

Climate adaptation in Western National Forests: Defining vulnerability to guide land management



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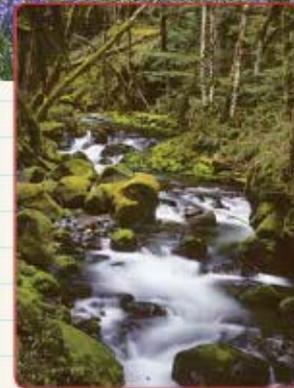
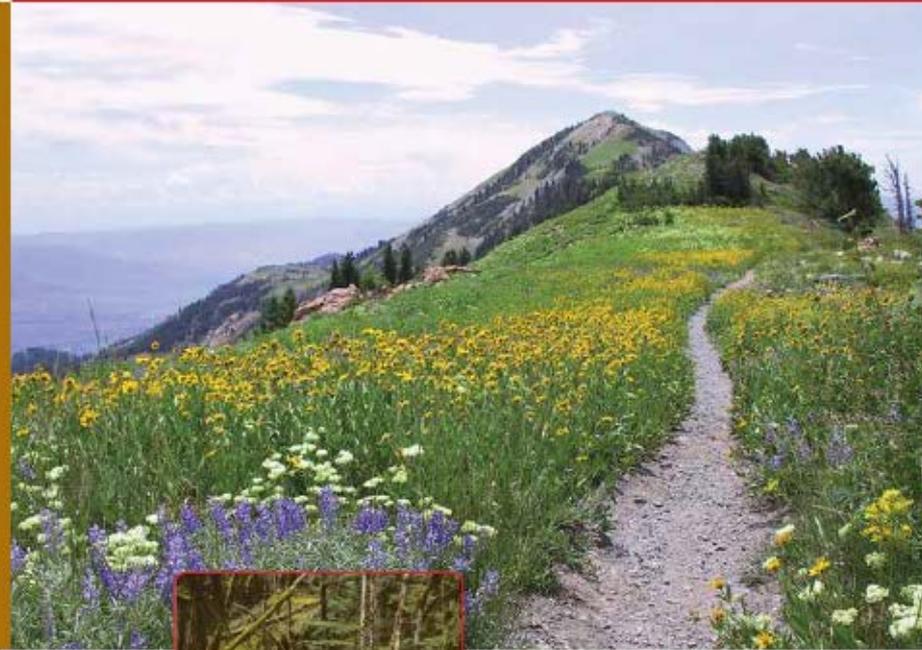
Guidance to the Field Units on Responding to Climate Change

The goal is to have climate change considerations in land management within the Forest Service by 2015.

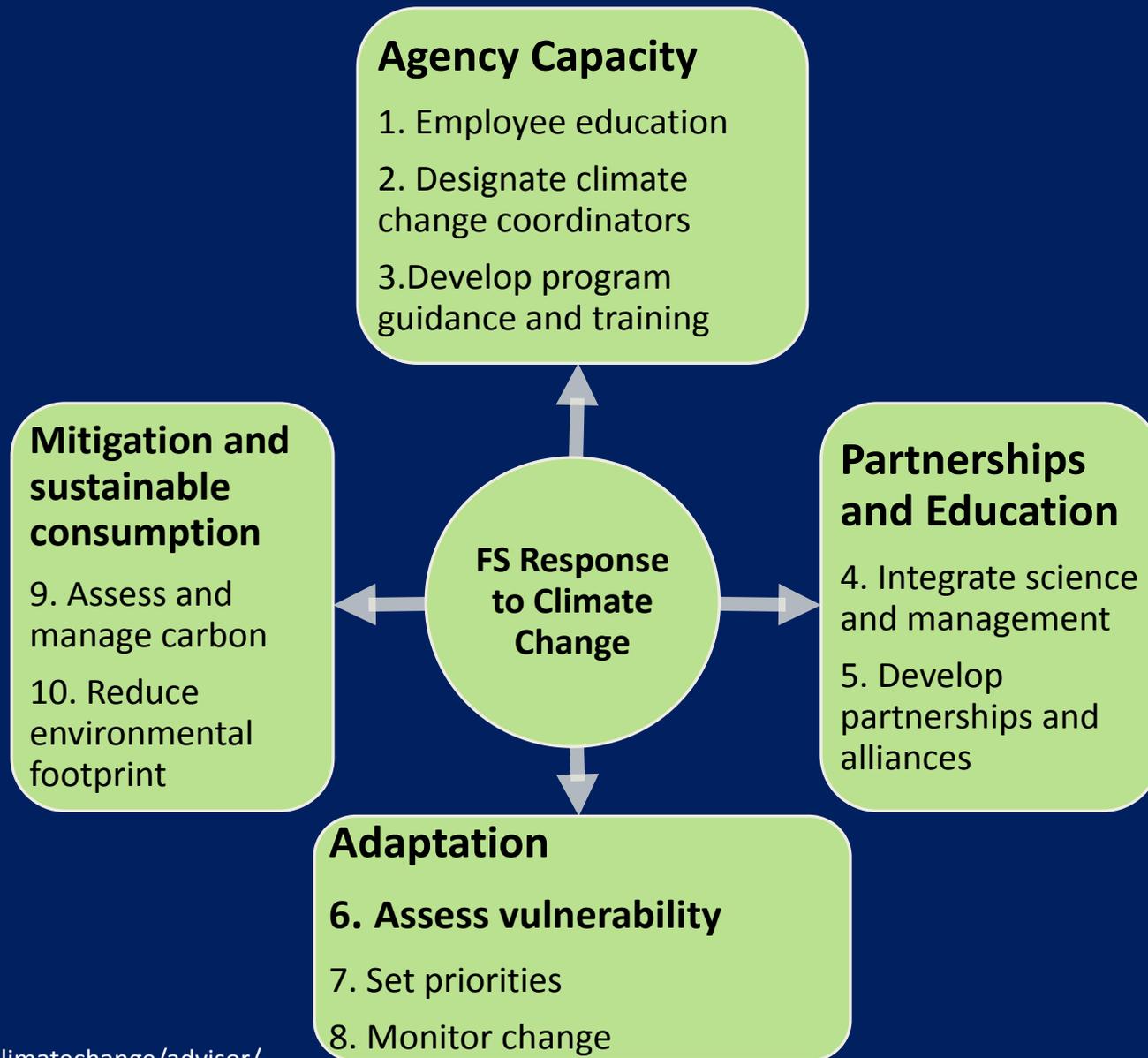
National Roadmap for Responding to Climate Change



