



U.S. Geological Survey Nonnative Wildlife Research Updates

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1 - USGS Wetland and Aquatic Research Center

2 - USGS Fort Collins Science Center

3 - National Park Service Big Cypress National Preserve

4 - University of Florida

Research Focus

Primary Collaborators:



Primary Funders:

- USGS Greater Everglades Priority Ecosystem Science Program
- USGS Biological Threats and Invasive Species Research Program
- Office of Everglades Restoration Initiative
- National Park Service, Natural Resources Preservation Program

Core Field Team: Jose Torres, Judy Baird, Genesis Aponte-Santiago, Lisa McBride, Sarah Sherburne, Matt Metcalf



What's New? Recent Publications (2023-2024)

Python eats endangered Key Largo Cotton Mouse

- Lord IA, Redinger J, Dixon J, Hart KM, Guzy JC, Romagosa CM, Cove MV. 2023. Telescoping prey selection in invasive Burmese pythons spells trouble for endangered rodents. Food Webs: e00307.

Hatchling python eats two different rat species in one meal

- Evers T, Currylow A, Sandfoss M, McBride L, Romagosa C, Boone W, Guzy J, Anderson G, Hart K, McCollister M, Yackel Adams A. 2024. Double take: Ingestion of two rats by a juvenile Burmese Python (*Python bivittatus*) in Big Cypress National Preserve, Florida, USA. Reptiles & Amphibians, 31(1), e21283.

Python nest fails from flooding event

- Sandfoss MR, McBride LM, Anderson GE, Kissel AM, McCollister MF, Romagosa CM, and Yackel Adams AA. 2024. Flooding-induced failure of an invasive Burmese python nest in southern Florida. Reptiles and Amphibians, 31 (1), e21384.

Optimize camera trap surveys for pythons

- Cove MV, Dixon J, King K, Wilson M, and Hart KM. 2023. Survey optimization for invasive Burmese pythons informed by camera traps. Wildlife Letters. 1(3):143-148

USGS Python Vital Rate Collaborative Research

USGS + partners + stakeholders

Age-/size-specific survival rates

Sex ratios

Age/size at maturity

Reproductive output and frequency

Population growth rates

Dispersal

Benefits: Evaluate removal methods

- Develop management strategies
- Modeling population growth
- Inform potential novel control methods (i.e., genetic biocontrol)



BICY Scout Program

- Research focus, 2 sites: track pythons called “scouts”; social aggregation during breeding season
- **Turner (since 2017):**
 - 24 Scouts (10 M, 14 F)
 - 2024 season, 29 associates: 11F, 18M
 - 8 (7F, 1M) recruited to Scout Program
- **Loop (since 2022):**
 - 9 Scouts (5 M, 4 F)
 - 2024 season, 2 associates: 1M, 1F
 - 1 (M) recruited to Scout Program



Adult Python Survival

- Telemetry data
- Regional assessment
- 6 locations
- 241 individuals
- Spanning 19 years (2005-2024)

