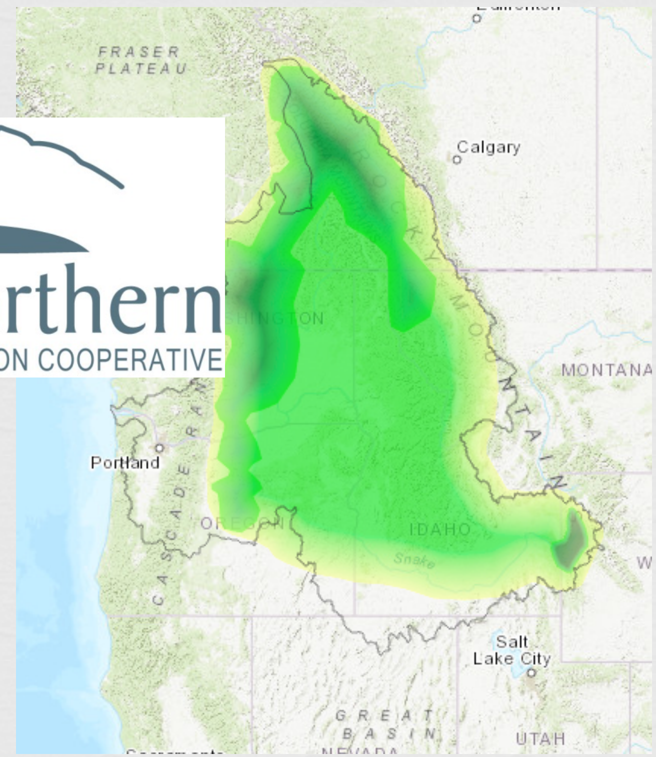
Using the Three Step Decision Framework

To Develop Protection, Restoration and Enhancement Strategies for Greater Sage-Grouse

8th Annual Northwest Climate Conference • 10 October 2017 • Tacoma, WA

Working Relationships

Columbia Basin Partner Forum



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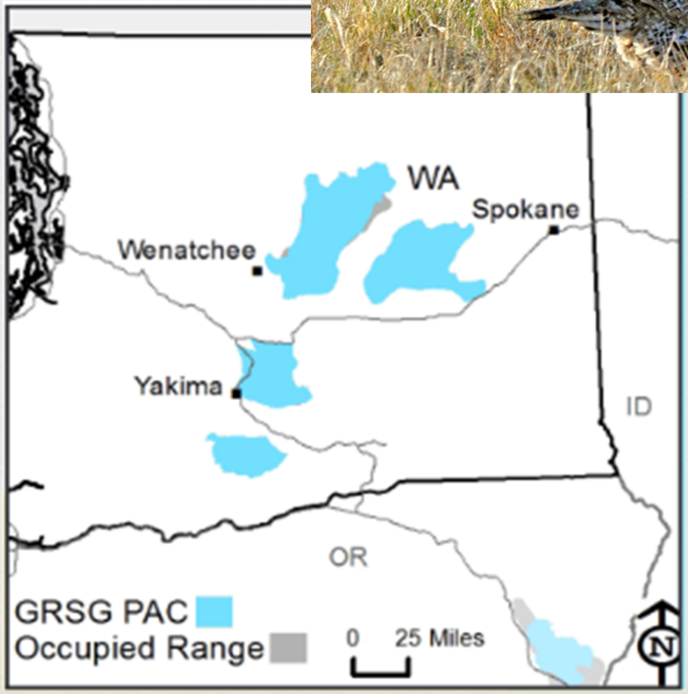
ROCKY MOUNTAIN PARTNER FORUM

Greater Sage-Grouse

in the Columbia Basin of Washington

- Four extant populations
  - All geographically isolated from external populations
- Shrub-steppe Obligate
- Associated with:
  - Riparian
  - Wetlands
- Major non-climate Threat:
  - Land Conversions
  - Fragmentation



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A Bird Well Studied …

- Listing Reviews (rangewide, western populations, CP DPS)
- Long-term population index monitoring via lek counts
- Google Scholar lists >1,000 publications on the species since 2010

Notable Management & Planning Documents include:

- Washington State Wildlife Action Plan (http://wdfw.wa.gov/conservation/cwcs/)
- WDFW Greater Sage-grouse Ecology page (http://wdfw.wa.gov/conservation/research/projects/grouse/greater_sage-grouse/)
- Washington State Recovery Plan (http://wdfw.wa.gov/publications/00395/)
- Columbia Basin Landscape Conservation Design (https://www.sciencebase.gov/catalog/item/53fbab92e4b040acab80df7a)
- Science Framework for the Conservation and Restoration Strategy (https://www.fs.usda.gov/treesearch/pubs/52275)

