OUR CHANGING CLIMATE: LATEST INSIGHTS FROM THE NATIONAL CLIMATE ASSESSMENT

Emma Kuster
University of Oklahoma
20 March 2024

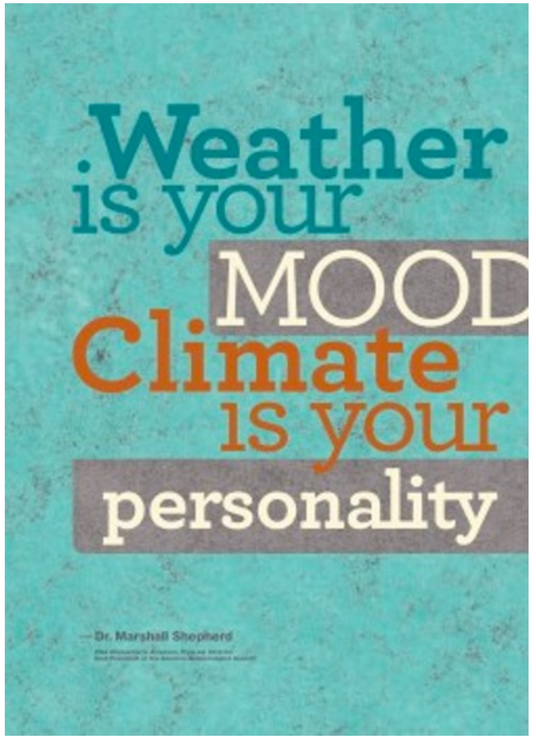
SOUTH CENTRAL
CLIMATE ADAPTATION SCIENCE CENTER

WEATHER VS CLIMATE

Weather – state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness; short-term

Climate – statistical collection of weather conditions at a place over a period of years; long-term

“Climate is what you expect. Weather is what you get.”



ENERGY BUDGET & GREENHOUSE GAS EFFECT

Energy budget: balance of incoming and outgoing radiation

Greenhouse effect: atmosphere absorbs some outgoing radiation to keep the planet warm

Increases in greenhouse gases alter how much is emitted out to space and how much is trapped by our atmosphere

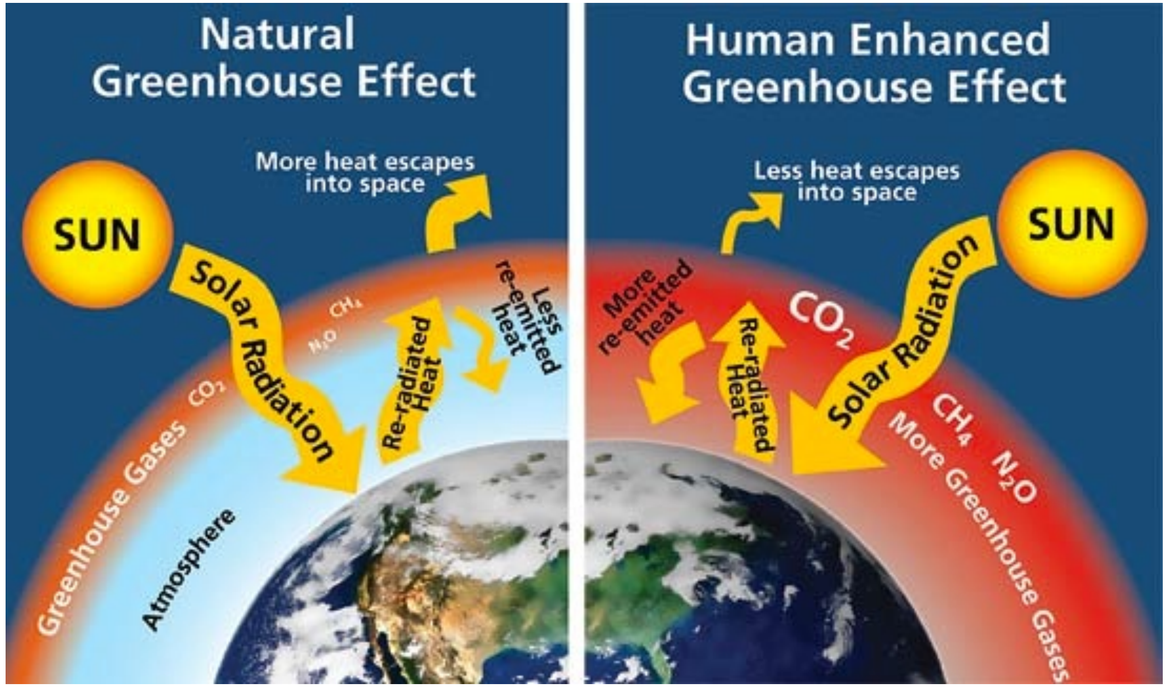
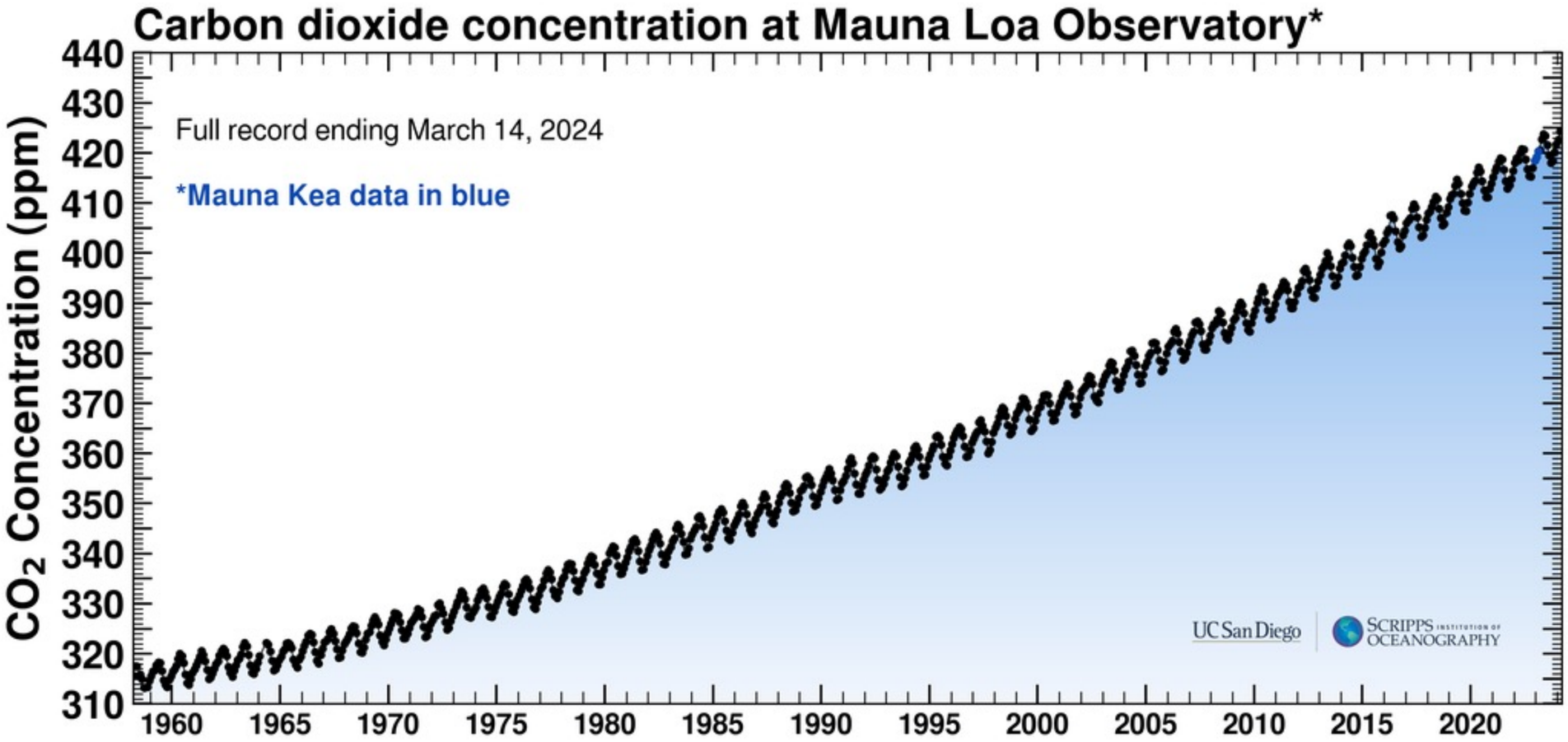
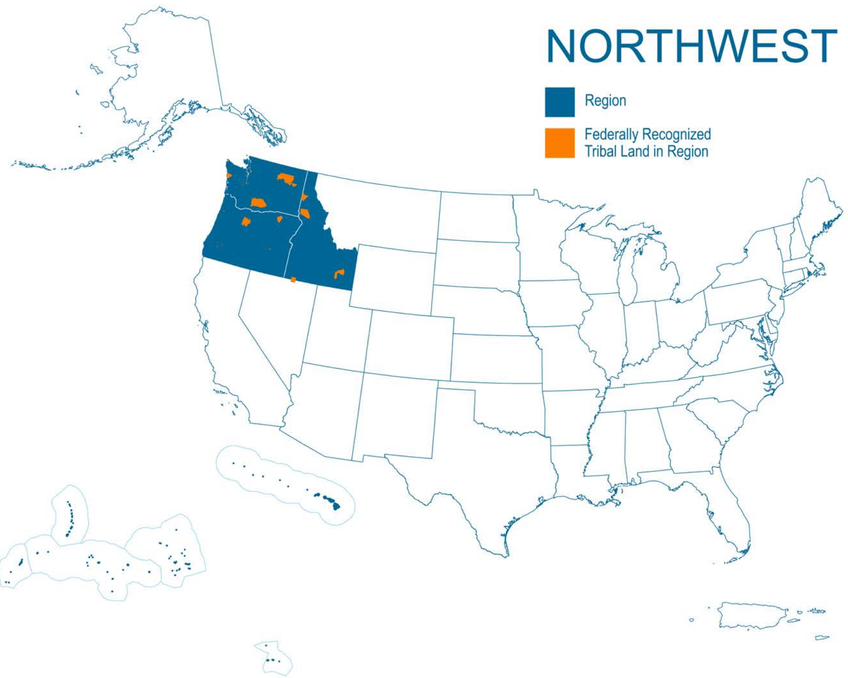


