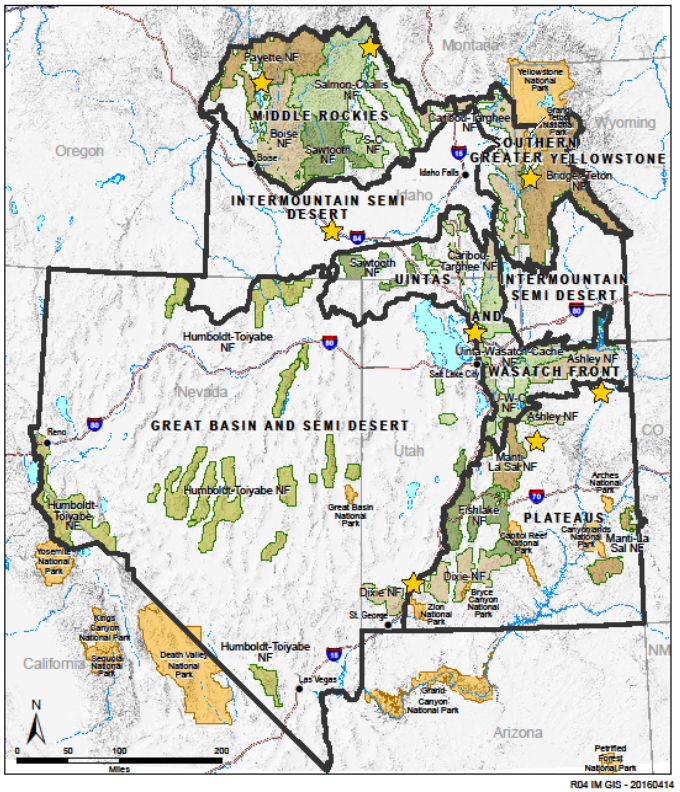
Intermountain Climate Assessment Workshop

May 22-24, 2018

Main location: Ogden, UT

Virtual locations:
Ashley National Forest (NF), Vernal, UT
Bridger-Teton NF, Jackson, WY
Dixie NF, Cedar City, UT
Manti-La Sal NF, Price, UT
Payette NF, McCall, ID
Salmon-Challis NF, Salmon, ID
Sawtooth NF, Twin Falls, ID

More info at: www.fs.usda.gov/goto/cc



United States Department of Agriculture

Housekeeping
Special Announcements
Safety

Effects of Climatic Variability and Change on Forest Vegetation

Intermountain Region – Climate Assessment Workshop
May 22, 2018

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Effects of Climatic Variability and Change on Forest Vegetation

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Contributors

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Plant species respond to:

- Energy constraints
- Water constraints
  - o ↑ temperatures = ↑ evapotranspiration
  - o ↑ CO_2 = ↑ water use efficiency?
- Disturbance regimes

Individual plant effects

- Productivity
- Seedling establishment
- Mortality
- Phenology
- Genetic limitations

Tree species assessment

Vulnerability assessment is based on:

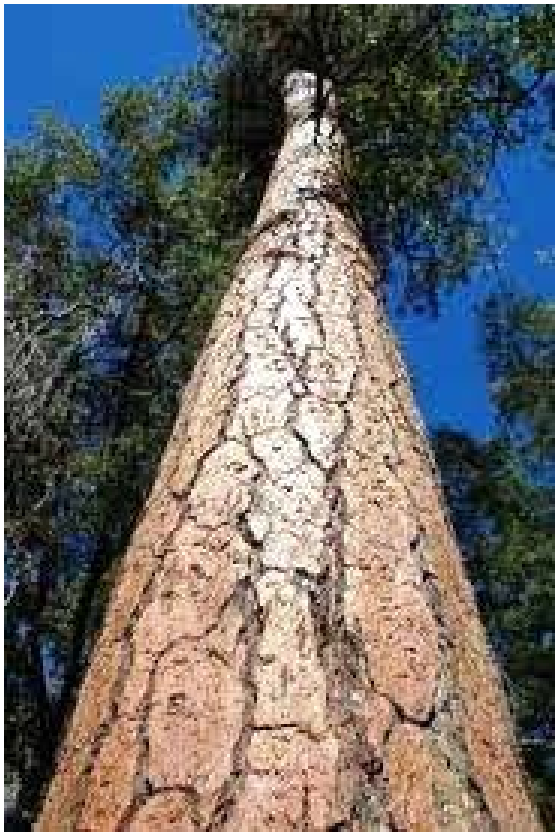
- Ecological characteristics
- Disturbance interactions
- Current vs. historical conditions
- Potential climate change responses

High-elevation forests

- Less snow and longer growing seasons = increased growth?
- Some species may move to higher elevations, assuming suitable substrate and regeneration.
- Increasing susceptibility to fire, insects, and drought.

