

# Current Python Science

*USGS and Collaborators*

Brian J. Smith

Contracted to USGS



**EVERGLADES CISMA**

# 3 Updates

- USGS in Davie
- USGS in Everglades National Park
- Collaborators in SW Florida

# USGS in Davie

Kristen Hart, Mike Cherkiss, Brian Smith, Thomas Selby, Andrew Crowder, Hayley Crowell

Summer interns Devon Nemire-Pepe and Luke Stevens

# Current Projects

Telemetry and “Judas” Snakes

Diet

Impacts to Native Fauna

eDNA

Testing New Biologging Tools

Python Facility in Davie

# Telemetry and “Judas” Snakes

Translocation Paper  
*published*

Telemetry Paper  
*in revision*

Breeding Aggregation Note  
*in press*

“Judas” Technique Paper  
*in prep*

# Translocation Paper

*Published!*

biology  
**letters**

[rsbl.royalsocietypublishing.org](http://rsbl.royalsocietypublishing.org)

Research



**Conservation biology**

Homing of invasive Burmese pythons in South Florida: evidence for map and compass senses in snakes

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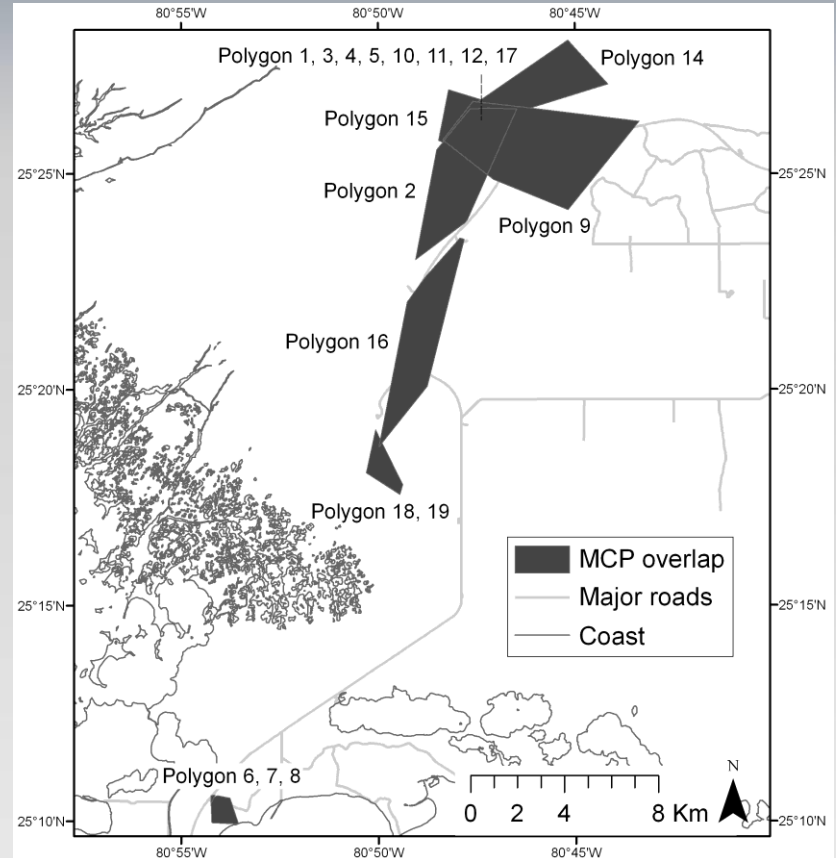
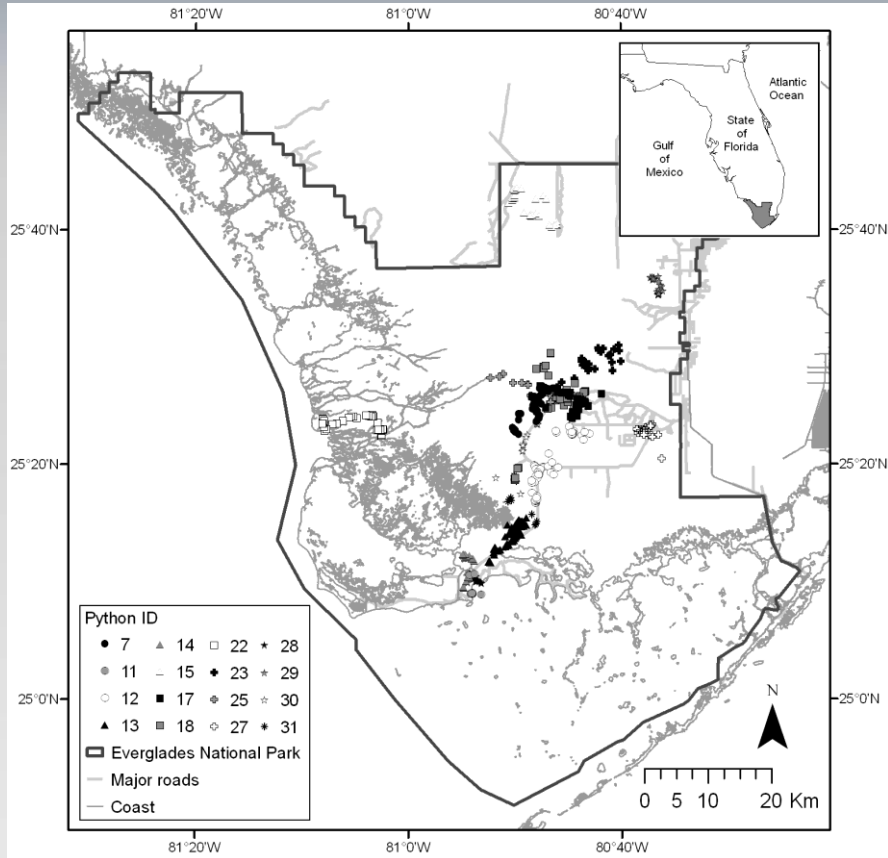
Shannon E. Pittman<sup>1</sup>, Kristen M. Hart<sup>2</sup>, Michael S. Cherkiss<sup>2,3</sup>, Ray W. Snow<sup>4</sup>,  
Ikuko Fujisaki<sup>3</sup>, Brian J. Smith<sup>2</sup>, Frank J. Mazzotti<sup>3</sup> and Michael E. Dorcas<sup>1</sup>

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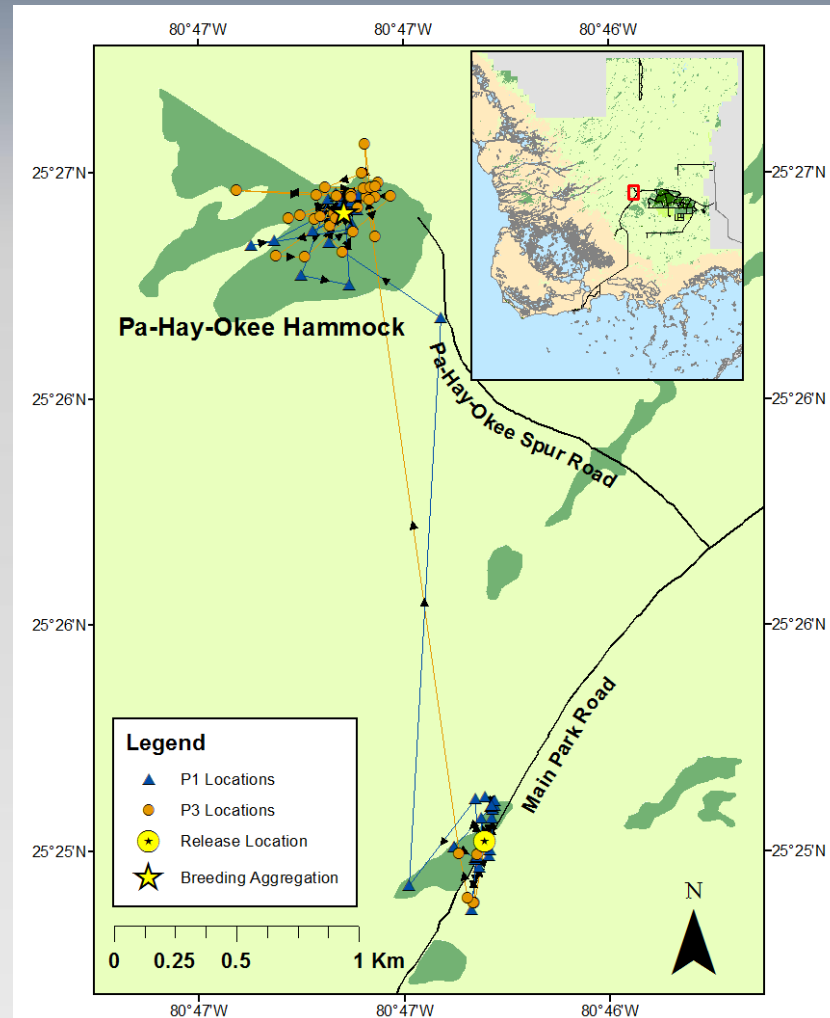
# Telemetry Paper

