Future Climate Change Projections to Support County Natural Hazard Mitigation Planning in Oregon

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OCCRI

Oregon Department of Land Conservation and Development

Outline

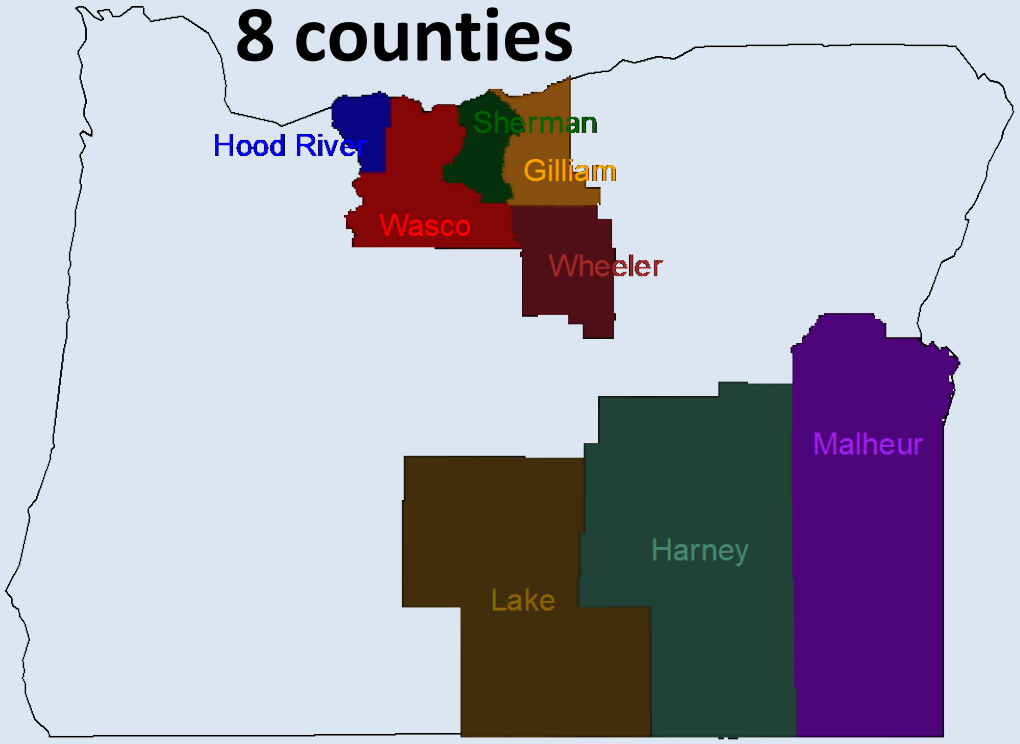
- Introduction
- OCCRI-DLCD Scope of Work (Tricia)
- Climate Change in NHMPs (Tricia)
- Overview of Climate Change (Meghan)
- County-Level Future Climate Change Projections (Meghan)
- Q&A

OCCRI-DLCD Scope of Work

OCCRI-DLCD Scope of Work

Perform analysis of the influence of climate change on natural hazards and provide county-specific data, graphics, and text.

8 counties



11 climate-related natural hazards

Heat waves
Cold waves
Heavy rains
River flooding
Drought
Wildfire
Air quality
Windstorms
Dust storms
Increased invasive species & pests
Loss of wetland ecosystems

Climate Change in NHMPs

Hazard Mitigation & Climate Adaptation

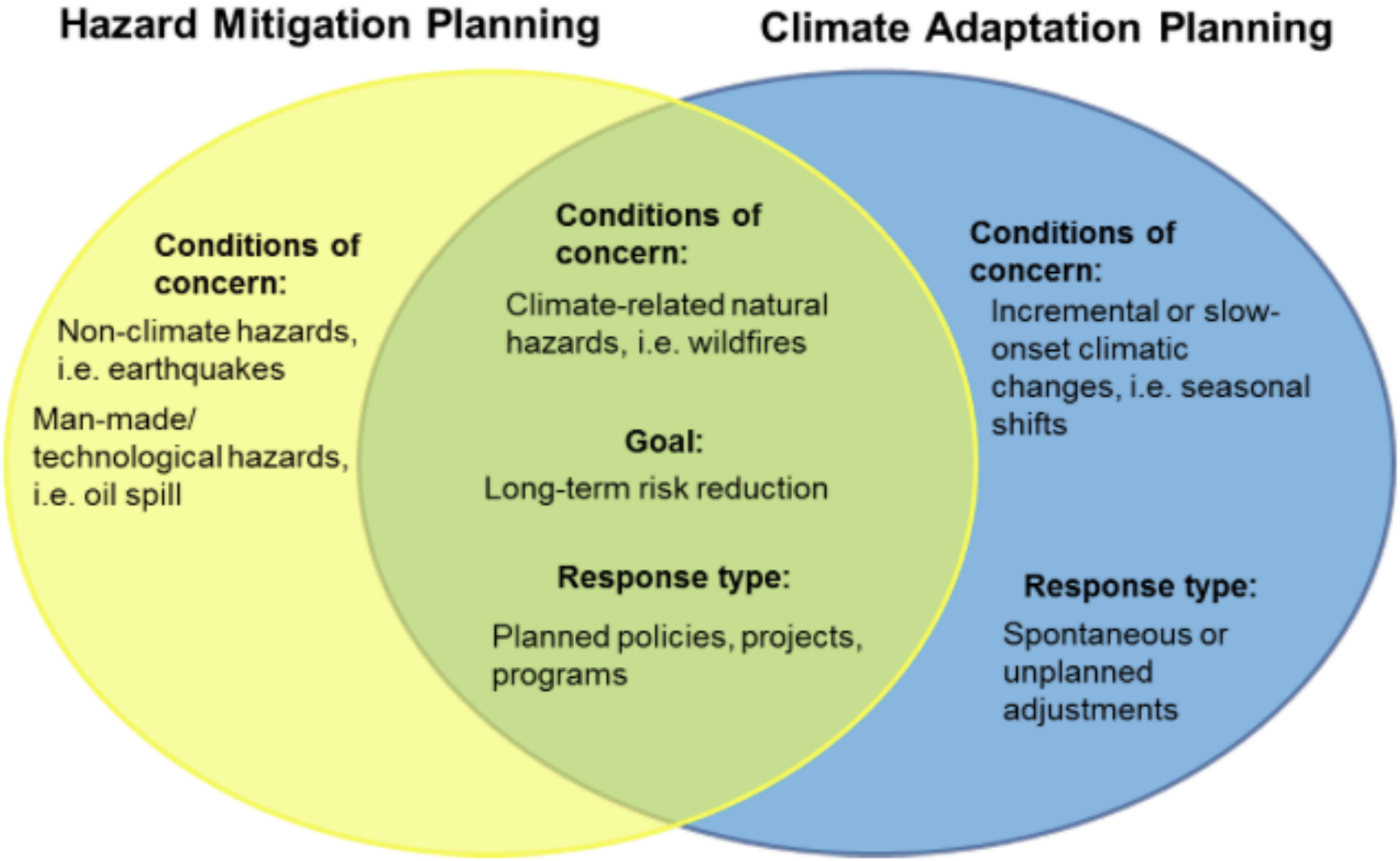


Figure 5: The intersection of Hazard Mitigation and Climate Adaptation Planning

Source: http://icleiusa.org/wp-content/uploads/2015/08/Integrating-Hazard-Mitigation-and-Climate-Adaptation-Planning.pdf

What is a Natural Hazard?

- A **natural hazard** is a source of harm or difficulty created by a meteorological, environmental, or geological event.

- **Examples:** drought, flood, wildfire, landslides, earthquakes, volcanic event, severe weather (rain storms, snow storms, hot and cold temperatures), dust storms, and air quality

Hazard Mitigation

- **Hazard mitigation** is defined at 44 CFR 201.2 as *any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.*

- **Benefits of hazard mitigation actions:** fewer injuries and deaths; less damage to buildings, critical facilities, and infrastructure; diminished interruption in essential services; reduced economic hardship; minimized environmental harm; and quicker, lower-cost recovery.