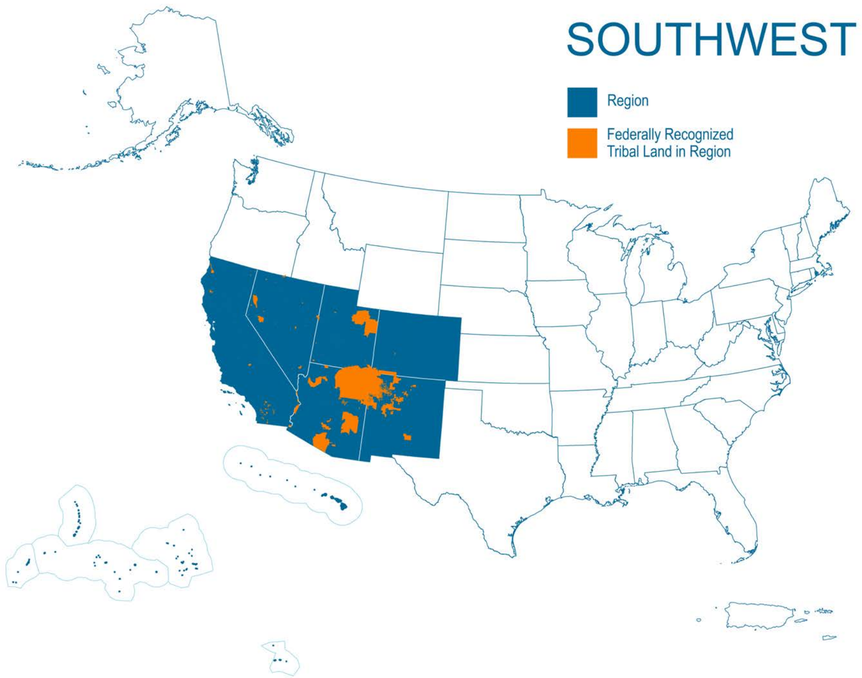
Figure from NPS

CHANGE IN ATMOSPHERIC CO_2



Join at menti.com
Code: 9932 9081





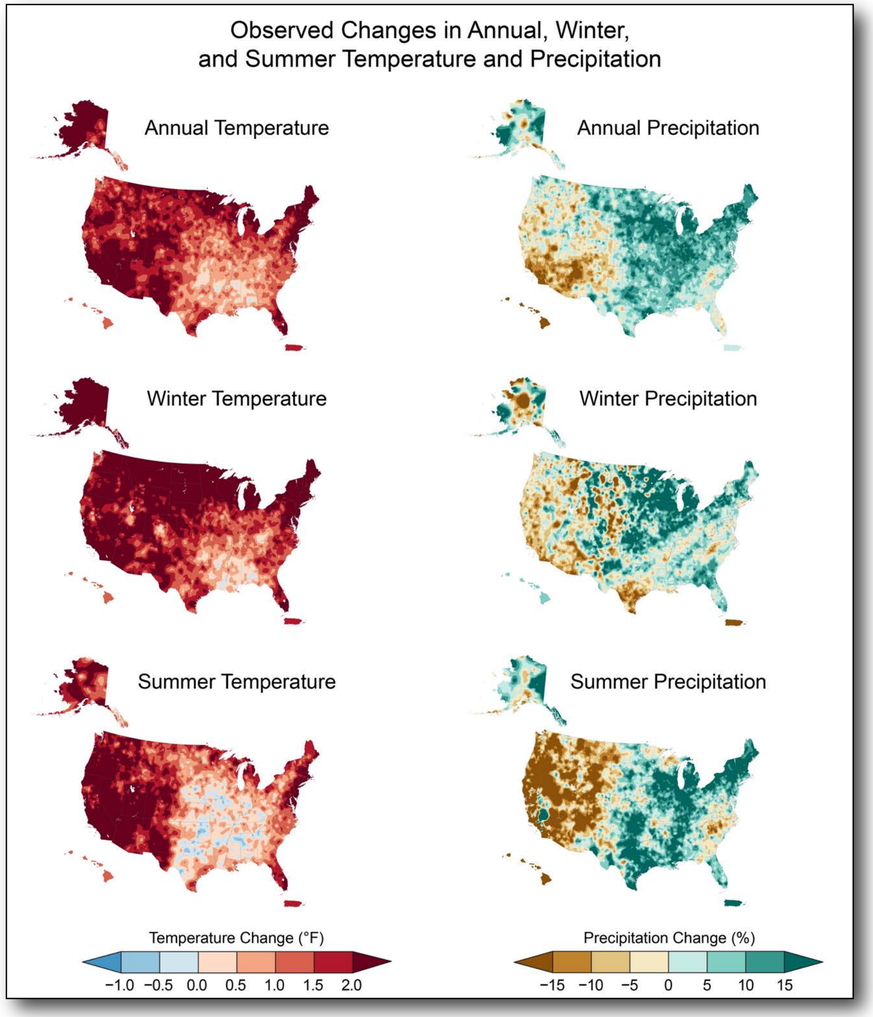
WESTERN UNITED STATES

CHANGES IN TEMPERATURE & PRECIPITATION, 1900 TO 2020

Annual average temperatures have **increased 1.5 to 2.5°F** for much of the western US.

