This document summarizes a the status of python control in Florida.

Division: Habitat and Species Conservation
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All Photos are MyFWC unless otherwise noted.

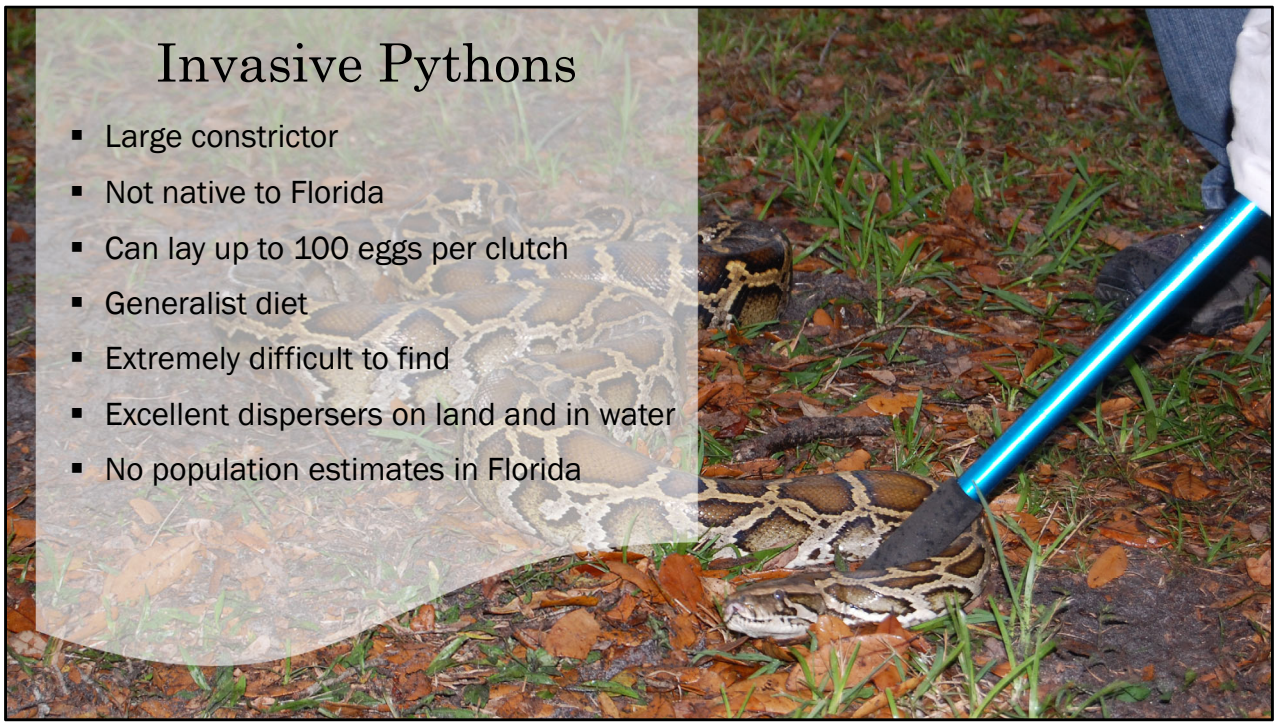
Nonnative Wildlife in Florida

Florida's subtropical climate is conducive to the establishment and expansion of many nonnative species including pythons, large lizards such as tegus, monitors and iguanas, many freshwater fish species and even mammals. Over 500 different species have been documented in Florida. Of these introductions, 125 species are estimated to have reproducing populations.

The FWC's Nonnative Fish and Wildlife Program is charged with determining which nonnative fish and wildlife species may become established and cause a problem for Florida's ecology, economy or human health and safety. Those species causing adverse impacts or are likely to cause adverse impacts are considered invasive.

The majority of Florida's invasive species became established after they either escaped or were illegally released from captivity.

Photos:
Left: Nile monitor in southeast Florida (FWC)
Center: Yellow anaconda was removed from Myakka River state park in Sarasota County, Florida on March 29, 2018 (FDEP)
Right: Mongoose removed from south Florida (FWC)



Burmese pythons may be one of the most well-known invasive species in Florida. This large constrictor snake, native to southeast Asia, can grow to be over 20 feet in length. Possessing many traits common to successful invasive species, pythons have high reproductive output, a generalist diet and can tolerate a variety of habitats. As adults, they lack natural predators in Florida. Their diet in Florida consists of mammals, birds, and reptiles including alligators. Pythons have also been documented to consume white-tail deer.

Pythons are well established in south Florida, utilizing vast natural areas. This cryptic species is hard to detect even in grass as short as 3-6 inches high. Though estimating population size has not been possible due to low detectability, to date, over 8,000 pythons have been observed or removed from Florida and reported to the FWC since 1979. The combination of low detection rates and harsh and difficult to access habitat has challenged the FWC and other public land manager's ability to remove or control the presence or spread of this species.

