Climate change trends and potential impacts on specialty crops in the Southern Coast

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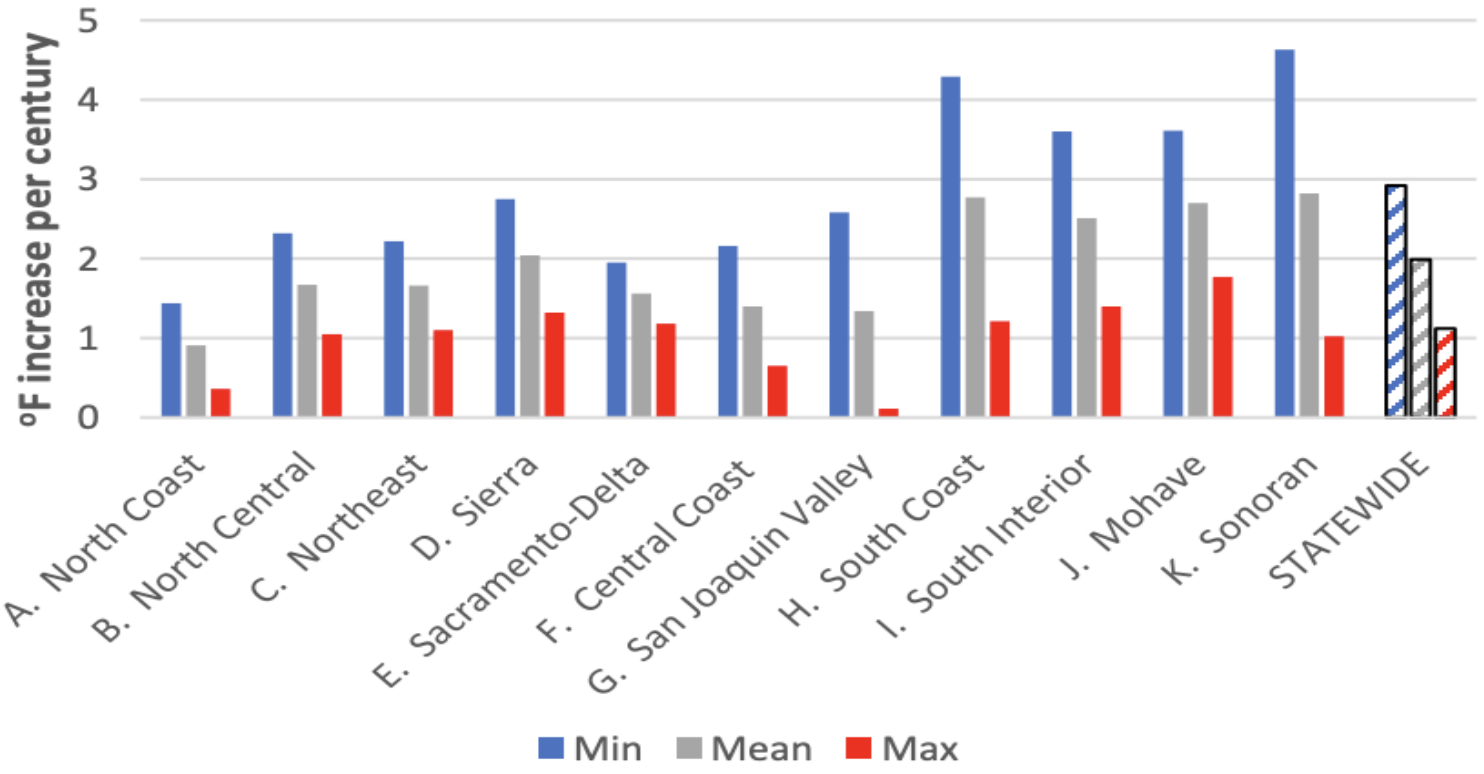
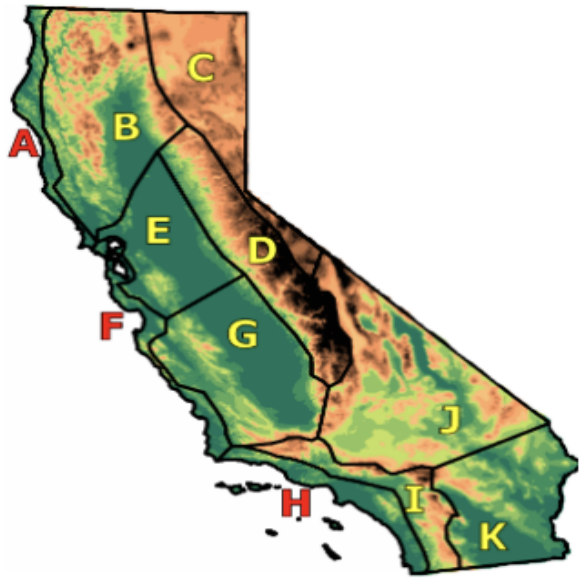
Changes in California Temperatures