Forest Service
FS-957b
February 2011



Forest Service Performance Scorecard

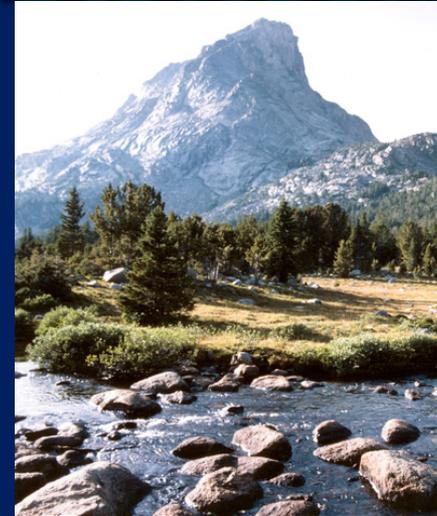


Vulnerability Assessments

Regional Scale

vs.

Forest Scale



Qualitative '30,000 ft level'

- Expert and literature based
- Provides a foundation to begin developing adaptation strategies
- Helps identify topics that may warrant future detailed analysis

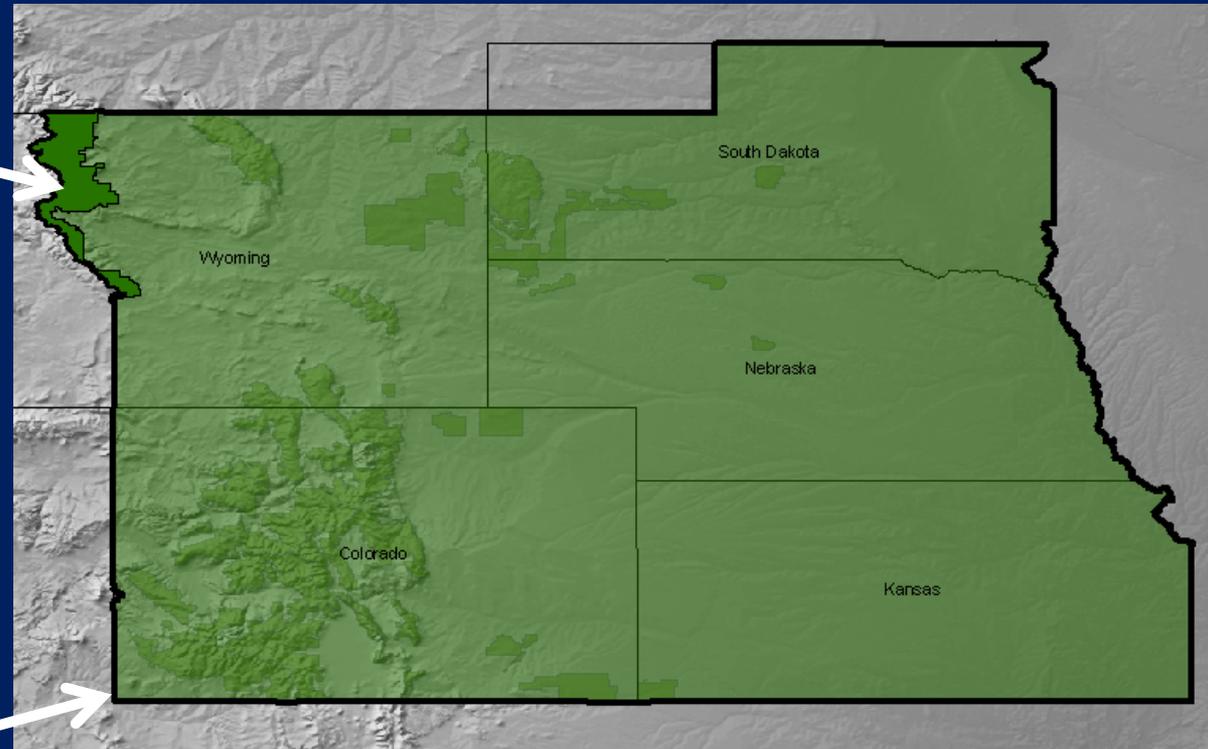
Quantitative

- Data intensive
- Spatially detailed information for conservation and monitoring project planning

