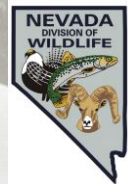


Mapping Greater Sage-Grouse Preliminary Priority Habitat in the Bi-State DPS

Technical Advisory Committee



Purpose

Develop a scientifically defensible decision support tool (models and maps) for management of sage-grouse populations

FOCUS MANAGEMENT EFFORTS ON THE AREAS MOST MEANINGFUL FOR SAGE-GROUSE POPULATIONS

Hierarchical Approach



Decision support tool to map areas
important to sage-grouse
populations

Microhabitat objectives – factors
that influence sage-grouse
populations

Hierarchical Approach

**Decision support tool to map areas
important to sage-grouse
populations**



Decision Support Mapping Tool

Data-driven approach to:

- Map habitat (seasonal and composite)
- Identify factors that influence grouse populations
- Identify management action and where they are needed
- Provide a basis to evaluate those actions

Data Input for Mapping Approach

Existing and newly acquired data

Maps

Good Existing vegetation layers (i.e., 30-m resolution)

Better High resolution map layers (i.e., 5-m)

Telemetry (sage-grouse locations)

Good Individual grouse location data

Better Individual vital rate information (i.e., nest survival)

Data Input for Mapping Approach

A sage-grouse is shown sitting on a nest of sagebrush. The bird is the central focus, with its head and neck visible. The background is a soft-focus field of sagebrush. The text is overlaid on the image.

Existing and newly acquired data

Maps

Good Existing vegetation layers (i.e., 30-m resolution)

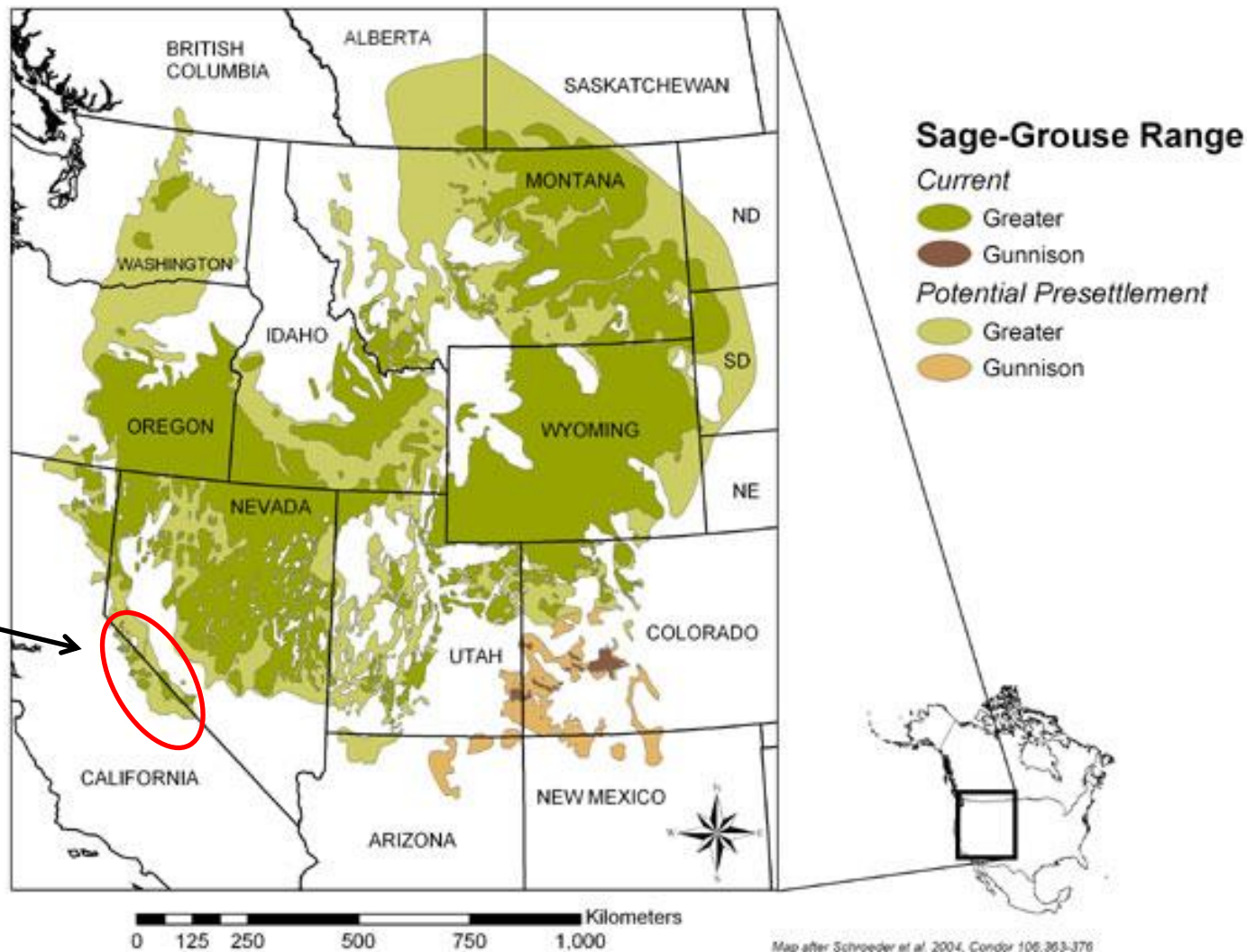
Better High resolution map layers (i.e., 5-m)

Telemetry (sage-grouse locations)

Good Individual grouse location data

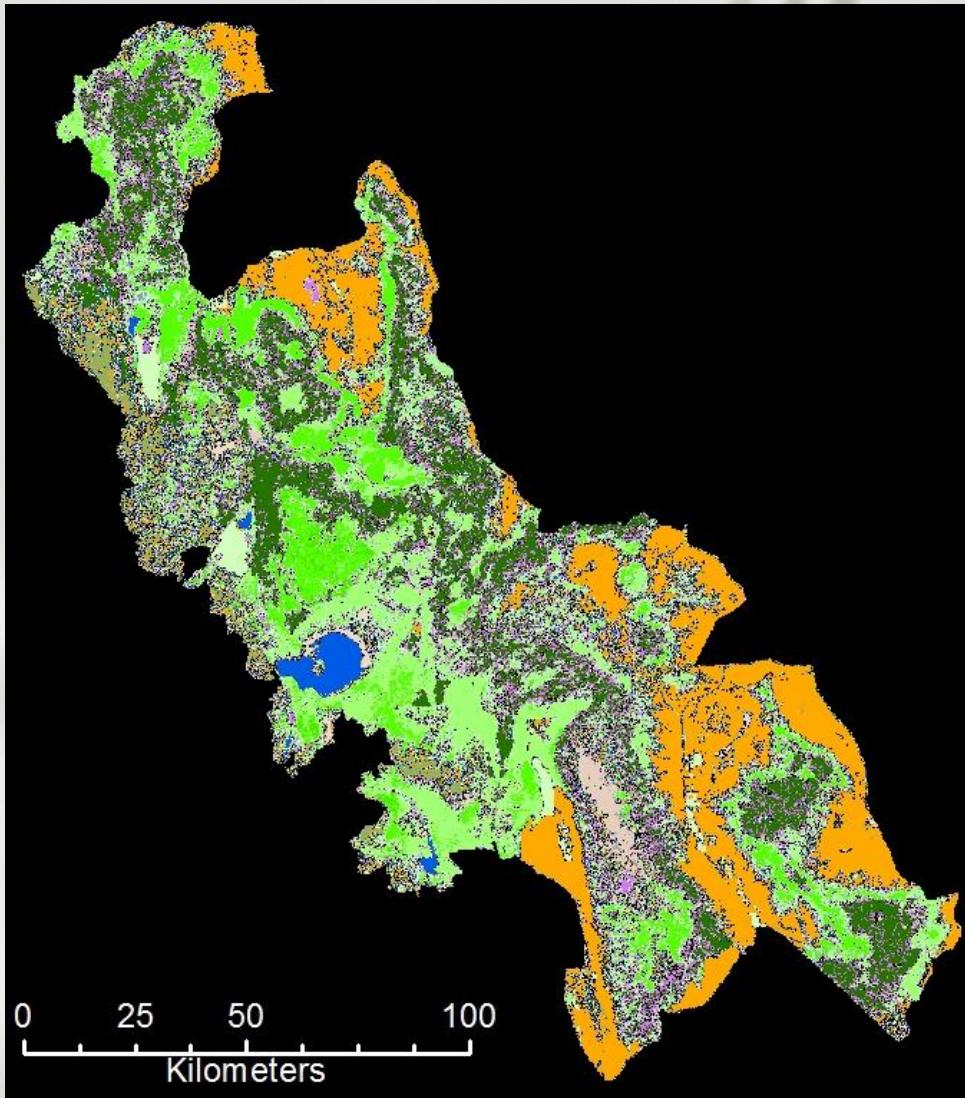
Better Individual vital rate information (i.e., nest survival)

Bi-State Distinct Population Segment



**Bi-State
DPS**

Composite Land Cover Map of Bi-State DPS



15 Model Variables at 2 spatial scales

Pinyon-juniper phases

Three sagebrush communities

Upland and lowland non-sagebrush shrubland communities

Annual and Perennial Grasslands

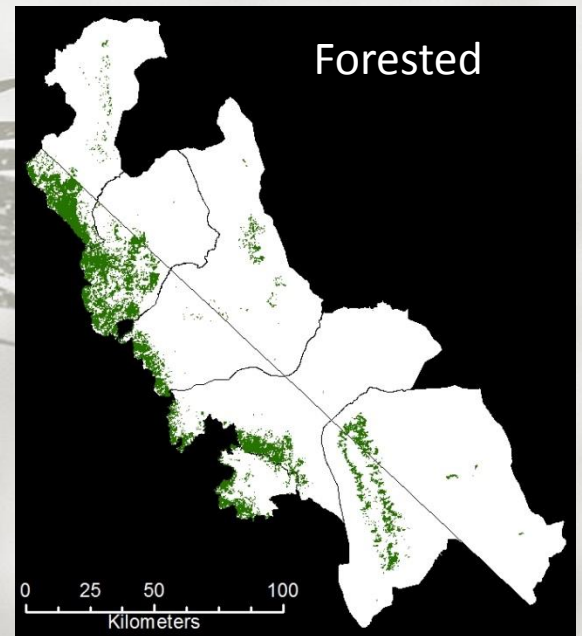
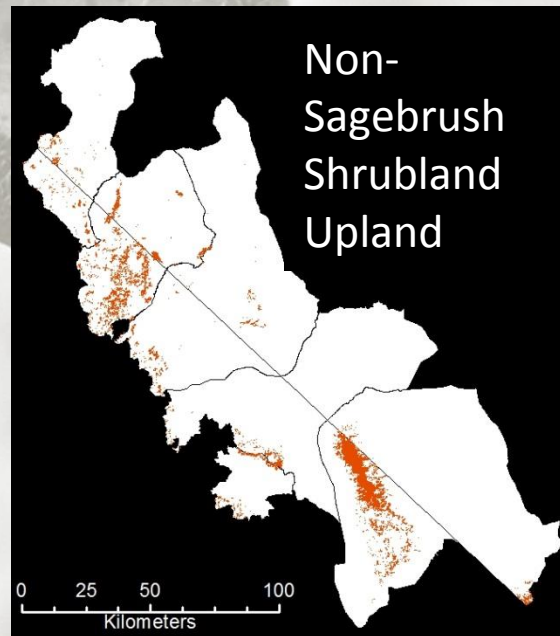
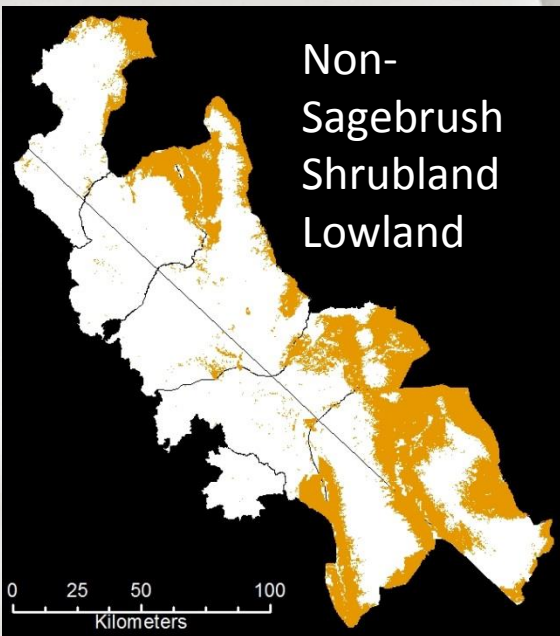
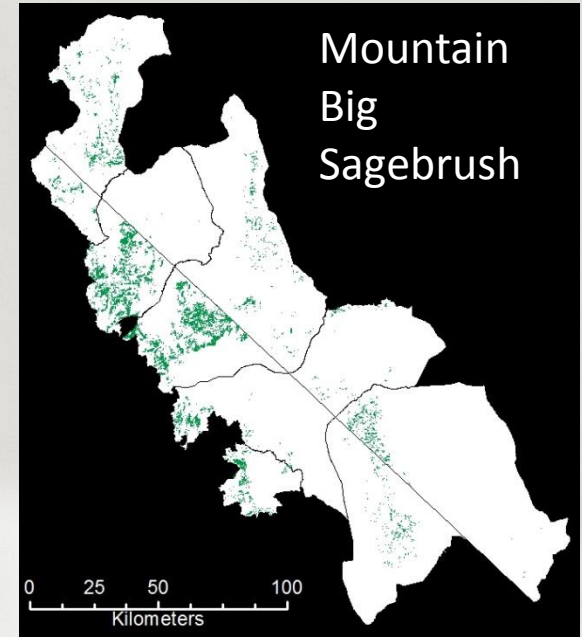
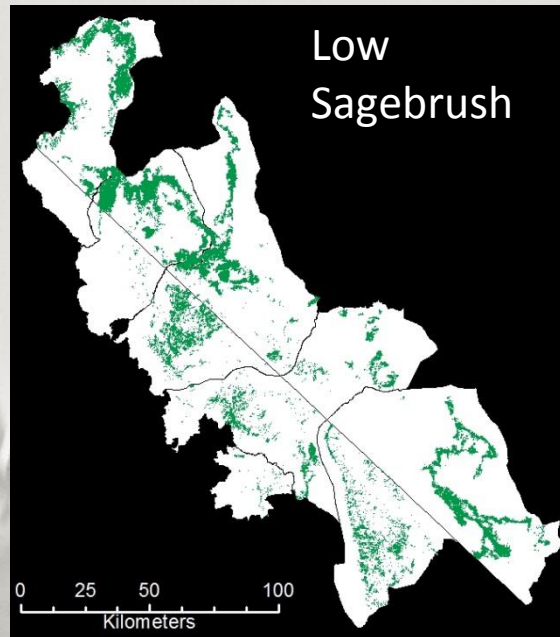
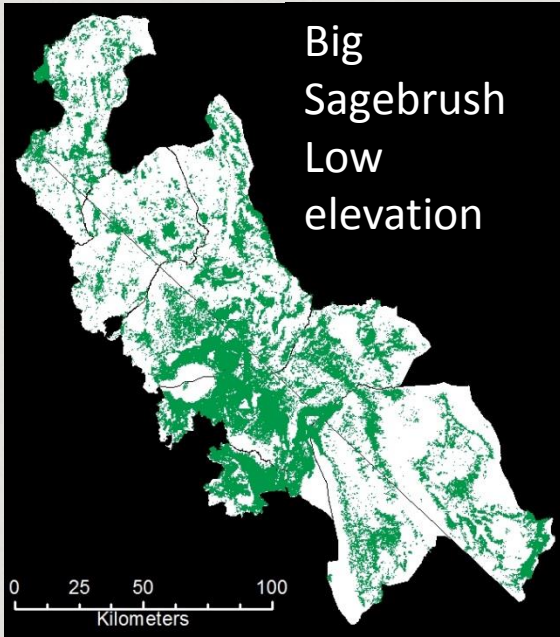
Agricultural areas

