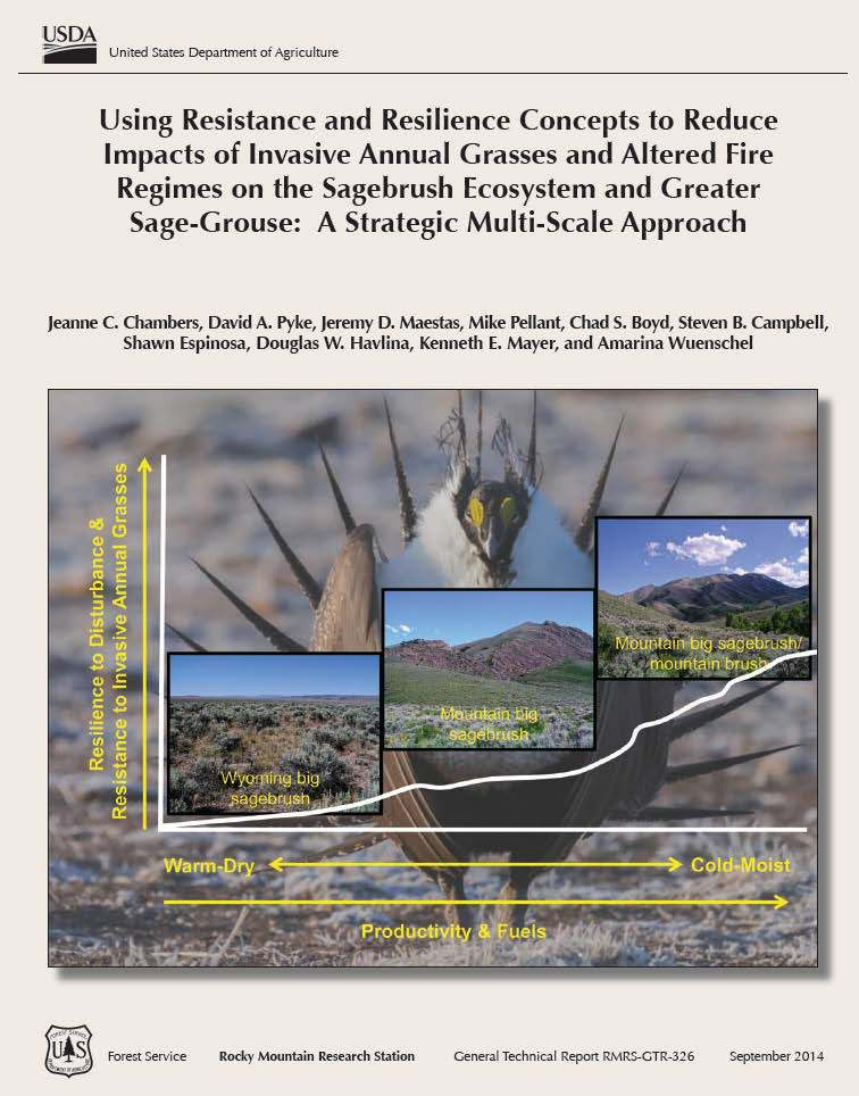
Using Resilience and Resistance Concepts to Manage Threats to Sagebrush Ecosystems, Gunnison Sage-Grouse, and Greater Sage-Grouse

http://www.treesearch.fs.fed.us/pubs/53201use

Jeanne C. Chambers, Jeffrey L. Beck, Steve Campbell, John Carlson, Thomas J. Christiansen, Karen Clause, Jonathan B. Dinkins, Kevin E. Doherty, Kathleen A. Griffin, Douglas W. Havlina, Ken Henke, Jacob D. Hennig, Laurie Kurth, Jeremy D. Maestas, Mary Manning, Kenneth E. Mayer, Brian A. Mealor, Clinton W. McCarthy, Marco A. Perea, David A. Pyke

