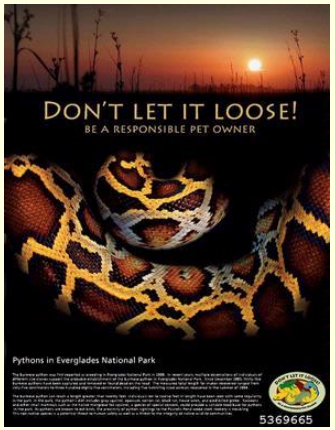
Structured Decision Making Workshop: Management response to the threat of Burmese pythons to Arthur R. Marshall Loxahatchee National Wildlife Refuge



Held: June 2 – 6, 2014

Participants: USFWS (Lox Refuge), NPS (ENP), FWC, USGS, University of Florida, University of Melbourne

Where: NCTC, Shepherdstown, WV





Problem – What question are we trying to answer

- **Where, when, and what actions by the conservation community will minimize the ecological impacts of pythons in Loxahatchee NWR?**

- **Because the effectiveness of various detection and control methods is highly uncertain, how can management be undertaken in such a way that this uncertainty can be reduced over time? (Adaptive management)**





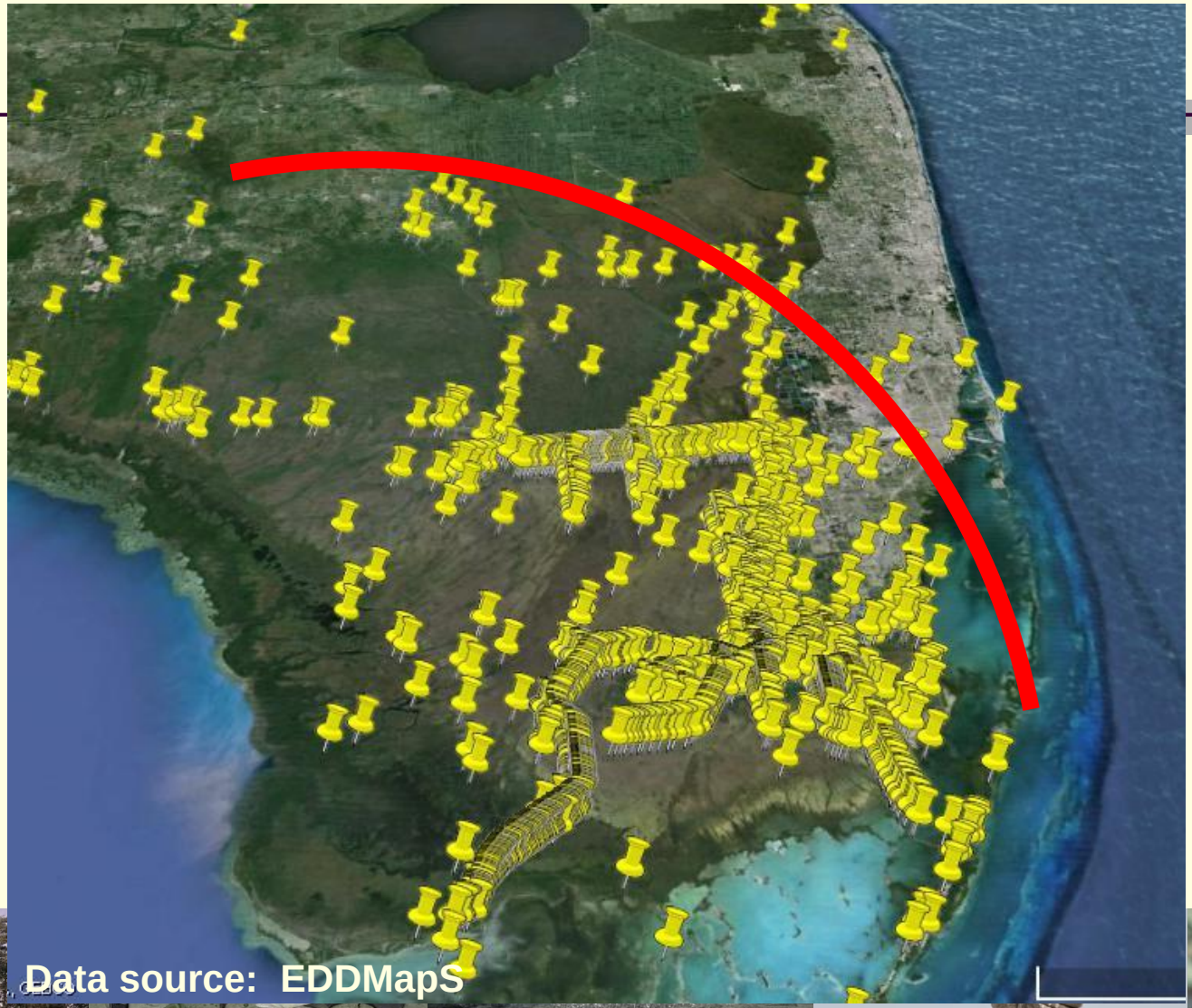
Objectives – What will the solution to the problem achieve?