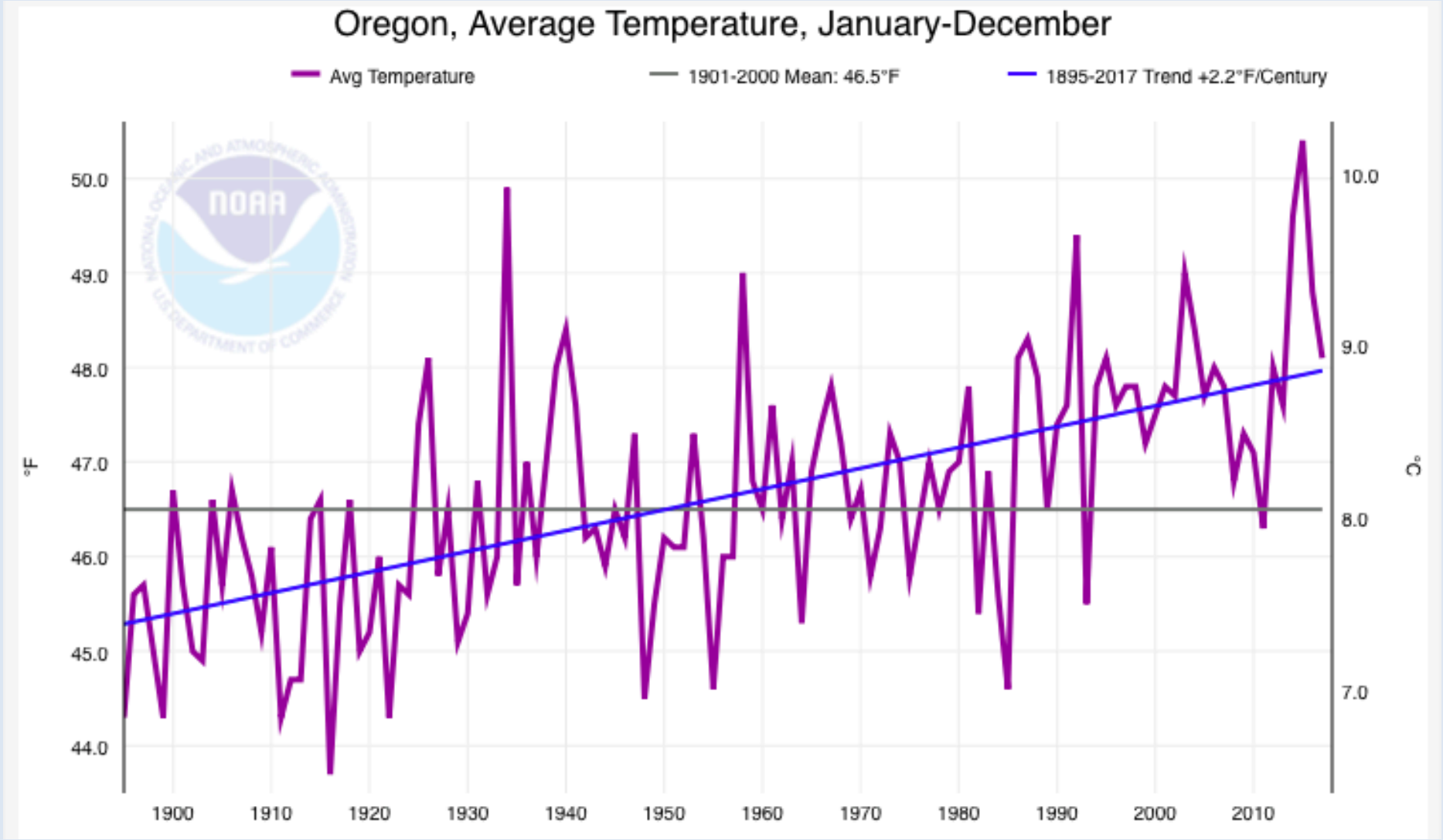
Summary of NHMP Requirements

Is Climate Change Information Required?

- **Local NHMPs** (County, City, Special District) – Not required. Encouraged. “Probability of future events for each identified hazard.”
- **State NHMPs** – Required. “Effect of long-term changes in weather patterns and climate on identified hazards.”
- **Tribal NHMPs** – Required. “Effect of long-term changes in weather patterns on identified hazards.”

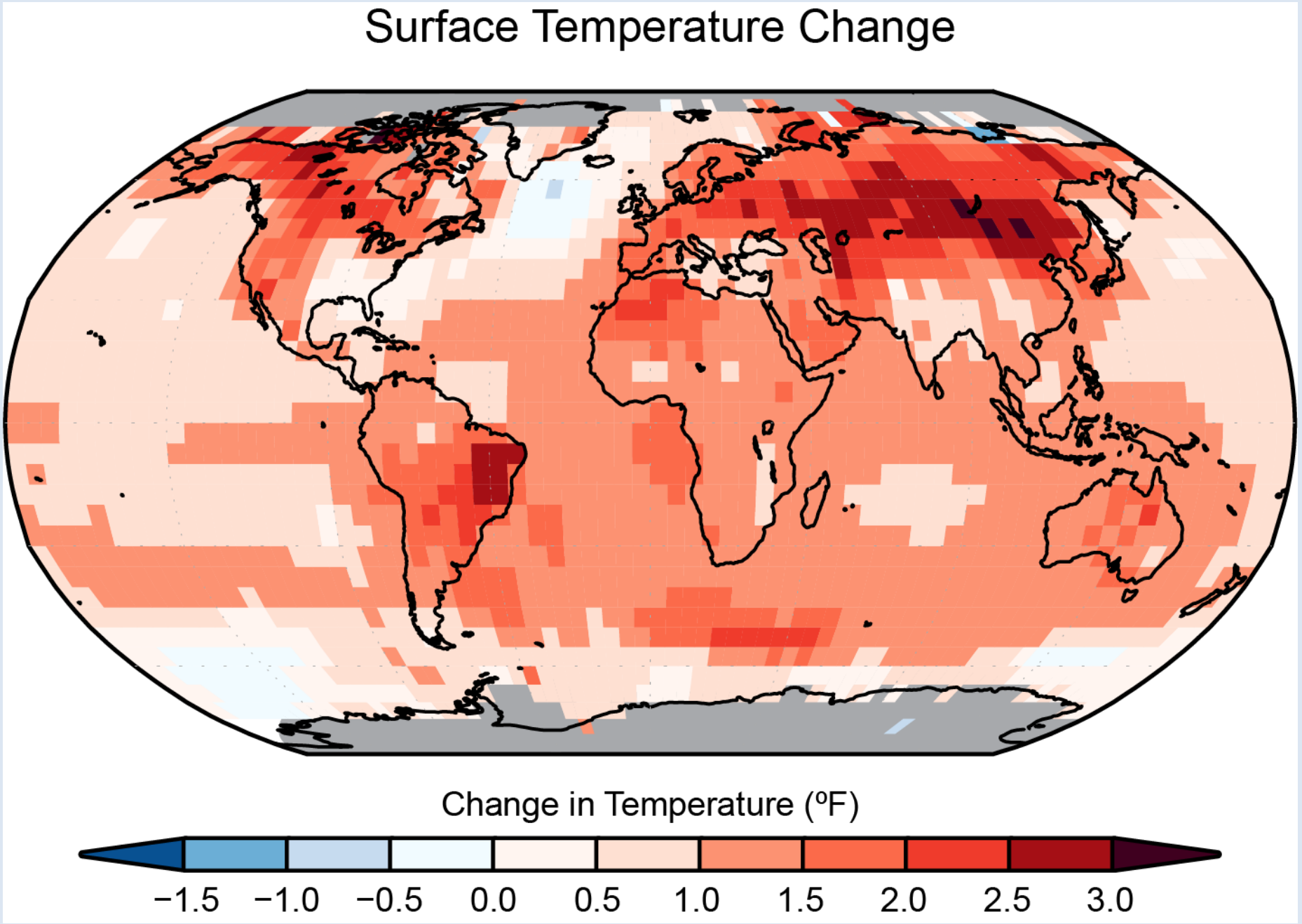
Overview of Climate Change

Oregon's Average Temperature



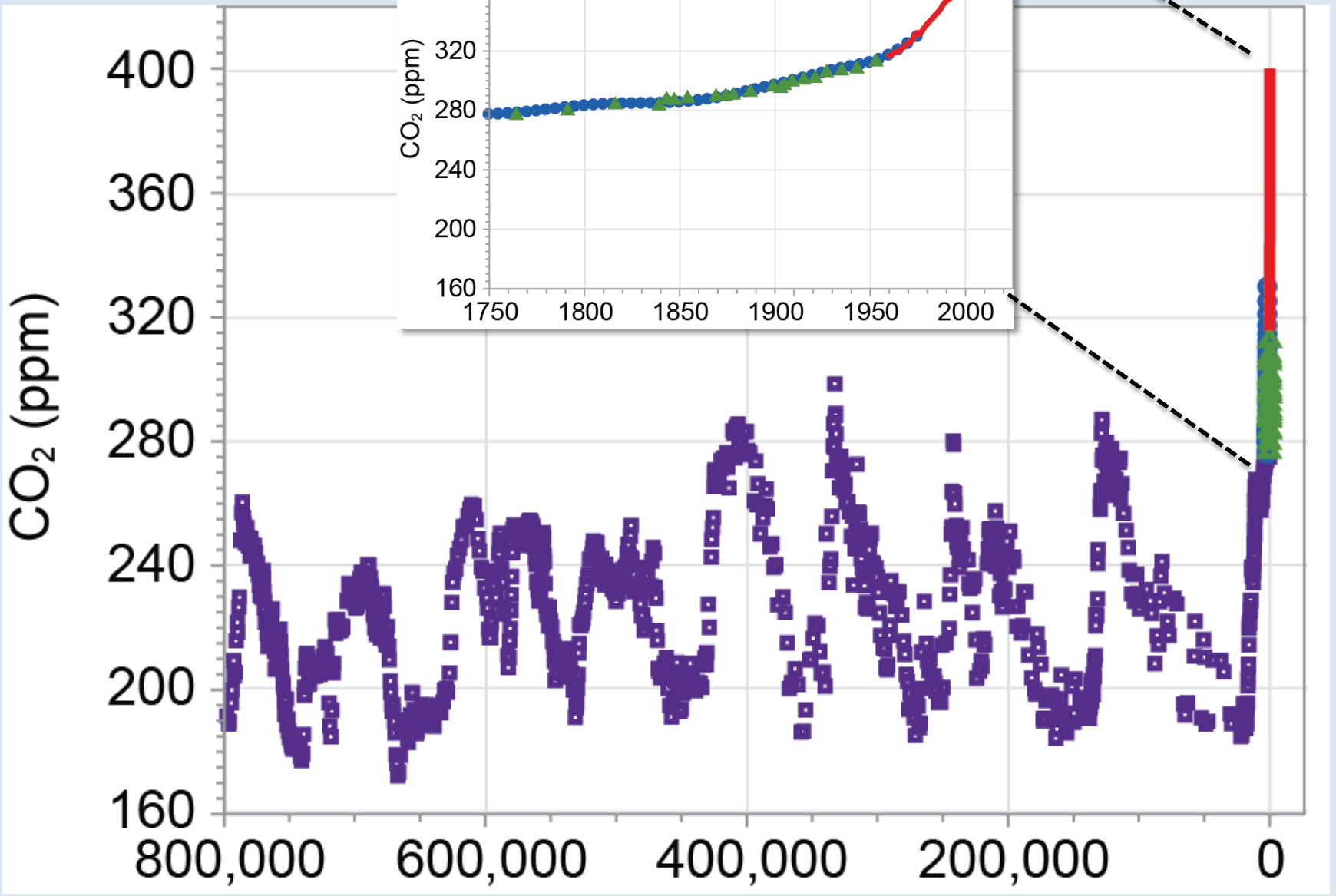
Source: NOAA NCEI Climate at a Glance, https://www.ncdc.noaa.gov/cag/

