental contaminants; and illegal shootings.

Pumas and Roads: Pumas utilize fire roads, dirt roads, and other low-speed or low use roadways, and have been observed crossing two-lane paved roads (Dickson et al. 2005, Wilmers et al. 2013). Florida panthers use old logging trams, swamp buggy ruts, and fire breaks (McBride et al. 2008). Puma movements are limited by high-speed roadways, highways, and interstates (Dickson et al. 2005, Wilmers et al. 2013, Knopff et al. 2014, Gray et al. 2016), but pumas in wilderness areas of Alberta, Canada, switched from avoiding areas of high road density during the day to selecting them at night (Knopff et al. 2014).

High-speed highways are often considered to be a source of habitat fragmentation and a leading cause of puma road mortality (Onorato et al. 2010, Frakes et al. 2015). Wildlife crossings have been installed in strategic locations along some interstates and other high-volume roadways in Florida to reduce road mortality of panthers and other species of wildlife (e.g., Interstate 75 [I-75], I-4, Suncoast Expressway, State Road 29, and State Road 46). Underpasses or overpasses have been installed on many high-speed highways to maintain farm connectivity on either side of the highway, and panthers have the potential to use these crossings to avoid collisions with motor vehicles. Mowed rights-of-way along road corridors, cleared land around buildings, agricultural fields, and gardens often provide prime foraging habitat for ungulates, especially white-tailed deer, a primary prey species of panthers (Rea 2003). In summary, although high-speed roadways present a higher risk of mortality to panthers on the move, such roads are nonetheless somewhat permeable, may allow for some panther movements that maintain connectivity among potentially suitable habitats throughout Florida, and may attract prey to open roadside edges.

Pumas, including Florida panthers, have demonstrated a negative response to increasing road density (i.e., length of roads per unit area) (Burdett et al. 2010, Wilmers et al. 2013, Knopff et al. 2014, Frakes et al. 2015, Yovovich et al. 2023). Frakes et al. (2015) found that, out of 15 variables, human population density followed by wetland forest had the greatest influence on probability of panther occurrence whereas road density was of medium importance to predicting the suitability of panther habitats in Florida.

Road and Highway Mortality: From February 10, 1982, through February 28, 2018, the leading cause of mortality of **radio-collared** panthers was intraspecific aggression, which accounted for 40% of recorded mortalities (Onorato et al. 2010). During this period, the second leading cause of mortality of **radio-collared** panthers was collisions with motor vehicles, which accounted for 21% of known mortalities. However, when records of radio-collared and uncollared panthers are pooled, vehicle collisions accounted for 60% of all panther mortalities recorded during this period (FFWCC unpublished data). Vehicle mortalities have risen since 2000 as the panther population has increased following the introduction of 8 female pumas from Texas into South Florida in the mid-1990s. Prior to 2000, panther roadkills were 4 or fewer per year, but since 2000, these numbers have ranged from 6 to 34 annually (Figure 3). The deadliest year for panther roadkills was 2016 when 34 vehicle mortalities were documented. In 2024, 28 panthers died by collisions with motor vehicles.

Multiple roadkill mortalities have been recorded along US 41 (Tamiami Trail) west and south of the project site (Figure 4). Least cost path modeling has been used by FFWCC to identify travel pathways likely to be followed by panthers moving from Big Cypress National Preserve to Everglades National Park (Swanson et al. 2008). This work identified several priority road segments along US 41 that might be candidates for construction of road crossings to minimize the likelihood of panther roadkills in the future. Several priority road segments occur in the vicinity of the project site (Figure 4).

Puma Response to Human Developments: Pumas have been shown to respond to a gradient of human development in regions as diverse as Washington state; Alberta, Canada; the front range of the Colorado Rockies; the Santa Cruz and Santa Monica Mountains of California; and South Florida (Kertson et. al 2013, Wilmers et al. 2013, Knopff et al. 2014, Frakes et al. 2015, Moss et al. 2016, Maletzke et al. 2017, Blecha et al. 2018, Alldredge et al. 2019, Yovovich et al. 2020, Riley et al. 2021). A comprehensive literature review of human-puma interactions revealed that puma use of areas with residential development is commonplace, but interactions with people occur infrequently relative to the intensity of this use. As residential density increases, puma use decreases and home range size increases. Puma use of highly urban landscapes is rare.

Landscaped open spaces within developed areas, such as cemeteries, golf courses, or parks, may be avoided, perhaps due to a lack of cover (Riley et al. 2021). Greater amounts of forest, increased proximity to wildlands and open space, greater terrain complexity, and fewer houses or greater distance to residential development were consistently associated with increased puma presence in developed portions of the landscape (Human-Cougar Interactions Science Review Team et al. 2022). However, pumas in the Santa Monica Mountains of southern California selected areas closer to development than expected by chance, likely related to the presence of mule deer (*Odocoileus hemionus*) or other prey in or adjacent to urbanization (Riley et al. 2021). Additionally, pumas can and do find their way through some intensively developed areas often using thin strips of vegetation.

Numerous studies in the western United States cited above have assessed puma use of the landscape according to a scale of residential density developed by Theobald (2005), who defined the following categories of land development: (1) urban lands have >10 dwelling units per ha, (2) suburban lands have 1.47–10 dwelling units per ha, (3) exurban lands have 0.062–1.47 dwelling units per ha, and (4) rural areas have <0.062 dwelling units per ha. Burdett et al. (2010) added a fifth category of undeveloped lands which have zero dwelling units per ha.

In general, these studies found that pumas generally occur in landscapes with a dwelling unit density of <0.062 dwelling units per ha (i.e., areas characterized as undeveloped or rural by Theobald et al. [2005]). Pumas that did occur in exurban areas were at greater risk of mortality, were more likely to be younger than 5 years of age, were more likely to approach housing as hunger increased, and were more likely to include synanthropic wildlife (i.e., species that live near humans and benefit from human-modified environments) and domestic species in their diet. Florida panthers regularly occur in the exurban residential landscape of the 230-km^2 Golden Gate Estates (GGE) in Collier County where there is an average of 0.40 residences per ha. The occurrence of

panthers in this area is a continuing source of human-panther conflicts and depredations on domestic pets and livestock (Interagency Florida Panther Response Team 2017). Puma occurrence in suburban or urban environments is uncommon.

Puma Response to Artificial Lighting: Pumas tend to avoid areas with artificial light, especially bright or unpredictable lighting. Studies using trail cameras have shown that puma activity decreases near well-lit areas, especially in regions close to human development. Work in southern California showed a pronounced avoidance of artificial lighting within 500 m of the light source; however, there is marked individual variation in tolerance (Barrientos et al. 2023). In contrast to artificial lighting, neither sky glow nor moonlight significantly affect habitat selection. In a study in the intermountain Southwest, mule deer were drawn to light-rich areas near human developments, but hunting by pumas was restricted to darker areas (Ditmer et al. 2020).

POPULATION GROWTH AND SEA LEVEL RISE 2070

Future Growth and Development in Southwest Florida: The population of Lee, Collier, and Hendry counties where most of the occupied panther habitat occurs is expected to increase from 1,233,723 to 2,252,721 residents between 2022 and 2070, a projected increase of 1,018,998 new residents (Carr and Zwick 2016, BEBR 2023). To identify areas of Florida most likely to absorb future growth, the University of Florida Center for Landscape Conservation Planning and 1000 Friends of Florida [CLCP-1000 FOF] (2023) developed models of future growth through 2070 assuming current development patterns continue, and no additional land conservation occurs.

Sea Level Rise: Relative sea level along the contiguous United States coastline is expected to rise on average as much over the next 30 years (0.25–0.30 m between 2020–2050) as it has over the last 100 years (1920–2020). Scenarios of sea level rise by 2100 relative to a baseline of the year 2000 were reported for coastal regions of the U.S. by Sweet et al. (2022). The median sea level rise for the Intermediate scenario for the Eastern Gulf coast, which includes the Southwest Florida study area, was 1.2 m (low 0.6 m – high 2.2 m) by 2100.

Estimates of Panther Habitat Loss in South Florida by 2070: Kautz et al. (in preparation) created a model of panther habitats in Southwest Florida (Figure 5) for inclusion in the Florida Panther Species Status Assessment Version 2.0 (FWS in review). The CLCP-1000 FOF (2023) model of future growth in Florida was overlain on the panther habitat model for South Florida to predict loss of panther habitat by 2070. A separate model was used to estimate loss of panther habitat due to sea level rise of 0.9 m by 2070. The results of these analyses were combined to calculate the total loss of panther habitats due to population growth and sea level rise in south Florida through 2070.

The 2070 growth model would result in the loss of 487 km^2 (9.8 percent) of the area mapped as panther habitat in Southwest Florida by Kautz et al. (in preparation). Sea level rise of 0.9 m by 2070 would result in the loss of 151 km^2 (3.6 percent) of panther habitat in Southwest Florida. The combined effects of population growth and sea level rise models predict the loss of 638 km^2 (12.9 percent) of panther habitat in Southwest by 2070.

Habitat loss may result in fragmentation, which is the subdivision of a single large area of habitat into several smaller areas with the remaining areas becoming farther away from one another or even isolated (i.e., loss of connectivity) (Lindenmayer and Fischer 2006). An analysis of fragmentation effects on habitat patches remaining after habitat loss revealed that the Corkscrew Regional Ecosystem Watershed habitat area will become too small and isolated to support panthers, and remaining habitat patches in Southwest Florida will be reduced by 19 percent of the area existing in 2022. Consequently, remaining habitat patches in 2070 would have the capacity to support 55-162 panthers (Kautz et al. in preparation). These numbers may be compared to the current estimated population of 120-230 panthers (FWC 2024) and to the range of 146-187 panthers needed for a viable population based on the models of van de Kerk et al. (2019). If habitats remaining in 2070 are of high quality, the future panther population may remain viable. However, if lower quality habitats remain, the future number of panthers may be so low that persistence of the panther population is in doubt.

BIG CYPRESS DETENTION CENTER PROJECT SITE AND PANTHER OCCURRENCE

Big Cypress Detention Center and Surrounding Landscape: Prior to construction of the detention center, the project site consisted of 350.65 acres of paved runway, taxiways, and adjacent grassy edges based on the polygon of the site extracted from the Cooperative Land Cover database version 3.8, December 2024, downloaded from the FWC website. The project site is in the Big Cypress Swamp province of the Southwestern Flatwoods physiographic district (Brooks 1981). This area is described as a rockland and marl plain with elevations largely below 16 feet and vegetation dominated by wet to dry prairies, marshes, and stunted cypress (Brooks 1981). Soils within 1 mile of the project site are dominated by types that typically support herbaceous freshwater marsh species (73%) with scattered low ridges that support oaks (*Quercus* spp.), tropical hardwoods, cabbage palms (*Sabal palmetto*) and other species in their native state (Table 1). Land cover types within 1 mile of the site are dominated by wetlands, primarily freshwater marsh (90%) but also include human-derived features associated with the project site (7%), rockland hammock (1.6%), and water in borrow pits (1%) (Table 2).

Panther Occurrences Near the Big Cypress Detention Center Site: The Big Cypress Detention Center site is in the southeastern corner of an expansive region of Southwest Florida that is occupied by Florida panthers based on data collected since 1982 (Figure 4). Panther use of the site and surrounding area was assessed by using a 6701 m buffer (i.e., the mean daily distance traveled by male panthers during the dry season [Criffield et al. 2018]) to select VHF telemetry records collected by FFWCC, Big Cypress National Preserve, and Everglades National Park biologists between 1982 and 2014 (Table 3, Figure 5). These panthers would have a high likelihood of easily traveling to the site in a single day.

Telemetry records within the buffer include 1164 points representing 12 male panthers, 10 females, and 1 Texas female introduced into the southwest Florida population as part of the effort to restore genetic diversity to the population in the 1990s. In addition, there are records of 4

panther dens within 12 km to the northwest, west, and southwest of the site (Figure 5). These data indicate that panthers have occurred consistently in the landscape immediately surrounding the site for over a 30-year period since data collection first began in 1982. The lack of records since 2014 is not because panthers no longer occur in the area but because federal budget constraints led to discontinuous monitoring by BCNP staff beginning in March 2013 (FFWCC 2020). Limited monitoring of some panthers in BCNP continued through June 2018 but the panthers that were monitored were not in the vicinity of the project site between 2014 and 2018. The panthers that have used the area around the site during the period of record are represented by all age classes of both sexes from juvenile to older adults (Table 3), indicating that the surrounding landscape has supported a stable and reproducing population of panthers over many years.

Although no panthers have been recorded on the paved areas of the project site, 3 individuals have occurred within 70-300 m of the site. Moreover, the minimum convex polygon home ranges of 8 of 11 males and 4 of 10 females overlap the site. These data suggest that it is very likely that panthers traverse the paved areas during periods of movement based on evidence that they readily cross paved roads, often use unpaved roads as travelways, and multiple home ranges defined by telemetry records overlap the site.

IMPACTS OF BIG CYPRESS DETENTION CENTER PROJECT ON FLORIDA PANTHERS

Increased Human Presence: The Big Cypress Detention Center will increase the presence of humans in a landscape that is relatively wild and that is part of the range of the only viable population of Florida panthers on earth. Studies in Florida and elsewhere have demonstrated that the presence of pumas decreases with increasing human presence as measured by either residential density or human population density. Although it is difficult to determine how the human population of the detention center compares with data on residential density, it is highly likely that the increased density of humans will reduce the value of natural areas surrounding the site as panther habitat. Studies have shown that pumas in Canada avoided areas within 270 m of buildings during the day, but at night avoided areas within 210 m of buildings. Thus, natural habitats within 210 m of the project site, a total area of 1024 acres including the previously paved areas, may receive less use by panthers than occurs without the presence of the detention facility. However, individual panthers may well approach more closely, particularly at night or in pursuit of prey based on panther/puma behavior observed in Florida and elsewhere.

Fencing: Although panthers and their primary prey species, white-tailed deer, can leap 4-foot-high farm field fencing, chain link fencing 6 feet and higher precludes use of bounded areas by panthers and deer, especially when topped by barbed wire outriggers or razor wire. Thus, all areas of the Big site enclosed by fencing will become unusable by panthers and their prey. Although paved areas would not normally be considered as panther habitats, panthers nevertheless likely cross the paved areas of the site in search of prey or during their normal movement patterns. In their reviews of the construction of solar electric generating facilities in the Panther Focus Area, USFWS

biologists regard all areas surrounded by 6-foot chain link fencing as a complete loss of habitat, and mitigation is recommended at a ratio of 2:1 for impacts within the Primary Zone.

Artificial Lighting: A key security feature of the Big Cypress Detention Center is the installation of bright artificial night lighting throughout the site. Studies in California and the intermountain West have shown that pumas typically avoid areas within 500 m of bright sources of artificial lighting, but there is individual variation in puma response. This information suggests that panthers may not venture within 500 m of the Big Cypress Detention Center site during the periods when they are most actively searching for prey. The total affected area within a 500 m buffer around the site covers 1895 acres including the paved area of the site.

Road Mortality: Highway traffic associated with guards, administrative staff, detainees, food service personnel, maintenance workers, portable toilet services, etc., traveling to and from the site will increase. The increase in highway traffic on US 41 and other highways leading to the site, such as SR 29, is likely to increase the number of panthers killed in collisions with motor vehicles. Panther highway mortality rates are higher on major roads, such as I-75, US 41 and SR 29, than on minor roads (e.g., residential streets, unpaved roads, trails) (Schwab and Zandbergen 2011). Data downloaded from the Florida Department of Transportation web site shows that Average Annual Daily Traffic (AADT) on US 41 west of the project site ranged 3,400-3,800 AADT but east of the site 6,300 vehicles per day were documented in 2024. Smith (2019) reported that panther-vehicle collisions occurred on roads with 450 AADT but mortality rates were higher on roads with 4,400-7,800 AADT. US 41 lacks dedicated wildlife crossings that would prevent or reduce the risk of additional mortalities. Collisions with motor vehicles are the most significant factor affecting the survival of individual panthers. Approximately 13-25% of the estimated population of 120-230 panthers die each year in collisions with motor vehicles. Increased vehicular traffic to and from the site, particularly from the west, is likely to increase the danger to panthers in a road segment that already has AADT rates that put panthers at risk to traffic-related mortality.

