

# Conservation in changing ecosystems, from fragmentation to invasive species

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Postdoctoral Researcher,

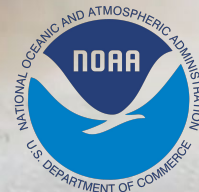
Washington Cooperative Fish and Wildlife  
Research Unit

University of Washington



# Optimizing the Monitoring and Management of Invasive Brown Treesnakes

Staci Amburgey, Amy Yackel Adams, Aadithya Prakash, Brett McClintock, Shane Siers, Beth Gardner, and Sarah Converse











China

Philippines

Australia

Google

5,663 mi  
9,113.7 km

USA





Farallon de Pajaros

Maug Island

Asuncion Island

Pacific

Ocean

Agrihan

Pagan

Alamagan

Guguan

Sarigan

Anatahan

Farallon de  
Medinilla

Saipan

Tinian

Aguijan

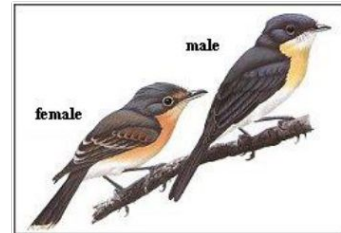
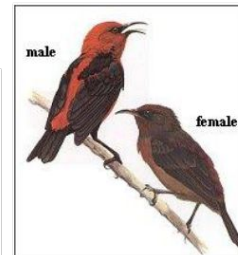
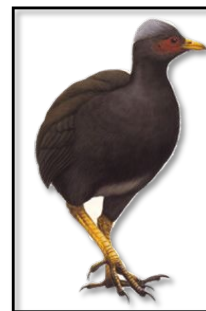
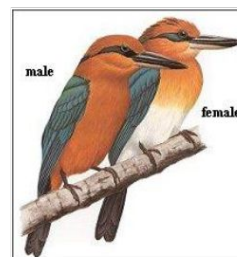
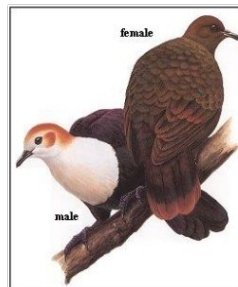
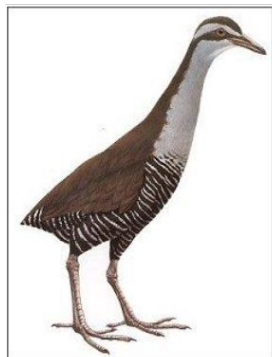
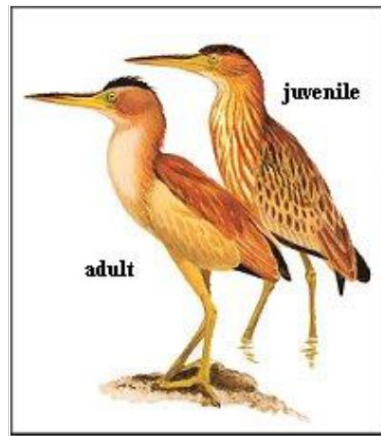
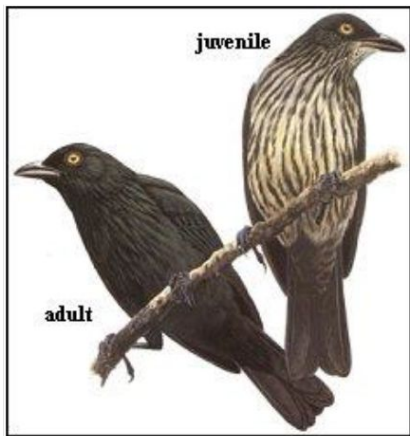
Rota

