Trial by Fire

Improving Our Ability to Reduce Wildfire Impacts to Sage-Grouse and Sagebrush Ecosystems Through Accelerated Partner Collaboration

By Tim Murphy, David E. Naugle, Randall Eardley, Jeremy D. Maestas, Tim Griffiths, Mike Pellant, and San J. Stiver

On the Ground

- Conservation partners across 11 western states are rallying in unprecedented fashion to reduce threats to sage-grouse and the sagebrush ecosystem they occupy.
- Improvements made in the Bureau of Land Management’s (BLM) wildfire policy are a tremendous step forward but the 2012 wildfire season is a harsh reminder that more action is needed to improve our effectiveness in reducing impacts to sage-grouse.
- Challenges and opportunities presented here are intended to heighten awareness of the wildfire issue and to further accelerate a mutually agreed upon, spatially explicit path forward, so that all partners can quickly engage in its implementation.

Keywords: Great Basin, fuels management, landscape approach, partnerships, sage-grouse, cheatgrass, wildfire

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Already preventing 97-99% of wildfires from becoming large

<table>
<thead>
<tr>
<th>Fire Size (Acres)</th>
<th>&lt; 1</th>
<th>&lt; 10</th>
<th>&lt; 100</th>
<th>&lt; 1k</th>
<th>&lt; 10k</th>
<th>&gt; 10k</th>
</tr>
</thead>
<tbody>
<tr>
<td># of fires</td>
<td>17,838</td>
<td>8,742</td>
<td>3,819</td>
<td>2,202</td>
<td>939</td>
<td>242</td>
</tr>
<tr>
<td>Cumulative % of all fires</td>
<td>53%</td>
<td>79%</td>
<td>90%</td>
<td>97%</td>
<td>99%</td>
<td>100%</td>
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Data sources: NIFC; Short 2014
What to do about the 1-3%?

- Occurring under Extreme Fire Hazard conditions
- *The Perfect Storm* - High temperatures, high winds, low humidity, and multiple fire starts
- Example: 2012 fire season

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Human nature: 

Fight harder!
Fire Managers:

Help us ‘compartmentalize’ before fire
We lacked a mutually agreed upon strategic approach

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

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FWS Conservation Objectives Team (2013)

Greater Sage-Grouse Management Objective ~
"the long-term conservation of sage-grouse and healthy
sagebrush shrub and native perennial grass and forb communities
by maintaining viable, connected, and well-distributed populations
and habitats, through threat amelioration, conservation of key
habitats, and restoration activities,“

Key element ~ managing for resilience

- Broadly distributed and widely ranging species
- Requires large populations in large blocks across full
  range of habitats
- Strategic multi-scale approach – Landscape to site

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**INVASIVE SPECIES AND WILDFIRE MANAGEMENT GOALS**

- *Increase resilience of native ecosystems to disturbance*

- *Enhance resistance to invasive species*
  - Maintain amount of landscape sagebrush cover required for sage-grouse
  - Increase perennial herbaceous species
  - Decrease invasive annual grass abundance & spread
ENVIRONMENTAL GRADIENTS

- Warm-Dry
- Cold-Moist
- Elevation/Productivity/Fuels

Big Sage - Pinyon/Juniper
Wyoming Big Sage
Mtn Big Sage - Pinyon/Juniper
Mtn Big Sage
Mtn Big Sage - Mtn Brush
RESILIENCE TO DISTURBANCE

Resilience changes over environmental gradients

- More favorable growing conditions, higher productivity & fire tolerant species
  - Less change
  - More rapid recovery

(Wisdom & Chambers 2009; Brooks and Chambers 2011; Condon et al. 2011; Davies et al. 2012; Chambers et al. 2014a, b; Miller et al. 2014)

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**Resilience to Disturbance**

Resilience decreases with disturbance/stress outside of natural range of variability

- Changes in vegetation structure or composition
  - Invasive species
  - Woody species
- Altered fire regimes
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Resistance to Cheatgrass

Resistance depends on climate suitability & community attributes
- Lowest – Wyoming sage
- Highest - mountain sage

(Chambers et al. 2007, Condon et al. 2011, Davies et al. 2012)
RESISTANCE TO CHEATGRASS

Resistance decreases with disturbance/stress

- Fire, surface disturbance, inappropriate grazing
- Increases in soil water & nutrients
- Decreased competition
  - Removal – 2 to 3 fold
  - Burning – 2 to 6 fold
  - Removal + Burning –10 to 30 fold