Surface Temperature Change



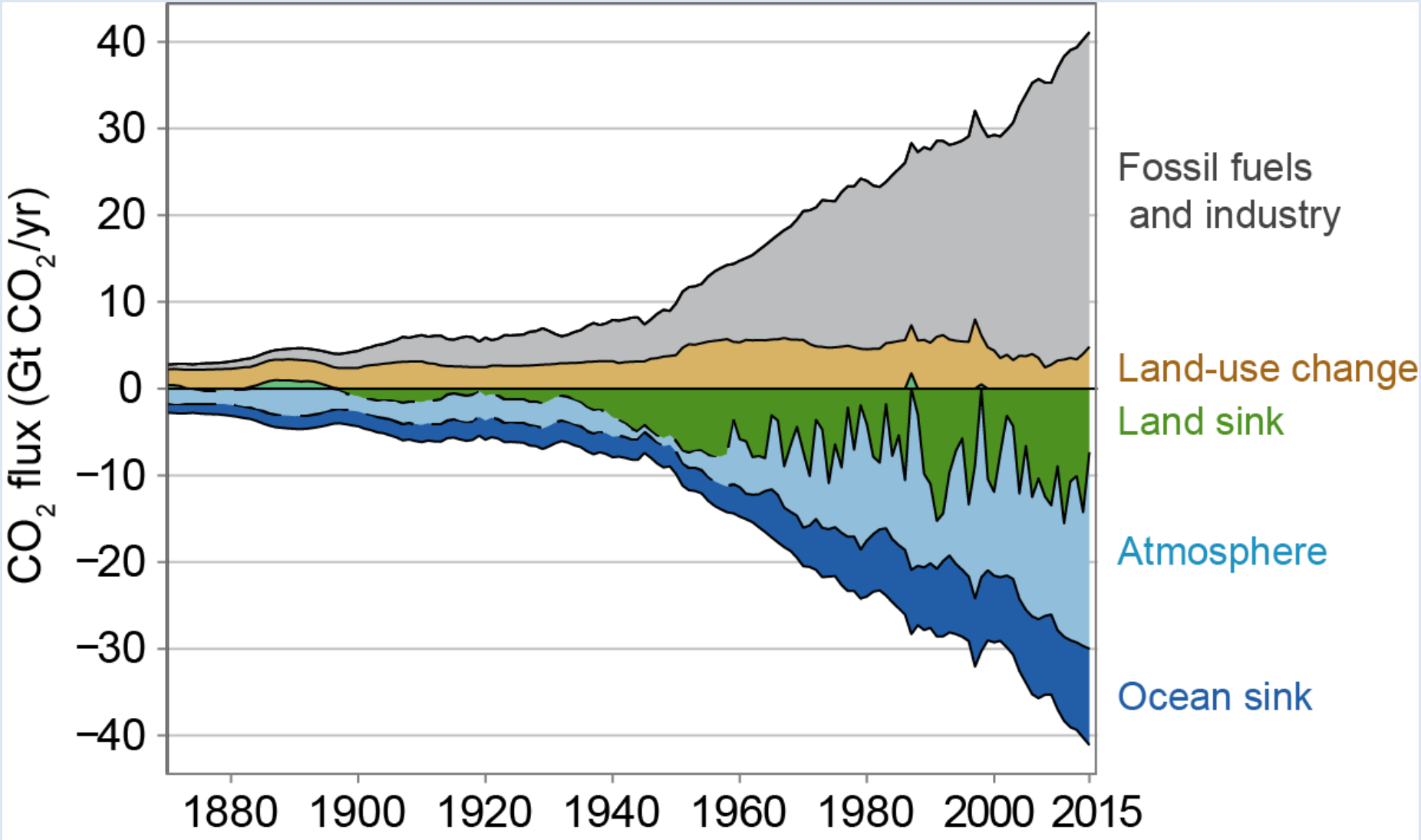
Source: NCA4, Vol 1: https://science2017.globalchange.gov/chapter/1#fig-1-3

Atmospheric Carbon Dioxide



Source: NCA4, Vol 1: https://science2017.globalchange.gov/chapter/2#fig-2-4

Carbon Dioxide Emissions



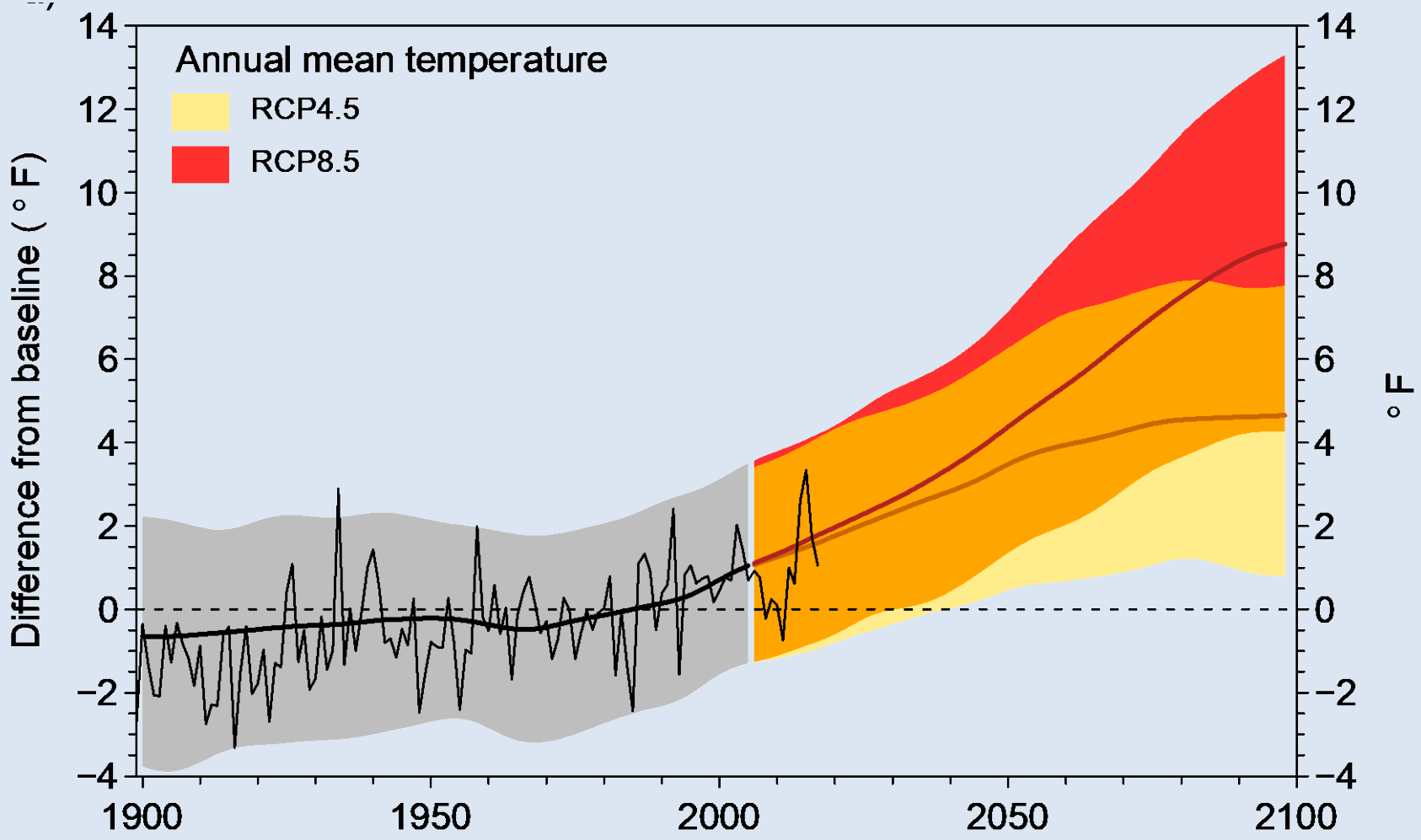
Source: NCA4, Vol 1: https://science2017.globalchange.gov/chapter/2#fig-2-7