Agana

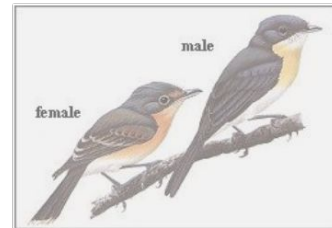
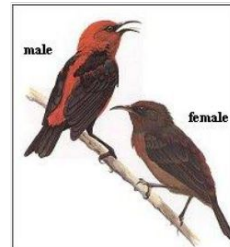
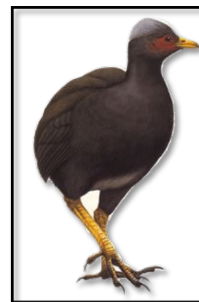
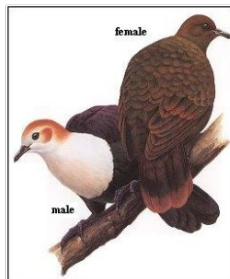
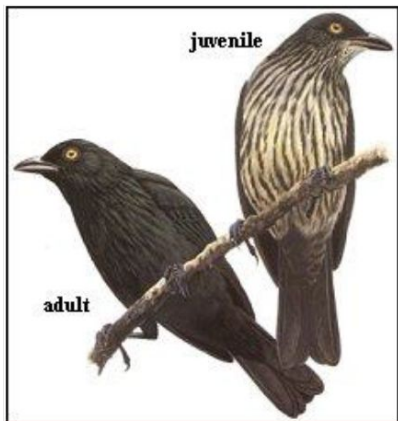
Guam  
(U.S.)