*In revision*



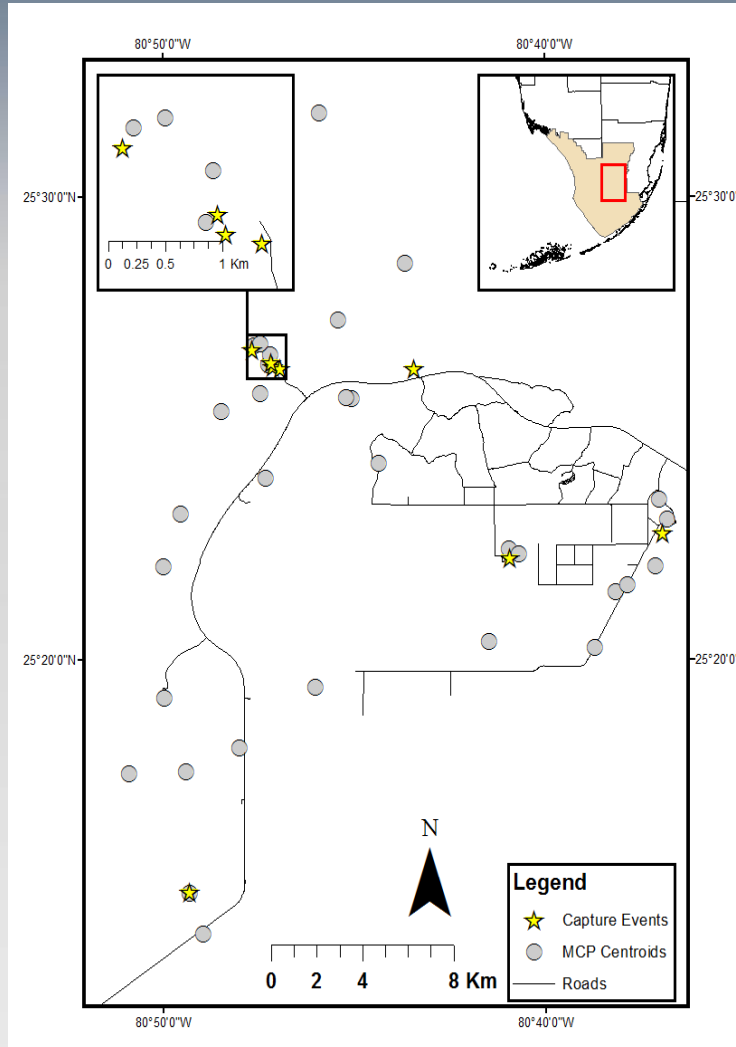
# Breeding Aggregation Note

*In press (Southeastern Naturalist)*



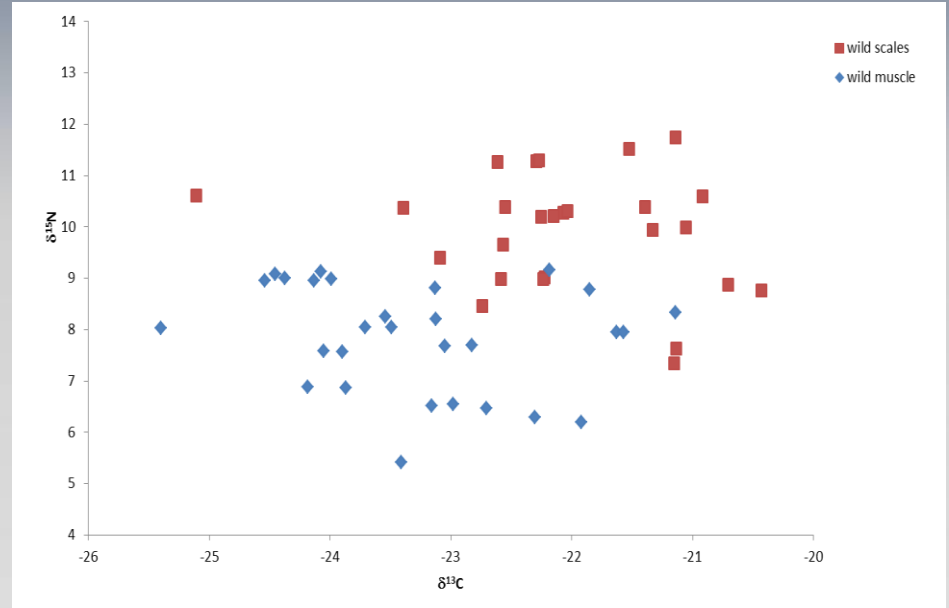
# “Judas” Technique Paper

*In prep*



# Diet

Gut contents, stable isotopes, genetics



- Diet Paper, in prep, Cherkiss & Mazzotti
- Proposal in for genetic ID of gut contents (Hunter & Hart)

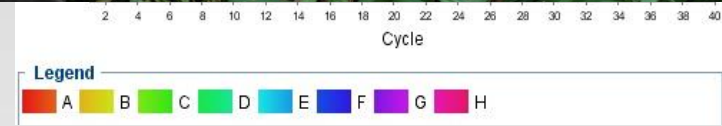
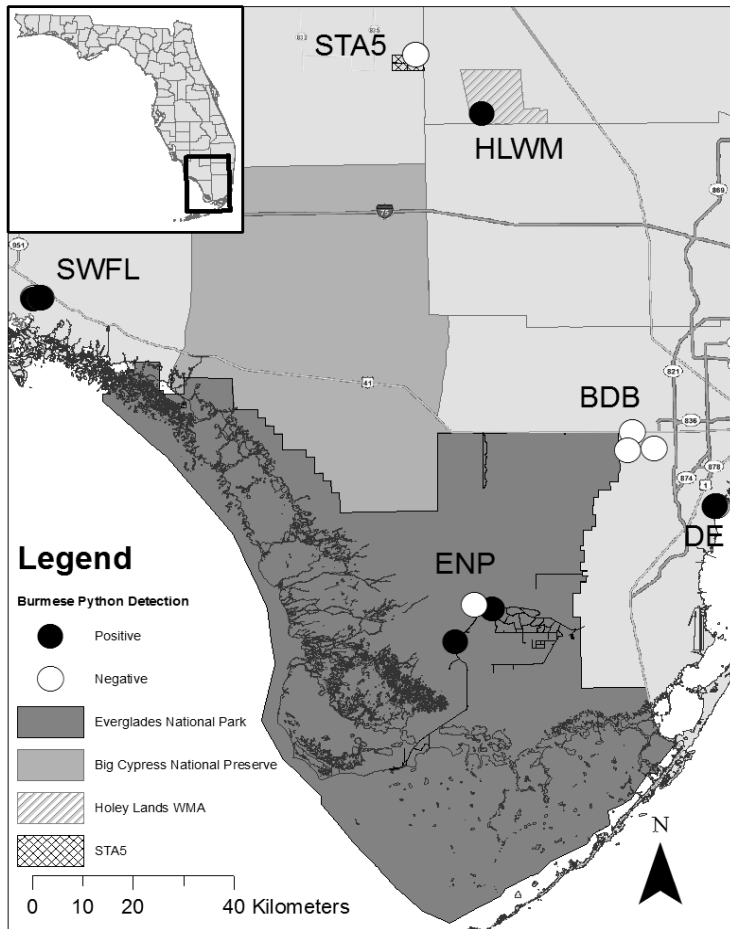
# Impacts to Native Fauna