In their native range, python numbers have dwindled. This population decline is likely due to extreme habitat loss and increasing human population. Pressure from animal trade has also contributed to their decline in Asia.

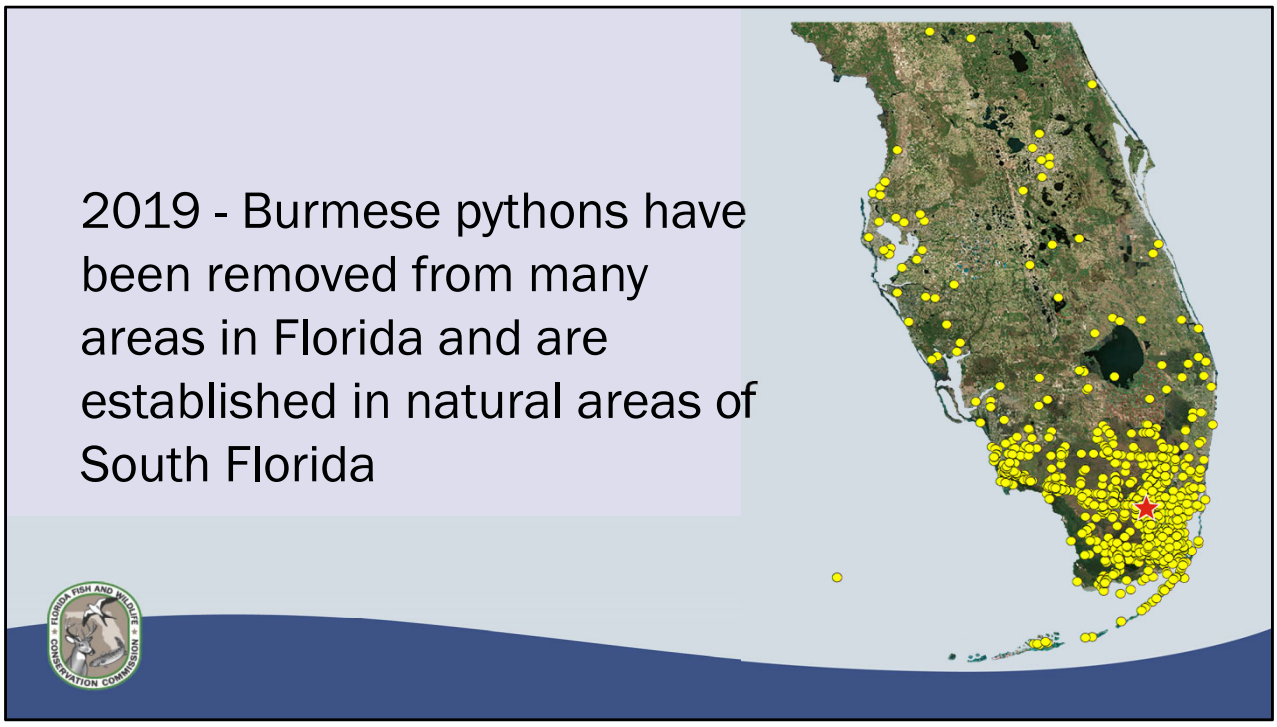
How Pythons Got Here

- 1960's-early 2000's: Booming python pet trade
  - Unwanted pets released
  - Likely multiple introductions
- 1979: First python documented in Florida's environment in Everglades National Park
- 1992: Hurricane Andrew destroyed breeding facility
- Spread across south Florida's natural areas

A misconception exists regarding how pythons became established in Florida. Some believe Hurricane Andrew in 1992 caused the python problem, but pythons had been detected prior to that hurricane event. Since the mid 1900s, Burmese pythons were a popular pet in the live animal trade due to their beautiful markings and low cost coming out of southeast Asia. Importation data from 1989-2000 indicates that Burmese pythons were the fourth most popular snake brought into the U.S. From 1999-2006, federal importation data show over 99,000 individual Burmese pythons were imported to the U.S. Breeders and vendors sold python hatchlings to buyers. Within a few years 12 inch hatchlings can grow to unmanageable sizes for many people. Captive pets can grow ~8 inches/month; among the fastest recorded for all snakes and females can reach maturity in 3 years. We will never know the exact cause of the invasion, but several introduction events likely occurred in multiple locations across south Florida. The first documented Burmese python in the wild occurred in1979 along Tamiami Trail on the northeast end of Everglades National Park. Cryptic species, like pythons, can go undetected and impacts can be unrecognizable until the point of eradication is not possible. In 1992, a category 5 hurricane (Andrew) added to the python problem by destroying a breeding facility near Homestead that resulted in the release of additional pythons.

