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
Current Occupied Range

Priority Areas for Conservation (PAC) and Important Priority Areas (IPA)

Bi-state DPS (CA/NV)
What does it mean to be a “landscape species”?

Sagebrush from horizon to horizon
Effects of landscape fragmentation

- Proportion Cropland, 6.4 km
- Probability of lek activity

\[ y = e^{-0.5 \times \text{feature density}} \]
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

Legend
- Lek locations
- Major highways
- Exotic grassland

Impacted lek
Non-impacted lek

Annual Survival

Recruitment

2003 2004 2005 2006 2007 2008 2009
Increasing wildfire size and frequency adds urgency.
Burn Perimeters 1984 - 2014
Sage-Grouse Project Area
Southeast Oregon

Areas Burned | Acres
--- | ---
1984-1989 | 756,220.17
1990-1999 | 544,279.60
2000-2009 | 1,750,114.54
2010-2014 | 2,296,873.53
Total | 5,347,487.48

Data Sources:
Burn Perimeters (GeoMAC, BER, and RSAC)
Project Area Boundary and Cartographic layers (The Nature Conservancy, 2013)
Highways, Rivers, City limit, County and State boundaries (Oregon Geospatial Clearinghouse)
Basemap (ESRI - ArcGIS Online)

Map created by The Nature Conservancy, January 2015

Courtesy of: Garth Fuller, TNC
Desired Ecological State

Threshold

Undesired Ecological State
Managing Risks using Resilience and Resistance Concepts

Environmental Gradient of Sagebrush Ecosystems

Productivity & Fuels

Warm-Dry -- Cold-Moist

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Environmental Gradient of Sagebrush Ecosystems

Productivity & Fuels

Warm-Dry -- Cold-Moist
**Resilience** is the capacity to recover

**Resistance** is the ability to remain largely unchanged
Risk Varies along Environmental Gradient

Elevation/Productivity/Fuels

Warm-Dry  Cold-Moist

Resilience & Resistance

Wyoming Big Sage

Big Sage - Pinyon/Juniper

Mtn Big Sage

Mtn Big Sage - Mtn Brush

(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.
Soil temperature and moisture regimes = Landscape indicators of R&R
Prioritizing among landscapes

Assessing Relative Risks to Sage-Grouse Breeding Centers
### Prioritizing within landscapes

<table>
<thead>
<tr>
<th>Invasion State</th>
<th>Cheatgrass Free</th>
<th>Trace</th>
<th>Mild Infestation</th>
<th>Moderate Infestation</th>
<th>Cheatgrass Dominated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level*</td>
<td>Level 1</td>
<td>Level 2</td>
<td>Level 3</td>
<td>Level 4</td>
<td>Level 5</td>
</tr>
</tbody>
</table>

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

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## Prevention
- Aggressive management?

## Eradication of source populations

## Restoration

## Long-term management

## Containment

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Adapted from Mealor et al. 2013
Closing Thoughts

• Strategically target the right places
• Focus on increasing resilience and resistance
  = ↑perennial grass density + ↓weeds