Application of a tiered management framework for raven management in Nevada

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Sagebrush Ecosystem Council, Nov. 2, 2023

2023

US Geological Survey[1] – Nevada Department of Wildlife[2] –USDA-APHIS-Wildlife Services[3]

Overview

USGS science for a changing world

Problem

Raven predation on sage-grouse

↓

Where are there enough ravens to warrant direct removal

↓

What treatment areas would benefit sage-grouse most

Solution

Science-based tiered framework

↓

Decision support tools - SMaRT

↓

USGS raven and sage-grouse products

Science-based tiered framework

1. Identify priority areas
2. Estimate site-level raven densities
3. Compare estimate to ecological threshold
4. Provide management options
5. (Re)assess management action(s)

From science-based framework to a decision support tool

SMaRT

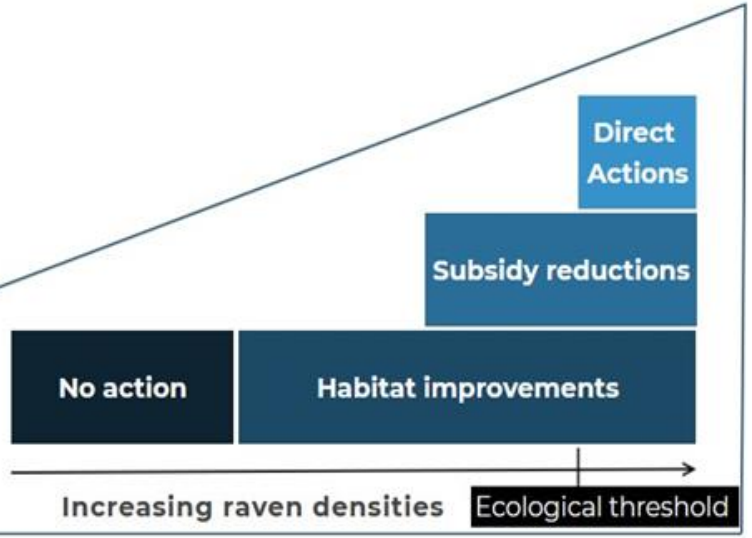
01 Desktop Analysis
Use mapping tools to identify areas of concern

02 Field Assessment
Employ rapid field protocols to obtain in-field estimate of raven densities in areas of concern

03 Compare Density to Ecological Threshold
Compare in-field density estimate to an established ecological threshold for species of concern

04 Prescribe Management Action Using 3-tiered Process
Identify management action(s) based on interaction of density estimate and ecological threshold from step 3

05 Post Management Monitoring
Monitor results using new density estimates. Compare new estimates to ecological threshold and adjust management action(s)

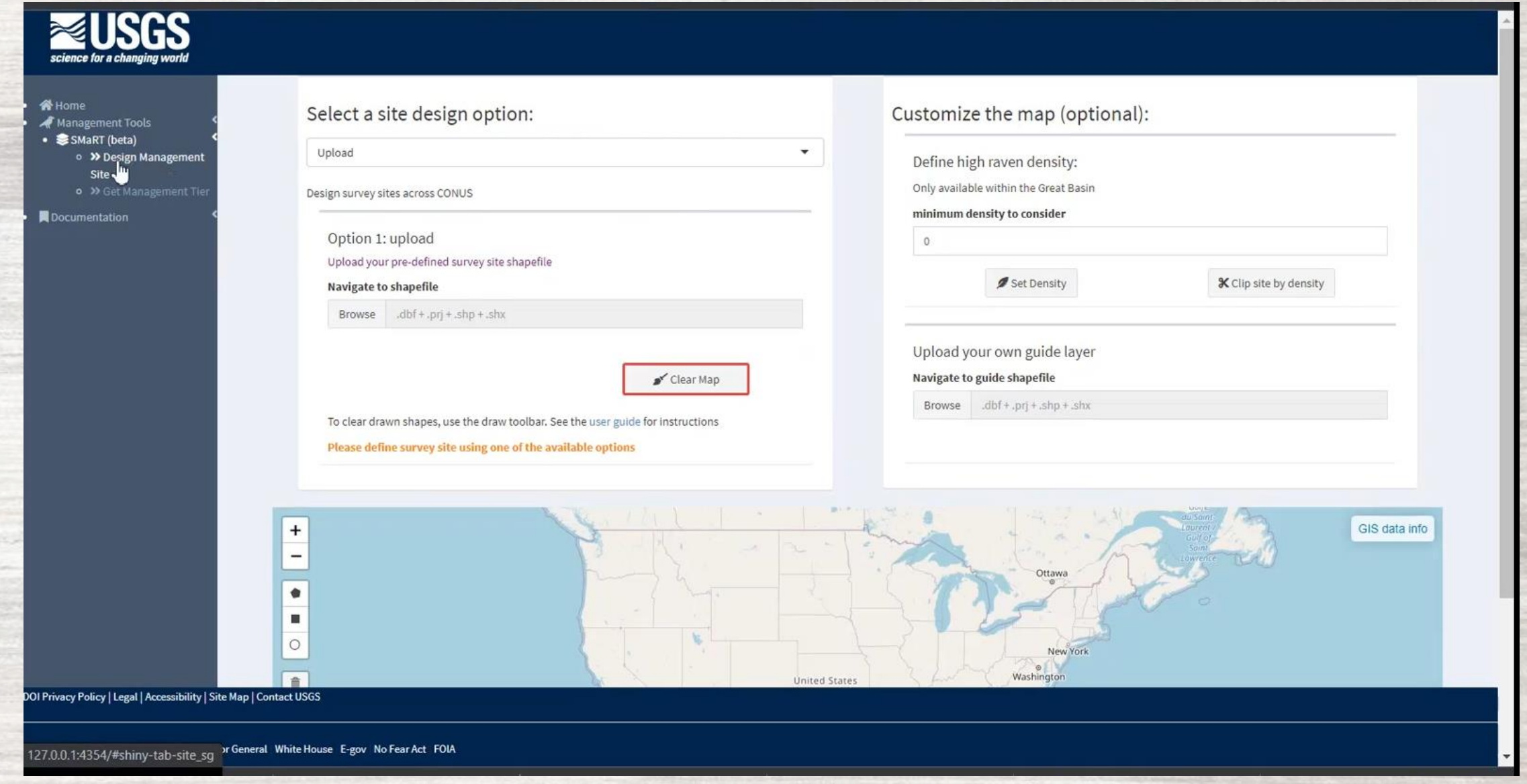


Dettenmaier SJ, PS Coates, CL Roth, SC Webster, ST O'Neil, JC Tull, and PJ Jackson. *In press*. SMaRT: a science-based tiered framework for common raven management, *Human-Wildlife Interactions*.

SMaRT – Science-based Management of Ravens Tools

Roth, C.L., Coates, P.S., Webster, S.C., Dettenmaier, S.J., O'Neil, S.T., and Brussee, B.E. 2021. Science-based Management of Ravens (SMaRT): U.S. Geological Survey software release. https://doi.org/10.5066/P9B5ANSM

Step 1. Identify Management Areas



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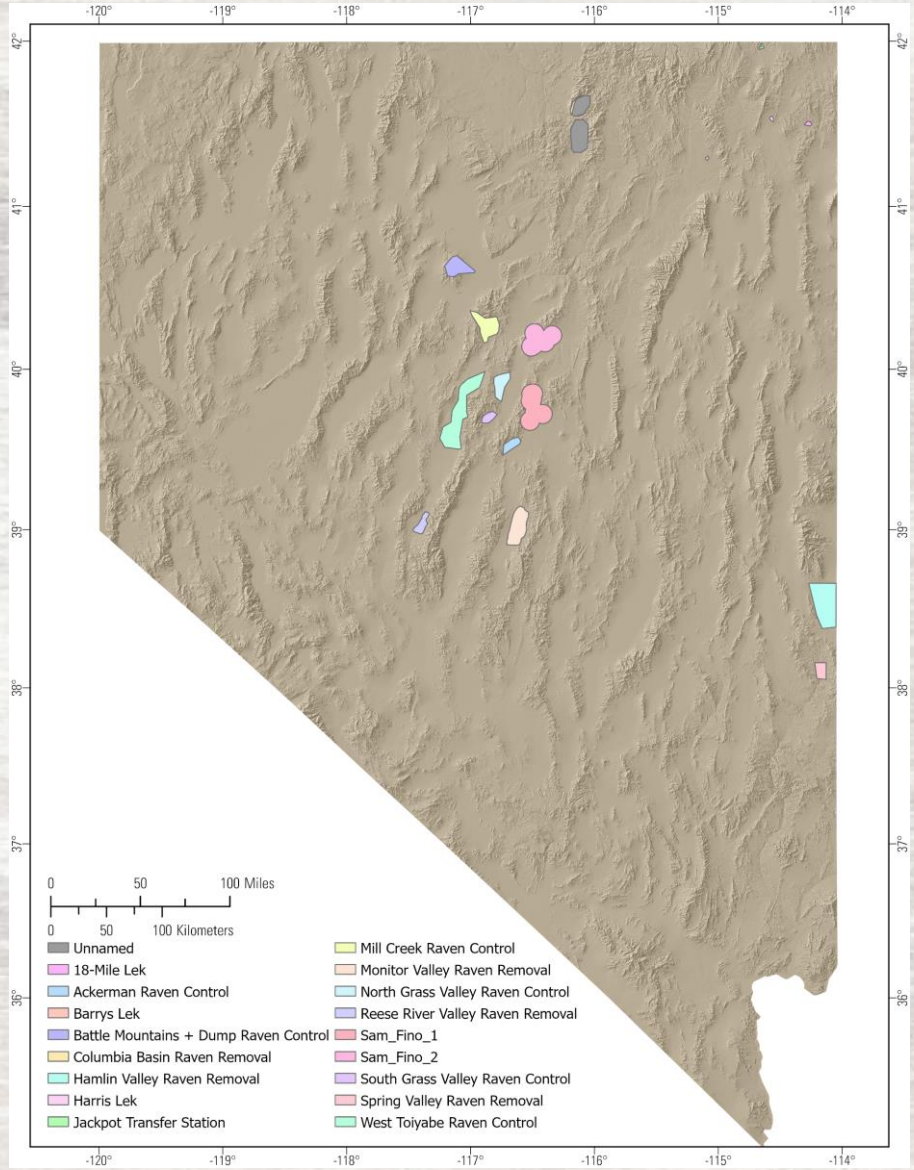

