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EcoAdapt™

Meeting the challenges of climate change

Climate Change Projections & Impacts

SANTA ROSA, CALIFORNIA

Introduction

LIKELY CLIMATE STRESSORS FOR SANTA ROSA

Higher average temperatures, more extreme heat, and warmer nights

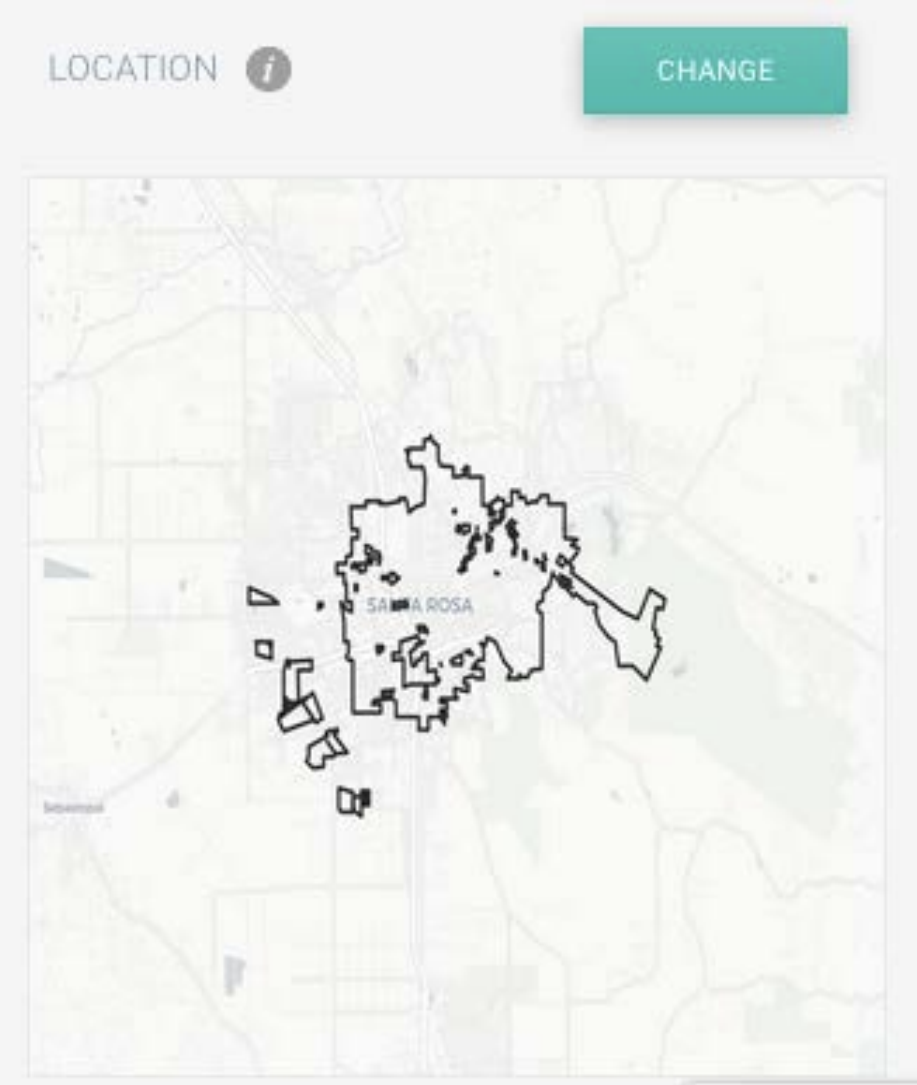
Shifts in rainfall seasonality and increased flood risk

More frequent and/or more severe droughts

More frequent and/or more severe wildfires

Cal-Adapt Projections

Cal-Adapt Projections



Source:
Cal-Adapt. Data: LOCA Downscaled Climate Projections (Scripps Institution of Oceanography), Gridded Historical Observed Meteorological Data (University of Colorado, Boulder).