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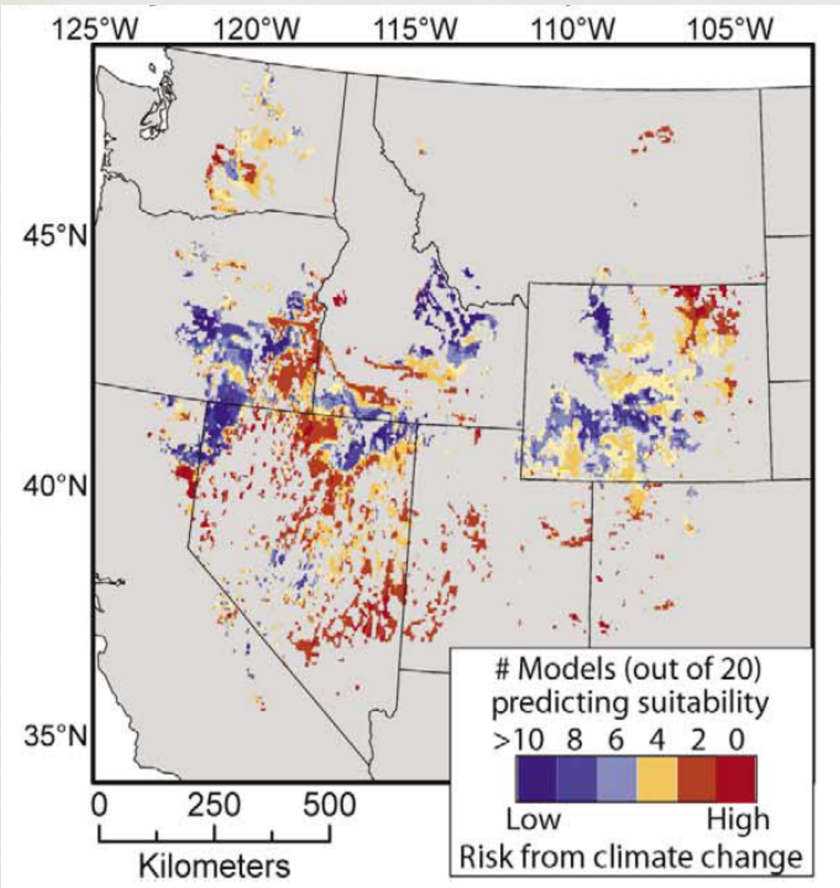
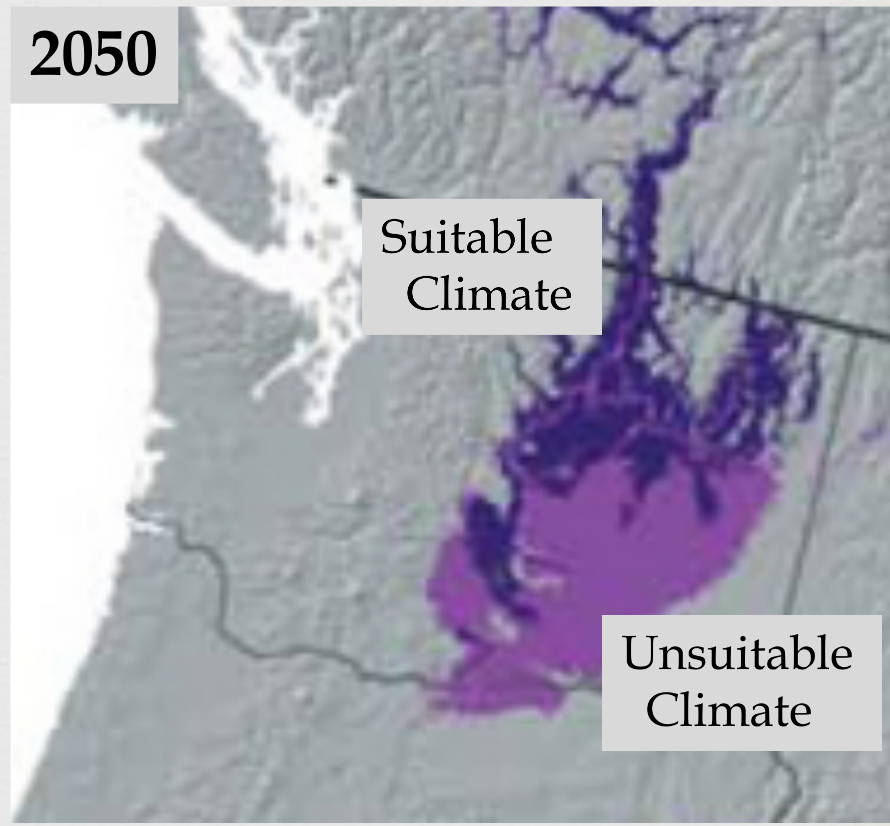
Climate Suitability: Sagebrush