NDOW candidate treatment areas:

- Polygons provided by NDOW Biologists based on lek locations and observed ravens

Data and processes for polygon development were conducted by the Nevada Department of Wildlife.

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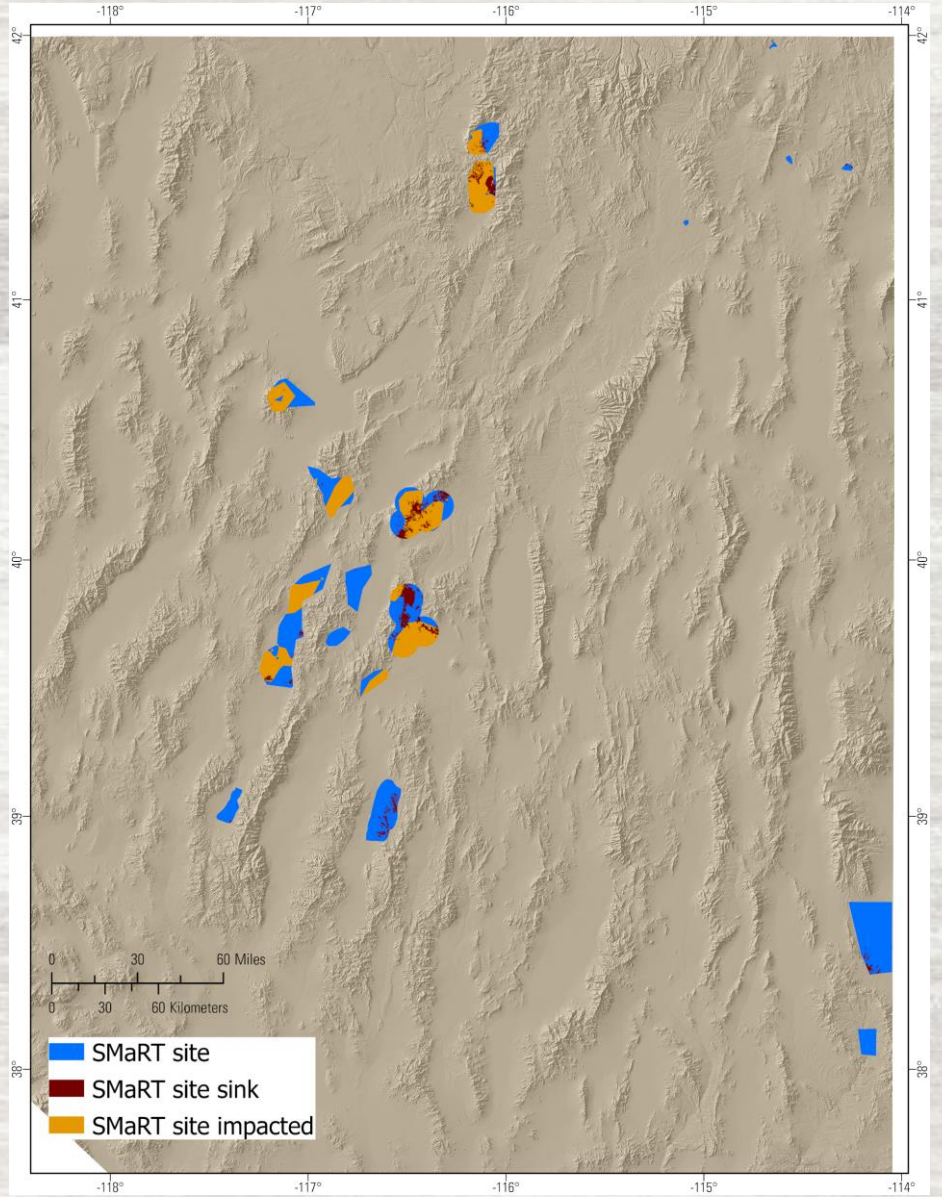

NDOW candidate treatment areas

USGS provided maps of:

- Nest sink areas
- Sage-grouse concentration areas
- High density areas (>0.4 ravens/km2)

Polygon revisions were conducted by the Nevada Department of Wildlife.

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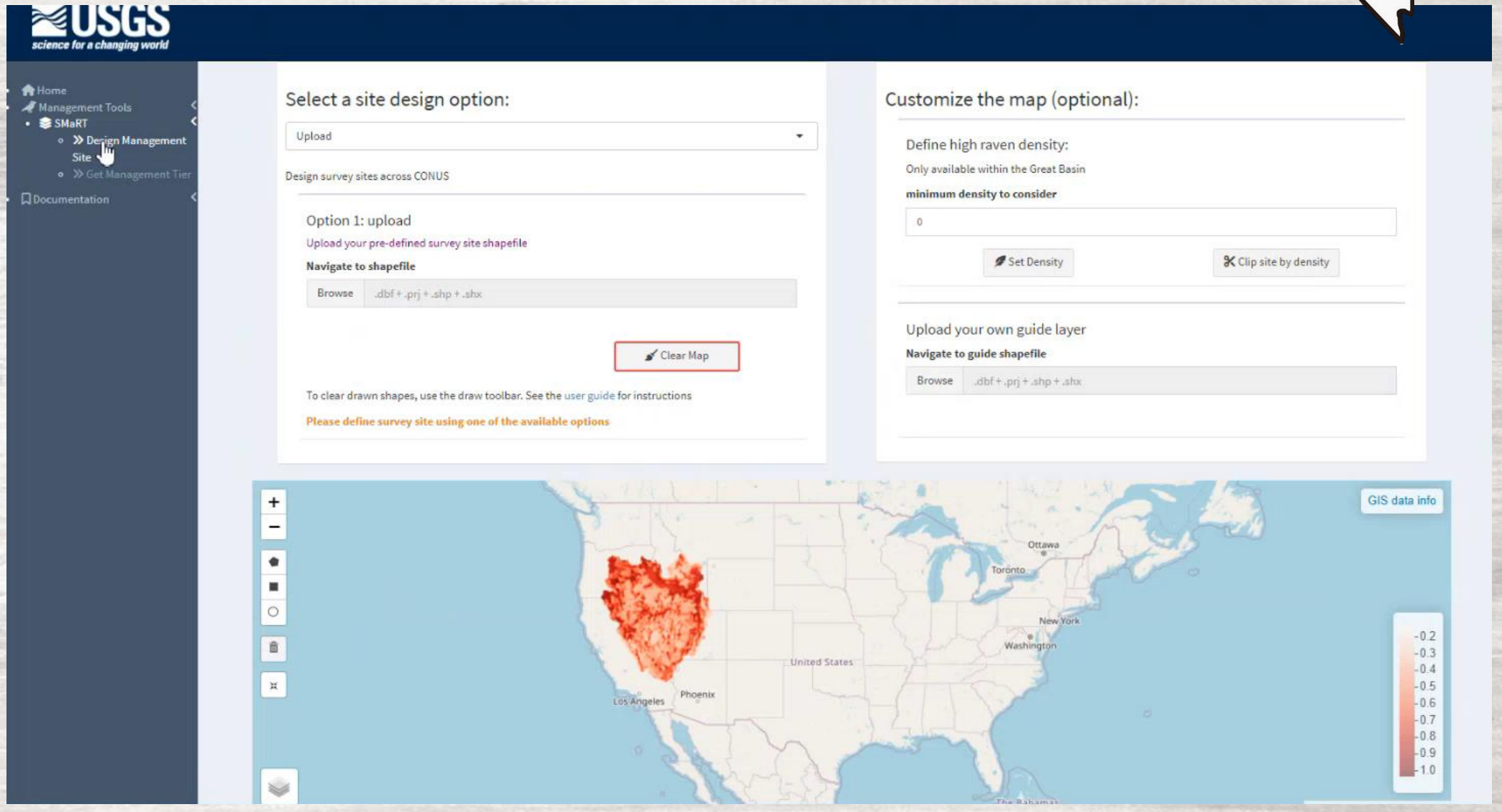

