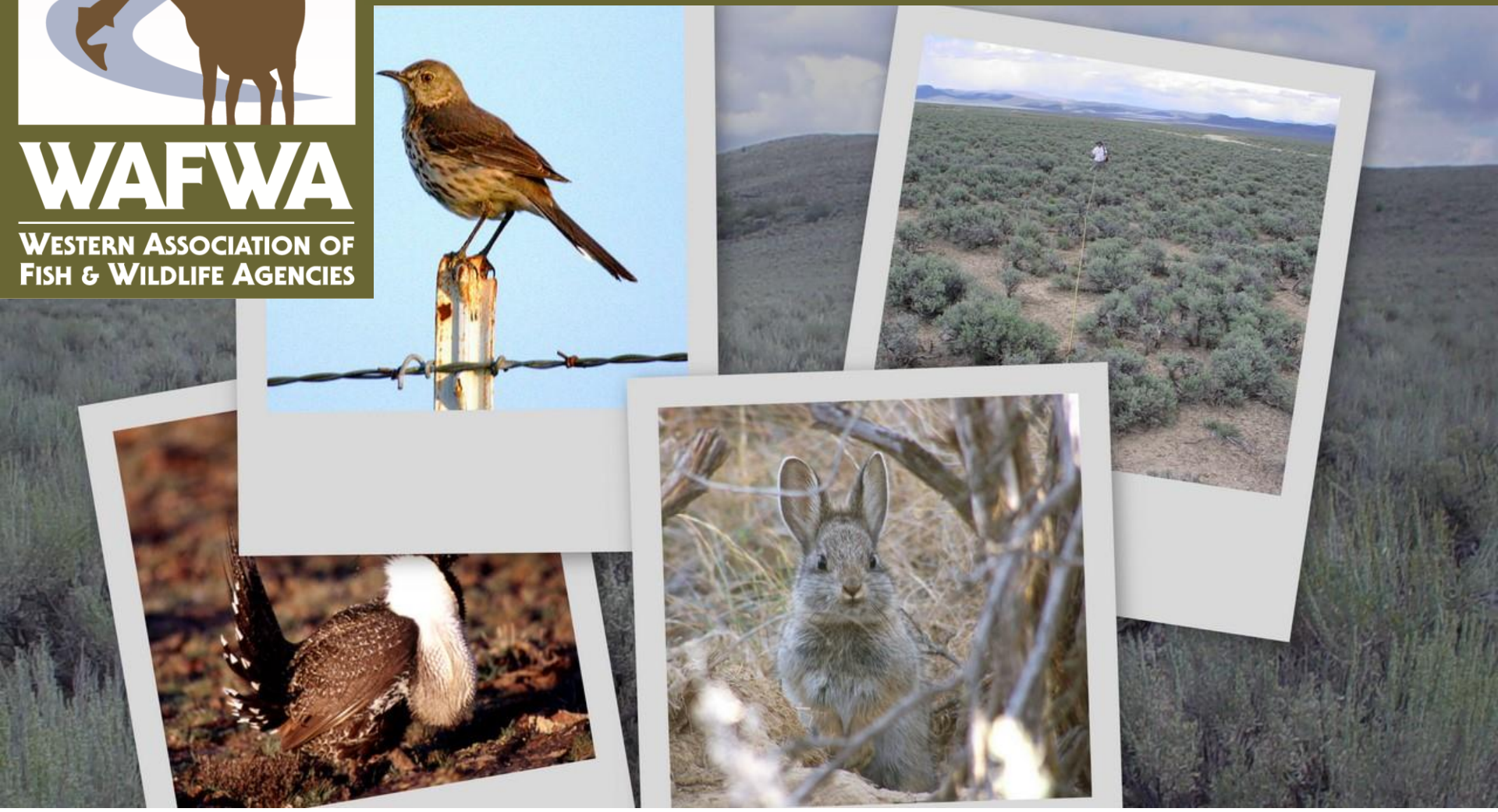
WAFWA

WESTERN ASSOCIATION OF FISH & WILDLIFE AGENCIES

Sagebrush Conservation Strategy Workshop

November 1-3, 2016

Embassy Suites – Denver, Colorado



Management Context

San Stiver, WAFWA
Matt Magaletti, BLM
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GREATER SAGE-GROUSE COMPREHENSIVE CONSERVATION STRATEGY 2.0

Transitioning to

Sagebrush Ecosystem Conservation Strategy

Western Association of Fish and Wildlife Agencies
Sagebrush Conservation Strategy Workshop
Denver, Colorado
November 1-3, 2016

WAFWA
Western Association of Fish & Wildlife Agencies

Background

- Based upon observations of declining sage-grouse populations
  - The Sage and Columbian Sharp-tailed grouse Technical Committee requested that the states, provinces and land management agencies begin significant conservation efforts in the sagebrush biome in 1994.
  - The Technical Committee brought those concerns to the Directors in 1995.
  - WAFWA Directors at first and then with Federal partners joined in a series of MOUs that would assess the status of the species, develop a conservation strategy and finally implement that strategy.
- In the early 2000s, Terry Crawforth, Director sponsor from Nevada, reminded all of the partners that this was a SAGEBRUSH issue and sage-grouse were a symptom of an ecosystem in trouble. Director Crawforth and the technical team recommended that we broaden the approach to include the ecosystem.
- The Partnership agreed, but directed the Technical team to stay focused on sage-grouse since resources were short and conservation on behalf of sage-grouse would benefit most species

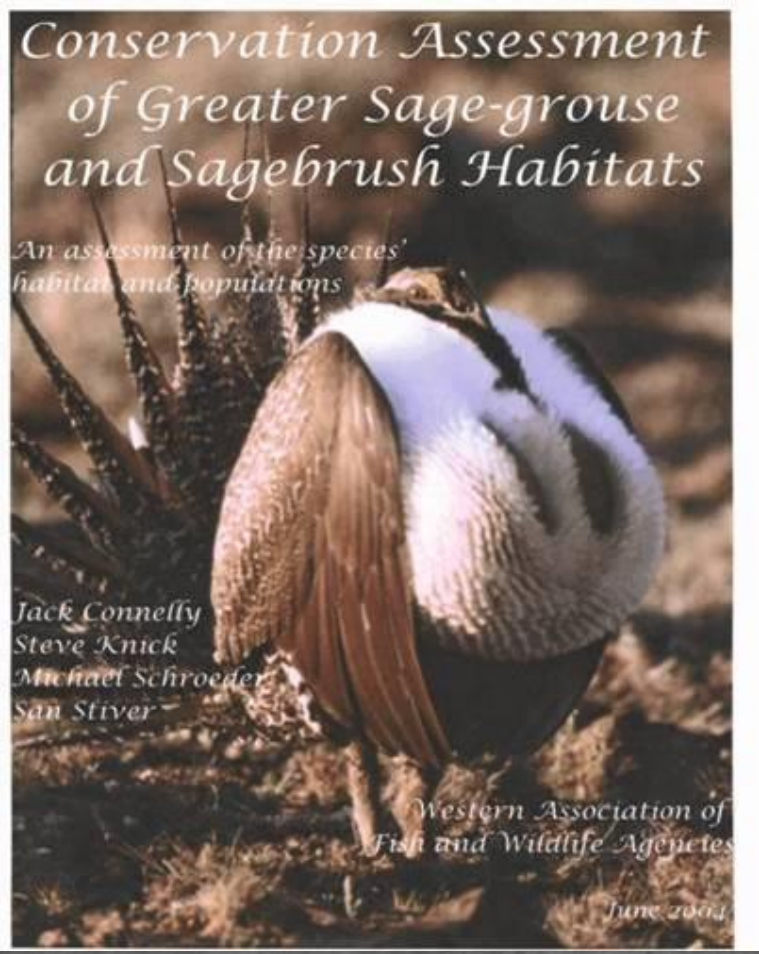
Conservation Outcomes

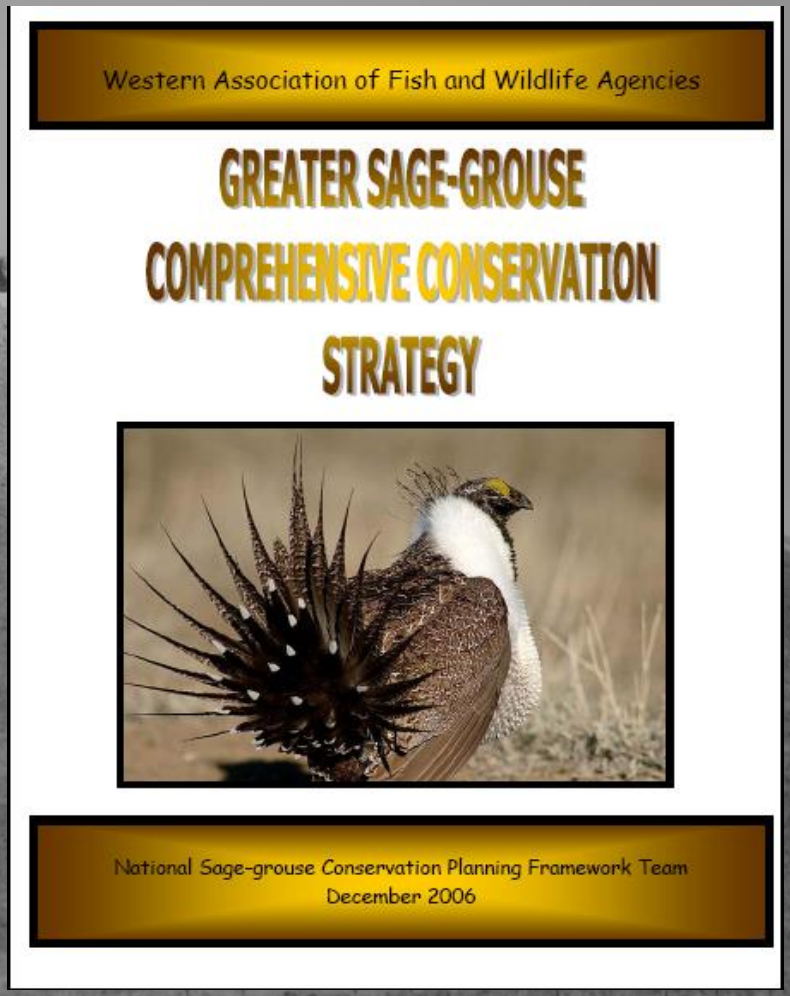
- The directors/partnership were right to maintain the focus on sage-grouse.
  - We have delivered several assessments of the status of sage-grouse and sagebrush habitats,
  - We have developed a Comprehensive Conservation Strategy that guides sage-grouse conservation,
  - Since the early 2000s we have dealt with a “not warranted”, warranted but precluded” and “not warranted” findings,
  - The community has delivered and continues to deliver an unprecedented scope and quantity of conservation efforts to the sagebrush ecosystem on behalf of sage-grouse; the community has delivered approximately $750 million and we anticipate another $500 million will be delivered in the next 5 years.

Sagebrush Ecosystem Needs

- **350 vertebrate species depend upon sagebrush during part or all of their life history.**
  - **Prioritize conservation needs for these species,**
  - **Determine where conservation efforts for sage-grouse intersects conservation needs for other species,**
  - **Design sage-grouse conservation efforts that benefit other species.**

The Sage-grouse Approach






Communication & Outreach Sub-Strategy
Assessment & Conservation Sub-Strategy
Funding Sub-Strategy
Adaptive Management Sub-Strategy
Sagebrush Ecosystem Comprehensive Strategy
Implementation Monitoring Sub-strategy
Research & Technology Sub-Strategy
Effectiveness Monitoring Sub-Strategy

How did this work?

- We needed to measure effectiveness of conservation actions (Strategy)
  - Need to assess sage-grouse populations with a robust analysis technique.

- In a RFP process, WAFWA and the FWS contracted with the University of Montana to develop a scalable population model that provides biologists with bounded population estimates.

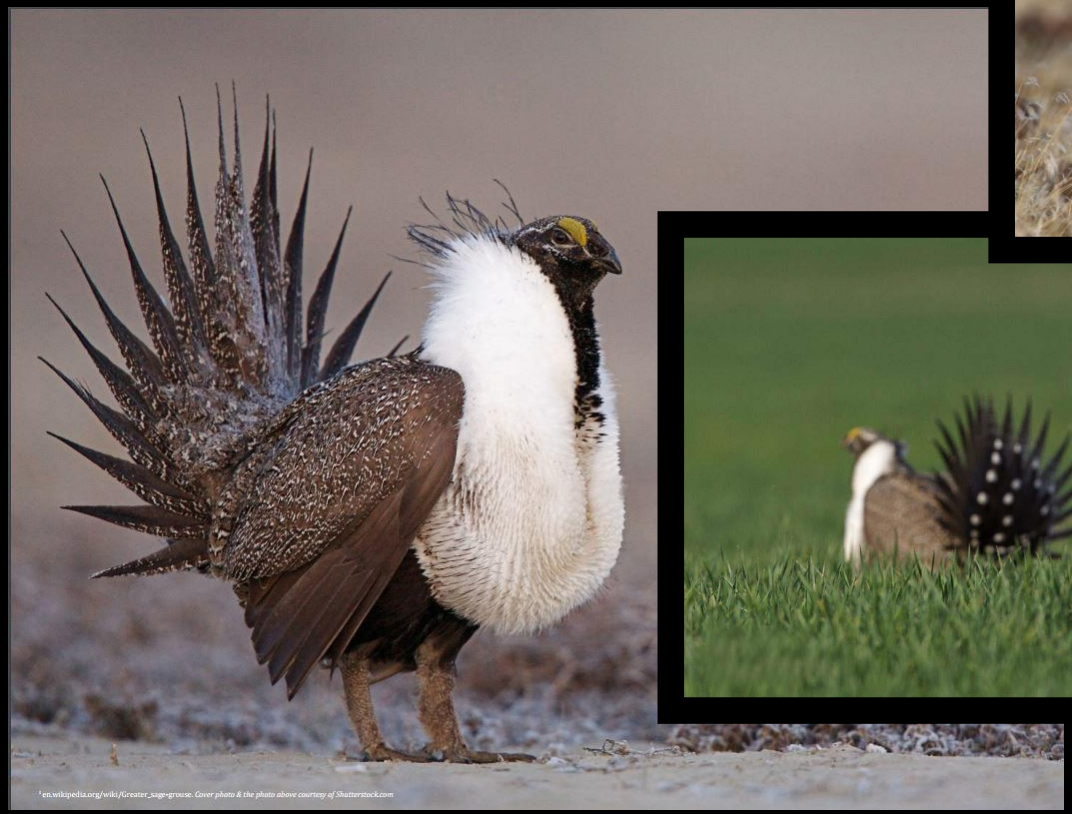
How did this work?

- We needed to address the Regulatory Authority short-comings(Strategy)

- With a little prompting from Western directors and assistance from USFWS, and a huge amount of work from the BLM and USFS we closed the 800 pound regulatory authority issue.


Thanks!

Greater Sage-Grouse Plan Amendments and RODs



[1] en.wikipedia.org/wiki/Greater_sage-grouse. *Cover photo & the photo above courtesy of Shutterstock.com*

Thanks to Wendy Fuell, H-T

Sage Grouse 101

History

- March 2010: Warranted to list, but deferred listing based on other higher priorities.
- Fish and Wildlife Service findings identified inadequacy of regulatory mechanism as a significant threat to GRSG.
- December 2011: BLM and Forest Service jointly decided to amend land management plans for GRSG conservation
- BLM as lead federal agency and the Forest Service as a Cooperating Agency

Threats To GRSG

Primary Threats

- widespread present and potential impacts of wildfire
- loss of native habitat to invasive species
- conifer encroachment

Other threats

- Energy development
- mining
- infrastructure
- recreation
- urbanization
- sagebrush elimination
- free-roaming equids (horses and burros)
- improper livestock grazing

Greater Sage-Grouse Planning Effort

98 Plans Amended (includes BLM and FS)

2 Regions

- Great Basin
- Rocky Mountain
- 15 EISs

Timeline

- NOI issued December 2011
- DEIS released November 2013
- FEIS released May 2015
- Record of Decision issued September 2015
  - 2 RODs for BLM: Great Basin and Rocky Mountain
  - Forest Service has separate LMPs and RODs (16 Forest Plans Amended)
- September 24, 2015: Federal Register Notice for Mineral Segregation of SFAs

Summary of Record of Decision

- Consistent approach between FS and BLM within GRSG range.
- Defined conservation actions to address threats identified by USFWS in each of the defined habitat areas.
- Defined Habitat Management Areas:
  - Sagebrush Focal Areas (SFA)
  - Priority Habitat Management Areas (PHMA)
  - General Habitat Management Areas (GHMA)
  - Other Habitat Management Areas (OHMA)

Greater Sage-Grouse Record of Decision

Sagebrush Focal Areas (SFA's)

Areas identified by the U.S. Fish and Wildlife Service that represent recognized "strongholds" for greater sage-grouse

- SFAs are managed as a subset of PHMA with additional requirements

Greater Sage-Grouse Record of Decision

Priority Habitat Management Areas (PHMA)

Identified as having the highest habitat value for maintaining sustainable GRSG populations

General Habitat Management Areas (GHMA)

Occupied seasonal or year-round habitat outside of PHMA where some special management would apply to sustain GRSG populations

Greater Sage-Grouse Record of Decision

Other Habitat Management Areas (OHMA, Nevada)

Unmapped habitat in that are within the planning area and contain seasonal or connectivity habitat areas

Important Habitat Management Areas (IHMA, Idaho)

High value habitat and populations that provide a management buffer for the priority and sagebrush focal management areas and connect patches of priority and sagebrush focal management areas

Components

Desired Conditions

Descriptions of specific social, economic, and/or ecological **characteristics of the plan area,** toward which management of the land and resources should be directed. Described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates.

Standards

Mandatory constraints on project and activity decision making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements

Components

Guidelines

Constraints on project and activity decision making that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Objectives

Concise, measurable, and time-specific statements of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets.

Program Areas

- Livestock Grazing
- Wild Horse and Burro Management
- Fire and Fuels Management
- Vegetation Management
- Lands and Realty
- Wind and Solar
- Vegetation Management (within GRSG habitat)
- Roads and Transportation
- Recreation
- Minerals

Program Area Direction

- Desired Seasonal Habitat Conditions (Table 1s)
- Anthropogenic Disturbance (3% or 5% anthropogenic disturbance threshold in PHMA)
- Seasonal Restrictions, Noise Limits for breeding and nesting periods
- Net Conservation Gain by avoiding, minimizing or compensatory mitigation: actual benefit or gain above baseline conditions
- Pre-planning surveys for projects in PHMA and GHMA (Nevada Only)

Direction Specific to Livestock Grazing

- Grazing is managed to achieve Desired Conditions (Table 1s)
  - ***May be adjusted based upon local ecological site capability.**

- Specific Grazing Guidelines (Table 3s)

  - **<u>Breeding and Nesting Habitat</u>**
  - In Breeding and Nesting Habitat (Within 4 miles of the lek and independent of PHMA, GMHA, or SFA designations), perennial grass height will be maintained at a height of 7” from 3/1 to 6/30 and 4” from 7/1 to 9/15

  - ***Only applies in breeding and nesting habitat with >10% sagebrush cover to support nesting.**

Direction Specific to Livestock Grazing

Brood Rearing and Summer Habitat

When grazing occurs post breeding and nesting but before fall (7/1 to 9/15) retain 4” of herbaceous cover.

***Applies to all GRSG habitat with greater than 10% sagebrush cover irrespective of lek buffers and designated habitat management areas.**

Winter/Fall Habitat

Utilization of sagebrush ≤ 35%

Direction Specific to Livestock Grazing

Identifies range improvement design criteria and seasonal restrictions for bedding sheep and trailing livestock which includes the following:

- Installation of wildlife escape ramps in water troughs
- In PHMA, GHMA and SFA, construction of water developments has to be beneficial to greater sage-grouse habitat
- No fence construction or reconstruction within 1.2 miles from the perimeter of occupied leks, unless the collision risk can be mitigated through design features
- New permanent livestock facilities (e.g., windmills, water tanks, corrals) should not be constructed within 1.2 miles from the perimeter of a lek

Direction Specific to Livestock Grazing

- Bedding sheep and placing camps within 2.0 miles from the perimeter of a lek during lekking (March 1 to May 15) should be restricted.

- During the breeding and nesting season (March 1 to June 30), trailing livestock through breeding and nesting habitat should be minimized. Specific routes should be identified, existing trails should be used, and stopovers on active leks should be avoided.

Direction Specific to Livestock Grazing

Phased approach to Implementation of Grazing Guidance

- Habitat mapping and Allotment Evaluation (informed by Habitat Assessment Framework **(HAF)** monitoring) during 2016-2017
- Term Grazing Permits will be modified, if necessary by the 2017 or 2018 grazing season

- In most cases no NEPA analysis or decision is anticipated prior to permit modification.
- If its determined that existing AMP is preventing attainment of standards, guidelines or desired conditions, then new NEPA may be required to adjust the Terms and Conditions of the permit.

Wild Horse and Burro Management

In Priority and General Habitat:

- Consider adjusting AML when WH&B are contributing to the non-attainment of habitat objectives
- Maintain established AML
- Manage the population at the lower levels of the established AML
- Prioritize gathers when populations exceed the upper limit of AML

Fire and Fuels Management

- First Priority is fire fighter safety and public safety.
- Protection of sage-grouse habitat from loss due to unwanted wildland fires will be commensurate with other high priority resource values
- Forest will complete an Fire and Invasive Assessment to identify strategies to protect GRSG habitat
- Describes various guidelines to be used during pre-fire, fire suppression, and rehabilitation

Vegetation Management

- Desired Condition that sagebrush vegetation communities provide contiguous habitat for GRSG and are resistant and resilient to disturbance such as fire and invasive
- Identifies treatment Objectives (acres treated) for the removal of invading conifers and other undesirable species.
- Provides Guidelines for design, planning and prioritization of vegetation treatments in GRSG habitat.

Vegetation Management

	ACRES		
FOREST	MECHANICAL[2]	PRESCRIBED FIRE[3]	GRASS RESTORATION[4]
Boise	1000	2000	0
Caribou-Targhee-Curlew	3000	2000	3000
Salmon-Challis	5000	1000	0
Sawtooth	7000	1000	7000
Beaverhead-Deerlodge	0	0	0

	ACRES		
FOREST	MECHANICAL[2]	PRESCRIBED FIRE[3]	GRASS RESTORATION[4]
Humboldt-Toiyabe Total	202000	0	43000
Population Area 15	200000	0	26000
Population Area 26	2000	0	17000

	ACRES		
FOREST	MECHANICAL[2]	PRESCRIBED FIRE[3]	GRASS RESTORATION[4]
Ashley	10000	0	2000
Dixie	13000	1000	7000
Fishlake	7000	0	1000
Manti-La Sal	3000	0	4000
Uinta-Wasatch-Cache	9000	0	0

Lands and Realty

- Establishes the objective to retrofit existing tall structures with perch deterrents and other anti-perching devices within two years of ROD signing
- Provides guidance regarding ‘restricted’ authorization for Special Use Permits
- Direction for Land Ownership adjustments, Land Withdrawals and Wind and Solar authorizations

Wind and Solar

- In PHMA,GHMA, and SFAs do not authorize new utility scale solar development.
- In PHMA and SFAs, do not authorize new utility scale wind development
- In GHMA, authorization should be restricted (avoid, minimize or compensatory mitigation)

Roads/Transportation

- Identifies seasonal restrictions on forest transportation system roads and trails and when issuing special use authorizations for use of the forest transportation system.
- Identifies design, use and construction guidelines regarding road management and maintenance

Recreation

- Temporary SUP are not allowed in GRSG habitat (facilities or activities) if loss of habitat is to occur
- New Recreation facilities or expansion of existing facility is not authorized unless a ‘net conservation gain’ can be demonstrated.
- Nevada Only: No outfitter guide activities within .25 miles of the perimeter of the lek between March 1 and June 30.

Minerals

Locatable

- In PHMA, GHMA and SFA approved Plans of Operation must include mitigation to protect GRSG, consistent with rights associated with General Mining Act of 1872.
- Use a phased approach to development (consistent with rights associated with General Mining Act of 1872).
- Abandoned mines sites in GRSG habitat should be closed or mitigated to reduce predation of GRSG.

Minerals

- In PHMA and SFA, do not authorize new mineral material disposal or development.
- In PHMA and SFAs, free-use material collection permits and expansion of existing sites may be allowed within seasonal restriction periods.
- In GRSG habitat, all permits must include appropriate requirements to achieve GSRS habitat objectives (Table 1s)

Minerals-Fluids (Unleased)

Oil and Gas

- In PHMA, lease must contain a NSO. One exception allowed;
  - ❖No direct, indirect or cumulative effects to GRSG or habitat
  - ❖Exceptions provides a 'net conservation gain'
  - ❖Unanimous concurrence by FWS, FS and NDOW
- In SFAs, NSO with no exceptions.
- IN GHMA, may lease with appropriate controlled surface use and timing stipulations.
- Only allow geophysical or similar exploration that is consistent with habitat objectives (Table 1a and 1b)

Minerals-Fluids (Unleased)

Geothermal

- In SFAs, NSO with no waiver, modification or exceptions.
- In PHMA outside of SFAs, lease if
  - ❖A team of GRSG experts from FWS, FS, BLM and NDOW advise on project mitigation
  - ❖Mitigation are Consistent with Mitigation Strategy
  - ❖Foot print of the project is consistent with Disturbance Protocol
- IN GHMA, may lease with appropriate controlled surface use and timing stipulations.
- Only allow geophysical or similar exploration that is consistent with habitat objectives (Table 1s)

Minerals-Fluids (Leased)

(Oil and Gas/Geothermal)

- ❖ In PHMA and SFAs, on undeveloped leases require leaseholder to avoid and minimize surface disturbance consistent with rights granted in lease
- ❖ Authorize transmission line facilities in GRSG habitat with stipulations to protect GRSG and its habitat
- ❖ Coordinate with operators to minimize impacts to GRSG and habitat

- Leased (Operations)
  - ❖ Identifies numerous design recommendations and associated discretionary authorization (employee camps).

Other Key Elements

Monitoring Framework (Appendix A)

- Implementation (Decision) Monitoring
- Habitat Monitoring
  - --Sagebrush Availability (% sagebrush per unit area)
  - --Habitat Degradation (% human activity per unit area)
  - --Energy and Mining Density (facilities and locations per unit area)
- Population (Demographics) Monitoring
- Effectiveness Monitoring
  - --Amount and condition of sagebrush
  - --Amount relative to relative to pre-EuroAmerican

Other Key Elements

Mitigation Strategy (Appendix B)

- State interagency teams
- WAFWA Management Zone Regional Mitigation Strategy
- Established in 1 year from signing of Record of Decision

Nevada: Compensatory Mitigation

Conservation Credit System

- The conservation credit system is one form of mitigation that the BLM and Forest Service would consider using in the Proposed Plan.
- Developed for the state (Nevada Dept. of Conservation and Natural Resources) and the Sagebrush Ecosystem Council)
- Quantifies conservation outcomes (credits) and impacts from anthropogenic (debits), defines standards for market transactions, and provides reporting mechanism to track progress of implementing conservation actions
- Currently working on an MOU with the BLM and State to define how we will use.

Other Key Elements

Adaptive Management (Appendix C)

- The Plan Amendment identifies thresholds (soft and hard triggers) at which adjustments of management actions will occur.
- Soft Triggers result in additional project mitigation.
- Hard Triggers result in more conservative resource decisions and are specifically identified and analyzed in the FEIS.
- Requires interagency working group to evaluate data

Disturbance Cap

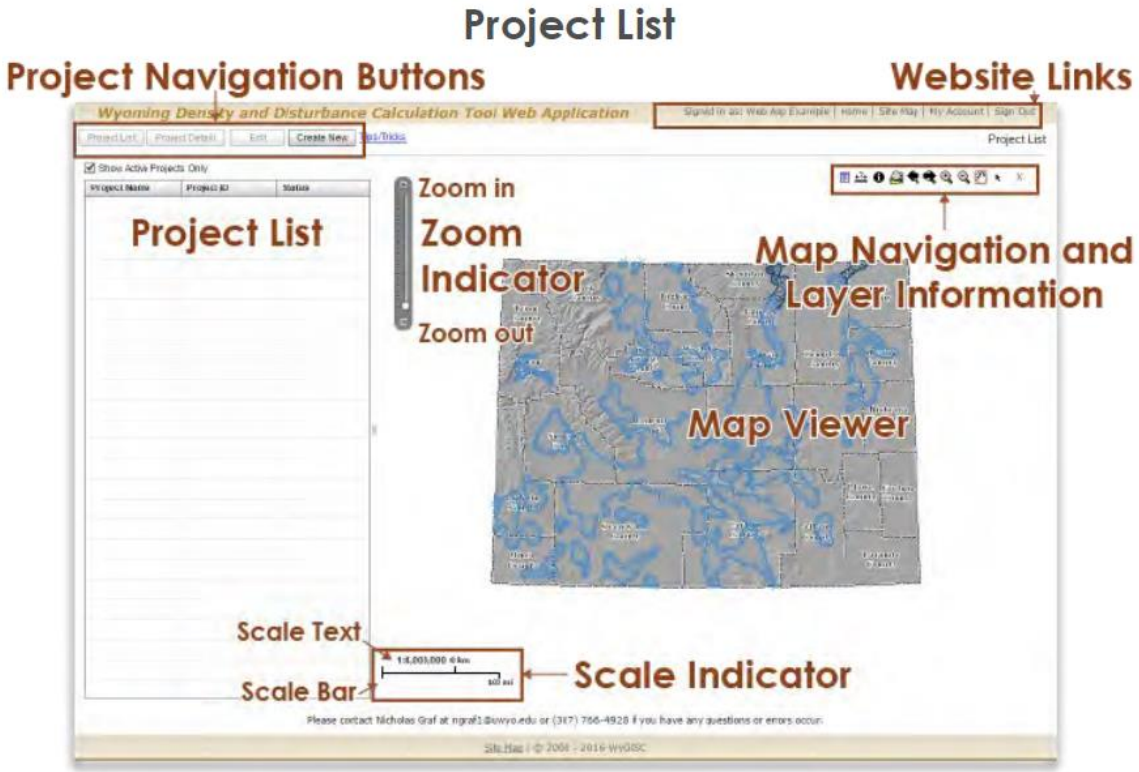
Provides that *discretionary anthropogenic** disturbance shall not exceed 3% (5% WY) on all lands managed as PHMA within a Biologically Significant Unit (BSU). Will be calculated at both the BSU scale and project scale.

Forest Service

- Project level can exceed if approved by Forest Supervisor with concurrence of Regional Forester. Must be able to demonstrate that there will be a 'net conservation gain' to the GRSG. (*Disturbance Protocol*)
- May use DDCT or SDART calculators

Disturbance Cap: WY Calculator

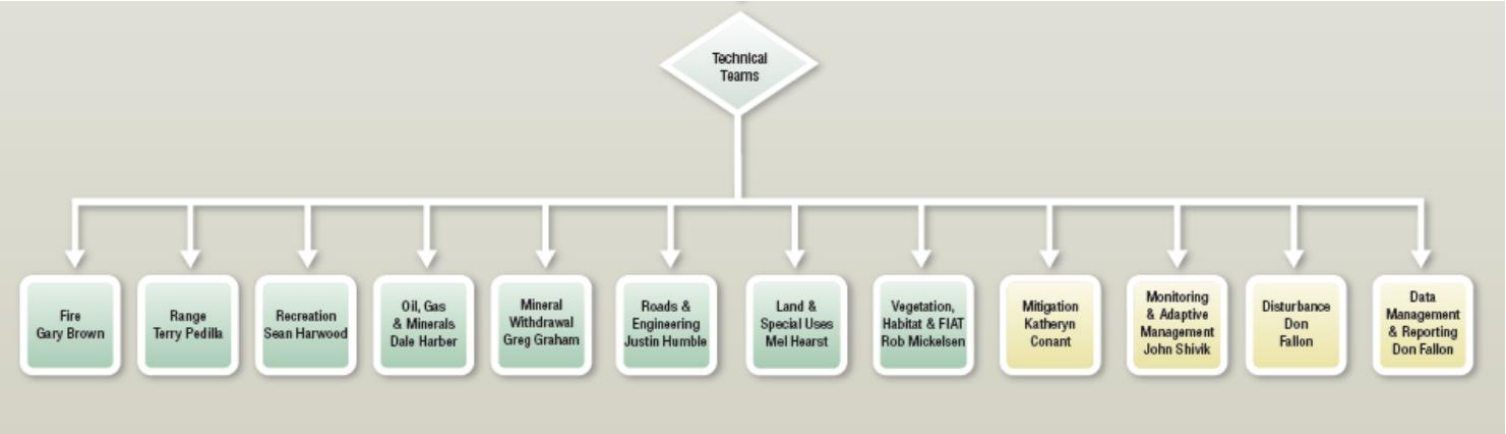
Density Disturbance Calculation Tool



Implementation

- Projects with decisions made before the effective date of the ROD may proceed unchanged.
- Projects with decisions on or after the effective date of the ROD must be consistent with the Plan Amendment.
- Site-specific projects implementation must be analyzed in accordance with NEPA.

Regional Office Technical Teams



- Producing internal guides to assist with implementation
- Easily used at the District level.
- Will likely be linked web-based guides
- Guides are expected to be ready for field review and implementation by April, 2016
- **SharePoint Site: https://ems-team.usda.gov/sites/fs-r04-sga/_layouts/15/start.aspx#/**

Technical Team Leads

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Humboldt-Toiyabe

Ron Rodriguez: Utah
Dixie

Mary Manning: Montana and Region 1
Regional Office, Missoula

Dennis Jaeger, Wyoming and Region 2
Medicine Bow-Routt National Forests, Thunder Basin National Grassland

Tom Ford, Idaho Coordinator
Salmon-Challis

Interagency Coordinators

- Primary point of contact for BLM, FWS, and all relevant state agencies within their assigned state.
- Conduit of communication at the state scale and forests (including across regions) within their state.
- Member of Interagency team or working groups which assess information and make decisions regarding Adaptive Management, Mitigation, Disturbance Calculations, and Monitoring.
- Assist with public outreach and interaction as needed.

Timeline

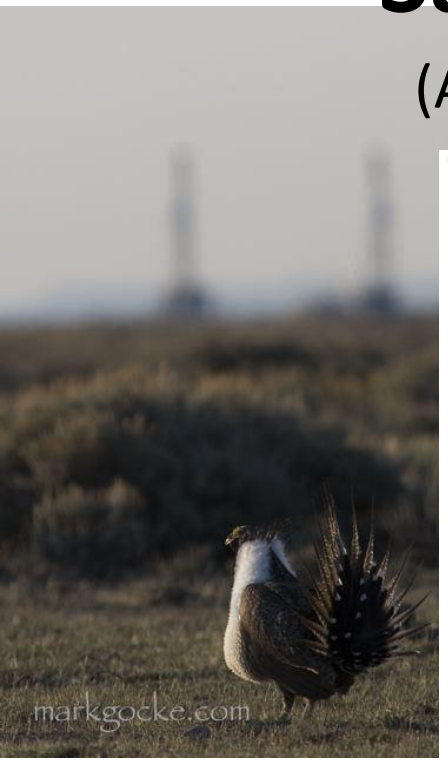
- March, 2016 Guideline Drafts Produced and Distributed
- April, 2016 Guidelines Finalized and Posted
- Summer, 2016 Habitat Assessments on Allotments
- Summer, 2016 Begin Working with Permitees and Modifying Grazing Permits
- Summer, 2017 Finalizing Formation of Interagency Teams and Working Groups for Adaptive Mgt, Mitigation
- Summer, 2017 Continue Habitat Analyses and Permit Modifications

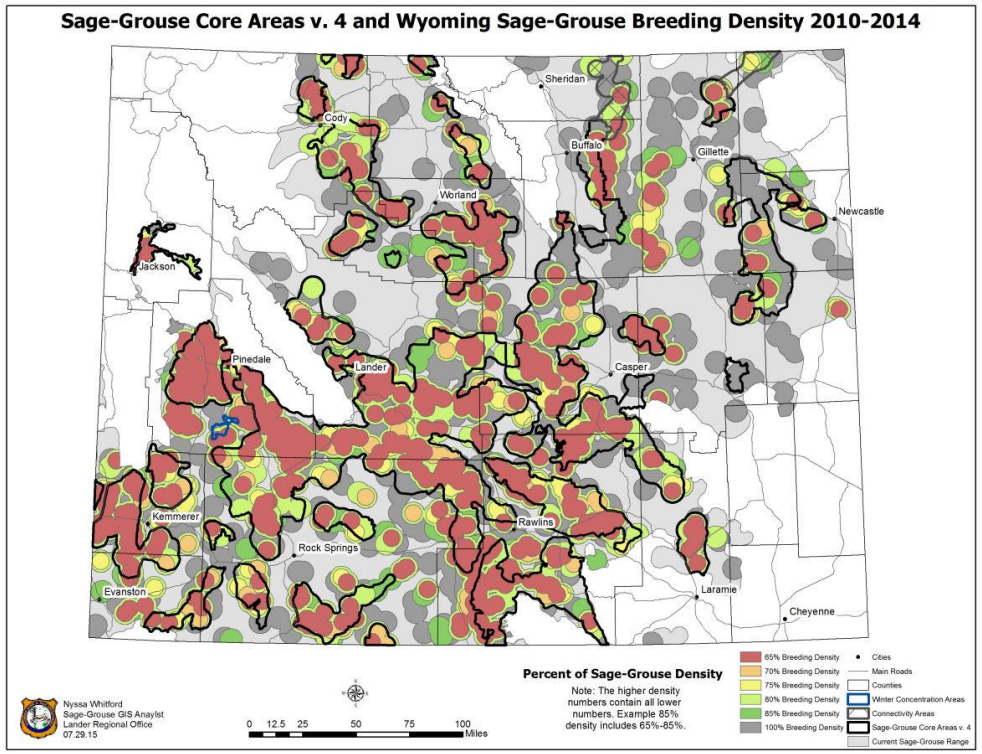
Guidelines

- They represent no change in policy and do not alter anything written in the RODs or amendments.
- Policy is already established, and there is nothing in these documents that can substitute for decisions that were signed last September.
- The purpose guides is to help field level staff address relevant components in the amendments regarding future actions.
- Most of the guides will be straight-forward and primarily be for internal Forest Service use.

Wyoming's Approach to Sage-Grouse Conservation

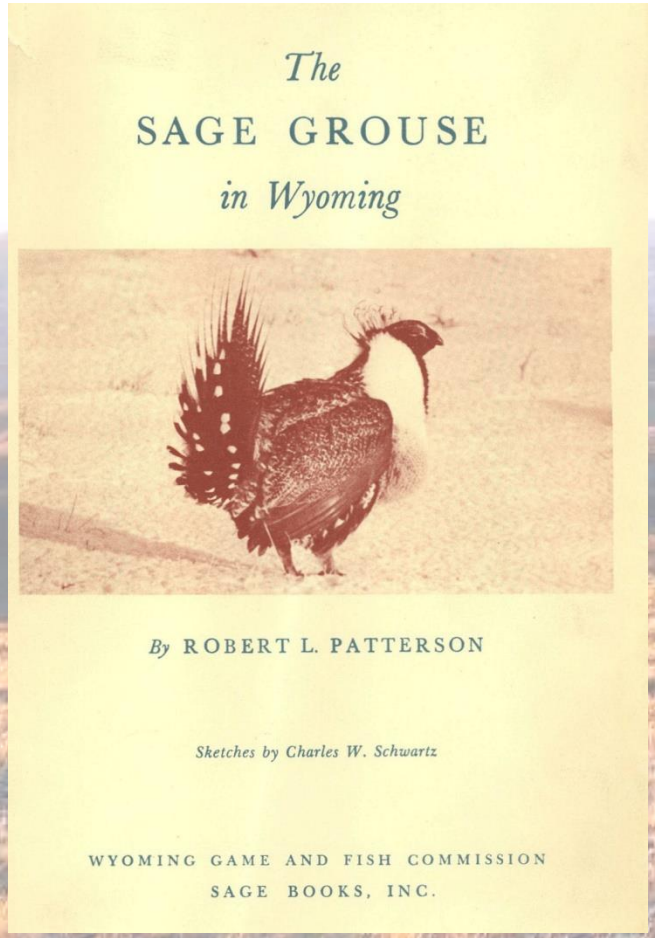
(A Shotgun Wedding of Science and Policy)





Tom Christiansen
Sage-Grouse Program Coordinator

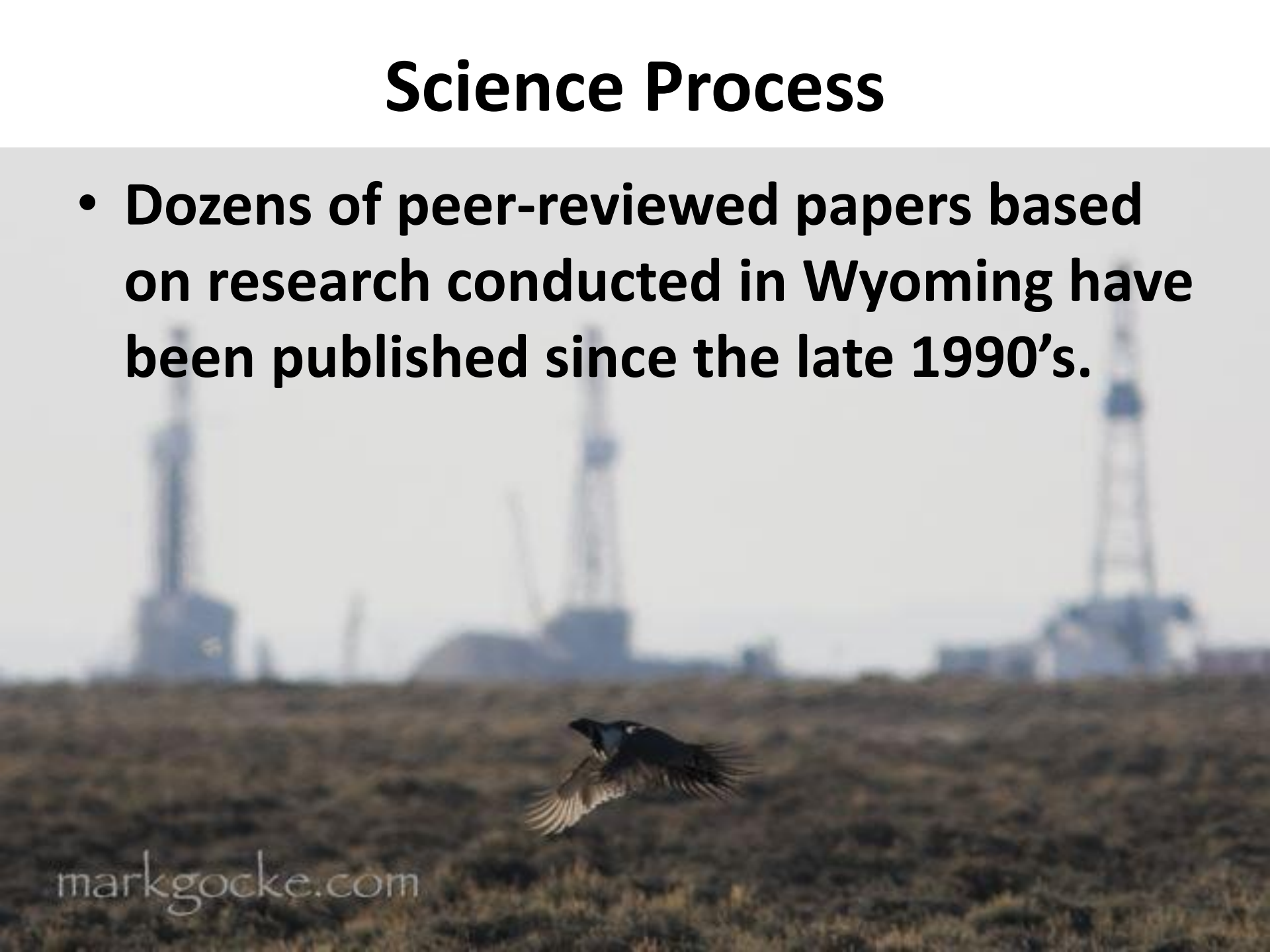
Historical perspective…



"The fate of sage grouse, as well as antelope and other associated wildlife species, will be dependent upon the degree of maintenance and preservation afforded the vast tracts of sage lands in the West." (p. 307)

Science Process

- **Dozens of peer-reviewed papers based on research conducted in Wyoming have been published since the late 1990's.**



Policy Process

- 2007: Governor's Sage-Grouse Summit & Implementation Team (SGIT)
- 2008: Governor's Executive Order – "Core Area" emphasis.
- 2010: Core Areas and EO revised
- 2010: Governor Mead elected
- 2011: Mead issued a new EO
- 2015: Core Areas and EO revised
- Each revision clarified details of the original EO but maintained the goal of preventing the need to list the bird as Threatened or Endangered, via a process of science-based regulations and incentives.

Wyoming's Core Area Strategy

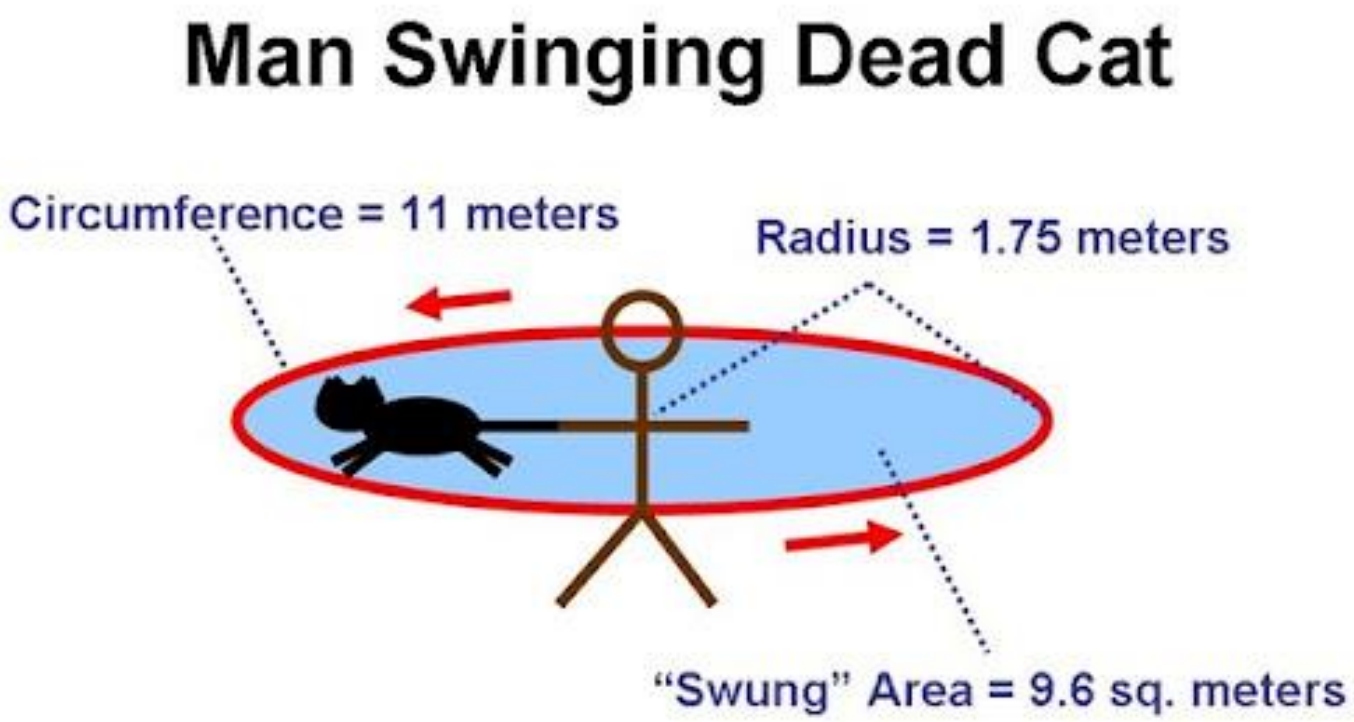
- **The upshot - while existing land use rights should be recognized and respected, new development within core areas should be authorized only when it can be shown that the activity will not cause declines in sage-grouse populations.**

https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management

Executive Order – Stipulations for Development

- **1 well pad/640 acres on average**
- **5% surface disturbance/640 acres on average**
- **.6 mi NSO from lek perimeter**
- **Main roads 1.9 miles from lek perimeter**
- **Seasonal stips**
- **Overhead power and transmission corridor**
- **Noise**
- **Vegetation removal**
- **Sagebrush treatment**
- **Reclamation**
- **Monitoring**
- **Pre-existing oil & gas units**
- **Mining**
- **Connectivity corridors**
- **Underground rights-of-way**
- **Wind energy**
- **Undefined activities**

Density and Disturbance Calculation Tool (DDCT) *aka "DeaD CaT"*



Surely, this is my finest RLHG*

*Really Lame Home Graphic

USF&WS Threats

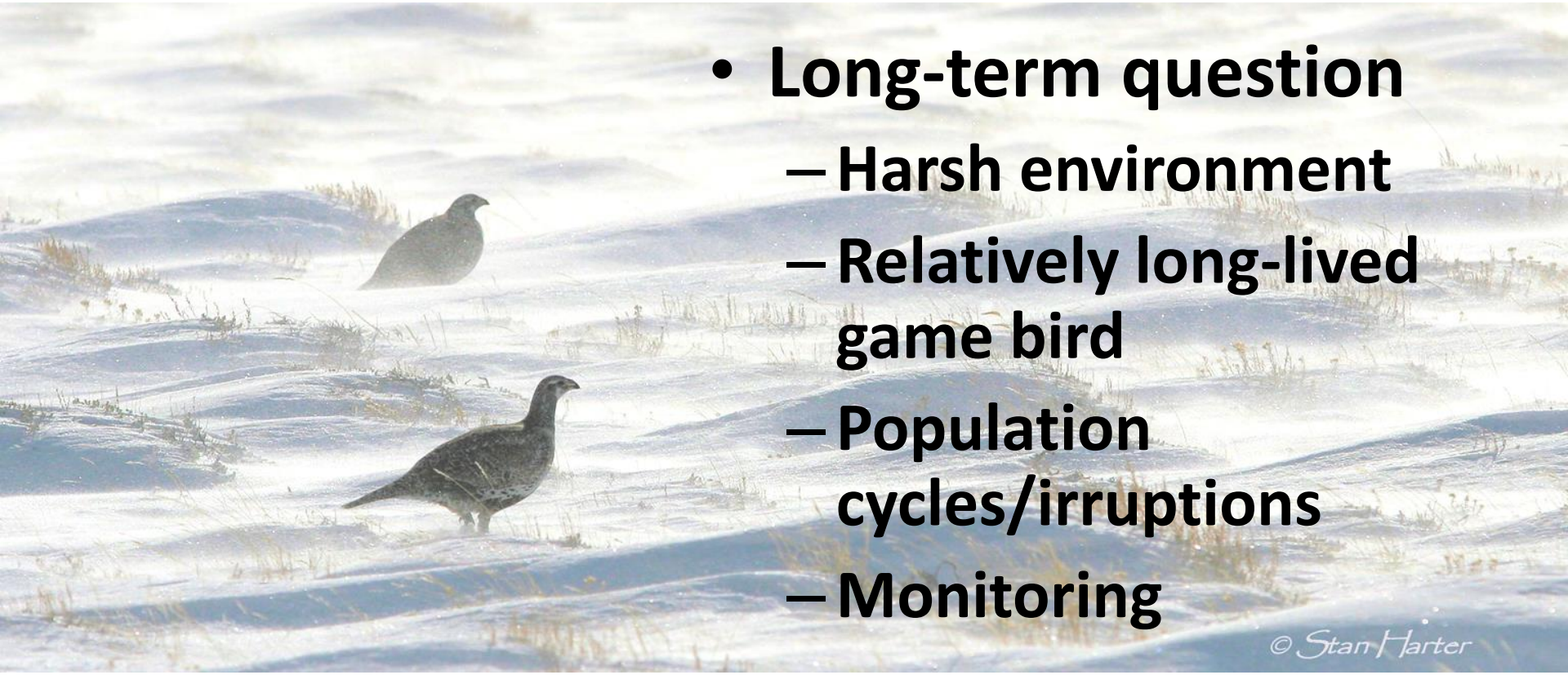
- **Habitat loss and fragmentation.**
- **Past regulatory mechanisms did not effectively addressed the threats.**

But…

- **The USFWS listing decision document supports Wyoming's Core Area Policy as a potentially effective regulatory mechanism if it is implemented as planned.**

So…is it working??