Photo: Python nest removed by a FWC paid hunter – some of the 39 eggs.

The first documented Burmese python was found in Florida in 1979 near the northeast portion of Everglades National Park. The star on this map indicates the location of that python.



Pythons are now established at least as far south as Key Largo and possibly further in the Keys, north to Loxahatchee National Wildlife Refuge, where they have been documented in low numbers on the east coast of Florida, areas south of Lake Okeechobee, and west through Collier County. The points on this map indicate confirmed python observations or removals. Points north of the known breeding range are likely escaped or released captive animals.

Impacts from Invasive Pythons

- Predator of native wildlife
  - Mammals
  - Birds
  - Reptiles
- Introduced parasites and disease
  - Pentastomes
  - Nidovirus

Pythons are considered an invasive species in Florida due to their adverse impacts on native wildlife. Pythons are dietary generalists, consuming a diversity of prey species. They consume mammals, birds and reptiles including large prey items, such as whitetail deer (pictured here in a python removed by the Conservancy of SWFL) and endangered/threatened species, such as the Key Largo Woodrat.

Researchers continue to learn more about the ecological disease and parasite risk that pythons pose to Florida. It is now known that pythons brought a parasitic Asian species of pentastome (a crustacean) to Florida. This parasite lives in the lungs and can be passed to native species of snakes. Recent research indicates that the parasitic pentastomes are now spreading independently of pythons and have been found from Key Largo to Volusia County. Other emerging disease risks including nidovirus, may impact native species of snakes, but the extent or impacts of this virus on Florida's wildlife are not fully understood.

Photos:
Right: Python removed by Conservancy of SWFL.
Left: The large bulge in the body of the python was a white-tail deer that was subsequently regurgitated by the python.

Burmese Python Diet

- Mammals
  - 70% of diet
  - 23 species of mammals
- Birds and reptiles
  - 30% of diet
  - 43 species of birds
  - 2 species of reptiles

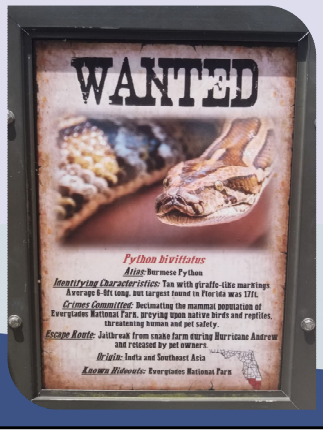
Many python diet studies have been conducted in Florida. These studies indicate that mammals may make up 70% of their diet, including 23 different species. The federally endangered Key Largo Woodrat has been documented in at least one python.

Pythons are also known to consume 43 species of birds and at least 2 species of reptiles, making up about 30% of their diet. Pythons have been found on tree islands in the Everglades targeting bird rookeries. Studies have documented python consumption of the Roseate Spoonbill (state-threatened) and the American Wood Stork (federally threatened). Both of these species are considered indicator species of Everglades restoration.

Photo:
Top: Burmese python with large prey item in stomach (NPS).
Bottom: Gut contents removed from a Burmese python: Roseate Spoonbill and Pied-billed Grebe (UF).