Two topographic variables

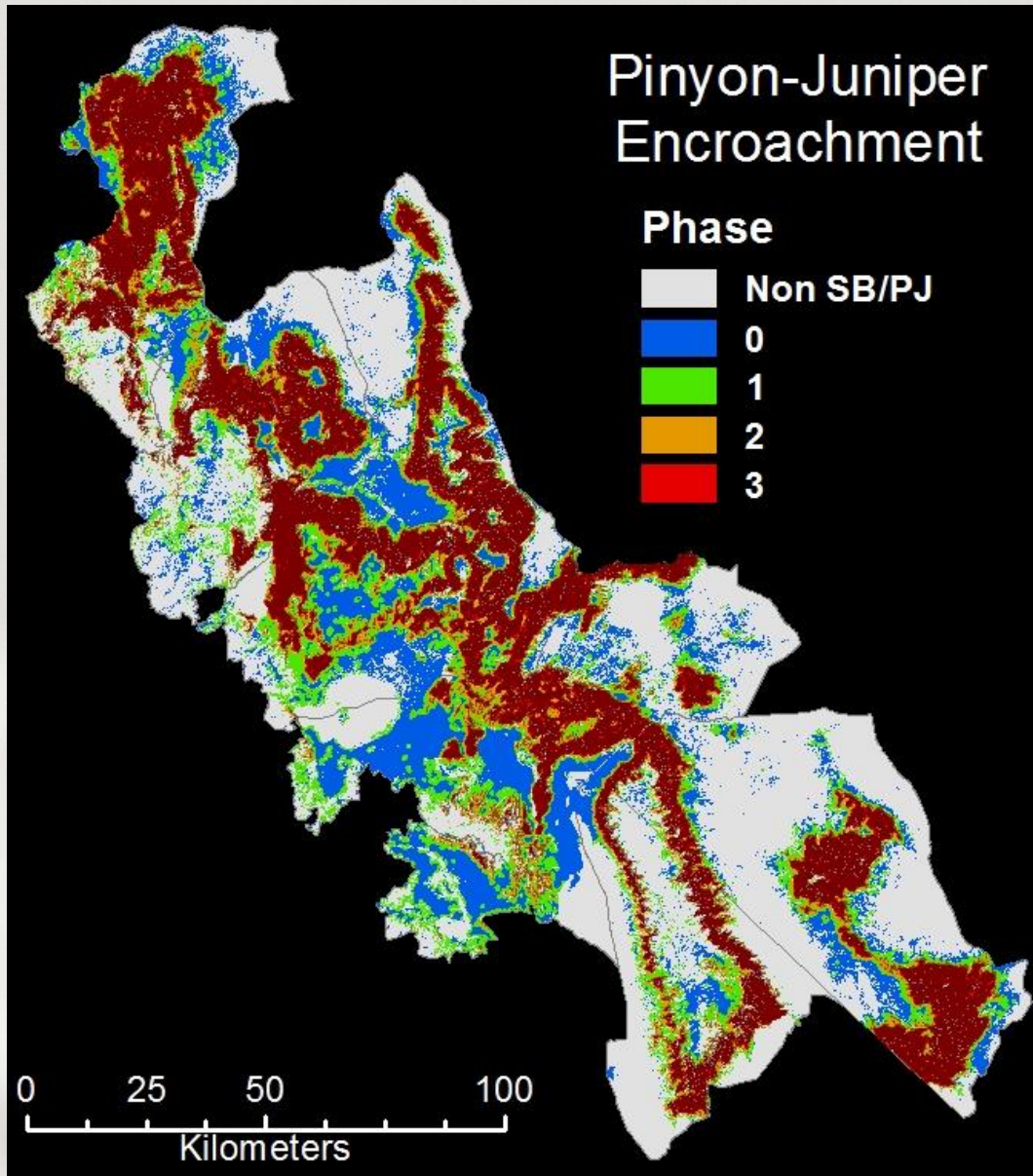
Roads

Urbanization Index

Land cover types



Pinyon-Juniper Land Cover Types



Delineated Pinyon-Juniper into Establishment Phases

Phase 0

sagebrush community with no encroachment

Phase I

<10% tree canopy cover

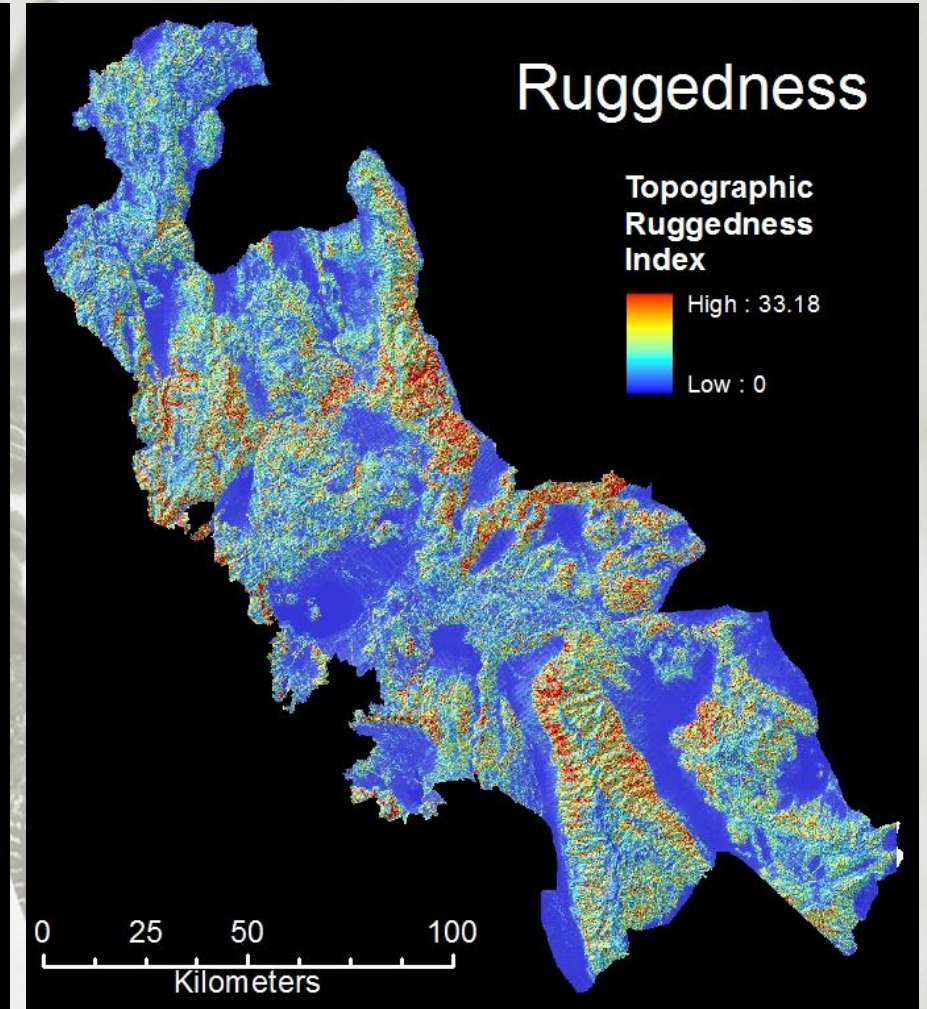
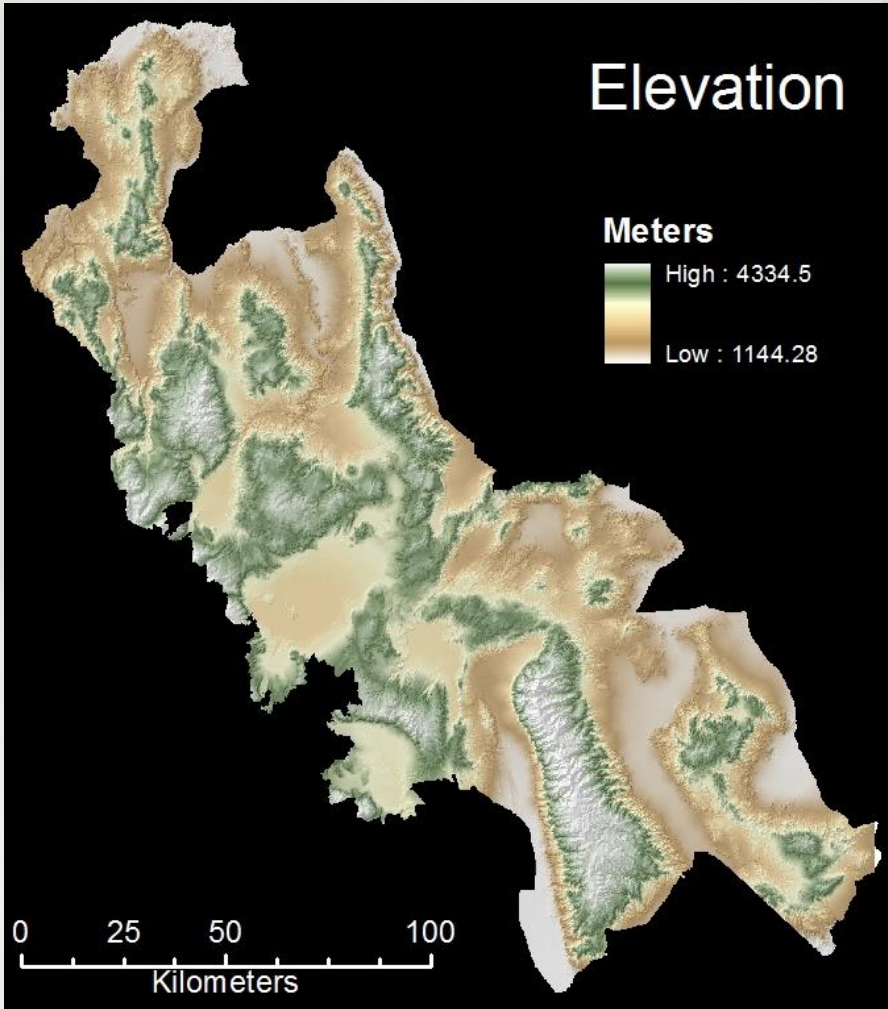
Phase II

≥10% and <50% cover

Phase III

≥50% cover

Topographical Factors

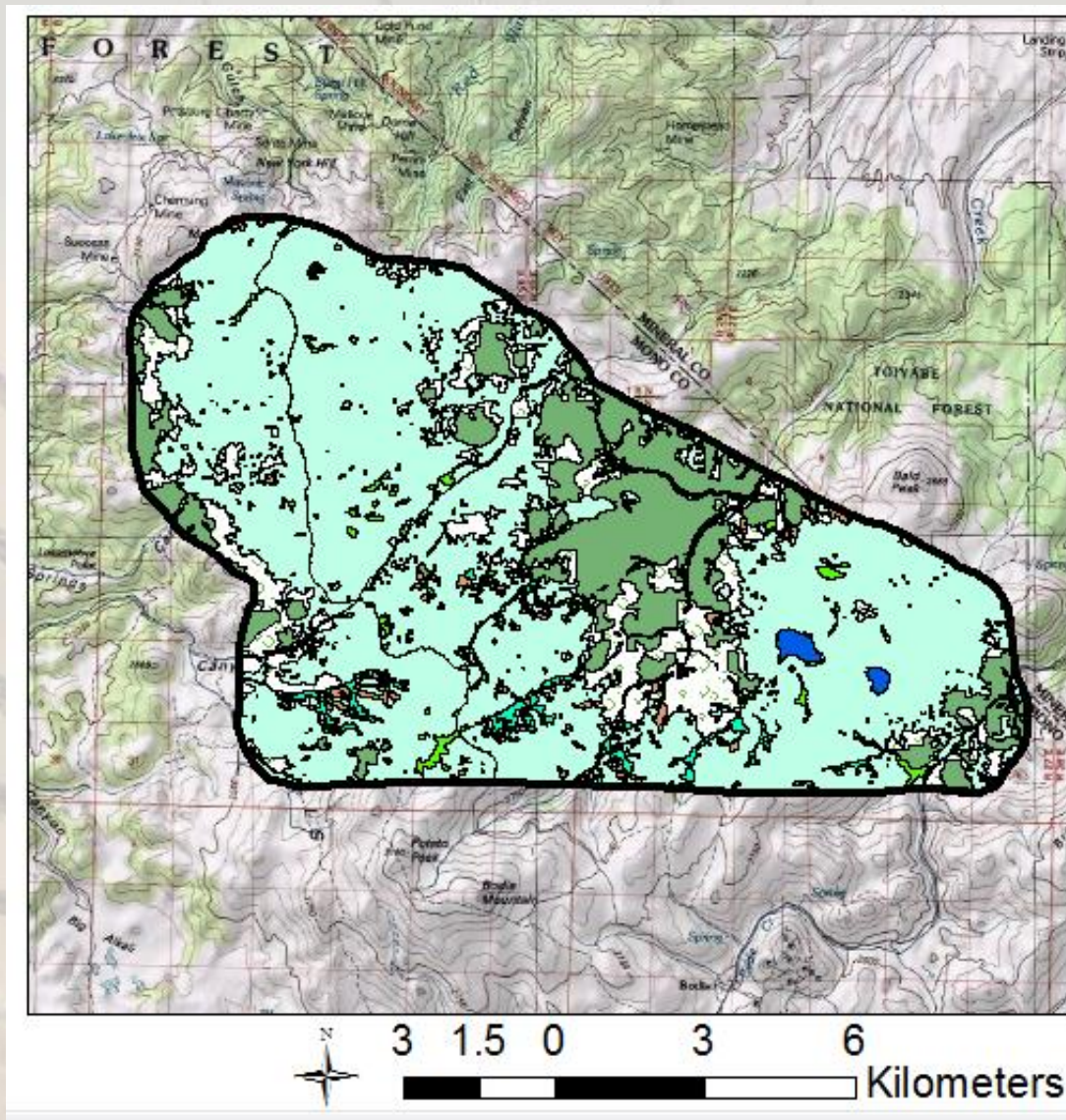


Modeling Procedure

Five Steps:

- 1) **Compile GIS coverages for all areas**
- 2) **Overlay telemetry points and generate random points**
- 3) **Extract environmental information from points**
- 4) **Estimate model parameters (coefficients) of each environmental factor by contrasting the used from the random points**
- 5) **Predict the probability of occurrence for each grid cell using the model parameters**

Building the Model – Bodie Hills Example



Landcover

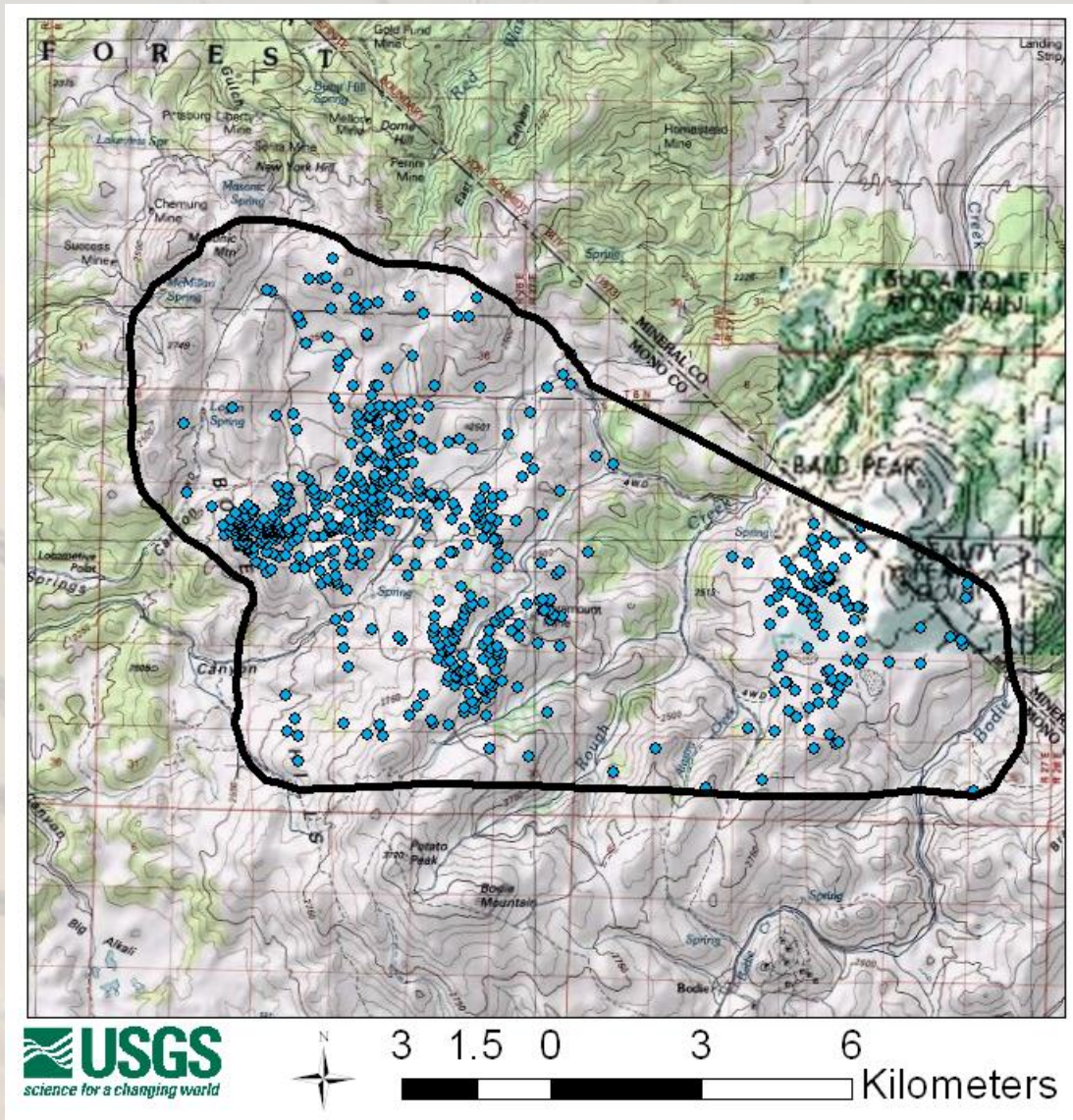
-  Barren
-  Anthropogenic
-  Forest Isolated Trees
-  Forest OC
-  Meadow
-  Non-sage shrubland
-  Riparian
-  Sagebrush
-  Water

Modeling Procedure

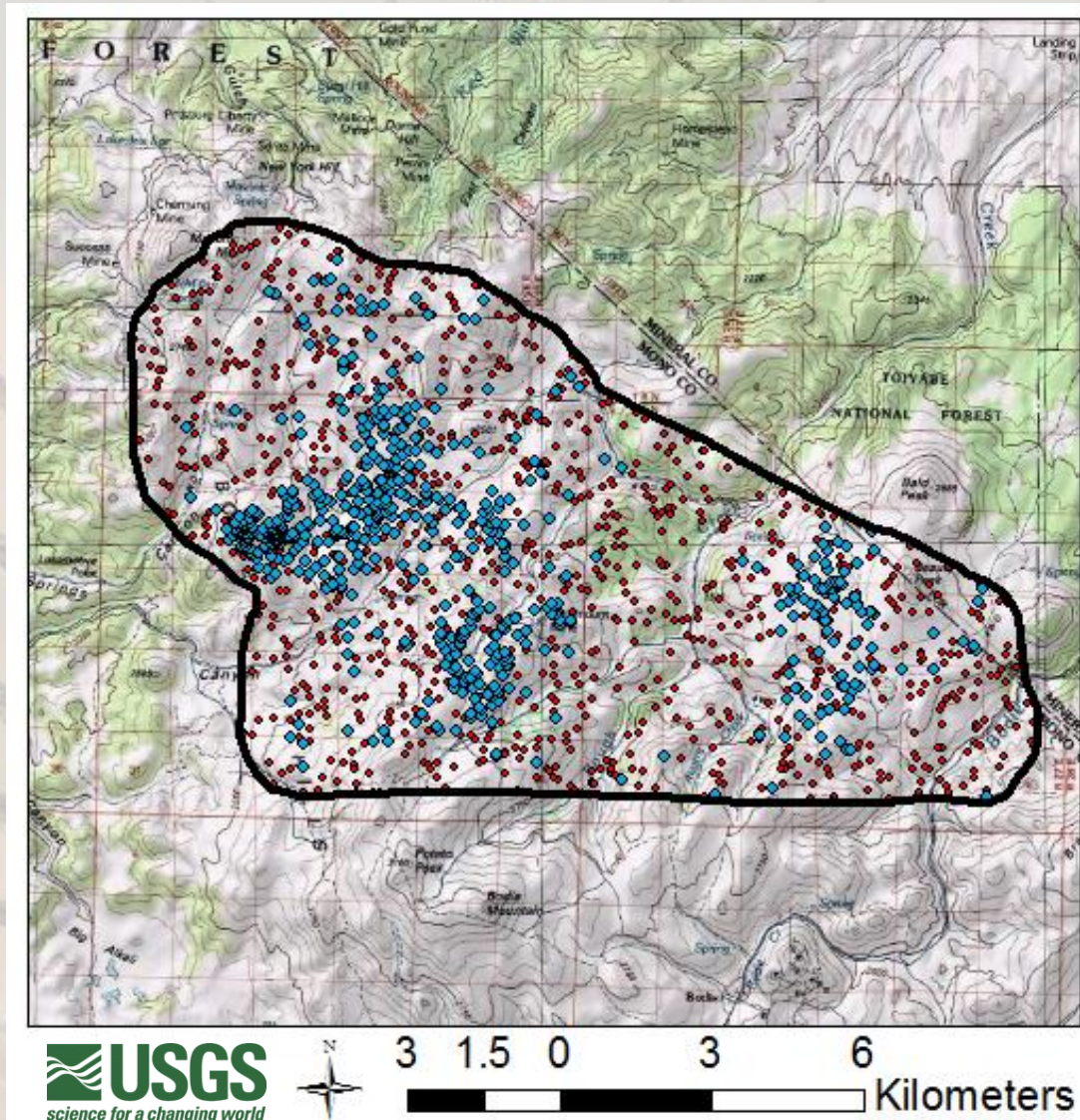
Five Steps:

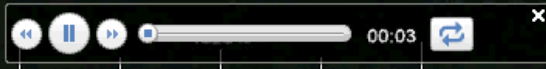
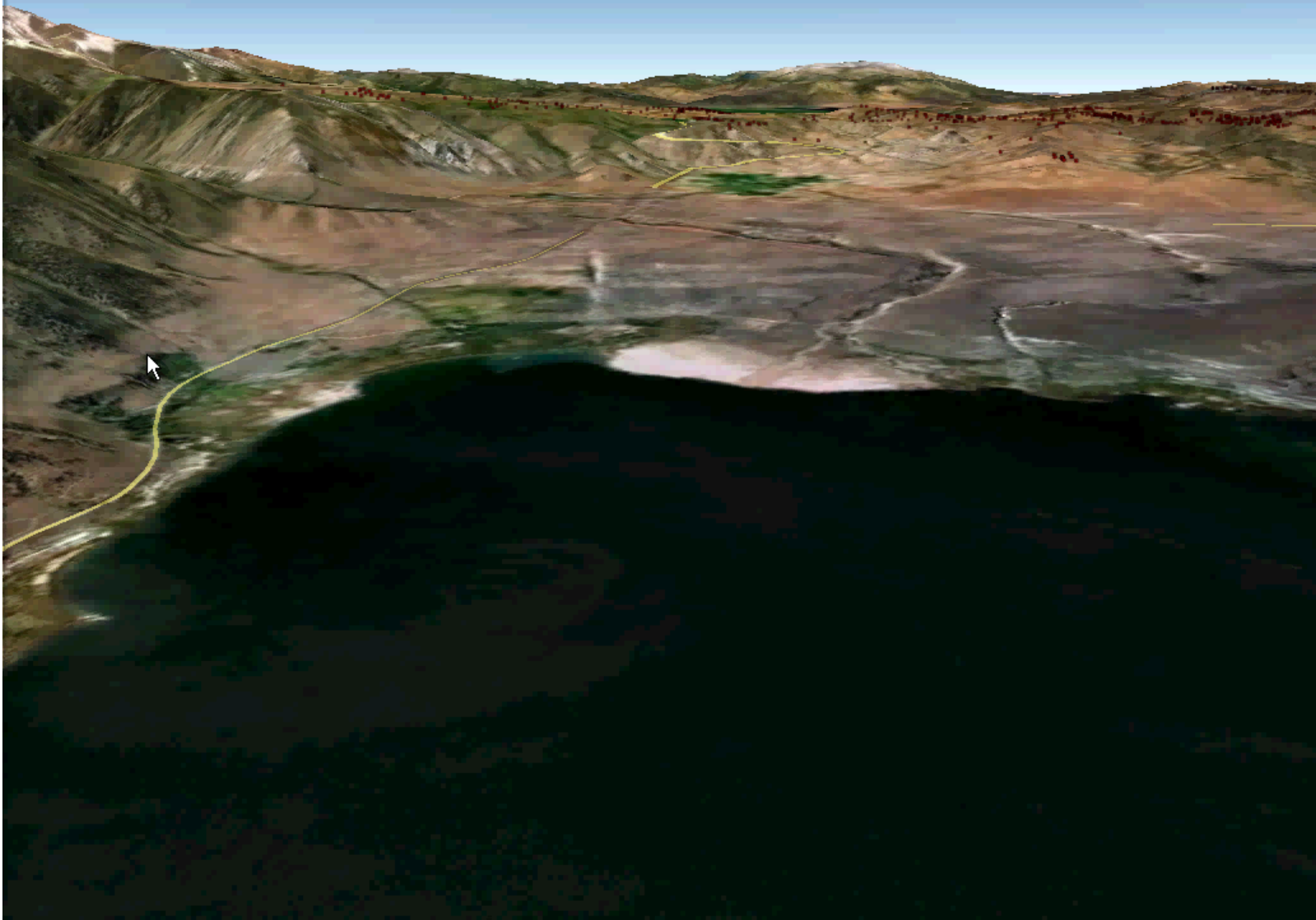
- 1) Compile GIS coverages for all areas
- 2) **Overlay telemetry points and generate random points**
- 3) Extract environmental information from points
- 4) Estimate model parameters (coefficients) of each environmental factor by contrasting the used from the random points
- 5) Predict the probability of occurrence for each grid cell using the model parameters

Overlay Grouse Telemetry Locations



Generate Random Points





© 2012 Google
Image © 2012 TerraMetrics

©2009 Google

Image © 2012 GeoEye
11 S 310713.27 m E 4208571.24 m N elev 6758 ft

Eve alt 9967 ft

Modeling Procedure

Five Steps:

- 1) Compile GIS coverages for all areas
- 2) Overlay telemetry points and generate random points
- 3) **Extract environmental information from points**
- 4) **Estimate model parameters (coefficients) of each environmental factor by contrasting the used from the random points**
- 5) Predict the probability of occurrence for each grid cell using the model parameters

Extract and Model Data

Contrast the used versus the available points to estimate the effect of each model variable

$$\text{Logit}(Y) = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n$$

% sagebrush

% phase I conifer

*% phase II
and III conifer*

Apply coefficients to map layers to calculate the probability of use per pixel

$$\text{RSF} = \exp(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n)$$

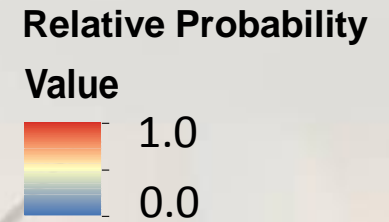
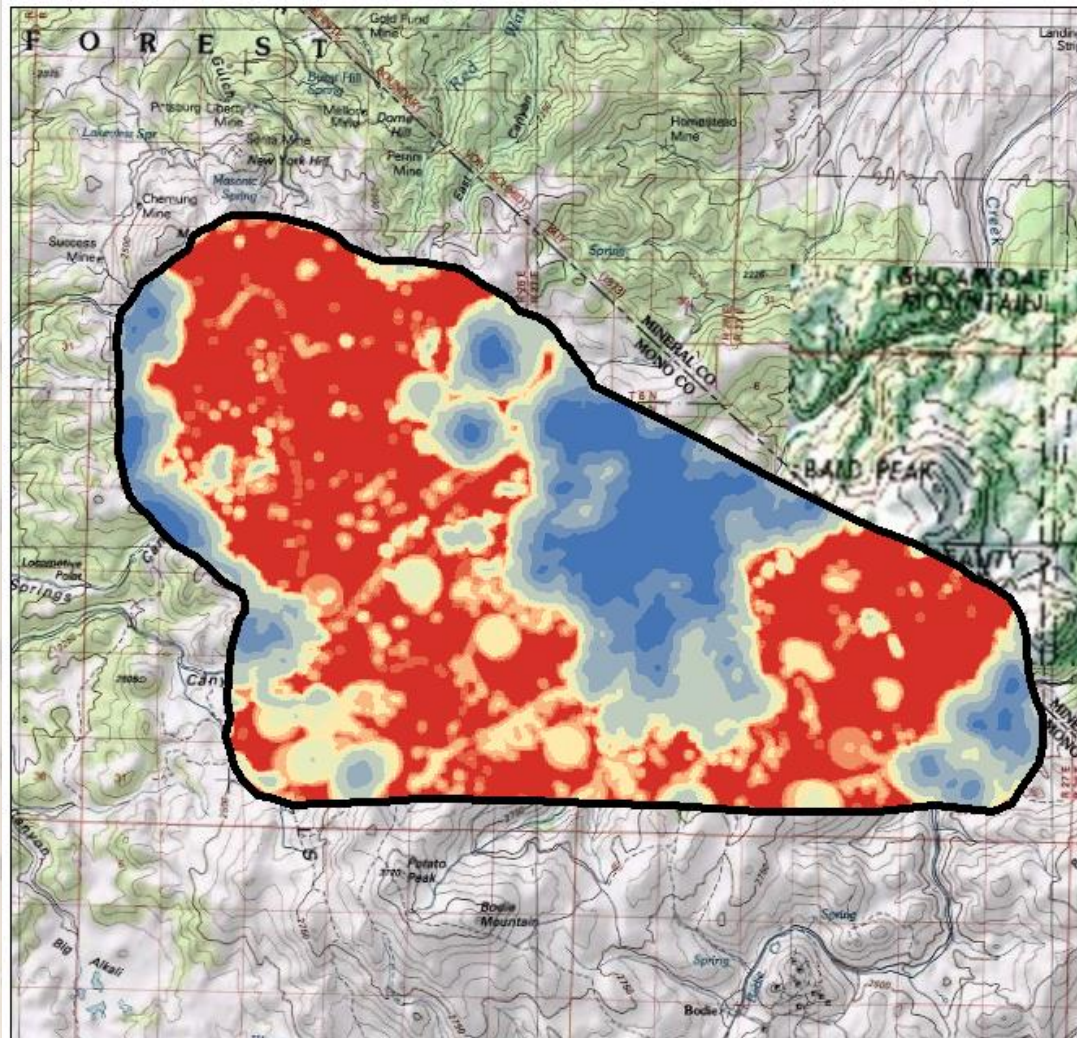
Modeling Procedure

Five Steps:

- 1) Compile GIS coverages for all areas
- 2) Overlay telemetry points and generate random points
- 3) Extract environmental information from points
- 4) Estimate model parameters (coefficients) of each environmental factor by contrasting the used from the random points
- 5) **Predict the probability of occurrence for each grid cell using the model parameters**

Resource Selection Function Map

Bodie Hills Example



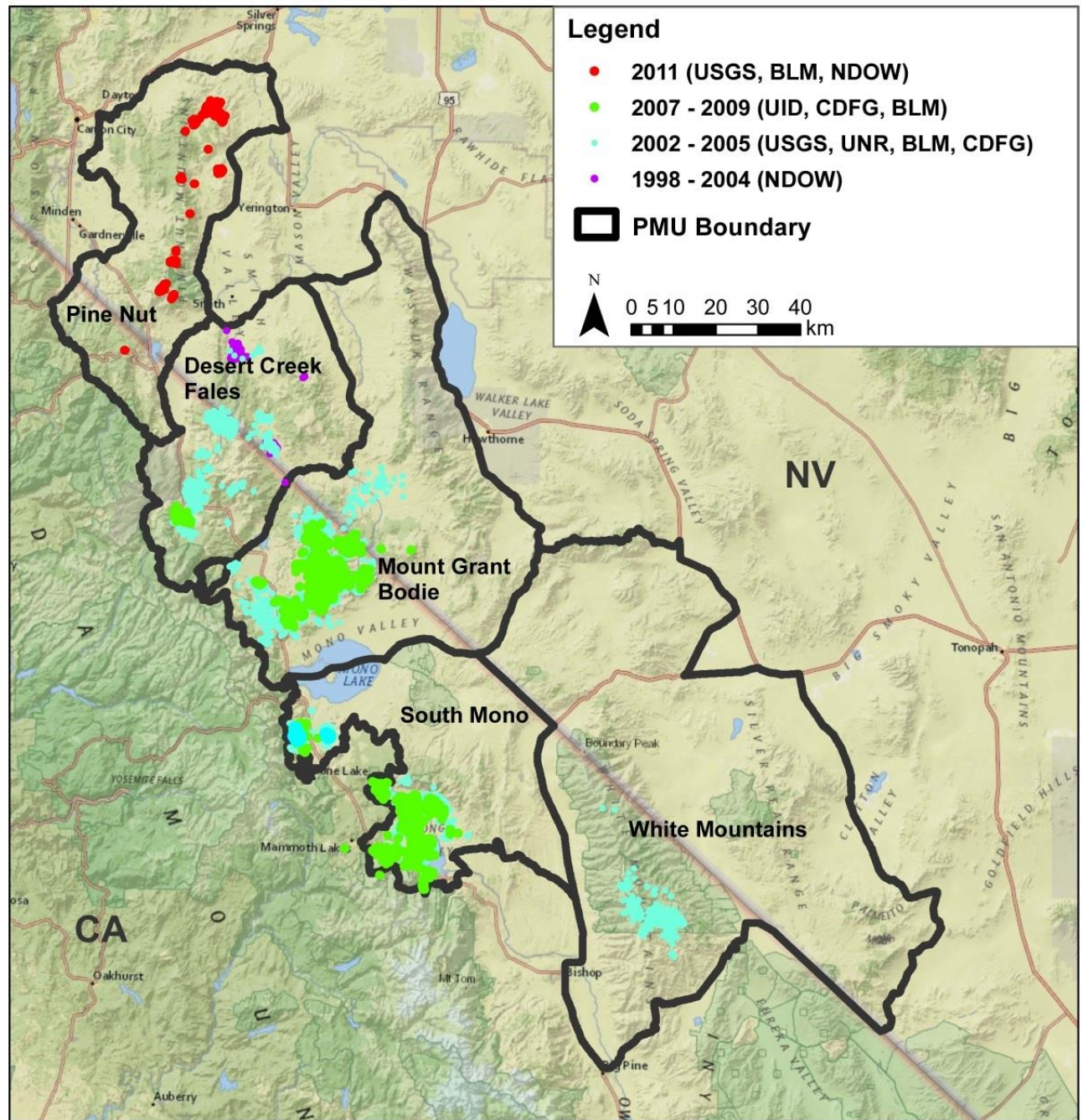
Over 10 years of
telemetry data

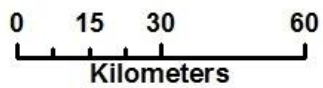
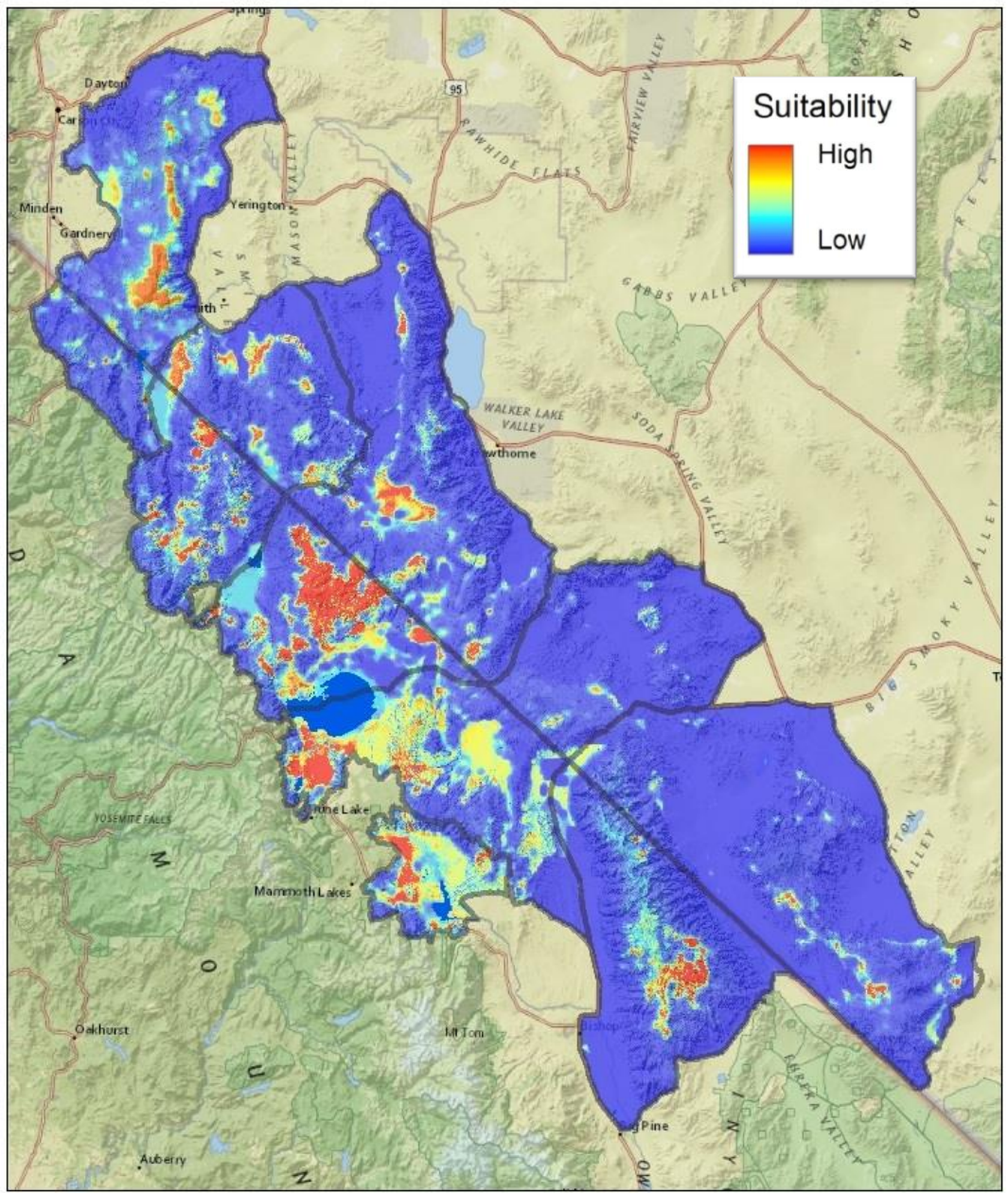
USGS, CDFG, NDOW,
BLM, USFS, UNR, UID

