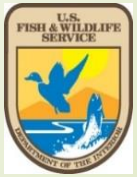
A Science Framework for Assessing Threats to Sagebrush Ecosystems and Greater Sage-grouse and Prioritizing Conservation and Restoration Actions



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Schedule

Evaluating species management guidance and monitoring programs for the Great Basin - June 25 at 1:00 PM (PDT)

Speaker: Dr. John Boone, Great Basin Bird Observatory

Species-based wildlife management in Nevada's Great Basin is conducted by multiple agencies using a diverse array of guidelines, protocols and information sets, many of which are outdated, incomplete or inconsistent. The first step of this project is to review the basis for species management in Nevada–focusing on a core set of avian species—to identify where opportunities for improvement exist. We then develop an array of both generalized and species-specific recommendations for more consistent and effective species management. These recommendations stress the use of monitoring data and incorporation of new information regarding disturbance buffers.

- Watch the webinar recording
- View the presentation slides
- Learn more about the project

Cheatgrass die-offs as an opportunity for restoration - July 14 at 1:00 PM (PDT)

9:43 AM
8/17/2015

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Talking: Enviroissues Inc.

9:43 AM
8/17/2015

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Cheatgrass die-offs as an opportunity for restoration - July 14 at 1:00 PM (PDT)

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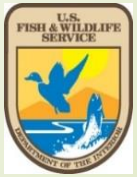
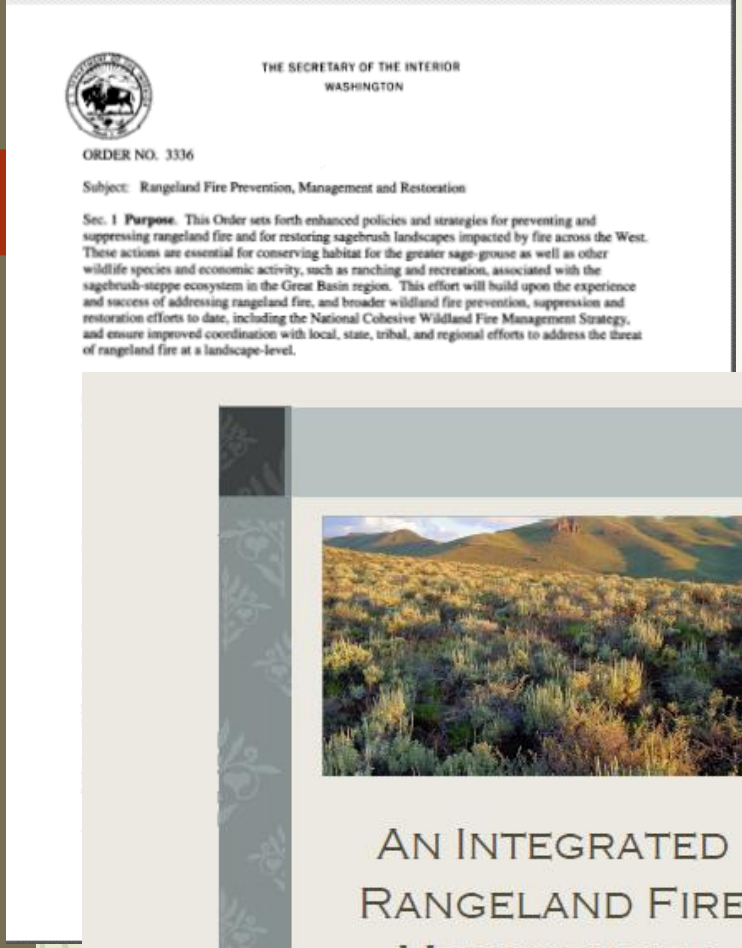


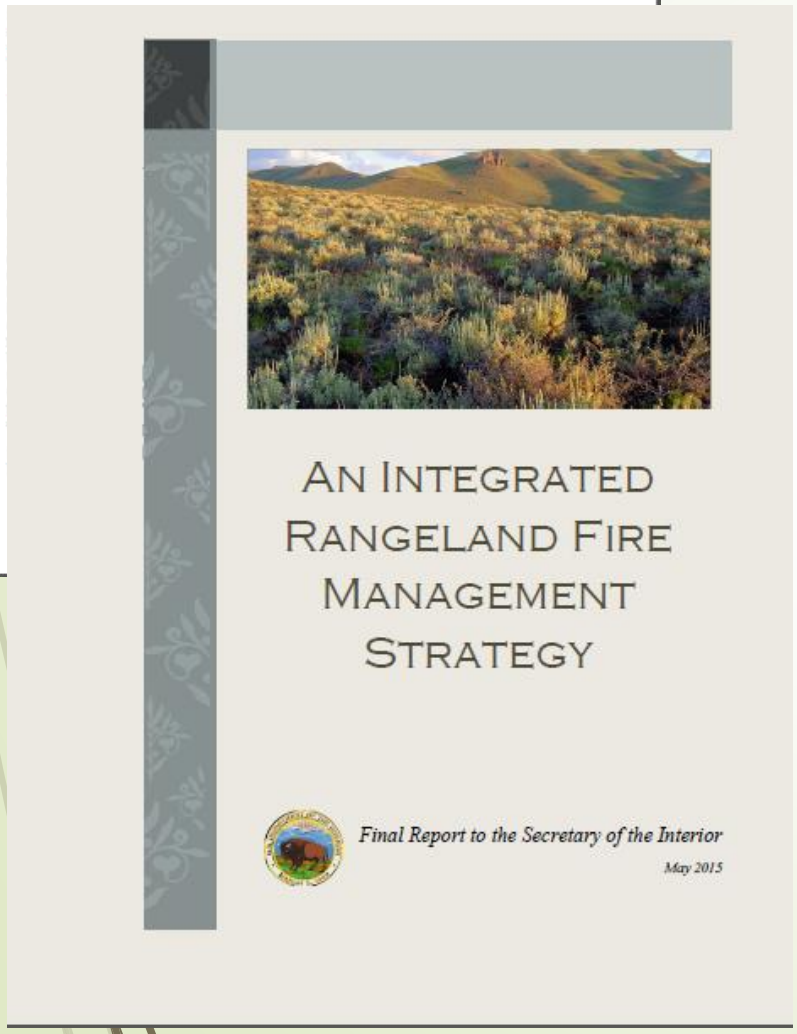


THE SECRETARY OF THE INTERIOR
WASHINGTON

ORDER NO. 3336

Subject: Rangeland Fire Prevention, Management and Restoration

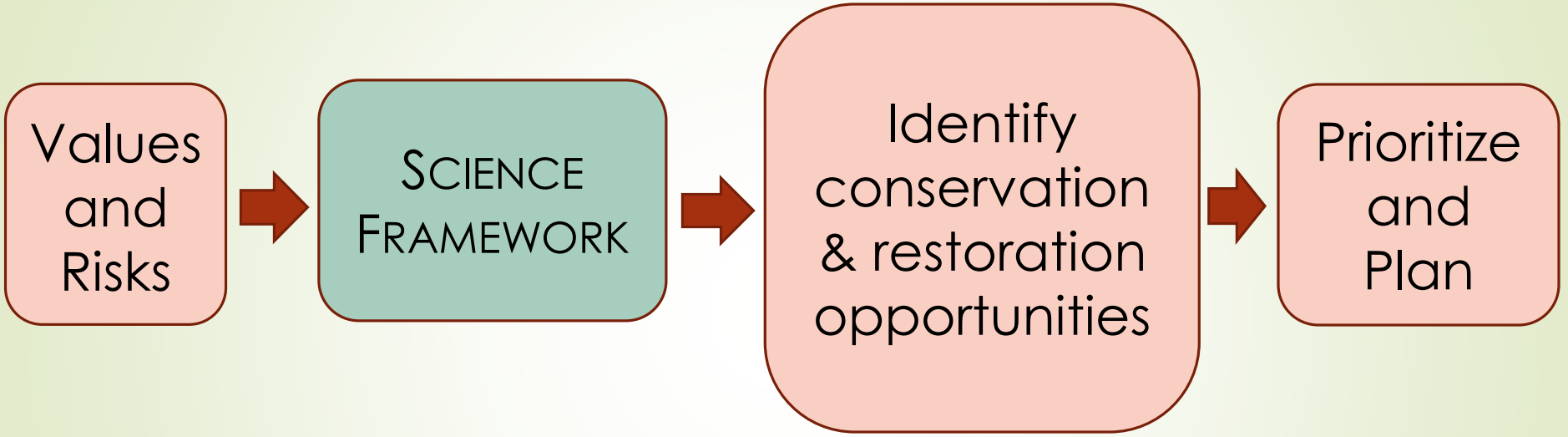
Sec. 1 **Purpose**. This Order sets forth enhanced policies and strategies for preventing and suppressing rangeland fire and for restoring sagebrush landscapes impacted by fire across the West. These actions are essential for conserving habitat for the greater sage-grouse as well as other wildlife species and economic activity, such as ranching and recreation, associated with the sagebrush-steppe ecosystem in the Great Basin region. This effort will build upon the experience and success of addressing rangeland fire, and broader wildland fire prevention, suppression and restoration efforts to date, including the National Cohesive Wildland Fire Management Strategy, and ensure improved coordination with local, state, tribal, and regional efforts to address the threat of rangeland fire at a landscape-level.



Conservation & Restoration Strategy Action Item 7b iv

- Guide the development of scientific information and tools for prioritizing areas for management
- Inform options for management activities across scales
- Provide clear linkages to existing assessments and plans
- Inform budget prioritization and adaptive management

Science Framework for the C&R Strategy



The Science Framework provides a holistic, science-based foundation for assessing resource values and threats across scales in the sagebrush biome

Science Framework Linkages

The Science Framework is linked to several SO 3336 components & multiple working groups

- Sagebrush ecosystems & sage-grouse
  - Invasive species (7bvii)
  - Restoration (7b v & vi)
- Fire & fuels management and suppression (7b i, ii, &iii)
- Climate change (new)
- Seed strategy (7 b ix)
- Actionable science plan (7 b viii)
- Monitoring (Crosscut #3)
- Data & geospatial (Crosscut #2)
- Mitigation

GRSG Mitigation Strategy

- Promote a consistent approach in determining mitigation requirements across the range of the species
- Use best available science in prioritizing mitigation locations at landscape scales
- Inform mitigation strategies at project scales

- *The Science Framework can inform these goals by providing a process, data, layers, and models to help mangers and specialists target areas for mitigation activities and determine appropriate management strategies*

The Science Basis – Resilience and Resistance

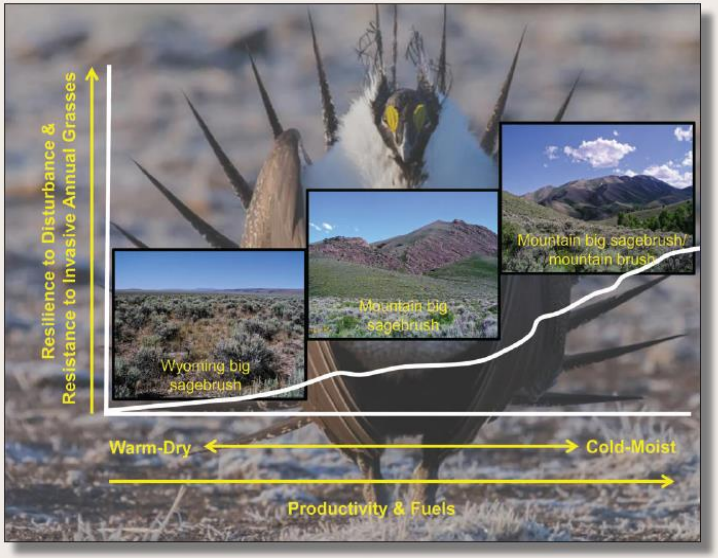
Two WAFWA Working Groups

USDA United States Department of Agriculture

2014

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



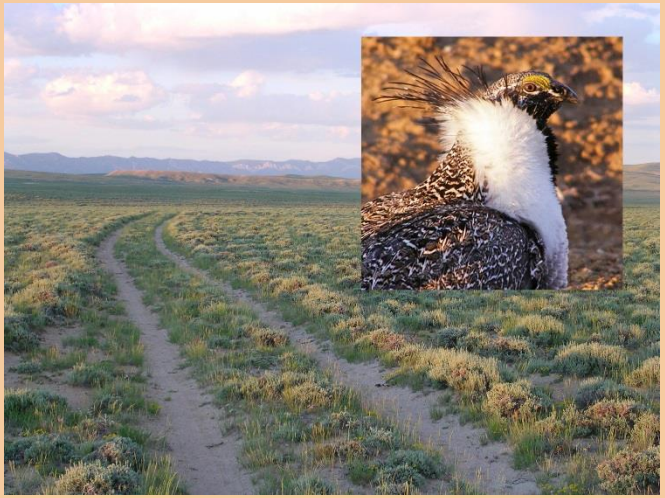
Forest Service Rocky Mountain Research Station General Technical Report RMRS-GTR-326 September 2014

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

2016

Using Resilience and Resistance Concepts to Manage Threats to Sagebrush Ecosystems, Gunnison Sage-Grouse, and Greater Sage-Grouse in their Eastern Range: A Strategic Multi-Scale Approach