Grouse Response ?

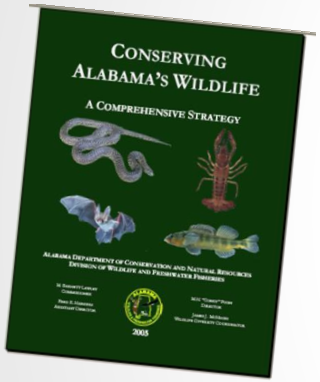


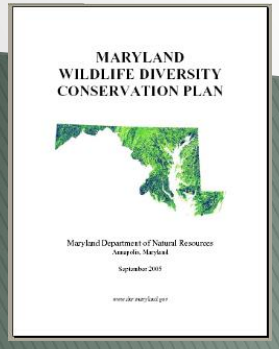
- **Long-term question**
  - **Harsh environment**
  - **Relatively long-lived game bird**
  - **Population cycles/irruptions**
  - **Monitoring**

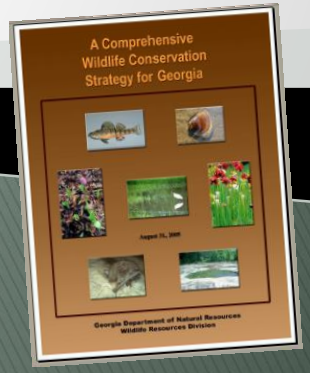
“Largest single-species conservation effort ever.”

State Wildlife Action Plans

Jennifer Newmark
Nevada Department of Wildlife







- Required to be eligible for State Wildlife Grants (SWG) – the primary source of funding
- First WAPs were finished in 2005 – all 50 states and territories
- Voluntary actions that will guide states in wildlife management for priority species and habitats
- Non-regulatory

- States allowed to create plans that are best suited for their own needs
- Almost all states and territories submitted revisions to their plans in fall of 2015 (some earlier).

8 Required Elements

- Identify distribution, abundance and status of Species of Greatest Conservation Need (SGCN)
- Identify condition of key habitats essential to the conservation of SGCN
- Identify problems and threats
- Determine and prioritize actions

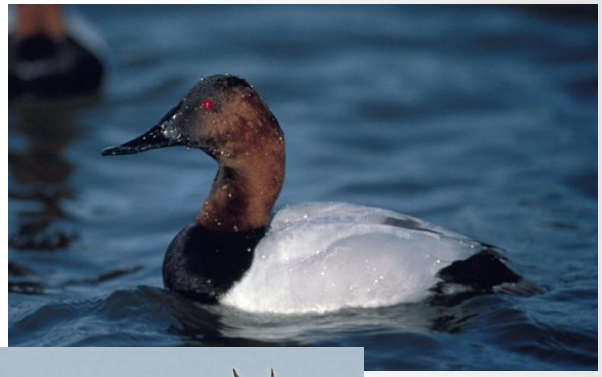
8 Required Elements

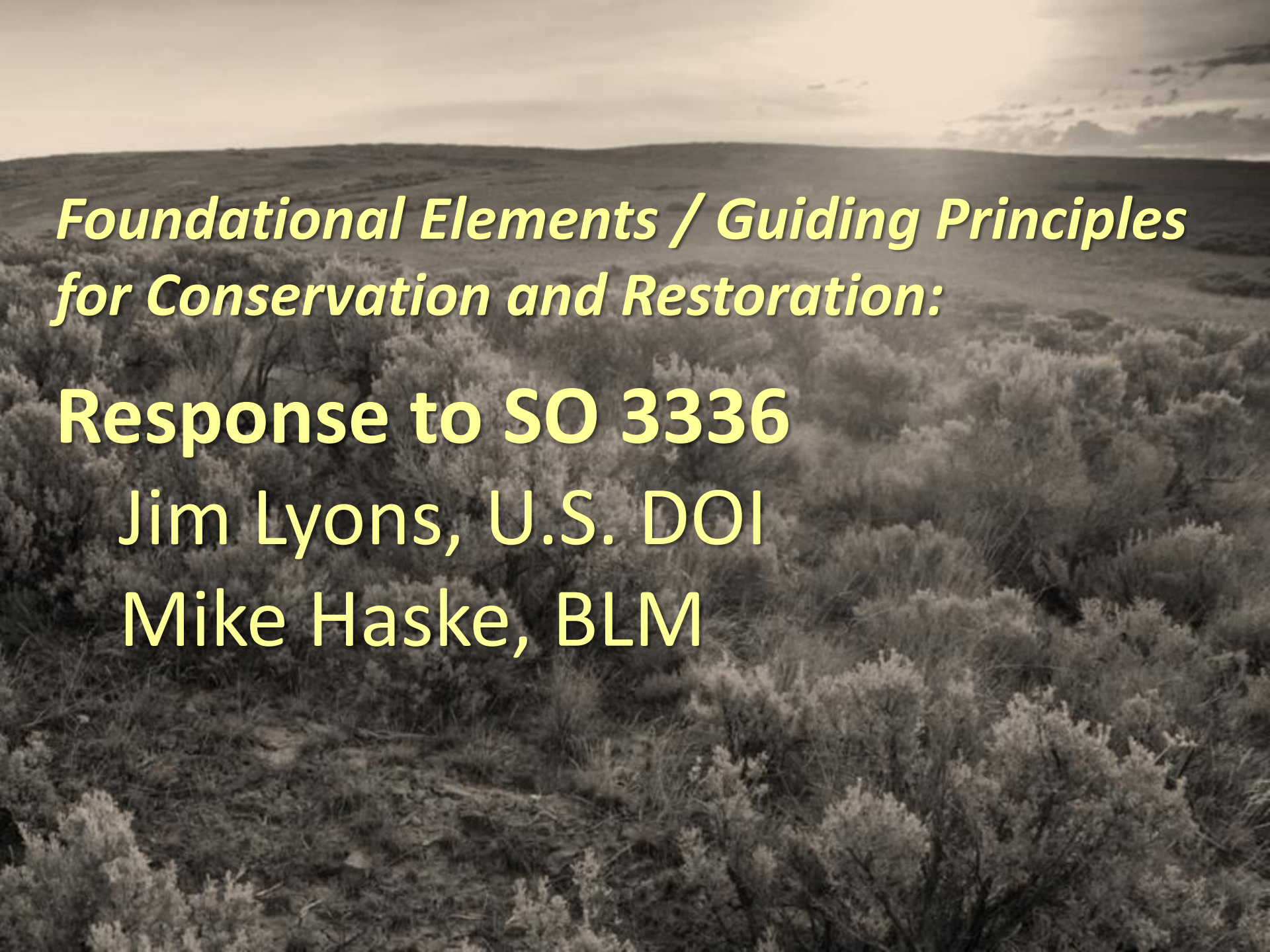
- Periodic monitoring and adaptive management
- Provide for review and revision of action plans
- Coordinate development and revision with federal, state, local agencies and tribes
- Include public involvement in the development, revision and implementation of the action plan

SGCN Species

- Backbone of the plan
- Each state decides
- Many include game species and other management priorities
- Most states do not include plants and invertebrates

Important Habitats



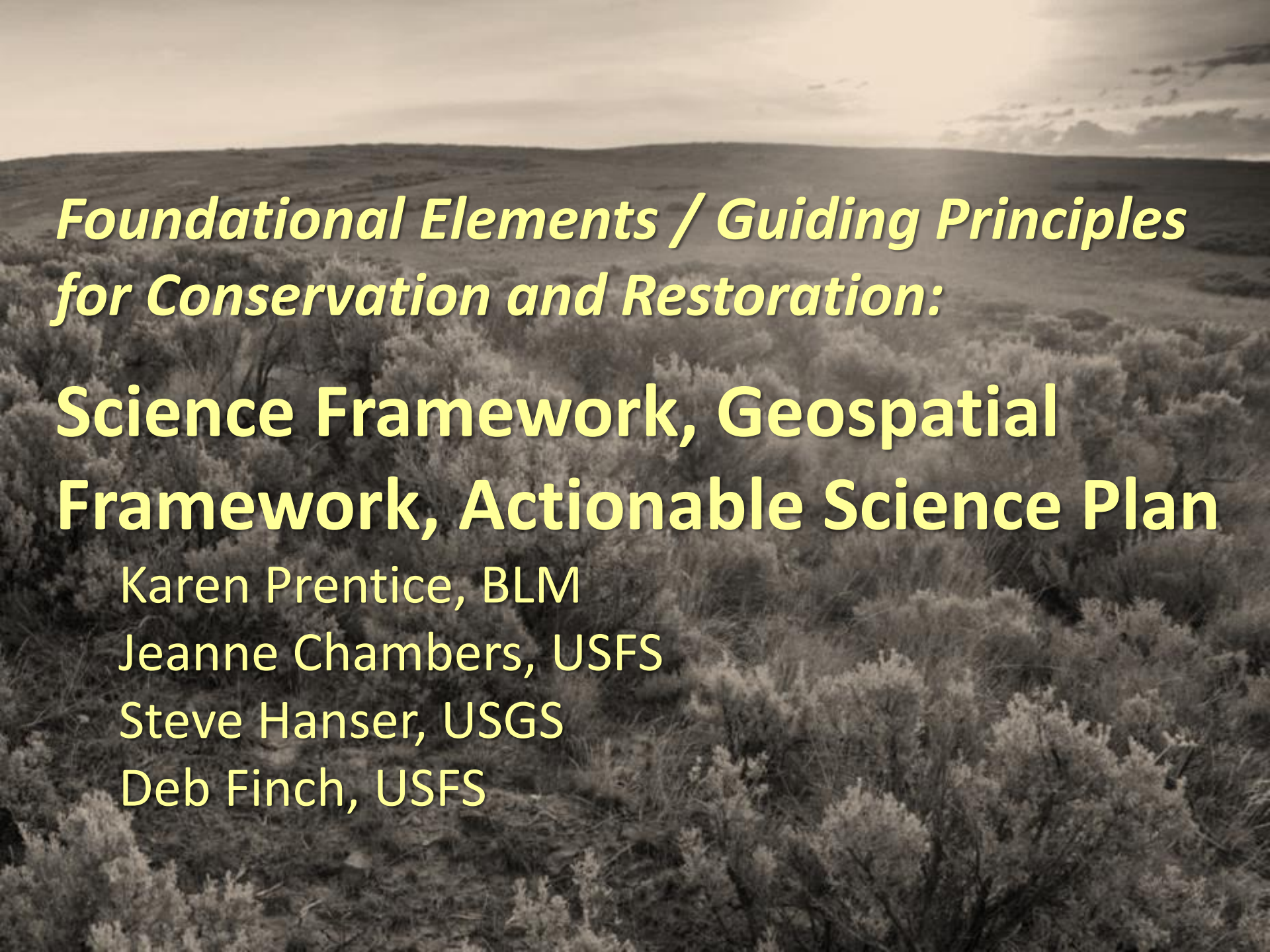


Foundational Elements / Guiding Principles for Conservation and Restoration:

Response to SO 3336

Jim Lyons, U.S. DOI
Mike Haske, BLM

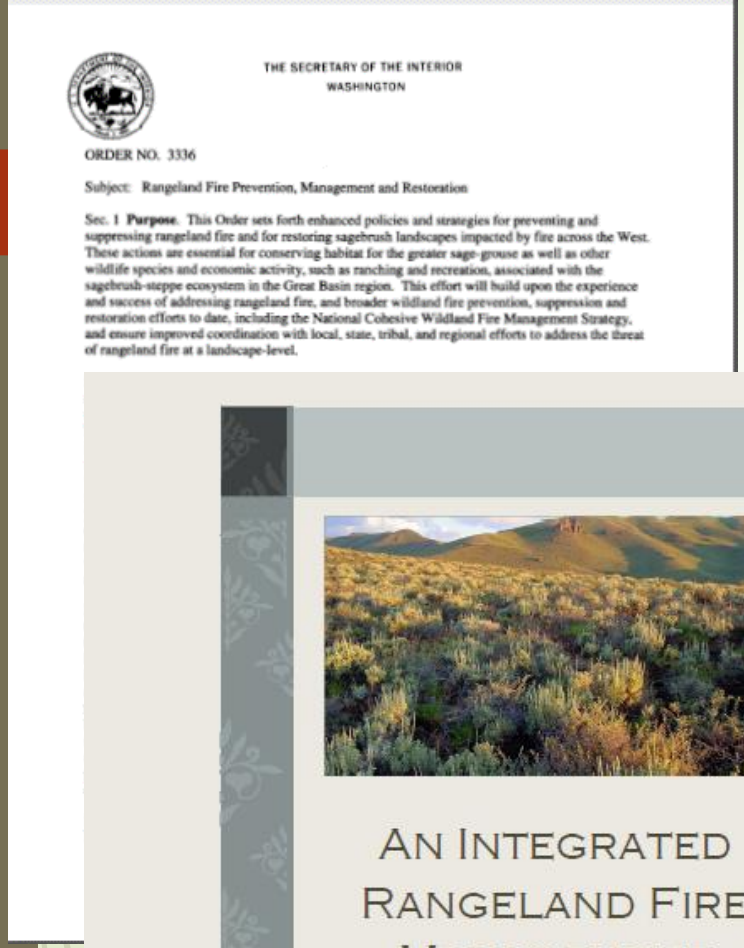

Break
Please return by 10:20 am



Foundational Elements / Guiding Principles for Conservation and Restoration:

Science Framework, Geospatial Framework, Actionable Science Plan

Karen Prentice, BLM
Jeanne Chambers, USFS
Steve Hanser, USGS
Deb Finch, USFS



THE SECRETARY OF THE INTERIOR
WASHINGTON

ORDER NO. 3336

Subject: Rangeland Fire Prevention, Management and Restoration

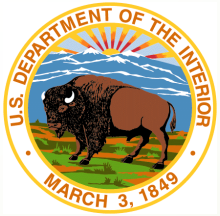
Sec. 1 **Purpose**. This Order sets forth enhanced policies and strategies for preventing and suppressing rangeland fire and for restoring sagebrush landscapes impacted by fire across the West. These actions are essential for conserving habitat for the greater sage-grouse as well as other wildlife species 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.

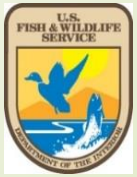
Conservation & Restoration Strategy

Action Item 7b iv

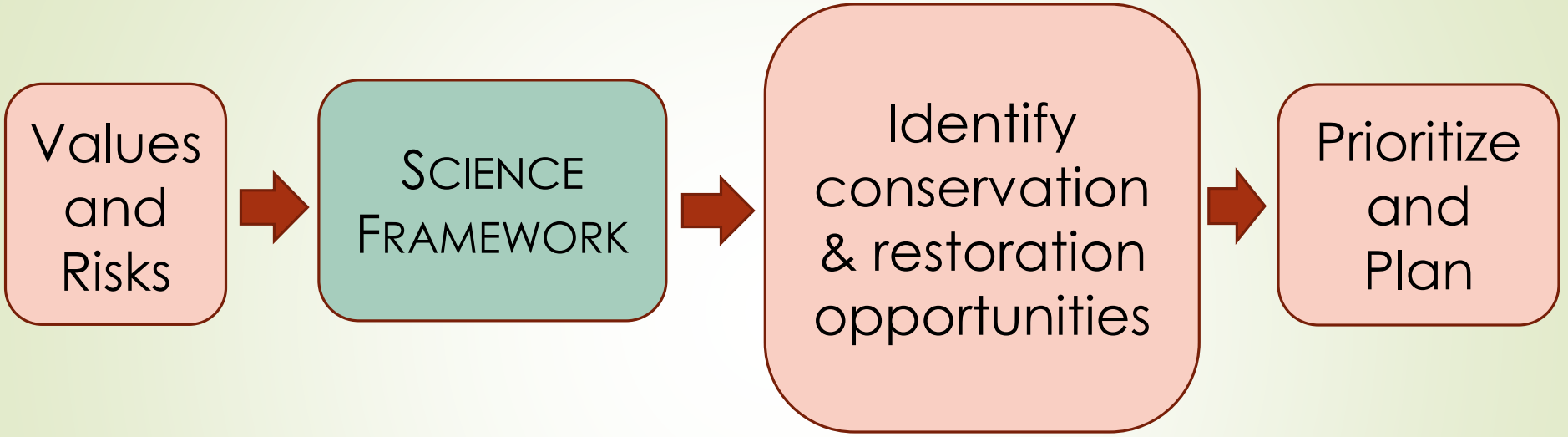
- Guide the development of scientific information and tools for prioritizing areas for management
- Inform options for management activities across scales
- Provide clear linkages to existing assessments and plans
- Inform budget prioritization and adaptive management

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





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

SO 3336 action items & 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

The Science Basis – Resilience and Resistance

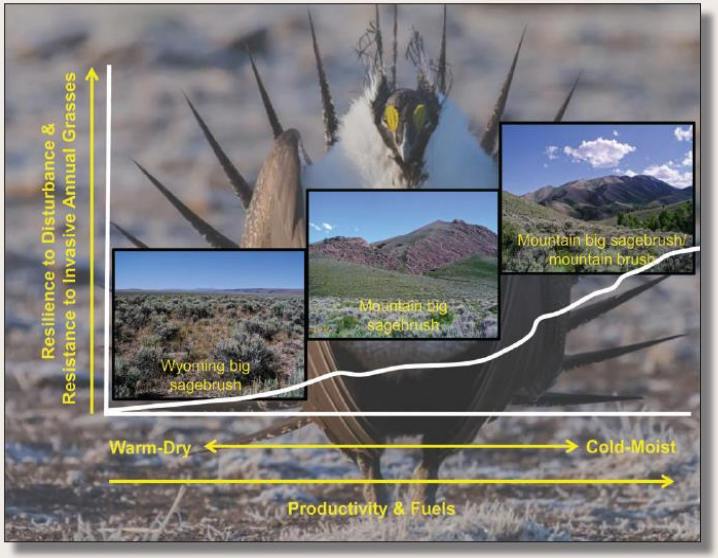
Two WAFWA Working Groups

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

USDA United States Department of Agriculture

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, and David A. Pyke

Forest Service Rocky Mountain Research Station General Technical Report RMRS-GTR-356 December 2016

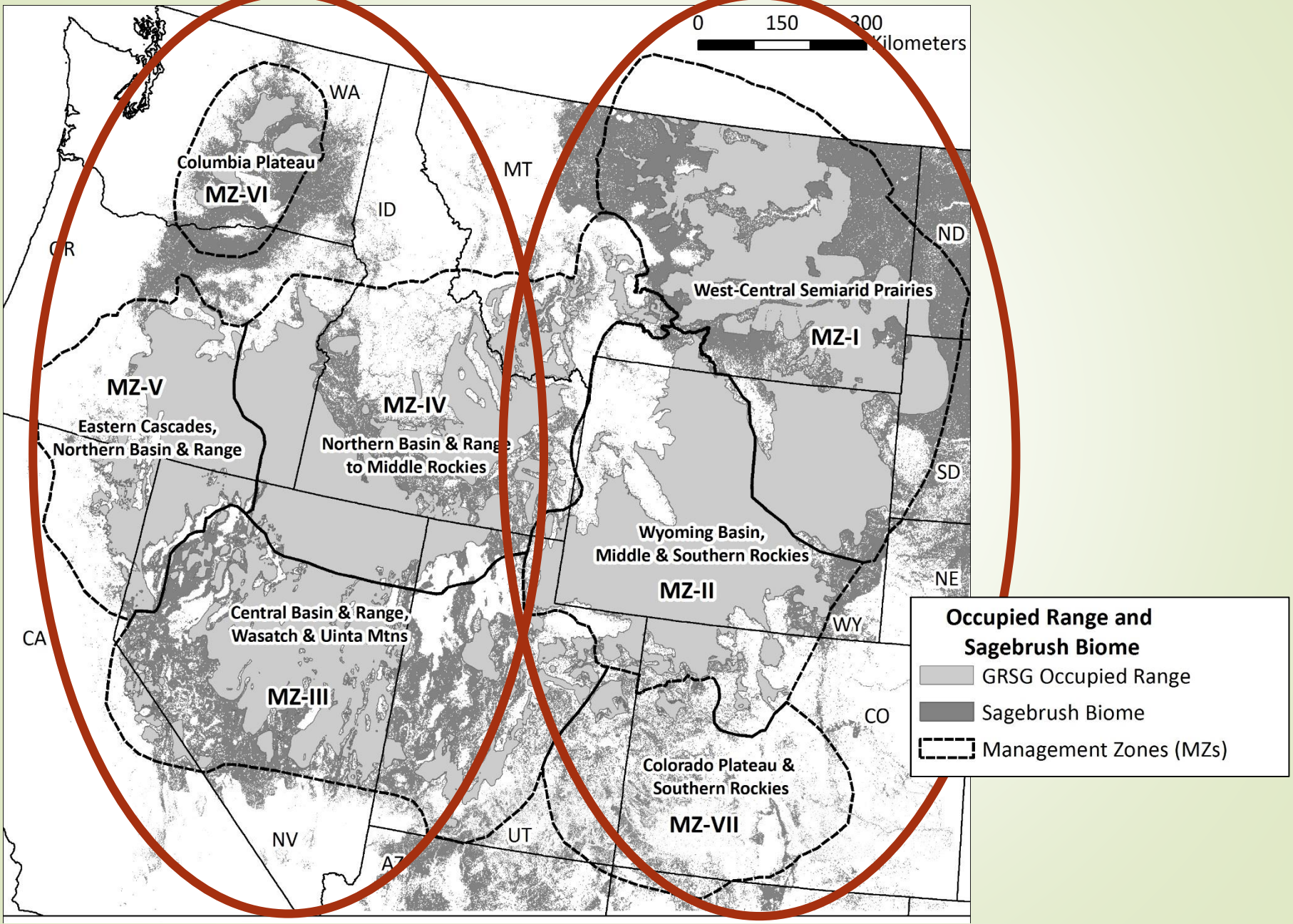
In press

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

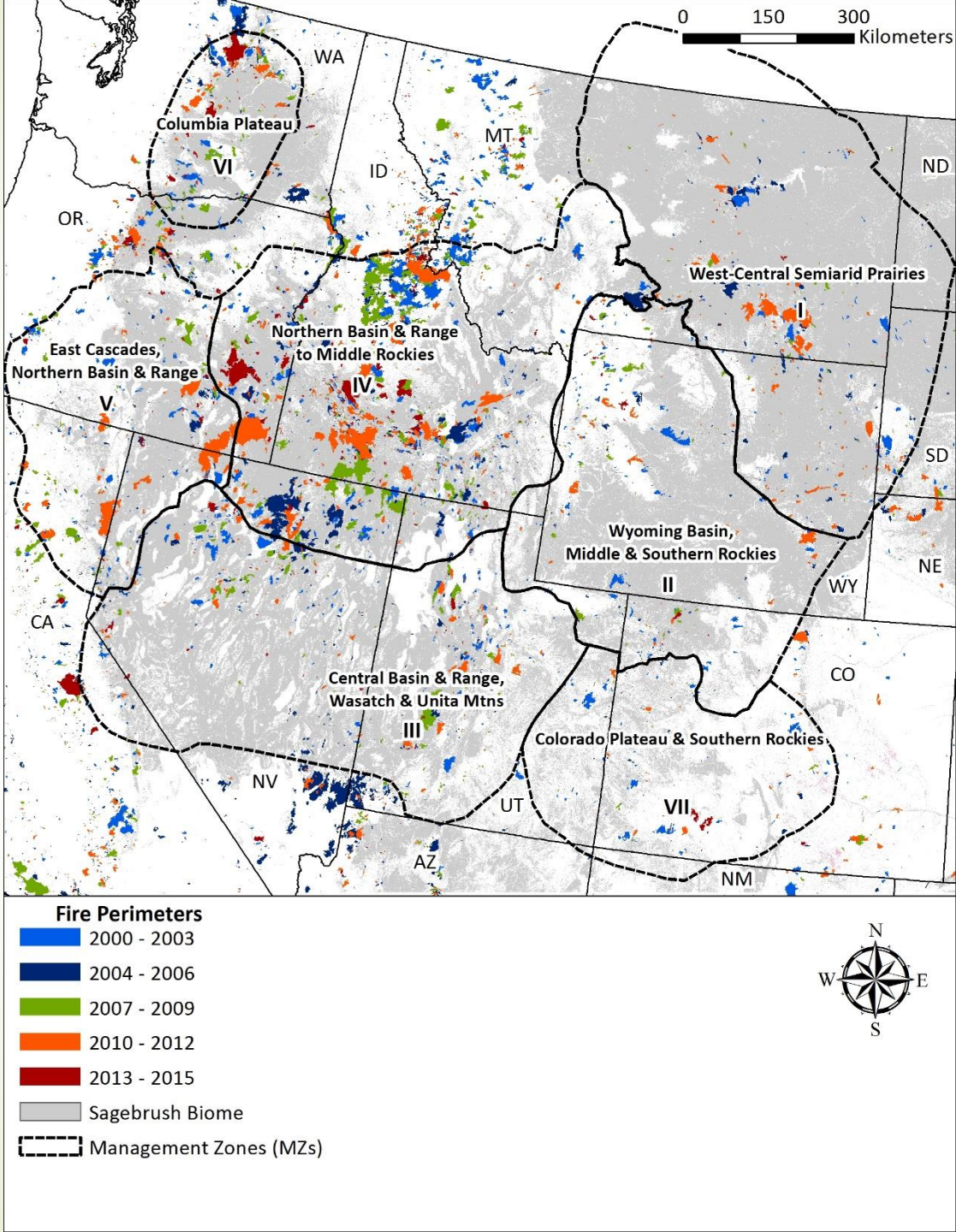


Threats to Sagebrush Ecosystems

Persistent Ecosystem Threats

- Altered Fire Regimes
- Invasive Annual Grasses
- Conifer Expansion

- Identified in Conservation Objectives Team Report (2013)



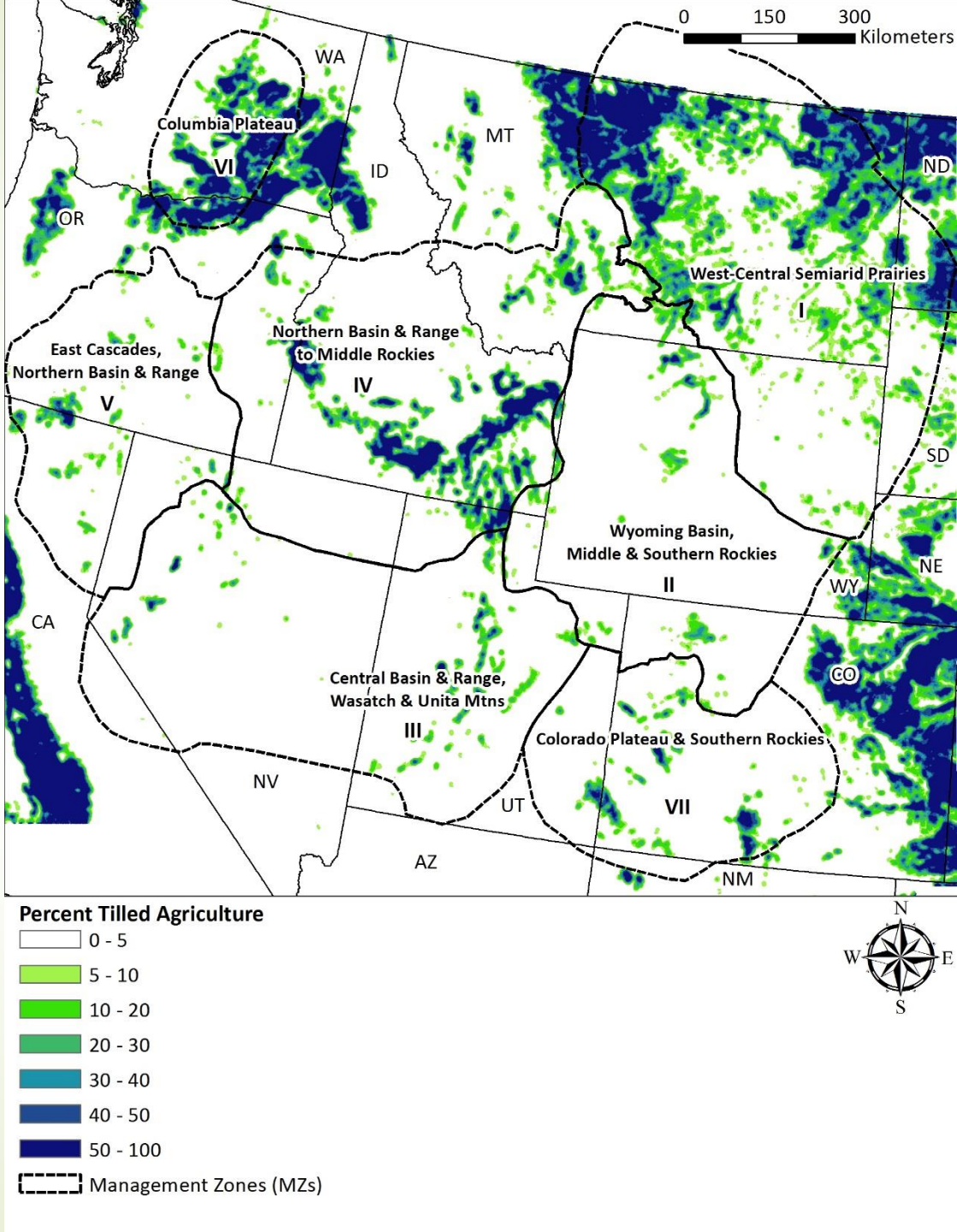
Threats to Sagebrush Ecosystems

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 & Information**	**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

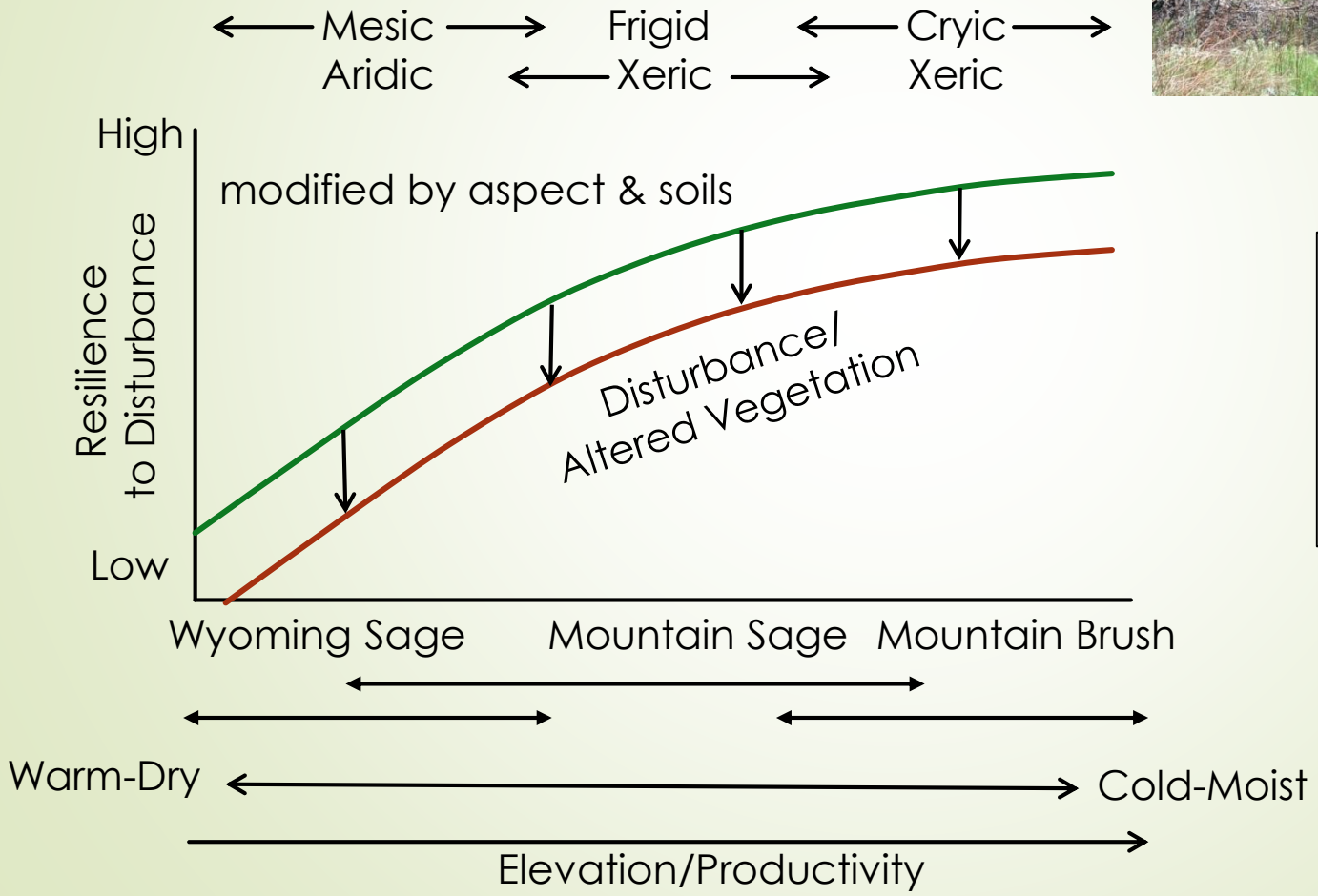
Chambers et al. 2014 GTR-326 & in press

Environmental Gradients
Cold Deserts

Warm-Dry ⟷ **Cold-Moist**

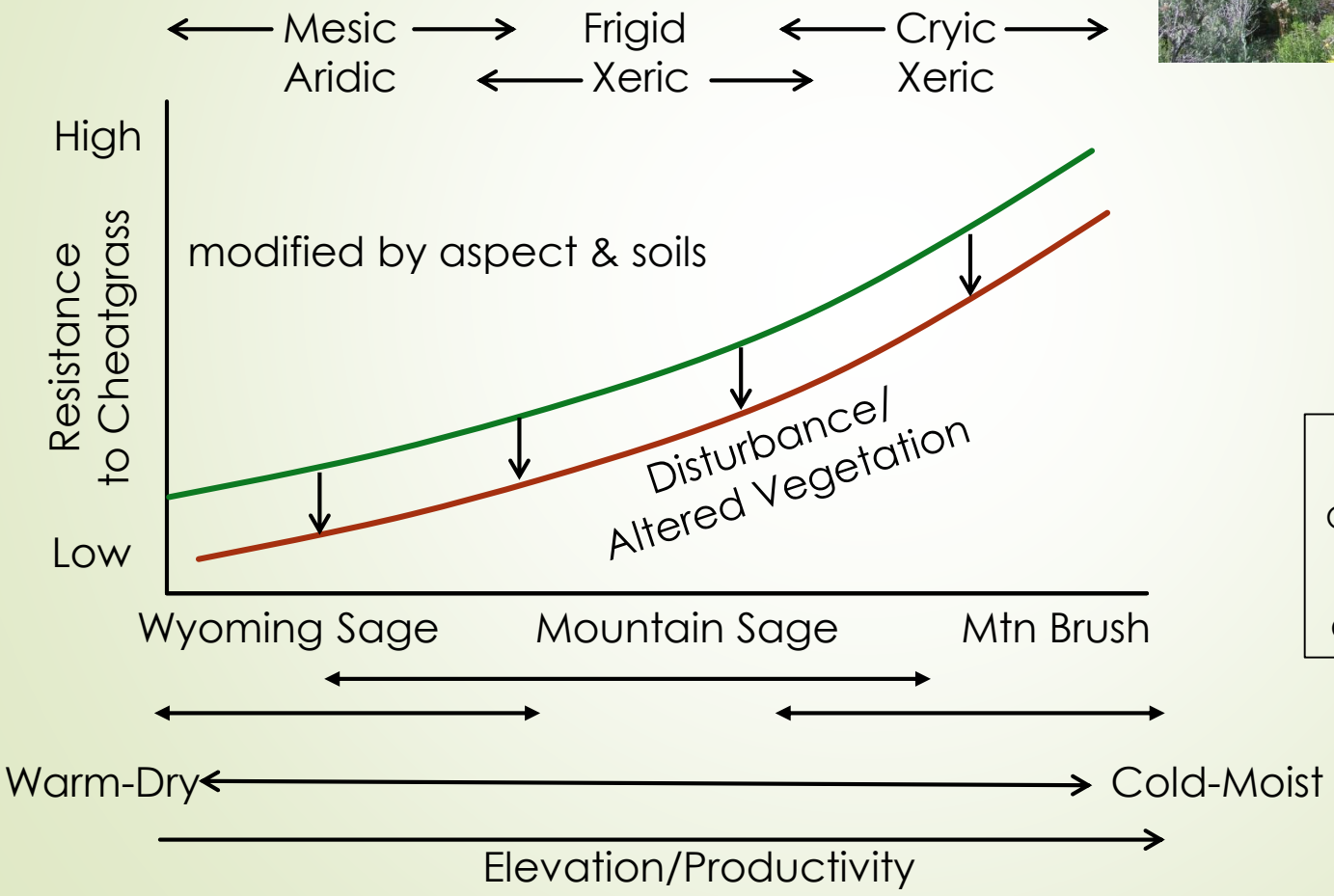
Elevation/Productivity/Fuels

Resilience to Disturbance



Chambers 2005,
Wisdom & Chambers 2009;
Brooks & Chambers 2011;
Condon et al. 2011;
Chambers et al. 2014a,b
Miller et al. 2015 a, b
Pyke et al. 2015 a, b
Chambers et al. in press

Resistance to Cheatgrass



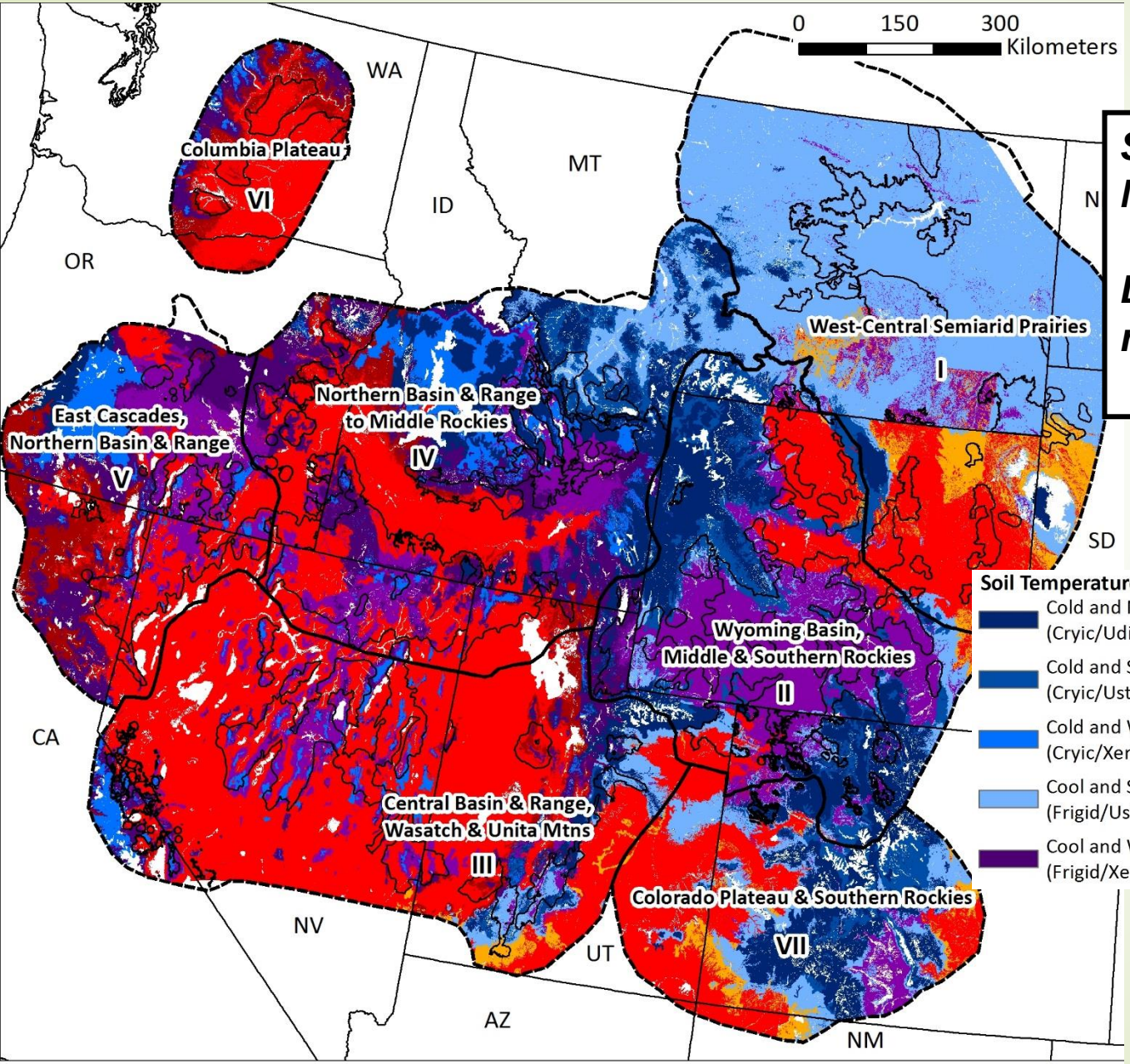
Chambers et al. 2007;
Condon et al. 2011;
Chambers et al. 2014a,b
Miller et al. 2015 a, b
Pyke et al. 2015 a, b
Chambers et al. in press

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 =

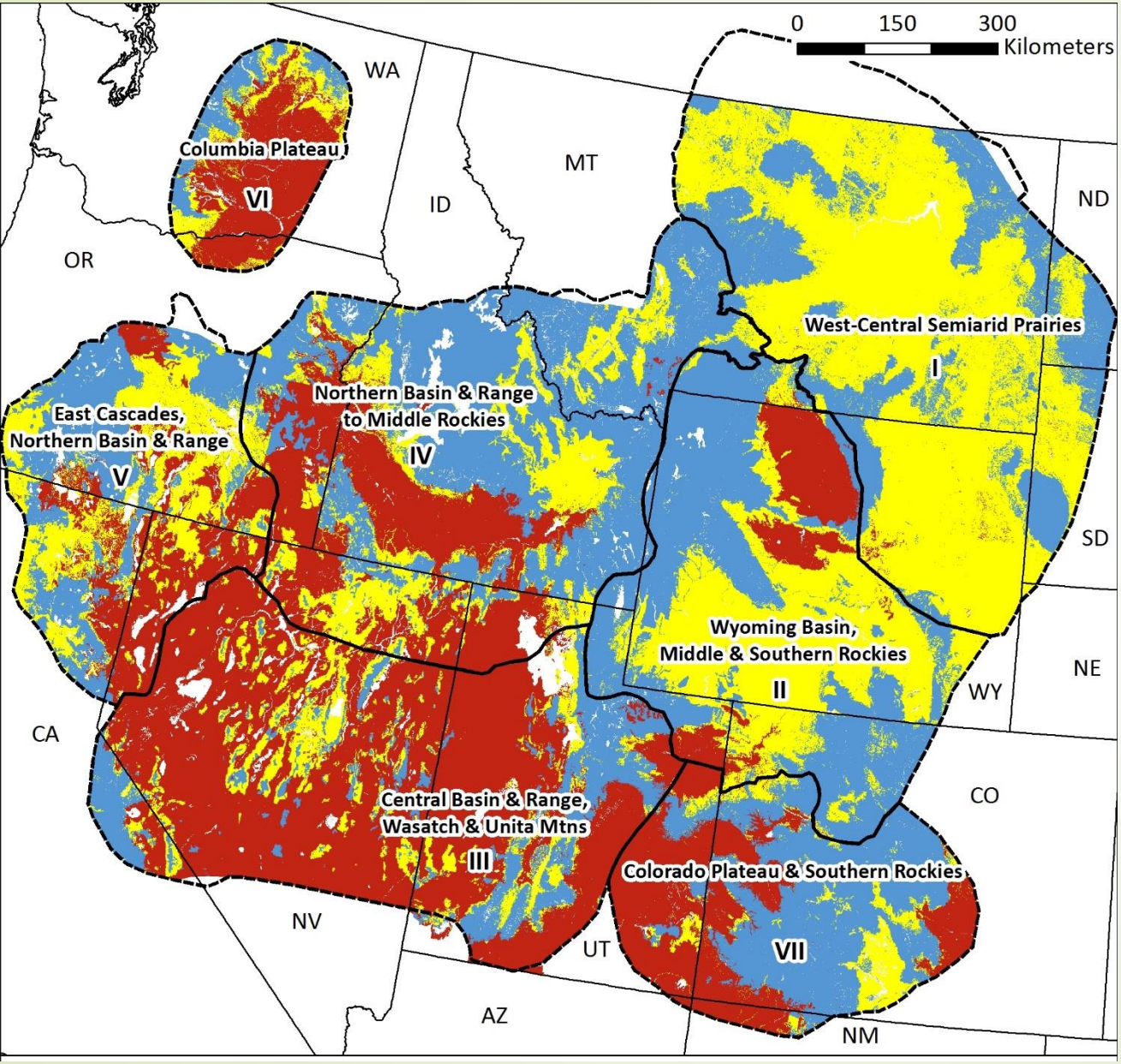
Landscape indicator of resilience & resistance

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 =

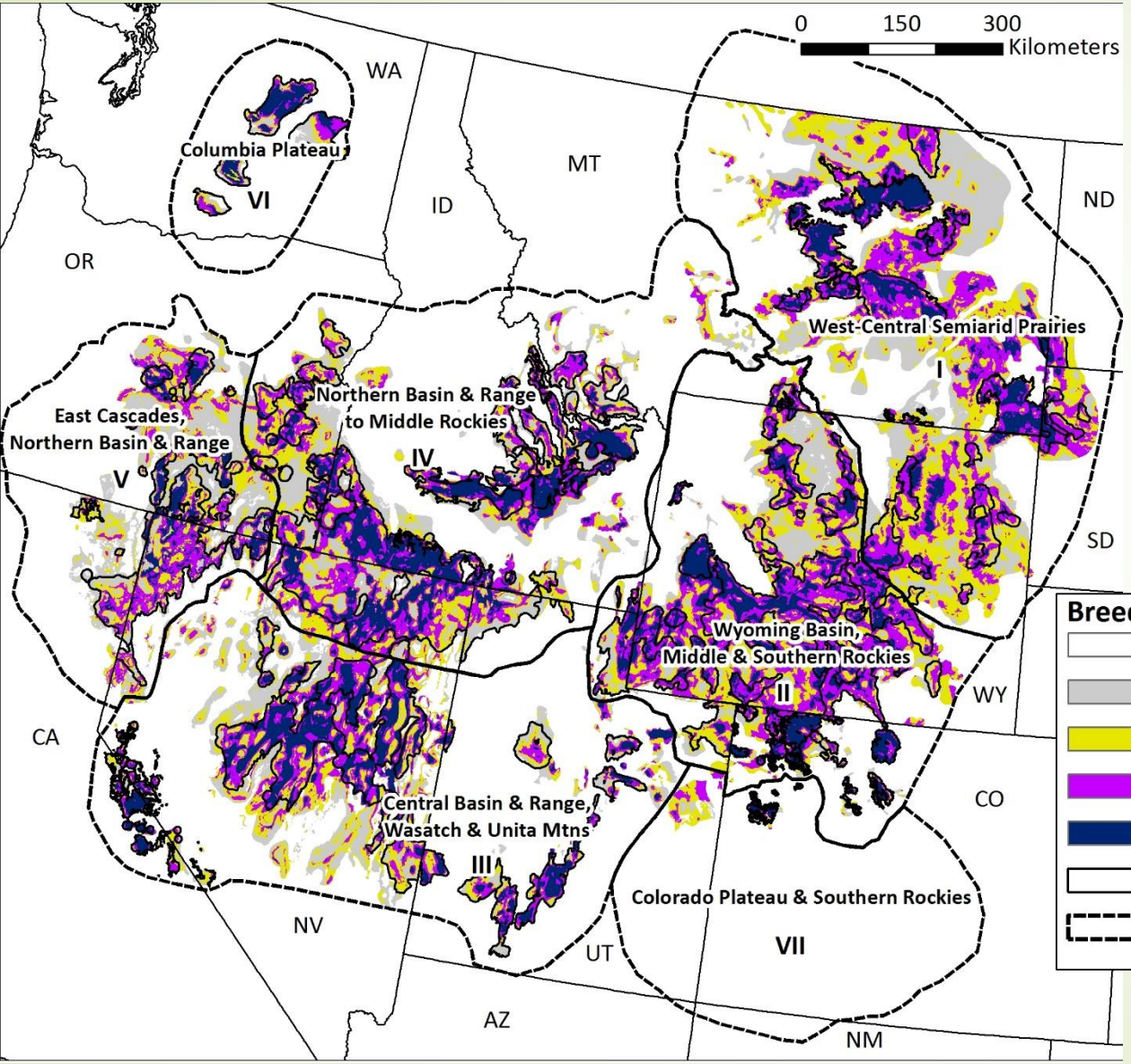
Landscape indicator of resilience & resistance

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 –

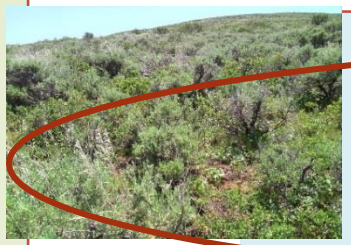
- ***2010 – 2014 BBD data***

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

Doherty et al. 2016

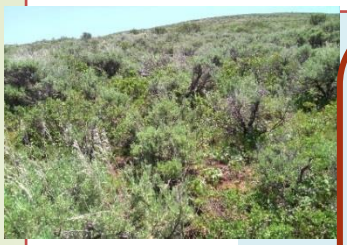
Sage-Grouse Habitat Matrix

Probability of Sage-Grouse Breeding Habitat

	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.
Sagebrush Ecosystem 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