The Science Basis - Resilience and Resistance


USDA 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

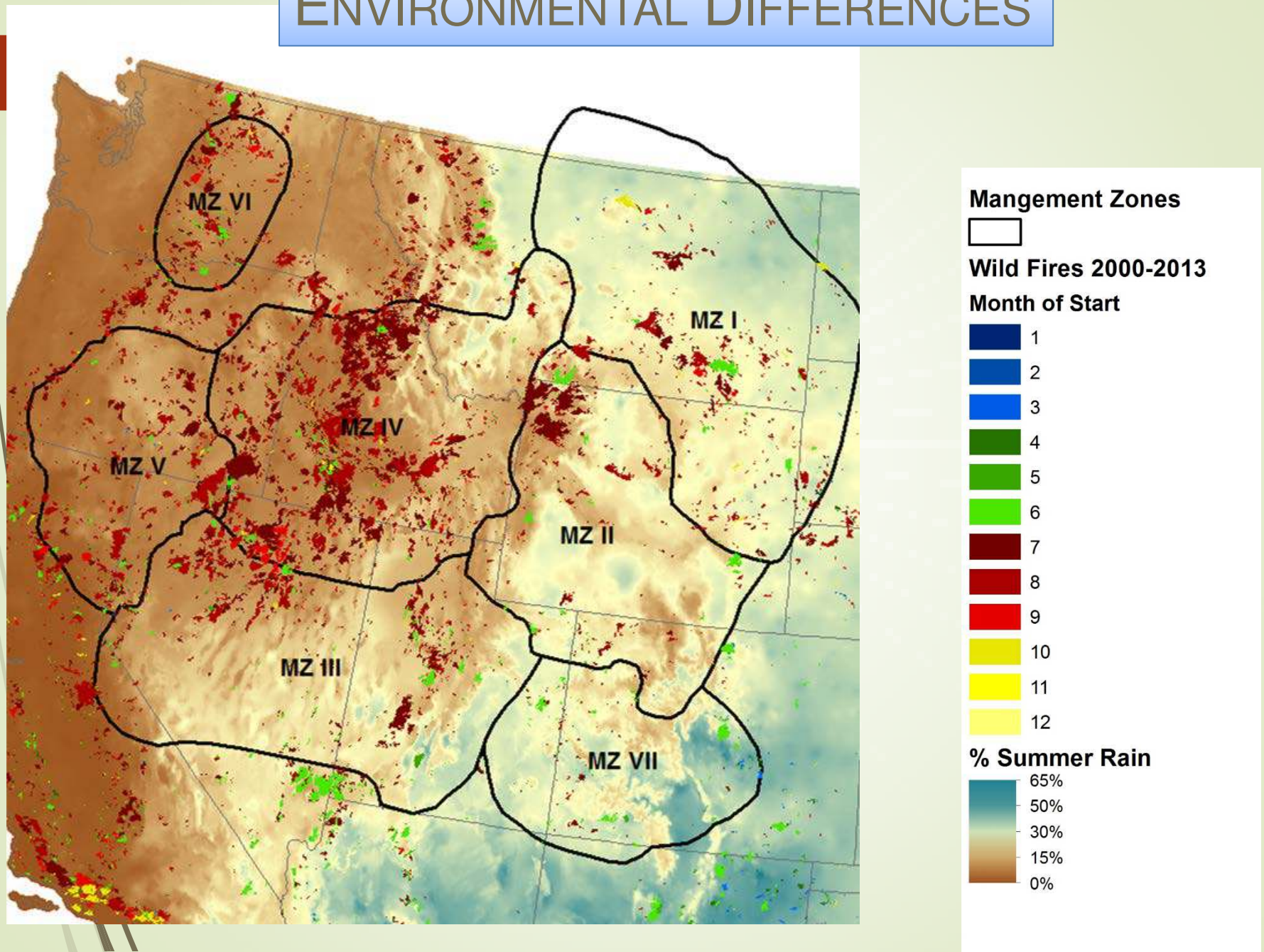
Forest Service Rocky Mountain Research Station General Technical Report RMRS-GTR-326 September 2014