Mesic mixed conifer forests

- Growth rates likely to decrease with less water availability.
- Late-seral forests will be increasingly susceptible to wildfire.
- Increased wildfire will favor some species (e.g., ponderosa pine, Douglas-fir).



Dry mixed conifer forests

- Many drought tolerant species will be able to cope with drier soils and increased wildfire.
- Some species sprout vigorously after fire (e.g., Gambel oak, mt. mahogany).
- Pinyon pines are killed by intense fire.

Lodgepole pine forests

- Number of fires will likely increase and fire return intervals will decrease.
- More frequent fire regime could change fuel dynamics.
- Mature and older forest will likely decrease.

Aspen forests

- Aspen is expected to maintain dominance because of its ability to sprout after fire.
- Productivity is expected to be lower.

Riparian forests

- Species tolerant of seasonal drought will dominate.
- Hardwood regeneration could become less common.
- Forests associated with small water sources (e.g., springs) will be more susceptible than forests near large water sources (e.g., rivers).

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Adaptation Options

Strategy 1 — Increase resilience of mixed conifer forests to higher fire frequency

Tactic 1 — Manage forest densities by removing smaller trees to reduce ladder fuels

Tactic 2 — Reduce surface fuels to decrease the intensity and severity of wildfires

Adaptation Options

Strategy 2 — Reduce existing stressors

Tactic 1 — Implement early detection/rapid response to eradicate or control invasive species (esp. cheatgrass)

Tactic 2 — Remove competing vegetation (e.g., juniper) and control ungulate browsing to allow for regeneration

Adaptation Options

Strategy 3 — Increase landscape heterogeneity

Tactic 1 — Enhance diversity of forest structure and age classes at all spatial scales

Tactic 2 — Use geospatial information to identify optimal patterns of forest and fuel structure to reduce wildfire spread.

Summary

- **Effects of climate change on forest vegetation will be driven primarily by vegetation responses to altered disturbance regimes, and secondarily through shifts in regeneration, growth, and mortality.**

- **Adaptation will focus primarily on management practices that increase resilience to disturbance (wildfire, insects), reduce existing stressors, and increase landscape heterogeneity.**

Effects of Climate Change on Rangeland Vegetation

Intermountain Region – Climate Assessment Workshop

May 22, 2018

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“IN PREPARING FOR BATTLE I HAVE ALWAYS FOUND THAT PLANS ARE USELESS, BUT PLANNING IS INDISPENSABLE.”
DWIGHT D. EISENHOWER
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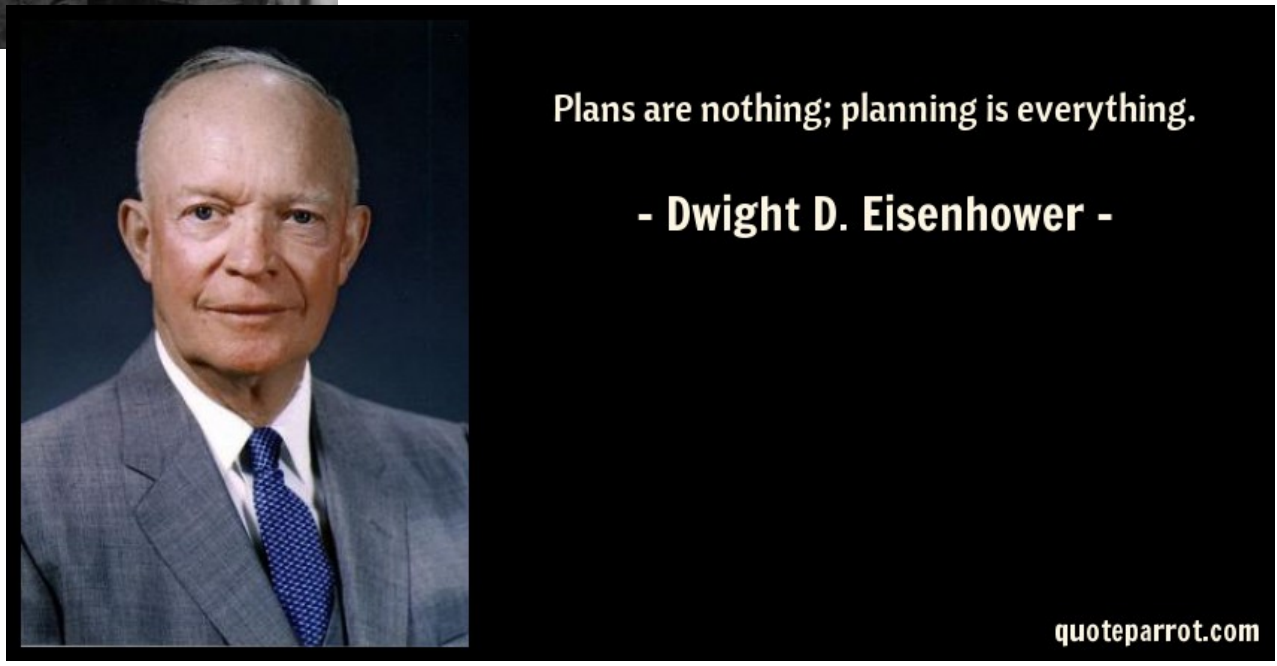
Plans are nothing; planning is everything.
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Overview of Topic – Why is it important