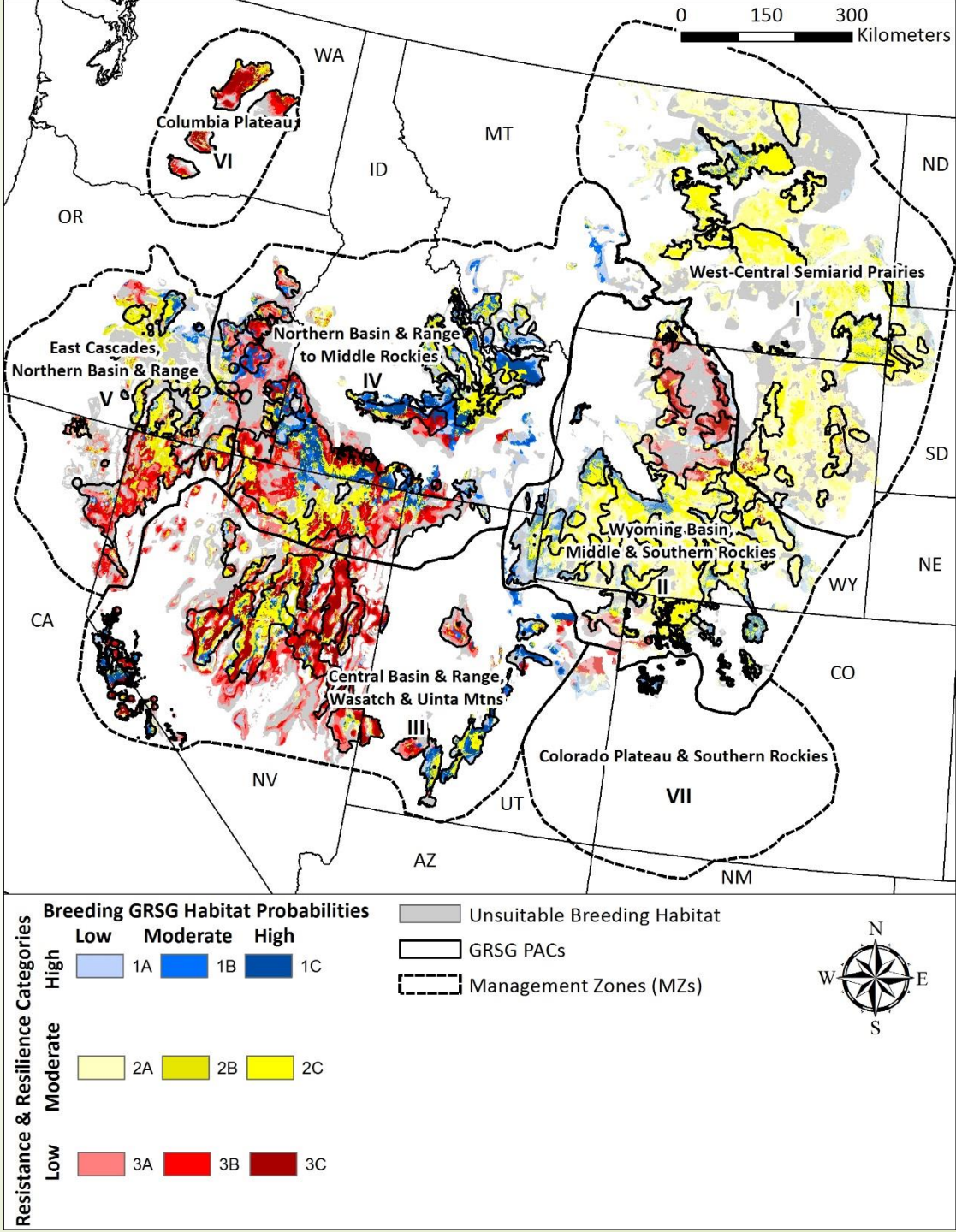
Probability of Sage-Grouse Breeding Habitat

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 –

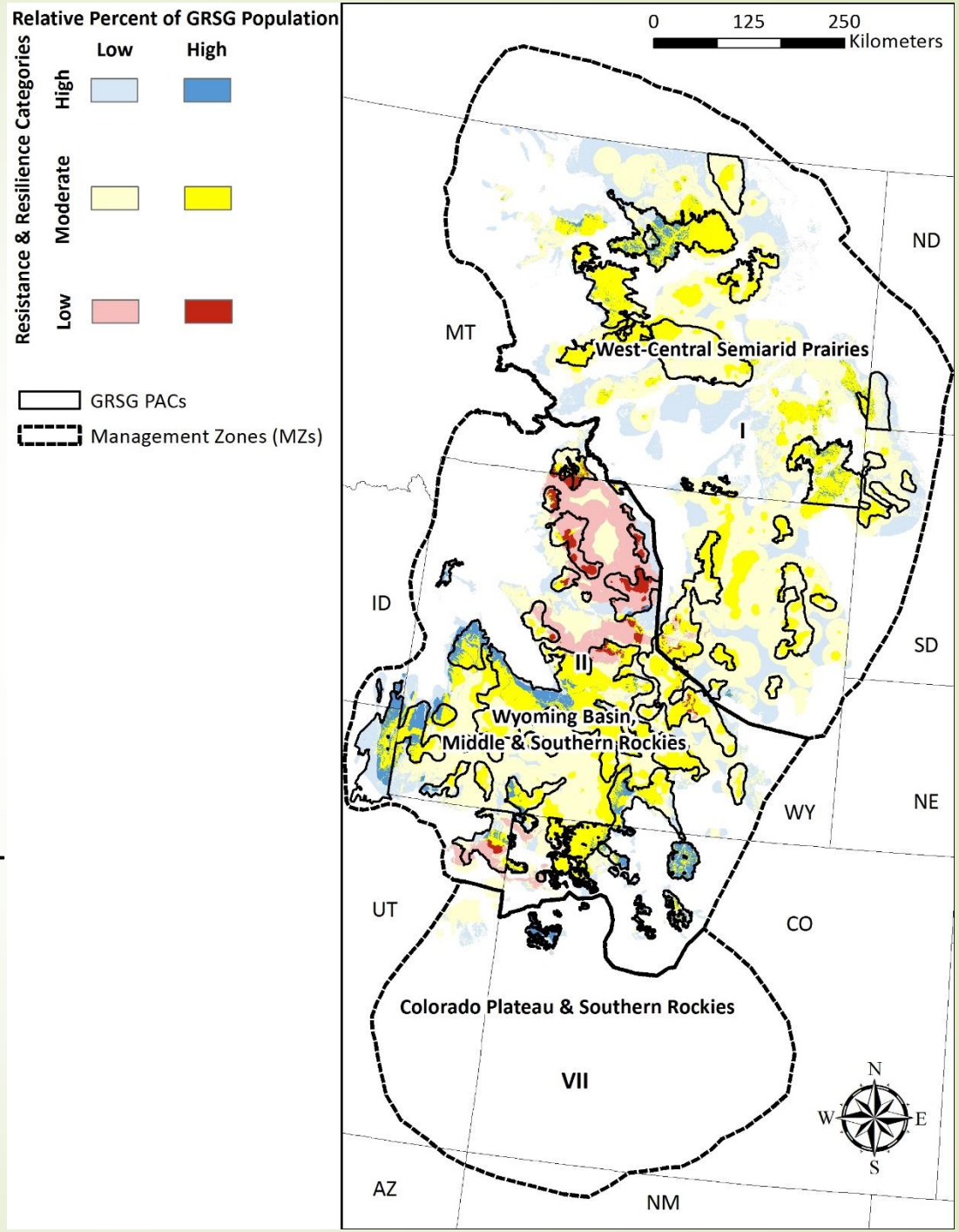
- First filters – GRSG PACS developed by States
- Resilience & Resistance
- Sage-grouse breeding habitat probabilities (Doherty et al. 2015)
- Management strategies can be matched directly to the Matrix



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 -

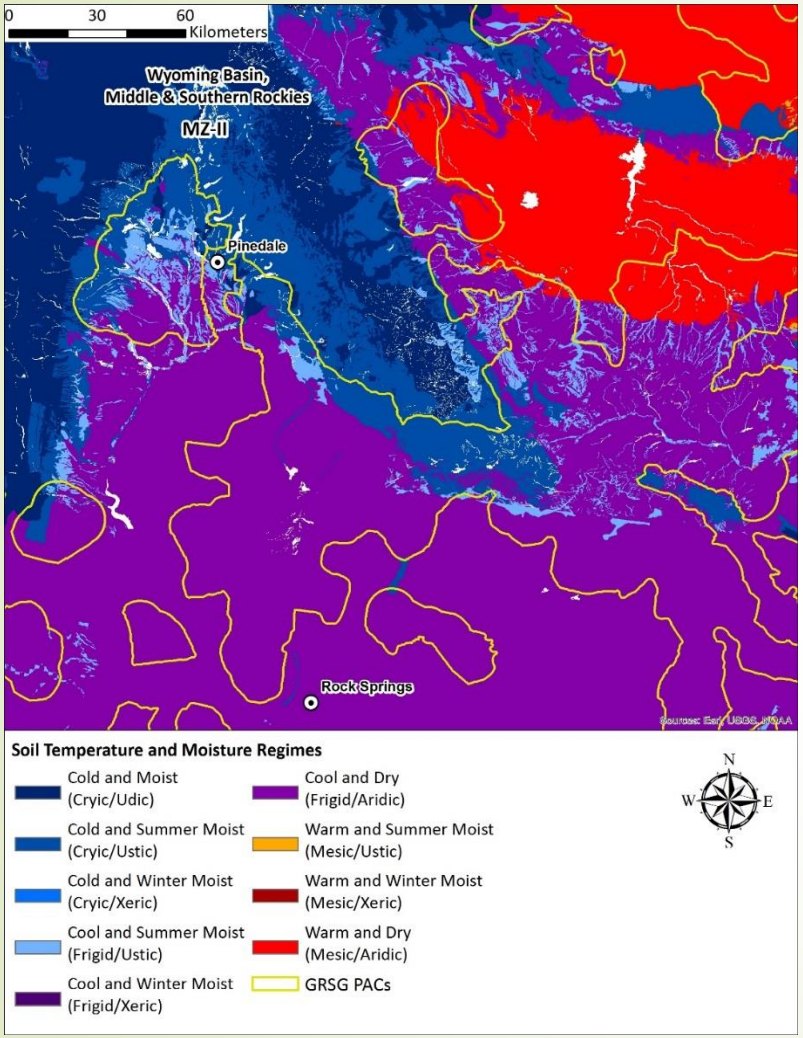
- Resilience & resistance
- Breeding habitat probabilities
- Sage-grouse breeding populations

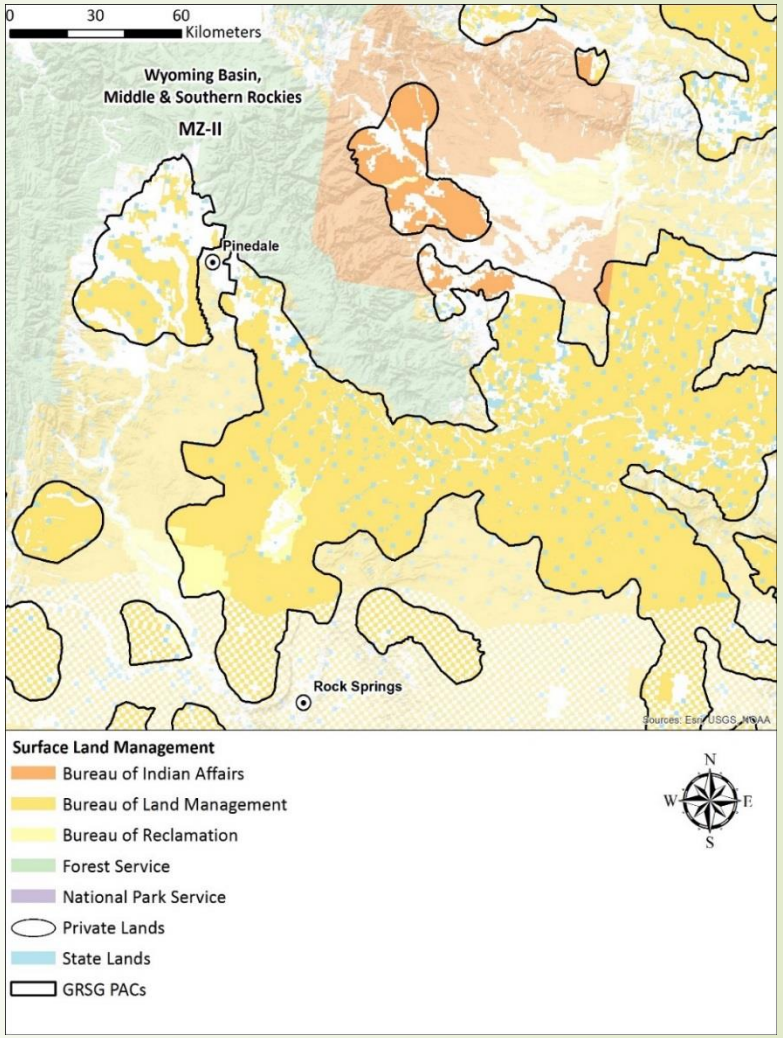
+ Dominant threats

+ Finer scale data

➢ Regional/local expertise

Southwestern WY – Oil & Gas Development

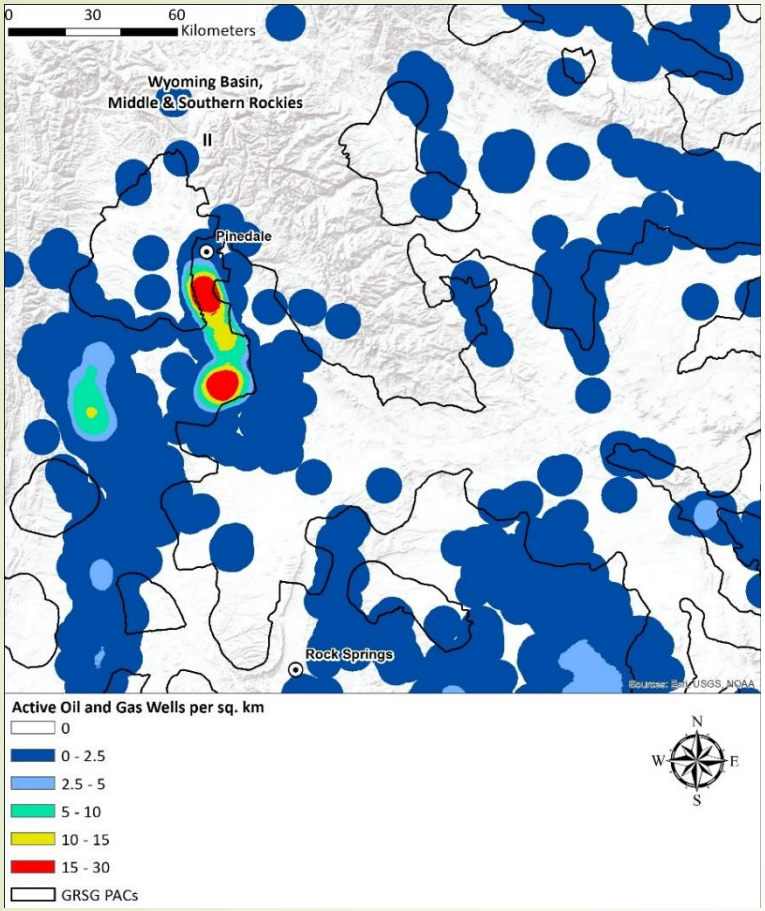


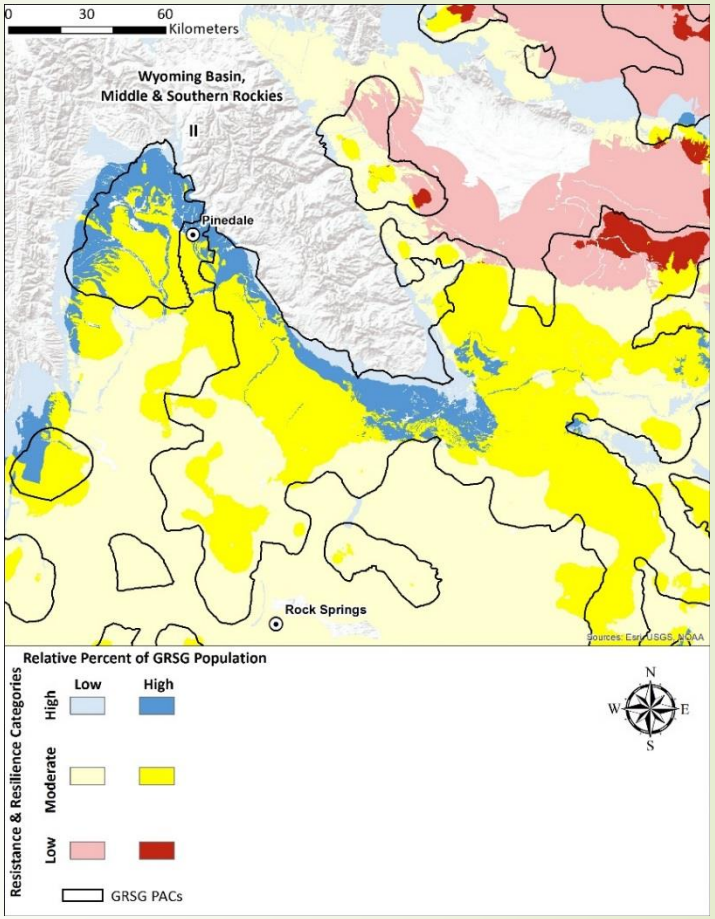


Physical Setting and Land Ownership

- 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

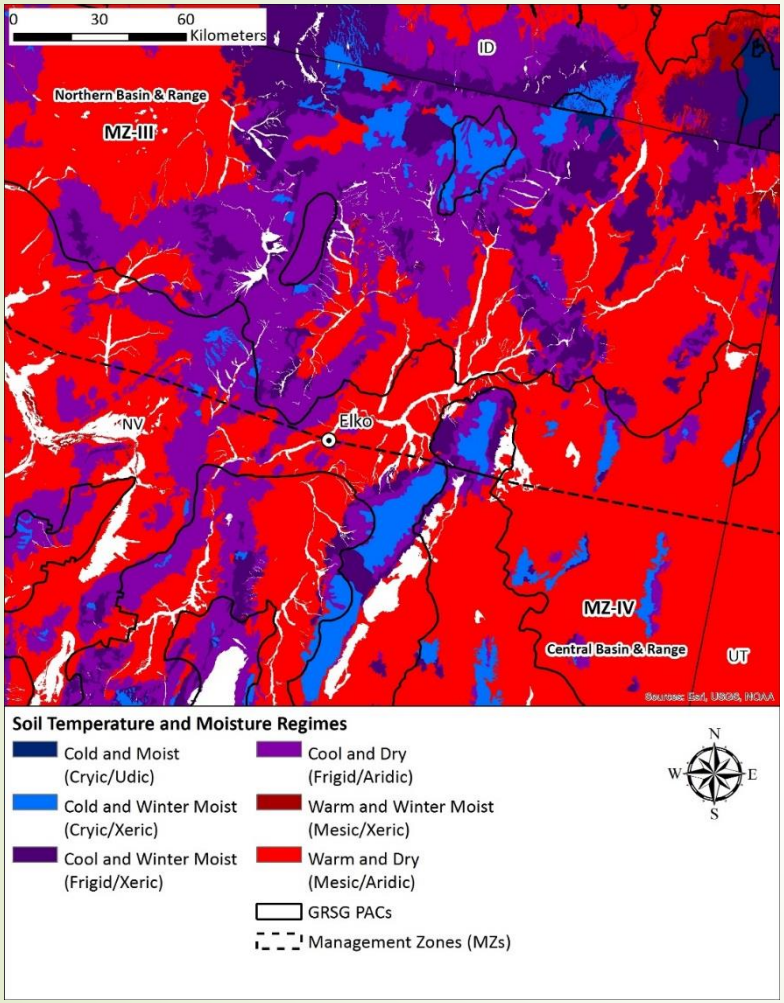
- Active oil and gas development
- Large parts of the area have high BBD with moderate to low R&R in and adjacent to oil wells

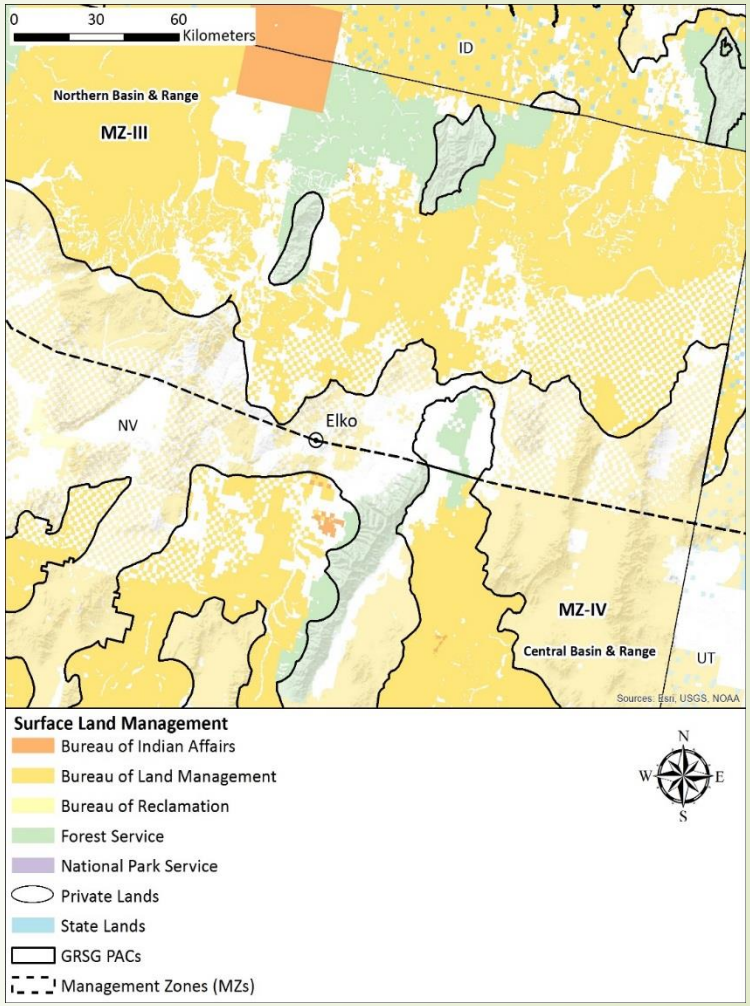
Southwestern WY – Oil & Gas Development

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

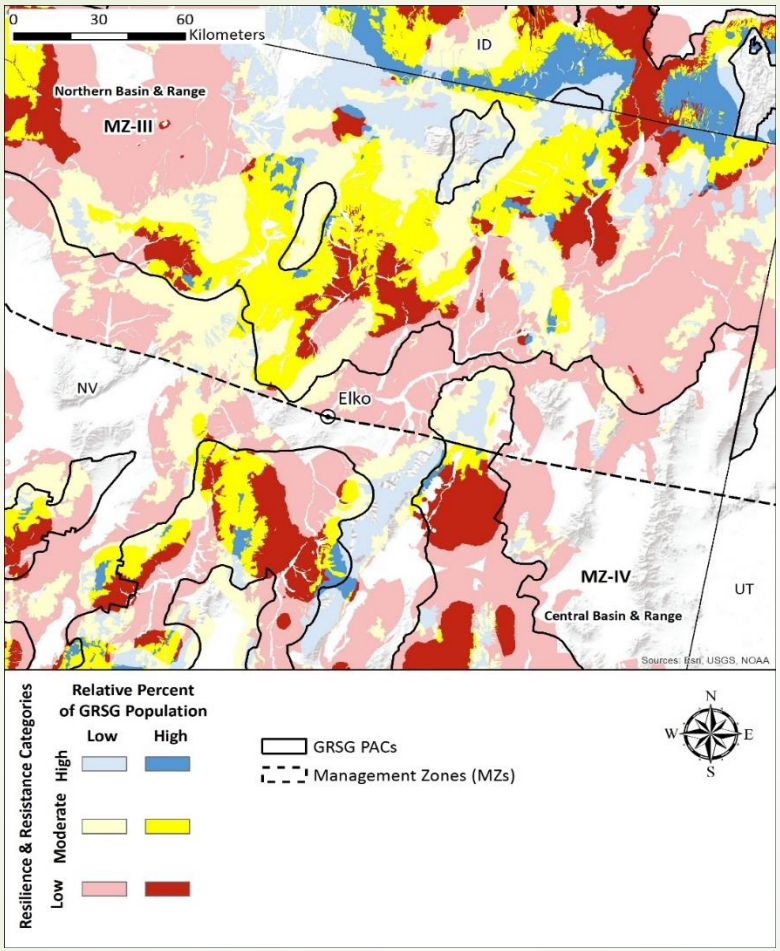




Physical Setting and Land Ownership

- Cold and moist (high R&R) to warm and dry (low R&R)
- BLM, Forest Service, State, Private

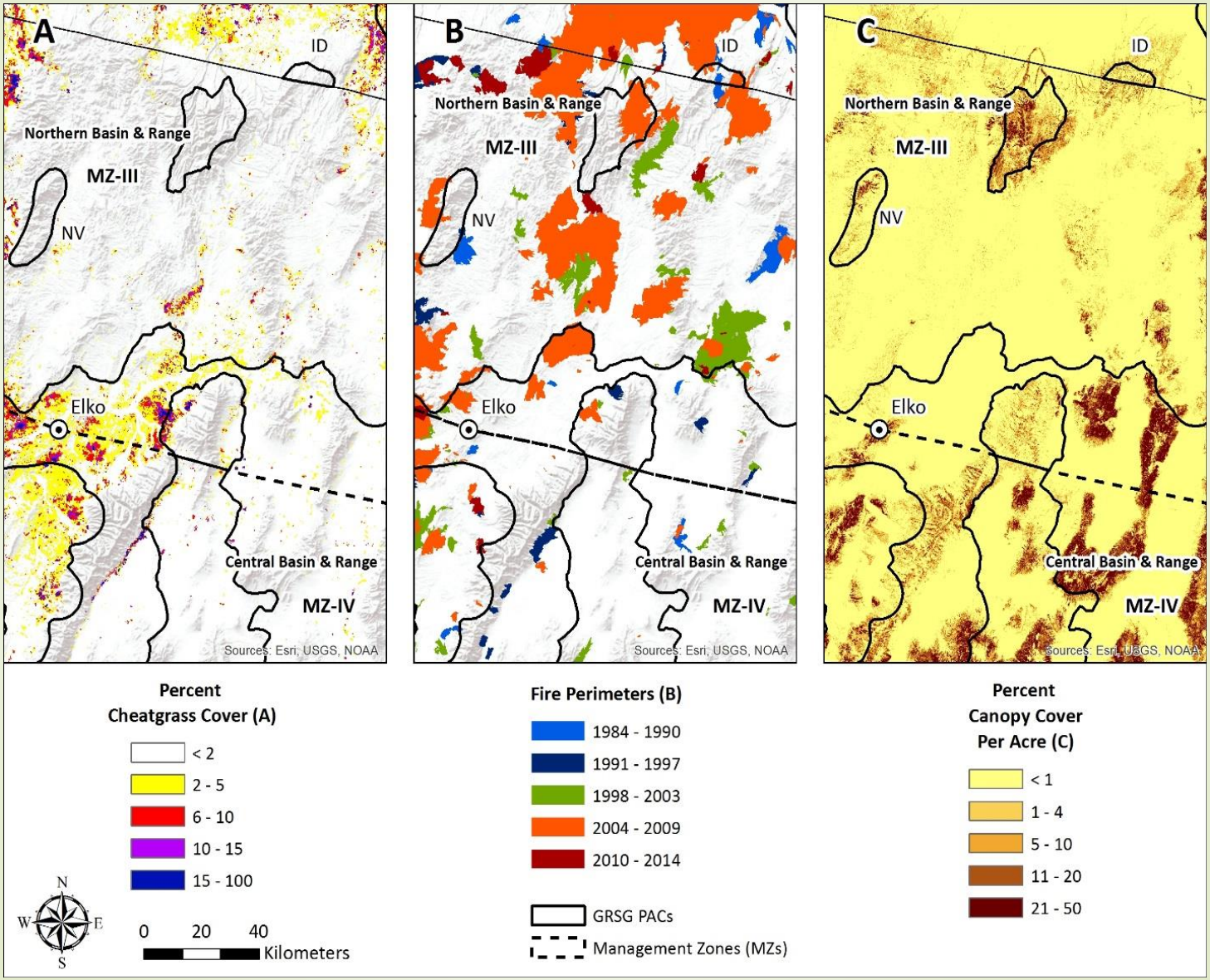
Northeast Nevada – Invasives, Fire, Conifers



Resilience and Resistance and Breeding Bird Density

- Large areas within the PACs have high breeding bird densities & they occur over a broad range of R&R

Northeast Nevada – Invasives, Fire, Conifers



Boyte et al. 2015

MTBS 2014

Fallkowski et al. in press

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

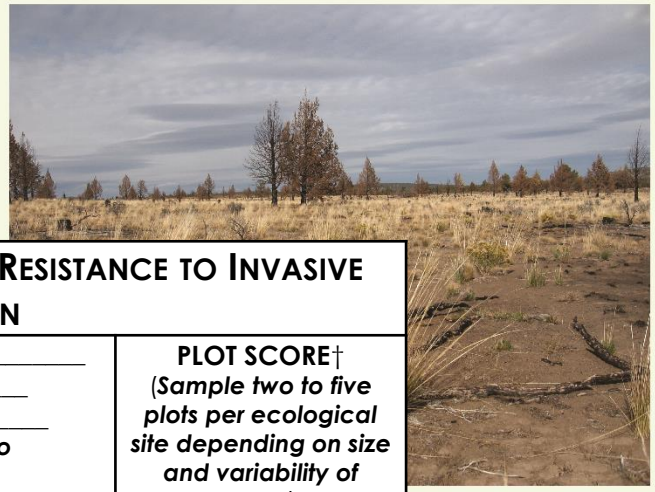
Information & Tools for Managers

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

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

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



…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.

Springer Series on Environmental Management

Matthew J. Germino
Jeanne C. Chambers
Cynthia S. Brown *Editors*

Exotic Brome-Grasses in Arid and Semiarid Ecosystems of the Western US

Causes, Consequences, and Management Implications

Springer

Great Basin Factsheet Series 2016

Information and tools to conserve and restore Great Basin ecosystems

y 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

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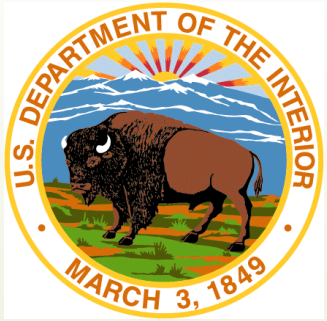
https://landscape.blm.gov/geoportal

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

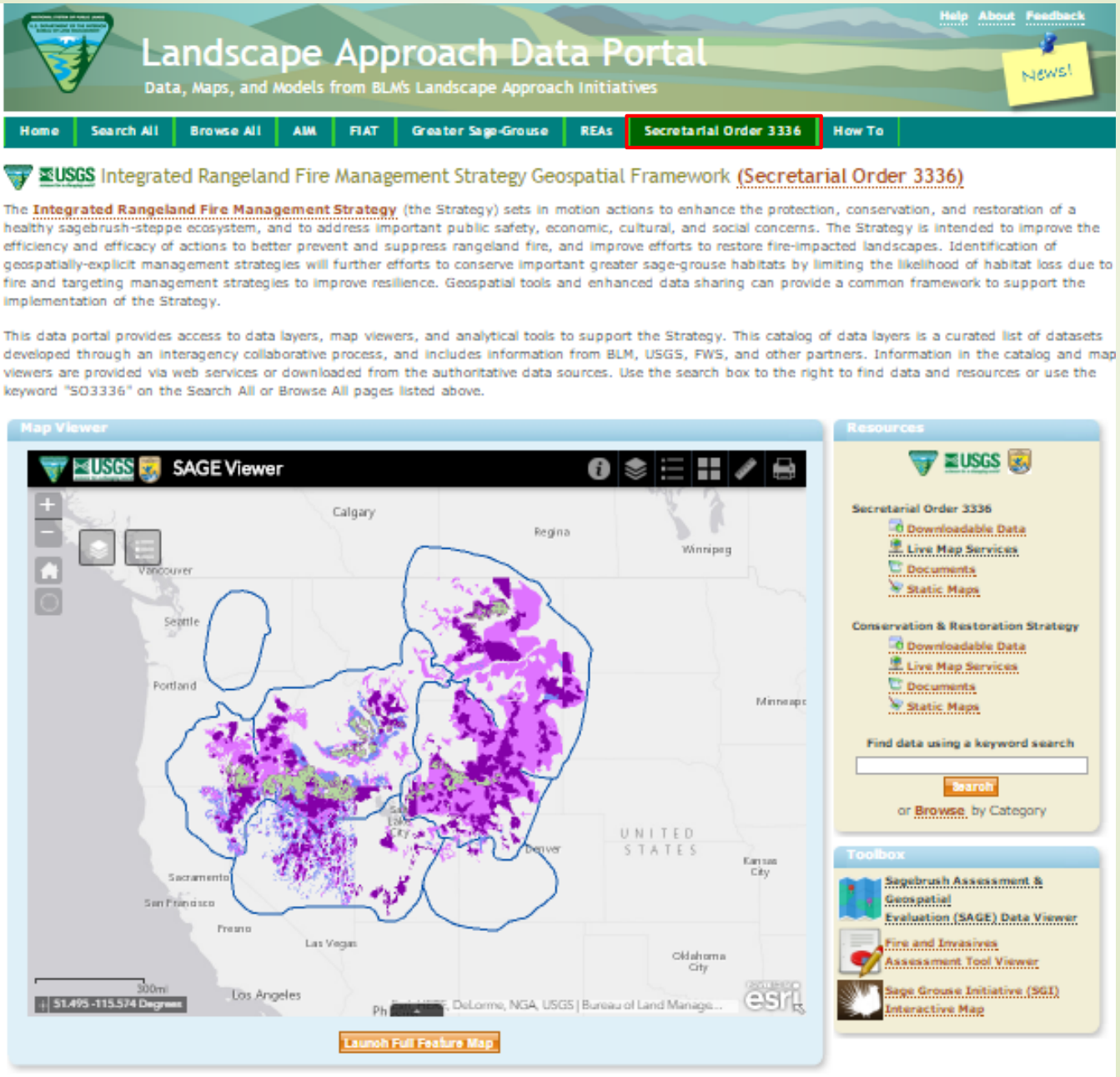
- Single landing page to numerous authoritative data sources
- Curated Content
- Easy Visualization and Access
- Assistance to partners

Primary Building Blocks

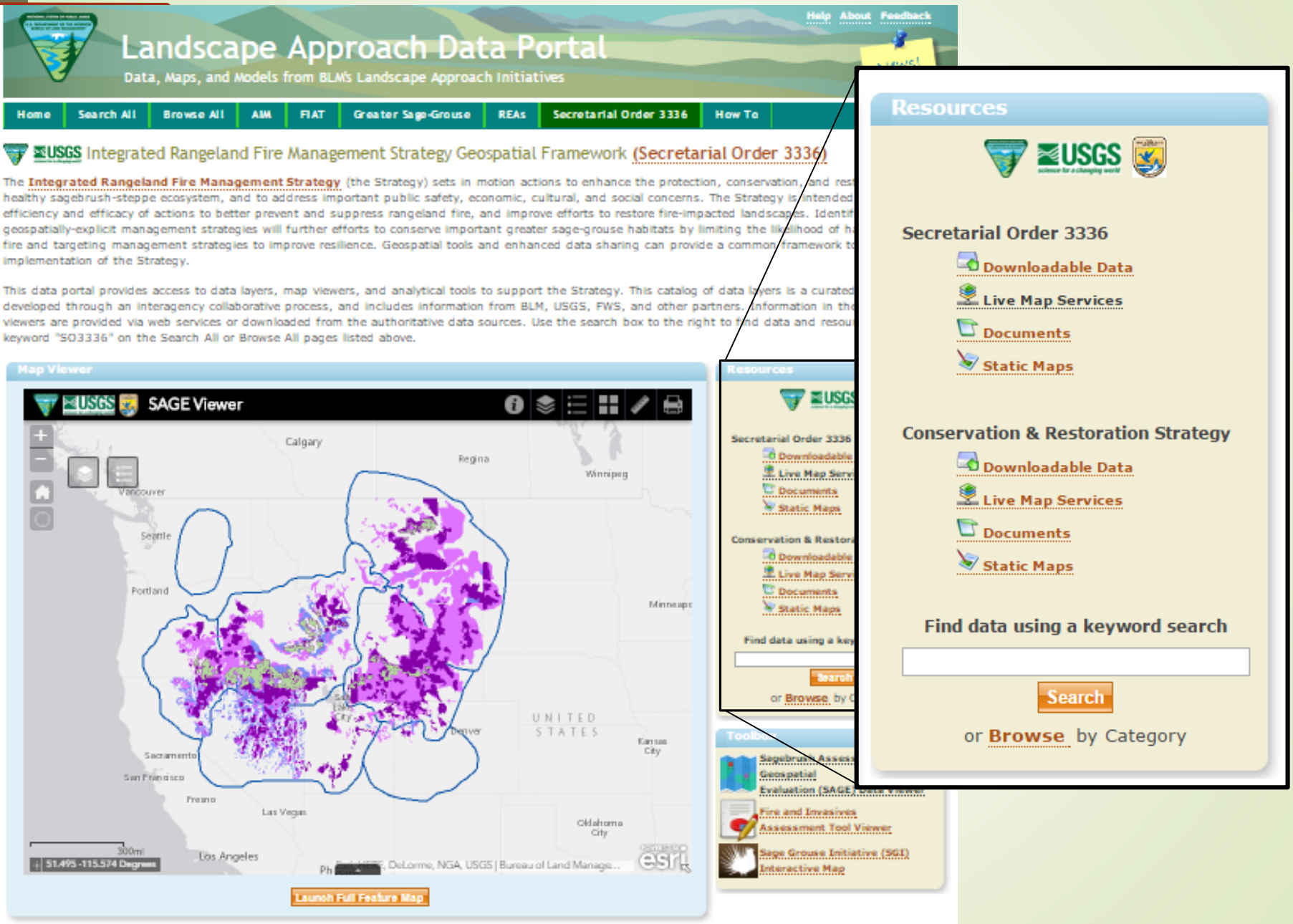
- BLM Landscape Approach Data Portal
  - Landscape focused data
  - BLM Managed
  - http://www.landscape.blm.gov/geoportal/

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

Geospatial Framework Interface



Geospatial Framework Interface



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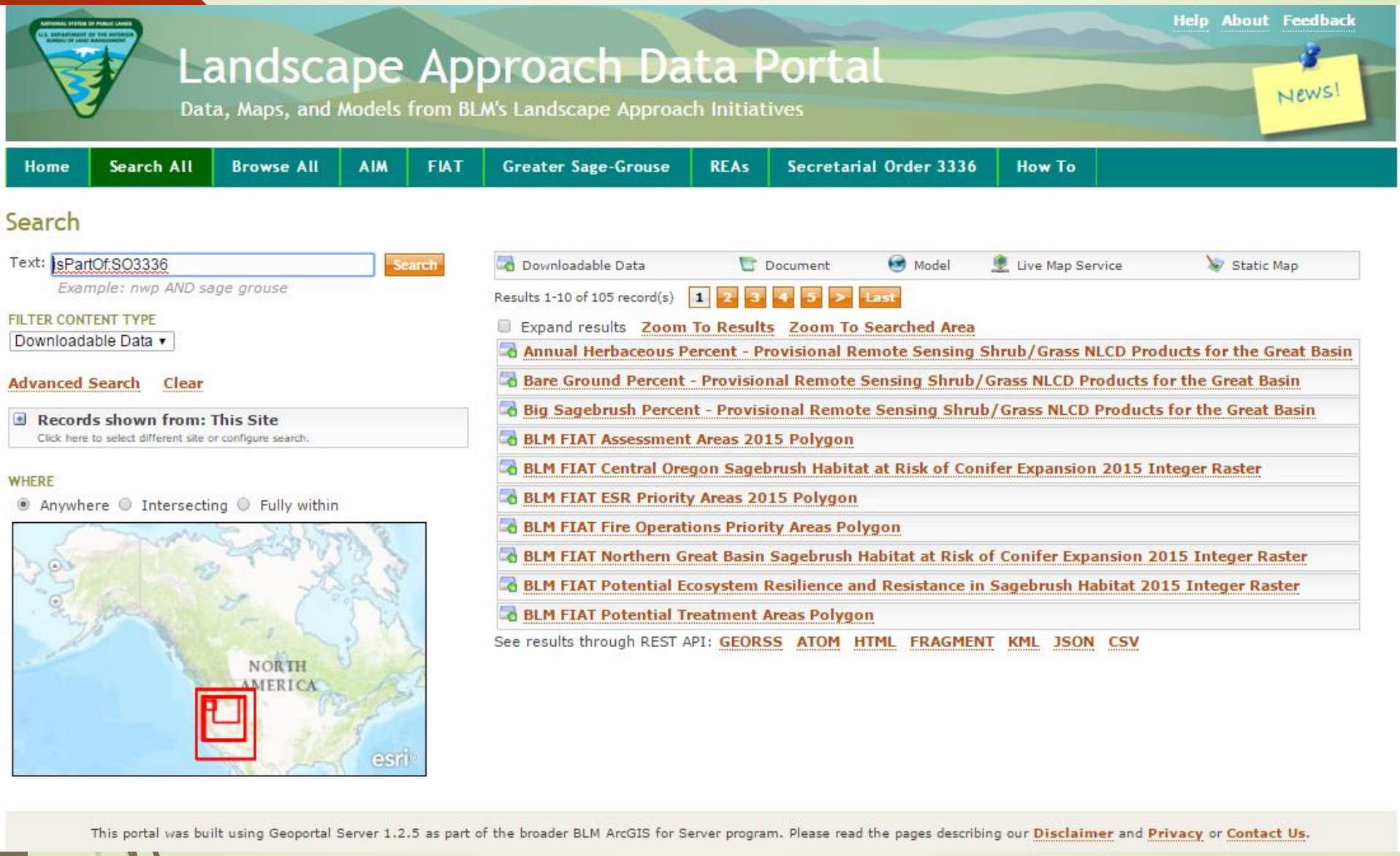

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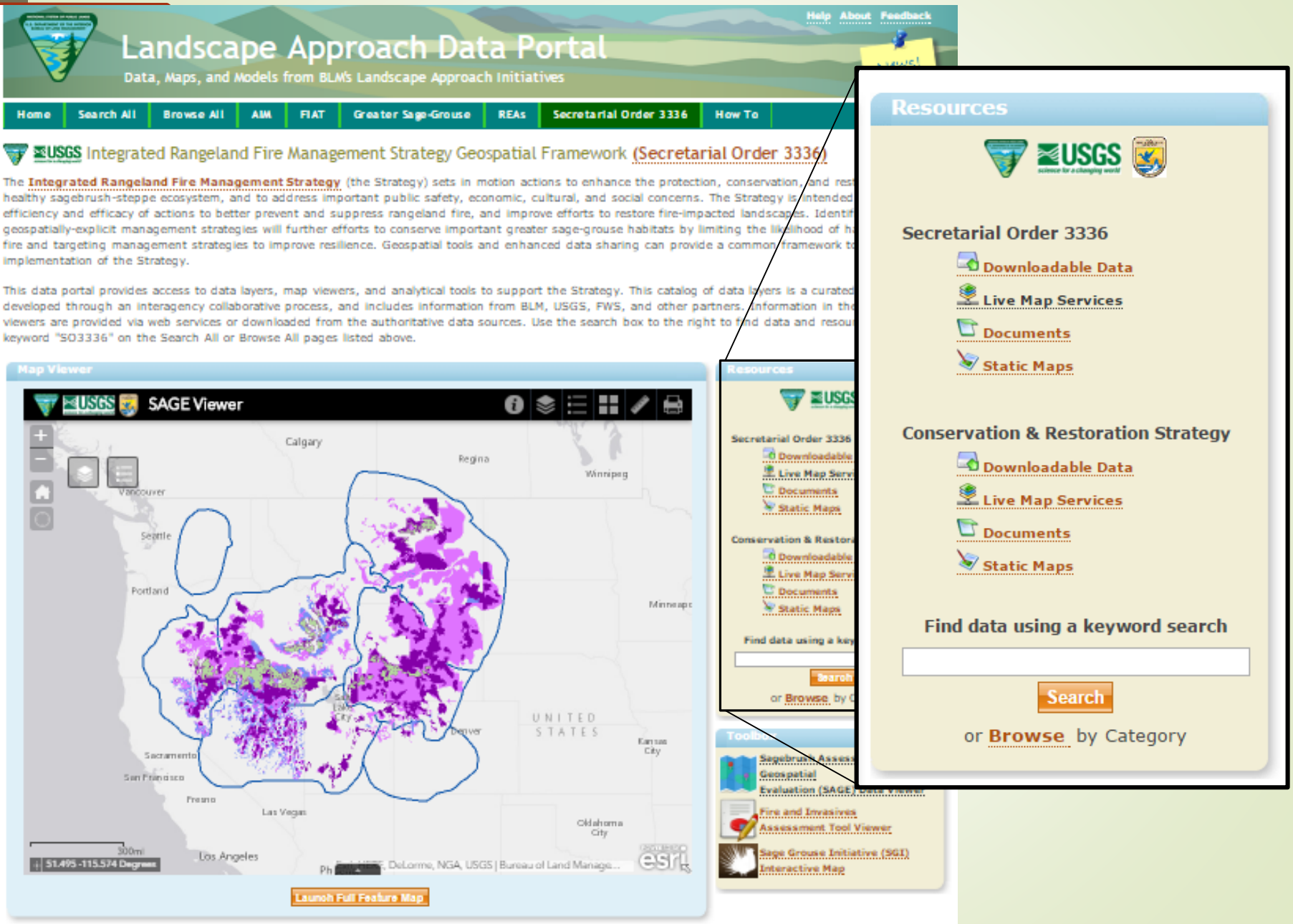

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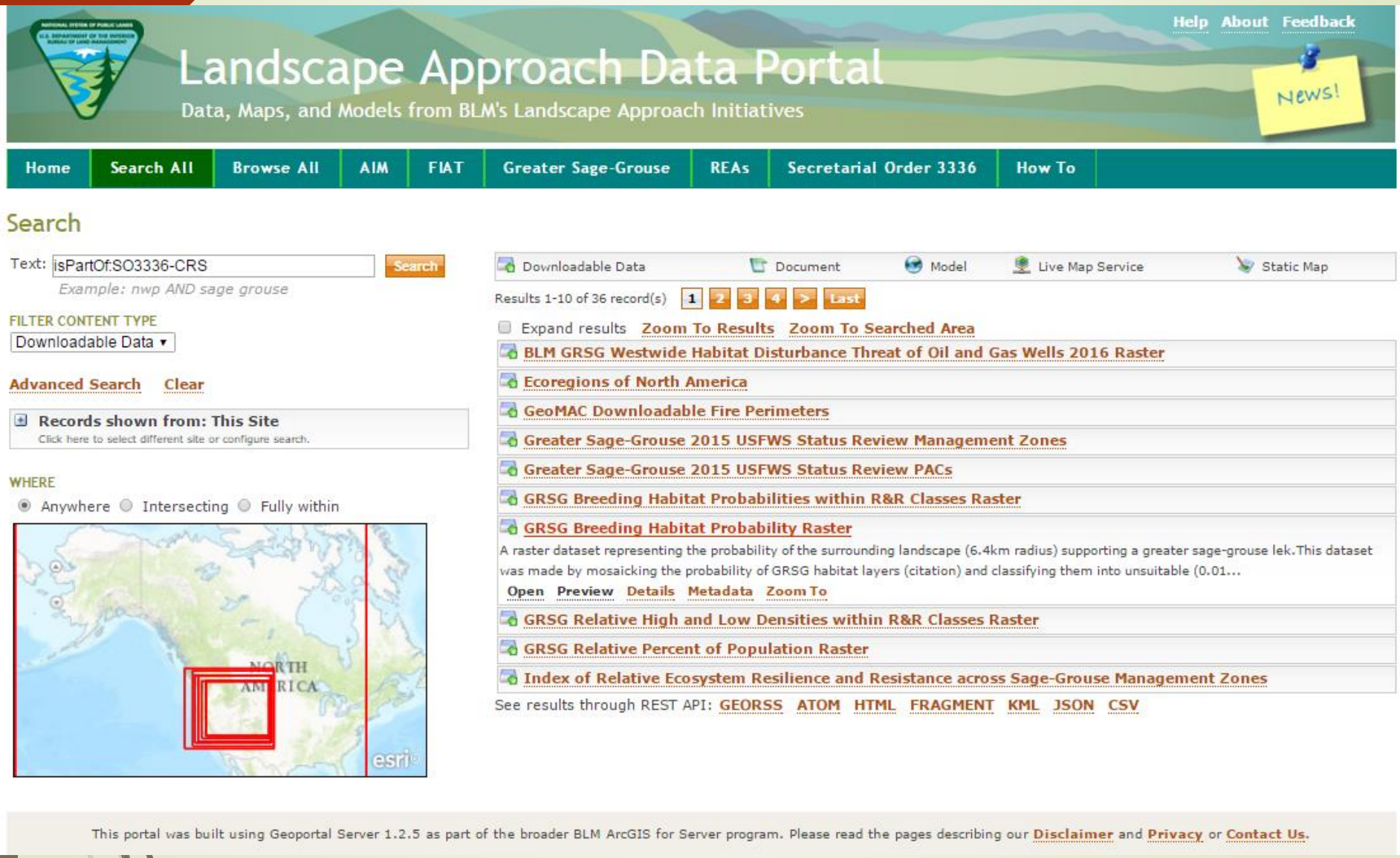

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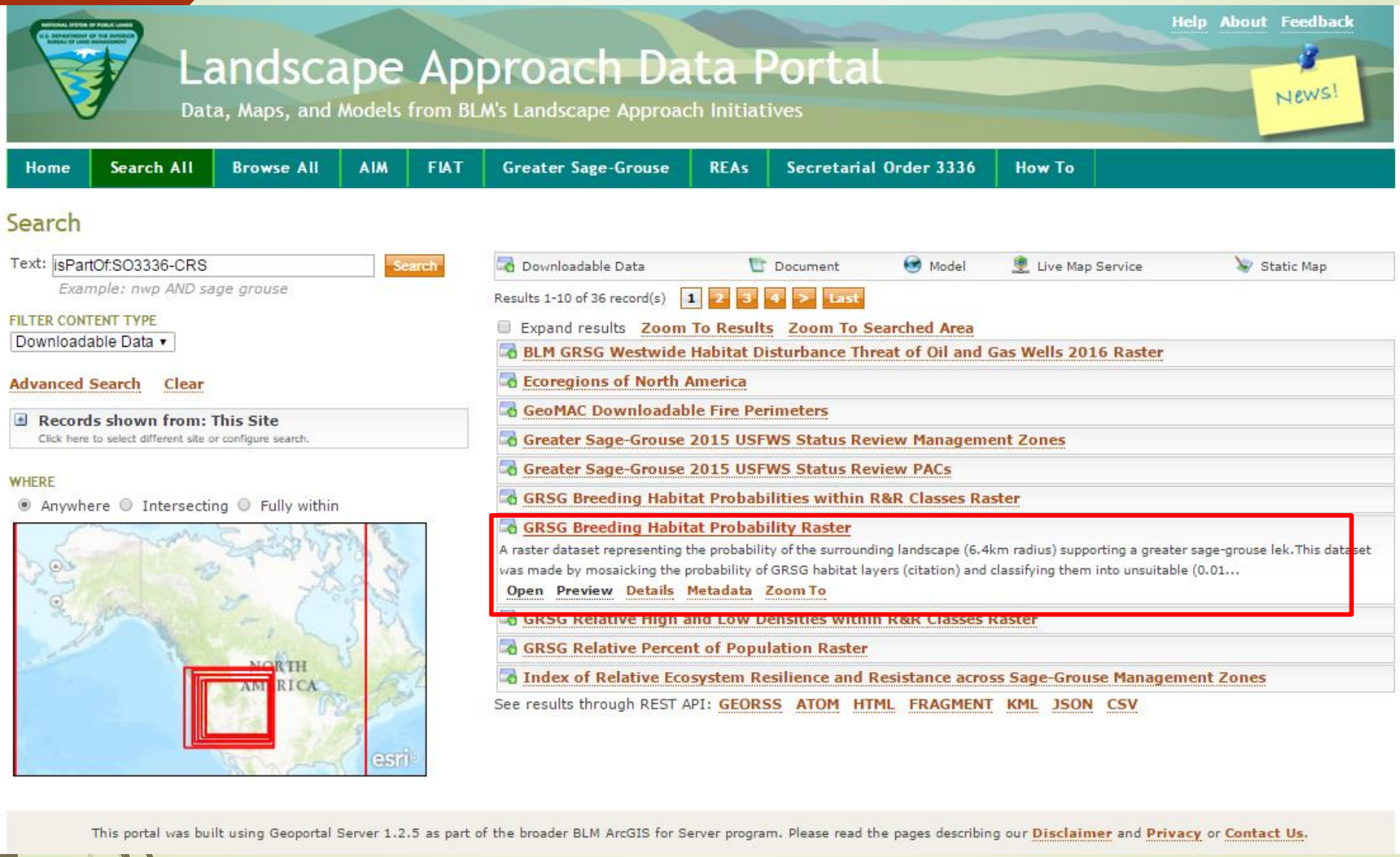