WAFWA Fire and Invasives Working Group –

- Developed scientific basis to -
  - Select areas for management in the Great Basin
  - Determine management strategies
- Approach incorporated into-
  - BLM Fire and Invasives Assessment Tool (FIAT)
  - Integrated Rangeland Fire Strategy DOI Sec. Order 3336
  - Eastern Range GTR (SMRRT)

http://www.treesearch.fs.fed.us/pubs/46329

Environmental Differences



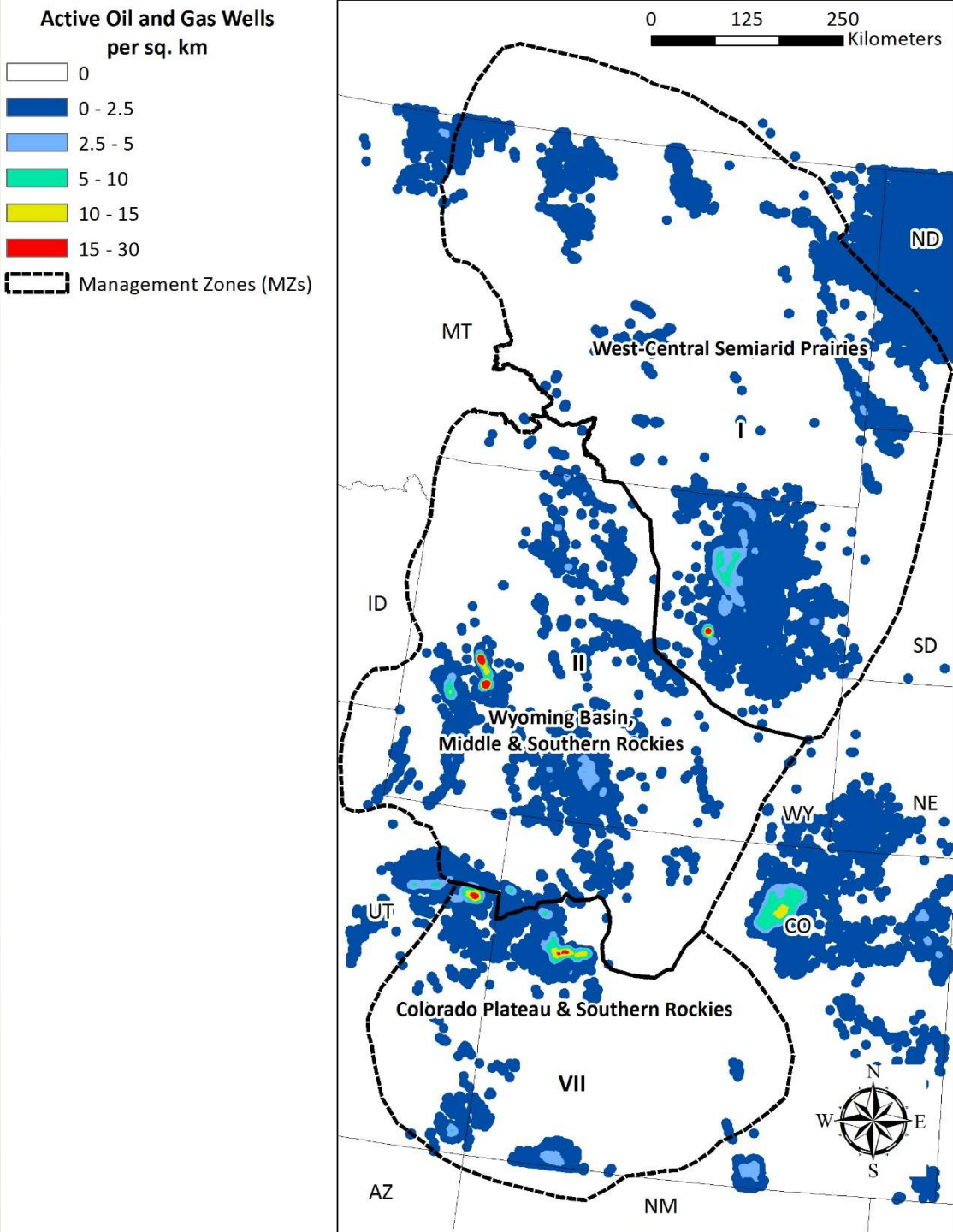
Threats to Sagebrush Ecosystems

Anthropogenic Threats

- Cropland Conversion
- Oil and Gas Development
- Exurban Development
- Improper Livestock Grazing
- Recreation

