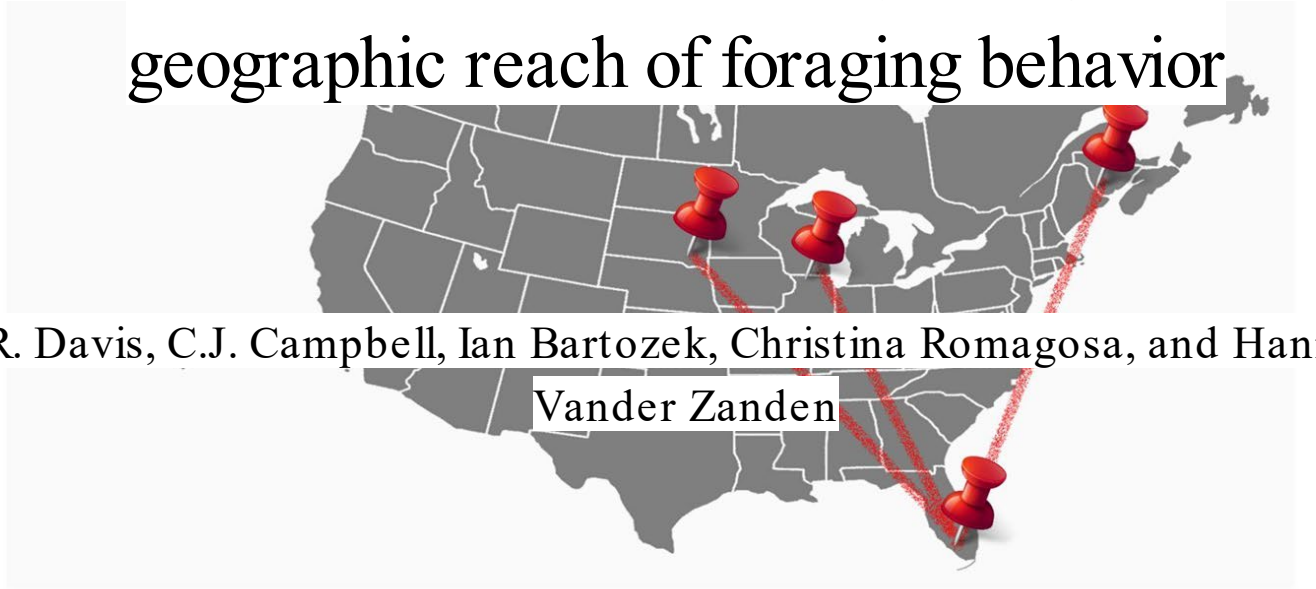
Bird feathers in invasive Burmese python guts reflect the geographic reach of foraging behavior

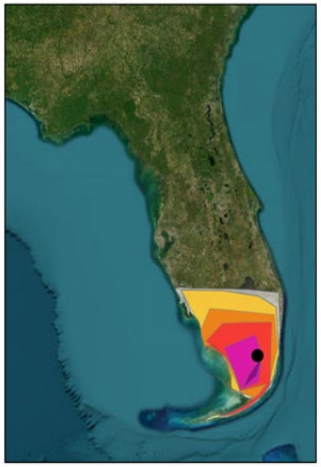


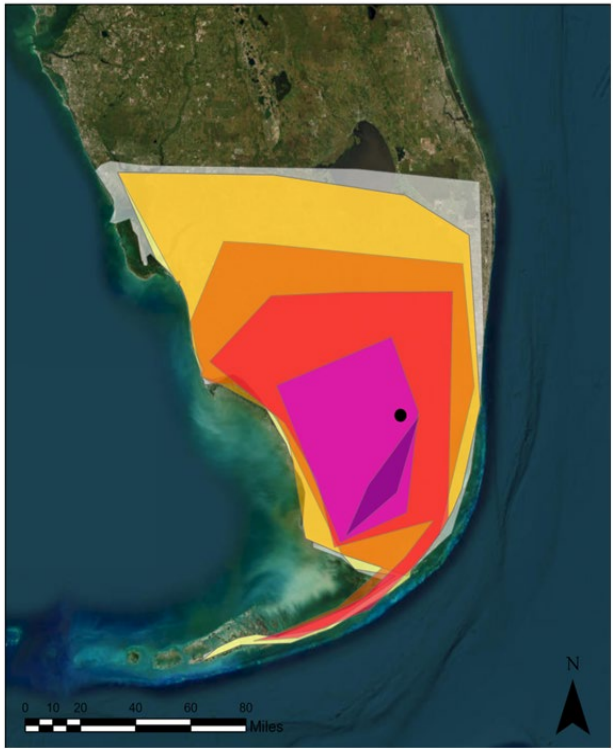
K. R. Davis, C.J. Campbell, Ian Bartozek, Christina Romagosa, and Hannah B. Vander Zanden

The Python Problem

Burmese python are a large species of constrictor snake introduced to the US through the pet trade.

