

PINE SNAKES: LIFE HISTORY, VULNERABILITIES AND CLIMATE CHANGE

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BACKGROUND

- Pine snakes are threatened or endangered throughout range.
- They are not common anywhere.
- New Jersey Pinelands seems to be a stronghold.
- Human populations are increasing in the Pinelands.
- Threats: People, people, people, poachers, poachers, poachers, habitat loss, predators, disease



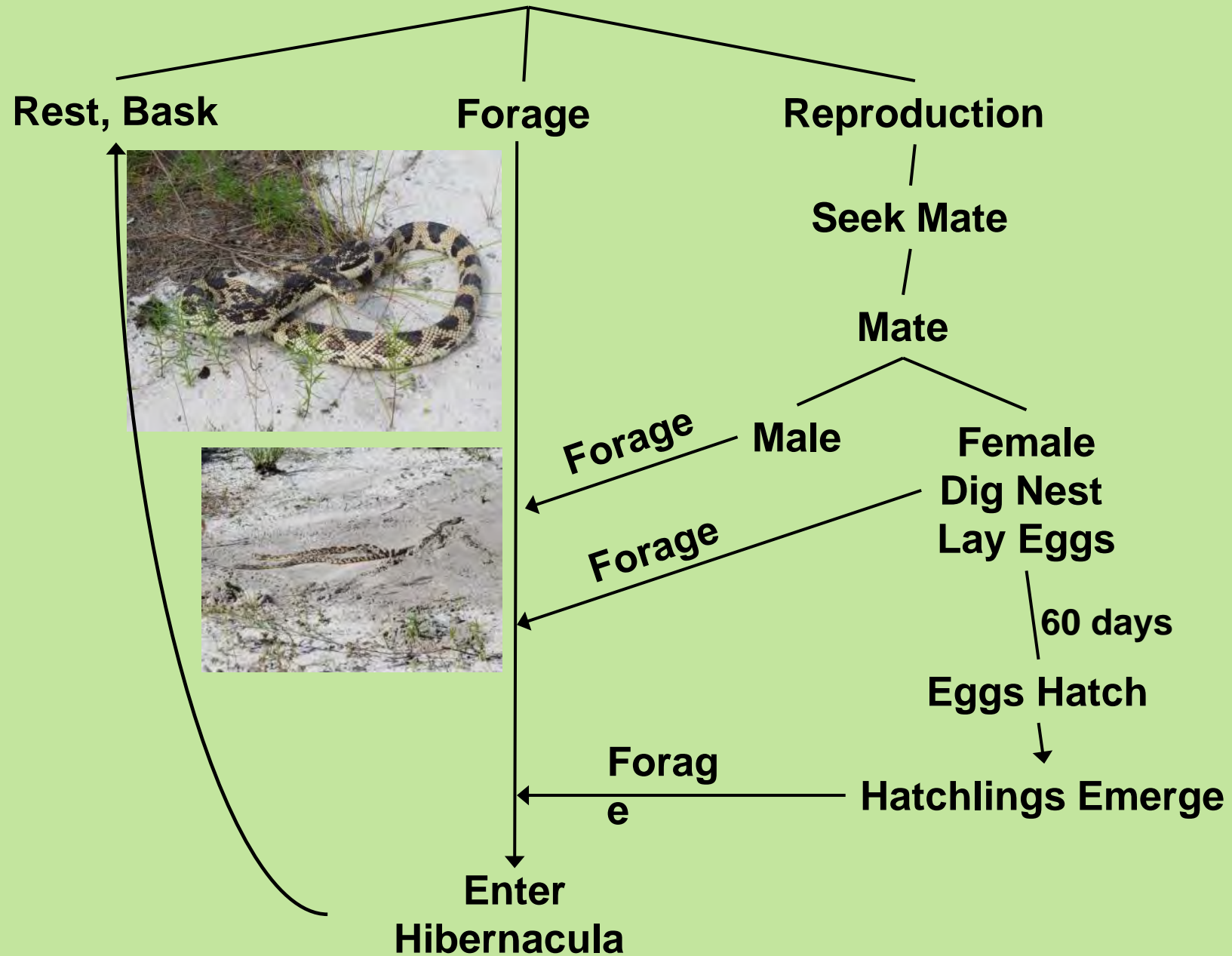
AND Climate Change

PINE SNAKE NATURAL HISTORY

- Top predator in Pine Barrens
- Northern limit of its range
- Prey: Red Squirrels, mice and voles, birds, bird eggs
- Excavate their own nests and hibernation sites
- Females dig their own nests
- Require open spaces for nesting
- Large home range (up to 4 km from hibernacula)
- Can live up to 25 years (most only 6-7)