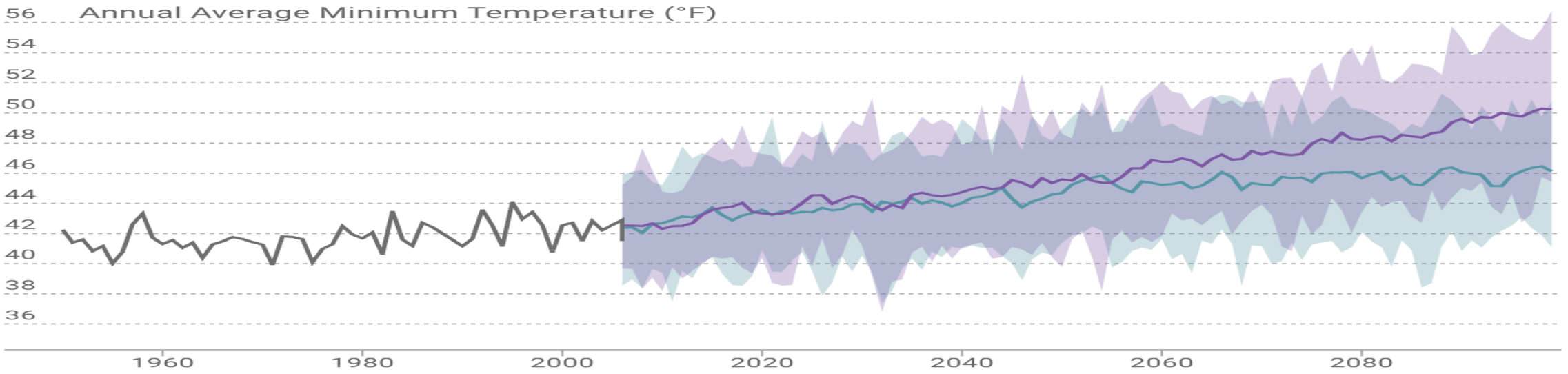
Figure 3. Regional and statewide temperature trends (1895 to 2020)