Now an entrenched breeding population over a large area of southern Florida.



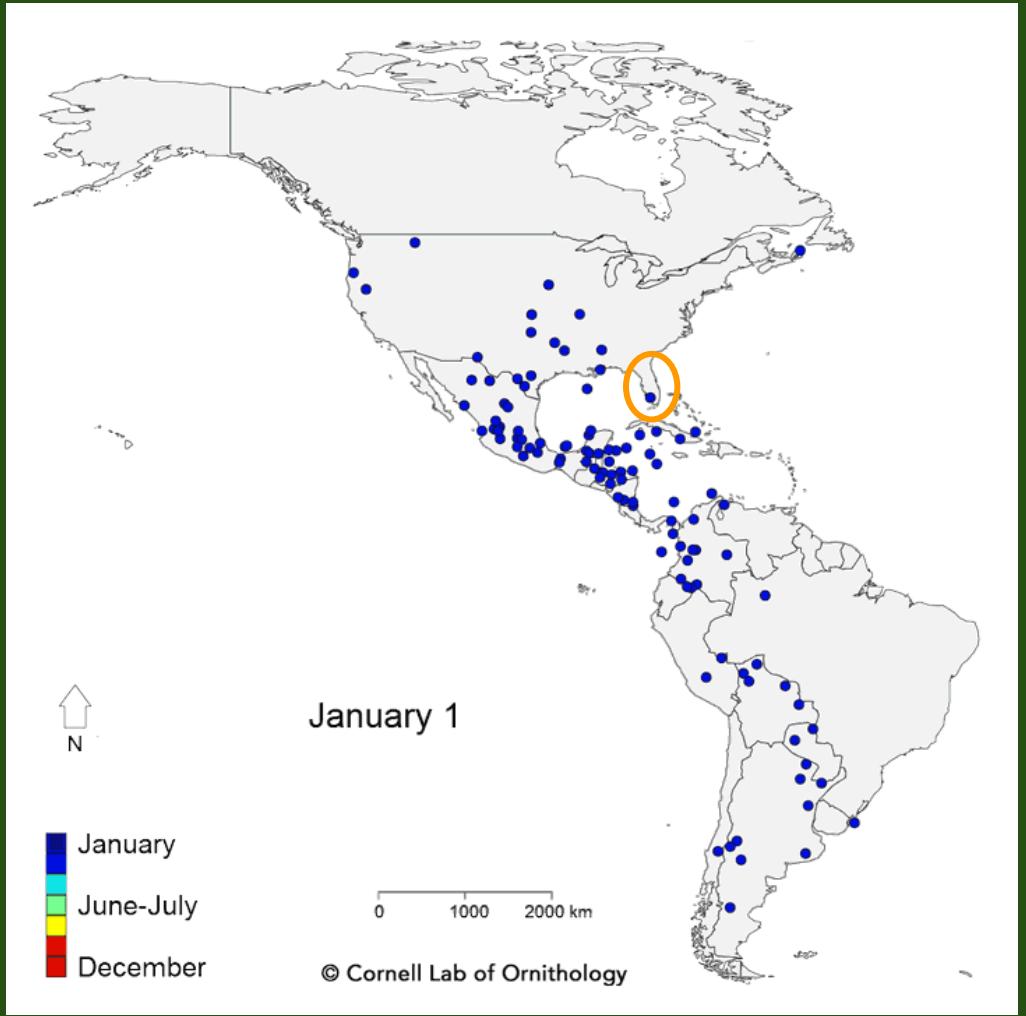


Data source: EDDMapS

Pythons are generalist predators and gut content analysis has shown they consume a wide array of native mammals, reptiles, and birds

Some of these prey items are not just native to Florida, however…

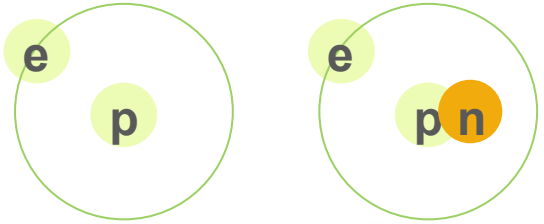
To date, of the 49 species of bird recovered from invasive python gut contents, 12 were non-permanent residents.