Ensemble projection for 2100 (after Bradley 2010)



(after Still and Richardson 2015)

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Key Vulnerability Components

Washington State Wildlife Action Plan

Conservation Objectives Team (COT) Report

GRSG: ecology and conservation of a landscape species

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Key Vulnerability Components

Conservation Target	Greater Sage-grouse
Habitat Type	Shrub-Steppe / Grasslands
Related Habitat Types	Wetlands, Riparian Floodplain
Geographic Scope	GRSG Priority Areas for Conservation
Key Vulnerability	**Habitat Suitability**
Habitat Attributes	Sagebrush (presence, vigor) Diverse Forb & Grass Components Adjacent mesic habitats (wetland, riparian) Grass (stubble) height
Key Vulnerability	**Competition / Species Interactions**
Habitat Attributes	Invasive Annual Grass Invasive Forbs Arthropod Prey Abundance Vulnerability to Predators
Key Vulnerability	**Connectivity**
Habitat Attributes	Genetic Connectivity (reproduction) Demographic Connectivity (distribution) Dispersal

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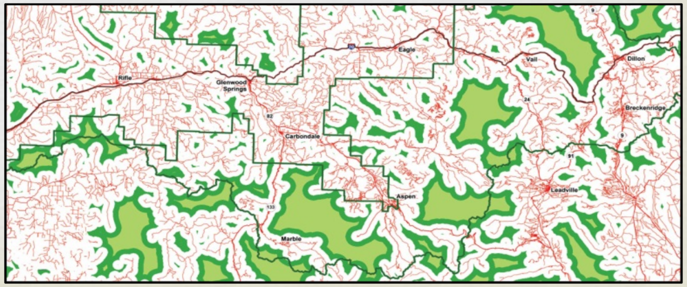
Vulnerability Levels

Climate Change Vulnerability Factors	Increasing Vulnerability to Climate Change		
Habitat Suitability	Habitat likely to remain or become suitable	Habitat likely to become marginal	Habitat likely to become suitable
Threats from Non-Native Species	Threat from annual grass invasions likely to be low		Threat from annual grass invasions likely to be high
Connectivity and Landscape Context	Population likely to connect		Population likely to remain or become isolated



3 Steps of the Framework

Assess vulnerability of selected population

Use vulnerability matrix to clarify management goals and select adaptation strategies

Select actions to implement chosen adaptation strategies

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Assess vulnerability of selected population

STEP 1: Assess Vulnerability of Greater Sage-grouse to Climate Change

Key Factors of Vulnerability	Habitat Suitability: To what extent will climate change alter sagebrush community composition, structure and function?	Threats from Non-Native Species: To what extent will climate change increase the threat that non-native plant invasions present to Greater Sage-grouse?	Connectivity and Landscape Context: To what extent will climate change alter the degree of connectivity of the population to a larger network of populations and suitable habitat?
e-related Questions to Consider	Will precipitation amounts, timing and form (rain/snow) remain consistent enough to support native plant populations and assemblages?	Are diverse native plant forage species currently present and abundant?	Is the focal Greater Sage-grouse population currently isolated, or are they connected to a larger network of populations and habitat?
	Will the area experience 3 or more drought years per decade?	Might climate change alter populations of native shrubs, forbs and grasses through altered fire cycles?	If currently connected to a larger network, do you expect this connectivity to remain giving changing climate conditions (e.g., is the existing habitat vulnerable to fragmentation by as climate changes)?
	Are key habitat structure and composition (e.g., big sagebrush presence, abundant diverse native forbs and shrubs) expected to remain or become suitable as climate changes?	Could climate change potentially further reduce the Greater Sage-grouse population's forage species?	Is there currently or is it expected that sagebrush-dominated communities will include ≥ 25% of the landscape?
	Will arthropod population abundance and diversity remain or become suitable to support adult and juvenile sage-grouse survival?	Will exotic annual grasses or other non-native weedy plant species expand their range or increase in density and exclude presence and abundance of native forbs and perennial grasses?	Are features present (>4 humans/km^2, agriculture, urban, other non-habitats) that could become barriers to sage-grouse movement under changing climate?
	Could climate-driven changes in human resource use (e.g., altered grazing intensity) affect Greater Sage-grouse habitat quantity or quality?		Are sagebrush patches expected to be equal to exceed (metric) in size now and in the future?
	Are sagebrush leaves expected to be available (exposed above snow cover) in winter?		Is the Greater Sage-grouse population likely to persist given changing climate conditions and associated extreme events?
	Is the Greater-Sage-grouse population naturally more resilient to changing climate conditions?		Are climate-driven changes likely to interfere with extent, persistence or juxtaposition of key Greater-Sage-grouse habitats (e.g., expansive sagebrush dominated stands, riparian and wetland habitats, seasonal mesic shrub/grass availability)?