- >15,000 locations
- >200 sage-grouse
- Year-round

Three independent
datasets:

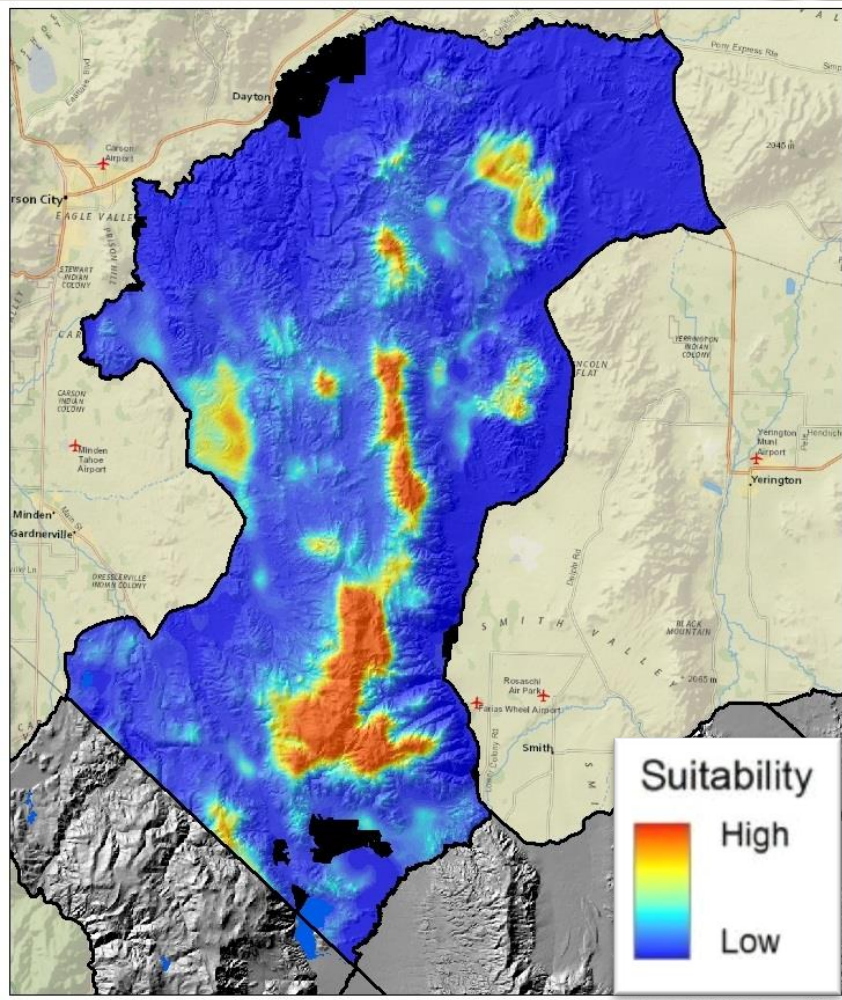
- Model Training
- Category Training
- Validation



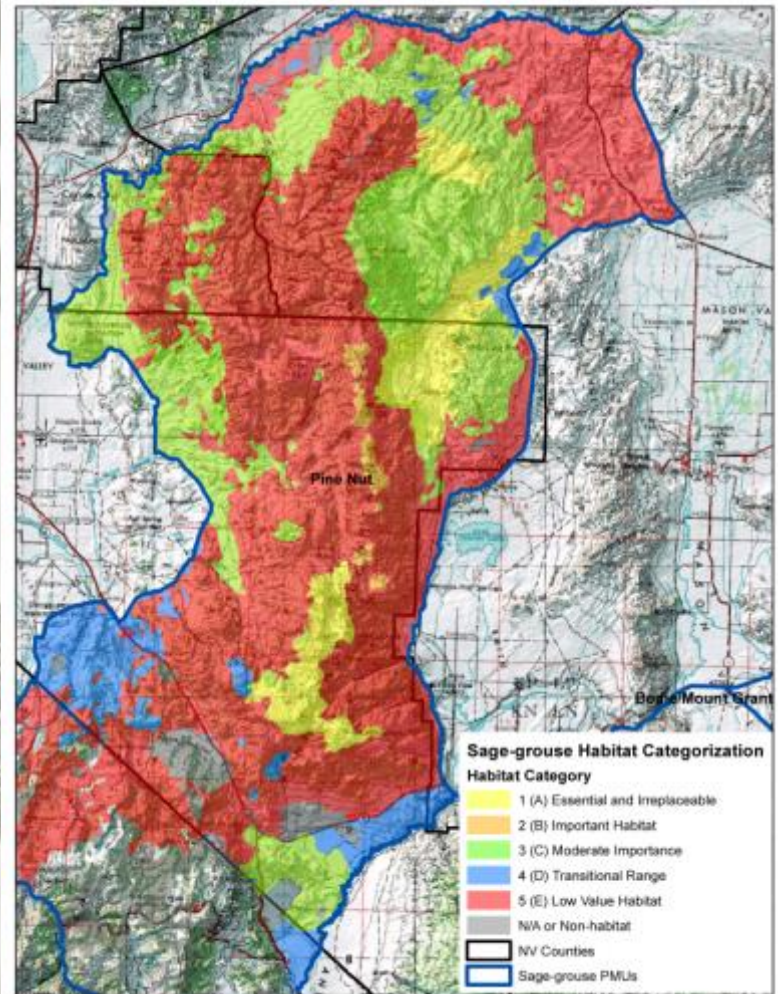


This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

Comparison between Maps

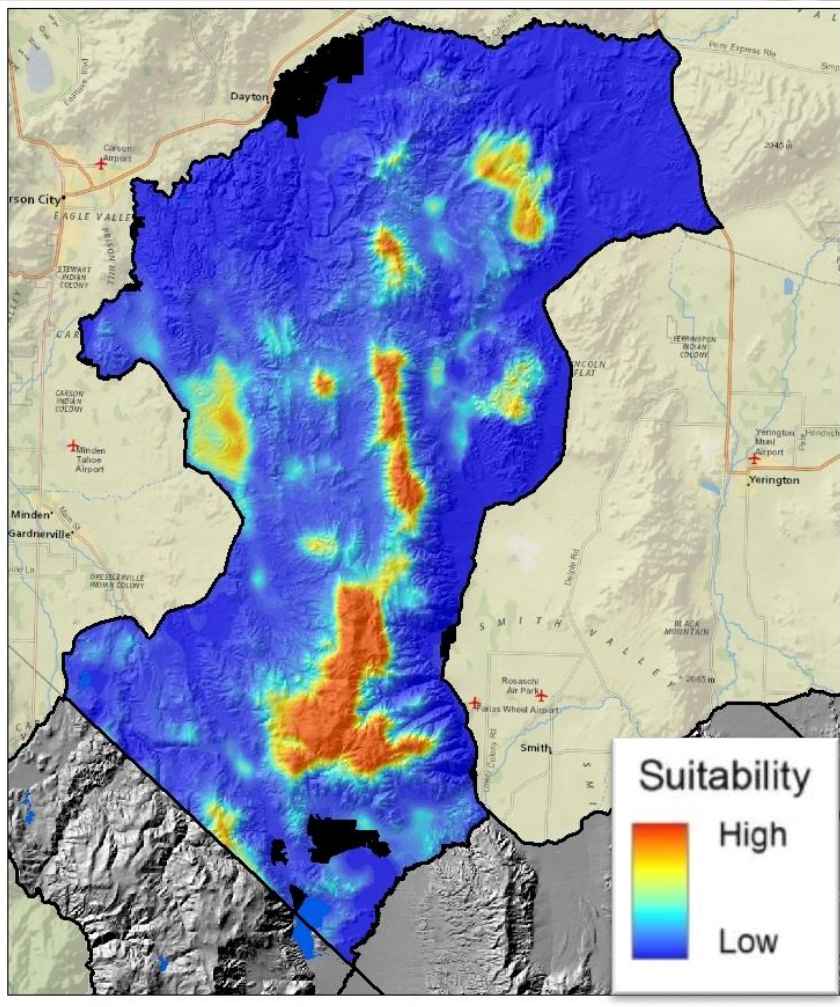


TAC Habitat Model

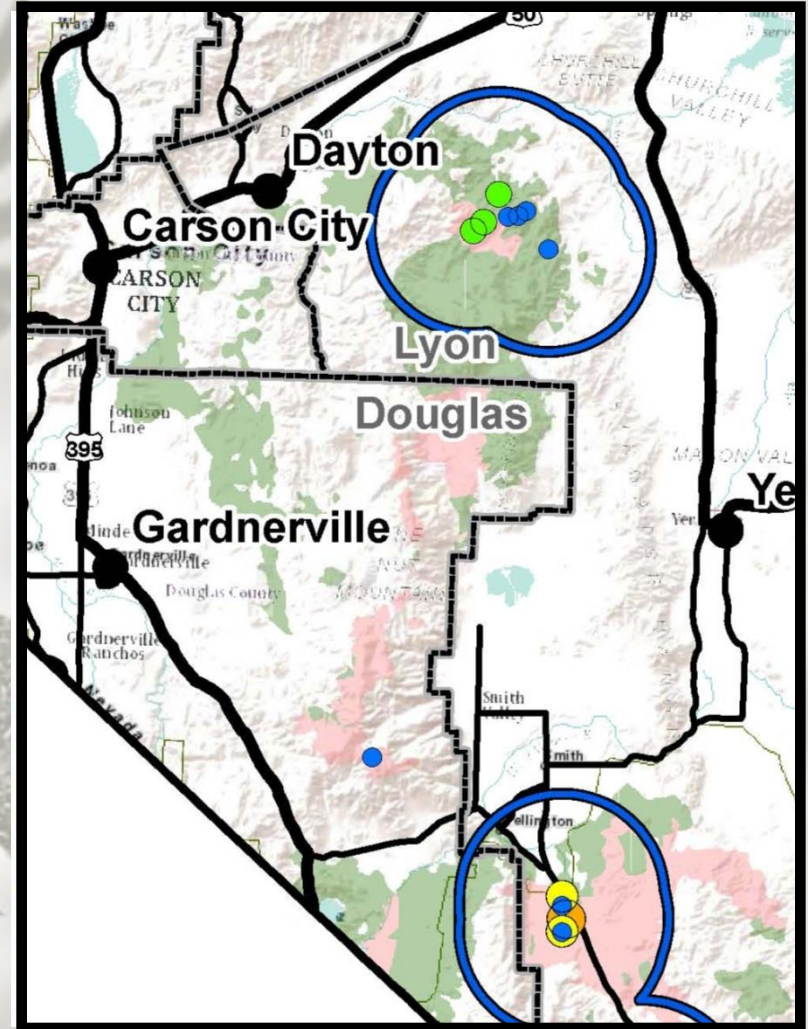


NDOW Habitat Categorization

Comparison between Maps



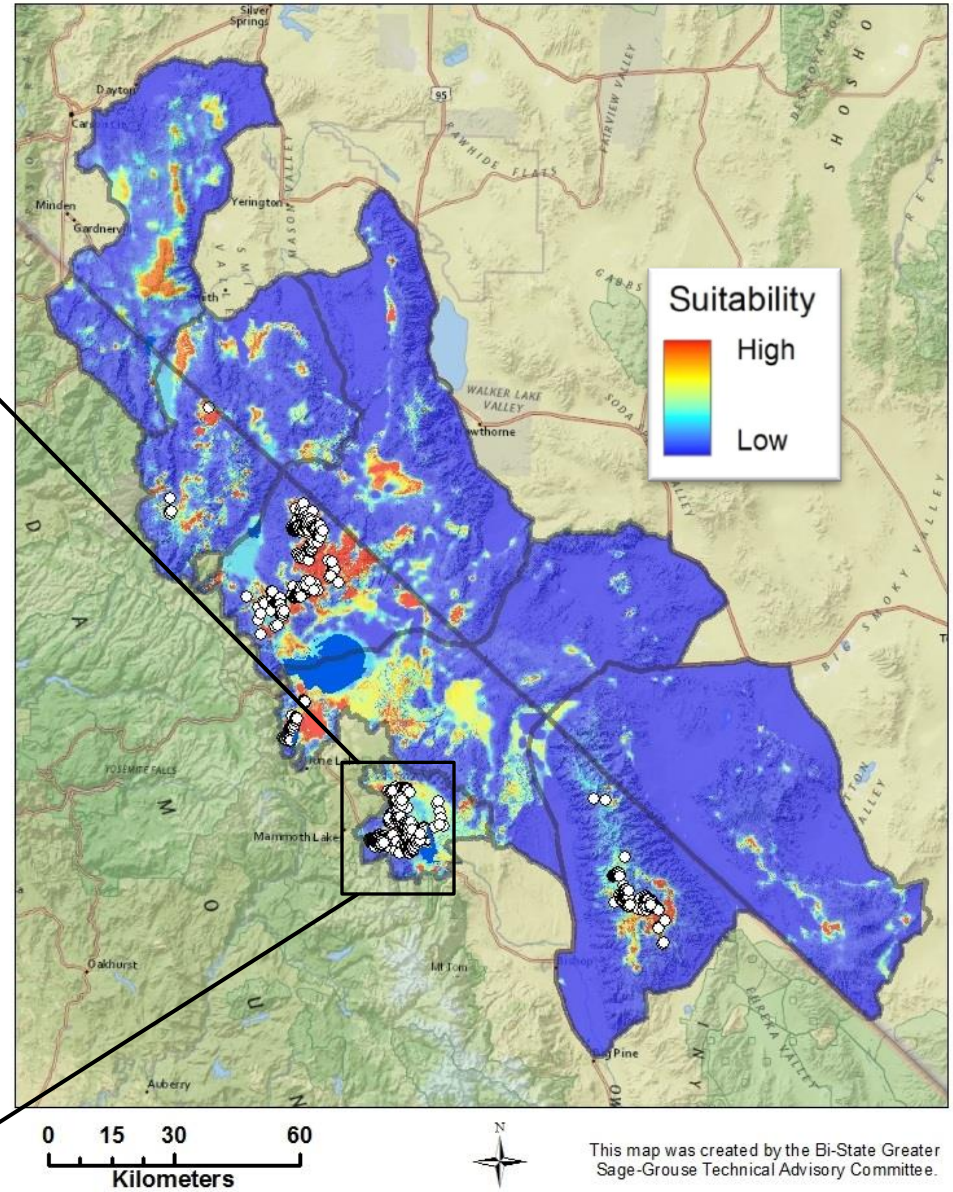
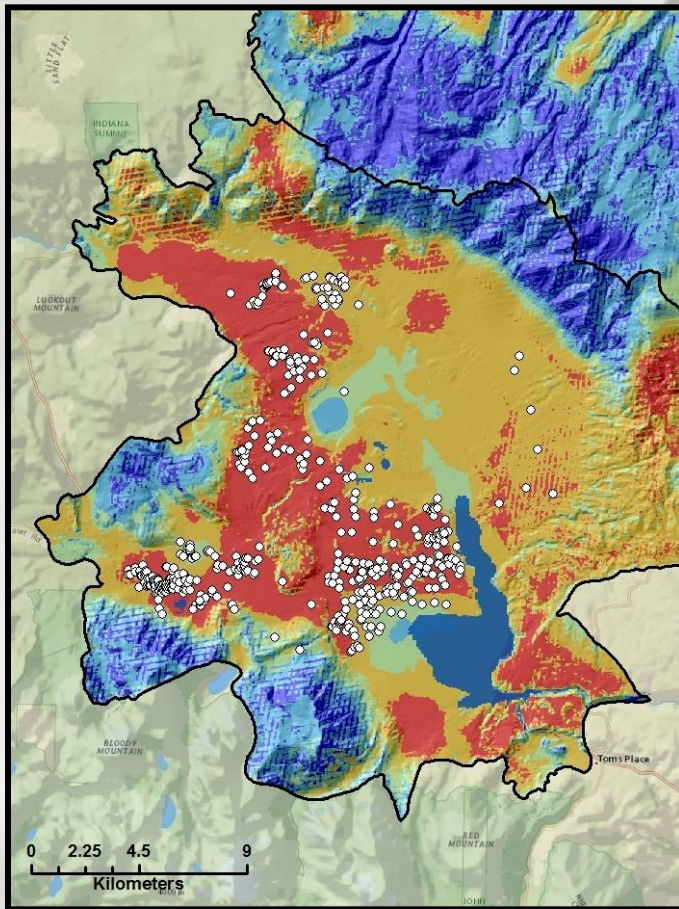
TAC Habitat Model