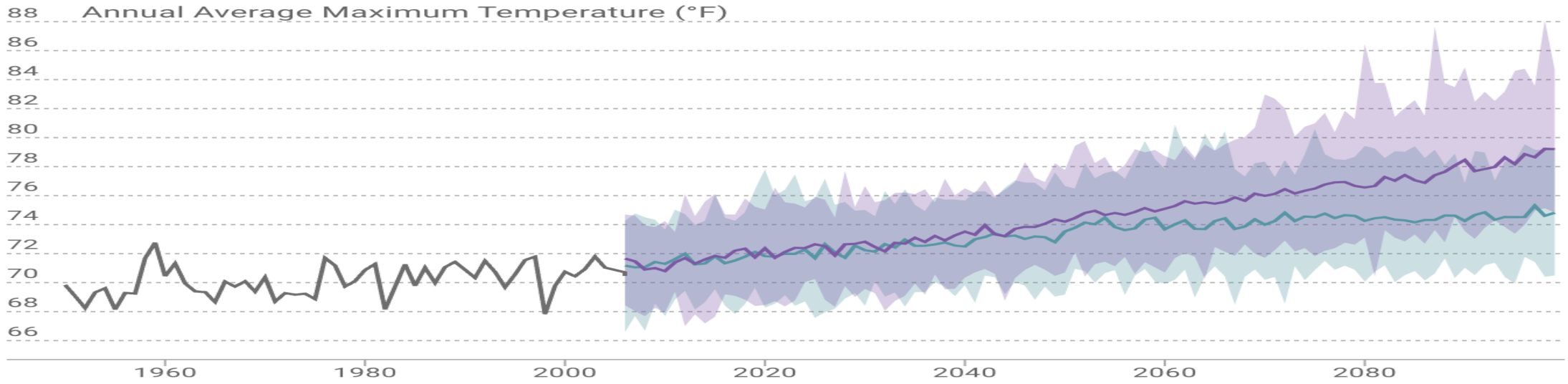




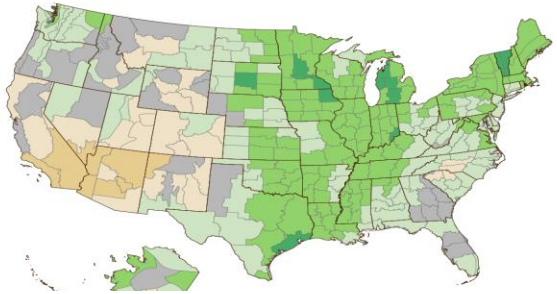
Source: WRCC, 2021

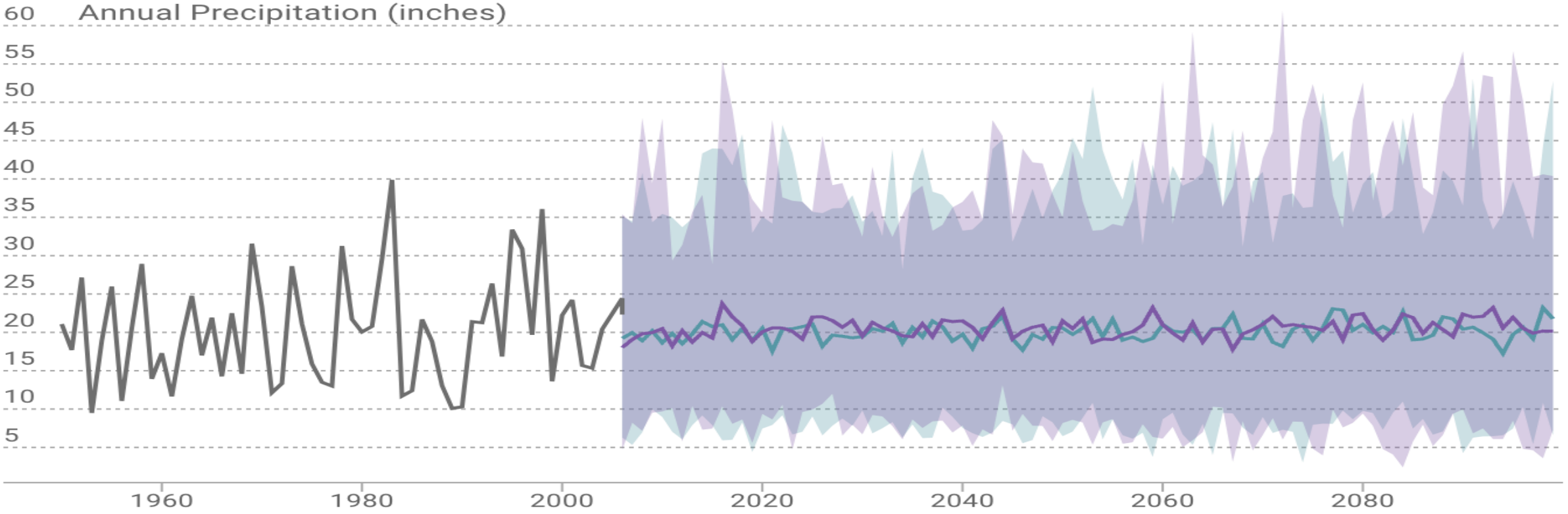
Temperature projections - Salinas





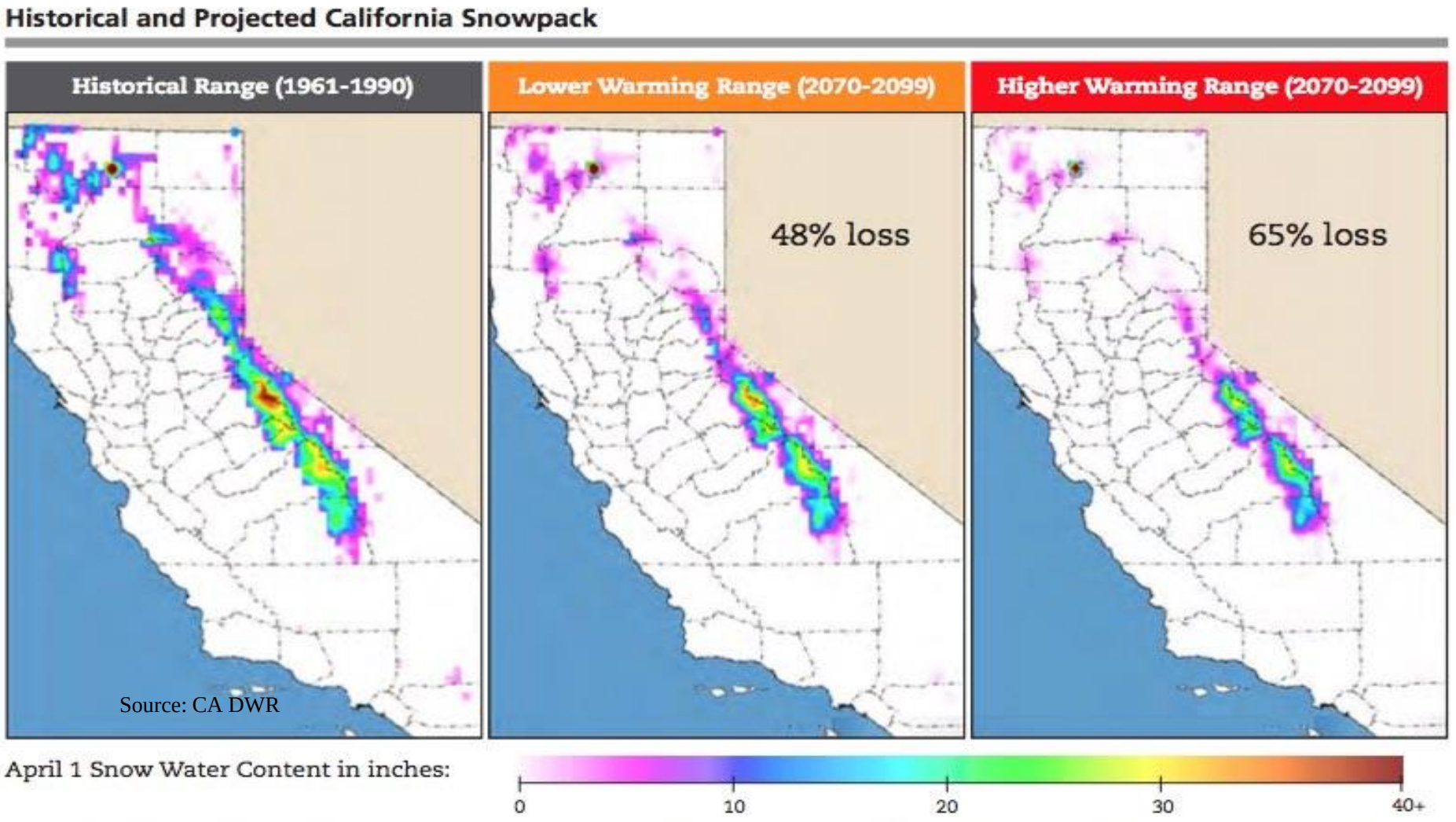
Precipitation Trends - Salinas





Ref: Cal-Adapt.Org

Snowpack



- A loss of 48% and 65% of the snowpack is projected under low and high emission scenarios, respectively
- By 2081–2100, average temperatures in the Sierra Nevada are projected to increase by about 7–10 degrees F

Extreme Heat (T>93°F) – Monterey County

Monterey County, California

Change Location

Projected changes in **Number of Extreme Heat Days per Year** when **daily maximum temperature** is above **92.5 °F** under a **High Emissions (RCP 8.5) Scenario**.