HIBERNATE (leave in April)



Methods for Long Term Studies

35+ Years



OPEN PATCHES FOR NESTING



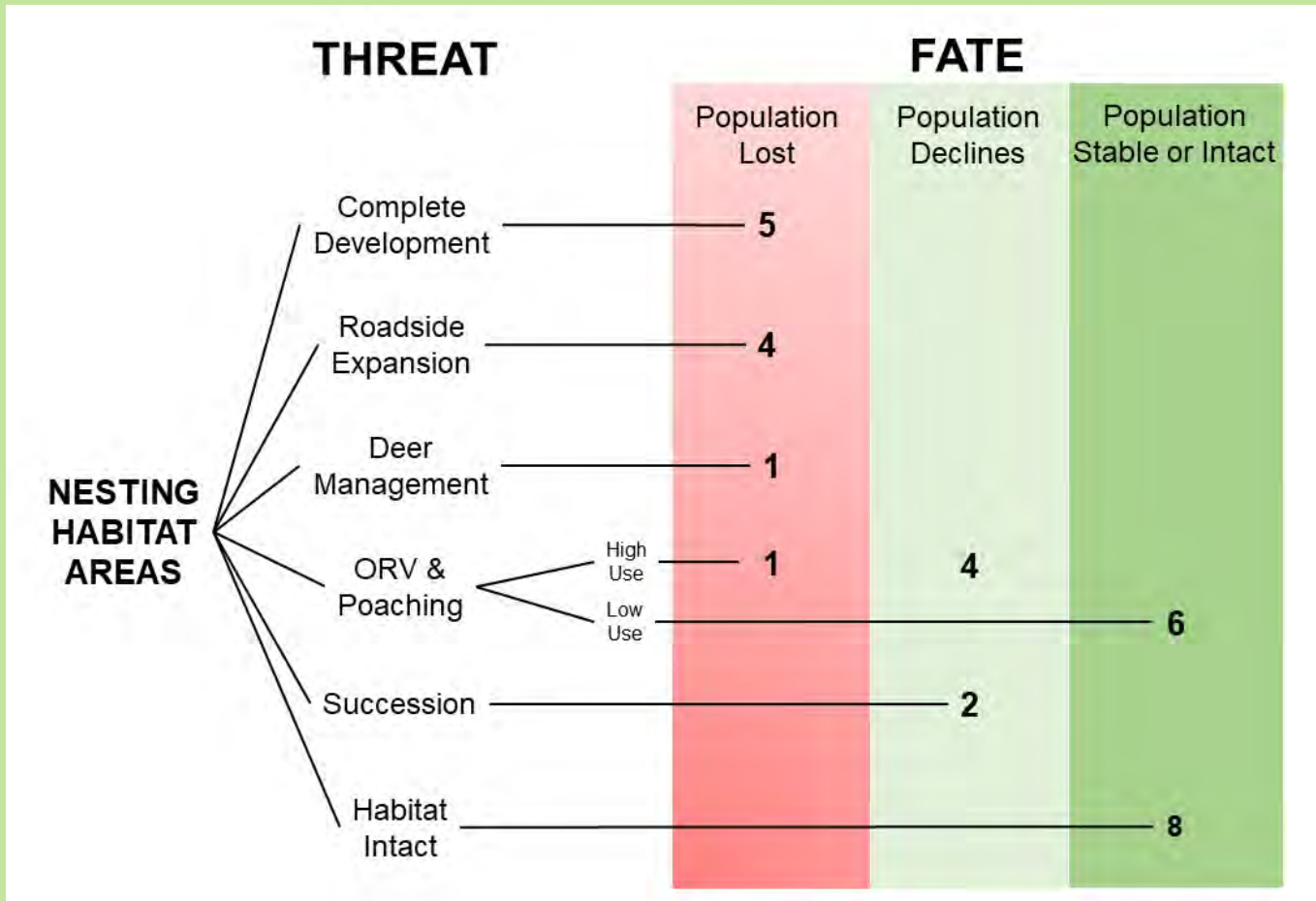
Multiple Clutches →

SHORT TERM MANAGEMENT LEADS TO LONG TERM SOLUTIONS

- Habitat protection and management
- Protection from ORVs and poaches
- Science to provide needed information