Geospatial Framework Interface

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 »

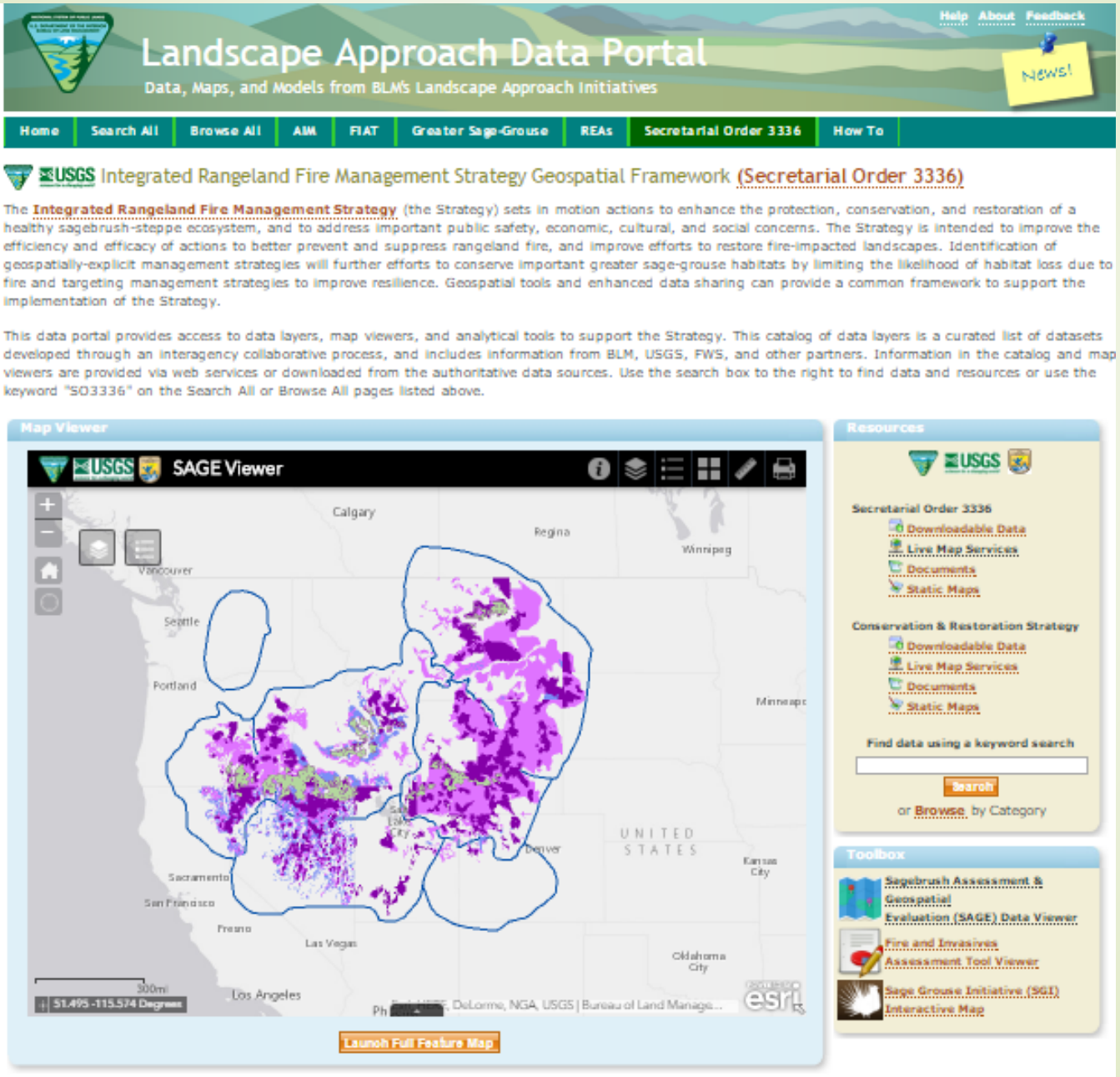
Spatial Services

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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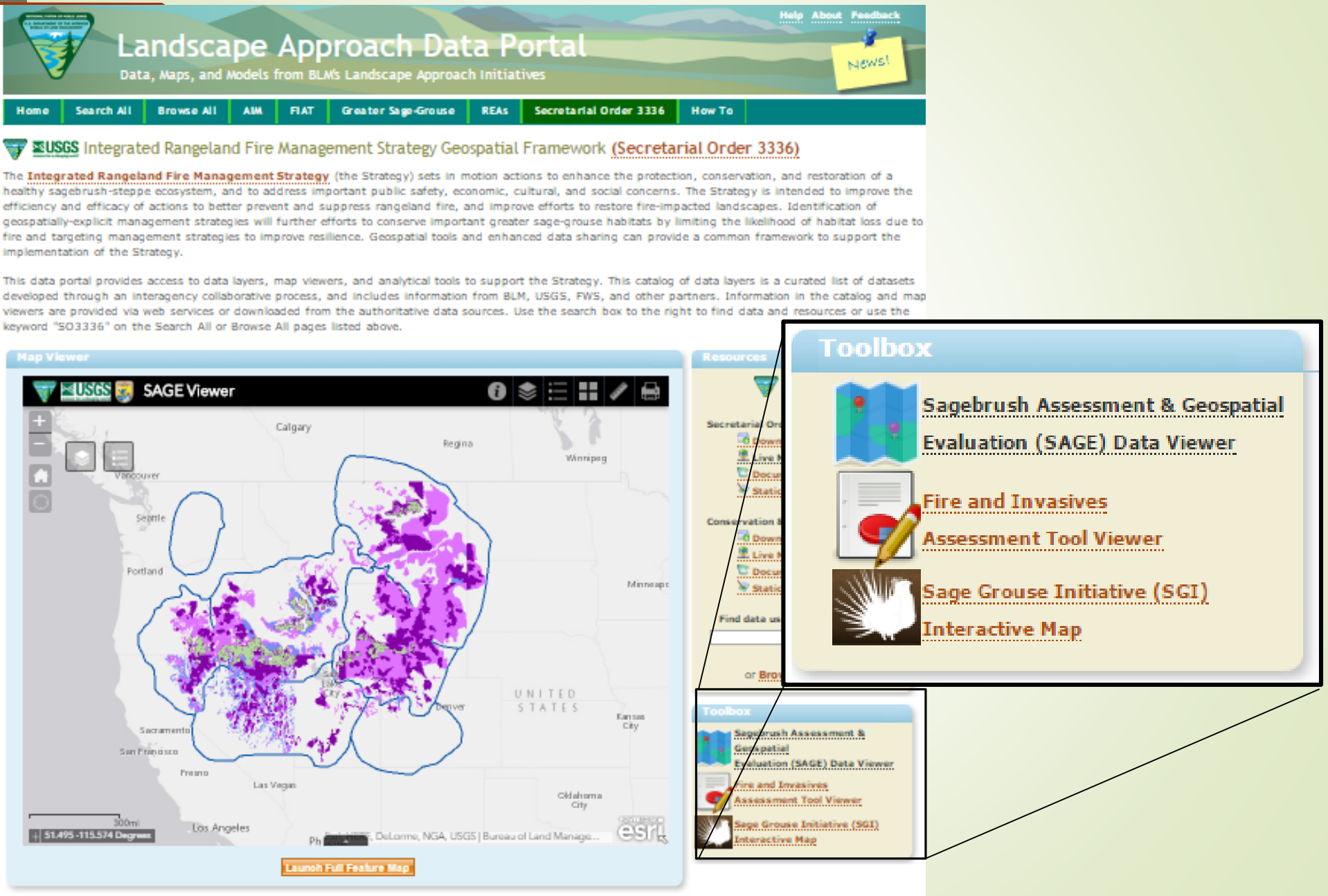

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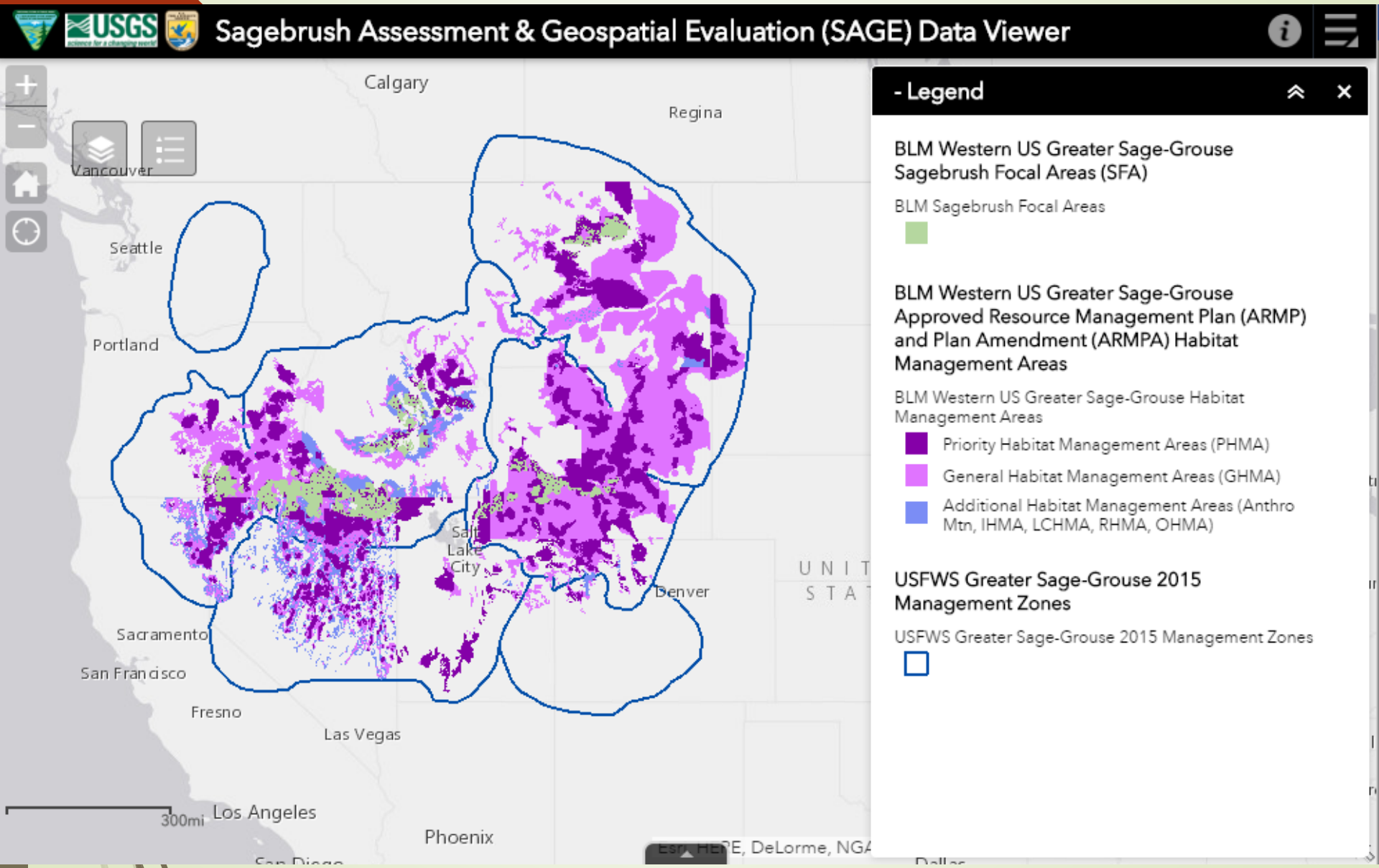
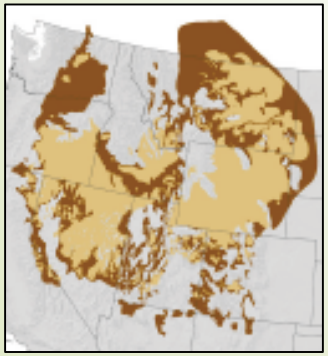


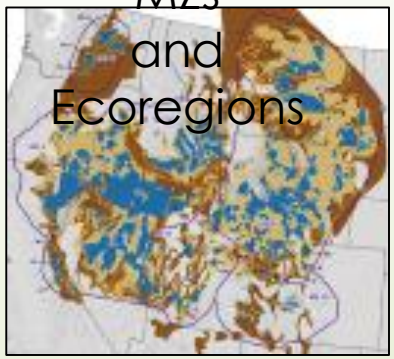
Toolbox

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

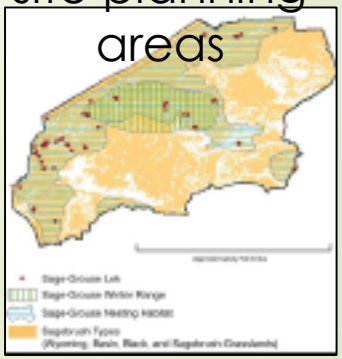
Sagebrush Biome



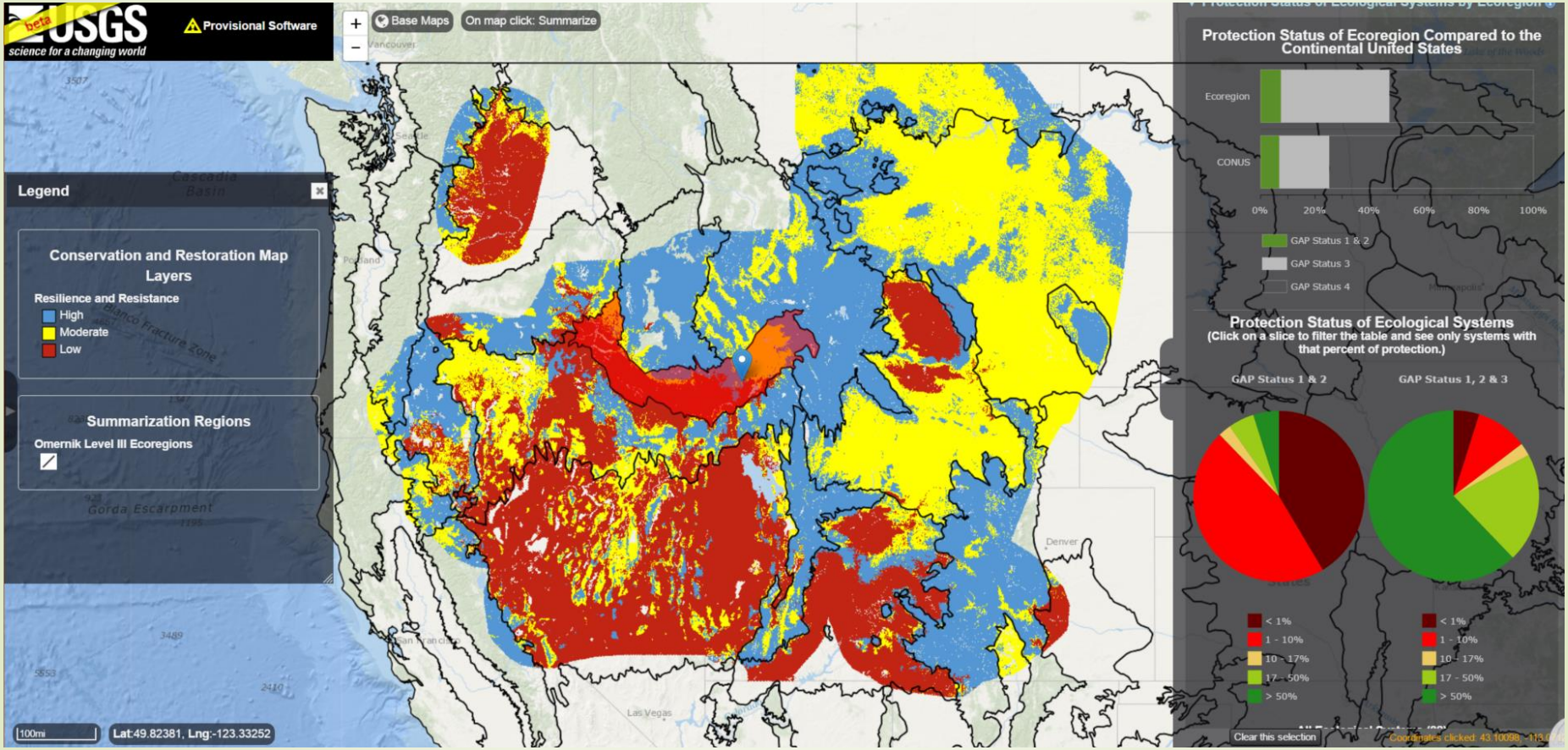
Sage-Grouse MZs and Ecoregions



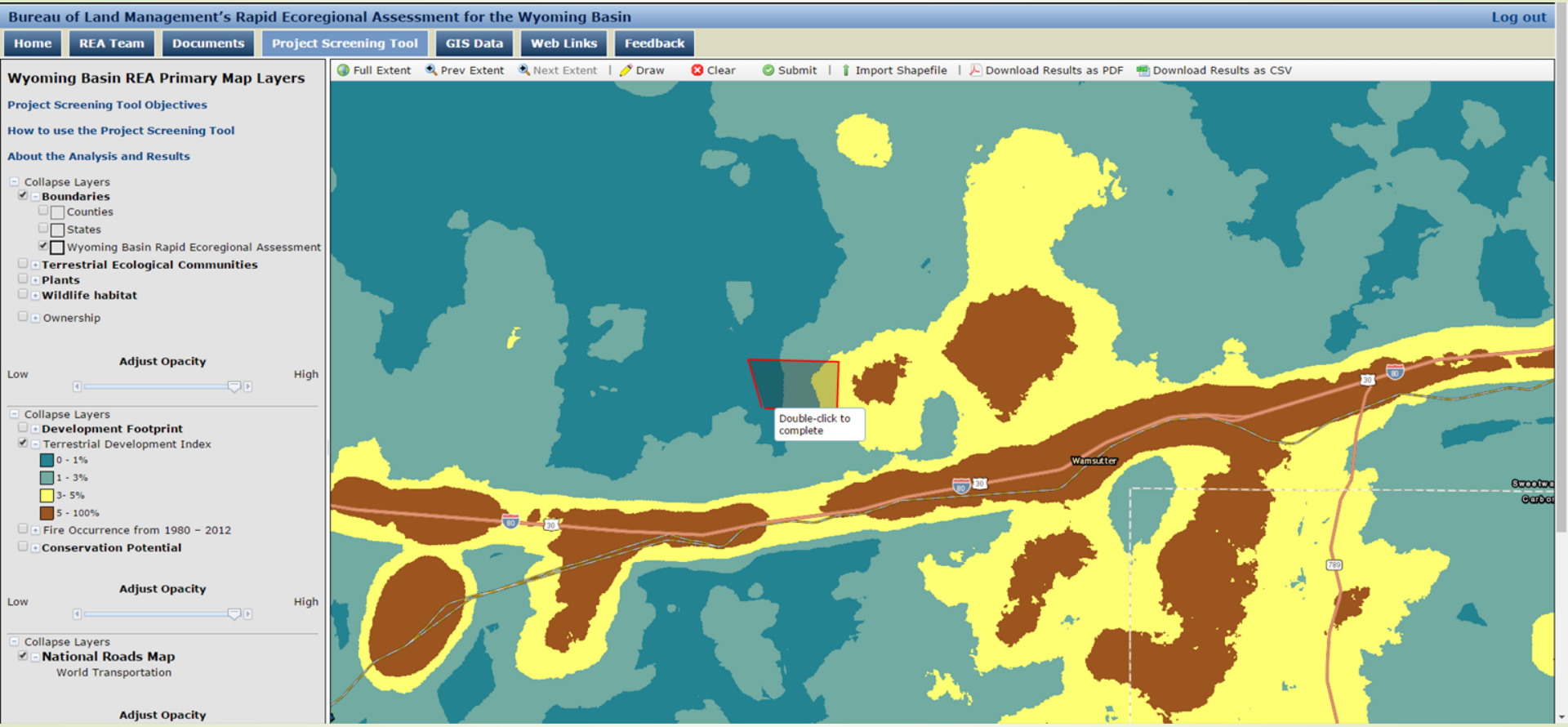
Local and site planning areas



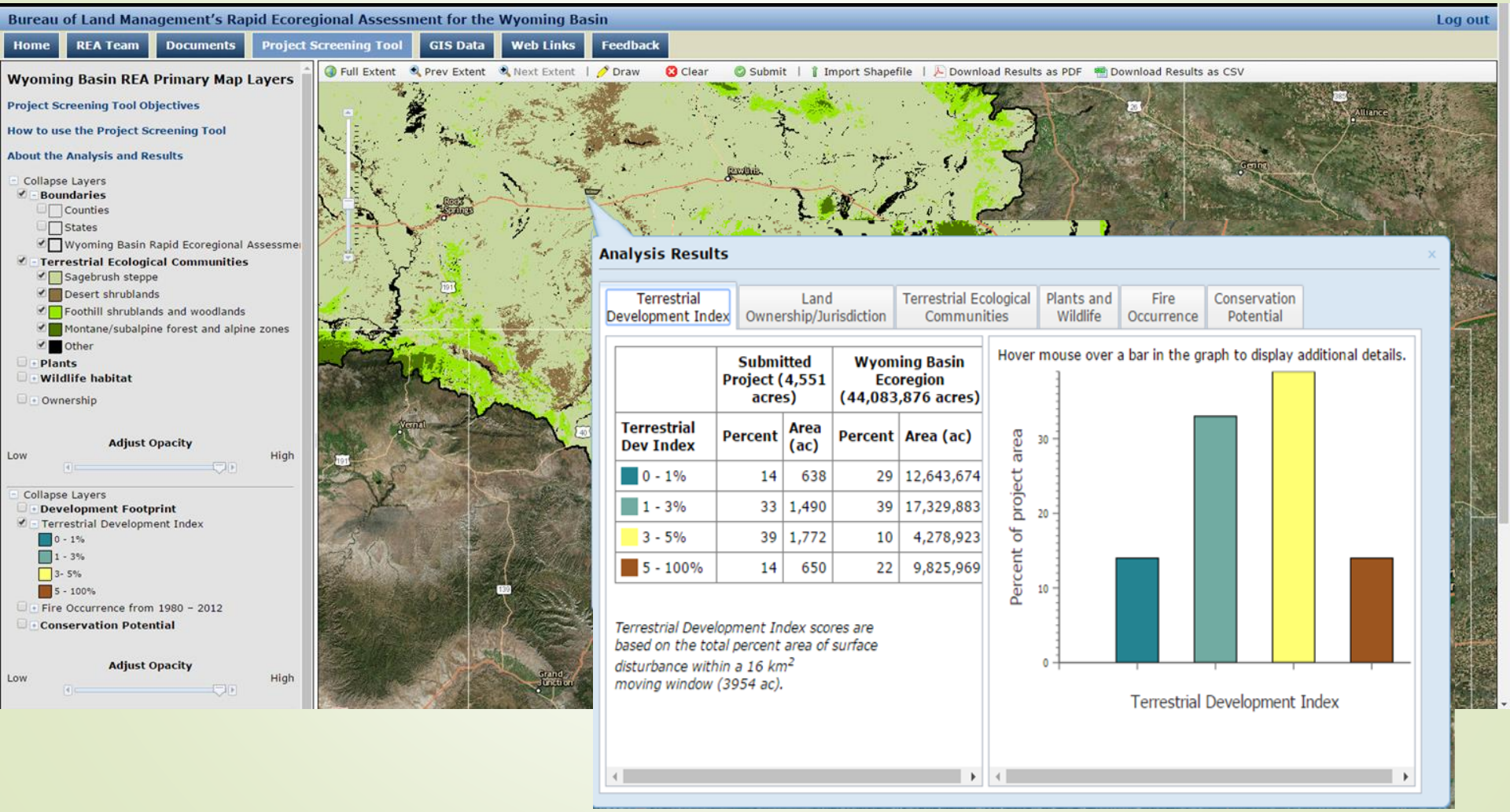
Science Framework Decision Support Tools



Science Framework Decision Support Tools



Science Framework Decision Support Tools



Geospatial Portal and Decision Tools

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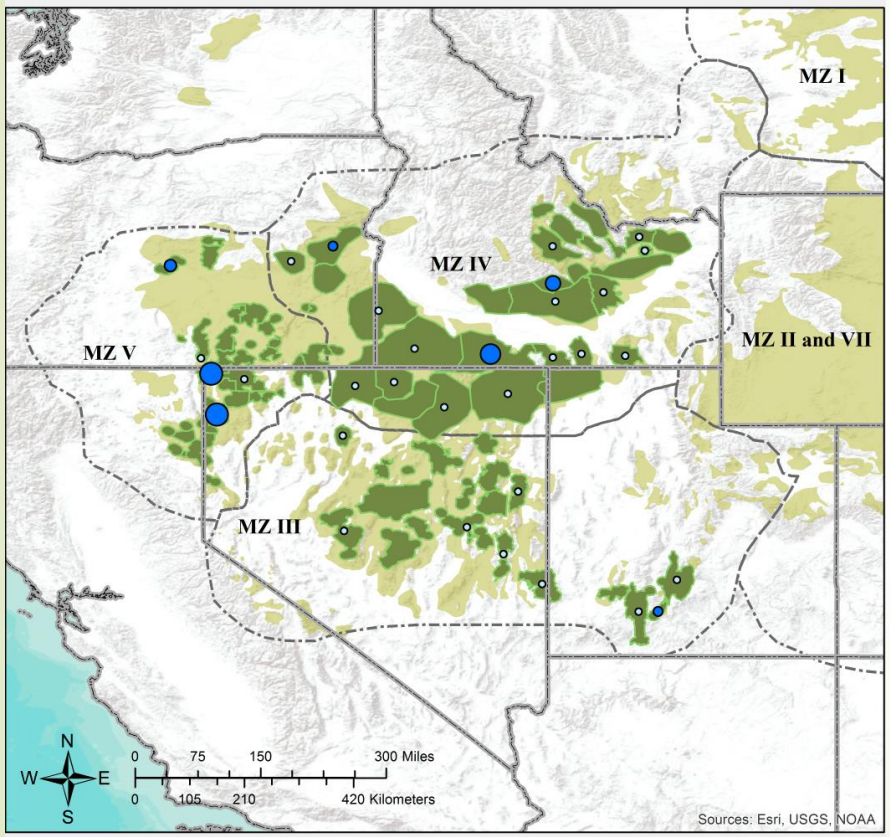
https://landscape.blm.gov/geoportal

Implementation of Approach –

BLM Identified Priority Habitat Areas & Funding Allocation

FY13 Accomplished



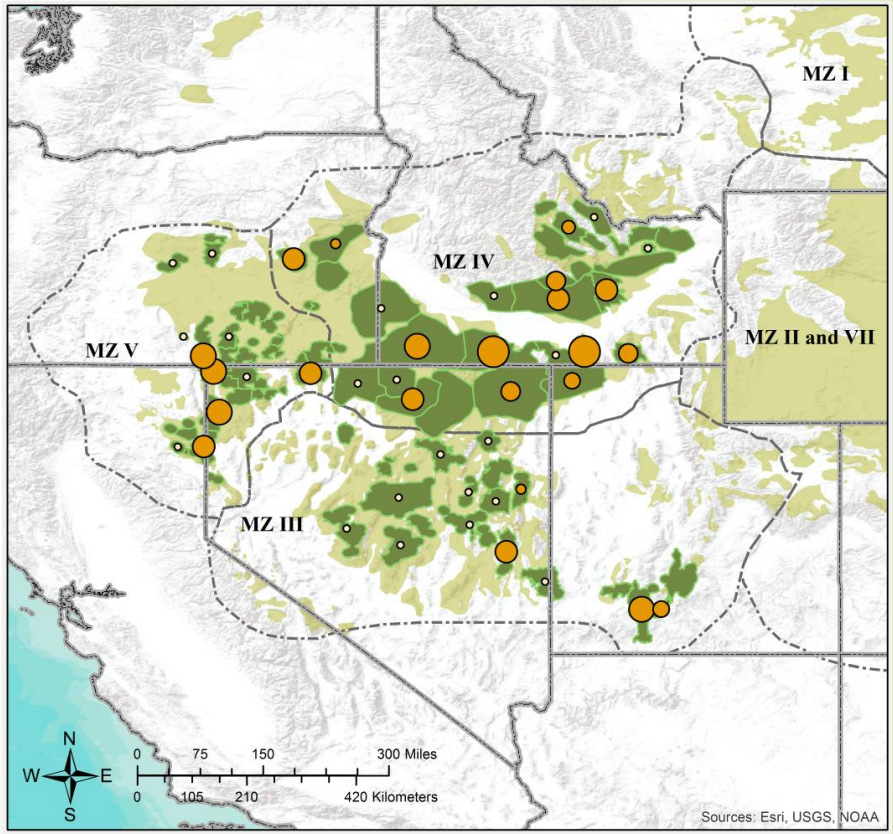
Explanation

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
- Includes all sage-grouse habit regardless of designation
- Conducted on individual Forest basis

Science Framework Timeline

Timeline	Key Dates
Science Framework Version 1 and provisional data layers available • http://www.treesearch.fs.fed.us/pubs/52275 • https://landscape.blm.gov/geoportal/catalog/main/portal.page	8/5
Eastern Range (SMRRT) GTR Published	11/11
External Review Period	11/14-11/28
Science Framework GTR, in press and additional data layers available	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, Doug Havlina, and Jeanne Chambers
Invasive Plants	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

Integrated Rangeland Fire Management Strategy Actionable Science Plan

Section 7b(viii) - Science and Research

Commit to multi-year investments in science and research

A multi-year plan for science and research that will provide a basis for an integrated approach to identifying, prioritizing, and funding science and research activities necessary to support the Strategy

2. Review existing research prioritization and strategy efforts to identify science needs for the Great Basin
3. Develop an actionable science plan of prioritized research needs
6. Conduct periodic reviews and updates of the science action plan

Actionable Science Plan Team

(in alphabetical order)

- **Ken Berg, Co-Lead, USGS**
- Gustavo Bisbal, USGS NWCSC
- Chad Boyd, USDA ARS
- Ed Brunson, JFSP
- John Cissel, JFSP
- Dawn Davis, USFWS
- Nicole DeCrappeo, USGS NWCSC
- Pat Deibert, USFWS
- **Debbie Finch, Co-Lead, FS R&D**
- Sean Finn, GNLCC
- Larisa Ford, BLM
- John Hall, JFSP
- Steven Hanser, USGS
- Michael Haske, DOI SO 3336
- Todd Hopkins, GBLCC
- Molly Hunter, JFSP
- Richard Kearney, GBLCC
- Kenneth Mayer, WAFWA
- Susan Phillips, USGS
- Bryce Richardson, USDA FS R&D / SWCH
- Carol Schuler, USGS
- San Stiver, WAFWA

Process – 7b(viii) Action Item #2

- Reviewed 32 existing publications and Federal and State strategies to identify science needs
- Removed redundancy, revised for consistency, and categorized into topics to help facilitate prioritization
  - Fire
  - Invasives
  - Restoration
  - Sagebrush and sage-grouse
  - Climate and weather

Process – 7b(viii) Action Item #3

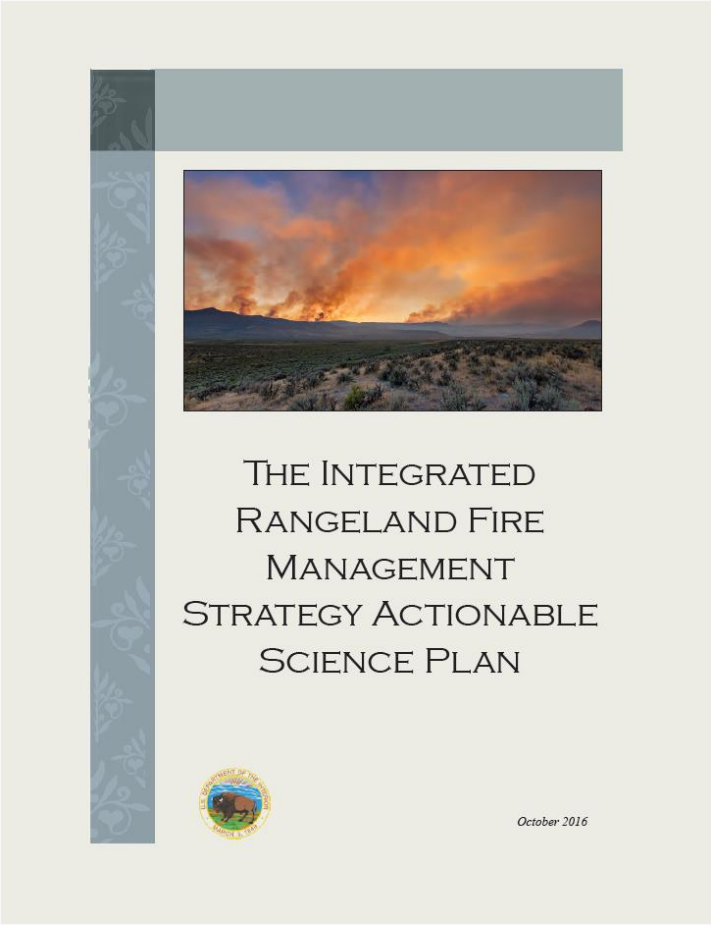
- Further refined the list of science needs
- List reviewed by Integrated Rangeland Fire Management Strategy action item teams
- Conducted a series of town-hall style prioritization sessions to select highest-priority needs from the list of 149 total needs
- Identified 37 priority science needs

Priority Science Needs

- Developed narratives outlining the background, recent science and syntheses, existing science gaps, and next steps
- Next steps: short-term (1 to 3 years) and long-term (accomplished in more than 3 years)
  1. Synthesize existing knowledge in a manner that is easily accessible and applicable in a management context
  2. Provide tools that will put new or existing knowledge in hands of on-the-ground managers and resource specialists
  3. Develop new knowledge when information is lacking or questions still remain

Plan Organization

- Introduction
- Process
- Priority Science Needs
  - Fire
  - Invasives
  - Restoration
  - Sagebrush and sage-grouse
  - Climate and weather
- Implementation



Released October 31, 2016

http://integratedrangelandfiremanagementstrategy.org/IRFMS_Actionable_Science_Plan.pdf

Fire

- Evaluate the effectiveness of fuel treatments
- Examine the effects of those treatments on sage-grouse populations
- Determine the role of fire in maintaining healthy sagebrush communities
- Assess fire regimes in the sagebrush ecosystem
- Improve the spatially-explicit understanding of fire risk

Determine which fuel breaks have met the objective of preventing fire spread or fire severity, and determine the characteristics of those that are successful, including synthesis of the literature, critical evaluation of techniques and plant materials used in fire breaks (species, structure, placement, and native versus nonnative species), and economic tradeoffs.

Short-term

- Review Fuels Treatment Effectiveness Monitoring (FTEM) records and compile fire-fuel break incursion reports if verifiable data are available.
- Analysis of the economic tradeoffs between fuel-break types in comparison to other non-fuel break alternatives.

Long-term

- Multi-year evaluation of fuel-break effects on fire spread, intensity, and severity.
- Quantitative assessment of fuel-break longevity and maintenance, including the type, timing of construction, and frequency of maintenance.
- Develop a database and standardized protocol for entry of information that allows for assessment of fuel break effectiveness.

Invasives

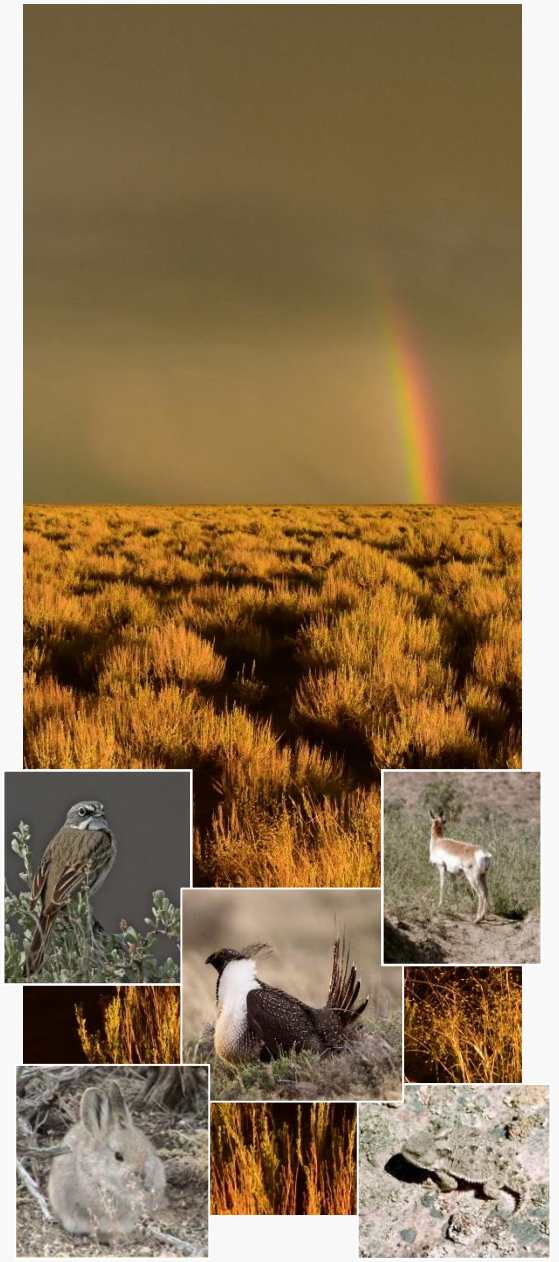
- Investigate potential biocontrols for cheatgrass
- Improve production and delivery systems of successful biocontrol agents
- Assess the effectiveness of targeted grazing with livestock to reduce nonnative annual grasses
- Determine the natural and anthropogenic factors that influence invasive plant species distributions
- Assess prevention, eradication, and control measures for invasive plant species
- Develop maps showing locations of invasive plant species to inform early detection and other control measures

Restoration

- Improve the application of restoration actions
- Determine the factors that lead to success of those actions and understand the effects of those actions
- Develop strategic approaches for acquiring, storing, and utilizing genetically appropriate seeds and other plant materials

Sagebrush and Sage-grouse

- Identify factors that affect sage-grouse movement patterns and population connectivity
- Improve understanding of the effects and thresholds of disturbance on sage-grouse behavior, habitat use, and populations
- Develop spatially explicit sage-grouse population models and identify seasonal habitats across the entire range of the species
- Develop next-generation vegetation mapping techniques
- Assess long-term dynamics of the sagebrush ecosystem
- Develop an understanding of how grazing influences sagebrush vegetation and sage-grouse
- Improve understanding the ecology of other sagebrush-obligate and sagebrush-associated species, including the influence of habitat conditions and threats on the distribution of these species



Develop sagebrush ecosystem-wide models identifying conditions necessary to support sagebrush-associated species, other than sage-grouse, using an individual species approach or species groups when necessary.

Short-term

- Conduct a comprehensive review and synthesis of available information for sagebrush-obligate and associated species to identify information that can inform modeling efforts.
- Update existing expert opinion and habitat suitability models.
- Develop empirically based models for those species where suitable and sufficient data exist.
- Initiate data collection to develop the information necessary to model those sagebrush-associated species that lack sufficient existing data to develop models.
- Develop standard monitoring strategies and protocols for priority species lacking current baseline habitat information.
- Identify and resolve information gaps for sagebrush-obligates and ecosystem management.

Long-term

- Develop empirical models for sagebrush-associated species as data become available.
- Develop decision-support tools to inform management actions for individual or groups of sagebrush-associated species.

Climate and Weather

- Develop predictive models for plant species used for restoration under climate-change scenarios
- Improve the collection of climate-appropriate seeds
- Develop native plant materials resilient to climate change
- Understand the complex set of variables that controls seeding success

Implementation

- Enhance the delivery of scientific information to managers
- Provide support to managers in interpretation of the science
- Allow for feedback between managers and researchers to identify new research needs based on both emerging issues and field results
- Assure development and delivery of tools and services needed by managers to use the science
- Develop an organized process for communicating ongoing research and funding sources to improve efficiency and effectiveness
- Conduct periodic review and evaluation of priority science needs

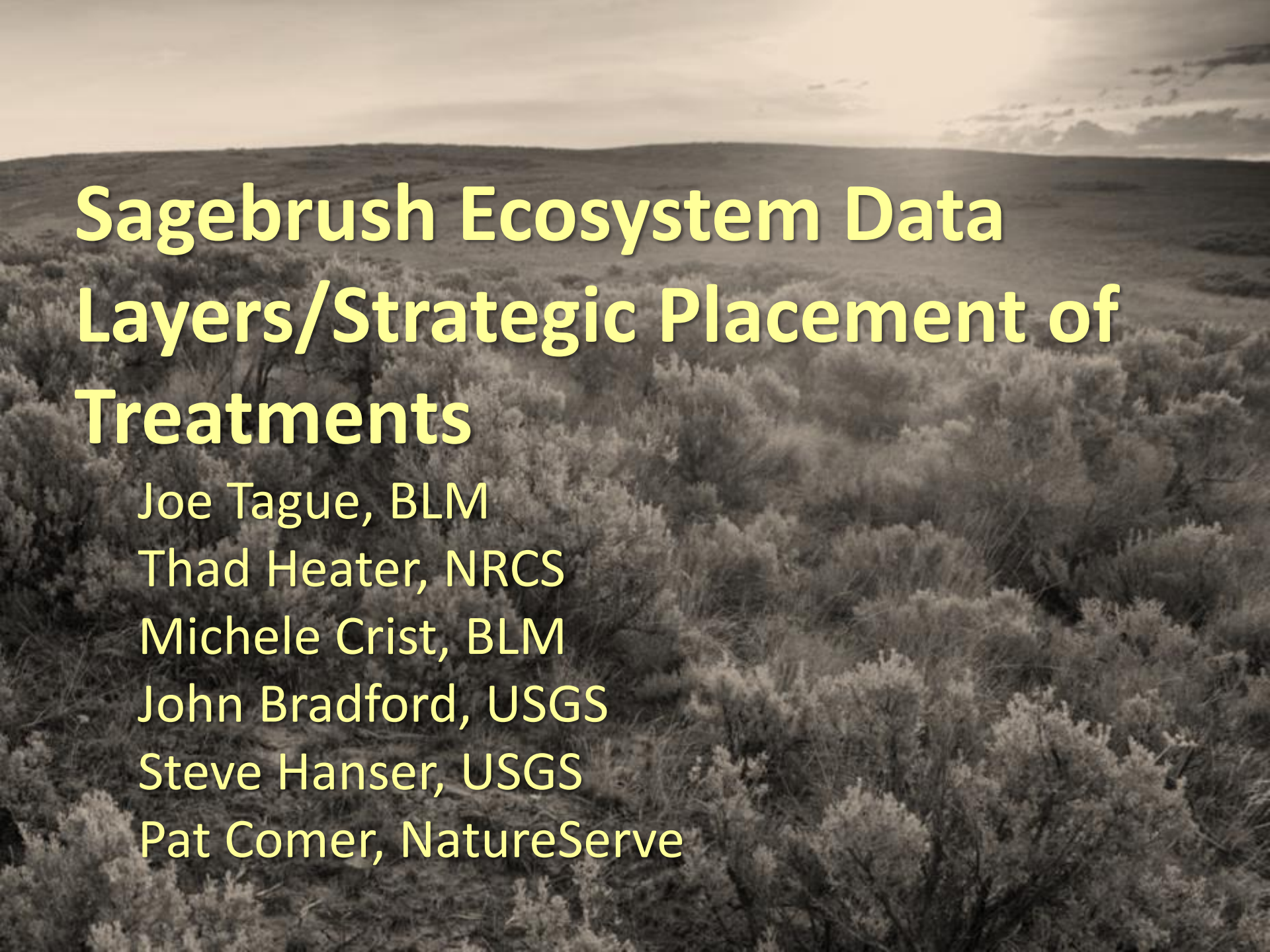
Integrated Rangeland Fire Management Strategy Actionable Science Plan

http://integratedrangelandfiremanagementstrategy.org/IRFMS_Actionable_Science_Plan.pdf

R.J. Sindelar

Discussion


Lunch
Please return by 1:00 pm



Sagebrush Ecosystem Data Layers/Strategic Placement of Treatments

Joe Tague, BLM
Thad Heater, NRCS
Michele Crist, BLM
John Bradford, USGS
Steve Hanser, USGS
Pat Comer, NatureServe

BLM'S 5 YEAR INTEGRATED PROGRAM OF WORK

Joe Tague, *Division Chief, Forest, Rangeland, Riparian, and Plant Conservation*

jtague@blm.gov

Why Have a 5-Year Program of Work (IPOW)

- Provides a regional approach to implementation
- Allow us to tell our story: IPOW is integrated, prioritized and strategic
- Show accountability in implementing our commitments in the sage-grouse plans to the FWS &Partners
- Provide increased level of certainty for out year funding allocations to managers and partners
- Get integrated picture of vegetation and habitat protection funding needs and workload in one place

Development of BLM's IPOW

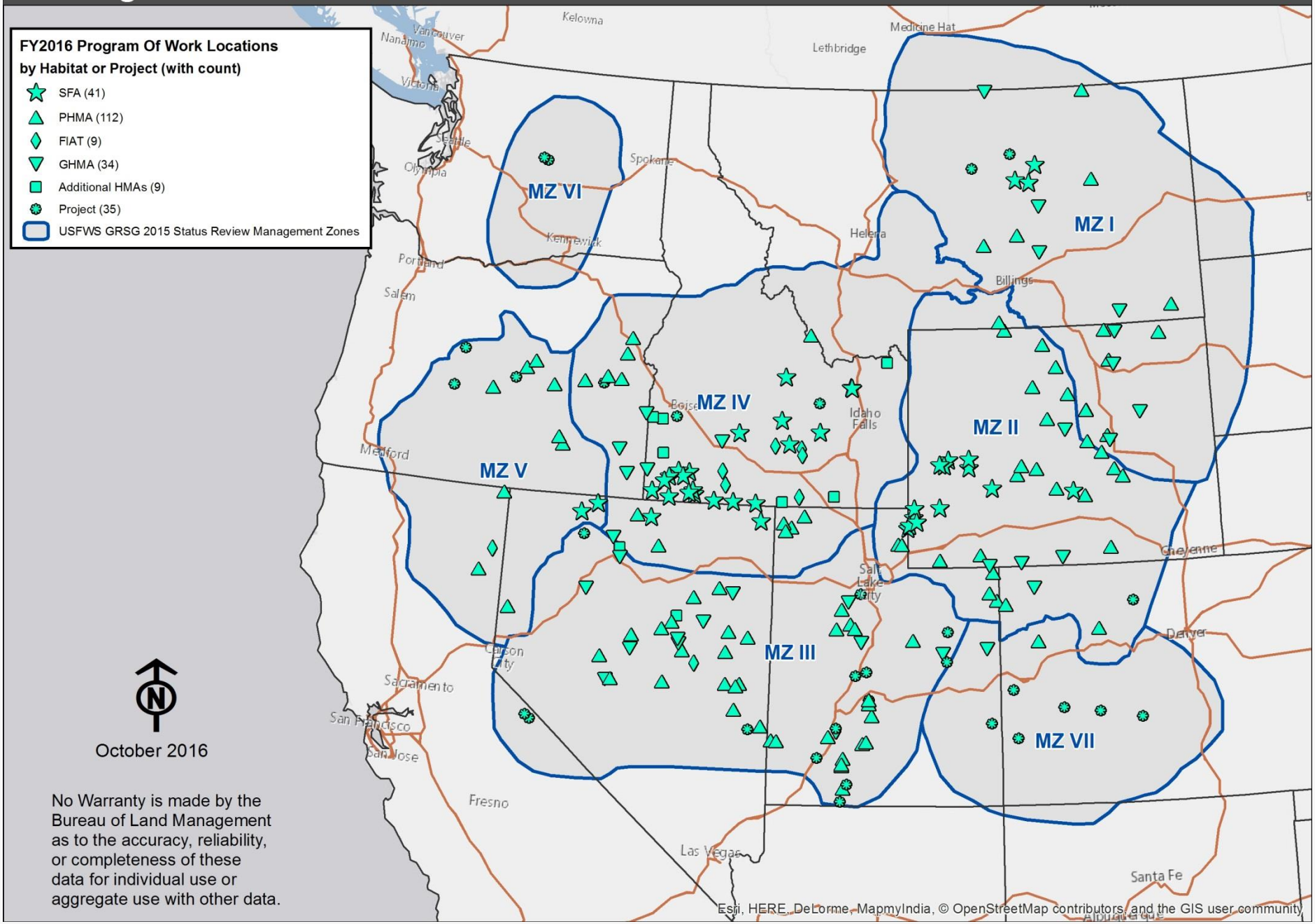
- Began funding sage-grouse (SG) Integrated Program of Work (IPOW) in FY2016 Annual Work Plan (AWP) in Feb 2016
- Issued 5 year Sage-Grouse (SG) POW Guidance (2017 to 2021) to States in April 2016
- States submitted detailed 5-year SG POW to Regional SG coordinators in May 2016
- Regional SG Coordinators facilitated prioritization of projects using State submissions in June 2016
- National Program Leads (Fire and Resources) developed recommended FY2017 priorities for funding by program in July 2016

Outcome Based SG Vegetation Management Actions

- **Conifer acres:** footprint of conifer removal treatment (i.e., thinning, piling)
- **Invasive species acres:** footprint of invasive species treatment (i.e. chemical spray, seeding)
- **Fuel break acres:** footprint of acres treated to protect habitat (i.e. mowing, seeding)
- **Habitat protection acres:** (i.e. exclosures, shrub treatment)
- **Riparian restoration miles:** (i.e. willow planting, exclosures)
- **Habitat protection miles:** (i.e. fence modification, road decommissioning)