Climate change expected to increase climate-related natural hazards

- Heat Waves
- Heavy Rains
- Flooding
- Drought
- Wildfire
- Air Quality

County-Level Future Climate Change Projections

Oregon Annual Mean Temperature Future Projections & Observations

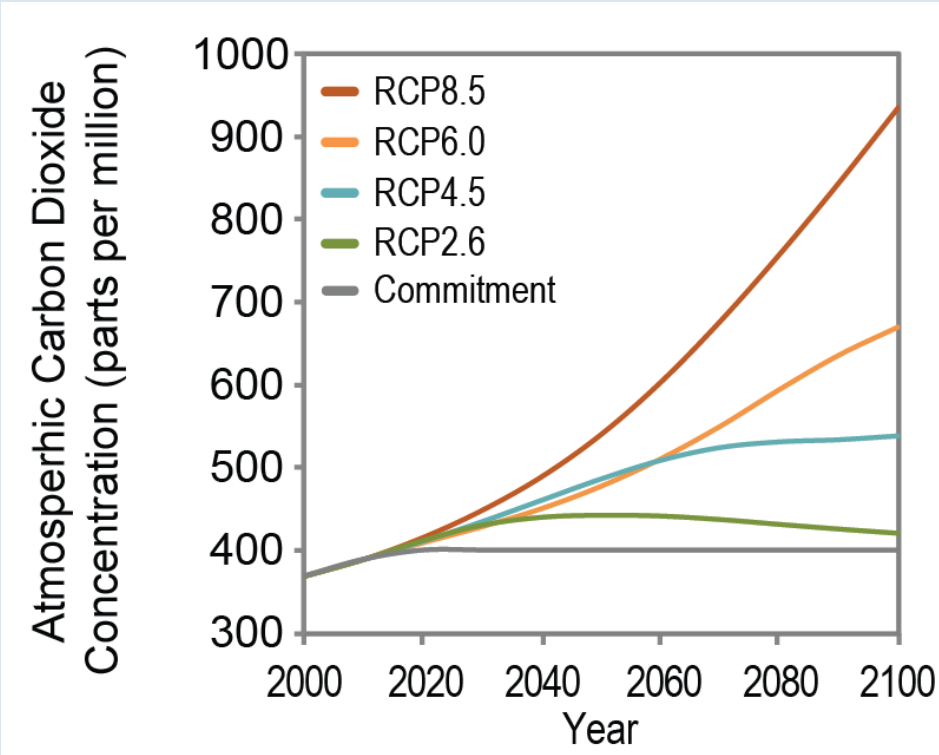


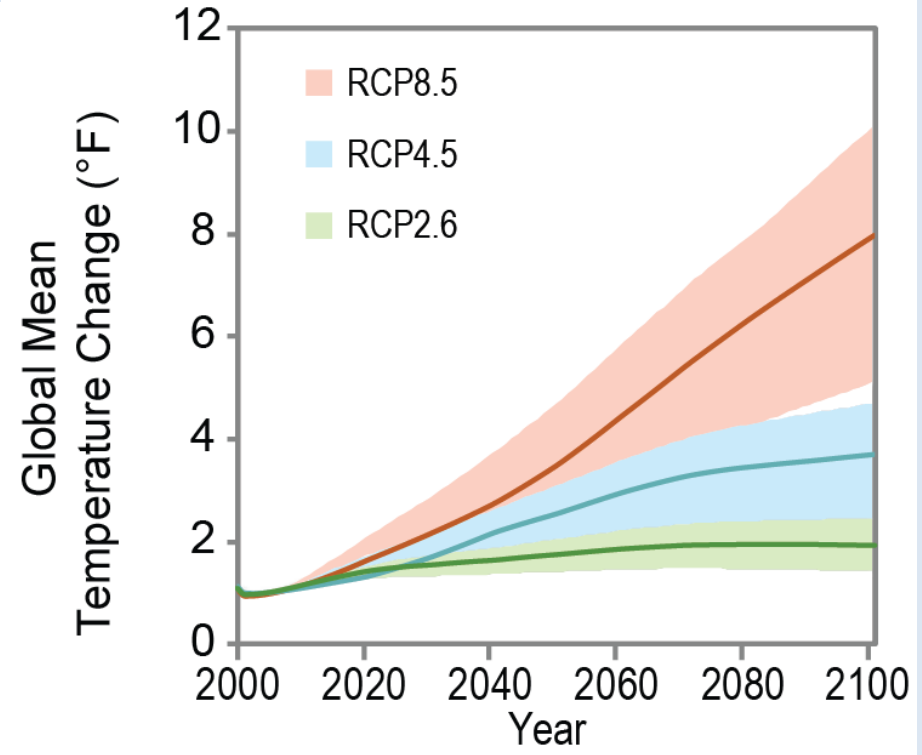
Source: David Rupp, Oregon Climate Change Research Institute

Future Scenarios

Higher Emissions Scenario (RCP 8.5)

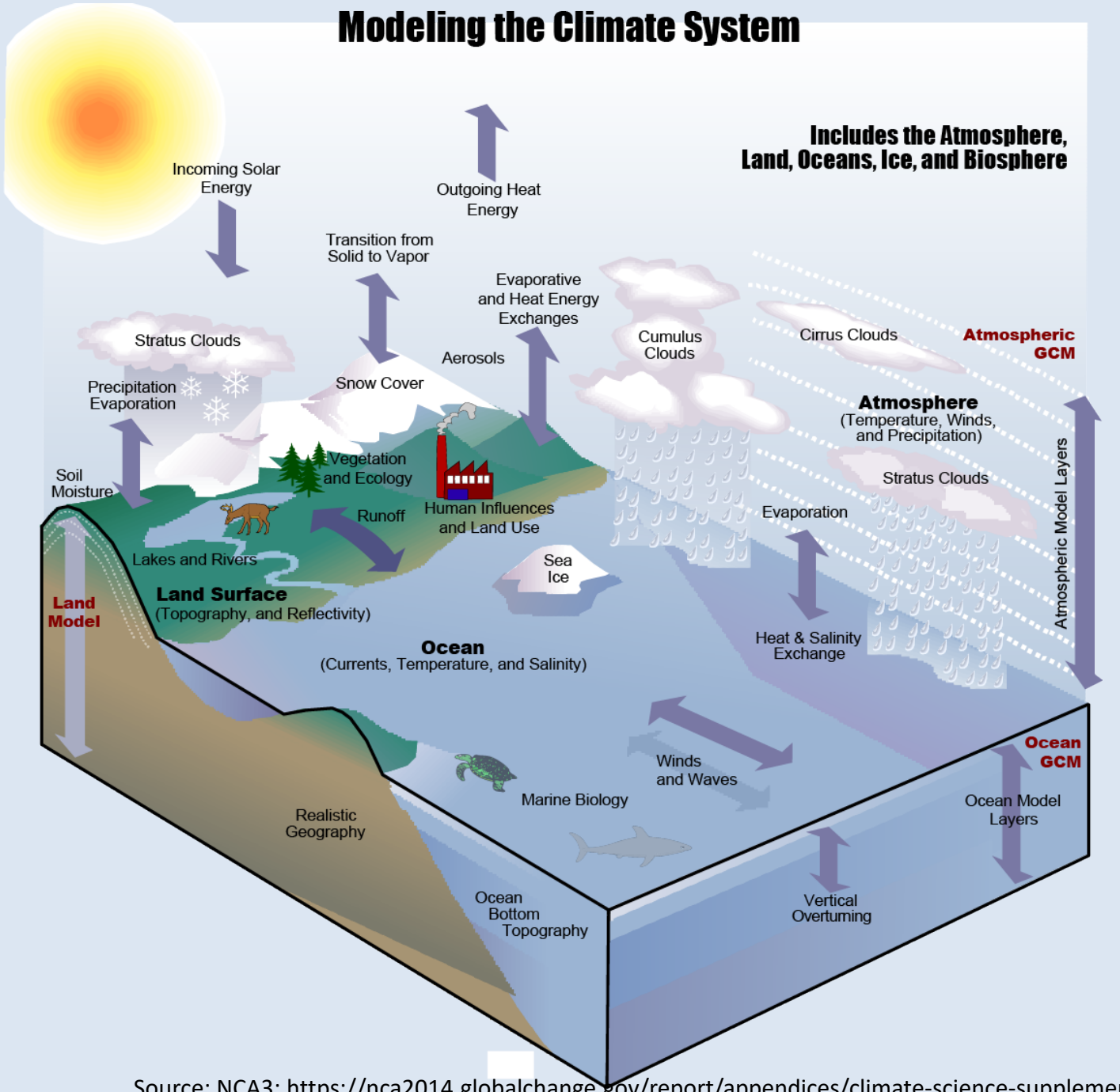
Lower Emissions Scenario (RCP 4.5)