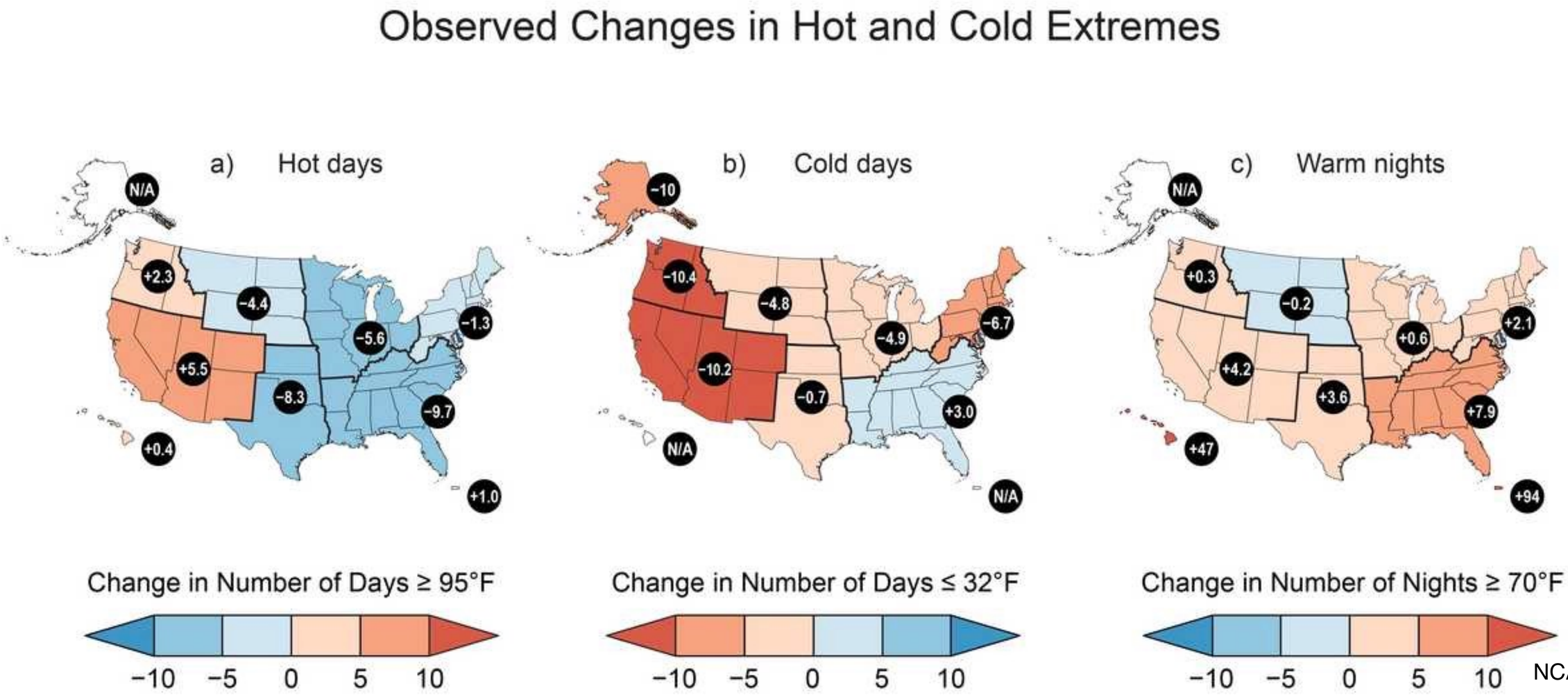
Annual precipitation has **decreased** across most of the western US, especially in the summer season.

Changes depend on **season and location**.



