LANDSCAPE PERSPECTIVE ON INVASIVE PLANTS AND SAGE-GROUSE: UNDERSTANDING IMPACTS AND MANAGING RISKS

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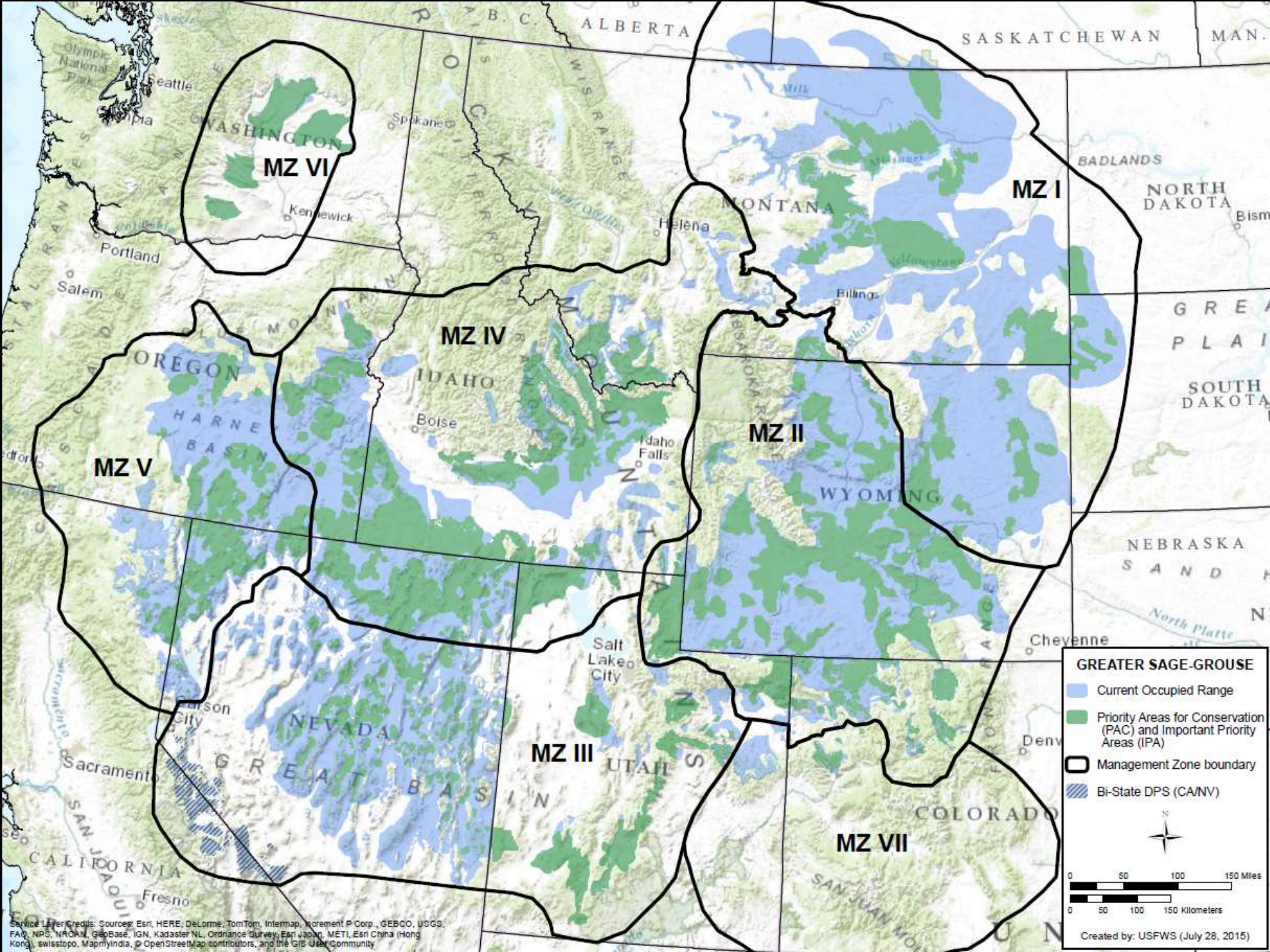
Outline

- Primer on sage-grouse biology/ecology
- Invasive plant impacts on sage-grouse
- Building resilience and resistance to manage risks

Sage-grouse biology and ecology

- Sagebrush obligate
- Diet of sagebrush, other soft plant materials and insects
- High survival, low productivity
- Lek mating system
- High site fidelity
- Clumped distribution
- Landscape species


MZ I
MZ II
MZ III
MZ IV
MZ V
MZ VI
MZ VII
GREATER SAGE-GROUSE
Current Occupied Range
Priority Areas for Conservation (PAC) and Important Priority Areas (IPA)
Management Zone boundary
Bi-State DPS (CA/NV)
0 50 100 150 Miles
0 50 100 150 Kilometers
Created by: USFWS (July 28, 2015)
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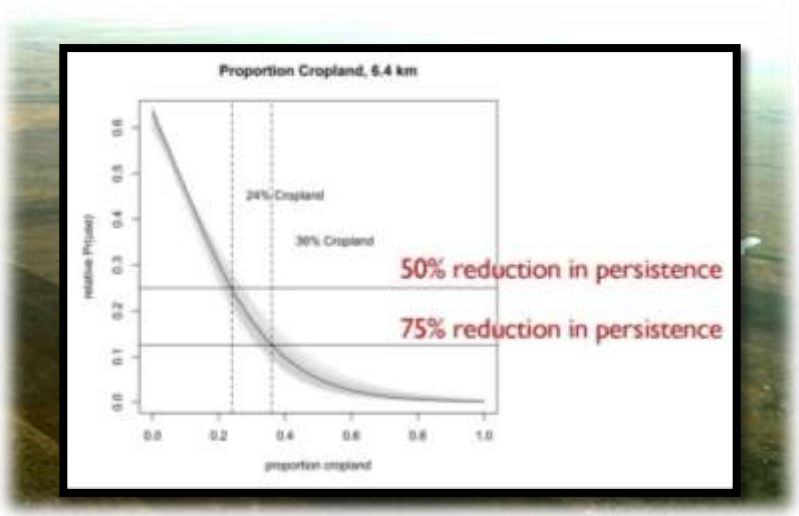
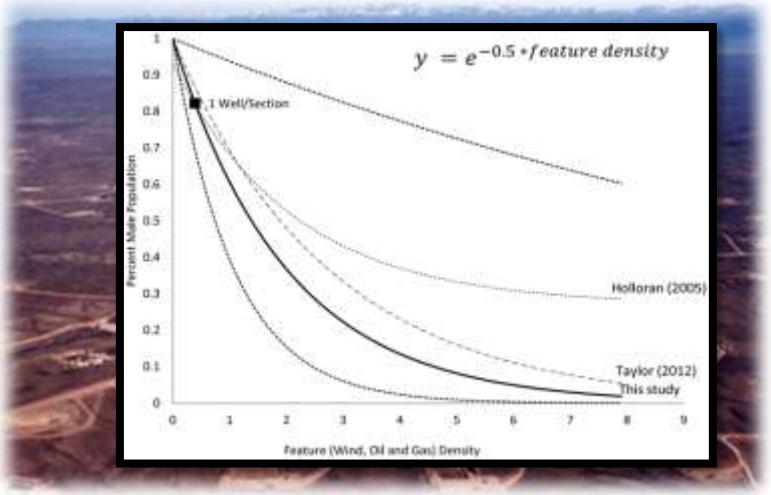
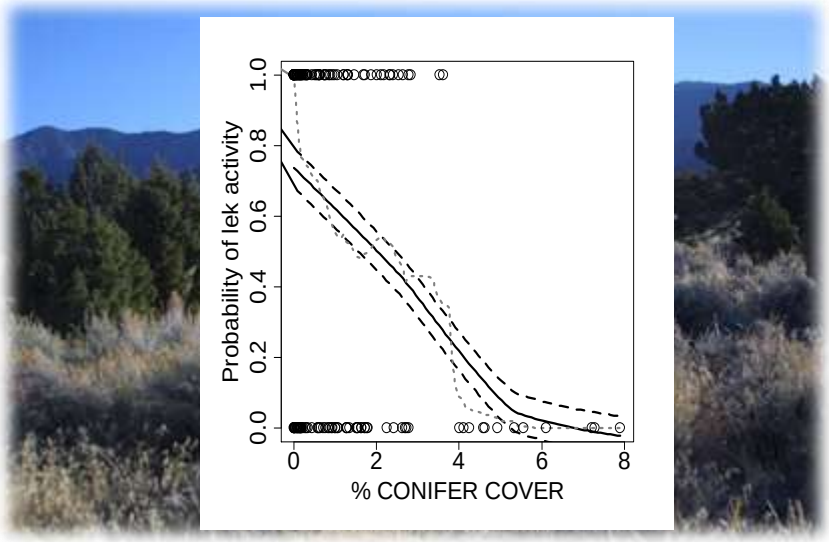
Nesting/ Early Brood-Rearing
Late Brood-Rearing
Fall/ Winter
Lekking/ Breeding