# Extirpated or Extinct











<https://www.youtube.com/watch?v=QxAGpDlrlLs>





Credit: C. Clark













**Ko'ko'**



**Åga**



**Sihek**



**Såli**

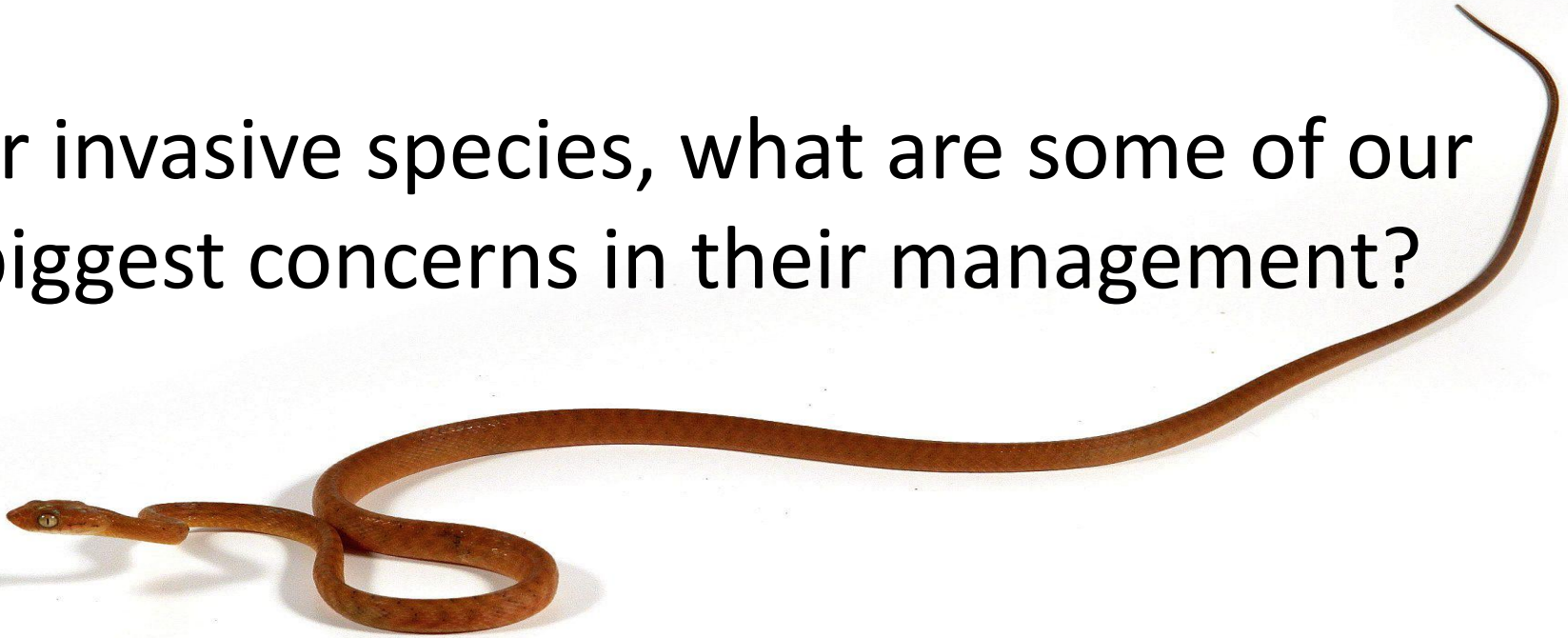


**Égigi**



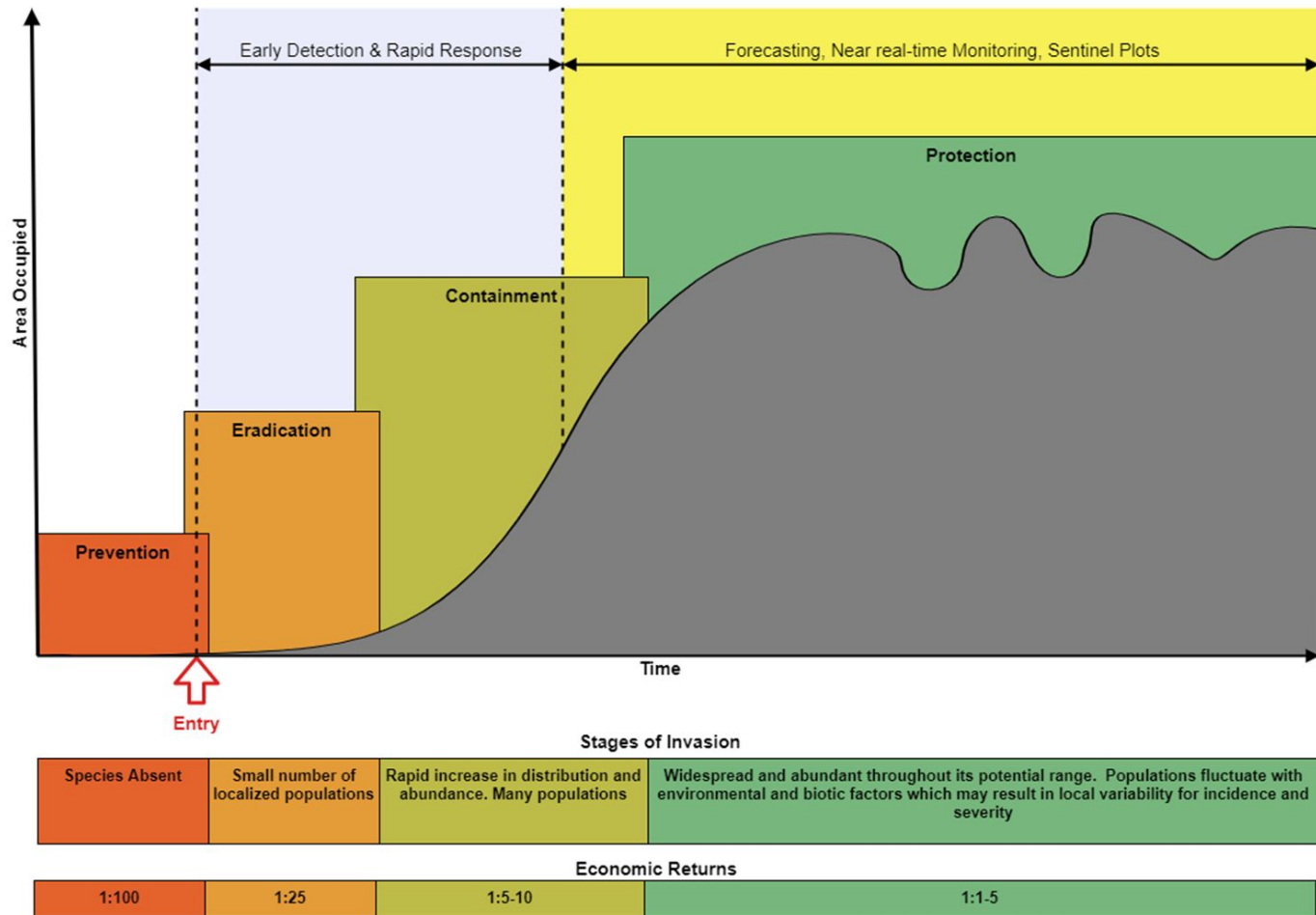
**Totot**

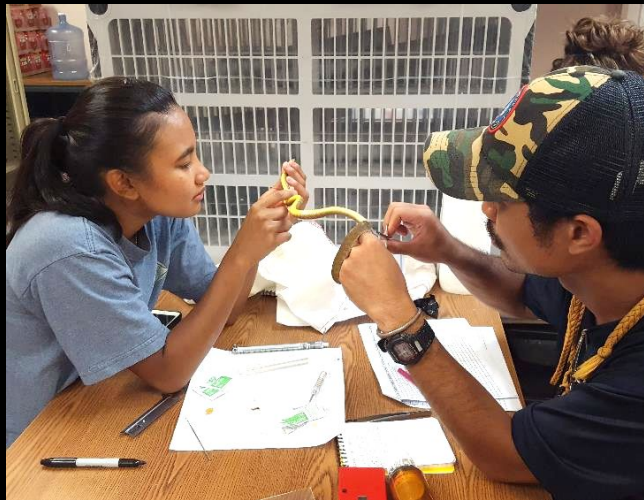
For invasive species, what are some of our biggest concerns in their management?





# The Invasion Timeline









TÅNO, TÅSI, YAN TODU





# Unifying and optimizing

- Make informed management decisions
  - Objective-driven
  - Timely
  - Cost-effective
- Leverage existing knowledge