Forest Service Regional and Forest Scale Vulnerability Assessments

Shoshone NF

- Key Resources:
 - Yellowstone cutthroat trout
 - Aspen
 - Water availability

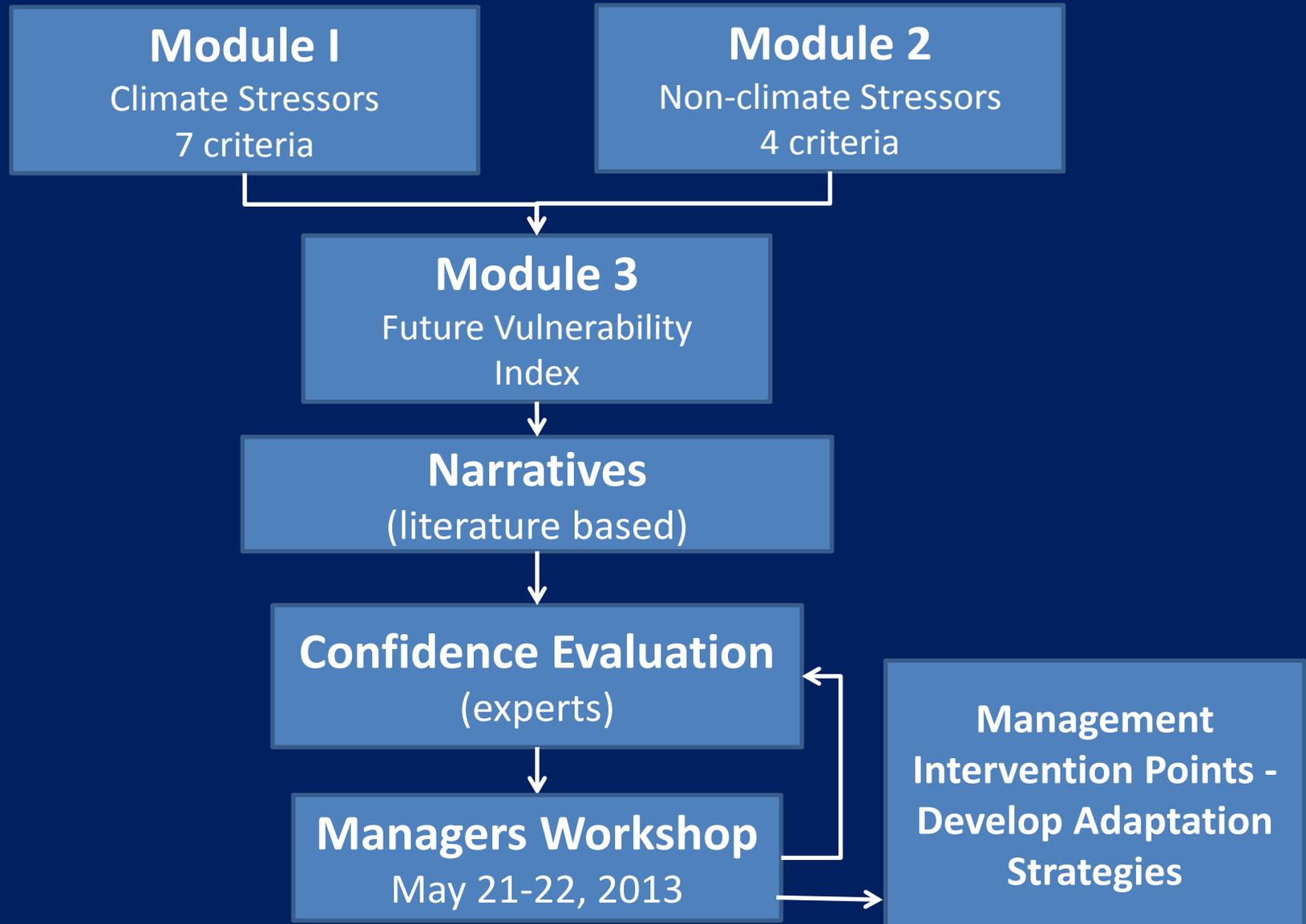


Rocky Mountain Region Vulnerability Assessments

- 6 Priority Ecosystems:
Ponderosa pine, alpine, subalpine spruce-fir, low-gradient mountain streams, glaciated valley wetlands, and Great Plains Streams