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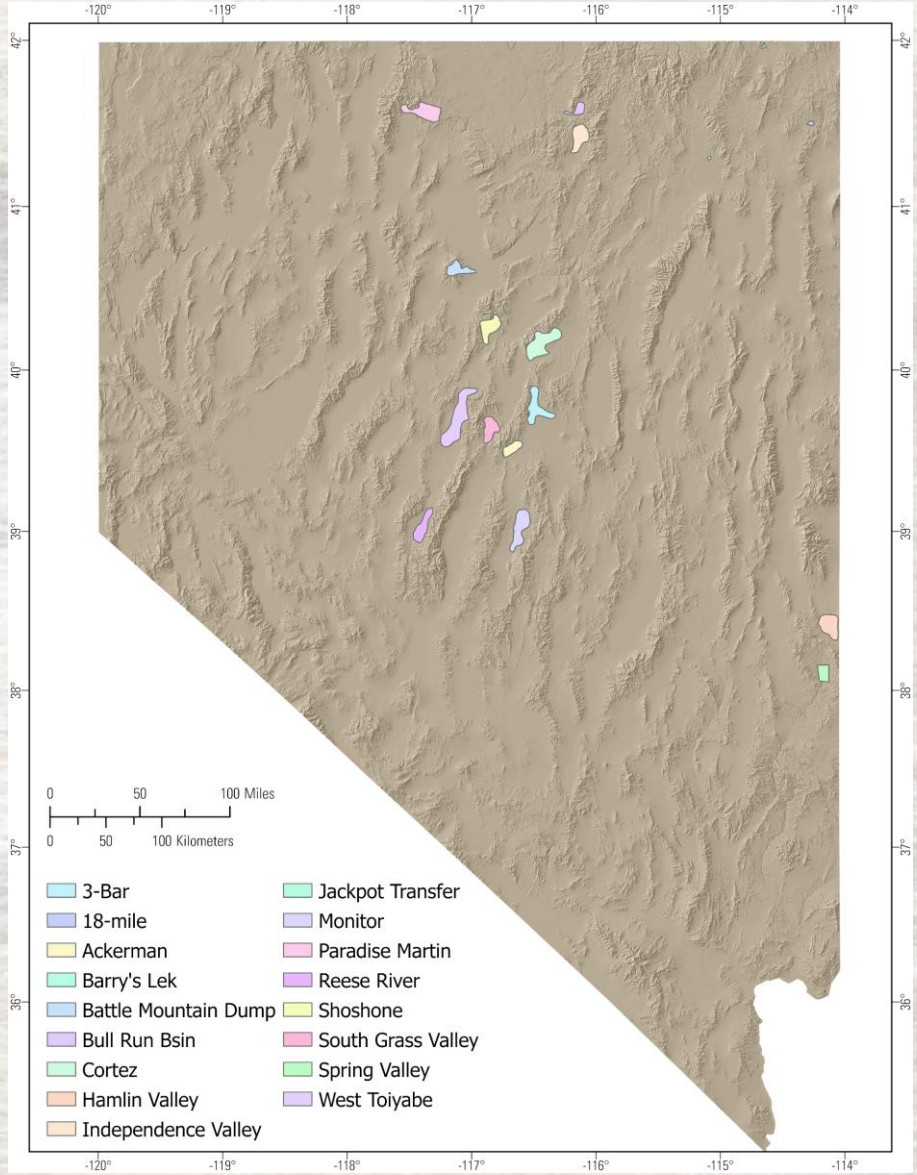


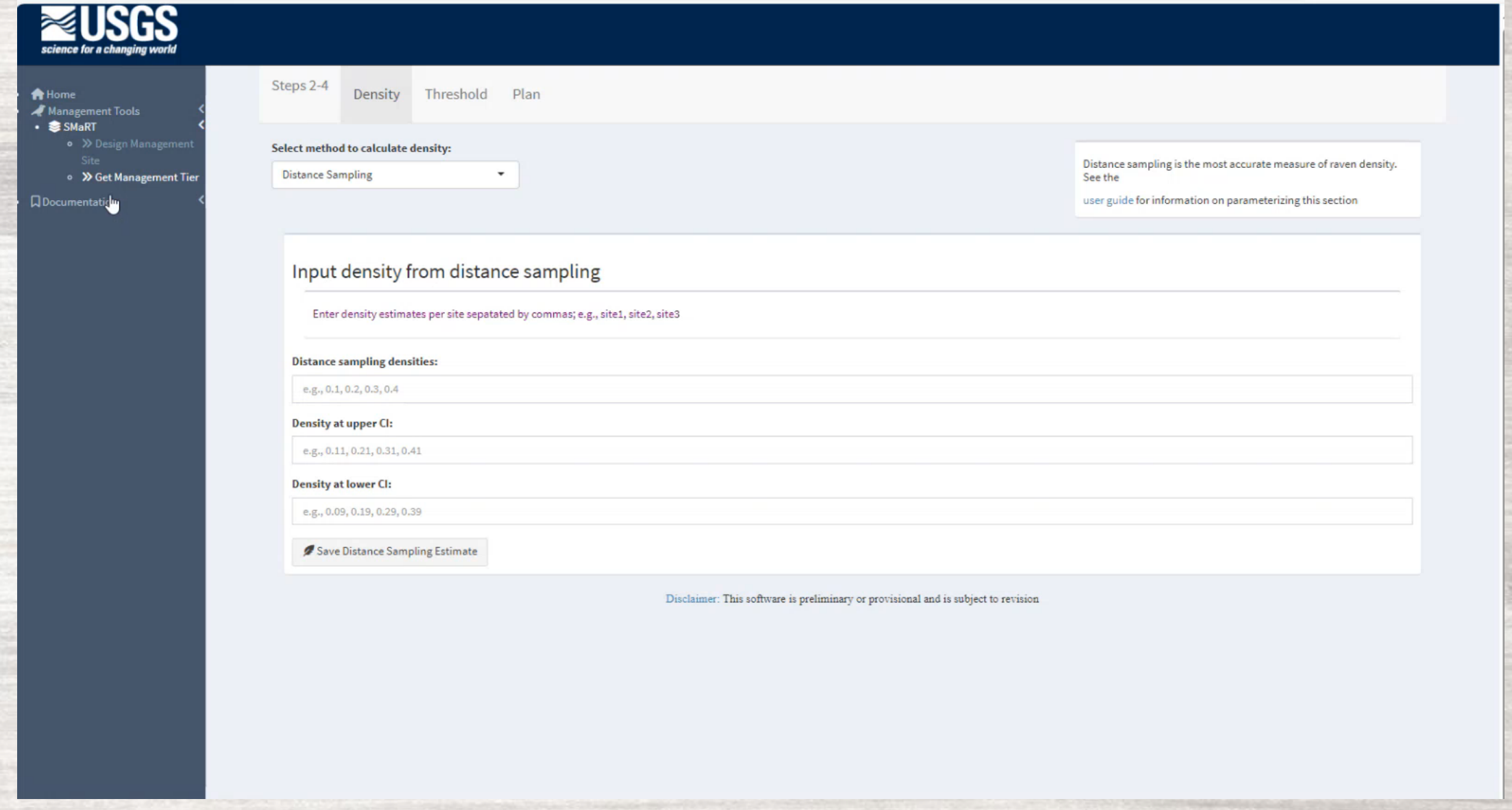
NDOW candidate treatment areas

NDOW revised polygons to:

- better match where the sink habitat is located
- reduce the size of the polygon where there was low selection
- better cover lek locations

Polygon revisions were conducted by the Nevada Department of Wildlife.