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



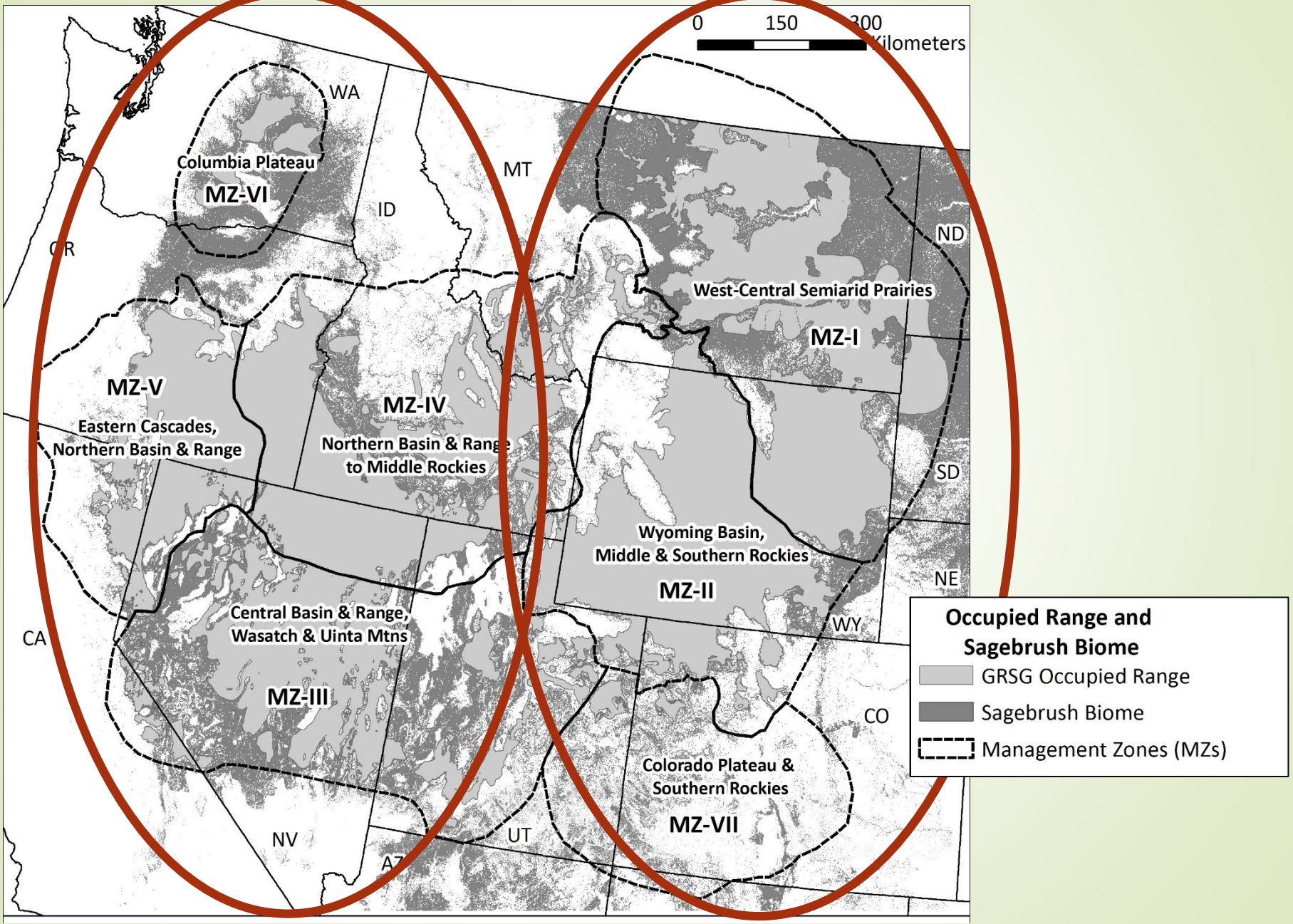
In press

Scope

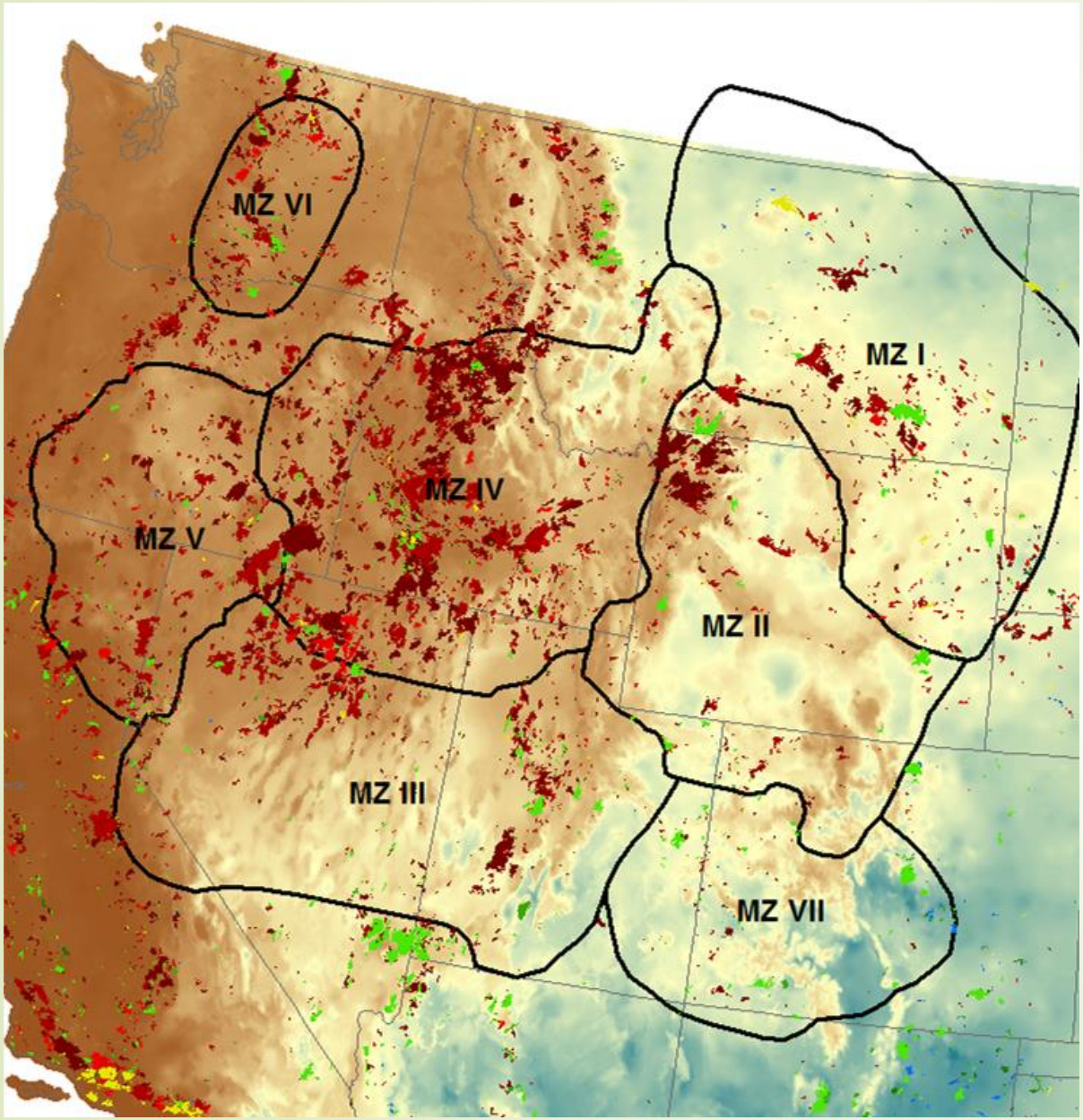
The Science Framework is being designed to address a variety of resources and values

- Primary emphasis - sagebrush ecosystems and greater sage-grouse populations
- Subsequent versions -
  - Passerines, reptiles, and other species at risk identified by the WAFWA & FWS Sagebrush Science Initiative
  - Greater sage-grouse brood rearing habitat
  - Big game migratory corridors & seasonal habitat
  - Riparian areas & cultural values
  - Other

Ecoregions and Management Zones



Environmental Differences

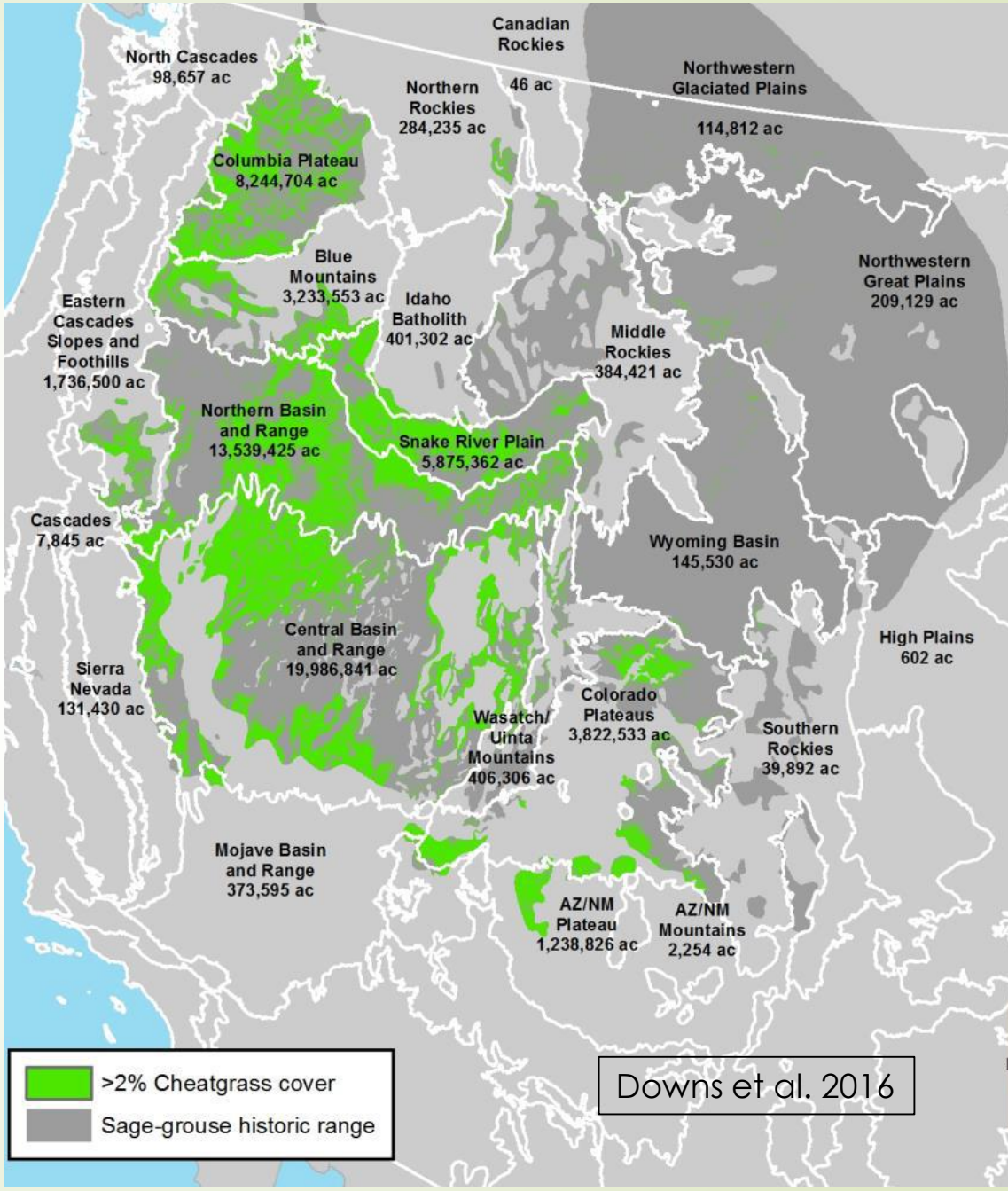


Threats to Sagebrush Ecosystems

Persistent Ecosystem Threats

- Invasive Annual Grasses
- Conifer Expansion
- Altered Fire Regimes

❖ Identified in Conservation Objectives Team Report (2013)



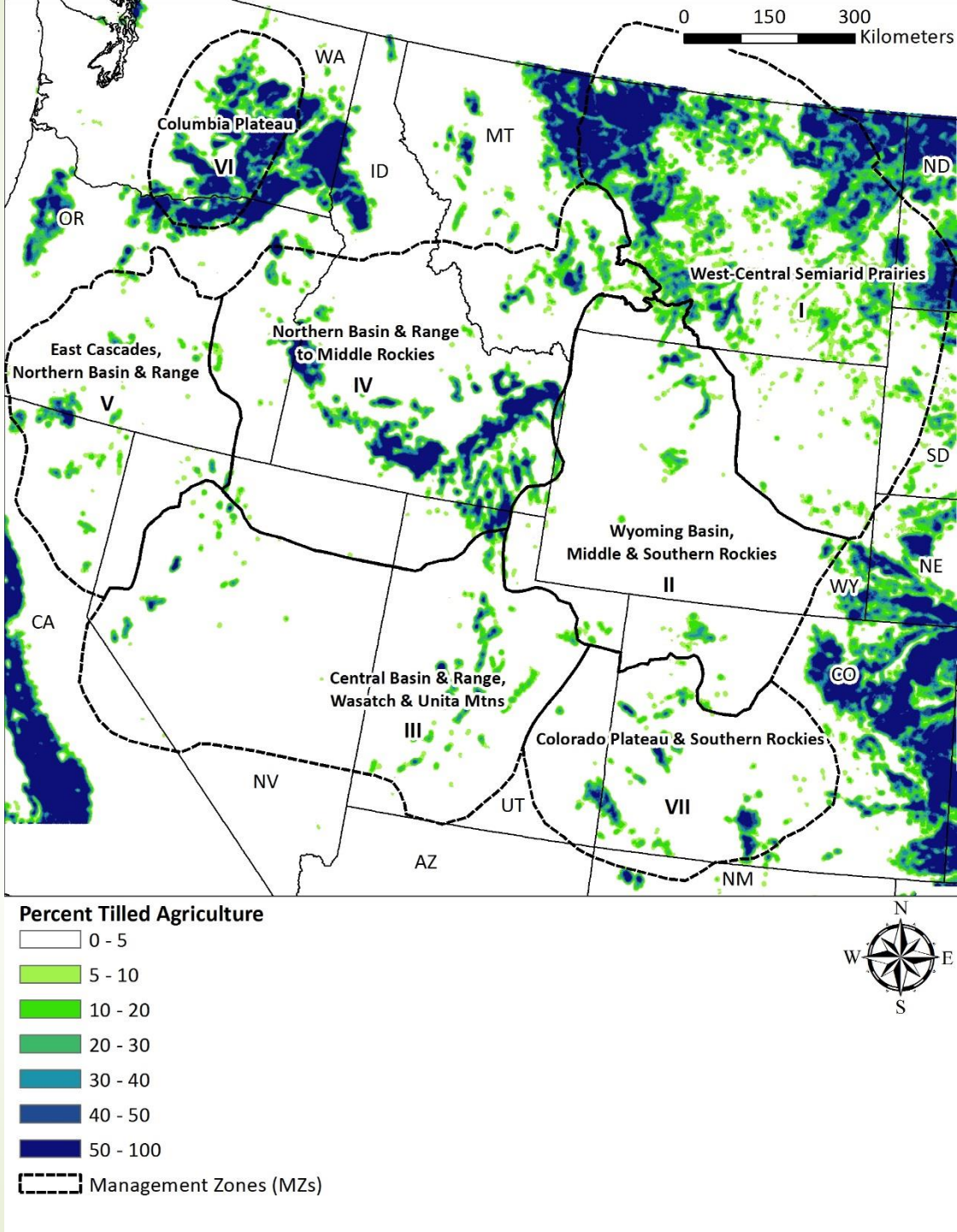
Threats to Sagebrush Ecosystems

Land Use & Development Threats

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

Climate Change

- Effects on Ecosystems and Species



A Strategic, Multi-Scale Approach

Scale/Area	Data/Tools/Models*	Process
	Scale-Dependent/Additive	
Sagebrush Biome	**Vegetation** **Soils** **Population data and models** **Fire and other threat data** **Climate change projections**	**Budget prioritization within DOI for rangewide consistency**
Sage-Grouse MZs and Ecoregions	**Above +** **Assessments & Planning Docs** **Regional Data/Models/Tools**	**Assessments to prioritize planning areas**
Local planning areas	**Above +** **Local Data & Models**	**Selection of treatments within priority planning areas**

*USFS, NRCS, USGS, BLM, WAFWA, FWS, NGOs, States, etc.

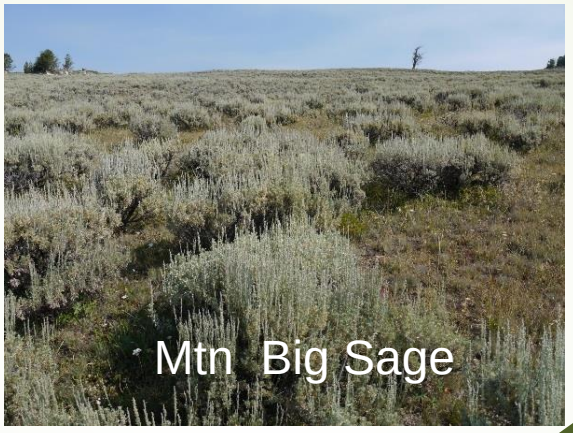
Components of a Strategic, Multi-Scale Approach

Six Components

1) Develop an understanding of ecosystem resilience and resistance for the planning region
2) Identify key habitat indicators
3) Develop management decision matrices
4) Assess key threats in planning area
5) Delineate focal habitats/areas for management
6) Determine the most appropriate management approach

Chambers et al. 2014 GTR-326 & in press

Environmental Gradients
Cold Deserts



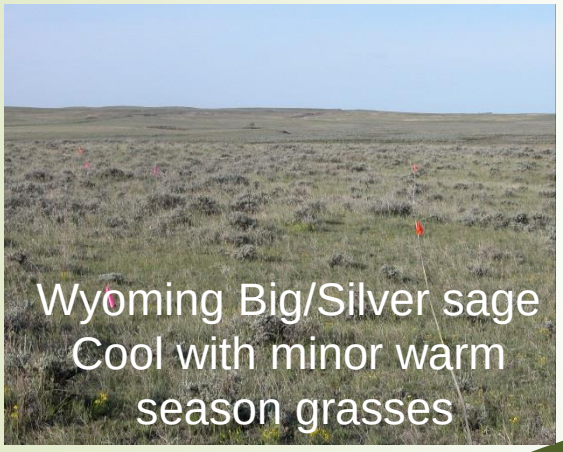
Chambers 2005,
Chambers et al. 2007,
Wisdom & Chambers 2009;
Brooks & Chambers 2011;
Condon et al. 2011;
Chambers et al. 2014a,b