FATE OF NESTING AREA REQUIRING SNAKE ADAPTATION



HABITAT MAINTENANCE



DEP, & Bass River State Forest Permits and Helpers

Habitat Modification



Before



After

ORV's: HOW BAD IS IT?



ORV's

- Disrupt nesting and hibernation.
- Injure snakes during ingress and egress from hibernation.
- ORVs have high activity levels.
- Illegal forest trails.



RECRUITMENT AND OFF-ROAD-VEHICLES

- Same nesting areas used for 50+ years
- Habitat maintained by Indians, fires from locomotives, early farmers, and managers/conservationist now
- Stakeholders: Monitor nesting areas, Manage habitat, Build berms and barriers to ORVs, Talk to ORV owners
- Education



POACHING IS EASY

Traditional sites are known



Up to 40 % of nests poached; Many adults and gravid females poached
HEAD-STARTING (about 25% of head start hatchlings reach hibernation less than 15% of natural nests reach hibernacula)



Saw Camera

Human Disturbance to Dens



Den entrance dug up twice in 2020
(between 3/18 and 5/2)



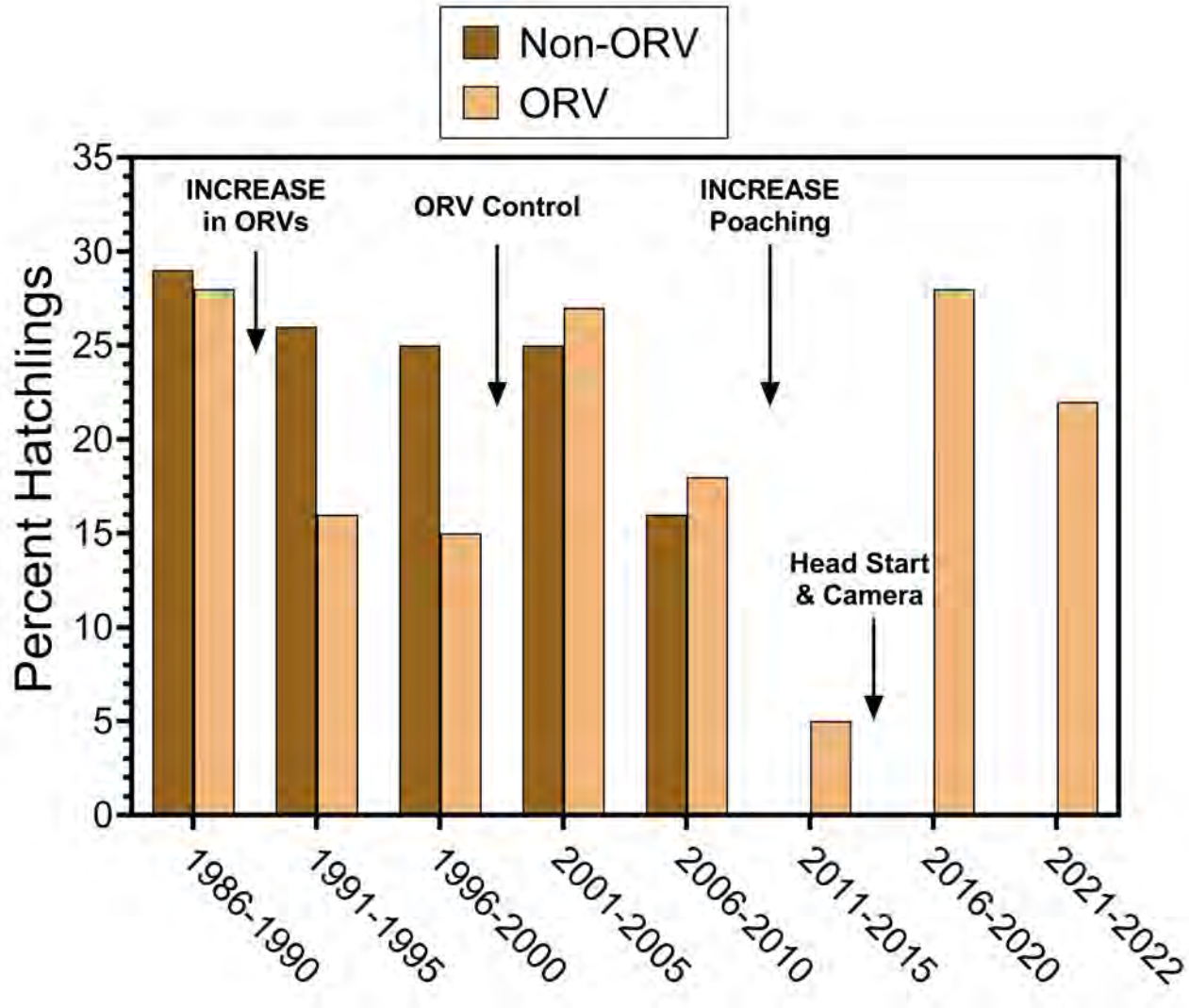
Wire cuton pit tag reader (they did not reach any snakes)