Step 2. Estimate Raven Density



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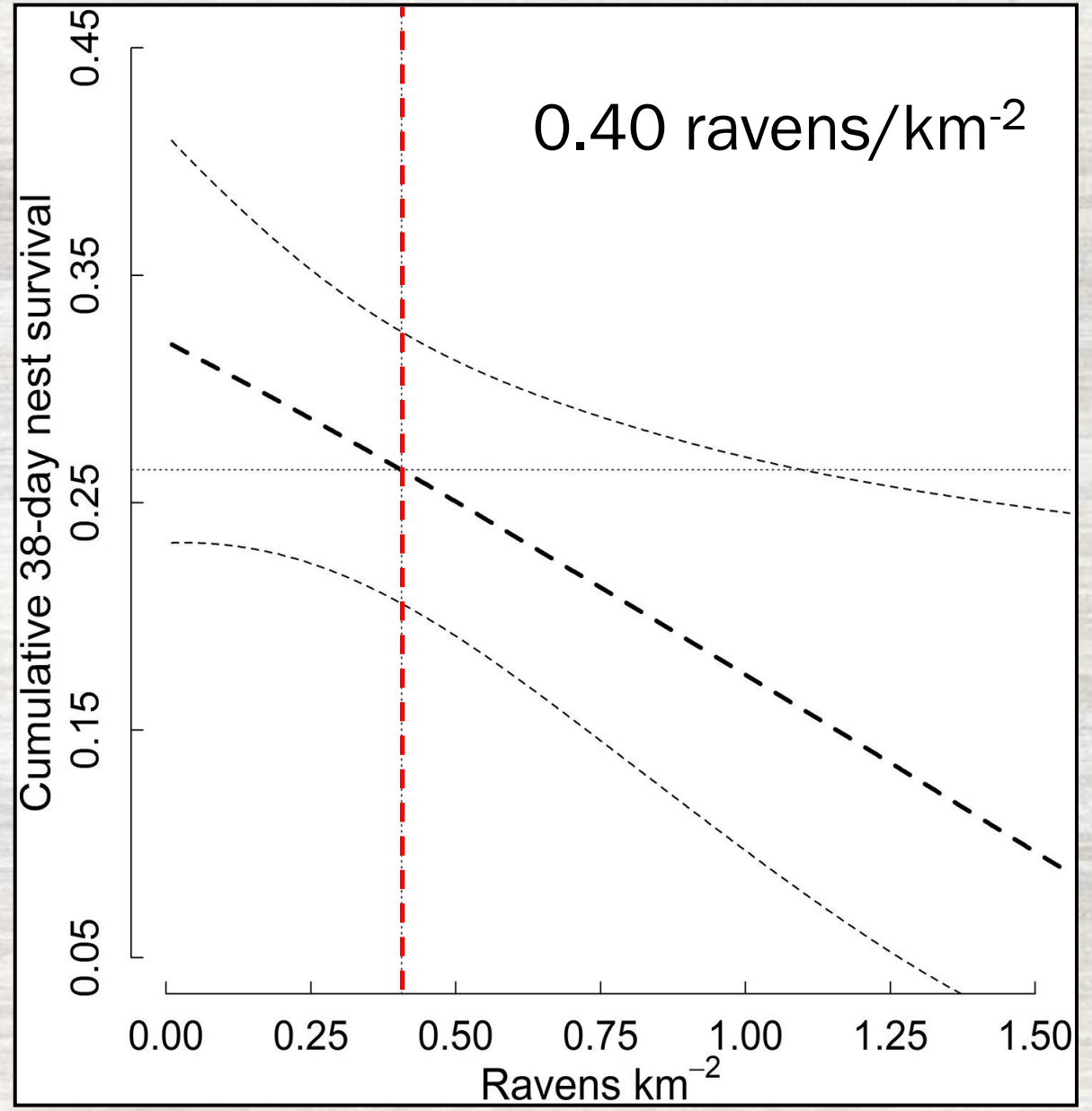
Step 3. Compare density estimate to threshold



ELSEVIER

Biological Conservation
Volume 243, March 2020, 108409

Broad-scale impacts of an invasive native predator on a sensitive native prey species within the shifting avian community of the North American Great Basin

Peter S. Coates [a], Shawn T. O'Neil [a], Brianne E. Brussee [a], Mark A. Ricca [a], Pat J. Jackson [b], Jonathan B. Dinkins [c], Kristy B. Howe [d], Ann M. Moser [e], Lee J. Foster [f], David J. Delehanty [g]

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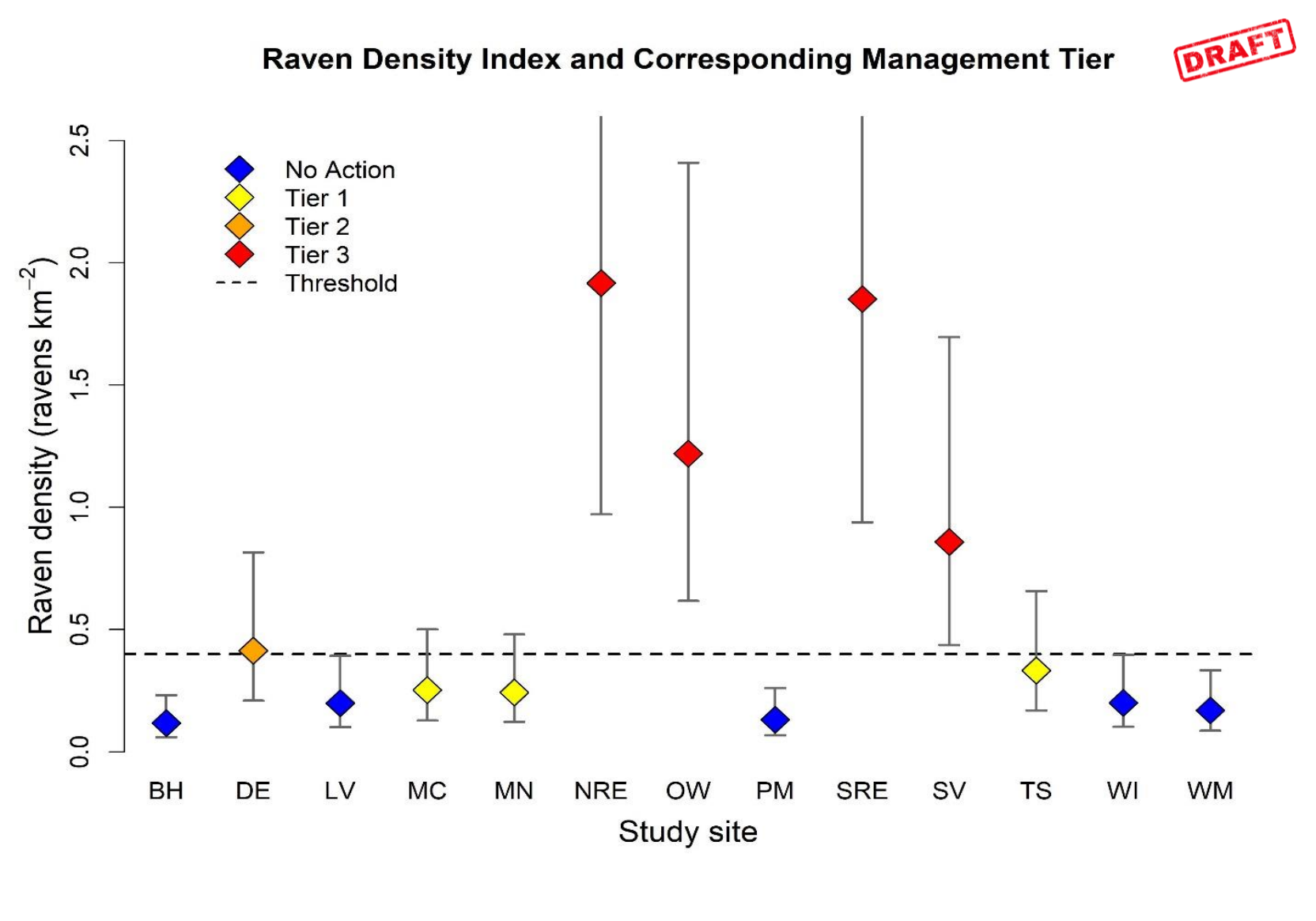