## Marsh Rabbit Study



# eDNA

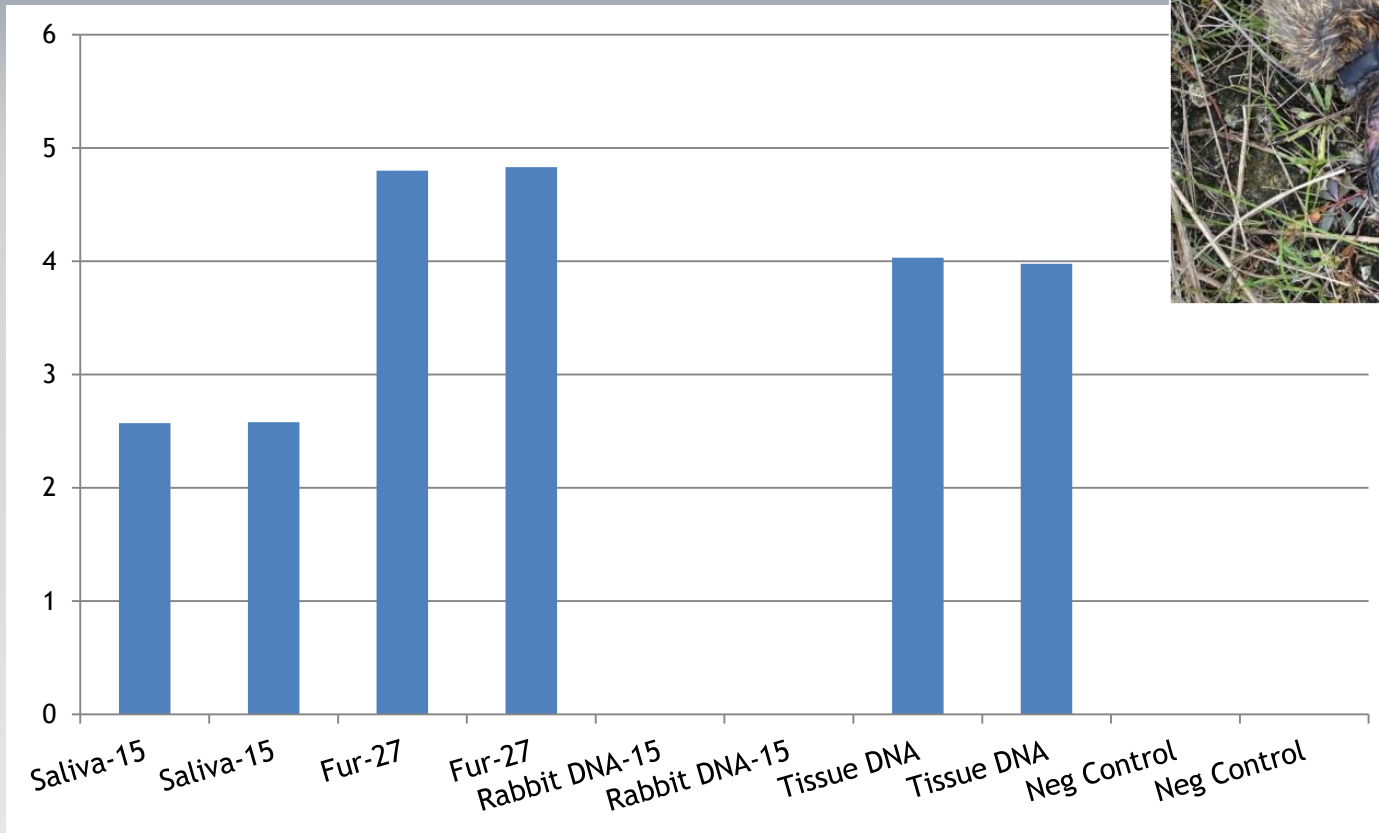
## Lab & Field Trials



# eDNA

## *Determining Predation*

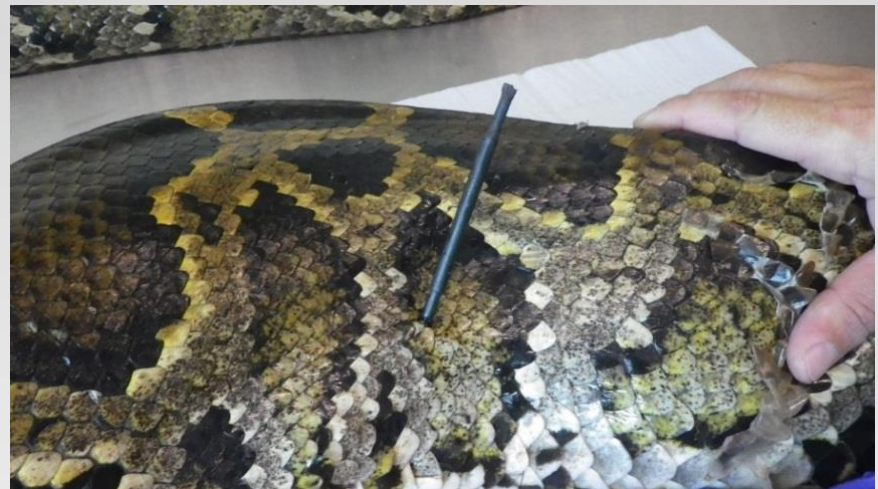
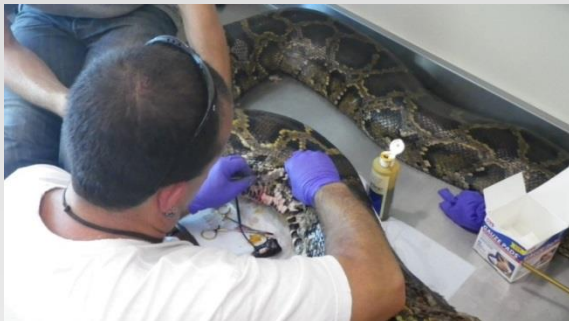
Log transformed DNA concentration (ng/ul)



