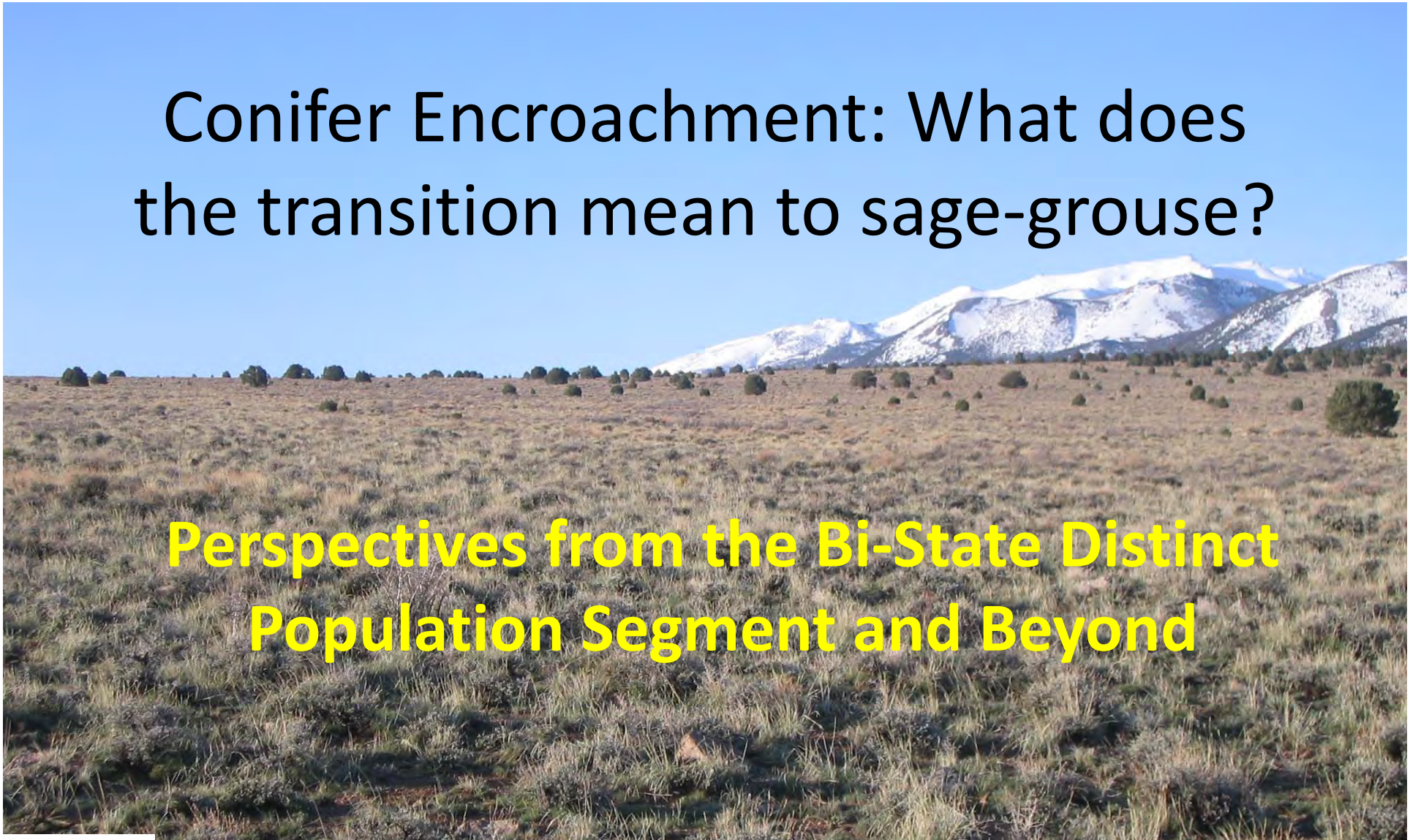
Conifer Encroachment: What does the transition mean to sage-grouse?



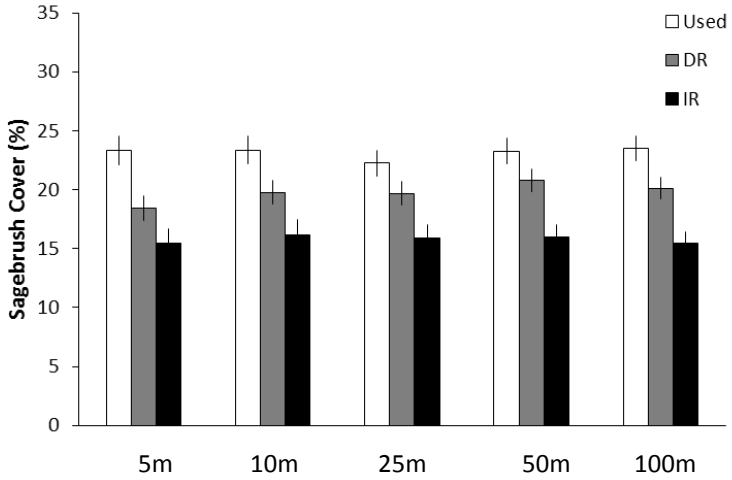
Perspectives from the Bi-State Distinct Population Segment and Beyond

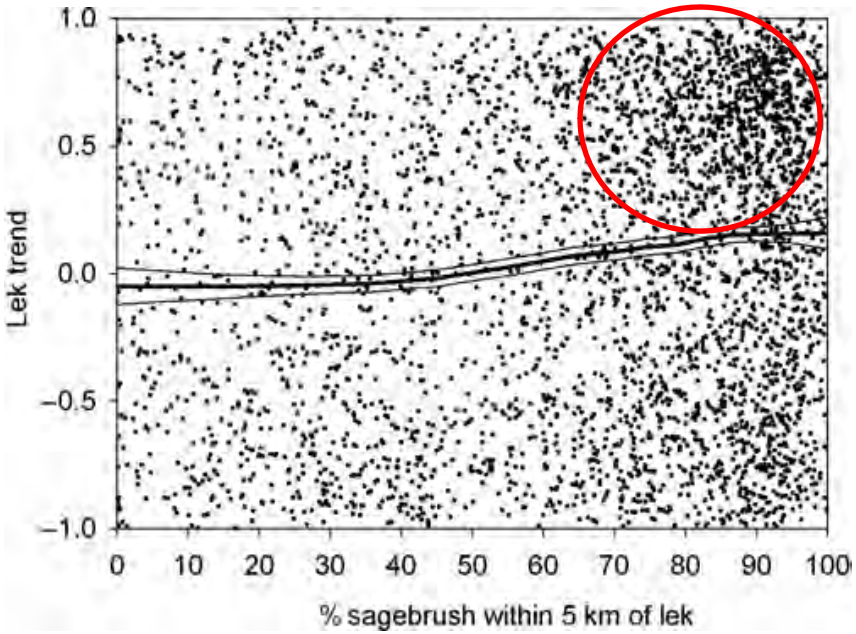
NEVADA DEPARTMENT OF WILDLIFE

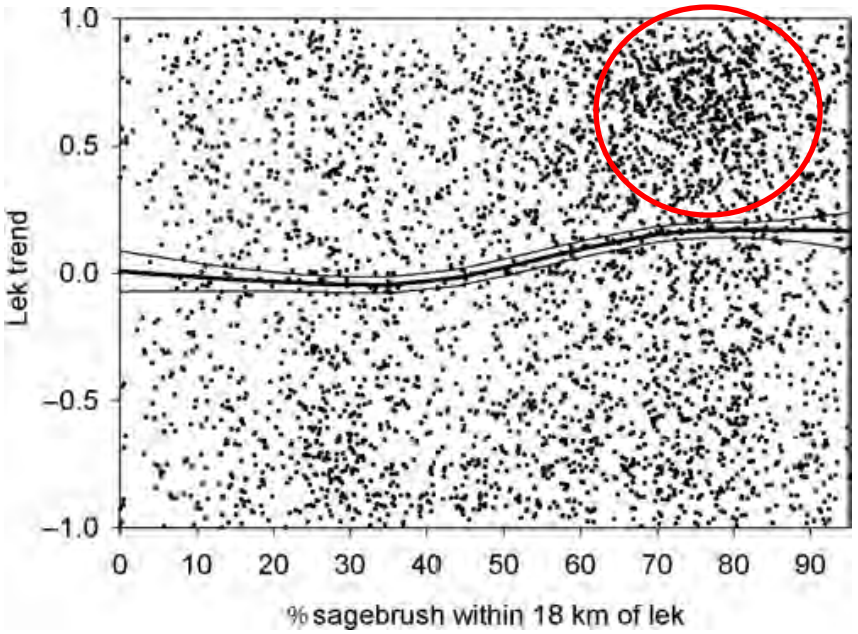
USGS science for a changing world

USDA NRCS U.S. Department of Agriculture Natural Resources Conservation Service

Sage-grouse Depend on Sagebrush at Multiple Scales

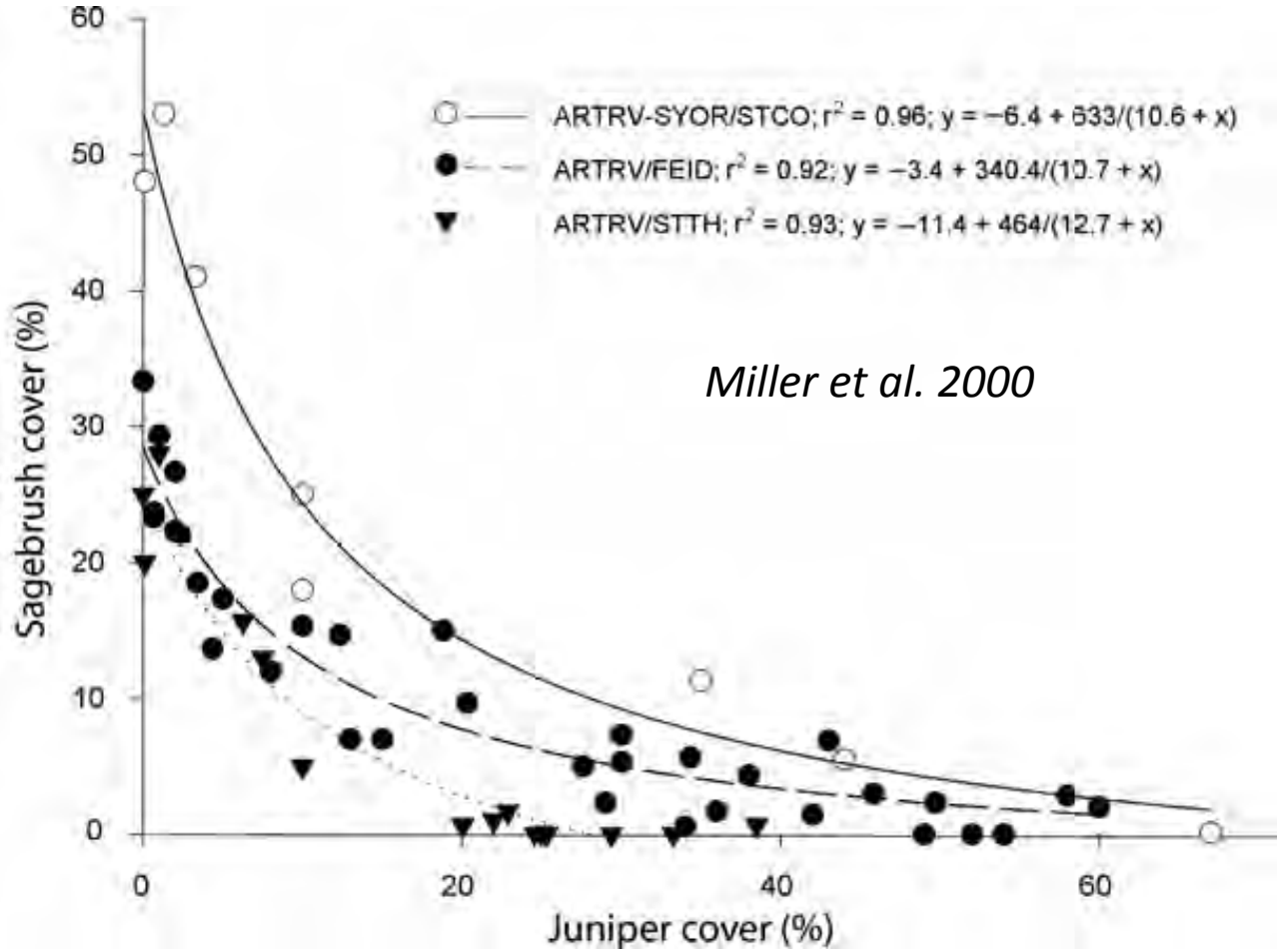






Relation between trend of lek counts (1997-2007) and all sagebrush within 5 km and 18 km, all management zones combined (Johnson et al. 2011 in SAB, Chapter 17)

Conifer Encroachment Diminishes Sagebrush Cover



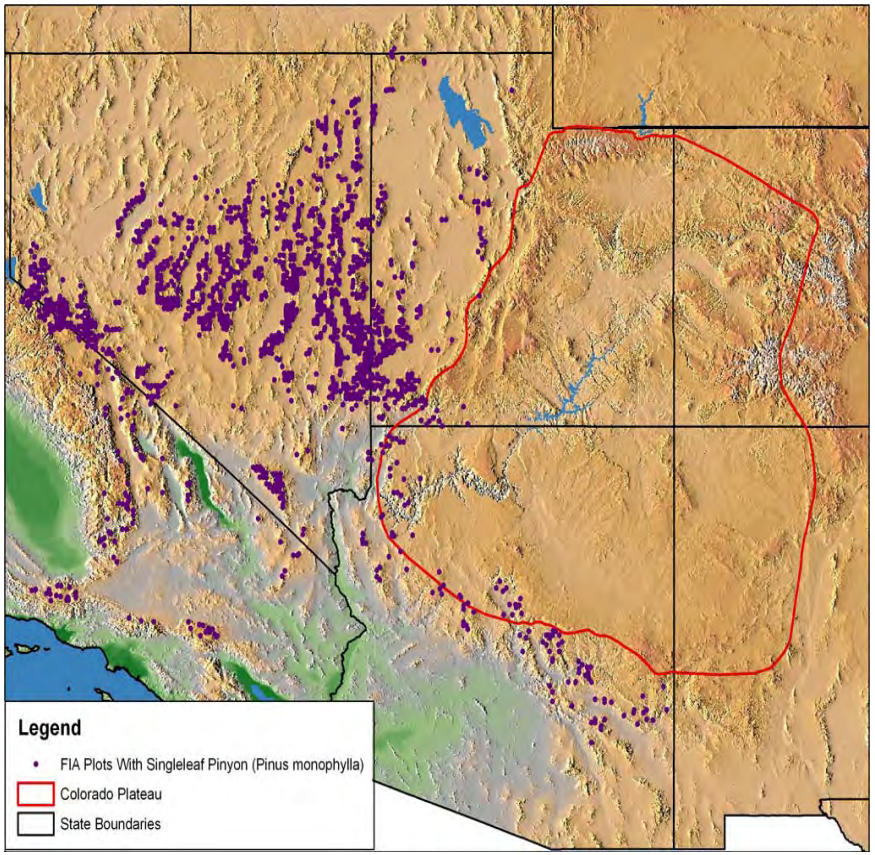
Miller et al. 2000

Conifer Encroachment

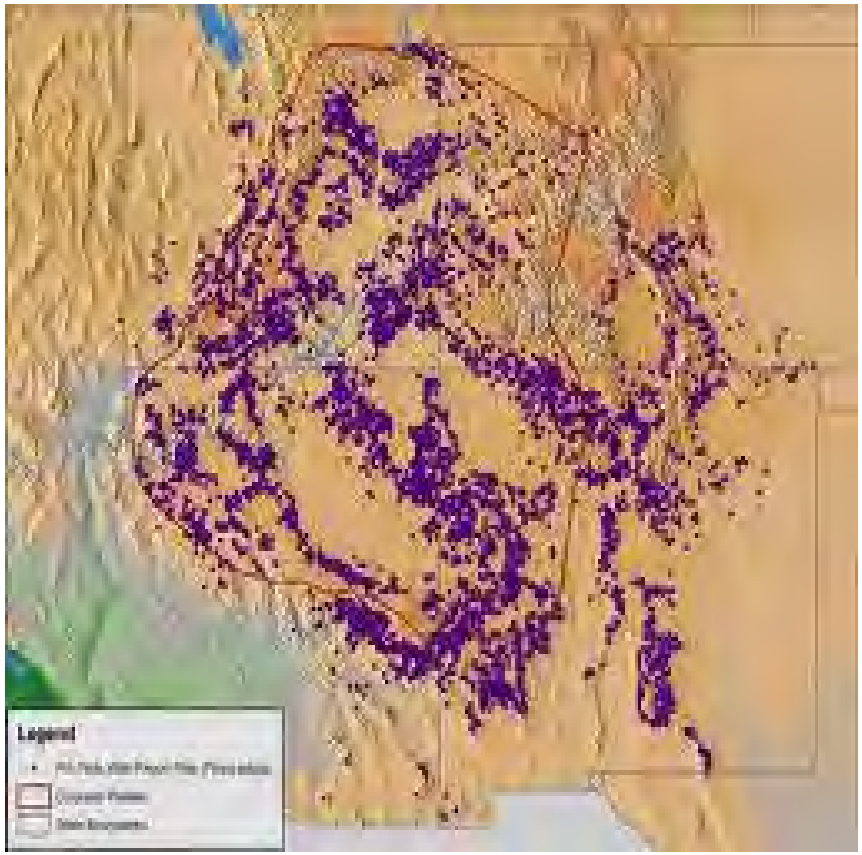
- Utah Juniper (*Juniperus osteosperma*)
- Western Juniper (*Juniperus occidentalis*)
- Single-leaf pinyon pine (*Pinus monophylla*)
- Two needle pinyon pine (*Pinus edulis*)
- Rocky Mountain juniper (Juniperus scopulorum)

Pinyon Distribution

Single Leaf Pinyon Pine

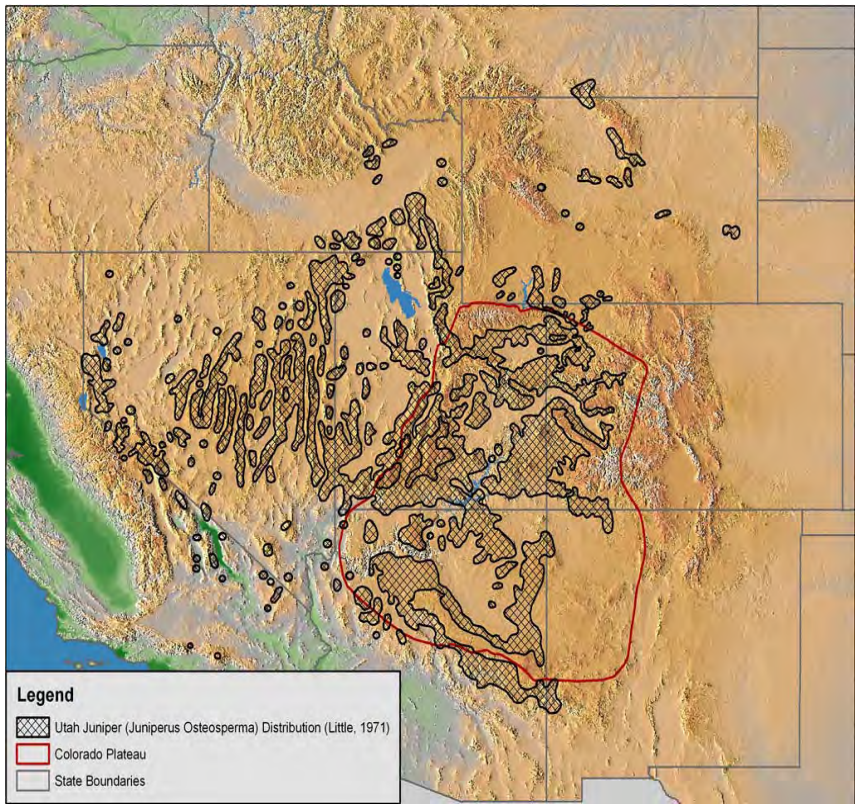


Two needle (Colorado) Pinyon

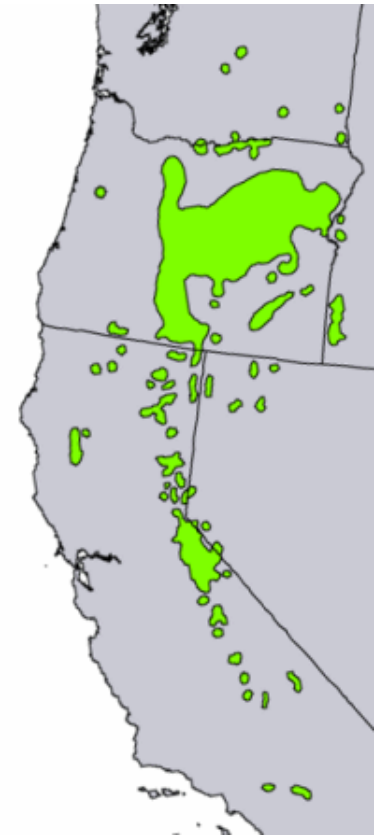


Juniper Distribution

Utah Juniper



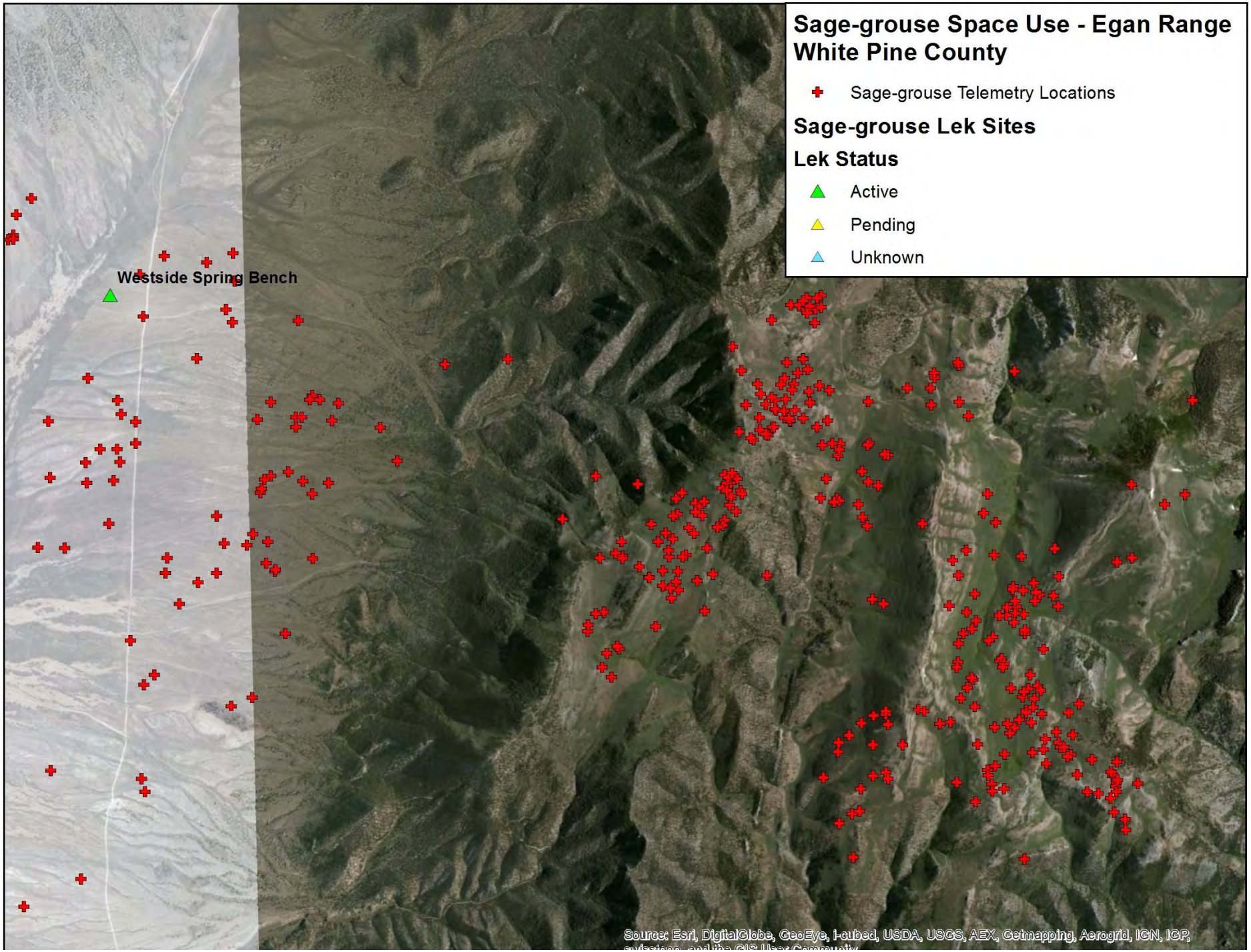
Western Juniper

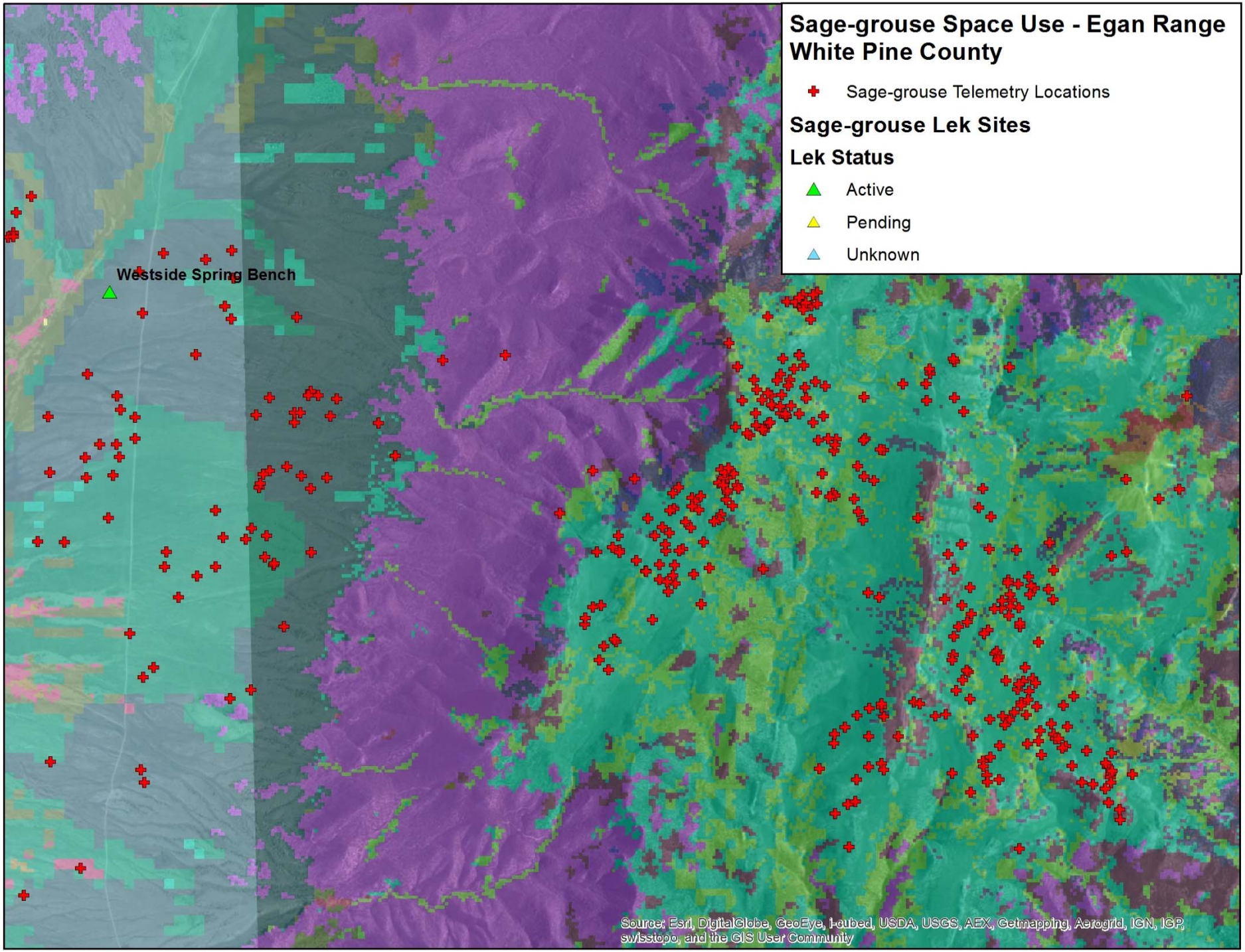


Upper Underdown Canyon, Shoshone Mountains, Nevada, June 1973

34 years of infilling and expansion in a central Nevada mountain range – photos by Robin Tausch, USDA-FS Rocky Mountain Research Station

Upper Underdown Canyon, Shoshone Mountains, Nevada, June 2007


Sage-grouse Space Use - Egan Range
White Pine County
Sage-grouse Telemetry Locations
Sage-grouse Lek Sites
Lek Status
Active
Pending
Unknown
Westside Spring Bench
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP,


Sage-grouse Space Use - Egan Range
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Lek Status
Active
Pending
Unknown
Westside Spring Bench
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


4/17/2014 2 am
Image Landsat
© 2015 Google
1999
Imagery Date: 10/5/2013 39°41'21.87" N 114°58'54.48" W elev 7085 ft eye alt 152

Available Literature

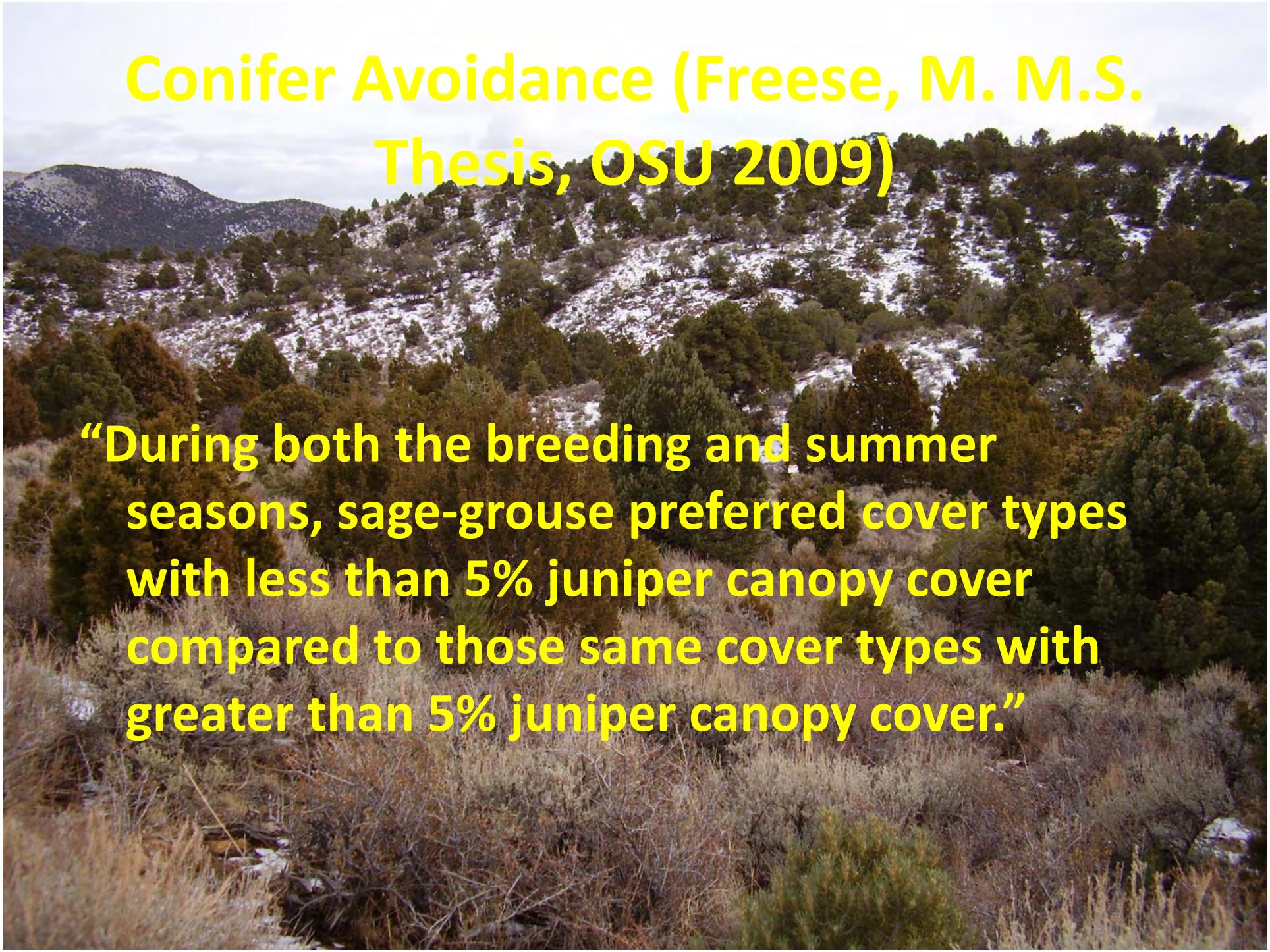
- ***Doherty et al. 2008***. Greater sage-grouse winter habitat selection and energy development. J. Wild. Manage.
- ***Freese, M. 2009***. Linking greater sage-grouse habitat use and suitability across spatiotemporal scales in central Oregon. MS thesis. OSU.
- ***Casazza et al. 2011***. Linking habitat selection and brood rearing in Greater sage-grouse. Ecology, Conservation and Management of Grouse. S.A.B.
- ***Baruch-Mordo et al. 2013***. Saving sage-grouse from the trees: A proactive solution to reducing a key threat to a candidate species. Biological Conservation
- ***Knick et al. 2013***. Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range. Ecology and Evolution.

