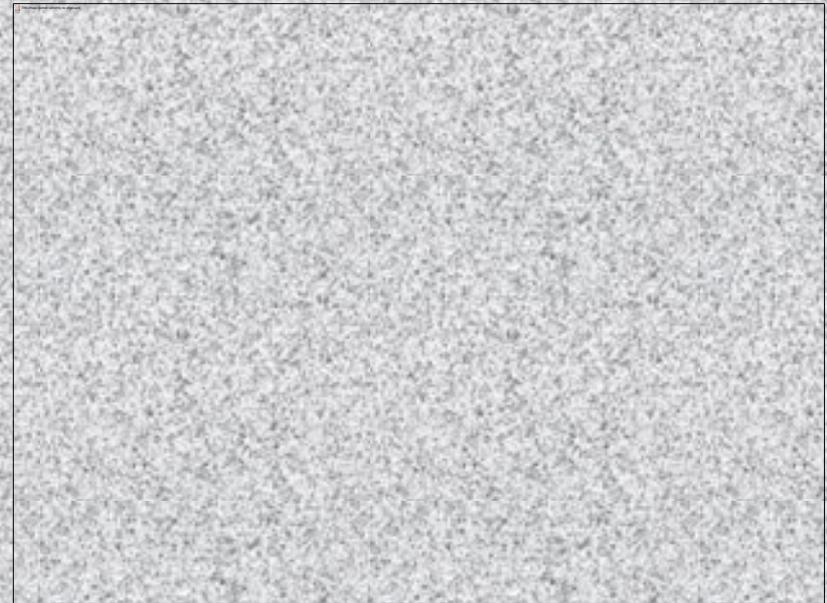


Incorporating Climate Change in Natural Resource Management

The impossible task in a 20 minute block of time.....



Jerry Krueger, PhD
Deputy Forest Supervisor
Black Hills National Forest

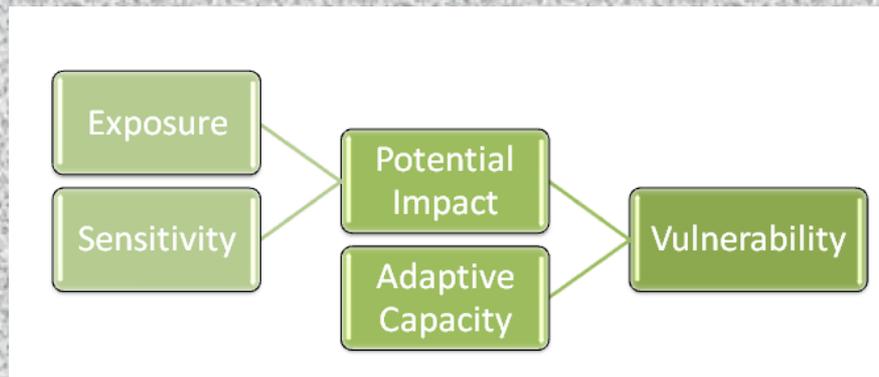
Climate Change Standards

Climate changes are likely to manifest in:

- slow changes in mean climate conditions
- increased interannual and seasonal variability
- increased frequency of extreme events

Our Common Challenge

- Federal lands -- addressing climate change is mandated.
- How will our Black Hills ecosystems respond
- Suffering from too much information?
- Too many players with no coordination
- Is research providing answers to YOUR questions?
- What suite of mitigation/adaptive management initiatives are worth the cost/effort?



Source: FS Northern Research Station

Availability of sub-regional climate change forecasts.