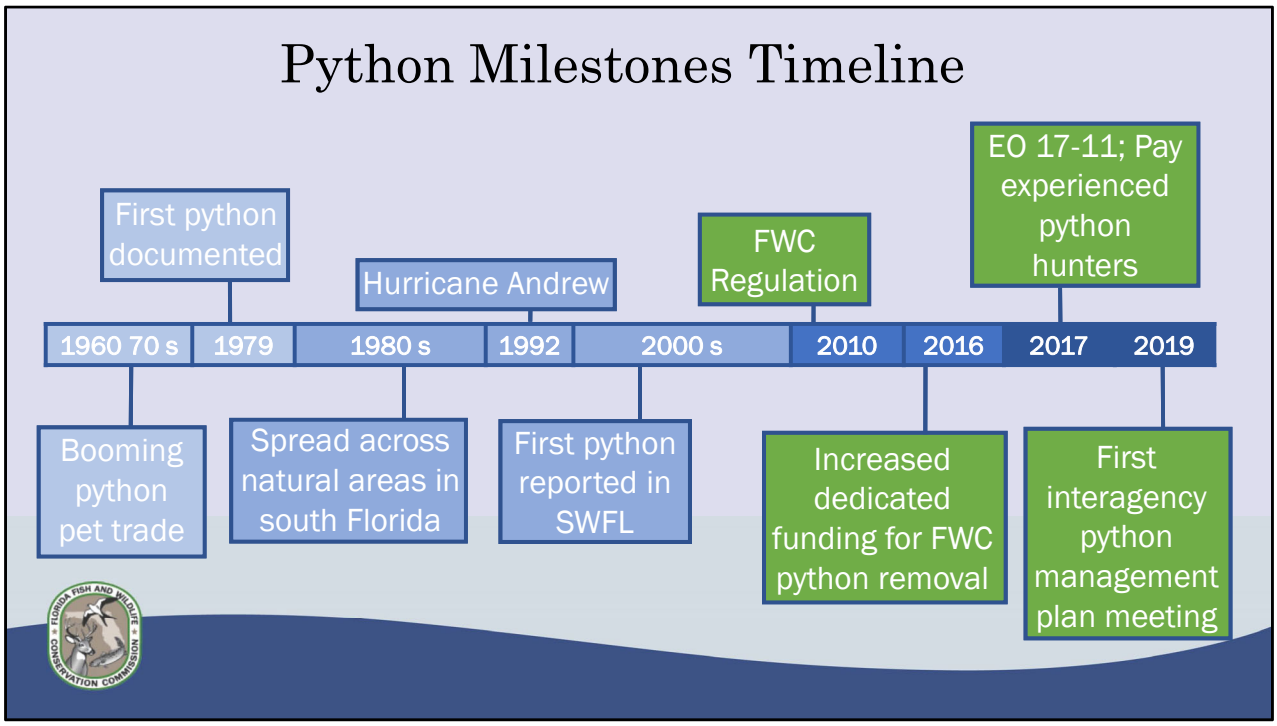
Overarching Python Management Goals

- Minimize adverse impacts to ecology of Florida
- Prevent new introductions and spread of established population
- Engage with partners and stakeholders in management process



Due to their cryptic nature, pythons are incredibly hard to find; thus, we do not have a population estimate for them in Florida and extirpation is unlikely with current technology and available tools. Land managers can mitigate impacts and increase ecosystem function if pythons are removed as much as possible. The FWC's management goals include minimizing adverse impacts to Florida ecology, preventing spread and establishment of new populations, and engaging with partners and stakeholders in the management process.

Photos:
Left: FWC staff during a safe capture demonstration (FWC).
Center: Python outreach flier.
Right: FWC public meeting (FWC).



The FWC has been engaged in this issue for a long time. In 2008, FWC started regulating large nonnative constrictor snakes by putting in rule the Reptiles of Concern language. This regulatory action required pet owners to register pythons as pets with the FWC. In 2010, Burmese pythons along with 7 other reptile species were added to the Conditional list under Rule 68-5 F.A.C., that limited future possession to research, commercial or public exhibition uses. During the next few years, the FWC ramped up efforts to remove pythons that included developing multiple approaches to public removal such as allowing removal on public lands through a permitting process, providing educational events such as the Python Challenge events, and training members of the public on what to do when they encounter a python.

In 2017, FWC removed regulatory barriers to public removal by issuing Executive Order 17-11 that allows for year-long take of nonnative reptiles, including pythons on 22 public lands without a permit or hunting license. That same year, the FWC launched a program to pay experienced people to remove pythons from some public conservation lands. More recently, the FWC has taken lead on python control coordination.

The FWC has Constitutional authority to manage Florida's fish and wildlife resources. The FWC has responsibility at a statewide level to ensure the long-term well-being of native wildlife. The FWC implements that role through awareness and education, research support, regulation and enforcement, control/management and coordination.

Photos:
Left: Burmese python (FWC).
Right: FWC staff providing a safe capture demonstration at Everglades Holiday Park (FWC).

Awareness and Education

- Python Challenge™
  - Worldwide awareness
  - Thousands of participants
- Public Identification and Capture Training
  - Over 2,400 trained
  - 167 classes
- Exotic Species Hotline
- Sportsman's Community

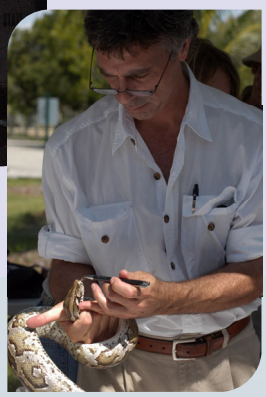
Image courtesy of Dave Steen

The FWC has emphasized the importance of public awareness and education on invasive species and Burmese pythons have been the "poster child" for those efforts. Engaging the public through a variety of programs and initiatives and encouraging people to participate in these programs is a primary goal of the FWC. In 2013 and 2016, the FWC hosted the ground-breaking Python Challenge™ as a way to remove pythons from the wild, but also to educate the masses on this important topic. These events were very popular, attracting visitors from all over the country and received worldwide media attention. The FWC also trains people on how to identify, report, and safely capture Burmese pythons. Since 2015, our staff have provided 167 trainings to over 2,400 people. The FWC also encourages the public to report sightings of nonnative wildlife to the FWC through the Exotic Species Hotline (888-IVEGOT1). The FWC continues to support opportunities for the sportsman's community to engage in python removal. In cooperation with partners, staff will be participating in an upcoming youth hunt for pythons in south Florida.