What does it mean to be a "landscape species"?
Sagebrush from horizon to horizon

Effects of landscape fragmentation



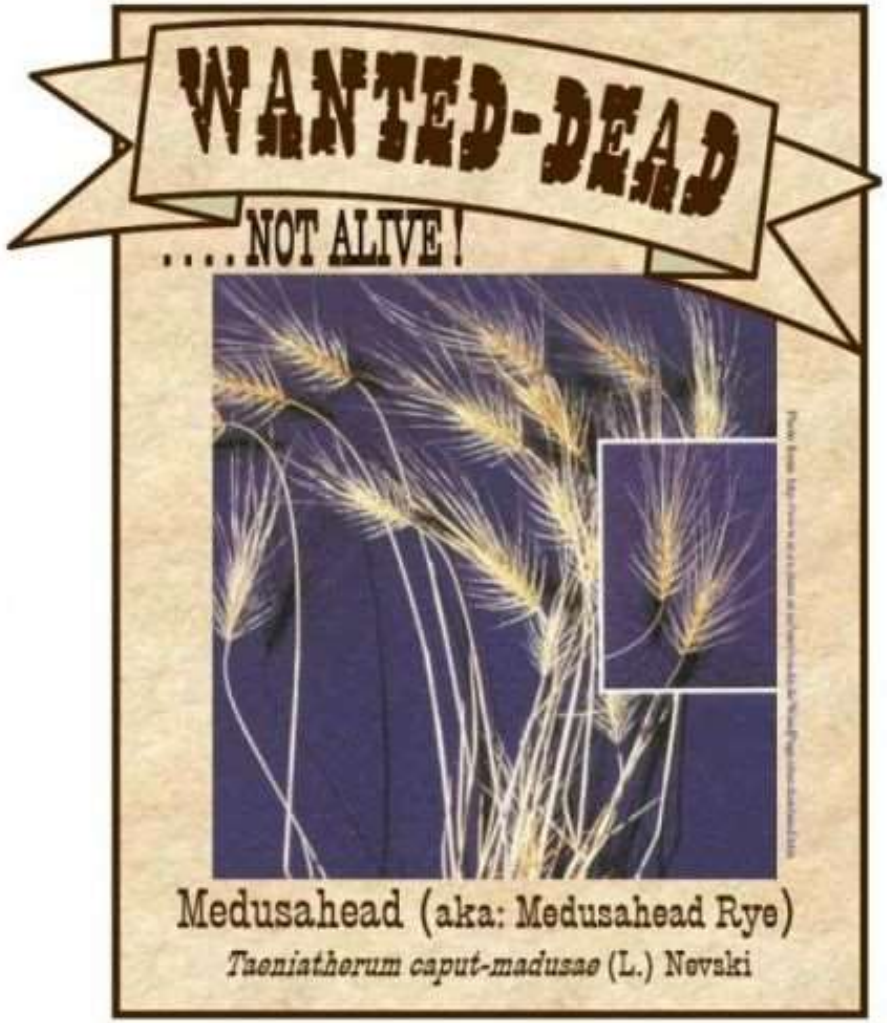




Sage-grouse are an ecosystem focal species

Top Weed Offenders

1. Medusahead
2. Cheatgrass
3. Spotted knapweed
4. Yellow starthistle
5. Diffuse knapweed
6. Leafy spurge
7. Rush skeletonweed
8. Dalmation toadflax
9. Sulpher cinquefoil
10. Canada thistle



Ielmini et al. 2015

Impacts to habitat quality and quantity

- Quality
  - Invasives reduce native grasses, forbs, shrubs
- Quantity
  - Type conversion to new ecological steady states

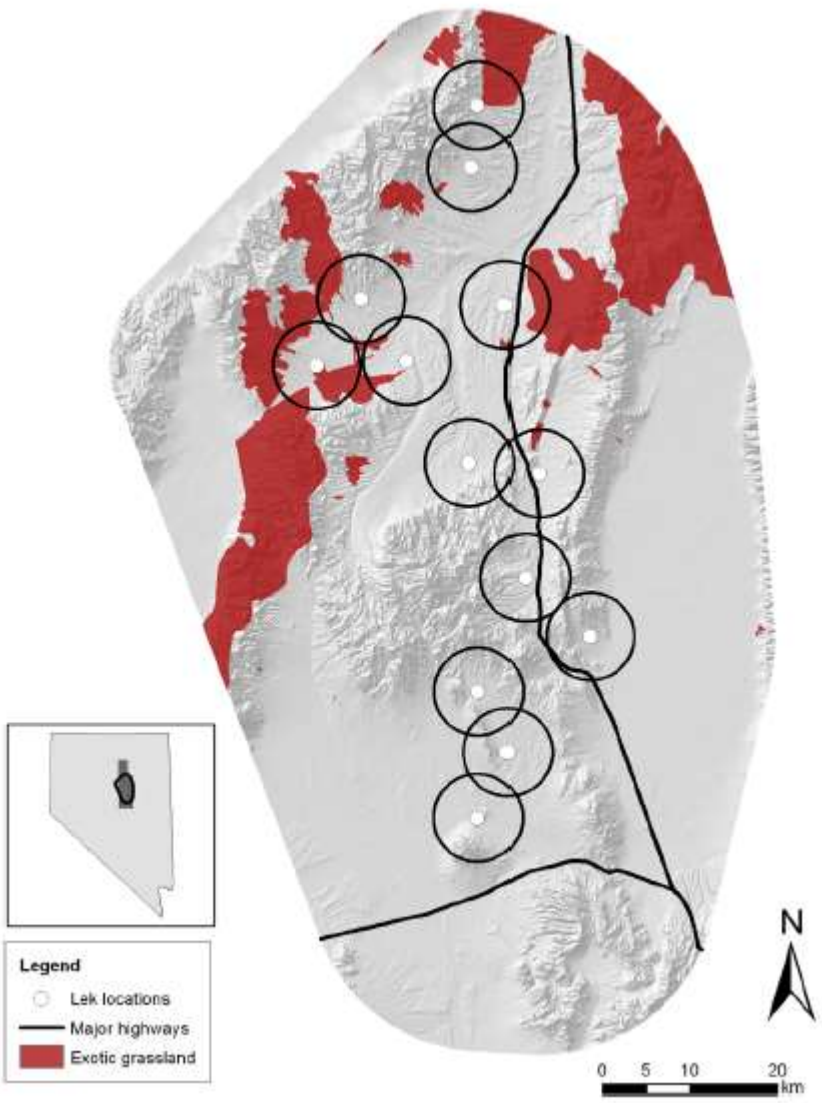
How do the birds respond?