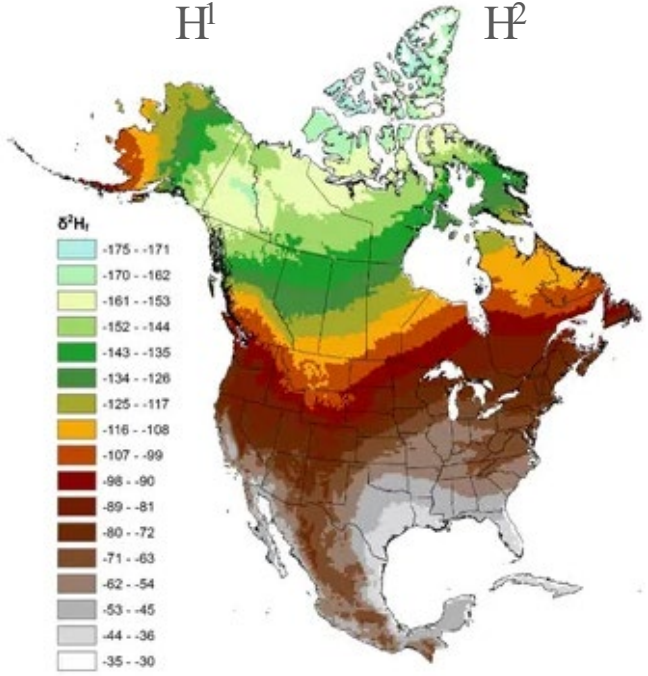
Many species of North American bird molt in their breeding range before migration.

The δ^2H isotope values of their feathers act as a passport stamp to where they were grown

Hydrogen stable isotopes



H^1 H^2



Hydrogen isoscape of North America
(Hobson et al, 2015)

Study Questions

1. Does digestion change the δ^2H values of the feathers?

1. How far is the geographic reach of python foraging behavior?

Methods-Question 1

- Acquired local farm raised muscovy ducks and pulled chest and flight feathers before feeding ducks to four individual captive pythons.

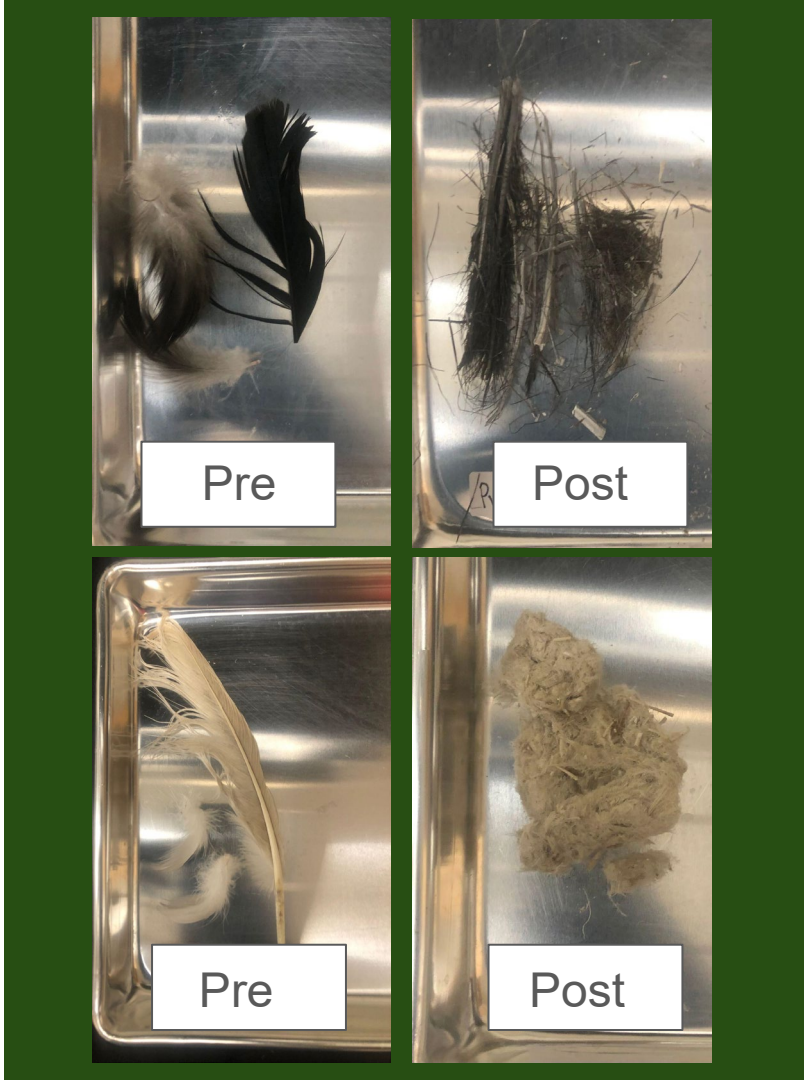
- Recovered the first fecal passed after each duck was consumed and washed for paired pre- and post-digested feathers from each individual.