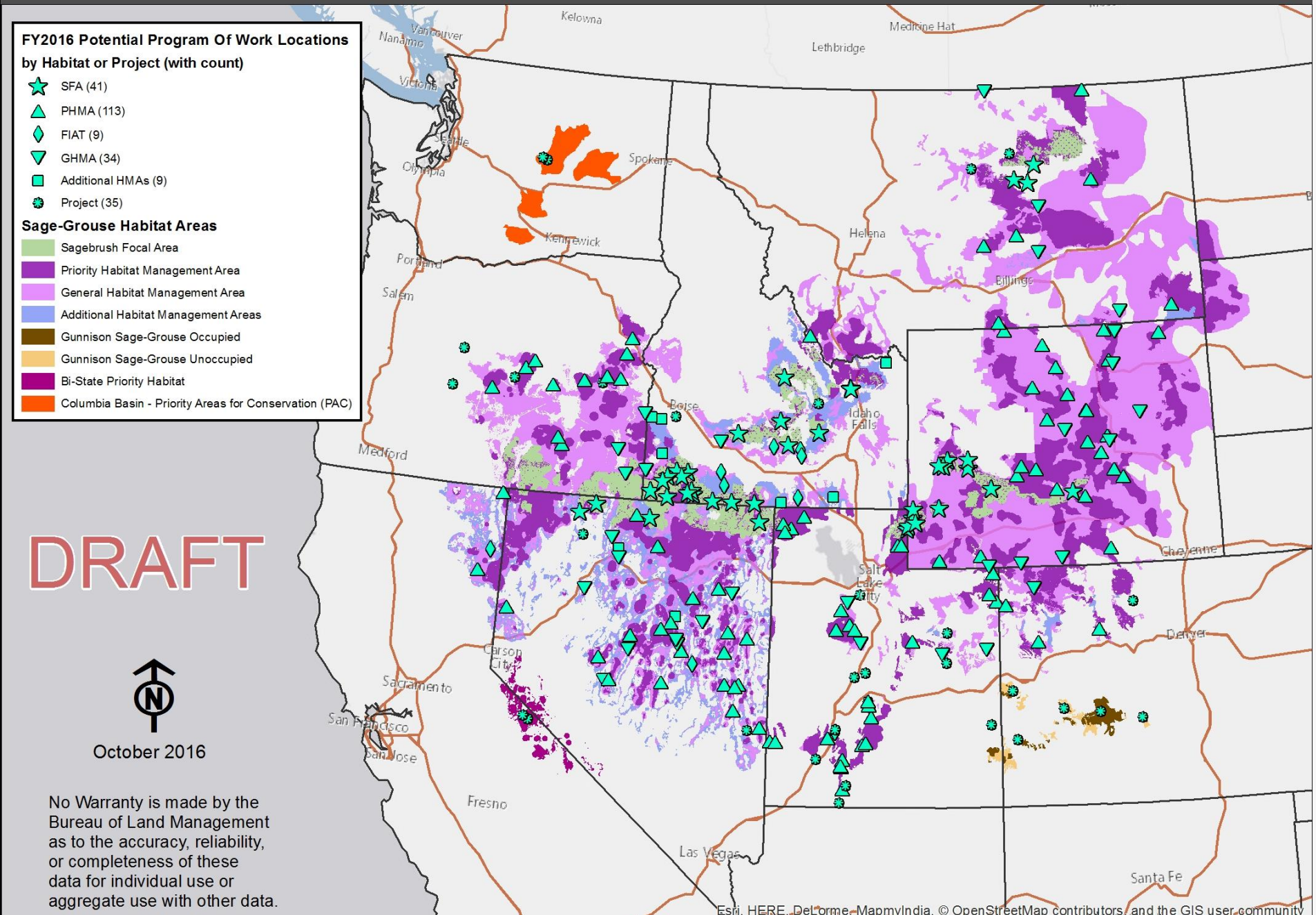
FY2016 Sage-Grouse Program Of Work Locations

Bureau of Land Management
U.S. Department of the Interior



FY2016 Sage-Grouse Potential Program Of Work Locations

Bureau of Land Management
U.S. Department of the Interior

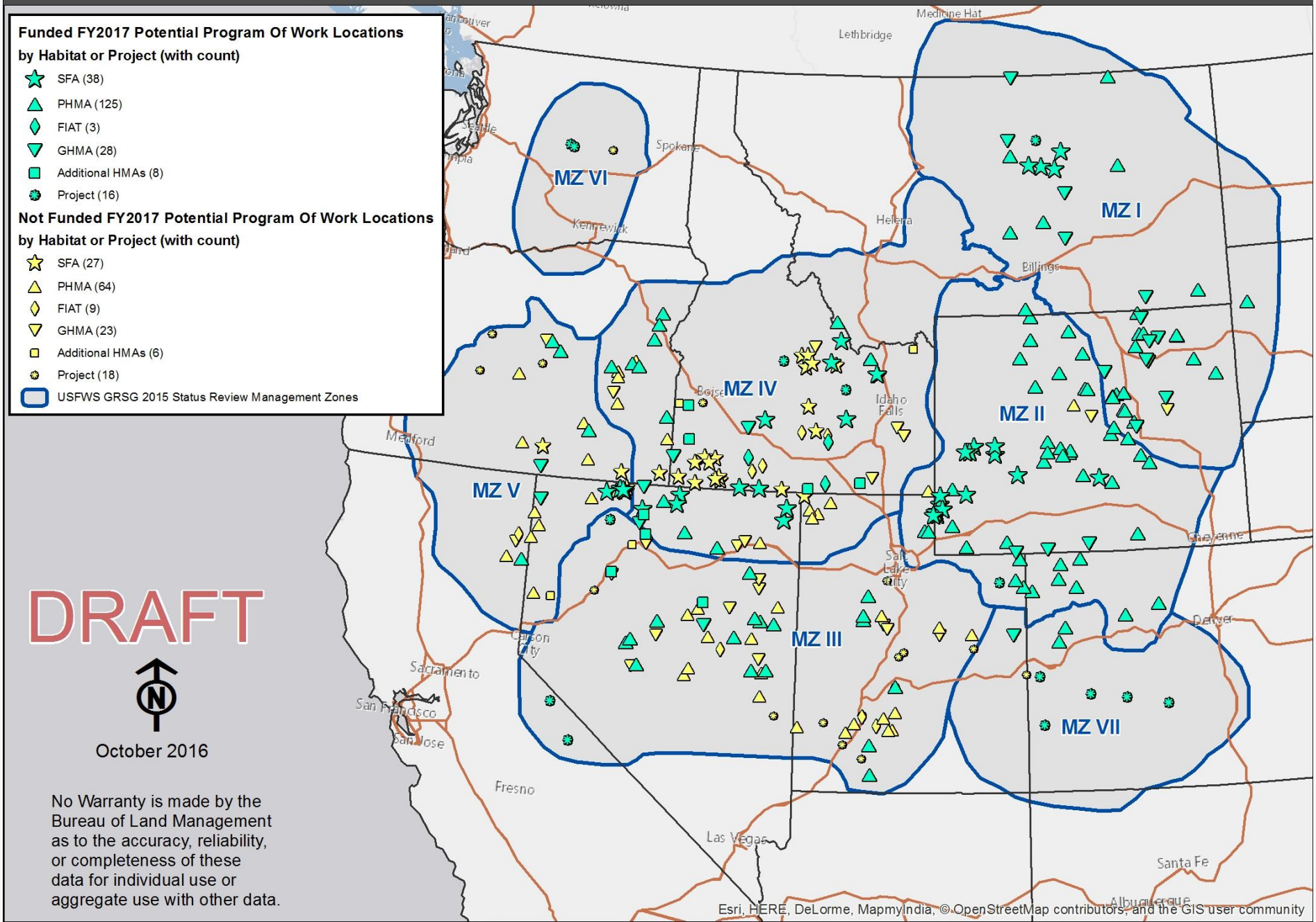


DRAFT

October 2016

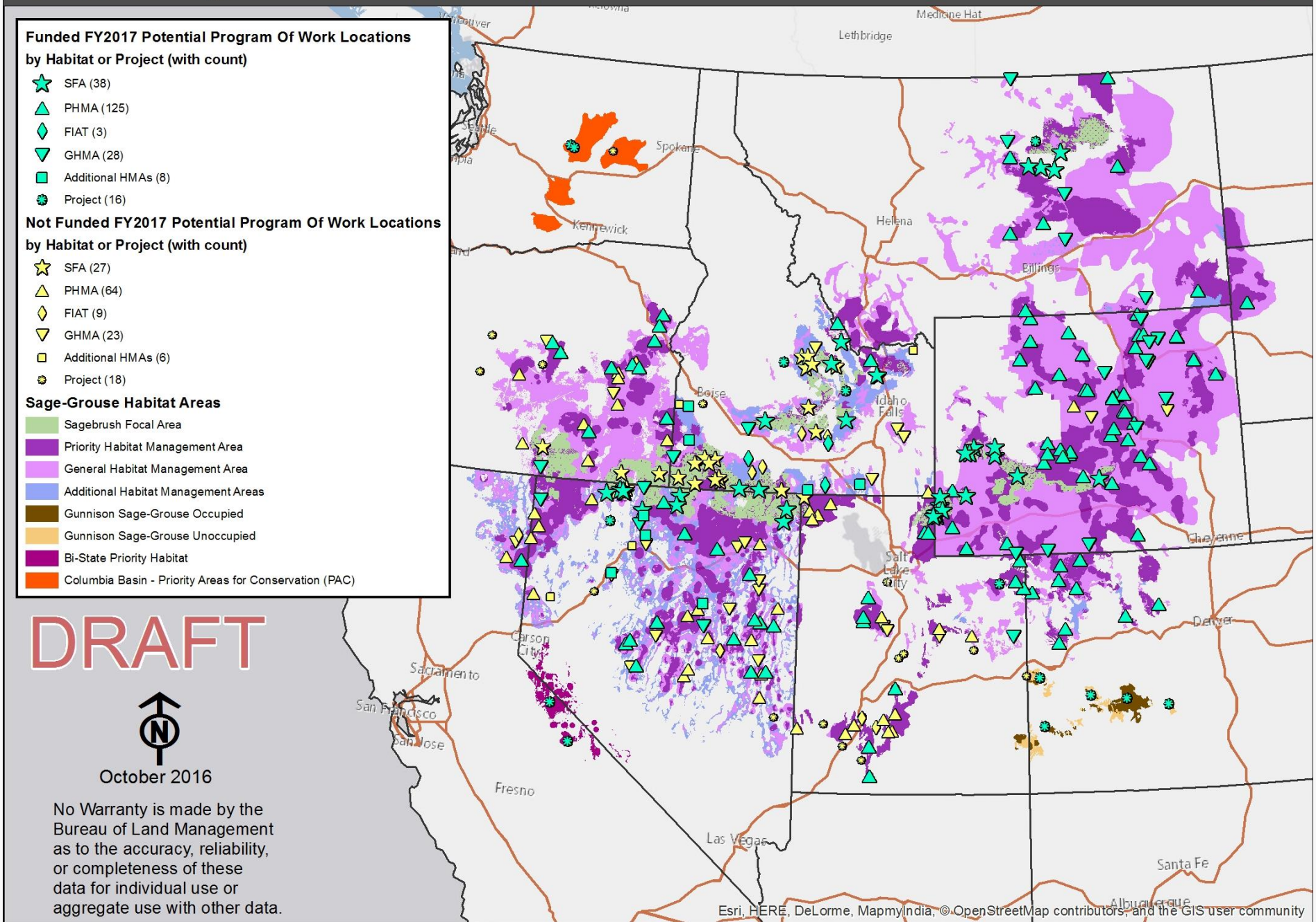
FY2017 Sage-Grouse Potential Program Of Work Locations

Bureau of Land Management
U.S. Department of the Interior



FY2017 Sage-Grouse Potential Program Of Work Locations

Bureau of Land Management
U.S. Department of the Interior



Next Steps: 2018-2021

- Compile lessons learned from FY 2017 process
- Convene team of WO, Regional, and State representatives to revise process for 2018 and beyond
- Brief management on proposed process
- Implement updated process
- Develop geospatial component (e.g. VTS, 3336, or other)
- **Include other partners in process**
- Integrate into SO 3336 Conservation and Restoration Strategy

USDA United States Department of Agriculture

Natural Resources Conservation Service

SAGE GROUSE INITIATIVE

WORKING LANDS FOR WILDLIFE

Sage Grouse Initiative

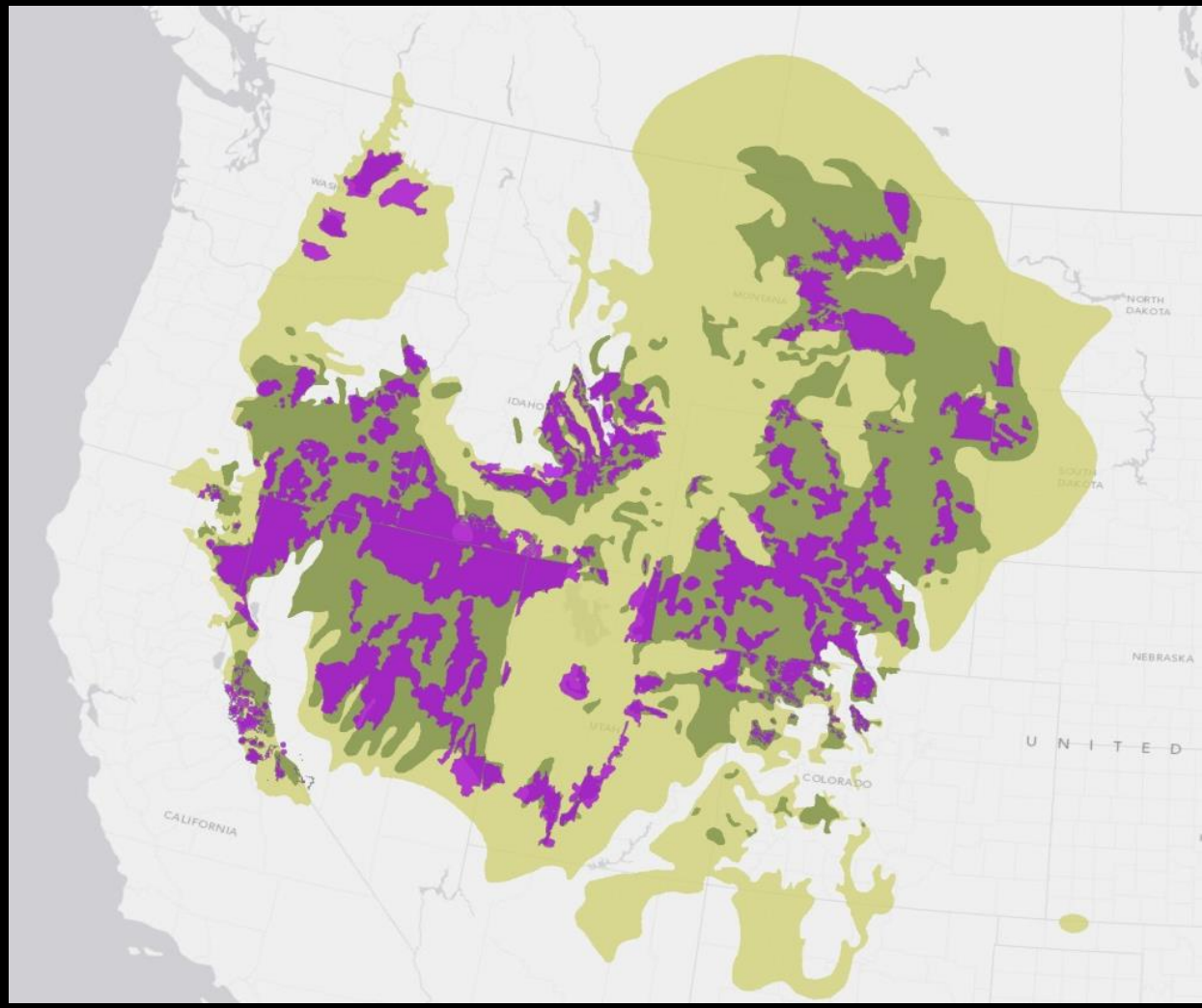
- Launched in 2010
- Proactively remove threats
- Scale-up the right practices in the right places
- Integrate science and communications

SGI 1.0
$424.5 M invested

SGI 2.0
$211 M committed

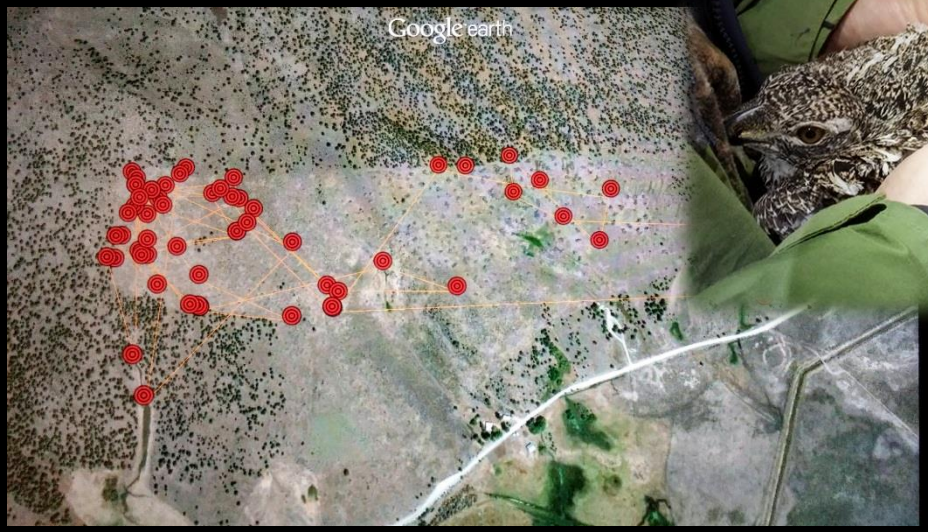
SGI is a vehicle for delivering strategic ecosystem conservation

- Conifer expansion
- Invasive annual grasses
- Large-scale wildfire
- Declining rangeland health
- Conversion to cropland
- Range infrastructure
- Exurban development
- Mesic area loss and degradation

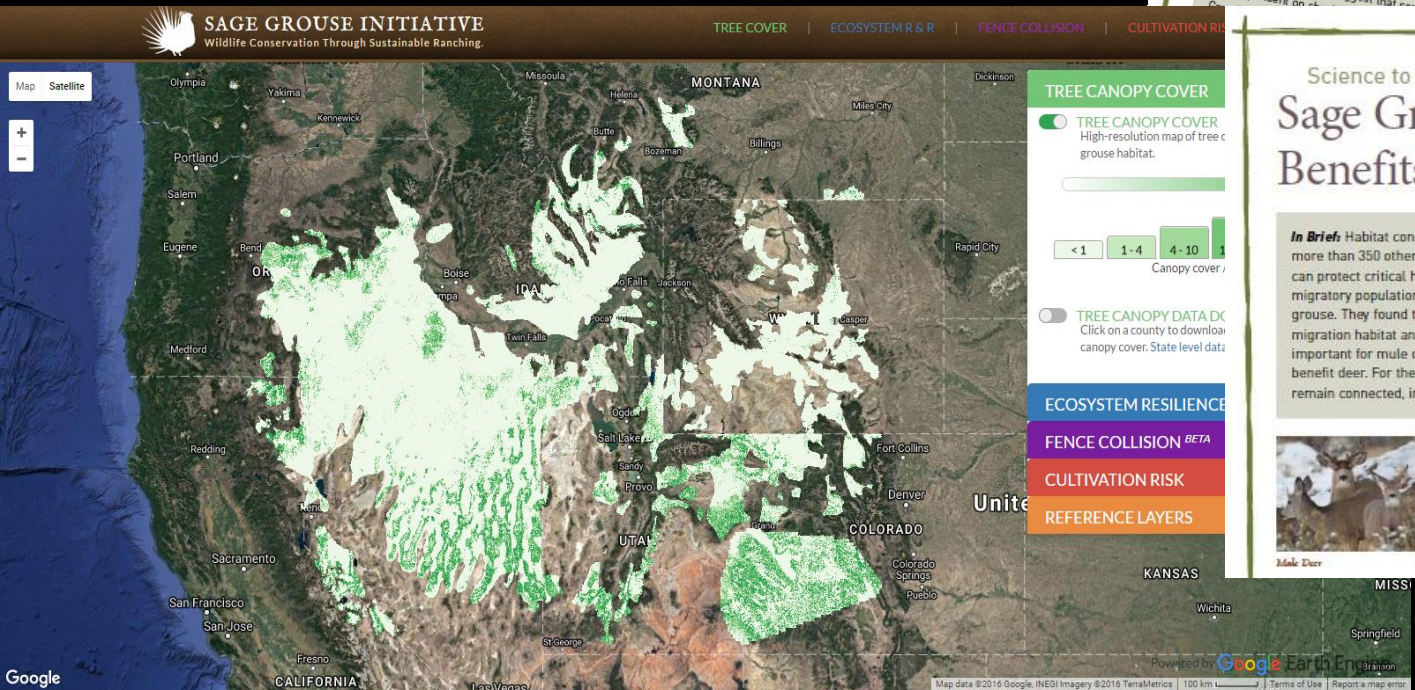


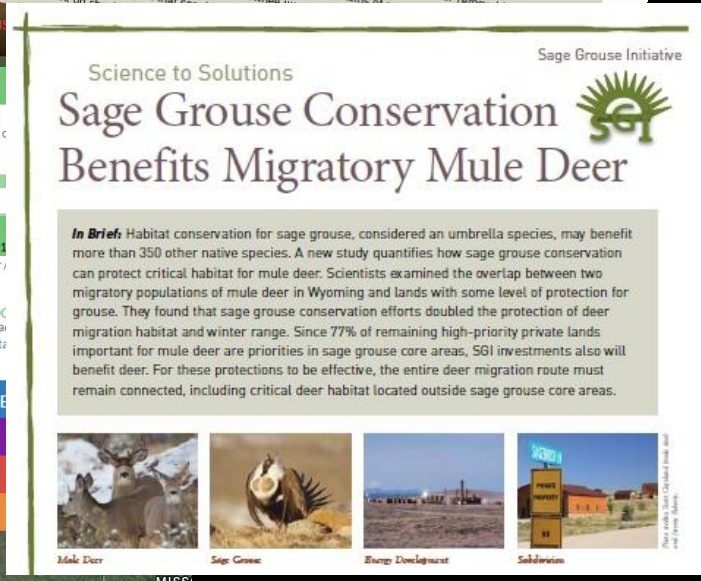
Partnerships

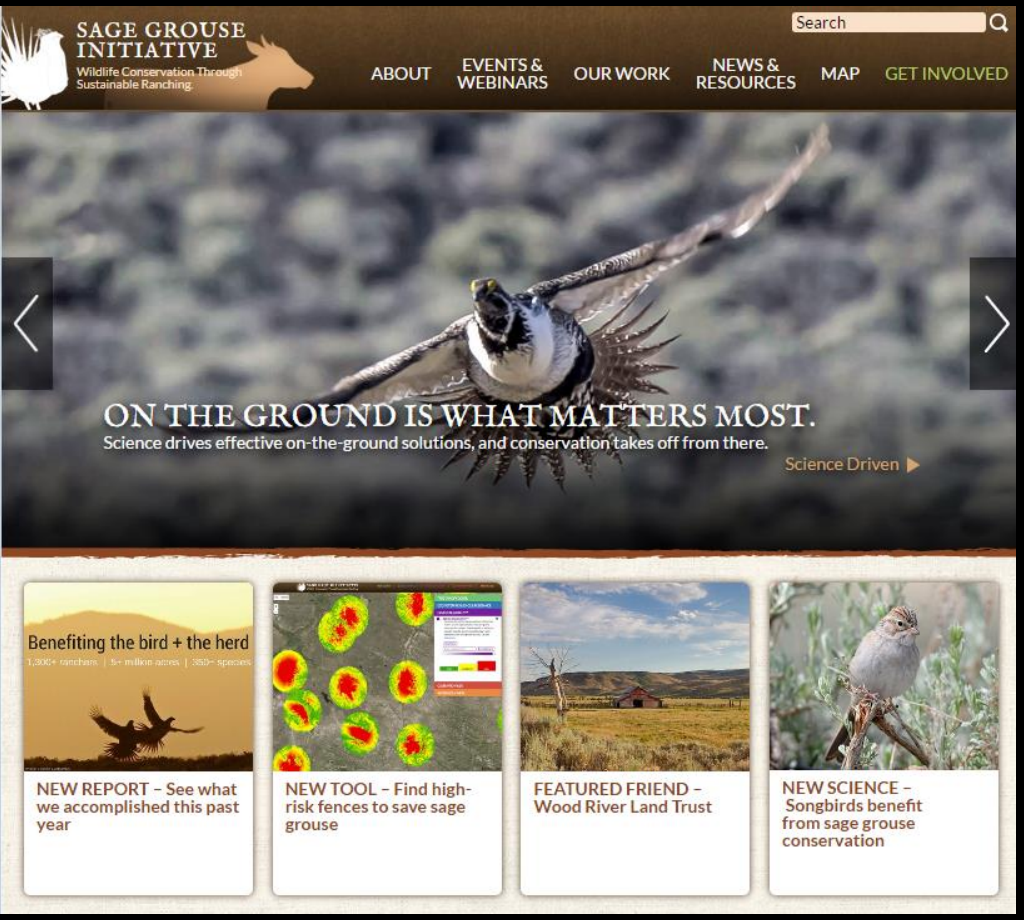
Science


Google earth


Science to Solutions
Sagebrush Songbirds Benefit from Sage Grouse Habitat Restoration
Sage Grouse Initiative
In Brief: Sage grouse breeding habitat is lost to invading juniper when trees exceed 4% canopy cover. Focused tree removal on early- and mid-successional sites prevents conversion of sagebrush-steppe to conifer woodlands and should benefit sage grouse populations. New science shows that conifer removal also benefits sagebrush-dependent songbirds. In the Warner Mountains of


SAGE GROUSE INITIATIVE
Wildlife Conservation Through Sustainable Ranching.
TREE COVER | ECOSYSTEM R & R | FENCE COLLISION | CULTIVATION RI
Map Satellite
MONTANA
Portland
Salem
Eugene
Medford
Redding
Sacramento
San Francisco
San Jose
Fresno
CALIFORNIA
Las Vegas
Salt Lake
Provo
Denver
COLORADO
UTAH
Fort Collins
Colorado Springs
Pueblo
Wichita
KANSAS
Springfield
TREE CANOPY COVER
TREE CANOPY COVER
High-resolution map of tree c
grouse habitat.
< 1
1 - 4
4 - 10
Canopy cover
TREE CANOPY DATA DO
Click on a county to downloa
canopy cover. State level data
ECOSYSTEM RESILIENCE
FENCE COLLISION BETA
CULTIVATION RISK
REFERENCE LAYERS
Google
Powered by Google Earth Engine


Science to Solutions
Sage Grouse Initiative
Sage Grouse Conservation Benefits Migratory Mule Deer
In Brief: Habitat conservation for sage grouse, considered an umbrella species, may benefit more than 350 other native species. A new study quantifies how sage grouse conservation can protect critical habitat for mule deer. Scientists examined the overlap between two migratory populations of mule deer in Wyoming and lands with some level of protection for grouse. They found that sage grouse conservation efforts doubled the protection of deer migration habitat and winter range. Since 77% of remaining high-priority private lands important for mule deer are priorities in sage grouse core areas, SGI investments also will benefit deer. For these protections to be effective, the entire deer migration route must remain connected, including critical deer habitat located outside sage grouse core areas.
Mule Deer
Sage Grouse
Energy Development
Subdivision



sagegrouseinitiative.com

Accelerating Public-Private Land Collaboration

- Implement specific actions at large scales mutually-selected priority areas across ownerships
  - Treat conifer expansion
  - Jointly implement FIAT to reduce fire/invasives
  - Mesic meadow habitat conservation
- Develop tools for targeting and tracking
- Jointly tell the story

Sage-grouse have served as a flagship species for ecosystem conservation

Fire Risk

A Fire Risk Assessment for the Science Framework

Michele Crist, Landscape Ecologist, NIFC, BLM: Fire and Aviation

Brief Context of Wildfire Trends Over Time

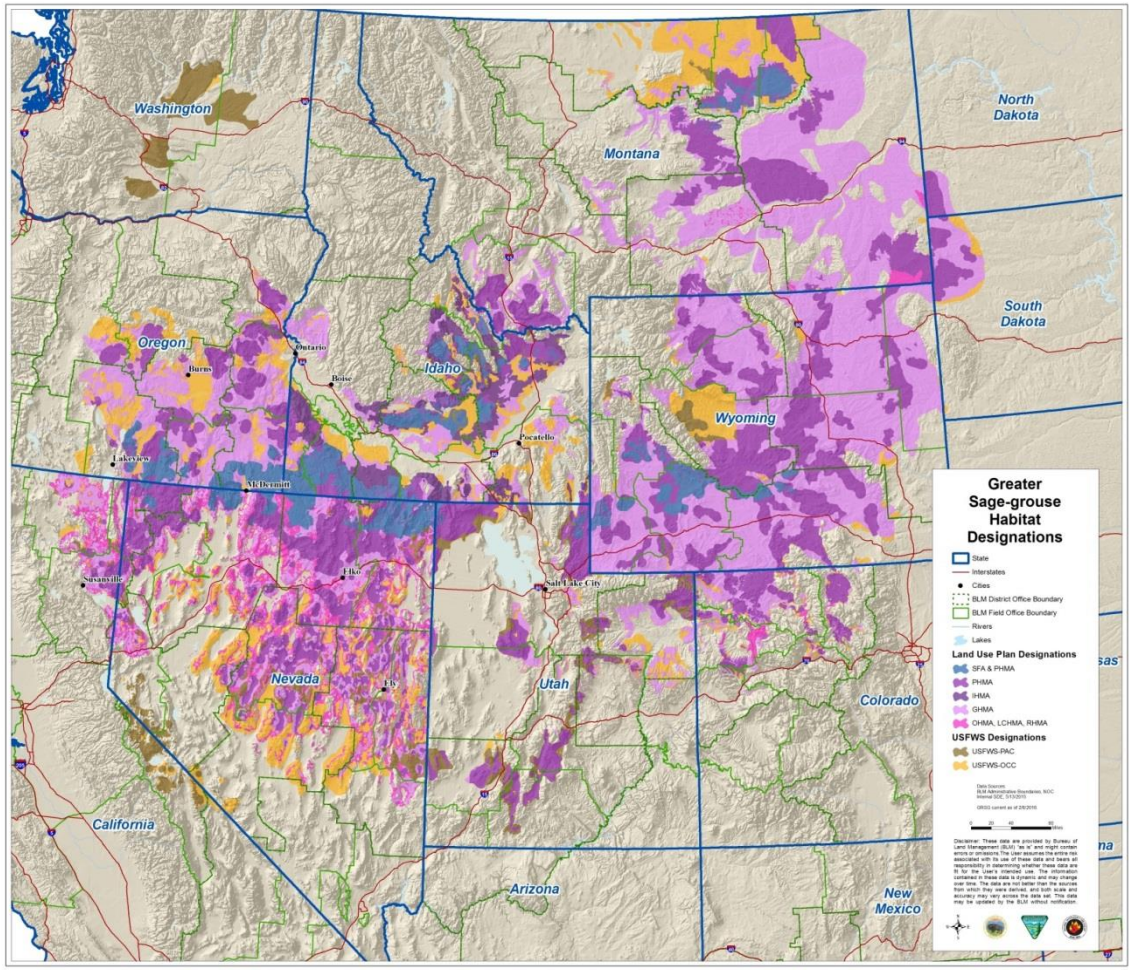
Historical Fire Cycles: *highly variable across the sagebrush biome*

- Fire Return Intervals
  - Several decades in colder-moisture higher elevations
  - Hundreds of years in hotter-drier lower elevations
- Sagebrush Landscape Structure
  - Large expansive areas dominated by dense sagebrush

Contemporary Fire Cycles: *substantially changed from historic trends*

- Fire cycles in the hotter-drier lower elevations
  - Return intervals are shorter and don't allow time for full recovery
  - Interaction with annual invasive grasses
    - Reburns occur on average every 7–15 years
  - Increase in area burned and large fire extents
- Fire cycles in the colder-moister higher elevations
  - Shift towards smaller and less frequent fires
    - Successful fire suppression efforts
    - Other human activities

Managing Wildfire using BLM Land-Use Plan Habitat Designations



- GRSG Habitat Designations are considered and prioritized during fire events among many other factors (e.g wildland urban interface).
- Focus fuel treatments based on Habitat Designations
- Challenges:
  - Prioritizing suppression response to multiple ignitions in higher priority designations
  - Directing fire suppression resources in response to forecasts of large fire potential across very extensive areas (e.g. CA and NV)

Secretarial Order 3336: Addressing Fire in Greater Sage-grouse Conservation.

Science Framework: Identified the need for a sagebrush biome wide fire risk assessment

Created a “Fire Risk Working Group” composed of multiple agencies (BLM, BOI, FWS, FS, NPS, USGS) to develop fire risk assessments.

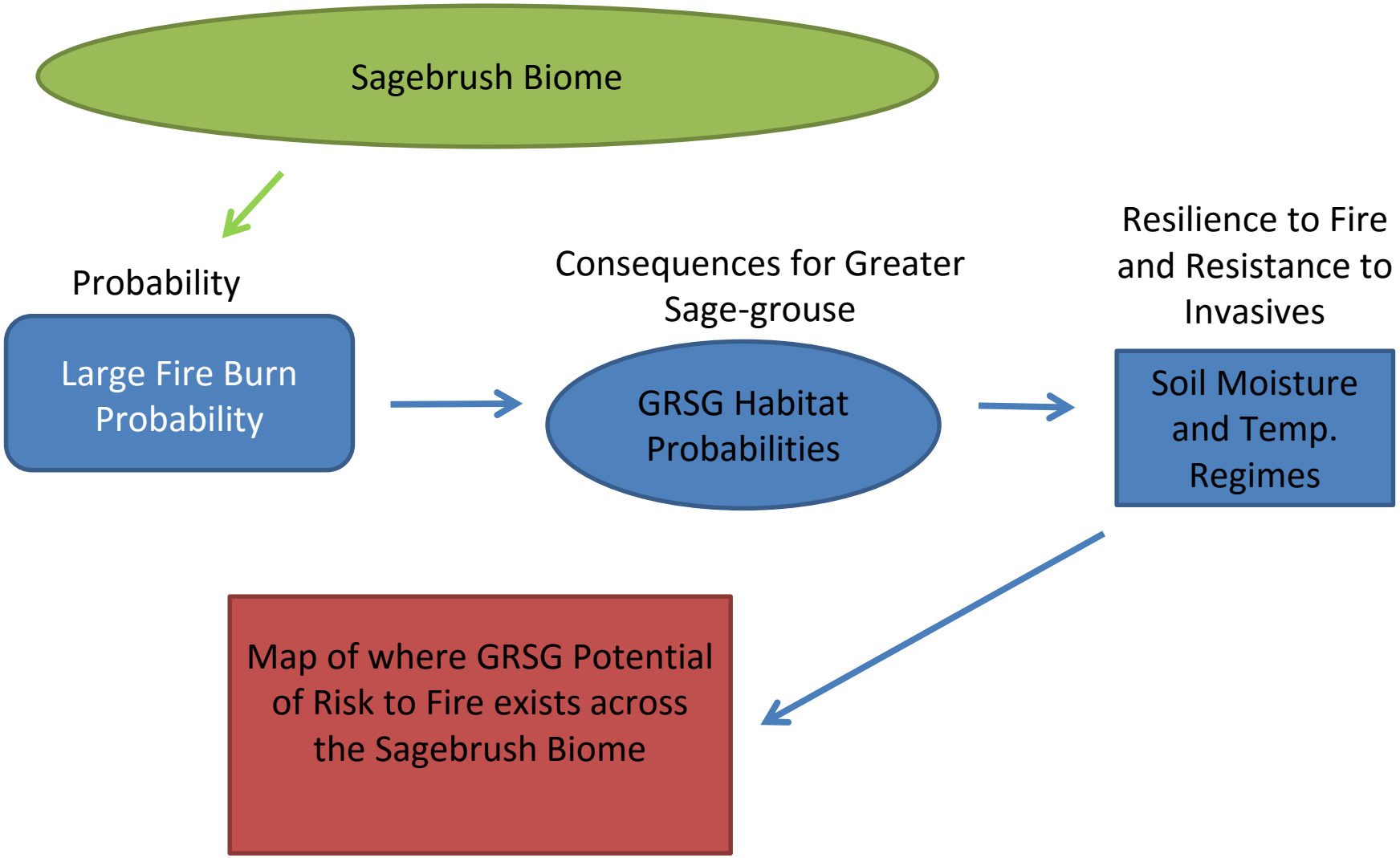
1. Identify a fire model and/or GIS data layers that can be used in mapping fire risk across the sagebrush biome, including factors from ecological (e.g. Greater sage-grouse, sagebrush obligates, sagebrush ecology), biophysical, and management perspectives.

2. Produce a "fire risk" map/products to be used in the final Science Framework GTR.

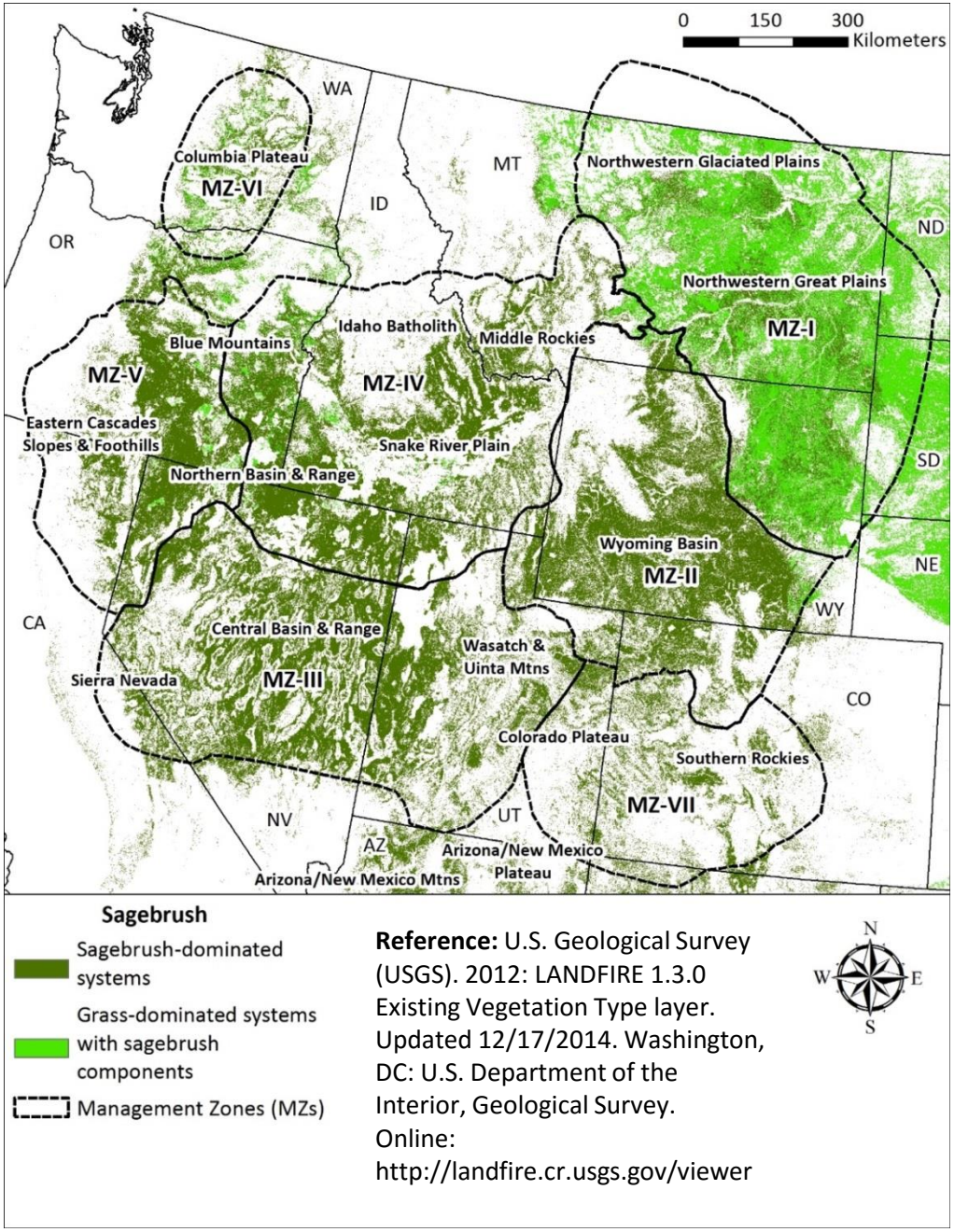
Created a “Sub-working Group” composed of Michele Crist, Jeanne Chambers, Jessica Haas (FS-Rocky Mountain Research Station), and Kevin Doherty (FWS)

Simplistic Fire Risk Conceptual Model

Risk = Probability and Consequences



Methods
Focus Area (Mask)

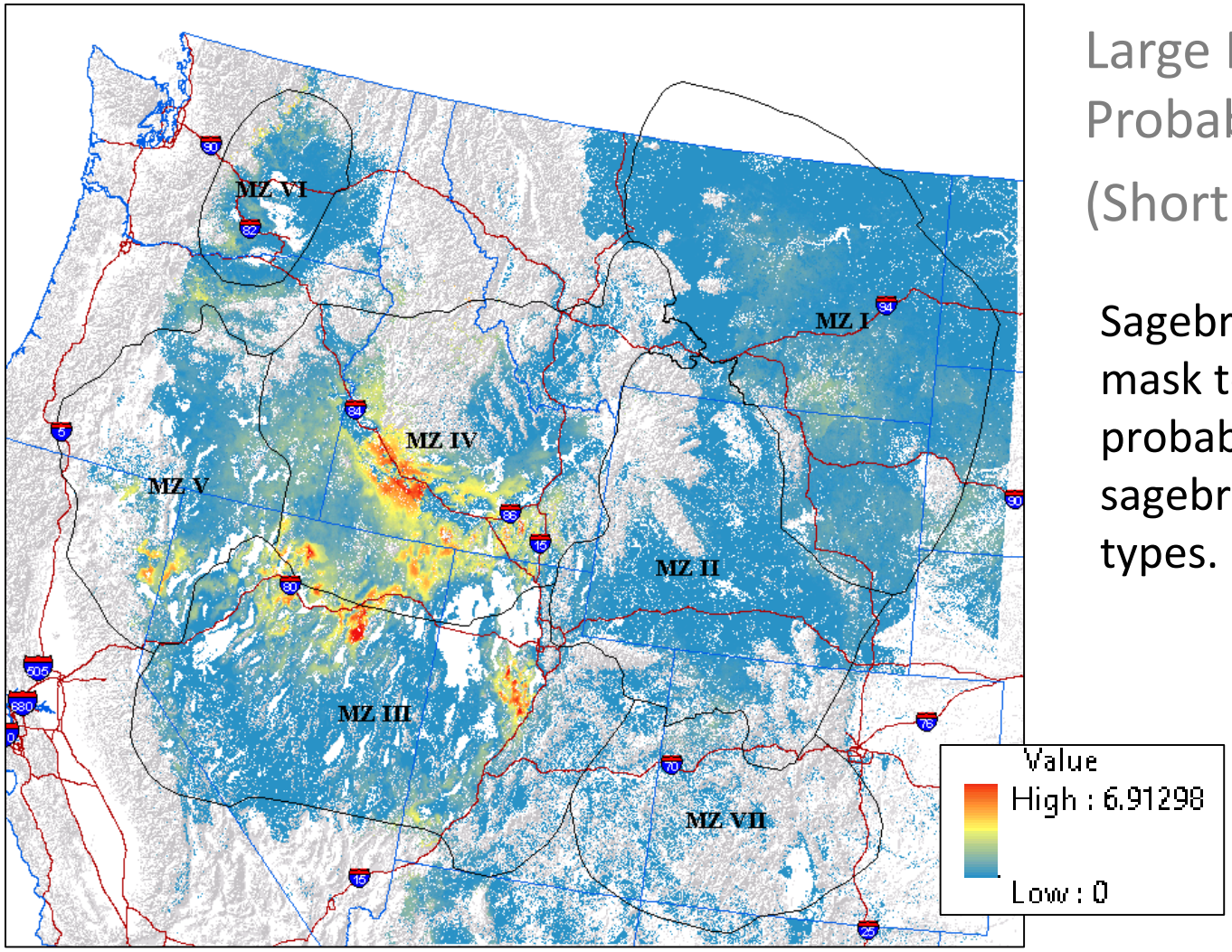


Reference: U.S. Geological Survey (USGS). 2012: LANDFIRE 1.3.0 Existing Vegetation Type layer. Updated 12/17/2014. Washington, DC: U.S. Department of the Interior, Geological Survey. Online: http://landfire.cr.usgs.gov/viewer

Sagebrush and Grassland with Sagebrush Components identified in LANDFIRE, Existing Vegetation Types

Cell Size: 30m
Extent: Western States

Factors: Probability



Large Fire Burn Probability

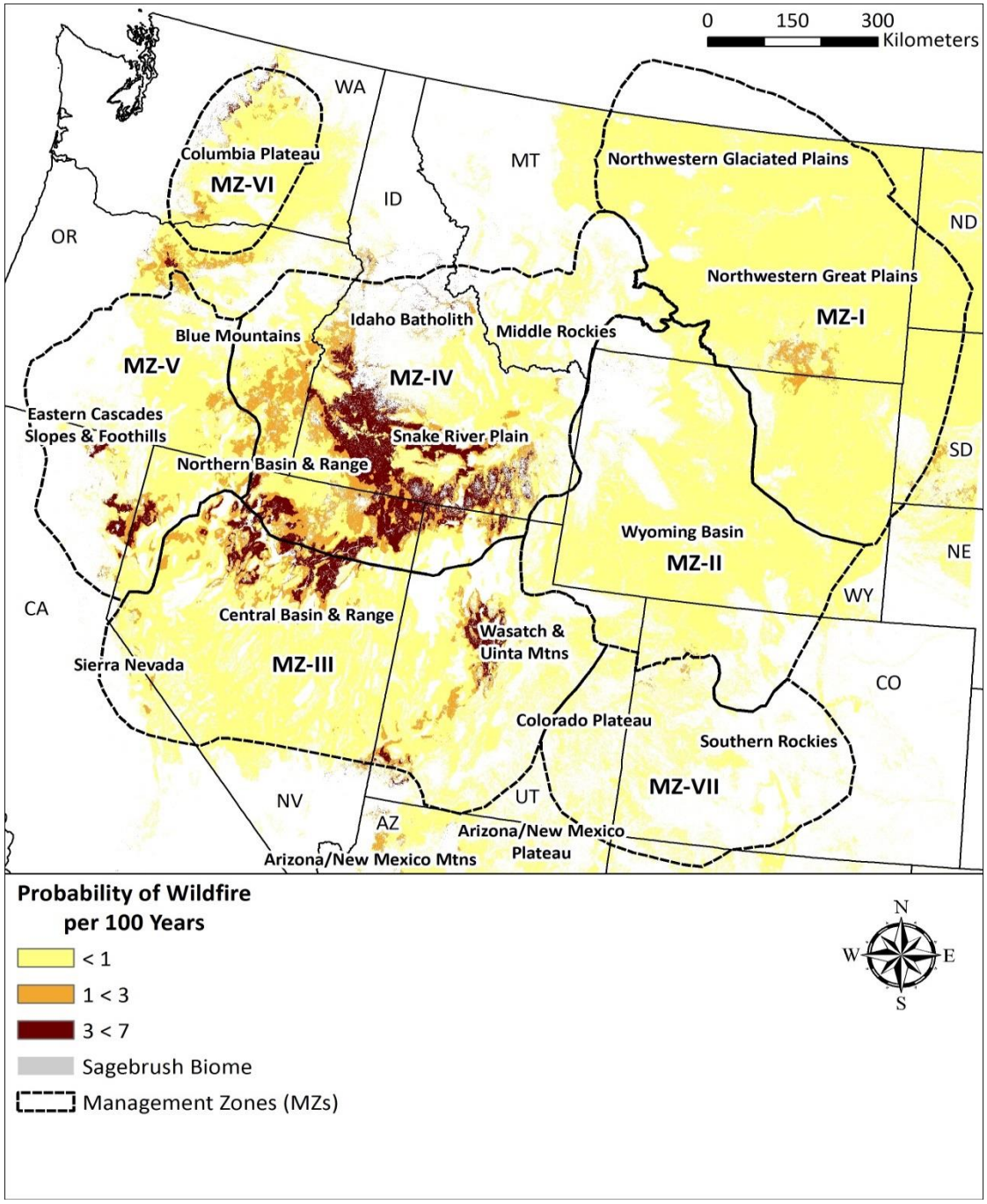
(Short et al., 2016)

Sagebrush Biome as a mask to retain all fire probability values for sagebrush vegetation types.

Reference: Short, K. C., M. A. Finney, J. H. Scott, J. Gilbertson-Day, and I. C. Grenfell. 2016. A spatial dataset of probabilistic wildfire risk components for the conterminous United States. Fort Collins, CO: USDA Forest Service Research Data Archive. .