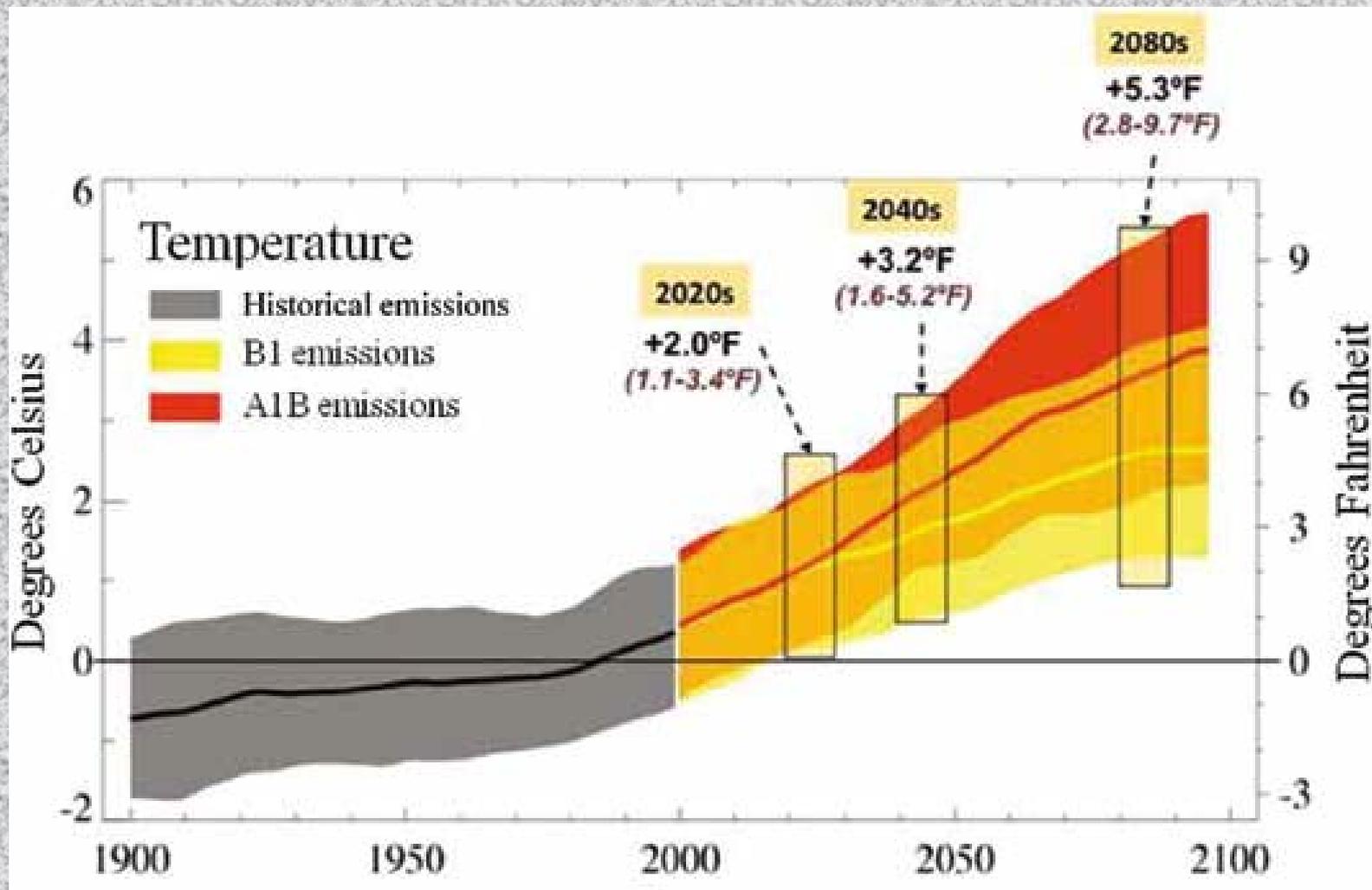
Table 1—Relevance of spatial scale for assessing vulnerability to climate change

	Spatial scale		
	Large ^a	Intermediate ^b	Small ^c
Availability of information on climate and climate change effects	High for future climate and general effects on vegetation and water	Moderate for river systems, vegetation, and animals	High for resource data, low for climate change
Accuracy of predictions of climate change effects	High	Moderate to high	High for temperature and water, low to moderate for other resources
Usefulness for specific projects	Generally not relevant	Relevant for forest density management, fuel treatment, wildlife, and fisheries	Can be useful if confident that information can be downscaled accurately
Usefulness for planning	High if collaboration across management units is effective	High for a wide range of applications	Low to moderate

^a More than 10 000 km² (e.g., basin, multiple national forests).