- Increasing Variability

- Ecological Impact
  - Uncharacteristic Fire Regimes
  - Drought – more recovery periods
  - Entering uncharted territory

- Economic Impact
  - Think of stakeholders
  - Less support for public land?
  - Opportunity to develop FS lands as “grassbanks”

Table 7.2—Vulnerability ratings for sensitivity and adaptive capacity of non-forest cover types in the IAP region, based on published literature and expert evaluations by a team of scientists.

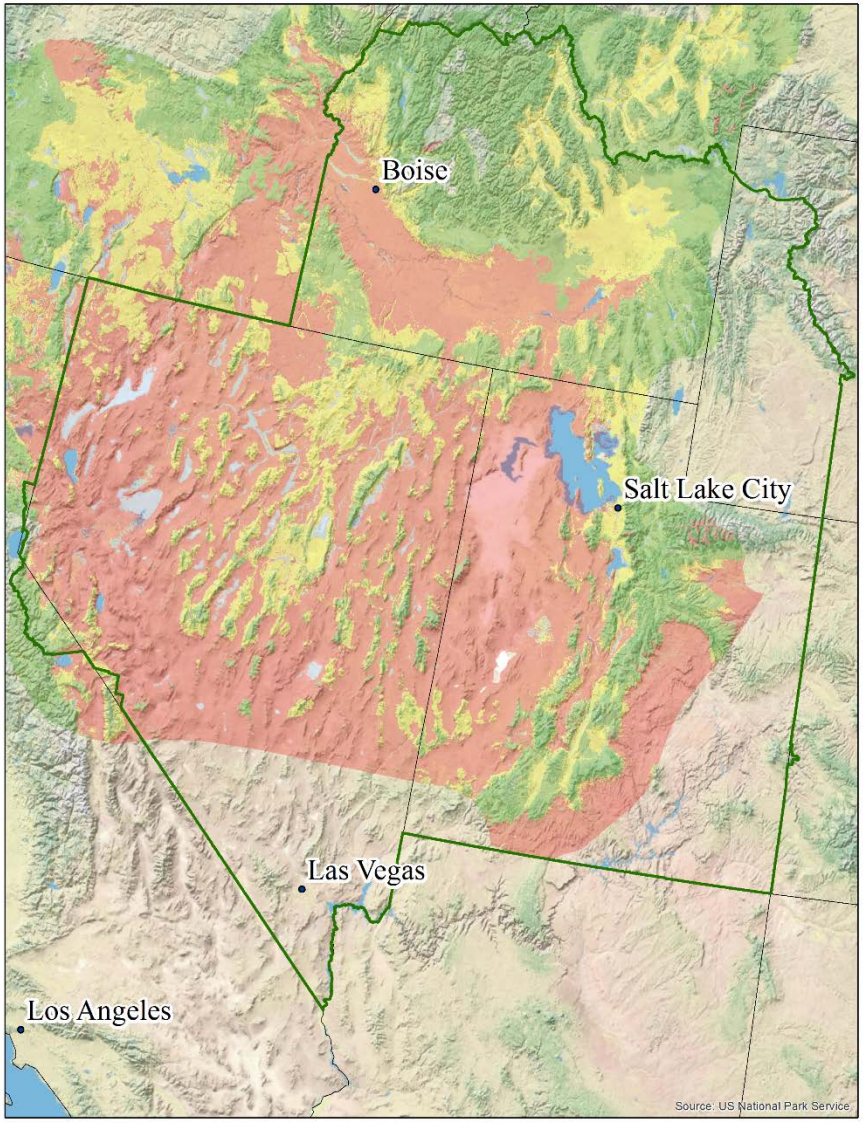
	Sensitivity rating	Sensitivity score	Adaptive capacity rating	Adaptive capacity score	Combined score	Vulnerability
Alpine	H	5	L	5	10	Very High
Dry big sagebrush shrublands	H	5	L	5	10	Very High
Low-elevation riparian	H	5	L-M	4	9	High-Very High
Subalpine forb communities	H	5	M	3	8	High
Persistent pinyon-juniper woodlands	H	5	M	3	8	High
High-elevation riparian	M-H	4	L-M	4	8	High
Mountain-mahogany woodlands	M	3	L-M	4	7	Moderate-High
Mountain big sagebrush shrublands	M	3	L-M	4	7	Moderate-High
Mountain grasslands	M	3	L-M	4	7	Moderate-High
Salt desert shrublands	M	3	L-M	4	7	Moderate-High
Mid-elevation riparian	M-H	4	M	3	7	Moderate-High
Blackbrush	L-M	2	L	5	7	Moderate-High
Dwarf sagebrush shrublands	M-H	4	M-H	2	6	Moderate
Sprouting sagebrush	M	3	M	3	6	Moderate
Oak-maple woodlands	L-M	2	M	3	5	Low-Moderate
Mountain shrublands	L-M	2	M-H	2	4	Low-Moderate