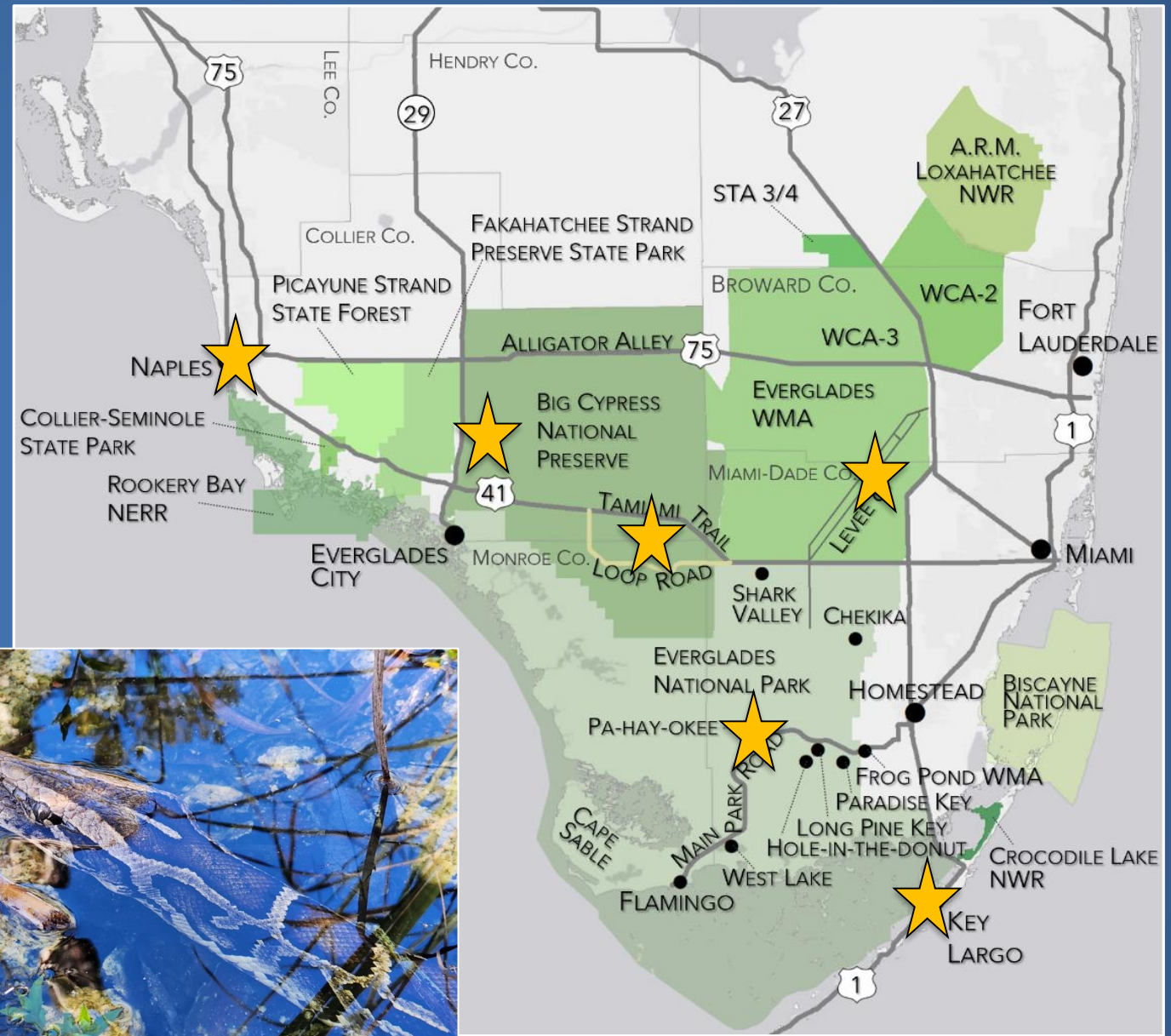


Photo Credit: Gretchen Anderson



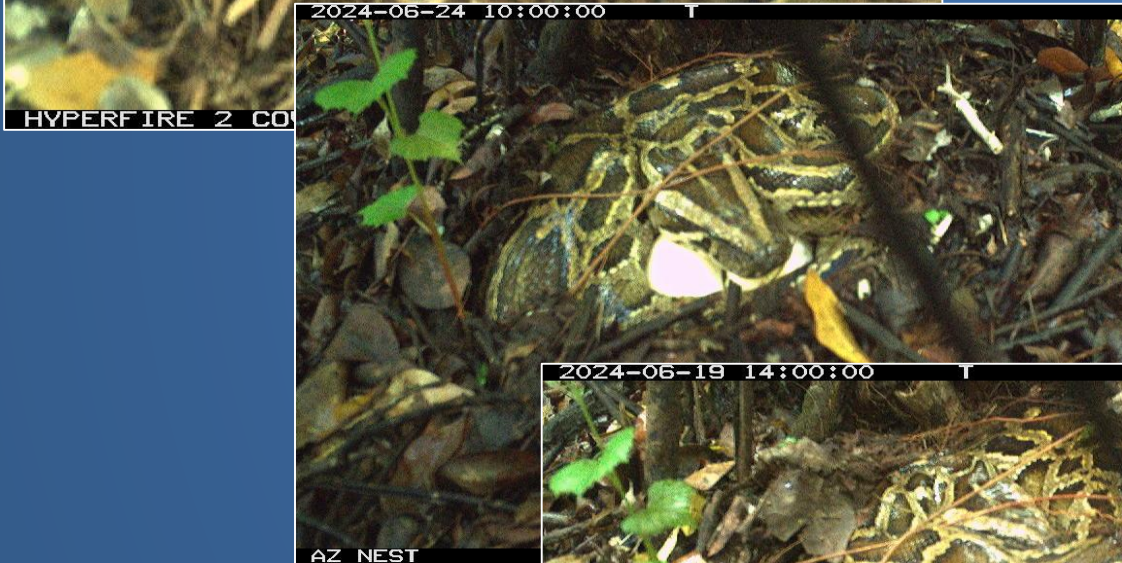
Hatchling Python Survival

- Survival rates
- Habitat use
- Behavior
- Growth rates: size at maturity informs reproductive output

- 2020: 12 tracked
- 2021: 22 tracked
- 2022: 50 tracked
- 2023: 27 (hatched) + 7 road cruised
- 2024: in progress...







Preliminary Information-Subject to Revision. Not for Citation or Distribution.