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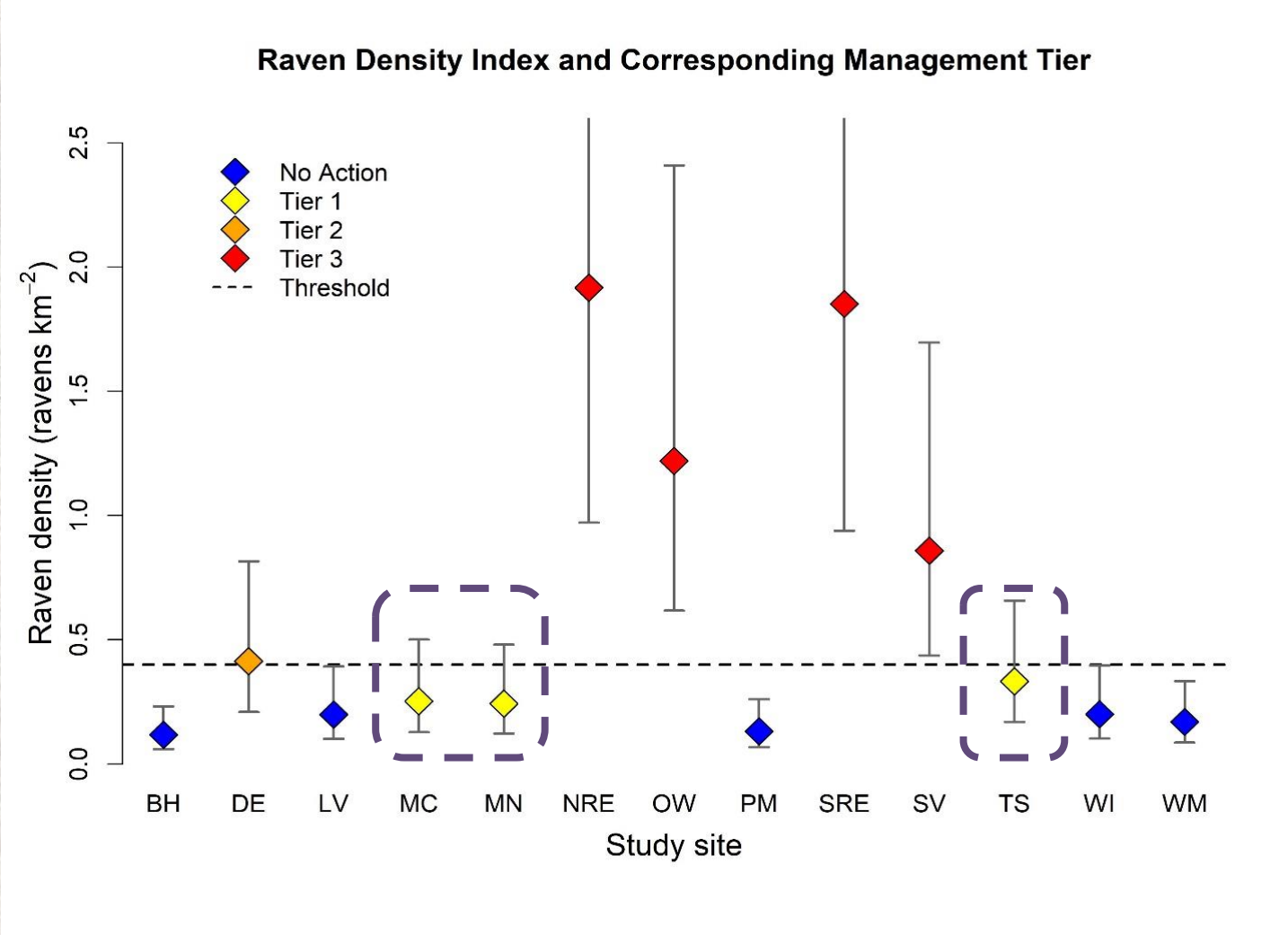
Step 3. Compare density estimate to threshold

Tier 1

Density estimate – below threshold
95% CI – overlaps threshold



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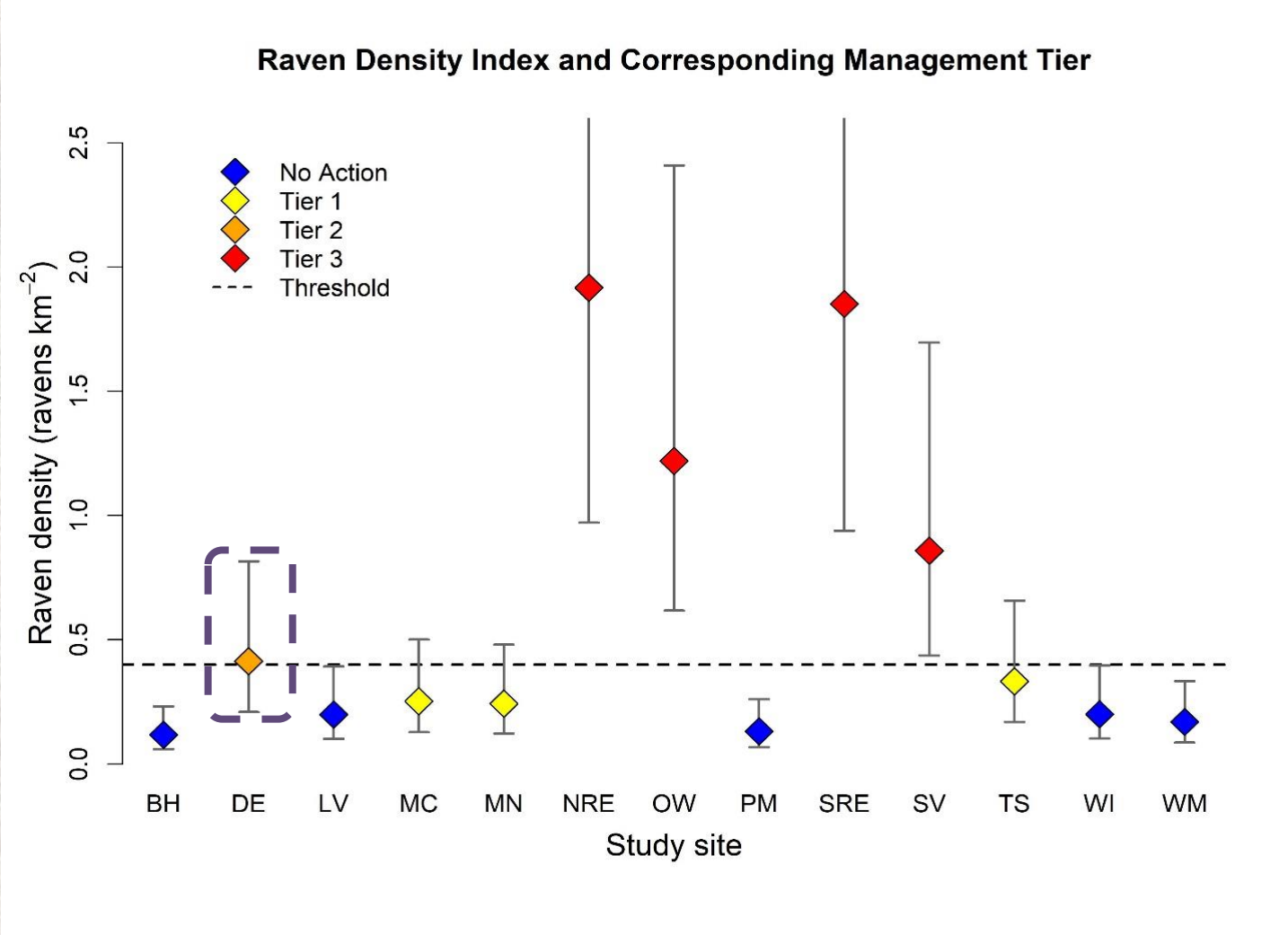
Step 3. Compare density estimate to threshold

Tier 2

Density estimate – above threshold
95% CI – overlaps threshold



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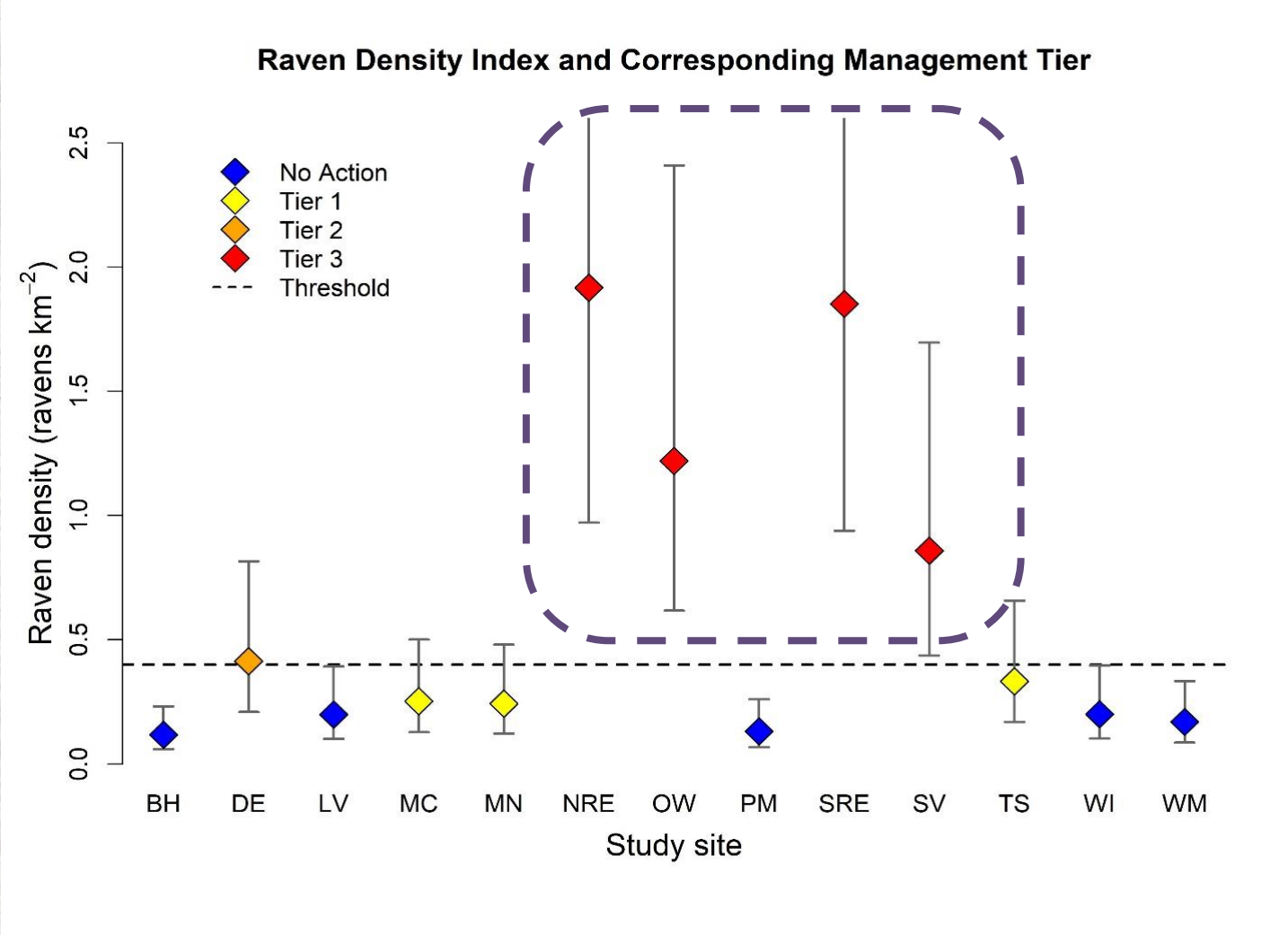
Step 3. Compare density estimate to threshold