Vulnerability of Vegetation Types

- Alpine forb & grass communities

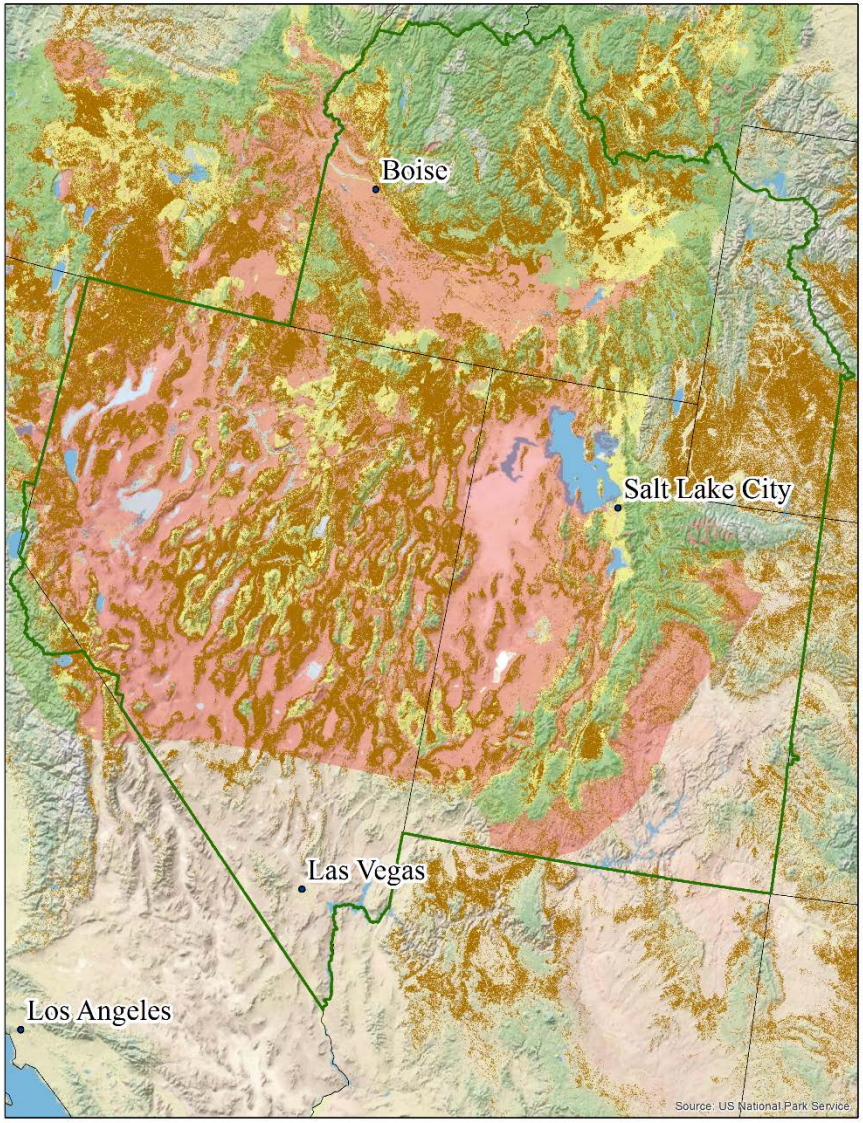
Vulnerability of Vegetation Types

- Alpine forb & grass communities
- Sagebrush systems (especially Wyoming big sagebrush communities)
  - Non-sprouters
  - Cheatgrass, especially in low resistance/resilience areas
  - Uncharacteristic fire regimes