Cumulative Loss of Panther Habitat 2070: Panther habitat, human population growth, and sea level rise models indicate the loss of 19 percent of panther habitat in Southwest Florida by 2070. This amount of habitat loss has the potential to jeopardize the persistence of panthers in the future depending on the quality of remaining habitats. High quality habitats have the potential to support a small but viable population by 2070, but, if lower quality habitats remain, the future persistence of the panther population is in doubt. The Big Cypress Detention Center project has the potential to result in the loss of approximately 1000-2000 acres of habitat in a remote area of occupied panther habitat in South Florida due to the effects increased human presence and artificial lighting extending into surrounding natural habitats. The project would, thus, contribute to the cumulative loss and degradation of panther habitat into the future.

SUMMARY

The Big Cypress Detention Center is being constructed in a remote area of South Florida home to the only population of endangered Florida panthers in the world. Panther use of the area immediately surrounding the site is well documented. The project is likely to adversely affect panther use of existing natural habitats in an area of at least 1024-1895 acres surrounding the site because of loss of habitat to panthers due to indirect impacts associated with human presence and artificial lighting. Increased traffic to and from the site is likely to increase panther roadkill mortality adding further strain to a population that appears to be in decline. This project will contribute to the cumulative loss, fragmentation, and degradation of panther habitats predicted by available models of future growth and development, sea level rise, and panther habitats. The combined effects of habitat loss, degradation, and fragmentation have the potential to jeopardize the viability of the panther population in the future depending on the quality of habitats remaining by 2070.

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Table 1. Soil type within 1 mile of the Big Cypress Detention Center and types of vegetation typically supported by each.

Soil Type	Acres	Percent	Vegetation/Land Cover
Biscayne-Rock Outcrop Complex	4,596.62	72.76	Freshwater marsh with limestone outcrops
Ravenwood-Boca-Urban Land Complex	1,183.04	18.73	Fill areas on poorly drained wetlands
Rattlesnake Ridge-Shark Valley-Hallandale Complex	282.36	4.47	Mixed freshwater marsh, wet flatwoods
Rattlesnake Ridge	158.05	2.50	Low oak-cabbage palm hammock
Cooper Town-Perrine-Rattlesnake Ridge Complex	97.47	1.54	Freshwater marsh, pond apple, cypress
Total	**6,317.54**	**100.00**	

Table 2. Land use/land cover types within 1 mile of the Big Cypress Detention Center based on data contained in the Cooperative Land Cover database version 3.8 (December 2024) downloaded from the Florida Fish and Wildlife Conservation Commission website.

Land Cover Type	Acres	Percent
Wetlands	**5,708.30**	**90.36**
Glades Marsh	4,275.08	67.67
Cypress	1,129.97	17.89
Mixed Scrub-Shrub Wetland	134.28	2.13
Isolated Freshwater Swamp	59.70	0.94
Mixed Hardwood-Coniferous Swamps	30.14	0.48
Marshes	22.96	0.36
Cypress/Pine/Cabbage Palm	17.34	0.27
Other Hardwood Wetlands	12.47	0.20
Marl Prairie	11.09	0.18
Prairie Hydric Hammock	7.79	0.12
Cypress/Tupelo (including mixed Cypress/Tupelo)	7.49	0.12
Uplands	**103.00**	**1.63**
Rockland Hammock	103.00	1.63
Cultural	**440.74**	**6.98**
Transportation	364.05	5.76
Vegetative Berm	40.81	0.65
Rural Open	13.46	0.21
Extractive	13.00	0.21
Exotic Plants	9.41	0.15
Water	**65.47**	**1.04**
Artificial Impoundment/Reservoir	65.47	1.04
Grand Total	**6,317.51**	**100.00**

Table 3. Florida panther VHF-telemetry records within 6701 m of the Big Cypress Detention Center in Collier County, FL. Records are from 12 male and 10 female panthers and 1 female Texas panther from the genetic restoration effort in the 1990s.

Cat ID	Sex	Points	First Date	Last Date	Age
FP007	M	13	1982-06-09	1982-10-26	6-7 yr
FP016	M	112	1989-08-03	1994-10-06	3-9 yr
FP023	F	116	1990-03-17	2000-05-31	2-12 yr
FP038	F	85	1990-02-18	1994-05-26	4-8 yr
FP042	M	22	1991-09-13	1994-11-11	2-5 yr
FP079	M	32	1999-04-19	2005-11-16	3-9 yr
FP086	F	8	2001-01-08	2001-10-17	1.5-2 yr
FP087	F	3	2000-07-03	2001-06-15	1.3-2 yr
FP088	F	22	2001-05-04	2002-10-18	1-2.3 yr
FP091	F	1	2001-03-16	2001-03-16	9 mo
FP103	F	375	2001-05-27	2007-07-11	9 mo-7 yr
FP104	M	166	2002-01-16	2006-03-08	1.5-5 yr
FP108	M	55	2002-03-04	2002-11-13	2-2.5 yr
FP124	F	22	2004-03-29	2008-03-28	4-8 yr
FP125	M	6	2004-03-29	2004-05-10	9-11 mo
FP126	M	12	2004-03-29	2004-05-26	9-11 mo
FP127	M	51	2006-03-31	2008-02-16	6-8 yr
FP129	F	21	2004-02-25	2006-02-22	3-5 yr
FP152	M	23	2007-05-04	2008-10-12	5-6 yr
FP169	M	5	2009-05-06	2009-11-30	5-5.5 yr
FP192	F	2	2014-03-31	2014-08-28	5-5.5 yr
FP230	M	1	2014-04-14	2014-04-14	6 yr
TX103	F	11	1998-08-21	1999-07-09	-
Total		**1,164**			

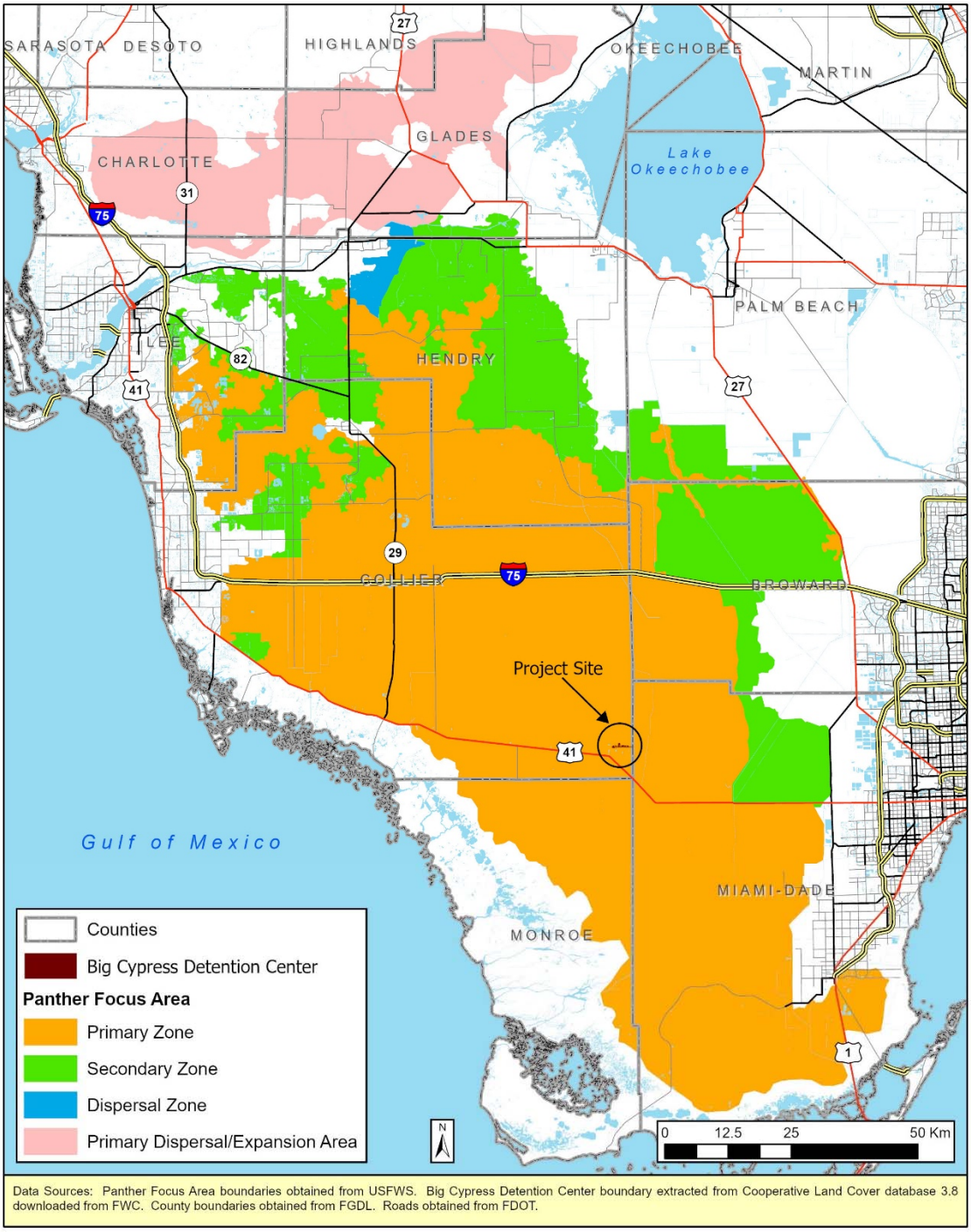

Figure 1. The Big Cypress Detention Center is in the Primary Zone of the U.S. Fish and Wildlife Service's Panther Focus Area.

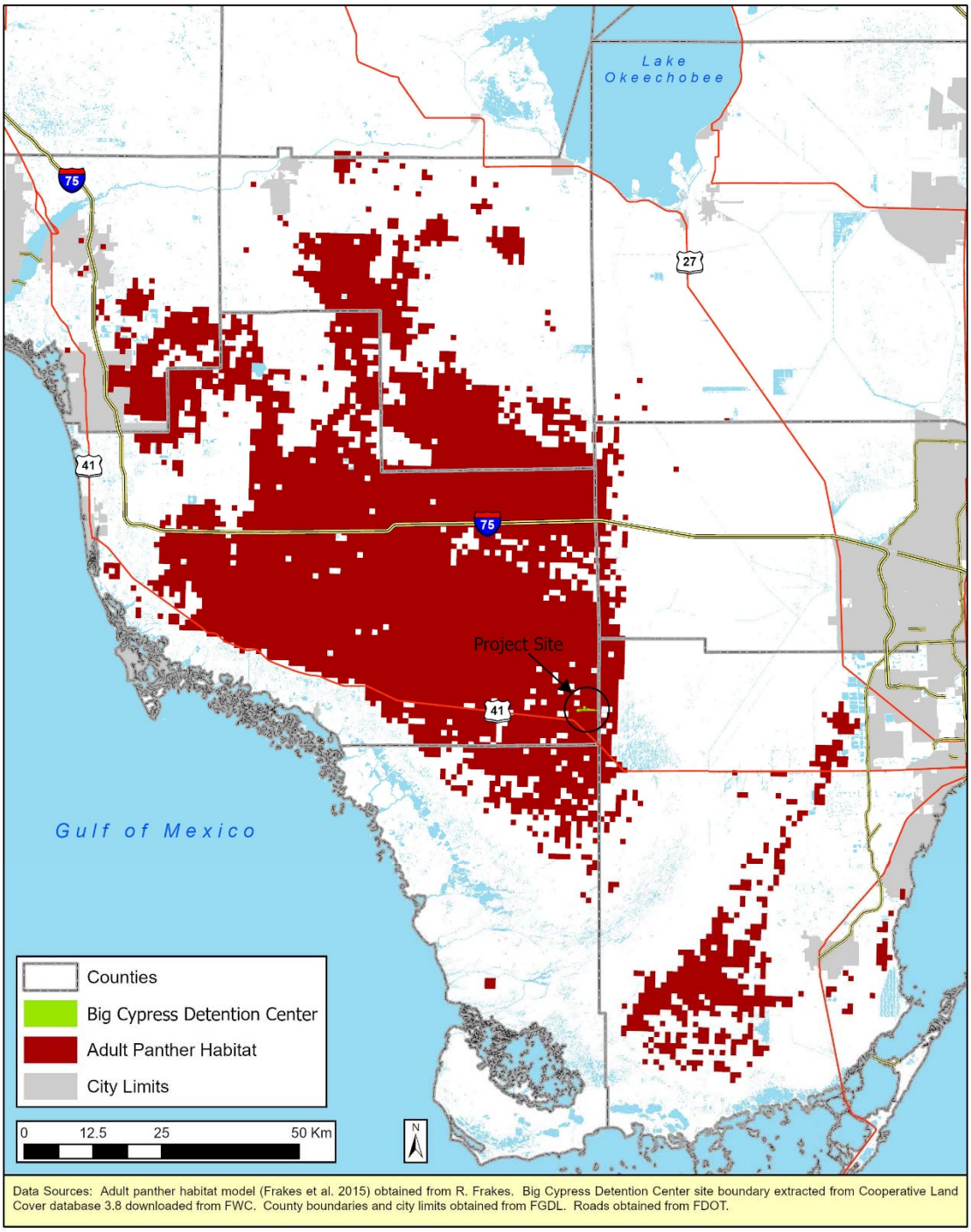

Figure 2. The Big Cypress Detention Center is in an area mapped as adult breeding habitat by Frakes et al. (2015).

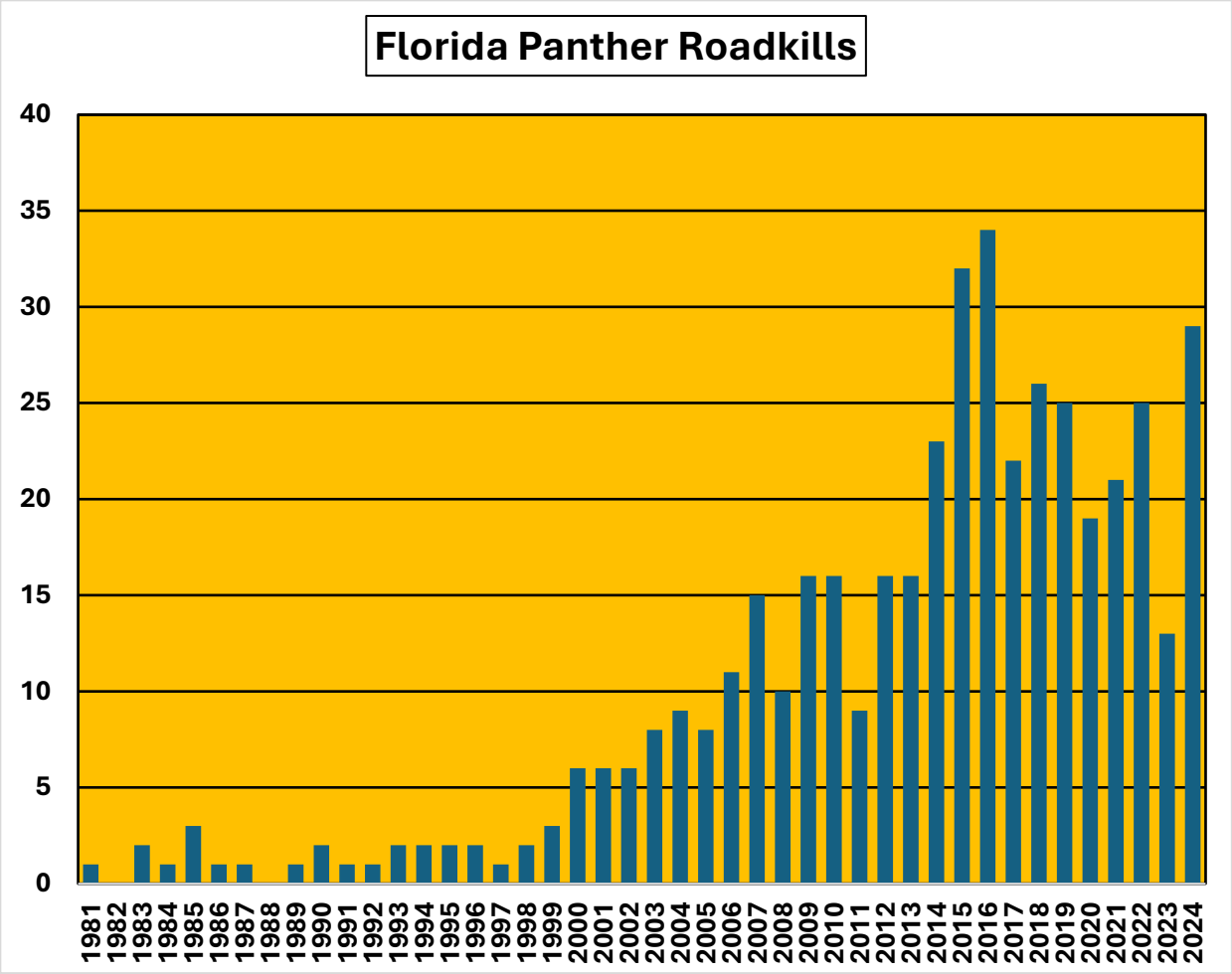

Figure 3. Number of Florida panthers killed in collisions with motor vehicles each year between 1981 and 2024. Data are inclusive of panthers of all age groups from dependent kittens to adults.