PROTECTING HIBERNATION SITES FROM ORV's and POACHING

- Some nesting and hibernation sites used for 50+ years
- Need Science to document and provide data



ORV's: HOW BAD IS IT?



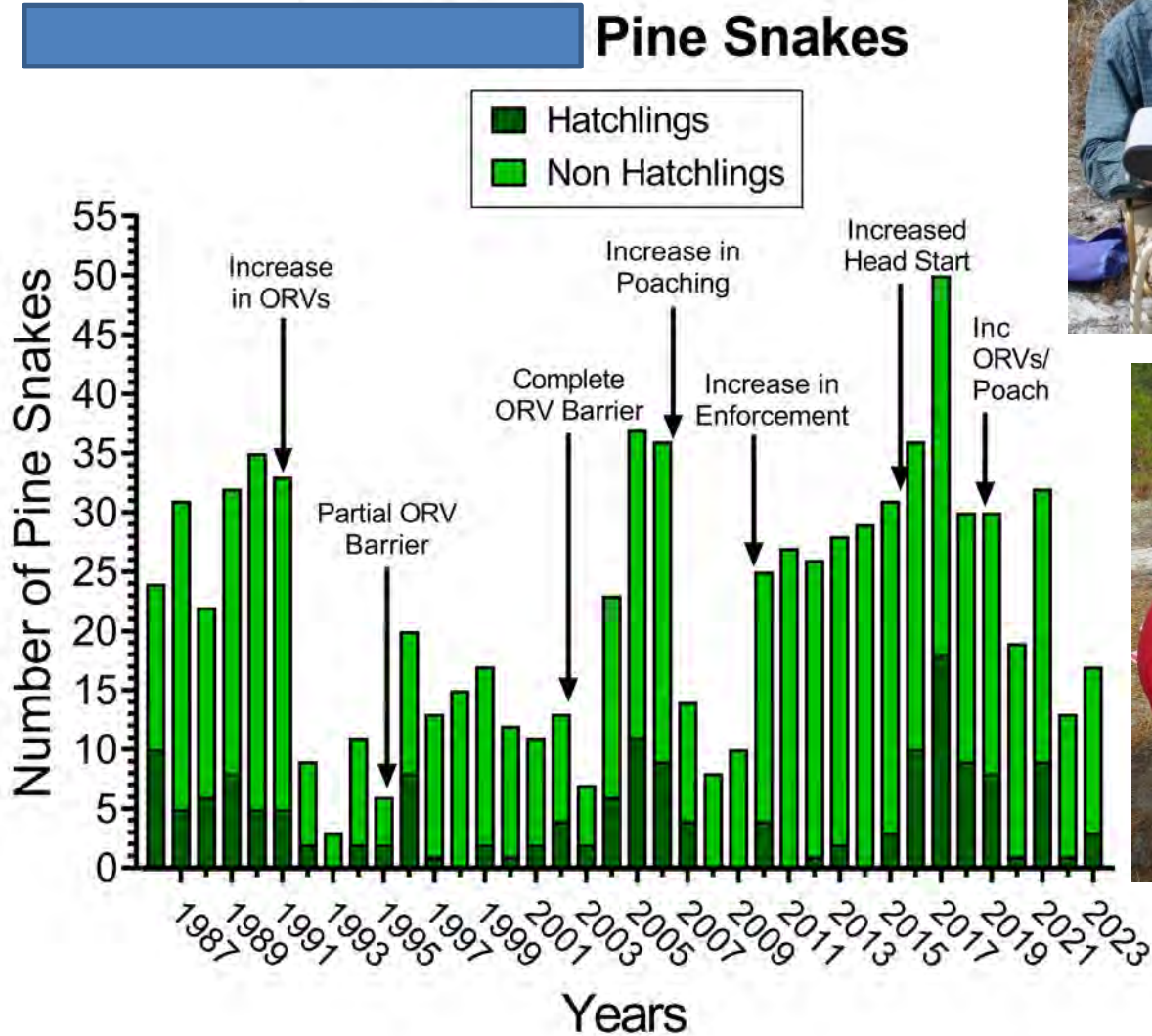
CONSERVATION OFFICERS ARE IMPORTANT

- Patrol nesting areas; Discourage poachers
- Cameras on nesting and hibernating areas
 - Nesting – 15 June to 10 July