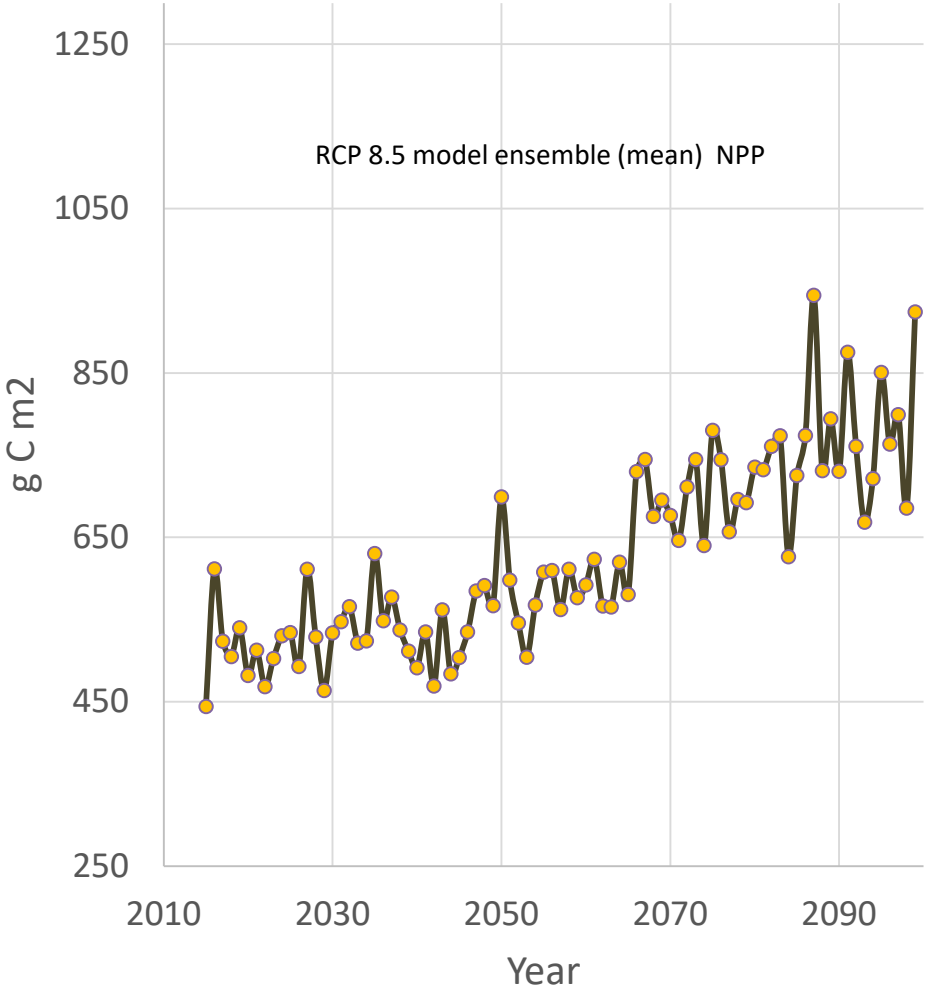
Using knowledge from
today to prepare for the future