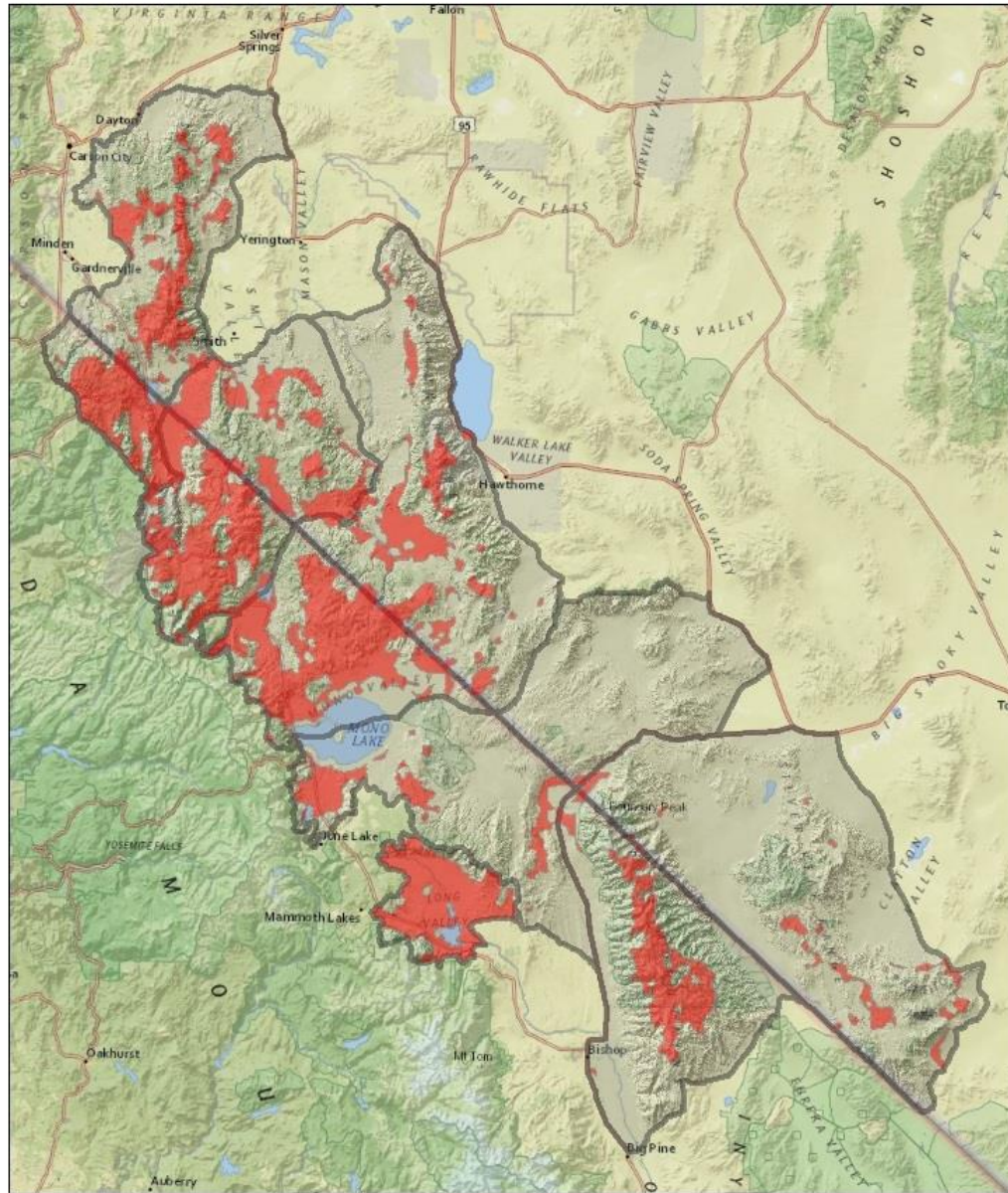
Core Area, LAWG, Preliminary Habitat

- **Overlay second data set to identify categories**
- **1,300 independent points (different grouse)**

Sage-Grouse Habitat Suitability of Bi-State DPS with Categorical Training Data Set



Greater Sage-Grouse Preliminary Priority Habitat - RSF



0 15 30 60
Kilometers

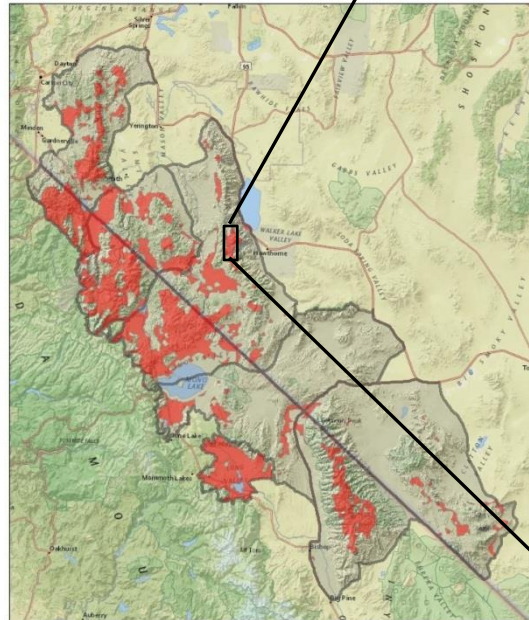


This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

EXAMPLE

Leks (traditional breeding grounds) on the near the edge of priority habitat

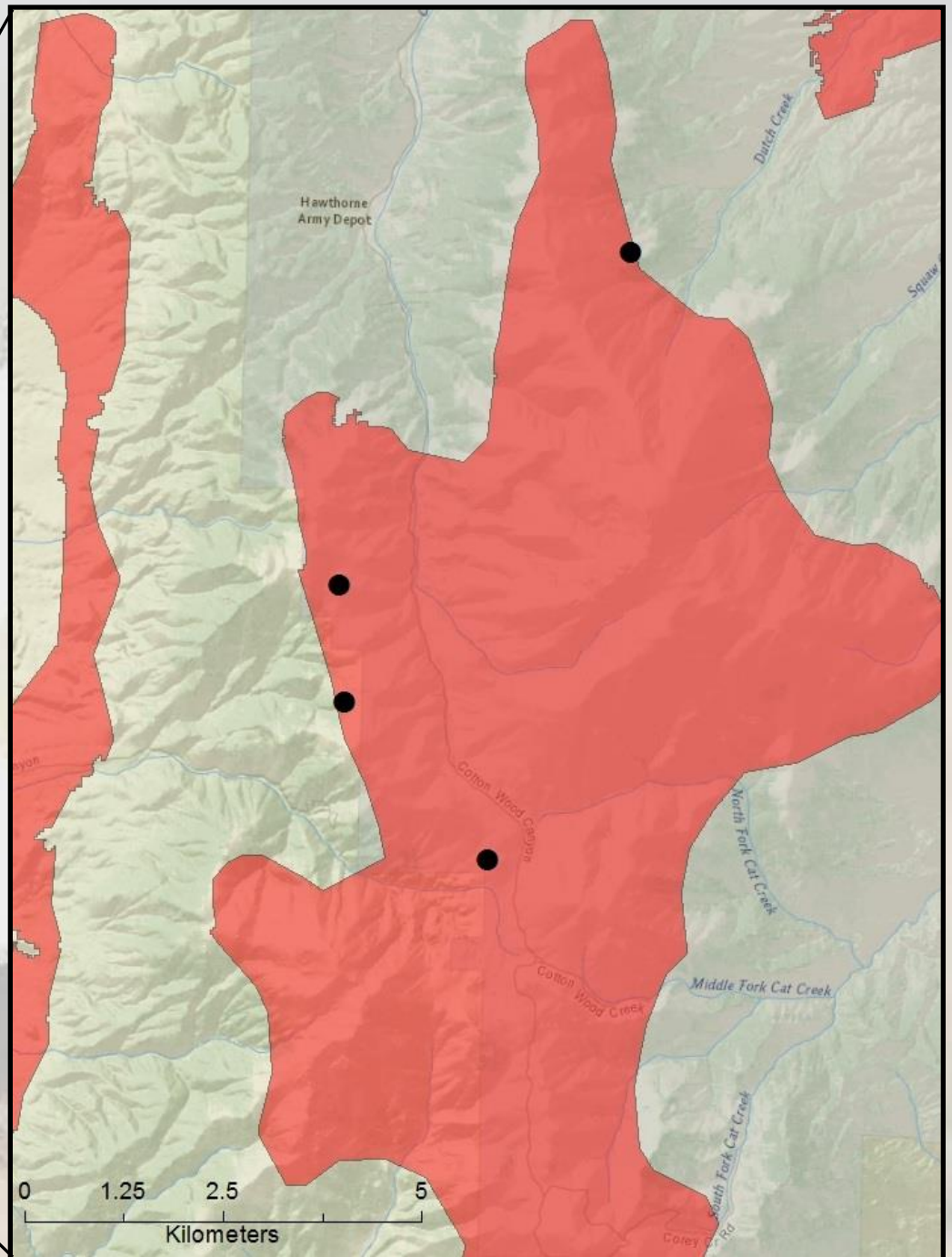
Potential effects of nearby disturbance



0 15 30 60
Kilometers



This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.



0 1.25 2.5 5
Kilometers

Nearby Disturbance Factor (edges)

Examples:

- Wildfire
- Subsidized Predation

Indirect
Effects

Direct
Effects

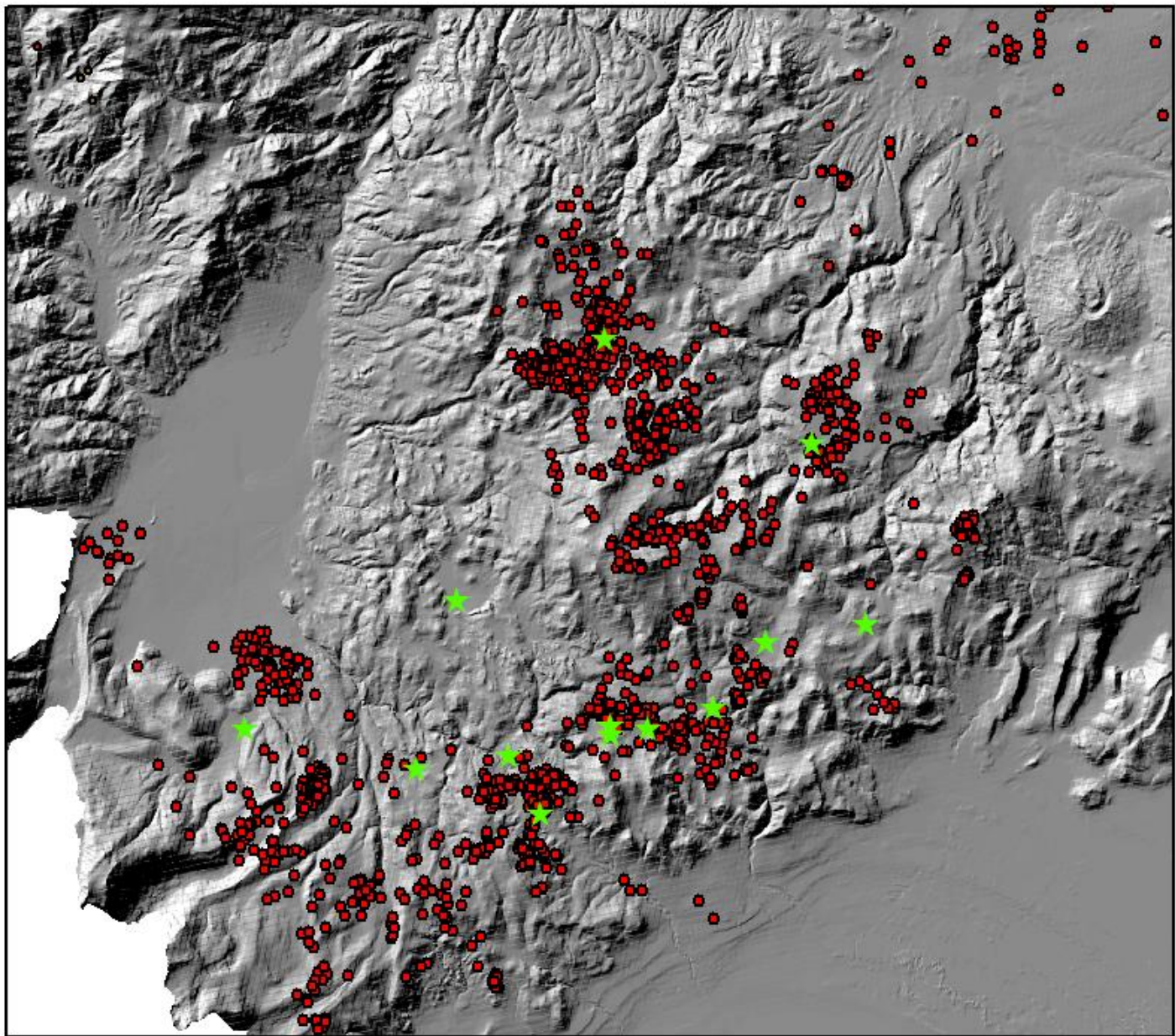
Examples:

- Vehicles
- Noise
- Vertical Structures

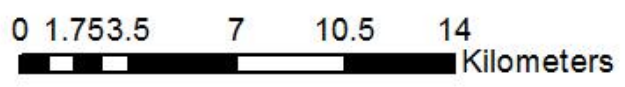
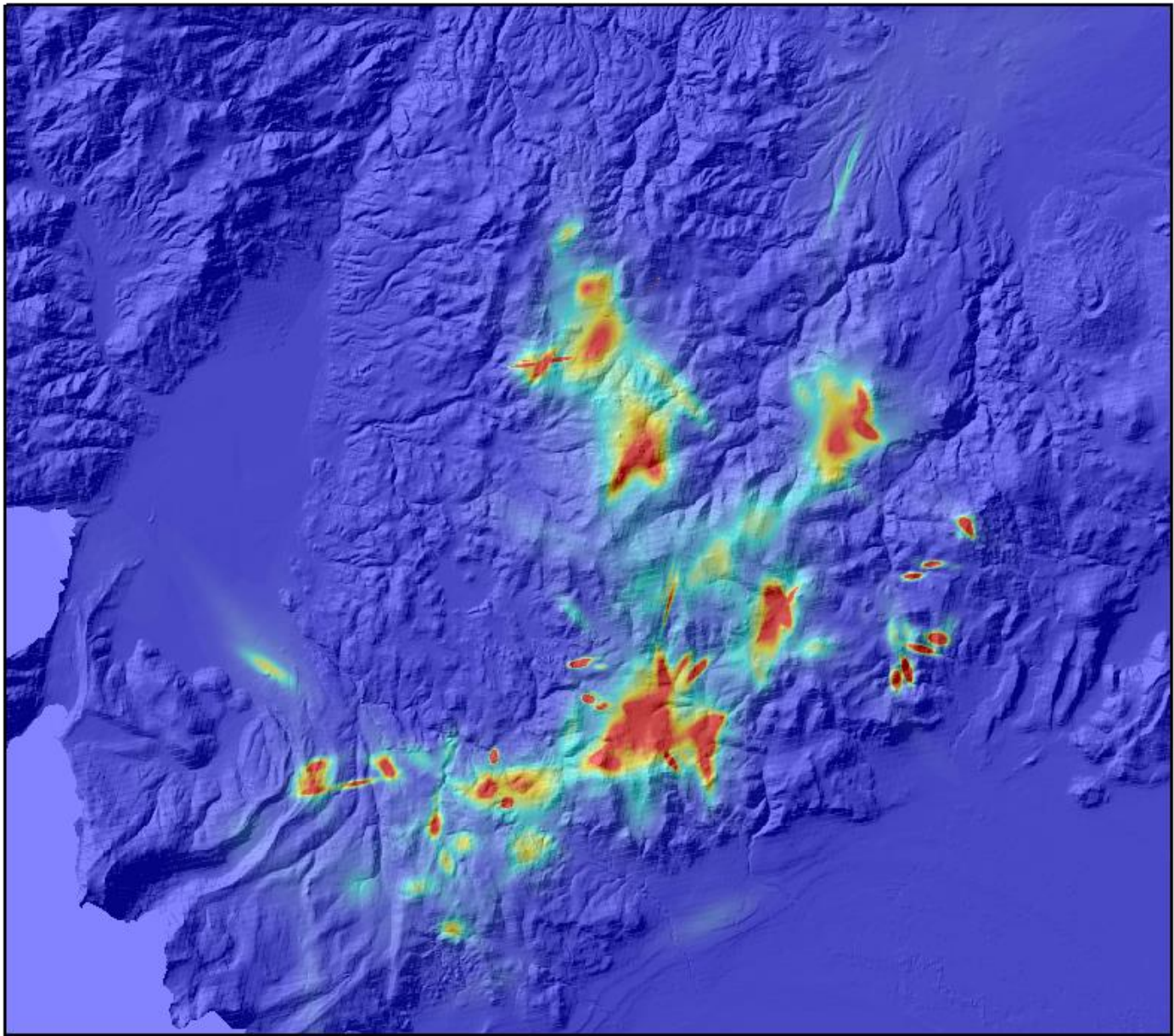
Reduced
Population
Persistence

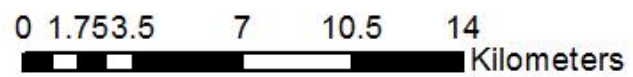
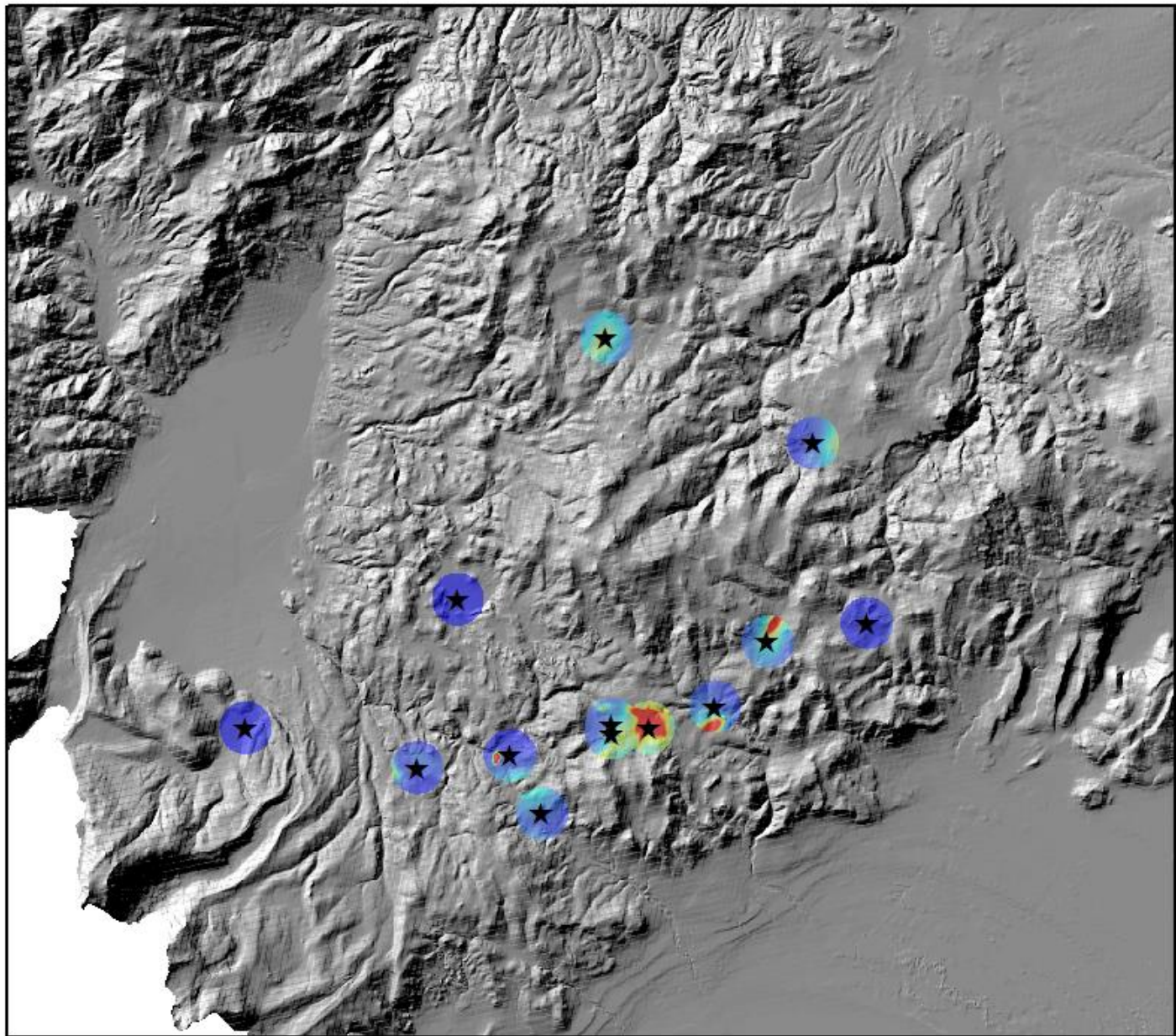
Edge Effects - Utilization Distribution Analysis