 - Entering Hibernation – 1 Oct – 15 Dec
 - Leaving Hibernation – March – April
- WE NEED TO WORK ON HIDING CAMERA
- Surveillance notices (even when no cameras)
- Enforce ORV regulations



Thanks to all NJ
Conservation
Police

CONSERVATION WORKS

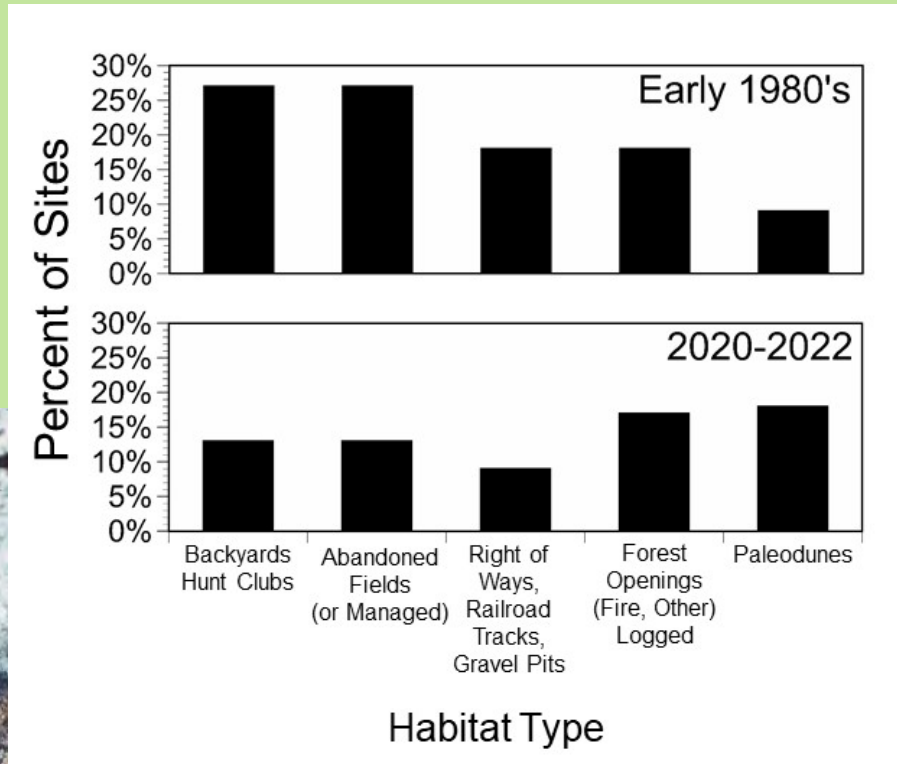


WHAT DO WE NEED TO KNOW TO EXAMINE CLIMATE CHANGE EFFECTS?