Digesting duck.

Photo credit: Dr. Steve Tillis
(holding permit: EXOT-23-333)

Methods-Question 1

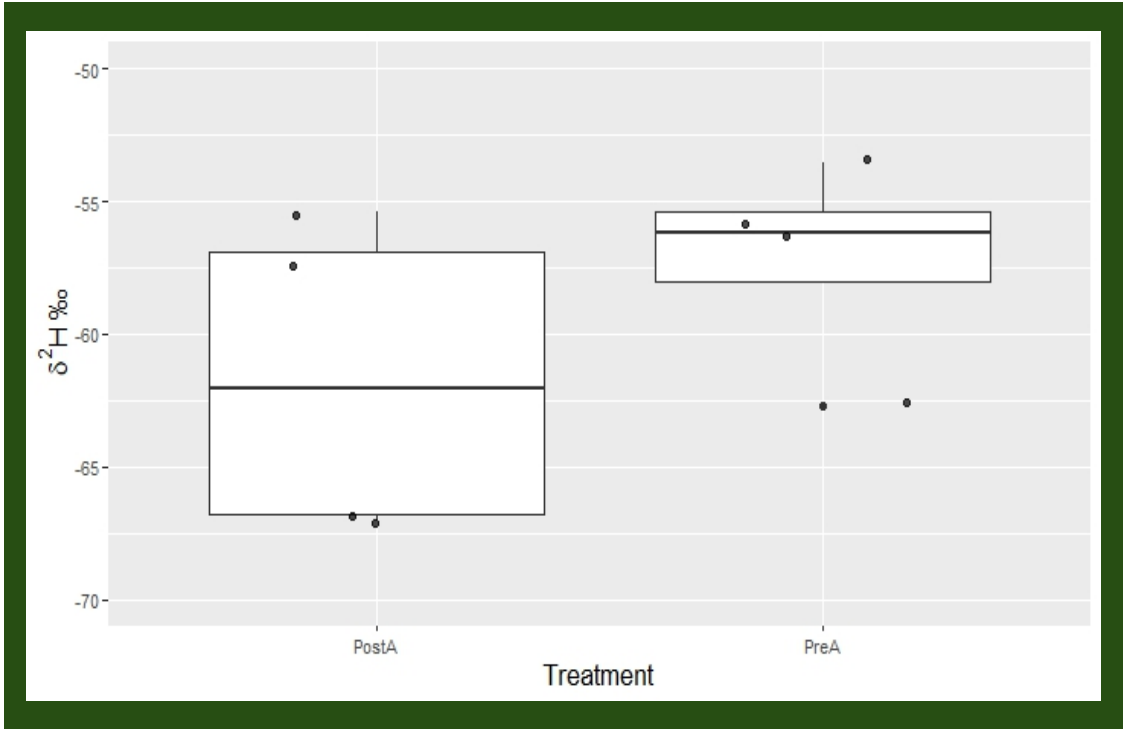
- Samples from all feathers were washed and run for stable isotopes at the Mass Spec Lab at the University of Florida.
- Because it can be challenging to determine what part of the bird the feathers came from post digestion, two samples from the post-digested feather pile were taken and the resulting values were averaged.
- A two-tailed T test was run to look for statistical differences between treatment groups



Results-Question 1

Found no significant differences (p-value=0.331) between pre and post digested feather hydrogen values.