MODELED HISTORICAL
Baseline (1961-1990)
Change Period

30 YEAR AVG	30 YEAR RANGE
5 days/yr	0–18 days/yr

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FUTURE PROJECTIONS
Mid-Century (2035-2064)
Change Period

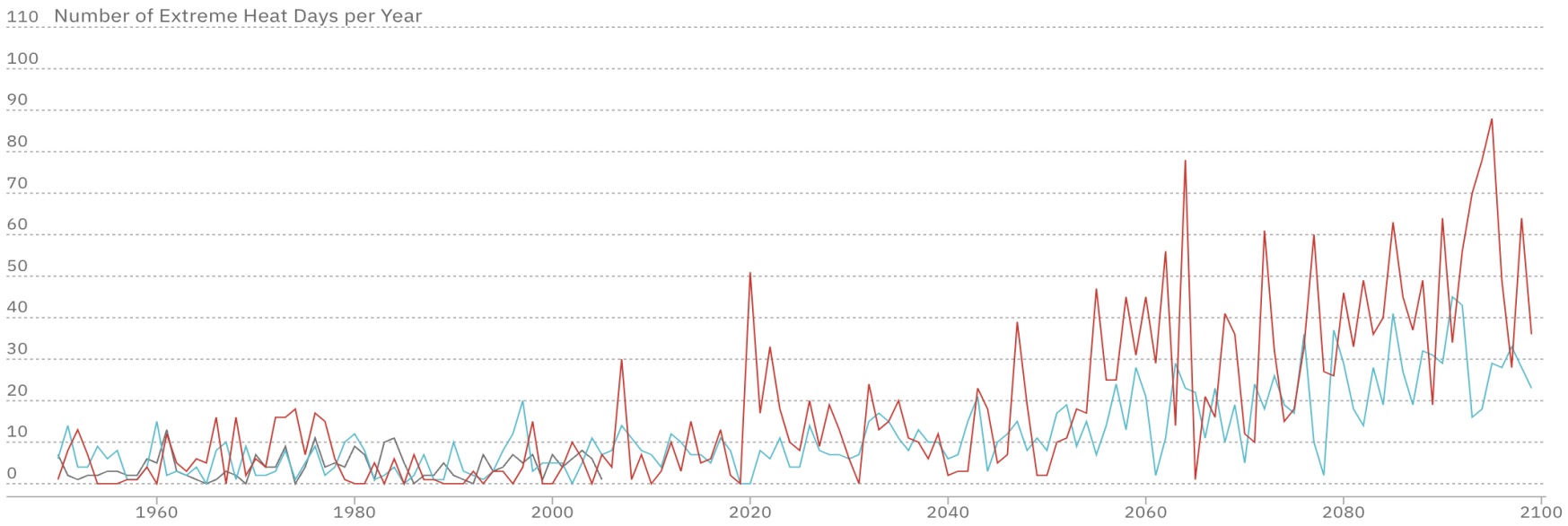
30 YEAR AVG	30 YEAR RANGE
19 days/yr	2–78 days/yr

Learn More

FUTURE PROJECTIONS
End-Century (2070-2099)
Change Period

30 YEAR AVG	30 YEAR RANGE
35 days/yr	2–104 days/yr

Learn More



SELECT LOCATION

Learn More

SELECT CLIMATE VARIABLE

- (•) Extreme Heat Days
- ( ) Warm Nights

Learn More

SELECT INDICATOR

Frequency

Learn More

SELECT SCENARIO

- ( ) Medium (RCP 4.5)
- (•) High (RCP 8.5)

Learn More

SET THRESHOLD

Add a new threshold value or select from list

Ref: Cal-Adapt.org

Warm Nights - Monterey County

Monterey County, California

Change Location

Projected changes in **Number of Warm Nights per Year** when **daily minimum temperature** is above **55.5 °F** under a **High Emissions (RCP 8.5) Scenario**.

MODELED HISTORICAL
Baseline (1961-1990)
Change Period

30 YEAR AVG	30 YEAR RANGE
5 days/yr	0–32 days/yr

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FUTURE PROJECTIONS
Mid-Century (2035-2064)
Change Period