Female Scout Nesting in 2024

- Turner: 8 females successfully oviposited
 - Additional female died prior to oviposition of 102 eggs (car strike?)
 - 2 additional nests found by contractors
- Loop: 2 females successfully oviposited

Across both sites we observed 3 females lay a 2nd nest for the 1st time in program history

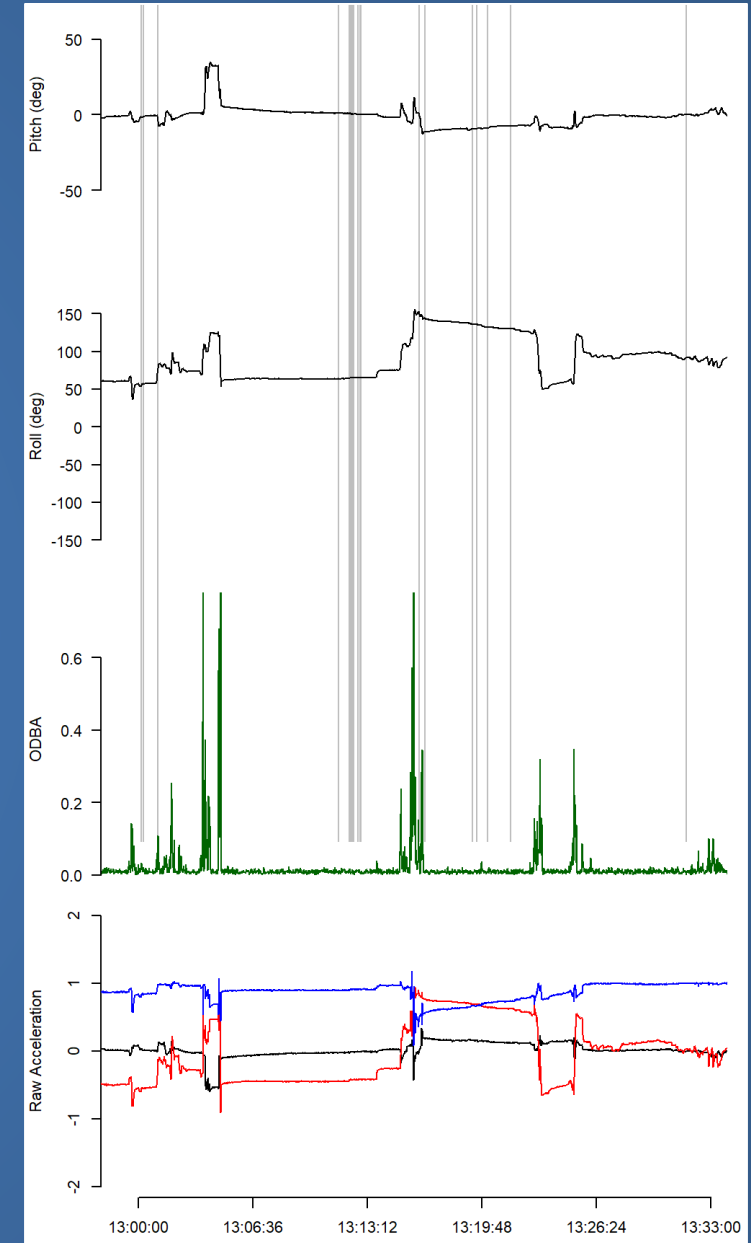
- Python AQ: 2021, 2024
- Python AW: 2022, 2024
- Python AZ: 2022, 2024