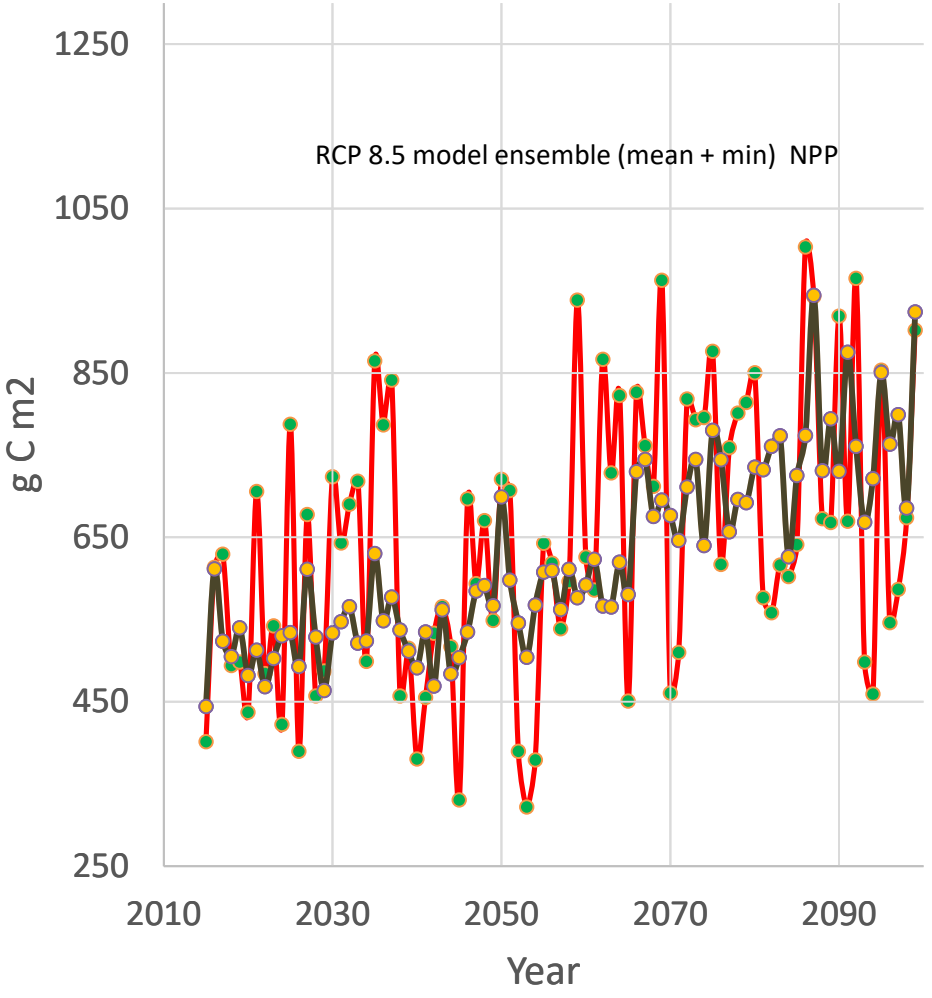
Relatively warmer and
drier sites are more vulnerable
(low resilience + low resistance



Much of our sagebrush occurs in warm/dry sites

Is new thinking required?


RCP 8.5 model ensemble (mean) NPP
1250
1050
850
650
450
250
g C m2
2010
2030
2050
2070
2090
Year


RCP 8.5 model ensemble (mean + min) NPP
1250
1050
850
650
450
250
g C m2
2010
2030
2050
2070
2090
Year

Adaptation Strategies & Tactics

- Learn from the past
  - New data and tools available!!!