Regional Scale Vulnerability Framework

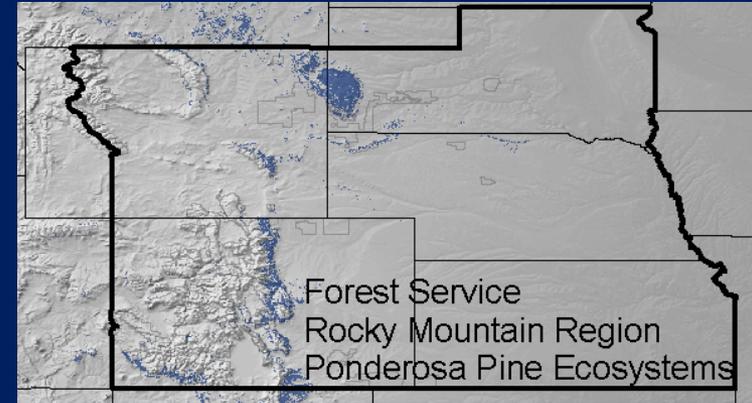
Modified NEAFWA



Regional Scale Vulnerability Assessment for Ponderosa Pine

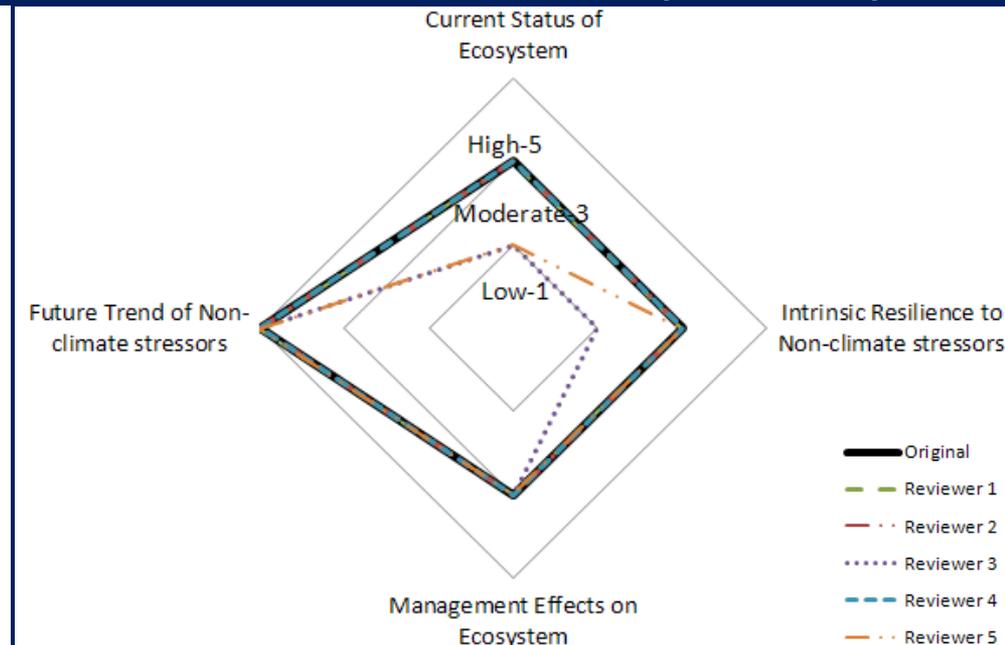
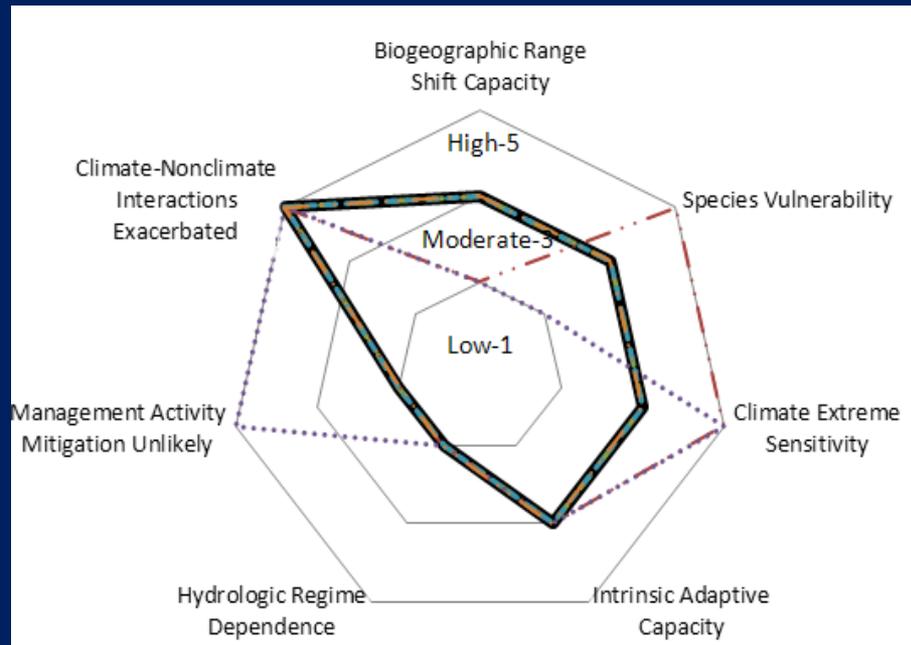
Vulnerability Ranking:
MODERATELY VULNERABLE

Confidence: **HIGH**



Climate Module 1 (7 criteria)

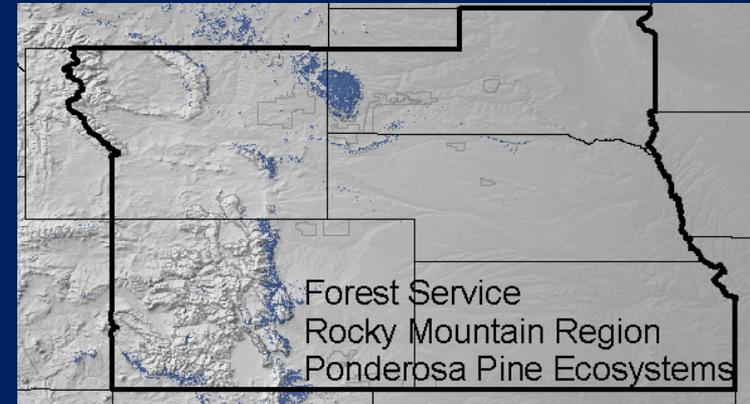
Non-Climat Module 2 (4 criteria)



Regional Scale Vulnerability Assessment for Ponderosa Pine

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Climate Module 1 (7 criteria)