Photo credit: Lisa McBride

Feeding Frequency

- Acceleration data loggers (ADLs)
- Feeding trials to define signature
- Free-ranging python observations
 - 4 females in deer-occupied areas of Turner
 - Obtaining visuals 2x/week: look for signs of bolus or deer ingestion

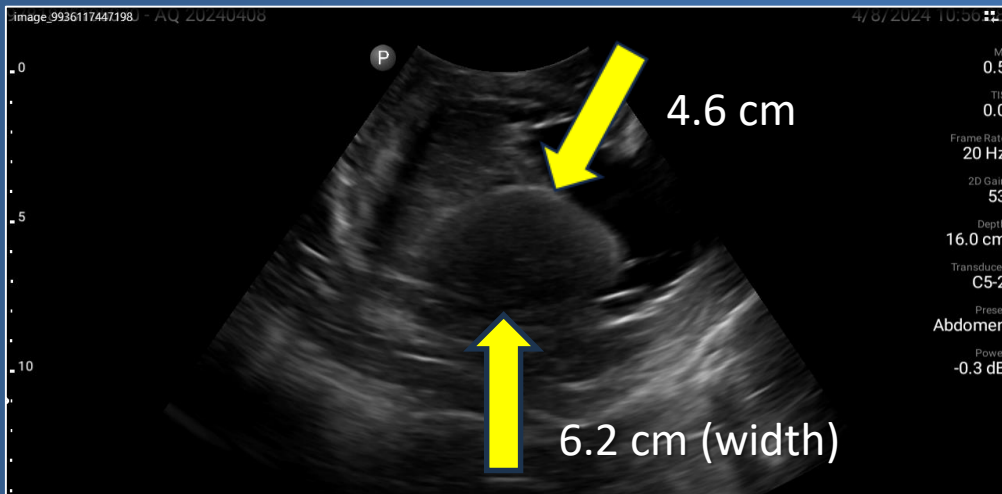


Python Reproductive Physiology