Conifer Avoidance (Doherty et al. 2008)

"In winter, sage-grouse selected large expanses of sagebrush with gentle topography and avoided conifer*, riparian areas, and energy development"

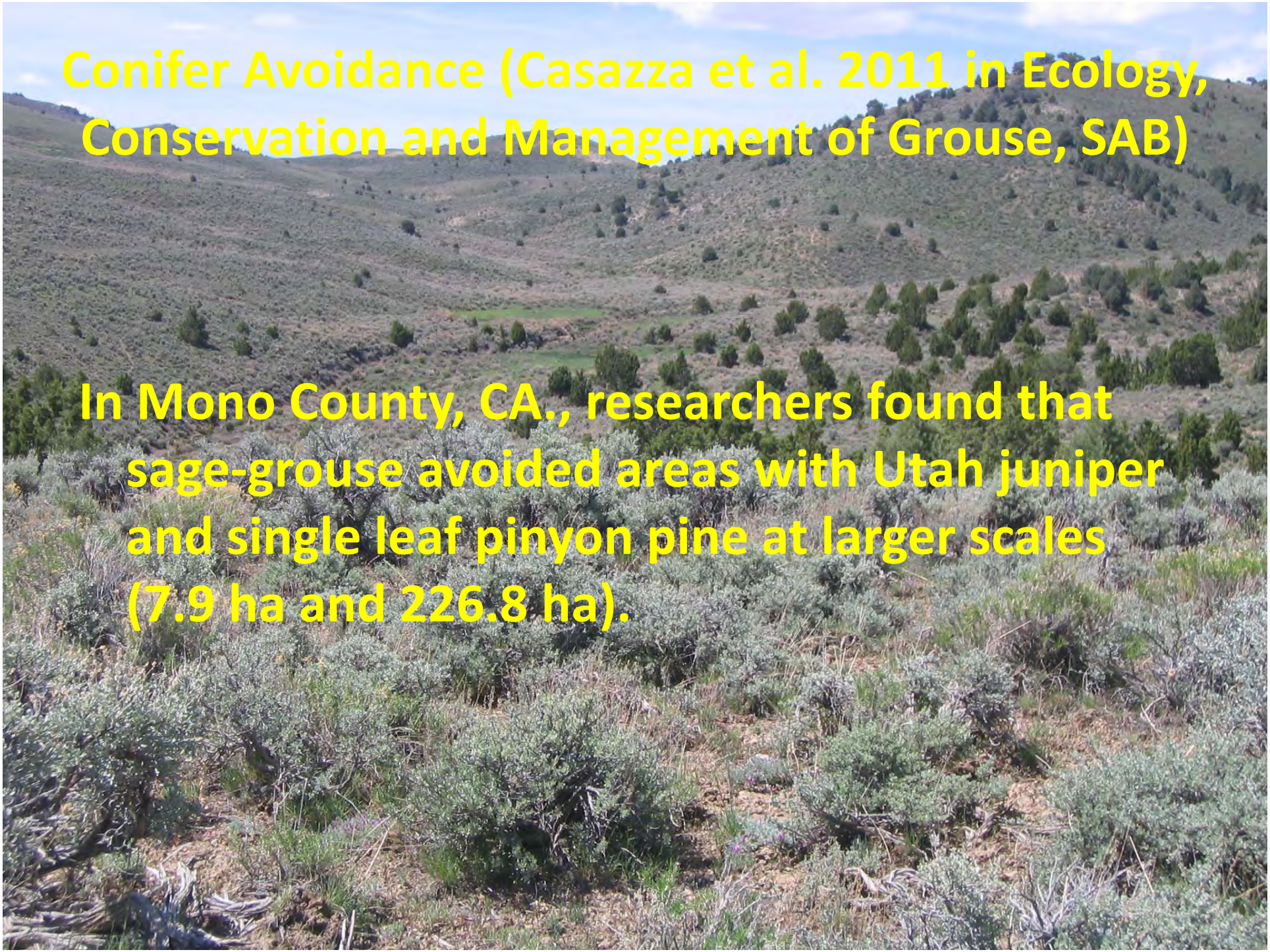
– Sage-grouse avoided conifer at the 0.65 km scale (805m x 805m) during winter.

***Conifer in the study area included Rocky Mountain Juniper and Ponderosa Pine**



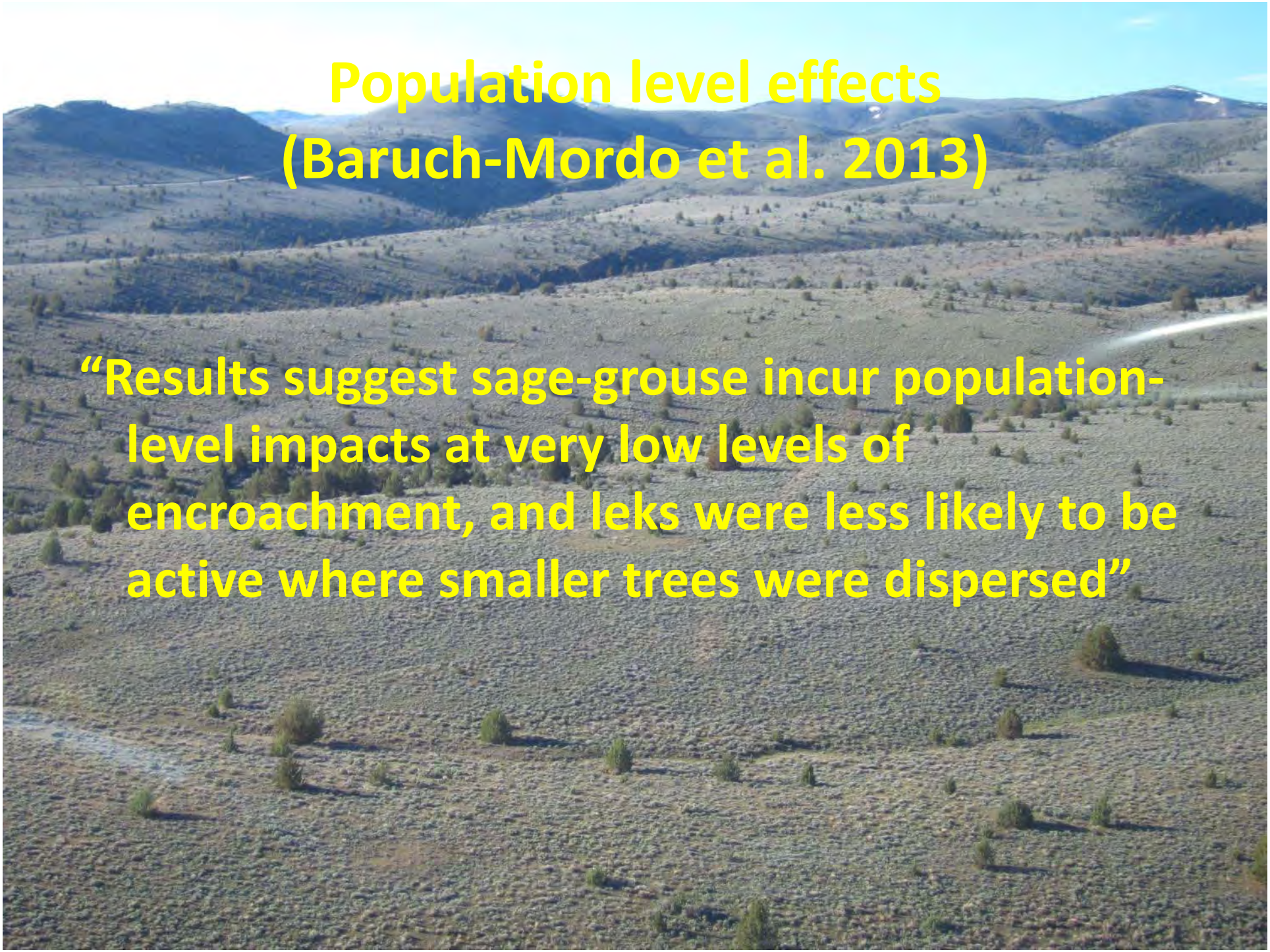
Conifer Avoidance (Freese, M. M.S. Thesis, OSU 2009)

"During both the breeding and summer seasons, sage-grouse preferred cover types with less than 5% juniper canopy cover compared to those same cover types with greater than 5% juniper canopy cover."

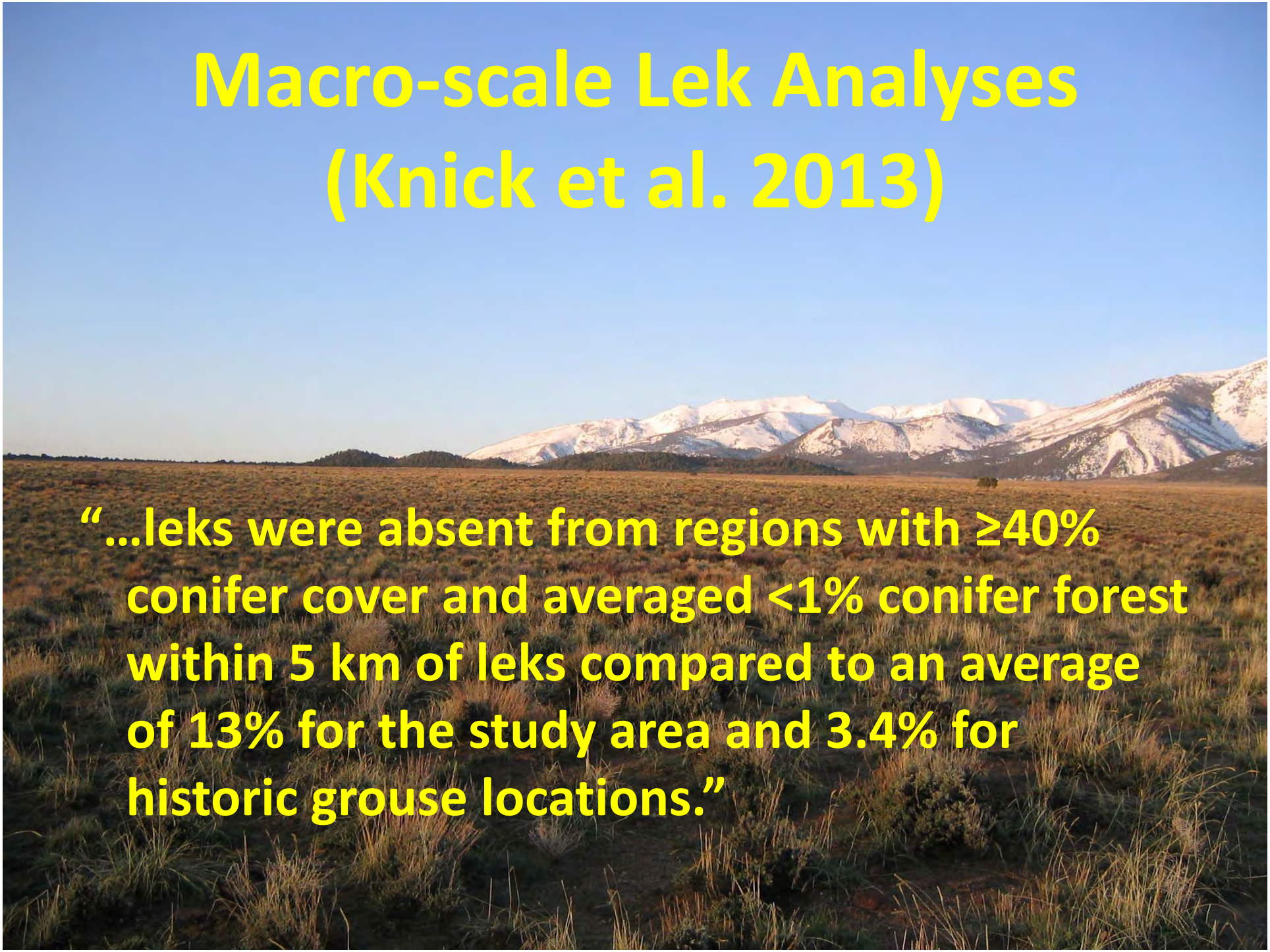


Conifer Avoidance (Casazza et al. 2011 in Ecology, Conservation and Management of Grouse, SAB)

In Mono County, CA., researchers found that sage-grouse avoided areas with Utah juniper and single leaf pinyon pine at larger scales (7.9 ha and 226.8 ha).

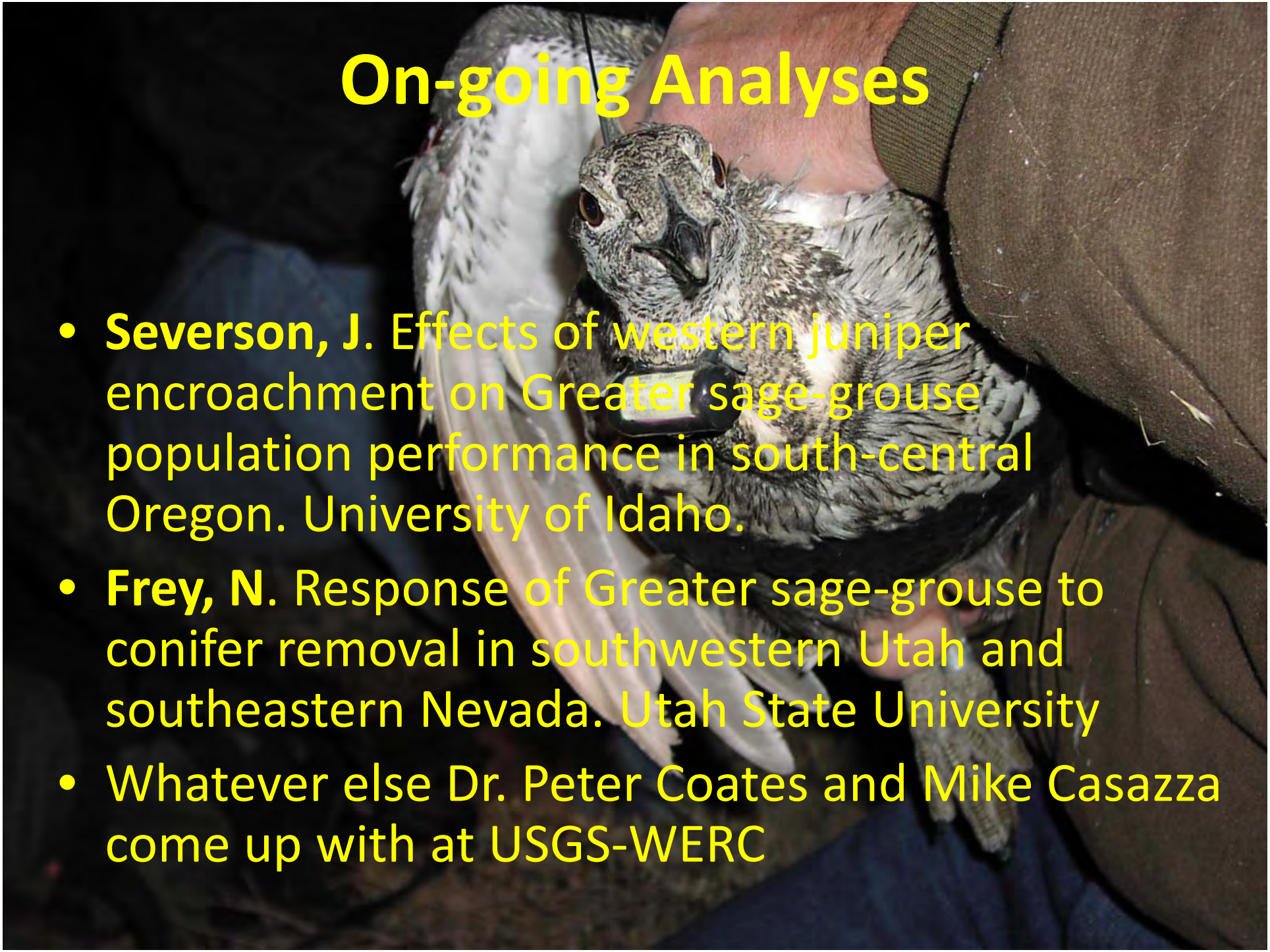

Population level effects
(Baruch-Mordo et al. 2013)
"Results suggest sage-grouse incur population-level impacts at very low levels of encroachment, and leks were less likely to be active where smaller trees were dispersed"

Macro-scale Lek Analyses (Knick et al. 2013)



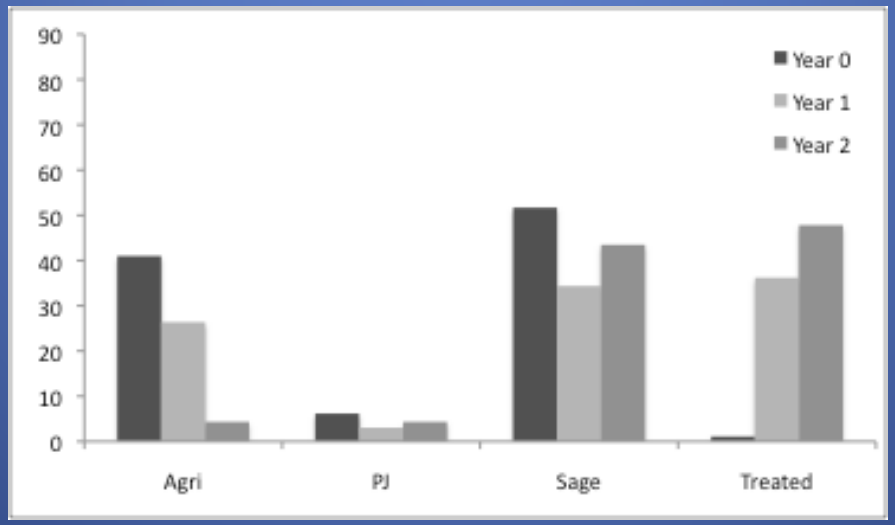
"…leks were absent from regions with ≥40% conifer cover and averaged <1% conifer forest within 5 km of leks compared to an average of 13% for the study area and 3.4% for historic grouse locations."

On-going Analyses



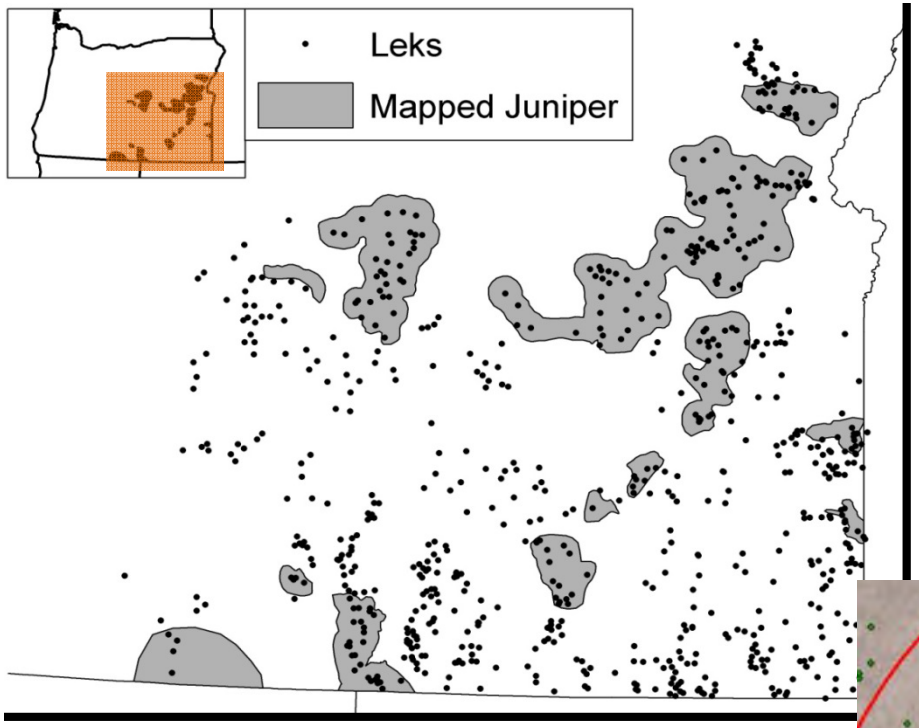
- **Severson, J**. Effects of western juniper encroachment on Greater sage-grouse population performance in south-central Oregon. University of Idaho.
- **Frey, N**. Response of Greater sage-grouse to conifer removal in southwestern Utah and southeastern Nevada. Utah State University
- Whatever else Dr. Peter Coates and Mike Casazza come up with at USGS-WERC

Response of Sage-grouse Post Treatment

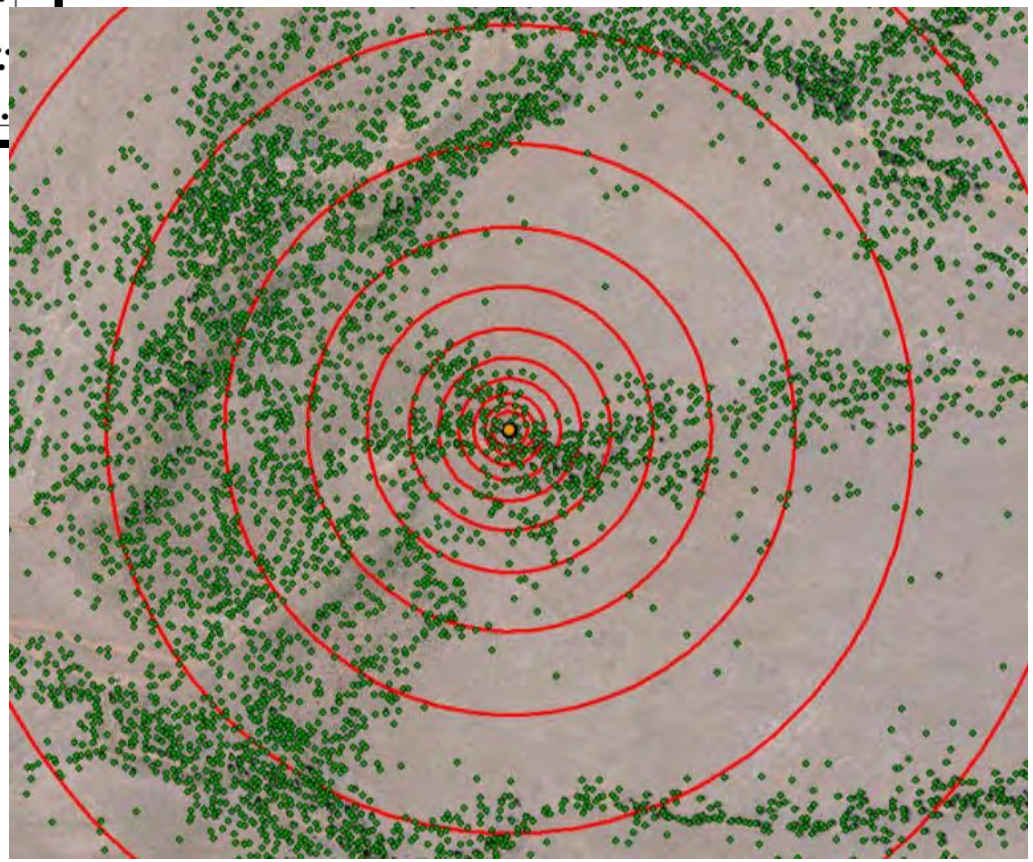


Proportion of total grouse locations found in each treatment type during the dispersal and fall season, Sink Valley, Utah, 2005 – 2007 (Frey, Utah State University Progress Report).