# Innovating and improving

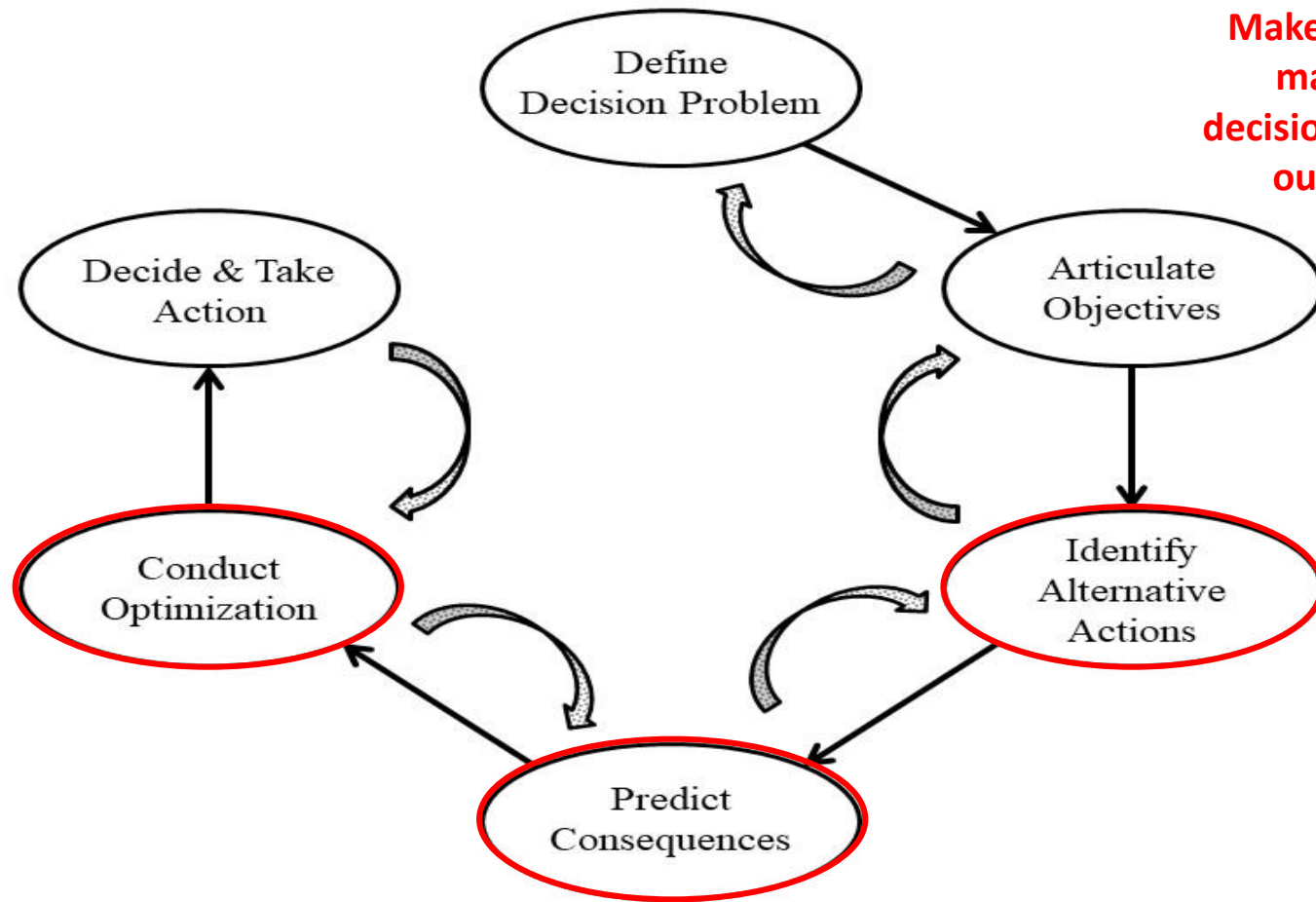
- Fill in missing knowledge
- Improve the methods we do have
- Be creative!





What would you want to know in order to manage brown treesnakes?





*modified from* Converse, Moore, Armstrong. 2013. Demographics of reintroduced populations: estimation, modeling, and decision analysis. *Journal of Wildlife Management* 77:1081-1093

# Objectives

## Cost and Technical Objectives

- Minimize the cost (in USD) of implementing

## Monitoring Objectives

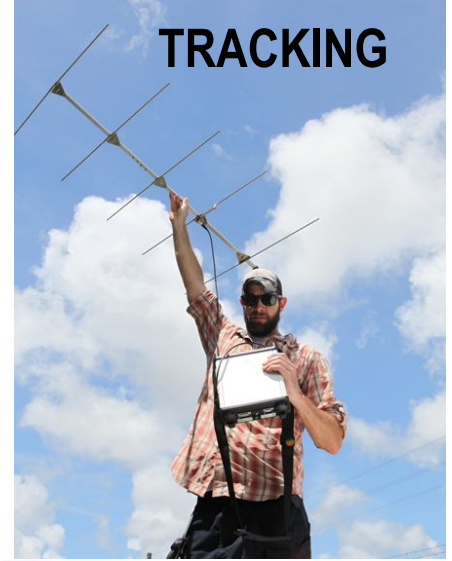
- Minimize error (e.g., RMSE) in estimates of abundance
- Maximize power to detect changes
- Maximize detection or encounter probability