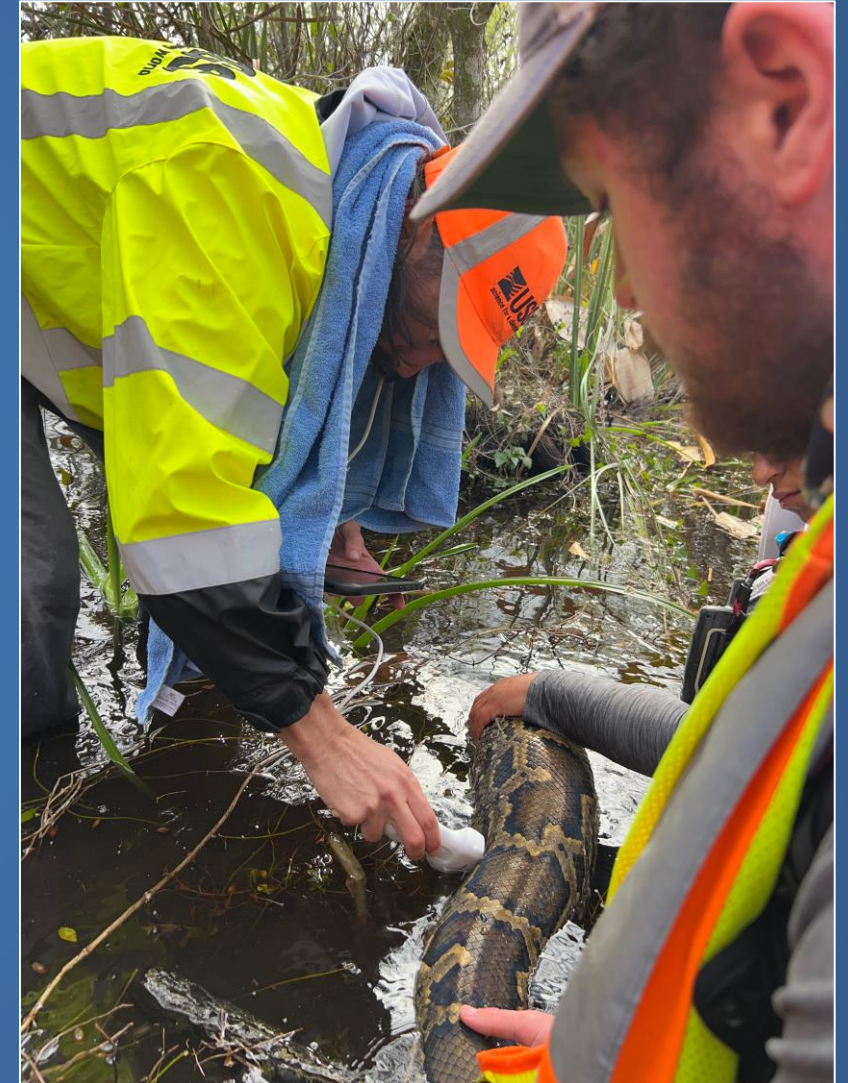
Understand factors affecting reproductive timing + success

Female Ultrasonography

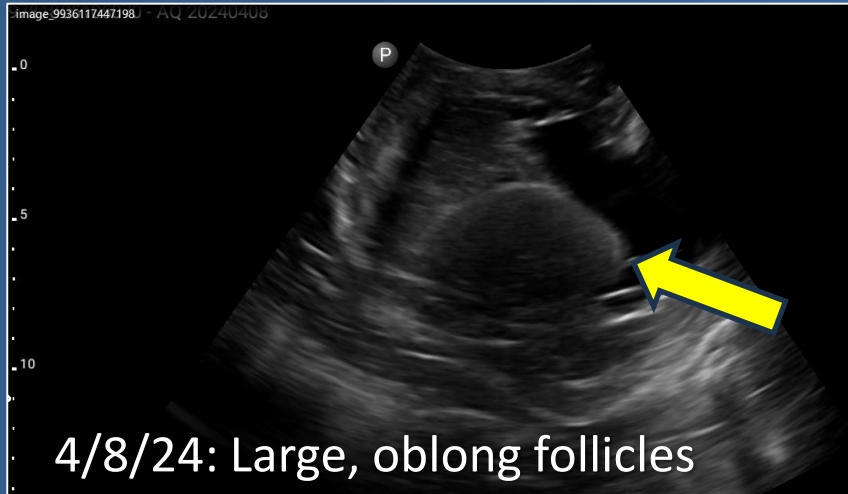
- Characterize follicular development
- Identify gravid females for study animals



Python AQ on 4/8/24: Large, oblong follicles, hyperechoic, likely post-ovulatory stage, preparing to shell – predicted to lay 2024