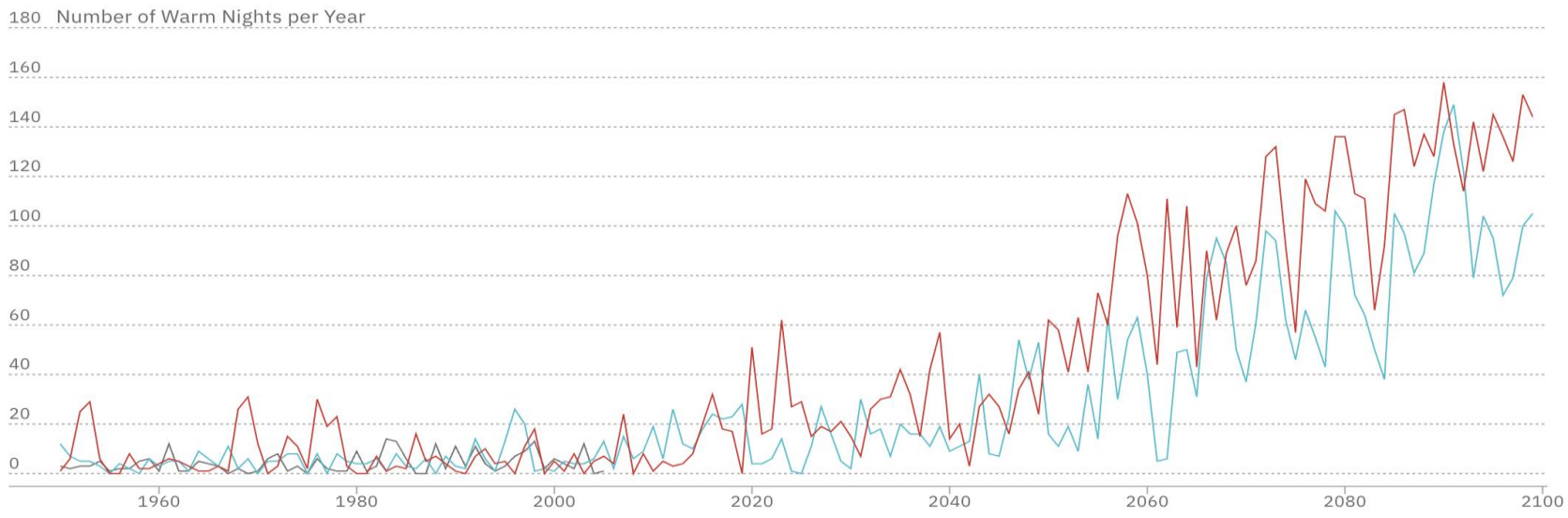
30 YEAR AVG	30 YEAR RANGE
38 days/yr	1–114 days/yr

Learn More

FUTURE PROJECTIONS
End-Century (2070-2099)
Change Period

30 YEAR AVG	30 YEAR RANGE
94 days/yr	13–168 days/yr

Learn More



SELECT LOCATION

Learn More

SELECT CLIMATE VARIABLE

- ○ Extreme Heat Days
- ◉ Warm Nights

Learn More

SELECT INDICATOR

Frequency

Learn More

SELECT SCENARIO

- ○ Medium (RCP 4.5)
- ◉ High (RCP 8.5)

Learn More

SET THRESHOLD

Add a new threshold value or select from list

Reference: cal-adapt.org

Timing of Extreme Heat - Monterey County

Projected changes in **Timing of Extreme Heat Days per Year** when **daily maximum temperature** is above **92.5 °F** under a **High Emissions (RCP 8.5) Scenario**.

MODELED HISTORICAL
Baseline (1961-1990)
Change Period

EARLIEST IN 30 YEARS	LATEST IN 30 YEARS
March	October

Learn More

FUTURE PROJECTIONS
Mid-Century (2035-2064)
Change Period

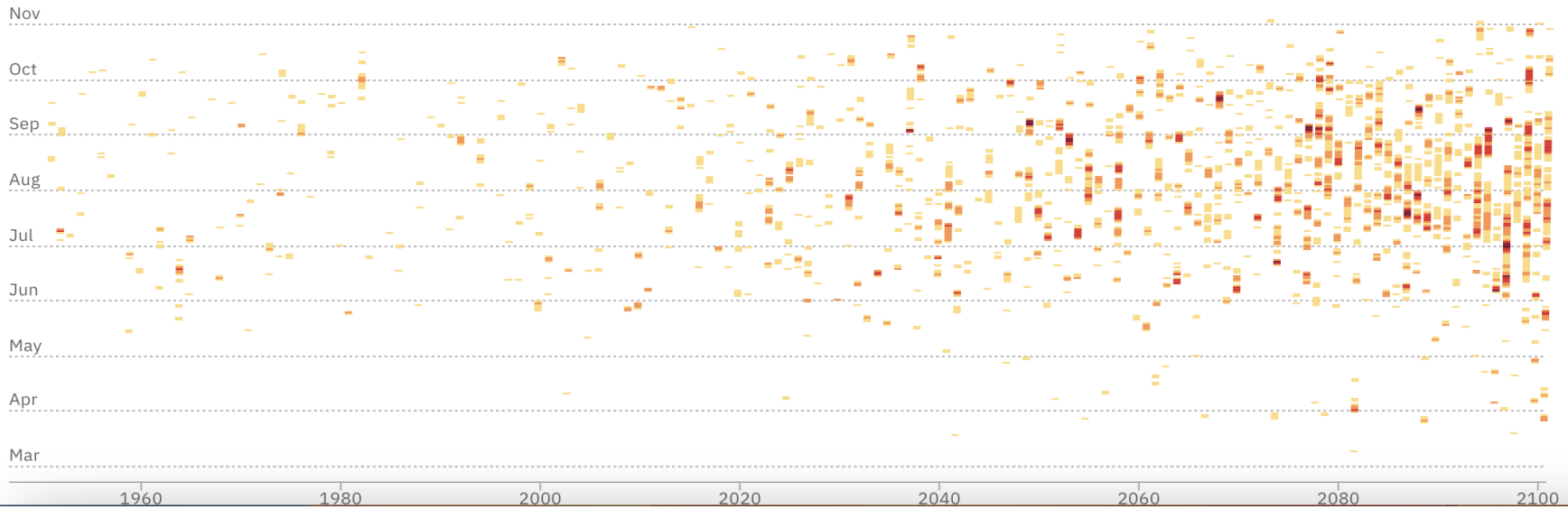
EARLIEST IN 30 YEARS	LATEST IN 30 YEARS
March	November