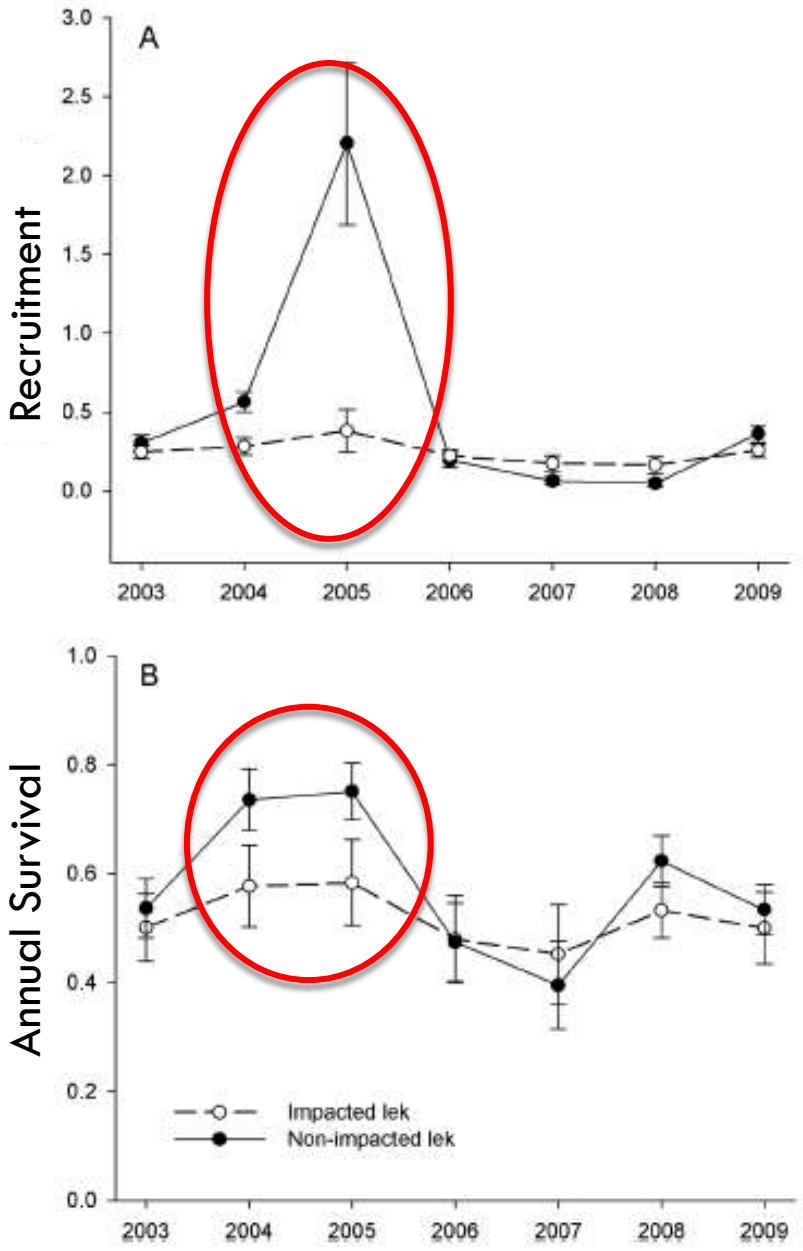
- Nest-site scale (a few m^2 to acres):
  - Sage-grouse hens select nest sites with less cheatgrass (Lockyer et al. 2015, Kirol et al. 2012)

- Landscape scale (several mi^2):
  - Lek trends tend to be lower as the cover of exotic vegetation increases (Johnson et al. 2011)