Photos:
Left: Eric Sutton at the 2013 Python Challenge™ awards ceremony (FWC).
Right: Photos of the 2016 Python Challenge™ (FWC and Dr. David Steen)

Regulation and Enforcement

- Rule 68-5. F.A.C.
  - Listed as “Conditional” in 2010
  - Not allowed as pets
  - Permit required for import, research, exhibition, commercial sales
- Executive Order 17-11
- Exotic Pet Amnesty



DON'T LET IT LOOSE!
BE A RESPONSIBLE PET OWNER

As the State agency with regulatory authority and enforcement capability, the FWC has also taken steps to regulate this invasive species. In 2010, the Burmese python was listed as Conditional. This status requires a permit for possession for research, exhibition or commercial sales. Personal possession of pythons is no longer allowed in Florida. The federal government in 2012 added Burmese pythons to the Injurious Species List under the Lacey Act requiring a permit from the U.S. Fish and Wildlife Service for importation into the U.S. Pythons are not protected and can be lethally taken year-round. Pythons can be humanely killed on private lands at any time with landowner permission and the FWC encourages people to remove and kill pythons from private lands whenever possible. Lethal take of pythons on our Wildlife Management Areas through hunting activities had been authorized in 2009 to help remove pythons by sportsmen. In 2017, the FWC removed barriers to lethal take on Commission-managed lands by issuing Executive Order 17-11 allowing year-round lethal take of all nonnative reptiles including pythons without a permit or hunting license on 22 Commission-managed lands in south Florida. The FWC also offers a legal alternative to the release of unwanted pets for people in possession of Burmese pythons through our Exotic Pet Amnesty Program.

Photos:
Left: FWC Law Enforcement with captured python. (FWC)
Right: Veterinarian examines a python surrendered at an Exotic Pet Amnesty Day event. (FWC)

Providing support to researchers is another priority for the FWC. Management decisions are science-based and staff rely on university and other research partners to fill knowledge gaps on this species and explore innovative solutions to the python problem. Research efforts have historically focused on diet and detection. Recent increases in State funds provided by the Florida Legislature have provided the FWC the opportunity to focus on refining existing detection and removal tools and developing new innovative ways to find and remove pythons.

Photos:
Left Bottom: University of Florida staff conducting necropsy of Burmese python (UF).
Center: University of Florida Irula tribe study (UF).
Top: University of Florida eDNA study (UF).

Research Support

Future Opportunities

- Innovative detection technology
  - Infrared
  - Drones
  - Sound waves
  - Lures
- Pheromone manipulation
- Python specific trap

With continued advances in technology, the search for a solution to the python challenge is ongoing. The FWC continues to support research and development of innovative detection and removal tools.

Photo: FWC, USDA and private industry testing an innovative python detection tool using sound waves in water (FWC).

The FWC relies on coordination and collaboration with partner agencies and organizations to address the problem across geopolitical boundaries. Although research has been helpful in developing and refining our ability to detect and remove pythons, a “silver bullet” does not exist to control pythons yet. Various tools and techniques exist to find and remove pythons, and collectively partners use a multi-faceted approach to management of pythons.

Photos:
Top: PATRIC member with captured python (FWC).
Center: PATRIC member with captured python (FWC).
Bottom: University of Florida detection dog team (UF).
Background: PATRIC member with captured python (FWC).