Cell Size: 270m

Extent: National



Factors: Large Fire Probability

Classified Large Fire Probability into Three Categories:

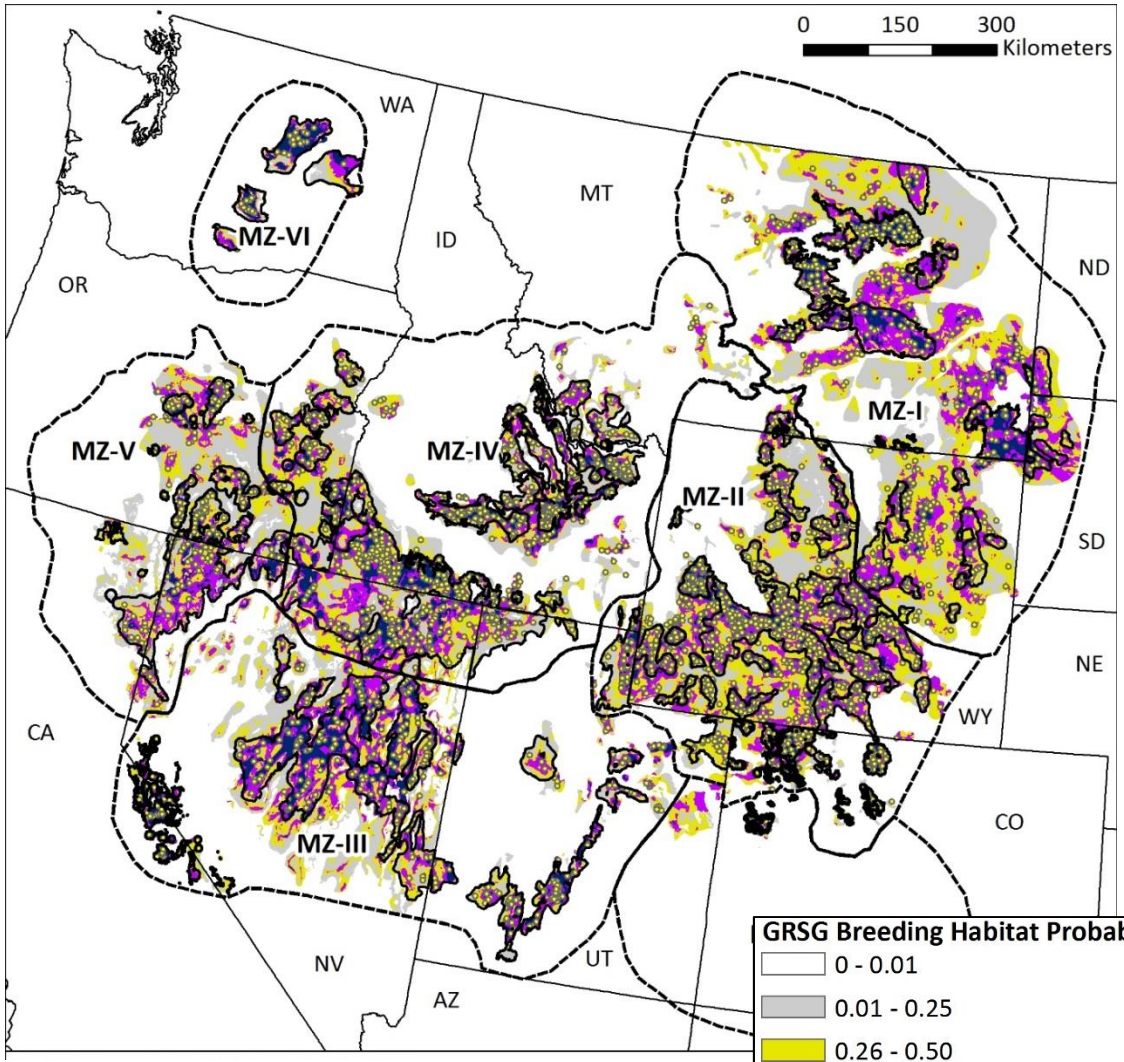
Probability	**Value**
Low Probability =	100
Mod. Probability =	200
High Probability =	300

Cell Size: 270m

Extent: National

Factors: Consequence to Greater Sage-Grouse

GRSG Breeding Habitat Probability Model (Kevin Doherty et al., 2016)



Classified Habitat Probability into Three Categories:

Probability	**Value**
Low Probability =	10
Mod. Probability =	20
High Probability =	30

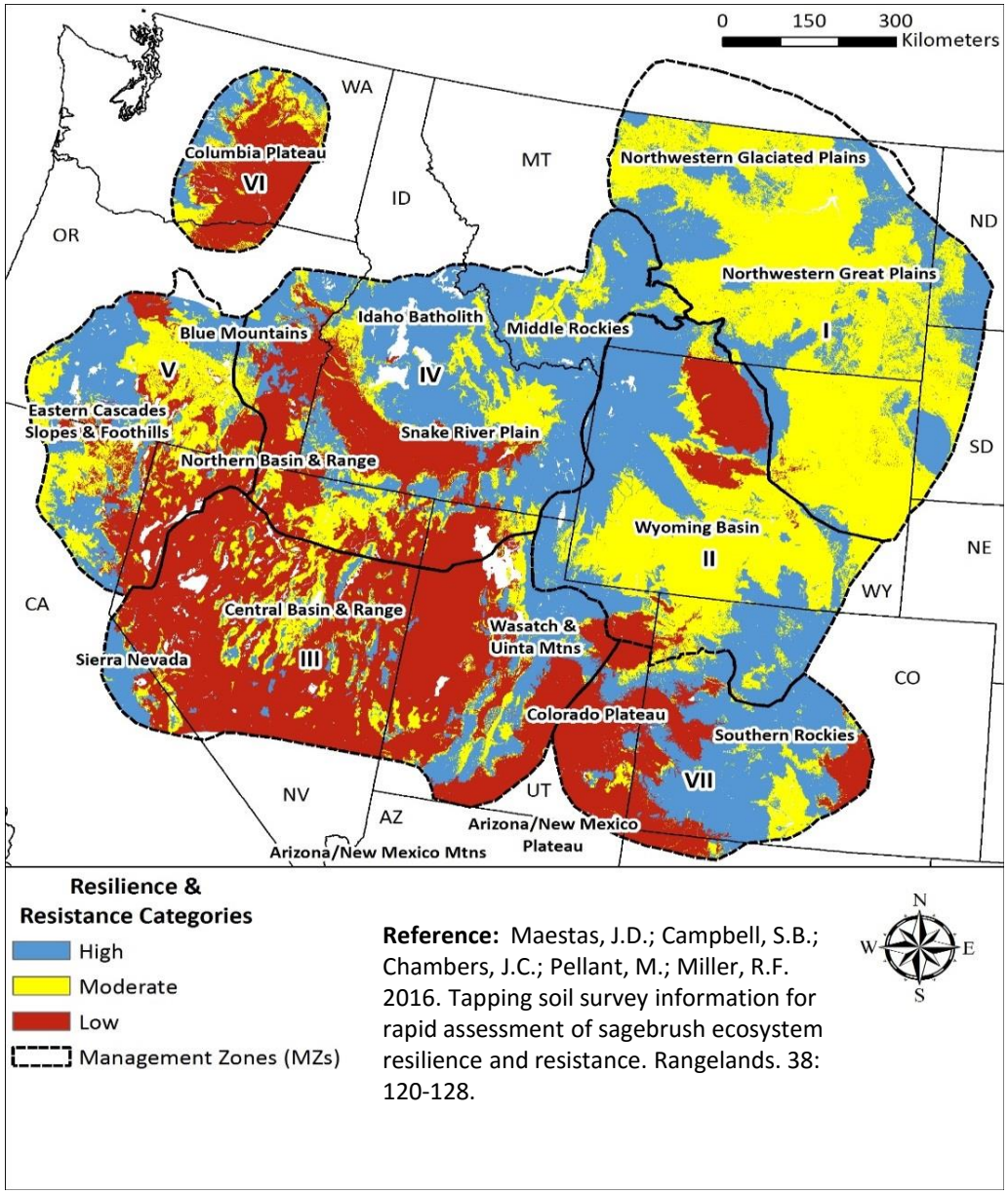
Cell Size: 30m
Extent: GRSG Range

Reference: Breeding Habitat Model: Doherty, K.E., Evans, J.S., Coates, P.S., Juliusson, L., Fedy ,B.C. 2015. Importance of regional variation in conservation planning and defining thresholds for a declining species: a range wide example of the greater sage grouse.
Online:
https://www.sciencebase.gov/catalog/folder/560ea672e4b0ba4884c5ebb7

Factors: Resilience and Resistance to Fire Disturbance and Invasive Annual Grasses

Soil Moisture and Temperature Regimes

(Campbell and Maestas, 2016; Maestas et al., 2016)



Reference: Maestas, J.D.; Campbell, S.B.; Chambers, J.C.; Pellant, M.; Miller, R.F. 2016. Tapping soil survey information for rapid assessment of sagebrush ecosystem resilience and resistance. Rangelands. 38: 120-128.

Classified into Three Resilience and Resistance Categories:

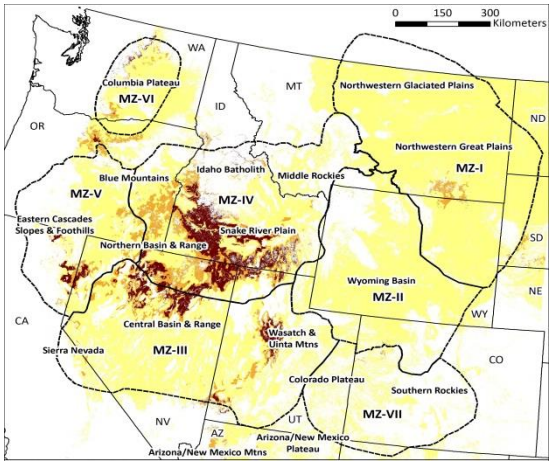
Resilience/ Resistance	**Value**
High R&R =	1
Mod. R&R =	2
Low R&R =	3

Cell Size: 10m
Extent: GRSG Management Zones

Methodology: Combined Risk Components

Risk = Probability and Consequences

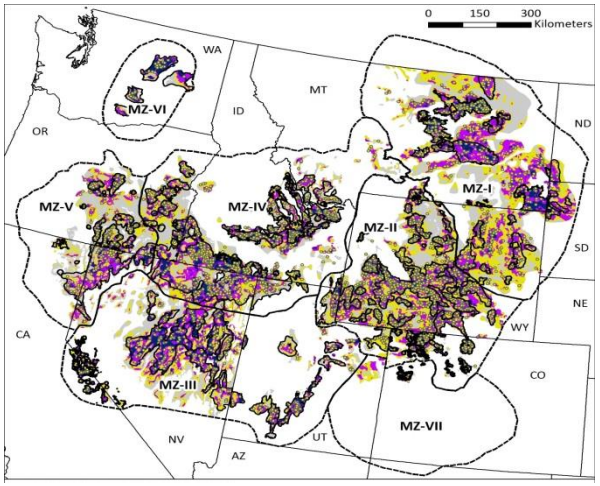
Large Fire Probability



High Probability = 300
Mod. Probability = 200
Low Probability = 100

+

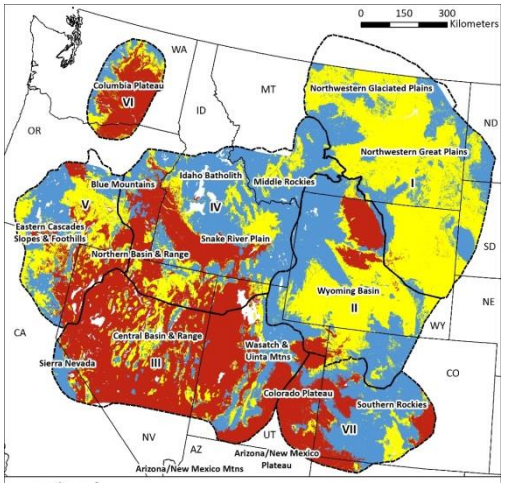
Greater Sage-grouse Habitat



High Probability = 30
Mod. Probability = 20
Low Probability = 10

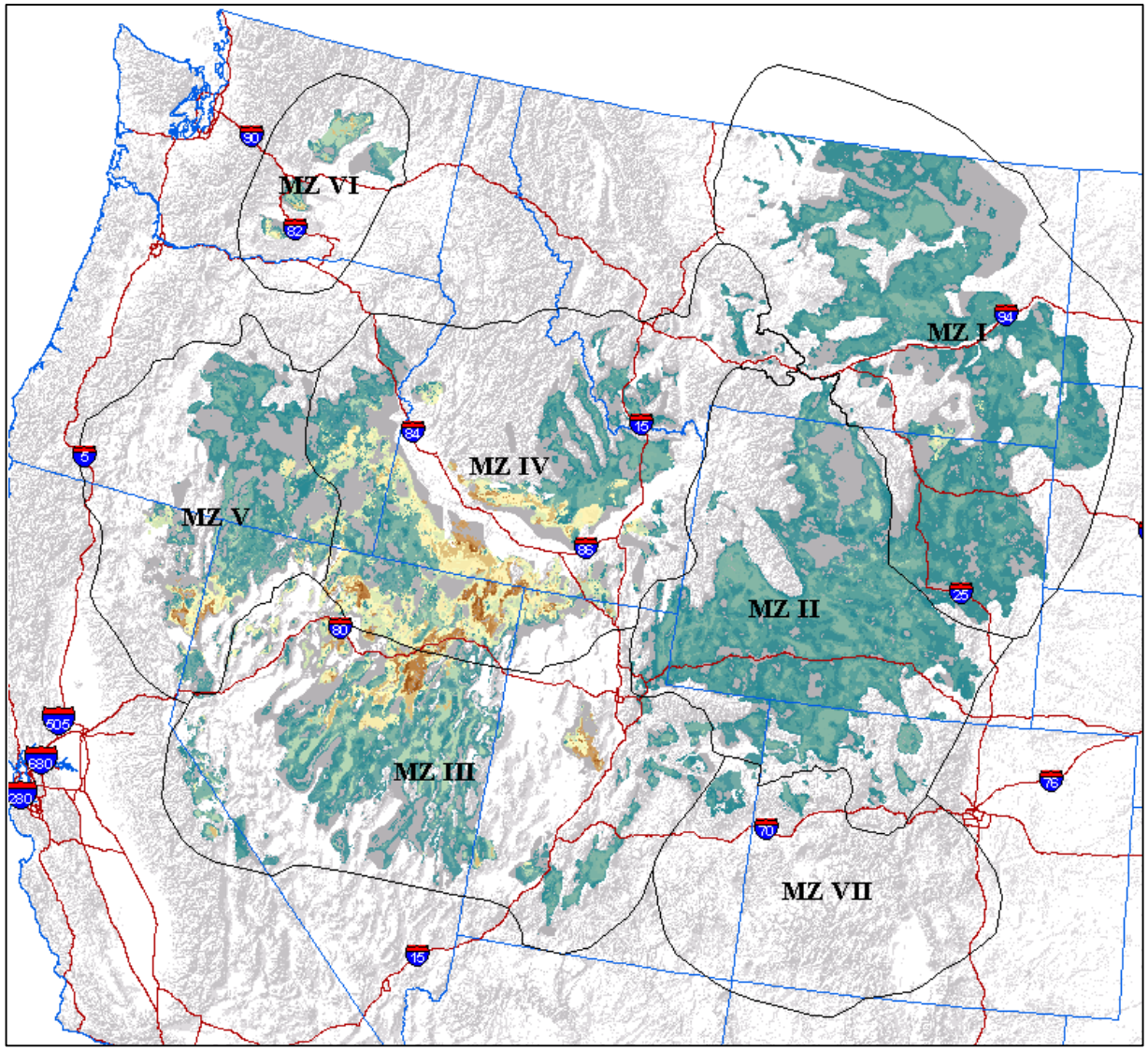
+

Resilience and Resistance



High R&R = 1
Mod. R&R = 2
Low R&R = 3

Preliminary Results: Fire Risk to Greater Sage-grouse



- 111 low fire, low hab, high R&R
- 112
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- 133 low fire, high hab, low R&R
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- 212
- 213
- 221
- 222 mod fire, mod hab, mod R&R
- 223
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- 232
- 233
- 311
- 312
- 313 high fire, low hab, low R&R
- 321
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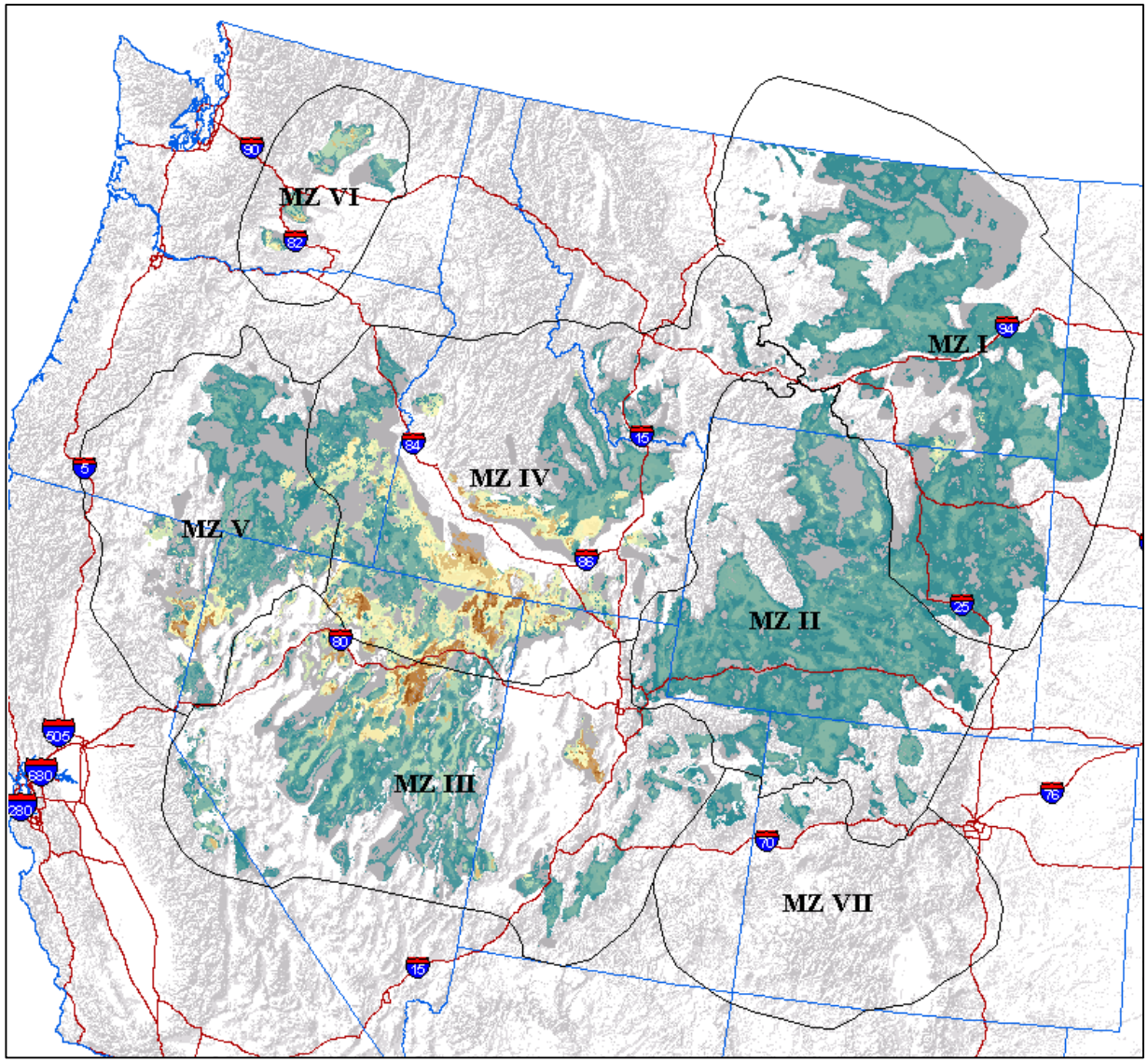
- 331 high fire, high hab, high R&R
- 332
- 333 high fire, high hab, low R&R

Informing Fire Management for GRSG at a Landscape-level

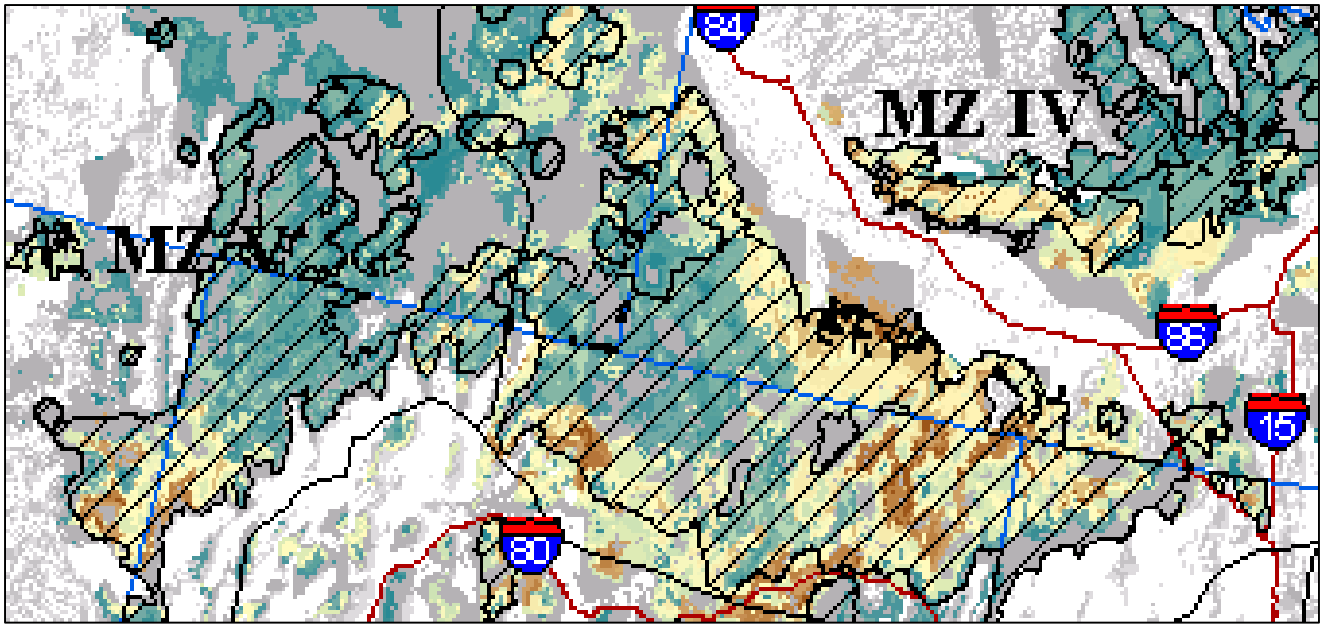


At a broad scale, distinguish between habitats at risk to fire and their capacity to recover from fire and resist annual grass invasions.

Prioritize fire planning and suppression resources for GRSG during fire events.

Prioritize restoration and fuel projects based on fire risk.

Informing Fire Management at Multiple Scales

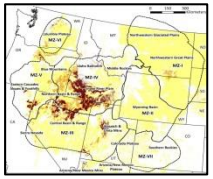


- Address challenges of prioritizing suppression response to multiple fire ignitions within Greater Sage-grouse Habitat Designations or Priority Areas of Conservation

- Focus restoration and fuels projects for Greater Sage-grouse in or around habitats at higher and lower risks from fire.

Preliminary Results: Fire Risk Assessment for Sagebrush Ecosystems and Sagebrush Obligates

Large Fire Probability



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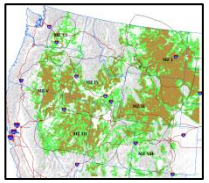
Sagebrush Cover Densities



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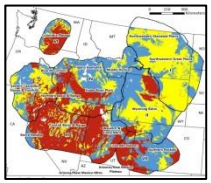
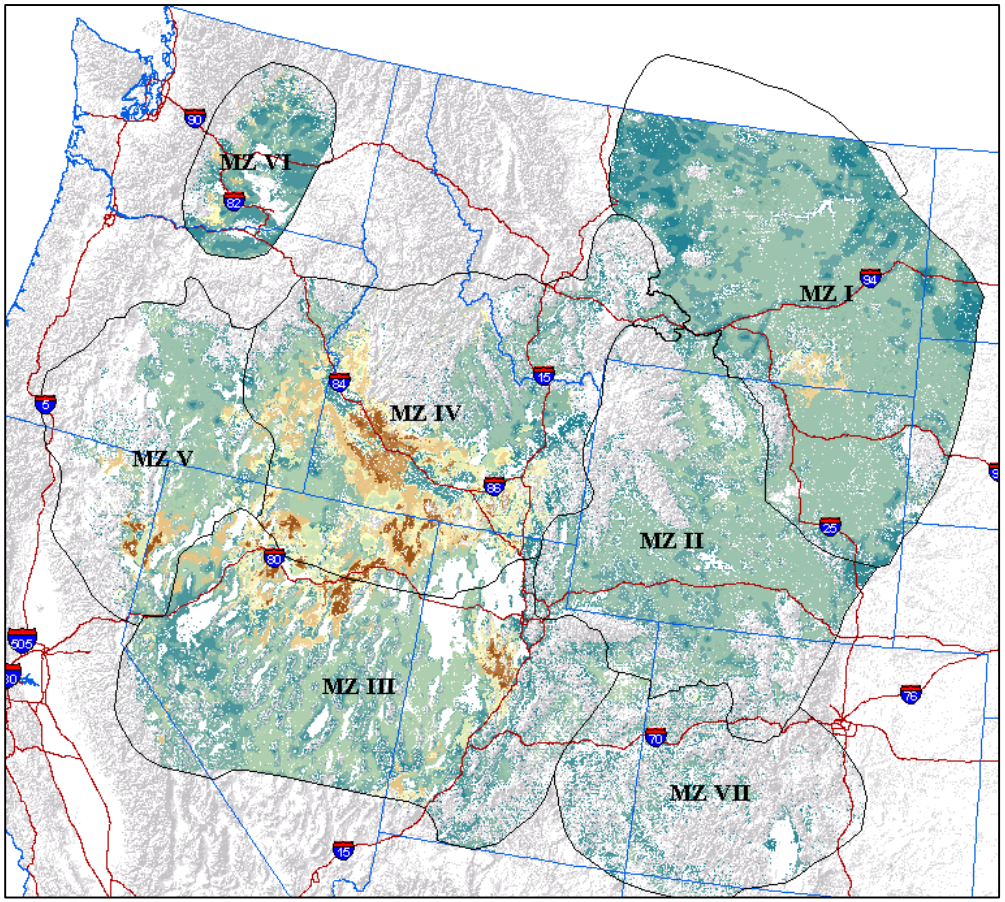
Resilience and Resistance





111	**low fire, low CD, high R&R**
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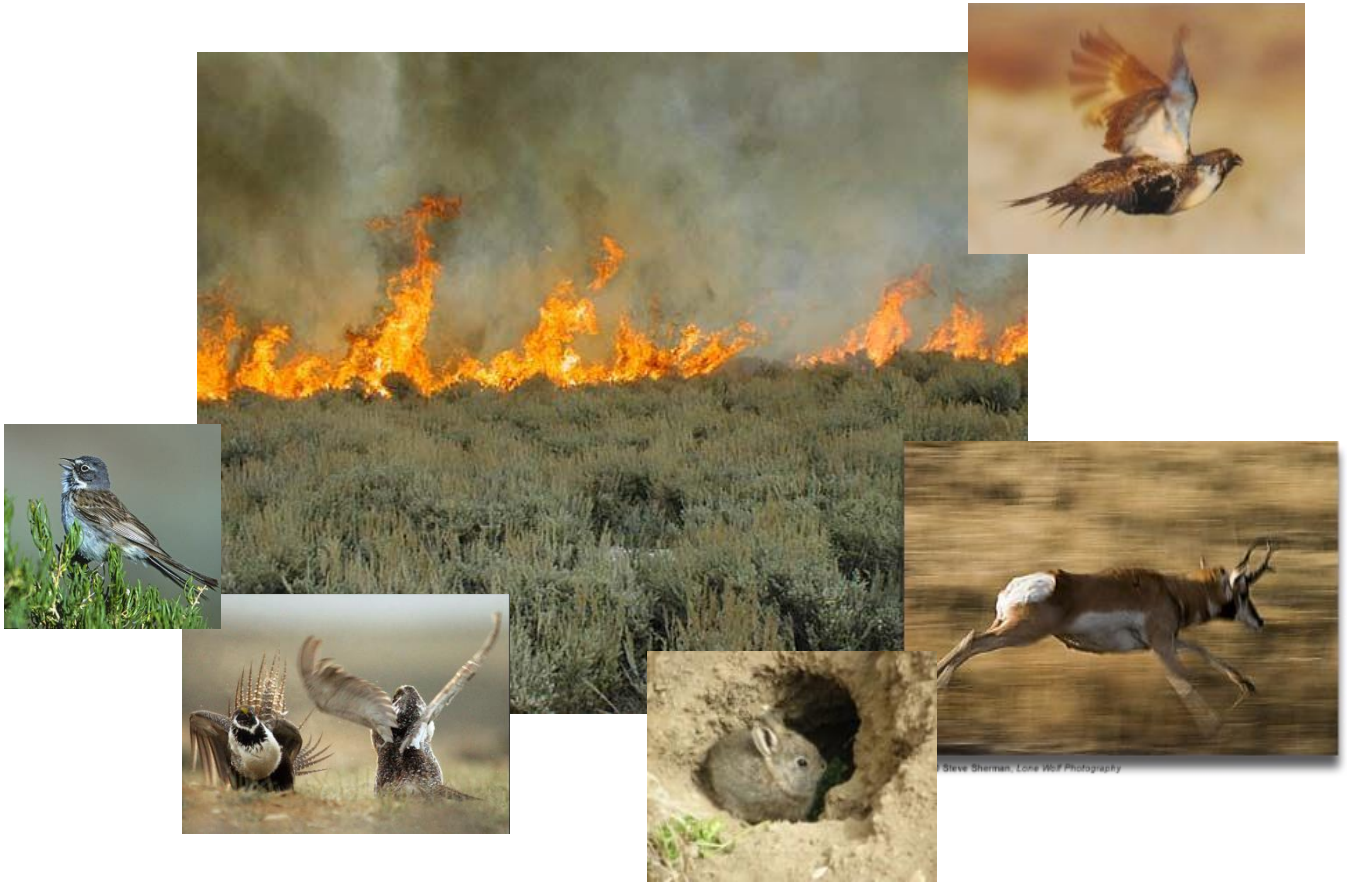
331	**high fire, high CD, high R&R**
332	
333	**high fire, high CD, low R&R**

Questions



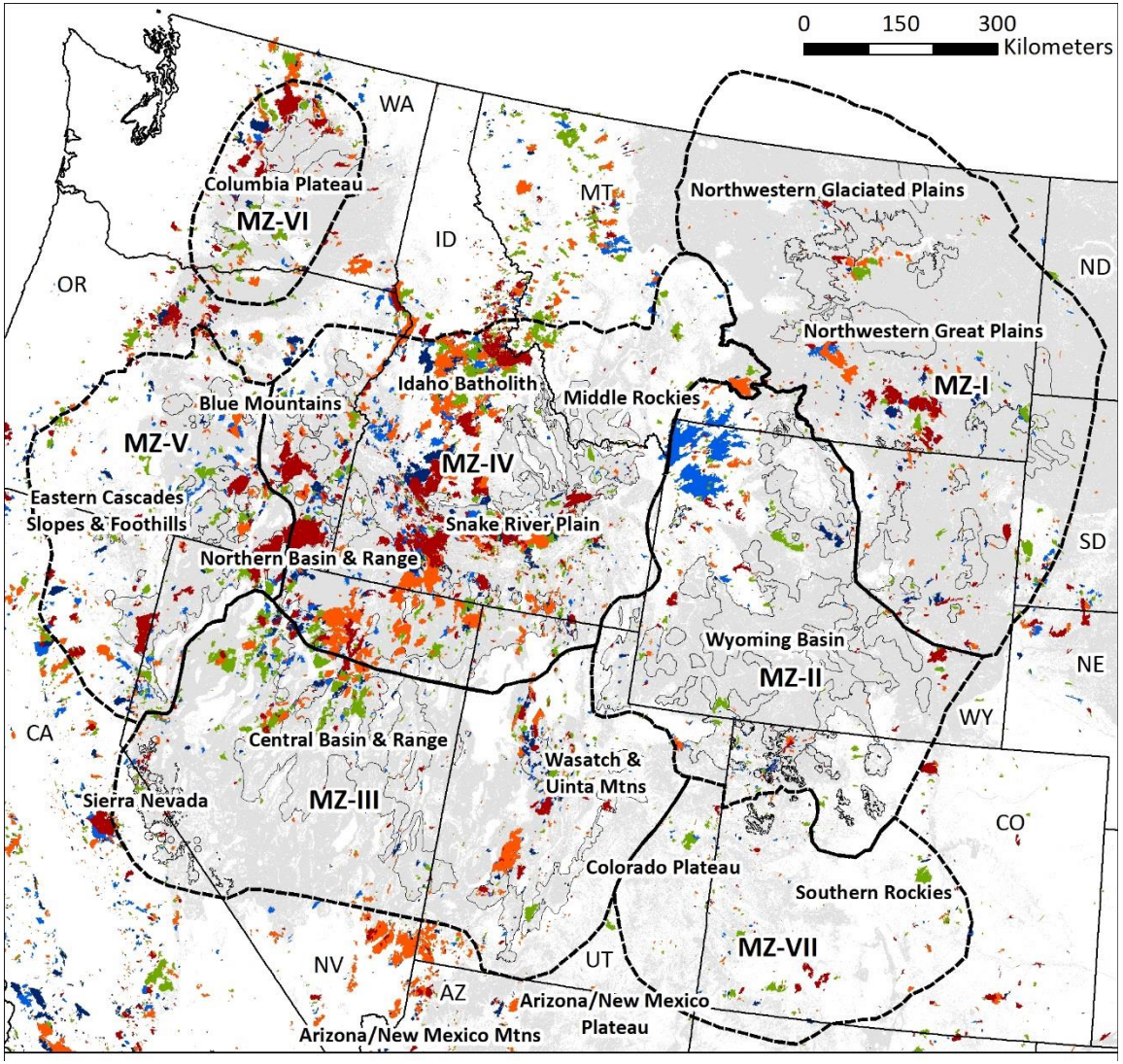
Wildfire Management Strategies Targeting Greater Sage-grouse Habitats

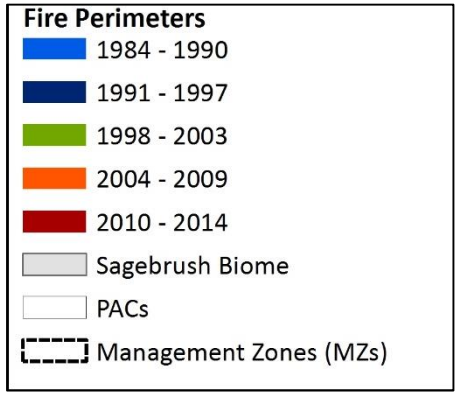
- USFWS 2010 Sage-grouse Listing Decision and the 2013 Conservation Objectives Report
  - Fire is one of the primary threats affecting Greater Sage-grouse populations and their habitats

- BLM: Sage-grouse habitat is a primary consideration in wildfire management decisions.
  - Updated land-use plans
  - Improved capacity in fire suppression
  - Fuels management projects
  - Focus on fire prevention and education in Greater sage-grouse habitats

Other GIS Datasets

Fire Perimeters: 1984 – 2014





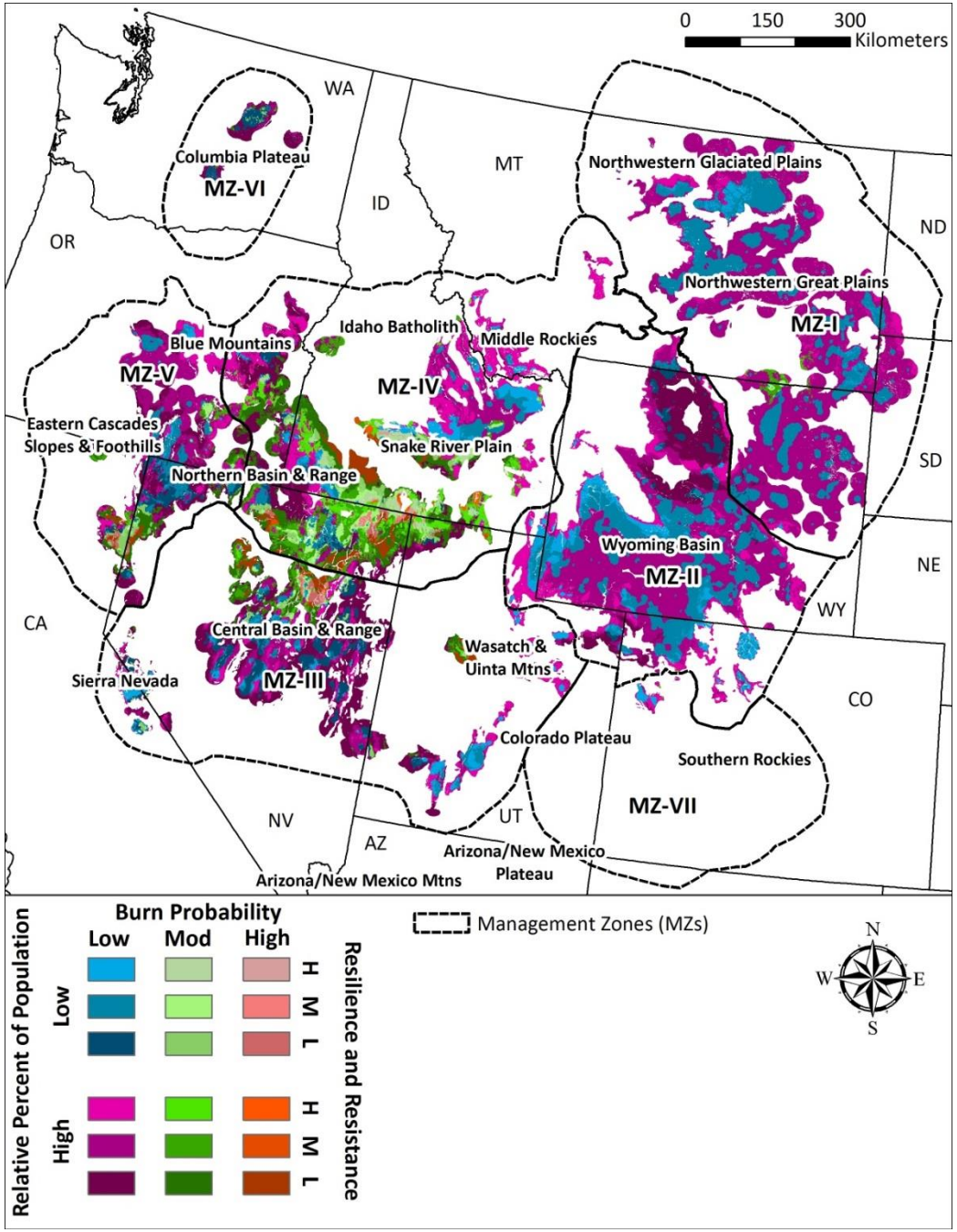
Layer Type: Polygon

Extent: National

Reference: Monitoring Trends in Burn Severity (MTBS) fire perimeters: Eidenshink, J., Schwind, B., Brewer, K., Zhu, Z., Quayle, B. and Howard, S., 2007, A project for monitoring trends in burn severity: Fire Ecology, v. 3, p. 3- 21.
Online: http://www.mtbs.gov/nationalregional/burnedarea.html

And

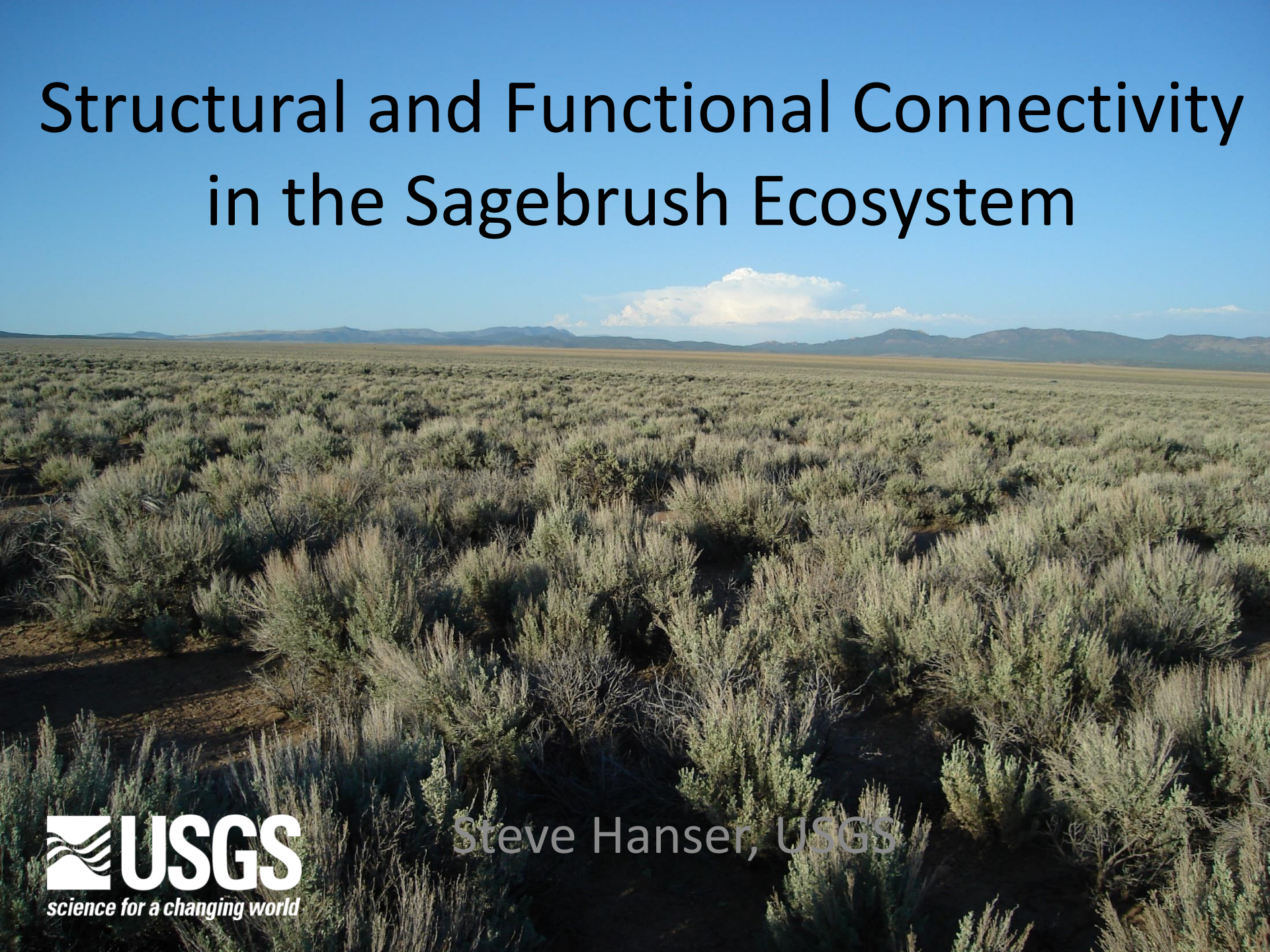
Walters, S.P, Schneider, N. J., Guthrie, J. D. 2011. **Geospatial Multi-Agency Coordination** (GeoMAC) wildland fire perimeters, 2008. Data Series 612. Washington, DC: U.S. Department of the Interior, U.S. Geological Survey. 6 p.
Online: https://pubs.er.usgs.gov/publication/ds612



Other GIS Datasets: Fire Risk Assessment for GRSG Relative Breeding Densities (Preliminary Results)

Map shows fire risk to GRSG relative breeding populations modified by resilience and resistance within and among GRSG Management Zones.

Structural and Functional Connectivity in the Sagebrush Ecosystem



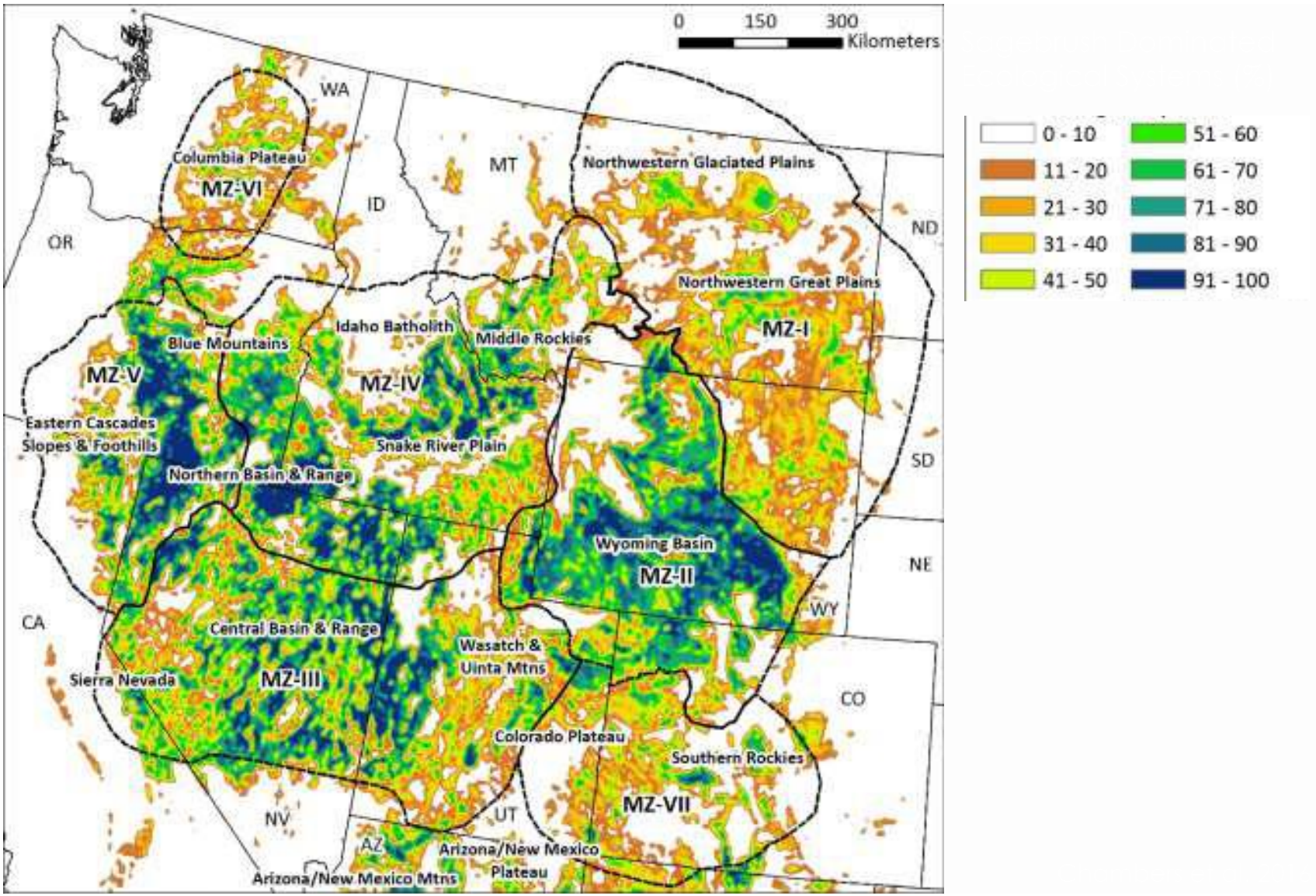
Steve Hanser, USGS

USGS
science for a changing world

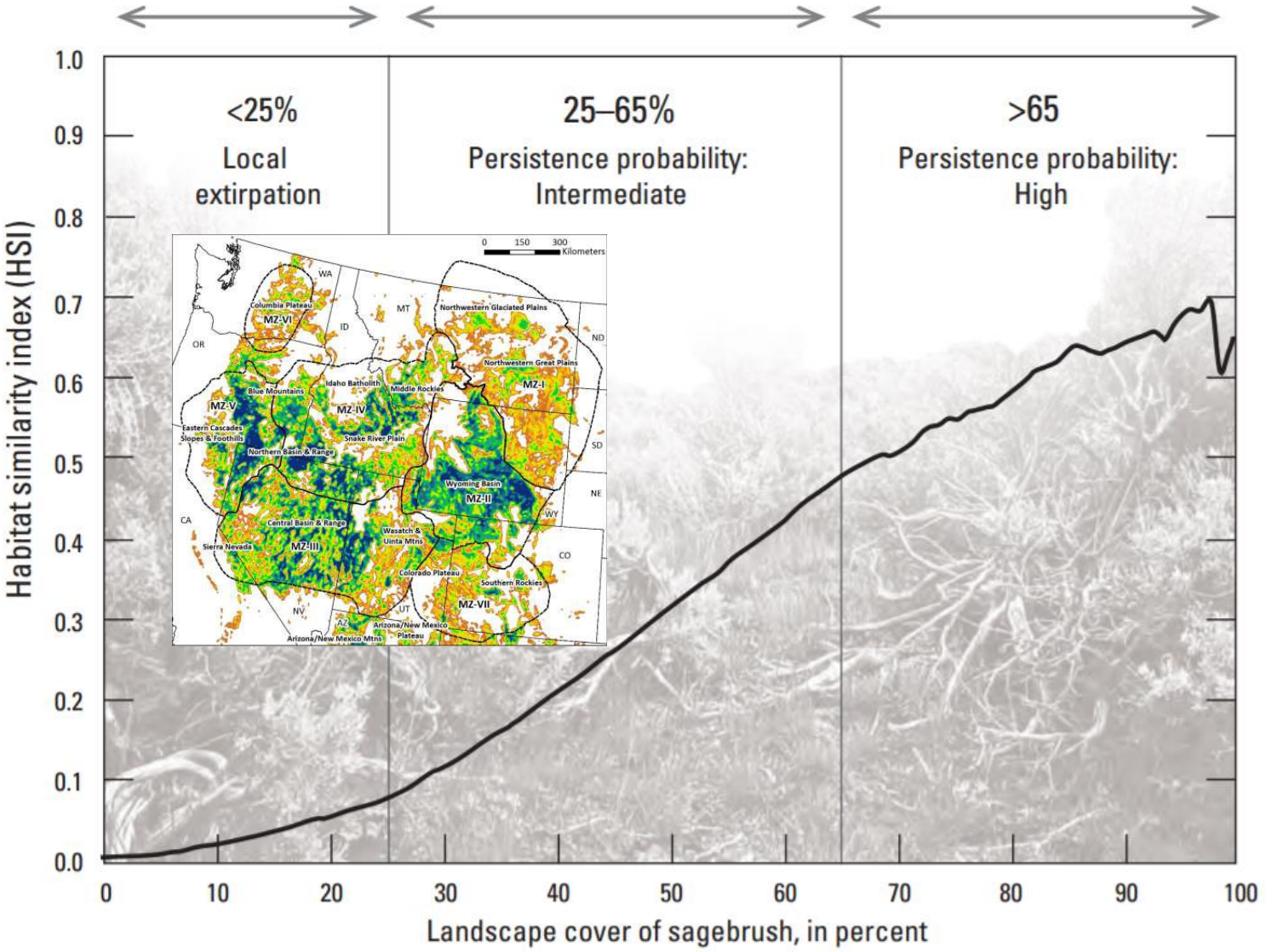
Importance of Connectivity

- Structural Connectivity
- Functional Connectivity
  - Daily movement
  - Seasonal movement
  - Dispersal
  - Gene Flow

Structural Connectivity

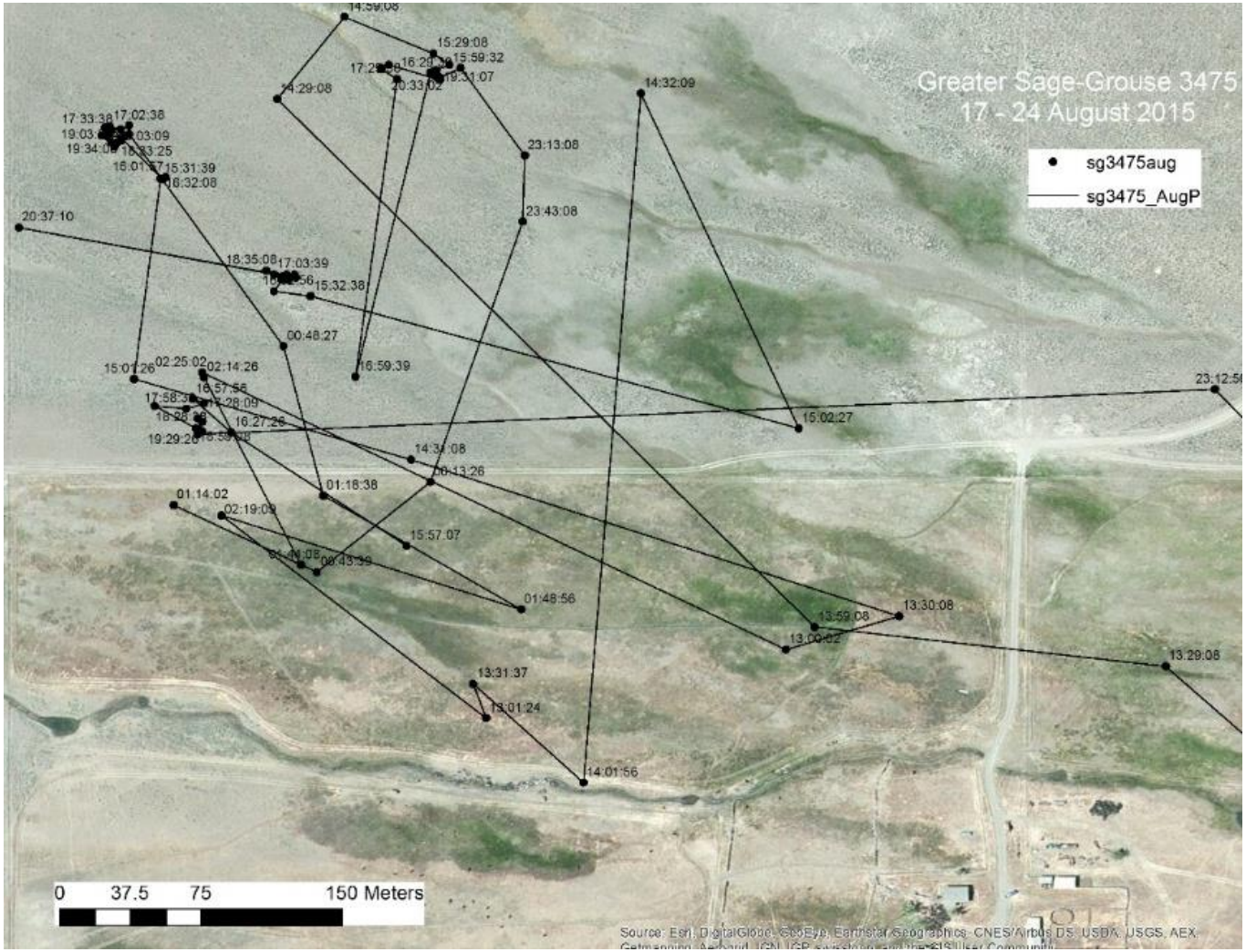


Structural Connectivity

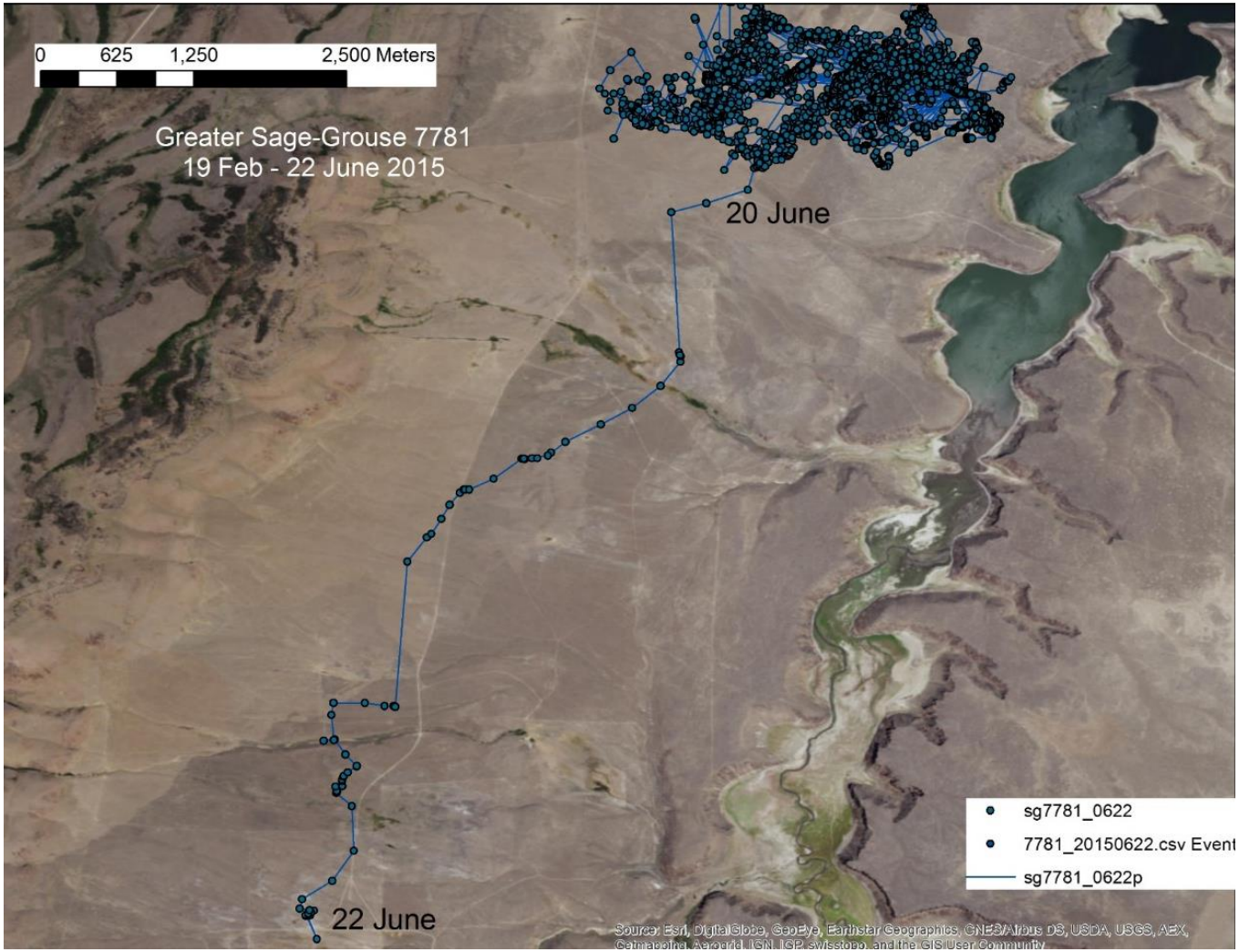


Pyke et al. 2015 (Modified from Knick et al., 2013)