Are diverse native plant forage species currently present and abundant?

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Use vulnerability matrix to clarify management goals and select adaptation strategies

Assess Vulnerabilities			
	Considering your answers above, choose the most appropriate level of vulnerability of the population to climate change effects on sagebrush community composition, structure and function:	**Considering your answers above, choose the most appropriate level of vulnerability of the population to climate change effects on non-native plant invasions:**	**Considering your answers above, choose the most appropriate level of vulnerability of the population to climate change effects on connectivity and landscape context:**
	A - Habitat likely to remain or become suitable	D - Threats from non-native plant invasions likely to be low	F - Population Likely to be connected to a larger network
	B - Habitat likely to become marginal (i.e., at or near thresholds for focal species)	E - Threats from non-native plant invasions likely to be high (because already present of likely to increase)	G - Population likely to remain or become isolated
	C - Habitat likely to become unsuitable		
	Answer: ________________	**Answer: ________________**	**Answer: ________________**

If you answered:	Go to Box:		If you answered:	Go to Box:		If you answered:	Go to Box:
A D F	1		B D F	2		C D F	3
A D G	4		B D G	5		C D G	6
A E F	7		B E F	8		C E F	9
A E G	10		B E G	11		C E G	12

Use vulnerability matrix to clarify management goals and select adaptation strategies

STEP 2: Use Vulnerability Matrix to Clarify Management Goals and Select Climate Adaptation Strategies

		Habitat Remains or Becomes Suitable	Habitat Becomes Marginal	Habitat Becomes Unsuitable
Population is Connected to a Larger Network	Low Threat from Non-Native Plant Invasions	Relative vulnerability to Climate Change: **Low – BOX 1**	Relative vulnerability to Climate Change: **Medium – BOX 2**	Relative vulnerability to Climate Change: **Medium-High – BOX 3**
		Relative value for conservation: High values in both the short and long term.	Relative value for conservation: Potential value over long term, but will likely require investment to moderate climate impacts	Relative value for conservation: Potential value in the short term to help with population recovery, maintenance of genetic diversity and/or local adaptations; Longer-term value is lower due to decreasing habitat suitability
		Potential Goal: Protect and maintain (or improve if warranted) habitat supporting this population for long-term conservation of Greater Sage-grouse	Potential Goal: Improve the suitability of habitat supporting this population for long-term conservation of Greater Sage-grouse	Potential Goal: Maintain population in the short-term; In the longer-term, consider facilitating the movement of current population to other locations with more suitable conditions, facilitating the transition of the location to a new state, and/or managing the location for other targets/objectives
		Strategies: • Maintain resistance from non-native plant invasions •Maintain resilience to wildfire •Maintain grazing pressure at or below current level •Prioritize wildfire fighting resources •Expand/Refound Populations •Maintain ecological connectivity •Reduce non-climate stressors	Strategies: •Promote resistance to non-native plant invasions •Minimize cattle grazing pressure •Remove wild horses •Prioritize wildfire fighting resources •Expand/Refound Populations •Maintain ecological connectivity •Reduce non-climate stressors	Strategies: •Facilitate plant community transition •Remove cattle grazing •Remove wild horses •Prioritize wildfire fighting resources •Maintain ecological connectivity •Reduce non-climate stressors •Consider moving Sage-grouse to better habitat
	High Threat from Non-Native Plant Invasions	Relative vulnerability to Climate Change: **Medium-Low – BOX 4**	Relative vulnerability to Climate Change: **Medium-High – BOX 5**	Relative vulnerability to Climate Change: **High – BOX 6**
		Relative value for conservation: High values in both the short and long term, but may require investment to prevent/remove/suppress non-native plant invasions	Relative value for conservation: Potential value over long term, but will require a high level of investment to both moderate climate impacts and prevent/remove/suppress non-native plants	Relative value for conservation: Potential value in the short term to help with population recovery, maintenance of genetic diversity and/or local adaptations but will require investment to prevent /remove/suppress non-native plants; Longer-term value is lower due to decreasing habitat suitability
		Potential Goal: Prevent invasion of non-native plants (or remove/suppress if already present) and protect and maintain (or improve if warranted) habitat of this population for long-term conservation of Greater Sage-grouse	Potential Goal: Prevent invasion of non-native plants (or remove/suppress if already present) and improve the suitability of habitat supporting this population for long-term conservation of Greater Sage-grouse	Potential Goal: Facilitate the movement of current population to other locations with more suitable conditions; Facilitate the transition of the location to a new state; Consider managing the location for other targets/objectives
		Strategies: •Manage for resistance to non-native plant invasions •Maintain resilience to wildfire •Expand/Refound Populations •Promote ecological connectivity •Reduce non-climate stressors	Strategies: •Restore resistance to non-native plant invasions •Prioritize for non-native plant management and wildfire prevention •Minimize cattle grazing pressure •Remove wild horses	Strategies: •Consider experimental approaches to restore resistance to non-native plant invasions •Facilitate plant community transition •Remove cattle grazing •Remove wild horses