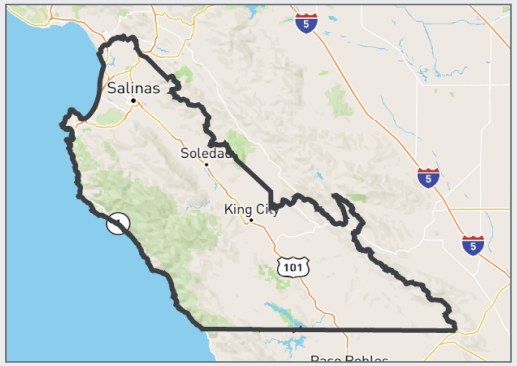
Learn More

FUTURE PROJECTIONS
End-Century (2070-2099)
Change Period

EARLIEST IN 30 YEARS	LATEST IN 30 YEARS
March	November

Learn More





Learn More

SELECT CLIMATE VARIABLE
- (•) Extreme Heat Days
- ( ) Warm Nights

Learn More

SELECT INDICATOR
Timing
Learn More

SELECT SCENARIO
- ( ) Medium (RCP 4.5)
- (•) High (RCP 8.5)

Learn More

SET THRESHOLD

Reference: cal-adapt.org

Impacts on Agriculture

Climate change impacts – Farmers views

"Our crops may have to change which also means that our markets may also change."

I feel water be feast or famine, more extremely wet or dry years

It's going to be hotter, already we harvest our crops much earlier than 30 years ago because of hotter summers

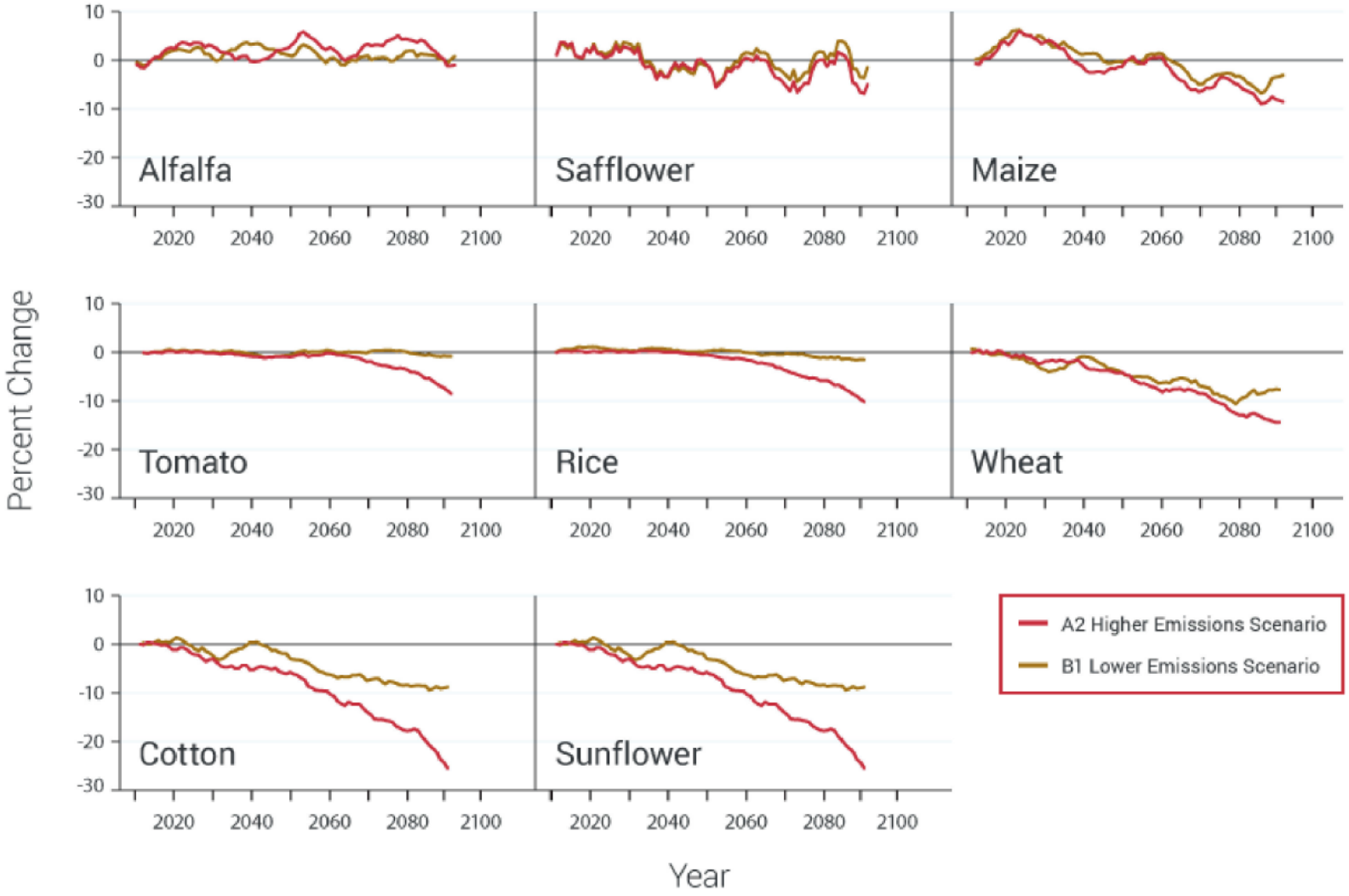
Yield losses

Due to these climate condition changes that are taking place, water districts are having to raise water rates.