**TRAPS**



**SEARCHERS**



**TRACKING**



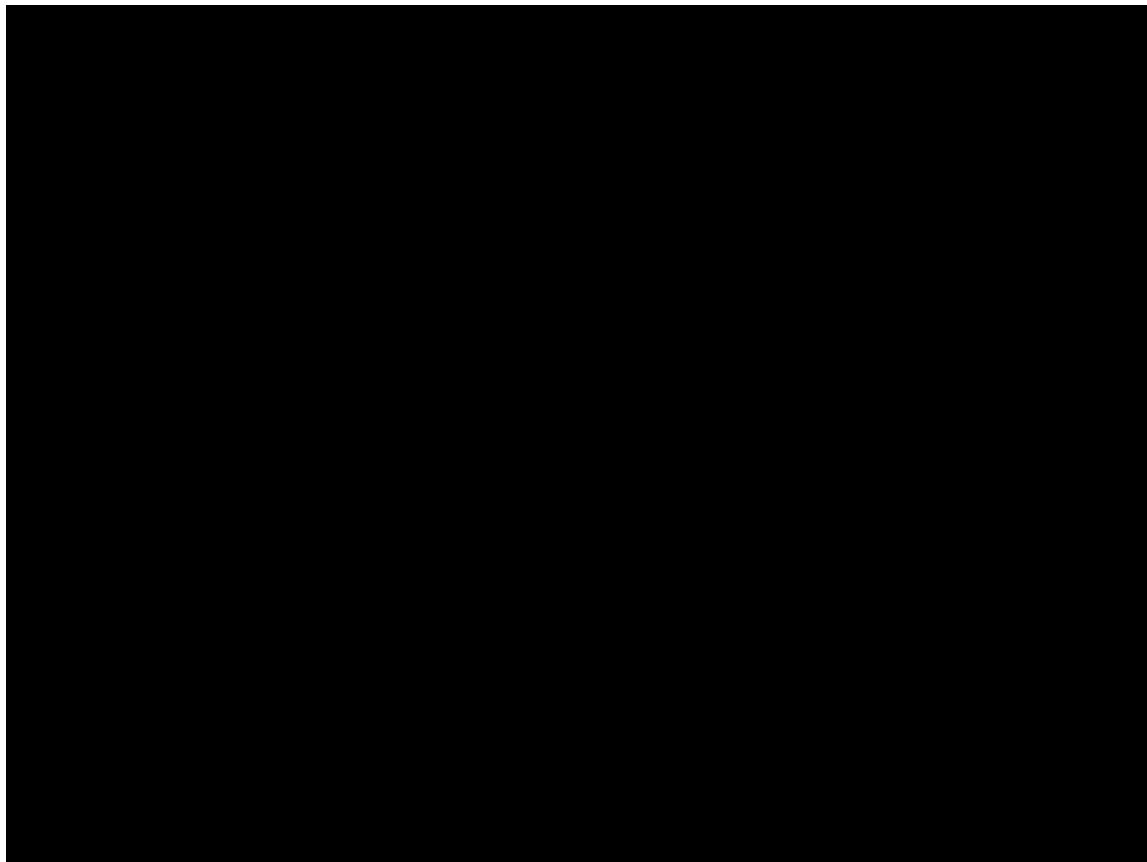


**Try out new  
methods**



# Snakes on a Coordinate Plane

**Understand  
why methods  
succeed or fail**



# Alternate Monitoring Scenarios

- Spatial and temporal extent
- Density
- Combinations of methods

Scenario 1: Trap captures

S1

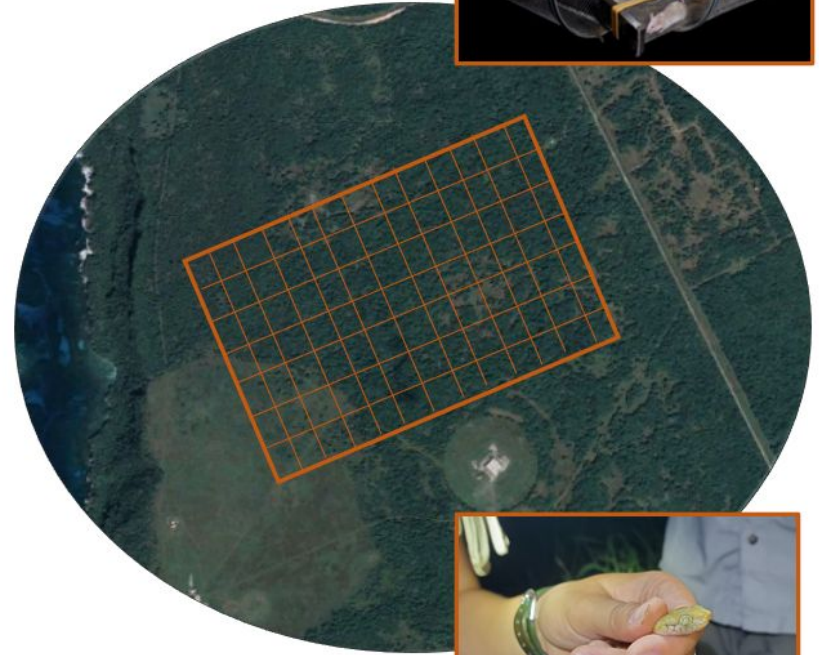
Scenario 2: Visual surveys

S2

Scenario 3: Visual and trap

S3


**Understand  
what methods  
get you**