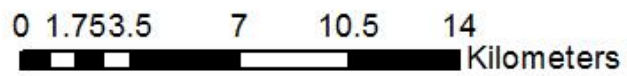
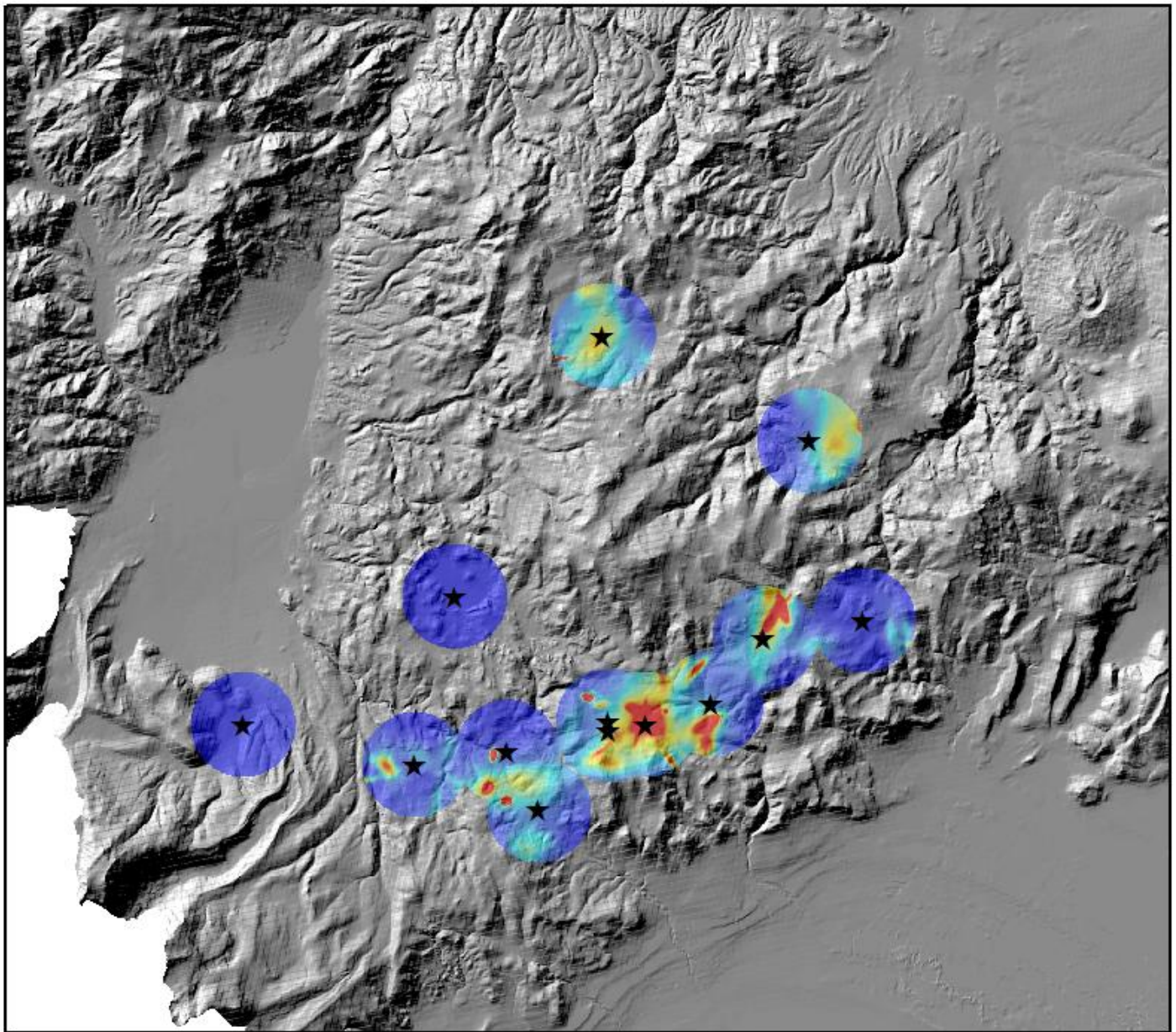
- 1) **Calculated seasonal use areas (utilization distribution; UD) for each grouse by season**
- 2) **Calculated volume of UD within each 30-m increase distance from lek**
- 3) **Diminishing returns in UD analysis with increasing buffer distance**

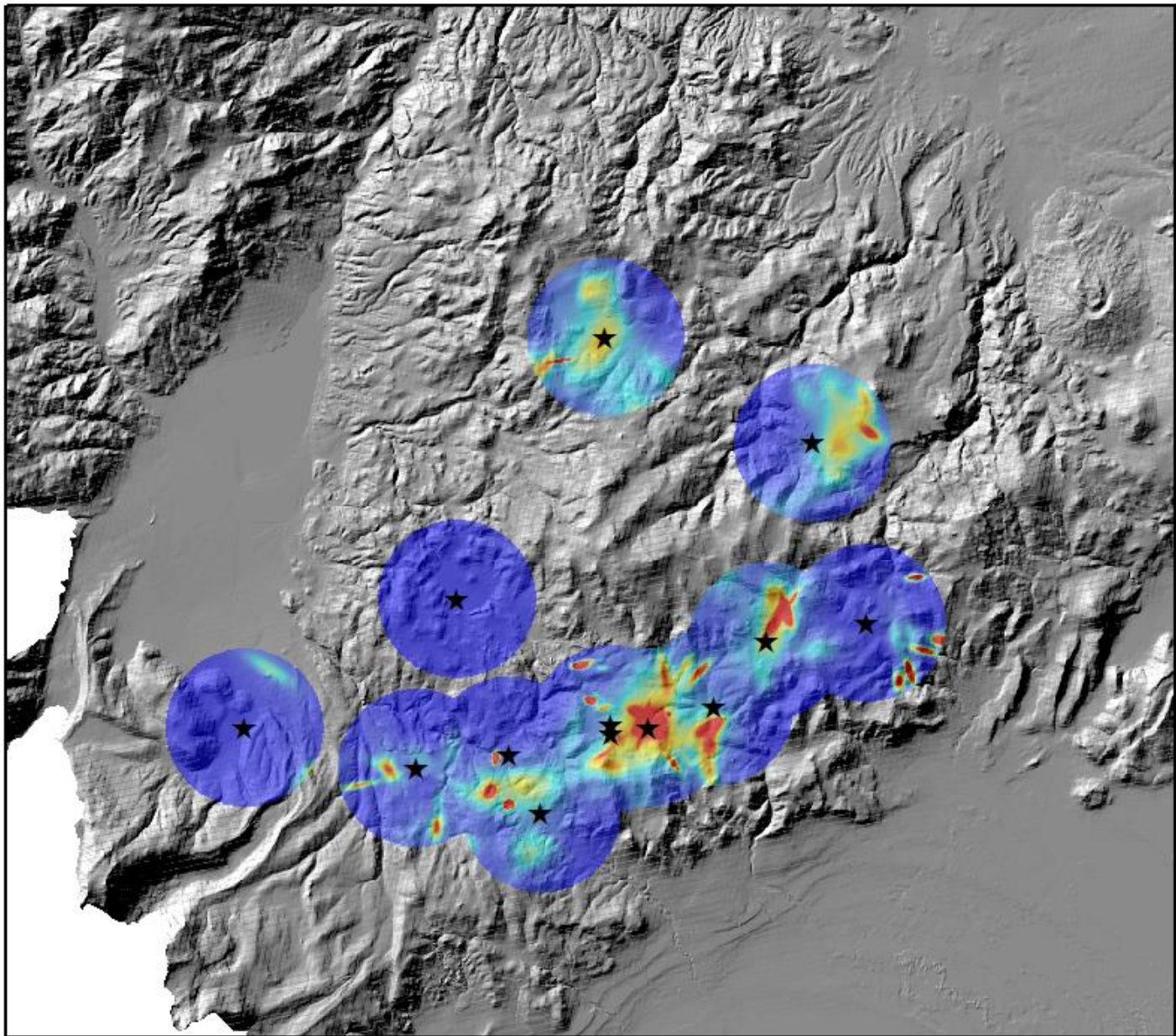


0 1.753.5 7 10.5 14
Kilometers

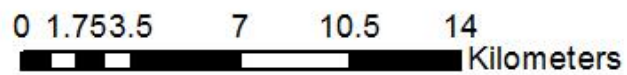
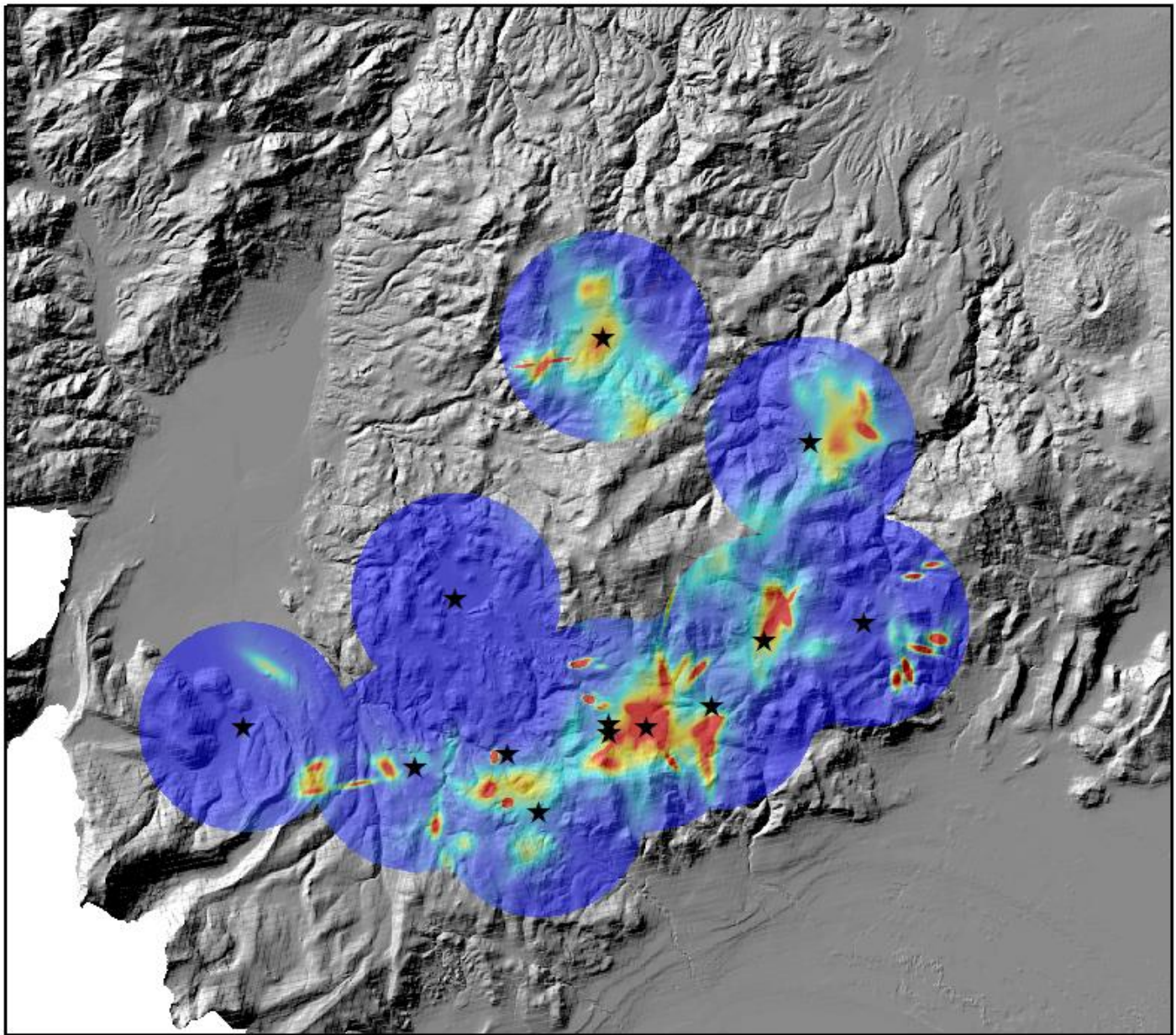


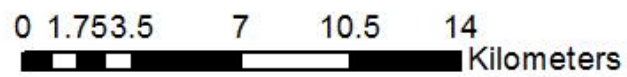
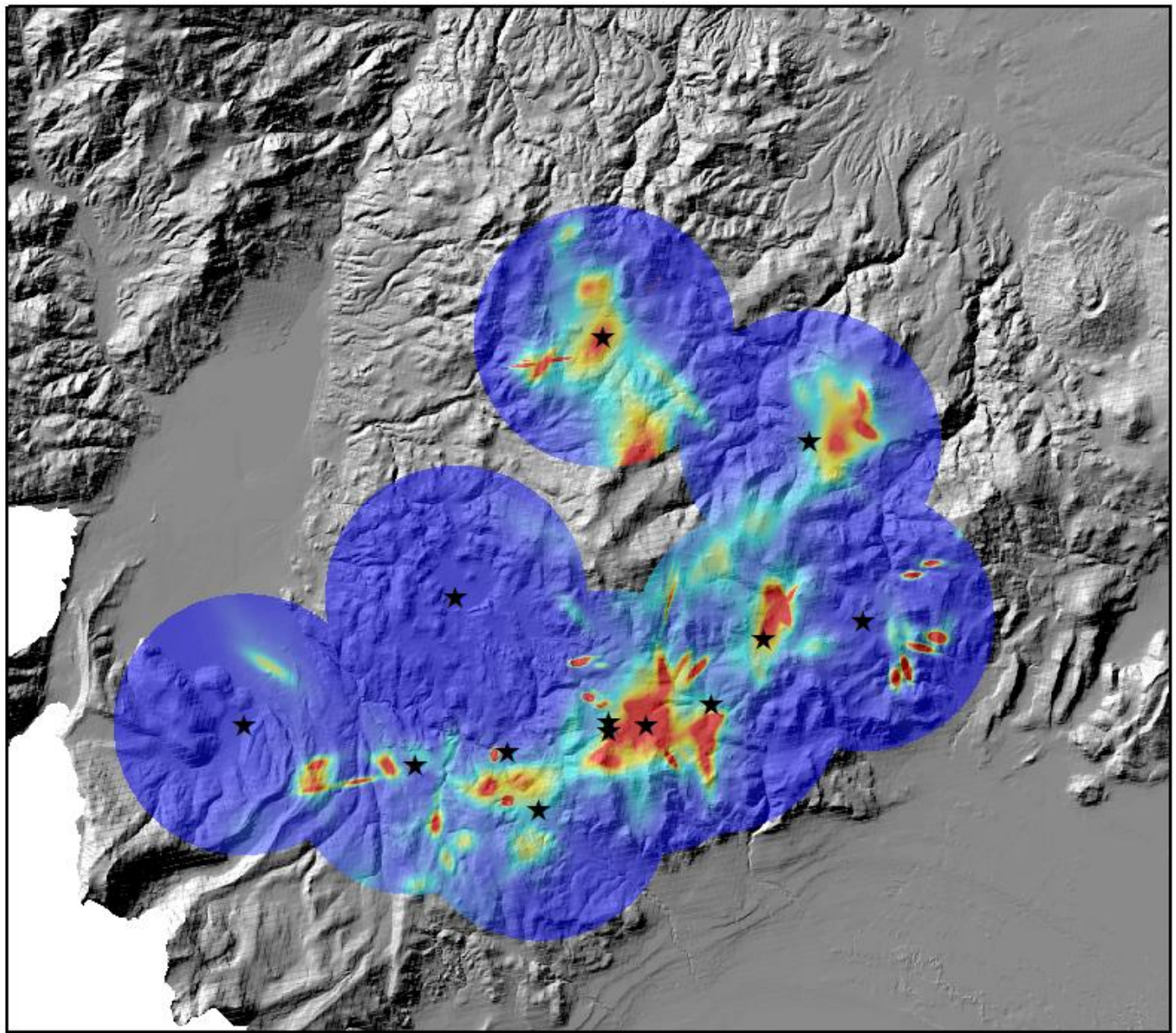