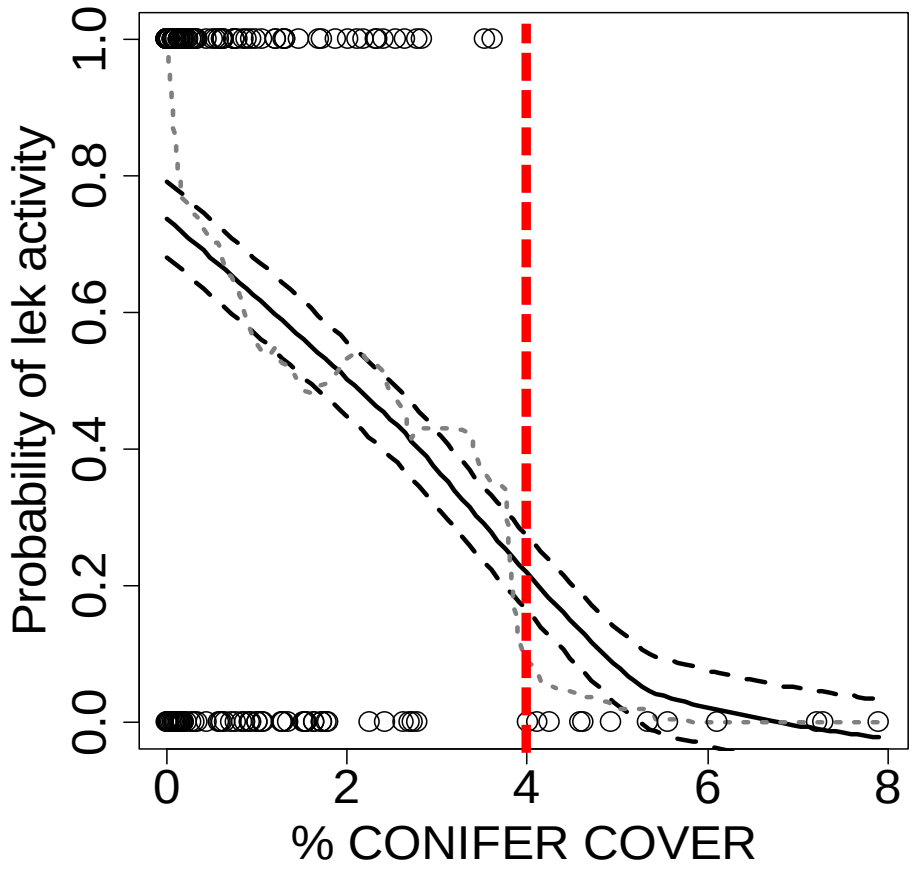

Effects to Lek
Activity…



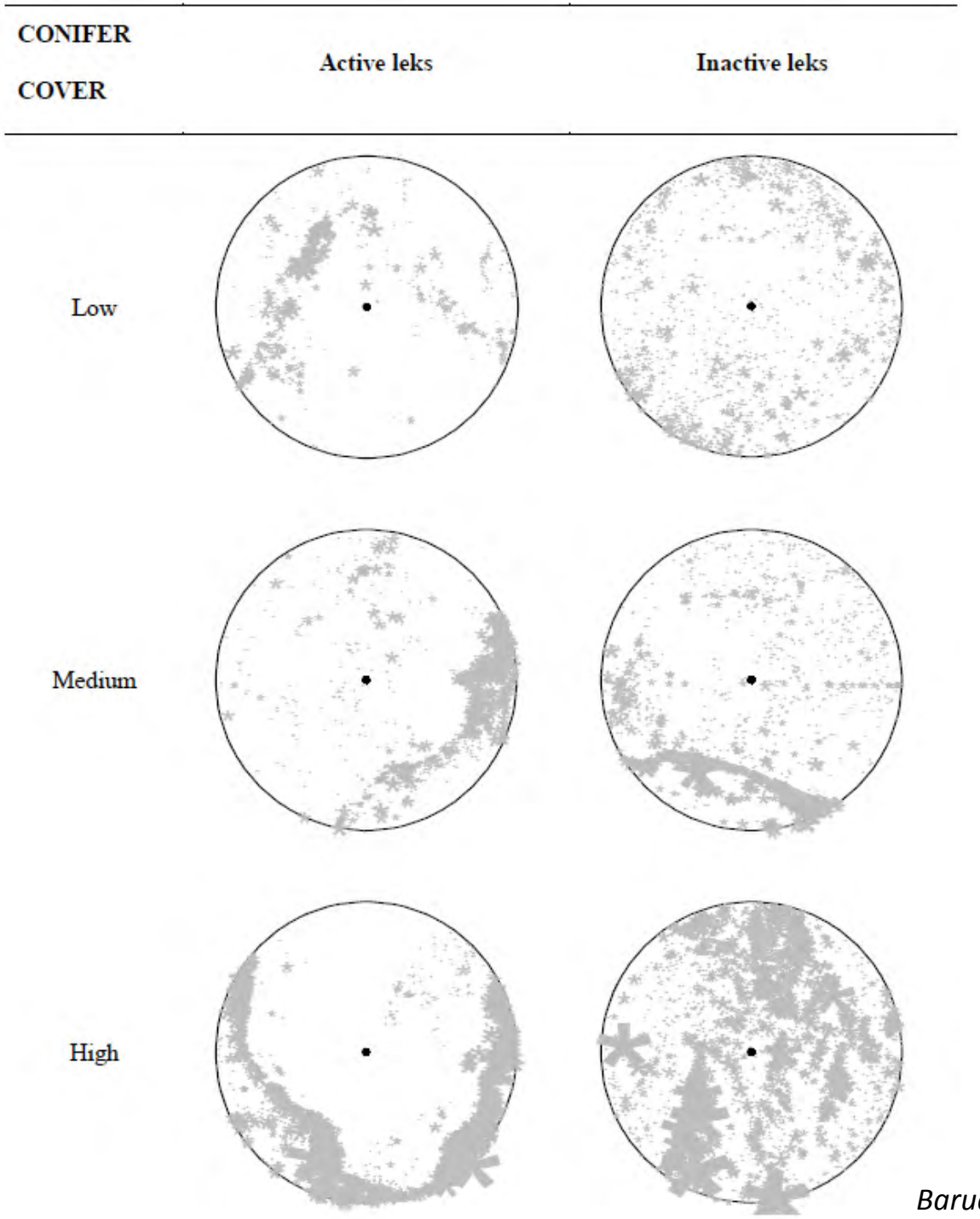
Baruch-Mordo et al. 2013. Biological Conservation



Lek activity impacts with very low levels of encroachment



Baruch-Mordo et al. 2013. Biological Conservation

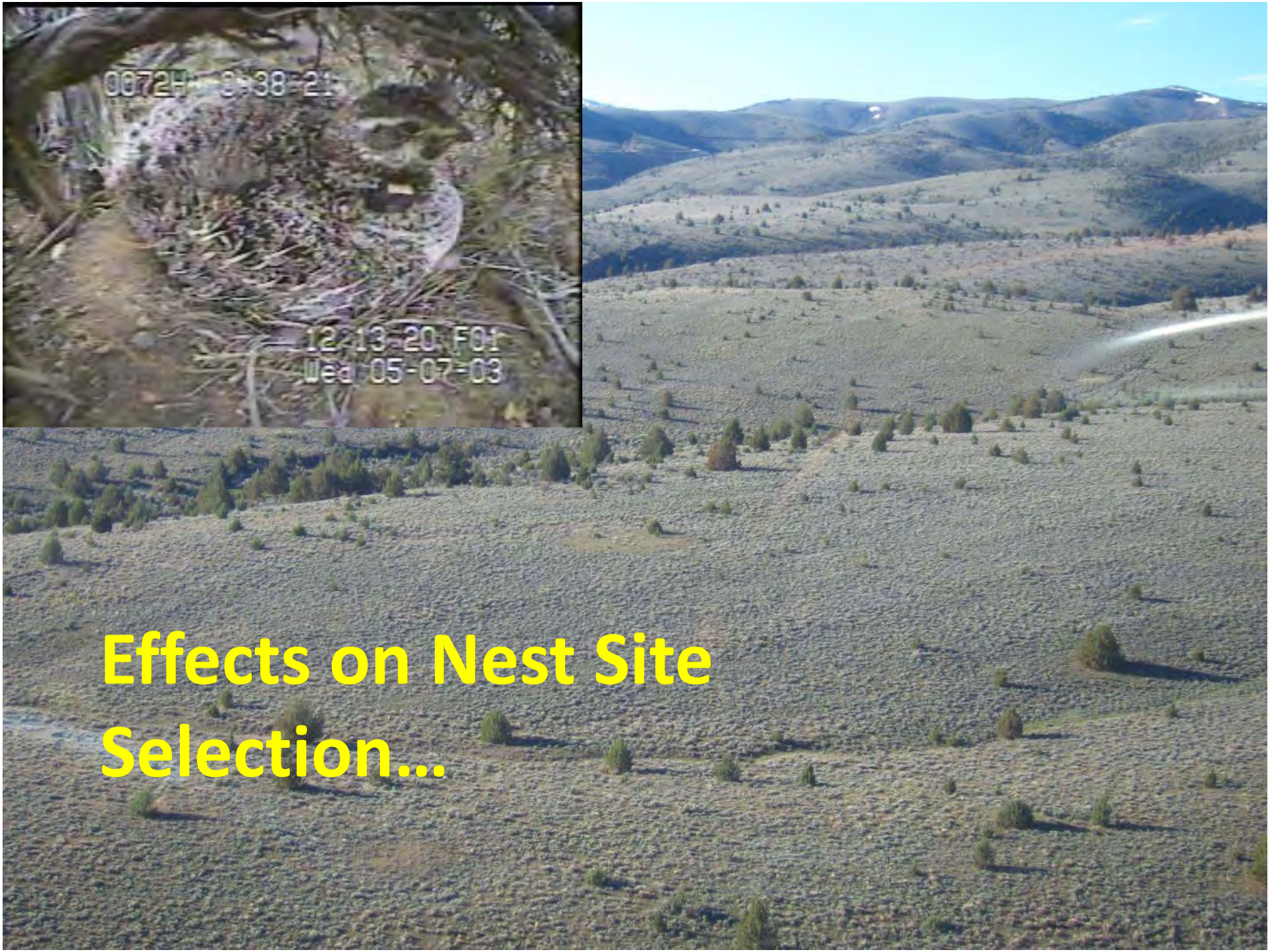


No leks active with >4% canopy cover, but for those persisting with trees….

Clumped = ☺

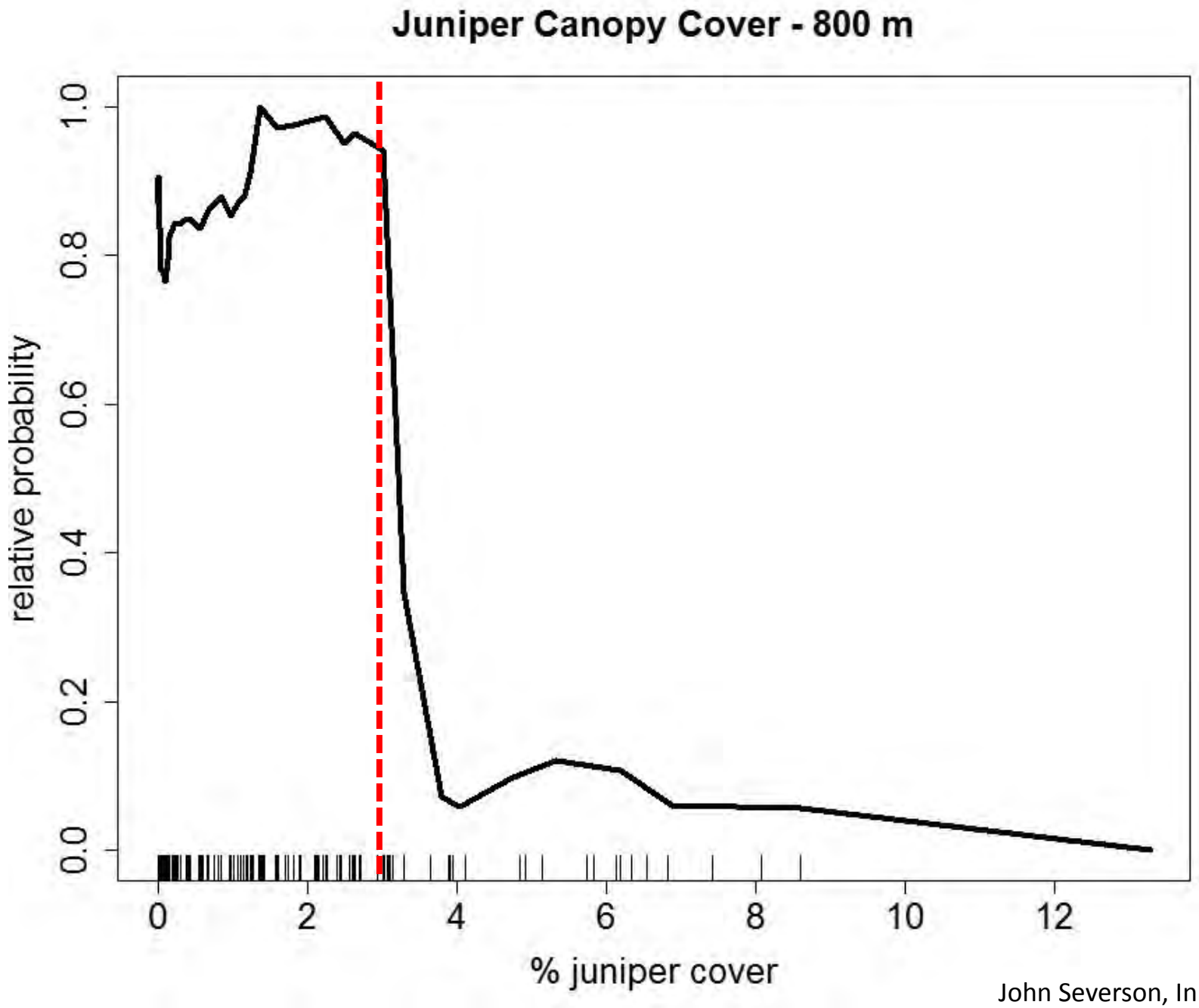
Dispersed = ☹

Baruch-Mordo et al. 2013. Biological Conservation



Effects on Nest Site Selection…

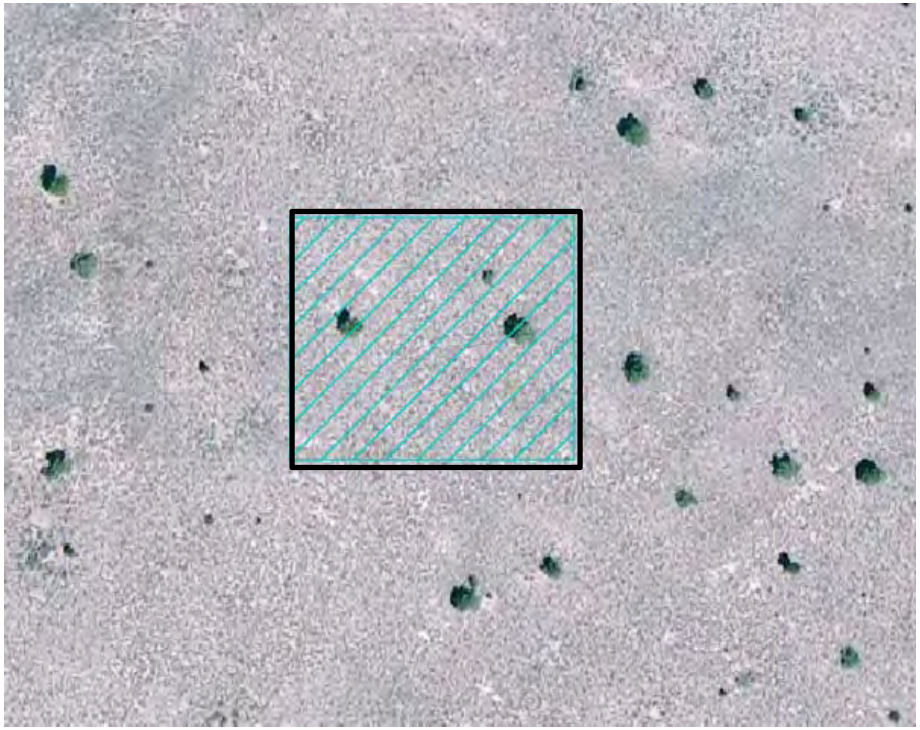
Nest-Site Selection Study



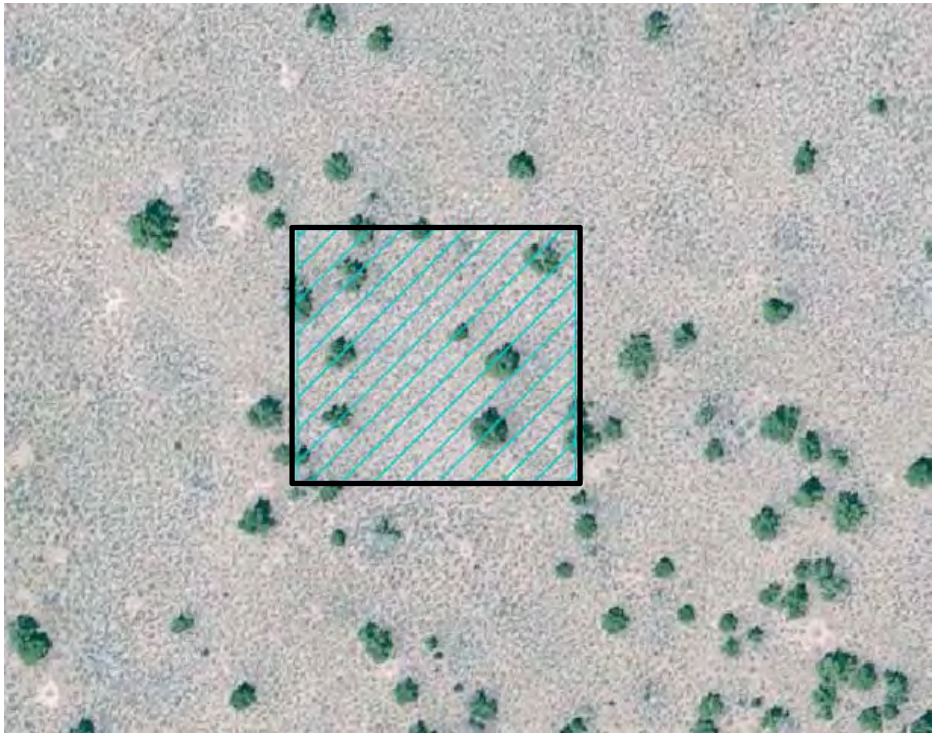
John Severson, In Progress

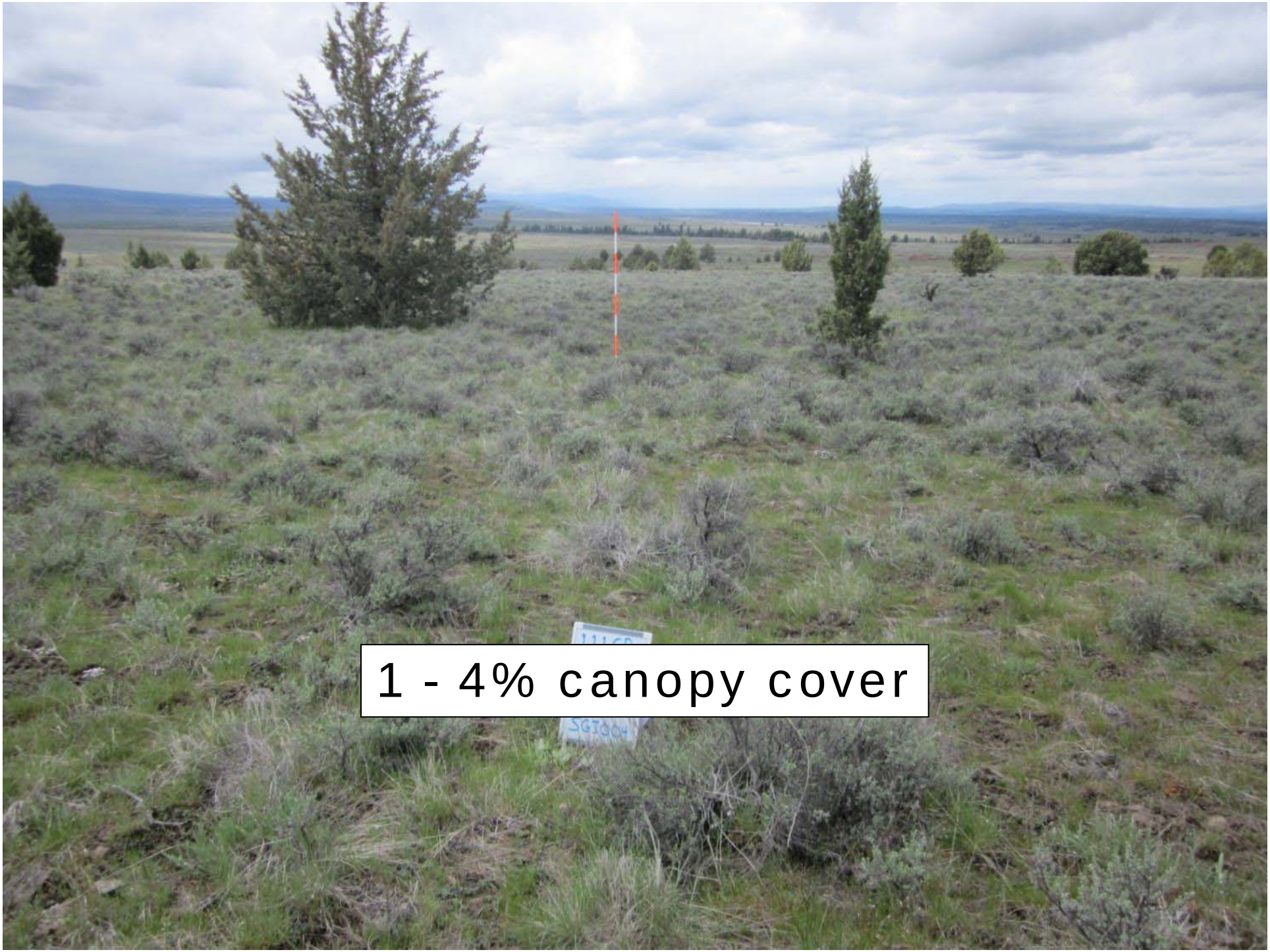
Estimating Tree Cover

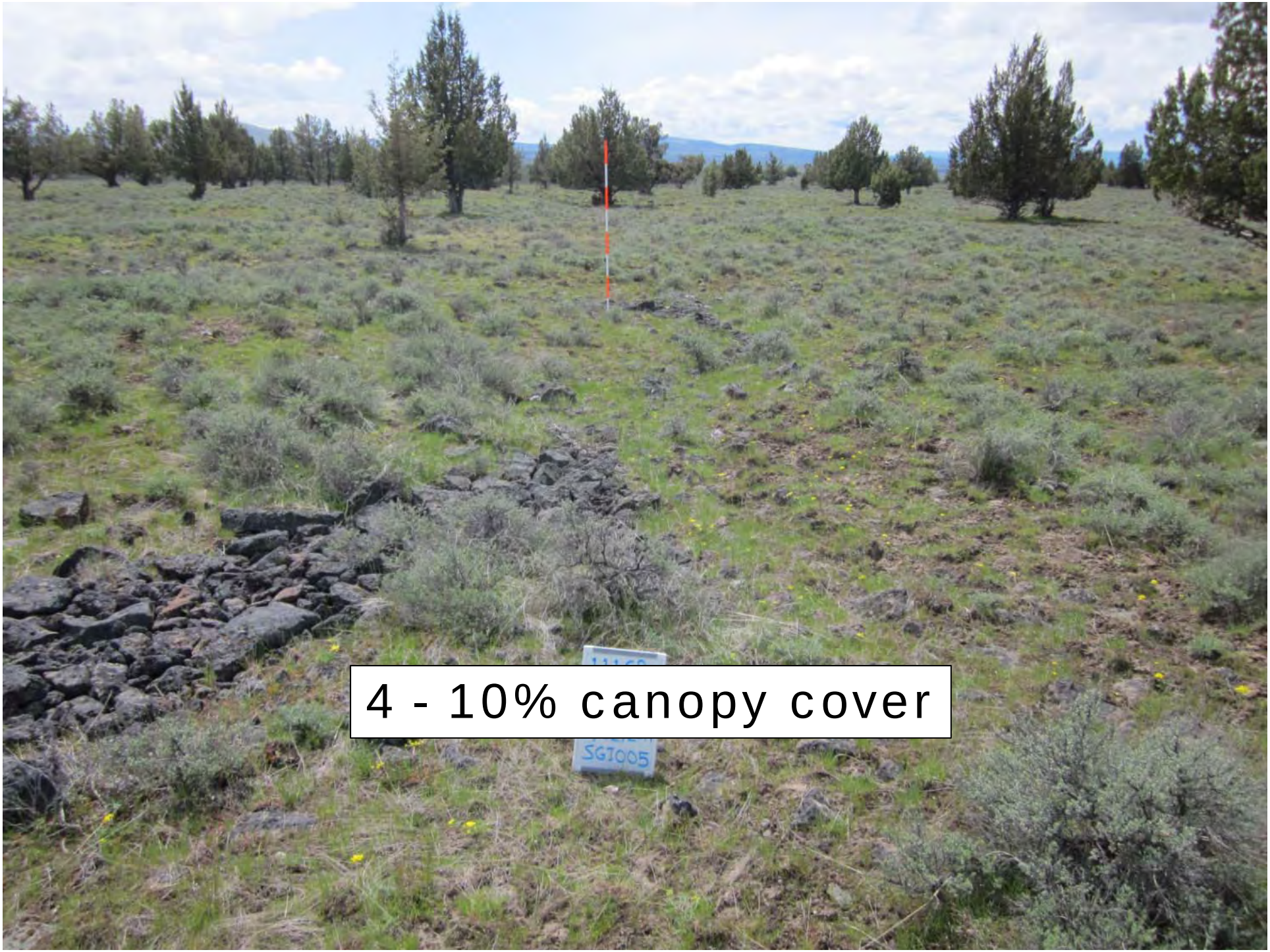
1% per acre

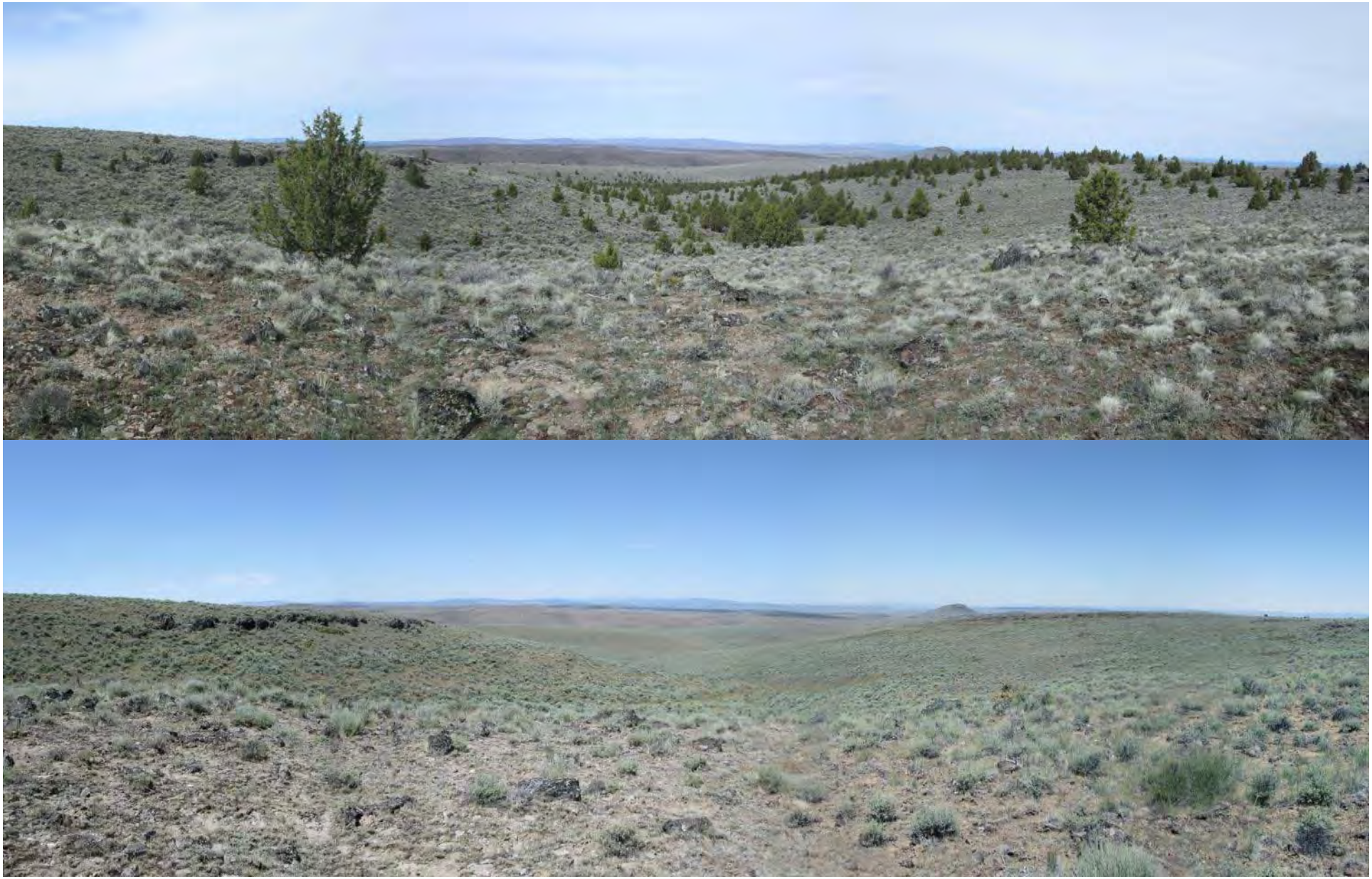


4% per acre




1 - 4% canopy cover


4 - 10% canopy cover
SGT005



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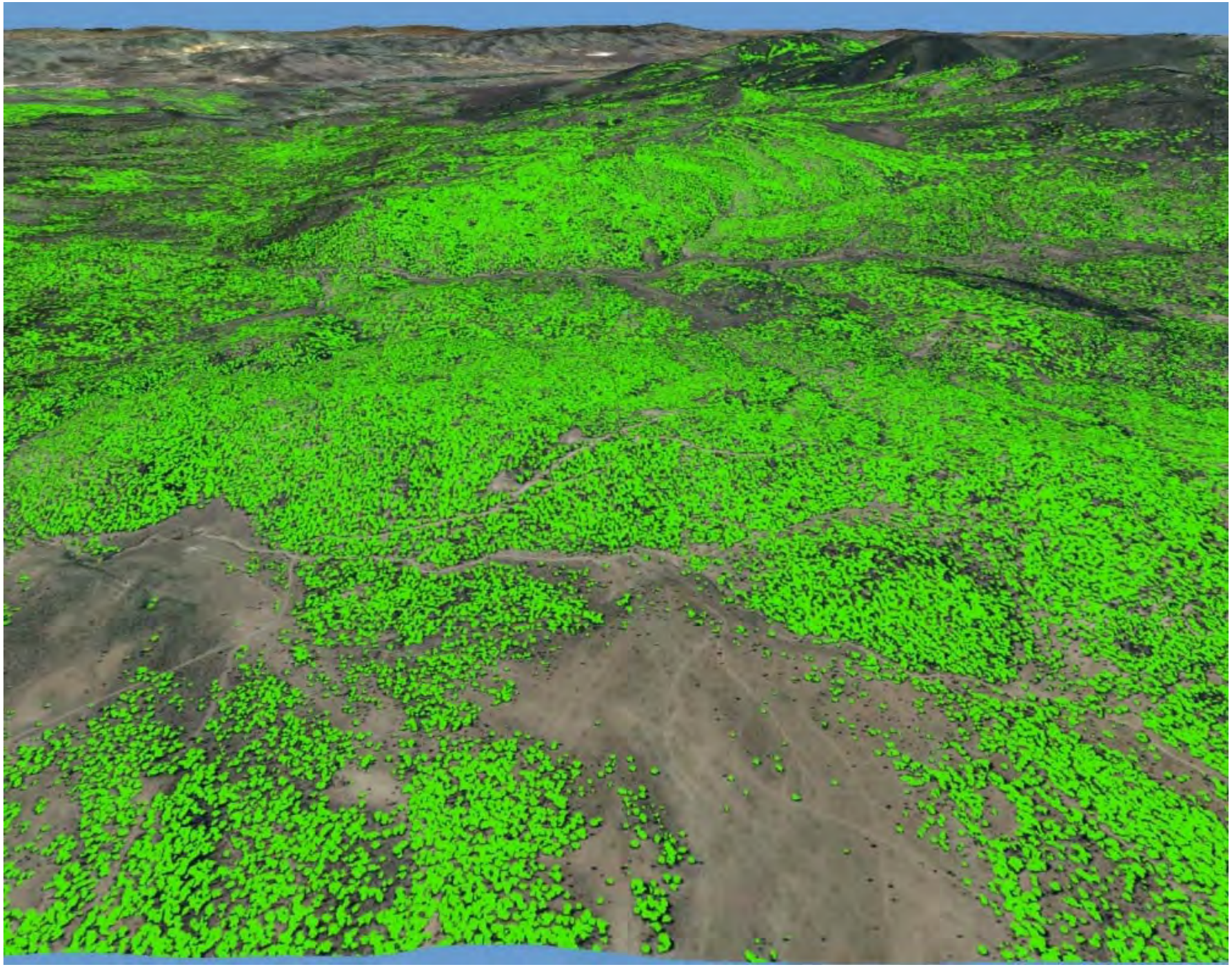
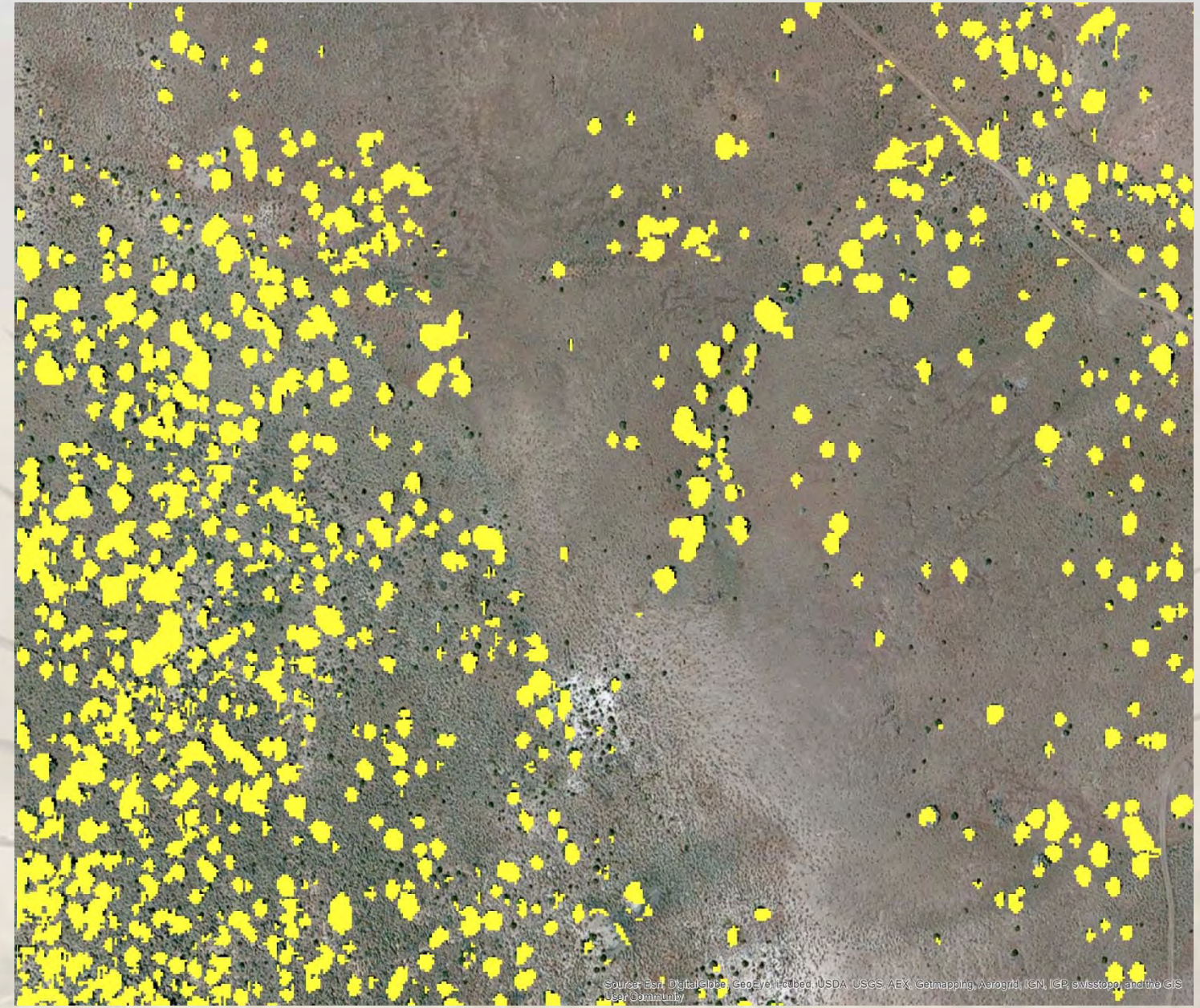
The Effects of Conifers on Sage-Grouse Site Selection, Survival and Movement