Climate Change

- Effects on Ecosystems and Species



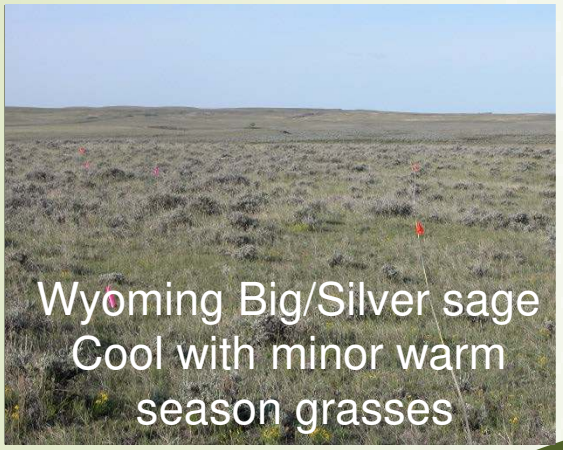
Environmental Gradients
Cold Desert

Chambers 2005,
Chambers et al. 2007,
Wisdom & Chambers 2009;
Brooks & Chambers 2011;
Condon et al. 2011;
Chambers et al. 2014a,b

Warm-Dry *to* Warm-Dry bordering on Summer Moist ⟷ **Cold-Wet *to* Cold- Summer Moist**