NCA5 Fig. 2.4

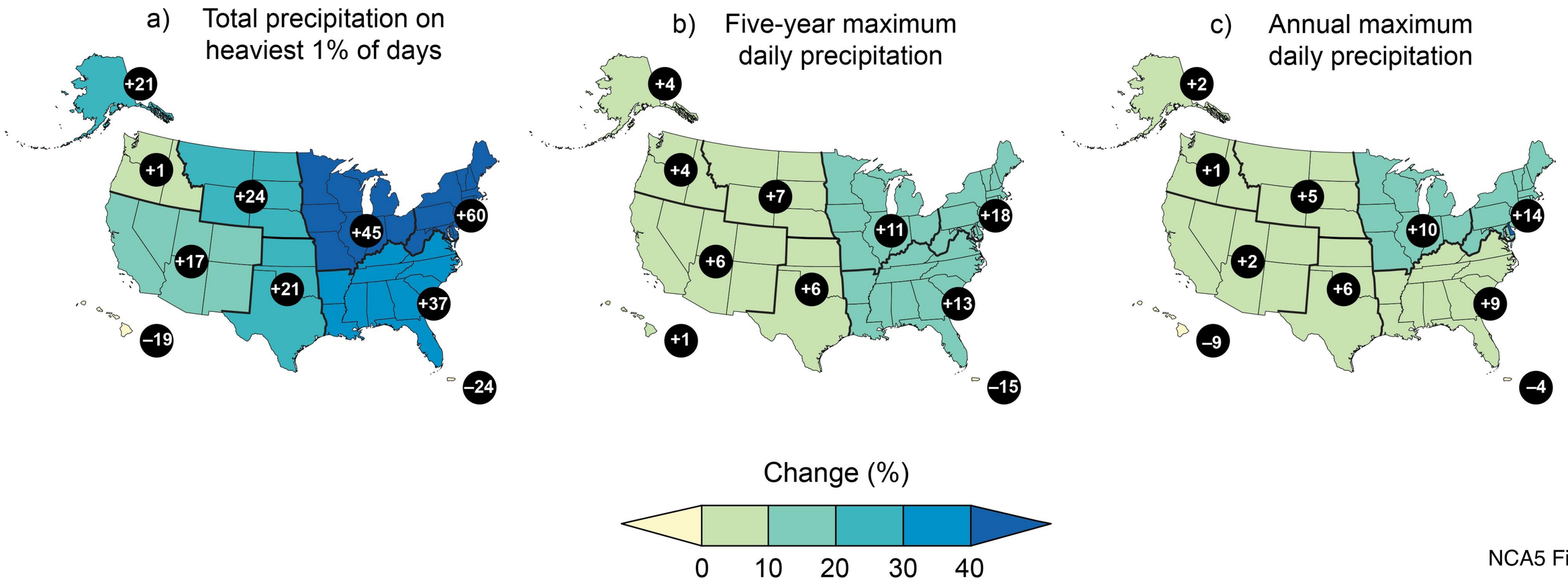
CHANGES IN EXTREME TEMPERATURE



NCA5 Fig. 2.7

CHANGES IN EXTREME PRECIPITATION

Observed Changes in the Frequency and Severity of Heavy Precipitation Events



NCA5 Fig. 2.8

IMPLICATIONS OF WARMING & DRYING

Declines in mountain snowpack

Greater proportion of winter precipitation falling as rain

Receding glaciers and rising elevation of snow lines

Decreases in streamflow

Increasing frequency and intensity of drought conditions

Biodiversity loss and ecosystem transformations

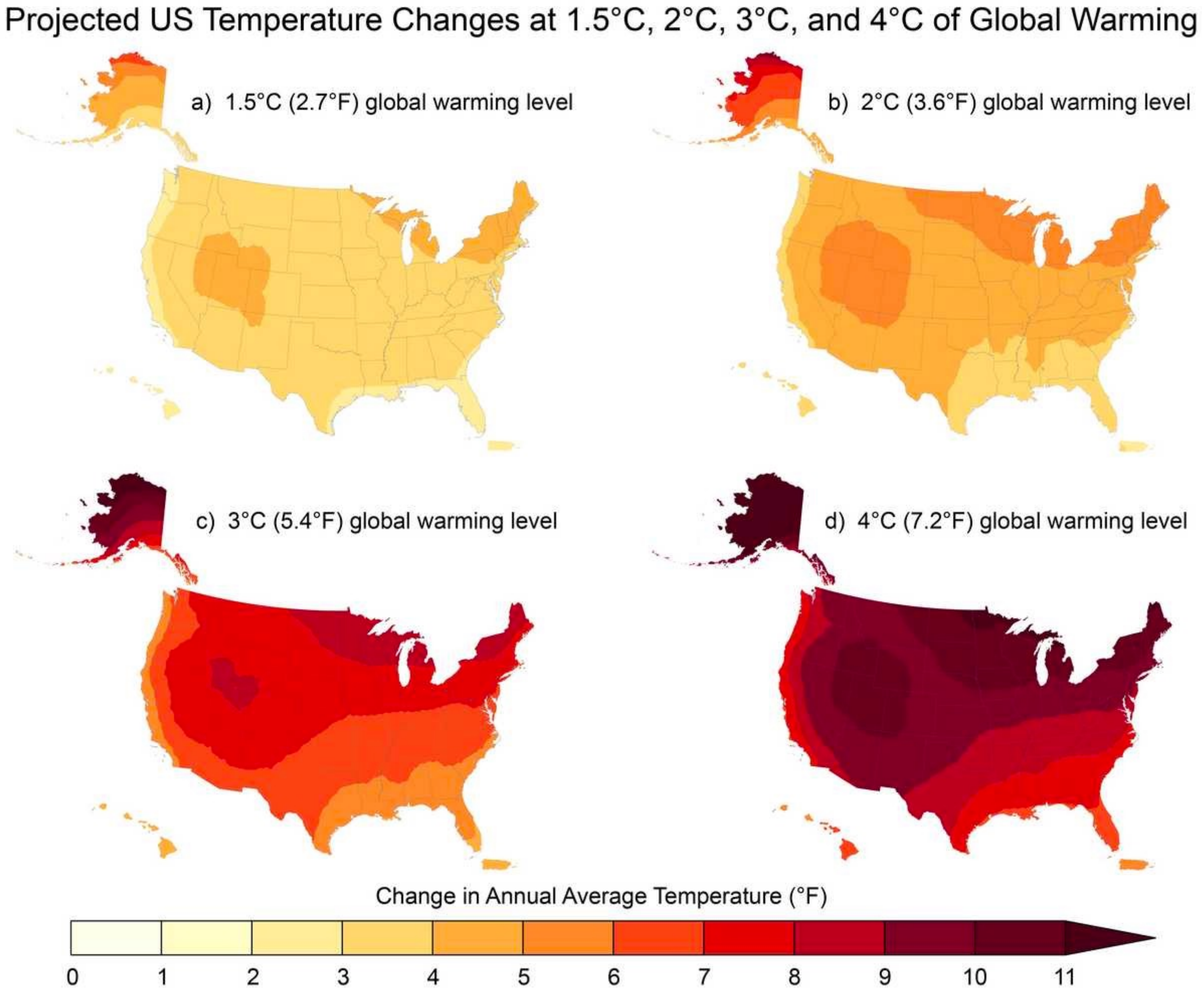
Increasing wildfire conditions

Join at menti.com
Code: 9932 9081

FUTURE PROJECTIONS OF TEMPERATURE

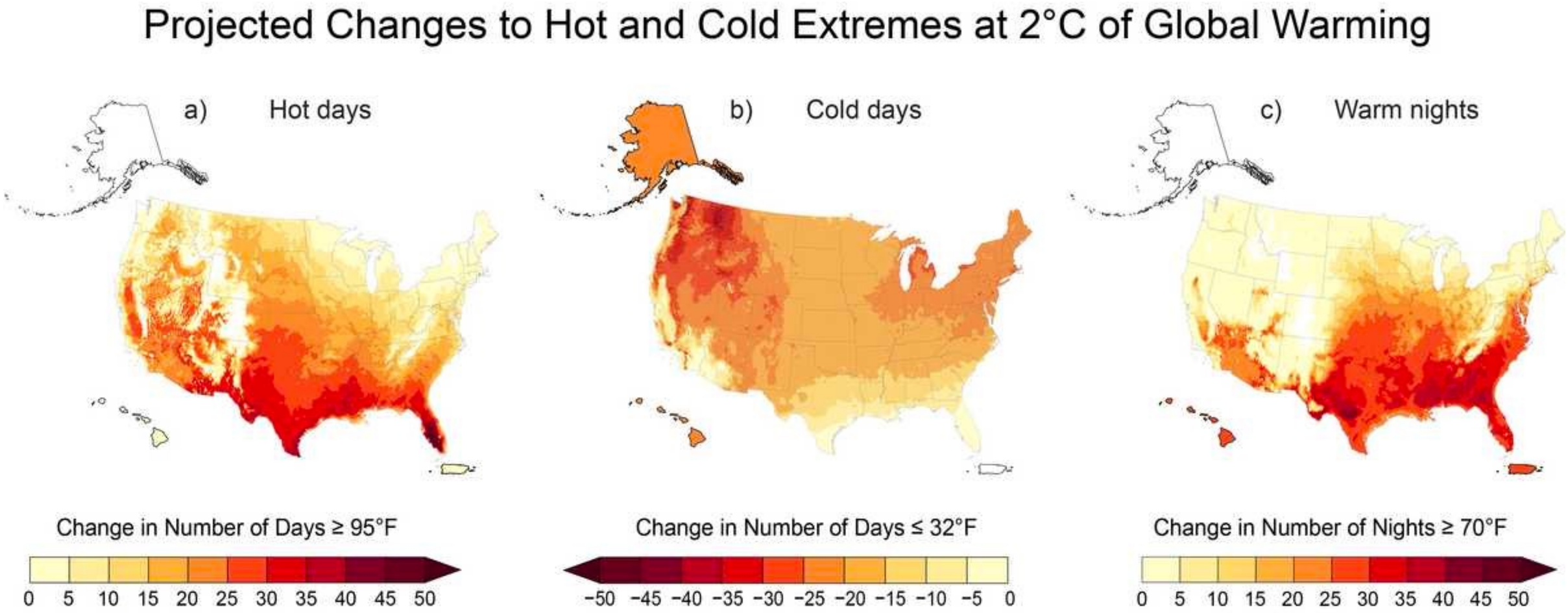
Northern and western parts of the country are likely experience proportionally greater warming

Scientists expect temperatures across the western US to **increase by 3 to 10ºF by 2100**