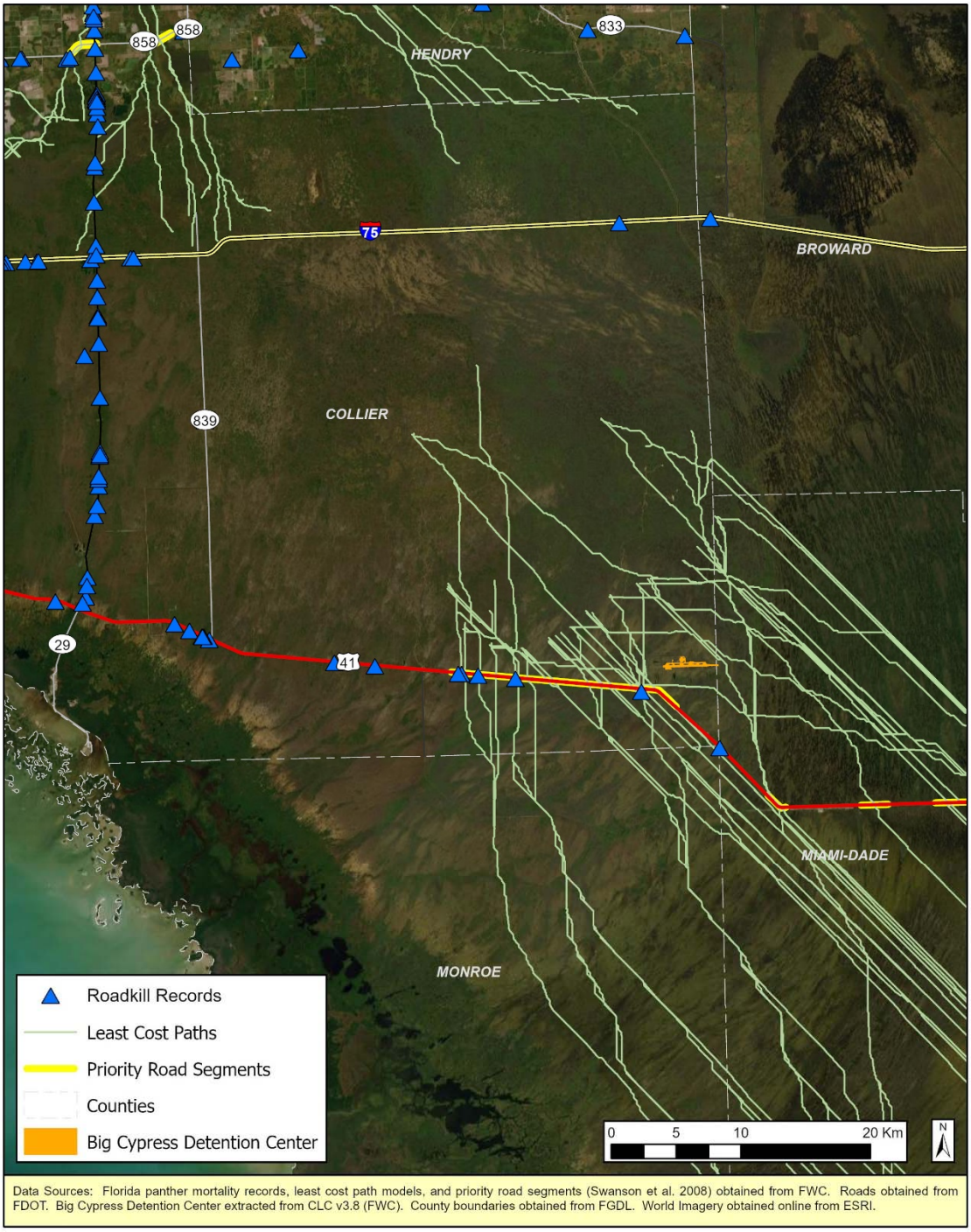

Figure 4. The Big Cypress Detention Center is near US 41 (Tamiami Trail) in an area where roadkill mortalities have been recorded and where priority road segments for reducing roadkill mortality based on least cost path modeling (Swanson et al. 2008). Average daily traffic on US 41 west of the site was 3,400-3,800 vehicles per day and east of the site was 6,300 vehicles per day in 2024.

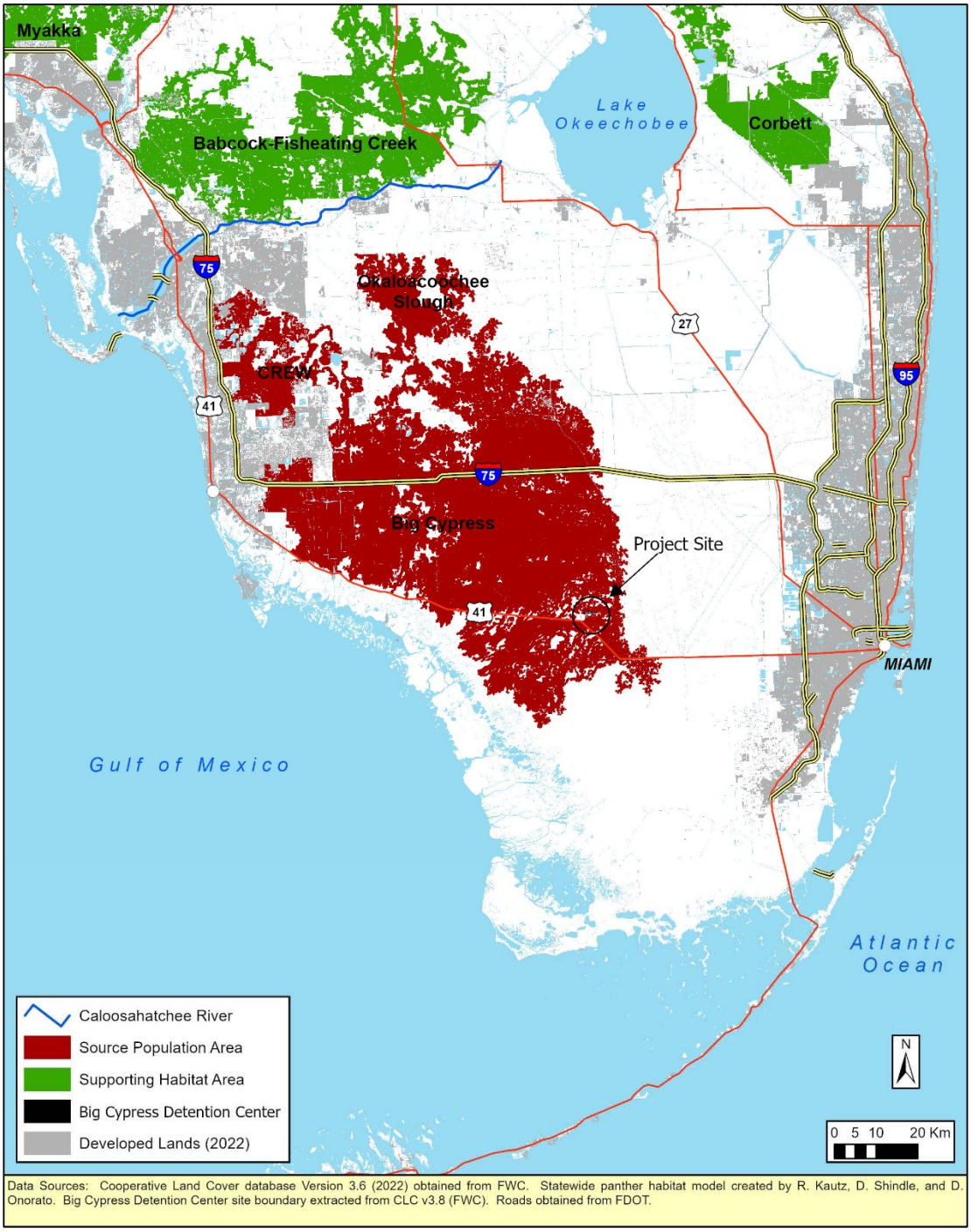

Figure 5. Big Cypress Detention Center project site in relation to panther habitat as modeled by Kautz et al. (in preparation) for the Florida Panther Species Status Assessment Version 2.0 (USFWS in review).

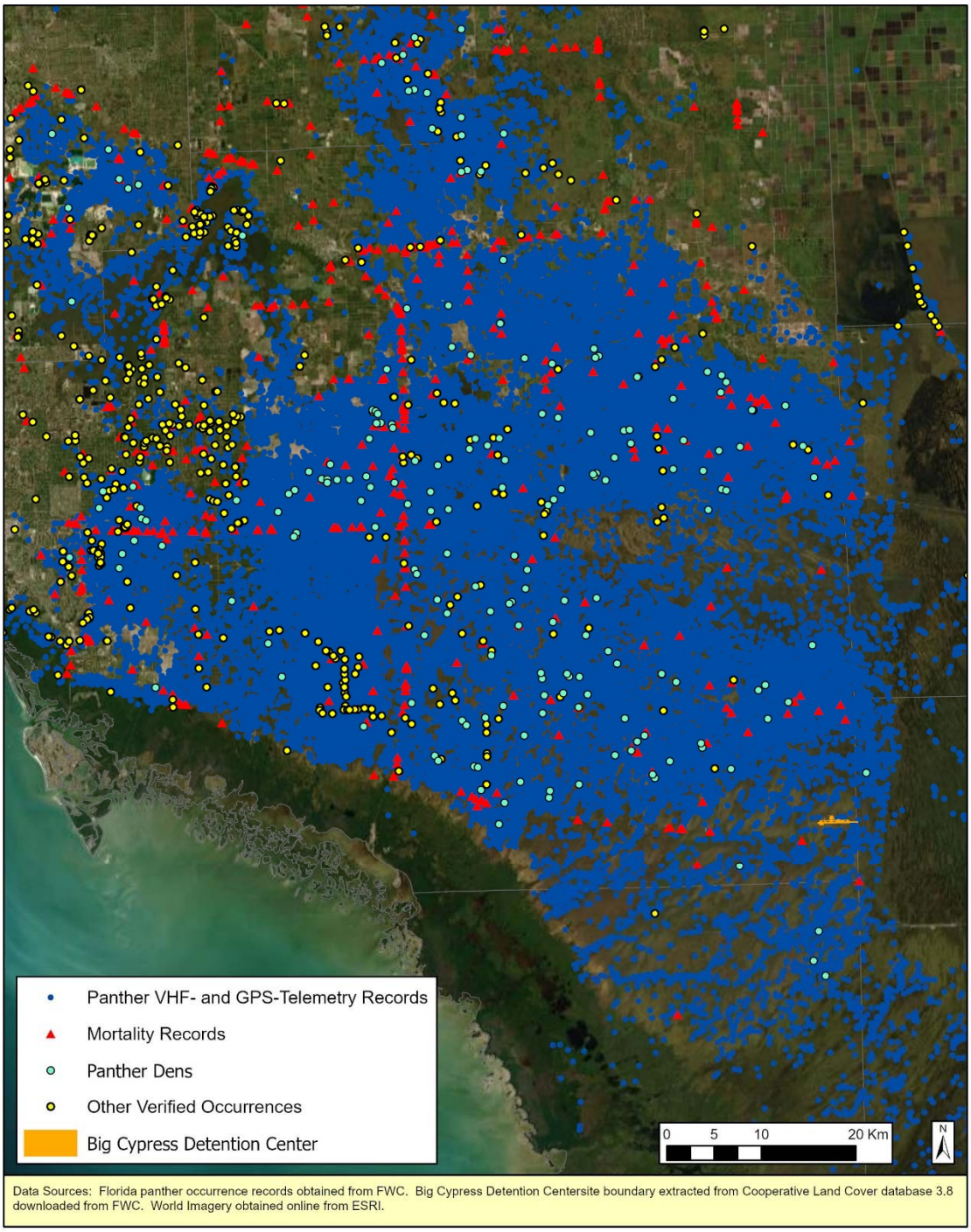

Figure 6. The Big Cypress Detention Center is in an area with many documented occurrences of panther since 1982.

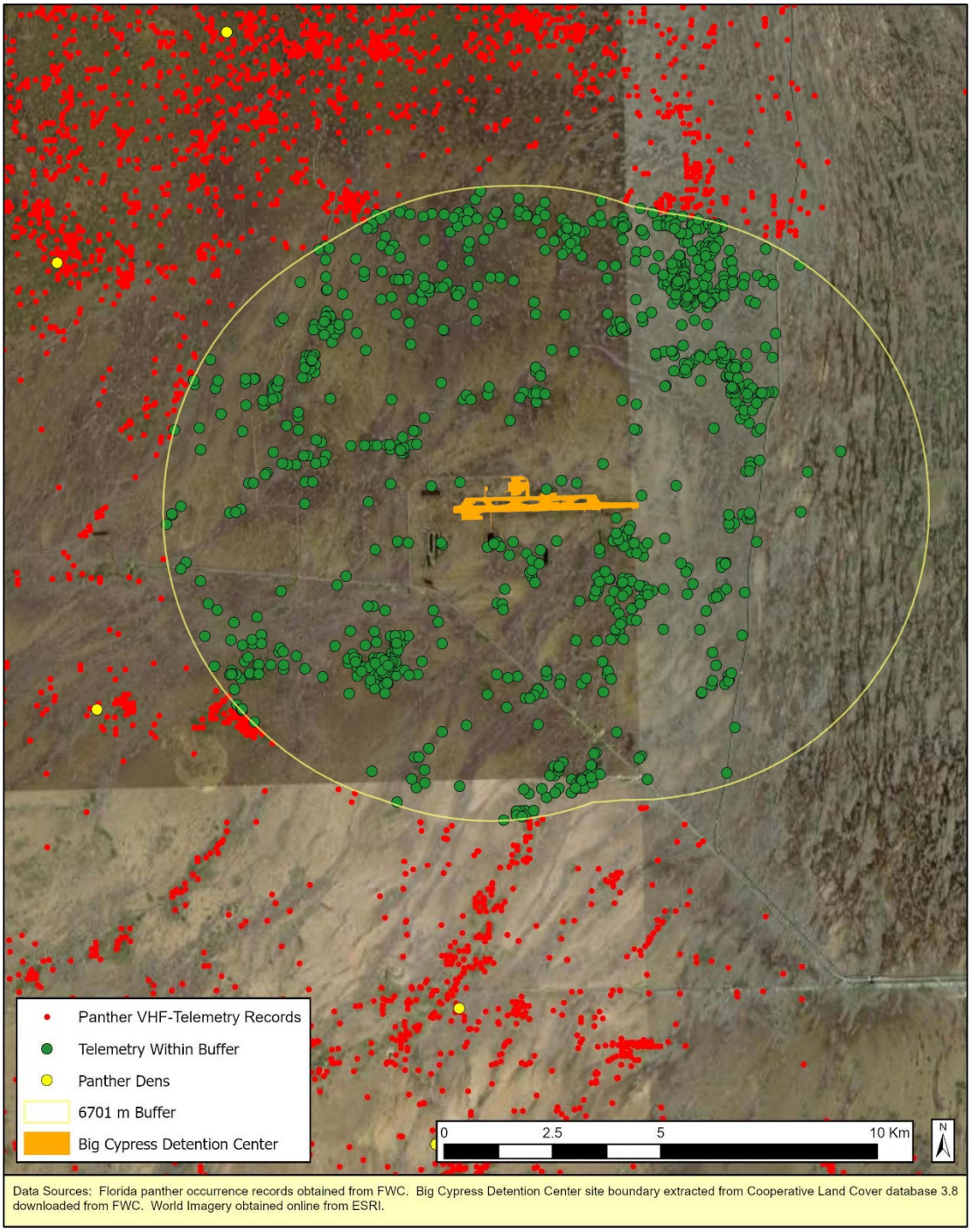

Figure 7. VHF-telemetry records of Florida panthers collected between 1982 and 2014 within 6701 m (i.e., mean daily travel distance of male panthers in the dry season) of the Big Cypress Detention Center.