Too hot for too long during growing season

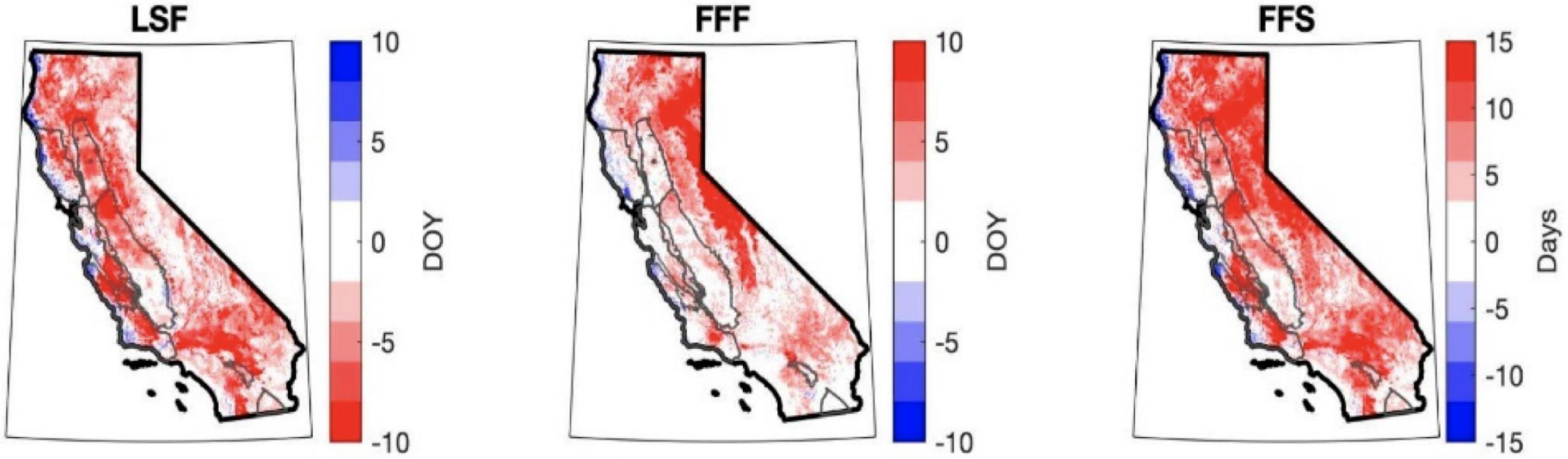
When you really see so much difference in a short amount of time …. we would have to look at that and say, well, we're going to have to adopt varieties because this is a 20- or 25-year planning and we're going to have to find crops or varieties that will adapt

Impacts on Crop Yield



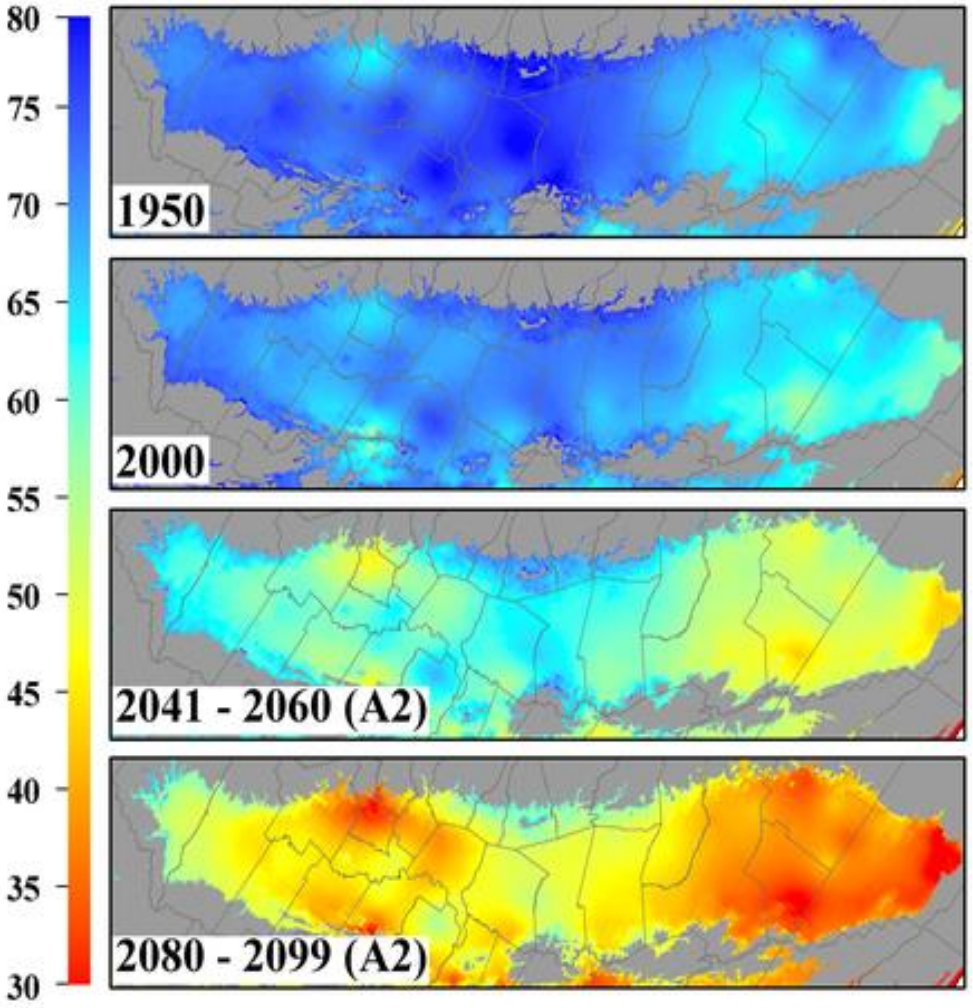
- Expected yield reductions by 2097: cotton (≈ 29%) > sunflower (≈ 26%) > wheat (≈ 15%) > maize (12%) > rice (≈ 10%) > tomato (≈ 9%)
- These yield decreases were mainly because high temperatures under climate change shorten the duration of phenological phases
- Limitations related to water supply to irrigated croplands
- Adaptation measures such as management practices and improved cultivars may alleviate some of the impacts