NCA5 Fig. 2.9

PROJECTIONS OF EXTREME TEMPERATURE



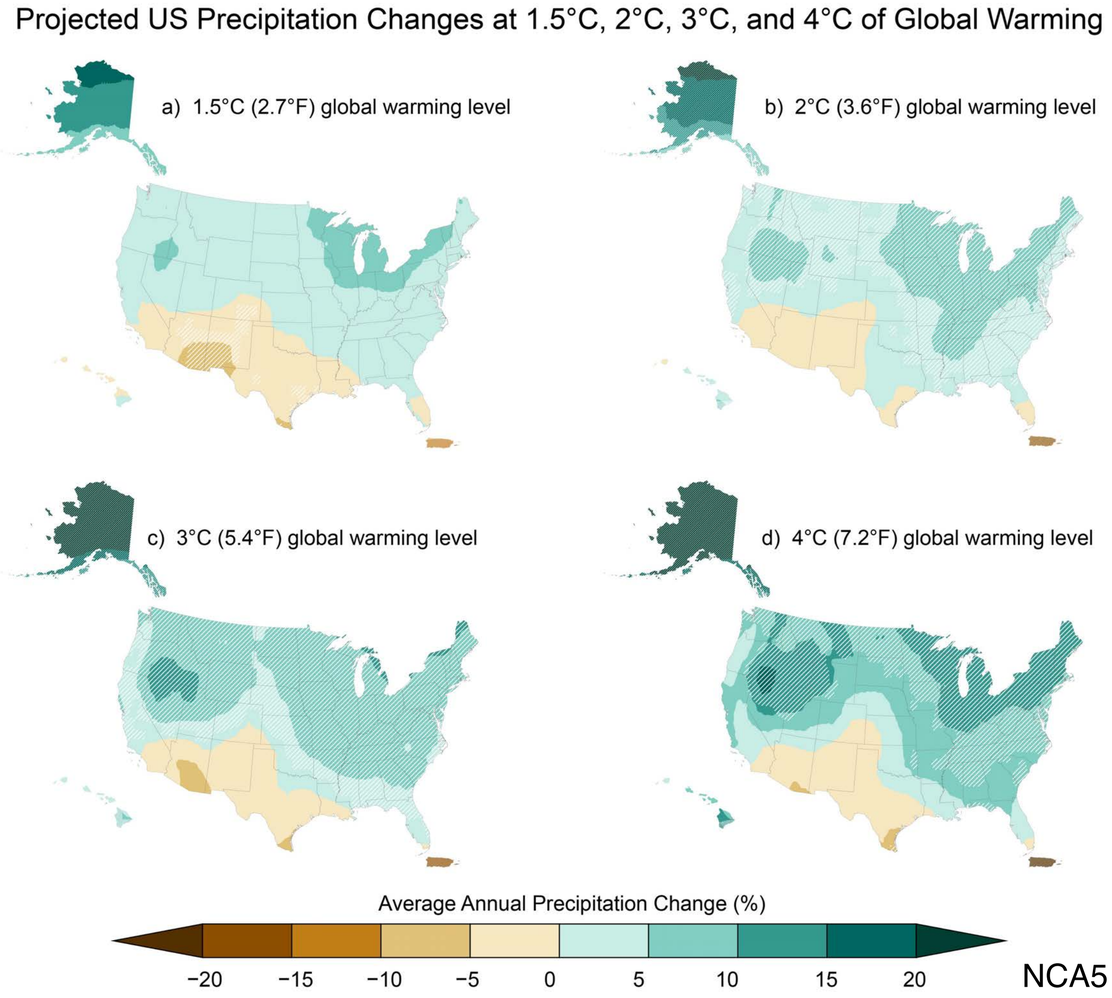
NCA5 Fig. 2.11

FUTURE PROJECTIONS OF PRECIPITATION

Scientists expect precipitation to **increase by 0 to 15% in the NW, but decrease by 0 to 10% in the SW**

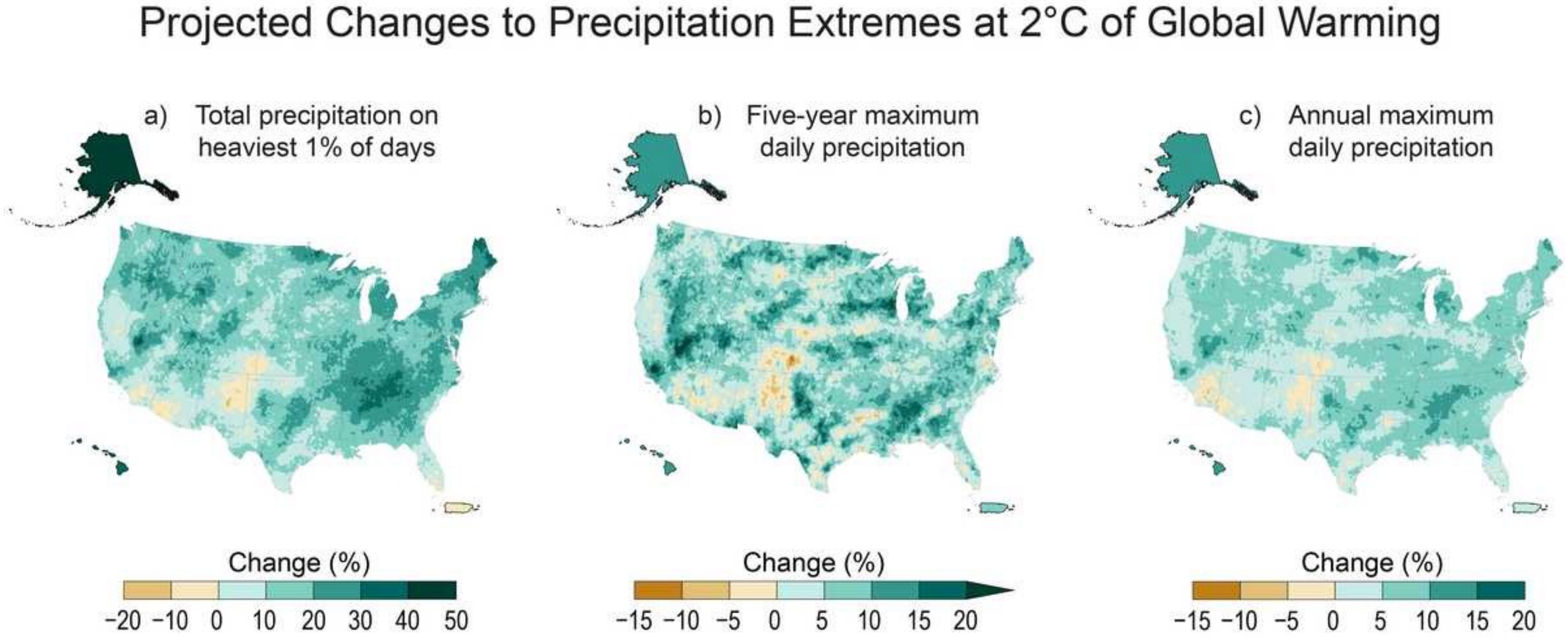
Precipitation increases very likely in winter, but decreases expected in the summer for the NW

Less snowfall expected, resulting in reduced snowpack and decreased spring runoff