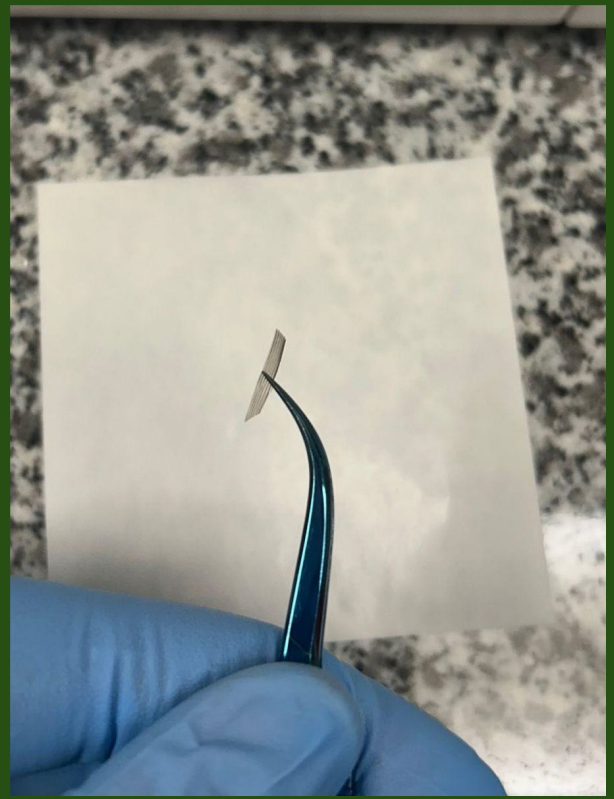
While there was some variance, we attribute that to the variance you would see along and between feathers.



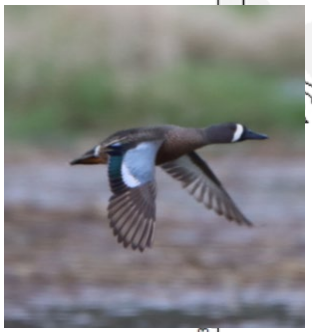
Now that I had all my ducks in a row…

Methods-Question 2

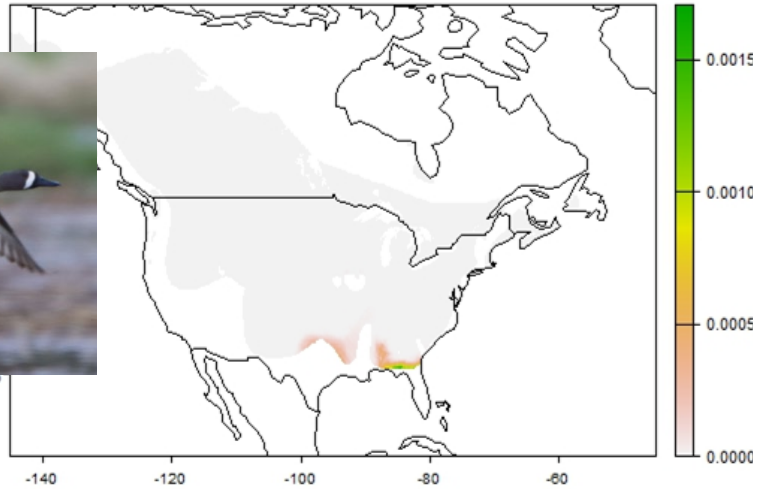
- Samples were washed and run for stable isotopes at the Mass Spec Lab at the University of Florida.
- Three samples from each feather pile were taken to get individual SD and average feather value
- Using rescaling equations, generated probability rasters using AssignR and cropped rasters to breeding range and stopover site shape files from ebird