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. in press

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

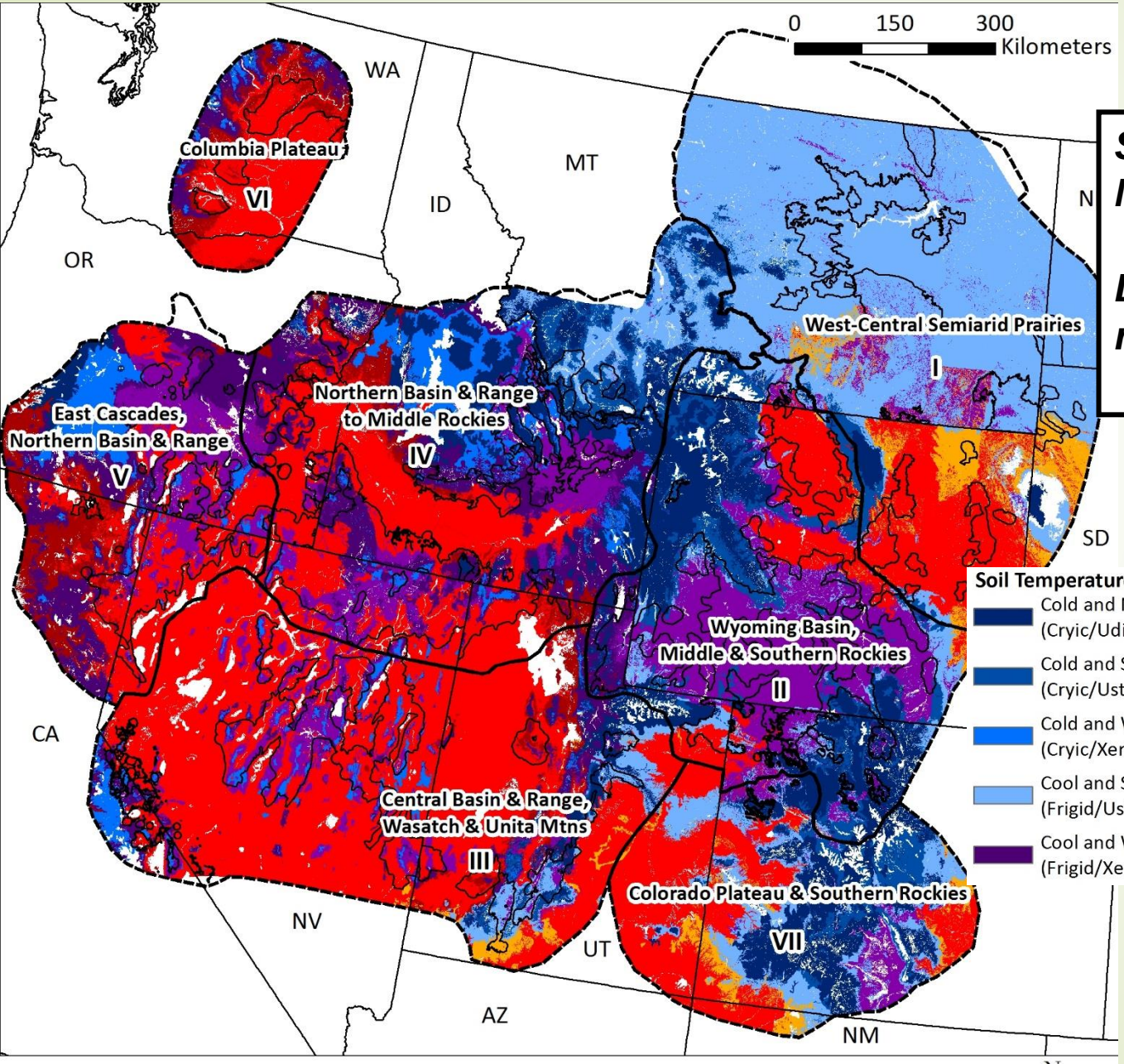
Productivity →

Resilience & Resistance of Ecological Types

Relative Resilience & Resistance: High ↑ Low

Ecological Type	Characteristics	Resilience and resistance
Cold & Moist *Cryic (all)*	Ppt: 15-20+' Typical shrubs: Mountain big sagebrush, snowberry, serviceberry, silver sagebrush. Cool season bunch grasses	Resilience – High Resistance– High
Cool & Summer Moist *Frigid/Ustic*	Ppt: 12-22" Typical shrubs: Mountain big sagebrush, bitterbrush, snowberry. Cool season grasses **Piñon pine and juniper potential**	Resilience – Moderate to high Resistance – Moderate to high
Cool & Summer moist to dry *Frigid/Ustic-Aridic*	Ppt: 12-16" Typical shrubs: Wyoming big sagebrush with basin big and silver sagebrush in drainages. Cool season grasses with some warm season grasses **Piñon pine and juniper potential**	Resilience – Moderate Resistance – Moderate
Warm & Summer moist to dry *Xeric/Ustic-Aridic*	Ppt: 10-14" Typical shrubs: Wyoming big sagebrush, fourwing saltbush. Cool season grasses with some warm season grasses **Piñon pine and juniper potential**	Resilience – Moderate to Low Resistance – Low
Warm & Dry *Mesic/Aridic*	Ppt: 5-9"" Typical shrubs: Wyoming big sagebrush, salt desert shrubs. Cool season grasses with some warm season grasses.	Resilience – Moderate to Low Resistance – Low

Soil Temperature & Moisture Regimes



Soil Temperature & Moisture Regimes =

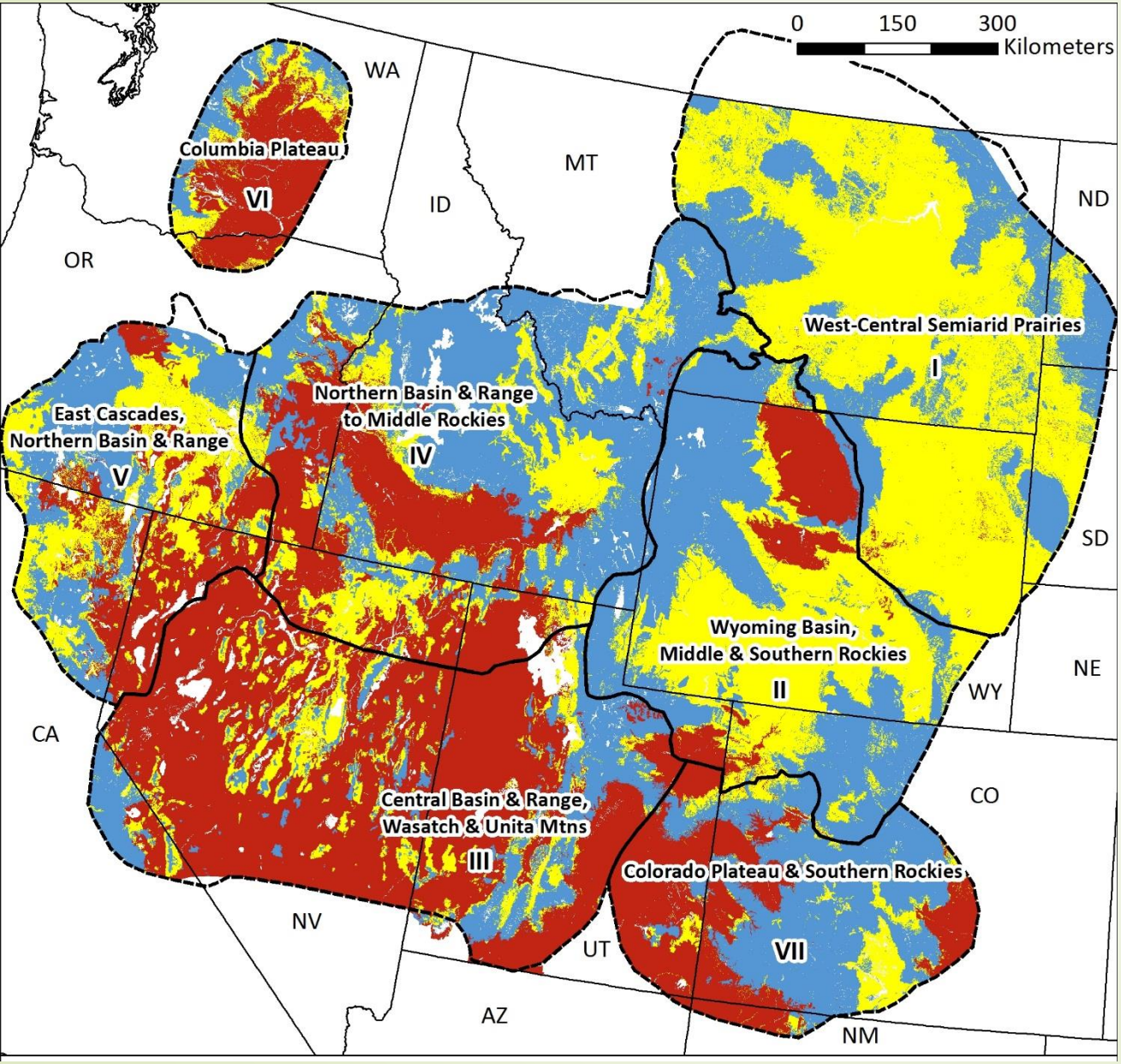
Landscape indicator of resilience & resistance

Soil Temperature and Moisture Regimes

- Cold and Moist (Cryic/Udic)
- Cool and Dry (Frigid/Aridic)
- Cold and Summer Moist (Cryic/Ustic)
- Warm and Summer Moist (Mesic/Ustic)
- Cold and Winter Moist (Cryic/Xeric)
- Warm and Winter Moist (Mesic/Xeric)
- Cool and Summer Moist (Frigid/Ustic)
- Warm and Dry (Mesic/Aridic)
- Cool and Winter Moist (Frigid/Xeric)
- GrSG PACs
- Management Zones (MZs)

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

Resilience & Resistance Classes



Soil Temperature & Moisture Regimes =

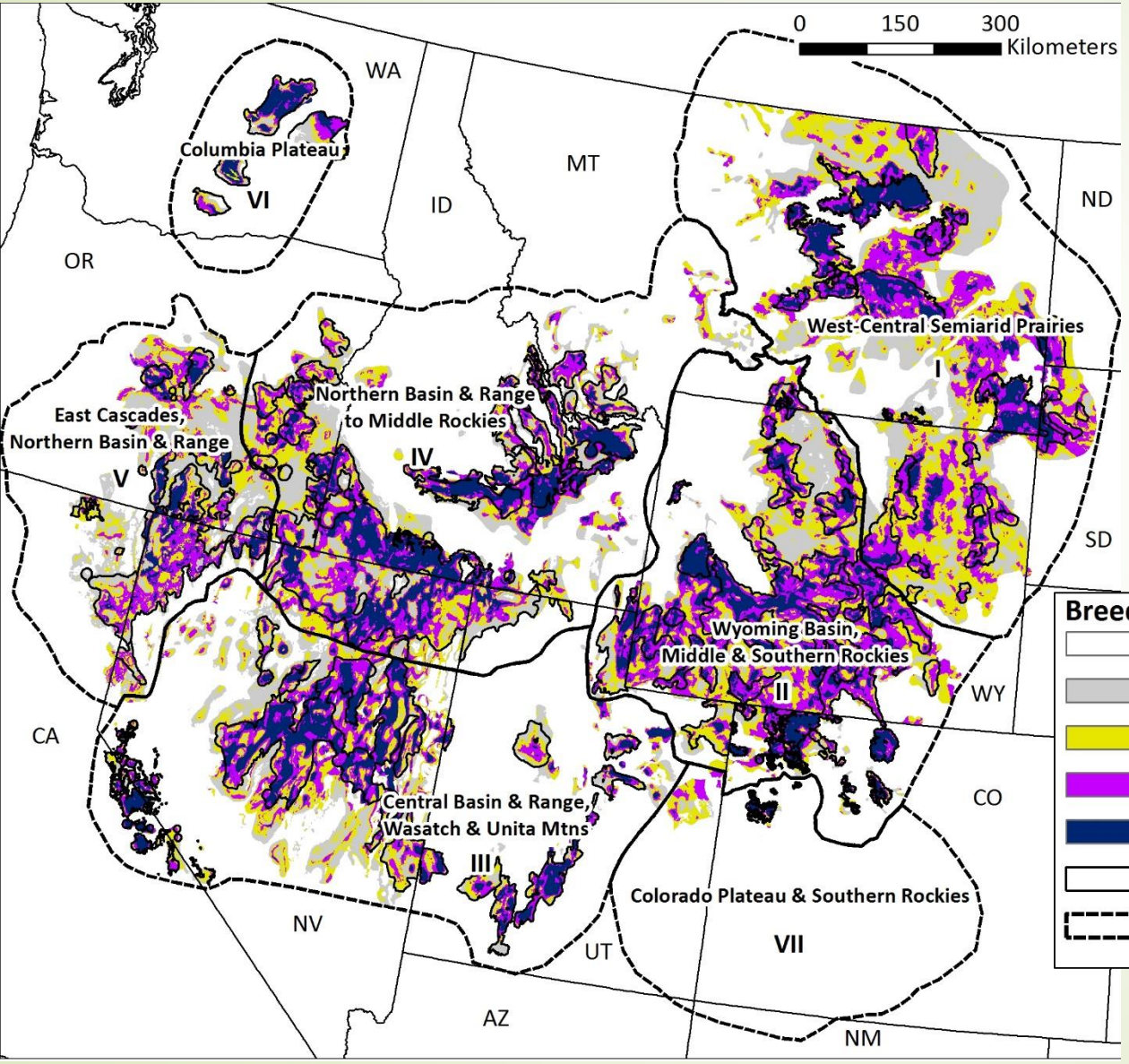
Landscape indicator of resilience & resistance

Resistance and Resilience

- High
- Moderate
- Low
- Management Zones (MZs)

SURGO – 1:24,000 with gaps filled with STATSGO -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***

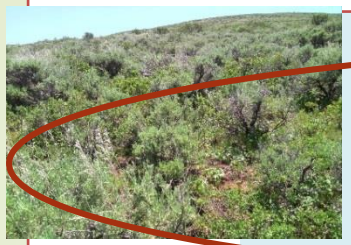
Breeding GrSG Habitat Probabilities

- 0 - 0.01
- 0.01 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- GrSG PACs
- Management Zones (MZs)

Doherty et al. 2015, in press

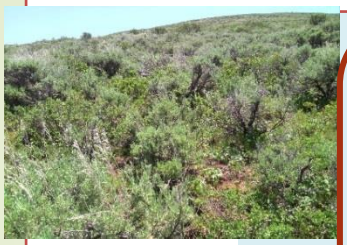
Sage-Grouse Habitat Matrix

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*		

Sage-Grouse Habitat Matrix

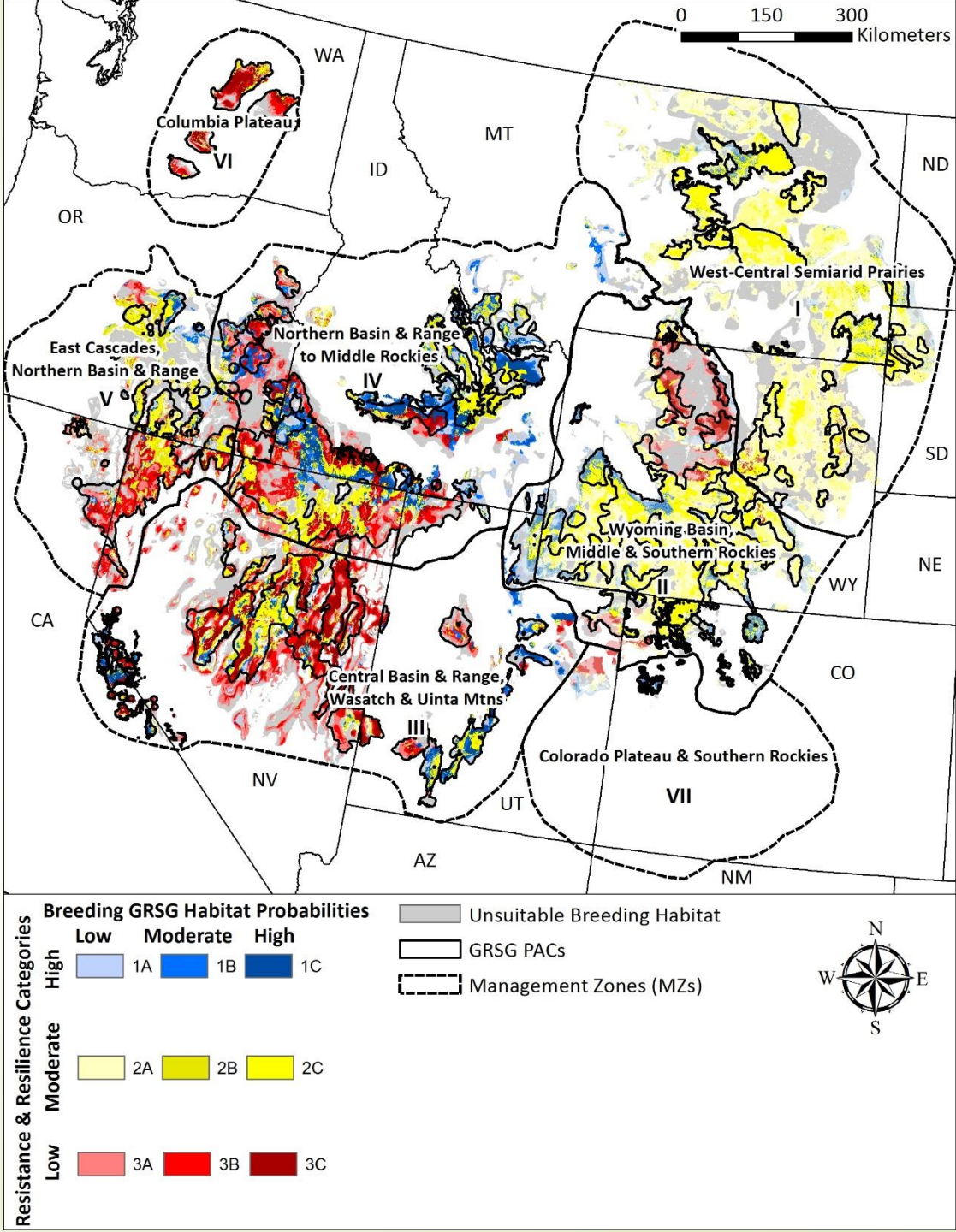
Probability of Sage-Grouse Breeding Habitat