Peter S. Coates, USGS



Landsat-derived classification (30-m) GREEN; Feature Analyst (1-m) Yellow



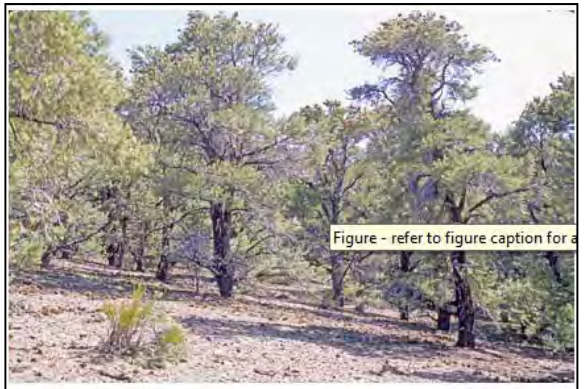
Pinyon and Juniper Phases of Encroachment to Cover Classes

(a) **Subordinate – Phase I**
A subordinate piñon-juniper site with up-slope woodland expansion into mountain big sagebrush.

0.0001 – 10.0000%

(b) **Co-Dominant – Phase II**
A co-dominate piñon-juniper, Wyoming big sagebrush site with moderately deep soils.

10.0001 – 20.0000%



(c) **Dominant - Phase III**
A dominant piñon-juniper site with Wyoming big sagebrush and moderately deep soils.

20.0001 – 100.0000%

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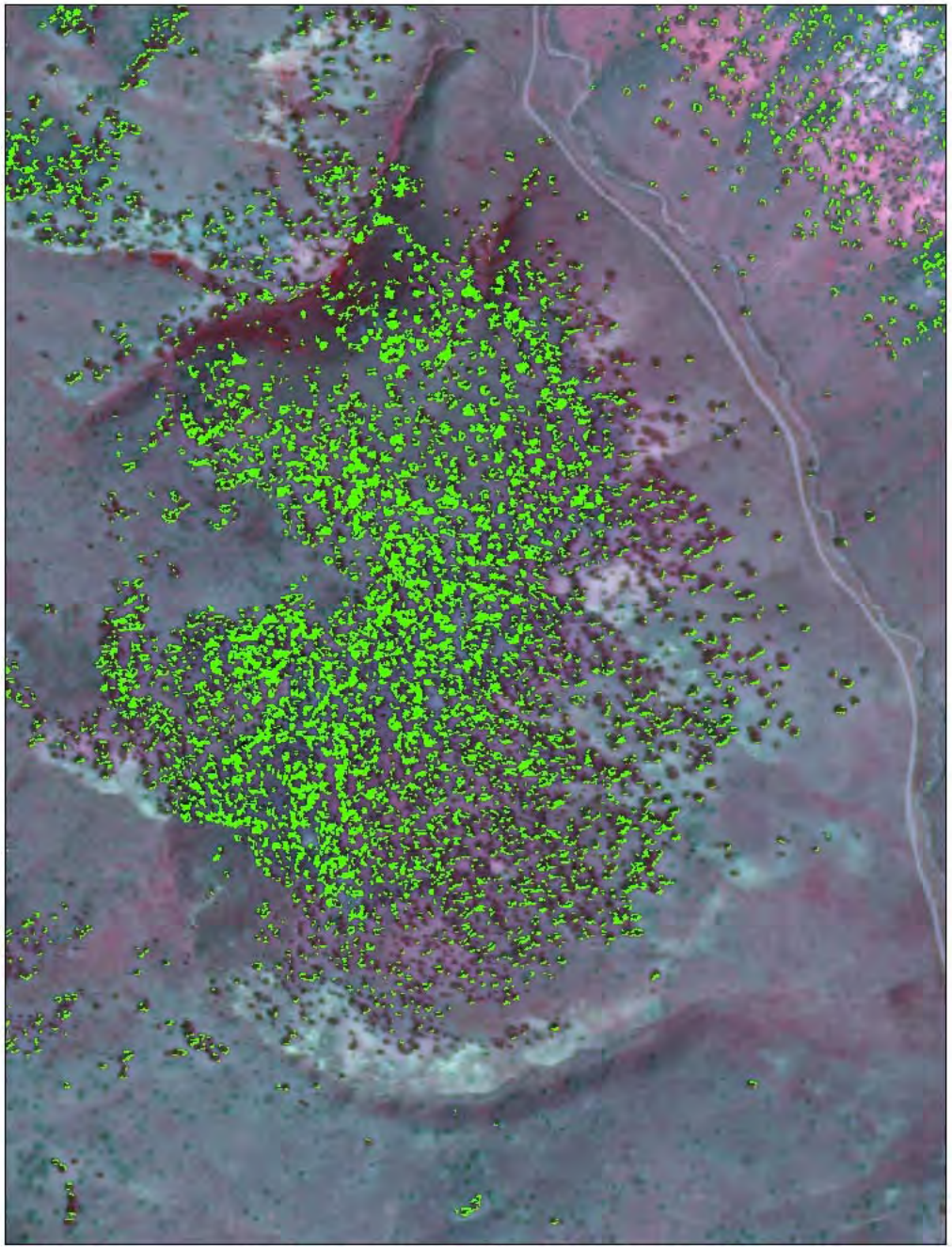

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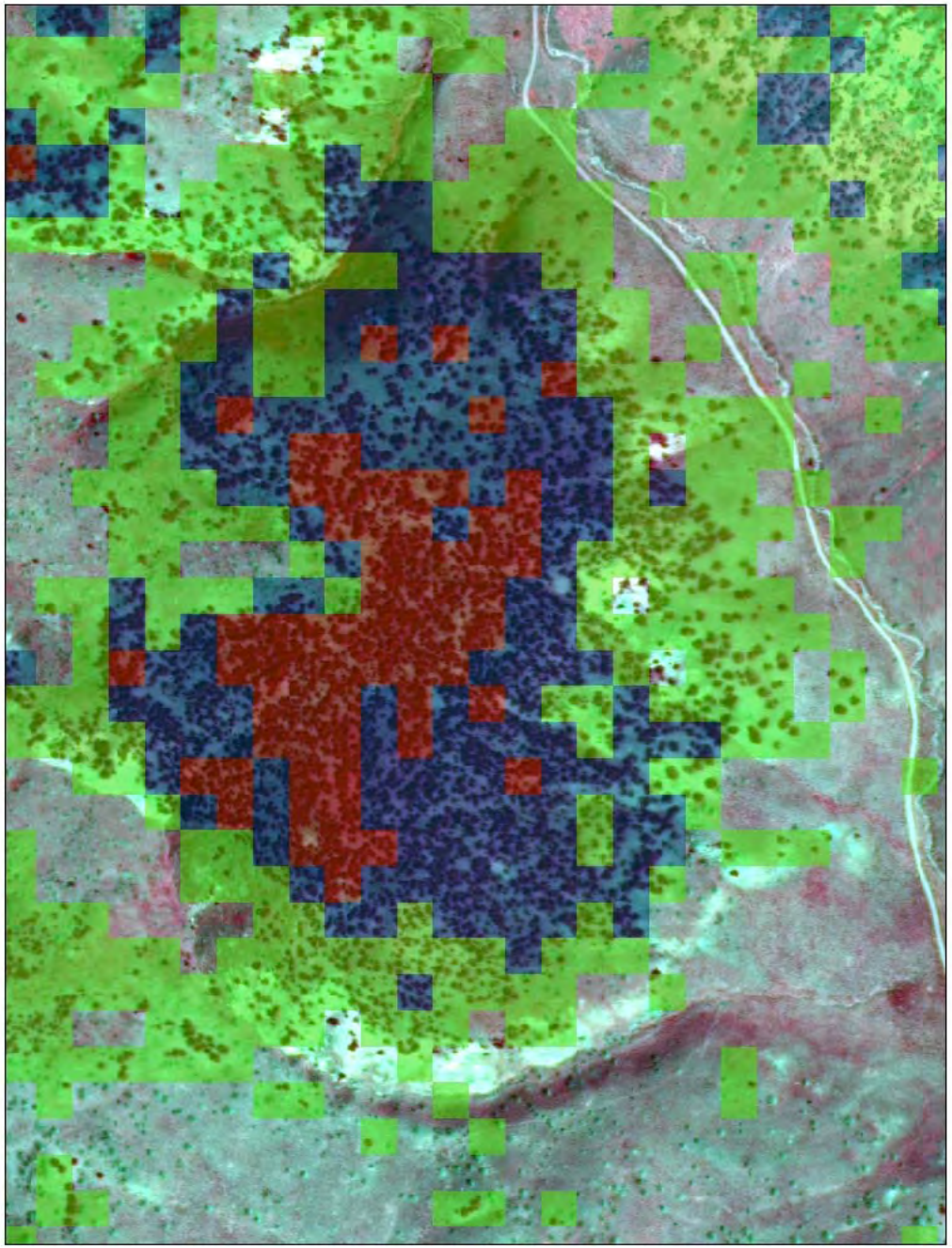
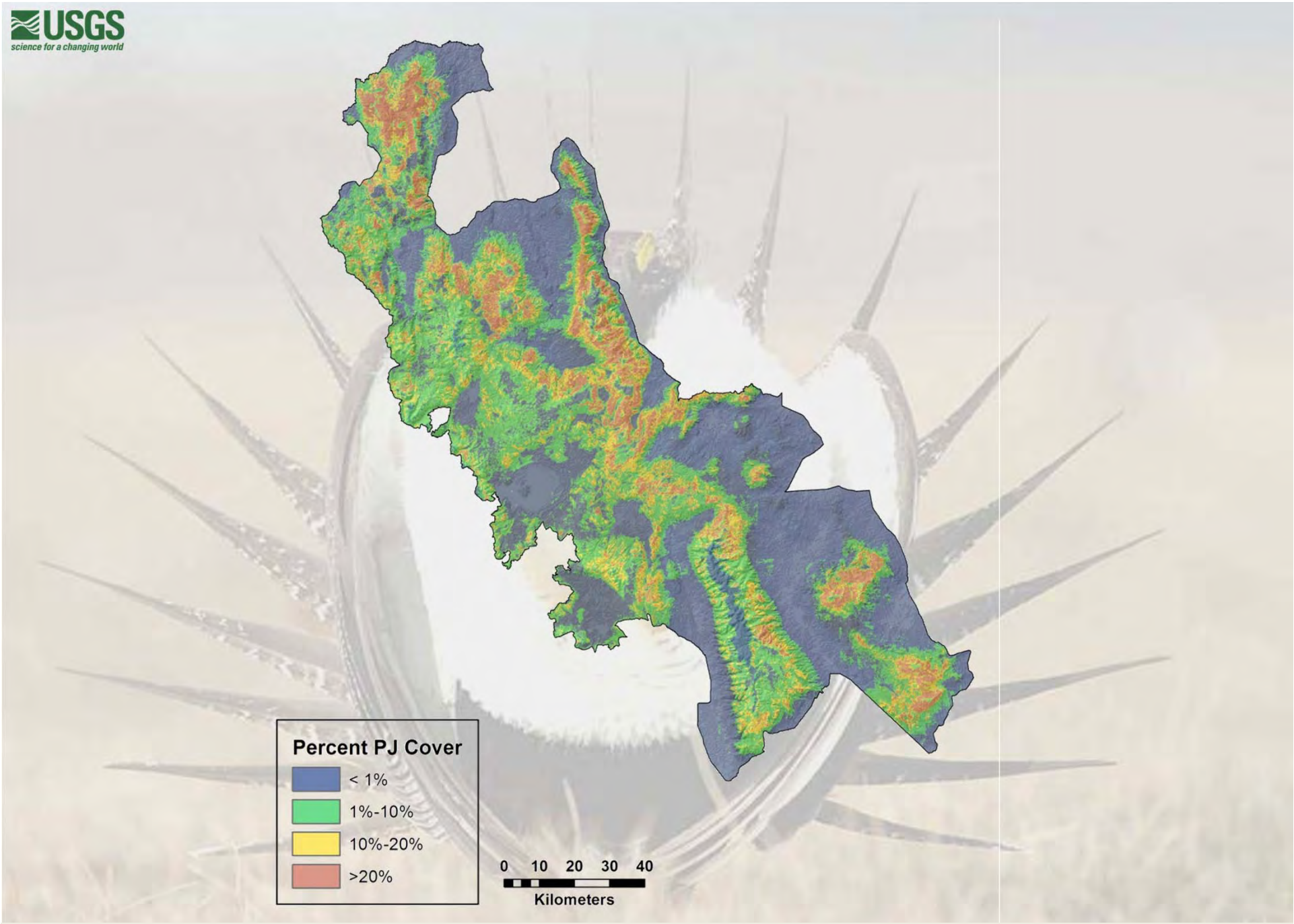
Conifer Cover Classes

Green
Class 1

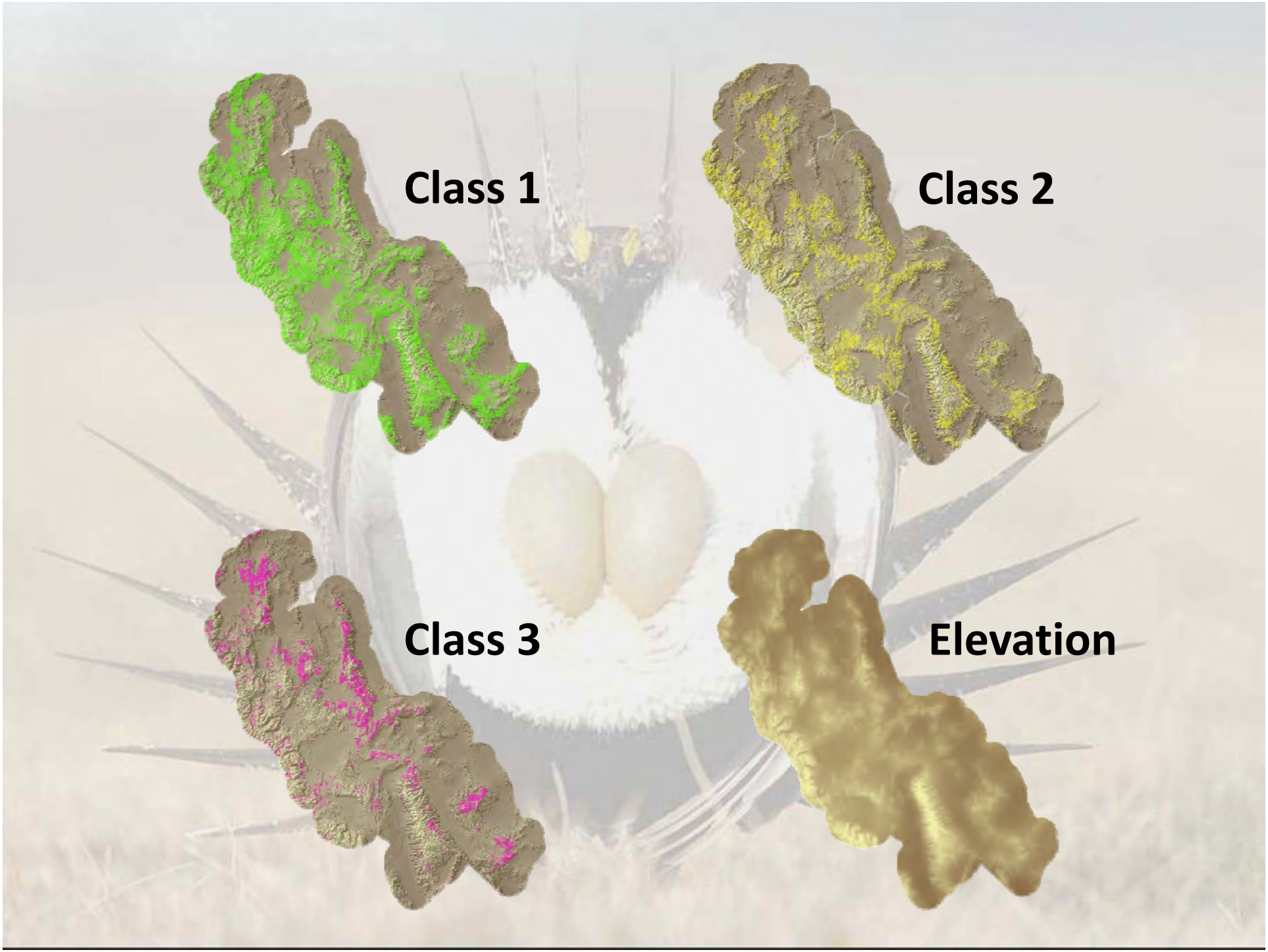
Blue
Class 2

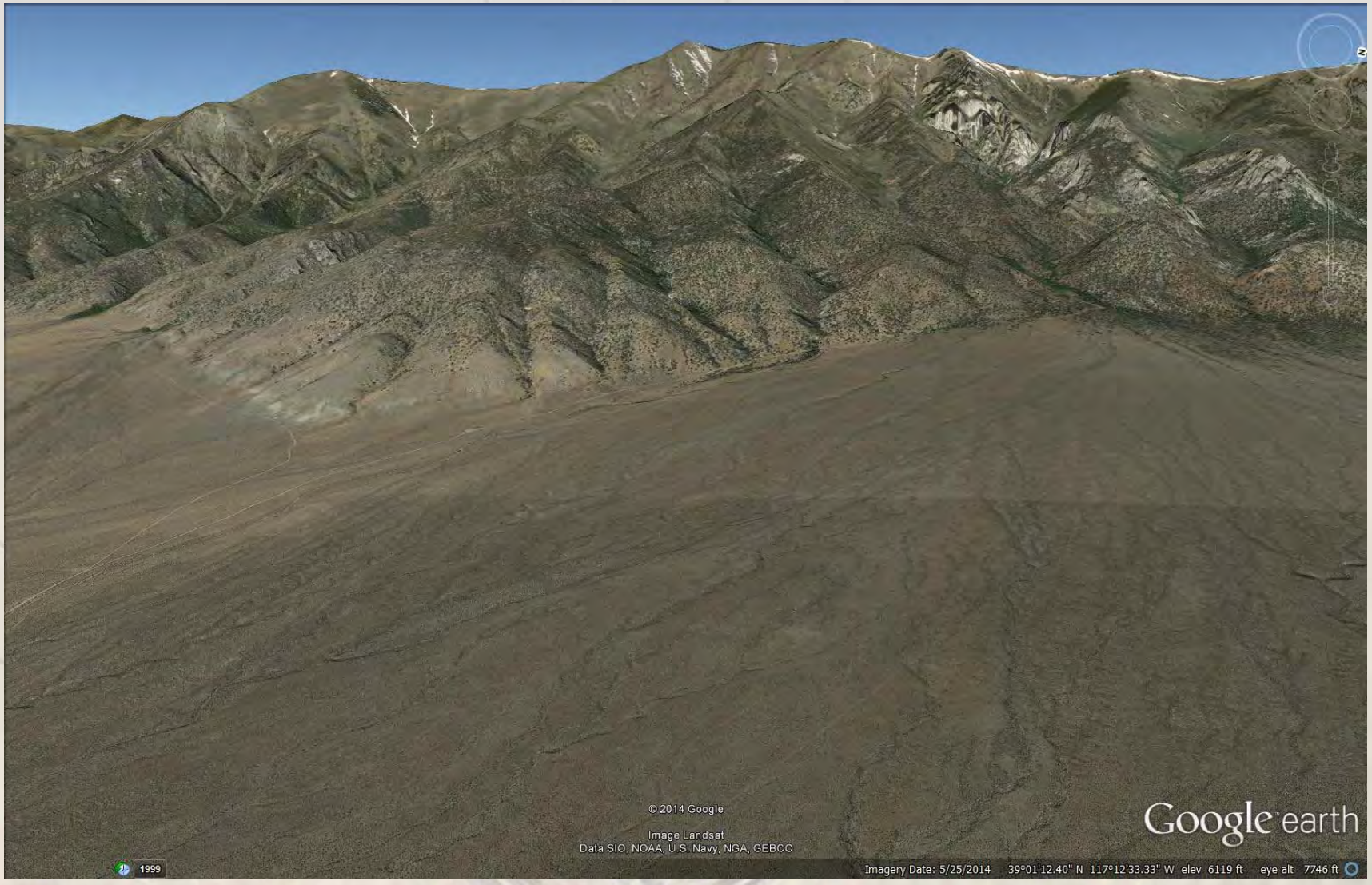
Red
Class 3





Preliminary Information—Subject to Revision. Not for Citation or Distribution


Class 1
Class 2
Class 3
Elevation


© 2014 Google
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth
1999
Imagery Date: 5/25/2014 39°01'12.40" N 117°12'33.33" W elev 6119 ft eye alt 7746 ft