Appendix E

Curriculum Vitae of Randy Kautz

Curriculum Vitae

RANDY S. KAUTZ
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Email: randykautz@gmail.com

Areas of Specialization:

Ecology of threatened and/or endangered (T&E) species of wildlife; application of geographic information system (GIS) technology to modeling and mapping wildlife and their habitats; land use and land cover mapping using remotely sensed data; and landscape-scale habitat conservation planning.

Experience:

Biological Consultant, Florida Power & Light (FPL), Juno Beach, Florida. 2014 to 2025.

- Provided technical assistance to FPL pertaining to issues involving the endangered Florida panther (*Puma concolor coryi*).
- Researched and developed panther-friendly site designs for new solar electric generating facilities within the range of the Florida panther.
- Assessed panther-related impacts and mitigation requirements for multiple solar electric generating facilities in South Florida and coordinated with state and federal agencies and stakeholders.

Biological Consultant, U.S. Fish and Wildlife Service, Naples, FL. 2022-2025.

- Drafted text, tables, figures, and literature citations to update the US Fish and Wildlife Service's (USFWS) Florida Panther Species Status Assessment to Version 2.0.
- Created a new GIS model of panther habitats statewide in Florida.
- Performed GIS analyses to evaluate the effects of habitat loss due to human population growth and development and sea level rise on panther habitats through 2040 and 2070 and evaluated effects of habitat loss on future panther population viability.

Biological Consultant, The Nature Conservancy, Tallahassee, Florida. September 2020.

- Completed a scientifically based overview of potential impacts to Florida panthers and other imperiled species associated with the proposed Southwest Florida Expressway project through Central and South Florida.
- Provided a written report with text, tables, maps, and literature citations to TNC.
- Provided public comments at the September 2020 MCORES Southwest Corridor meeting.

Biological Consultant, Florida Fish and Wildlife Conservation Commission, Naples, FL. 2018-2020.

- Conducted literature review and drafted 11 chapters of the USFWS Florida Panther Species Status Assessment Version 1.0, including text, tables, figures, and literature citations.

- Chapters included legal status of the species; historical causes of decline; physical description; distribution; life history; ecology and habitat characteristics; abundance, trend, and distribution; habitat suitability analysis; stressors (factors influencing viability); existing conservation measures; and landscape-factors which could impact future populations.

- Completed GIS analyses of a statewide panther habitat model; calculated potential loss of habitat through 2040 and 2070 associated with human population growth and development and sea level rise; and evaluated effects of future conditions on panther population viability.

Senior Scientist, Breedlove, Dennis & Associates, Inc. (BDA), Tallahassee, Florida. 2005 to 2014.

- Created spatially explicit GIS-based landscape-scale plans for conservation of wildlife and biodiversity.

- Conducted reviews of GIS databases for records of occurrence of T&E species of plants and animals and their habitats on sites proposed for development.

- Created and maintained an Access database of listed species of wildlife by county in Florida.

- Drafted assessments of impacts of proposed development projects on T&E species with a focus on the Florida panther, Florida black bear (*Ursus americanus floridanus*), Florida scrub jay (*Aphelocoma coerulescens*), Florida sandhill crane (*Grus canadensis pratensis*), crested caracara (*Caracara cheriway*), Florida grasshopper sparrow (*Ammodramus savannarum floridanus*), gopher tortoise (*Gopherus polyphemus*), and sand skink (*Neoseps reynoldsi*).

- Conducted field surveys for the presence of T&E species of wildlife.

- Conducted reviews of the potential need for wildlife crossings or underpasses based on species needs and site conditions.

Director, Office of Data Portal, Florida Fish and Wildlife Conservation Commission (FWC), Tallahassee, Florida. 2004 to 2005.

- Provided leadership, direction, and administrative oversight for the office.

- Coordinated with agency executive staff, partners and stakeholders, and the public.

- Planned and implemented enterprise data integration efforts.

- Evaluated, selected, and implemented portal software.

- Implemented Web-based access to GIS data.

- Participated in agency efforts to convert paper data records and technical reports to digital format.

Habitat Protection Planning Section Leader, Office of Environmental Services, FWC (formerly the Florida Game and Fresh Water Fish Commission [FGFWFC]), Tallahassee, Florida. 1984 to 2004.

- Planned, developed and managed budget, and implemented habitat protection efforts of Florida's Nongame Wildlife Program.
- Supervised and conducted environmental impact assessments, endangered species surveys, and incidental take permitting for endangered species in the Florida Keys.
- Developed and published guidelines for the protection of listed species and their habitats on lands slated for development.
- Supervised agency staff responsible for coordinating Partners in Flight.
- Identified priority lands for protection of Florida's biodiversity using Landsat satellite imagery, wildlife occurrence databases, and GIS technology.
- Provided GIS technical assistance to agency staff, other governmental agencies, private conservation organizations, private consultants, and the public.
- Implemented miscellaneous efforts to coordinate nongame habitat protection functions with other sections of the Nongame Wildlife Program, other agencies, and the public.

Biological Scientist, Office of Environmental Services, FGFWFC, Tallahassee, Florida. 1977 to 1984.

- Conducted field inspections and commented on the impacts of dredge and fill projects, public works projects, Developments of Regional Impact, mined land reclamation projects, National Pollutant Discharge Elimination System permits, etc., on fish and wildlife resources in northeast Florida.
- Coordinated agency review of proposed power plants, transmission lines, and sewage treatment plants statewide.
- Developed and published data concerning the effects of eutrophication and habitat change on fishery resources.

Environmental Specialist, Department of Environmental Engineering Sciences, University of Florida, Gainesville, Florida. 1976 to 1977.

- Served as Research Project Manager (PM) for a $300,000 study of human radiation exposure associated with Florida phosphate industry activities.
- Planned and implemented field studies of the occurrence of various radionuclides in homes, industrial facilities, and soils.
- Analyzed data and drafted reports.
- Supervised graduate student studies associated with the project.

Radiological Consultant, Earth Resources Development Corporation, Gainesville, Florida. 1977.

- Surveyed and reported on radiation levels in and around a proposed limestone mine in central Florida.

Wildlife Biologist, School of Forest Resources and Conservation, University of Florida, Gainesville, Florida. 1974 to 1976.

- Served as Research PM for a study of an urban pond owned by the National Park Service in Jacksonville, Florida.
- Planned and implemented field studies of small mammals, birds, reptiles, amphibians, fishes, hydrology, water quality, and vegetation communities.
- Provided modeling and computer simulation of the impacts of proposed management schemes.
- Drafted a management plan.

Whitewater Guide, Nantahala Outdoor Center, Bryson City, North Carolina. 1974 to 1974.

- Guided members of the public on whitewater rafting trips down the Nanatahala River.
- Provided lessons in whitewater safety and ensured the safety of the public during whitewater experiences.

Lab Assistant, School of Forest Resources and Conservation, University of Florida, Gainesville, Florida. 1973 to 1974.

- Conducted Soil and vegetation sampling, water level mapping, controlled burning in freshwater marsh and in pine (*Pinus* sp.) flatwoods ecosystems, hydrologic modeling, and computer simulation

Lab Assistant, Soils Department, University of Florida, Gainesville, Florida. 1973.

- Collected, prepared, and analyzed soil samples for nitrogen content.

Field Assistant: Eco-Impact, Inc., Gainesville, Florida. 1973.

- Installed bird nest boxes in developing areas.
- Revegetated manmade ponds.
- Sampled estuarine sediments and macroinvertebrates.
- Assisted in the preparation of environmental impact statements.

Education:

Graduate Coursework. University of Florida, Gainesville. 1976-1977. Environmental Biology.

B.S. University of Florida, Gainesville, 1974. Wildlife Ecology (Cum Laude).

A.A. Daytona Beach, Florida, Community College, 1971. Pre-engineering Curriculum.

Journal Articles and Book Chapters:

Bolch, W.E., N. Desai, C.E. Roessler, and **R.S. Kautz**. 1980. *Determinants of radon flux from complex media: virgin and reclaimed lands in the Florida phosphate region.* Pages 1673-1681 in T.F. Gesell and W.M. Lowder, editors. Natural radiation environment III, Volume 2. Technical Information Center, U.S. Dept. of Energy, Springfield, Virginia.

Enries, M., T. Gilbert, and **R. Kautz**. 2003. *Environmental planning in Florida: Mapping wildlife needs in Florida: The integrated wildlife habitat ranking system*. Pages 525-534 *in* Irwin, C.L., P. Garrett, and K.P. McDermott, editors. 2003 Proceedings of the international conference on ecology and transportation. Center for Transportation and the Environment, North Carolina State University, Raleigh, North Carolina.

Estevez, E.D., B.J. Hartman, **R.S. Kautz**, and E.D. Purdum. 1984. *Ecosystems of surface waters.* Pages 92-107 *in* E. A. Fernald, editor. Water resources atlas of Florida. Florida State University, Tallahassee, Florida.

Gilbert, T., **R. Kautz**, T. Eason, R. Kawula, and C. Morea. 2001. *Prioritization of statewide black bear roadkill problem areas in Florida*. Pages 574-579 *in* Evink, Gary, editor. Proceedings of the International Conference on Ecology and Transportation. Center for Transportation and Environment, North Carolina State University, Raleigh, NC.

Kautz, R.S. 1980. *Effects of eutrophication on the fish communities of Florida lakes*. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 34:67-80.

Kautz, R.S. 1981. *Fish populations and water quality in North Florida rivers*. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 35:495-507.

Kautz, R. 1992. *Wildlife habitats*. Pages 70-71 *in* E.A. Fernald and B.D. Purdum, editors. Atlas of Florida. University Press of Florida, Gainesville, Florida.

Kautz, R.S. 1984. *Criteria for evaluating the impacts of development on wildlife habitats.* Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 38:121-136.

Kautz, R.S. 1993. *Trends in Florida wildlife habitat 1936-1987*. Florida Scientist 56(1):7-24.

Kautz, R.S. 1998. *Land use and land cover trends in Florida 1936-1995*. Florida Scientist 61(34):171-187.

Kautz, R.S. and J.A. Cox. 2001. *Strategic habitats for biodiversity conservation in Florida*. Conservation Biology 15(1):55-77.

Kautz, R.S., D.T. Gilbert, and G.M. Mauldin. 1993. V*egetative cover in Florida based on 1985-1989 Landsat Thematic Mapper imagery*. Florida Scientist 56(3): 135-154.

Kautz, R.S., T. Gilbert, and B. Stys. 1999. *A GIS plan to protect fish and wildlife resources in the Big Bend area of Florida*. Pages 193-208 *in* Evink, G.L., P. Garrett, and D. Zeigler, editors. Proceedings of the third international conference on wildlife ecology and transportation. FL-ER-73-99. Florida Department of Transportation, Tallahassee, Florida.

Kautz, R.S., K. Haddad, T.S. Hoehn, T. Rogers, E.D. Estevez, and T. Atkeson. 1998. *Natural systems*. Pages 82-113 in E.A. Fernald and E.D. Purdum, editors. Water resources atlas of Florida. Florida State University, Tallahassee, Florida.

Kautz, R., R Kawula, T. Hoctor, J. Comiskey, D. Jansen, D. Jennings, J. Kasbohm, F. Mazzotti, R McBride, L. Richardson, and K. Root. 2006. *How much is enough? Landscape-scale conservation for the Florida panther*. Biological Conservation 130:118-133.

Kautz, R., B. Stys, and R. Kawula. 2007. *Florida vegetation 2003 and land use change between 1985-89 and 2003*. Florida Scientist 70(1):12-23.

Roessler, C.E., **R. Kautz**, W.E. Bolch, Jr., and J.A. Wethington, Jr. 1980. *The effect of mining and land reclamation on the radiological characteristics of the terrestrial environment of Florida's phosphate regions*. Pages 1476-1493 *in* T.F. Gesell and W.M. Lowder, editors. Natural radiation environment III, Volume 2. Technical Information Center, U.S. Dept. of Energy, Springfield, Virginia.

Stys, B., and **R. Kautz**. 1993. *Habitat protection guidelines for species threatened by large-scale development*. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:311-319.

Swanson, K., D. Land, **R. Kautz**, and R. Kawula. 2005. *Use of least cost pathways to identify key highway segments for Florida panther conservation*. Pages 191-200 *in* Beausoleil, R. A., and D. A Martorello, editors. Proceedings of the Eighth Mountain Lion Workshop, Washington Department of Fish and Game, Olympia, WA.

Tear, T. H., P. Kareiva, P. L. Angermeier, P. Comer, B. Czech, **R. Kautz**, L. Landon, D. Mehlman, K. Murphy, M. Ruckelshaus, J. M. Scott, and G. Wilhere. 2005. *How much is enough? The recurrent problem of setting measureable objectives in conservation*. BioScience 55(10):835-849.

Williams, V.P., D.E. Canfield, Jr., M.M. Hale, W.E. Johnson, **R.S. Kautz**, J.T. Krummrich, F.H. Langford, K. Langland, S.P. McKinney, and D.M. Powell. 1985. *Lake habitat and fishery resources of Florida*. Pages 43-120 *in* W. Seaman, Jr., editor. Florida aquatic habitat and fishery resources. Florida Chapter of the American Fisheries Society, Kissimmee, Florida.

Technical Reports:

Endries, M., T. Gilbert, and **R. Kautz**. 2008. *The integrated wildlife habitat ranking system 2008*. Technical report. Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.

Endries, M., B. Stys, G. Mohr, G. Kratimenos, S. Langley, K. Root, and **R. Kautz**. 2009. *Wildlife habitat conservation needs in Florida: updated recommendations for strategic habitat conservation areas*. FWRI Technical Report TR-15. Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.

Cox, J., D. Inkley, and **R. Kautz**. 1987. *Ecology and habitat protection needs of gopher tortoise (Gopherus polyphemus) populations found on lands slated for large-scale development in Florida*. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 4, Tallahassee, Florida.

Cox, J., **R. Kautz**, M. MacLaughlin, and T. Gilbert. 1994. *Closing the gaps in Florida's wildlife habitat conservation system*. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Cox, J., **R. Kautz**, M. MacLaughlin, and T. Hoehn. 1998. *Preservation 2000 Act study: biodiversity conservation analysis*. Office of Environmental Services, Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Cox, J.A., and **R.S. Kautz.** 2000. *Habitat conservation needs of rare and imperiled wildlife in Florida*. Office of Environmental Services, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Kautz, R.S. 1990. *Use of a geographic information system in wildlife habitat protection planning in Florida*. Pages 45-50 in J.E. Reynolds, III, and K.D. Haddad, editors. Report of the workshop on geographic information systems as an aid to managing habitat for West Indian manatees in Florida and Georgia. Florida Marine Research Publications No. 49, Florida Marine Research Institute, St. Petersburg, Florida.

Kautz, R. 1994. *Historical trends within the range of the Florida panther*. Pages 285-296 *in* D.B. Jordan, editor. Proceedings of the Florida panther conference. Florida Panther Interagency Committee, Ft. Myers, Florida.

Kautz, R.S. and J.A. Cox. 1993. *Identification of critical Florida wildlife habitats using GIS technology*. Proceedings of the Fourth Annual USFWS GIS Workshop. Lafayette, Louisiana.

Kautz, R. and J. Krummrich. 1985. *Fishery resources*. Pages 128-156 *in* L. Ross, editor. Limnology of the Suwannee River, Florida. Biology Section, Florida Department of Environmental Regulation, Tallahassee, Florida.