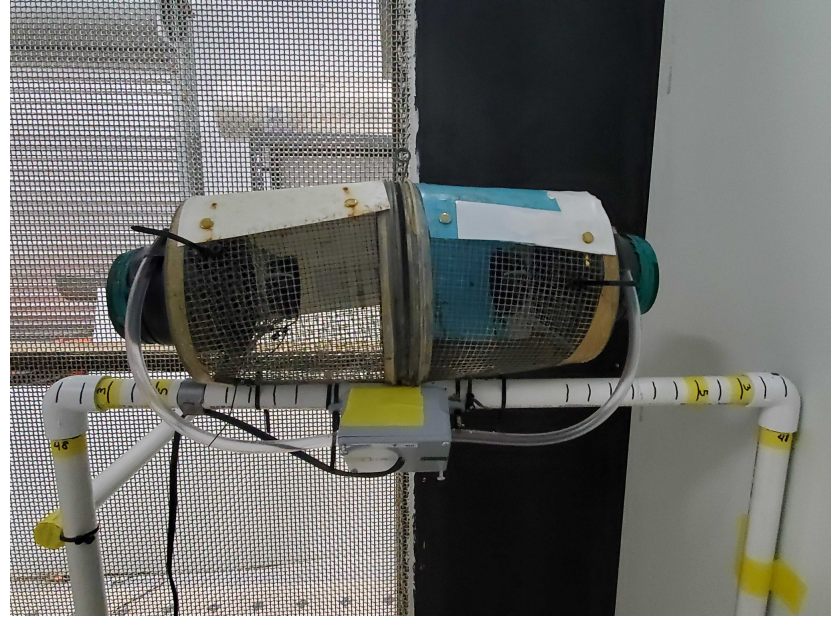


# Alternate Population Scenarios

Understand how this  
could vary in space  
and time

BTS Density		Monitoring Scenarios
<div>Low</div>	<p><b>More large</b> : less small</p> <p>Less large : <b>more small</b></p>	<div><div>S1S2S3</div><div>S1S2S3</div><div>S1S2S3</div></div>
<div>Current</div>	<p><b>More large</b> : less small</p> <p>Less large : <b>more small</b></p>	<div><div>S1S2S3</div><div>S1S2S3</div><div>S1S2S3</div></div>