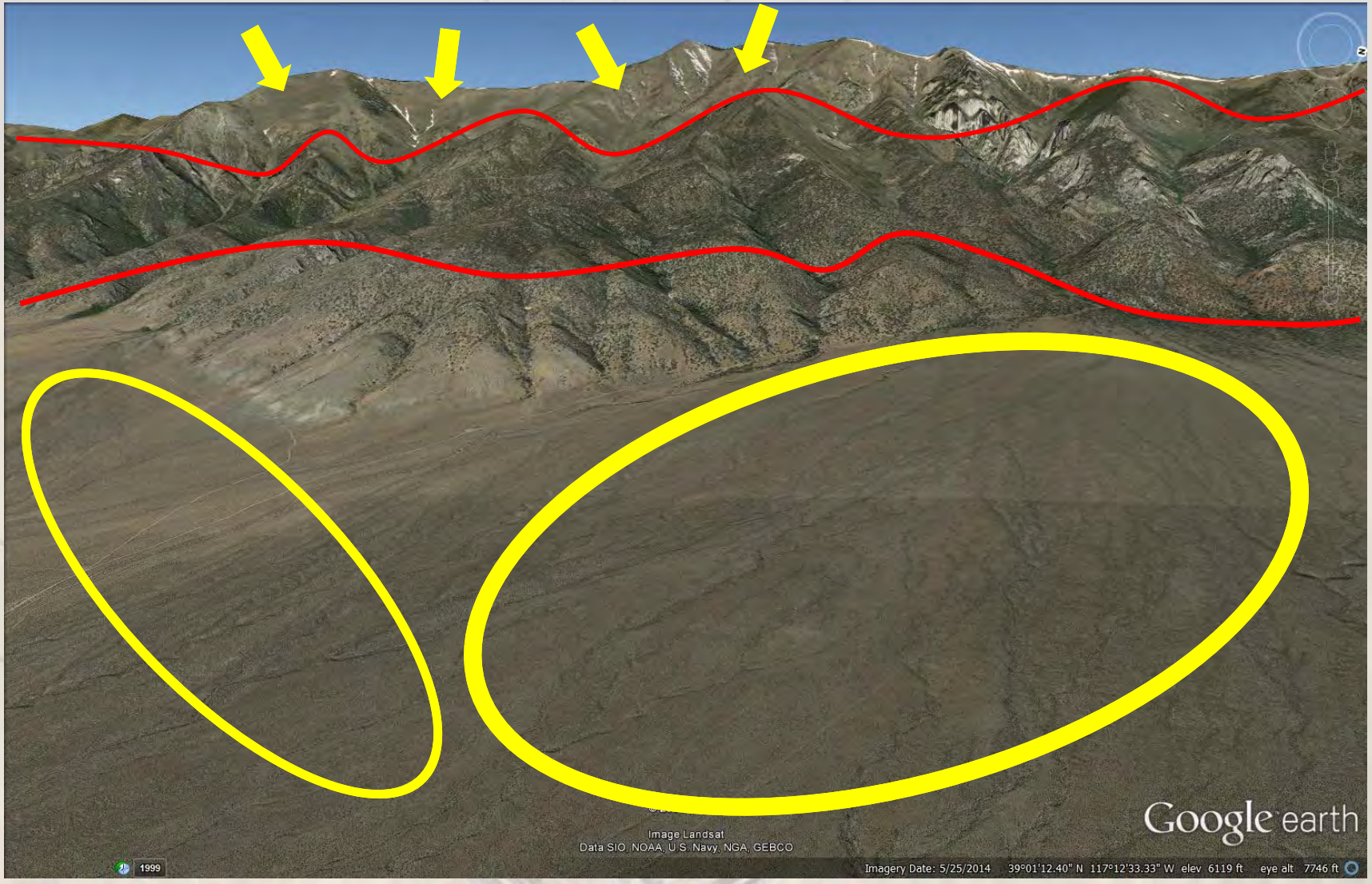
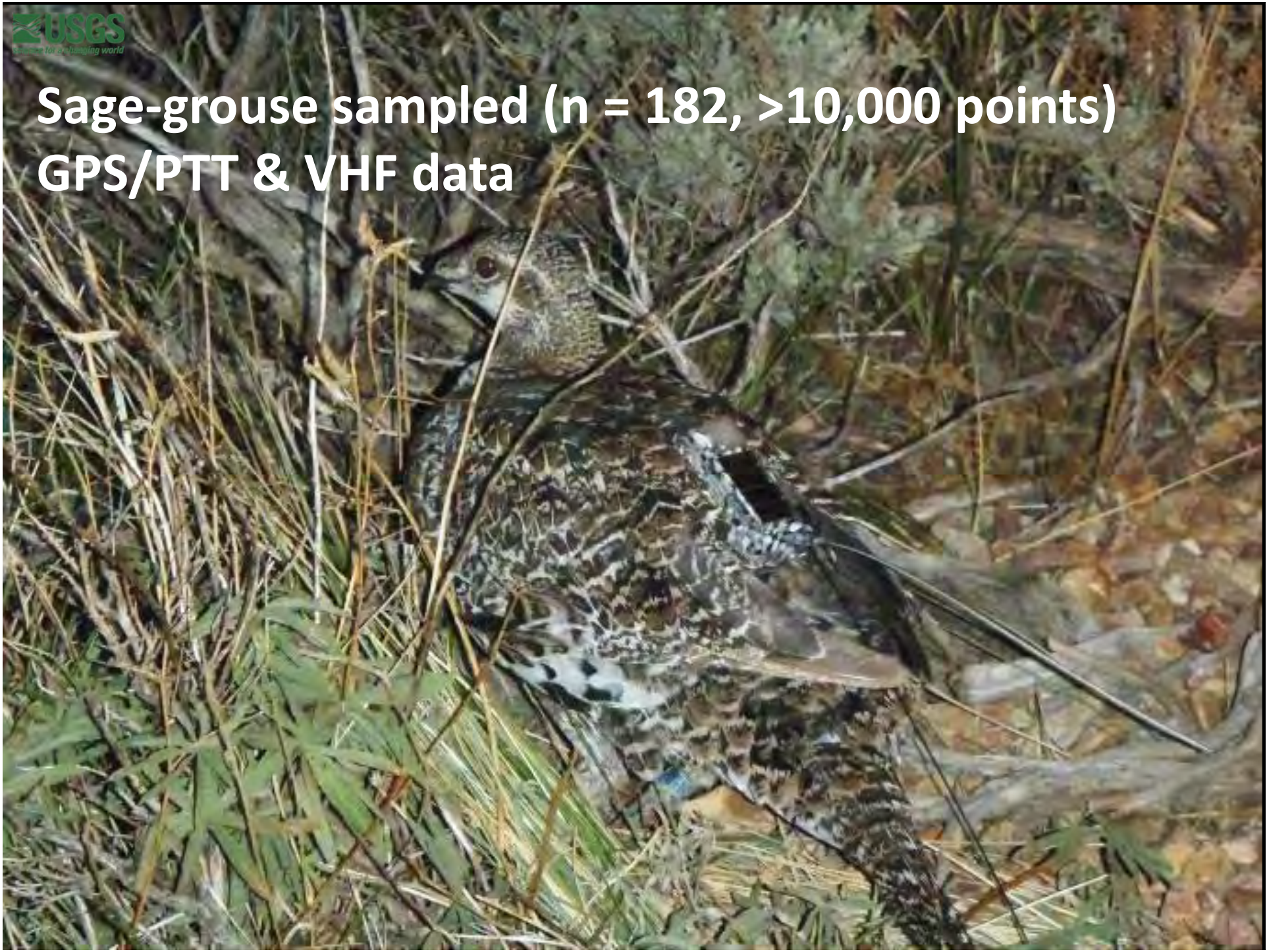
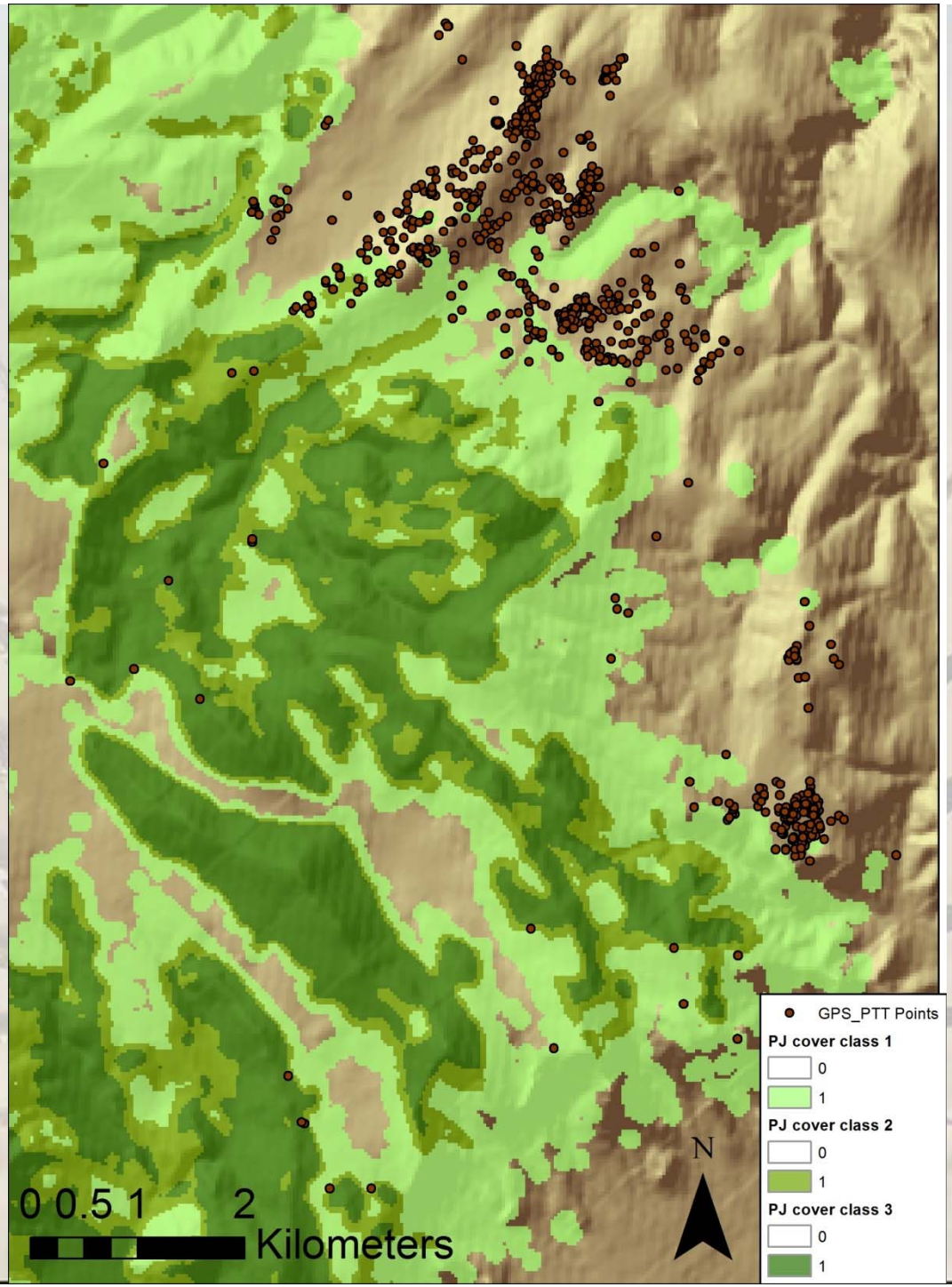


Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth
1999
Imagery Date: 5/25/2014 39°01'12.40" N 117°12'33.33" W elev 6119 ft eye alt 7746 ft


Sage-grouse sampled (n = 182, >10,000 points)
GPS/PTT & VHF data


GPS_PTT Points
PJ cover class 1
0
1
PJ cover class 2
0
1
PJ cover class 3
0
1
N
0 0.5 1 2
Kilometers

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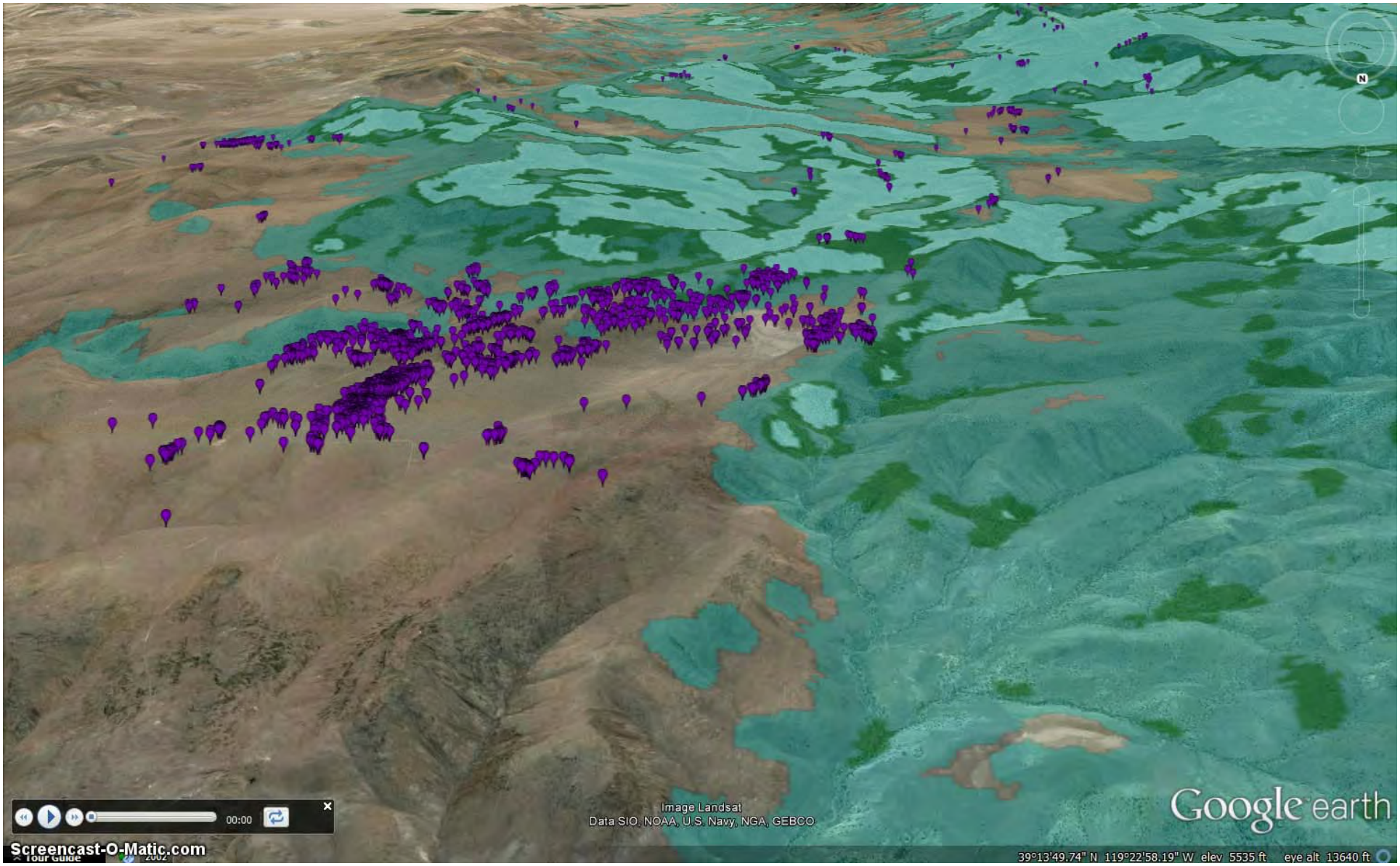
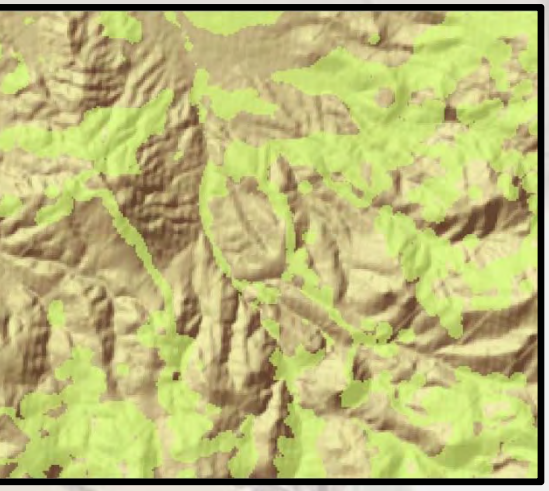
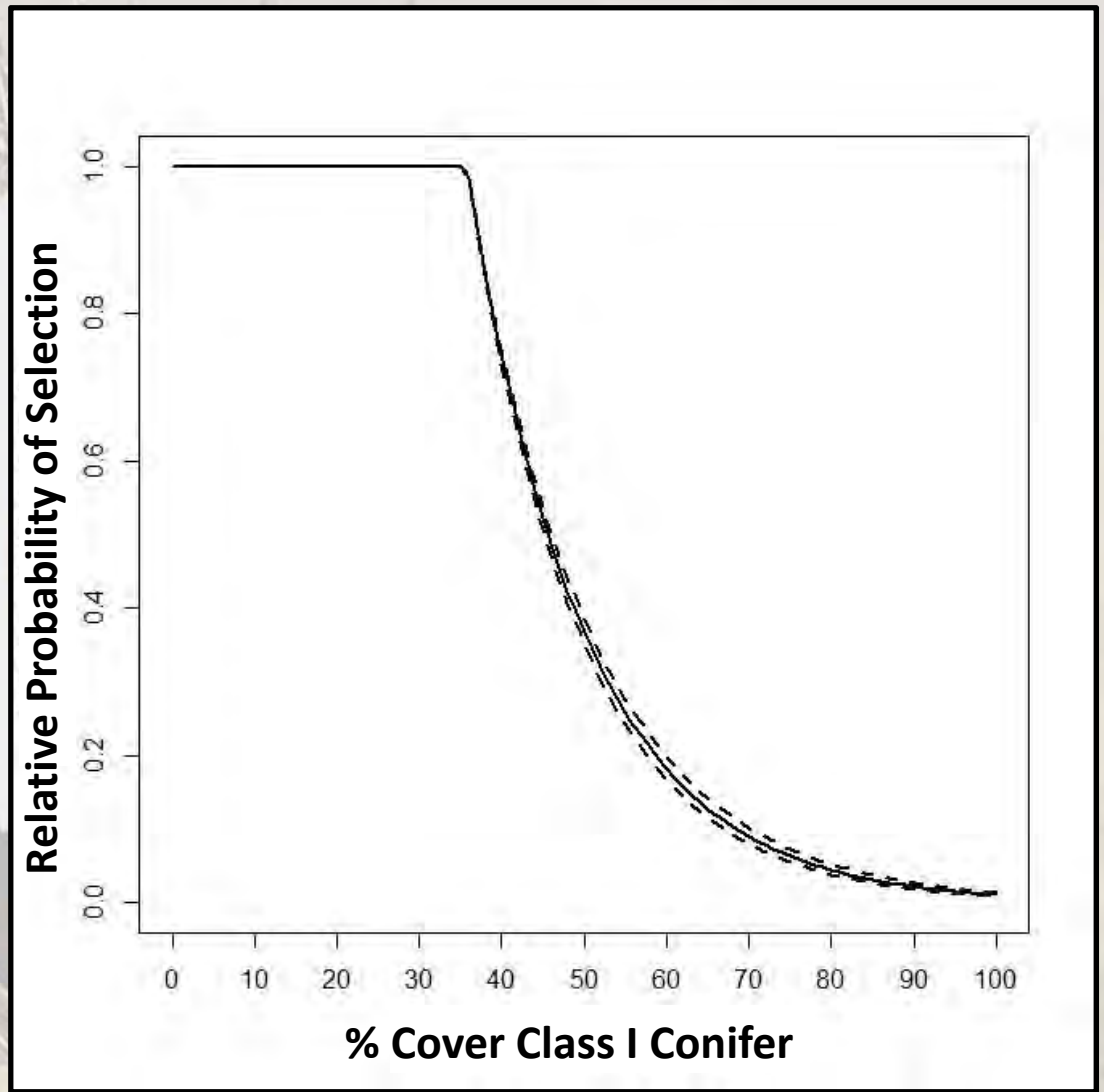


Sage-Grouse Avoid Cover Class I

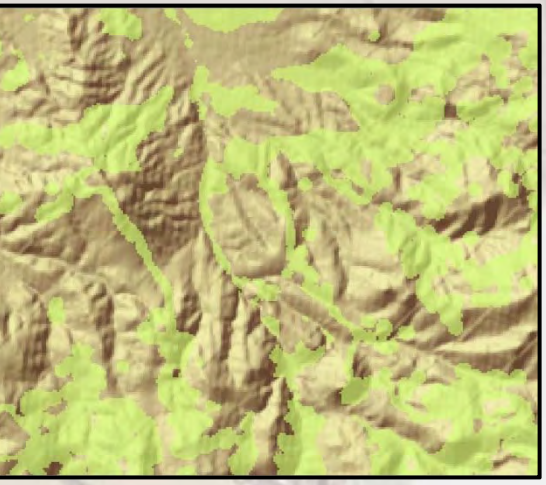


2.5 5
ometers

et al.