- Short-term flexibility in behavior
 - Nesting, foraging, hibernating
 - Nesting areas and nest sites
 - Foraging types or behavior
 - Movement
 - Changes in hibernation behavior
- Long-term ability to shift north.
 - Pine Barrens surrounded by urban environments
 - Lack of ability to move over large unfavorable environments



FLEXIBILITY IN NESTING AREAS



SHORT-TERM SELECTION OF NEST SITES (1983 vs 2020)

- **Use the Same Nest Sites = inflexible**
- Need open areas (clearing size can vary)
- Required: same percent tree cover over nest and 1 m from nest and in surrounding forest
- Lichens, heather for tunnel support
- Spike penetration the same



SHORT-TERM FLEXIBILITY IN FORAGING

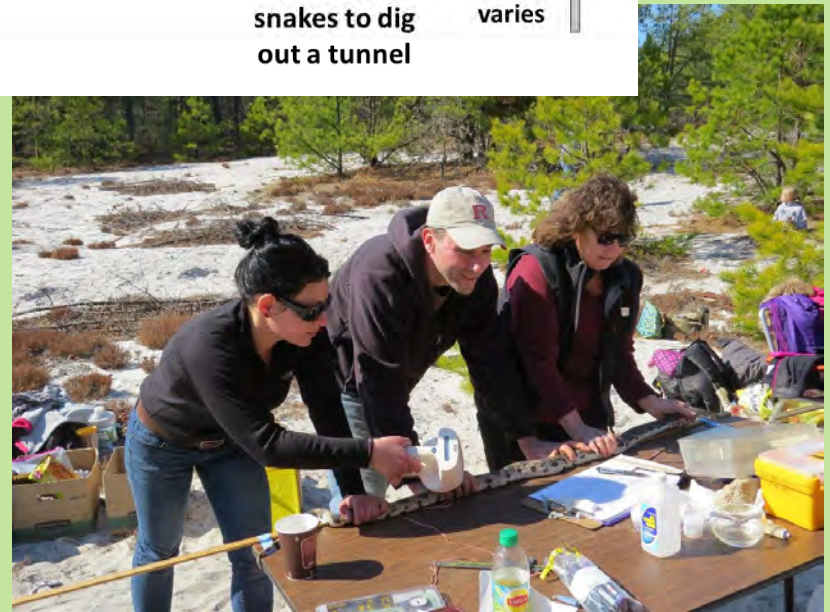
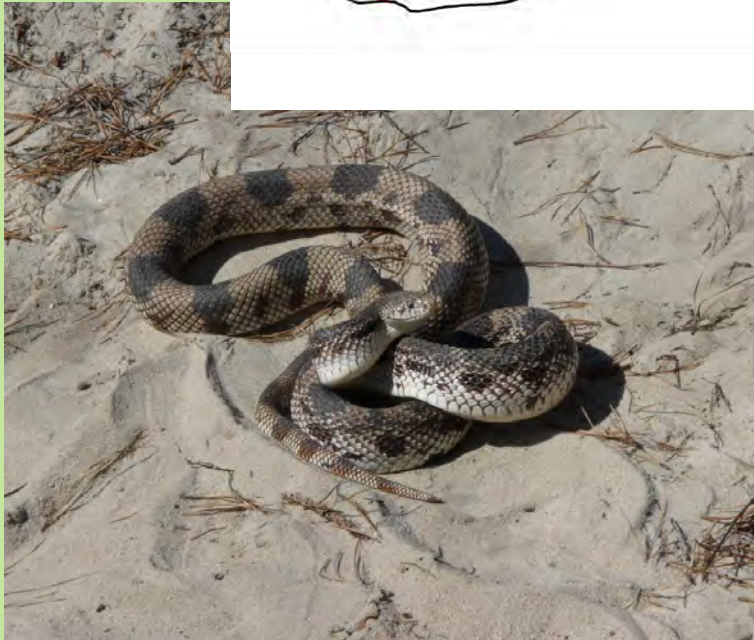
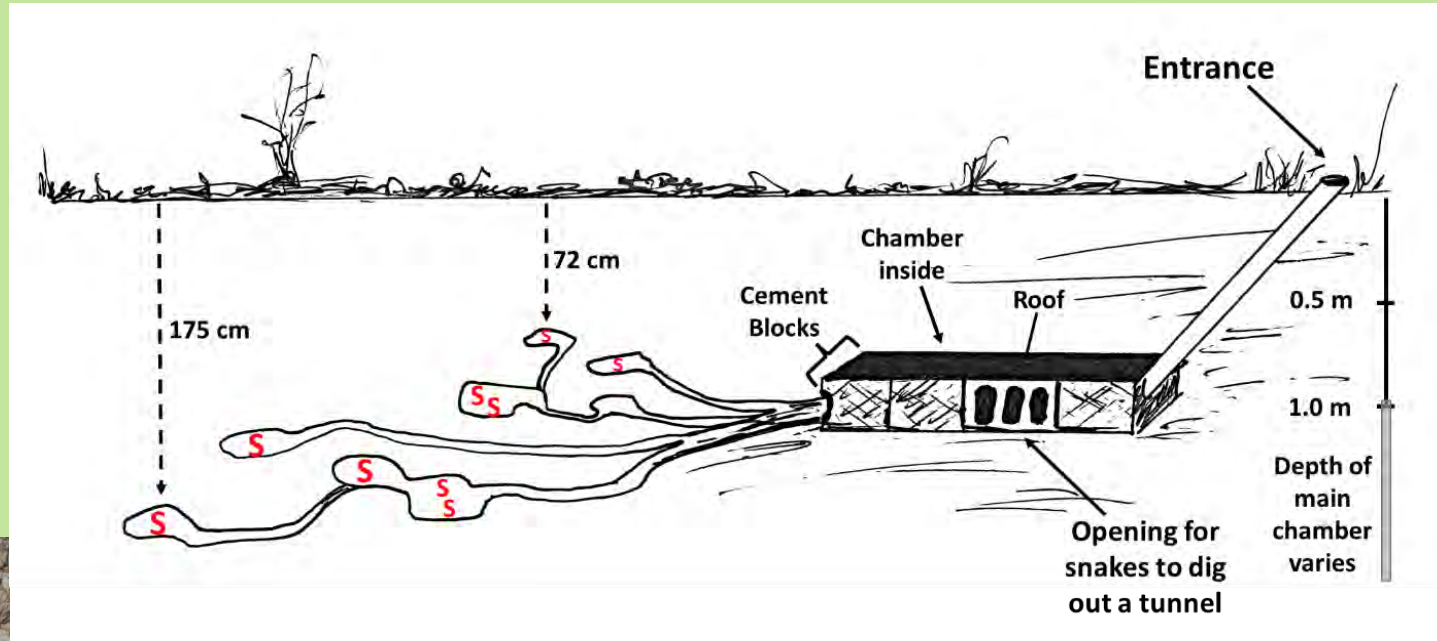
- Pine Snakes have a wide diversity of foraging behaviors and prey types = flexibility



SHORT-TERM CHANGES IN HIBERNATION BEHAVIOR

- Possibilities
 - Shift sites
 - Shift depths of hibernation
 - Shift when they come back to hibernacula
 - Change times they enter or leave
- Historical data
 - Used the same sites for decades
 - Entered hibernation: October-mid-November

SHIFT SITES OR DEPTHS



(research continues on natural vs modified dens)

FEMALE ADAPTATIONS

- Nest earlier and deeper
- Place nest under vegetation or in banks
- Move nest to sparse forest



TRADITIONAL VIEW OF ENTRY TO HIBERNACULA

- Returned to hibernacula in October to early November.
- Went in and usually stayed in, little basking by entrance.



FUNGUS: A New Potential Problem

- Hibernation Sites: "hibernation sores"
- Nesting: none of 4 females were positive in 2018/19



What Does it Mean?

Succession

More Activity than thought

Longer activity period in fall (Oct to mid-Dec)

Spring (less activity, but not predictable)

Climate Variability



High Vulnerability to ORV, Fires, Poachers



FROM SCIENTISTS TO THE PUBLIC