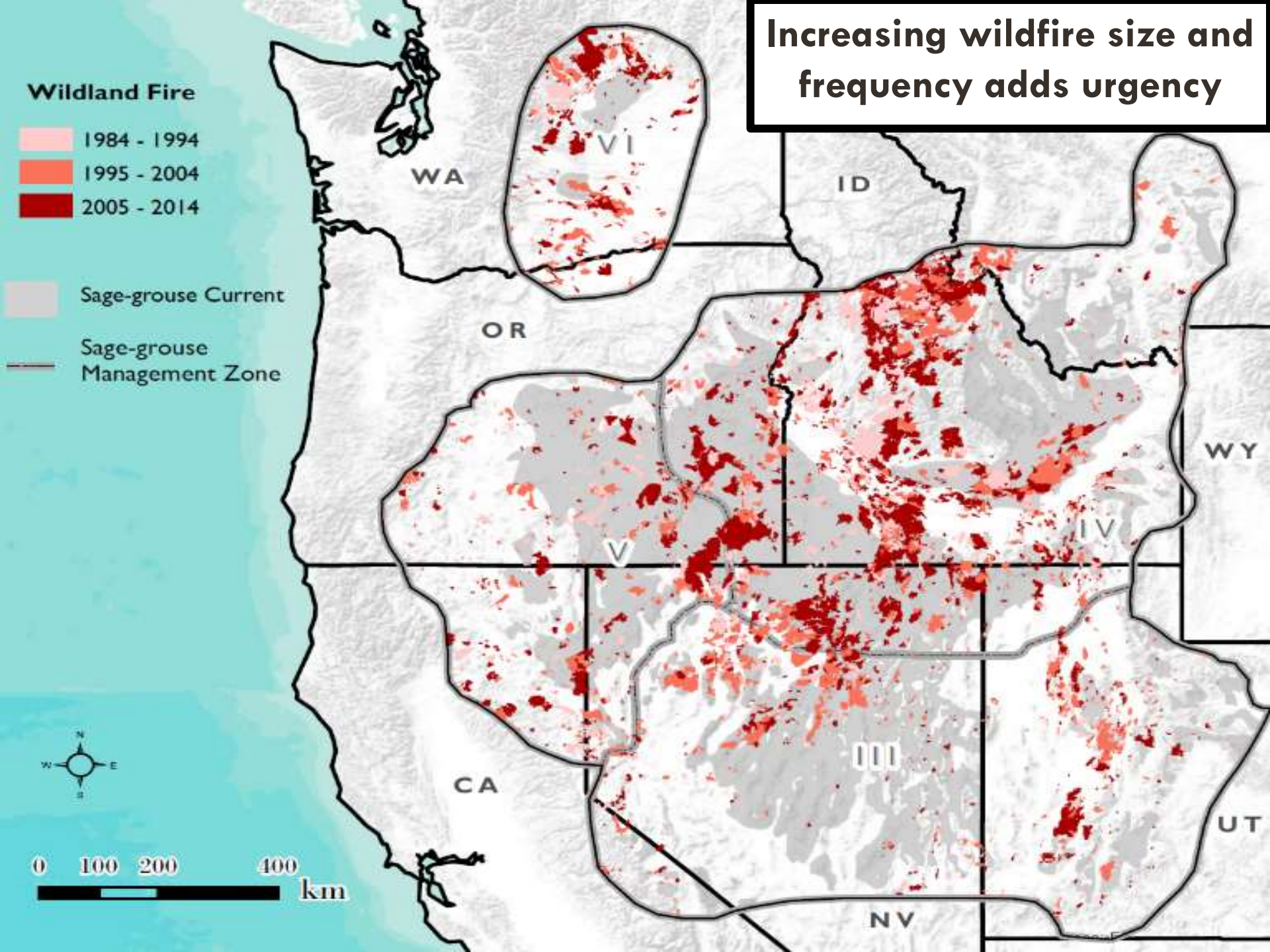
Landscape-scale population response

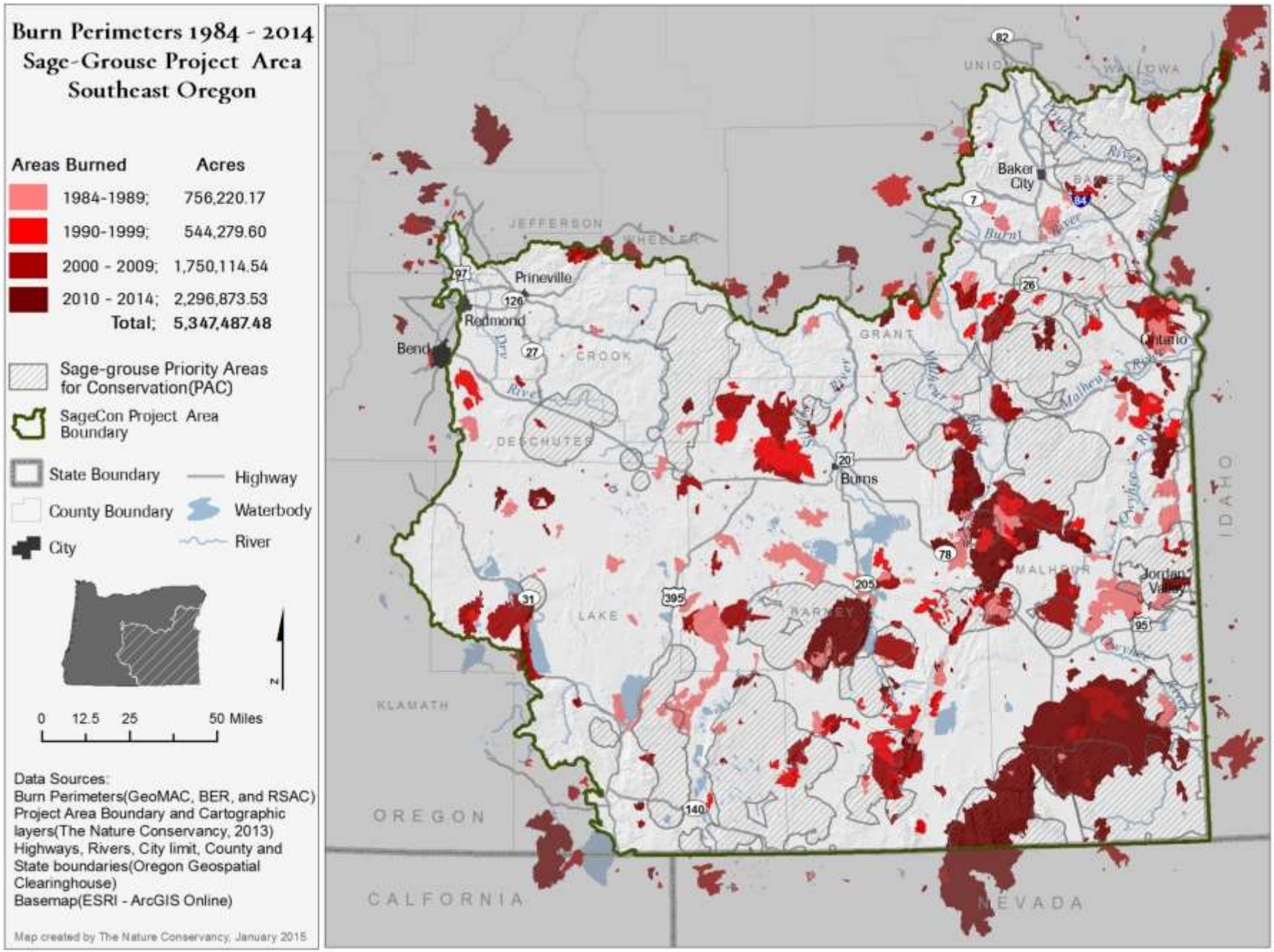
Blomberg et al. 2012



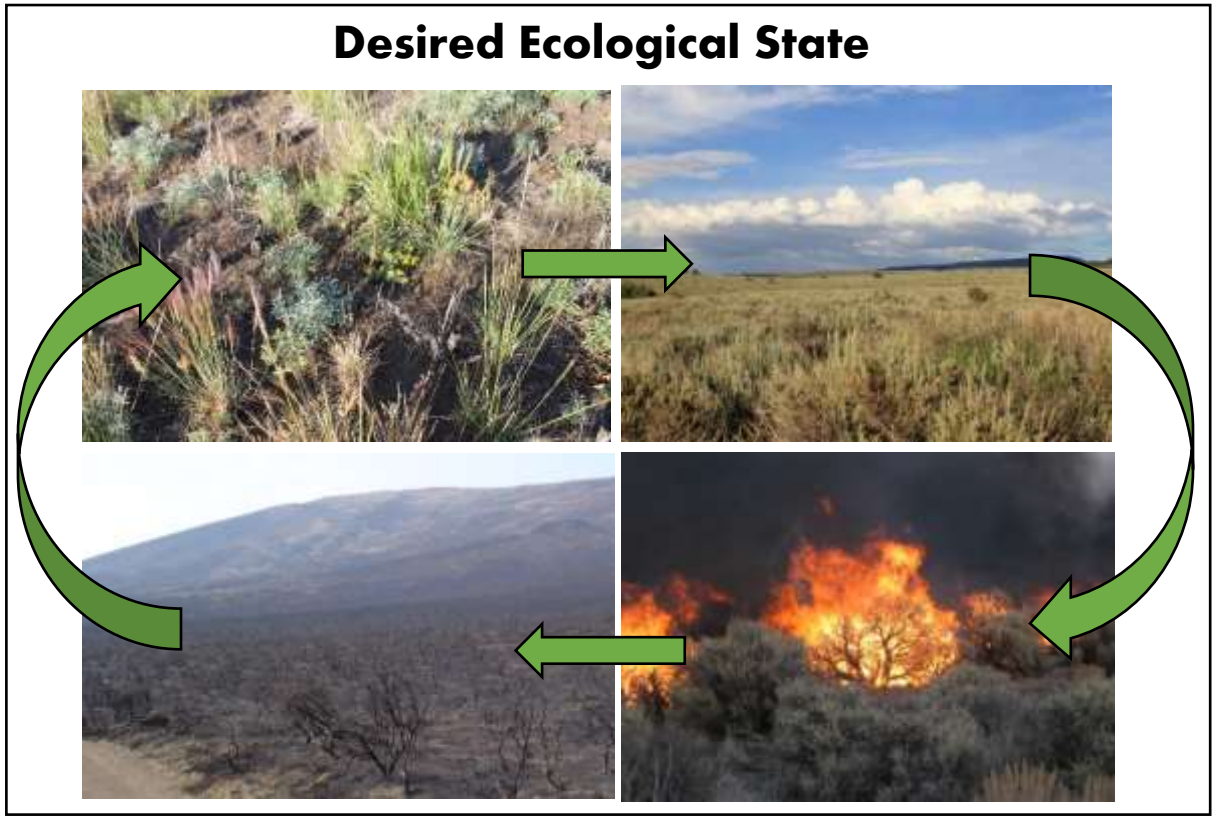


Increasing wildfire size and frequency adds urgency



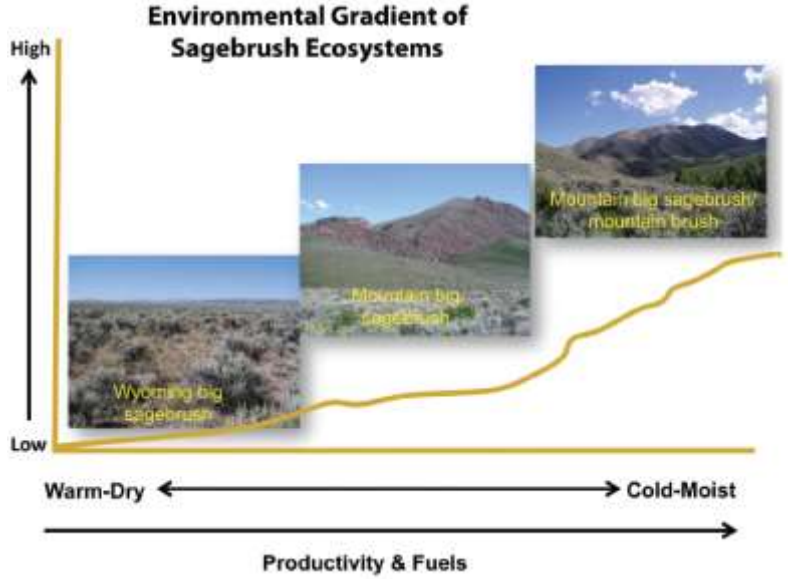


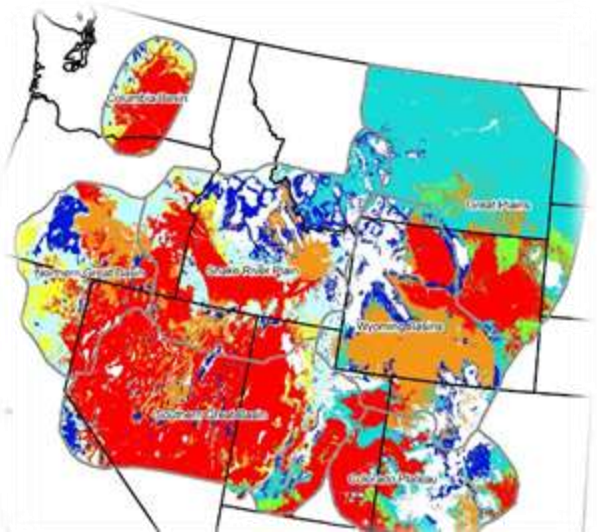
Courtesy of: Garth Fuller, TNC



Threshold

Managing Risks using Resilience and Resistance Concepts