Kautz, R., J. Cox, M. MacLaughlin, and J. Stys. 1994. *Mapping wetland habitats of high priority to endangered and threatened species on Florida.* Final project report to U.S. Environmental Protection Agency (EPA). Office of Environmental Services, Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Kautz, R., J. Cox, and M. MacLaughlin. 1998. *Status of biodiversity conservation in Florida*. Natural resources forum 98: Linkages in ecosystem science, management, and restoration. University of Florida, Gainesville, Florida.

Kautz, R., T. Gilbert, and B. Stys. 1998. *Big Bend coastal lowlands ecological resource assessment recommendations.* Office of Environmental Services, Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Kautz, R.S. and R. Reddy. 1996. *Land-based ecosystems workgroup results*. L. Berry, editor. Proceedings of the Florida Department of Environmental Protection/State University System ecosystem research needs workshop. Center for Environmental Studies, Florida Atlantic University, Boca Raton, Florida.

Kautz, R., B. Stys, and D. Reed. 2004. *A change detection analysis for Florida: 1985-89 to 2003*. Final report to U.S. Fish and Wildlife Service (USFWS), Wildlife Conservation and Restoration Program Grant R -1-1. FWC, Tallahassee, Florida

Stys, B., **R. Kautz**, D. Reed, M. Kertis, R Kawula, C. Keller, and A. Davis. 2004. *Florida vegetation and land cover data derived from 2003 Landsat ETM+ Imagery*. Final report to USFWS, Wildlife Conservation and Restoration Program Grant R-l-l. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Swanson, K., D. Land, **R. Kautz**, and R. Kawula. 2008. *Use of least-cost pathways to identify key road segments for Florida panther conservation*. Fish and Wildlife Research Institute Technical Report TR-13, Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL.

Popular Articles:

Kautz, R., J. Cox, T. Gilbert, and M. MacLaughlin. 1994. *Strategic habitat conservation areas for Florida wildlife*. Keep Florida Beautiful Magazine (Winter/Spring 1994):18-21.

Kautz, R.S. 1991. *Space age habitat mapping*. Florida Wildlife 45(3):30-33.

Kautz, R.S. 1994. *Closing the gaps: a plan to protect Florida's biodiversity*. Florida Wildlife 8(5):24-26.

Kautz, R.S. 1990. *Florida wildlife habitat, the last 50 years.* Florida Wildlife 44(5):2-6.

Kautz, R.S. 1992. *Satellite imagery and GIS help protect wildlife habitats in Florida*. GeoInfoSystems 2(1):37-42.

Invited Speaker Presentations:

Carnivores 2006. November 15, 2006. St. Petersburg, Florida. *Functional Habitat for Florida Panthers.*

Florida Panther Recovery Team. April 20, 2005. Orlando, Florida. *Landscape-scale Conservation Planning for the Florida Panther: Results of the Panther Sub-team of MERIT.*

Florida Dry Prairie Conference. October 5-7, 2004. Sebring, Florida. *Prairie Birds.*

Southeastern Association of Fish and Wildlife Agencies, State Wildlife Grants Ad Hoc Committee. July 12-14, 2004. Atlanta, GA. *Utilizing GIS for Landscape Level Planning.*

State Road (SR) 40 Environmental Feasibility Study, Task Force Meeting. December 11, 2003. Silver Springs, Florida. *Biodiversity Conservation Planning: SR 40 Ocala - Ormond Beach.*

National Gap Analysis Program Annual Meeting. October 6-9, 2003. Ft. Collins, CO. *Applications of Habitat Models to Decision-Making Processes Affecting Land Use in Florida.*

Defenders of Wildlife, Workshop on the Next 100 Years of the National Wildlife Refuge System. May 29-30, 2003. Washington, D.C. *Biodiversity Conservation Planning in Florida.*

US Fish and Wildlife Service, State Wildlife Grants Program, Comprehensive Wildlife Conservation Strategy Workshop for Southeastern States. April 21-23, 2003. Atlanta, GA. *Applications of Biodiversity Conservation Planning Data in Florida.*

Greater Everglades Ecosystem Restoration Annual Conference. April 15, 2003. Palm Harbor, Florida. *Florida Panther: Habitat and Landscape Linkage Modeling.*

US Fish and Wildlife Service, Conservation Data Workshop. April 1-2, 2003. Panama City, Florida. *Biodiversity Conservation Planning in Florida.*

Florida Public Interest and Environment Annual Conference. February 28, 2003. Gainesville, Florida. *Biodiversity Conservation Planning in Florida.*

Florida Land Acquisition Partnership Annual Conference. November 20-22, 2002. Howey-in-the-Hills, Florida. *Florida Panther: Habitat and Landscape Linkage Modeling. Moderator: Wildlife Corridors Session.*

International Association for Landscape Ecology, 17th Annual Symposium. April 23-26, 2002. Lincoln, Nebraska. *Identification and Protection of Landscapes Important to Biodiversity Conservation in Florida.*

Environmental Law Institute's National Biodiversity Symposium. January 17-18, 2001. Washington, D.C. *Florida's Closing the Gaps Project.*

Florida Land Acquisition Partnership Annual Conference. November 15-17, 2000. Haines City, Florida. *Are We Protecting Florida's Most Critical Resources?*

Florida Chapter of the Wildlife Society, Spring Meeting. April 11, 2000. Daytona Beach, Florida. *Strategic Habitats and Habitat Loss in Florida.*

Florida Forever Advisory Council Meeting. October 20, 1999. Tallahassee, Florida. *Habitat Conservation Planning in Florida.*

Society for Conservation Biology Annual Meeting, Regional-scale Conservation Planning Symposium. June 20, 1999. College Park, Maryland. *When Public Lands Aren't Enough: Identifying Strategic Habitats on Private Lands in Florida.*

GIS at Work in Florida's Environment Conference. June 5-6, 1997. Tallahassee, Florida. *Overview of GIS Programs at the Florida Game and Fresh Water Fish Commission.*

Ecosystem Management Society of Japan, Florida Tour. May 19, 1997. Wakulla Springs, Florida. *Closing the Gaps in Florida's Wildlife Habitat Conservation System.*

Southeastern States Natural Heritage Programs Annual Conference. Keynote Address. April 21, 1997. Tallahassee, Florida. *Closing the Gaps in Florida's Wildlife Habitat Conservation System.*

Florida Department of Transportation (FDOT) Annual Environmental Issues Conference. April 3-4, 1997. Archbold Biological Station, Lake Placid, Florida. *Environmental Impact Assessment Using GIS and 'Closing the Gaps' Report Data.*

Florida Institute of Park Personnel 133rd Annual Fall Conference. November 6, 1996. Tallahassee, Florida. *Wildlife Corridors - Urban to Rural.*

The Nature Conservancy (TNC) Annual Trustee Meeting (The Science of Portfolio Design Workshop). September 25-28, 1996. Washington, DC. *Implementation of Florida's 'Closing the Gaps' Project.*

FGFWFC, Division of Wildlife Annual Meeting. August 29, 1996. St. Augustine, Florida. Title: *Closing the Gaps in Florida's Wildlife Habitat Conservation System. GIS Workshop.*

Florida Native Plant Society Annual Meeting. May 30-June 2, 1996. Sarasota, Florida. *Habitat Fragmentation.*

Pinellas Chapter of the Florida Native Plant Society. March 6, 1996. Largo, Florida. *Closing the Gaps in Florida's Wildlife Habitat Conservation System.*

South Carolina State Mapping Advisory Committee Biennial Conference. January 23-24, 1996. Columbia, South Carolina. *Florida Gap Analysis.*

Florida Chamber of Commerce Environmental Permitting Short Course. Orlando, Florida. January 17-18, 1996. *Endangered and Threatened Species. Title: Ecosystem Management Progress Report.*

Florida Biotic Information Consortium, Annual Meeting. Gainesville, Florida. November 8-9, 1995. *GIS Data Layers Available from the Florida Game and Fresh Water Fish Commission.*

Florida Department of Environmental Protection (FDEP)/State University System Ecosystem Research Needs Workshop. St. Petersburg, Florida. June 13-14, 1995. Facilitator: Land-based Ecosystems Work Group.

Florida Youth Environmental Summit. Orlando, Florida. April 30-May 2, 1995. Invited Panelist: Habitat Pizza-Who Gets a Slice?

FDOT Annual Environmental Conference. April 19-21, 1995. Orlando, Florida. *GIS Data Layers Available from the Florida Game and Fresh Water Fish Commission.*

National Gap Analysis Principal Investigators Annual Workshop, Silverdale, Washington. 1994. *Modeling techniques used to predict vertebrate species distributions in Florida.*

Biodiversity of the Southern Appalachians Conference. March 18-19, 1994. Asheville, North Carolina. *Closing the Gaps Study in Florida.*

FGFWFC's 1993 Florida Fish and Wildlife Conference. November 5-7, 1993. Haines City, Florida. *Habitat Protection Planning for Florida Wildlife.*

Committee Appointments:

Florida Natural Areas Inventory and University of Florida GeoPlan Center, Critical Lands and Waters Identification Project, Technical Advisory Group Member. 2007 to Present.

Florida Fish and Wildlife Conservation Commission (FWC), MyFWC.com Design Guidelines and Review Standing Team. August 2004 to February 2005.

FWC, Data Standards Issue Team. December 2003 to February 2005.

FWC, Records Management Issue Team. November 2003 to February 2005.

FWC, US Fish and Wildlife Service (USFWS) State Wildlife Grants Issue Team. September 2003 to February 2005.

FWC, Senior Leadership Team. July 2003 to February 2005.

FWC, Information Technology Steering Committee. June 2003 to February 2005.

The Nature Conservancy, Workshop on Setting Quantitative Ecological Goals in Regional Planning Efforts, Seattle, Washington. June 2002 to February 2005.

Florida Natural Areas Inventory, Florida Forever Conservation Needs Assessment, Expert Technical Advisory Group Member. February 2002 to Present.

USFWS, South Florida Multi-species Ecosystem Recovery Implementation Team Member and Florida Panther Sub-team Member. October 1999 to February 2005.

FWC, Information Technology Council. October 1999 to July 2001.

Florida Keys Carrying Capacity Study, Species Workgroup Member, GIS Workgroup Member. June 1999 to February 2005.

Key Deer Habitat Conservation Plan Steering Committee. January 1999 to February 2005.

St. Johns River Water Management District, Cumulative Impacts of Wetlands Loss Committee. August 1998 to August 2000.

State of Florida, Geographic Information Advisory Council. 1996 to 2000.

Southern Appalachians Forest Coalition. Southern Appalachians Biodiversity Project "Kitchen Cabinet," Member. March 1996.

FDEP/State University System. Ecosystem Management Research Needs Workshop Steering Committee. 1995 to 1996.

Florida Greenways Commission. System Design Committee, Member. 1995 to 1997.

FDEP. Ecosystem Management Implementation Steering Committee, Member. Science and Technology Subcommittee, Co-chair. 1994 to 1996.

Florida Environmental Risk Assessment. Ecology Technical Advisory Committee, Member. 1994 to 1995.

Florida Preservation 2000 Needs Assessment. Data Inventory and Assessment Committee, Member. 1990.

Florida Keys Resource Planning and Management Committee, Member. Appointed by Governor Bob Martinez, 1990 to 1992.

Growth Management Data Network Coordinating Council, Alternate Council Member, Staff Advisory Committee Member. 1990 to 1995.

FGFWFC, Nongame Wildlife Program, Contracted Research Selection Committee Member, January 1985 to August 2001; March to April 2004.

Contracts and Grants:

Project Manager (PM). USFWS, State Wildlife Grants program grant to implement a data warehouse within the FWC and to publish fish and wildlife GIS data via the internet. 2004 to 2005.

PM. USFWS, Wildlife Conservation and Restoration Program grant to update the FWC's Landsat-based land cover database from 1985 to 89 through 2003. $108,000 contract amount. 2001 to 2004.

PM. Wildlife Foundation of Florida grant to update the FWC's Landsat-based land cover database from 1985 to 89 through 2003. $36,000 contact amount. 2001 to 2003.

PM. U.S. Geological Survey, Biological Resources Division, grant to the FWC to develop a GIS database of Florida's freshwater fishes and post results on the Internet. $56,000 contract amount. 1999 to 2000.

PM. Florida Game and Fresh Water Fish Commission (FGFWFC) subcontract with the Cooperative Fish and Wildlife Research Unit at the University of Florida to update a digital vegetation map of north central Florida and the Florida panhandle using Landsat Thematic Mapper imagery and ancillary databases. $170,539 contract amount. 1996 to 2000.

PM. EPA cooperative agreement with the FGFWFC to update a digital vegetation map of north central Florida and the Florida panhandle using Landsat Thematic Mapper imagery and ancillary databases. $170,539 contract amount. 1996 to 2001.

PM. USFWS cooperative agreement with the FGFWFC to perform specific recovery actions for the Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*), silver rice rat (*Oryzomys argentatus*), and Stock Island tree snail (*Orthalicus reses*) in the Florida Keys. $50,000 contract amount. 1994 to 1996.

Principal investigator/PM. EPA cooperative agreement with the FGFWFC to map Florida wetlands used by wetland-dependent species of wildlife listed as endangered, threatened, and species of special concern by the State of Florida. $76,000 contract amount. 1993 to 1994.

PM. FGFWFC contract with FDOT to produce a digital map of vegetation and land cover in Florida using Landsat Thematic Mapper imagery. $300,000 contract amount. 1987 to 1990.

Awards:

Osprey Award: Recognizing Extraordinary Effort to Protect and Preserve Florida's Environment. 1998. Florida Chapter of the Sierra Club.

Excellent Informational Poster Award. 1998. FDEP, Third Annual GIS Workshop.

Certifications:

Certified in the use of the USFWS' Habitat Evaluation Procedures. 1986.

Associations:

Florida Ornithological Society (1988-2011)

Society for Conservation Biology (1988-2011)

The Nature Conservancy (2006-2011)

Florida Academy of Sciences (1993-2011)

The Wildlife Society (2009-2011)

Appendix F

Letter from Robert A. Frakes, Ph.D., to Jason Totoiu, Center for Biological Diversity, Re: opinion on impacts of construction and operation of migrant detention facility on the endangered Florida panther

To: Jason Totoiu, Center for Biological Diversity

From: Robert A. Frakes, Ph.D.

July 8, 2025

The Center for Biological Diversity requested my opinion on whether the construction and operation of a migrant detention facility at the site of the old proposed Jetport (Jetport) in Collier County is likely to impact the endangered Florida panther. The Jetport property, approximately 5000 acres in size, is located in a vast area surrounded by natural, public lands, within Big Cypress National Preserve and near Everglades National Park, important refuges for the Florida panther and many other listed and imperiled species. This opinion is based upon my professional knowledge and my previous work on panther habitat modeling (Frakes et al. 2015, Frakes and Knight 2021), and it is limited by the lack of site-specific information available in the public domain.

The lack of detailed information on the construction, possible expansion, and current and future operation activities is problematic and makes it difficult to assess the full extent of impacts to panthers. Impacts would be highly dependent upon factors for which little information is available, such as intensity of night time lighting, noise levels, new fencing, human activity on the site, predator or animal control, and increased air traffic. In addition, due to a scale back in the state monitoring program, panther telemetry monitoring near the site has not occurred since 2008. However, historical data and panther habitat modeling suggest that the area around the site is valuable to panthers and that panthers are probably present near the site. If panthers may be adversely affected by the funding or operation of the facility by an agency of the Federal government, then the U.S. Fish and Wildlife Service is required by the Endangered Species Act to be consulted and produce a biological opinion, based on the best available science.

The Jetport parcel falls within an area known as the panther Primary Zone, an area of high conservation value to the panther, designated almost 20 years ago by a team of panther experts to be protected to support the small panther population (Kautz et al. 2006). The USFWS' current Panther Recovery Plan defines the Primary Zone as "lands essential to the long-term viability and persistence of the panther in the wild" (USFWS 2008). Therefore, the detention facility is within an area long considered essential habitat for the panther.