(Chambers et al. 2007)
<table>
<thead>
<tr>
<th>Ecological Type</th>
<th>Characteristics</th>
<th>Resilience and resistance</th>
</tr>
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<tbody>
<tr>
<td>Cold &amp; Moist</td>
<td>Typical shrubs: Mountain big sagebrush, Snowfield sagebrush, snowberry, serviceberry, silver sagebrush, and/or low sagebrushes</td>
<td>Resilience – Moderately high Resistance– High</td>
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<td>Cryic (all)</td>
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<td>Cool &amp; Moist Frigid/Xeric</td>
<td>Ppt: 12-22” Typical shrubs: Mountain big sagebrush, antelope bitterbrush, snowberry, and/or low sagebrushes Piñon pine and juniper potential in some areas</td>
<td>Resilience – Moderately high Resistance – Moderate</td>
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<td>Warm &amp; Moist Mesic/Xeric</td>
<td>Ppt: 12-16” Typical shrubs: Wyoming big sagebrush, mountain big sagebrush, Bonneville big sagebrush, and/or low sagebrushes Piñon pine and juniper potential in some areas</td>
<td>Resilience – Moderate Resistance – Moderately low</td>
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<td>Cool &amp; Dry Frigid/Aridic</td>
<td>Ppt: 6-12” Typical shrubs: Wyoming big sagebrush, black sagebrush, and/or low sagebrushes</td>
<td>Resilience – Low Resistance – Moderate</td>
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<td>Warm &amp; Dry Mesic/Aridic bordering on Xeric</td>
<td>Ppt: 8-12” Typical shrubs: Wyoming big sagebrush, and/or black sagebrush and/or low sagebrushes (large portion of the Great Basin)</td>
<td>Resilience – Low Resistance – Low</td>
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**RESISTANCE & RESILIENCE OF ECOLOGICAL TYPES**

**ECOLOGICAL TYPE CHARACTERISTICS**

- **Cold & Moist Cryic (all):**
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SOIL TEMPERATURE & MOISTURE REGIMES

Soil temperature & moisture regimes = Indicator of resilience & resistance

SURGO – 1:24,000 with gaps filled with STATCO -1:250:000
(Maestas & Campbell 2014)

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SAGE-GROUSE HABITAT REQUIREMENTS

- **Landscape cover of sagebrush**
  - High risk of extirpation with < 25% land cover of sagebrush
  - Intermediate probability of persistence with 25 to 65% cover
  - High probability of persistence with > 65% land cover of sagebrush
  (5-30 km radii around leks; Aldridge & Boyce 2007, Knick et al. 2013, Wisdom et al. 2011)

- **Landscape cover of conifers**
  - Leks average < 1% if conifer cover is present
  - Leks are absent with > 40% conifer cover
  (5-km radii around leks; Knick et al. 2013)

- **Cover of annual grasses**
  - Nesting areas have < 6 to 8% annual grass
  (Johnson et al. 2011; Kirol et al. 2012; Lockyer et al. in press)
Landscape Cover of Sagebrush

Landscape cover of sagebrush = Indicator of sage-grouse habitat

Proportion sagebrush within each categories in 5-km radius
Landfire 2013 Imagery

Sagebrush % Area
- 0 - 25
- 25 - 65
- > 65
# SAGE-GROUSE HABITAT MATRIX

## Proportion of Landscape Dominated by Sagebrush

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<tr>
<th>Resilience &amp; Resistance of Sagebrush Community</th>
<th>Low = &lt; 25%</th>
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<td>Requires longer timeframe, enhance connectivity.</td>
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- Annual invasive risk moderate
- Treatment success depends on site characteristics

**RESTORATION/RECOVERY POTENTIAL LOW**
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- Annual invasive risk is high
- May require multiple management interventions
**Sage-Grouse Habitat Matrix**

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MANAGEMENT STRATEGIES

Potential actions organized by management strategies within resilience and resistance categories

- Fire Operations – Preparedness, Prevention and Suppression
- Fuels Management
- Post-fire Rehabilitation
- Habitat Recovery/Restoration
Focal areas for management support viable populations of birds

- Priority Areas for Conservation (PACs)
  - Landscape scale cover of sagebrush
  - Soil temperature/moisture regimes
- Threats
  - Invasive annual grass cover
  - Pinyon and juniper cover

+ Breeding Bird Density – maximum counts of males on leks
  - High density = areas with 75% BBD
    (Doherty et al. 2010)
+ Locally relevant information
LANDSCAPE COVER OF SAGEBRUSH IN PACs

- Sage-grouse Management Zone
- Non Priority Area for Conservation
- Fire Perimeter (post 2000)
- Sagebrush % Area within a 5K Radius
  - 1 - 25
  - 25 - 65
  - 65 - 100

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BREEDING BIRD DENSITIES AND R & R

Low Density
Low R & R

High Density
High to Mod R & R

Low Density
Low R & R

High Density
Low R & R

Sage-grouse Breeding Bird Density

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SCALING DOWN TO THE SITE

Selecting Appropriate Sites and Management Treatments

- Steps in the process
  - Assess potential treatment area and identify ecological sites
  - Determine ecological states and plant communities for the different sites
  - Select appropriate action(s)
  - Monitor to determine post-treatment management
Warm and Dry Wyoming Big Sagebrush
Low Resilience and Resistance

DECISION TOOLS

State & Transition Models
that incorporate R & R concepts

- Ecological States
- Plant Communities
  ➢ Restoration pathways

Chambers et al. 2014
DECISION TOOLS

Field Guides

- Selecting the most appropriate treatments in sagebrush and pinyon-juniper ecosystems &
- Evaluating site recovery potential in sagebrush ecosystems after wildfire (Miller, Chambers, & Pellant 2014)
- Restoration of sagebrush-steppe ecosystems with special emphasis on Greater Sage-Grouse habitat (Pyke et al. in progress)