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 –

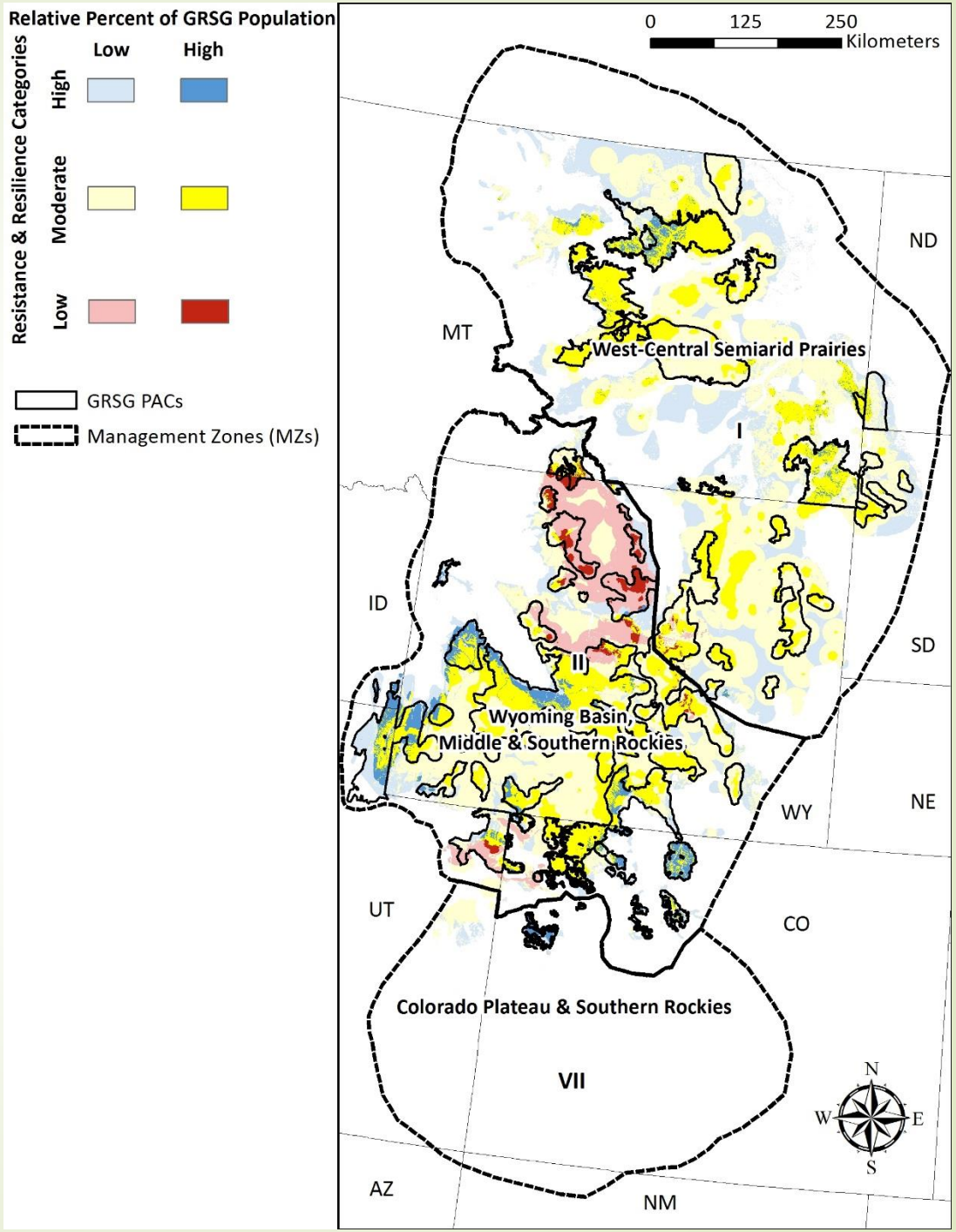
- First filters – GRSG PACS developed by States
- Resilience & Resistance
- Sage-grouse breeding habitat probabilities (Doherty et al. 2015)
- Management strategies can be matched directly to the Matrix



R&R PLUS Breeding Populations

Areas for targeted management –

- First filters – GRSG PACS
- Resilience & Resistance
- Breeding bird densities (High density = areas with 80% BBD (Doherty et al. 2015)
- Ensures management areas -
  1. Support large populations
  2. Provide connectivity
  3. Are close enough to breeding centers for recolonization



Stepping Down to the Land Planning Unit

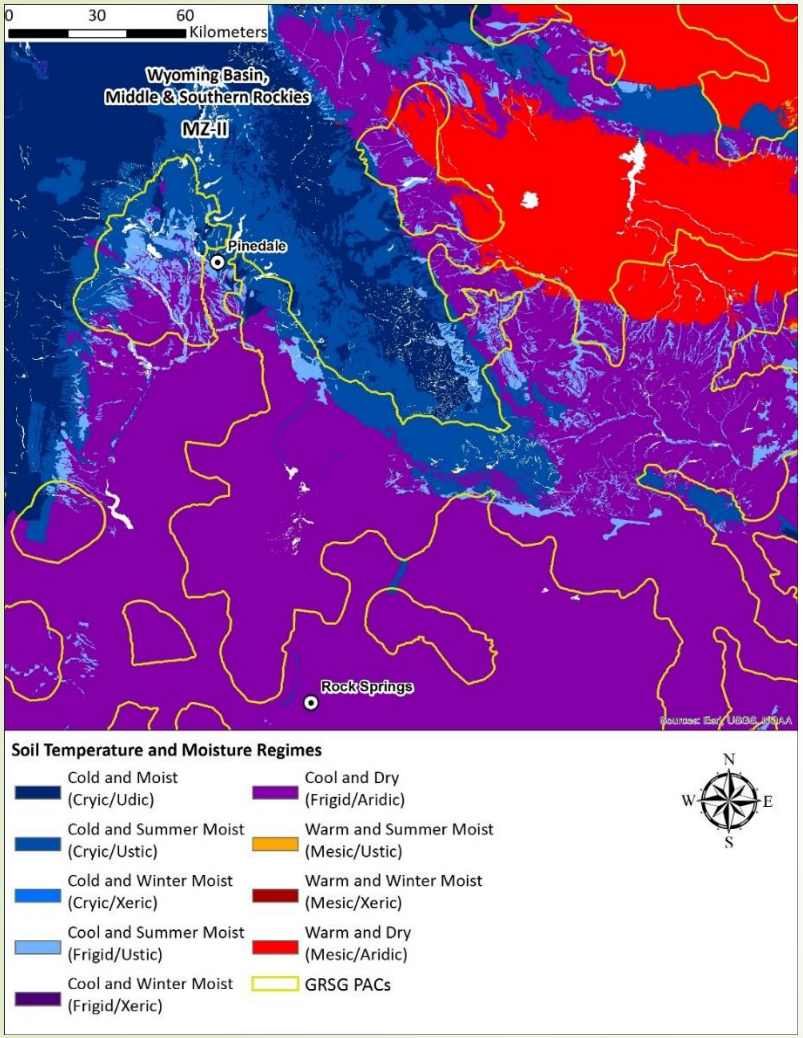
Management activities based on -

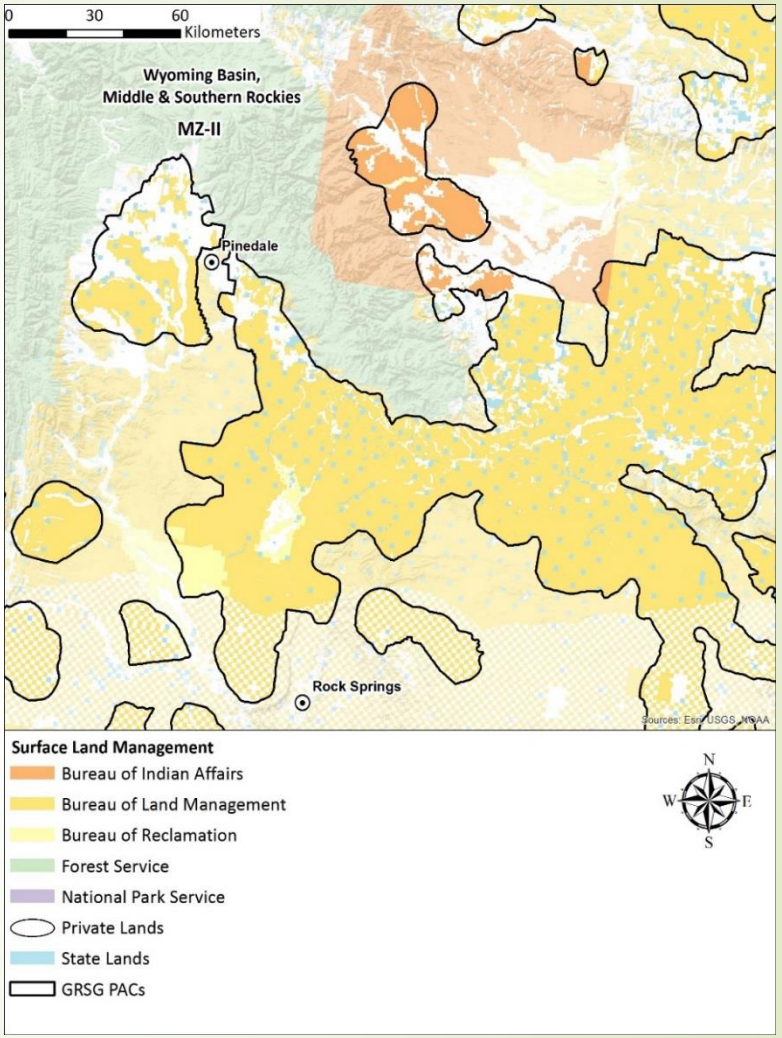
- Resilience & resistance
- Breeding habitat probabilities
- Sage-grouse breeding populations

+ Dominant threats
+ Regional risk models
+ Finer scale data

➢ Regional/local expertise

Southwestern WY – Oil & Gas Development

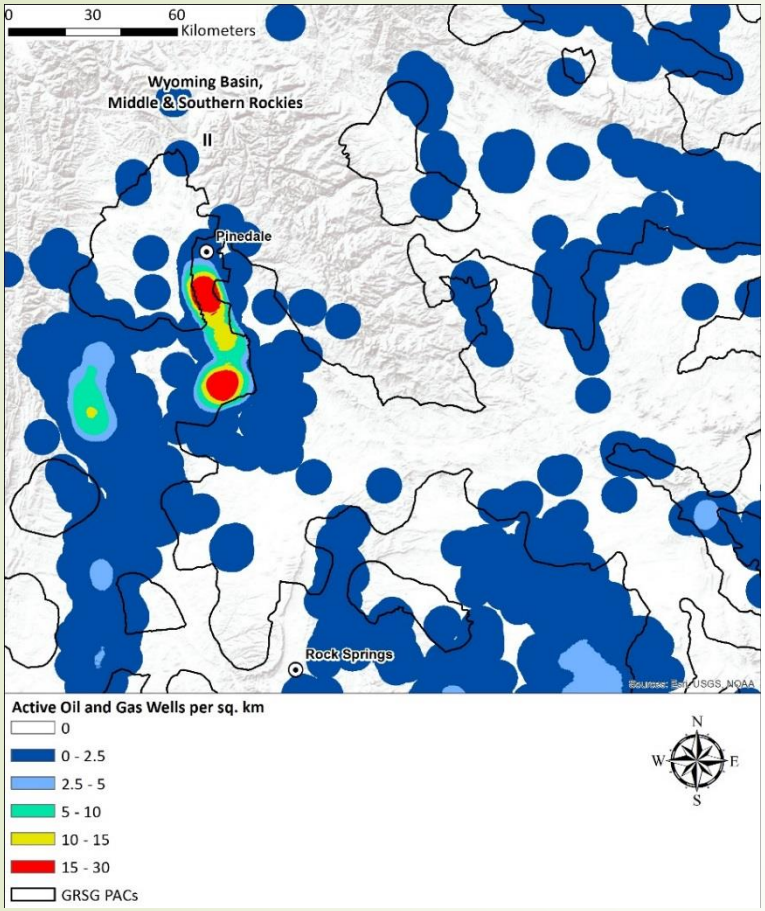


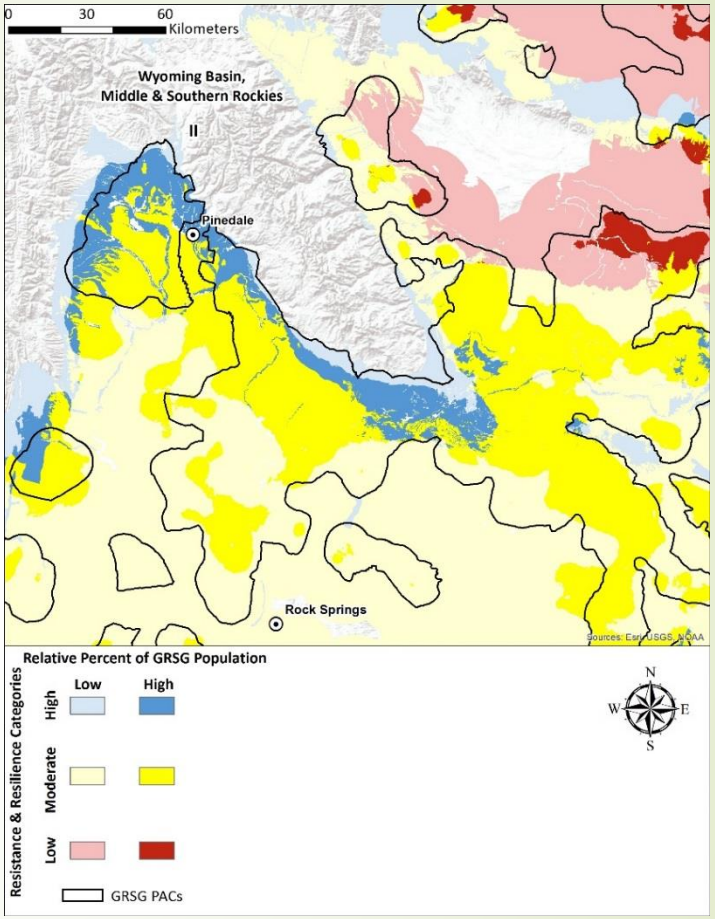


Physical Setting and Land Ownership

- Cold and moist (high R&R) to warm and dry bordering on summer moist (Low R&R)
- BLM, State, Private, BIA

Southwestern WY – Oil & Gas Development





Oil & Gas development, R&R, and BBD

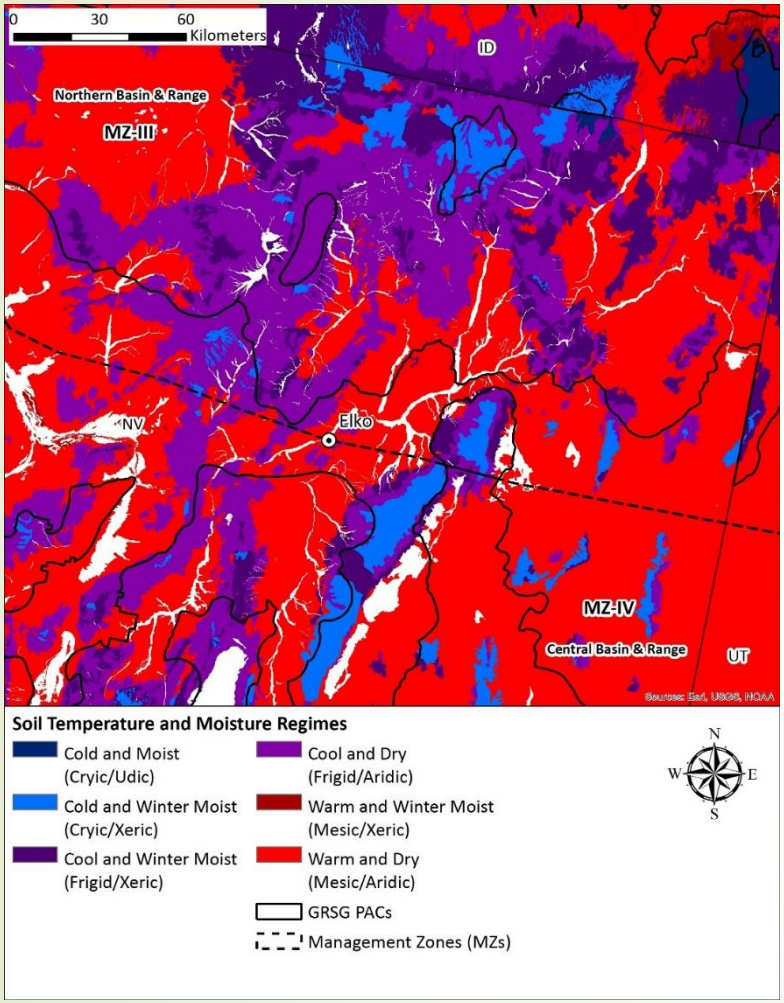
- Active oil and gas development
- Large parts of the area have high BBD with moderate to low R&R in and adjacent to oil wells

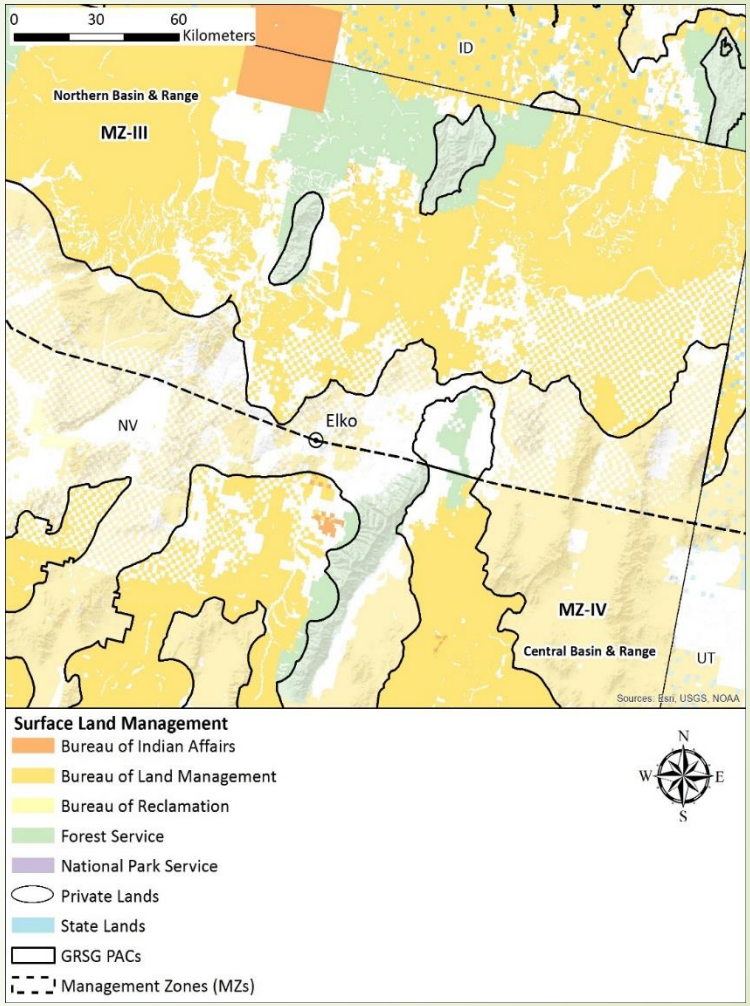
Southwestern WY – Oil & Gas Development

Management strategies **-**

A. Avoid development & transportation corridors in areas with high pops
B. Use Early Detection & Rapid Response for invasive plants
C. Improve grazing management, especially in lower R&R areas
D. Use best restoration practices (weed-free seed, etc.)