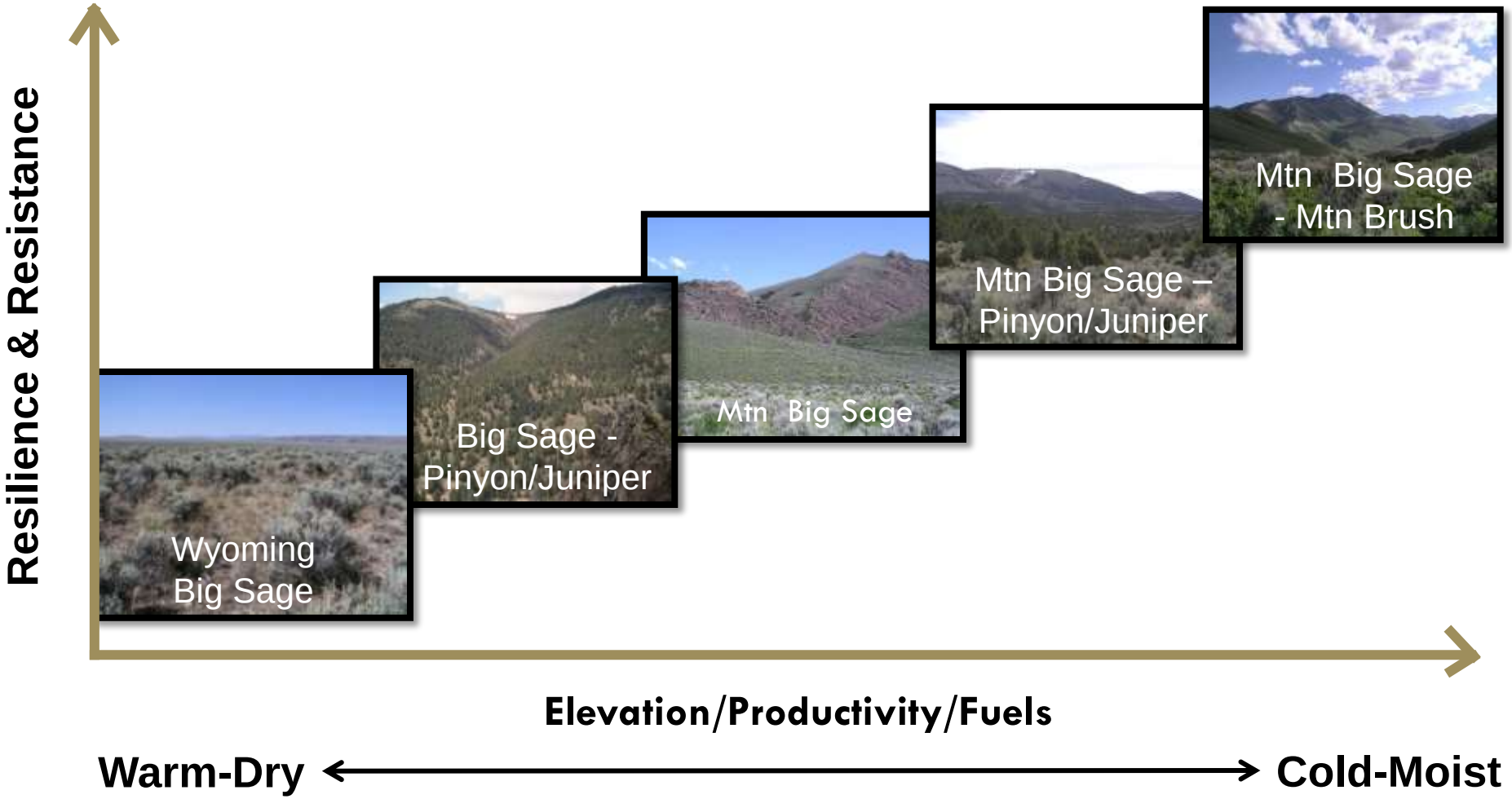




Resilience is the capacity to recover

Resistance is the ability to remain largely unchanged

Risk Varies along Environmental Gradient



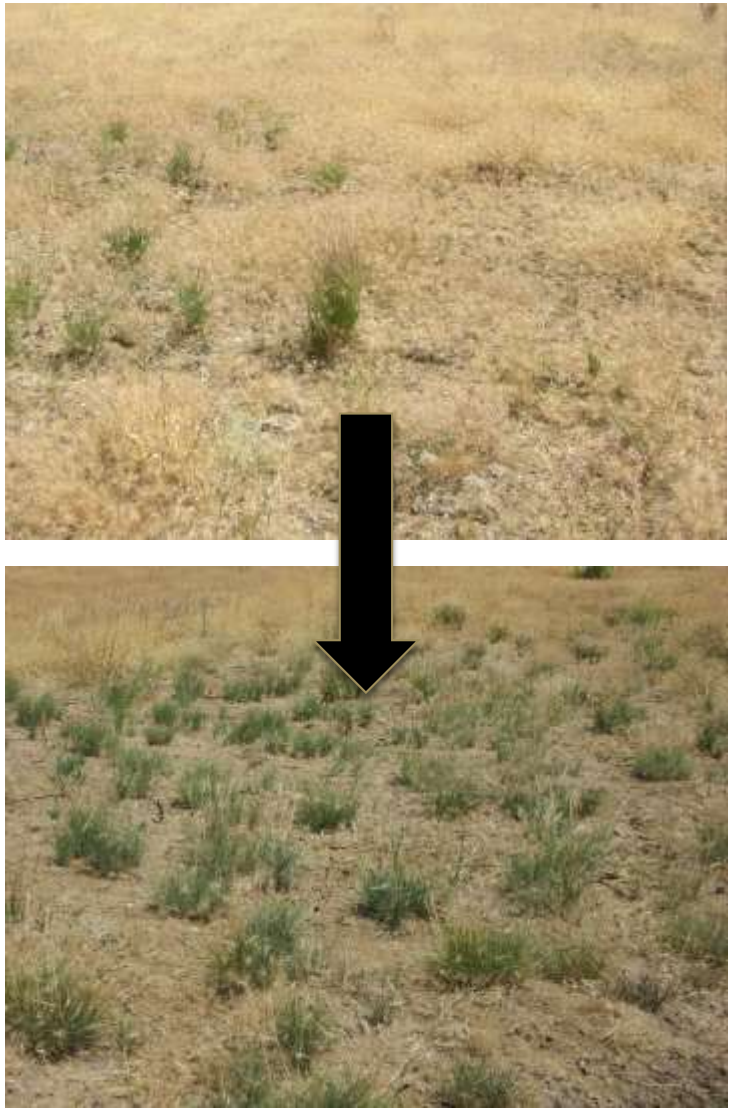
(Chambers et al. 2014. *Ecosystems*)

Key Factors Influencing R&R

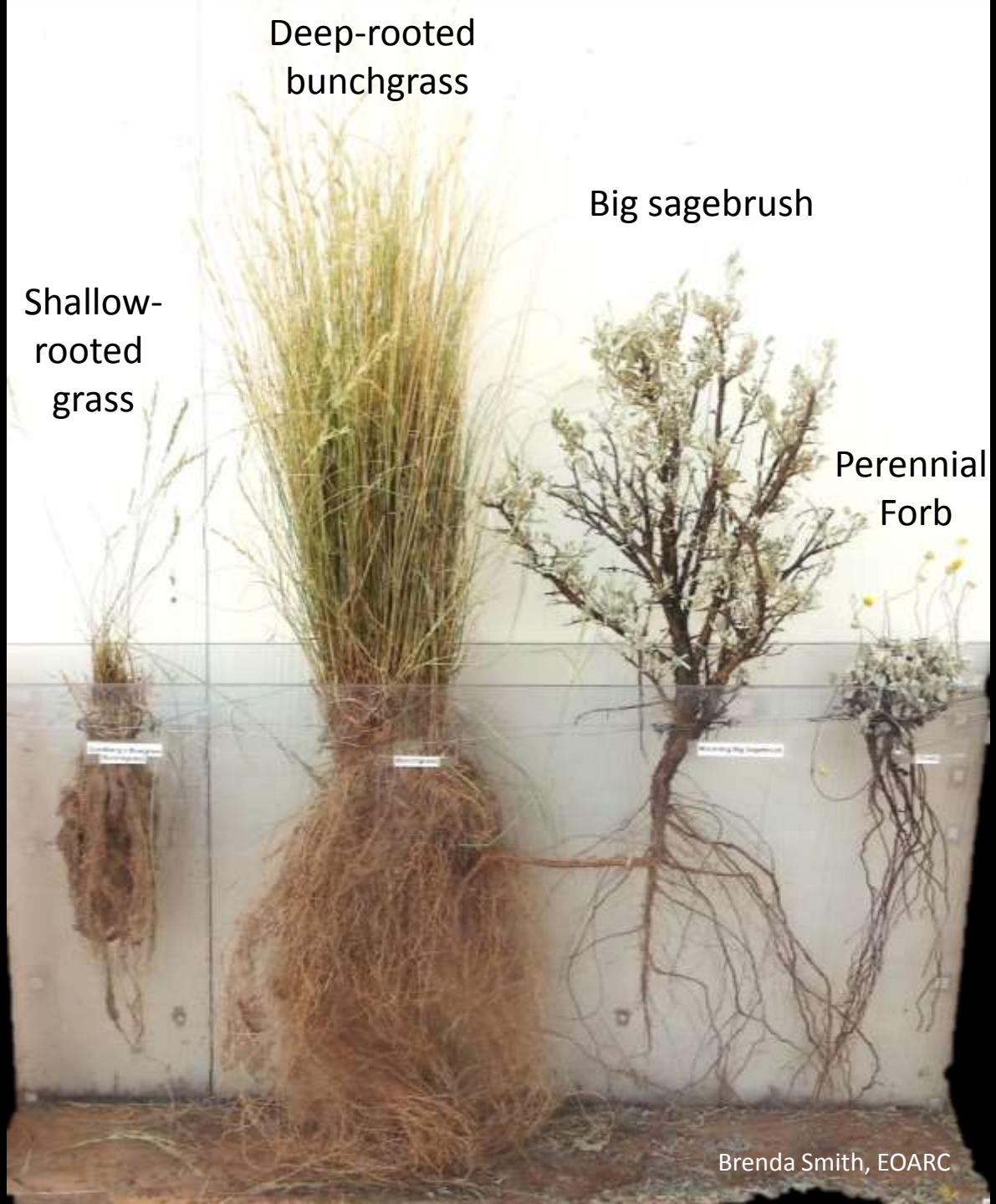
- Soil temperature and moisture
- Soil depth, texture, etc.