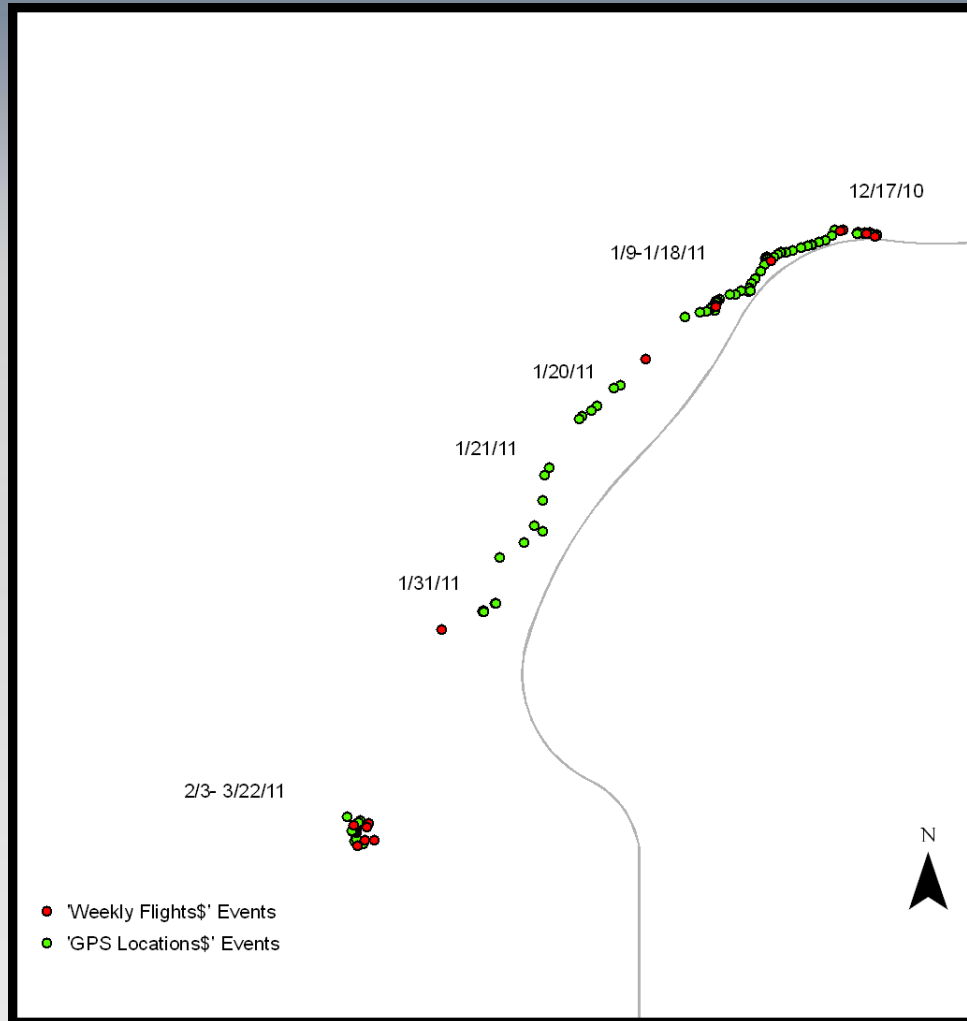
# Testing New 'Biologging' Tools



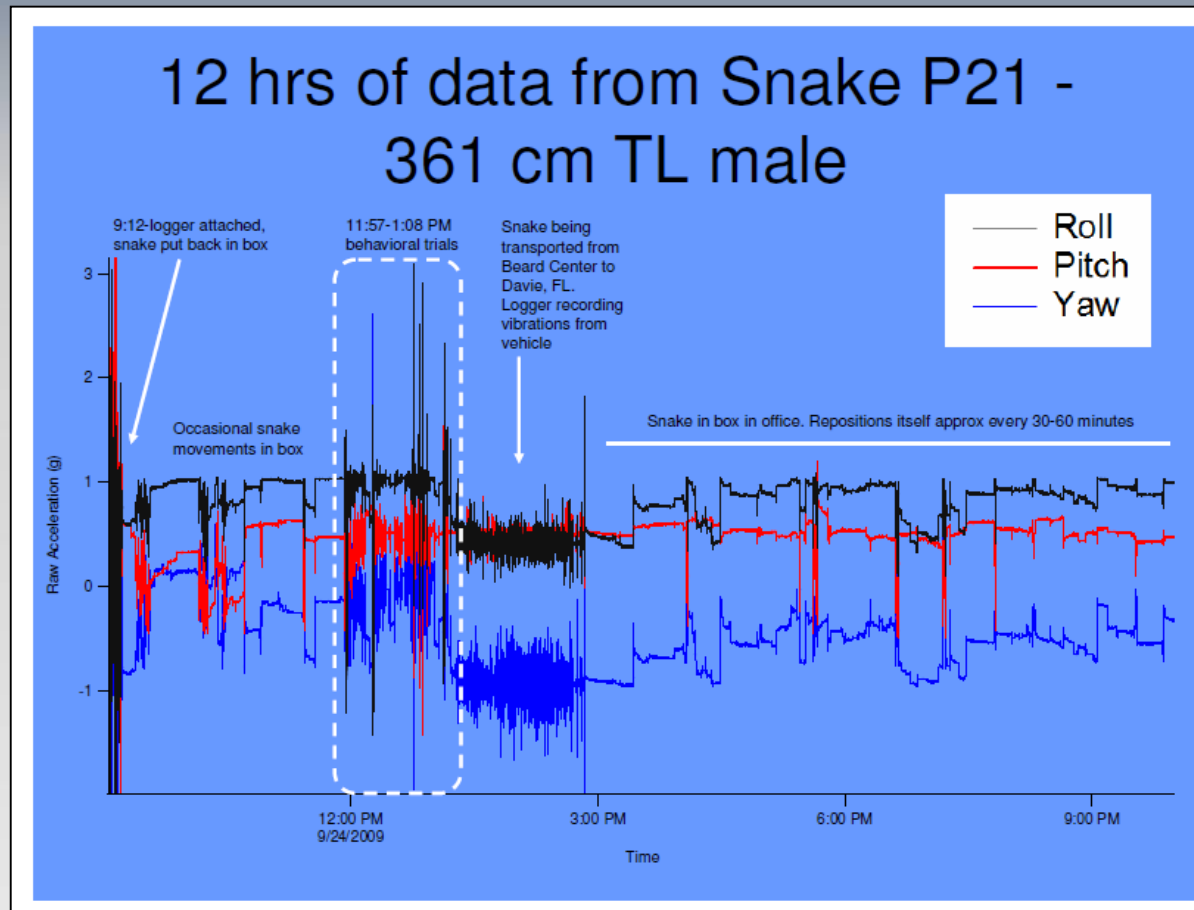
- GPS Tag
- Accelerometer



# GPS Tags



# Accelerometers

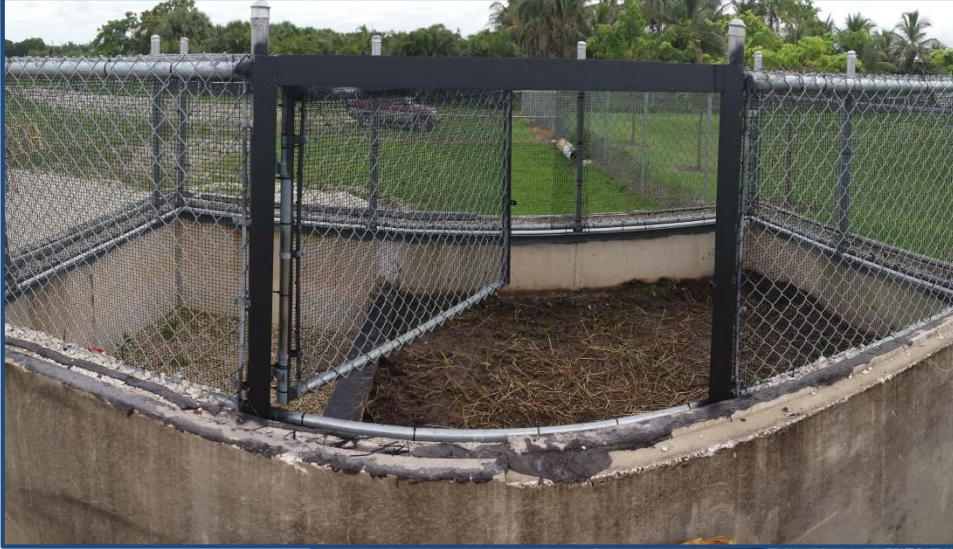


# Python Facility in Davie



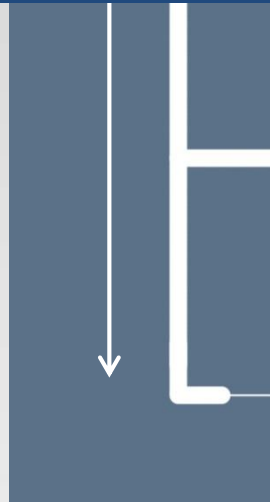
**EVERGLADES CISMA**

# Python Facility in Davie



**EVERGLADES CISMA**

# Python Facility in Davie



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# USGS in ENP

Bob Reed (Ft. Collins)