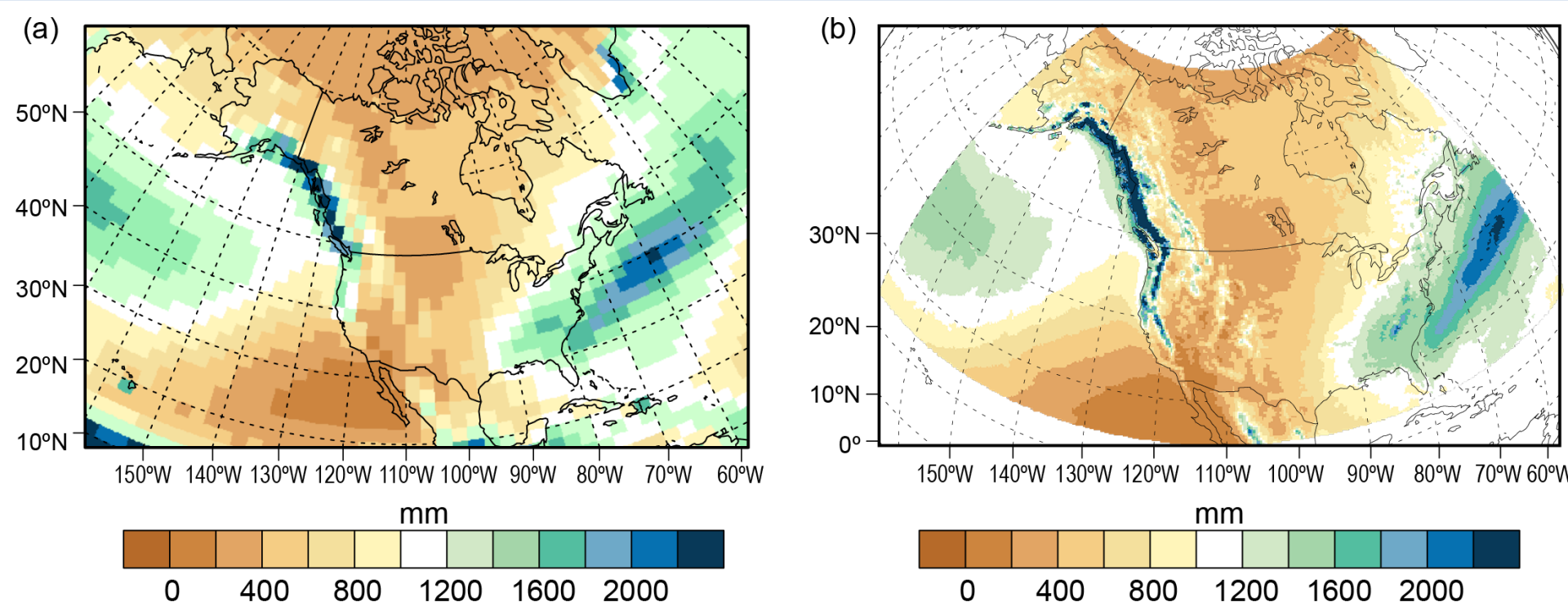
Source: NCA4, Vol 1: https://science2017.globalchange.gov/chapter/4#fig-4-1

Modeling the Climate System



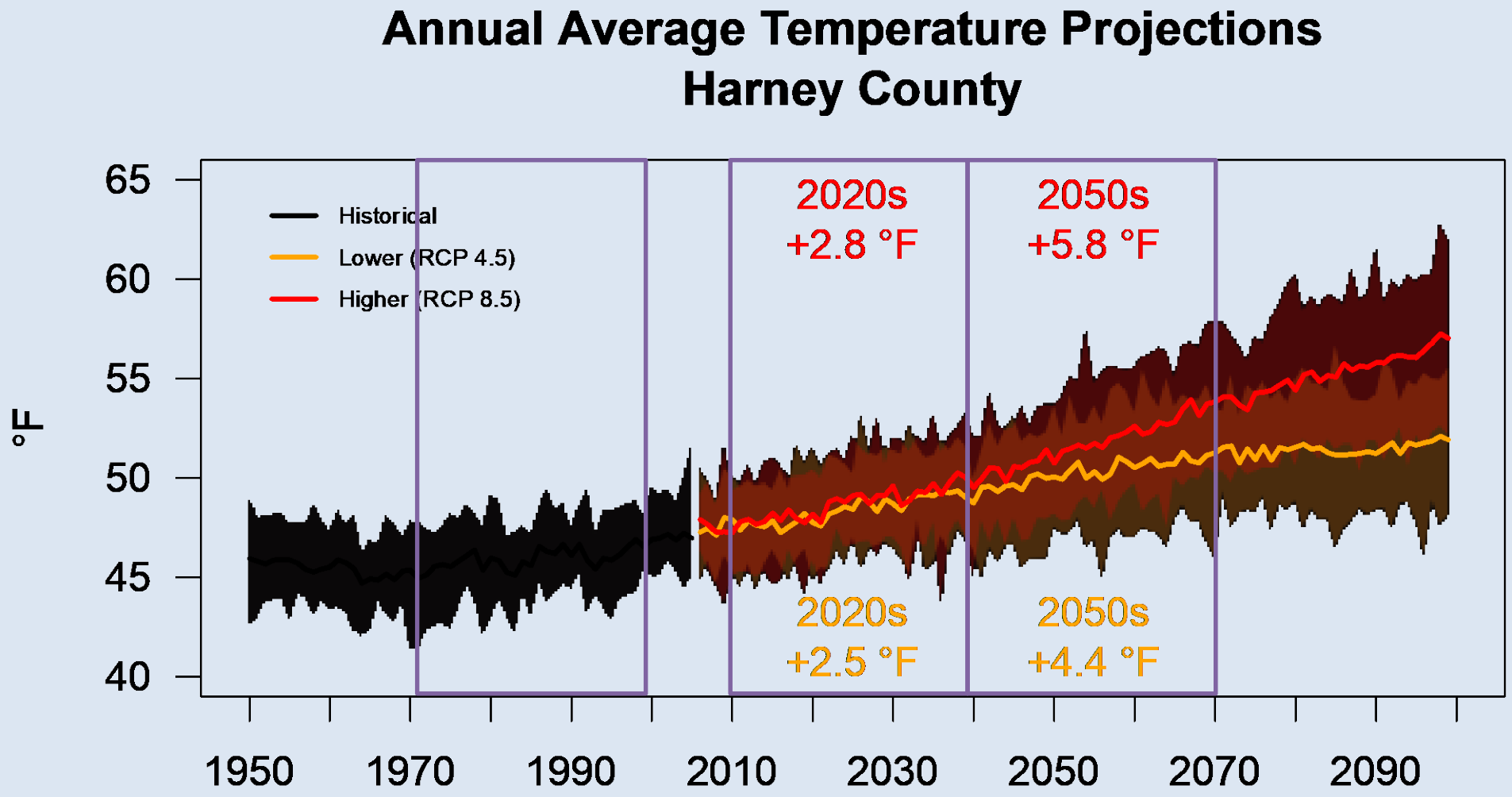
Source: NCA3: https://nca2014.globalchange.gov/report/appendices/climate-science-supplement#tab1-images

Downscaling Climate Models



Source: NCA4, Vol 1: https://science2017.globalchange.gov/chapter/4#fig-4-4

Historical Baseline	Early 21st Century "2020s"	Mid 21st Century "2050s"
1971–2000	2010–2039	2040–2069



Climate Metrics

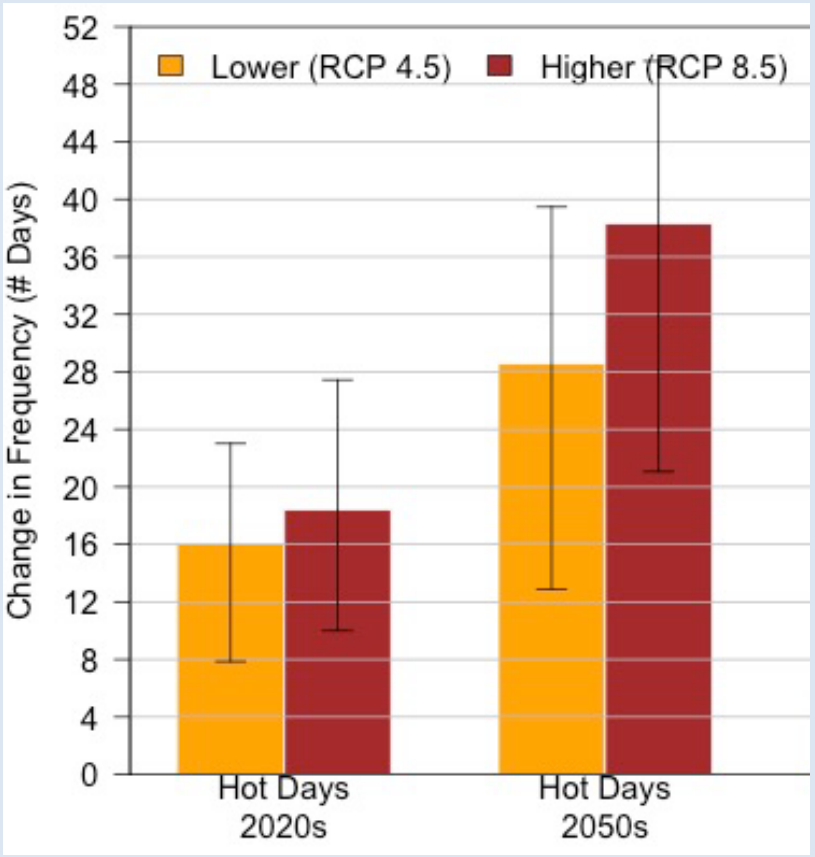
Table 1 Natural hazards and related climate metrics evaluated in this project.