Productivity →

Environmental Gradients West-Central Semiarid Prairies



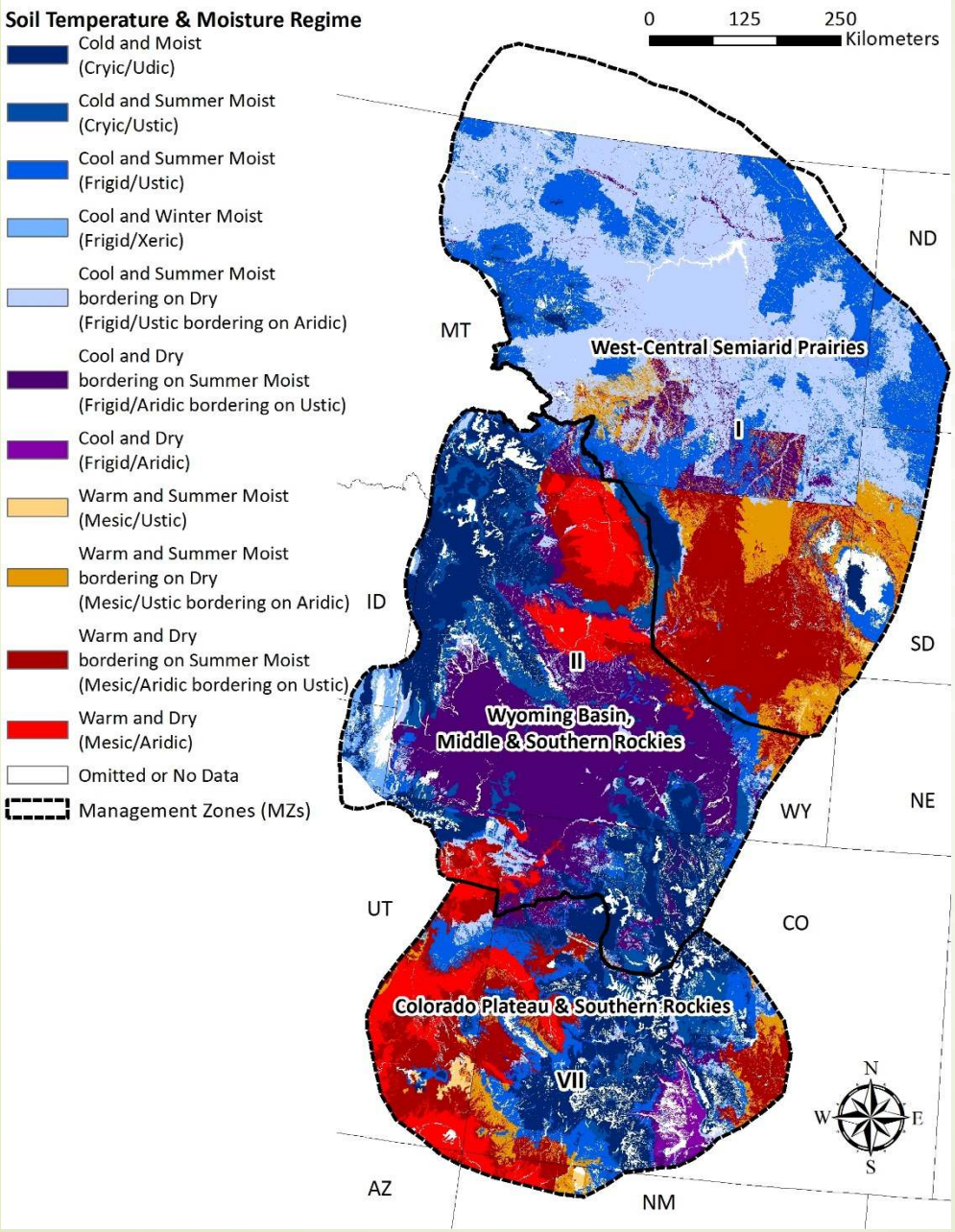
Chambers et al. 2016

Warm-Summer Moist ⟷ **Cold-Summer Moist**

Productivity

Soil Temperature & Moisture Regimes

Resistance & Resilience

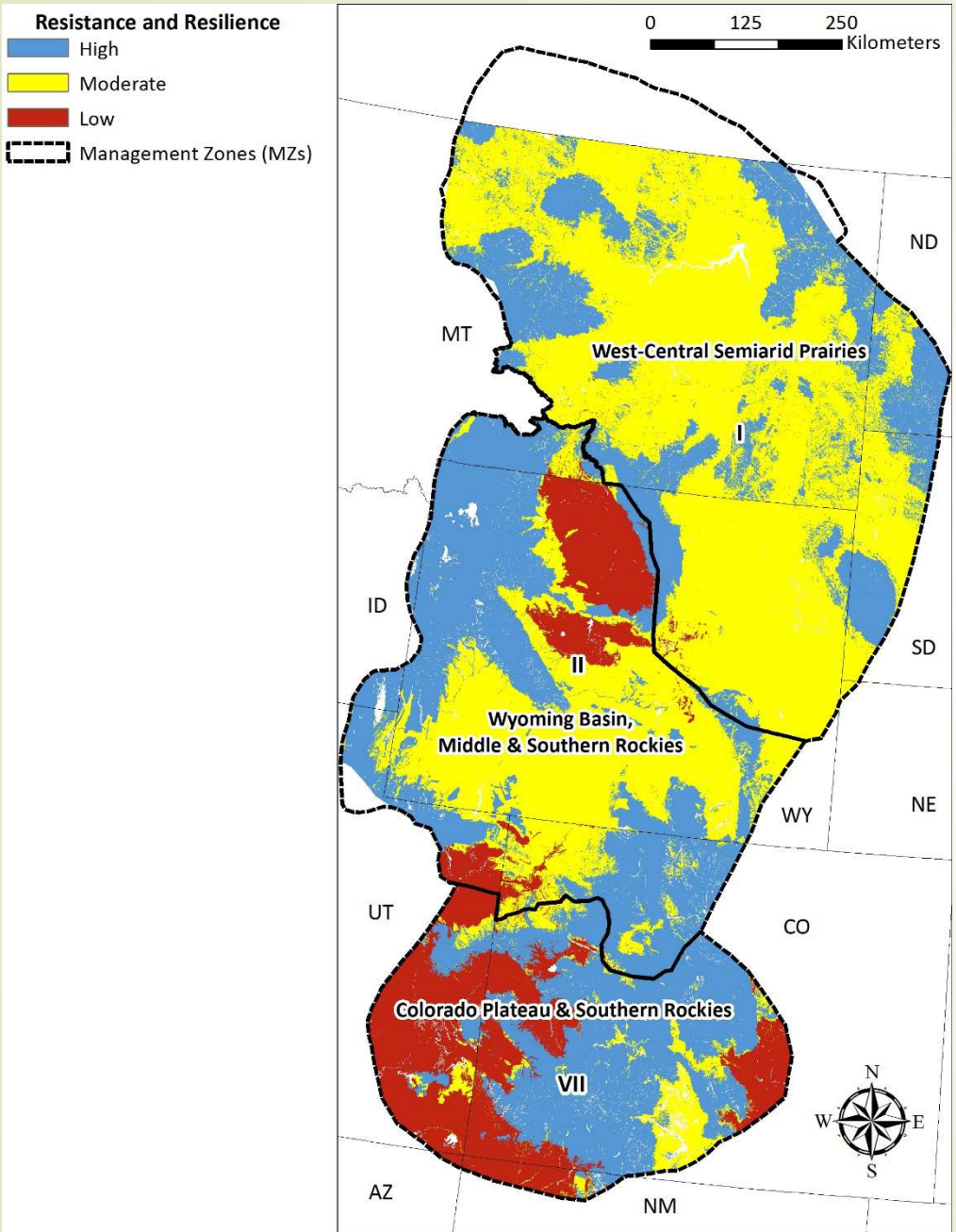


Soil Temperature & Moisture Regimes =

Landscape indicator of resilience & resistance

SURGO – 1:24,000 with gaps filled with STATSGO -1:250:000 (Maestas et al. 2016)