Bryan Falk, Michelle McEachern

# Transition year – USGS/NPS

- Interagency agreement
- USGS personnel stationed in Everglades NP (Bryan Falk)
- Continuing python work by Skip Snow:
  - Necropsies
  - Data/specimen management
  - Research
  - Authorized Agent Program



Black vulture in python gut - Pa-hay-okee

# Authorized Agent Program

- Volunteers authorized to remove pythons in Everglades NP
- Created in 2011
- Up to 30 agents authorized at one time
- Primary function is python removal



# Authorized Agent Program

## Changes in 2014

- Managed by Bryan Falk (USGS) with oversight by Tylan Dean(NPS)
- Renewed 19, recruited 7 (26 total agents currently)
- Increased EDRR capacity:
  - Expanded to Biscayne, pending expansion to Big Cypress
  - Authorized to remove all non-native herps (not just pythons)
- Greater emphasis on data collection and reporting – online form

**Trip Report -- Non-Native Herp Survey**

Use this form to document your efforts to search for non-native herps in Everglades and Biscayne National Parks. Please use one form/trip.

This is best viewed in Google Chrome.

**\* Required**

**Your name: \***  
Last, First (e.g., Linnaeus, Carl)

**If other people accompanied you, please list them.**  
Only one of you must fill-out this form. List alphabetically as Last, First; Last, First (e.g., Darwin, Chuck; Drinker Cope, Ed).

**Date your survey began \***  
Month  Day  2014

**Time your survey began \***  
Hr  : Min  AM

**Duration of your survey \***  
Round to the nearest 5 minutes, and ignore seconds  
Hrs  : Mins  : Secs

**Where did you search?**  
Note the number of times you searched each section in a single direction (e.g., if you did one section in both directions, it'd be "twice").

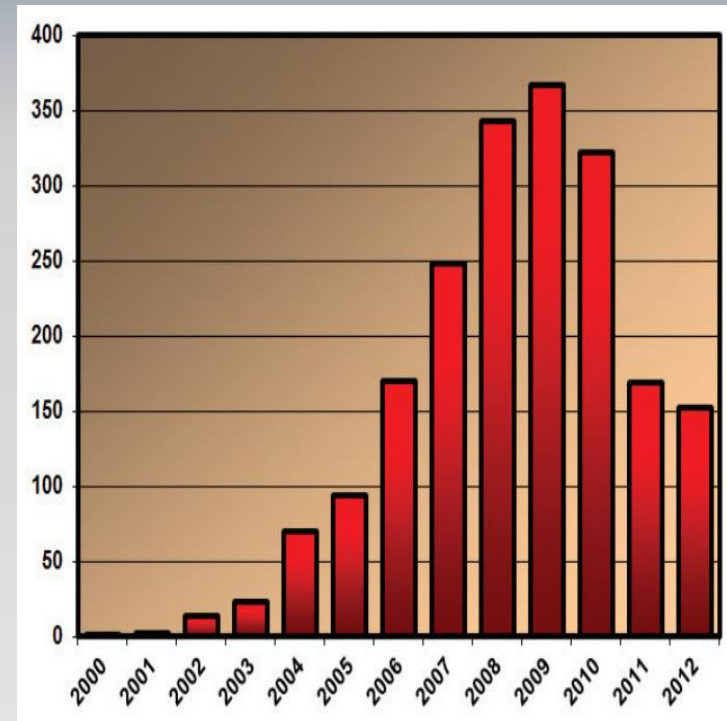
Once    Twice    Thrice    Four times    More than four times

Online trip report form

# Authorized Agent Program

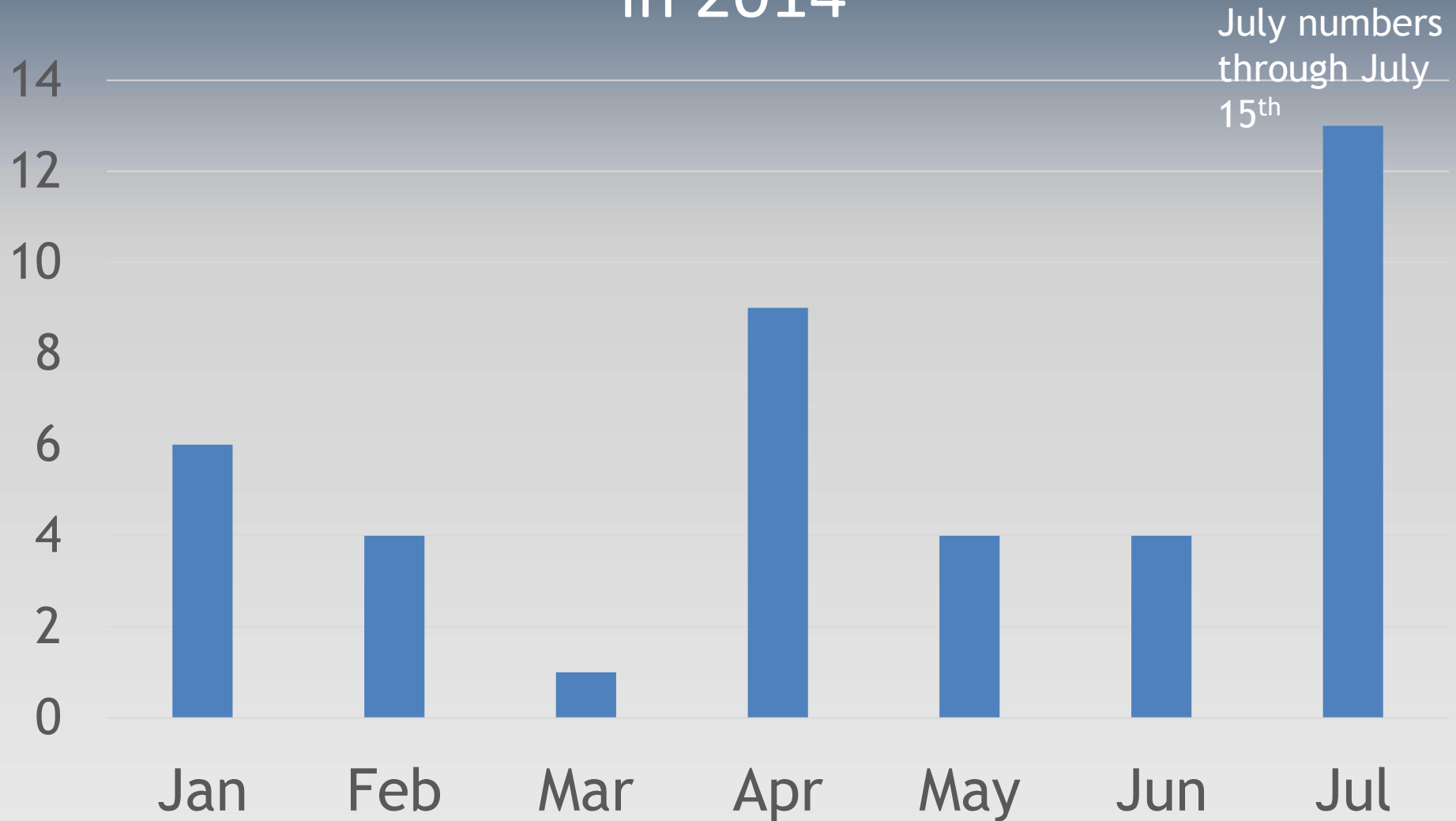
## Current Issues

- 5 no-python online trip reports since June 1<sup>st</sup>:
  - Overall search effort is low
    - *or* –
  - Agents don't submit effort data, especially for negative searches
- Haphazard search times and routes make meaningful analysis difficult
- Moving towards a more structured program for 2015:
  - Scheduled, predefined routes
  - Standardized data collection