Tier 3

Density estimate – above threshold
95% CI – exceeds threshold



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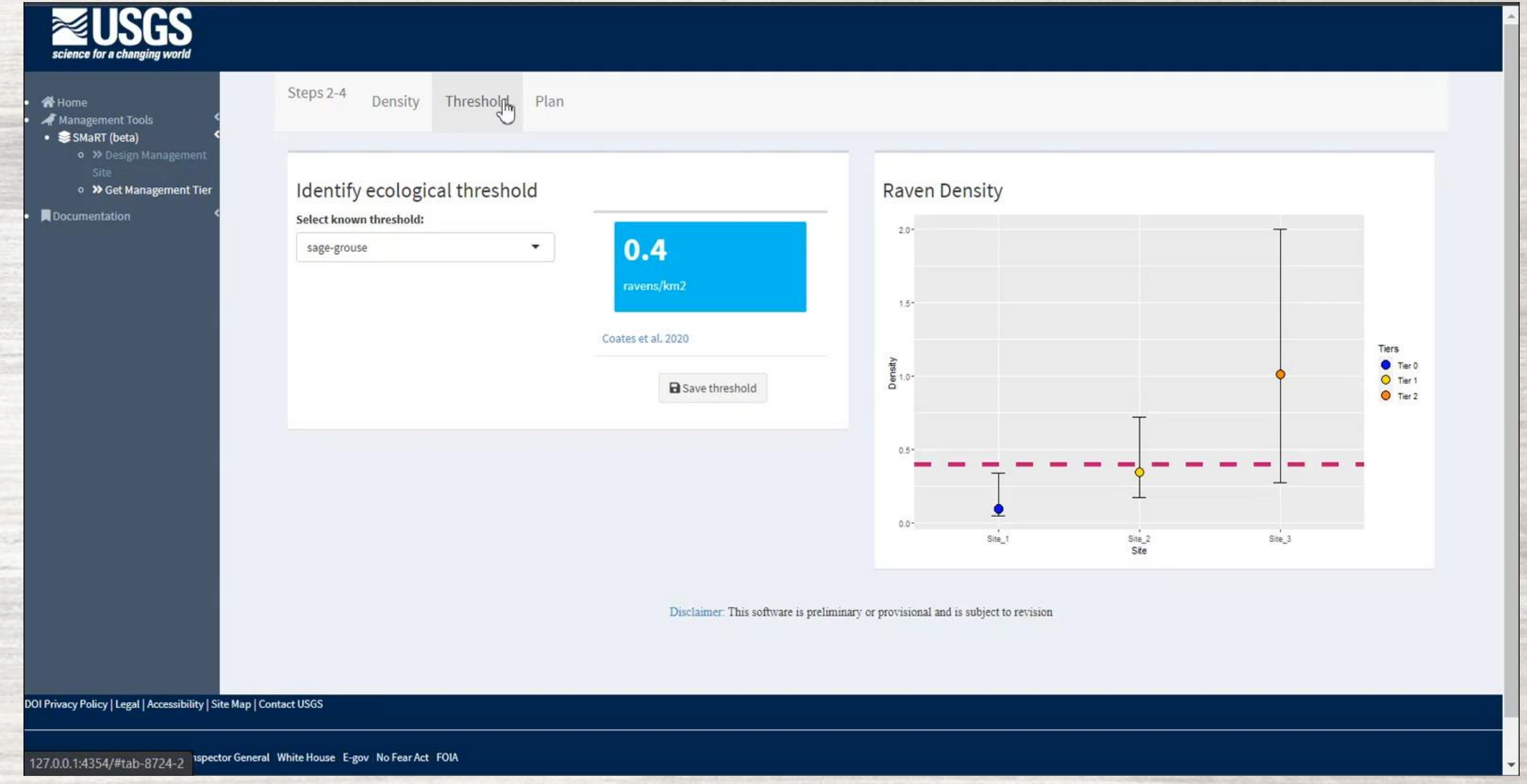

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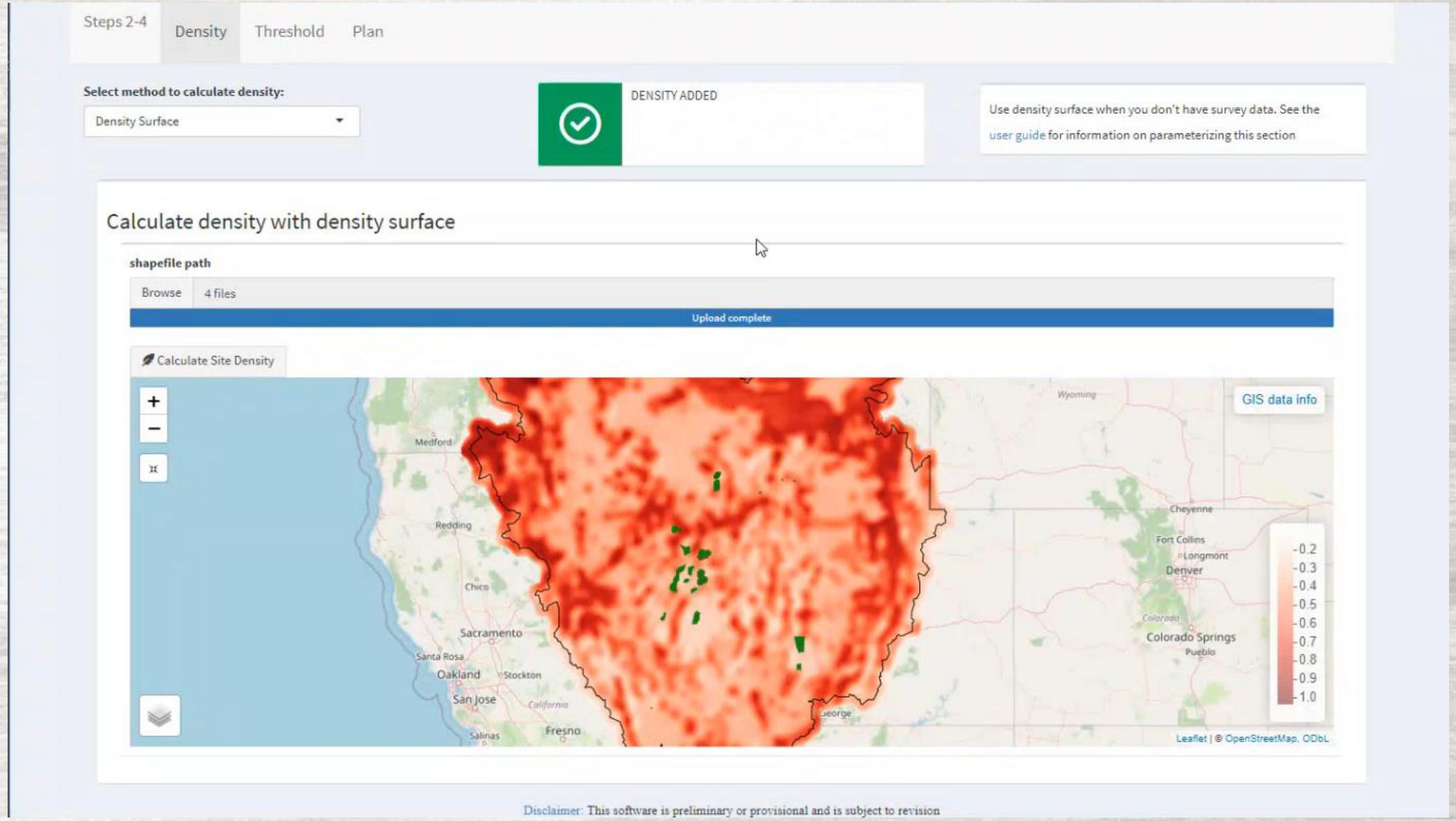