 **Heavy Rains** Wettest Day • Wettest Five Days Landslide Threshold Exceedance	 **Heat Waves** Hottest Day • Warmest Night "Hot" Days • "Warm" Nights
 **River Flooding** Annual maximum daily flows	 **Cold Waves** Coldest Day • Coldest Night "Cold" Days • "Cold" Nights
 **Drought** Summer Flow • Spring Snow Summer Soil Moisture	 **Air Quality** Unhealthy Smoke Days
 **Wildfire** Fire Danger Days	**Windstorms • Dust Storms** **Increased Invasive Species & Pests** **Loss of Wetland Ecosystems**

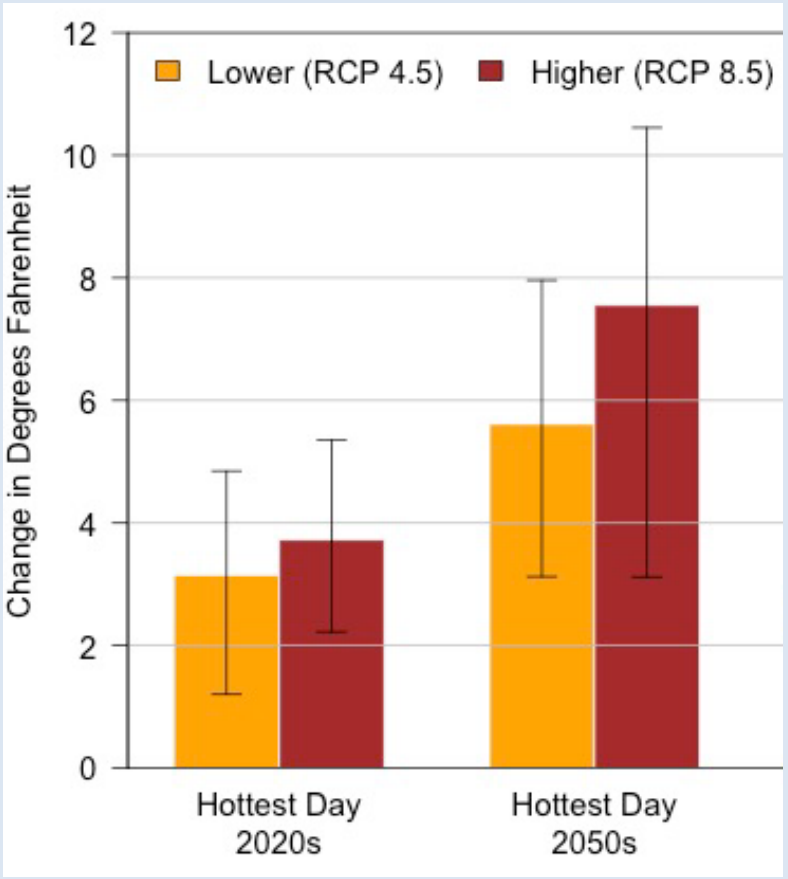
Heat Waves

Extreme heat events are expected to increase in frequency, duration, and intensity.

Malheur County



 # Days w/ Max Temp ≥ 90°F

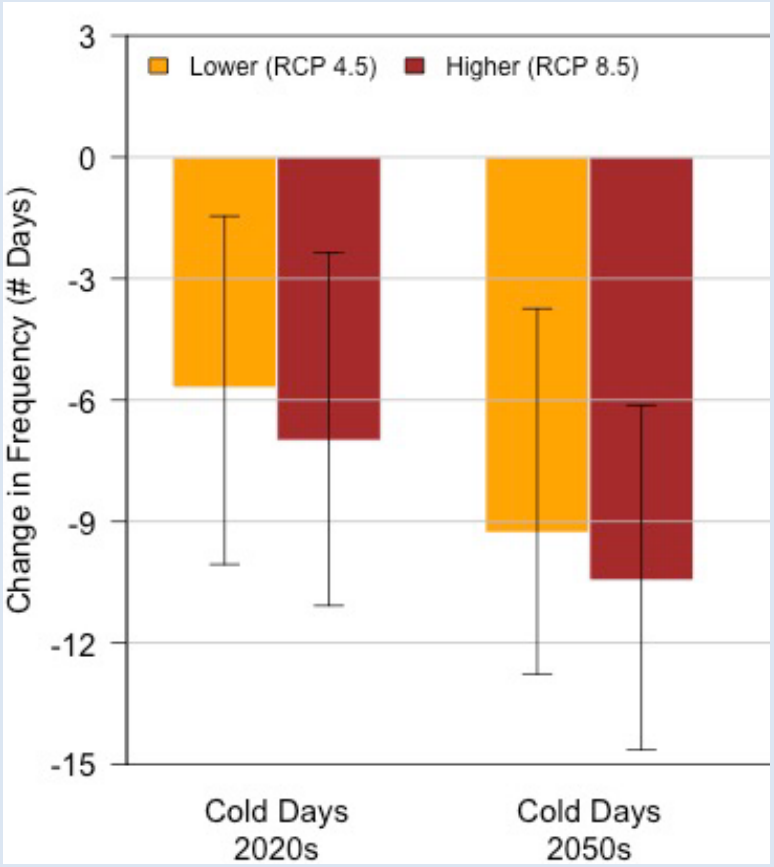


Annual Maximum of Max Temp

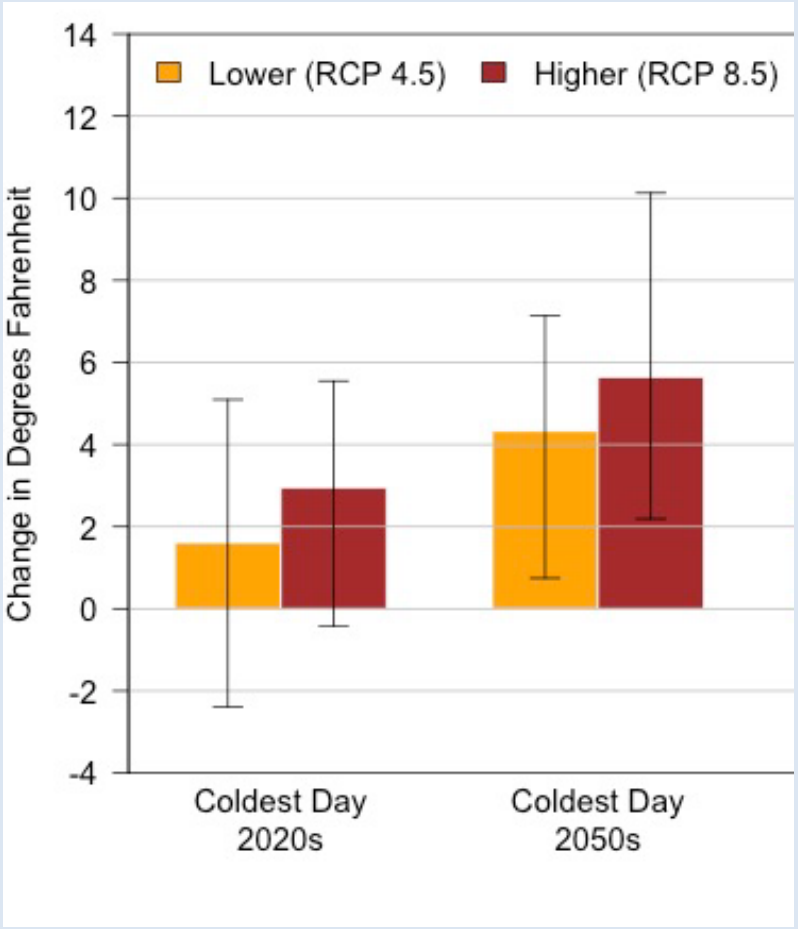
Cold Waves

Cold extremes are still expected to occur from time to time, but with much less frequency and intensity as the climate warms.