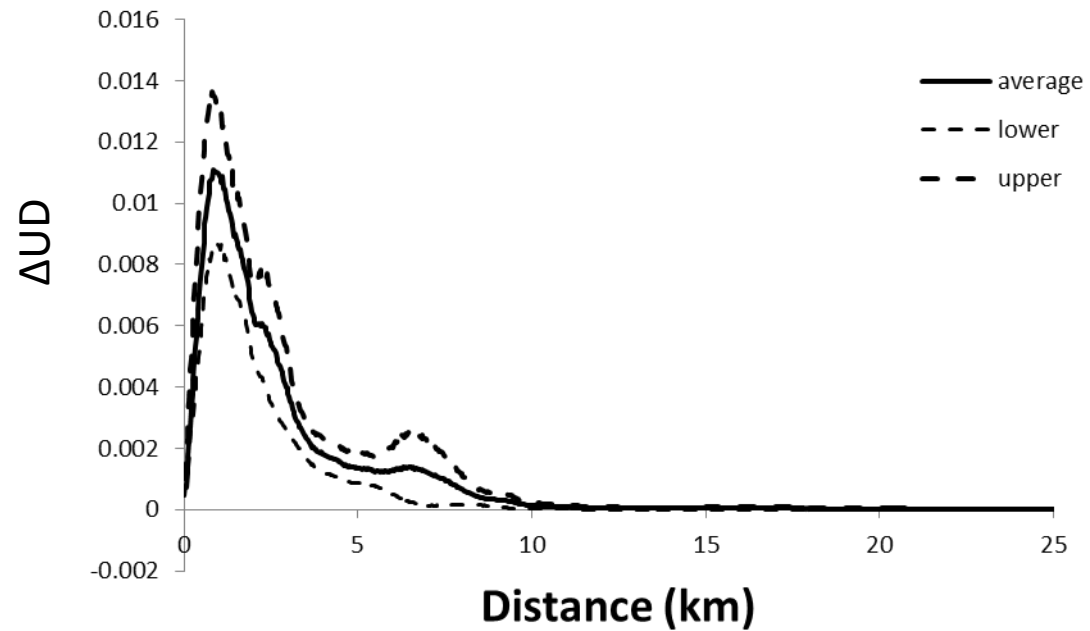
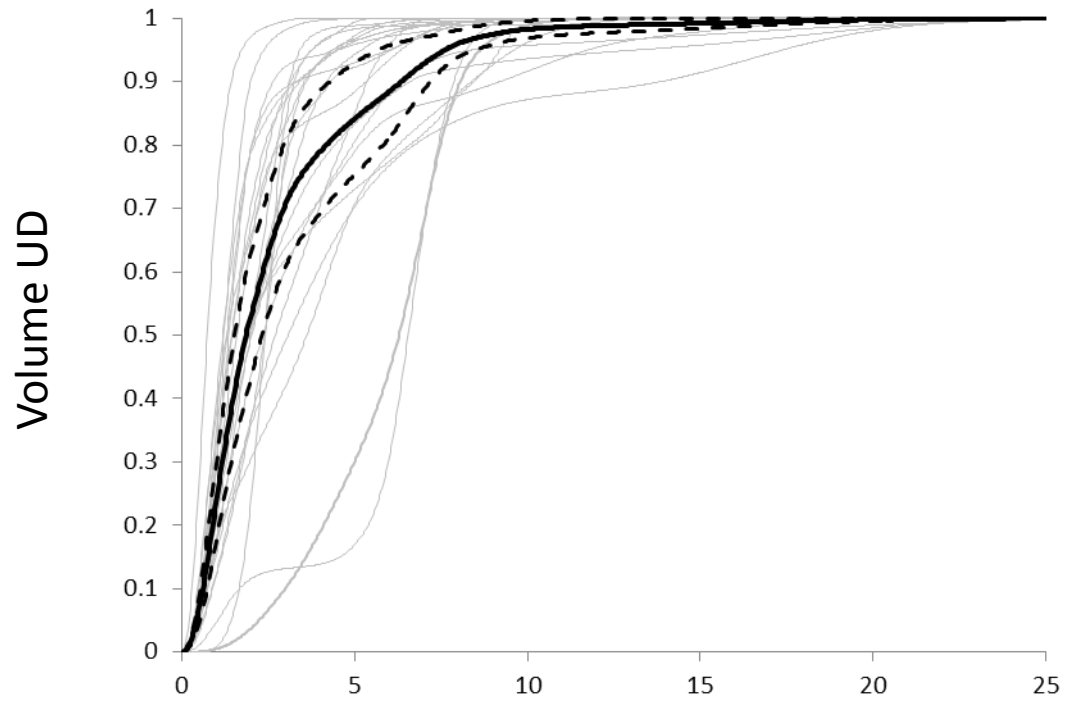


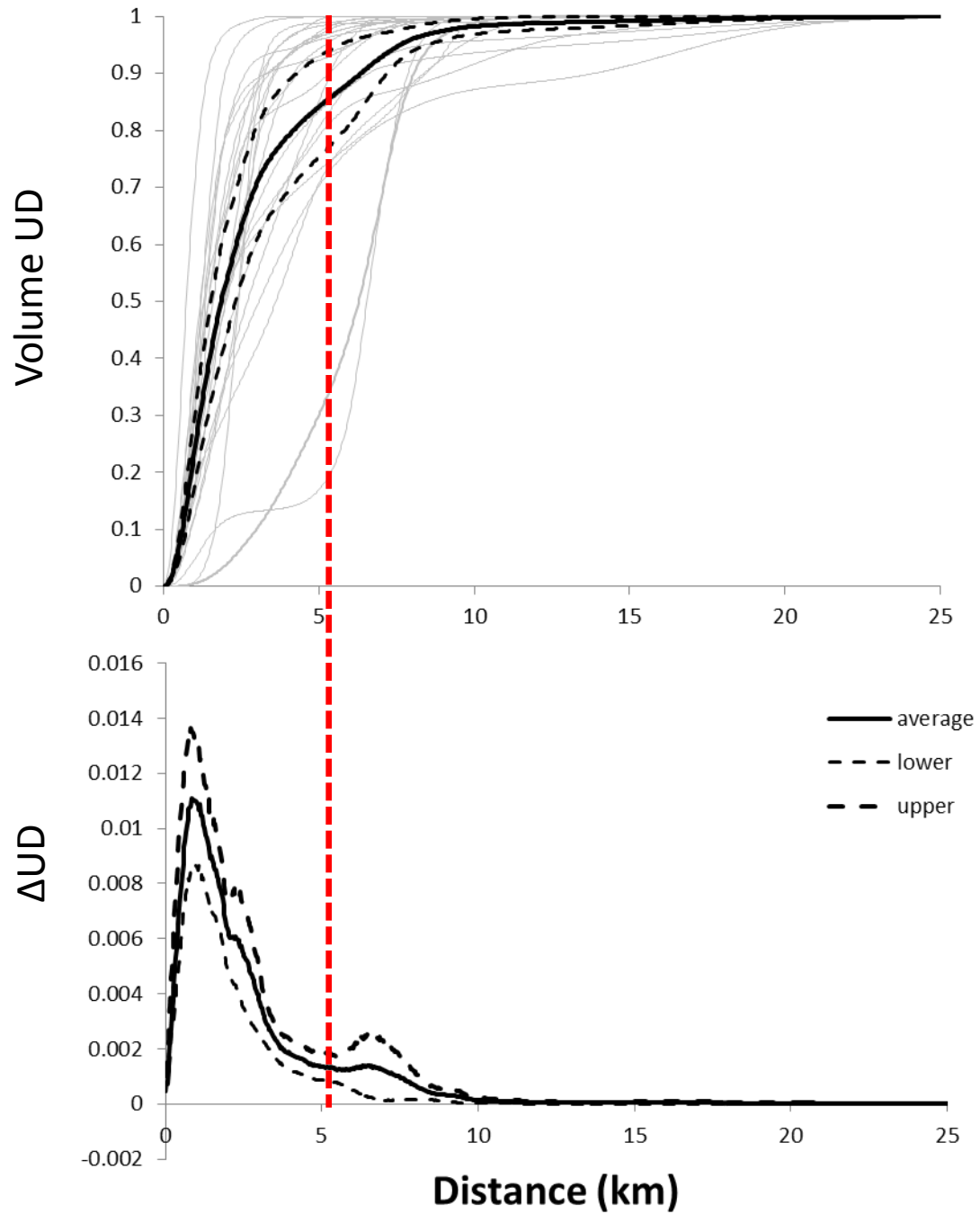


0 1.753.5 7 10.5 14
Kilometers

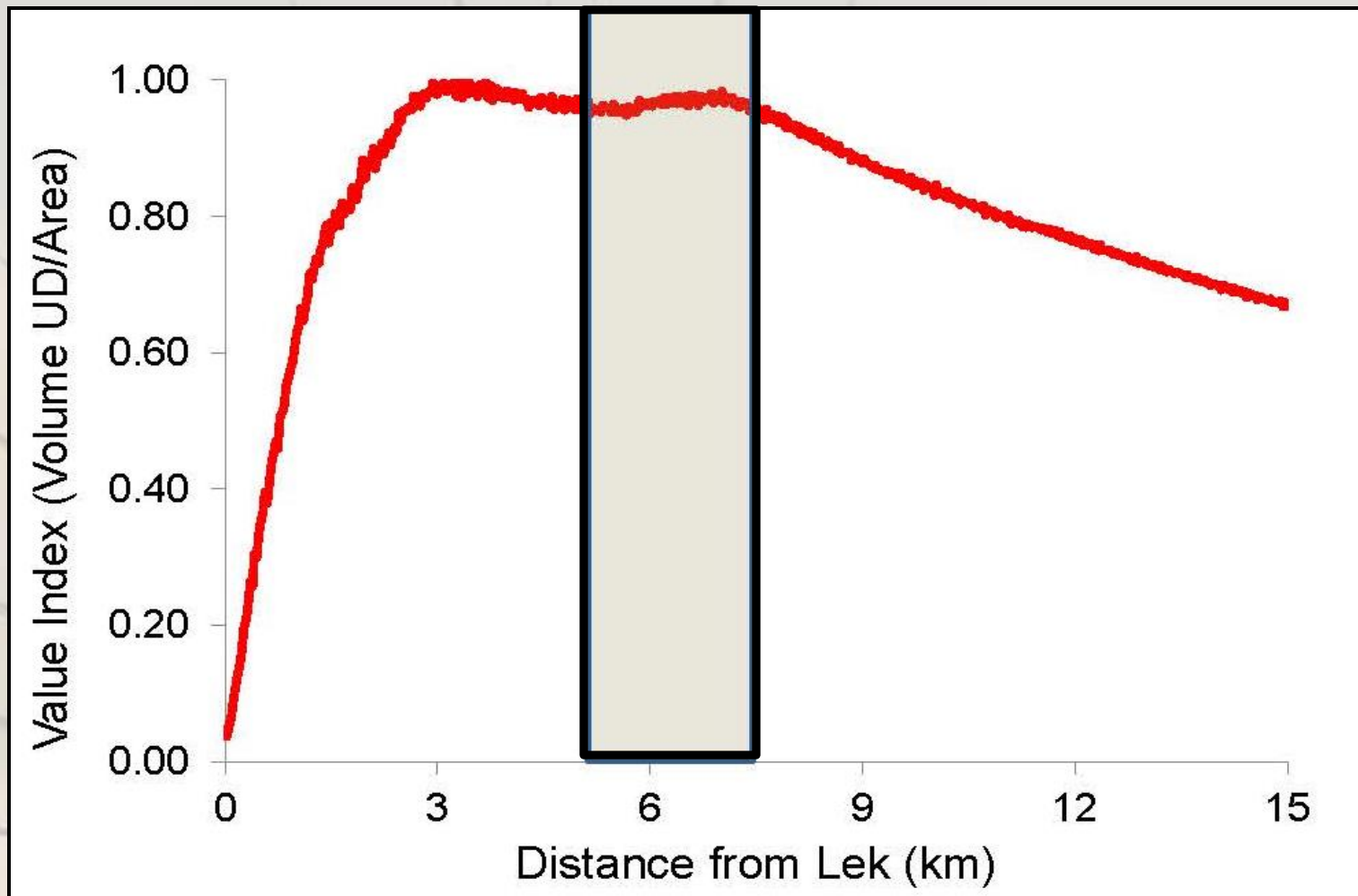








Diminishing Returns

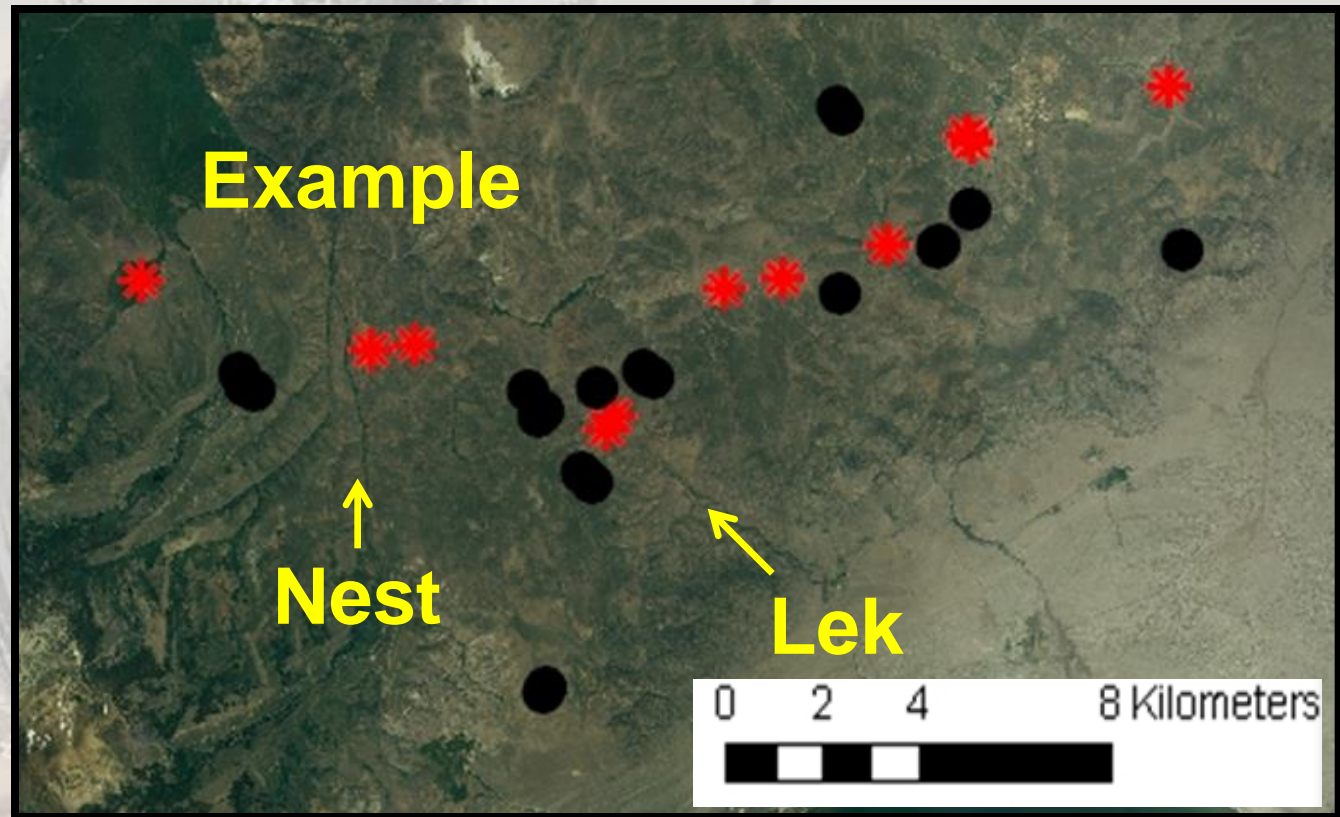


Distance to Nests Analysis

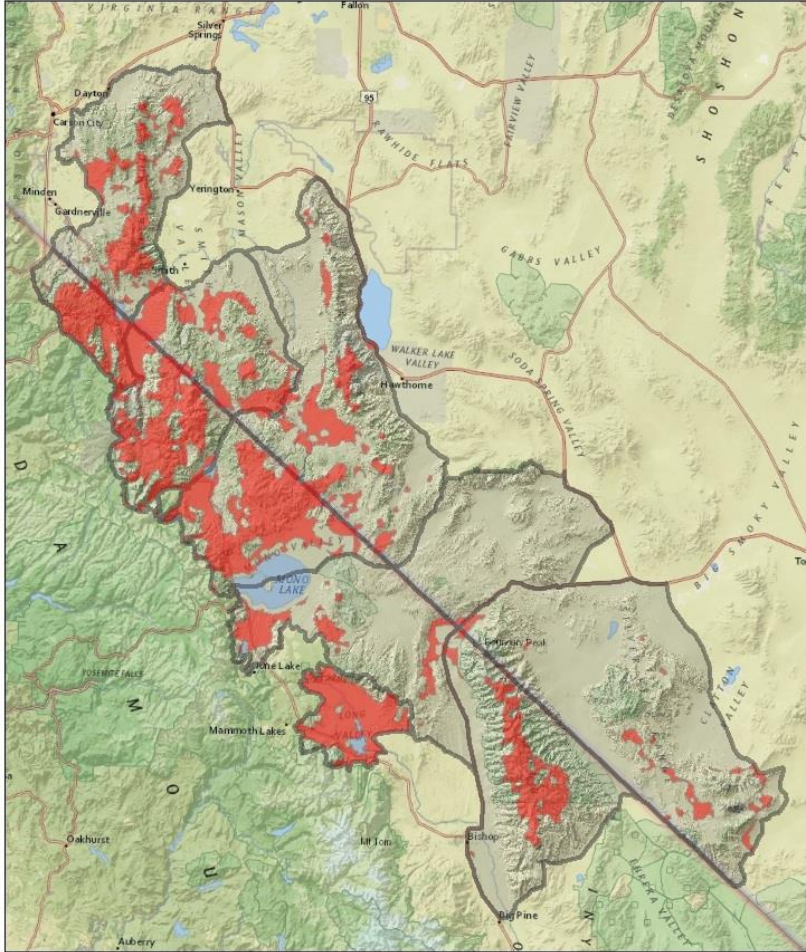
95% Percentile of
the Distribution

5.21 km

(range 0.16 – 8.35)