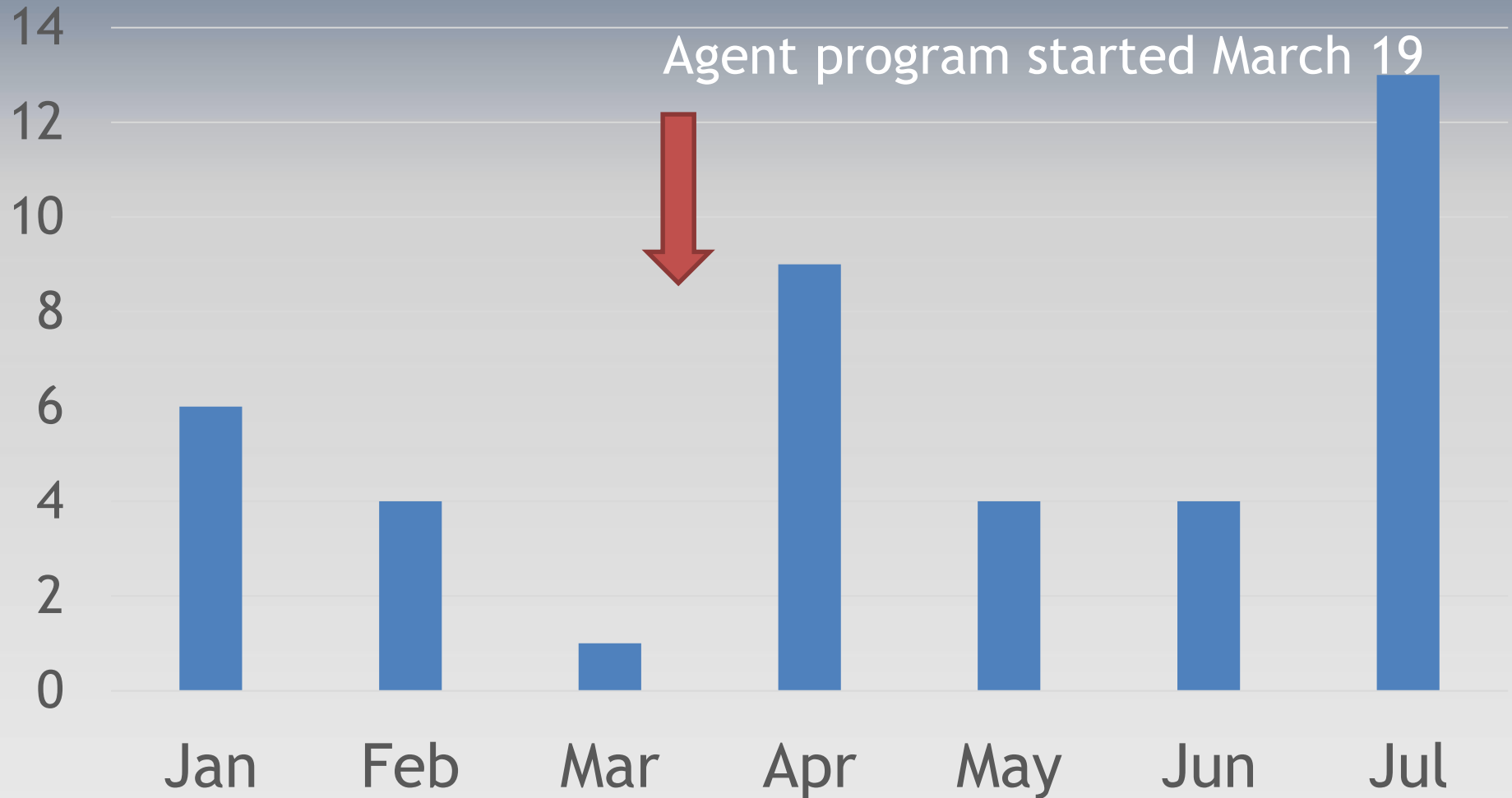


What do these trends in python removal actually mean?  
Can't answer with current data collection protocols

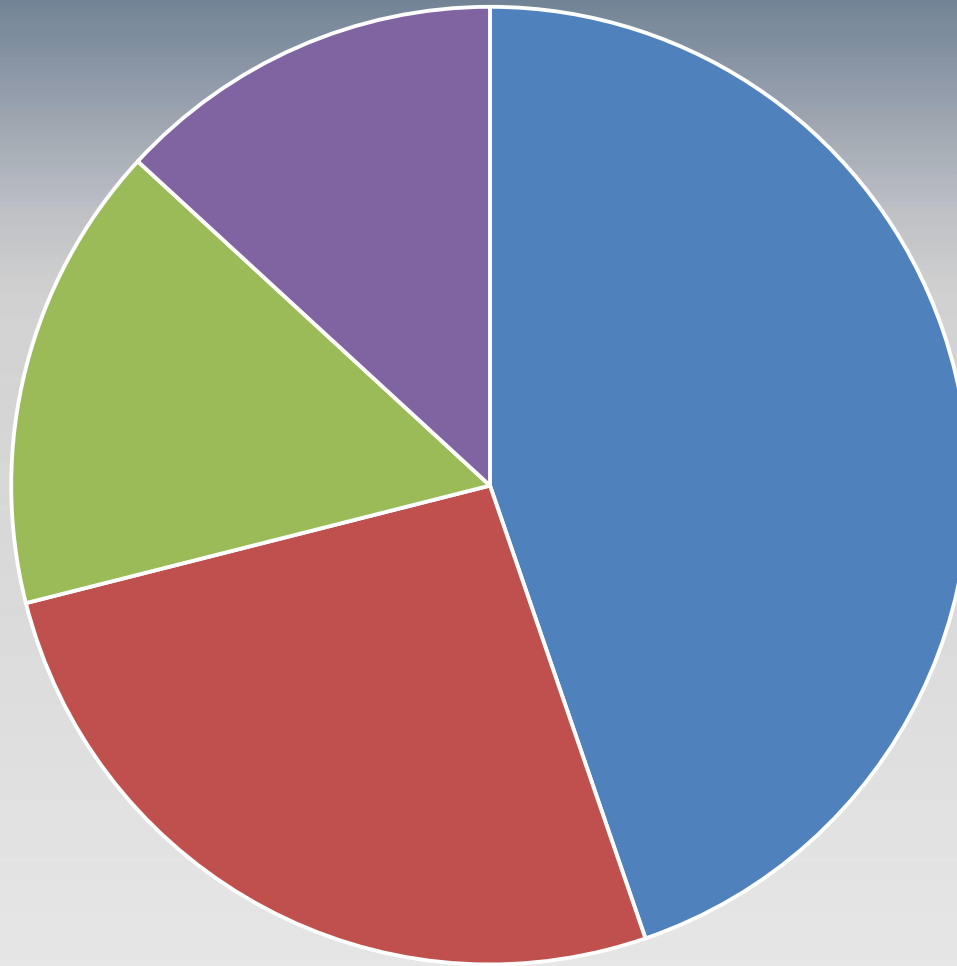
# 41 Burmese pythons collected in ENP in 2014



