# High Resolution Habitat Raster of Maritime Dune Ecosystem:
# Eastern Hognose Snake Analysis



*"In this democratic age there are hardly enough kings to go around, but given the chance I would rank hunting of the hognose snake of Cape Cod high on the list of their potential sports."*

**-James "Skip" Lazell**

**'This Broken Archipelago' 1976.**

## Natural History Background:



*Heterodon platirhinos* **distribution. Ernst and Ernst 2003.**
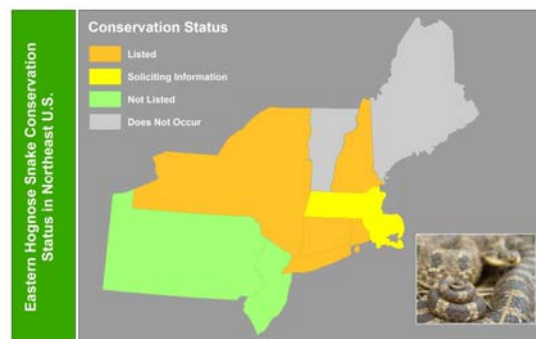


**Upturned rostrum utilized in digging for prey and burrowing out nests and hibernacula.**

- Found in eastern half of U.S.
- Greatest population densities in sandy soil environs.
- A documented variable diet, but feed primarily on toads.
- Upturned rostrum used to burrow through sandy soil.
- Noteworthy defensive behavior.

## Research Motivations:

- Expand the Knowledge:
  - Few studies on this species involving multiple individuals from single populations over multiple years.
- Conservation:
  - Noted declines via anthropogenic modifications to the landscape.
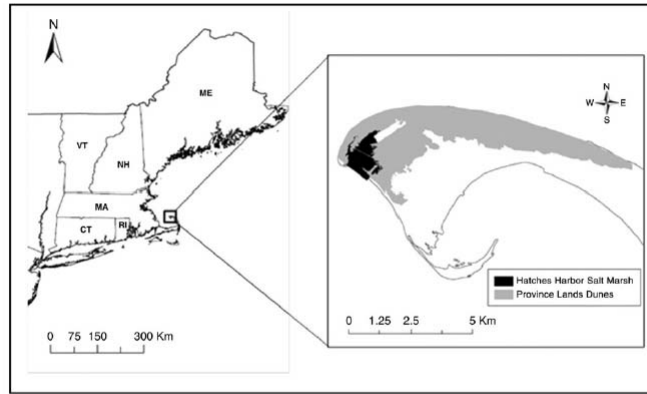  - Status:

## Study Area:



Fig. 1. Location of the Province Lands dunes and Hatches Harbor salt marsh study areas, Barnstable County, Massachusetts, United States.

Timm and McGarigal 2012

## Study Area:

# Radiotelemetry:

- 2009-2010
  - ~ once every 4.5 days from 15May – 30September
- 2011
  - ~ once every 1.5 days from 15May – 30September

A Total of **809 relocations** among **17 individuals** over **3 years**.

**10** Females, **7** Males.

Mean SVL = **580.3mm (22.3)**

Mean Relocations = **47.6 (7.9)**



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Remote Sensing of Environment 127 (2012) 106–117

Contents lists available at SciVerse ScienceDirect

## Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse

Fine-scale remotely-sensed cover mapping of coastal dune and salt marsh ecosystems at Cape Cod National Seashore using Random Forests
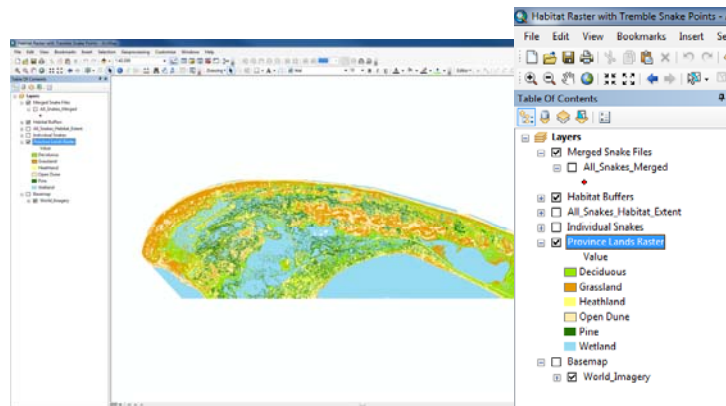
Brad C. Timm, Kevin McGarigal

Department of Environmental Conservation, University of Massachusetts-Amherst, Holdsworth Natural Resources Center, Amherst, MA 01003, USA
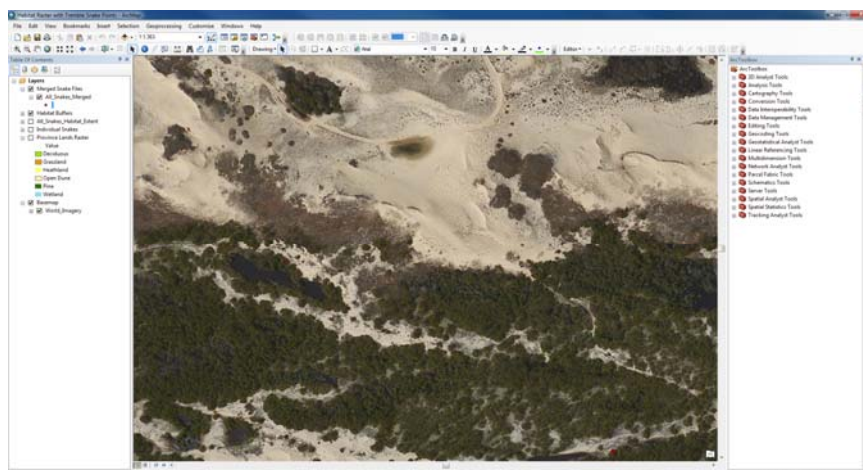
# Dr. Timm:



# 1m² Resolution Raster



- Created October 2013
- Snake-specific habitat categories
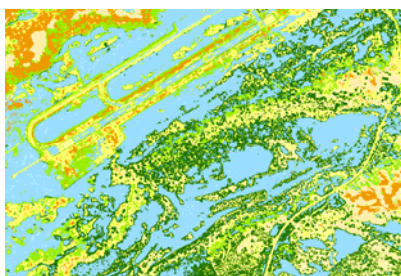- 12500 x 3500 = 43750000 pixels.

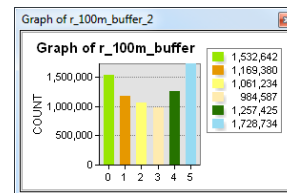# 1m$^2$ Resolution Raster



# Raster Challenges:
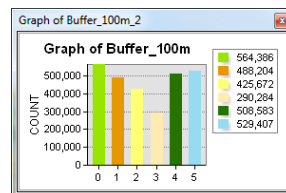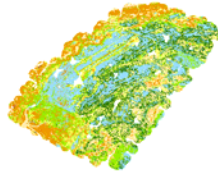
- Overall accuracy >80%
- Roads, structures, etc.
- Provincetown Airport
- Estuarine ecosystems
- Vertical overlap

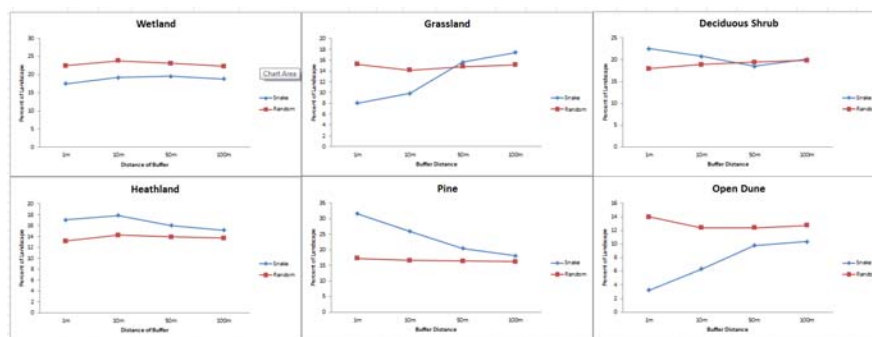| predicted observed | decidshrub | grassland | heathland | opendune | pine | wetland |
|---|---|---|---|---|---|---|
| decidshrub | 80 | 2 | 5 | 1 | 8 | 4 |
| grassland | 4 | 79 | 8 | 8 | 0 | 1 |
| heathland | 3 | 3 | 71 | 5 | 13 | 5 |
| opendune | 1 | 5 | 4 | 90 | 0 | 0 |
| pine | 6 | 0 | 3 | 0 | 88 | 3 |
| wetland | 0 | 1 | 3 | 0 | 11 | 85 |

## Snake Habitat Compositional Analysis:

1. Overlay Points on Raster

2. Buffer Points at Varying Distances (1m, 10m, 50m, 100m).

3. Extract Raster by Buffer Mask

4. Quantify Metrics using Fragstats…

5. Generate Random Points and Repeat Procedure at the Same Buffer Distances

6. Compare Proportional Amounts of each Habitat Type in Fragstats

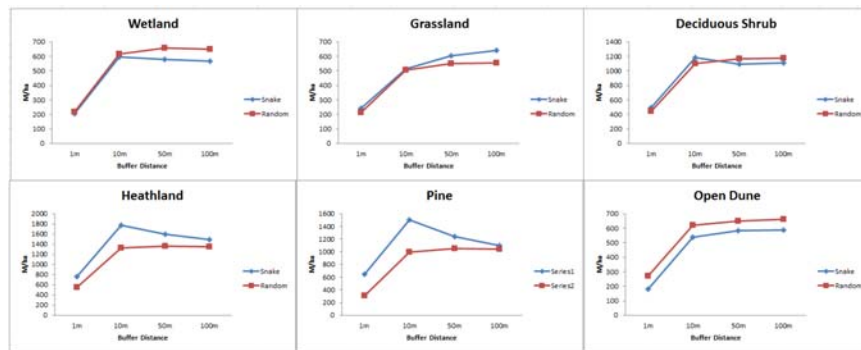7. Use vs. Availability; Preference?



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# Results: Percent of Landscape



- A snake point positioned above a random point indicates use that exceeds availability. This is often termed "preference."
- A snake point below indicates "avoidance."

# Results: Edge Density



# Future Work

- Deal with Repeated Measures
- Multiple Iterations
- Split Data by Sex and by Season
- Similar analysis with additional metrics in Fragstats:
  - Focusing on Class Metrics
  - Connectance
  - Aggregation Metrics
    - Isolation
    - Clumpiness
  - Core Area Metrics
    - Core area % of Landscape (need to define)