Control and Management
Contracted Python Removal

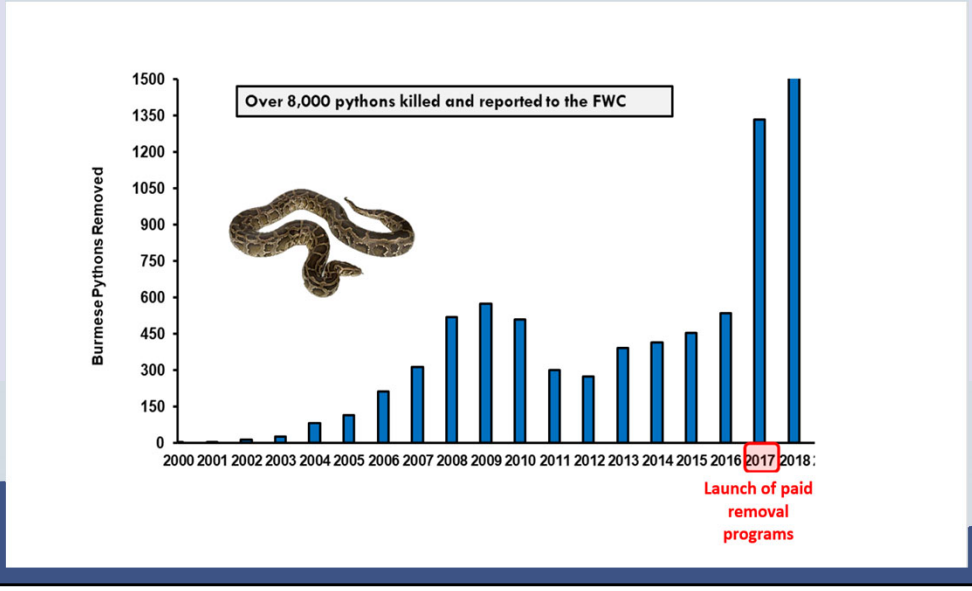
- NPS Authorized Agents
  - Everglades National Park
  - Big Cypress National Preserve
- SFWMD Python Elimination Program
- FWC's Python Action Team – Removing Invasive Constrictors (PATRIC)

Map to be updated

One of the most effective tools for removing pythons is utilizing people experienced in python removal. State and federal agencies utilize this technique through staff, volunteer programs and paid experienced python hunters.

Photo: Map indicating areas where members of the public can remove Burmese pythons.

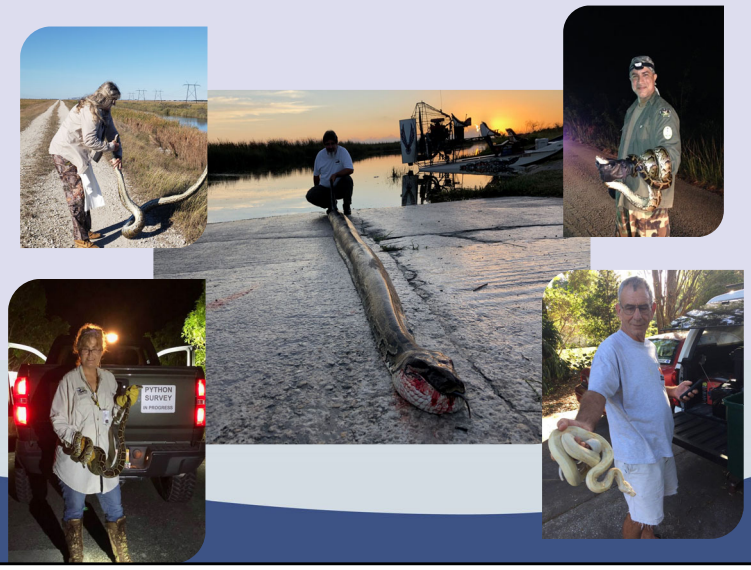
Control and Management
Impact of Contracted Python Removal



Since the South Florida Water Management District and the FWC launched programs that pay people experienced in python removal in 2017, python removals have increased dramatically. National Park Service staff also noted an almost 160% increase in python removals within Everglades National Park once paid python removal began inside the Park by FWC.

Control and Management
Python Action Team – Removing Invasive Constrictors

- 42 expert team members
- Over 500 pythons removed
- Work on public lands
  - Commission-managed lands
  - Federal lands



The FWC compensates people experienced in python removal by contracting them to conduct surveys on public lands and to respond to reports of large nonnative constrictors received across the State. This program began in April 2017, with 25 people, but it has expanded to include 42 people that can now work on state and federal properties including several Wildlife Management Areas, Everglades National Park, Big Cypress National Preserve, and Biscayne National Park. To date, hunters have removed over 500 pythons from the wild.

Occasionally, the FWC will receive reports of large nonnative constrictors through the Exotic Species Hotline (888-IVEGOT1). If available, PATRIC team members are sent to capture it and prevent new populations from establishing in new areas.

Photos: FWC PATRIC members with captured pythons.

Control and Management
Detector Dogs

- Goal to detect pythons
- Previous detection dog research indicated this method as a potential tool
- Dog teams
  - Miccosukee tribe
  - FWC coming soon

Another promising tool includes using python detection dogs. These dogs are trained to alert to certain scents and they can be specific to species. Human search trials as compared to detector dogs revealed that dogs can find pythons more quickly than humans in a controlled situation, but they have limitations including a short work day, the need for specific environmental conditions in which to work, and the limits of their handler. However, using dogs to help determine if a python is in the area will help human searchers target specific areas.

An example of a successful targeted search occurred in 2016, when the FWC contracted with University of Florida to use detector dogs to find pythons along the edge of their known range; specifically in Key Largo. The dogs alerted to the presence of pythons and a few days later, the Irula tribe located 4 pythons.