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Step 4. Identify management options

The 3 Tiers

Tier	Trigger	Management Options
Tier 3	Density estimate – exceeds threshold 95% CI – exceeds threshold	Direct Actions
Tier 2	Density estimate – exceeds threshold 95% CI – overlaps threshold	Reduce Access to Anthropogenic Subsidies
Tier 1	Density estimate – below threshold 95% CI – overlaps threshold	Habitat Improvement Actions
No Action	Density estimate - below threshold 95% CI – below threshold	

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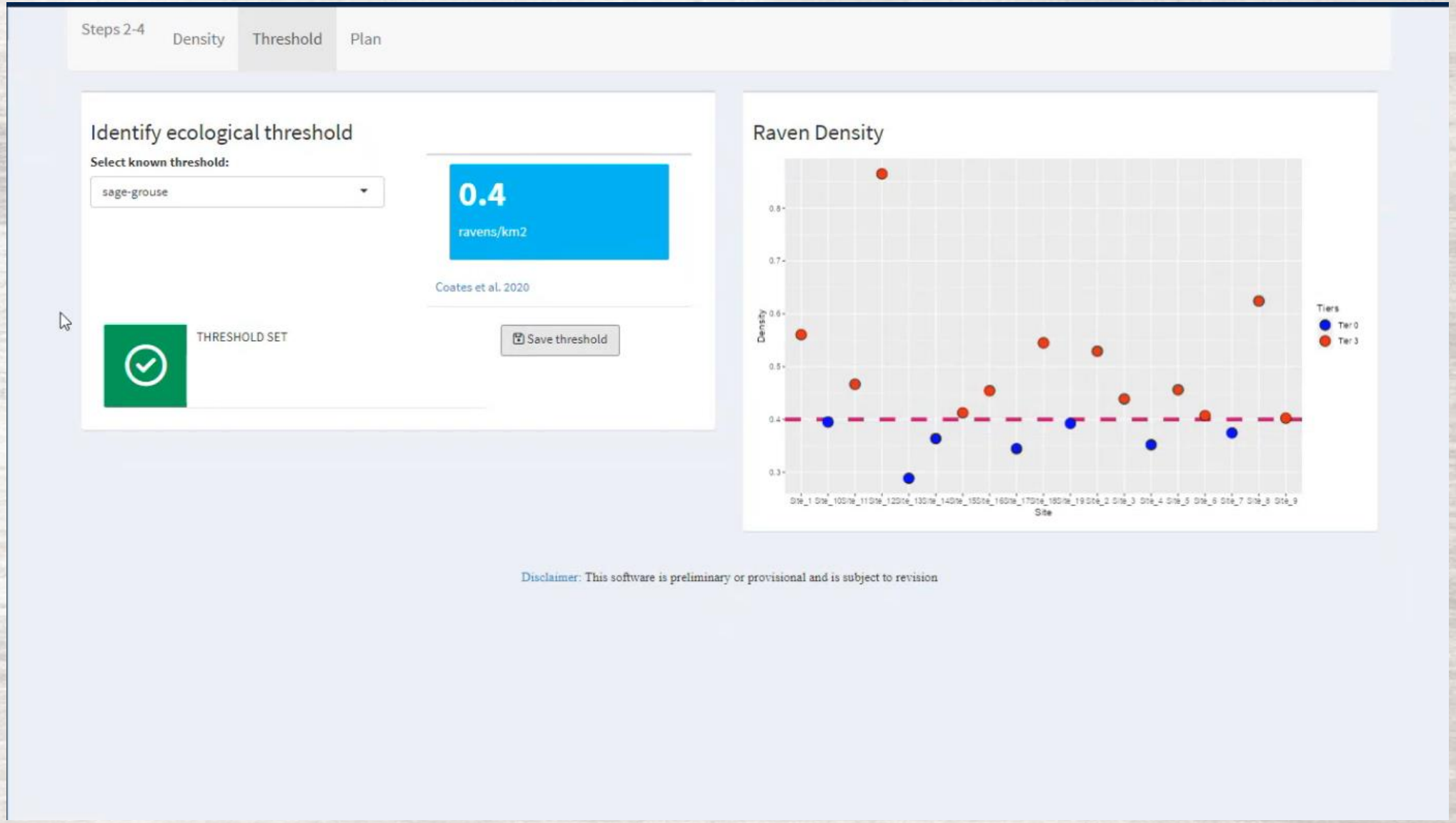

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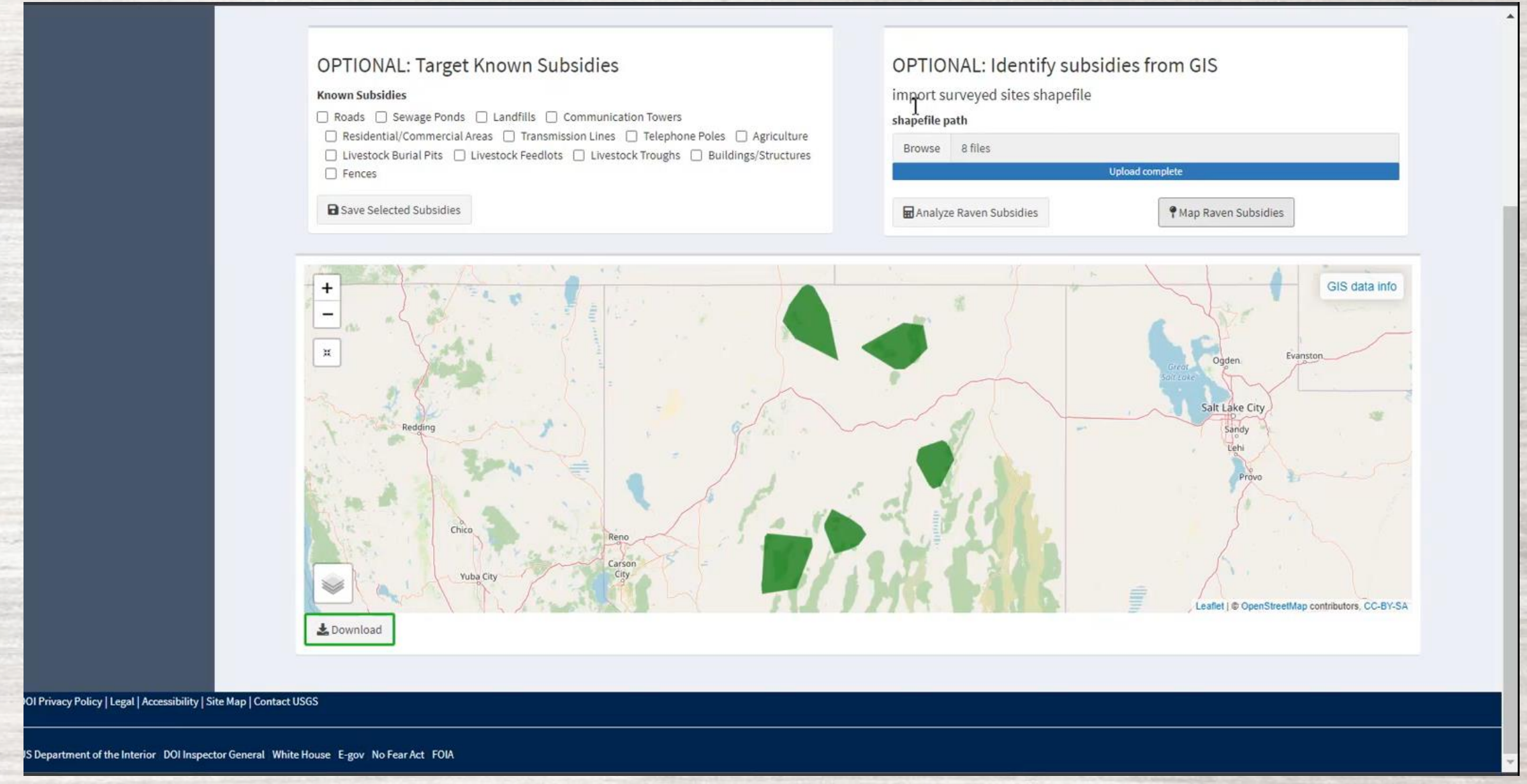

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Prioritize Management Actions

Density
- Density < 0.4 (with CI) = 0
- Density > 0.4 (with CI) = 0.5
- Density > 0.4 (without CI) = 1