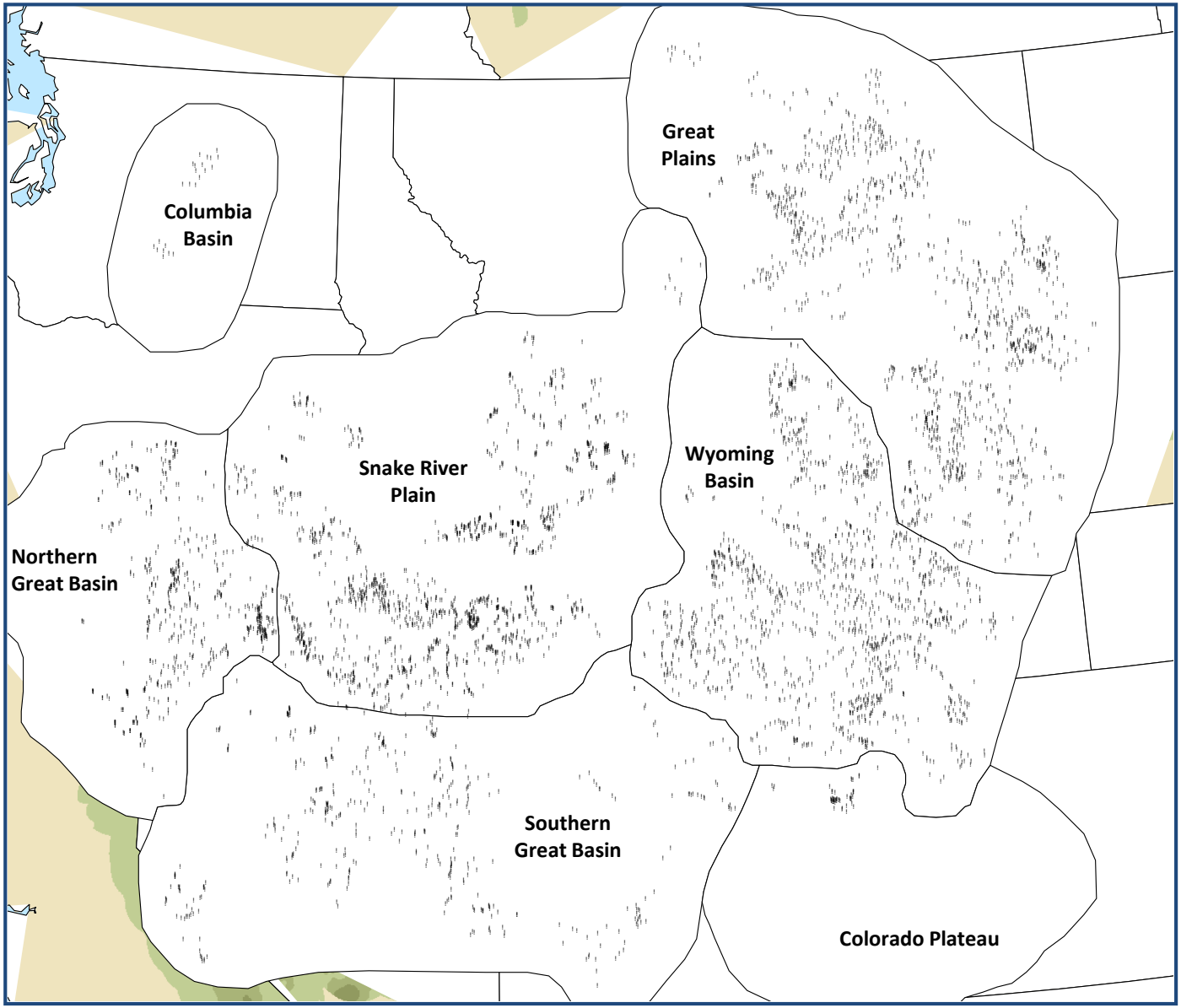
Functional connectivity – Daily and seasonal movements



Functional connectivity – Daily and seasonal movements



Functional connectivity – Dispersal



Sage Grouse Leks

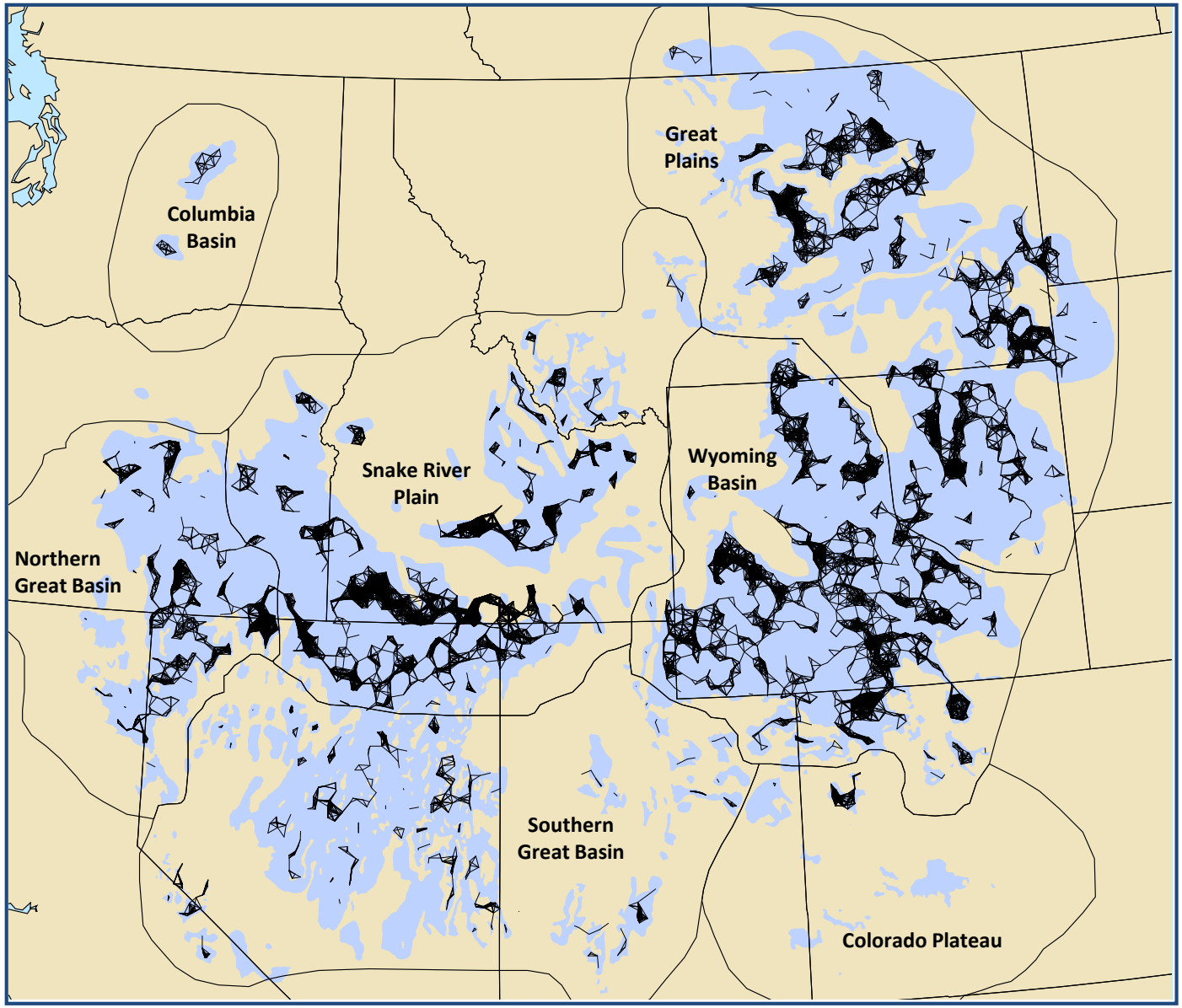
Sagebrush Habitat

- 0% - 15%
- 16% - 36%
- 37% - 62%
- 63% - 99%

Sage Grouse Management Zones

Knick and Hanser. 2011

Functional connectivity – Dispersal



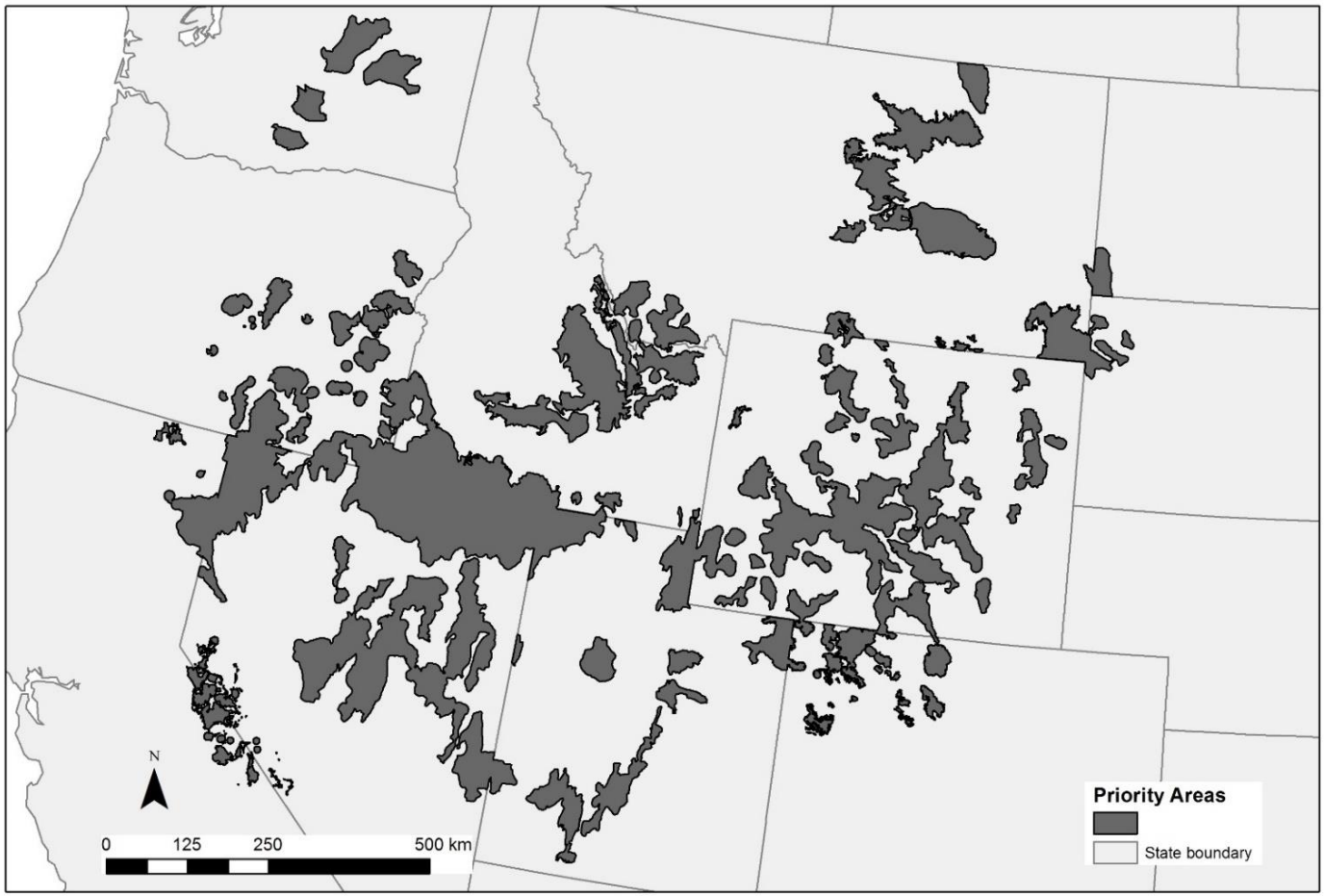
Linkages

Sage Grouse Range

Sage Grouse Management Zones

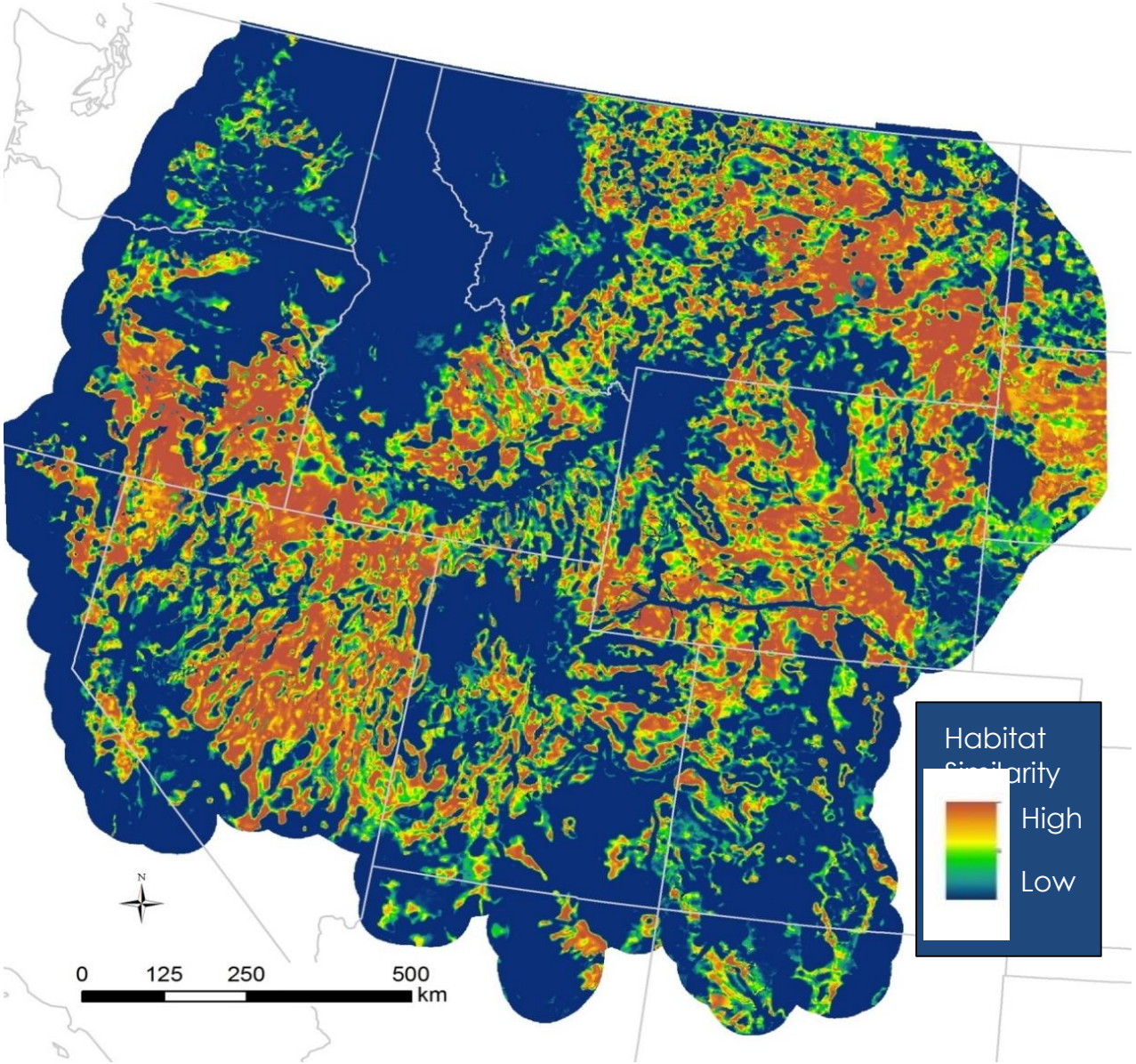
Knick and Hanser. 2011

Range-wide Network of Priority Areas:
Implications for long-term conservation of greater sage-grouse from graph theory



Michele Crist
Steve Knick
Steve Hanser

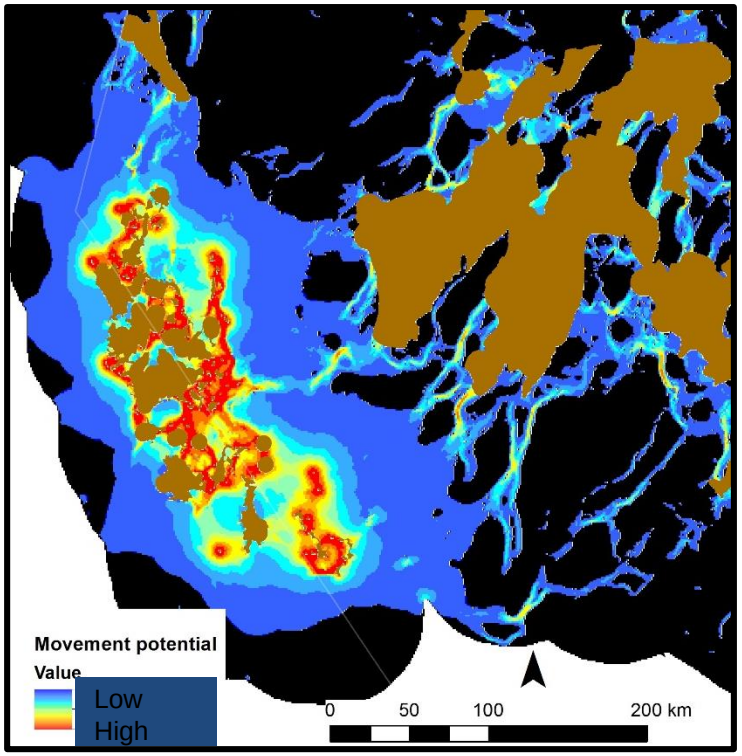
Ecological minimums



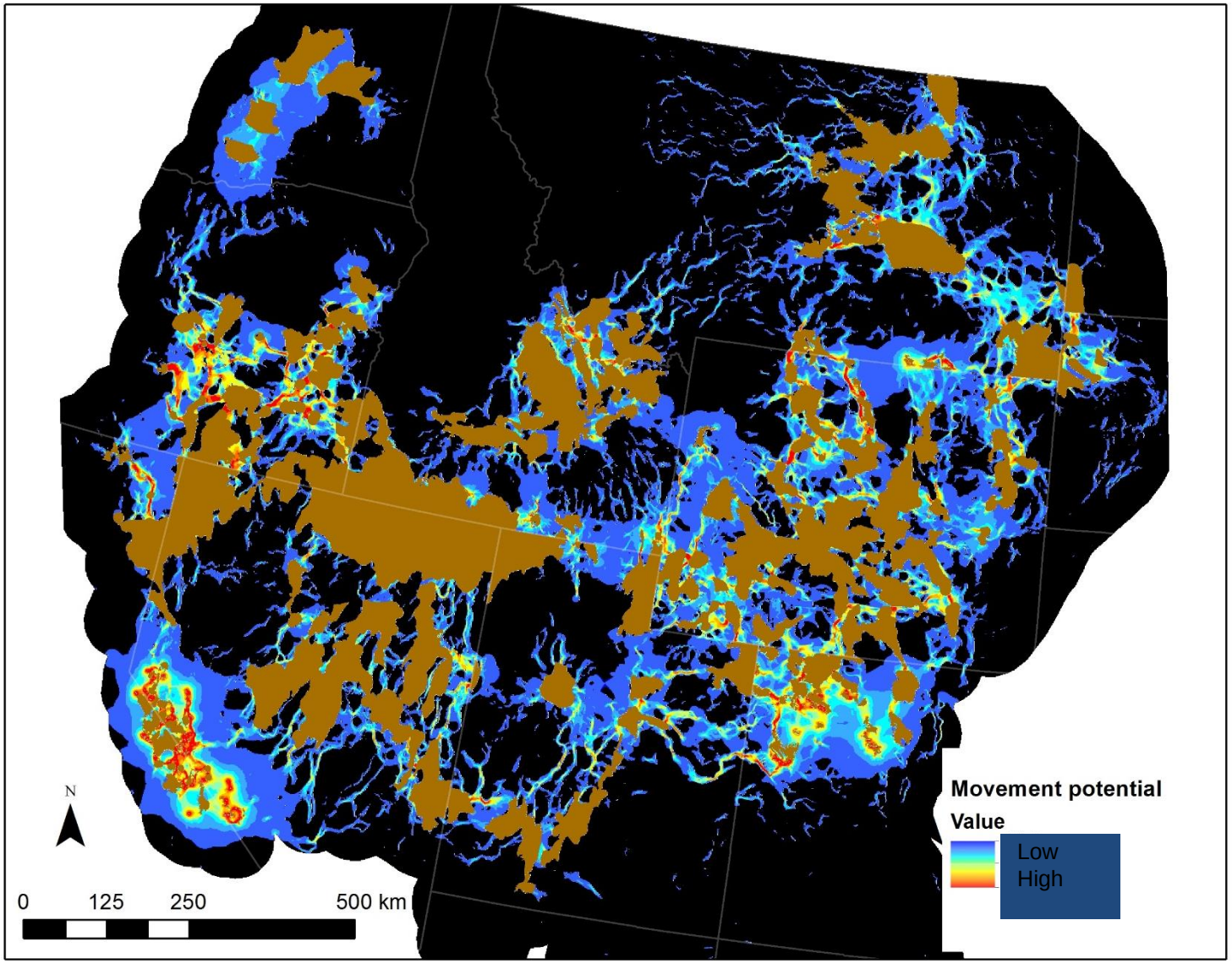
Crist et al 2015

Minimums to effective resistance (ER)

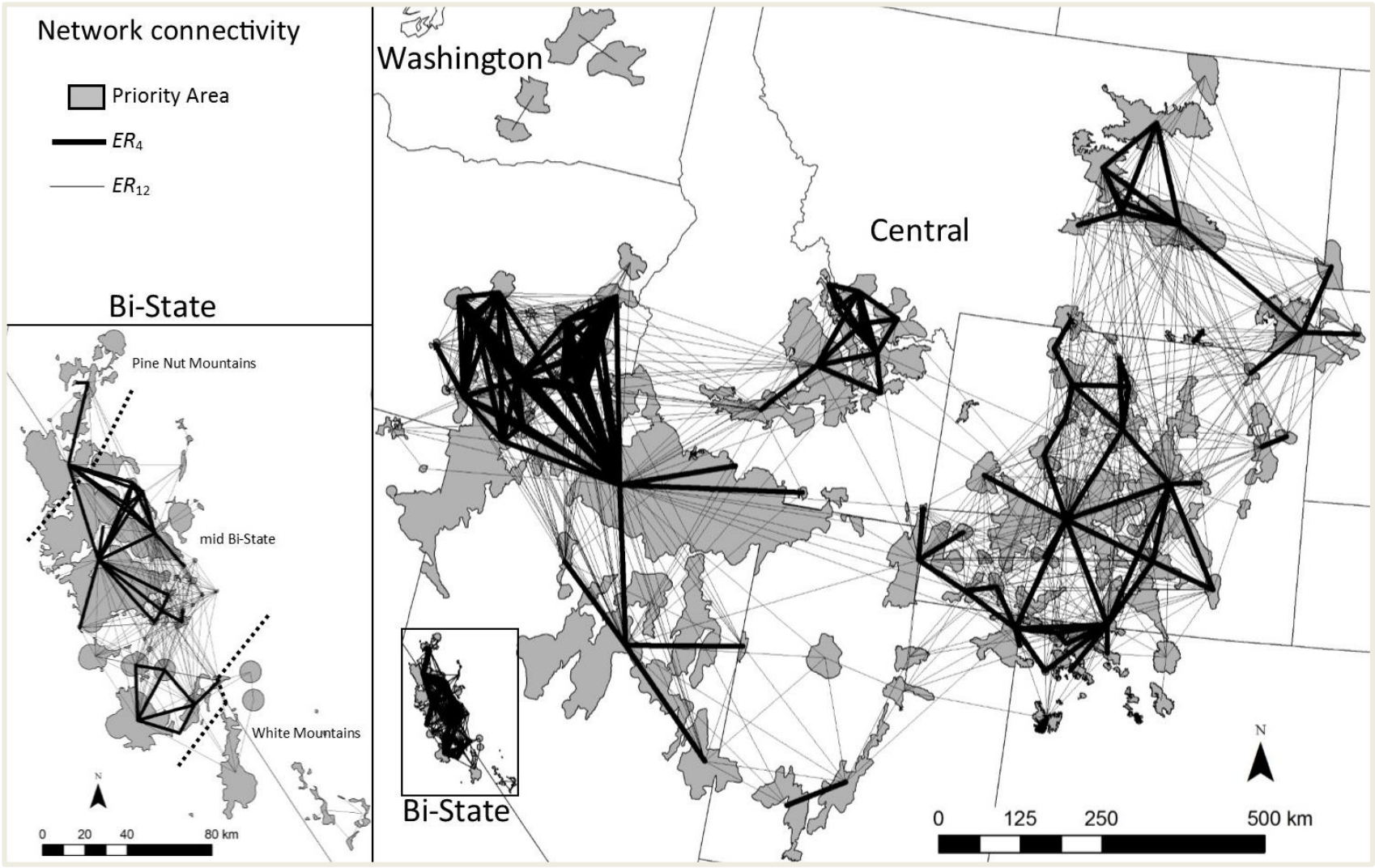
- Inverted habitat similarity of minimums to create resistance surface
- Circuit theory to estimate current flow through all possible pathways (link) between nodes
- Effective resistance



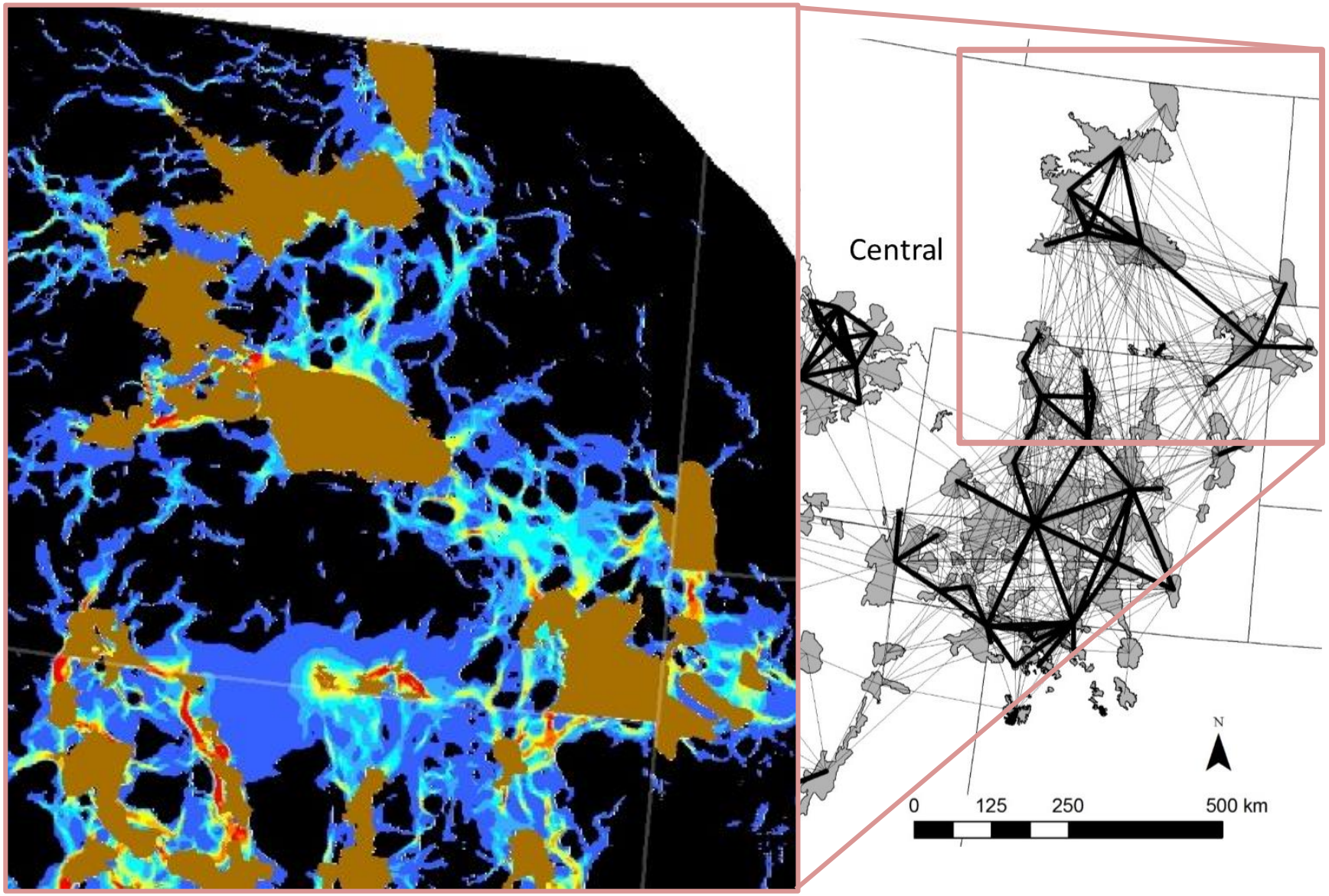
Movement potential



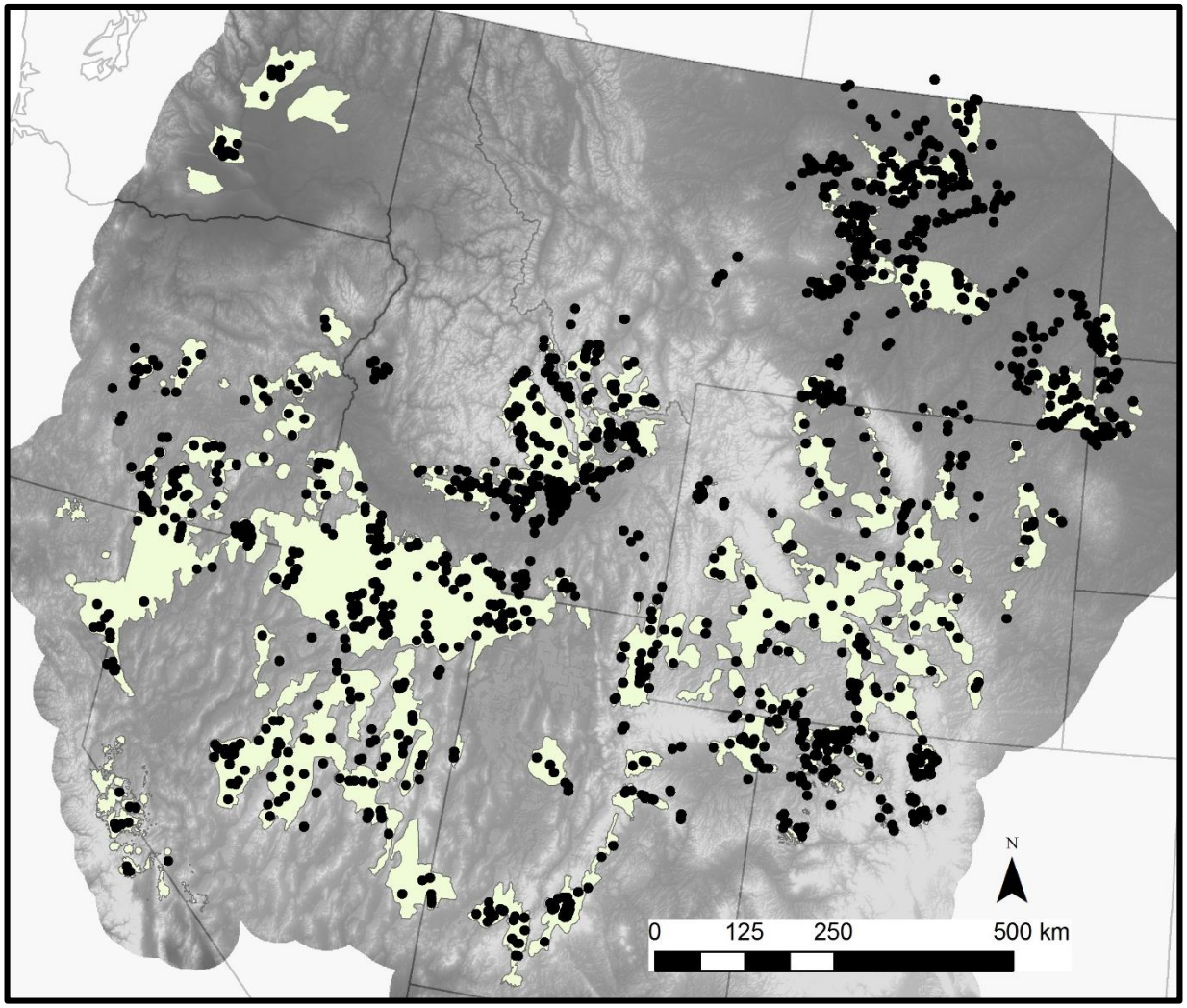
Connectivity



Connectivity



Functional connectivity – Gene flow



Mule Deer Connectivity

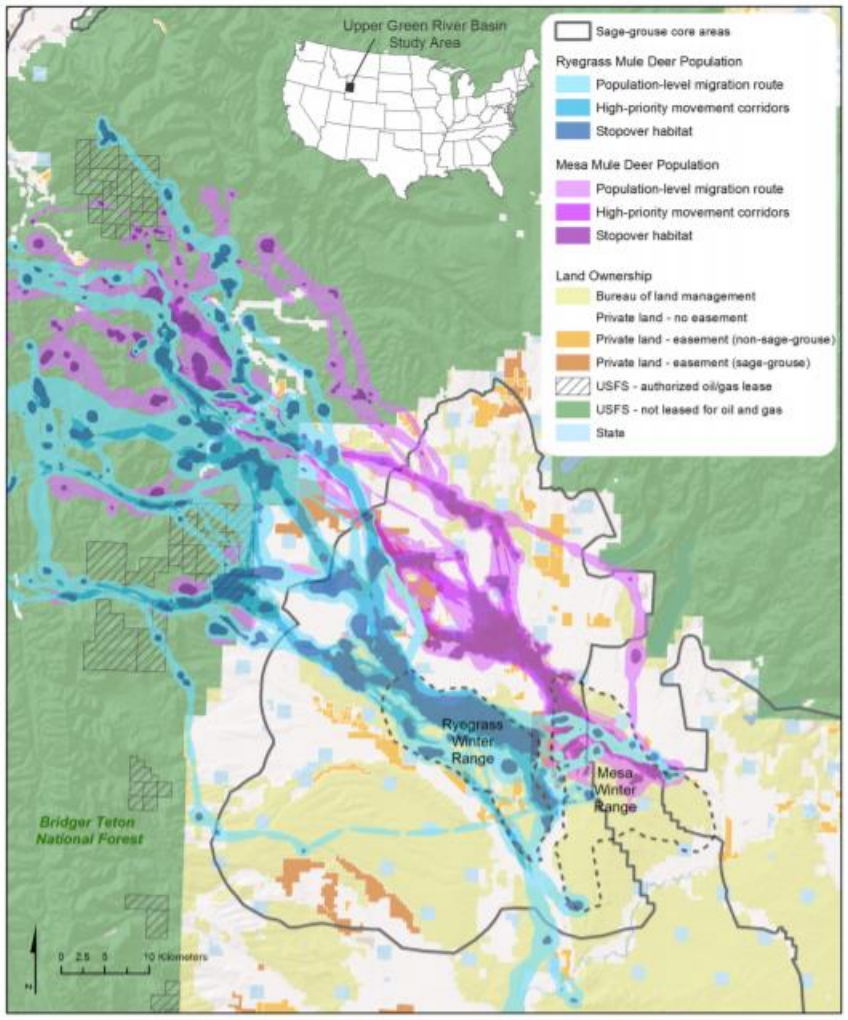
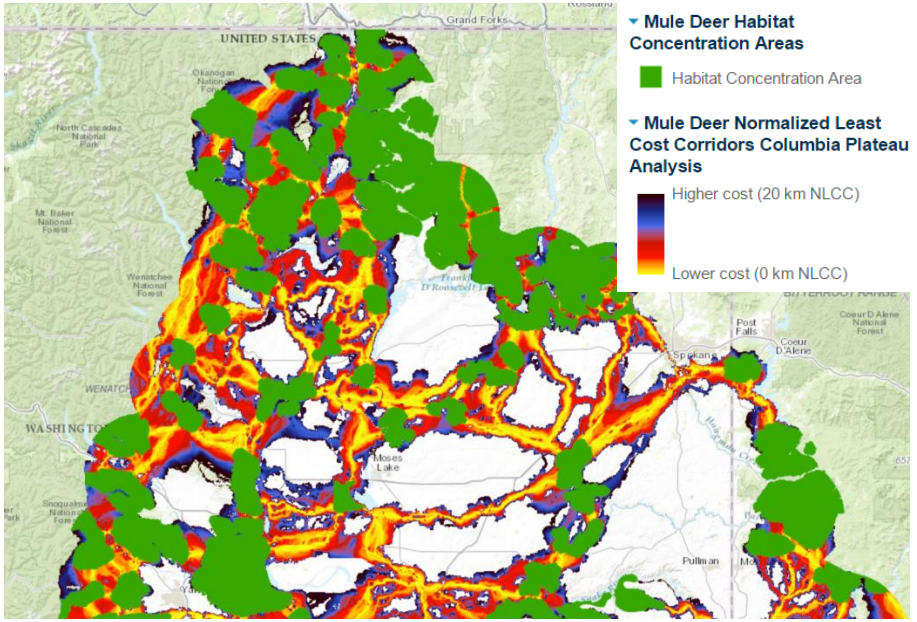


Fig. 1. Winter ranges, stopovers, and population-level migration routes (created with a BBMM) for mule deer in the Mesa and Ryegrass subpopulations, upper Green River Basin, Wyoming, USA relative to land ownership.

Copeland et al. 2014



Washington Wildlife Habitat Connectivity Working Group (WHCWG)

Importance of Connectivity

- Structural Connectivity
- Functional Connectivity
  - Daily movement
  - Seasonal movement
  - Dispersal
  - Gene Flow

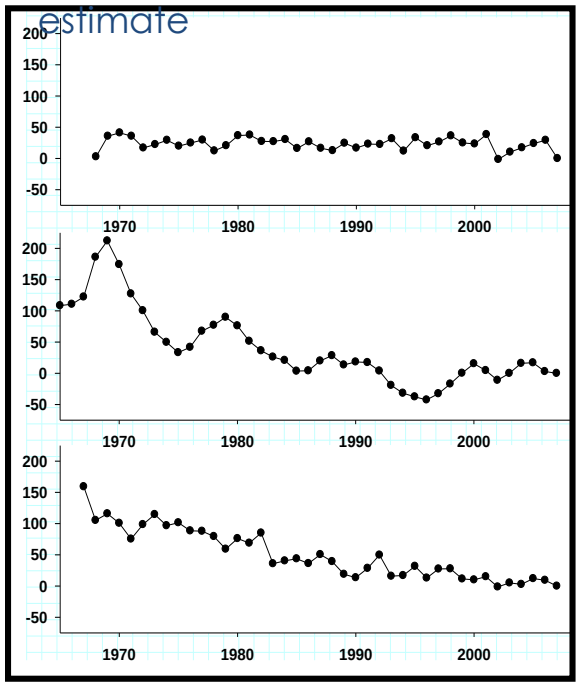
Bird Connectivity

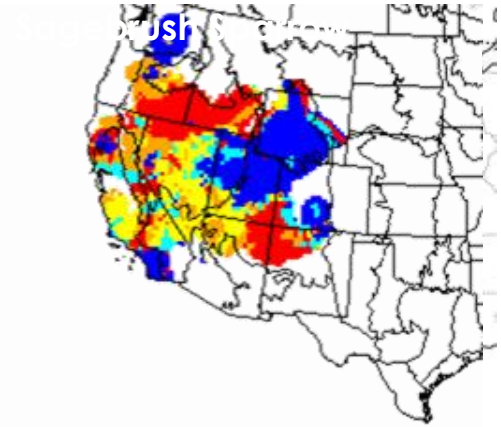
Sagebrush Sparrow

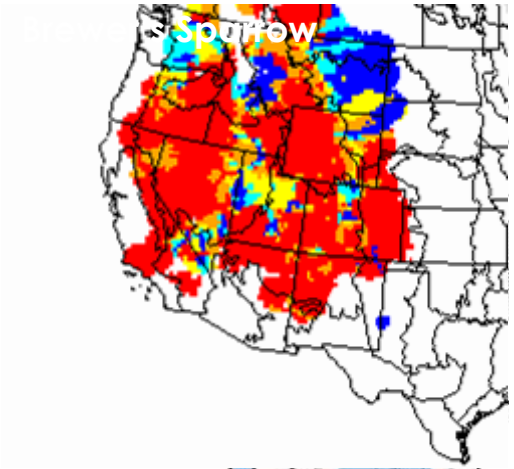
Greater Sage Grouse

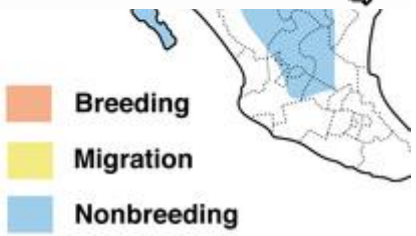
Brewer's Sparrow

Percent change from 2007 estimate









Migratory connectivity?
Wintering habitat conditions?

Data Layers: Invasive Plants

Photos: Matt Lavin

Patrick Comer,
Chief Ecologist

NatureServe
A Network Connecting Science With Conservation

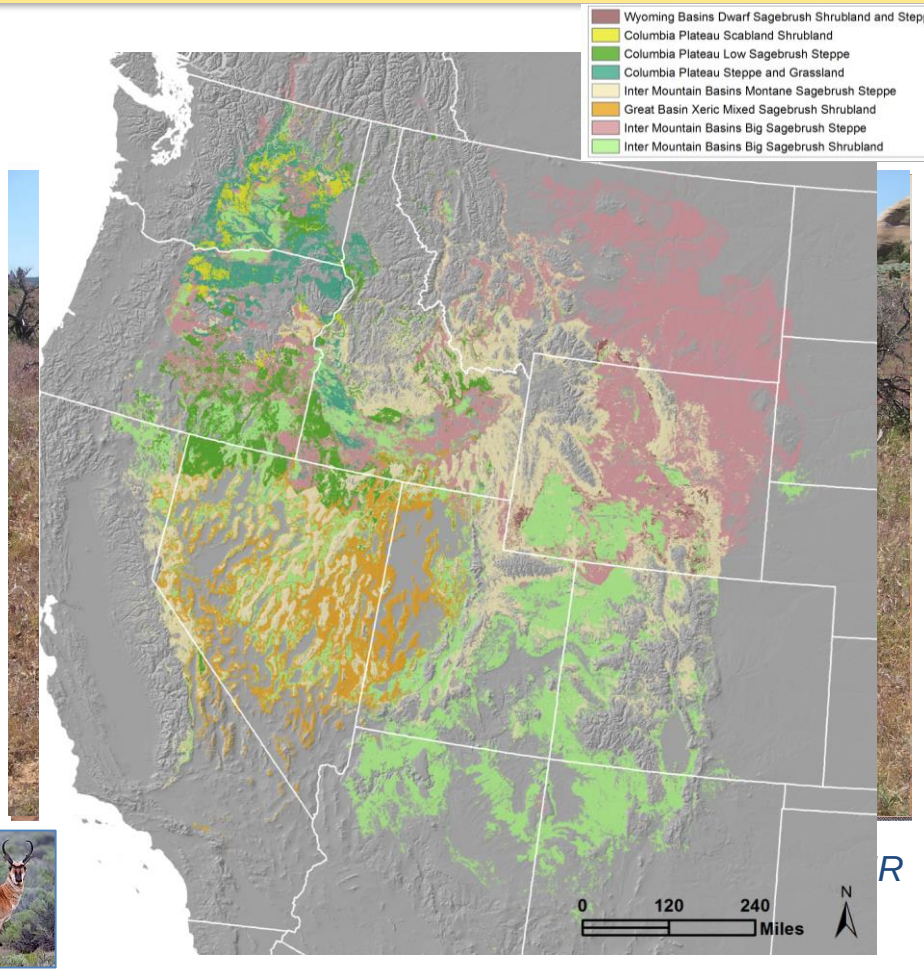
WAFWA Sagebrush Conservation Strategy Workshop
November 1, 2016

Invasives: Overview of the Issue

- Introductions from Asia and Mediterranean
- Surface disturbance, contaminated seed, overgrazing, soil compaction, wildfire…
- Cold desert shrubland - cheatgrass
- Steppe and grassland – annual grasses plus more perennial and biennial forbs

Invasives: Overview of the Issue

- Effects on sagebrush ecosystems
  - Loss of bunchgrass density
  - Loss of forb diversity
  - Altered fire regime *(size, frequency, severity)*
  - Decreased woody canopy
  - Decreased site productivity
  - Conversion to invasive dominance
- Effects on sagebrush obligate species
  - Loss of nesting habitat
  - Loss of brood-rearing habitat
  - Fragmentation effects on survival



Invasives: Key Management Questions

- Where are they? *(range, presence)*
- How much? *(percent cover, proportional extent)*
- Where will they invade next? (and when?)
  - after wildfire (*next year, within 3 years)*
  - after other surface disturbances *(past, present, future)*
  - with climate change *(this decade, upcoming decades)*

Invasives: Key Management Questions

- Where and how to prevent spread?
- Where and how to target restoration?
- Where to consider “letting nature take its course”?

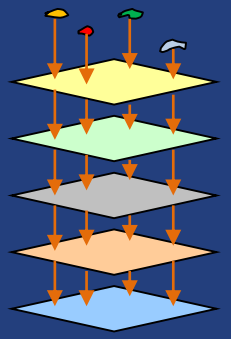
Invasives Mapping: Technical Considerations

- Rangewide extent of map product *(geographic gaps?)*
- Thematic resolution *(species by species or "invasive annual grass" "invasive perennial forb")*
- Spatial resolution *(800m/250m/30m rasters needed to support which decisions?)*
- Temporal resolution *(10yr/5yr/1yr/"real time" re-map intervals needed to support which decisions?)*
- Improvements needed to advance conservation?