Detection dogs have been used across the python's range, but currently only the Miccosukee tribe uses detector dogs to find pythons. The FWC will be advertising a request for proposals to operationalize a detector dog team in the upcoming fiscal year.

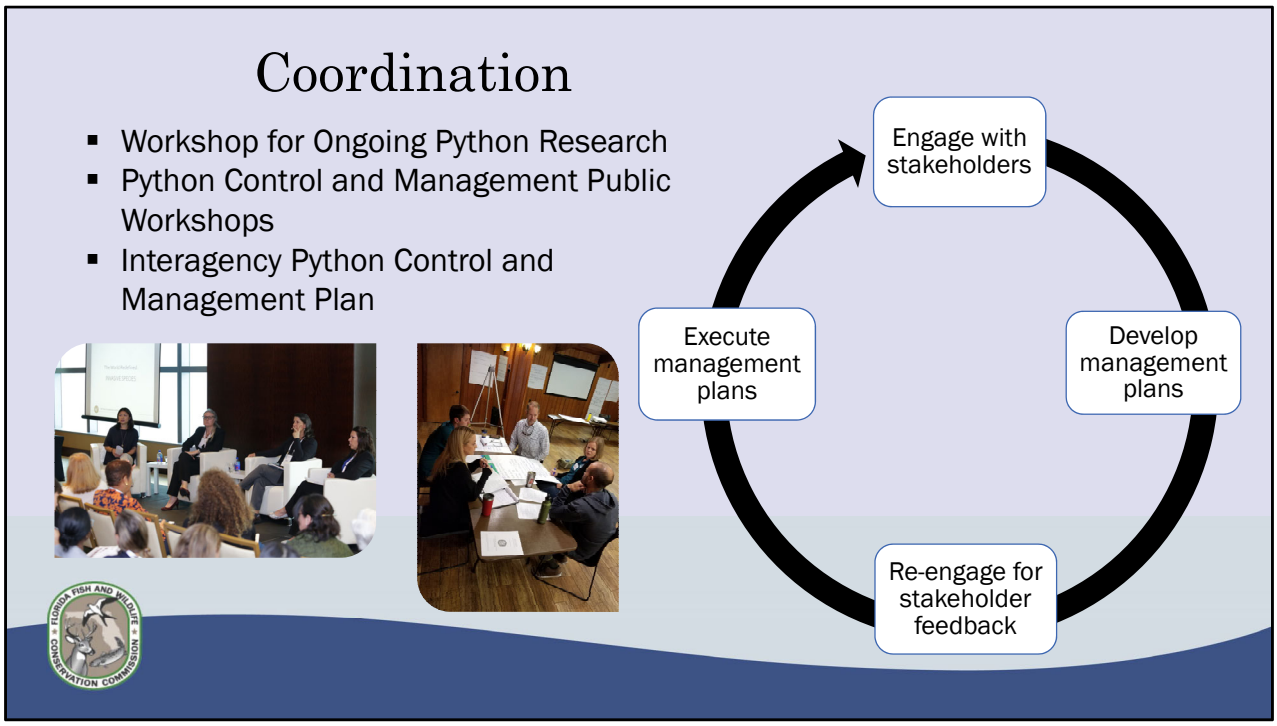
Photo: Detection Dog team from UF/Auburn University in 2016 study (UF).

Control and Management
Sentinel Snakes

- Goal to remove reproductive females and learn behaviors
- Radio-tagged pythons
- Current locations
  - Big Cypress National Preserve
  - Rookery Bay National Estuarine Research Preserve

Another tool proving successful in certain parts of south Florida is the use of Sentinel snakes. Pythons are captured in the wild and appropriately sized individuals are fitted with a radio tag then rereleased at the point of capture. Through the use of telemetry, land managers are able to track the radio-tagged python to learn about behaviors, habitat use and movement patterns, and most importantly to target breeding aggregations during mating season. In the spring, pythons will form breeding balls of one female and multiple male suitors. The radio-tagged python, or Sentinel snake, can lead managers to not just one, but many reproductive adults leading to the removal of multiple individuals in areas that might not otherwise be searched. This tool, though effective, can be very expensive and labor intensive.

Photo: Conservancy of SWFL staff using telemetry to locate a radio-tagged python (Conservancy SWFL).



Ultimately, this effort requires a statewide collaborative team composed of interagency partners, and the FWC is leading the development of an interagency python control and management plan. This plan will help land managers align their goals and identify action items to address pythons across Florida. Partners clearly work across boundaries to cooperate and have been doing so for years; however, the State does not yet have a document that lays out the details and goals of python management. Agreed upon invasive species control and management plans have proven effective with collaborative partners (e.g. Melaleuca plan) and staff are striving to create this document for pythons now. To kickstart this process, the FWC hired an Interagency Python Management Coordinator with the support of Everglades National Park. The first meeting to develop this plan was held in Fort Lauderdale in April 2019 and the next will be held in Naples in August. Over the course of the next year, this interagency team will draft this plan and implement actions items in the field.