Sage-Grouse Avoid Cover Class I



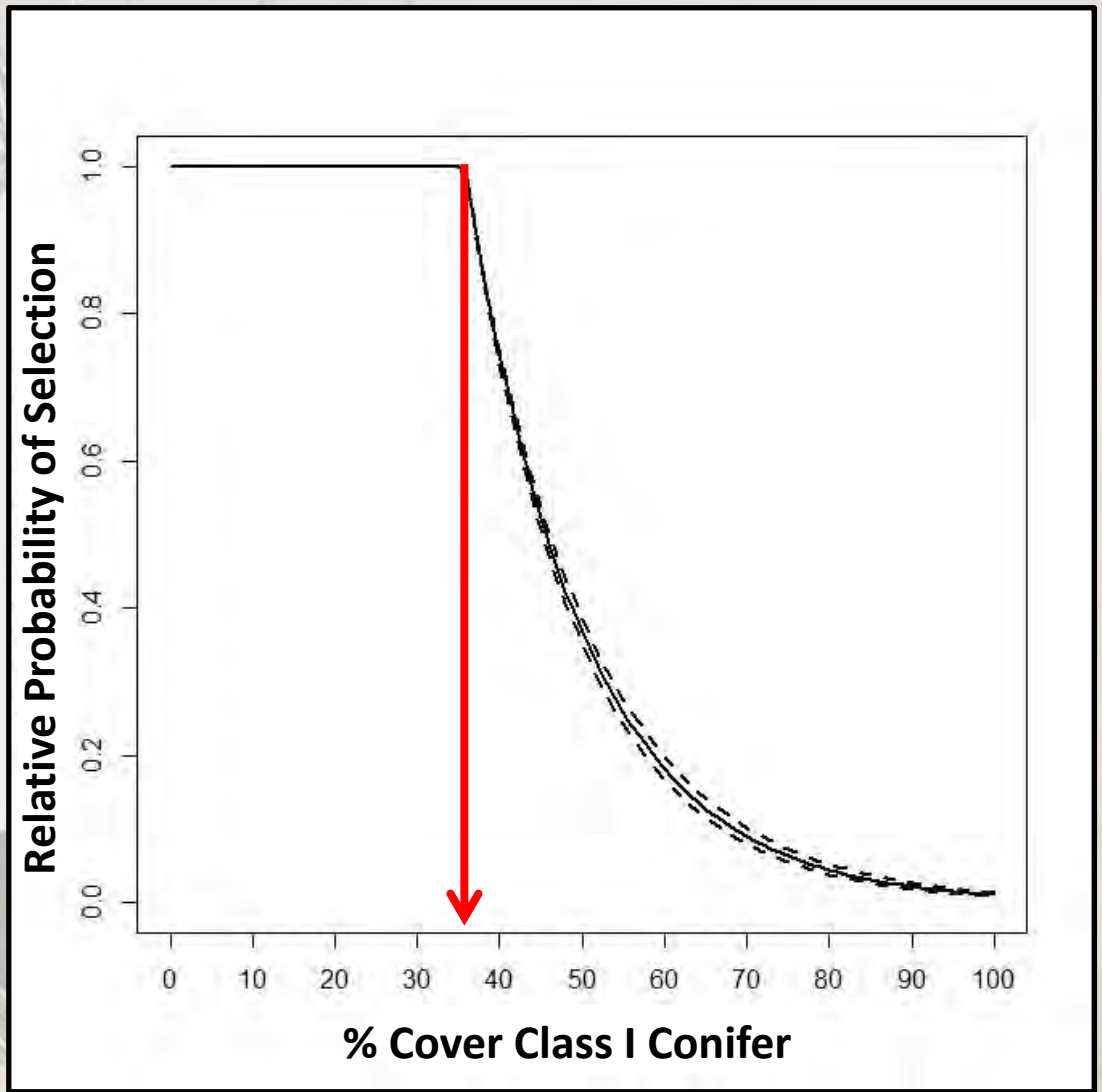
N

0 1.25 2.5 5

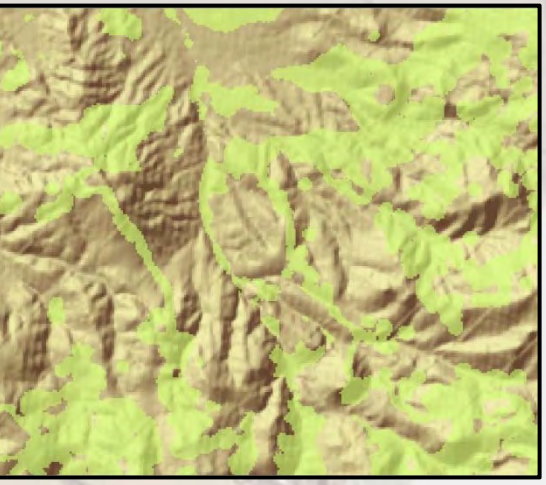
Kilometers

ge-grouse tolerate
nifers up to 36% of
Cover Class 1

qualing 1.6% total
cover



Sage-Grouse Avoid Cover Class I



N

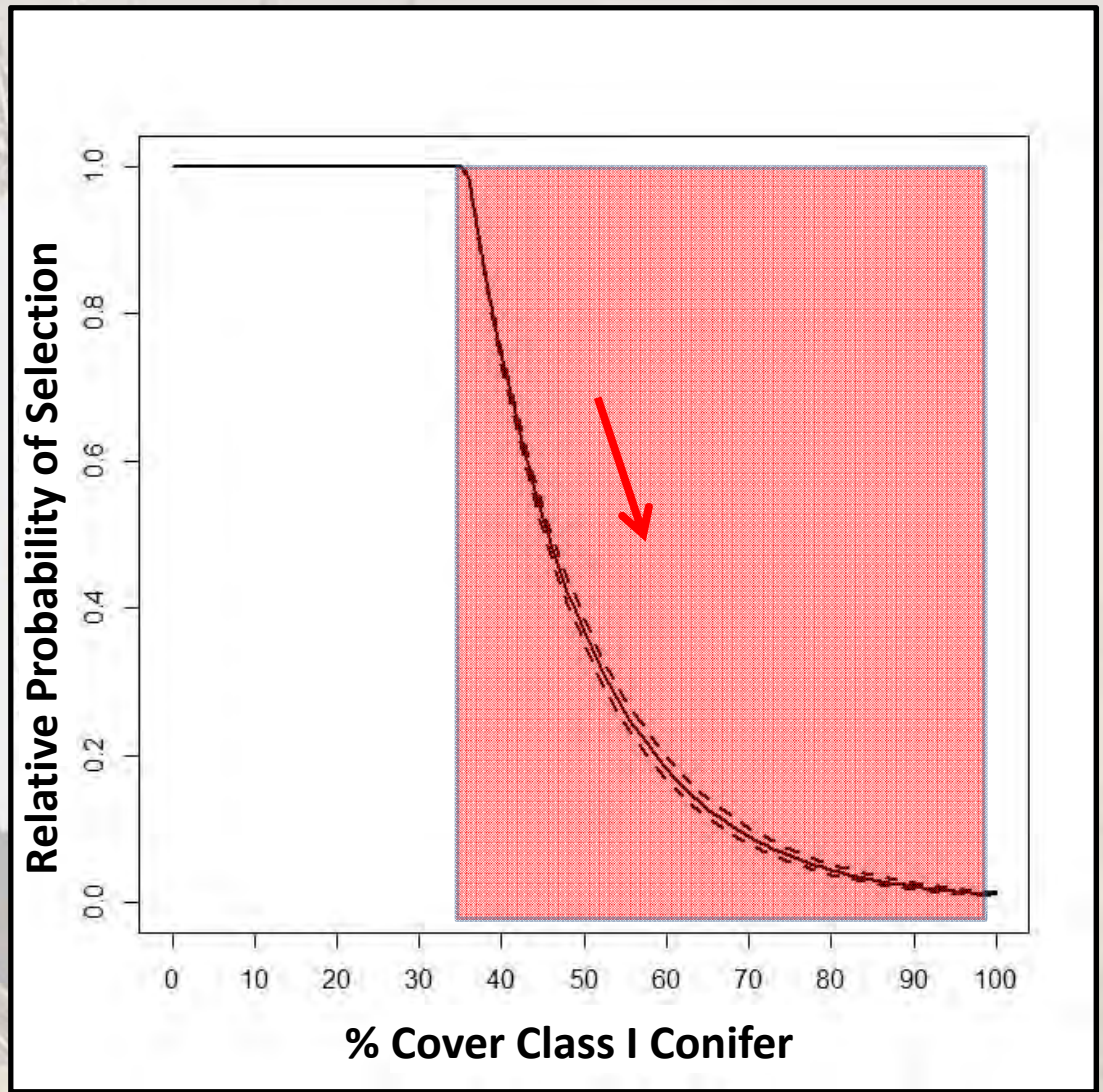
0 1.25 2.5 5

Kilometers

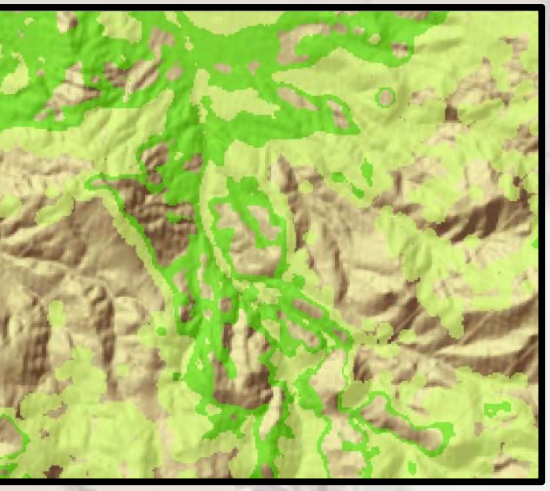
% increase in Cover Class I

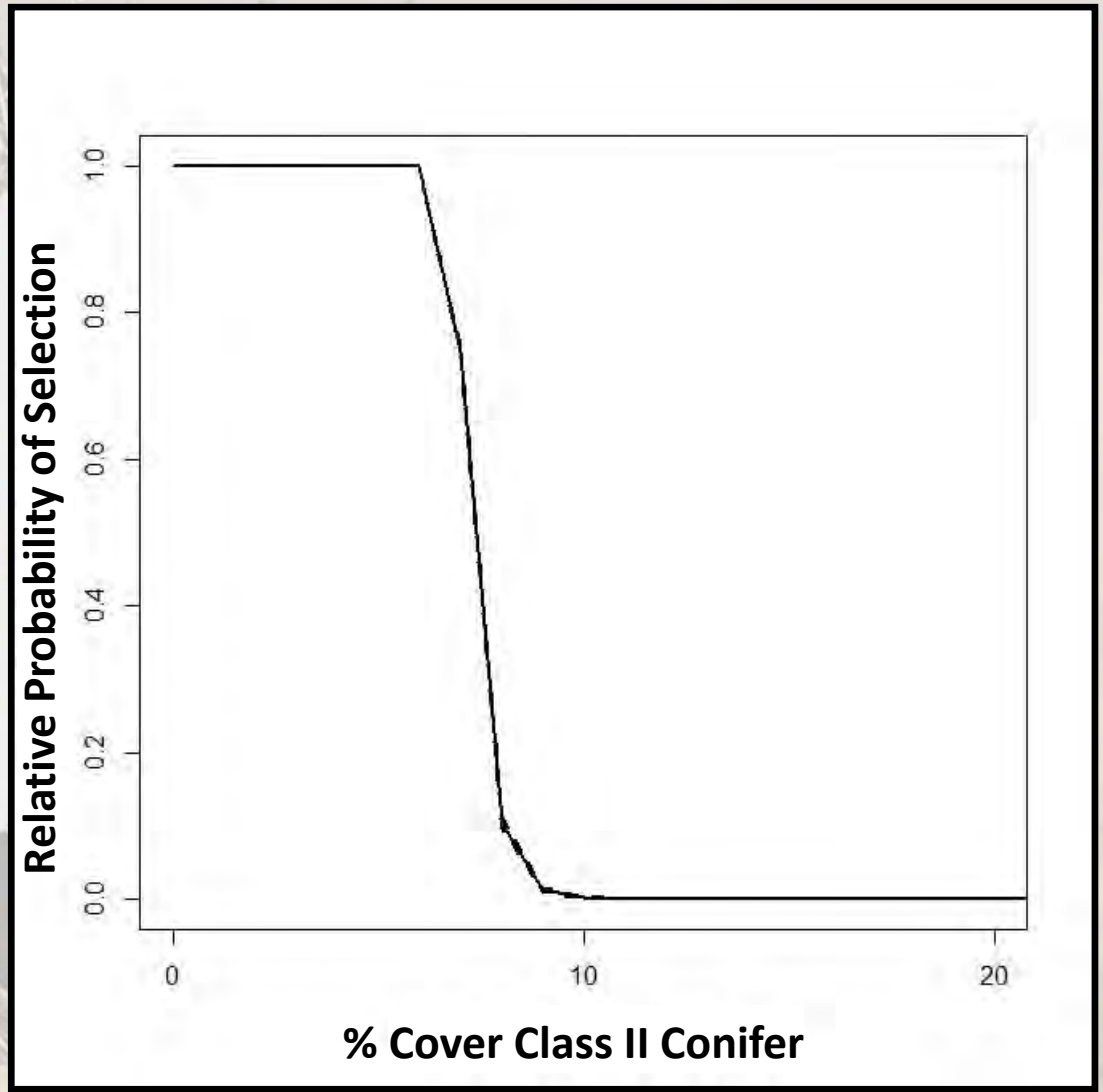
=

% decrease in the bability of selection

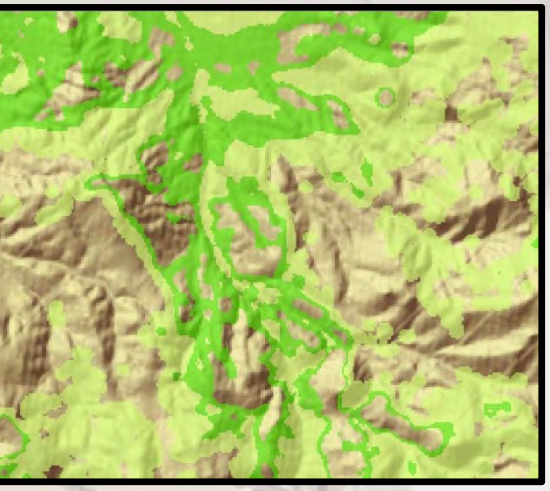


Greater Avoidance for Cover Class II



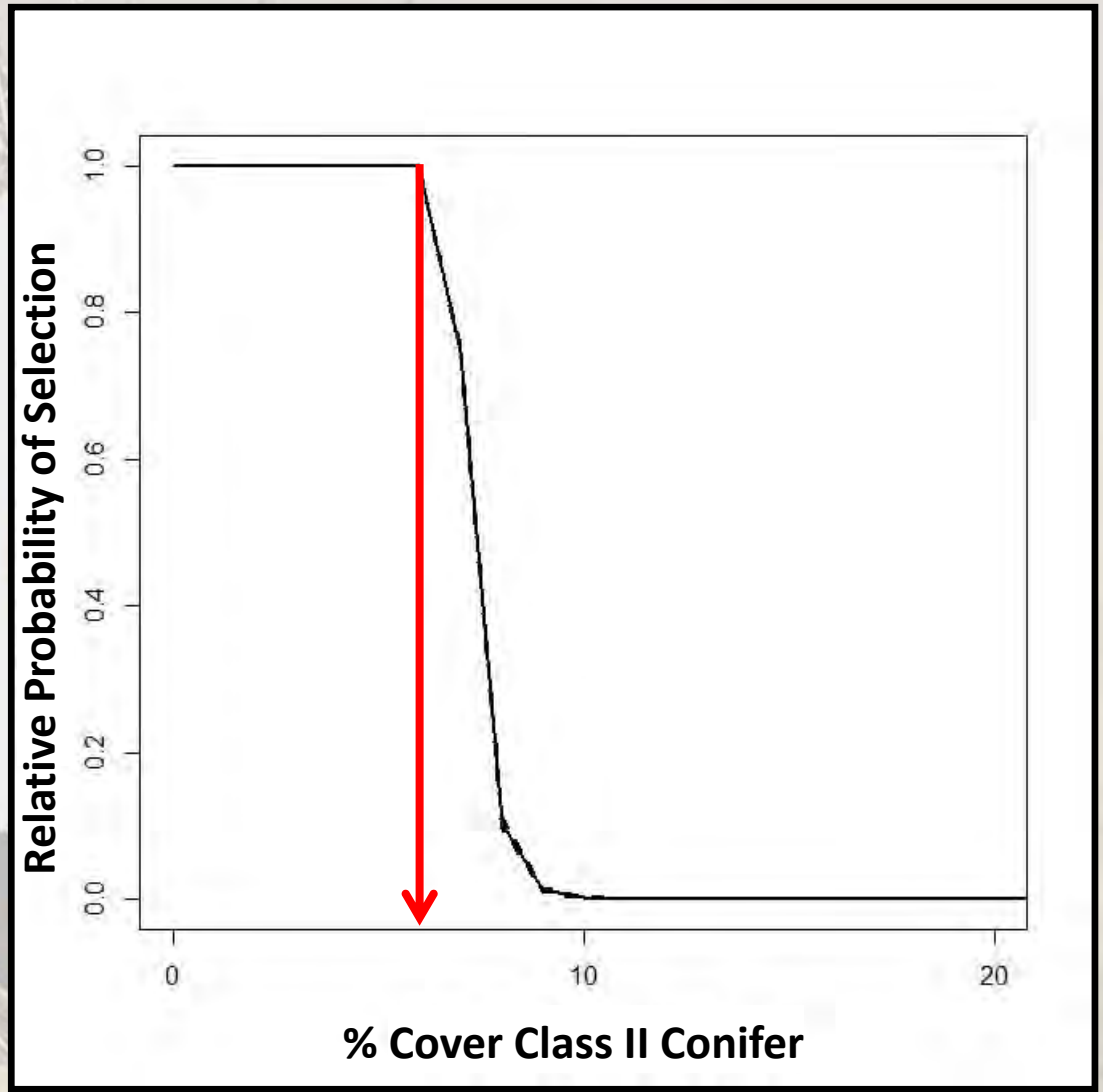


Greater Avoidance for Cover Class II

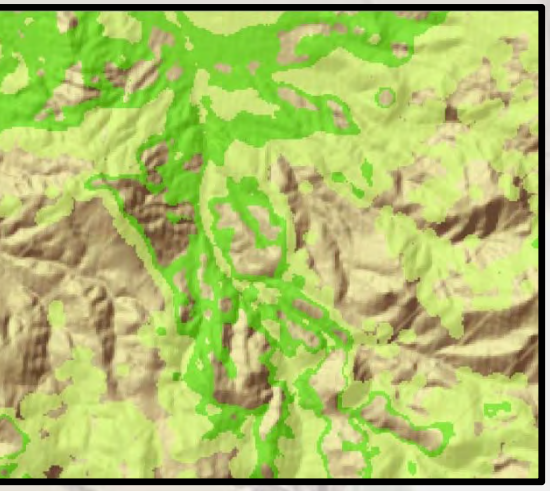


ge-grouse tolerate
onifers up to 6.8%
Cover Class 2

qualing 1.0% total
cover



Greater Avoidance for Cover Class II



N

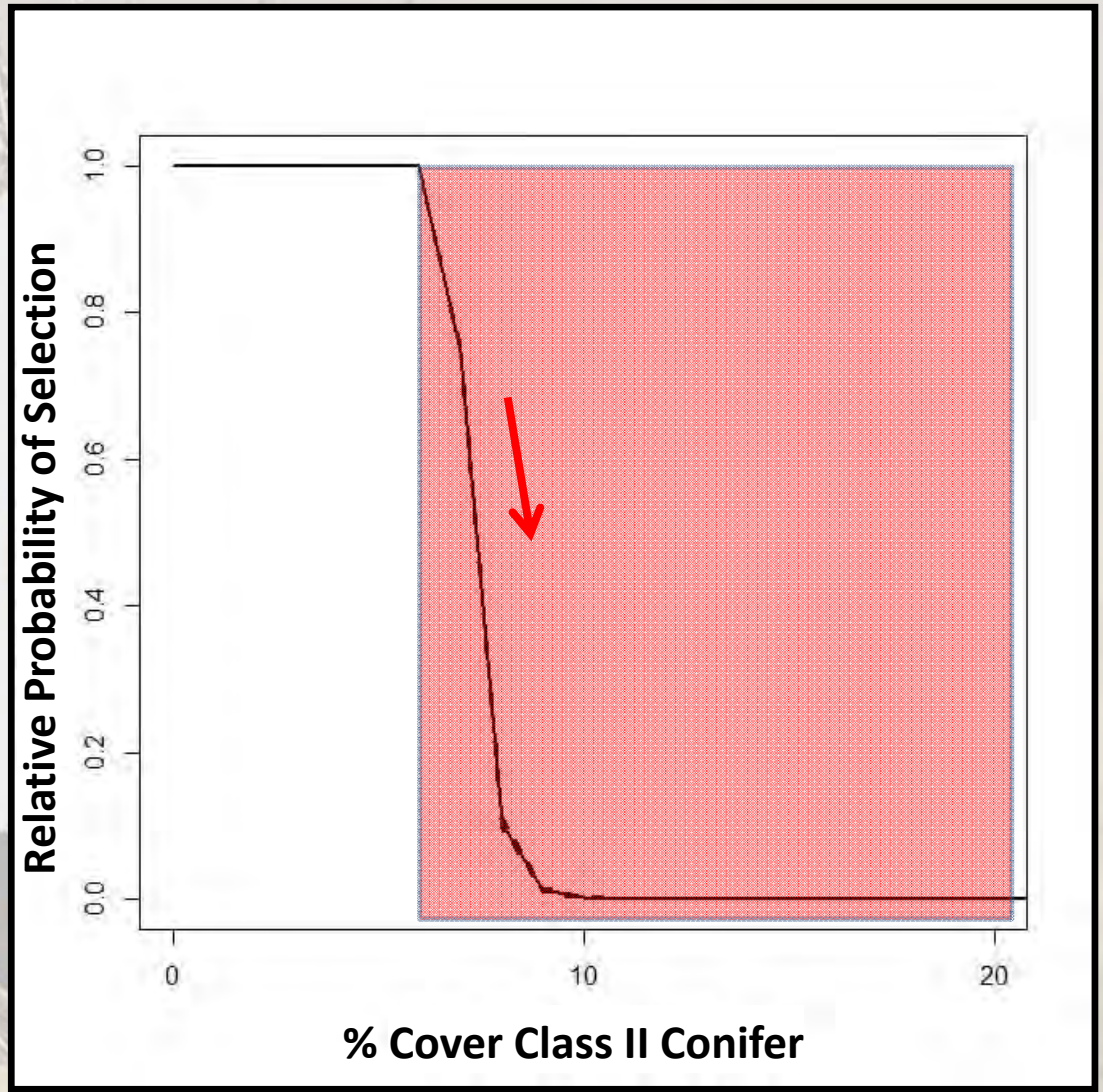
0 1.25 2.5 5

Kilometers

% increase in Cover Class I

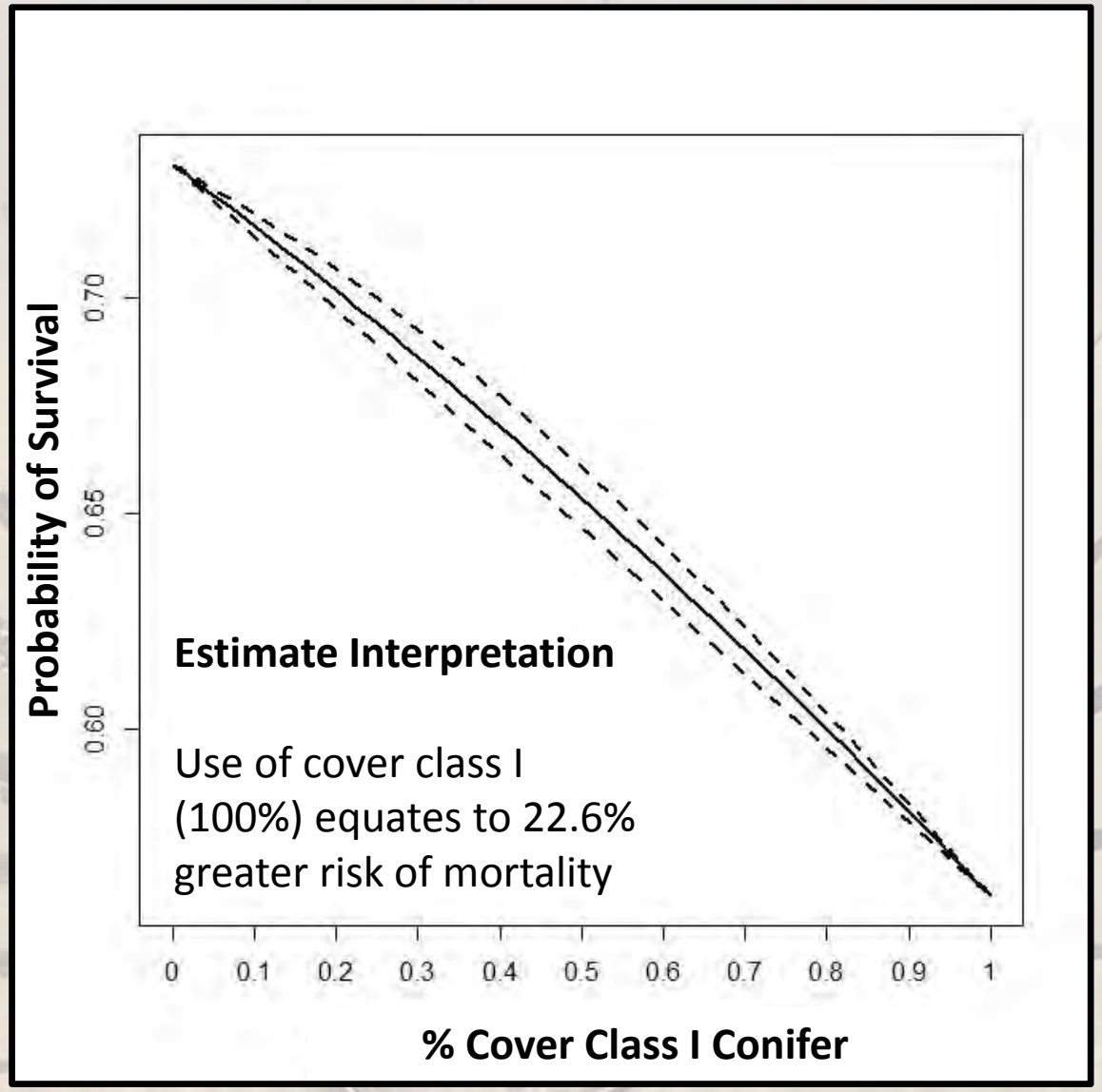
=

% decrease in the bability of selection

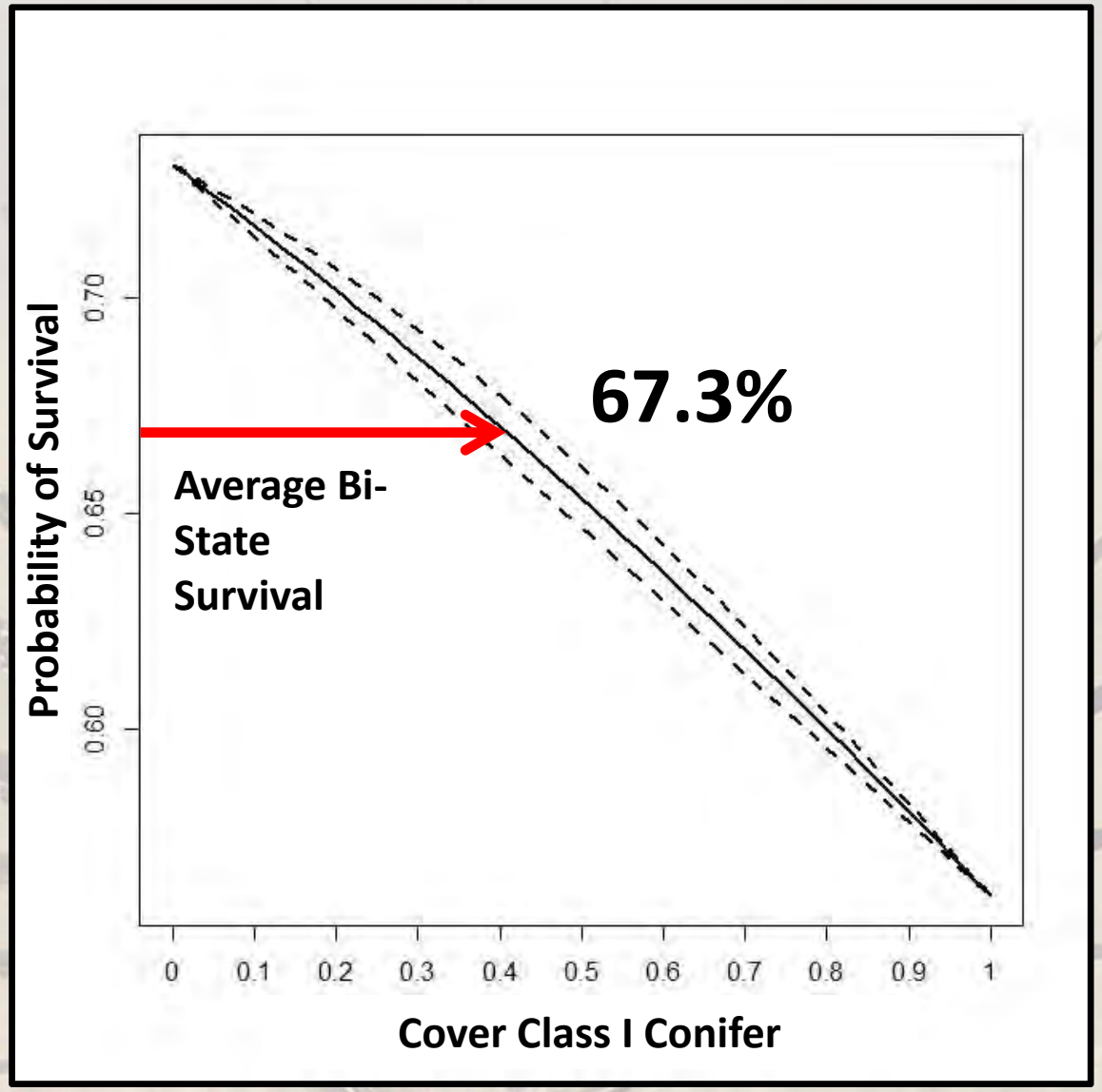


Do conifers affect survival?

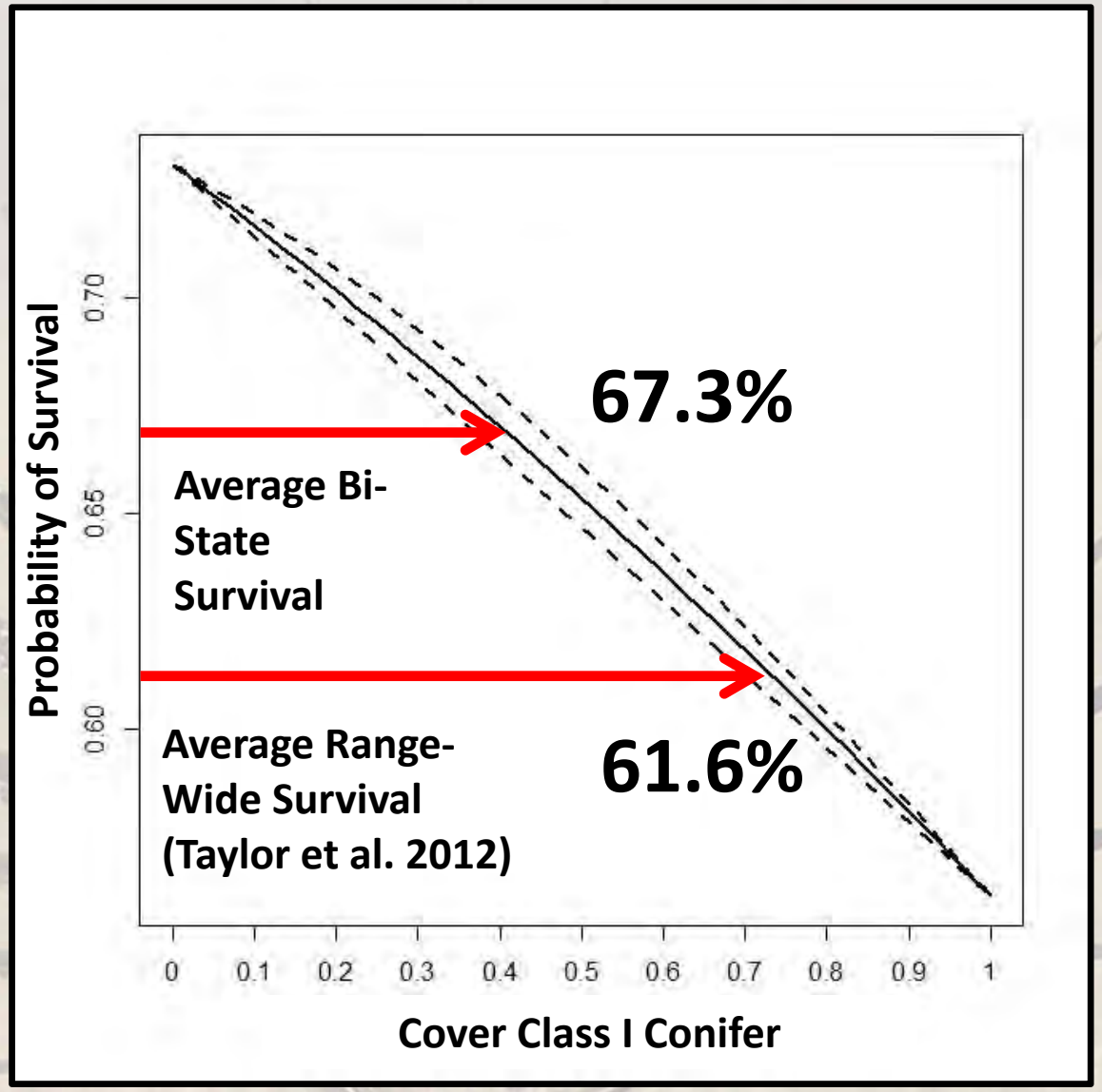
Conifer negatively influences survival



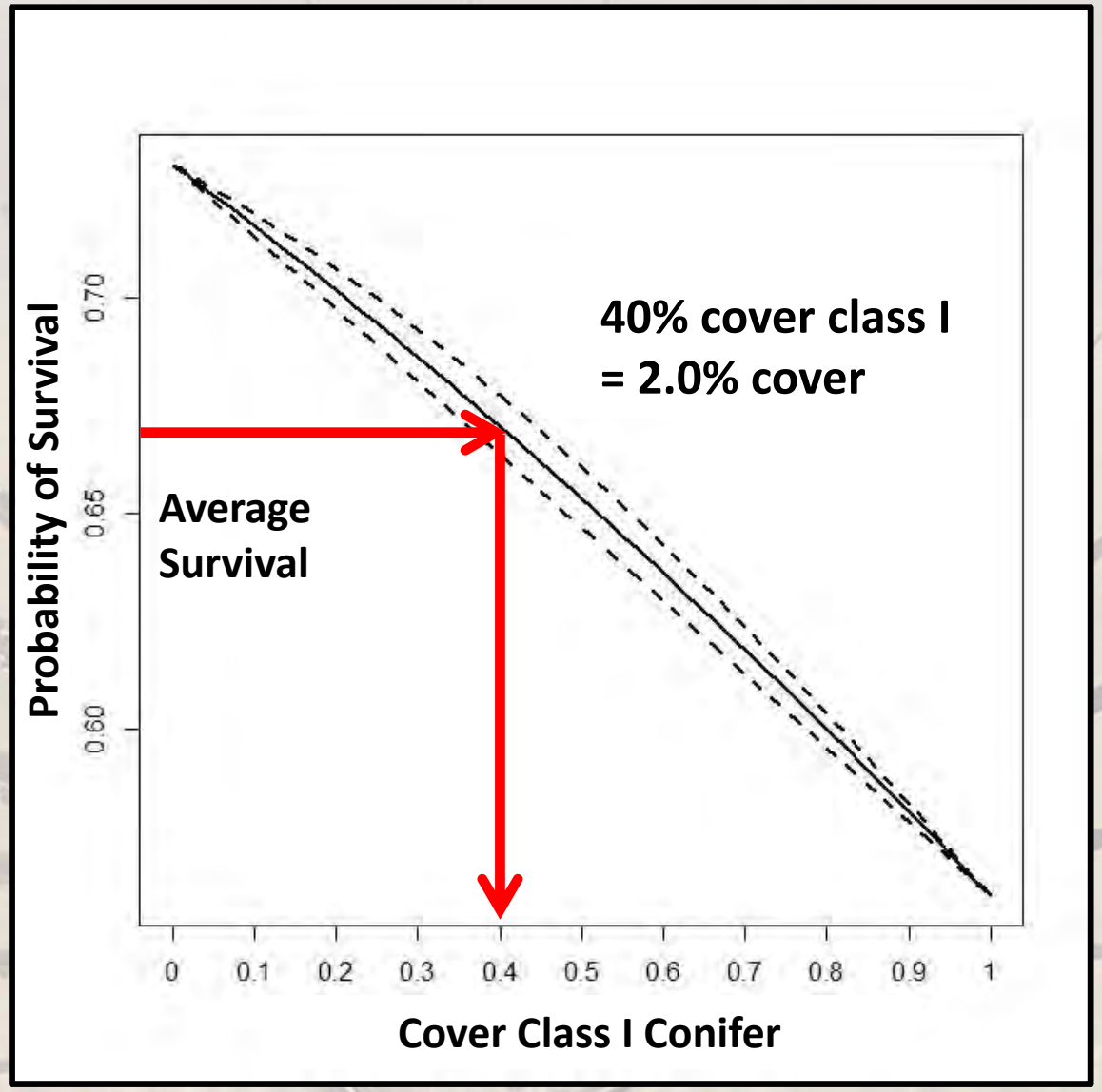
Conifer negatively influences survival



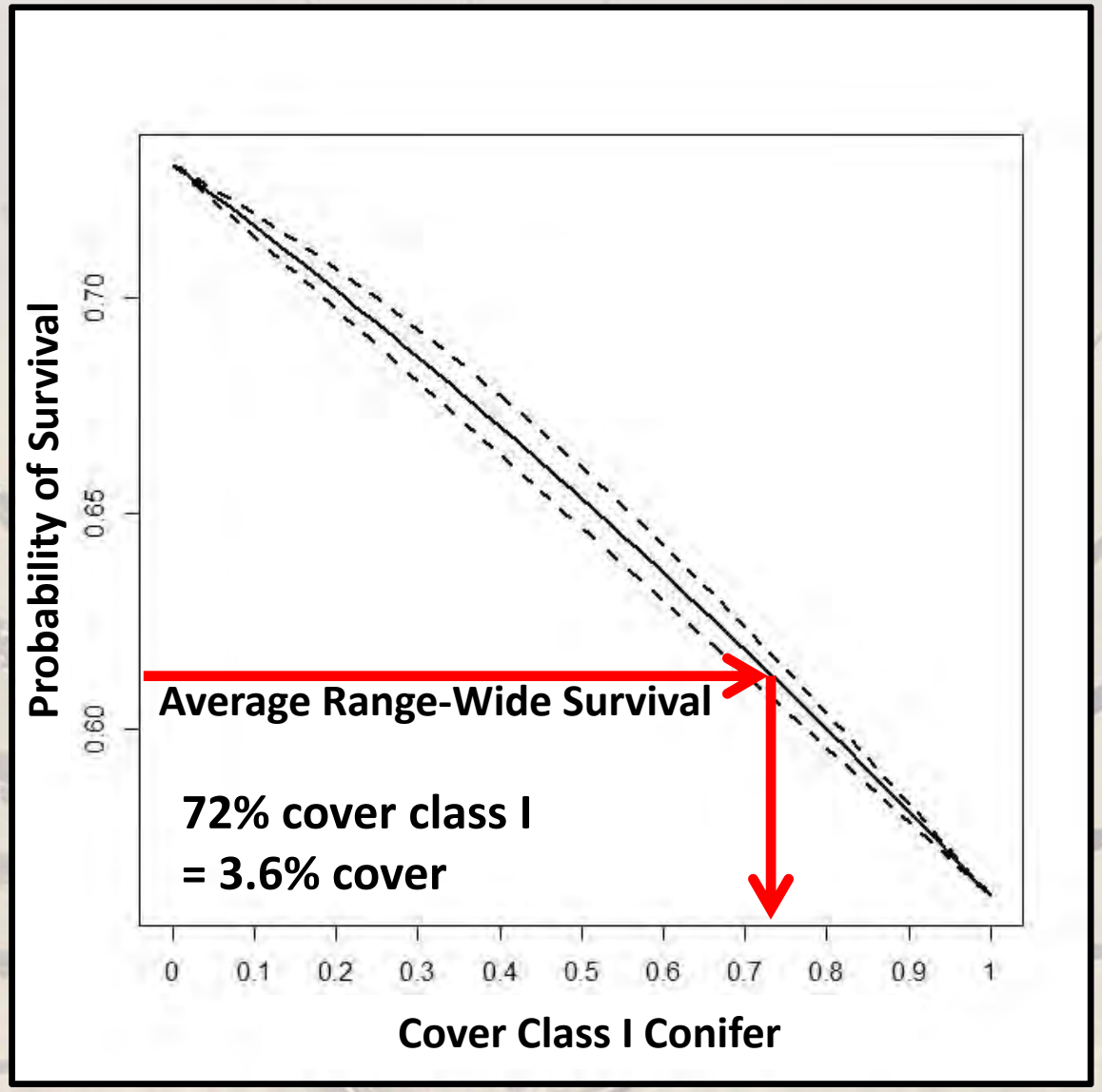
Conifer negatively influences survival



Conifer negatively influences survival



Conifer negatively influences survival

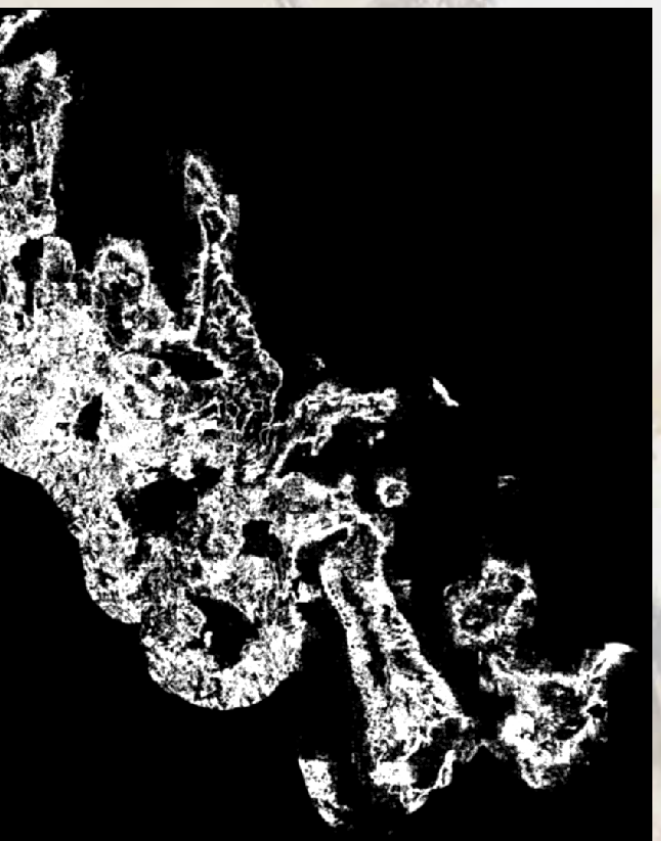


Spatially-Explicit Annual Survival Probability (Cover Class I)