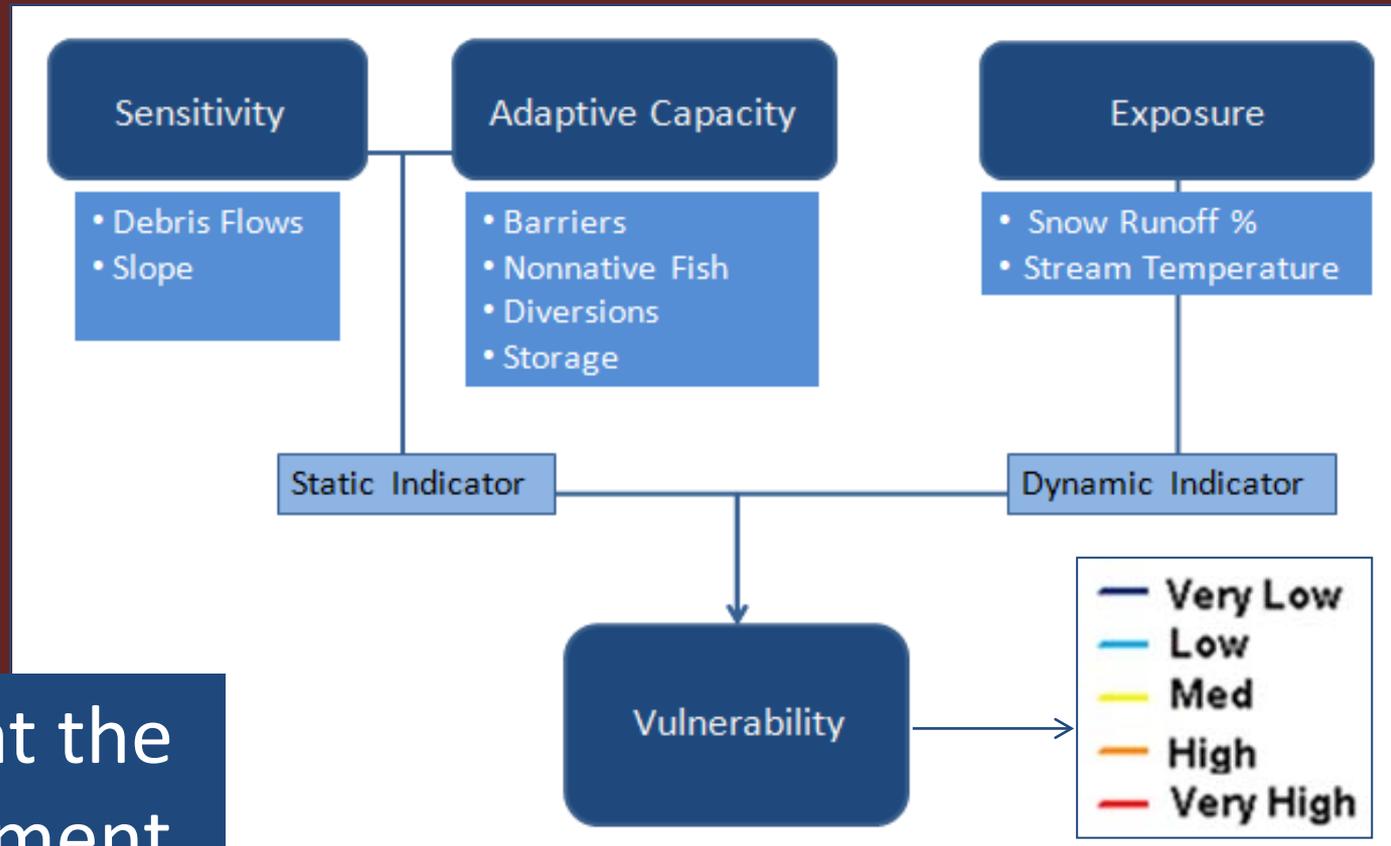
“...climate change may cause ponderosa pine ecosystems to undergo changes that could restructure distributions, reducing the ecosystem from lower montane elevations and expanding it into higher elevations. Elimination is unlikely...”

Non-Climat Module 2 (4 criteria)

“Non-climate factors have significantly altered the structure, function and disturbance regime of this ecosystem and will likely continue to do so in the future. Natural and human-caused disturbances (especially fire) are likely to continue to affect the structure, composition and function of this ecosystem...”

Shoshone National Forest Vulnerability Assessment Framework

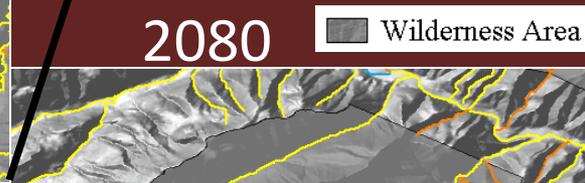
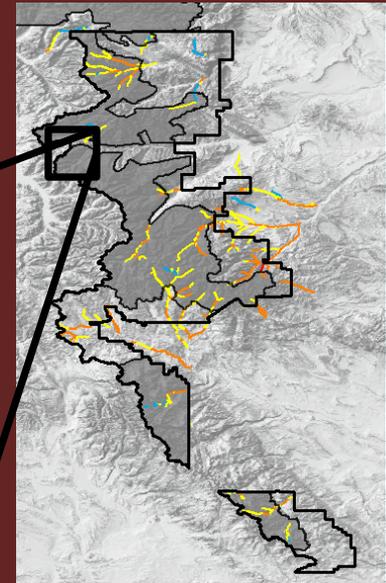
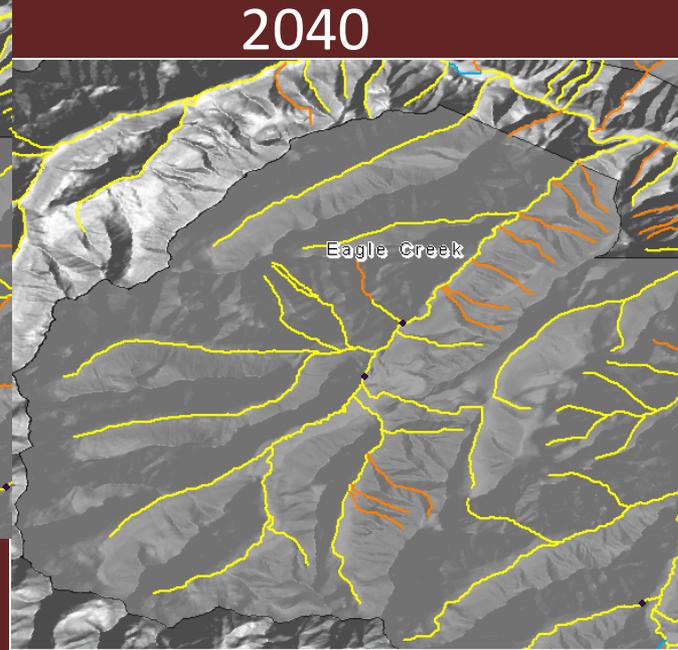
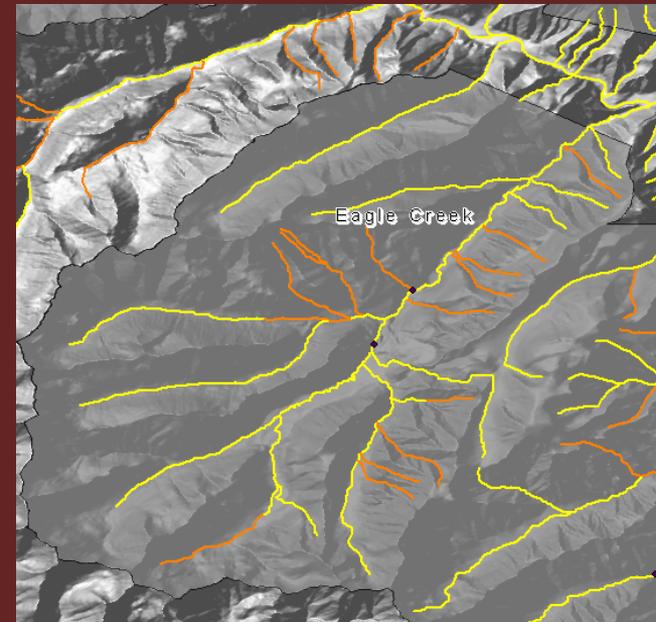
Yellowstone cutthroat trout