Northeast Nevada – Invasives, Fire, Conifers





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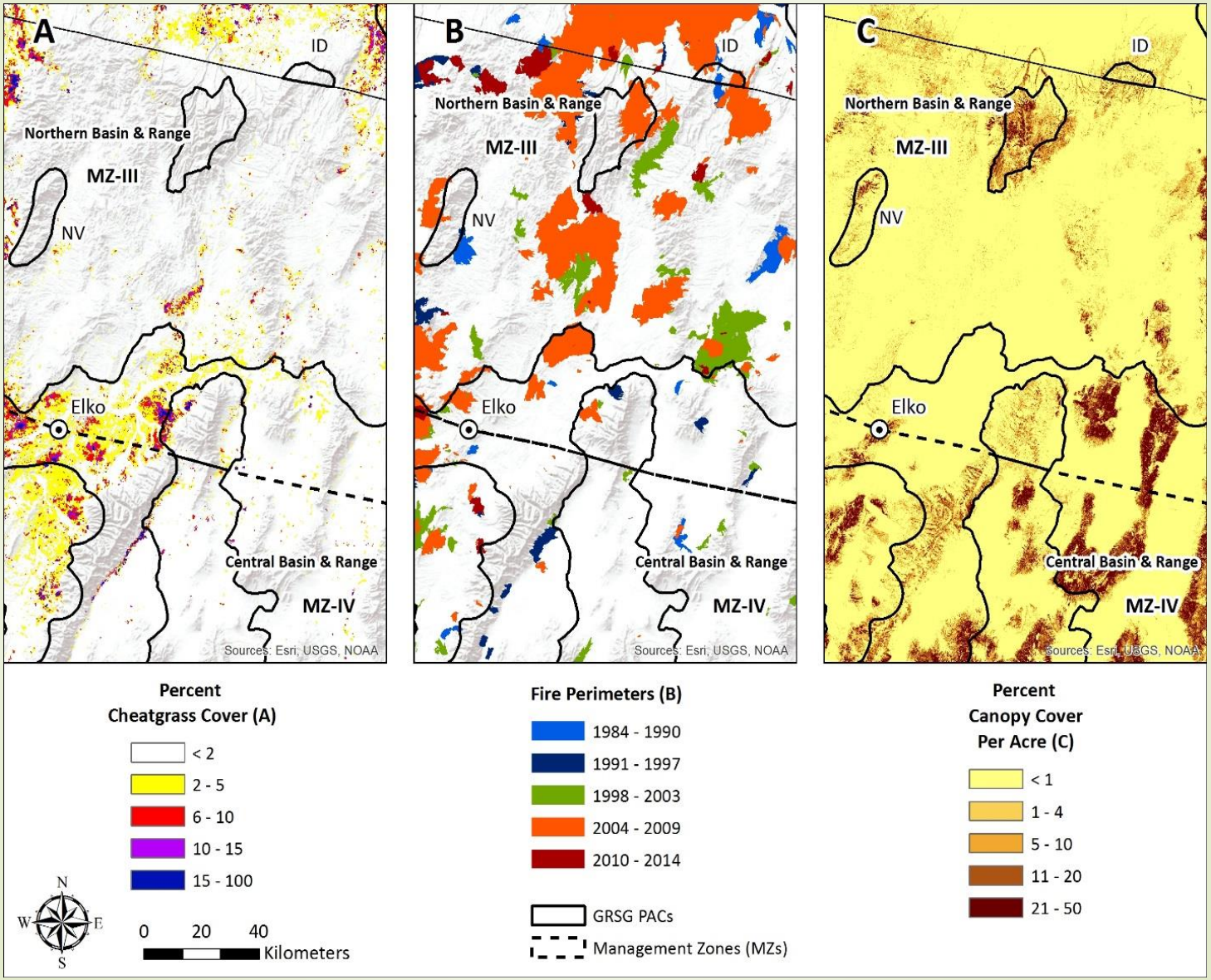
- BLM, Forest Service, State, Private

Northeast Nevada – Invasives, Fire, Conifers

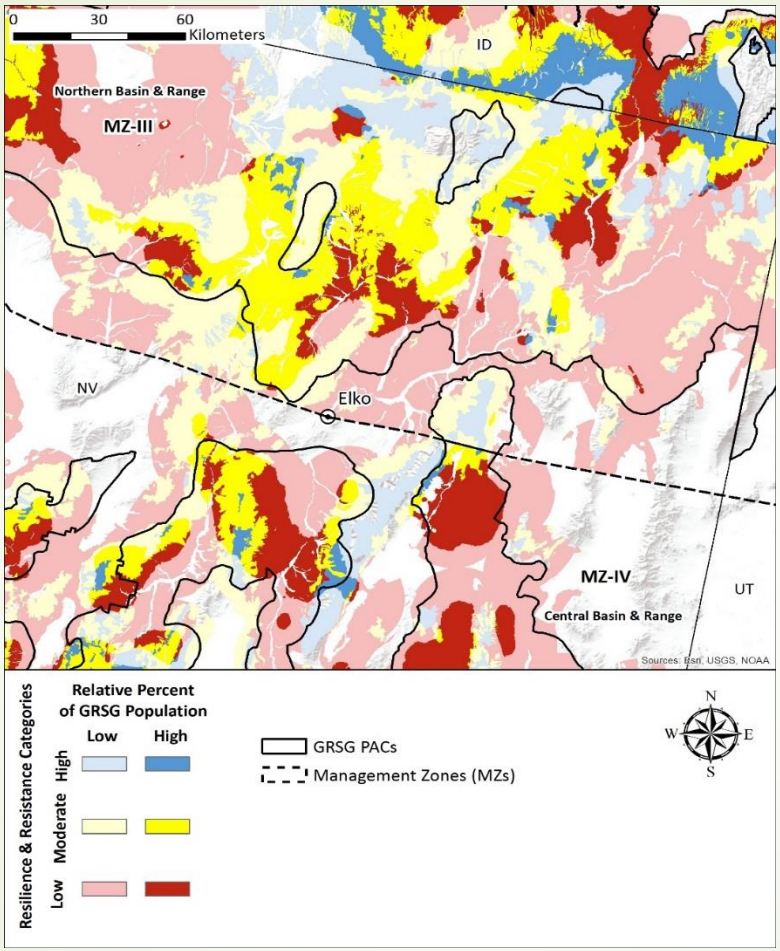


Boyte et al. 2015

MTBS 2014

Fallkowski et al. in press

Northeast Nevada – Invasives, Fire, Conifers



Persistent Ecosystem Threats, R&R, and BBD

- Areas within the PACs with high breeding bird densities occur over a broad range of R&R

Northeast Nevada – Invasives, Fire, Conifers

Management strategies **-**

A. Strategic fire suppression and fuels management
B. Targeted tree removal in Phase I and II expansion areas
C. Post-fire rehabilitation that promotes native perennial grasses & forbs
D. Livestock management that helps maintain native perennial herbs

USDA

United States Department of Agriculture
Forest Service
Rocky Mountain Research Station
General Technical Report RMRS-GTR-322
June 2014

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

Cool and dr… mountain bi… sagebrush—Reference State

Information & Tools for Managers

USDA United States Department of Agriculture

A Field Guide for Rapid Assessment of Post-Wildfire Recovery Potential in Sagebrush and Piñon-Juniper Ecosystems in the Great Basin

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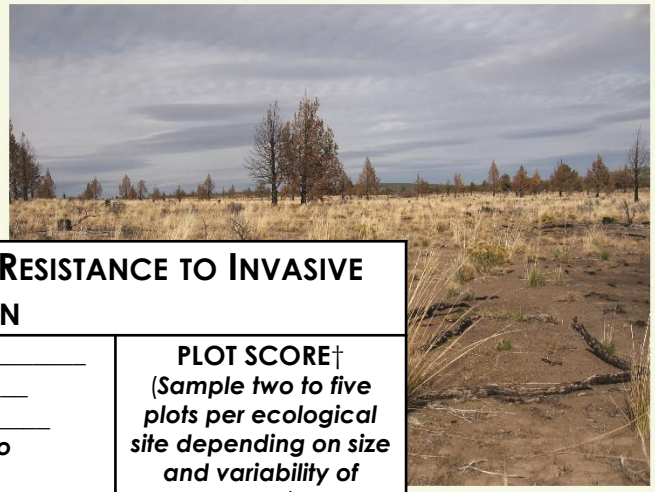

…al Technical Report …-GTR-338 July 2015

SCORE SHEET FOR RATING RESILIENCE TO DISTURBANCE AND RESISTANCE TO INVASIVE ANNUAL GRASSES IN THE GREAT BASIN

Ecological Site or Type Name: _____

_____

%Area: _____ **UTMs:** _____

(Use ecological site descriptions or guidelines for the MLRA with field assessmnt to complete score sheet.)

PLOT SCORE† (***Sample two to five plots per ecological site depending on size and variability of area.***)

SITE CHARACTERISTICS	SCORE FOR VARIABLE	1	2	3	4	5
Temperature (Soil temperature regime + Species or subspecies of sagebrush)						
Soil temperature regime	**1**=hot-mesic, **2**=warm-mesic, **3**=cool-mesic, or cool-cryic (resilience is low but resistance is high), **4**=warm-frigid, **5**=cool-frigid, **6**=warm-cryic					
Species or subspecies of sagebrush	**1**=Wyoming, low, black, or Lahontan; **2**=basin, Bonneville, or xeric; **3**=mountain					
A. Temperature Score =						
Moisture (Precipitation + Soil texture + Soil depth)						
Precipitation in inches (in)	**1**=<10, **2**=10-12, **3**=12-14, **4**=>14					
Soil texture	**1**=clay, sand, or silt; **2**=silty, sandy, or clay loams; **3**=loam					
Soil depth in inches (in)	**0**=very shallow (<10), **1**=shallow (10-20), **3**=moderately deep to deep (>20)					
B. Moisture Score =						
Temperature Score (A)+ Moisture Score (B)						

Information & Tools for Managers

USGS
science for a changing world

Prepared in cooperation with U.S. Joint Fire Science Program and National Interagency Fire Center, Bureau of Land Management, Great Northern Landscape Conservation, and Western Association of Fish and Wildlife Agencies

Restoration Handbook for Sagebrush Steppe Ecosystems with Emphasis on Greater Sage-Grouse Habitat—Part 1. Concepts for Understanding and Applying Restoration

USGS
science for a changing world

Prepared in cooperation with U.S. Joint Fire Science Program and National Interagency Fire Center, Bureau of Land Management, Great Northern Landscape Conservation, and Western Association of Fish and Wildlife Agencies

Restoration Handbook for Sagebrush Steppe Ecosystems with Emphasis on Greater Sage-Grouse Habitat—Part 2. Landscape Level Restoration Decisions

Circular 1418

U.S. Department of the Interior
U.S. Geological Survey

SRM

Tapping Soil Survey Information for Rapid Assessment of Sagebrush Ecosystem Resilience and Resistance

By Jeremy D. Maestas, Steven B. Campbell, Jeanne C. Chambers, Mike Pellant, and Richard F. Miller

On the Ground

- Emerging applications of ecosystem resilience and resistance concepts in sagebrush ecosystems allow managers to better predict and mitigate impacts of wildfire and invasive annual grasses.

pressure from invasive species, like cheatgrass (*Bromus tectorum*). Resilience and resistance concepts help managers better understand key drivers of ecosystem change, identify relative risks of crossing thresholds to undesired states, and design appropriate management actions to promote desired ecosystem trajectories.

Great Basin Factsheet Series 2016

Information and tools to conserve and restore Great Basin ecosystems

Edited by Jeanne C. Chambers

Geospatial Portal and Decision Tools

Help About Feedback

Landscape Approach Data Portal

Data, Maps, and Models from BLM's Landscape Approach Initiatives

News!

Home | Search All | Browse All | AIM | FIAT | Greater Sage-Grouse | REAs | Secretarial Order 3336 | How To

Home

The **BLM's Landscape Approach** Data Portal is a one-stop source for **geospatial data, maps, models and reports** produced by BLM's landscape initiatives including the:

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- Greater Sage-Grouse (GRSG)
- Rapid Ecoregional Assessments (REAs)
- Secretarial Order 3336, Integrated Rangeland Fire Management Strategy (SO3336).

To learn more about each initiative and the products that are available for them, click on the images to the right or the tabs above. You can find products from all of these initiatives by using the Search or Browse tabs above.

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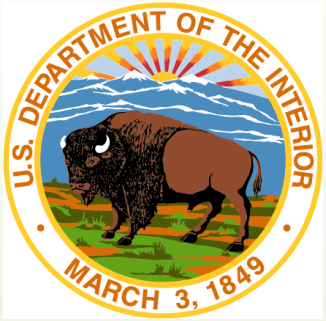
- Subject — such as *sage-grouse, soils, intactness*
- Place — such as *CO, Northern Great Basin.*

You can conduct advanced searches on the Search page such as filtering by content type (e.g., data, map, model) or geographic extent. You can even search other data portals simultaneously, including USGS Science Base, Data.gov, and ArcGIS Online. Click on this **How To...** link for instructions.

On the Browse page, simply click each header to expand the various categories. For example, you can browse by Content Type (data, maps, models) or a specific REA (e.g., Colorado Plateau REA).

http://www.landscape.blm.gov/geoportal/

Integrated Rangeland Fire Management Strategy Geospatial Framework



Cross-Cutting Action Item #2

- Develop and share a **geospatial tool** that highlights areas of concern and priority habitats in the Great Basin, including within priority greater sage-grouse habitat, particularly in areas identified using the FIAT.

- This tool will provide a **common framework** and common terminology to support the implementation of the Order.