Lake County



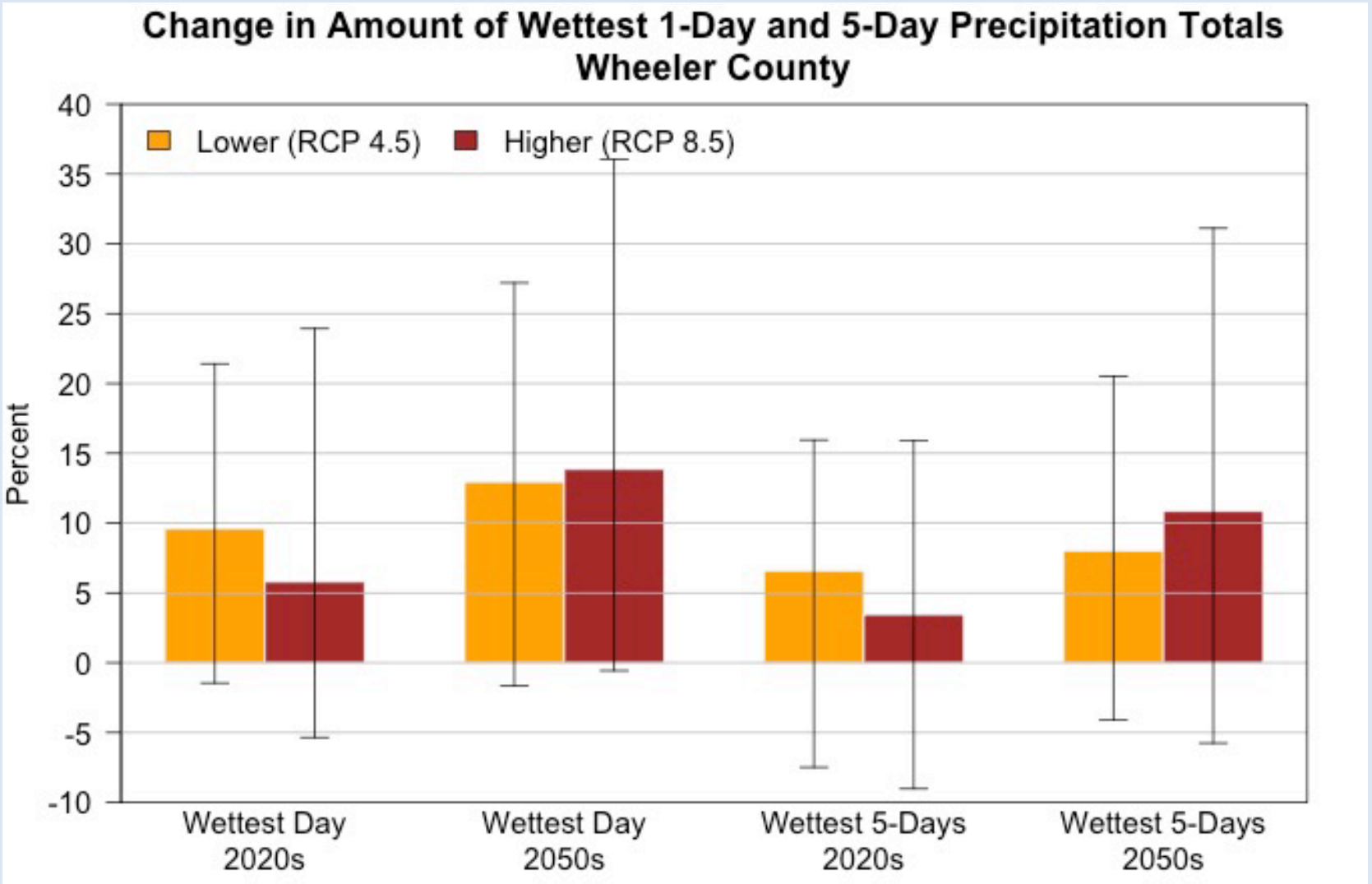
 # Days w/ Max Temp ≤ 32°F



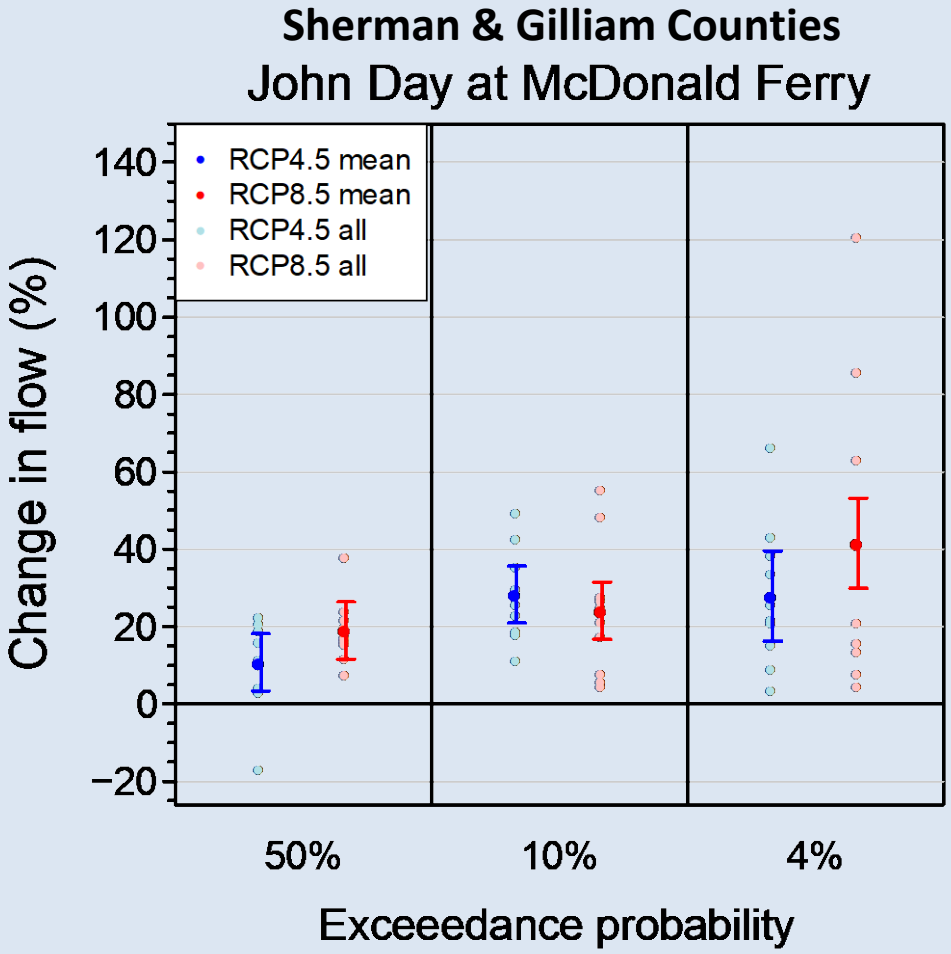
Annual Minimum of Max Temp

Heavy Rains

As the atmosphere warms and is able to hold more water vapor, the frequency and intensity of extreme precipitation events is expected to increase.