^b 100 to 10 000 km² (e.g., subbasin, national forest, ranger district).

^c Less than 100 km² (e.g., watershed).

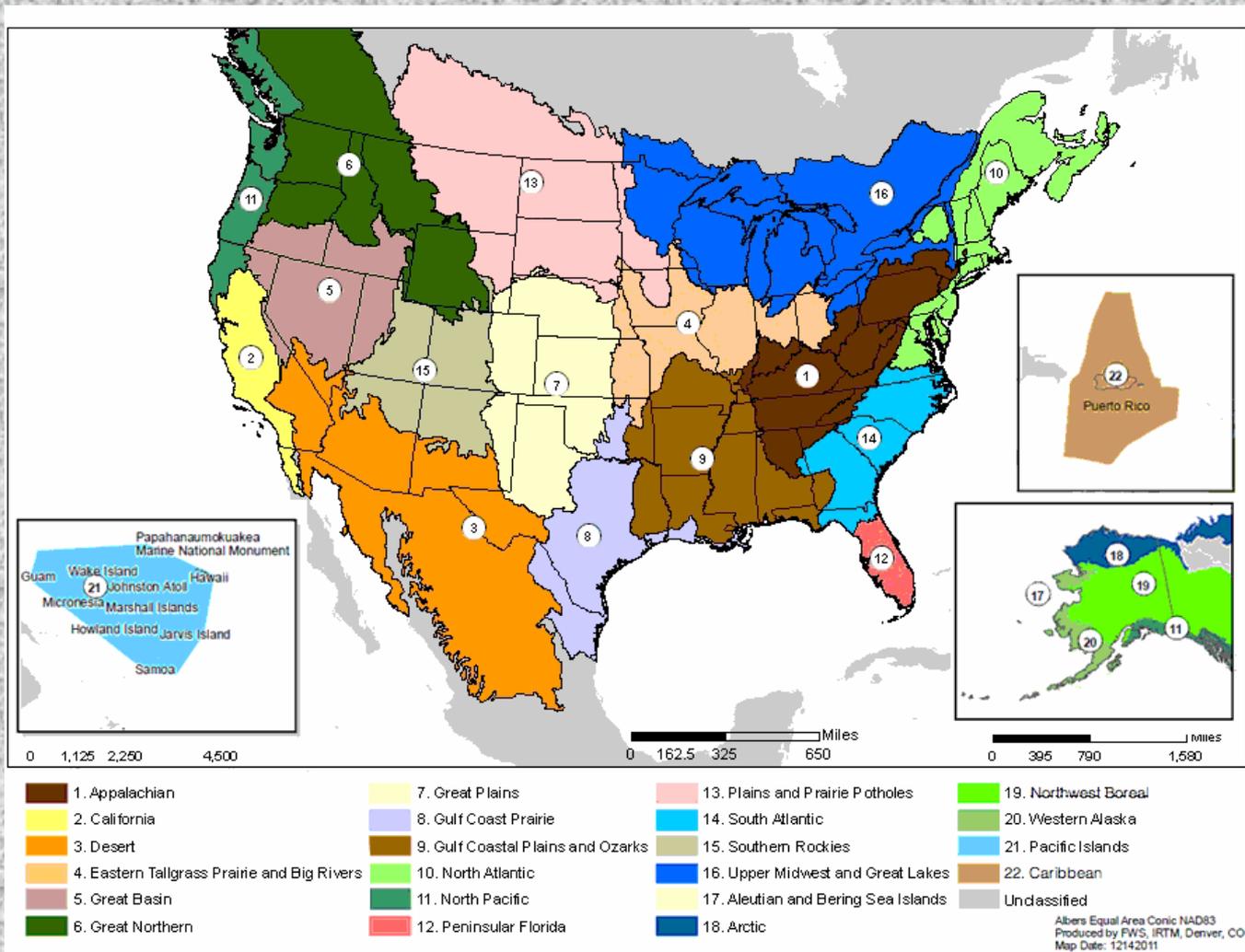


Considerations....