Integrating Organizations through a Geospatial Framework

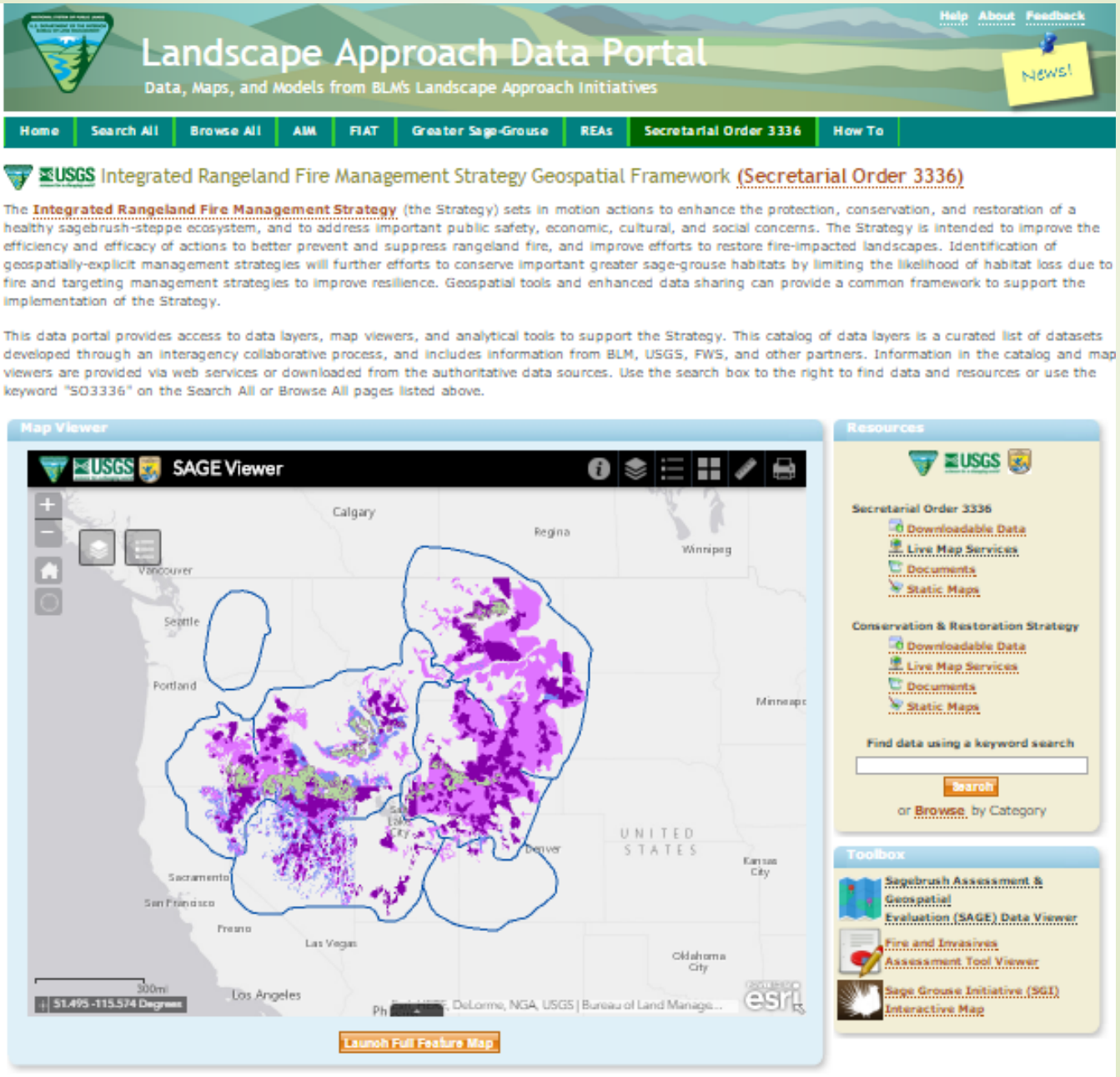
- Single landing page to numerous authoritative data sources
- Curated content
- Easy visualization and access
- Assistance to partners

Primary Building Blocks

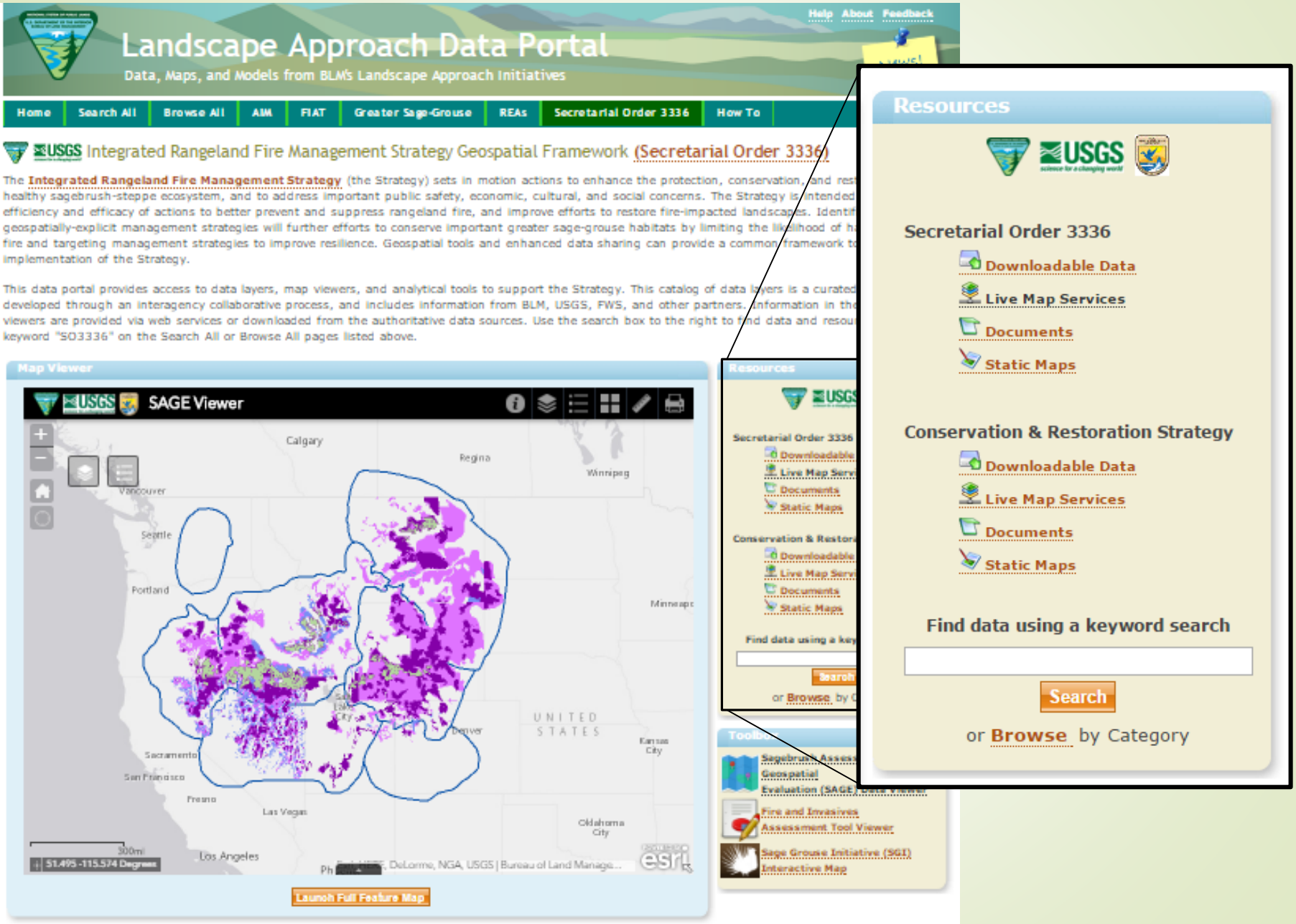
- BLM Landscape Approach Data Portal
  - Landscape focused data
  - BLM Managed
  - http://www.landscape.blm.gov/geoportal/

- USGS ScienceBase
  - Data from project to landscape
  - Allows verified partners
  - Open Platform
  - https://www.sciencebase.gov/

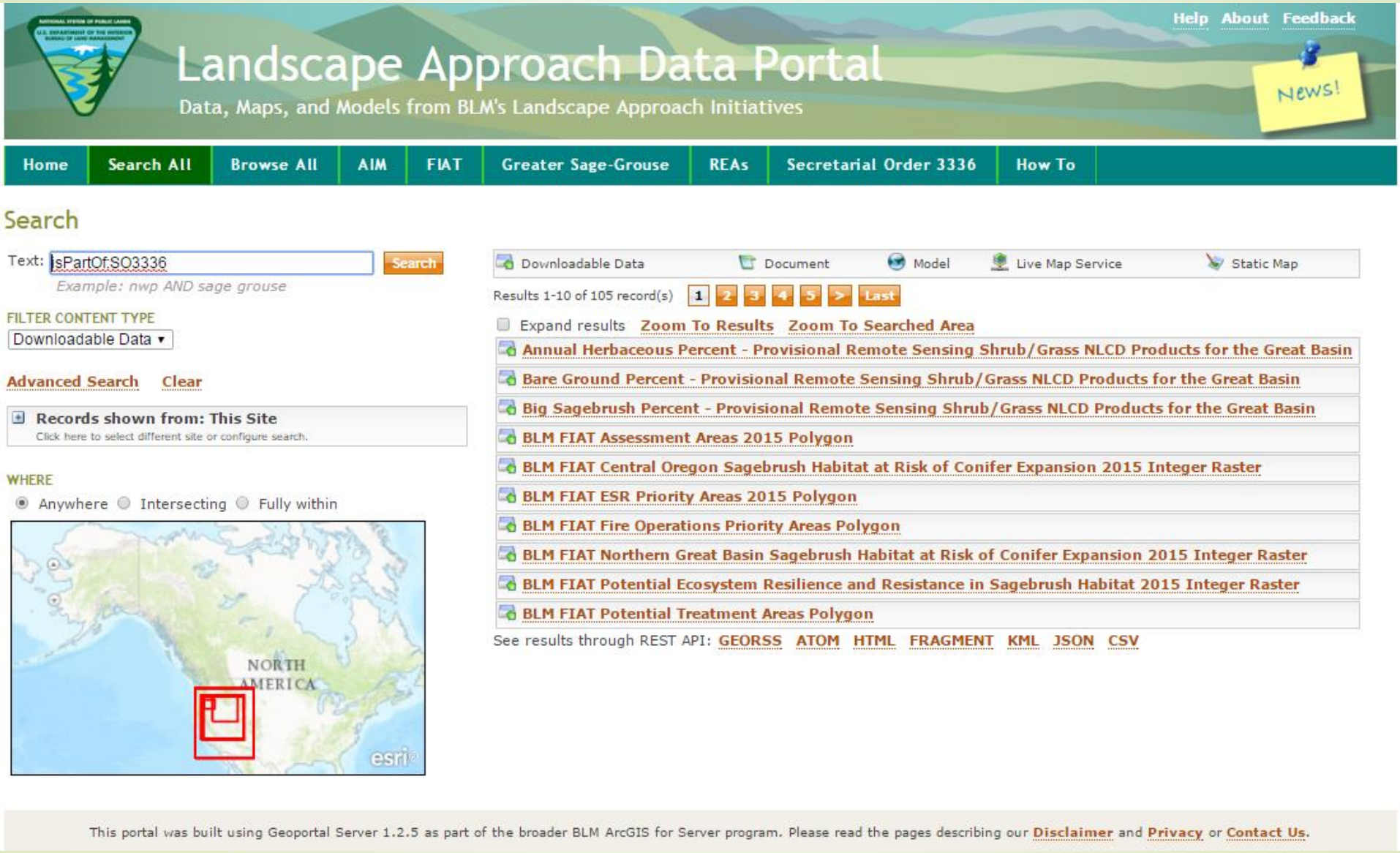
Geospatial Framework Interface



Geospatial Framework Interface



Geospatial Framework Interface



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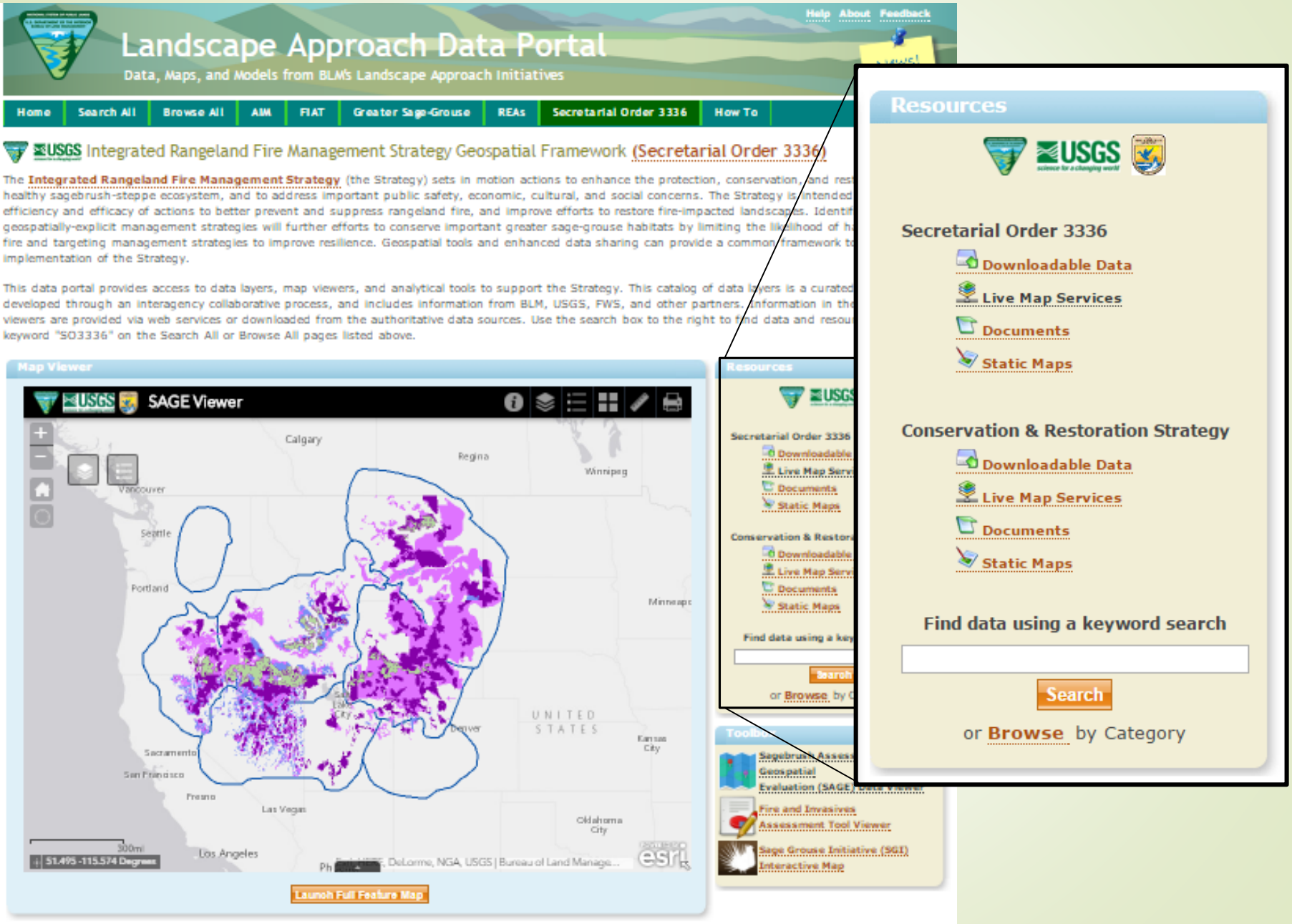

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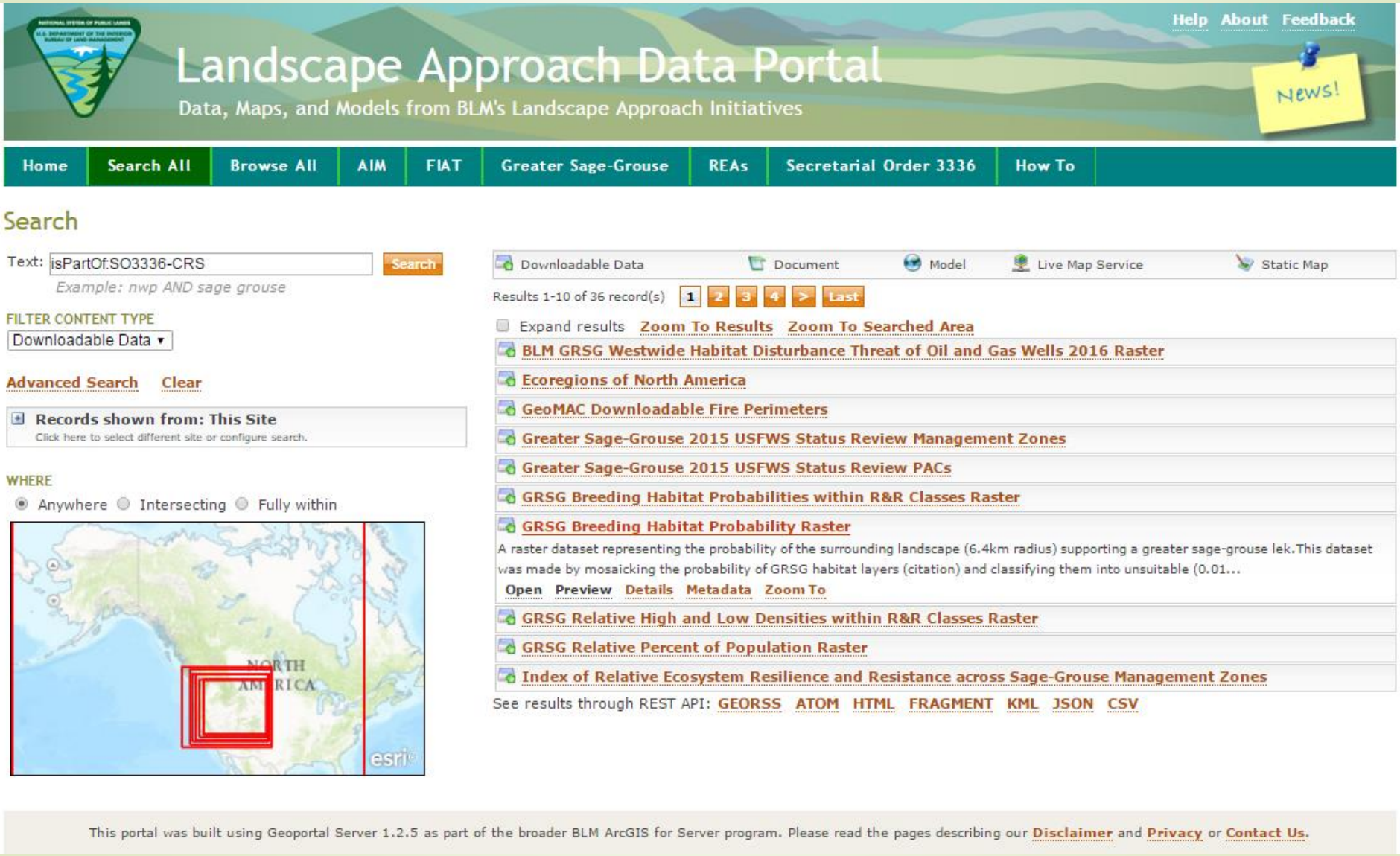