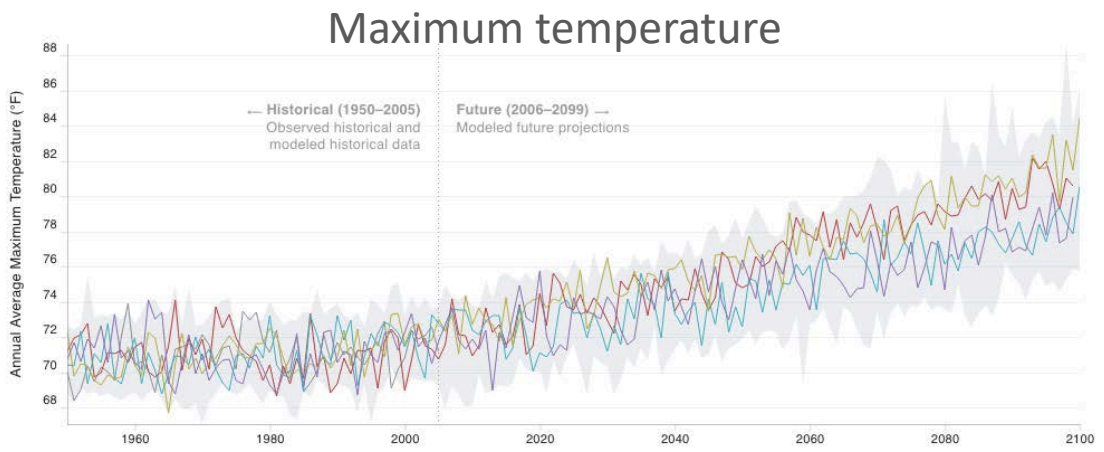
Important Considerations

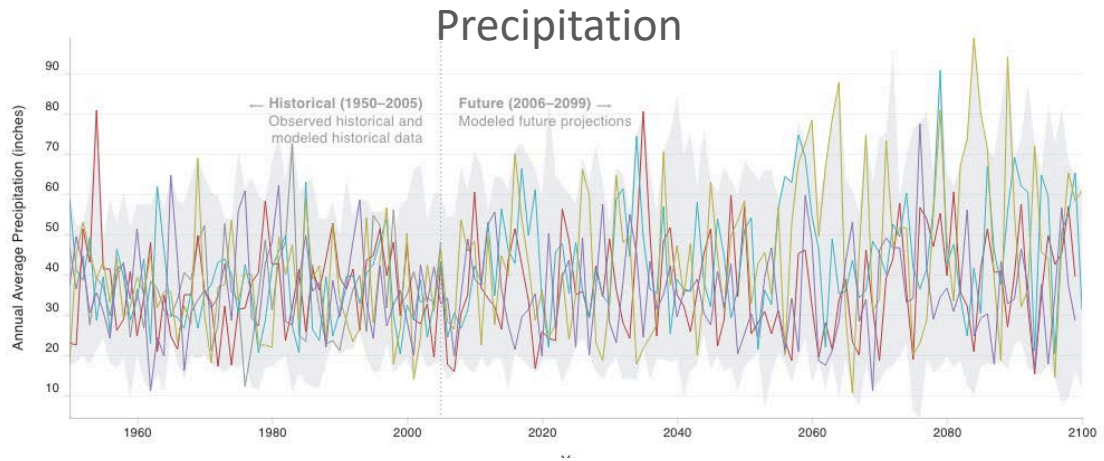
- Trend direction ▲ ▼ –
- Magnitude of change
- Shifts in timing/variability
- Model agreement

Observed historical 1961–1990

Mid-Century 2040–2069

Late-Century 2070–2099





Climate Stressors

Air temperature

Precipitation

Extreme heat

Drought & Wildfire

Extreme precipitation

Severe storms/wind

Flooding

Landslides

Air Temperature

HIGHER AVERAGE TEMPERATURES

- ▲ Minimum temperature

  +8.1°F by 2100 *(increase from 43°F to 51.1°F)*

- ▲ Maximum temperature

  +7.5°F by 2100 *(increase from 71.1°F to +78.6°F)*

MORE EXTREME HEAT & WARMER NIGHTS

- ▲▲ Extremely hot days

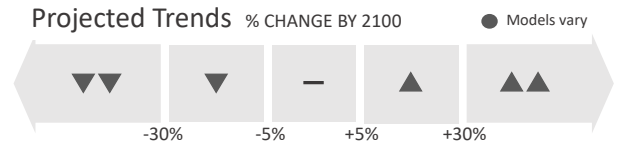
  +20 days per year over 98.1°F *(increase from 4 to 24 days)*