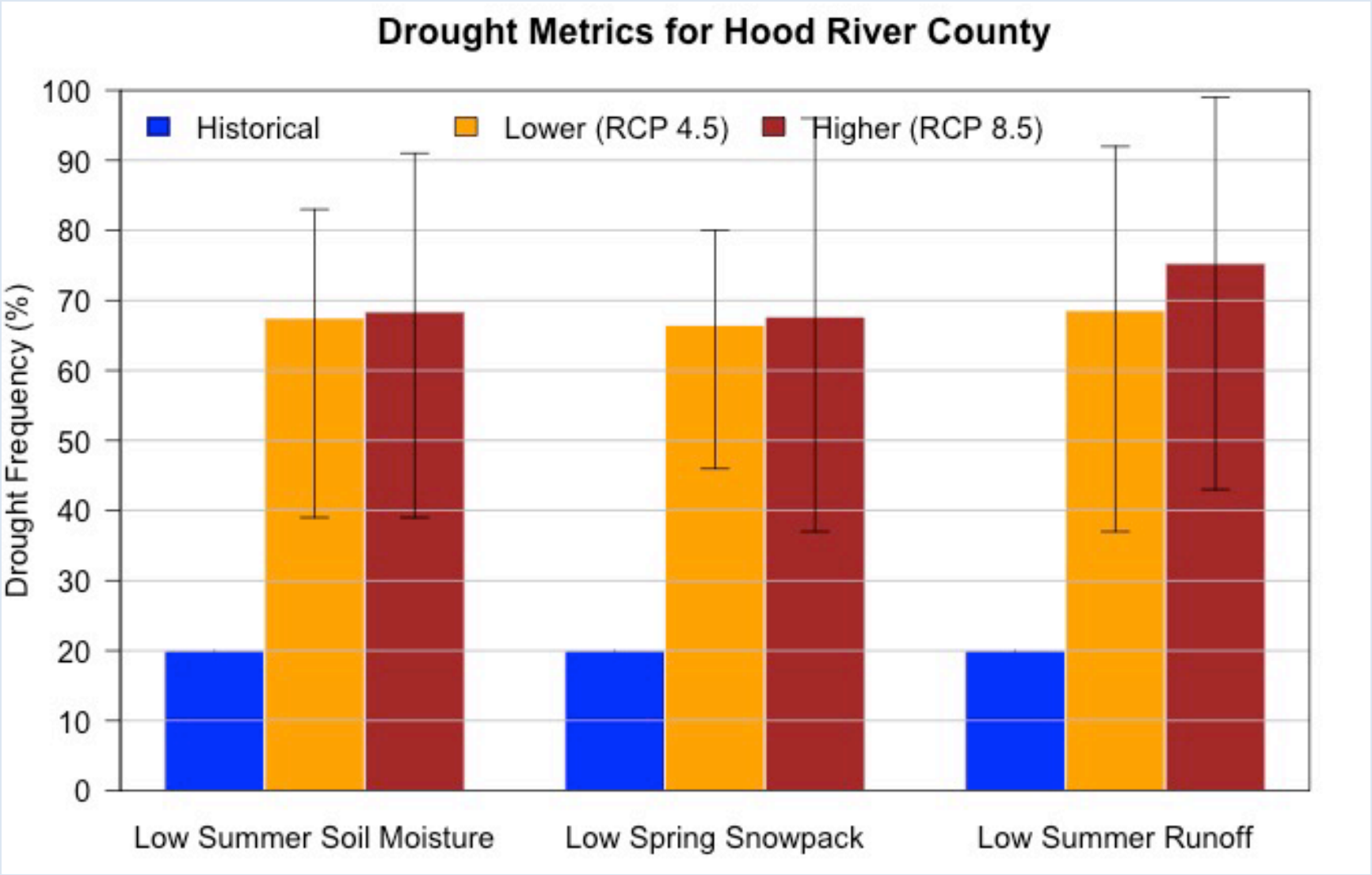


Flooding



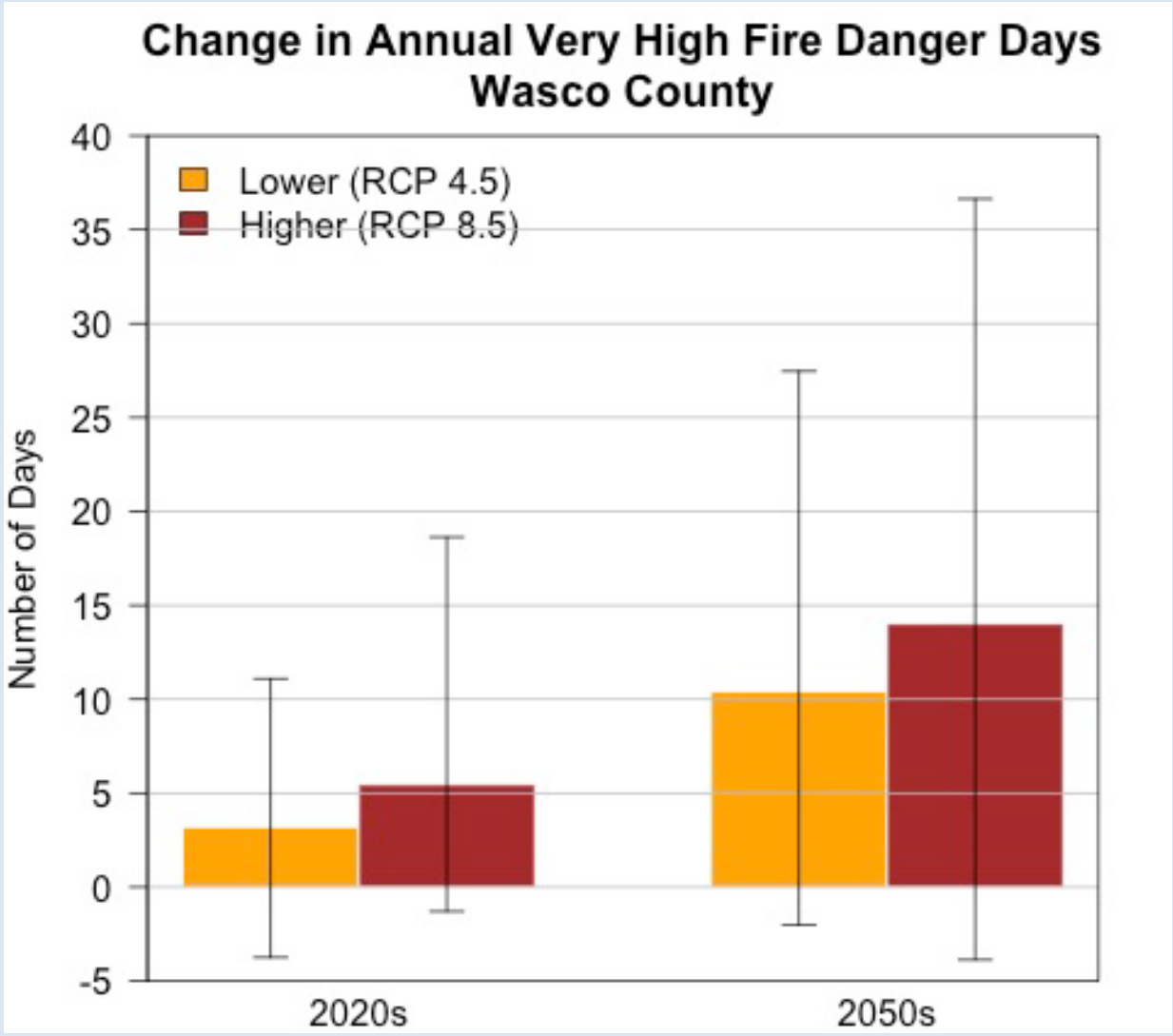
Mid- to low-elevation tributaries that are near freezing level in winter, receiving a mix of rain and snow, may experience an increase in winter flood risk due to warmer winter temperatures causing precipitation to fall more as rain and less as snow, as well as more intense precipitation events.

Drought


Drought Metrics for Hood River County
Historical
Lower (RCP 4.5)
Higher (RCP 8.5)
Drought Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
Low Summer Soil Moisture
Low Spring Snowpack
Low Summer Runoff

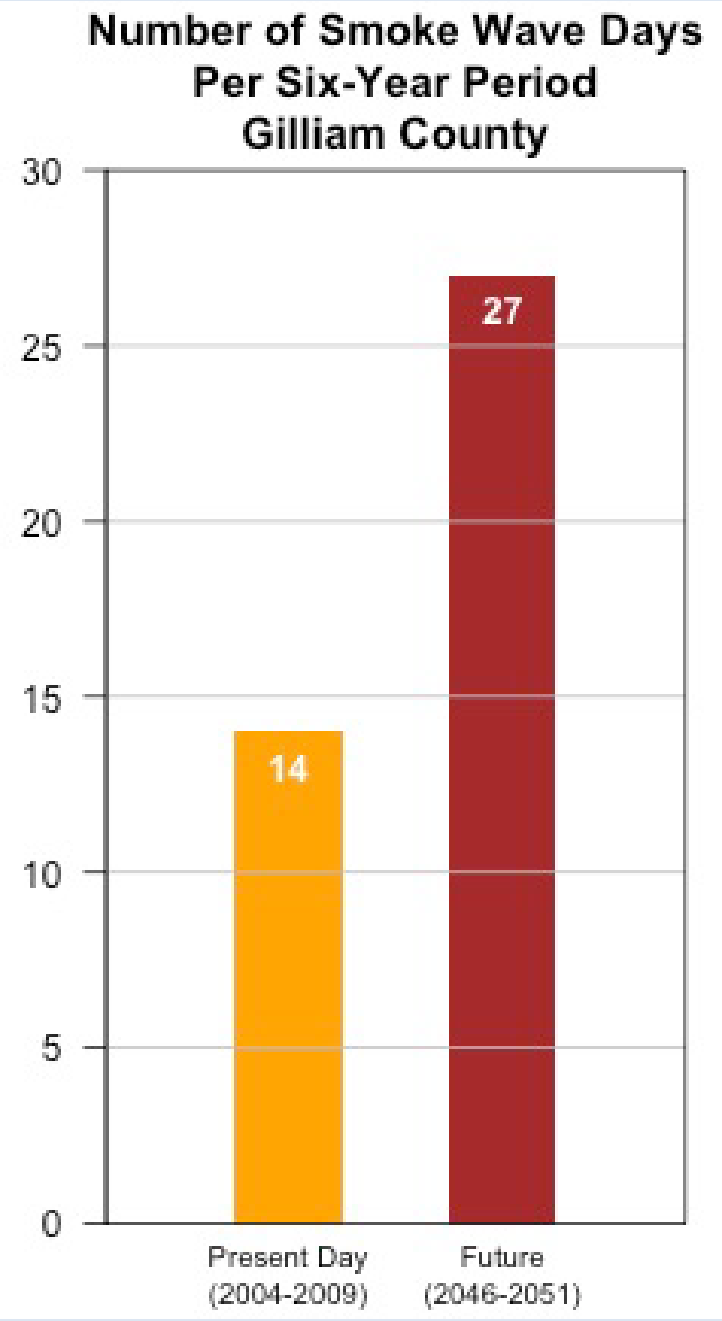
Wildfire

Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change.



Air Quality

Under future climate change, the risk of wildfire smoke exposure is projected to increase.



Other Climate-Related Hazards

Windstorms. Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.

Dust Storms. Limited research suggests that the risk of dust storms in summer would decrease under climate change in parts of eastern Oregon that experience an increase in vegetation cover from the carbon dioxide fertilization effect.

Increased Invasive Species. Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species, insect and plant pests for forest and rangeland vegetation, and cropping systems.

Loss of Wetland Ecosystems. Freshwater wetland ecosystems are sensitive to warming temperatures and altered hydrological patterns, such as changes in precipitation seasonality and snowpack reduction.

Summary of Projected Changes

	Low Confidence	Medium Confidence	High Confidence
Risk Increasing ↑	Poor Air Quality	Heavy Rains Flooding Drought Wildfire Increased Invasive Species Loss of Wetland Ecosystems	Heat Waves
Risk Unchanging =	Windstorms		
Risk Decreasing ↓	Dust storms		Cold Waves

How to Use this Information

- Explore a range of plausible future outcomes taking into consideration the climate system's complex response to increasing greenhouse gases
- These are NOT weather predictions
- Envision how current systems may respond under climate conditions different from those the systems were designed to operate under
- Evaluate potential mitigation actions to accommodate future conditions (e.g., NHMP, CWPP)
- Should NOT be used for engineering/design
- Influence the assessment of likelihood of a particular climate-related hazard risk

Contact Us

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