- Evaluated at the stream segment
- 3 climate models

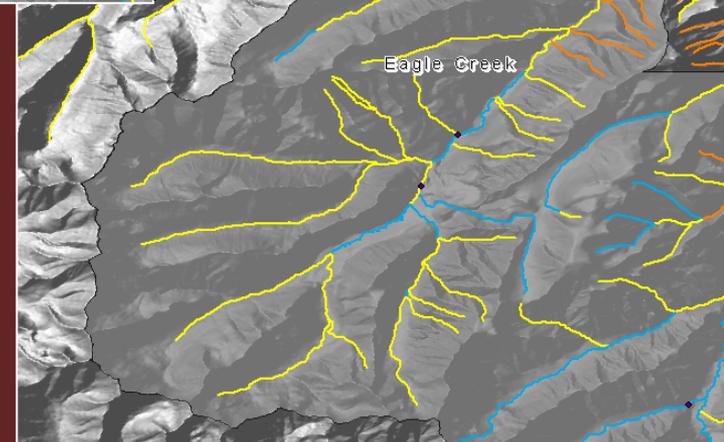
Modified from Glick et al., 2011 (National Wildlife Federation)

Potential Restoration Project Conditions Improve



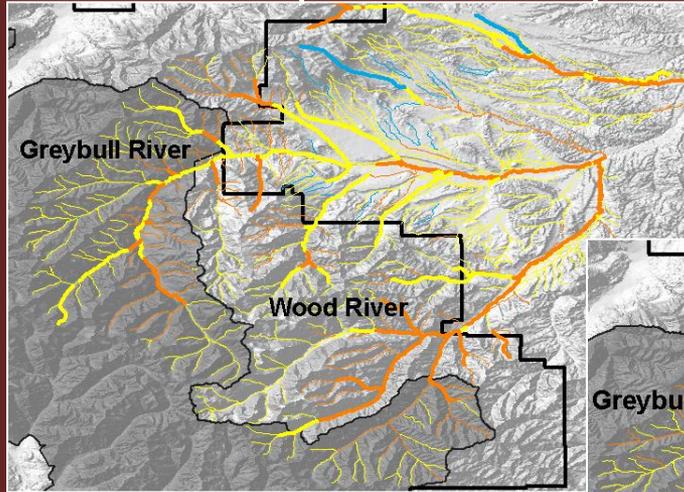
Historic (1915-2006)

	Stream Miles		
	<u>Historic</u>	<u>2040</u>	<u>2080</u>
— Very Low	0	0	0
— Low	0	0	10
— Medium	42	47	49
— High	22	17	5
— Very High	0	0	0



Conditions Don't Improve

Historic (1915-2006)

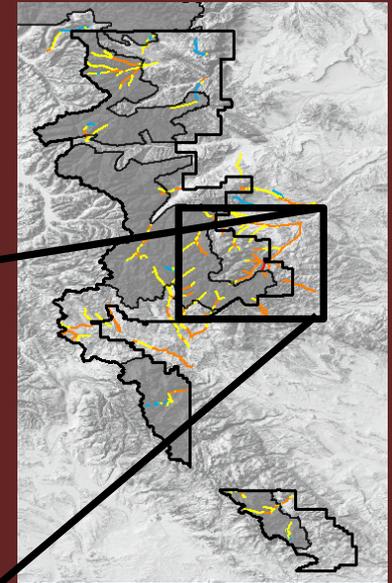
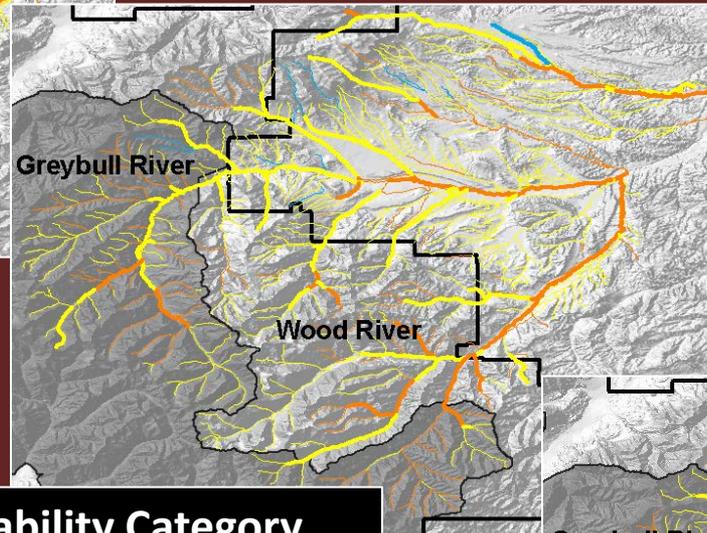