NCA5 Fig. 2.10

FUTURE PROJECTIONS OF EXTREME PRECIPITATION



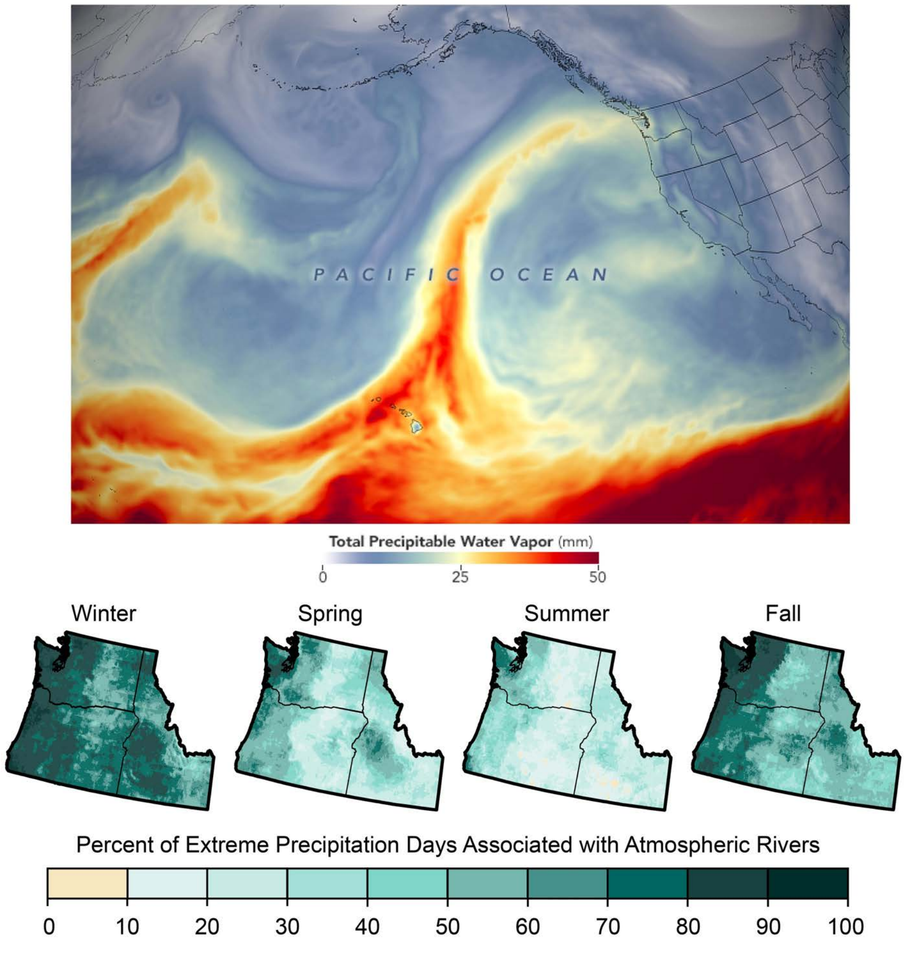
NCA5 Fig. 2.12

ATMOSPHERIC RIVERS

Long, narrow bands of water vapor in our atmosphere associated with extreme precipitation

Scientists project a greater number of strong Atmospheric Rivers that also reach farther inland