Resilience & Resistance Classes

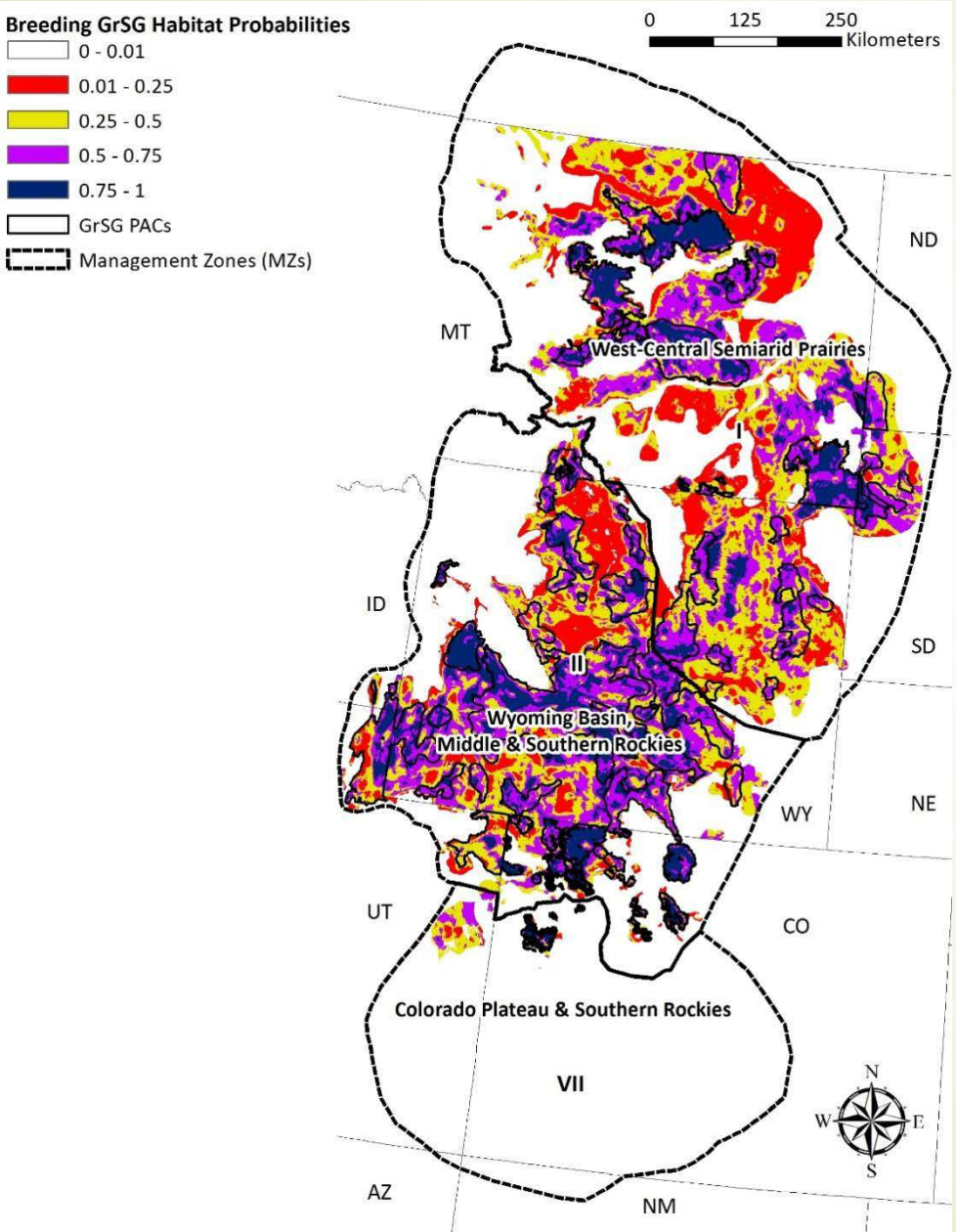


Soil Temperature & Moisture Regimes =

Landscape indicator of resilience & resistance

SURGO – 1:24,000 with gaps filled with STATGSO -1:250:000 (Campbell & Maestas 2016, Maestas et al. 2016))

Sage-grouse Breeding Habitat Probabilities