High

Low

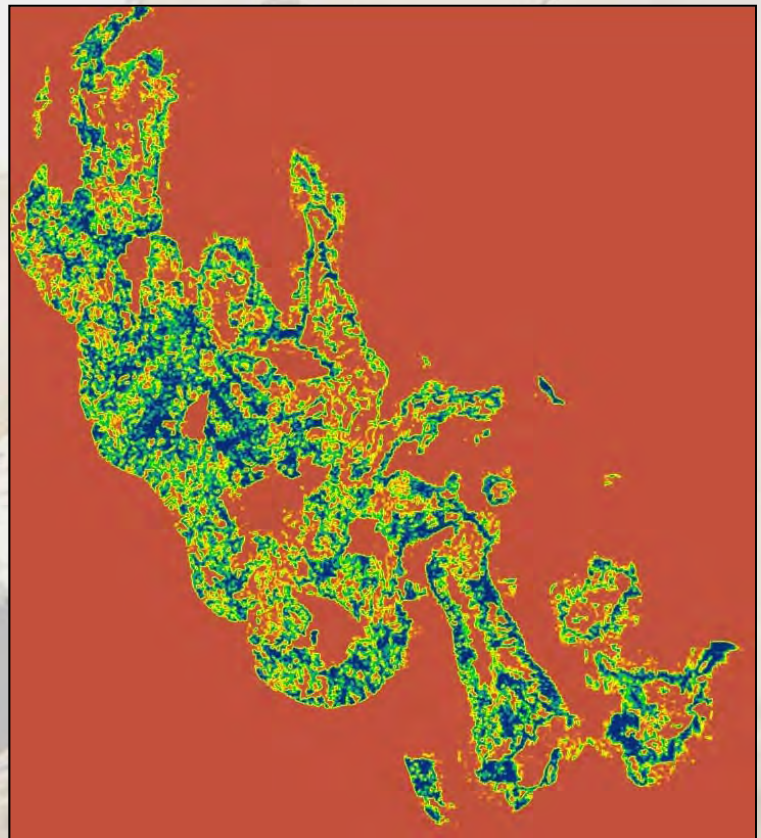
Percentage Conifer Class 1 (439m)



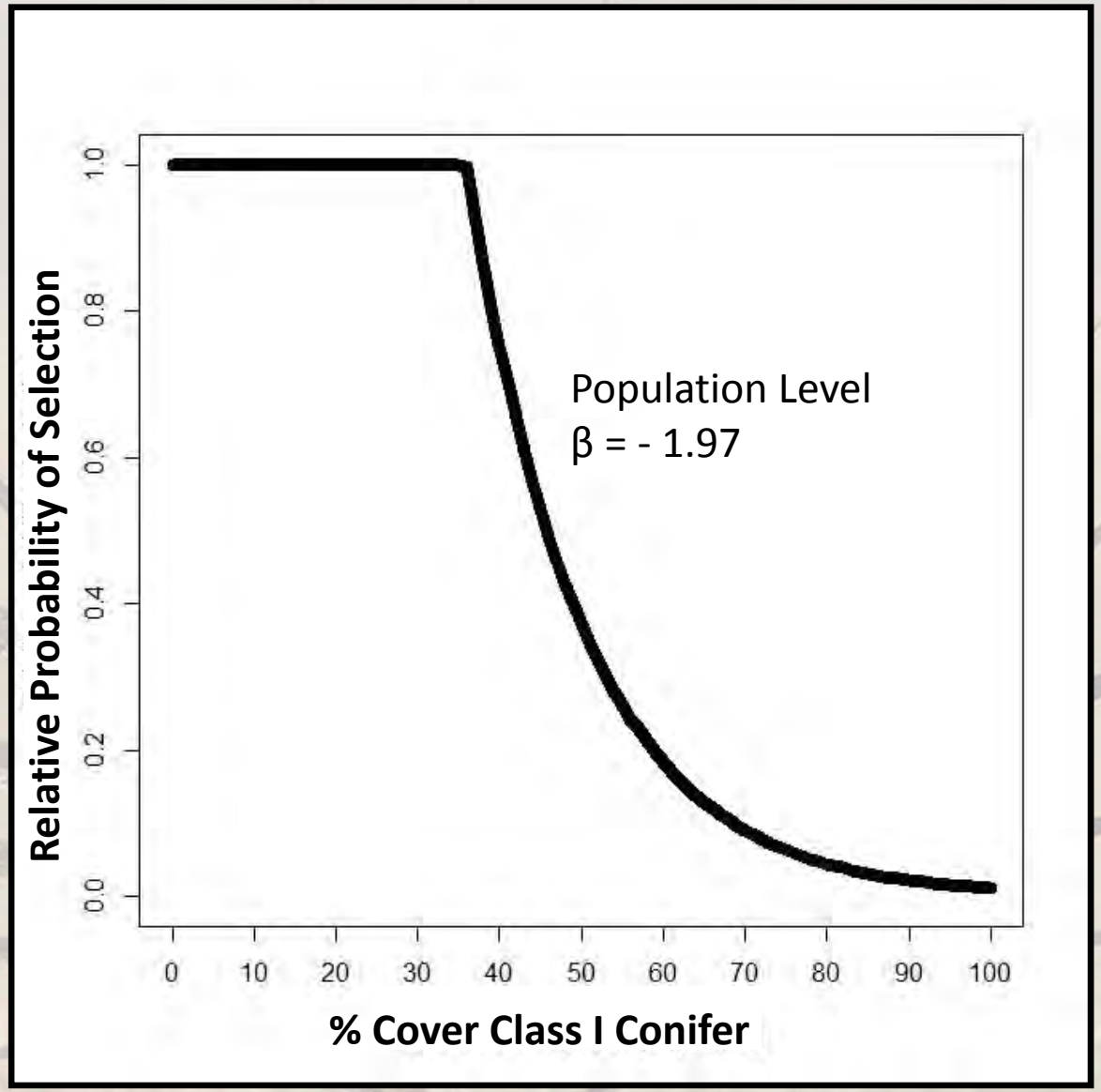
High

Low

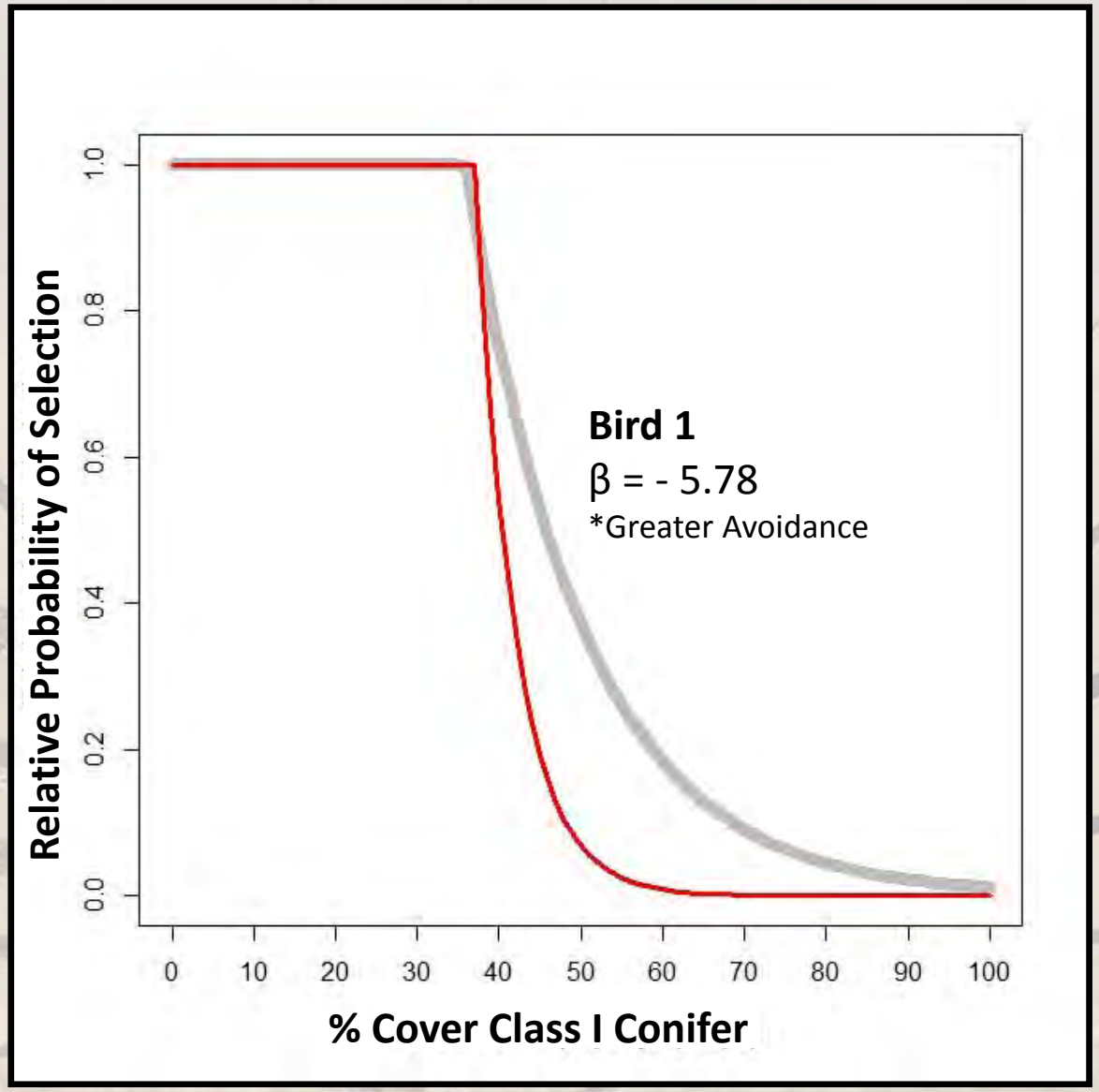
Annual survival probability



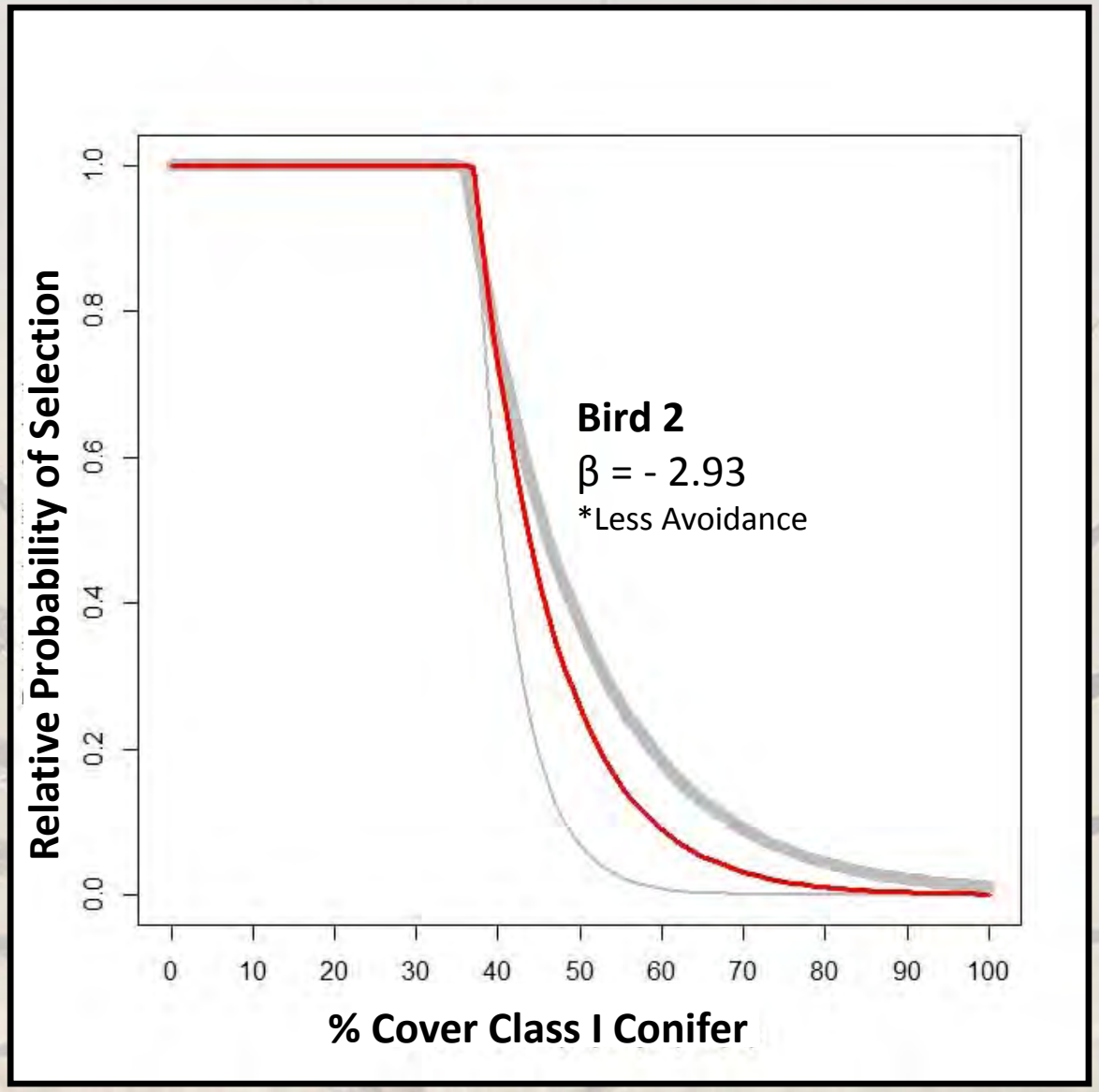
Linking bird behavior to survival



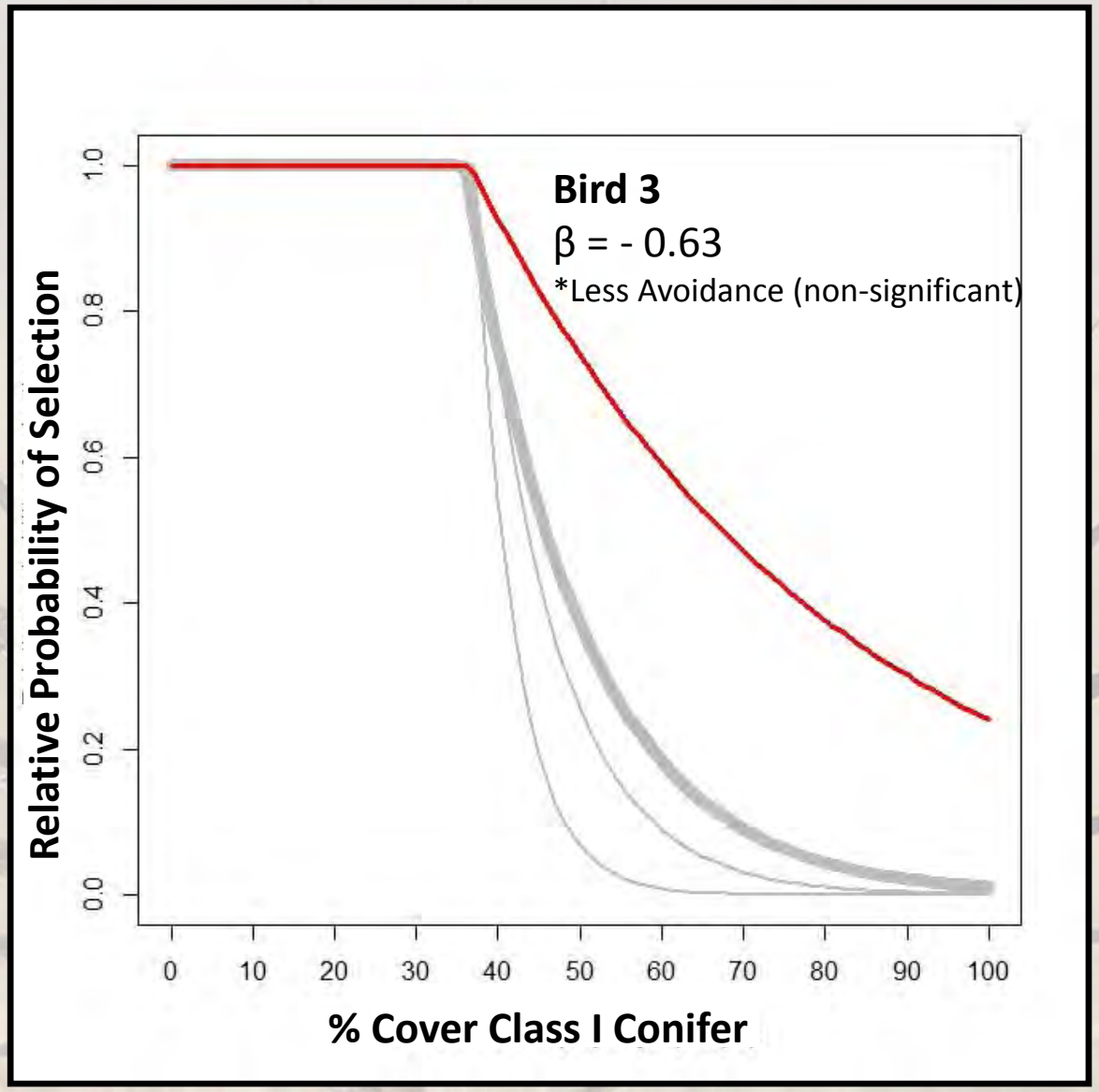
Linking bird behavior to survival



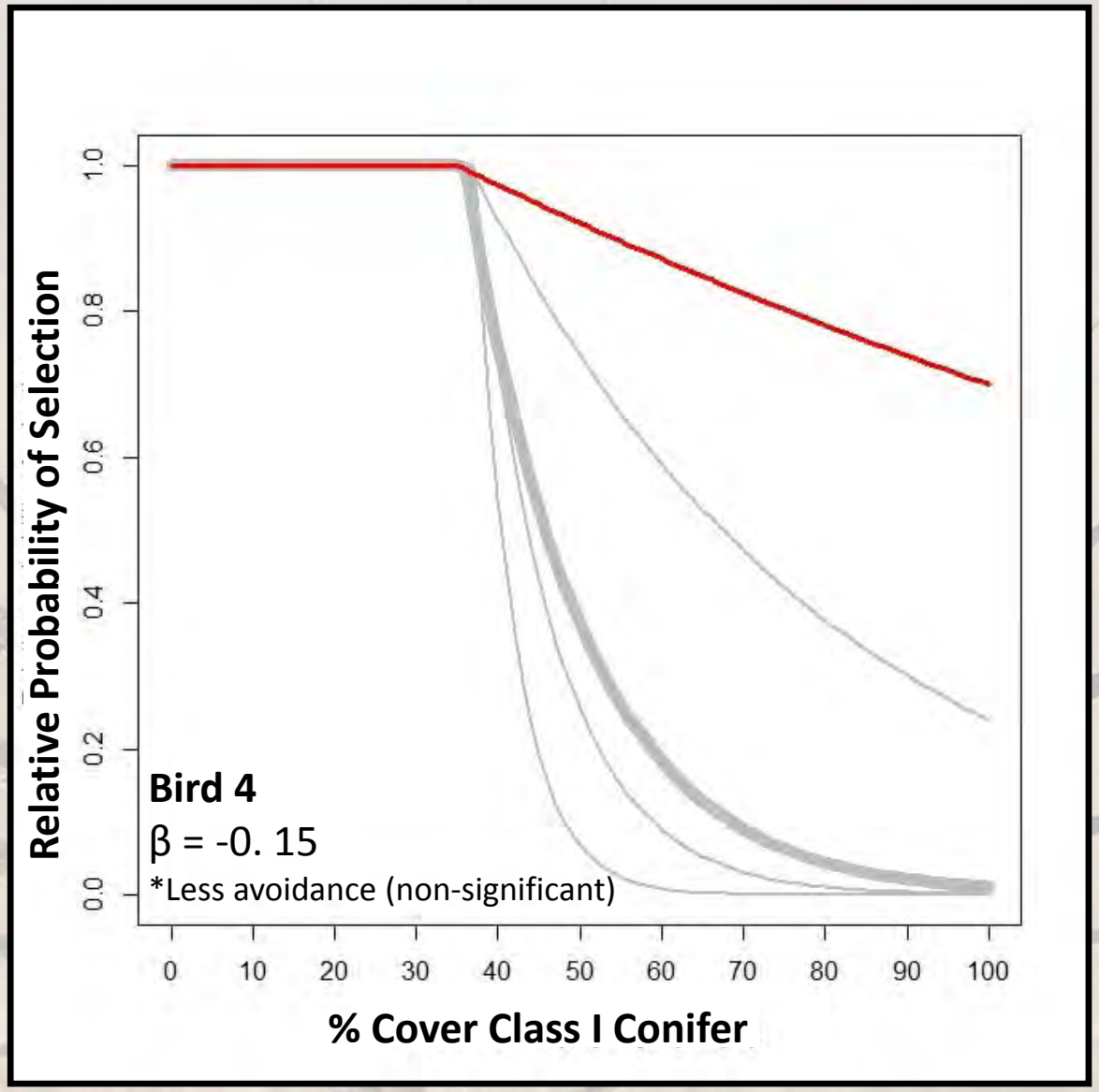
Linking bird behavior to survival

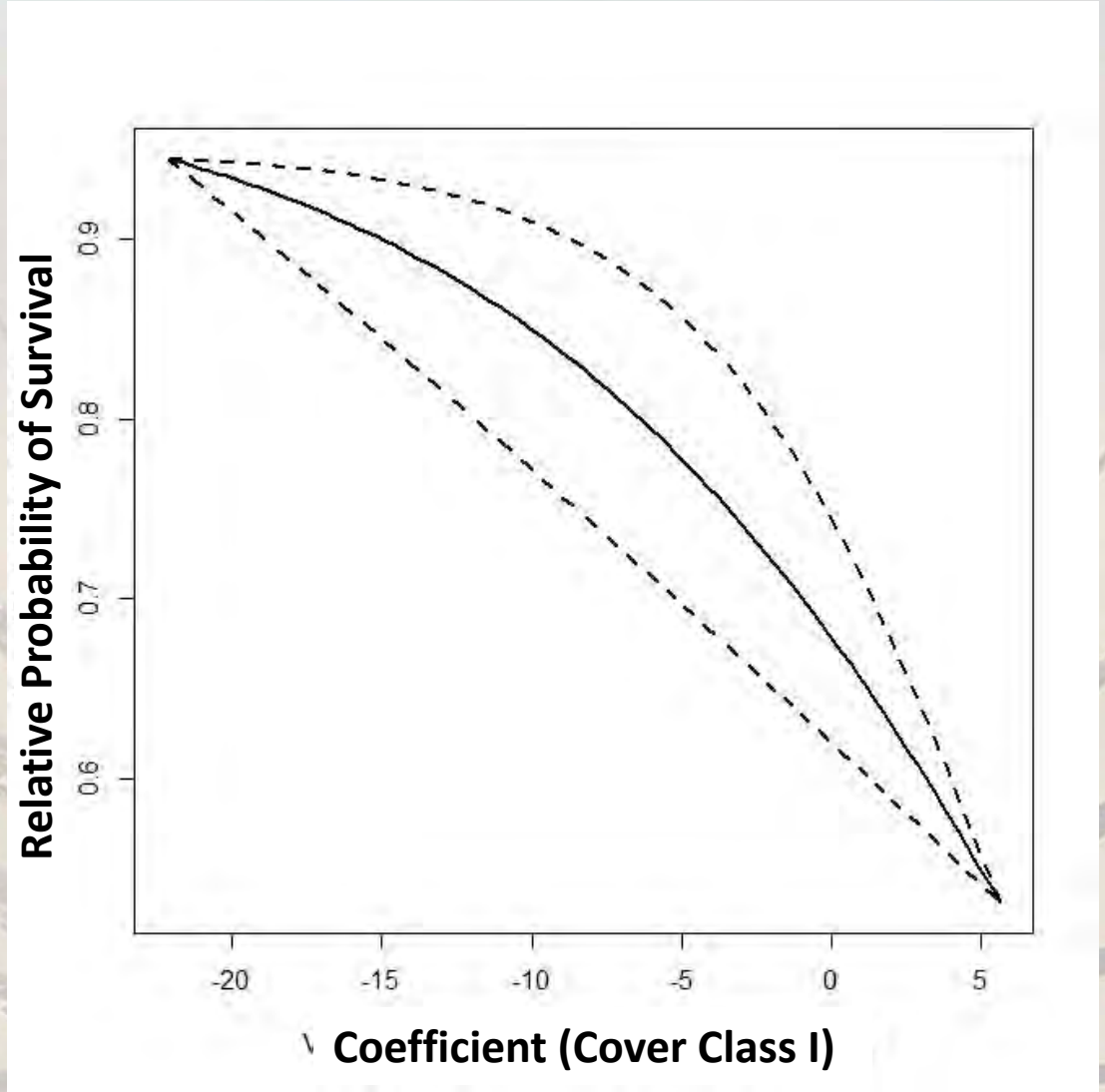


Linking bird behavior to survival

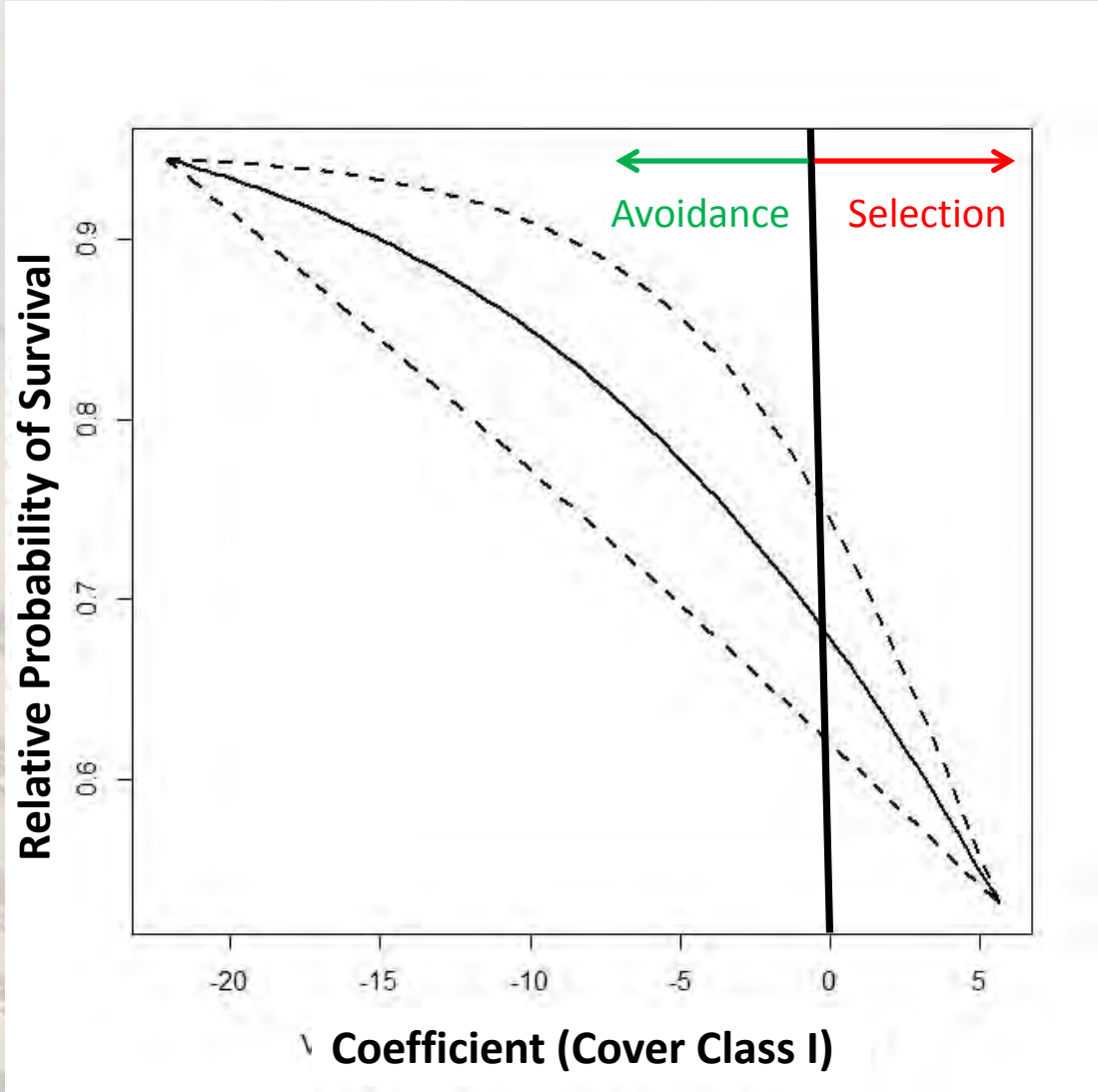


Linking bird behavior to survival





Sage-grouse that exhibited avoidance (negative values) of conifers had much lower risk of mortality