More recent peer-reviewed science also shows that the Jetport parcel contains important habitat for adult breeding panthers. As part of a study of panther habitat use (Frakes et al. 2015), we estimated home ranges of 87 adult panthers using telemetry data from 2004 through 2013. During the years 2004 to 2008, the home ranges of four adult panthers (3

males and one female) included the location of the proposed facility (Figure 1). Based on this historical evidence and assuming panther densities and habitat conditions are similar today, disturbances from the proposed facility may impact at least four existing adult panther home ranges. The actual number affected may be higher because not all panthers (only about half) were radio-collared during the time frame of the study. Because panthers are expected to avoid approaching close to the site due to increased lighting, noise, and human presence, the possible impacts will be changes in the size or shape of several panther home ranges. Additionally, increased traffic on the access road to the facility may cause some panthers to avoid crossing the road, thus fragmenting any existing panther home ranges which may lie on both sides of the road, such as those shown in Figure 1. Changes to panther home ranges and decreases in prey abundance may also have harmful effects of increasing intraspecific aggression, a leading source of panther mortality (see USFWS 2008 for a fuller discussion).

As mentioned above, due to a scale back in the state panther monitoring program, no recent telemetry data are available in the area. However, recent habitat modeling suggests that panthers are almost certainly present near or on the site (of course, if the runway areas are currently fenced, this would exclude panthers from using those areas). In 2021, we published a panther habitat suitability map based on random forest modeling, intended to be used as a guide in panther recovery planning (Frakes and Knight 2021). The model uses landscape characteristics such as land cover, human population density, roads, hydrology, and forest edge to predict the relative probability of panther presence in an area. Values greater than about 0.34 indicate areas likely to be used as breeding habitat by adult panthers. As shown in Figure 2, the parcel being used for the detention center is surrounded by mid- to high-value panther habitat. Sensitivity analysis of model predictions showed that the presence of human populations, roads, and agriculture (other than pasture) had strong negative effects on the probability of panther presence (Frakes et al. 2015). This strongly suggests that noise, lighting, and the presence of large numbers of humans on the site will affect some adult panthers. The magnitude of effects and number of panthers affected cannot be predicted given the scarcity of information on the facility and lack of recent panther monitoring data.

In summary, historical data and panther habitat modeling suggest that the area around the site is valuable panther habitat. It is highly likely that panthers continue to be present at or near the site, and that operation of a detention facility there will have adverse effects on this endangered species.

Literature Cited:

Frakes, R.A., R.C. Belden, B.E. Wood and F.E. James. 2015. Landscape analysis of adult Florida panther habitat. PLoS ONE 10(7): e0133044.doi:10.1371/journal.pone.0133044.

Frakes, R.A. and M.L. Knight. 2021. Location and extent of unoccupied panther (Puma concolor coryi) habitat in Florida: Opportunities for recovery. Global Ecology and Conservation 26 (2021) https://doi.org/10.1016/j.gecco.2021.e01516.

Kautz R, Kawula R, Hoctor T, Comiskey J, Jansen D, Jennings D, et al. 2006. How much is enough? Landscape-scale conservation for the Florida panther. Biological Conservation 130: 118–133.

U.S. Fish and Wildlife Service. 2008. Florida Panther Recovery Plan (*Puma concolor coryi*), Third Revision. U.S. Fish and Wildlife Service. Atlanta, Georgia. 217pp.

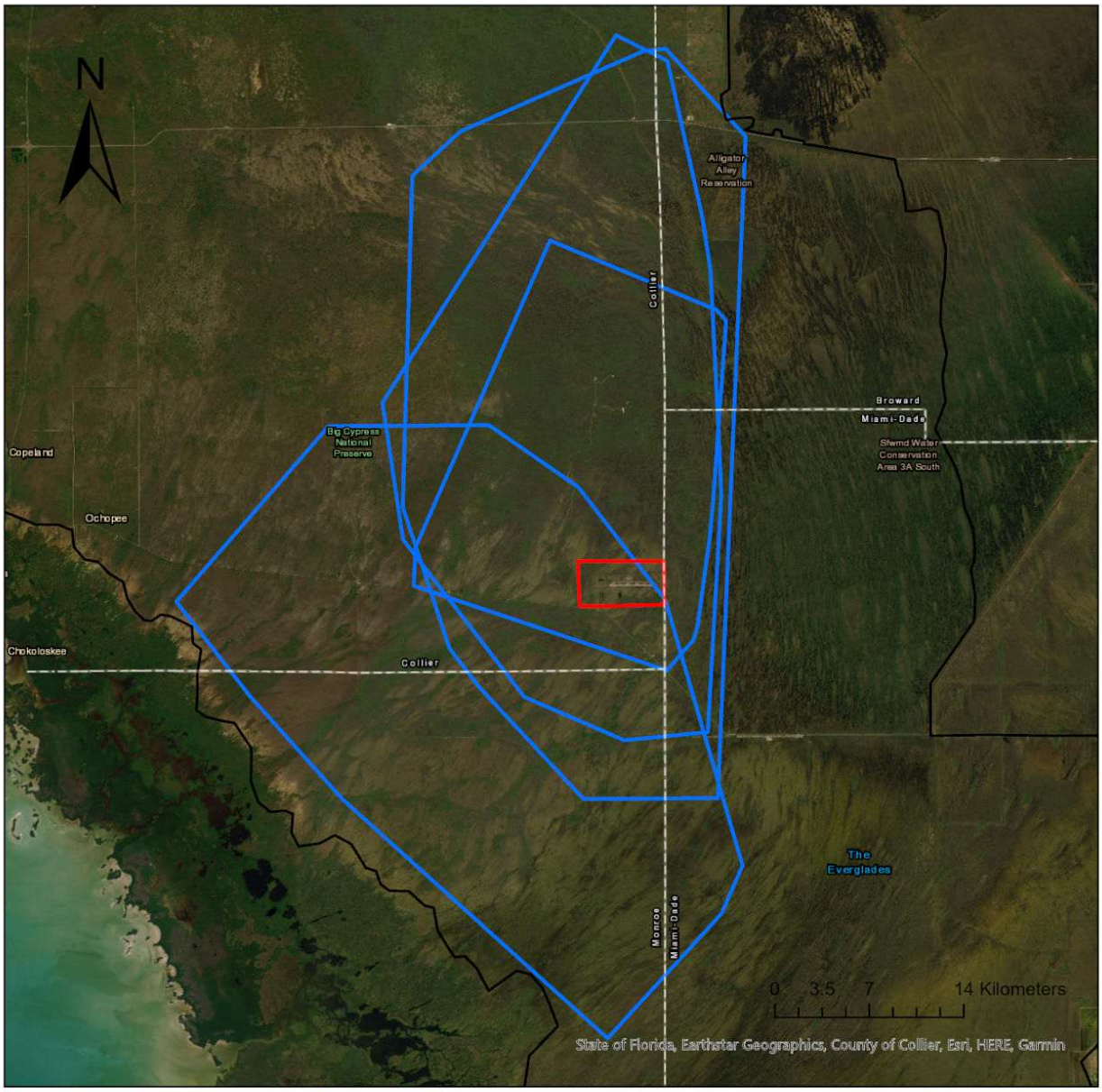

Figure 1. Florida panther home ranges that overlapped with the project site during 2004 to 2008. MCP home ranges of FP103, FP104, FP127, and FP152 are shown in blue.

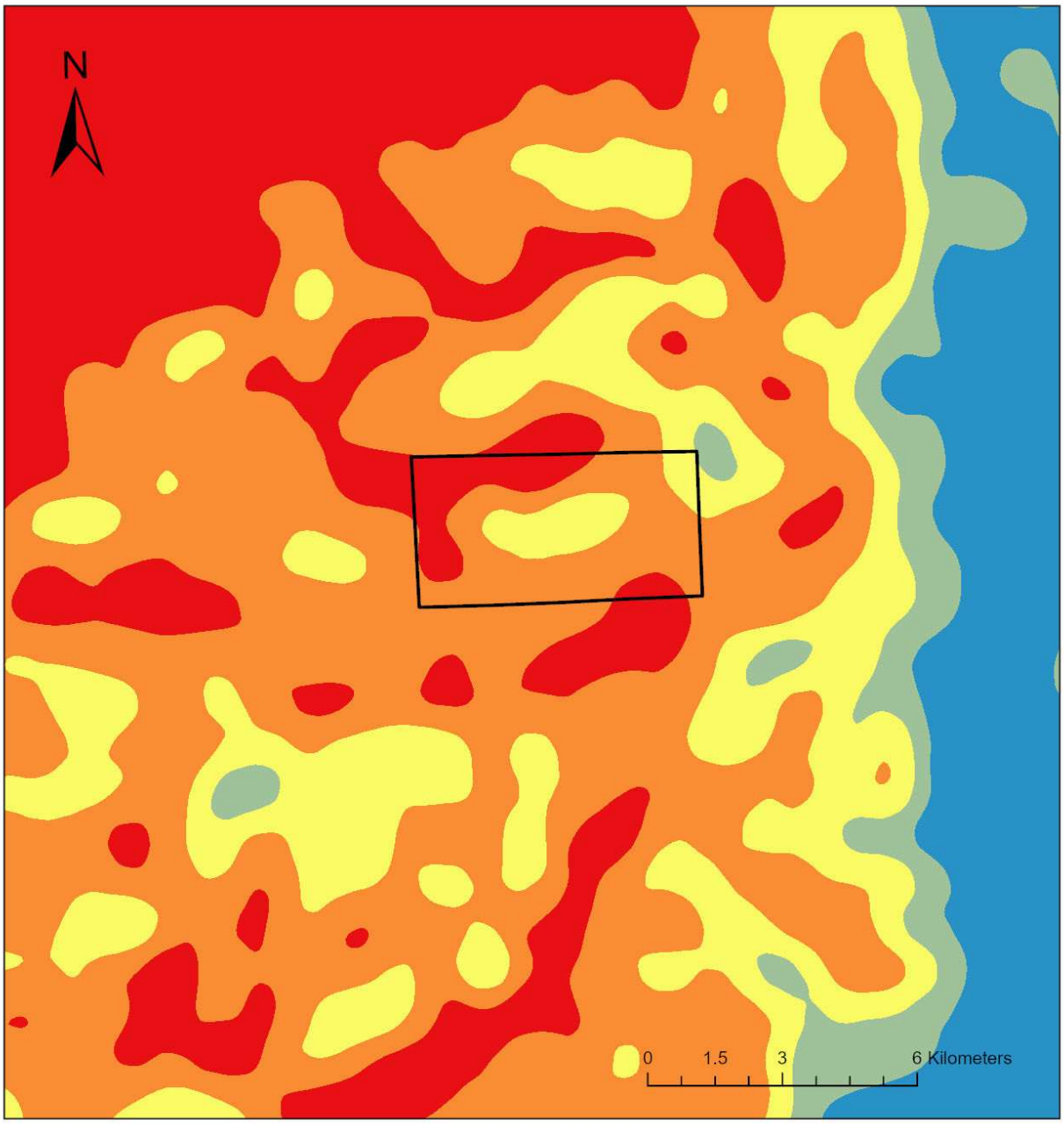

Figure 2. Panther habitat suitability (relative probability of presence) in the vicinity of the old Jetport parcel which is being converted to a detention facility.

Appendix G

Curriculum Vitae of Robert A. Frakes, Ph.D.

CURRICULUM VITAE

Robert A. Frakes, Ph.D.
2455 Johnston Road
Fort Pierce, FL 34951
772-429-0087 (Home)
Email: frakesr@comcast.net

EDUCATION:

Ph.D. in Environmental Toxicology
Center for Environmental Toxicology and Department of Veterinary Sciences, Utah State University, Logan, UT, 1985

M.S. in Zoology (Animal Ecology)
Department of Zoology, Washington State University, Pullman, WA, 1978

B.S. in Biology
Department of Biology, University of Cincinnati, Cincinnati, OH, 1973

Graduate Training Fellowship
National Institute of Environmental Health Sciences Predoctoral Trainee in Toxicology
Utah State University, Logan, UT (1981-1985)

EXPERIENCE:

Supervisory Ecologist (2000-2014)
U.S. Fish and Wildlife Service, South Florida Ecological Services Office, Vero Beach, FL.
Developed food chain and habitat models for endangered species such as the Everglade snail kite and Florida panther. Recommended contaminant clean-up levels at Everglades restoration sites. Developed Florida panther habitat compensation methodology. Briefly served as acting panther recovery coordinator.

Refuge Manager (1998-2000)
U.S. Fish and Wildlife Service, Florida Keys National Wildlife Refuges, Big Pine Key, FL.
Worked on conservation and management of nine endangered species in the Florida Keys, including the Key deer, American crocodile, and Lower Keys marsh rabbit.

Supervisory Fish and Wildlife Biologist (1993-1998)
U.S. Fish and Wildlife Service, New Jersey Field Office, Pleasantville, NJ.
Conducted and supervised environmental contaminant studies to assess risks to the bald eagle, peregrine falcon, and other species. Supervised the Partners for Fish and Wildlife Program. Prepared biological opinion on New Jersey water quality standards.

State Toxicologist (1986-1993)
Maine Department of Human Services, Augusta, ME.
Primary authority in Maine state government on toxicology and chemical risk assessment for humans, fish, and wildlife. Developed dioxin standards and advisories for fish in Maine rivers.

PEER-REVIEWED PUBLICATIONS:

Leskova, O.V., R.A. Frakes and S.H. Markwith. 2022. Impacting habitat connectivity of the endangered Florida panther for the transition to utility-scale solar energy. *Journal of Applied Ecology* 00: 1–13. https://doi.org/10.1111/1365-2664.14098.

Frakes, R.A. and M.L. Knight. 2021. Location and extent of unoccupied panther (*Puma concolor coryi*) habitat in Florida: Opportunities for recovery. *Global Ecology and Conservation* 26 (2021) https://doi.org/10.1016/j.gecco.2021.e01516.

Frakes, R.A., R.C. Belden, B.E. Wood and F.E. James. 2015. Landscape analysis of adult Florida panther habitat. *PLoS ONE* 10(7): e0133044.doi:10.1371/journal.pone.0133044.

Hoang, T.C., R.L. Pryor, G.M. Rand, and R.A. Frakes. 2011. Use of butterflies as nontarget insect test species and the acute toxicity and hazard of mosquito control insecticides. *Environmental Toxicology and Chemistry* 30(4): 997-1005.

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Hoang, T.C., L.J. Schuler, E.C. Rogevich, P.M. Bachman, G.M. Rand, and R.A. Frakes. 2009. Copper release, speciation, and toxicity following multiple floodings of copper enriched agricultural soils: Implications in Everglades restoration. *Water Air Soil Pollut.* 199: 79-93.

Frakes, R.A., T.A. Bargar and E.A. Bauer. 2008. Sediment copper bioavailability to freshwater snails in south Florida: risk implications for the Everglade snail kite (*Rostrhamus sociabilis plumbeus*). *Ecotoxicology* 17: 598-604.

Hoang, T.C., E.C. Rogevich, G.M. Rand, and R.A. Frakes. 2008. Copper uptake and depuration by Florida apple snails (*Pomacea paludosa*): Bioconcentration and bioaccumulation factors. *Ecotoxicology* 17: 605-615.

Hoang, T.C., E.C. Rogevich, G.M. Rand, P.R. Gardinali, R.A. Frakes and T.A. Bargar. 2008. Copper desorption in flooded agricultural soils and toxicity to the Florida apple snail (*Pomacea paludosa*): Implications in Everglades restoration. *Environmental Pollution* 154: 338-347.

Frakes, R.A. and L.R. Hicks. 1993. Fungicides, in: *Handbook of Hazardous Materials*, M. Corn, ed. Academic Press, Inc., San Diego, CA.

Frakes, R.A., C.Q.T. Zeeman and B. Mower. 1993. Bioaccumulation of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) by fish downstream of pulp and paper mills in Maine. *Ecotoxicology and Environmental Safety* 25: 244-252.

Frakes, R.A. 1988. Drinking water guideline for ethylenethiourea, a metabolite of ethylene bisdithiocarbamate fungicides. *Regul. Toxicol. Pharmacol*. 8: 207-218.

Frakes, R.A., R.P. Sharma, C.C. Willhite and G. Gomez. 1986. Effect of cyanogenic glycosides and protein content in cassava diets on hamster prenatal development. *Fundam. Appl. Toxicol*. 7: 191-198.

Frakes, R.A., R.P. Sharma and C.C. Willhite. 1986. Comparative metabolism of linamarin and amygdalin in hamsters. *Food and Chemical Toxicology* 24: 417-420.

Frakes, R.A., C.C. Willhite and R.P. Sharma. 1985. Developmental toxicity of the cyanogenic glycoside linamarin in the golden hamster. *Teratology* 31: 241-246.