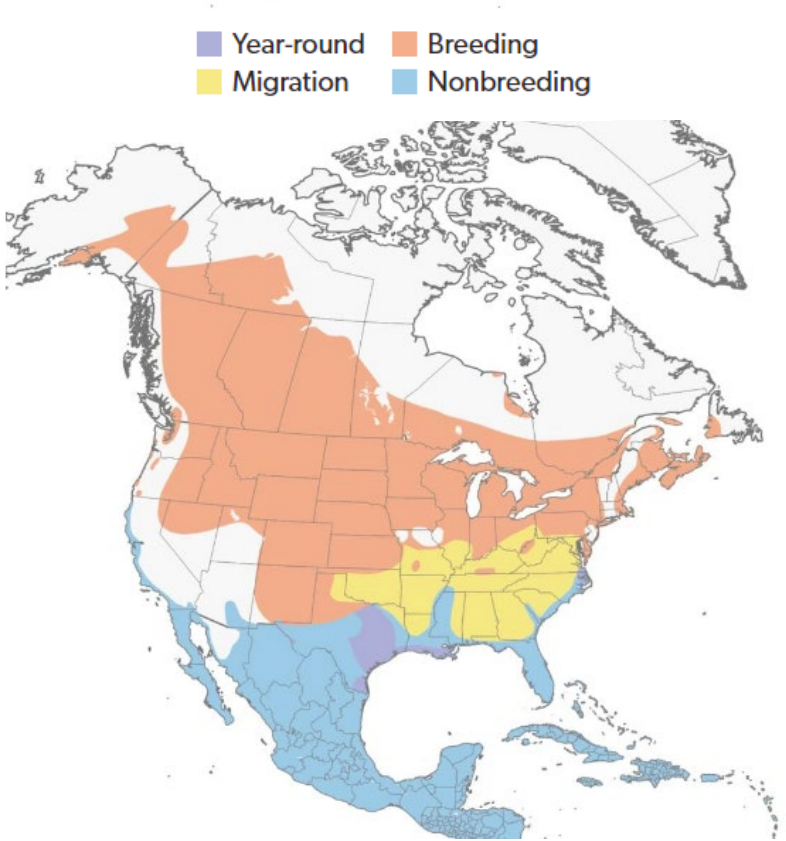


Results-Question 2



Blue-winged Teal



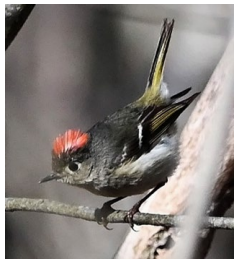


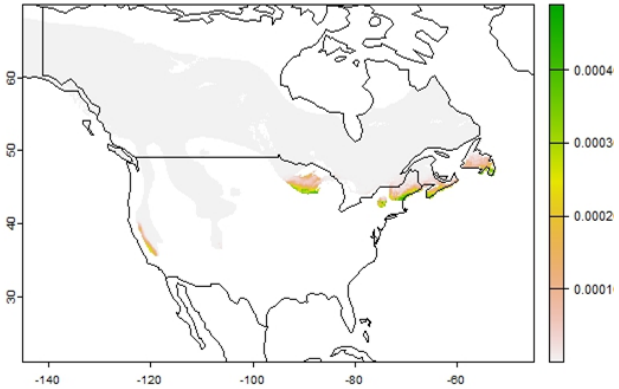
All bird photos courtesy of The Macaulay Library

Some species came from nearby….