- Time available compared to information overload
- Degree of precision needed
- When do I have enough information
- Differential response of associated plant/plant communities
- Restoration reference conditions and HRV are likely of marginal value in novel climates of the future.
- Groundwater and soil moisture projections vary considerably
- Below ground carbon dynamics
- Insect and disease response
- Disturbance patterns -Fire and fire behavior
- Invasives and exotics
- Short-term/long-term reliability of model forecasts
- Adaptation barriers from an increasingly fragmented landscape

Resources

- Agency guidance
 - Translate policy into planning action
- Peer crosstalk! Make use of your time/connections today
- National initiatives
 - Forest Service Climate Change Resource Center
 - 2010 FS Watershed vulnerability assessments
 - FS Regional ecosystem/habitat type vulnerability assessments.
 - USGS National Climate Change and Wildlife Science Center
 - Great selection of tools and applications
 - DOI Landscape Conservation Cooperative
 - NOAA Climate.gov



Geographic inconsistencies in yarding up information and groups

Action

- Determine what specific information you are after.
- Determine exposure and planning horizon.
- Evaluate sensitivity of identified values – a vulnerability analysis.
- Set priorities that can enhance resilience



- Template for Assessing Climate Change Impacts and Management Options (TACCIMO)
- Forest Service Climate Change Scorecard
 - Vulnerability Assessment
 - Adaptation capacity and mitigation
 - Monitoring (2012 Planning Rule)
 - Carbon assessment
- Preserve diversity in all forms
- Get involved – so many avenues to gain great information. NRAP webinar on 18 March.

Table 4—The Climate Project Screening Tool in tabular format, with an example project activity^a

Project activity	Climate change trends and local impacts	Key questions for managers	Response narrative	Continue with project?
----- Completed by specialists or scientists -----		----- Completed by managers -----		
Thinning for reduction of hazardous fuels	Trends: Increased fuel buildup and risk of uncharacteristically severe and widespread forest fire; longer fire seasons; higher elevation insect, disease, and wildfire events; increased interannual variability in precipitation, leading to fuels buildup and causing additional forest stress; increased water temperatures in rivers and lakes and lower water levels in late summer; increased stress to forests during periodic multiyear droughts; decrease in water quality from increased sedimentation.	<ul style="list-style-type: none"> • Will the projected density of the stand after it has been thinned withstand extreme wildfire events? Does spacing between trees need to increase? 	<ul style="list-style-type: none"> • The proposed basal area and average distance between remaining trees should buffer this stand from all but the worst crown fires. Removal of small-diameter trees adds to the fire resistance of the stand. 	Yes, without modification
		<ul style="list-style-type: none"> • Should stands be thinned at a more frequent interval to mitigate for increased forest stress and fire susceptibility or for altered growth patterns? 	<ul style="list-style-type: none"> • Yes, we should plan to thin this stand, perhaps every 10 years. 	Yes, with modification
		<ul style="list-style-type: none"> • Does the project area include anticipated future fire-prone areas (i.e., higher elevation sites or riparian areas)? 	<ul style="list-style-type: none"> • This stand is in the middle of the elevation zone for the native species. We do not anticipate increases in invasive species, accelerated establishment of understory vegetation, or increased occurrence of high-intensity fire. 	No
	Local impacts: Increased risk	• Given reduced snowpack	• We already plan to harvest	Yes

Dave Thom
Cons Ldr agenda (dra
Dave M (and Jerry):
week about the agen



Parting thought

The thought that natural resource managers can remain bystanders to climate change is years in the review mirror – the status quo is no longer an option when we consider managing for the future of our forest.