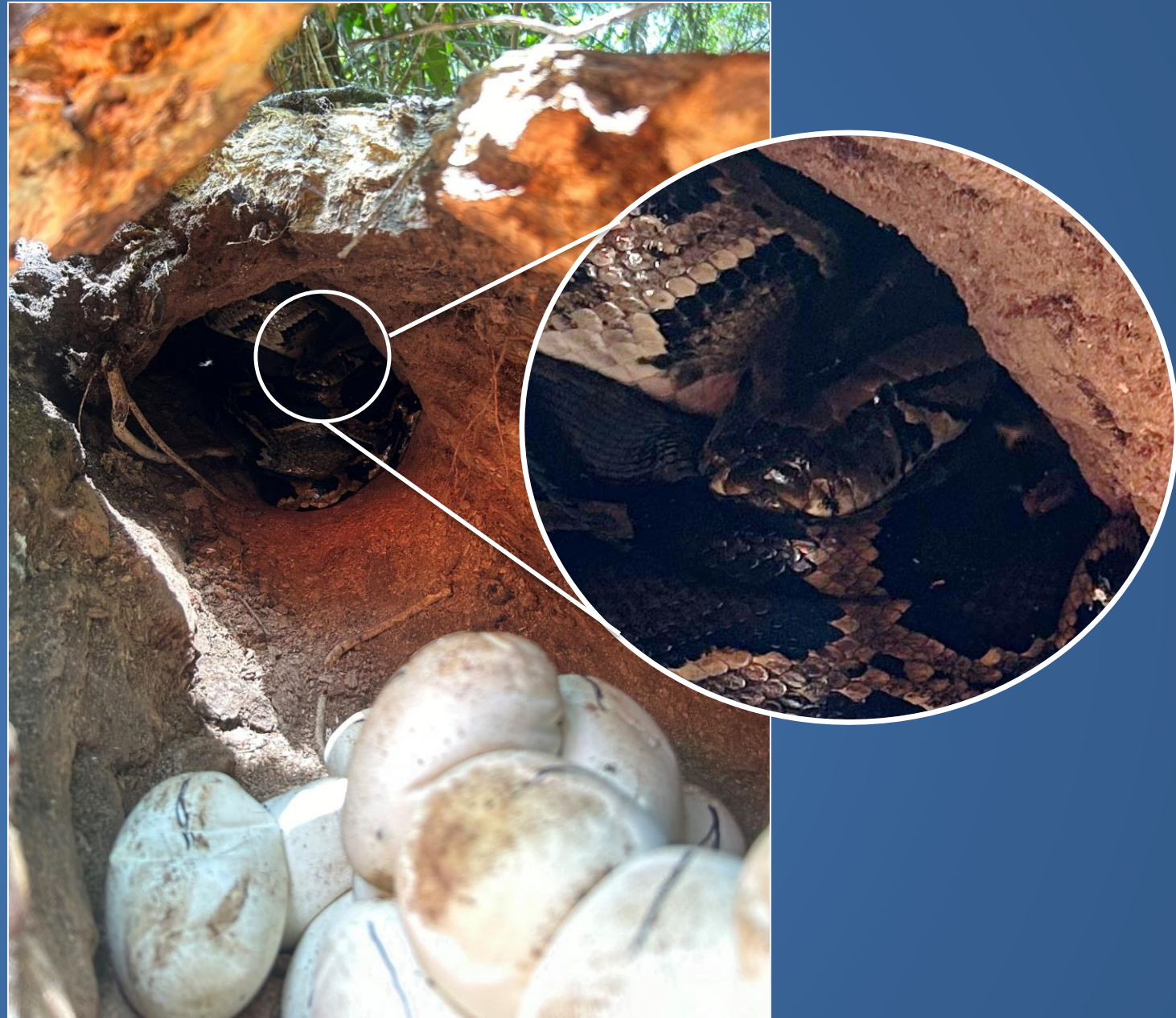


Python "AQ"