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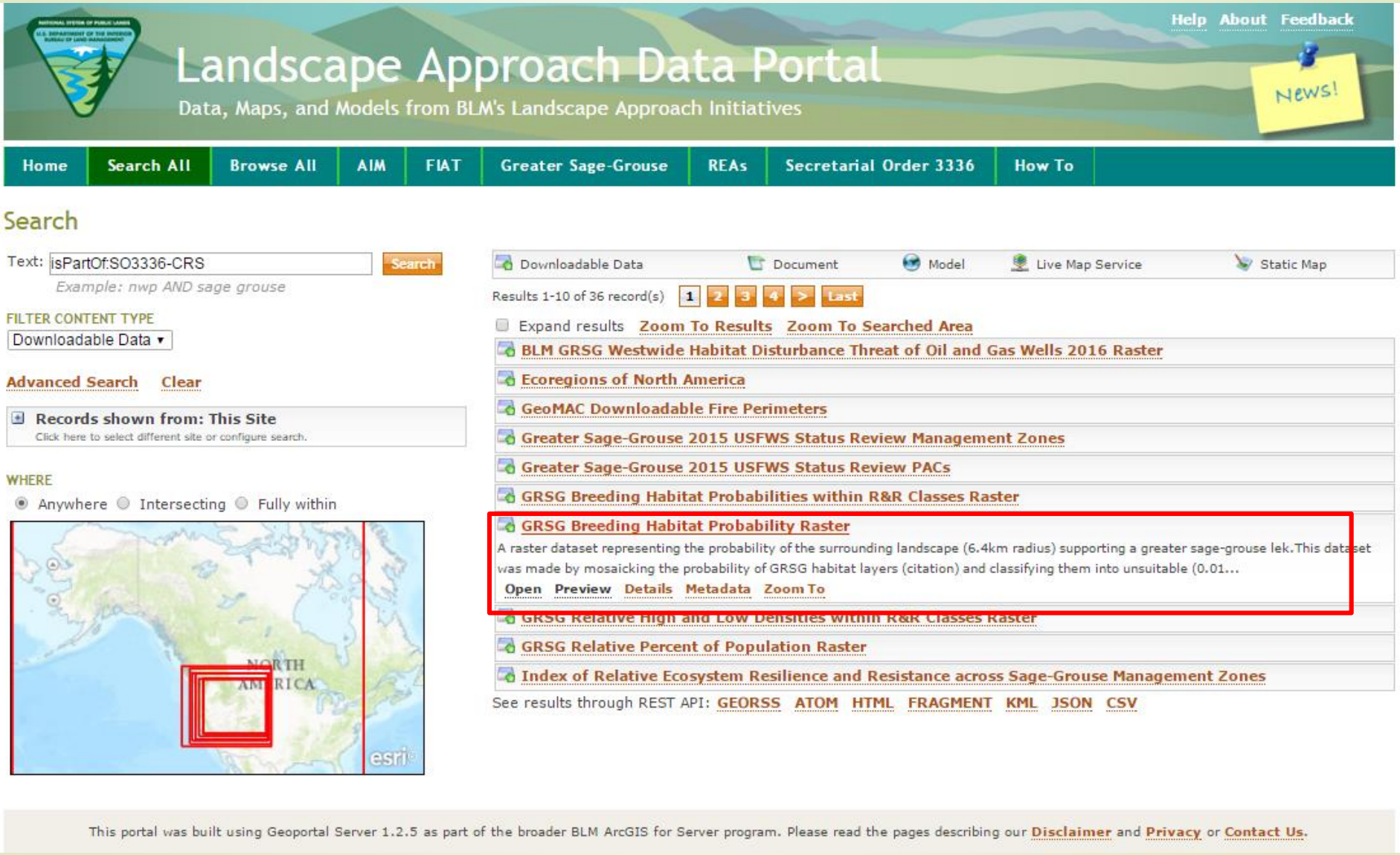


Geospatial Framework Interface

USGS science for a changing world

ScienceBase-Catalog | Communities | Help | Log in

Communities → Science Framework for the ... → GRSG Breeding Habitat Pro...

GRSG Breeding Habitat Probability Raster

Go to | View

Dates

Publication Date : 2016-07
Time Period : 2016-07

Citation

Department of Ecosystem Science, University of Wyoming, 201607, GRSG Breeding Habitat Probability Raster: .

Summary

A raster dataset representing the probability of the surrounding landscape (6.4km radius) supporting a greater sage-grouse lek.This dataset was made by mosaicking the probability of GRSG habitat layers (citation) and classifying them into unsuitable (0.01-0.25), low (0.25-0.50), moderate (0.50-0.65), and high (0.65-1.0) probabilities of the landscape supporting a lek.

Contacts

Point of Contact : United States Department of Agriculture (USDA), United States Forest Service (USFS)
Process Contact : Jacob D. Hennig
Originator : Department of Ecosystem Science, University of Wyoming
Metadata Contact : Jacob D. Hennig
Distributor : United States Geological Survey

Attached Files

Click on title to download individual files attached to this item or download all files listed below as a compressed file.

Breeding_Habitat_Probability.tif.xml *Original Metadata*	View	12.67 KB
Breeding_Habitat_Probability.zip		6.71 MB

Map »

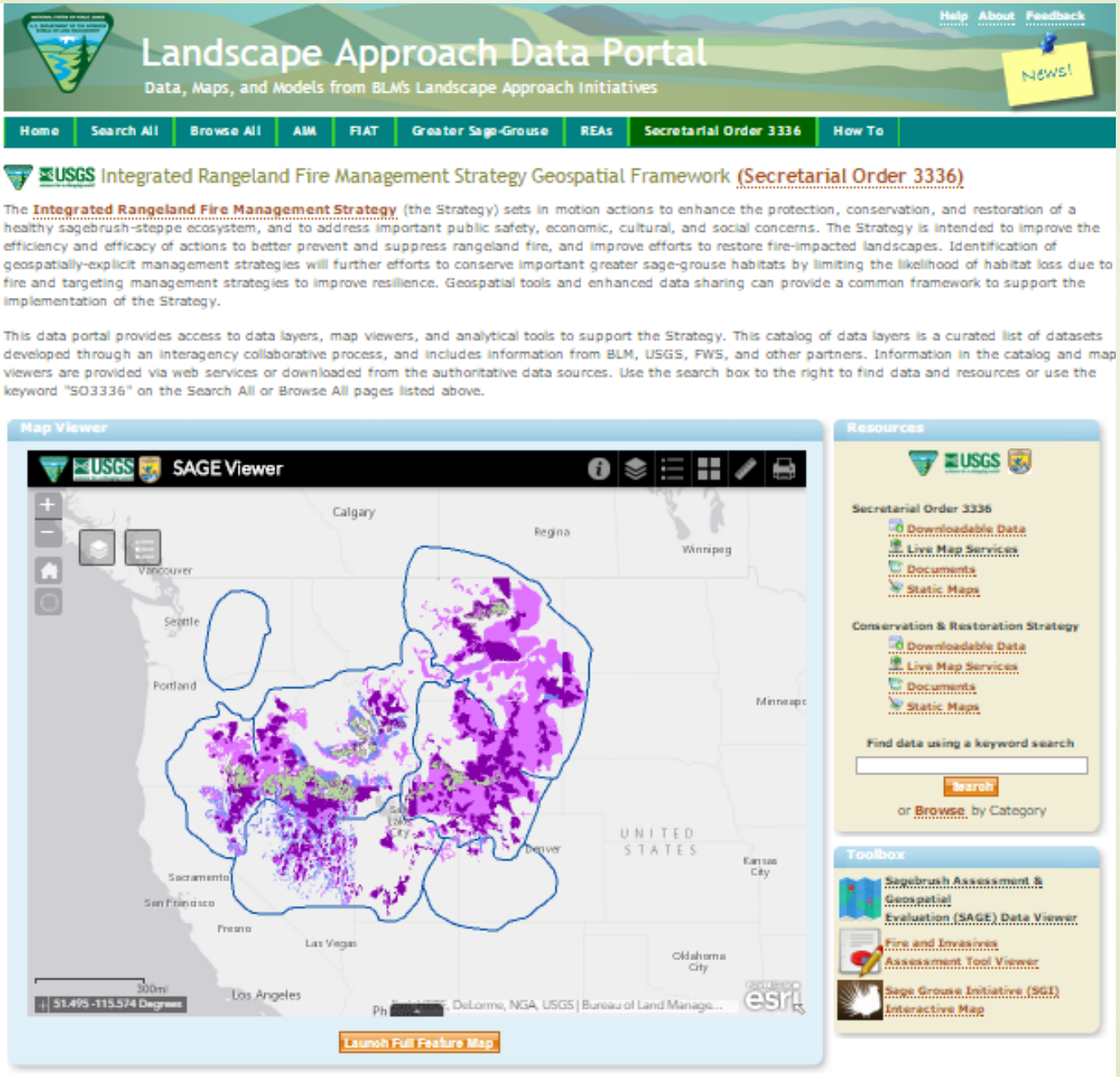
Spatial Services

ArcGIS Mapping Service : https://www.sciencebase.gov/arcg
WMS Service : https://www.sciencebase.gov/arcg
ScienceBase WMS : https://www.sciencebase.gov/cata

Tags

Categories : Data
Theme : CRS, Geospatial, Management,

Geospatial Framework Interface



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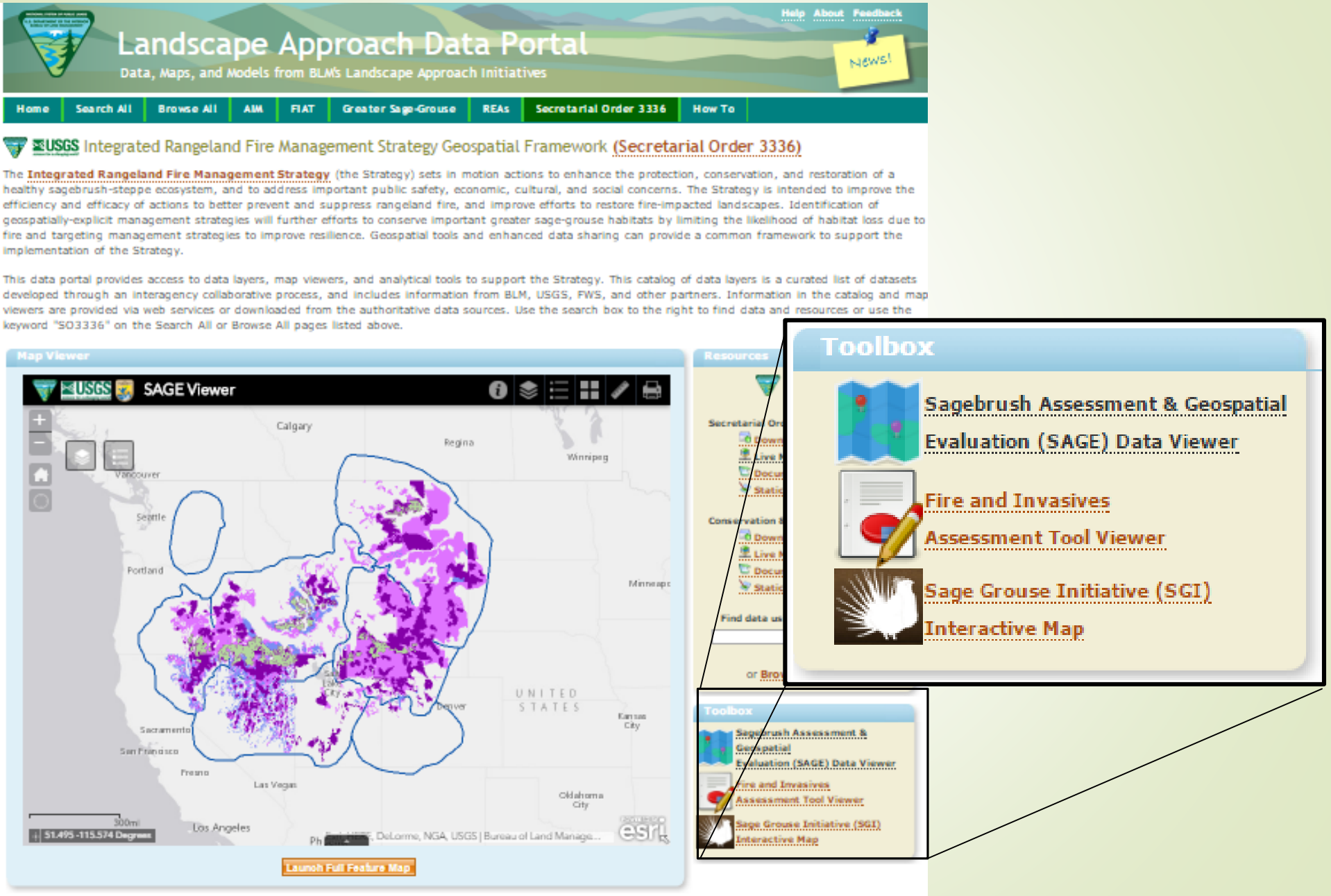

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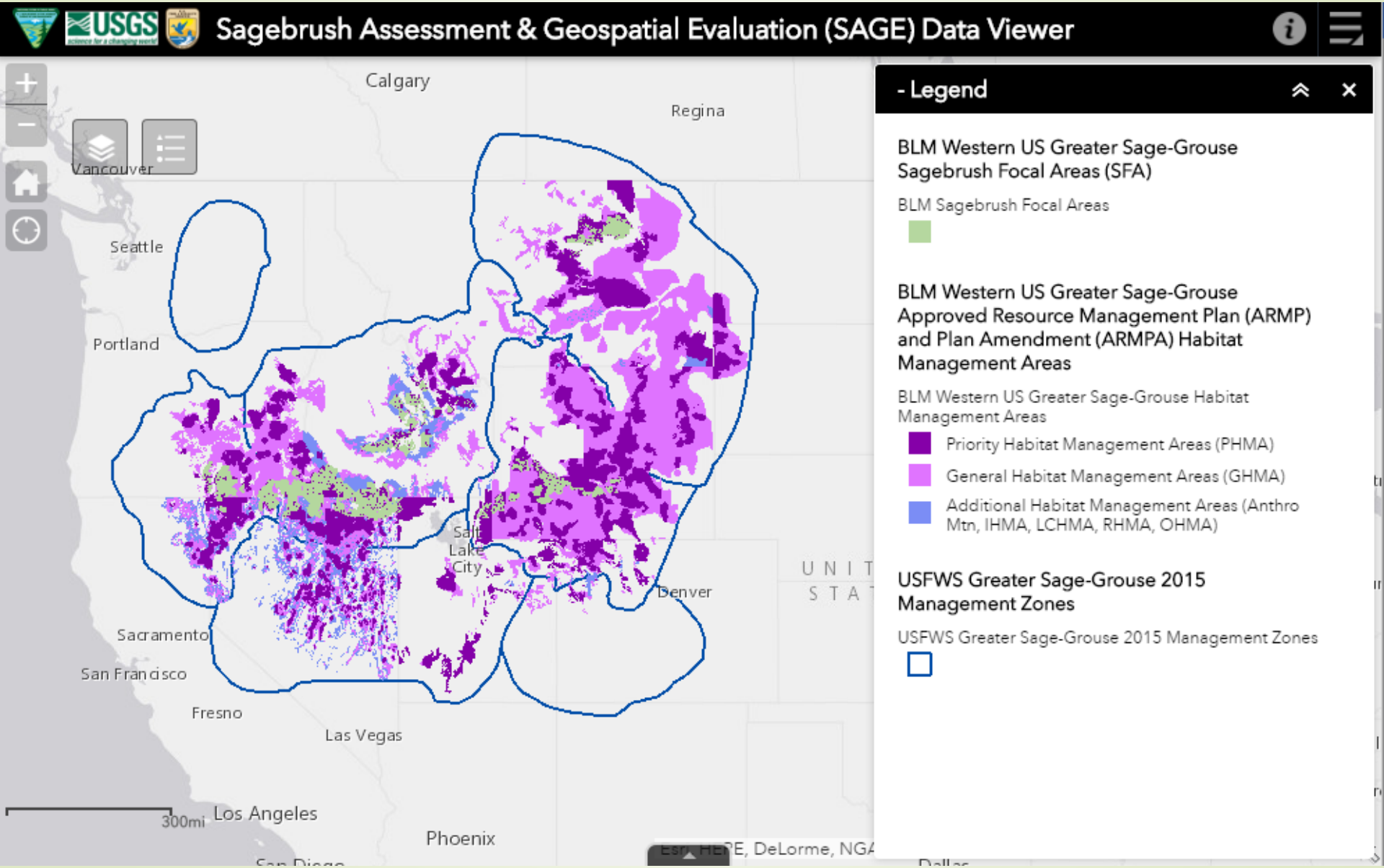
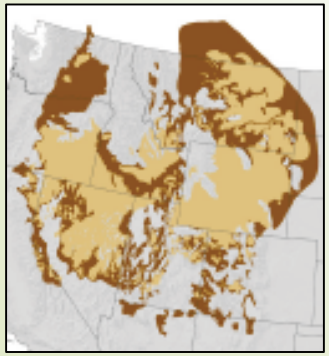