Willhite, C.C., N.L. Rossi, R.A. Frakes and R.P. Sharma. 1985. Cranioschisis aperta with encephaloschisis in cephalothoracopagus hamster twins. *Can. J. Comp. Med*. 49: 195-201.

Taylor, M.J., R.A. Frakes, R.P. Sharma and C.C. Willhite. 1984. Comparative pharmacokinetics of trypan blue in female Sprague-Dawley and Long-Evans rats. *Food and Chemical Toxicology* 22(11): 875-878.

Frakes, R.A. and R.E. Johnson. 1982. Niche convergence in *Empidonax* flycatchers. *Condor* 84: 286-291.

TECHNICAL REPORTS:

Frakes, R.A. 2018. Impacts to panther habitat from the proposed Eastern Collier Multiple Species Habitat Conservation Plan: a quantitative analysis. Report prepared for the Conservancy of Southwest Florida, October 2018.

Frakes, R.A., T.A. Bargar, B. Arrington, J.F. Boggs, J. Tutton, and A. Sowers. 2010. Pesticide and nutrient contamination in the Cypress Swamp of the A.R.M. Loxahatchee National Wildlife Refuge. U.S. Fish and Wildlife Service, Vero Beach, FL. July 2010.

Frakes, R.A., T.A. Bargar, B. Arrington, J.F. Boggs, J. Tutton, and A. Sowers. 2010. Pesticide and nutrient contamination in the Strazulla Marsh of the A.R.M. Loxahatchee National Wildlife Refuge. U.S. Fish and Wildlife Service, Vero Beach, FL. July 2010.

Frakes, R.A., E.A. Boughner, J.F. Boggs, J. Tutton, and T.A. Bargar. 2007. Delineation of the nature and extent of contamination at the former NAS Key West Skeet Club on Great White Heron National Wildlife Refuge. U.S. Fish and Wildlife Service, Vero Beach, FL. October 2007.

Bargar, T.A., R.A. Frakes, J.F. Boggs, and E.A. Boughner. 2005. Uptake of copper by apple snails from contaminated sediments in south Florida. Interim report. U.S. Fish and Wildlife Service, Vero Beach, FL. January 2005.

Frakes, R.A. 2004. Ecological risk assessment guidance for wetland restoration on agricultural lands in south Florida. U.S. Fish and Wildlife Service, Vero Beach, FL. August 2004.

Frakes, R.A. 2000. McMurrain Farms ecological risk assessment, summary and recommendations. U.S. Fish and Wildlife Service, Vero Beach, FL. November 2000.

Frakes, R.A. 2000. Derivation of "No-Application Periods" for interim use pesticides. U.S. Fish and Wildlife Service, Vero Beach, FL. April 2000.

USFWS. 1999. Evaluation of contaminant residues in Delaware Bay bald eagle nestlings, 1996-98. U.S. Fish and Wildlife Service, Pleasantville, NJ. January 1999.

Frakes, R.A. 1998. Preliminary contaminants survey, Naval Air Station Key West Skeet Club. U.S. Fish and Wildlife Service, Big Pine Key, FL. October 1998.

USFWS. 1998. Metals in New Jersey's Pinelands National Reserve sediments, surface water and biota: an emphasis on mercury. U.S. Fish and Wildlife Service, Pleasantville, NJ. April 1998.

USFWS and NJDEP. 1998. Reproductive success and egg contaminant concentrations of southern New Jersey peregrine falcons. U.S. Fish and Wildlife Service, Pleasantville, NJ. March 1998.

USFWS. 1996. Biological opinion on the effects of the U.S. Environmental Protection Agency's approval of the State of New Jersey's Surface Water Quality Standards on the bald eagle, peregrine falcon, and dwarf wedgemussel. U.S. Fish and Wildlife Service, Pleasantville, NJ. June, 1996.

USFWS. 1996. Environmental contaminants impact analysis and ecological risk assessment for the Federal Aviation Administration Technical Center CERCLA sites in Atlantic County, New Jersey. U.S. Fish and Wildlife Service, Pleasantville, NJ. April 1996. (study director).

USFWS and NJDEP. 1995. Evaluation of contaminant residues in Delaware Bay bald eagle nestlings. U.S. Fish and Wildlife Service, Pleasantville, NJ. October 1995. (study director).

USFWS. 1994. Evaluation of contaminants in sediments and forage organisms, Cape May National Wildlife Refuge. Technical assistance report. U.S. Fish and Wildlife Service, Pleasantville, NJ. August 1994. (study director).

Frakes, R.A. 1990. Health-based water quality criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Maine Department of Human Services, Augusta, ME. November 1990.

Frakes, R.A. 1989. Risk assessment of uncontrolled ash releases from the Maine Energy Recovery Company (MERC) in Biddeford, Maine. Maine Department of Human Services, Augusta, ME. January 1989.

Frakes, R.A. 1987. Maximum Exposure Guideline for ethylenethiourea in drinking water. Maine Department of Human Services, Augusta, ME.

Frakes, R.A. 1987. Risk assessment for dioxin-contaminated fish. Maine Department of Human Services, Augusta, ME. February 1987.

Frakes, R.A. 1986. Health risks associated with land-spreading of dioxin-contaminated sludge. Maine Department of Human Services, Augusta, ME. June 1986.

SELECTED TRAINING

Spatial Distribution, Animal Movement and Home Range Analysis. National Conservation Training Center, US Fish and Wildlife Service, Shepherdstown, WV (2012).

Data Analysis IIIB: Species Distribution Modeling Using R (40 hrs). National Conservation Training Center, US Fish and Wildlife Service, Panama City, FL (December 2009).

Data Analysis IIIA: Species Distribution Modeling Using R (40 hrs). National Conservation Training Center, US Fish and Wildlife Service, Panama City, FL (August 2009).

Data Analysis II. Ecological Modeling Using R (40 hrs). National Conservation Training Center, US Fish and Wildlife Service, Panama City, FL (July 2009).

GIS Introduction for Conservation Professionals. National Conservation Training Center, US Fish and Wildlife Service, Vero Beach, FL (2008).

Geostatistical Analysis of Environmental Data. University of Florida, Gainesville, FL (2006).

Migratory Bird Conservation – A Trust Responsibility. National Conservation Training Center, US Fish and Wildlife Service. Taught at Vero Beach, FL, February 5-8, 2007.

Hazardous Waste Operations and Emergency Response (40-hour). Center for Safety and Environmental Management, Slippery Rock University. Taught at Vero Beach, FL, May 1-4, 2006.

Endangered Species Act - Section 7 Training: Level 1. U.S. Fish and Wildlife Service, Vero Beach, FL (2003).

National Environmental Contaminants Training Conference. Division of Environmental Quality, U.S. Fish and Wildlife Service, Tucson, AR (2003).

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National Environmental Contaminants Training Conference. Division of Environmental Contaminants, US Fish and Wildlife Service, Branson, MO (1999).

Cold Weather Oil Spill Response. US Coast Guard, Portland, ME (1996).

Oiled Wildlife Recovery, Reception, and Response. Tri-State Bird Rescue and Research, Sudbury, MA (1996).

Natural Resource Damage Assessment. National Conservation Training Center, US Fish and Wildlife Service, Tacoma, WA (1995).

Mid-America Toxicology Course. Kansas City, MO (1992).

Appendix H

Report: Strategic searches for Florida bonneted bat (*Eumops floridanus*) roosts in Big Cypress National Preserve (BCNP) (March 19, 2019)

Project title: Strategic searches for Florida bonneted bat (*Eumops floridanus*) roosts in Big Cypress National Preserve (BCNP)

March 19, 2019

Principal Investigators:
Katie Gillies, Bat Conservation International
Deb Jansen, Big Cypress National Preserve
Ralph Arwood, Big Cypress National Preserve
John Kellam, Big Cypress National Preserve

Report Author:
Mylea Bayless, Bat Conservation International

Executive Summary:
From October 2016 to September 2017 Bat Conservation International (BCI) and Big Cypress National Preserve (BCNP) worked in partnership to search for Florida bonneted bat (FBB) roosts in Big Cypress National Preserve (BCNP). During this project period 2,449 calls of FBBs were detected in five areas under surveillance. No roosts were detected by our team during this project period.

Project Location:
The location of this project is the National Park Service's (NPS) Big Cypress National Preserve in Collier, Monroe, and Miami-Dade Counties in southwest Florida. Activities were focused upon Raccoon Point and Annette's Pond near Austin's old campsite, but other important areas of interest were surveyed, including Deep Lake, Bass Lake, and Buckskin Trail.

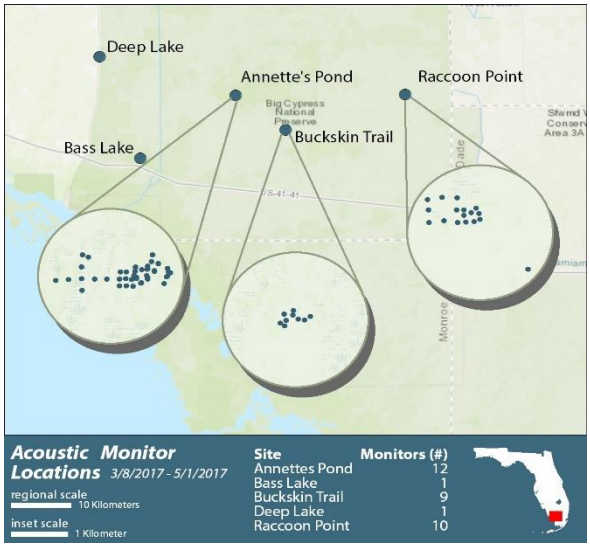


Fig. 1 Overview of survey effort in Big Cypress National Preserve. Image is also available full size in Appendix A.

Methods:
We used available geospatial and acoustic data collected by BCNP prior to the onset of this project to determine potential locations for targeted searches and acoustic monitoring efforts. We focused on hot spots of known acoustic activity and areas with existing red-cockaded woodpecker activity to increase the likelihood of identifying tree roosts. We deployed a grid of acoustic detectors across the landscape to survey for the ultrasonic calls of emerging and travelling bats. When bat calls were identified shortly after sunset or just prior to sunrise, the detector grids were adjusted to focus surveillance on those key locations. We had hoped this technique would allow us to isolate potential cavity trees and/or other potential roost sites for visual inspection of cavities or observations to detect emergence.

Bat detector units were individually identified, and we documented detector placement location using UTM's. We determined how to adjust the acoustic grid to isolate roost trees by using sunset time, time of first FBB call, time of sunset and total number of FBB calls. Other data collected during detector deployment included total number of calls reviewed, temperature at sunset, wind, precipitation, total files collected, and days deployed for each unit. A detailed description of detector deployment can be found in Appendix C in a narrative of work provided by the technicians conducting the field activities.

Results:
We deployed bat detectors for 35 nights in BCNP between March 22 and May 1, 2017. Collectively we recorded 48,808 acoustic recordings, 7,462 of which were auto-classified to FBBs. We manually vetted the auto-classified calls and were able to confirm 2,449 as FBB calls. The table below provides a summary of calls reviewed and confirmed by BCNP area during the season (Table 1). A visual representation of the confirmed calls can also be seen below in Figure 2 (and Appendix B) and supplemental material provided as an animation file (Bat_Calls_Animation.mp4). Full datasets from each detector deployment can be found in Appendix D and in the supplemental materials provided as an EXCEL document (Acoustic Call Data BCNP 2017.xls).

Although this method of deploying bat detectors was able to identify areas of high activity for FBBs, we did not discover any bat roosts as a result of the effort.

Table 1. Summary of FBB calls reviewed and confirmed at BCNP between March 22-May 1, 2017

Annette's Pond		
	# calls reviewed	2339
	# FBB calls	1018
Raccoon Point		
	# calls reviewed	4649
	# FBB calls	1326
Buckskin Trail		
	# calls reviewed	206
	# FBB calls	79
Deep Lake		
	# calls reviewed	187
	# FBB calls	20
Bass Lake		
	# calls reviewed	81
	# FBB calls	6
TOTAL CALLS		

 # calls reviewed is the number calls autoclassified as FBB calls and manually vetted.
 # FBB calls is the number of calls confirmed by manual vetting as positive for FBB

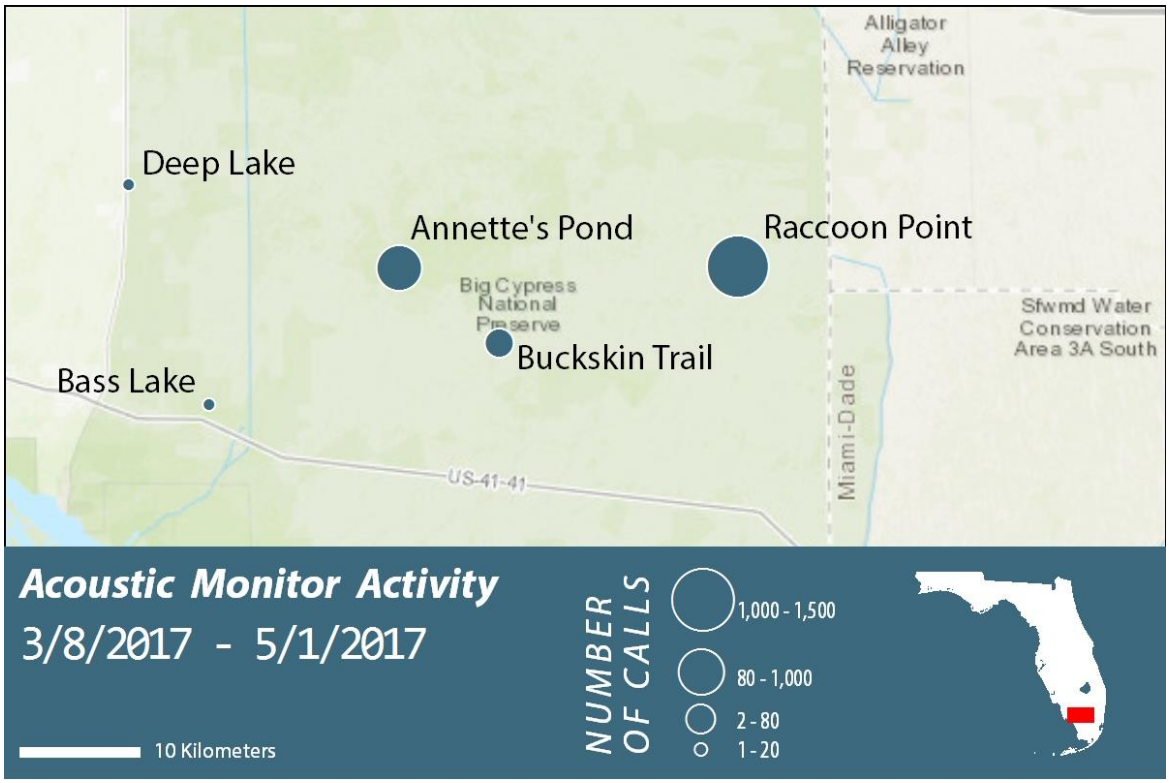
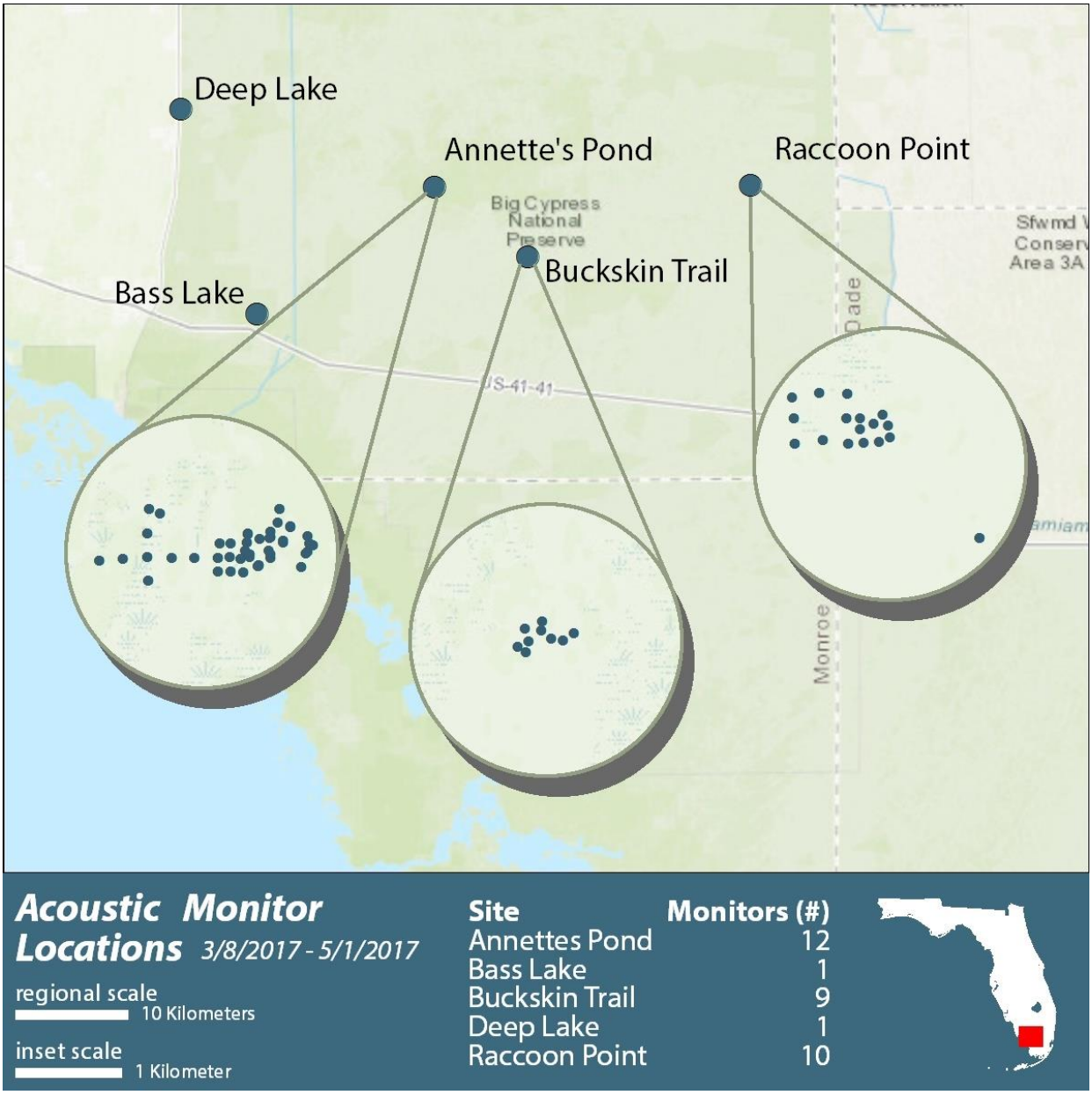