- Vegetation composition and abundance
- Disturbance or treatment severity

(Chambers et al. 2007, 2014; Miller et al. 2014)

Perennial grasses are disproportionately important to resistance and resilience



(Davies 2008; Chambers et al. 2007, 2014; Blank and Morgan 2012; Reisner et al. 2013)

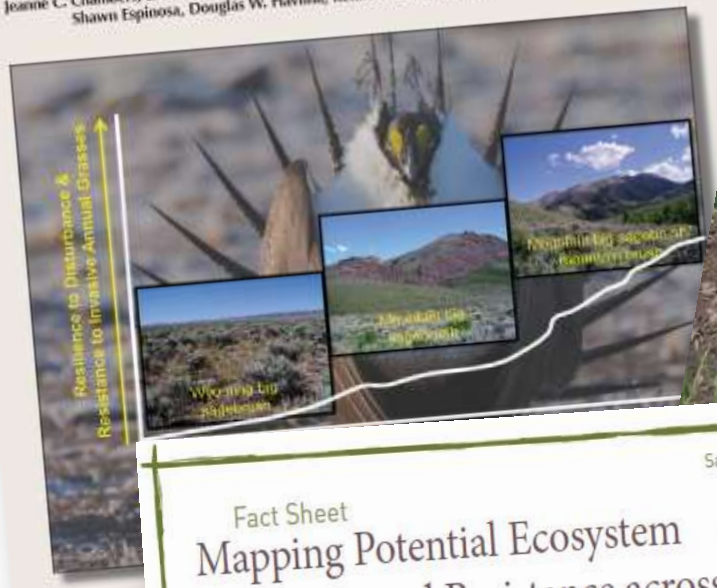

Deep-rooted bunchgrass
Big sagebrush
Shallow-rooted grass
Perennial Forb
Brenda Smith, EOARC