- **In order to minimize the ecological impact (*fundamental*), minimize the abundance of pythons in the refuge over time (*means*)**
- **Minimize the cost of management, in terms of FTEs, operational costs ($$), and indirect costs to the management community (*fundamental*)**
- **Maximize human well-being, in terms of safety, public perceptions, and potential property damage (*process*)**

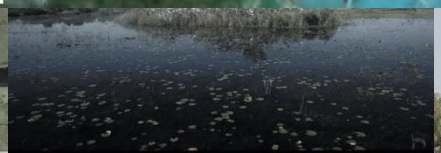
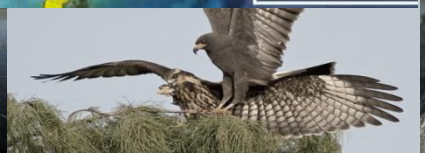




Slowing the Invasion Front






Actions

- Road cruising (med det, control, r&d)
- Walked surveys (med det, control, r&d)
- Dogs (med det, control, r&d)
- Capture/monitor training (med det, control)
- Judas snakes (med det, control)
- Thermal refugia on levees (uncertain det, control, r&d)
- Drift fence (uncertain det, control, r&d)
- Marsh rabbit sentinels (high det, control, r&d)
- Camera trap (uncertain det, r&d)
- Helicopter surveys (uncertain det, control, r&d)
- Aerial infra red (uncertain det, r&d)
- Signs & brochures (uncertain det)
- Electro-fishing (uncertain det, control, r&d)
- Crows (uncertain det, control, r&d)

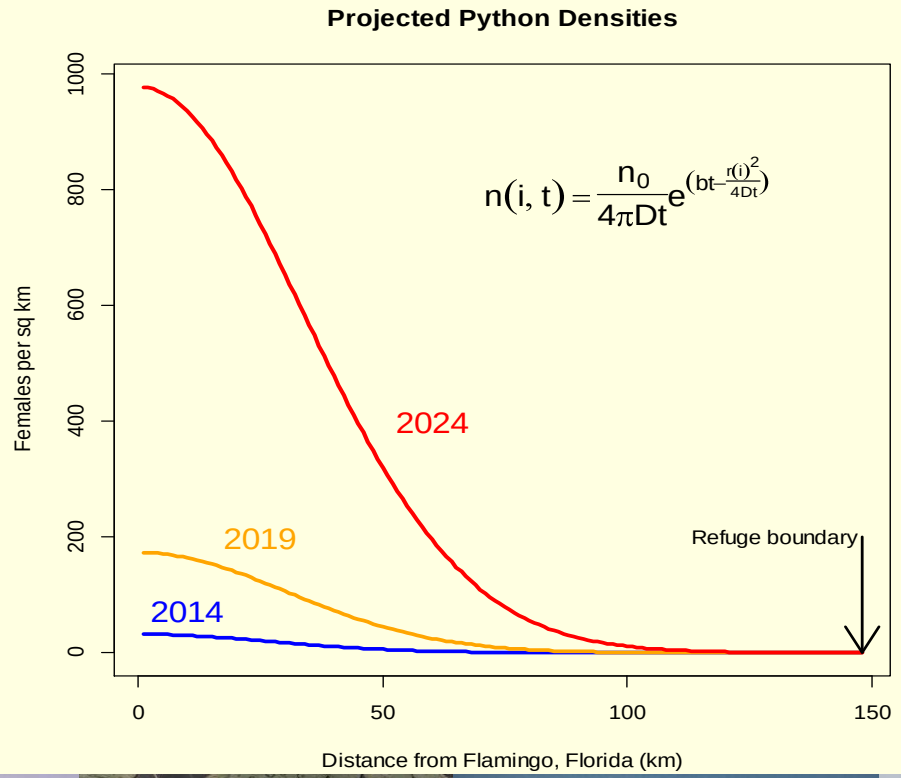




Consequences

- **Reaction-diffusion model to predict the abundance of pythons over space & time**

(what happens in ENP matters to LNWR)