- ▲▲ Heat wave duration

  +4 days per year *(increase from 2.4 to 6.4 days)*

- ▲▲ Frost-free nights

  +29 nights per year *(increase from 333 to 362 nights)*



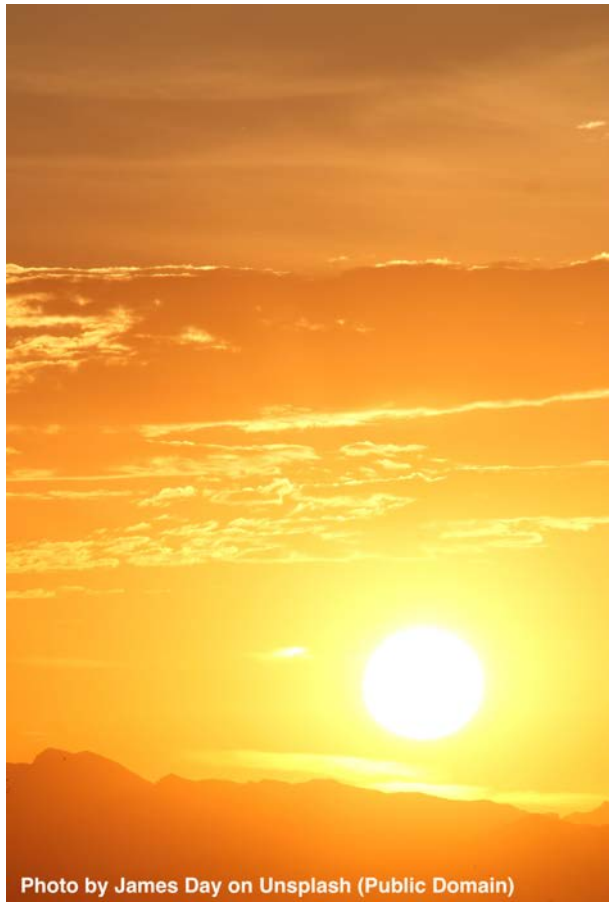


Photo by James Day on Unsplash (Public Domain)

Air Temperature

Likely impacts of higher average temperatures, more extreme heat, and warmer nights:

- ▲ Evapotranspiration, enhancing overall water stress
- ▼ Plant growth/productivity due to heat stress
- ▲ Insect pests, pathogens, and disease vectors
- ▲ Heat-related illness and death
- ▲ Demand for emergency services, cooling centers, water
- ▲ Energy demand and associated risk of rolling blackouts

Precipitation

SHIFTS IN AMOUNT/TIMING OF RAINFALL

- Annual precipitation

  +28% by 2100 *(increase from 34.9 to 44.8 in)*

- ▲▼ Shorter/more intense wet season and longer dry season; increased variability

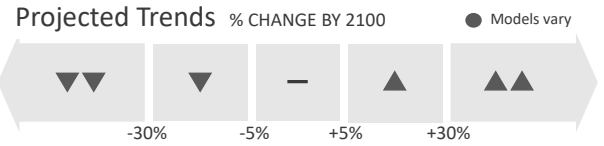
EXTREME PRECIPTATION (FLOODING)

- ▲ Intensity of extreme events

  +20% in 2-day total for 20-year event *(from 9.4 to 11.3 in)*

- Frequency of extreme events

  +3 events with 2-day total over 1.99 in *(from 3 to 6 events)*



Cal-Adapt; Swain et al. 2018

Precipitation

Likely impacts of shifts in rainfall seasonality and increased risk of extreme flooding:

- ▼ Plant growth and productivity due to longer dry season that enhances water stress
- ▲ Risk of landslides and flash floods, particularly during heavy rainfall events that follow dry periods
- ▲ Risk of injuries/death and property damage
- ▲ Road damage and/or loss of access to isolated areas
- ▲ Interruption of public services (e.g., utilities)
- ▲ Economic impacts of damage to businesses and agriculture

Drought

MORE FREQUENT AND/OR SEVERE DROUGHTS

▲▲ Risk of drought years

Twice as likely to occur in any given year by 2050

▲▲ Drought severity

20-year drought will become 10-year drought and
100-year drought will become 20-year drought by 2100

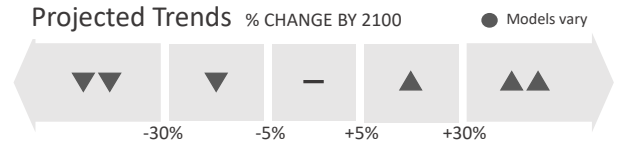



Photo by Brad Sutton/NPS (Public Domain)

Rising drought risk even if precipitation increases due to enhanced evapotranspiration associated with warmer temperatures


Photo by Nathan Stephenson/USGS (Public Domain)

Cook et al. 2015; Pierce et al. 2018

Drought

Likely impacts of more frequent and/or severe drought:

- ▼ Water availability due to declining surface water supplies and groundwater recharge combined with increased demand for agricultural and municipal use
- ▲ Plant water stress and mortality rates
- ▲ Potential for human-wildlife conflict due to increased density around fewer resources
- ▲ Cost of food and water
- ▲ Economic losses due to crop failures, business expenses, loss of tourism, etc.