# 41 Burmese pythons collected in ENP in 2014



# Source of Pythons -- 2014 ENP



■ Agents ■ NPS/USGS ■ EIRAMP/UF ■ Other

# Collaborators in SW Florida

Paul Andreadis (Denison University)

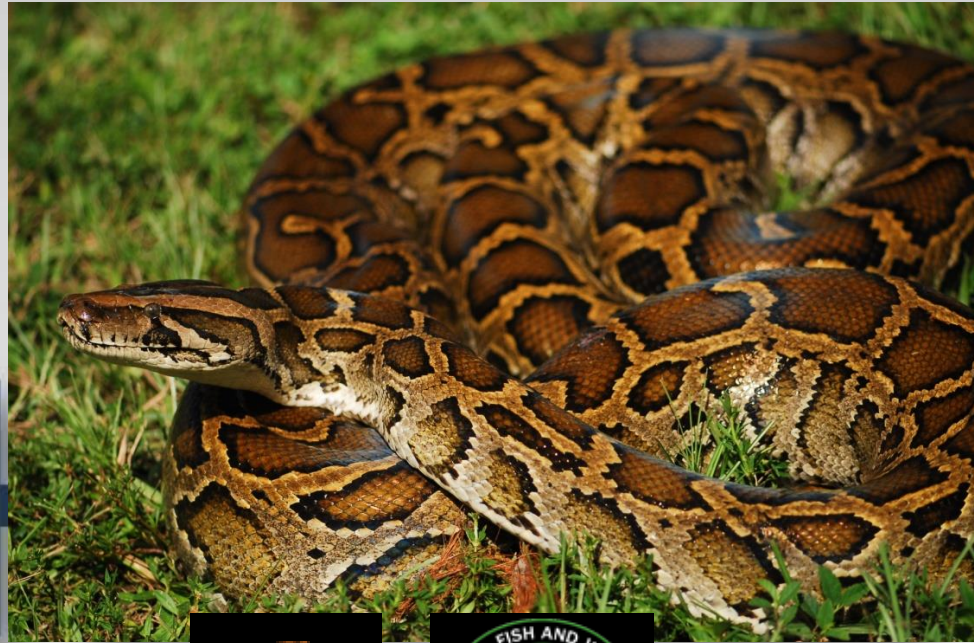
Ian Bartosek (Conservancy of SW Florida)

# Questions?



**EVERGLADES CISMA**

# An Integrated Approach to Adaptive Management of Invasive Reptiles: the Burmese Python Lesson



# The Detection Dilemma: What happens when you can't find the needle in the haystack?



What is detection?

Why is it important?

Can we estimate it?

How can we use it and improve it?

What do we do next?

What is detection = detectability = probability of detection =  $P_{\text{detect}}$ ?

- $P_{\text{detect}}$  = the probability of seeing a python on the condition that one is present
- $P_{\text{detect}}$  is a function of habitat, behavior, observer method



# Why is $P_{\text{detect}}$ important?

- Measures of abundance, density, and occupancy require an estimate of  $P_{\text{detect}}$  to be reliable
- If you know what (and how) factors affect  $P_{\text{detect}}$  you might be able to improve it
- Low  $P_{\text{detect}}$  may give an impression of a small population
- Ability to remove (or model) pythons (any invasive species) can be limited by low  $P_{\text{detect}}$ ;

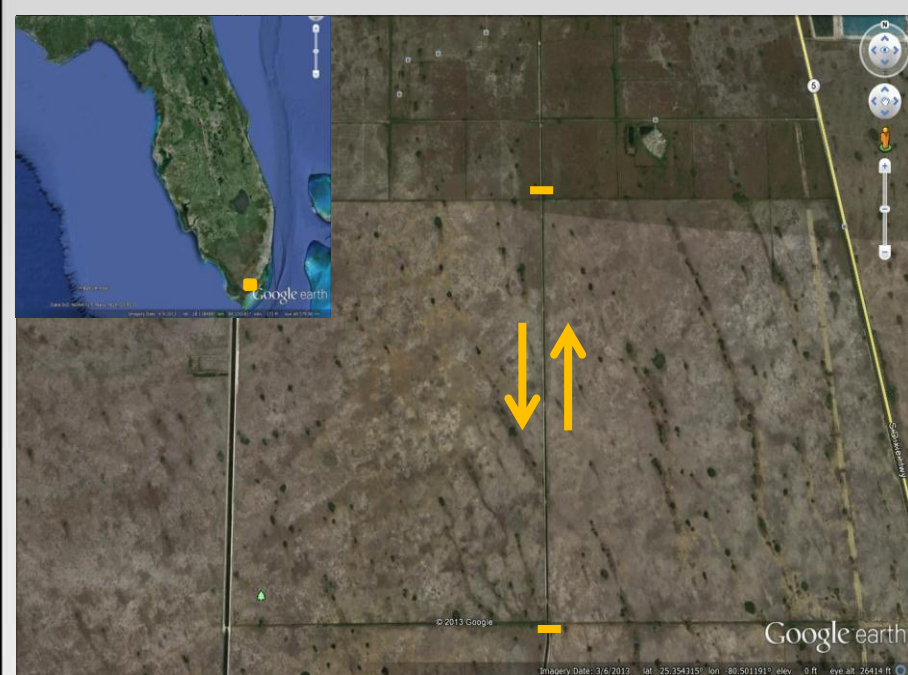
$$P_{\text{catch}} = P_{\text{there}} \times P_{\text{detect}} \times P_{\text{seize}}$$

# Estimating $P_{detect}$

- Empirical – repeated surveys along C110 with telemetered snakes
- Model – as part of analysis of occupancy of pythons in ENP using weekly surveys
- Application
- Improvement

# 2013 Intensive surveys, UF/USGS

- C-110 canal surveyed on foot 3x/week
- $\geq 2$  independent observers/survey
- Round trip (both sides,  $\sim 8$  km total)



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## 3 adult male pythons captured on C110 received transmitters

<u>ID</u>	<u>SVL (cm)</u>	<u>Dates tracked</u>
PyMo27	171	16 Jan - 02 Jun 2013
PyMo32	215	16 Jan - 11 Apr 2013
PyMo60	293	01 Feb - 18 Mar2013



# Results

- 62 locations of 3 telemetered pythons, 16 Jan - 02 July
- One or more pythons on canal or levee on 51 of 62 days
- 198 person-opportunities to see a telemetered python

*Number of times pythons detected during visual searches = 0*

# Results

However....PyMo32 was spotted once. Pretend it was found by one of us.....