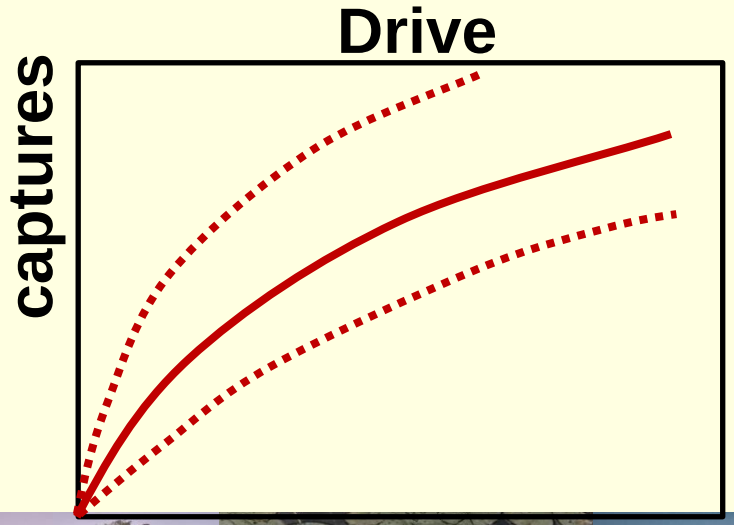


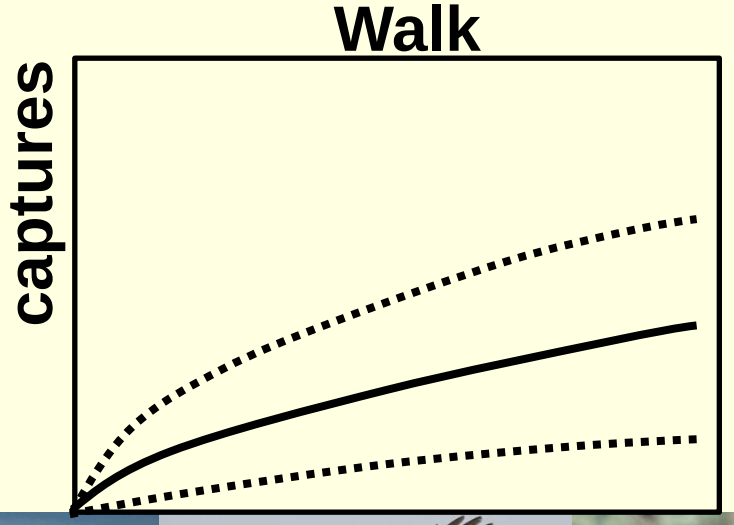


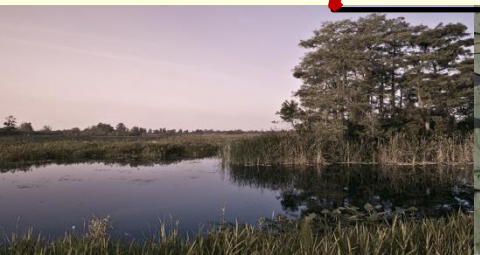


Consequences / Uncertainty

- **Use existing data and expert opinion to posit efficiency curves for different actions**
- **How do we allocate actions within a unit for a given budget to maximize effectiveness *and* learning?**

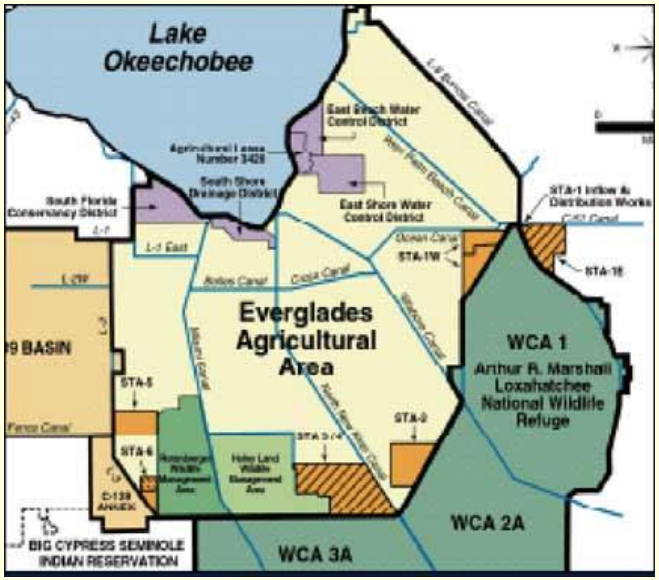






Optimization

- **Stratify the area into 5 units: ARMLNWR, EAA, WCA2, WCA3, Urban**
- **How should a total budget be allocated among the 5 areas?**
- **Within a unit, and for a given unit budget, how much effort should be invested in various control actions?**







Optimization

- **Use active adaptive management *within each area* to determine optimal allocations of alternative control actions**
- **Predict the effect on python abundance at the *unit level* for various budget levels**
- **Use this information to dynamically allocate the given budget *over all 5 areas***





Monitoring & Learning

1) **Monitor the effectiveness of various actions in each unit**
2) **Update the functions describing the cost-effectiveness of each action**
3) **Update expected python abundance (potentially, use capture information to estimate abundance to compare with predicted abundance from the reaction-diffusion model)**
4) **Re-allocate resources based on updated models**
5) **Return to step 1**





Next Steps

- Model optimization/Final Report
  - Continue to collect data
  - Further development
    - Including as a tool for other areas, species
- Participate in development of interagency large constrictor management plan
- Continue to seek adequate funding to operationalize the control program
- Design/Implement monitoring/control program
- Python sighting response group expansion





Participants/Coaches*

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