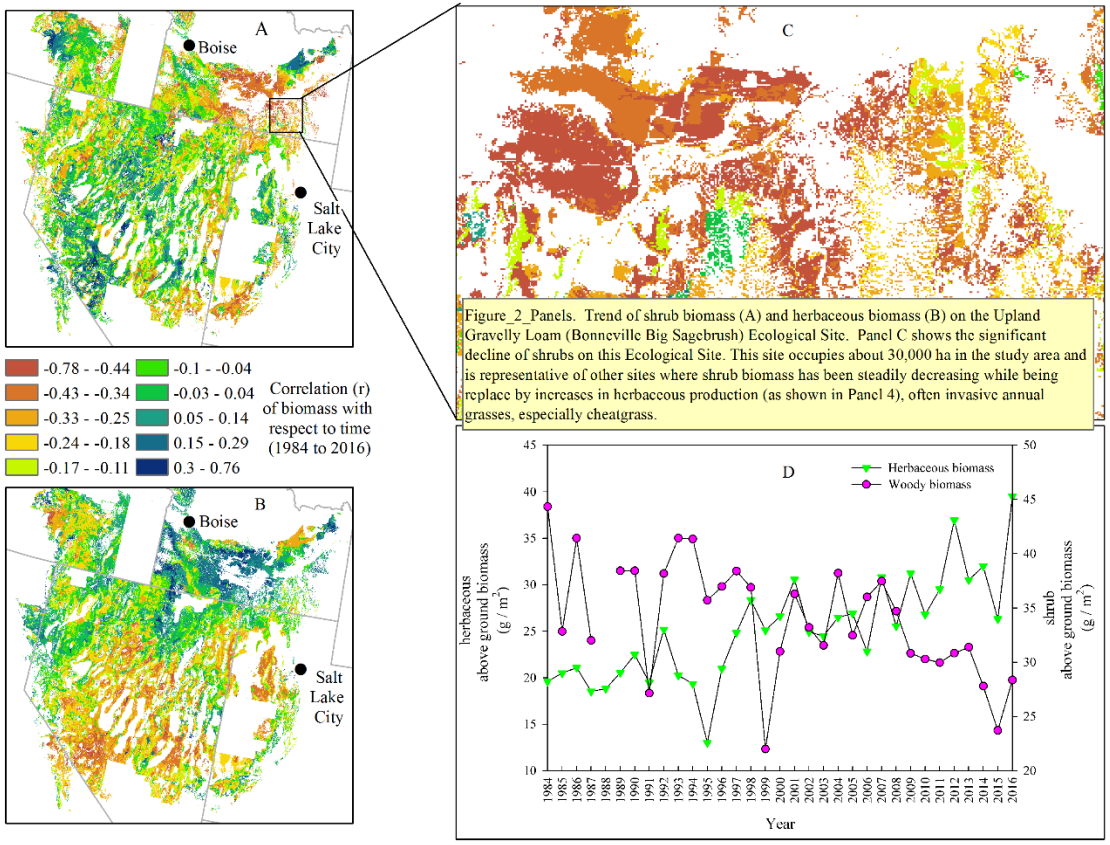


Figure_2_Panels. Trend of shrub biomass (A) and herbaceous biomass (B) on the Upland Gravelly Loam (Bonneville Big Sagebrush) Ecological Site. Panel C shows the significant decline of shrubs on this Ecological Site. This site occupies about 30,000 ha in the study area and is representative of other sites where shrub biomass has been steadily decreasing while being replace by increases in herbaceous production (as shown in Panel 4), often invasive annual grasses, especially cheatgrass.

Adaptation Strategies & Tactics

- Learn from the past
  - New data and tools available!!!
- Consult adaptation library for starters
  - Developed during IAP & NRAP events for managers
- We already know what to do (for the most part)
- Drought & wildfire & recovery = longer, more uncertain
  - Communicate these ideas to stakeholders!!
- **Communication…now**
  - **Open dialogue**
  - **Revise allotment management plans (AMPs) to account for variability**
  - **Expand your sphere of contacts**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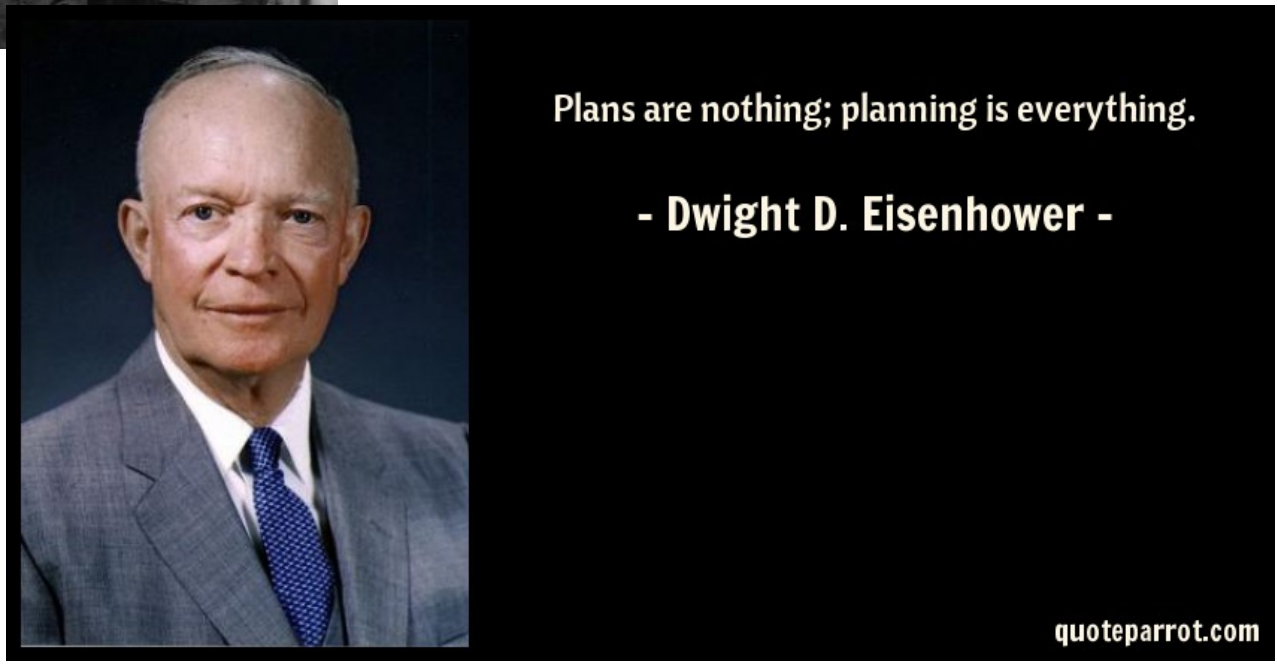
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Summary & Major Results