5/24/2024

- 52 eggs, 100% fertility
- 2nd recorded nesting event



Python Semen Collection and Analyses



Evaluate population and seasonal variation in male sperm quality

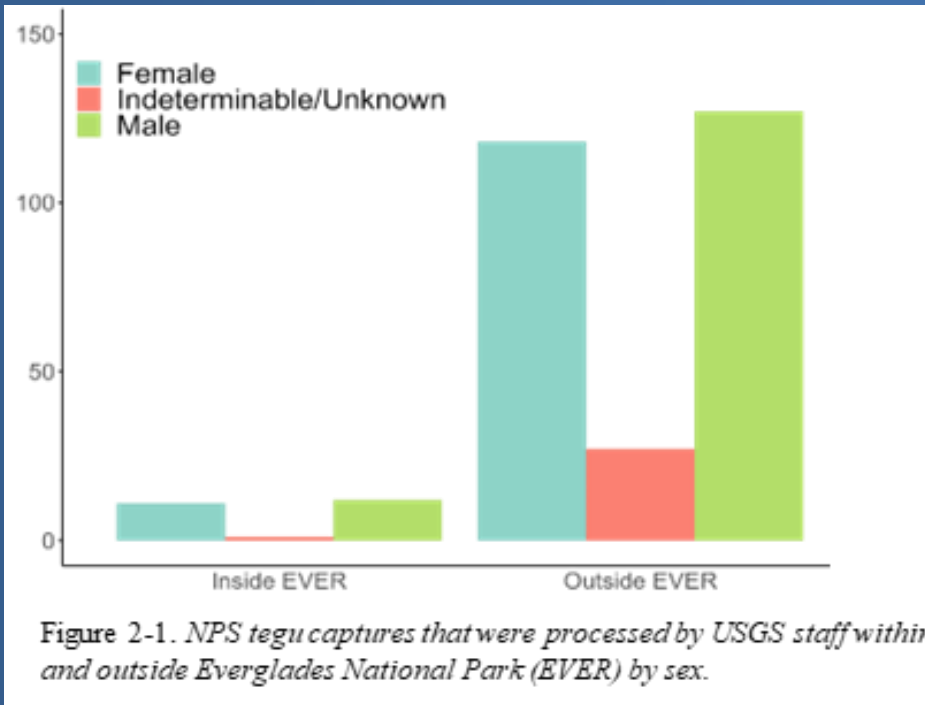
Assess potential for sperm competition; females may mate with multiple males

Develop techniques for potential genetic biocontrol methodology



Additional Invasive Reptile Projects

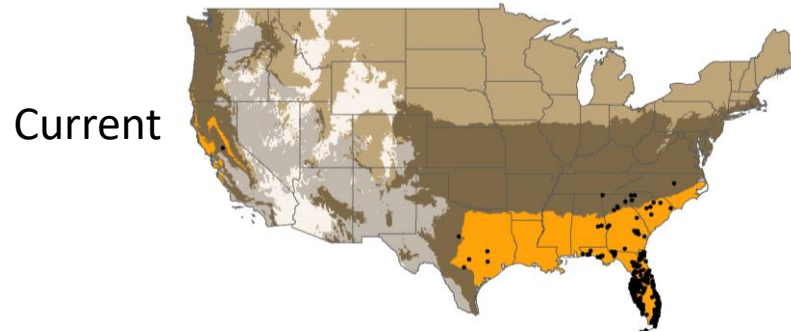
- Tegus Surveillance (since 2016 around Everglades NP)
 - 10-yr stationary and mobile EDRR cameras monitored
 - ~ 300 tegus removed from the area by NPS; necropsied by USGS