Maintaining and restoring resilient and resistant sagebrush communities serves as a unifying goal

United States Department of Agriculture

Using Resistance and Resilience Concepts to Reduce Impacts of Invasive Annual Grasses and Altered Fire Regimes on the Sagebrush Ecosystem and Greater Sage-Grouse: A Strategic Multi-Scale Approach

Jeanne C. Chambers, David A. Pyke, Jeremy D. Maestas, Mike Pellant, Chad S. Boyd, Steven B. Campbell, Shawn Espinosa, Douglas W. Havlina, Kenneth E. Mayer, and Amarina Wuenschel



A Review of Fire Effects on Vegetation and Soils in the Great Basin Region: Response and Ecological Site Characteristics

Richard F. Miller, Jeanne C. Chambers, David A. Pyke,

USDA

A Field Guide for Selecting the Most Appropriate Treatment in Sagebrush and Piñon-Juniper Ecosystems in the Great Basin

Evaluating Resilience to Disturbance and Resistance to Invasive Annual Grasses, and Predicting Vegetation Response

Richard F. Miller, Jeanne C. Chambers, and Mike Pellant

Warm and dry Wyoming big sagebrush—Invaded State

Sage Grouse Initiative

Fact Sheet

Mapping Potential Ecosystem Resilience and Resistance across Sage-Grouse Range using Soil Temperature and Moisture Regi

Great Basin Factsheet Series

Information and tools to conserve and restore Great Basin ecosystems

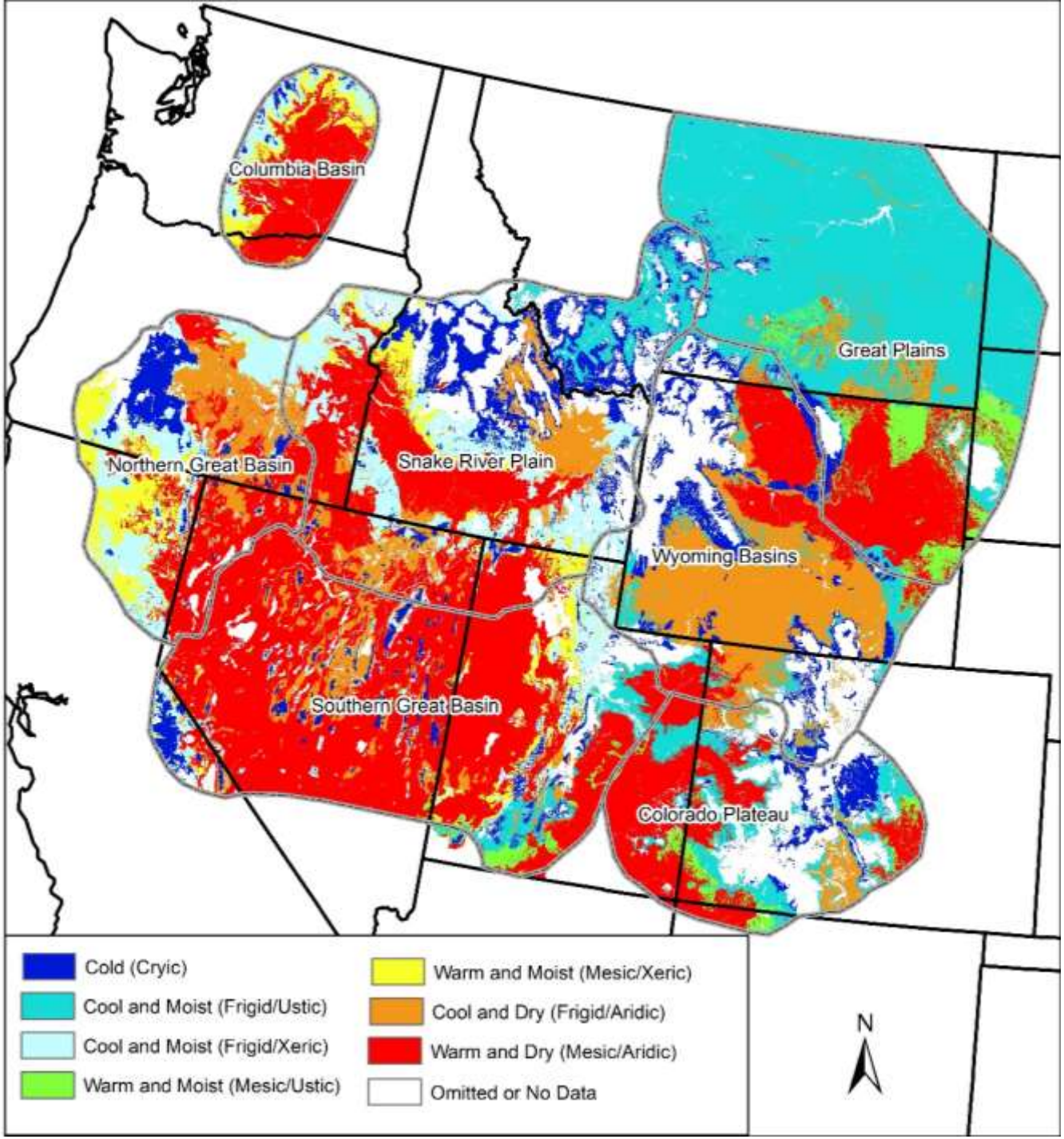
Number 1 • 2015

Putting Resilience and Resistance Concepts into Practice

Estimates of resilience and resistance provide information on how an area is likely to respond to disturbances and management. Relative resilience depends on the underlying characteristics of a site or landscape like climate, soils, and the type of vegetation. In the topographically diverse Great Basin, resilience has been shown to increase with elevation and to differ among vegetation types (Chambers et al. 2014 a, b). Higher precipitation and cooler temperatures, coupled with greater soil development and plant productivity, result in greater resources and more favorable environmental conditions for plant growth and reproduction at mid to high elevations (Figure 1).

In contrast, lower precipitation and higher temperatures in lower available resources for plants at low Aspect, slope, and topographic

Purpose: Land managers are increasingly interested in improving resilience to disturbances, such as wildfire, and resistance to invasive species, such as cheatgrass and medusahead. This factsheet is designed to assist land managers in using resilience and resistance concepts to assess risks, prioritize management activities, and select appropriate treatments.