Yellowstone cutthroat trout
Vulnerability at Greybull and
Wood Rivers

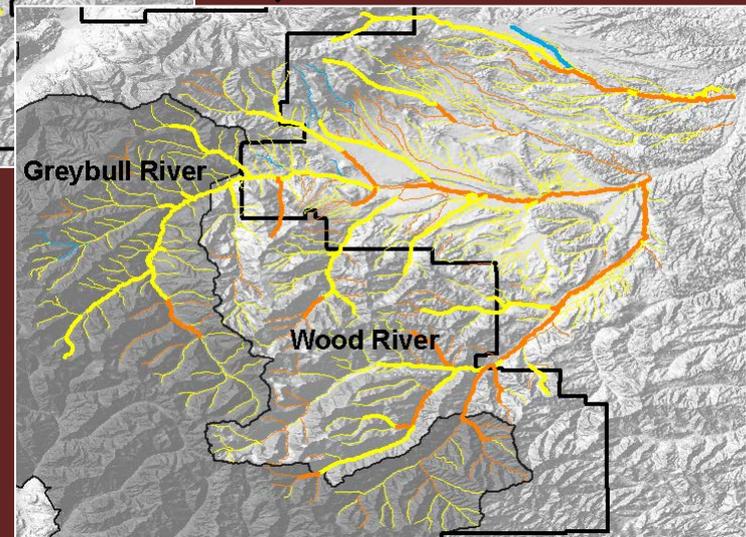


Thick lines:
YCT Conservation Population

2040



2080

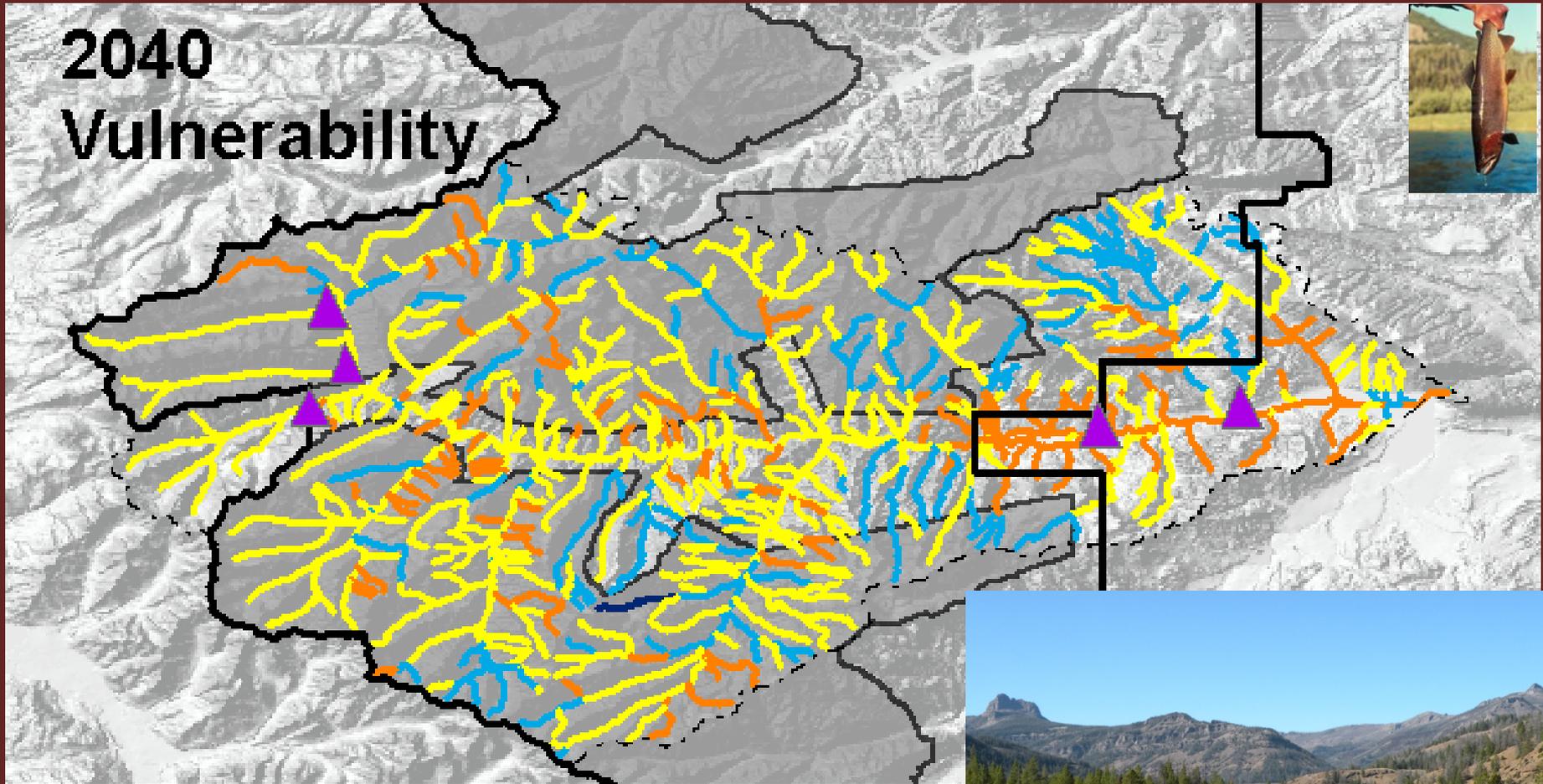


Stream Miles by Vulnerability Category

	<u>Historic</u>	<u>2040</u>	<u>2080</u>
— Very Low	0	0	0
— Low	58	32	23
— Medium	713	754	760
— High	321	306	309
— Very High	0	0	0

Monitoring - North Fork Shoshone River

2040
Vulnerability



- Very Low
- Low
- Medium
- High
- Very High

- Forest Boundary
- Wilderness Area
- 4th level HUC
- Historic Air-Stream
- Temp Measurement

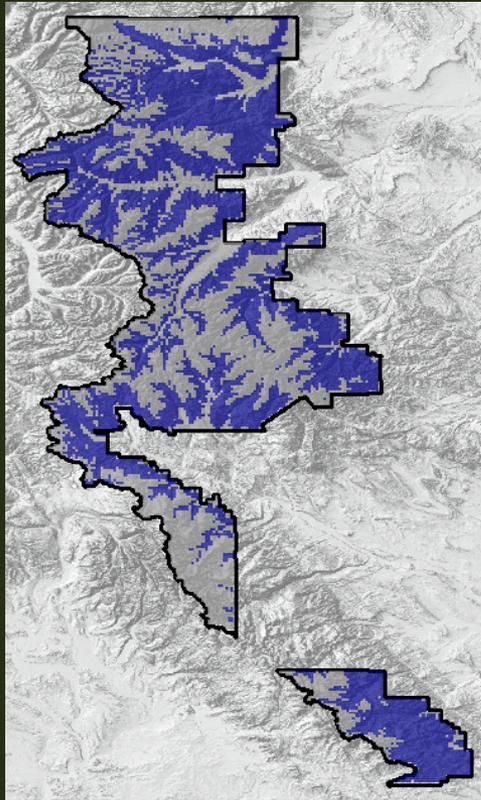


Shoshone Aspen Assessment

(Preliminary Results)

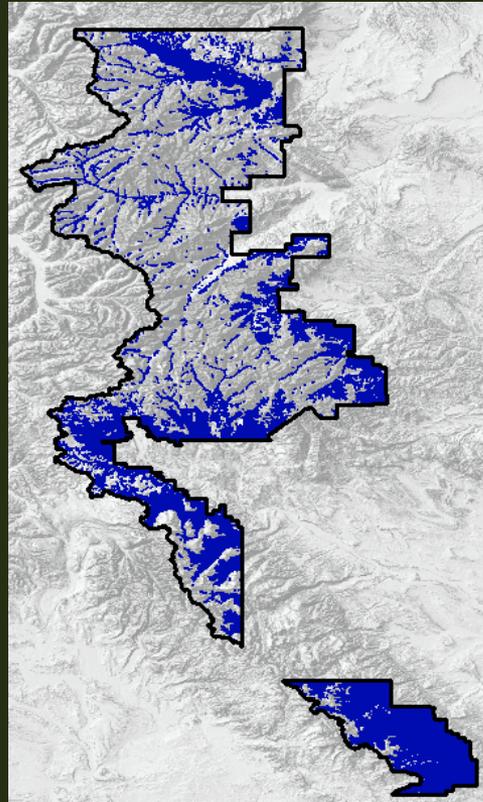