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Use vulnerability matrix to clarify management goals and select adaptation strategies

In this example …

- Habitat Remains or Becomes Suitable
- Populations Remain or Become Isolated
- Low Threat from Non-Native Grass Invasions

…The Users get a summary of

- Population's relative vulnerability
- Relative value for conservation
- Population-specific potential goals and strategies

Relative vulnerability to Climate Change: **Medium-Low – BOX 7**
Relative value for conservation: Potential value for providing genetic diversity and/or local adaptations in both the short and long term, but will likely require investment to address fragmentation
Potential Goal: Evaluate representativeness of this population across the landscape, and determine what level of protection/reconnection to other habitats is warranted
Strategies: • Maintain resistance from non-native plant invasions • Maintain resilience to wildfire • Expand/Refound Populations • Recover ecological connectivity with adjacent landscapes • Reduce non-climate stressors • Augment genetic diversity

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Strategy to Action

Select actions to implement chosen adaptation strategies

Strategies:
- Maintain resistance from non-native plant invasions
- Maintain resilience to wildfire
- Expand/Refound Populations
- Recover ecological connectivity with adjacent landscapes
- Reduce non-climate stressors
- Augment genetic diversity

Actions "Menu" drawn from locally-relevant conservation plans

(i.e., SWAP, Yakama Climate Adaptation Strategy)

Strategy	Objective	Example Actions
Maintain resistance from non-native plant invasions	Prevent non-native plants (especially exotic annual grasses) from gaining a foothold	• Emphasize funding for early detection, rapid response • Regular monitoring for early detection of invasions • Rapid Response strategy to quickly treat invasive plant detections • Curtail invasion vectors • Enhance native plant communities to promote natural resilience • Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation (SWAP) • Update and implement the 2009 Integrated Weed Management Plan (YN) • Invasive species control (cheatgrass in particular) (SWAP) • Mechanical and herbicide control of invasive species (SWAP)

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Decision Support

Select actions to implement chosen adaptation strategies

Framework provides:

- Scaling: How widespread are challenges & solutions?
- Triage: Which populations warrant conservation investment?
- Cost/Benefit: Where is best bang for buck?
- Actions: What should be done? And how much confidence do we have in those actions?
- Roles: Who among partners is most poised for a given action?

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Cross Reference with Sympatric Decision Processes

Common structure enables a consistent, collaborative approach

to landscape-scale, climate smart conservation planning and implementation

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Outcomes

- Structured approach to integrate Vulnerability into landscape-scale management decisions
- Coordinated decision process informed by best-available science
- Opportunity for inter-organizational coordination across species & ecosystem management
- Framework for scaled & replicated conservation action treatment evaluation
- Integration pathway to manage for climate change resilience at a landscape scale

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