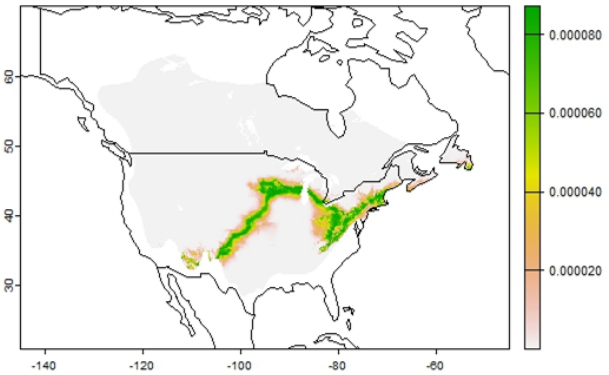
Results-Question 2

Ruby-crowned Kinglet

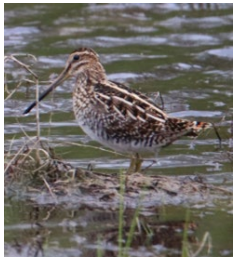


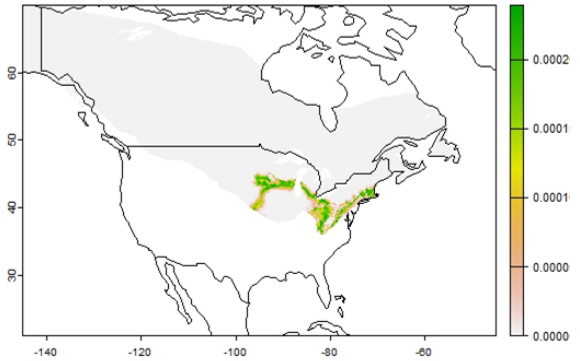


American Bittern



Wilson's Snipe

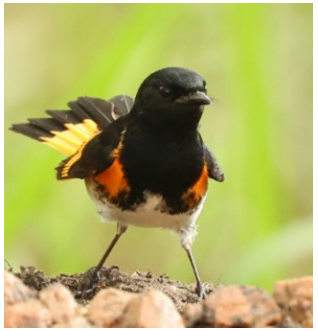


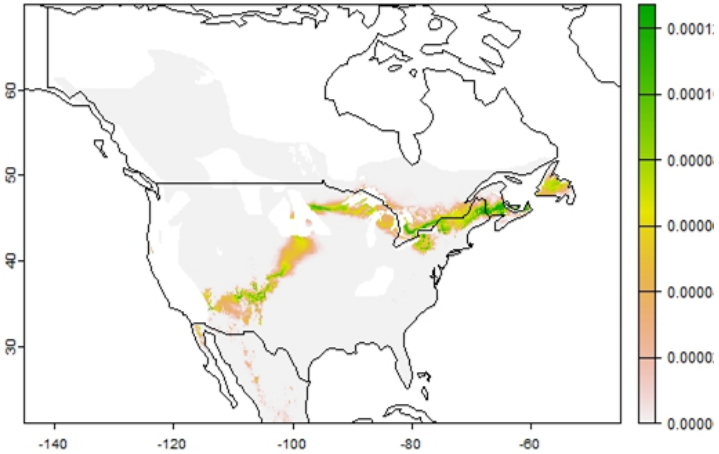


..while others likely came from further away..