Bases Breeding Habitat on multivariate models –

- ***2010 – 2014 BBD data***

- ***General Habitat***
- ***Climate***
- ***Landform***
- ***Disturbance***

Doherty et al. 2015

Sage-Grouse Habitat Matrix

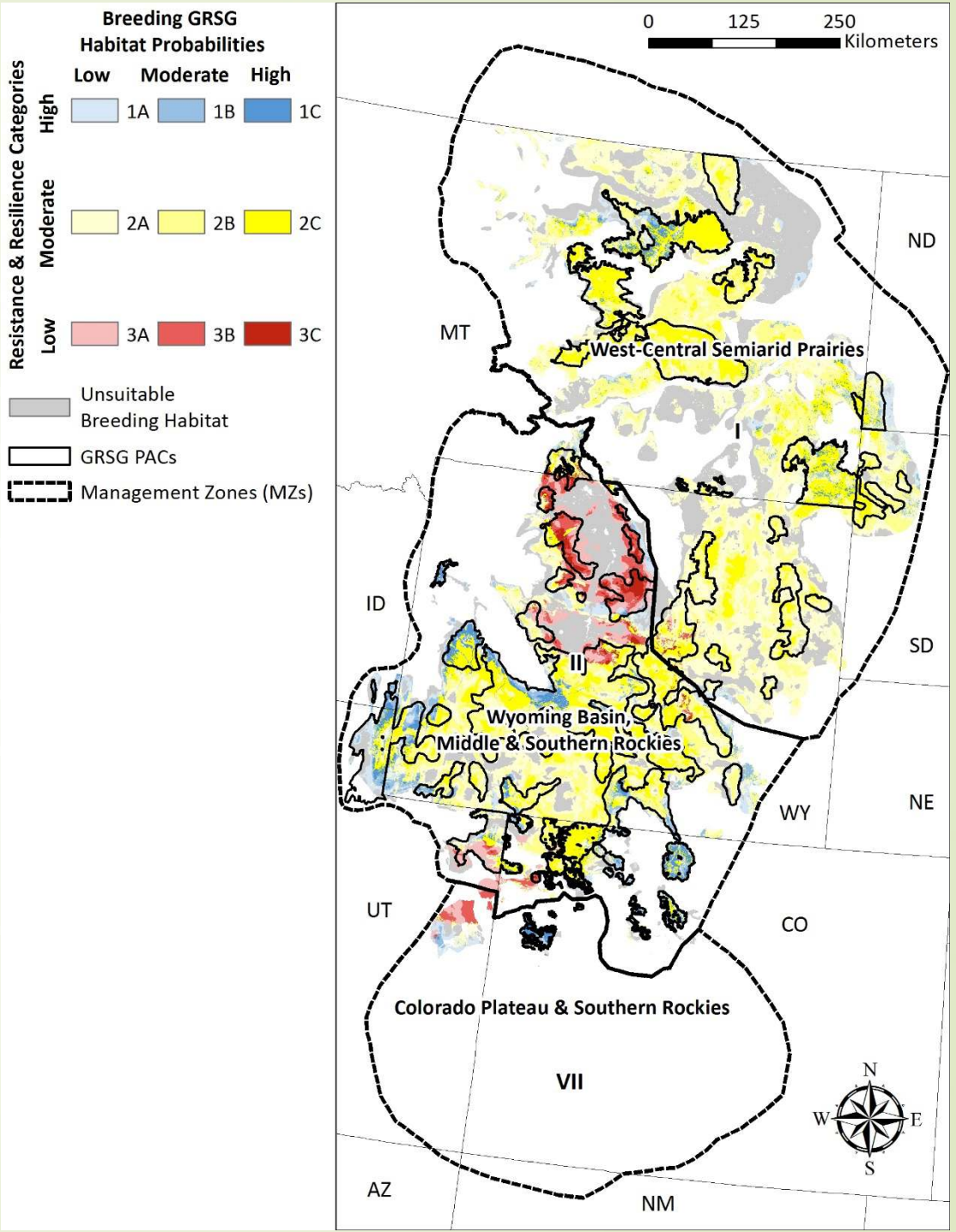
Probability of Sage-Grouse Breeding Habitat