Wildfire

MORE FREQUENT AND/OR SEVERE WILDFIRES

▲ Annual area burned

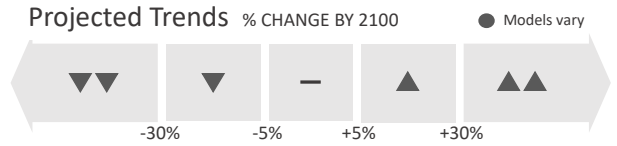
+18% by 2100 *(increase from 230 to 272 acres per year)*

▲▲ Frequency of very large fires

50% increase in fires >25,000 acres statewide by 2100

▲▲ Longer fire seasons and more days of extreme fire weather

Dependent on fuel availability and moisture, ignition sources, and weather conditions



Cal-Adapt; Westerling et al. 2018; Goss et al. 2020

Wildfire

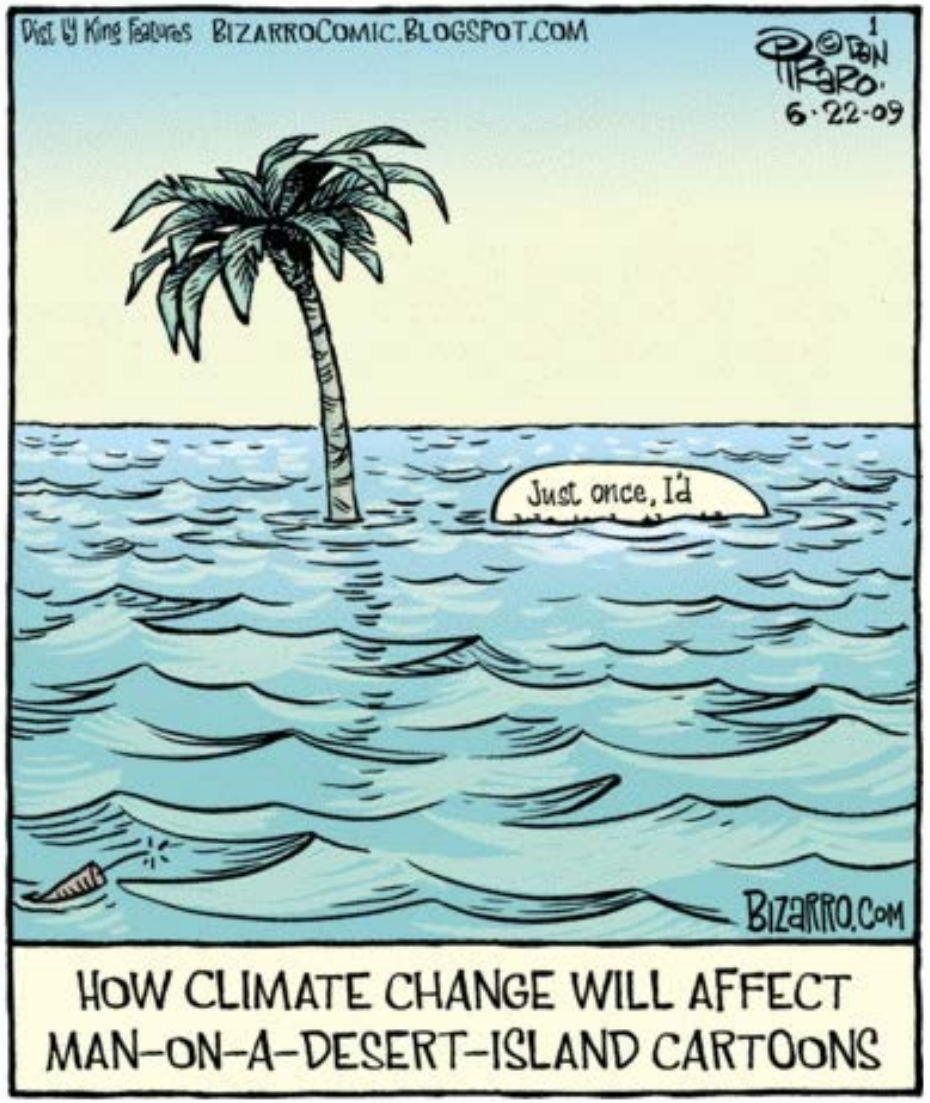
Likely impacts of more frequent and/or severe wildfires:

- Risk of injuries and death due to burns/smoke inhalation as well as longer-term health impacts
- Damage/loss of homes, businesses, and other infrastructure
- Disruption of critical supply chains, public services, etc.
- Economic losses due to direct damages as well as declines in tourism and recreation following fire
- Preemptive power outages for wildfire prevention, resulting in loss of air conditioning, risk of food/medication spoilage, disruption to public services, etc.

Important Tools and Resources

- Cal-Adapt (http://cal-adapt.org)
- California's Fourth Climate Change Assessment (https://www.climateassessment.ca.gov/)
- California Adaptation Clearinghouse (https://resilientca.org/)
- California Adaptation Planning Guide (https://resilientca.org/apg/)
- Climate Action 2020 and Beyond: Sonoma County Regional Climate Action Plan (https://rcpa.ca.gov/projects/climate-action-2020/)
- CalEnviroScreen 3.0 (https://oehha.ca.gov/calenviroscreen)
- California Heat Assessment Tool (https://www.cal-heat.org/)

Questions?



Next step:

Group discussion of climate impacts!

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