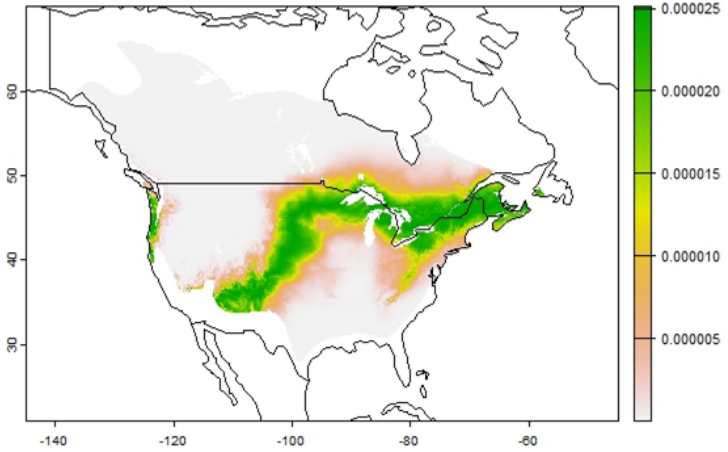
Results-Question 2

American Redstart





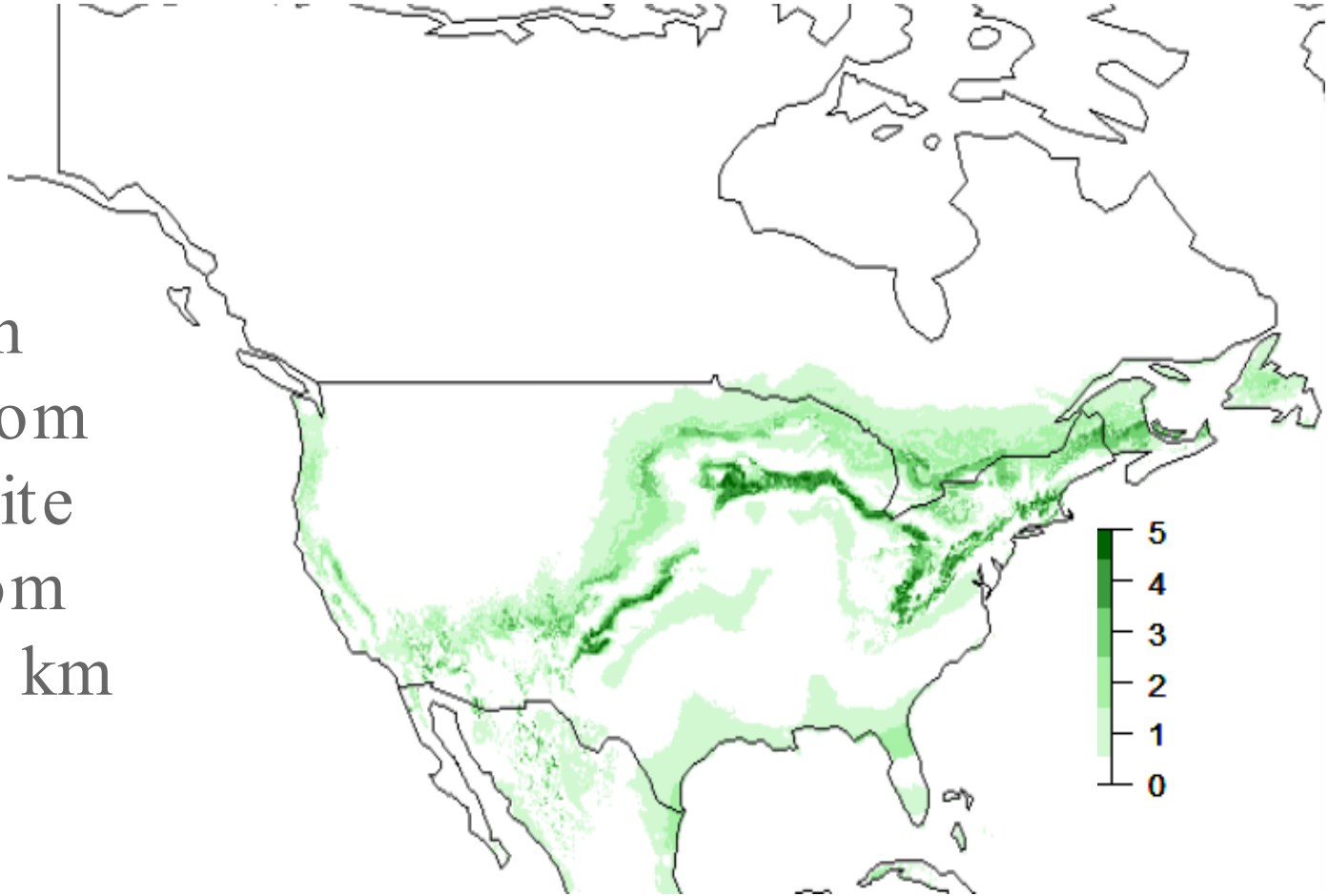
Sora



..we even have some likely Canadians!

Results

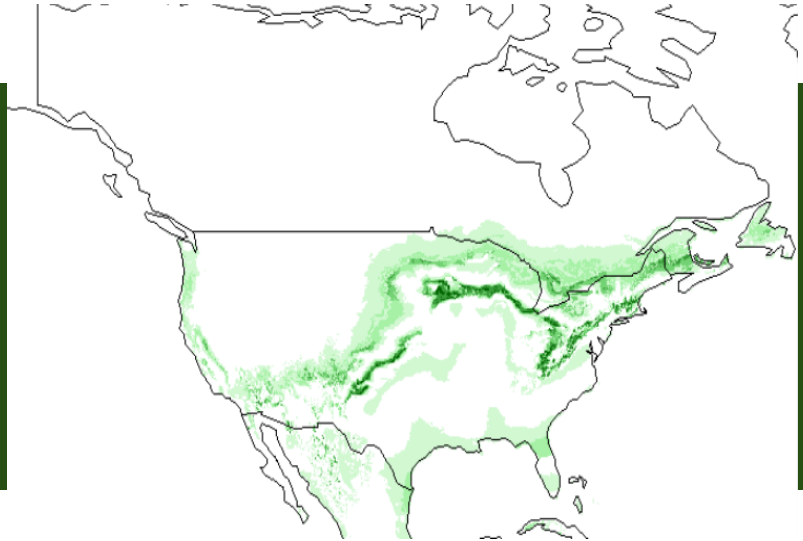
Minimum distance from recovery site ranged from 0 km-2090 km



Discussion

This is the first study to use the digested remains of prey to determine area of origin, we think this method could be used in other studies of invasion ecology.

The reach of foraging behavior of Burmese pythons goes far beyond Florida.



Acknowledgments and Questions

Thank you:

The Smith Memorial Fellowship
The Vander Zanden Lab
The Romagosa Lab
Steve Tillis
Jason Curtis
CJ Campbell
Carla Dove
USGS
The Conservancy of Southwest Florida

FLORIDA INVASION ECOLOGY LAB FIEL

CONSERVANCY of Southwest Florida
OUR WATER, LAND, WILDLIFE, FUTURE.

Smithsonian
National Museum of Natural History

USGS
science for a changing world