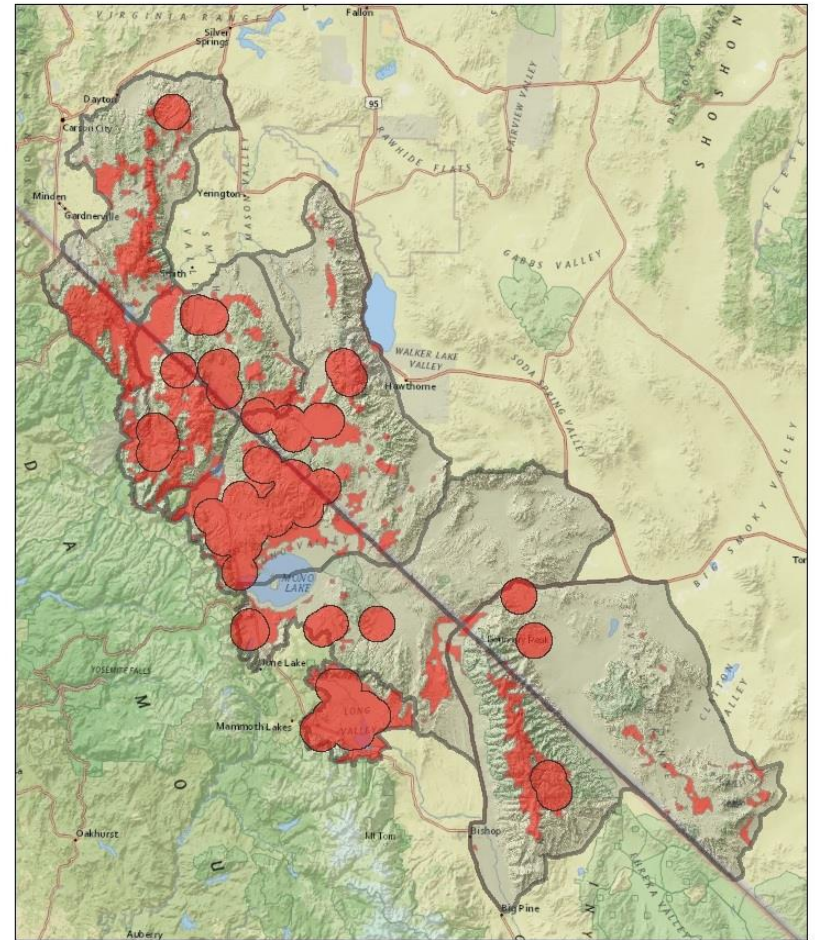


Greater Sage-Grouse Preliminary Priority Habitat - RSF



This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

Greater Sage-Grouse Preliminary Priority Habitat
RSF and UD Buffers



This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

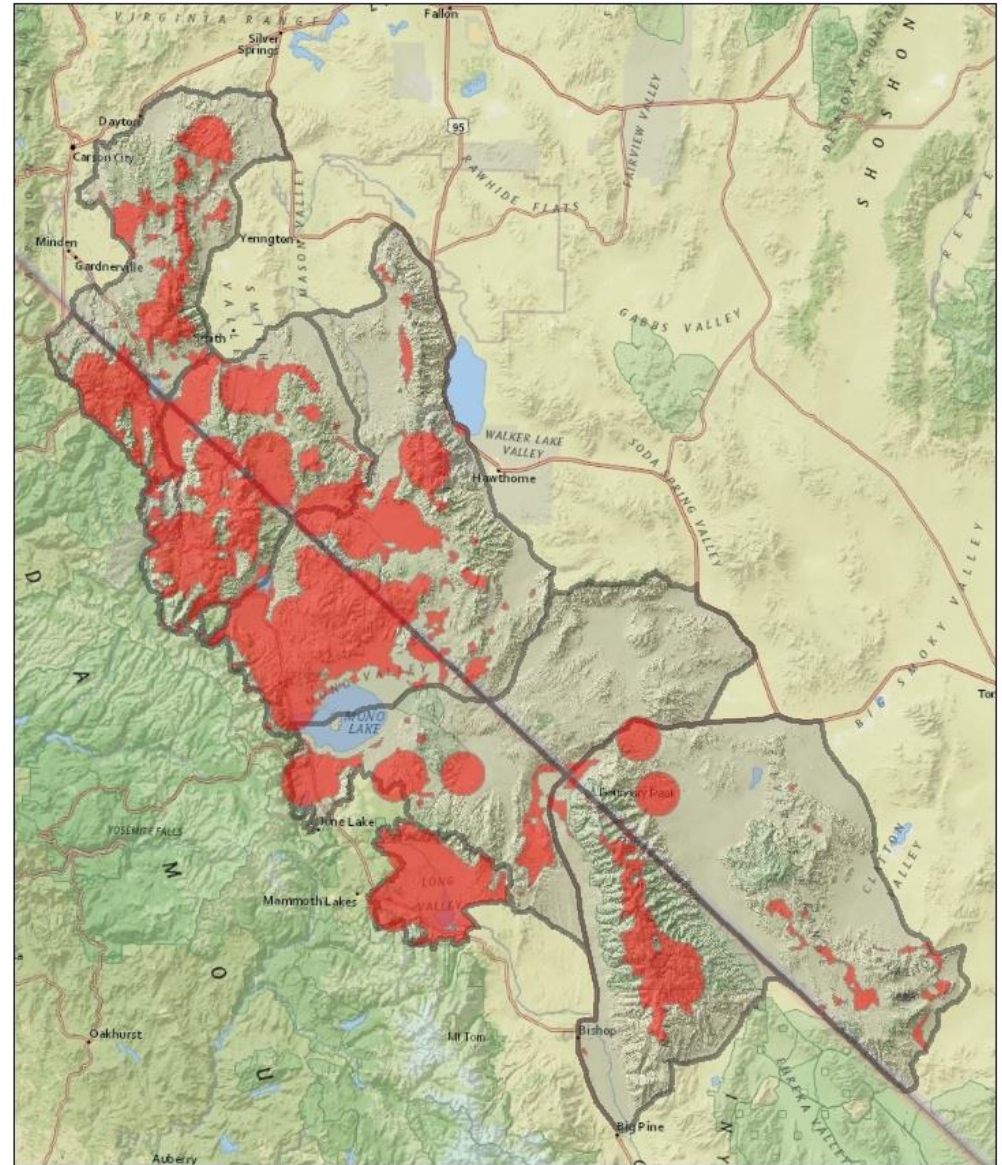
Greater Sage-Grouse Preliminary Priority Habitat

Area with buffers

1,371,760 acres (30%)

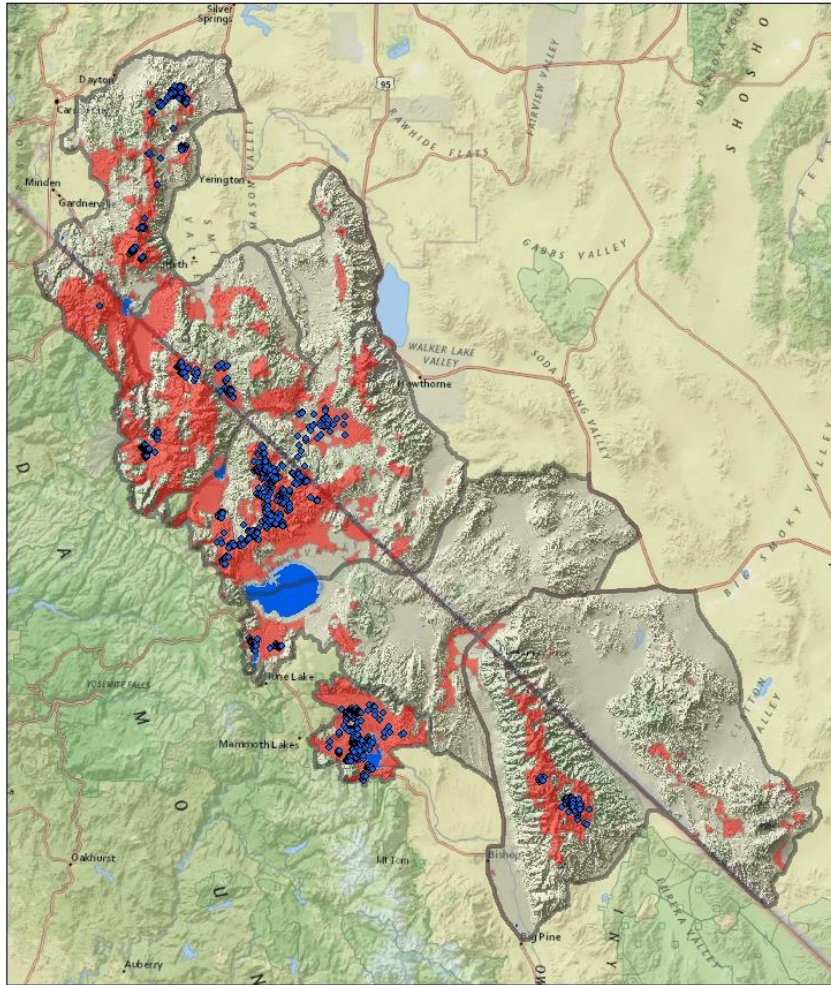
Areas without buffers

1,047,020 acres (23%)



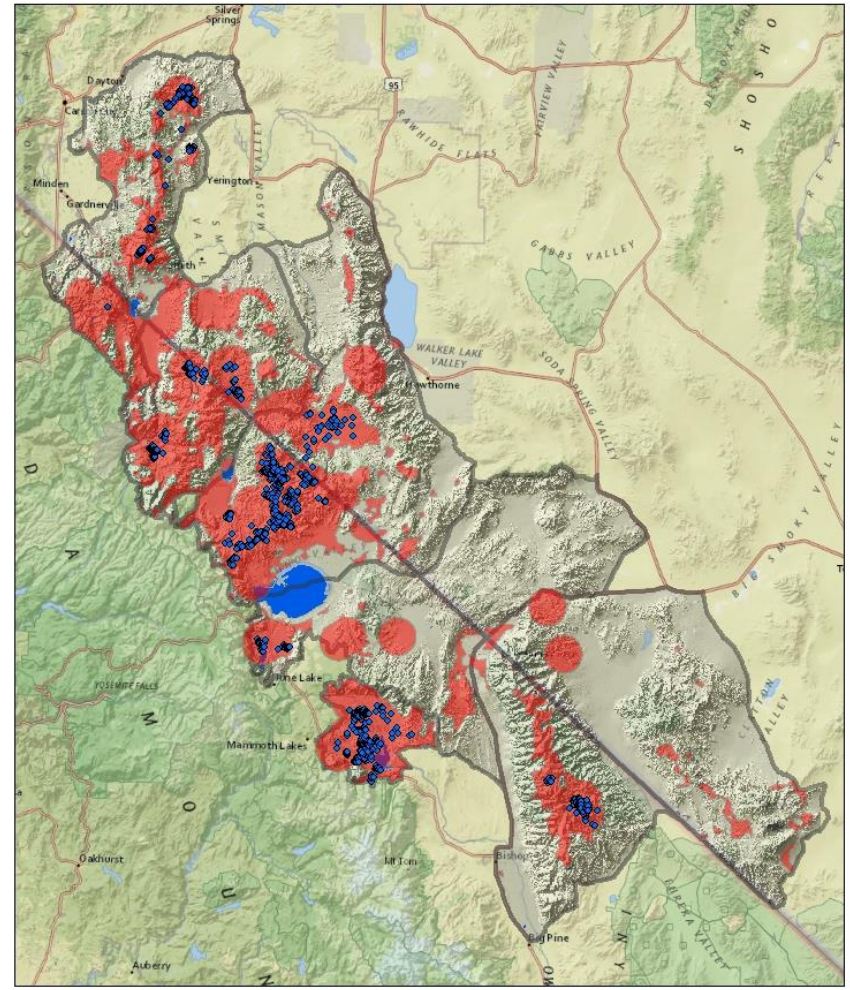
This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

Greater Sage-Grouse Preliminary Priority Habitat with Validation Data



This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

Greater Sage-Grouse Preliminary Priority Habitat No Buffers with Validation Data

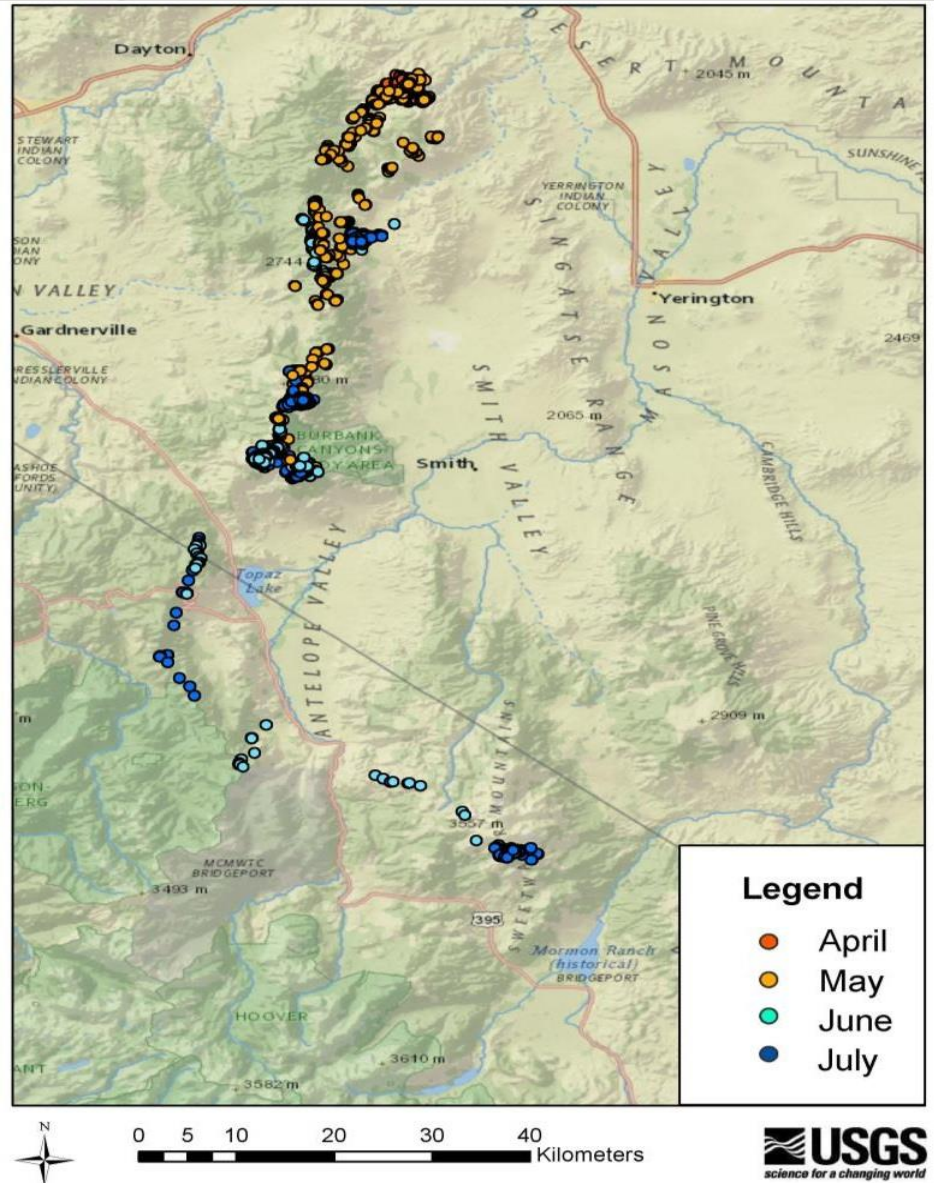


This map was created by the Bi-State Greater Sage-Grouse Technical Advisory Committee.

>97% within PPH

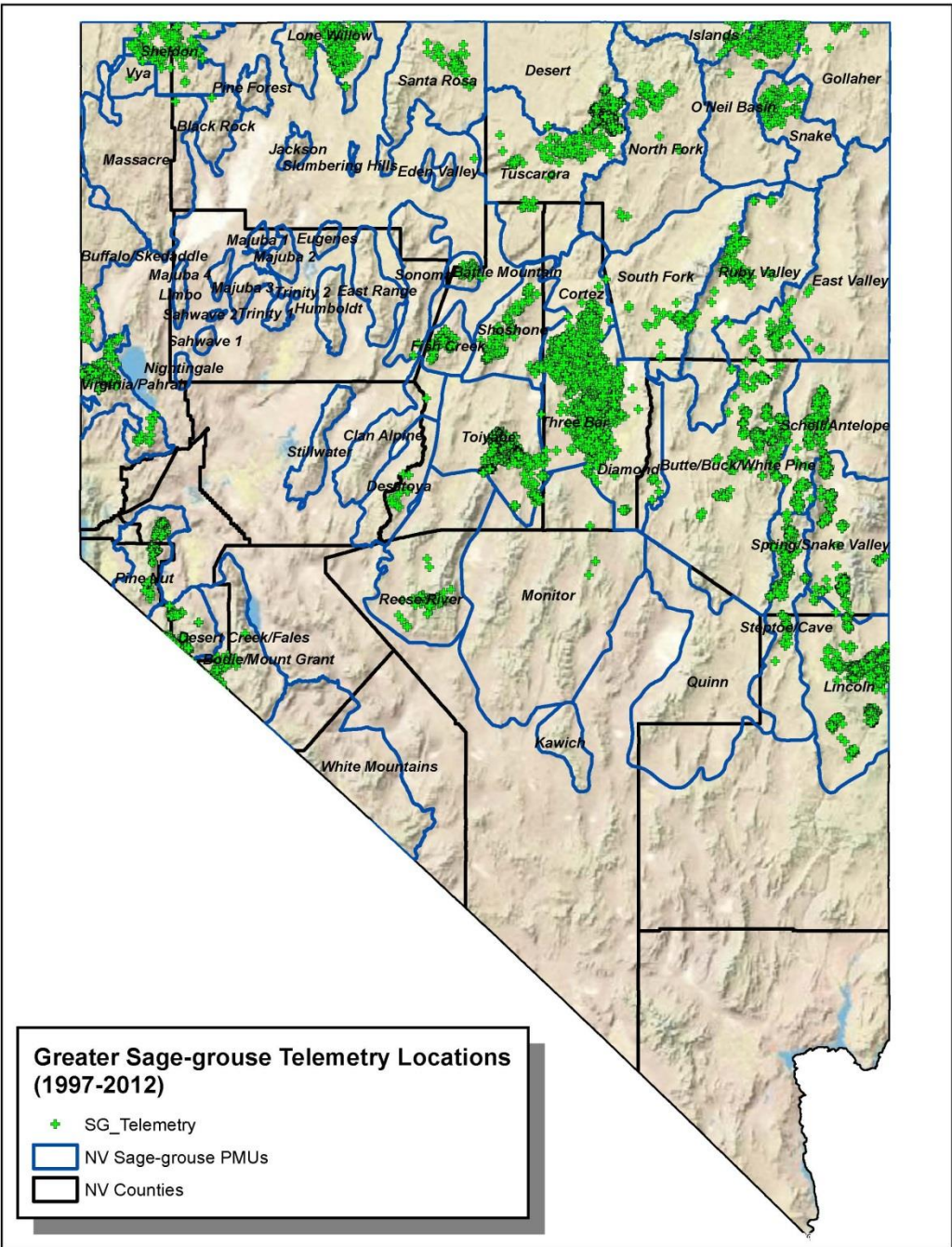
>99% within PPH

GPS Technology





EARTH GRAPHIC



Acknowledgments

Nevada Department Of Wildlife

California Department of Fish and Game

University of Nevada Reno

Idaho State University

University of Idaho

Bureau of Land Management (CA)

Bureau of Land Management (NV)

US Fish and Wildlife Service

USDA Forest Service