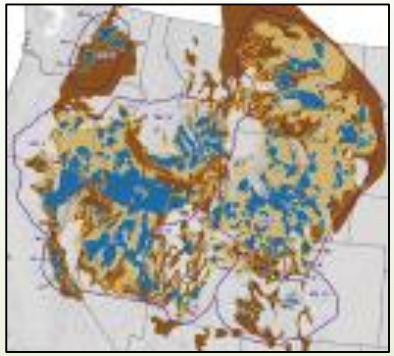
Toolbox

- Visualization
- Decision Support
  - Support for large-scale assessment and prioritization
  - Assist with regional and project level planning

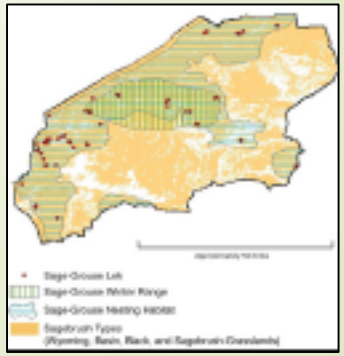
Sagebrush biome



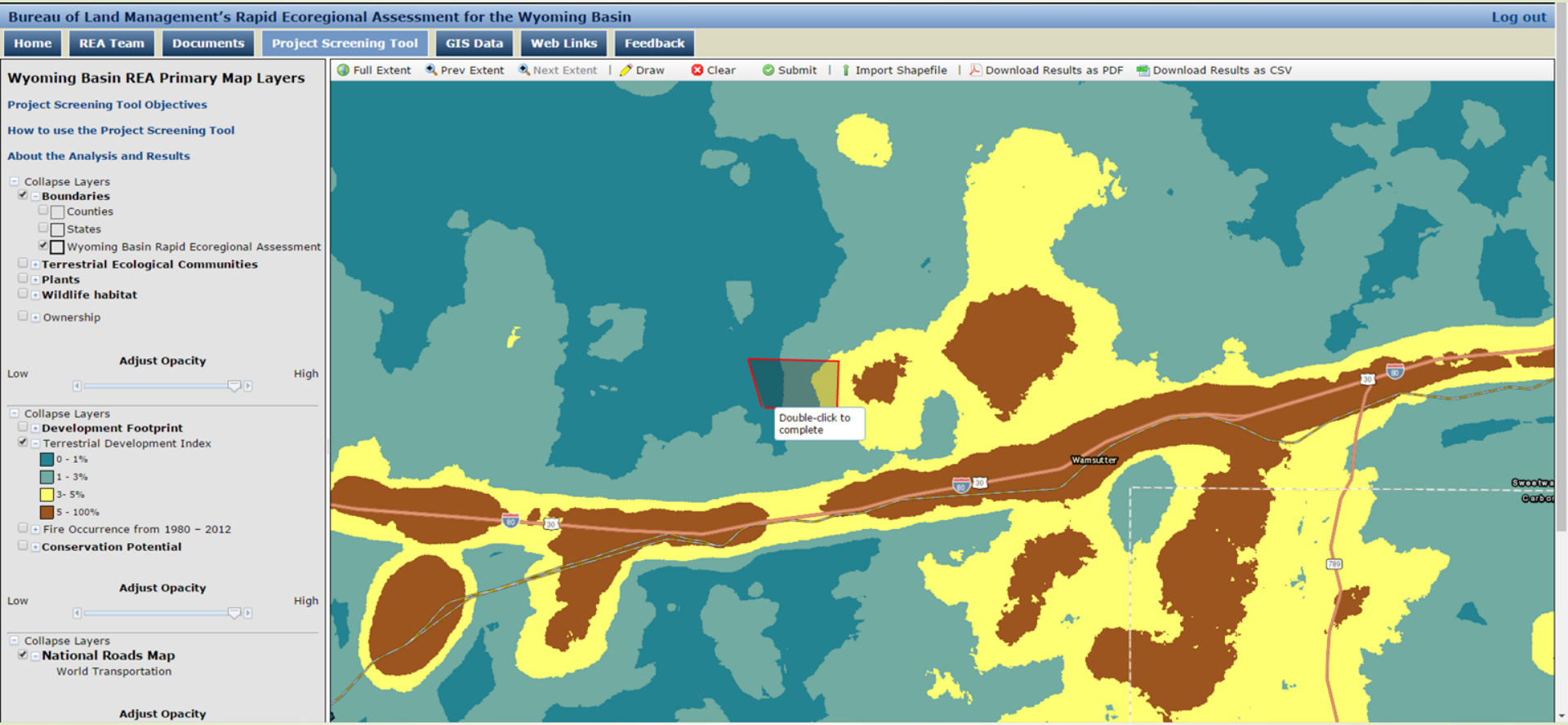
Sage-Grouse MZs and ecoregions



Local and site planning areas



Example Tool



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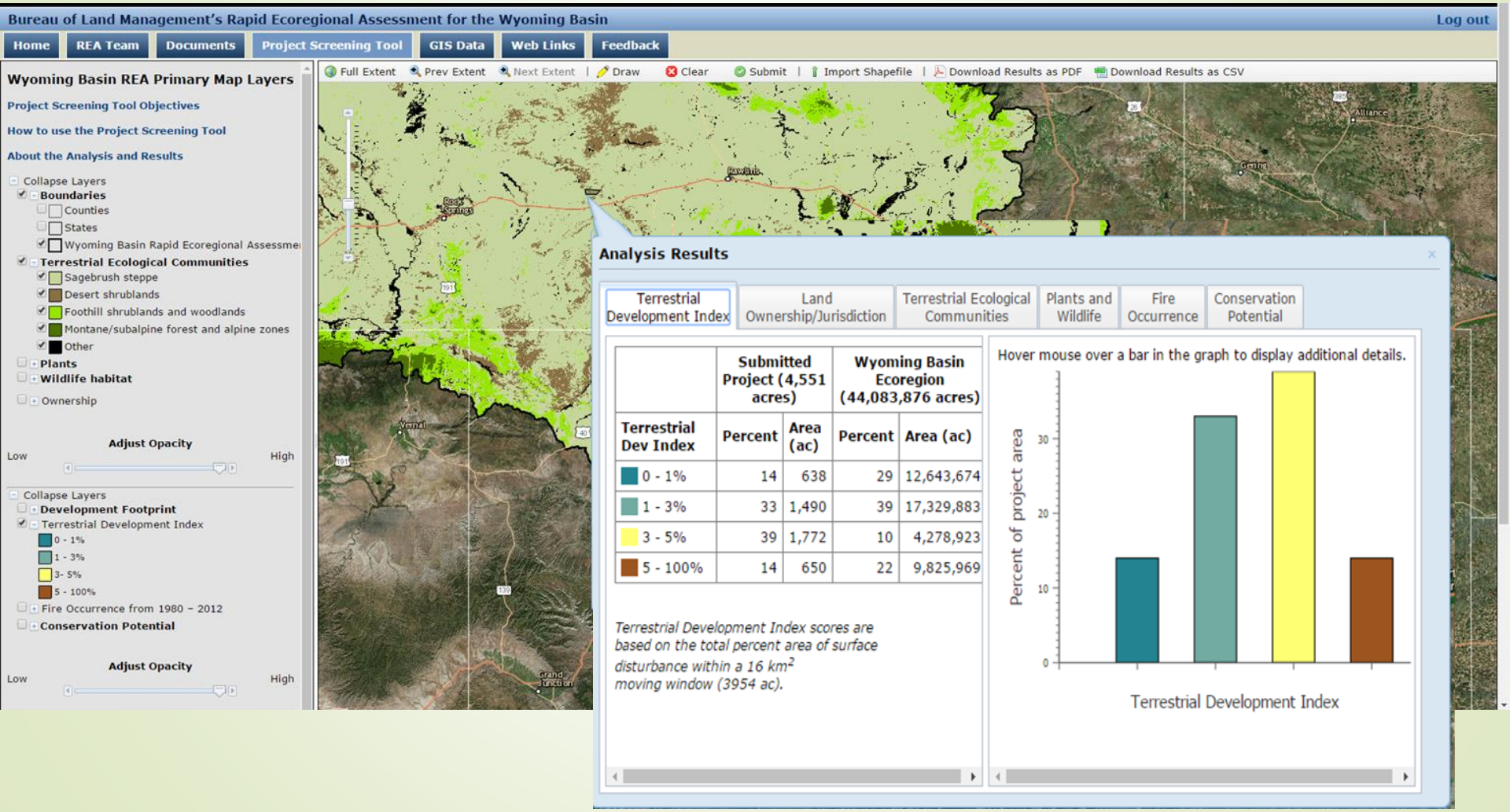

Geospatial Portal and Decision Tools

Help About Feedback

Landscape Approach Data Portal

Data, Maps, and Models from BLM's Landscape Approach Initiatives

News!

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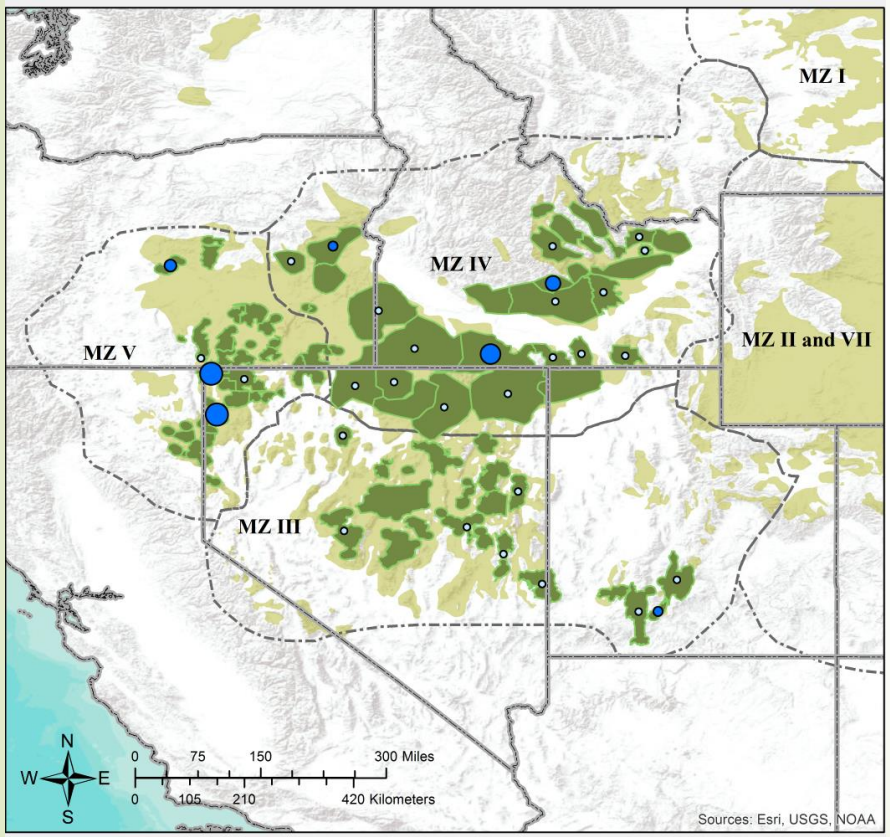
http://www.landscape.blm.gov/geoportal/

Implementation of Approach –

BLM Identified Priority Habitat Areas & Funding Allocation

FY13 Accomplished



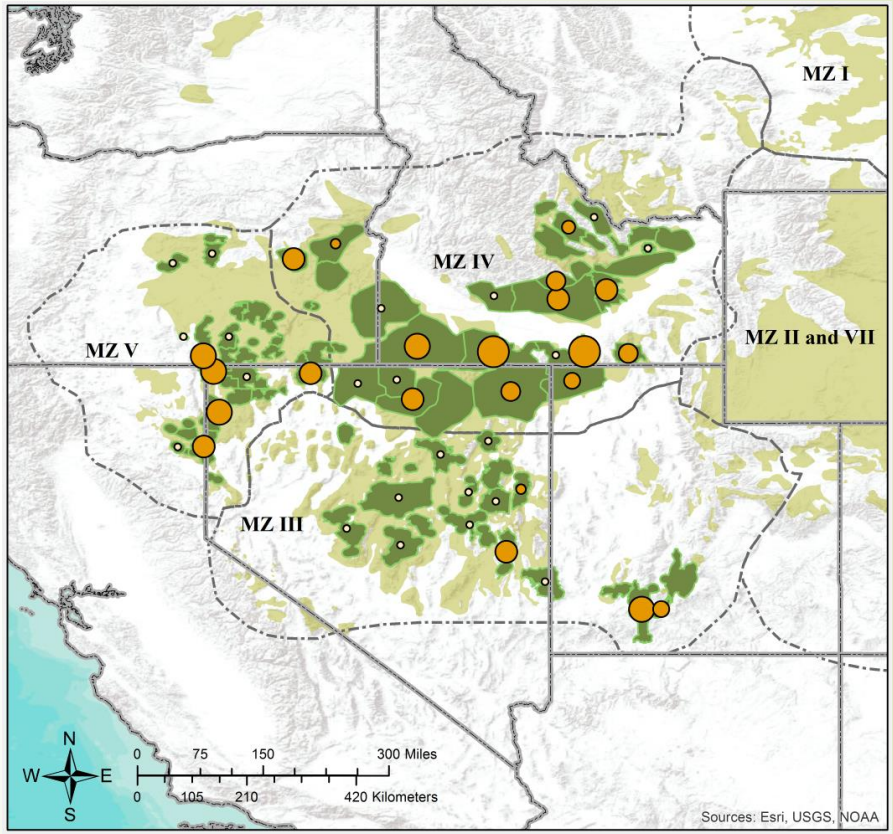
Explanation

FY13 DOI Funding ($)

- 0
- 1 - 5,000
- 5,001 - 10,000
- 10,000 - 50,000
- 50,001 - 100,000
- 100,001 - 300,000
- 300,001 - 500,000

- Project Planning Priority Areas
- Greater Sage-Grouse Range
- Management Zones

FY16 Planned



Explanation

FY16 Planned DOI Funding ($)

- 0
- 1 - 5,000
- 5,001 - 10,000
- 10,001 - 50,000
- 50,001 - 100,000
- 100,001 - 300,000
- 300,001 - 500,000
- 500,001 - 700,000
- 700,001 - 900,000

- Project Planning Priority Areas
- Greater Sage-Grouse Range
- Management Zones

Source: NFPORS

Implementation of Approach –

FS Fire and Invasive Assessments in R1/R2/R4

Prioritization uses a risk analysis and a scoring process

- Uses a risk based approach – includes fire risk models and invasive annual grass models in addition to R&R, sagebrush cover, and conifer cover
- Includes all sage-grouse habit regardless of designation
- Conducted on individual Forest basis

Science Framework Timeline

Timeline	Key Dates
Science Framework Version I and provisional data layers available **http://www.treesearch.fs.fed.us/pubs/52275**	*7/22*
Science Data available through Geospatial Framework + Portal	*7/22*
Eastern Range GTR published	*10/30*
WAFWA/BLM Conservation and Restoration Workshop	*Nov 1-3*
Science Framework GTR, in press	*12/16*

Science Framework Team

Part 1 – Science Approach and Applications (Jeanne Chambers, Lead)

Writing Team	Reviews
Jeanne C. Chambers, Jeffrey L. Beck, Steve Campbell, John Carlson, Thomas J. Christiansen, Karen J. Clause, Michele R. Crist, Jonathan B. Dinkins, Kevin E. Doherty, Shawn Espinosa, Kathleen A. Griffin, Steven E. Hanser, Douglas W. Havlina, Kenneth F. Henke, Jacob D. Hennig, Laurie L. Kurth, Jeremy D. Maestas, Mary Manning, Kenneth E. Mayer, Brian A. Mealor, Clinton McCarthy, Mike Pellant, Marco A. Perea, Karen L. Prentice, David A. Pyke, Lief A. Wiechman, and Amarina Wuenschel	Mike Wisdom, Peter Weisberg and about 60 science and management interagency reviewers

Science Framework Team

Part 2 - Management Sections (Karen Prentice, Lead)

	Writing Team Leads
Climate Change	Jeanne Chambers, Louisa Evers, and Linda Joyce
Fire	Michele Crist and Doug Havlina
Invasives	Lindy Garner, Ken Mayer, and Mike Ielmini
Seed Strategy	Fred Edwards, Francis Kilkenny, and Sarah Kulpa
Monitoring	Dave Pyke and Lief Weichman
Mitigation	Leigh Espy

Science Framework - Discussion

A Science Framework for Assessing Threats to Sagebrush Ecosystems and Greater Sage-grouse and Prioritizing Conservation and Restoration Actions

Jeanne Chambers, jchambers@fs.fed.us

Steve Hanser, shanser@usgs.gov

A recording of today's webinar and slides from the presentation will be available at **www.GreatBasinLCC.org**.

For more information on the Great Basin LCC contact: Rick Kearney, Coordinator, rkearney@blm.gov, (775) 861-6556.

Let us know what you thought of today's webinar!

Please take our two minute survey when you log off.