Fig. 2. Frequency of Florida Bonneted Bat calls detected at different survey sites across Big Cypress National Preserve.

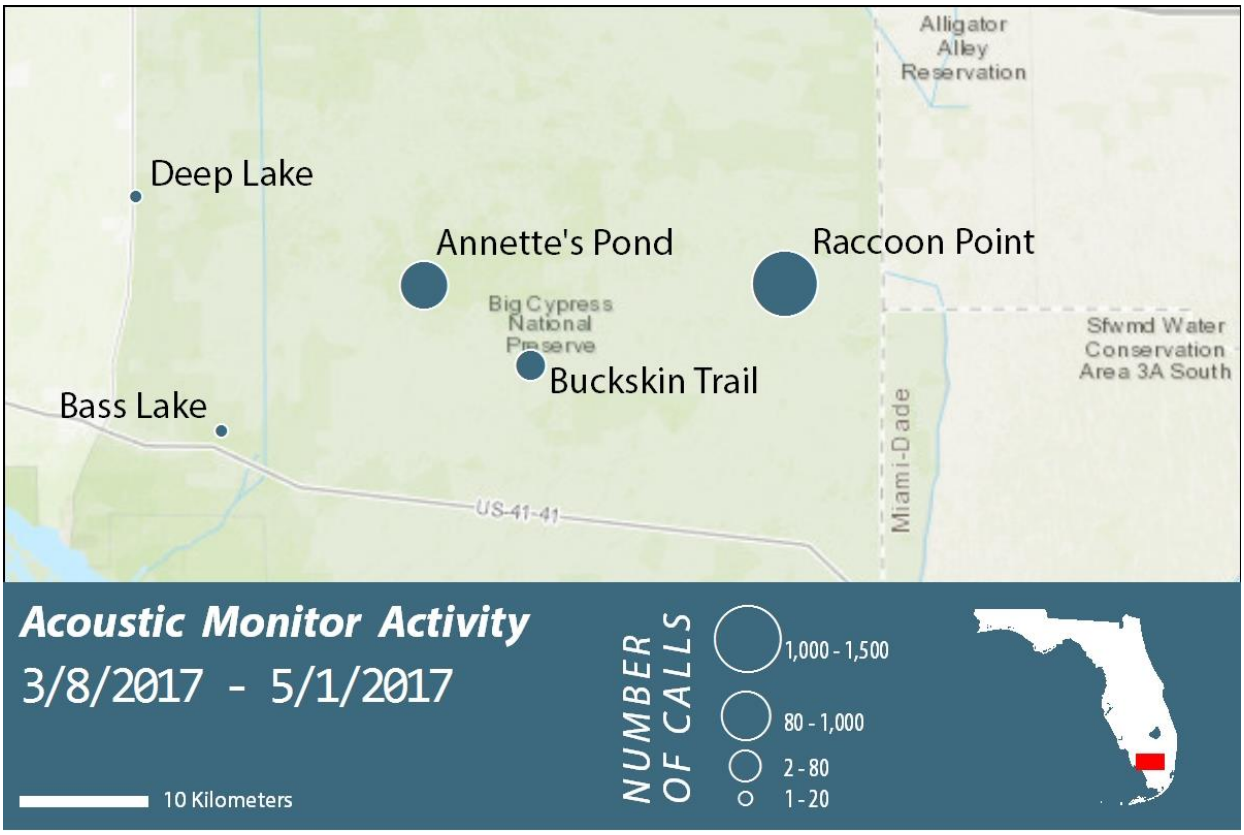
Partners/Collaborators:
NPS/BCNP provided housing, vehicle, equipment (e.g., visual inspection camera systems, acoustic detectors), and logistical support for this project. NPS/BCNP provided day-to-day support for on-the-ground field staff, as needed. Bat Conservation International (BCI) hired temporary staff for field activities and provided BCI staff to assist with project initiation.

##

APPENDIX A. Overview of survey effort to locate roost trees using acoustic detectors at Big Cypress National Preserve.



APPENDIX B. Frequency of Florida Bonneted Bat calls detected at different survey sites across Big Cypress National Preserve.



APPENDIX C. Detailed narrative summary of detector deployment provided by technicians conducting field work at Big Cypress National Preserve.

Provided by Janie and Robert Hinson (May 02, 2017)

Our first day consisted of orientation where we not only discussed the BCI way of pay and communication but also where we were going to put the monitors, in what formations, and how we were going to organize all of this data. We expanded the Excel program we had been using at BICY, to organize our data, using the following columns that were updated every time the SD cards were replaced. The columns were labeled as: Area the place we were working, primarily Annette's Pond (AP) but because of the fire we also set monitors at different locations noted in the Excel program. Unit refers to the acoustic monitor's name. There were ten monitors so we named them Alpha, Bravo, Charlie, Delta, Echo, Fox Trot, Gulf, Hotel, India and Juliet. These names would remain constant throughout the study. Quadrant, Easting and Northing refer to the UTM location. The GPS Point Name is the first letter of the name of the monitor and the date the monitors were set out at this location and are on the maps. Date lists the days the monitor was at this location so A-308 means the monitor was set out at this UTM on March 8, 2017 and would stay at that location until March 12, 2017 according to the Excel Program. We also have Sunset, Time of first Eumops Call, Time after Sunset, and Total Number of Eumops Calls; these values were used to decide the direction to move the monitors. The consensus is that the earlier the calls after sunset the closer one was to the nursery roost tree; the total number of calls would be the tie-breaker. For statics we had columns for Total Number Calls Reviewed, Eumops File Names, Style of Unit, Temperature at Sunset, Wind, Rain, Total Files Collected, and Days Deployed for the collection period. The Excel Program updates and maps were emailed to Katie Gilles, Deborah Jansen, Ralph Arwood, Annette Johnson, and Liz for comments and suggestions after the data from the SD cards was analyzed.

To start the study we collected the acoustic monitors from their various locations in the field and got them ready to set out at Annette's Pond (AP). The first formation was a cross (see map AP 3-08) we went back and collected the SD cards after two days as was agreed. We left the monitors in the location until we decided where to move them and again removed SD cards and added the analyzed data to the Excel program. As agreed the decision on which direction to move the monitors was made by looking at the shortest time after sunset and the most calls. For this presentation I have printed out the part of the Excel program with just that information. We decided to move the monitors in the direction of the Alpha monitor (A-308) which had the earliest time of thirty-nine minutes after sunset and a two day total of seven calls. Echo had a forty-two minute call but only a total of five calls. India also had early calls but that was after we had already moved the monitors and it was very near the pond.

The 308 monitors had been two hundred meters apart. In the fear that we had missed some calls we put the next monitors one hundred meters apart, in a nine monitor grid. We moved the monitors on March 13, 2017 so they are called 313. Look at the next map and Excel printout. This is still not an area normally considered bat habitat. There are not open pine areas; there are no potential trees with cavities that would be accessible to these large, fast, high flying bats that do not maneuver well in close quarters. But we were getting close. From the maps we can see the prairies not far away.

We decided to move our entire operation east and walk west towards the AP area. On the twentieth (320) we once again moved the monitors this time placing them near trees with cavities and around the prairies and cypress domes and strands. These locations produced some varied recording times we may have been getting near a roost tree but the unusually cold nights may have been confusing us. We were hoping for some consistently warm nights so we could tell. Then the fire started. We took the monitors out of the field on March 23, 2017 and could not put them back in until April 9, 2017. We will talk about the other locations we visited after we finish with the AP.

On April 9, 2017 we put out monitors (409) near many of the places we had had them on the twentieth and the thirteenth of March, all the time looking for trees with cavities. In all we have tagged ten trees in this area. Some have the large cavity holes of Pileated Woodpeckers. One even has had an adult Pileated Woodpecker in and out of the cavity. Others have the smaller cavity holes of smaller woodpeckers such as Flickers and Red-bellies. This is not an area of documented RCW roost trees.

On April 13, 2017 we moved four of the monitors B-409, D-409, E-409 and F-409 became B-413, D-413, E-413, and F-413; the rest of the monitors were left at the 409 locations. We were collecting data but it did not seem to be pointing us in any one direction. We removed all of the monitors. We visited Webb-Babcock and talked to people. There is so little information known about these bats nobody really knows what all this data means. It was agreed that we may have been recording single bats staying in a cavity for a night or so but that the main Nursery roost must be somewhere close. We returned to AP invigorated.

We spent one day just looking for roost trees and this time when we put the monitors out on April 25, 2017 we put them near a cavity tree. I-425 was near T-855, H-425 near T-806, C-425 near T-890 and D-425 near T-919. B-525 was in an area of several possible trees but none tagged.

On May 1, 2017 we decided to sit out and listen and watch. Bob, Deb Jansen, and I sat near three different trees. I sat near T-917 and brought a monitor with me. Bob sat under a new found palm tree and watched Great Crested Flycatchers go in for the evening, no bats. Deb sat near the tree T-890, no bats. I didn't see any bats but my monitor recorded Eufl five times from 8:38 until we left at 9 pm, sunset was at 7:54. Liz is planning to come and listen. During the fire break we put the monitors up in several other locations two were around easily accessible ponds that seem to have water even in the dry season. One was at Bass Lake which is a gated area that Reserve visitors are not allowed to enter. The other was near the Fire offices called Deep Lake. Neither gave good early call times but we did record bats visiting these areas on the two nights we had the recorders out. We also sat in the car out one evening to see if we could see bats emerging from a couple of Royal Palms that would be difficult to set up monitors near. We didn't see anything which doesn't mean much but we thought we would give it a try.

Because we had placed two of the monitors out and wanted to leave them at least two nights we only had eight monitors to take to Raccoon Point where the other roost had been observed. We know they had been at this roost at one time we also know they had left. We wanted to see if we could find their other roost tree if there was one. We put the monitors out on April 28, 2017 around the Roost Tree but never closer than two hundred meters. On the thirtieth we moved them based on the way we had always interpreted it, earliest time most calls. That meant we moved them towards the A and F monitors. On the thirtieth we also set out C-430 ten meters from the Roost tree. The first night 4-28 we got a total of forty-eight calls from eight with the most recordings for one monitor of twenty-four. The next night the same eight monitors recorded thirty-six times with the most of one monitor being ten. When we added a ninth monitor ten meters from the Roost Tree, the original eight made a total of seventy-one recordings while the one monitor near the Roost Tree had eighty-nine. That one monitor had more recordings than the other eight just two hundred meters away. Either we are missing many calls or bats go in so many directions or stay close to the Roost Tree that the numbers just don't mean anything two hundred meters away. Hunting for the bat roosts is slow work if you move thru an area too quickly you may miss something. This was also shown in the times of the first emergence. They ranged from eighteen minutes to one hour and eleven minutes after sunset.

We also put the monitors out on Buckskin Trail near where bats had been heard the previous summer. We had some good early times but no great concentrations for the three nights we had the monitors out.

Some of the things we have learned.

1. The monitors must be set out at least ten meters from a cavity tree and at least one hundred meters from another monitor.
2. The only way to know if there is a roost tree is to sit out at emergence time either listen or photograph the bats. There are only going to be a few bats and will not all come out at once. You can't really tell unless there is someone who can hear bats well enough to tell where they are coming from and going to or can see or photograph them come out of the roost.
3. Systematic searching: I personally don't think this method helps much more than a good map. We knew they were coming to Annette's Pond. We were also pretty sure they weren't roosting there. A good map would have showed us the area we ended up in only a short distance away. There is also an interesting area north of Annette's Pond that we never got to go investigate.

APPENDIX D. Summary of Florida Bonneted Bat Calls Detected During Acoustic Monitoring to Identify Roosting Sites at Big Cypress National Preserve Between March 8 – May 1, 2017.

SUMMARY OF FLORIDA BONNETED BAT CALLS DETECTED DURING ACOUSTIC MONITORING TO IDENTIFY ROOSTING SITES AT BIG CYPRESS NATIONAL PRESERVE

	3/8/2017	3/9/2017	3/10/2017	3/11/2017	3/12/2017	3/13/2017	3/14/2017	3/15/2017	3/16/2017	3/17/2017	3/20/2017	3/21/2017
Annette's Pond												
# calls reviewed	146	174	132	119	98	248	47	27	4	0	63	518
# FBB calls	8	16	40	51	67	163	23	18	1	0	17	24
Raccoon Point												
# calls reviewed												
# FBB calls												
Buckskin Trail												
# calls reviewed												
# FBB calls												
Deep Lake												
# calls reviewed												
# FBB calls												
Bass Lake												
# calls reviewed												
# FBB calls												

	3/22/2017	3/27/2017	3/28/2017	3/29/2017	3/30/2017	3/31/2017	4/1/2017	4/2/2017	4/3/2017	4/9/2017	4/10/2017	4/11/2017
Annette's Pond												
# calls reviewed	109									22	53	135
# FBB calls	44									17	49	128
Raccoon Point												
# calls reviewed			279	1207	439	373	371	683	1297			
# FBB calls			48	36	159	146	95	151	691			
Buckskin Trail												
# calls reviewed												
# FBB calls												
Deep Lake												
# calls reviewed		63	124									
# FBB calls		15	5									
Bass Lake												
# calls reviewed		21	60									
# FBB calls		2	4									

	4/12/2017	4/13/2017	4/14/2017	4/15/2017	4/18/2017	4/19/2017	4/20/2017	4/25/2017	4/26/2017	4/27/2017	5/1/2017
Annette's Pond											
# calls reviewed	47	26	90	52				45	131	48	5
# FBB calls	41	22	83	42				29	98	32	5
Raccoon Point											
# calls reviewed											
# FBB calls											
Buckskin Trail											
# calls reviewed					80	62	64				
# FBB calls					38	21	20				
Deep Lake											
# calls reviewed											
# FBB calls											
Bass Lake											
# calls reviewed											
# FBB calls											