Bioclimatic projection
A1B 2030



■ Climate Viability
> 0.5 for aspen

Landscape conditions



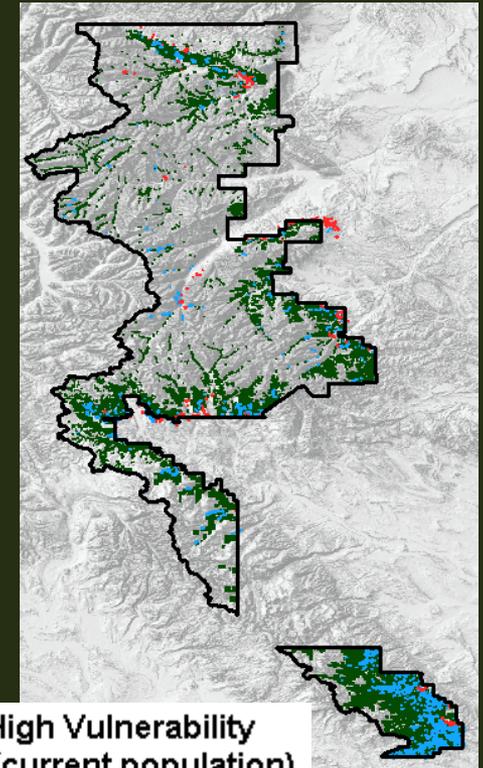
■ Regression
prediction of topo-
edaphically suitable
areas likely to
support aspen



Over-
lap



Aspen Vulnerability
A1B 2030



■ High Vulnerability
(current population)
■ Low Vulnerability
(current population)
■ Potential Aspen
Expansion Area
□ Forest Boundary

Key Points

- Regional vs. Forest scale
 - Different approaches – different utility
- Resource manager–Scientist–Expert interaction
 - Validation
- A valuable process
 - Can provide useful information for decision-making



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