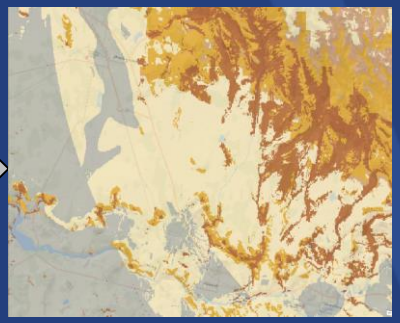
Primer on Modeling Processes

Input Data
Imagery – greenness indices (NDVI)
Climate: bioclimate classes, interpolated climate variables
Landform: elevation, aspect, slope, drainage, surface flow Soil: depth, texture, drainage class, pH, geologic extremes
Land Use: surface disturbance, distance away from/ density of these features

Field Observations (point/polygons)



Imagery
Climate
Landform
Soil
Use Features

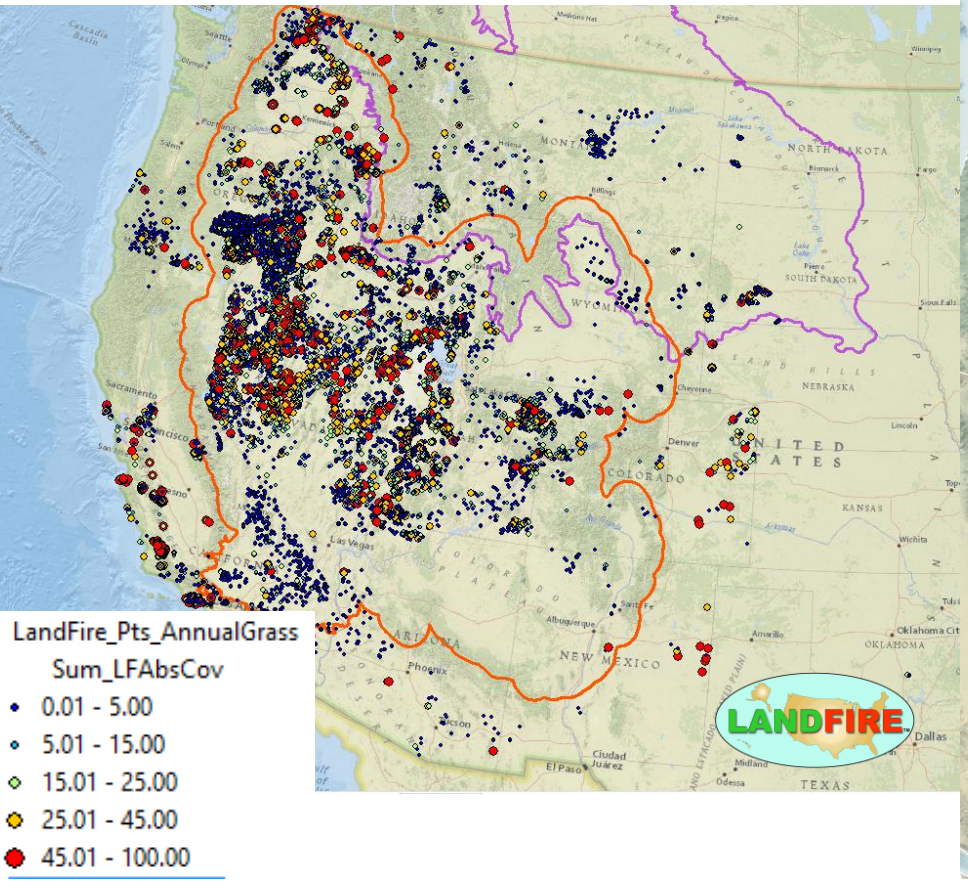


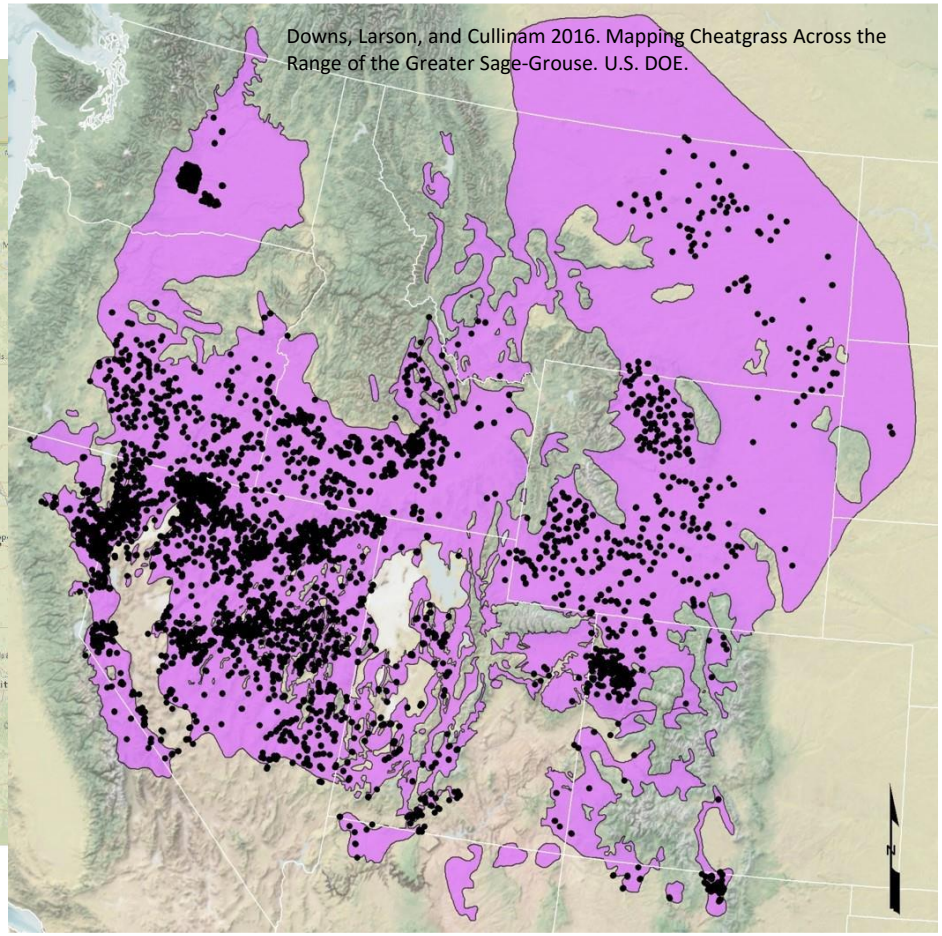
Output translates to map product

Observations held aside for validation of map product

Modeling Algorithms
CART – Classification and Regression Trees (boosted)
RandomForest
Maximum Entropy
GAM - Generalized Additive Models
MARS – Multivariate Adaptive Regression Splines

Field Samples with Invasive Annual Grass





Mapping Cheatgrass Across the Range of the Greater Sage-Grouse

J. L. Downs, K. B. Larson, V. I. Cullinan

Developed using 250m resolution eMODIS imagery

<u>Model Variables</u>

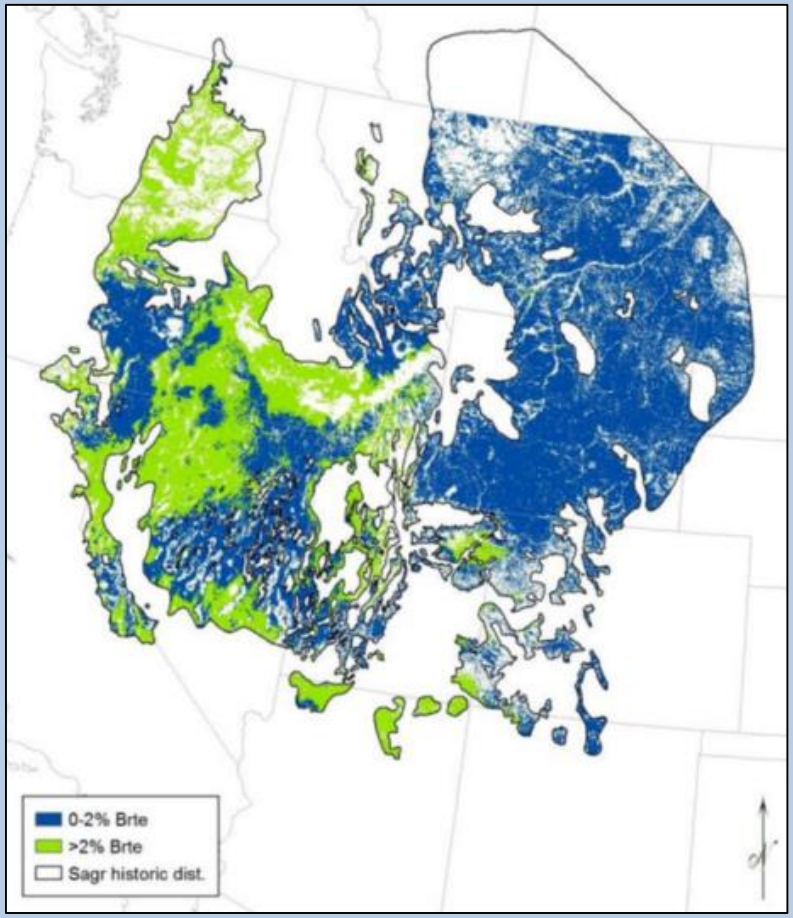
Elevation
Potential Solar Radiation Index
Cumulative Growing Degree Days (Oct-Apr)

Median Annual Peak NDVI (14-yr)
Deviation of Peak NDVI (Year of Maximum Winter Precipitation) from 14-yr Median NDVI
Cumulative Winter Precipitation (Dec-Feb)

Mean March Precipitation
Mean June Precipitation
Mean July Precipitation
Average Maximum Winter Temperature (Nov-Feb)
Mean Minimum March Temperature
Mean Minimum November Temperature

Mean Maximum May Temperature

Predicted Occurrence of Cheatgrass



Mapping Cheatgrass Across the Range of the Greater Sage-Grouse

J. L. Downs, K. B. Larson, V. I. Cullinan

Strengths

Full extent for GSG

~ 2014 status

Readily updated/downscaled

Applicable to future climate

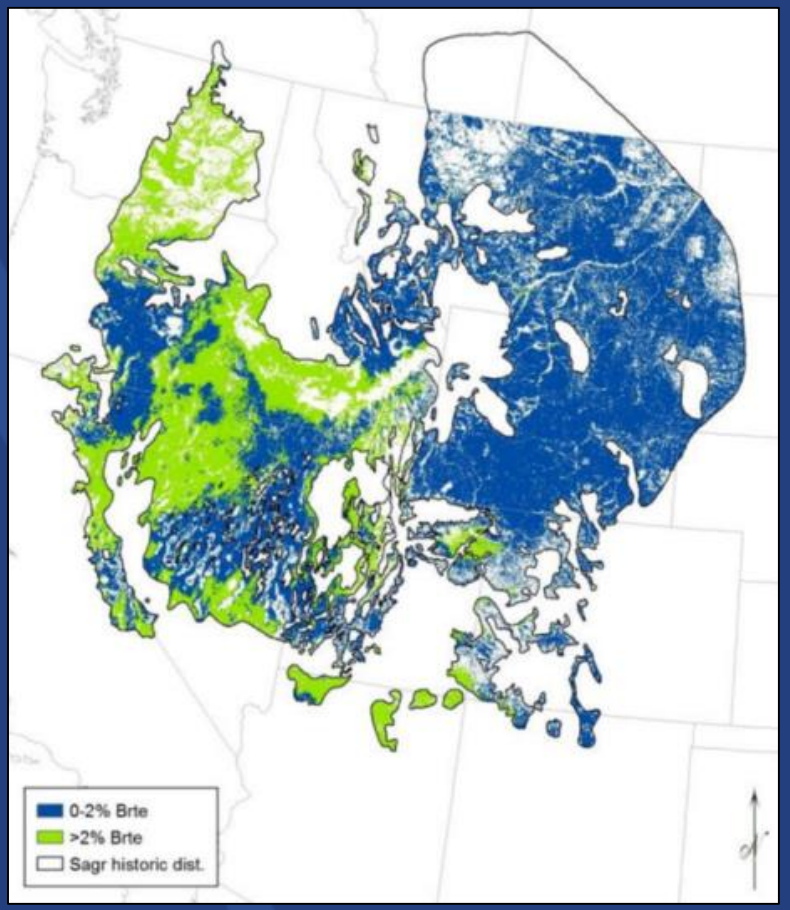
Limitations

0-2% vs >2% cover classes

250m spatial resolution

Prone to error in field samples

Predicted Occurrence of Cheatgrass

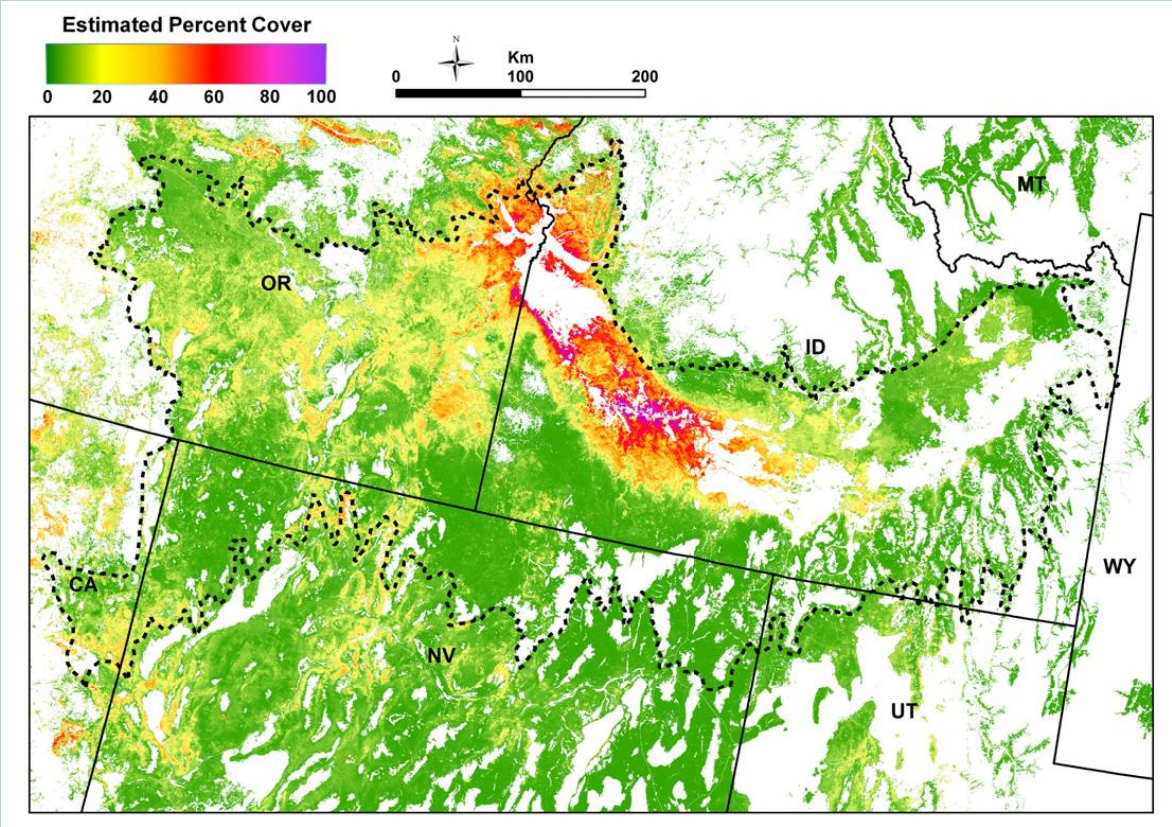


Near-Real-Time Cheatgrass Percent Cover in the Northern Great Basin, USA, 2015

Boyte, S.P. and Wylie, B.K., 2016. Near-Real-Time Cheatgrass Percent Cover in the Northern Great Basin, USA, 2015. *Rangelands*.

Developed using 250m resolution eMODIS imagery *(2000-2013 model applied to 2015)*

<u>Ancillary data</u>
Topography
Land cover
Soil characteristics
Geographic position
Water flow index



Near-Real-Time Cheatgrass Percent Cover in the Northern Great Basin, USA, 2015

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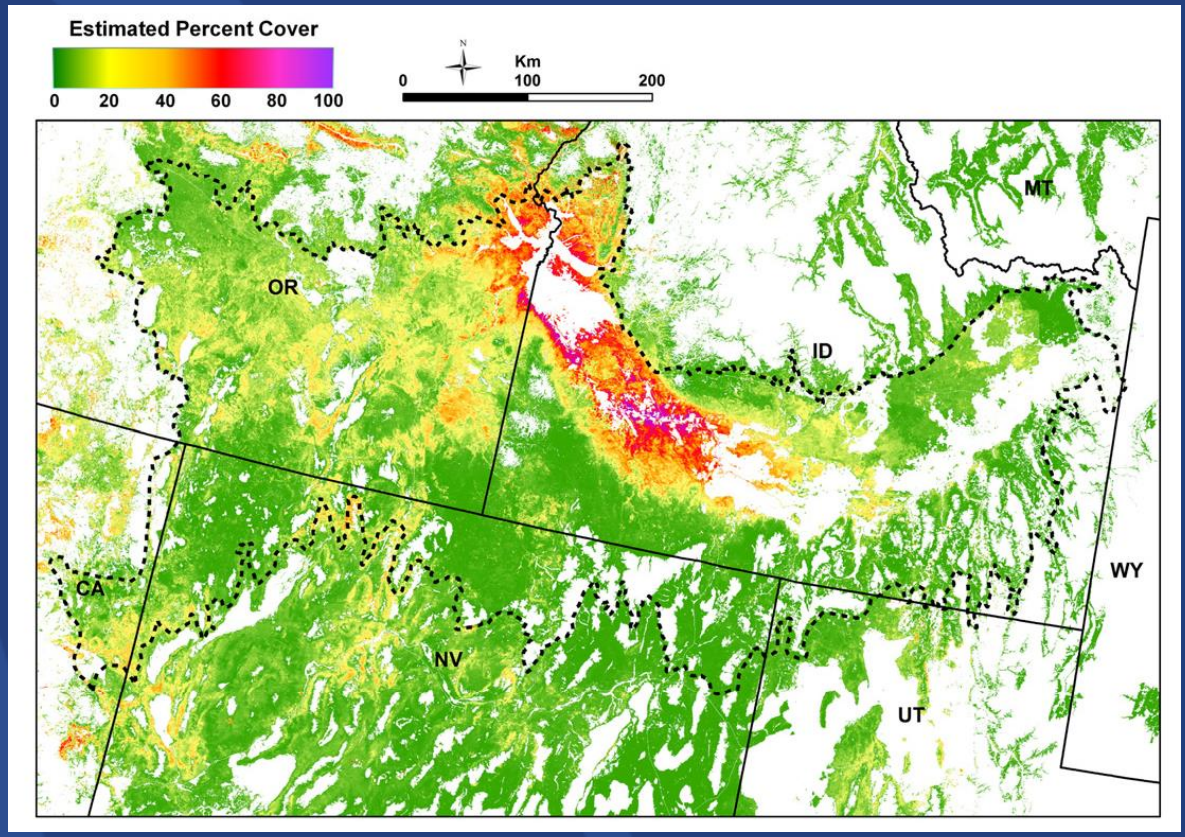

Strengths

0-100% continuous cover estimate

~ 2015 status

Readily updated/downscaled

Applicable to future climate

Limitations

Extent limited to N. Great Basin Ecoregion

250m spatial resolution

Prone to error from biased field samples

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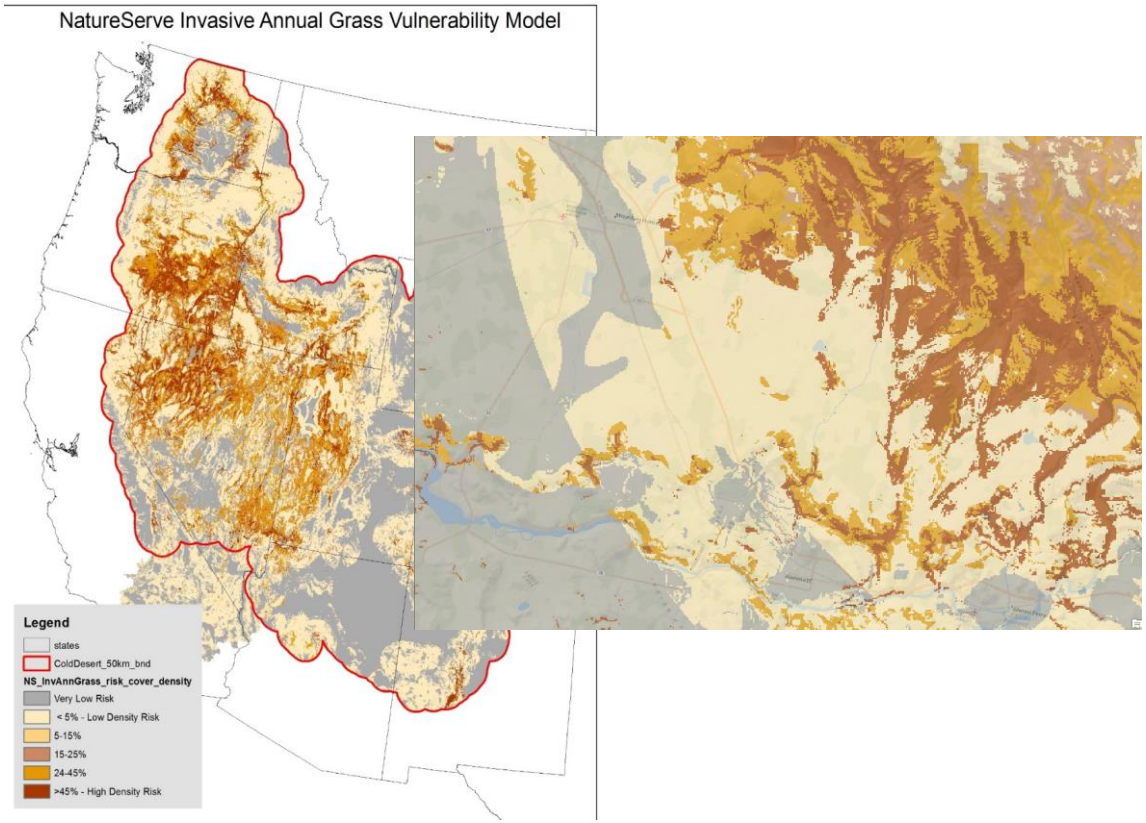
A Network Connecting Science With Conservation

Invasive Annual Grass Risk in Intermountain Basins
(expansion and update in progress)

Jon C. Hak, Patrick J. Comer



- 90m "vulnerability" model
- Combines distinct models based on % cover
- Uses 20K+ LANDFIRE plots

Input Layers

19 climate variables
Potential Solar Radiation Index
Landform/elevation
Soil texture/pH
Distance to hydro characteristics
Distance to/density of surface disturbance
Fire occurrence

- Potential use of MODIS data in model evaluation

Invasive Annual Grass Risk in Intermountain Basins
(update in progress)

Jon C. Hak, Patrick J. Comer

Strengths

Full extent *(once extended)*

6 cover classes *(no risk, <5%, 5-15%, 15-25%, 25-45%, >45%)*

90 m resolution

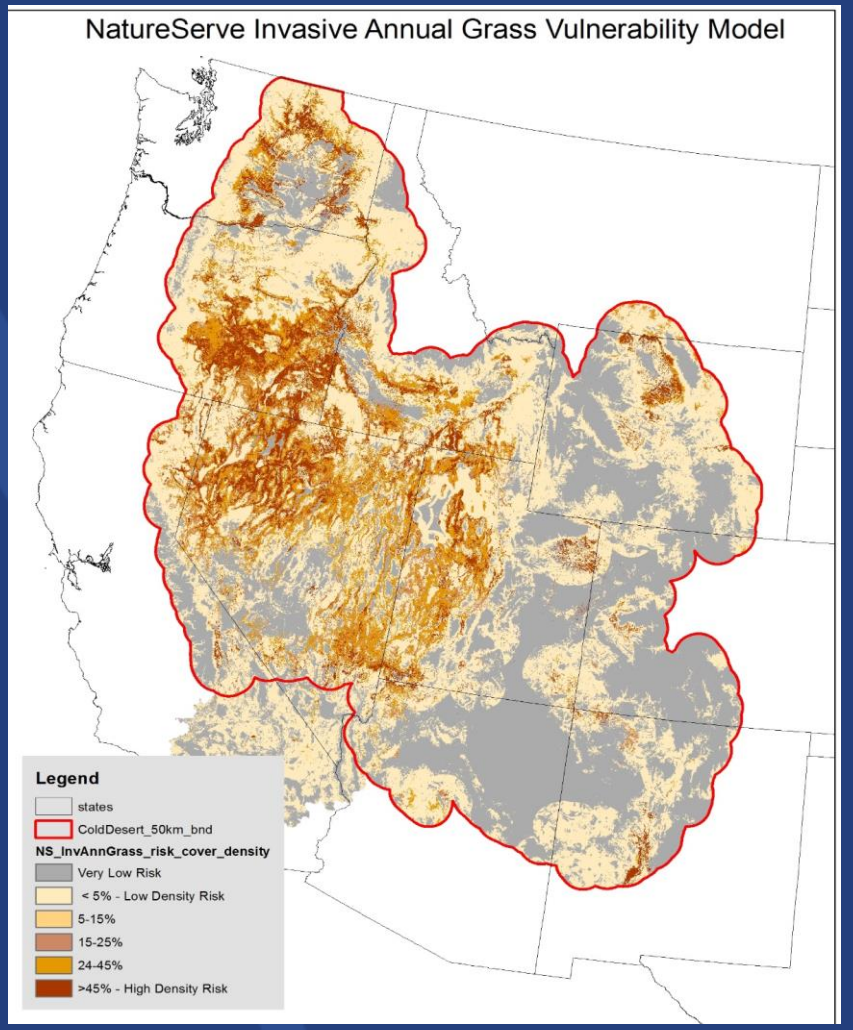
Readily updated/downscaled

Applicable to future climate

Limitations

Imagery not used *(but could be)*

Prone to error in field samples



Invasives Mapping: Where do we need to go?

- Rangewide extent of all map products
- Thematic resolution *(certain individual forb species* and *"invasive annual grass"* and *"invasive perennial forb")*
- Spatial resolution *(250m/90m rasters)*
- Timeframe *("potential", current, next year, next 30 years)*
- Refresh Interval *(10yr forecast plus 1yr re-map intervals)*

Data Layers: Invasive Plants

Photos: Matt Lavin

Thank you!

Patrick Comer,
Chief Ecologist
Pat_comer@natureserve.org

NatureServe
A Network Connecting Science With Conservation

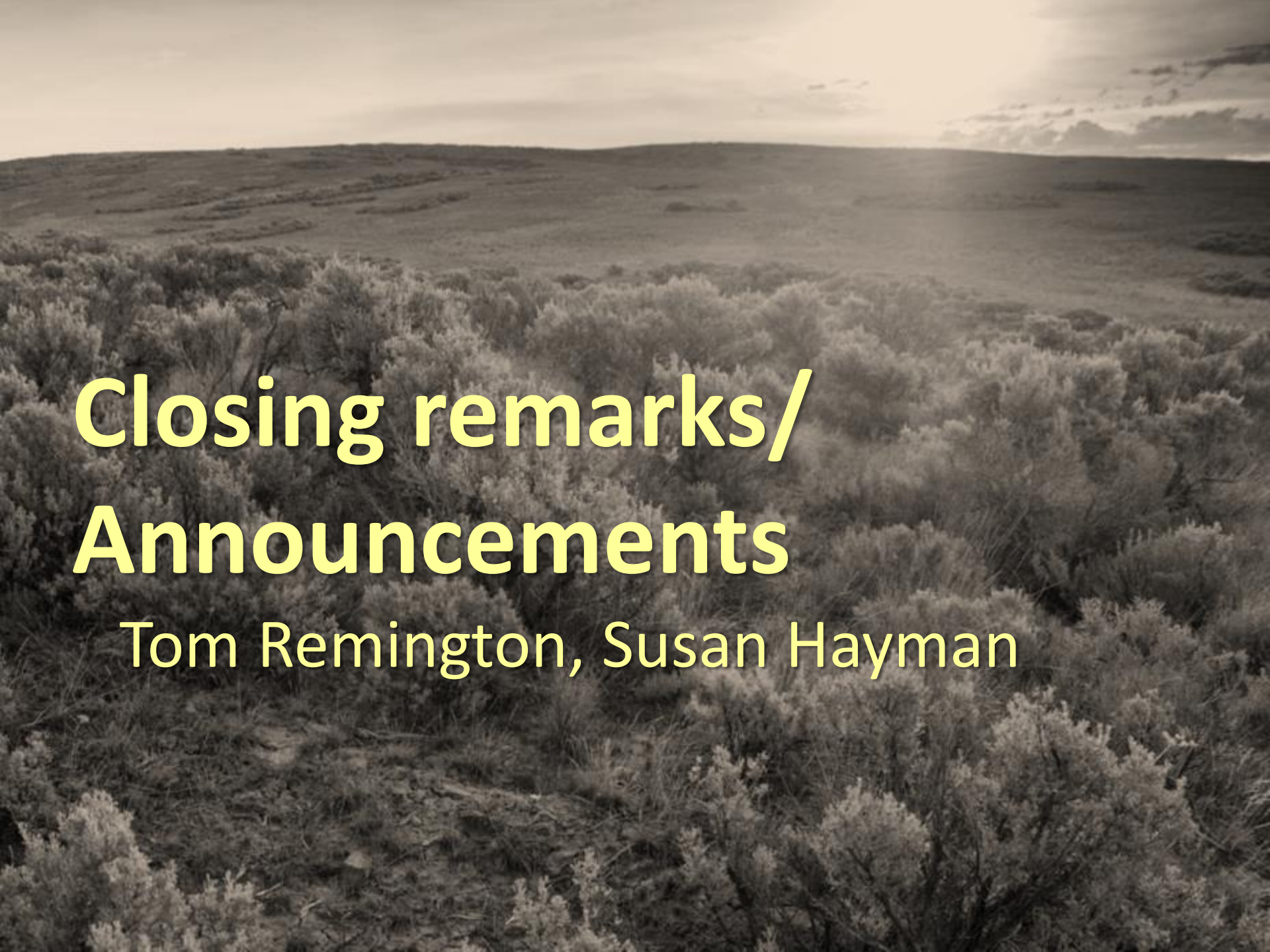

Break
Please return by 2:50 pm


Jump-starting Wednesday….
Susan Hayman

Three Rounds…

1. How are these materials and approaches useful in sagebrush conservation?
2. How would you apply the materials and approaches within your organization/agency?
3. **How might these materials and approaches be modified to be more useful to your organization/agency?**

Please write one takeaway on one of these large white cards at your table and post it on the purple wall as you leave today.



Closing remarks/ Announcements

Tom Remington, Susan Hayman

Ren Lohoefener

USFWS, Pacific Southwest Regional Director

The Sagebrush West:

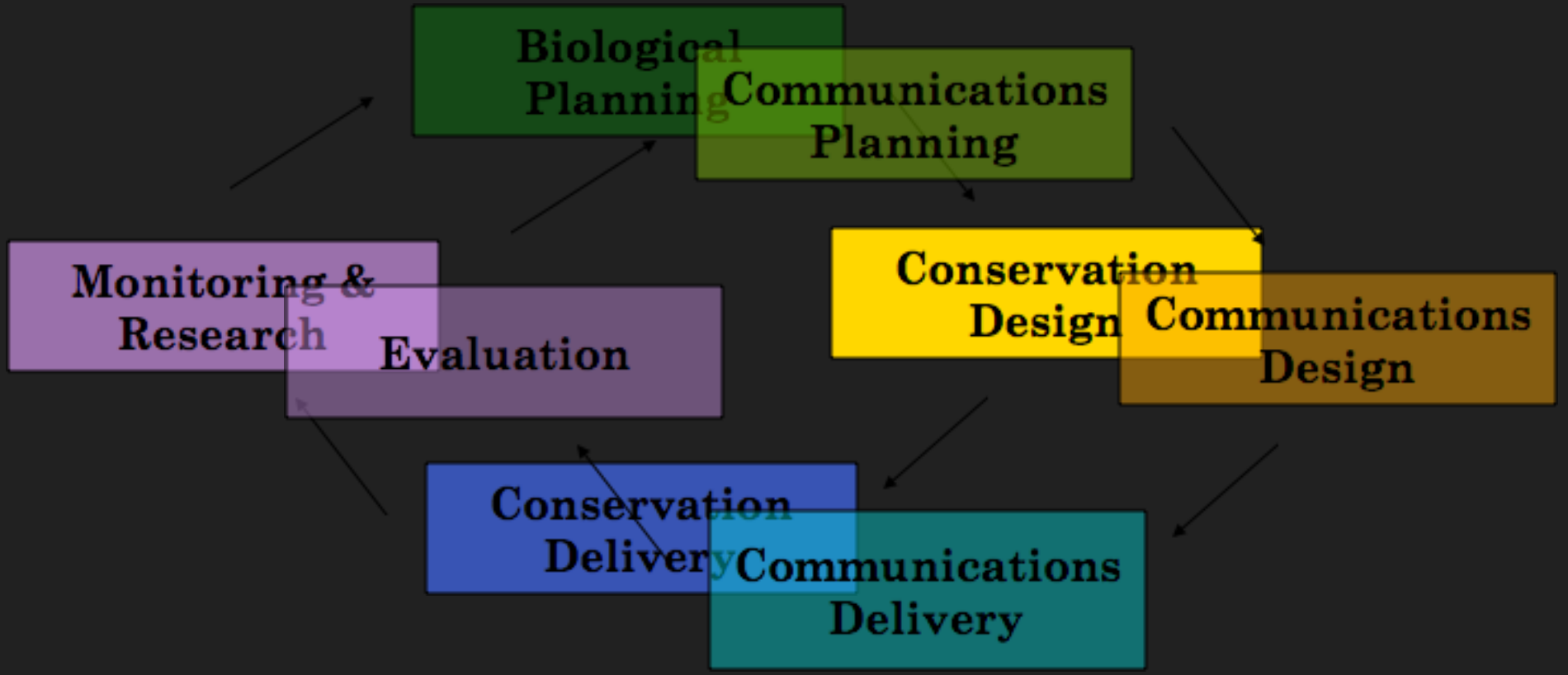
Joining Communications and Science

Our Vision

A Healthy Sagebrush Landscape

Working for People and for Wildlife

Communications processes are not so different from scientific processes...



Start with Heart: Values in Action

Communications Framework Objectives

- Fostering **public** understanding
- Increasing communication among **stakeholders**
- Build **support** by increasing awareness
- **Educate** future sagebrush stewards
- **Network** the diverse group of communicators

Communication is Essential to Success

Internal

Scientists

Land managers

Agency leadership

You!

Tech Transfer

External

Members of Congress

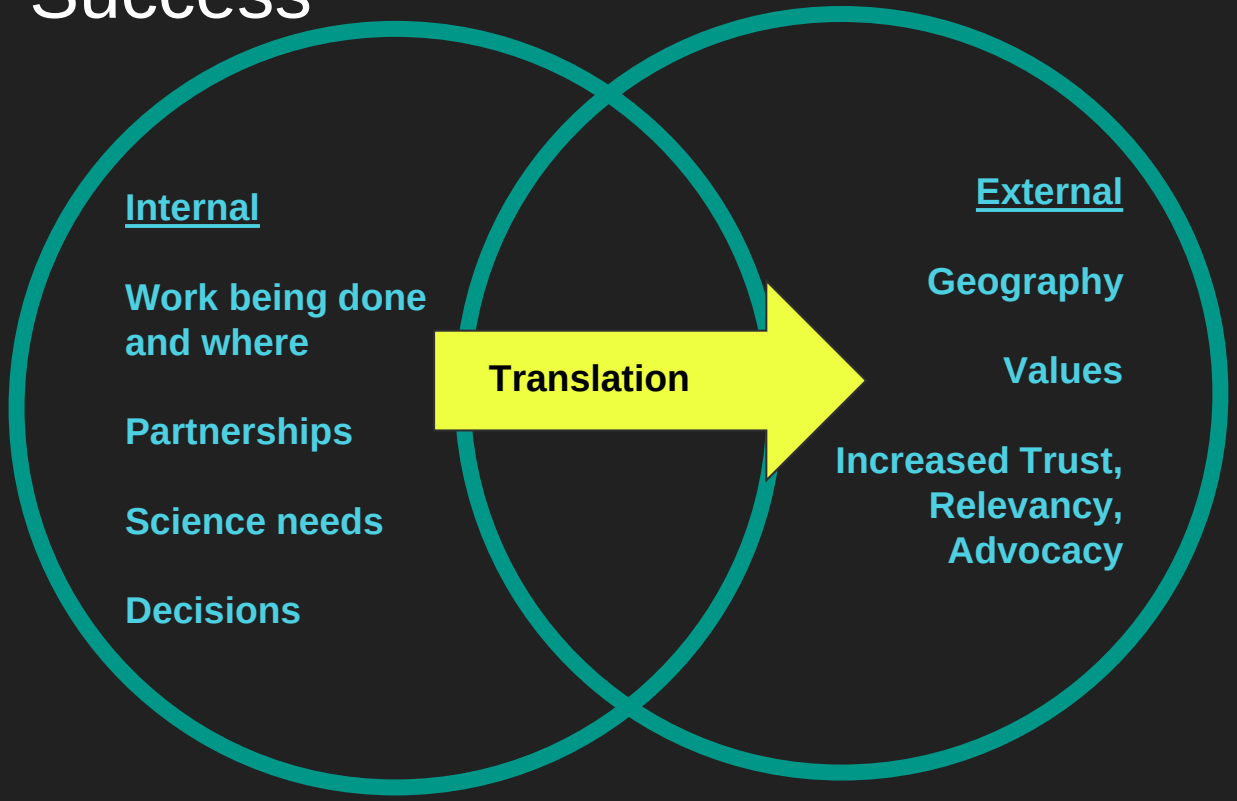
Communities (Cities, Tribes)

Media

Landowners

Advocacy

Communication is Essential to Success



Internal Communication Tools

Internal

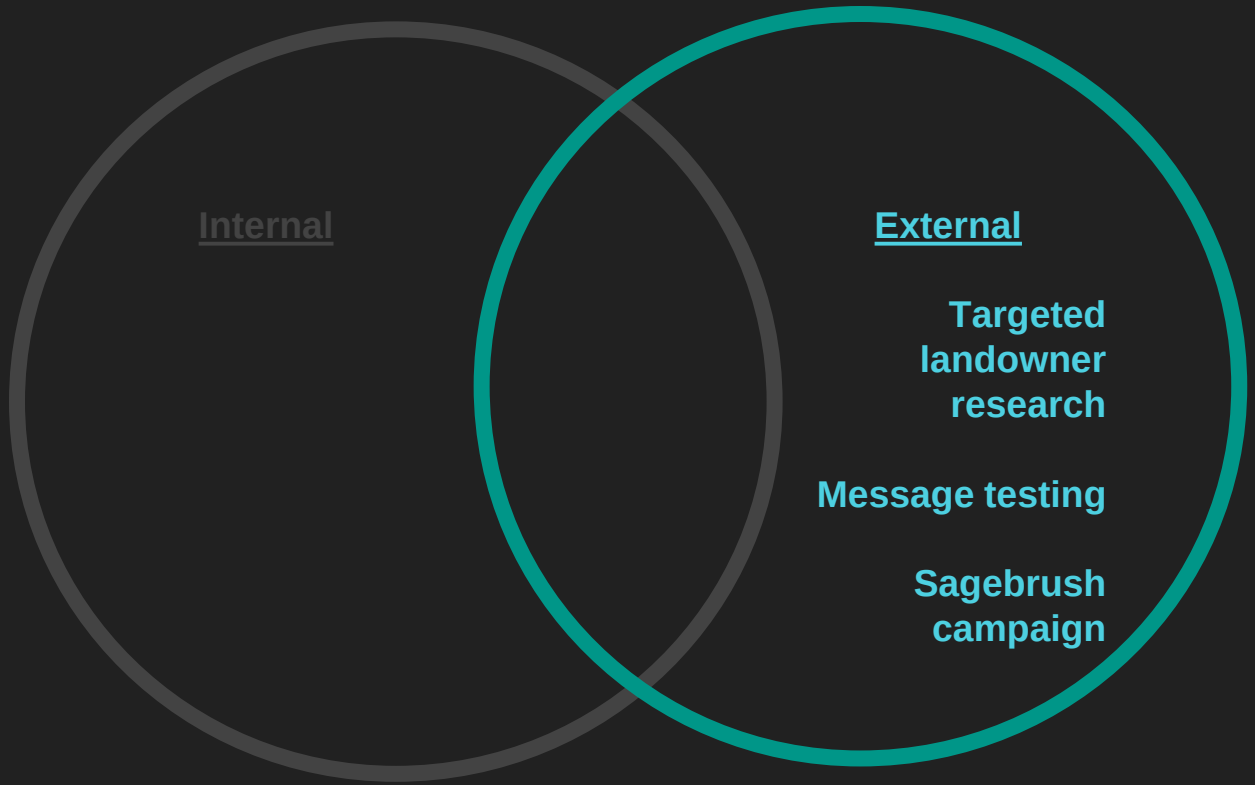
Electronic newsletter/info sharing

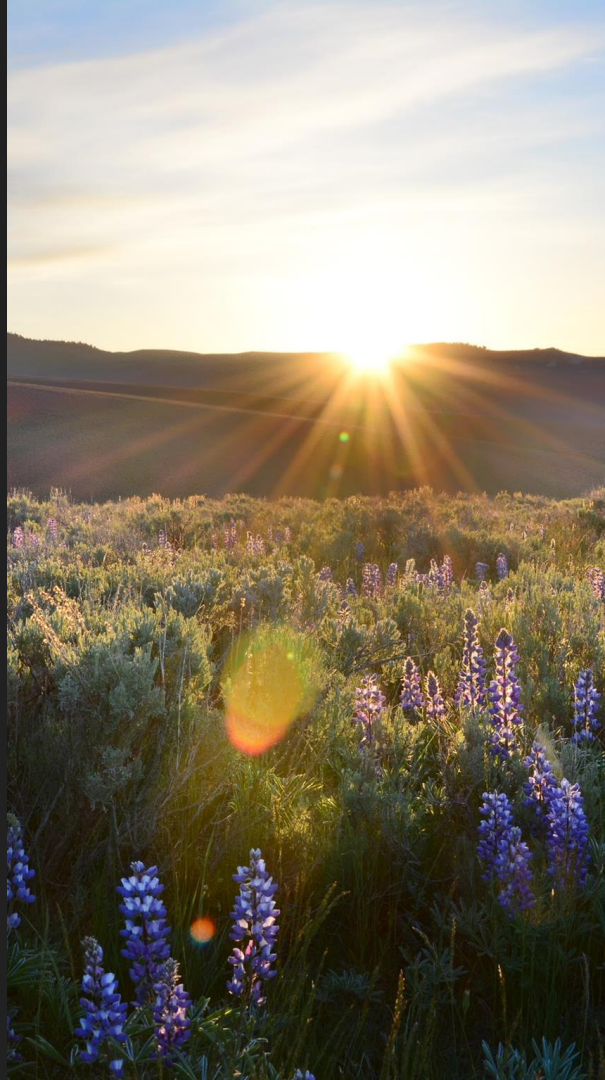
In-person meetings

Training

External

External Communication Tools





We’re Your Sagebrush Salespeople

What You Can Do Today

Tell us your story! Contact us!

(We will be contacting you.)

Let’s get the right story out now, before someone else does with their own motivations.

Contact Us

Daly Edmunds (Audubon)	dedmunds@audubon.org
Alison Holloran (Audubon)	aholloran@audubon.org
Hannah Ryan (IWJV)	hannah.ryan@iwjv.org
Amanda Smith (FWS)	amanda_smith@fws.gov
Jennifer Strickland (FWS)	Jennifer_Strickland@fws.gov
San Stiver (WAFWA)	stiver@cableone.net

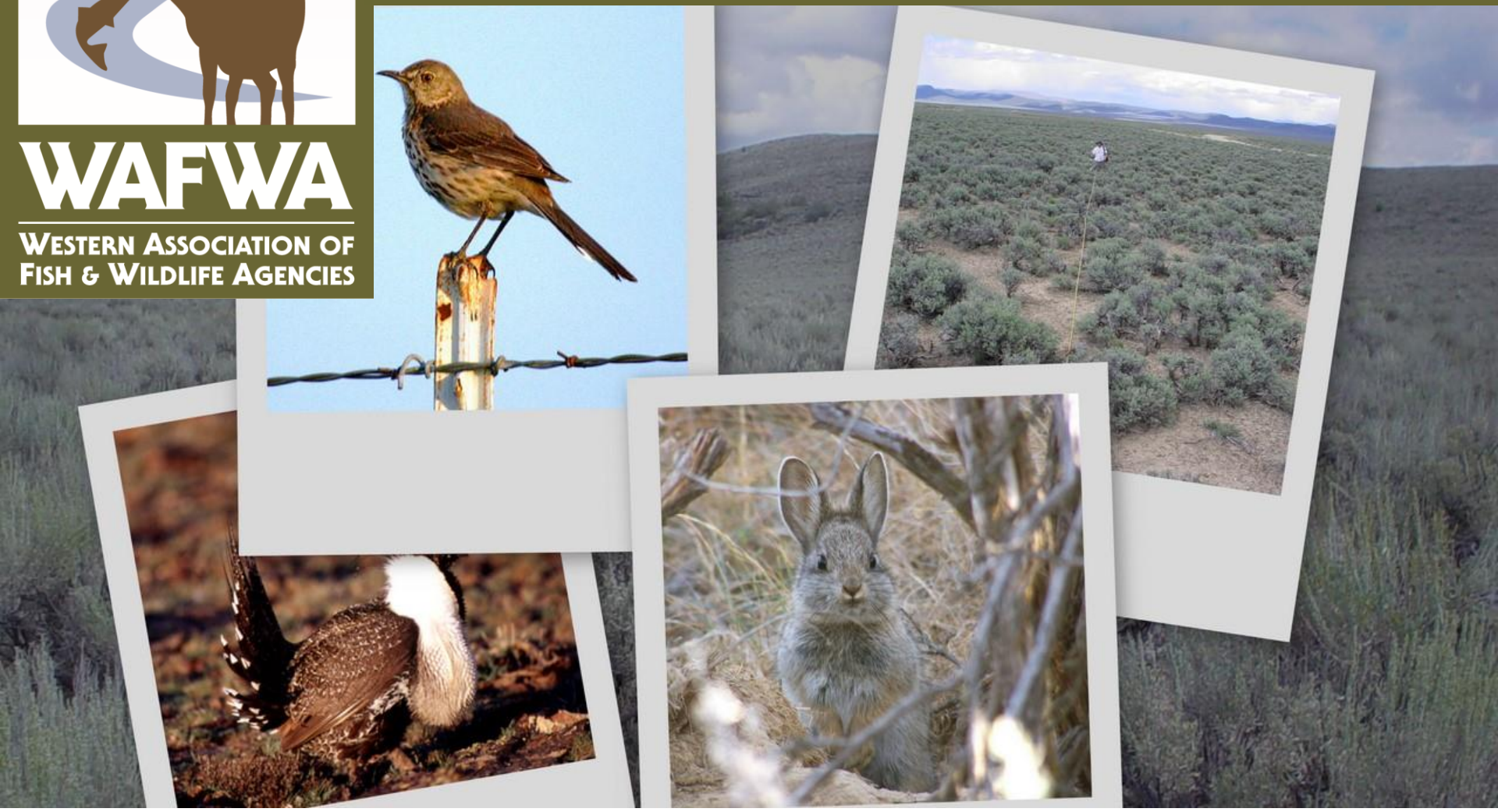
WAFWA

WESTERN ASSOCIATION OF FISH & WILDLIFE AGENCIES

Sagebrush Conservation Strategy Workshop

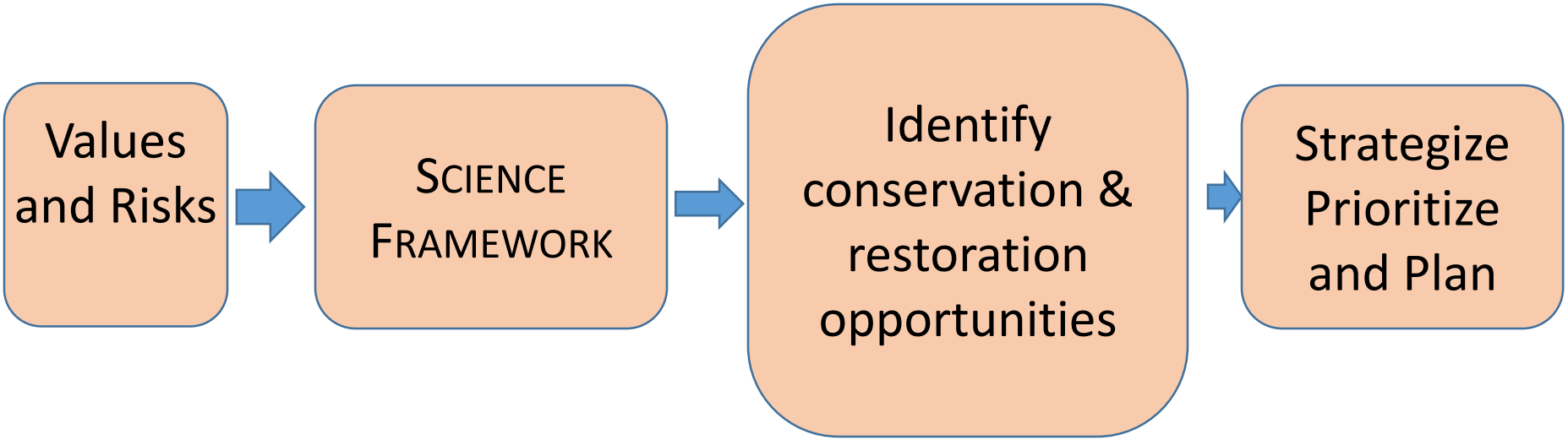
November 1-3, 2016

Embassy Suites – Denver, Colorado



Integrative Focus
Work Group Reports

- Communications/Outreach
- Climate Change
- Sagebrush Communities/Landscape Ecology
- Invasives
- Program & Policies Synthesis



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

Challenges & Opportunities for Conservation

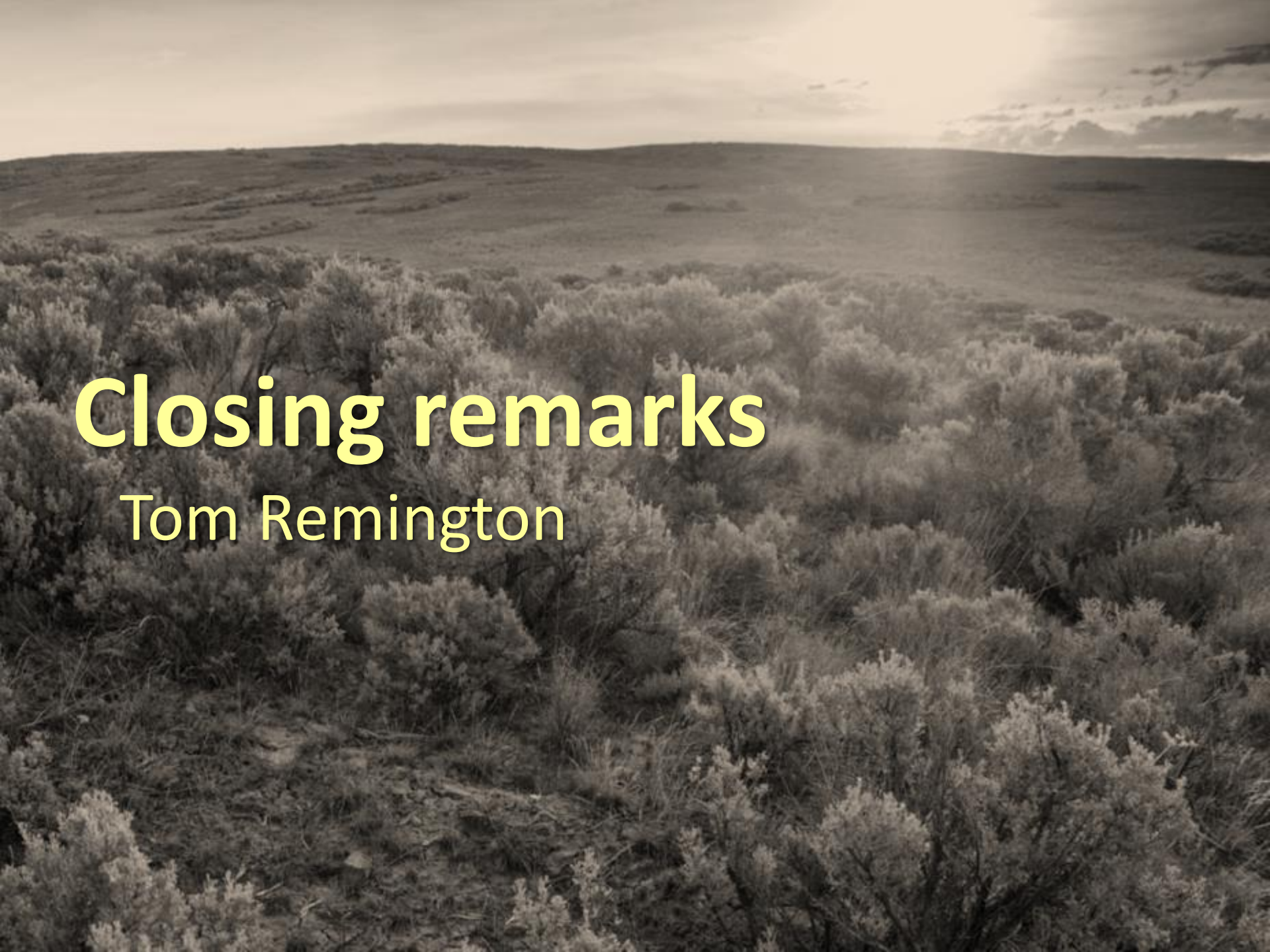
Susan Hayman

Sagebrush Sea Conservation: Looking to the Future

Janice Schneider, Department of Interior

Path Forward

Ken Mayer, WAFWA
Tom Remington



Closing remarks

Tom Remington