- Weave the concept of risk management into discussions
- Learn how to be more flexible
- Speak the language
- Get help…. It’s a marathon not a sprint….you can’t do it by yourself

Weblinks & Additional Resources

- http://adaptationpartners.org/library.php
- Rangeland story maps: Drought
- SPI Explorer or similar tools
  - https://cals.arizona.edu/climate/index.htm
- Communication: http://guide.cred.columbia.edu/

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Effect of Climate Change on Terrestrial Animals

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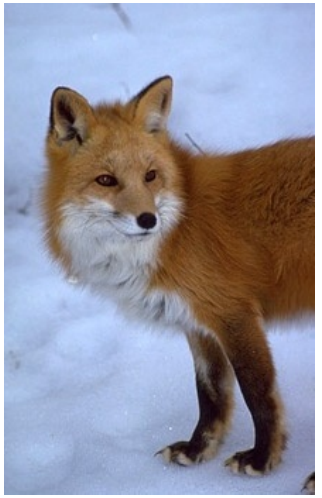

Megan Friggens, PhD

Rocky Mountain Research Station

– USDA Forest Service

Chapter 9: Effects of Climate Change on Terrestrial Animals

Megan M. Friggens, Mary I. Williams, Karen E. Bagne, Tosha T. Wixom, and Samuel A. Cushman

I. Climate change impacts to habitats

Review potential terrestrial species responses and ecological impacts for major habitats within R4

II. Species' vulnerability assessments

Quantify exposure, sensitivity and adaptive capacity for 3 birds, 7 mammals, 3 amphibians,1 reptile using SAVS

GTR-375, Part 2, p264-315

Wildlife Habitats

Forest types, p267-273
Woodland types, p273-276
Non-forest types, p276-282

Forest types	Woodland types	Non-forest types
Alpine pine	Pinyon-juniper woodland	Sagebrush
Sub-alpine spruce fir	Mountain mahogany woodland	Mountain shrubland
Lodgepole pine	Maple/oak	Mountain grassland/ Montane meadows
Mixed conifer		Salt-desert shrubland
Aspen		Tall forb
Ponderosa pine		Alpine
Riparian forests		Riparian Wetlands

Species Vulnerability

Summaries, p282-293
SAVS Scores, p314-316

Selection Criteria:

- Management concern
- Present within Forests
- Representative of habitats
- Data available

1. American Pika
2. Bighorn Sheep (Desert & Sierra Nevada)
3. Boreal Toad
4. Canada Lynx
5. Columbia Spotted Frog
6. Fisher
7. Great Basin Spadefoot
8. Greater Sage-grouse
9. Northern Idaho Ground Squirrel
10. Prairie Rattlesnake
11. Three-toed Woodpecker
12. Townsend's Big-eared Bat
13. Utah Prairie Dog
14. Western Yellow-billed Cuckoo
15. Wolverine

General Results: Habitat

- Loss, shift, expansion of habitats
- Changes in structure and composition
- Loss of critical habitat elements
- Change in timing of resources
- Change in disturbances
- Change in snow cover

General Results: Wildlife

Increased vulnerability

- Loss of habitat
  - High elevation habitats
  - Open water, Wetlands
- Reliance on snowpack
- Timing mismatches
- Negative impacts from fire
- Increase in disease
- Increased issues with barriers

Decreased vulnerability

- High mobility
- Extended breeding season
- Habitat increases
- Increased winter foraging
- Reduced fish predation

Example Strategies

Vulnerability	Possible Actions
Invasive species	Apply chemical or mechanical treatments, bio-control, reduce vectors
Fire	Fuel treatments, wildland fire use and planning, fuel breaks
Disease	Monitor at-risk populations, reduce carrier species, vaccinate, maintain dispersed resources
Snowpack	Focus conservation on areas where snow accumulates, snow fences, thinning, landscape level planning
Water	Build or enhance artificial water sources, remove dams, regulate withdrawals, fence livestock
Dispersal ability	Translocation, create corridors, enhance dispersal habitats, regulate road use
Food fluctuations	Food supplementation during critical periods, restore habitats, predator or competitor removal, hunting or trapping regulation

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Chapter 14: Adapting to the Effects of Climate Change.....404

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DIALOGUE AND Q&A

GROUP EXERCISE

BREAK TIME