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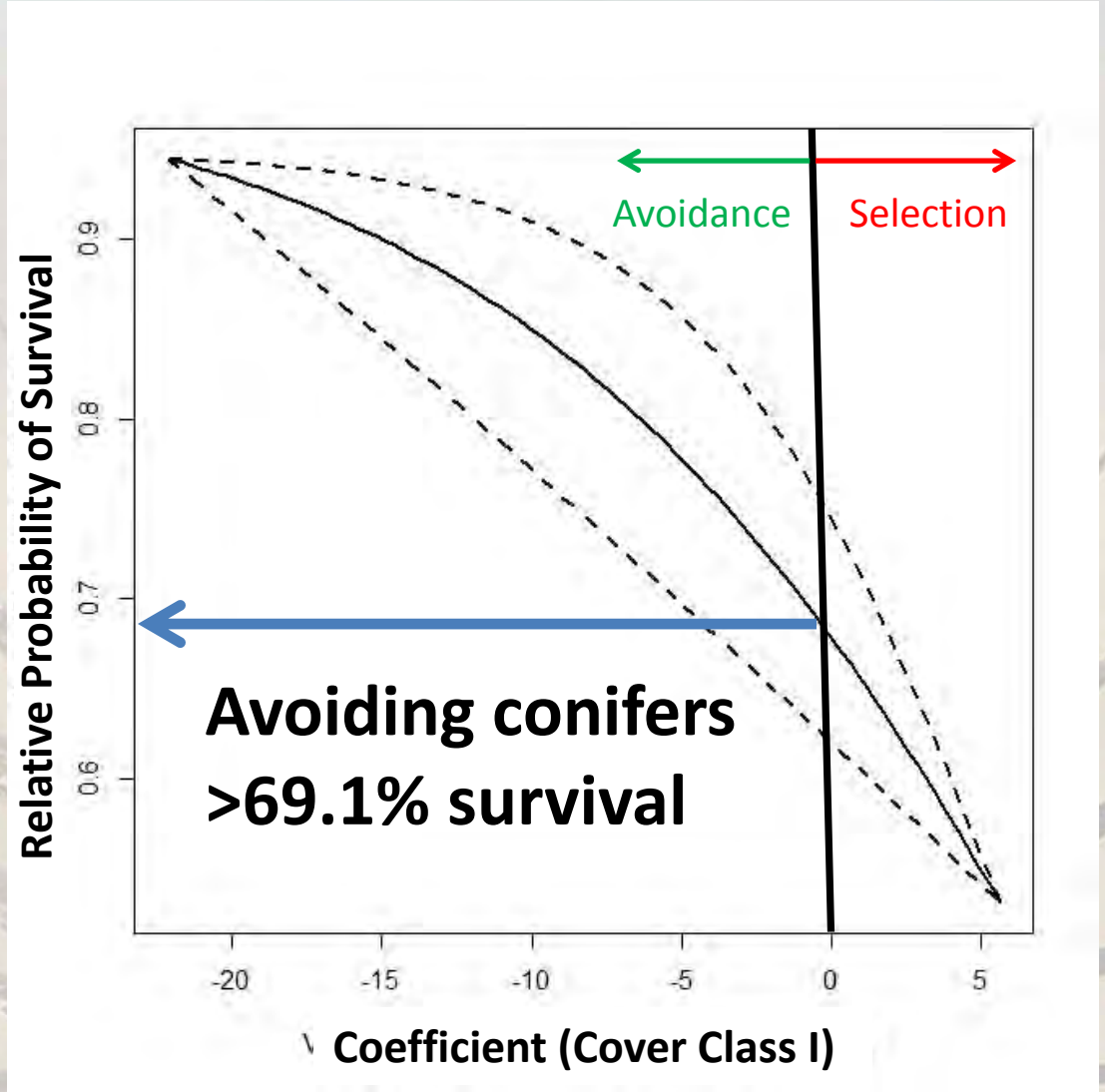
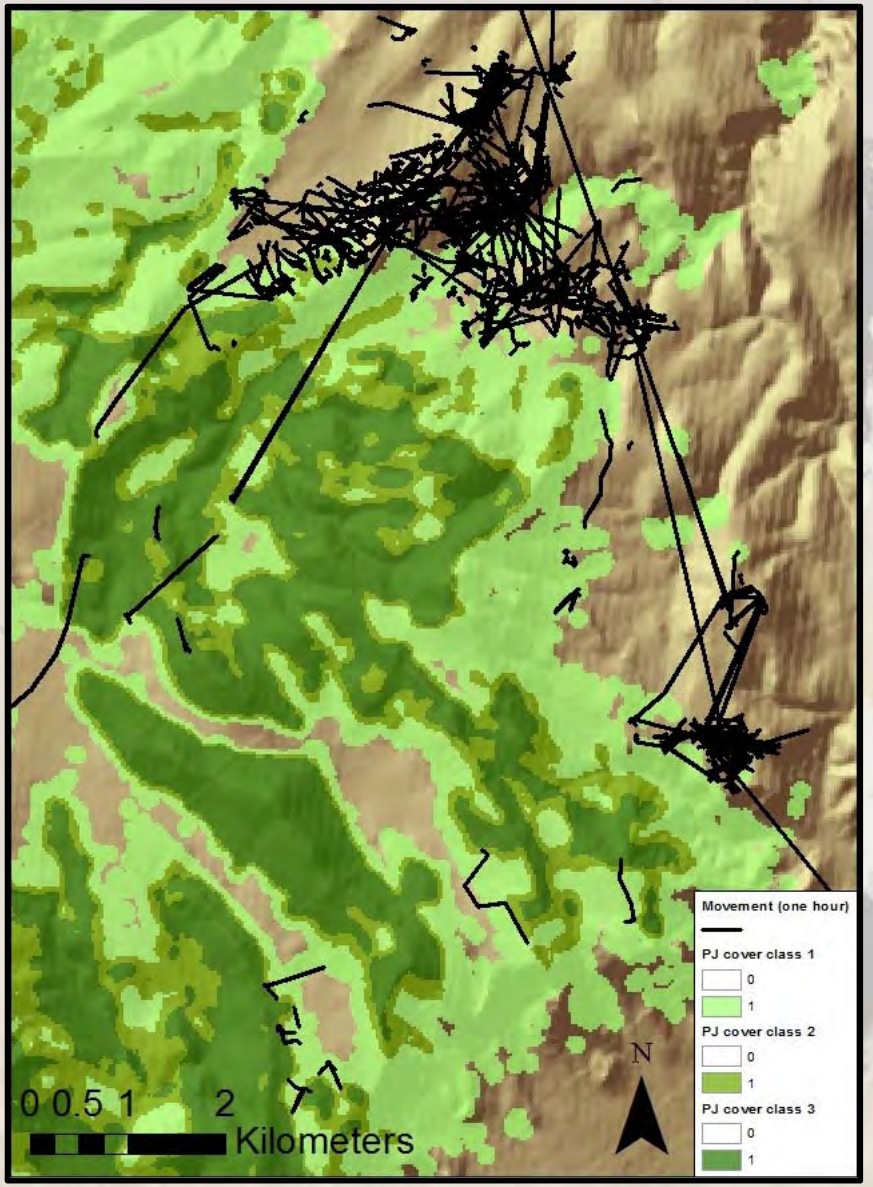


Sage-grouse that exhibited avoidance (negative values) of conifers had much lower risk of mortality

Movement and Survival

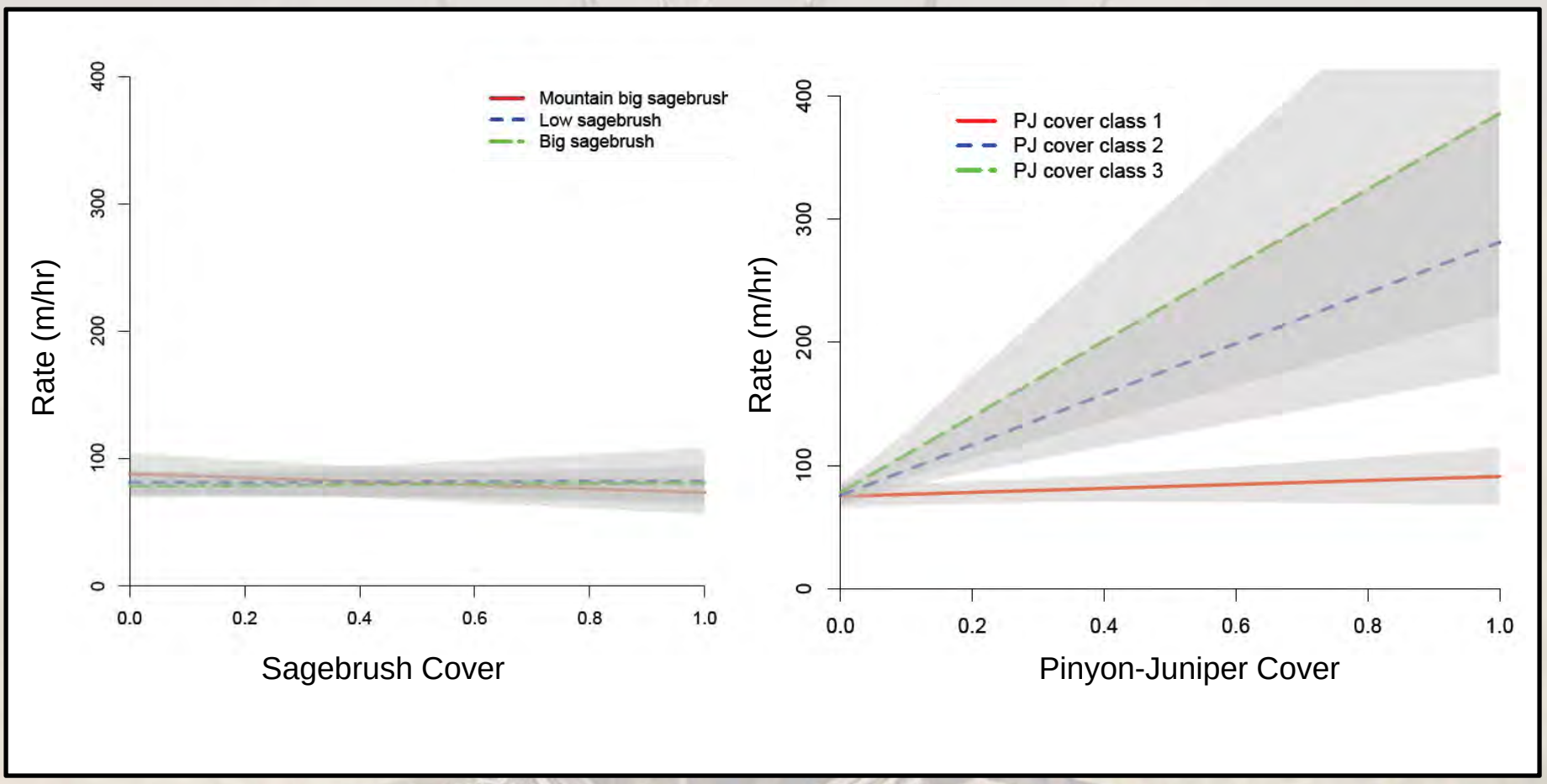


Data Analysis:

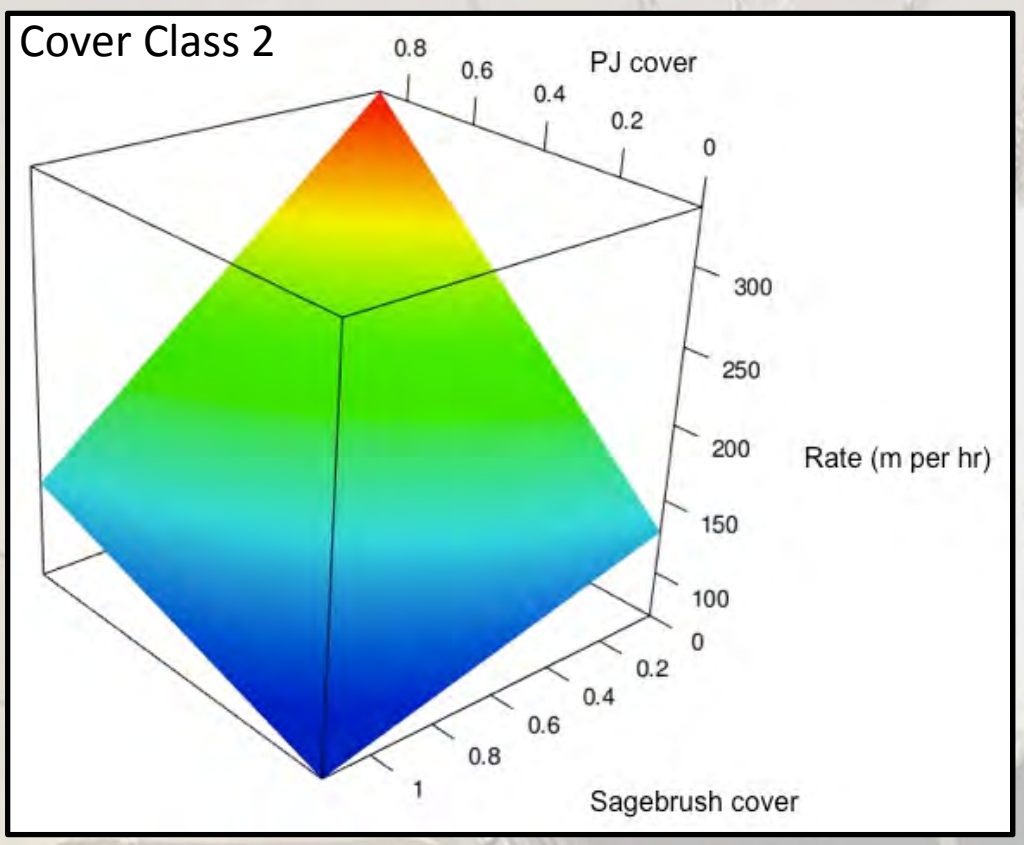
- **Restricted data to subsequent hourly locations**
- **Calculated distance traveled between successive locations (m/hr)**
- **Calculated % intersection of each cover type (PJ1, PJ2, PJ3, sagebrush)**
- **Generalized linear mixed model**

  Response = rate
  Predictors = PP1, PP2, sagebrush (interactions)
  Random = individual, year, site

Interaction between PJ and Sagebrush



Interaction between PJ and Sagebrush



Sage-grouse movement rate is greater through PJ cover

This relationship depends on how much sagebrush is present

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Take Home Points

- **Sage-grouse avoid all conifer cover classes**
  - **Dispersed or clumped trees are negatively influence distribution**
  - **More avoidance as density of trees increases**
- **Cover class 1 was the only class that influenced survival**
  - **Dispersed trees are not good for survival**
  - **>2% lead to below average estimates**
- **Behavior was linked to survival**
  - **Grouse that use areas with trees less than available predicted risk of mortality was lower than the average survival estimate (67.3%)**
- **Next step – Incorporate parameter estimates into spatially-explicit conservation planning tool**

Acknowledgement

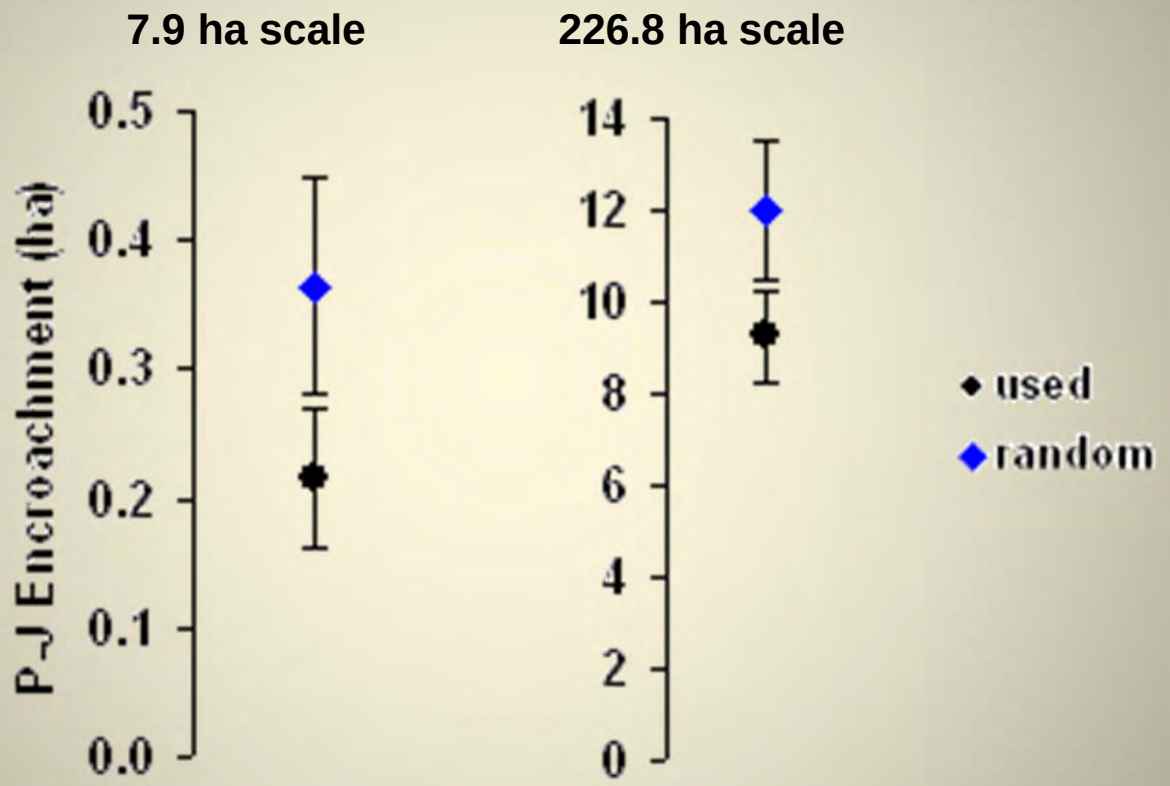
Bi-State Technical Advisory Committee

Nevada Department Of Wildlife
California Department of Fish and Wildlife
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

Habitat Selection in Areas with Conifer Encroachment (Casazza et al. 2011)

- At larger scales (7.9 ha and 226.8 ha), areas encroached by Utah juniper and single leaf pinyon pine were avoided by grouse.
- Sage-grouse avoided mixed sagebrush/tree (MST) (≤40 trees/ha) areas at both scales, but the larger scale had greater support.
- There was an age difference in how sage-grouse chose to avoid, or not, tree encroached habitats.
    1. During the spring, yearlings selected areas with more pinyon pine and juniper trees.
        a) Yearling females are less experienced at selecting nest sites and may be more tolerant of trees.
        b) Additionally, evidence suggests that not all yearling females attempt to reproduce, which may partly explain age class differences.

Pinyon-Juniper Encroachment



~ 3.5% cover of P/J

~4.5% cover of P/J

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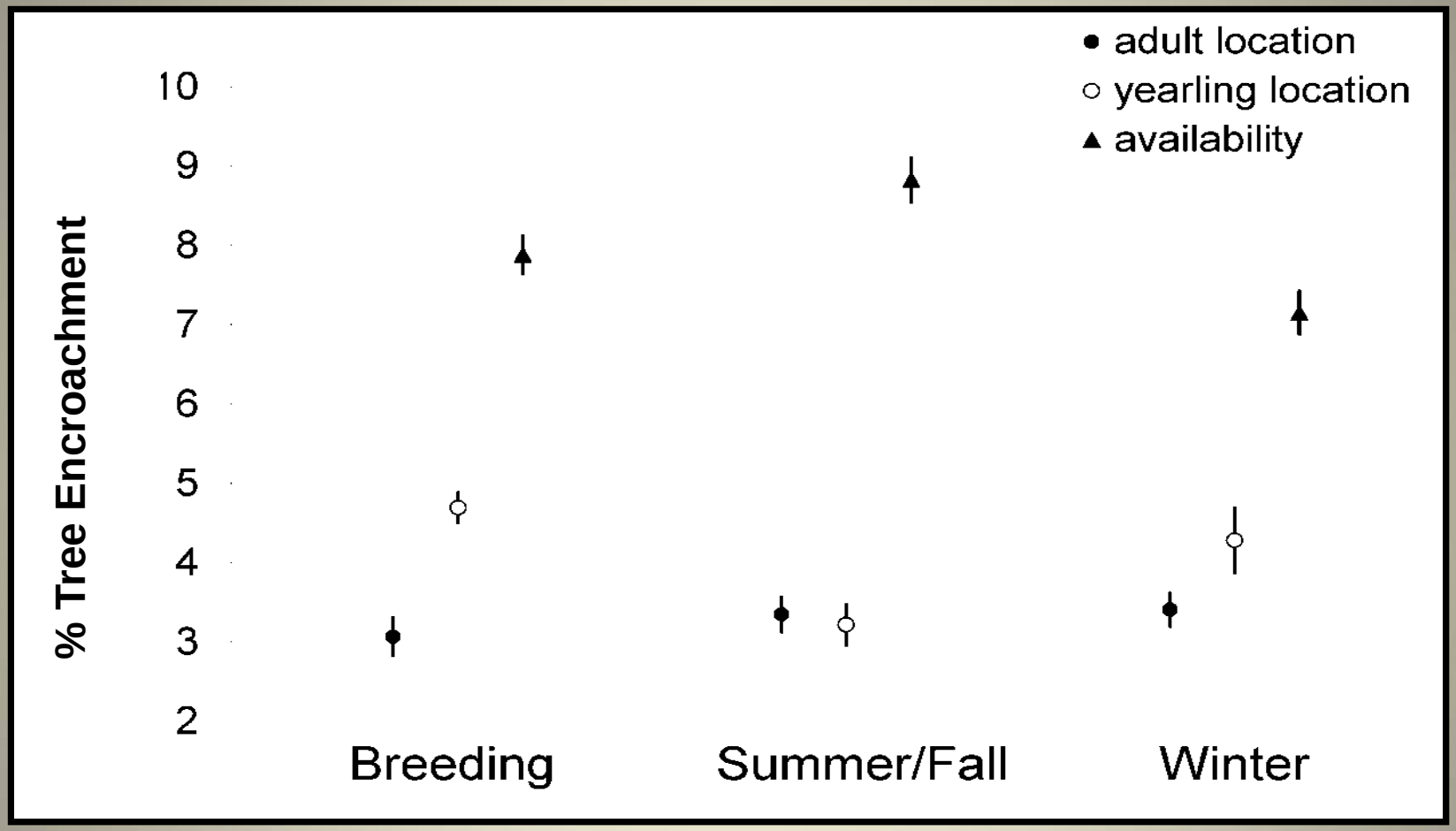
Differential Use by Age and Season



During the breeding and winter seasons adults selected sites with less tree encroachment than yearlings.

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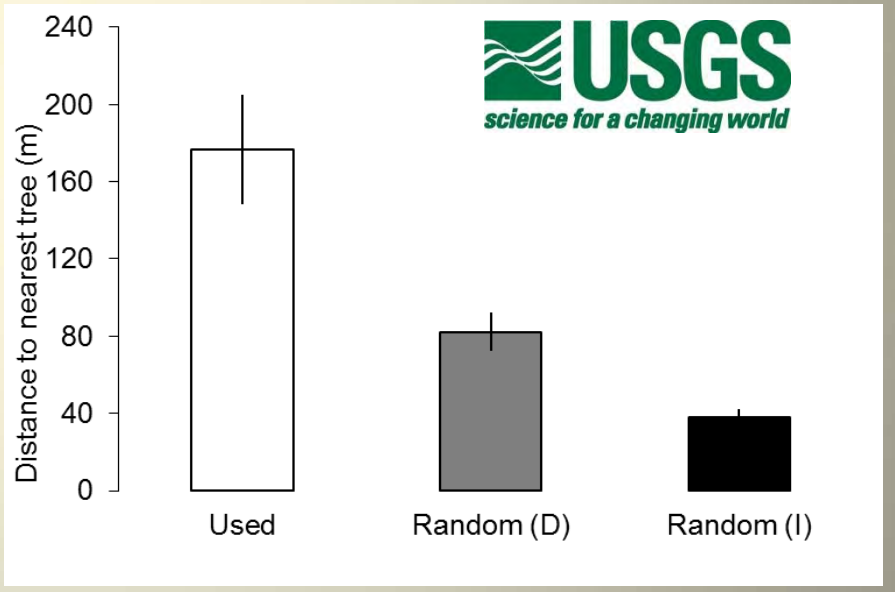
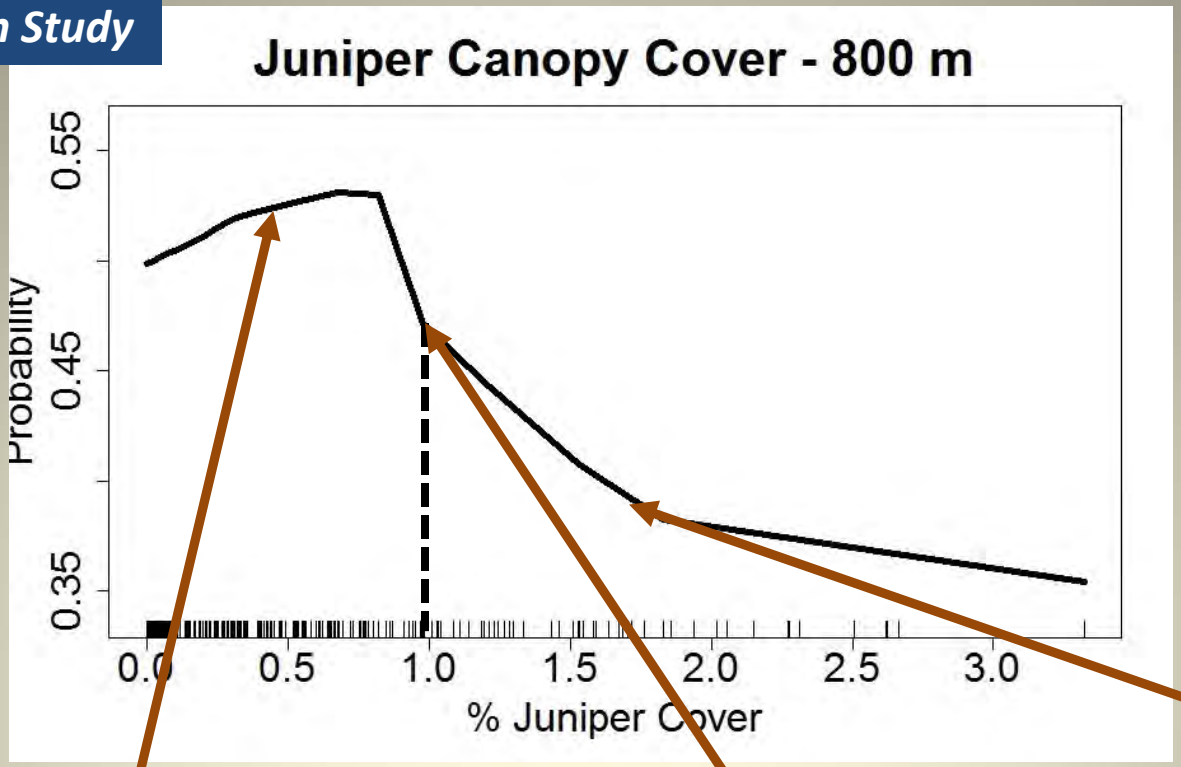
Tree Avoidance (Pine Nut Mountains)

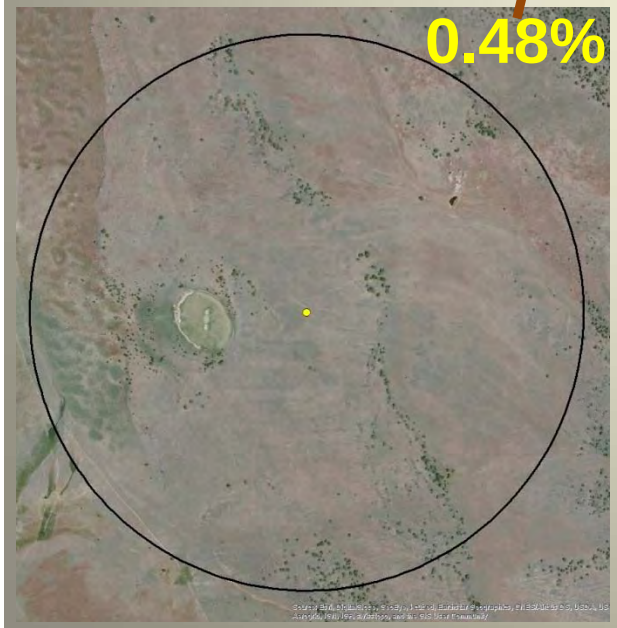
- Evidence of avoidance of trees using general telemetry locations:
  - Mean distance between used day locations and the closest tree was 176.5 m ± 28.5;
  - Additionally, in 2012, a strong avoidance of PJ was observed for used night locations (109.8 m ± 24.7), much more so than used day locations (45.5 m ± 7.8).
- During the day, grouse appeared to use locations farther from PJ (50.0 m ± 10.0) than locations at the population level (23.5 m ± 2.9).
- At night, sage-grouse used locations farther from PJ (111.0 m ± 23.7) than those random locations within the vicinity (48.9 m ± 11.4) and within the study area (17.4 m ± 6.8).

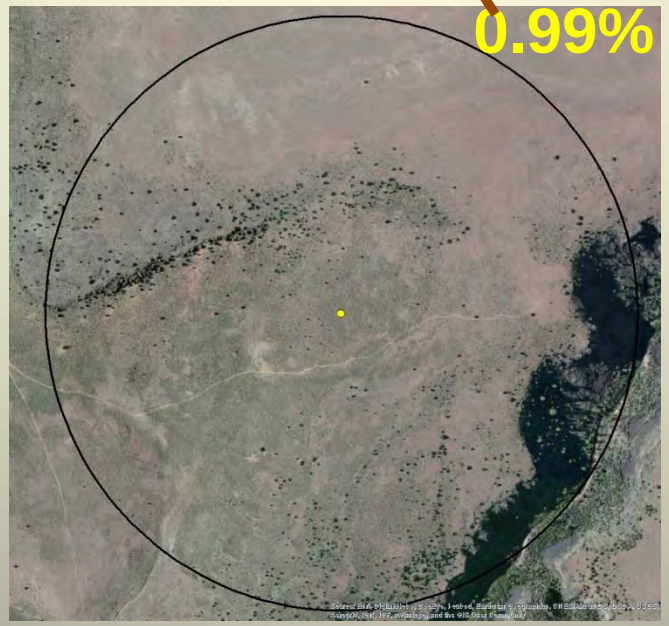


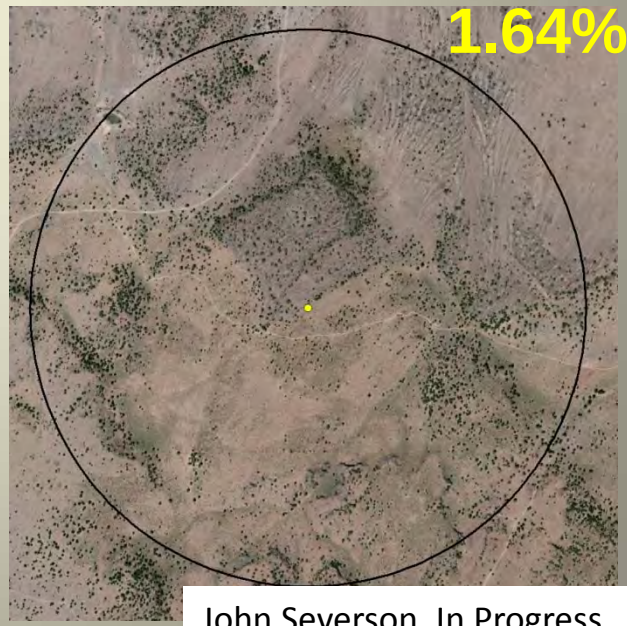
(Preliminary Results – USGS Open File Report XXX-XXXX)

Nest-Site Selection Study









John Severson, In Progress