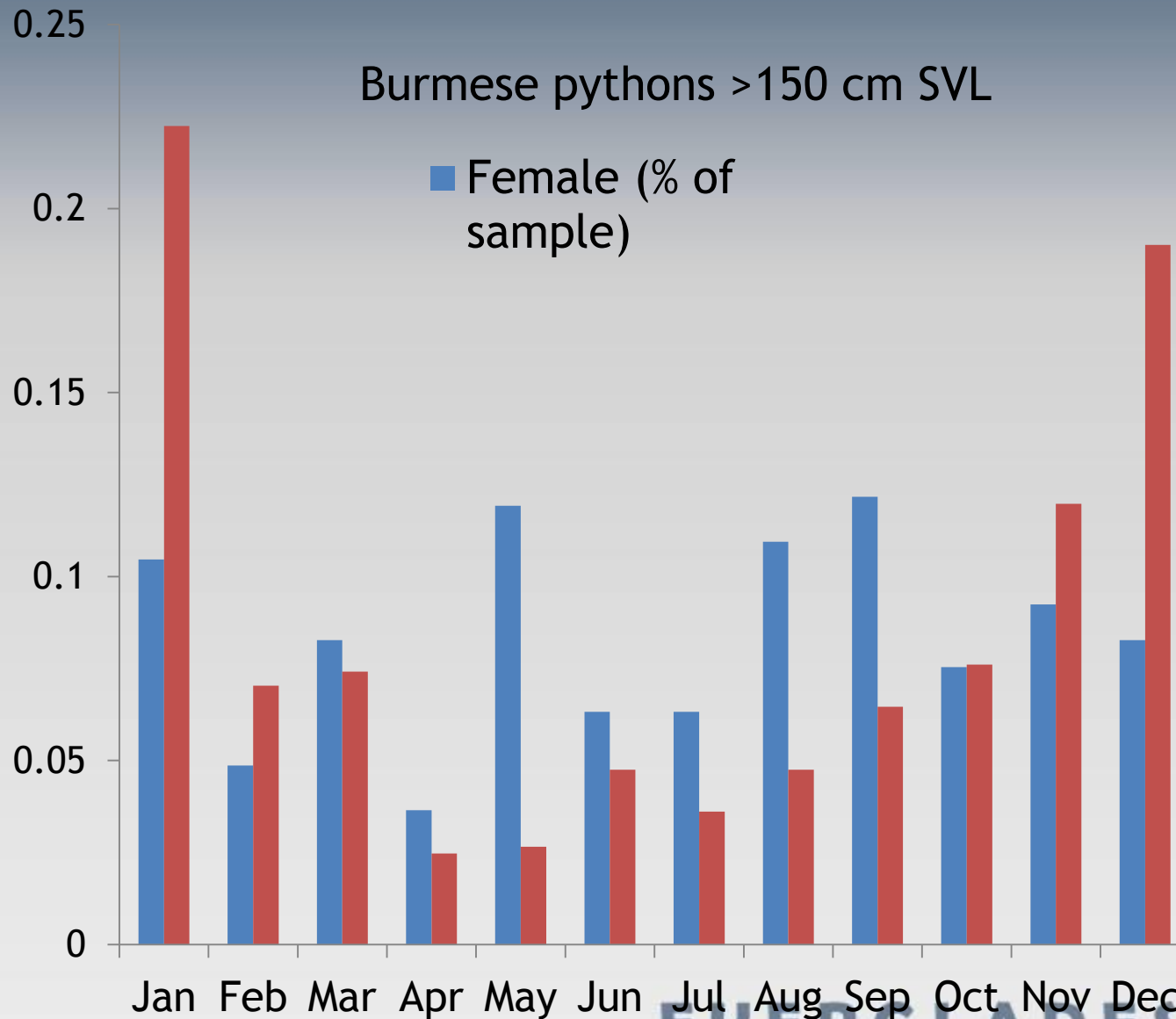
- Raw detection probability of PyMo32:

$$1/80 \text{ opportunities} = 0.0125$$

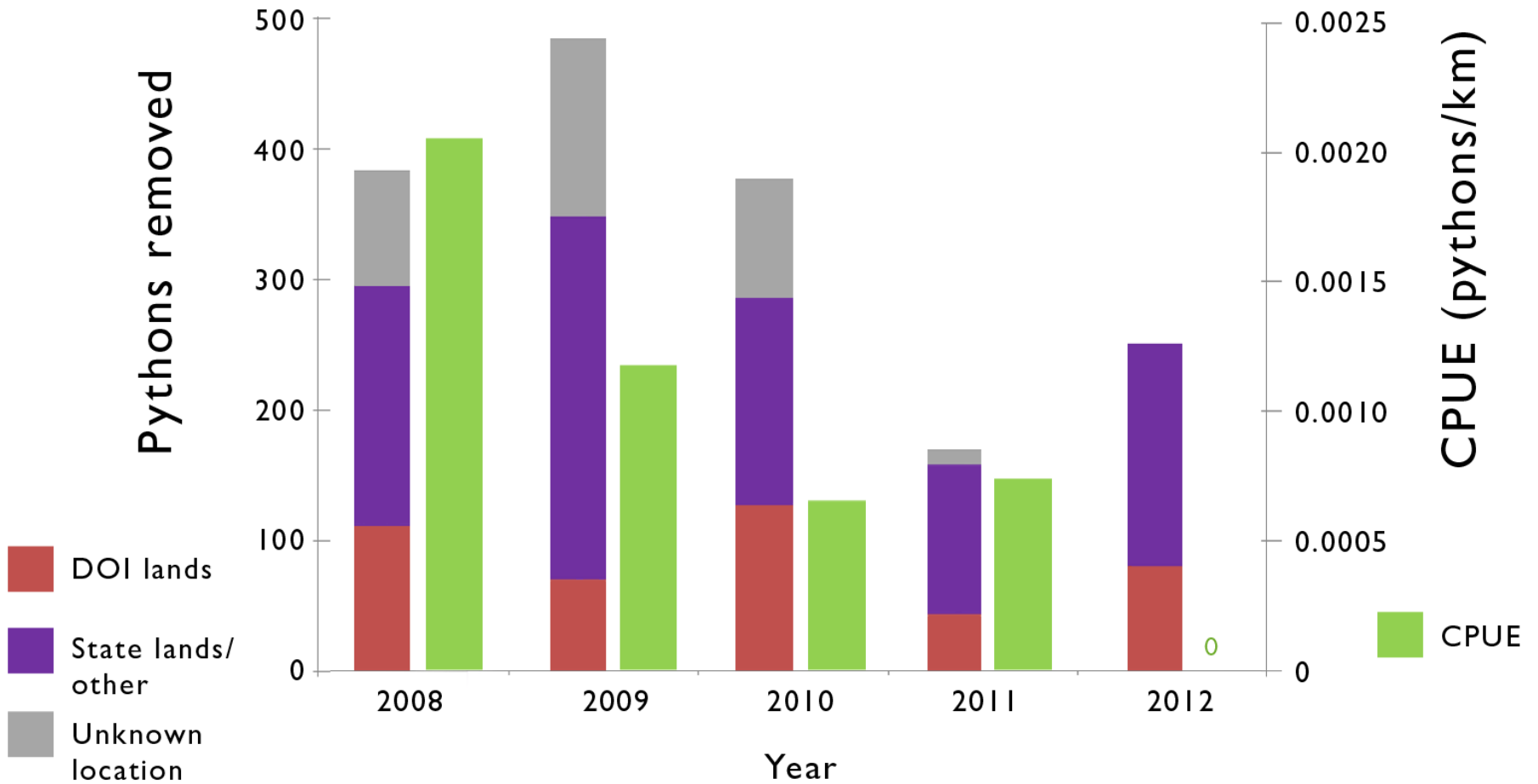
- Raw detection probability across all opportunities:

$$1/198 = 0.005$$

# Application



# PYTHONS REMOVED AND CATCH PER UNIT EFFORT



# EIRAMP Occupancy Modeling – UF/USGS

- Weekly surveys main ENP road at dusk were conducted 2008 – 2011
- To model detection we held occupancy constant and modeled detection as a function of temperature and time of day
- $P_{\text{detect}}$  averaged 0.0054 (0.0030-0.0096)
- Does this mean that  $P_{\text{detect}}$  for python is 0.005?  
**NO!** It does mean that  $P_{\text{detect}}$  is very low ( $<0.01$ ).  
So low that we need to be concerned about bias in our results.

# Findings and Next Steps

- Just because you can estimate  $P_{\text{detect}}$  doesn't mean you can use it to model abundance, density, or occupancy
- We need to improve  $P_{\text{detect}}$  for pythons for modeling, management, and monitoring
- More than just doing more surveys – refine surveys by location, season, time, weather, and method, under natural conditions

# Findings and Next Steps

- We don't have a model to deal adequately with low  $P_{\text{detect}}$
- We need a new model, a new sampling method, or both
- We need to do comparative studies with other invasive reptiles. Tegus are more detectable. What does this mean for modeling, management, and monitoring?
- What happens when you can find the needle in the haystack?



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This is Not



The End



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