Sagebrush Ecosystem Resilience & Resistance	*Low (0.25-0.50)* Landscape context is likely limiting - significant restoration may be needed.	*Medium (0.5-0.75)* Landscape context may be affecting habitat suitability – improve with management.	*High (> 0.75)* Landscape context is highly suitable - maintain and enhance resilience & resistance.
High 	**RESTORATION/RECOVERY POTENTIAL HIGH** *Native grasses and forbs sufficient for recovery* *Annual invasive risk low; Conifer expansion is a local issue* *Seeding success is typically high*		
Moderate 	**RESTORATION/RECOVERY POTENTIAL INTERMEDIATE** *Native grasses and forbs usually adequate for recovery* *Annual invasive risk moderate; Conifer expansion is a local issue* *Treatment success depends on site characteristics*		
Low 	**RESTORATION/RECOVERY POTENTIAL LOW** *Native grasses and forbs inadequate for recovery* *Annual invasive risk is high* *Seeding success depends on site characteristics, invasives & ppt* *May require multiple management interventions*		

Map of GRSG Habitat Matrix

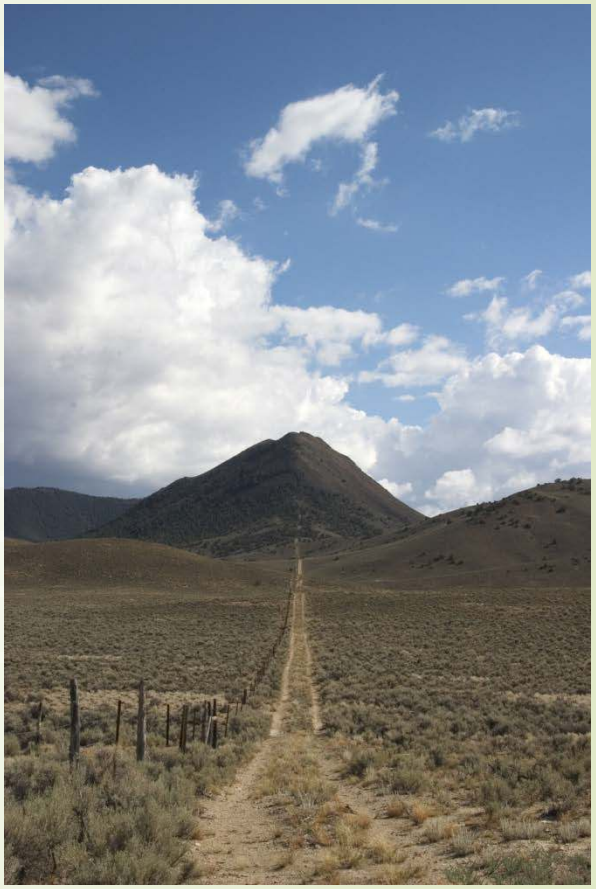
Areas for targeted management –

- First filters – GRSG PACS developed by States
- Resilience & Resistance
- Sage-grouse breeding habitat probabilities (Doherty et al. 2015)
- Management strategies can be matched directly to the Matrix



Down the Road

A holistic approach that addresses large-scale persistent threats to sage-grouse habitat should benefit sagebrush ecosystems and most sagebrush obligate species



- GTR-356 is now being combined with GTR-326 in a Science Framework for the Conservation & Restoration Strategies (SO 3336)