Soil temperature and moisture regimes

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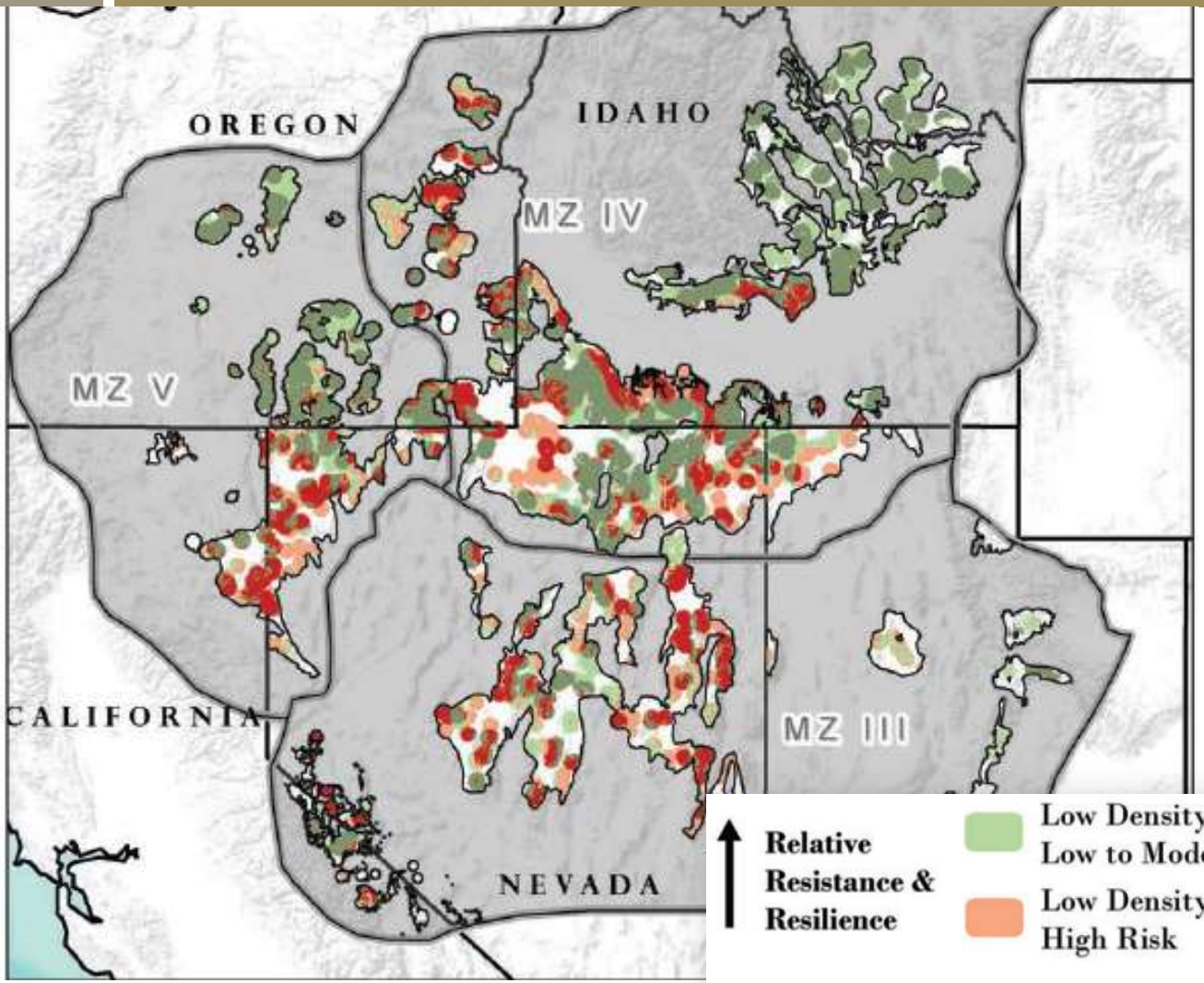
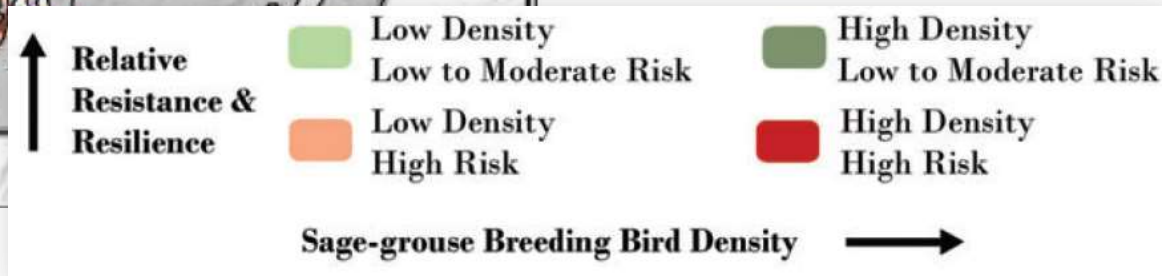
Landscape indicators of R&R

Prioritizing among landscapes

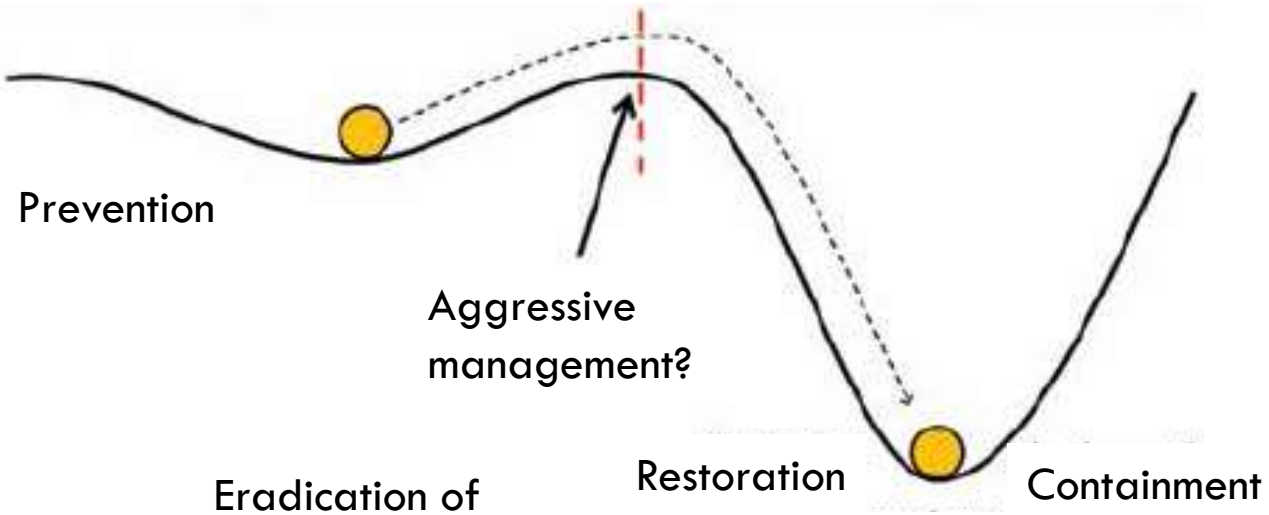


ASSESSING RELATIVE RISKS TO SAGE-GROUSE BREEDING CENTERS



Prioritizing within landscapes

Invasion State	Cheatgrass Free	Trace	Mild Infestation	Moderate Infestation	Cheatgrass Dominated
	There is no cheatgrass present on the site. Desirable community is thriving; functional and structoral groups are represented.	Cheatgrass is present (1-5% cover) but manageable. Desirable community is thriving; functional and structural groups are represented.	Cheatgrass is common (6-25%). Desirable community is still present and functioning.	Cheatgrass is approaching dominance (26-50%). Desirable community is impacted with some structural and functional groups missing.	Cheatgrass comprises a majority of the vegetation (51-100%). Desirable community is rare or non-existent.
Level*	Level 1	Level 2	Level 3	Level 4	Level 5



Adapted from Mealor et al. 2013

Closing Thoughts

- **Strategically target the right places**
- **Focus on increasing resilience and resistance**
  = ⬆ perennial grass density + ⬇ weeds