Atmospheric Rivers and Extreme Precipitation in the Northwest

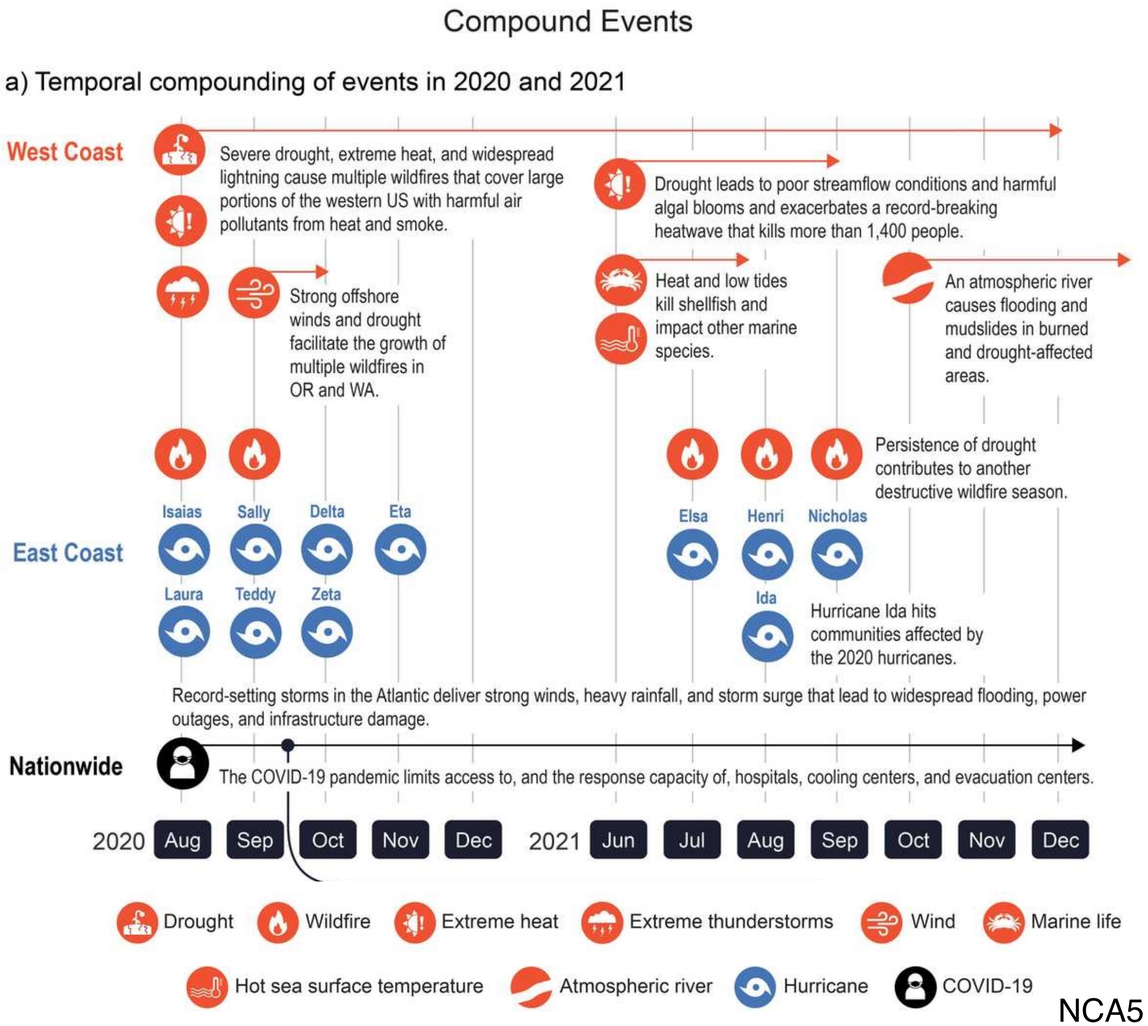


NCA5 Fig. 27.1

COMPOUND EVENTS

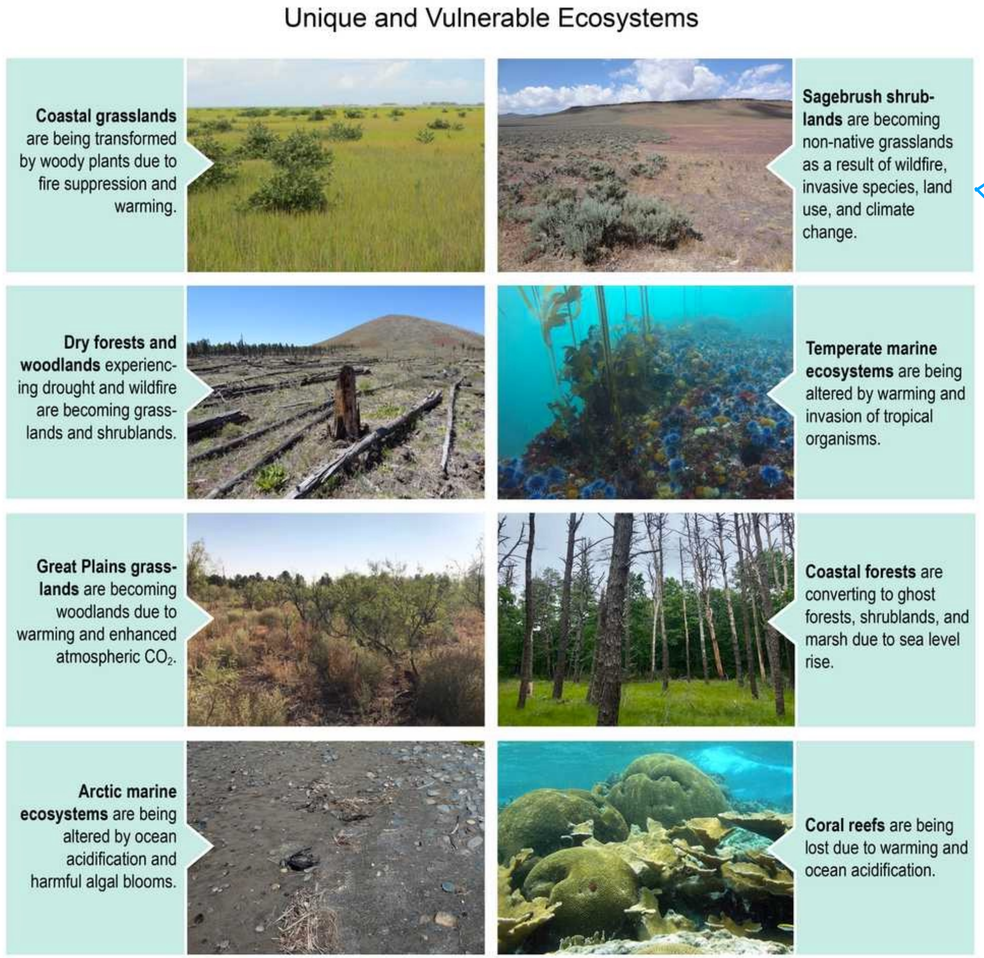
Compound events result from the occurrence of multiple climate drivers or hazards that when combined have greater impacts than isolated hazards

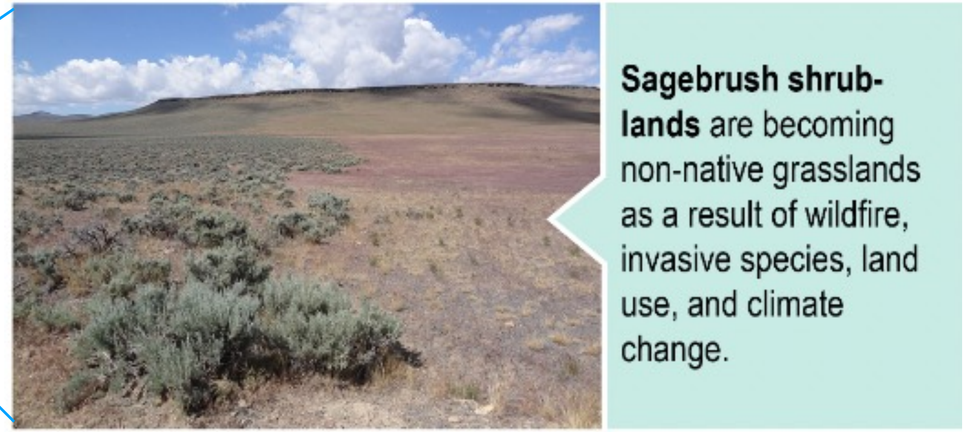
They are expected to become more frequent with continued climate change



NCA5 Fig. F1.1

1 CLIMATE CHANGE IS DRIVING RAPID ECOSYSTEM TRANSFORMATIONS





Distribution and abundance of non-native and highly flammable cheatgrass continues to increase before and after wildfires.

Length of wildfire season is expected to increase as drought frequency, duration, and intensity increase.

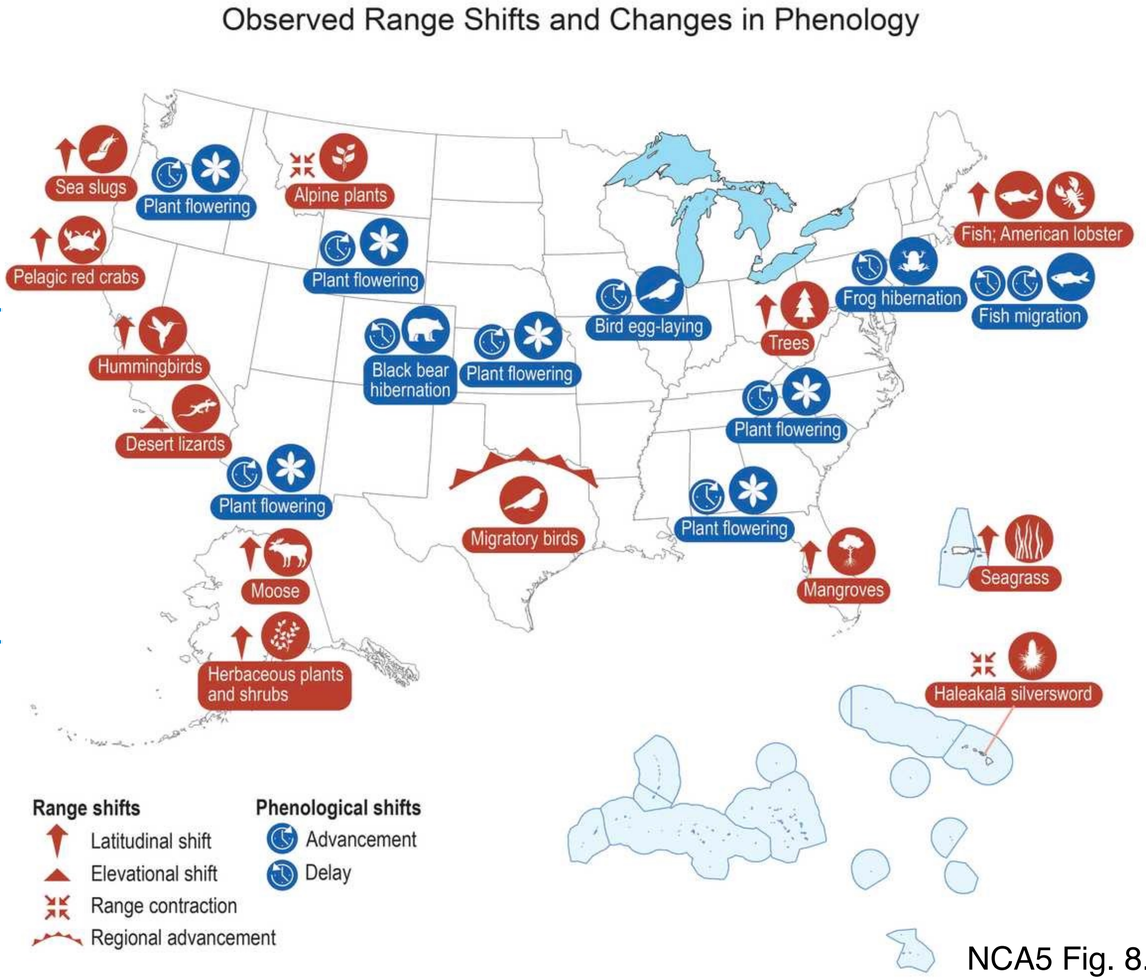
NCA5 Fig. 8.7

2 SPECIES CHANGES AND BIODIVERSITY LOSS ARE ACCELERATING

Many plant and animal species are shifting to higher elevations or more northern latitudes.