Photos:
Left: FWC staff discussing pythons on an invasive species panel at the 2019 International Leadership Conference for Women (FWC).
Right: Interagency Python Control and Management Plan Workshop 2019 (FWC).

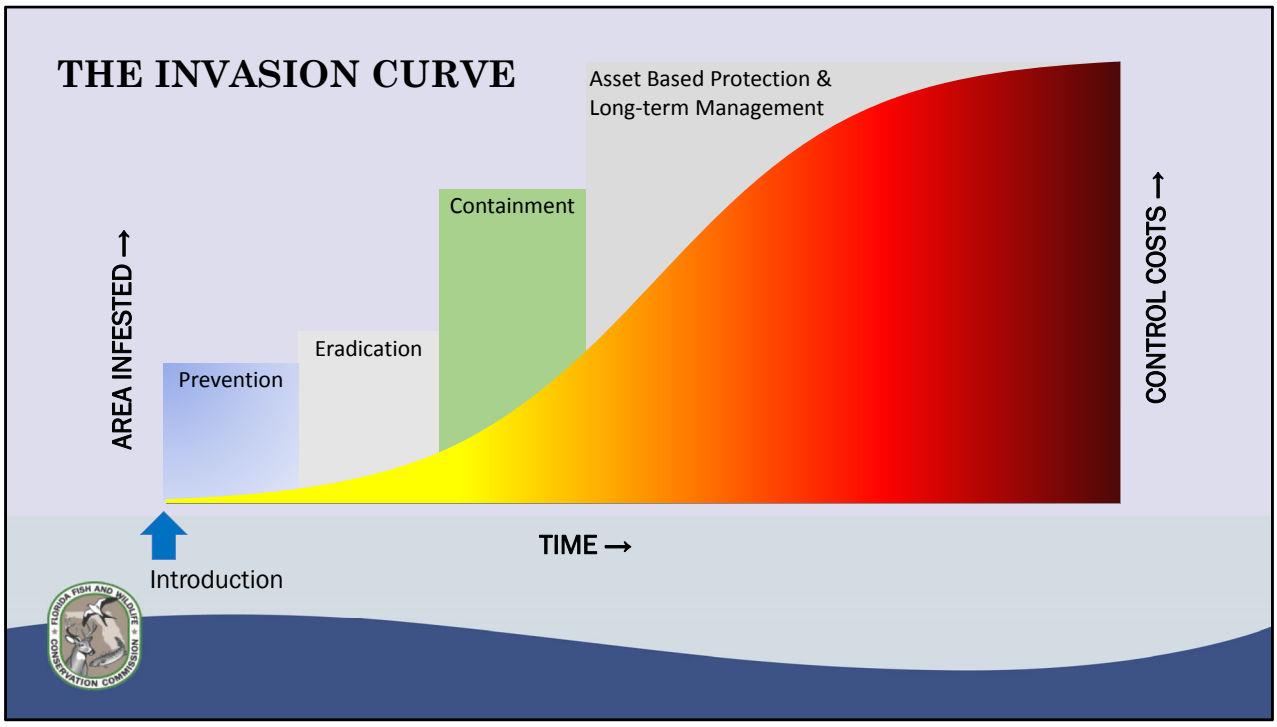
Summary: Where do we go from here?

- Increase research on detection and removal methods
- Add more experienced python hunters
- Expand areas of hunting
- Improve coordination among partners
- Increase public understanding, support and participation

- More pythons removed
- Range expansion reversed
- Fewer pythons on landscape
- Fewer impacts to native species

Photo:
Left: FWC Commissioner Kellam learning to capture pythons.
Right: FWC Commissioner Rood with FWC PATRIC member who captured a python at Everglades Holiday Park in 2019 (FWC).

The following slides are considered backup material and are not anticipated to be part of the actual presentation


THE INVASION CURVE
Asset Based Protection &
Long-term Management
Containment
Eradication
Prevention
AREA INFESTED →
CONTROL COSTS →
TIME →
Introduction

FY 19-20 Research and Contractor Projects

Category	Funds
PATRIC	$ 120,000
Detector Dogs	$ 115,000
Python Traps	$ 103,371
Mammal Lures	$ 92,972
IPMP Facilitation	$ 11,040
Nidovirus testing	$ 5,000
TOTAL	**$ 447,383**

FWC Outreach Effort

- Python brochures
  - English
  - Spanish
- FWC Website
- ECISMA newsletter
- Outreach events