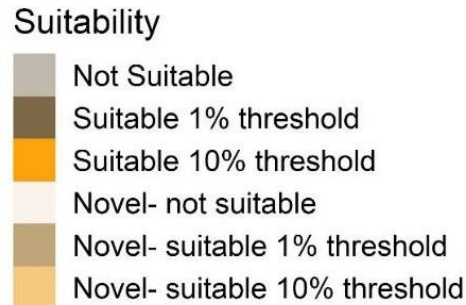
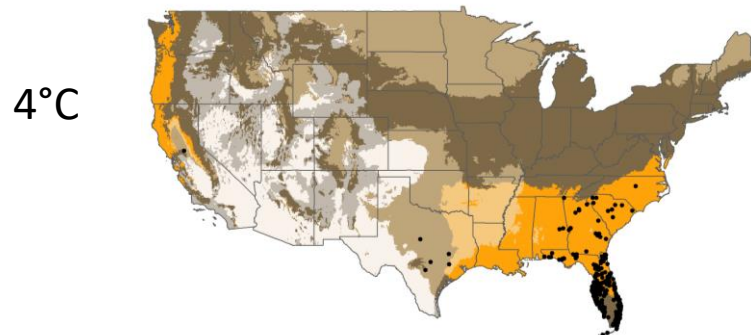
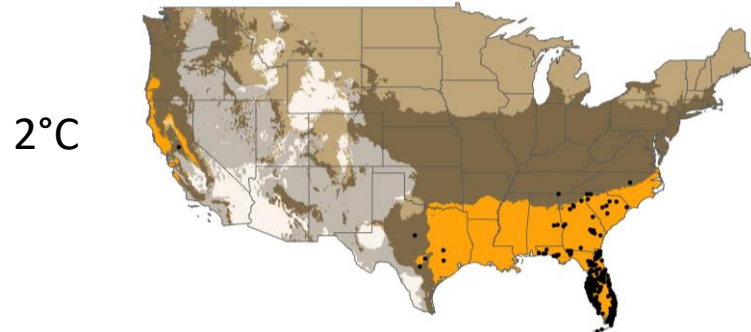
Modeling Distribution of Invasive Tegus Under Climate Change Scenarios



Proportion of state with suitable habitat



- Updating Jarnevich et al. 2018
- Will climate change result in more suitable habitat for tegus in North America?
- Modeled 3 scenarios: current conditions, 2° and 4°C warming
- Binned habitat suitability: highly suitable, likely suitable, and not suitable
- Quantified changes in habitat suitability by state
- Help develop and enforce regulations



Early Detection Rapid Response Tools for Invasive Reptiles

- Goal: Increase detection in new areas while minimizing human effort
- Methods:
 1. Automated workflow for analyzing camera trap images (tegus)
 - Cameras deployed and left for long periods
 - Minimal equipment and people power
 2. Terrestrial eDNA (tegus & brown treesnakes)
 - Minimally invasive (no equipment left behind)
 - No visual required

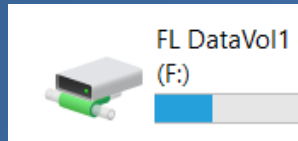


Evaluating Early Detection Rapid Response for Invasive Tegus

1. Automated workflow for detecting tegus from camera trap images



Deploy cellular trail cameras with bait cages



Cell cams email photos; automatically downloaded (Power Automate)



Analyze photos using Megadetector algorithm

Which method is more useful for managers (effort, time to detection)?

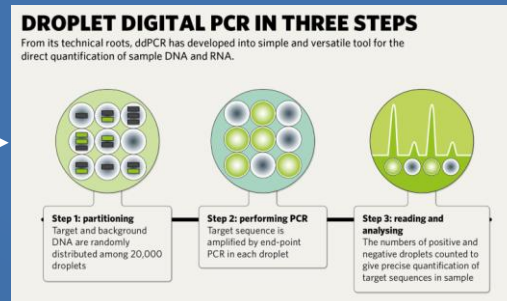
2. Detecting tegus via terrestrial eDNA



Sample substrate for eDNA using paint roller



Submerge paint roller in water, agitate, and filter water



<https://www.nature.com/articles/d42473-020-00123-x>

Analyze filter using droplet digital PCR to determine if tegu DNA is present



Notify NPS of tegu detections in new areas



NPS deploys traps with goal to suppress or eradicate tegus in 'newly' occupied area



Continued UF/USGS Research Internship Opportunities

- Began 2014
- Dr. Christina Romagosa
- USGS

- Field Labor

- Mentoring
 - Invasive species issues
 - Publications
 - Grad School
 - Networking



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Questions?

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Video Credit: Isaac Lord



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RECONYX

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