Milder winters and warmer growing seasons are expected to expand ranges for some species.

Climate refugia occur in locations where environmental conditions are changing more slowly than surrounding areas



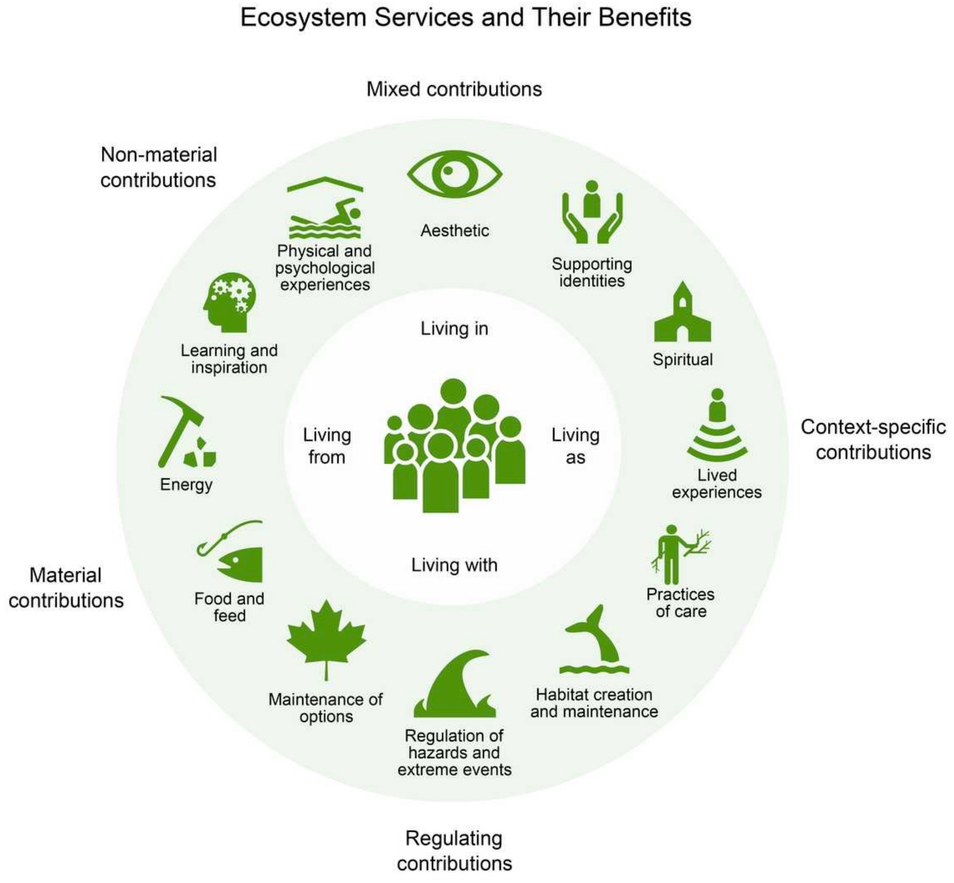
NCA5 Fig. 8.11

3 IMPACTS TO ECOSYSTEM SERVICES CREATE RISKS AND OPPORTUNITIES

Rising temperatures can extend seasonal recreational opportunity, but if it's too hot, recreation tends to decrease.

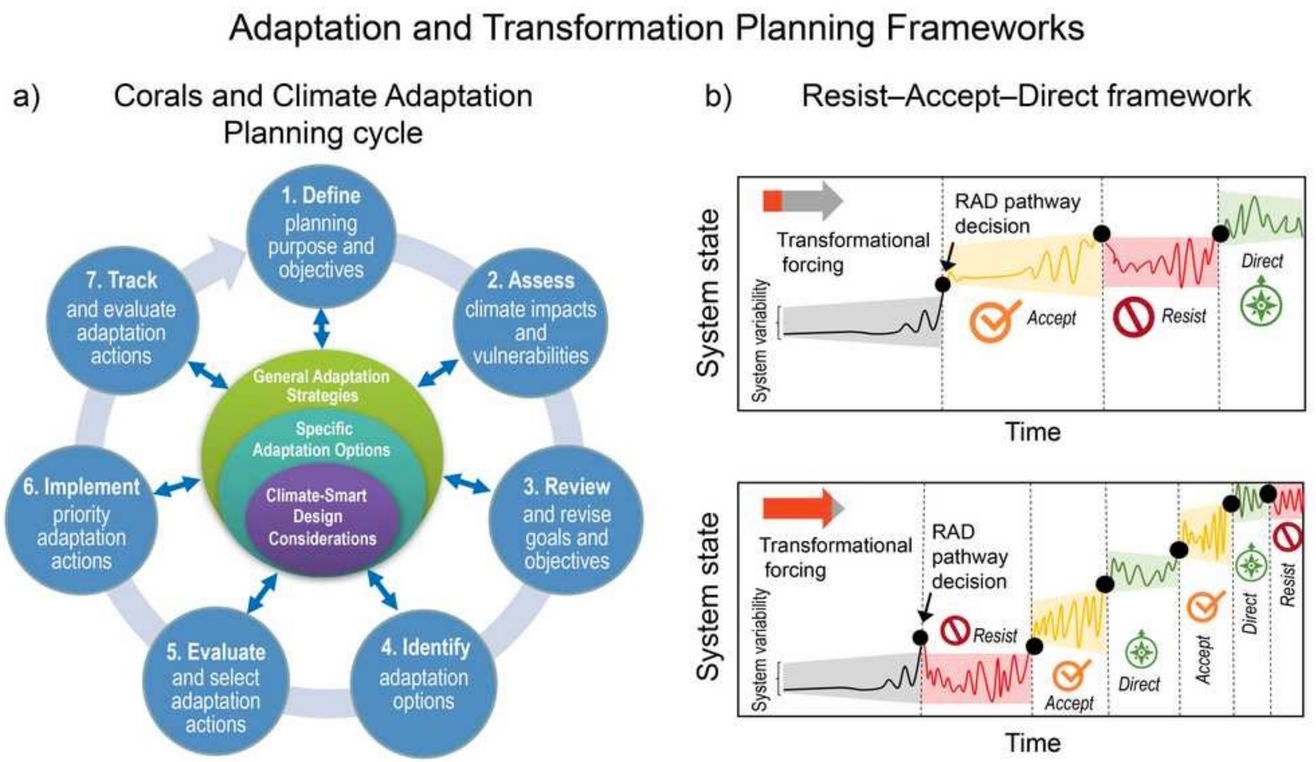
Ecosystem-based adaptation is a type of nature-based solution aimed at increasing community resilience to climate change through the use of ecosystems.

Future trends on ecosystem use and benefits are not always clear.



NCA5 Fig. 8.17

ADAPTATION AND TRANSFORMATION PLANNING FRAMEWORKS



NCA5 Fig. 8.9

Adaptive management iteratively plans, implements, and modifies strategies for managing resources under uncertainty.

RAD framework helps identify conditions where ecosystem management should resist, accept, or direct change.

Questions?

Emma Kuster
emmakuster@ou.edu