# Remote PIT Tag Reader (RePTaR)

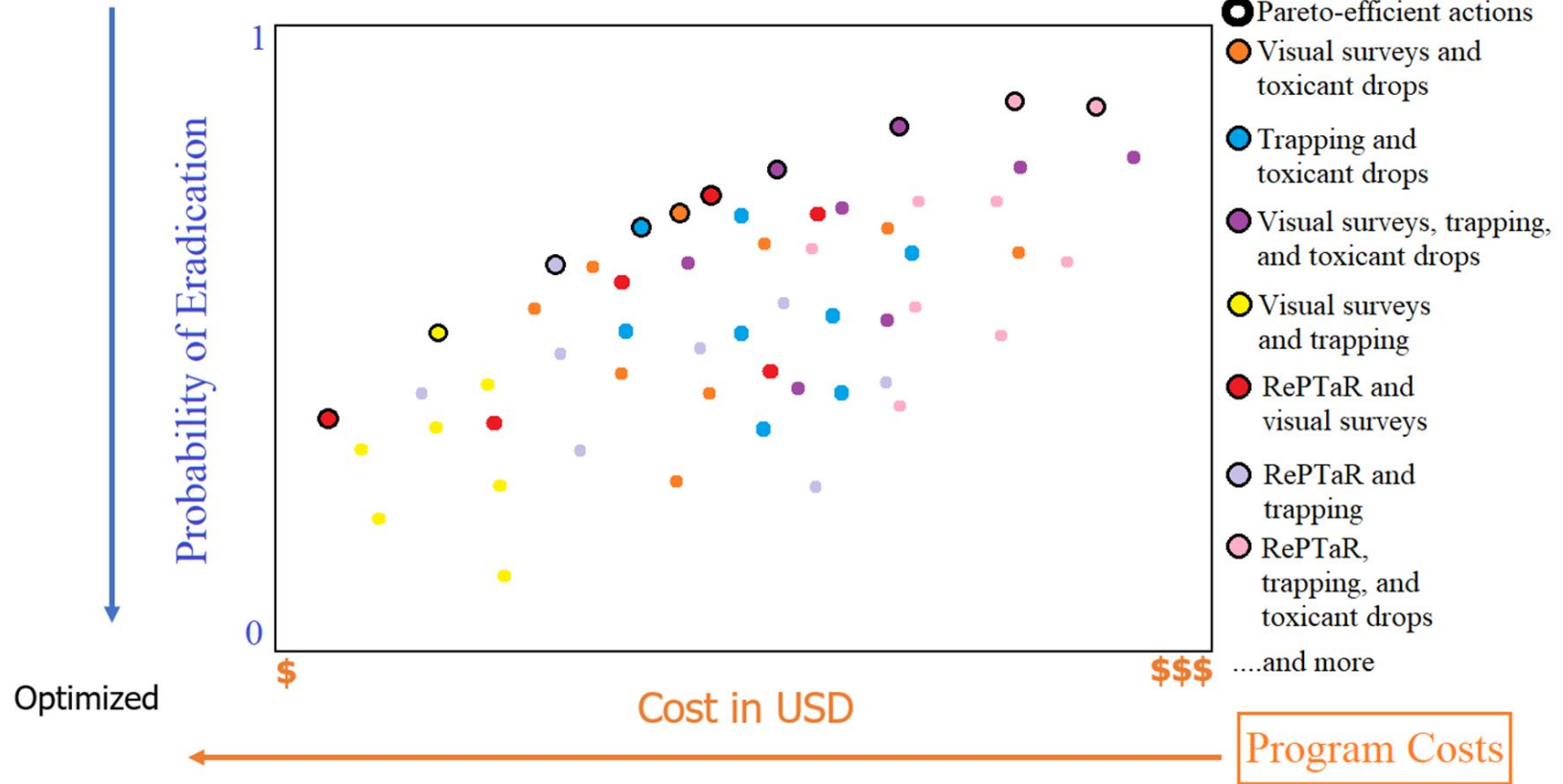


**Innovate new  
methods**





## Management Objective



**Help decide what can be done**



Partnerships are key

Innovation is crucial

Test out your methods

Use a robust process to  
make decisions

# Acknowledgments

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