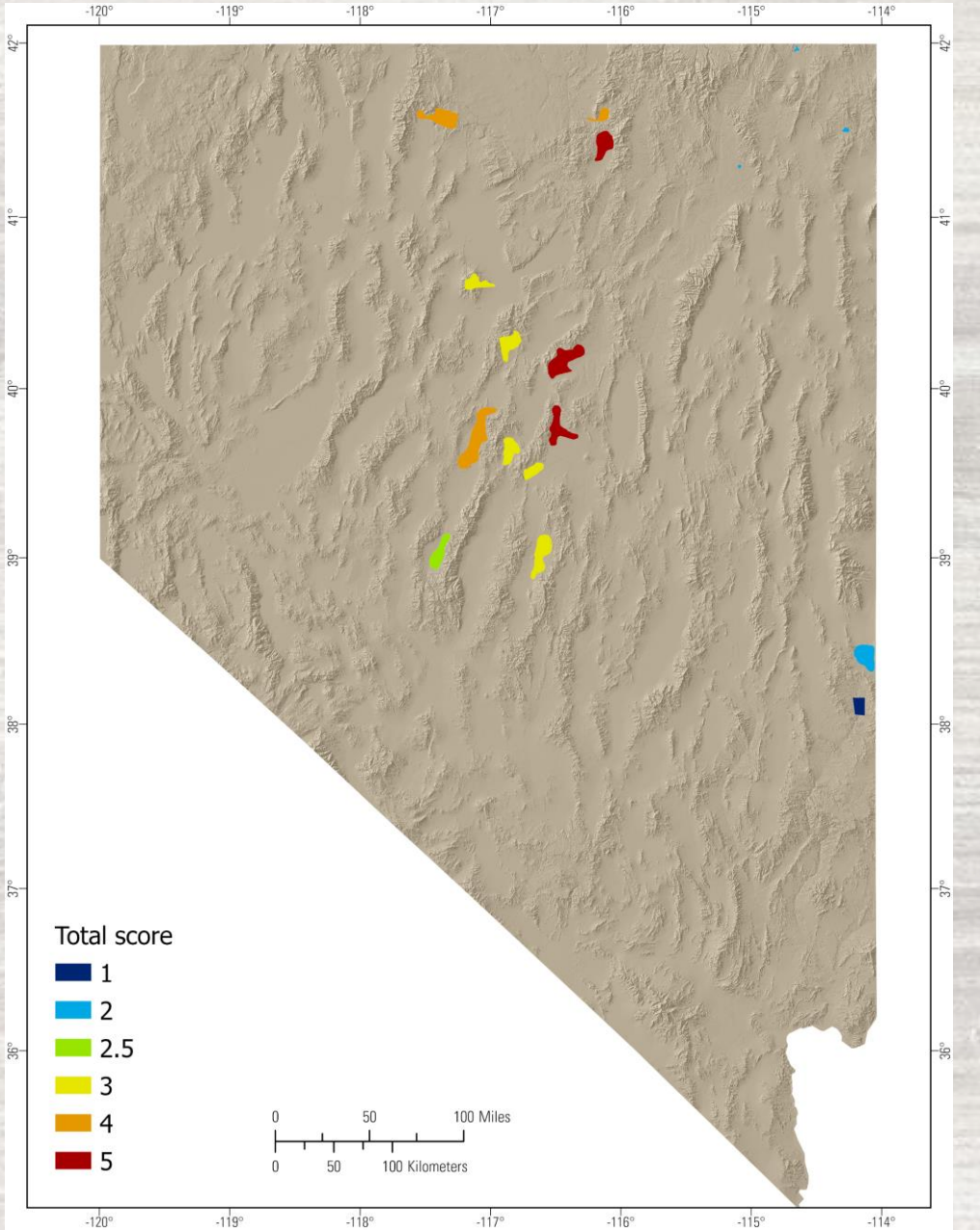
Impacted by ravens?
- No = 0
- Yes = 1

Concentration Area?
- No = 0
- Yes = 1

Habitat Quality
- Low = 0
- Moderate = 1
- High = 2

Polygon prioritization was determined by the Nevada Department of Wildlife.

Additional Prioritization by NDOW



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Step 5. Post-action Monitoring

Methods – Raven surveys and data collection

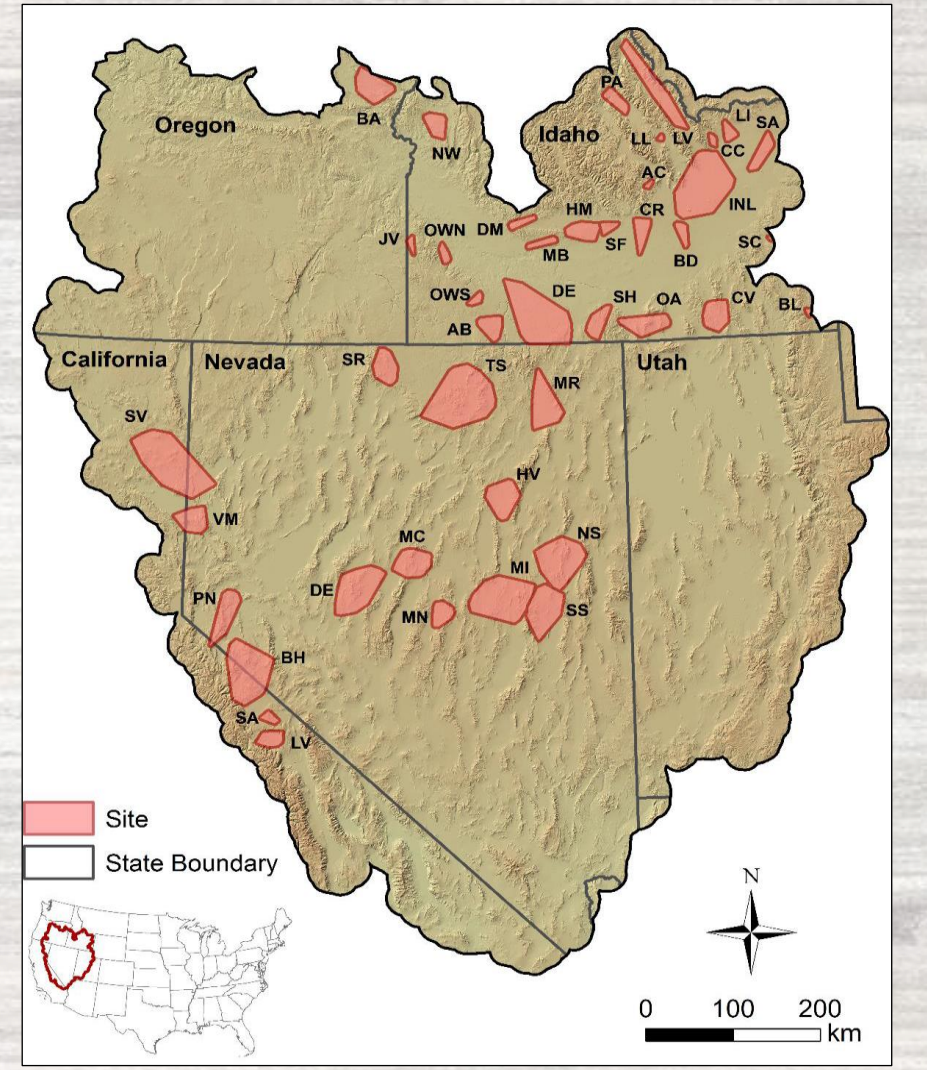

Figure from: O'Neil, S.T., Coates, P.S., Brussee, B.E., et al. (2018) *J. Applied Ecology 55:6*

Raven point counts

- California, Nevada, Idaho, Oregon
- 2007 – 2021 (>30,000 surveys)
- 43 sites, >145 site-year combinations
- April – July

Step 5. Post-action Monitoring

Raven point counts

- 10 minute survey, 360°
- Binocular, rangefinder, GPS, compass
- Estimate distance to raptor/raven
- Surveys in conjunction with sage-grouse monitoring
  - Random locations
  - Lek locations
  - Nest locations
  - Brood locations
  - Treatment locations

O'Neil, S.T., Coates, P.S., Brussee, B.E., et al. (2018) J. Applied Ecology 55:6

Step 5. Post-action Monitoring

Methods – Raven surveys and data collection

Generate random RRHL locations within sites

- 50 locations per site
  - 40 within 50-100 m of roads
  - 10 > 100 m from roads
- Surveys on same day must be 2 km apart

Step 5. Post-action Monitoring

Methods – Raven surveys and data collection

Goals:

- Survey 30-50 locations per site
- Survey pre and post treatment
- Analyze density with rapid assessment function
- Analyze density with distance sampling methods

Preliminary information, subject to revision. Not for citation or distribution.

Lessons Learned

Challenges for adaptive management

- Goal to use the Rapid Assessment Function (RAF), to estimate density with data with < 50 individual observations
- Time and Effort needed to sufficiently survey ravens
- Flexibility in survey location selection process for field logistics
- Improvements needed for navigating to survey locations

Questions?

USGS science for a changing world

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