Length of the growing season

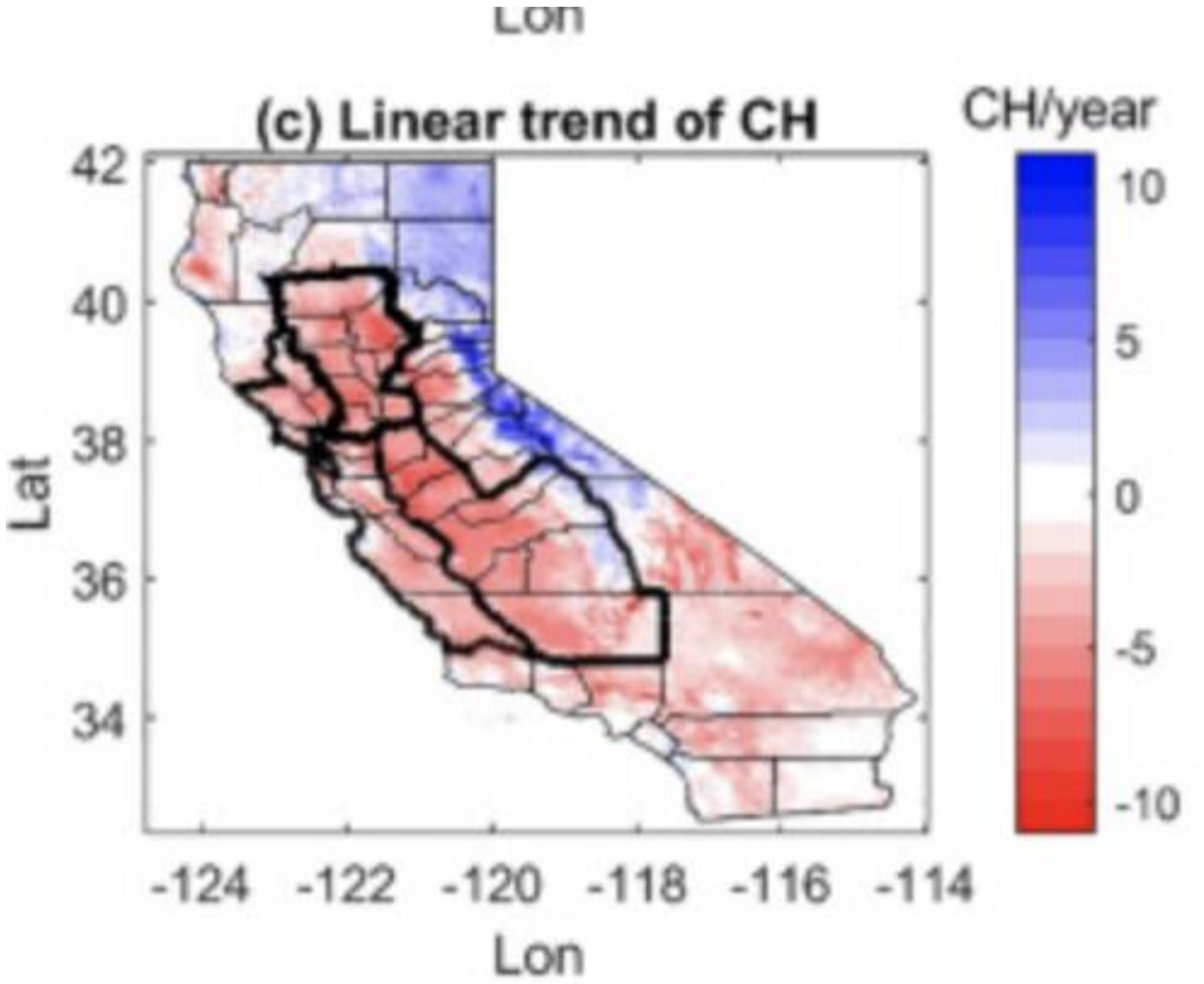


Lauren E. Parker; Ning Zhang; John T. Abatzoglou; Steven M. Ostoja; Tapan B. Pathak. 2022.

Impacts on chill accumulations



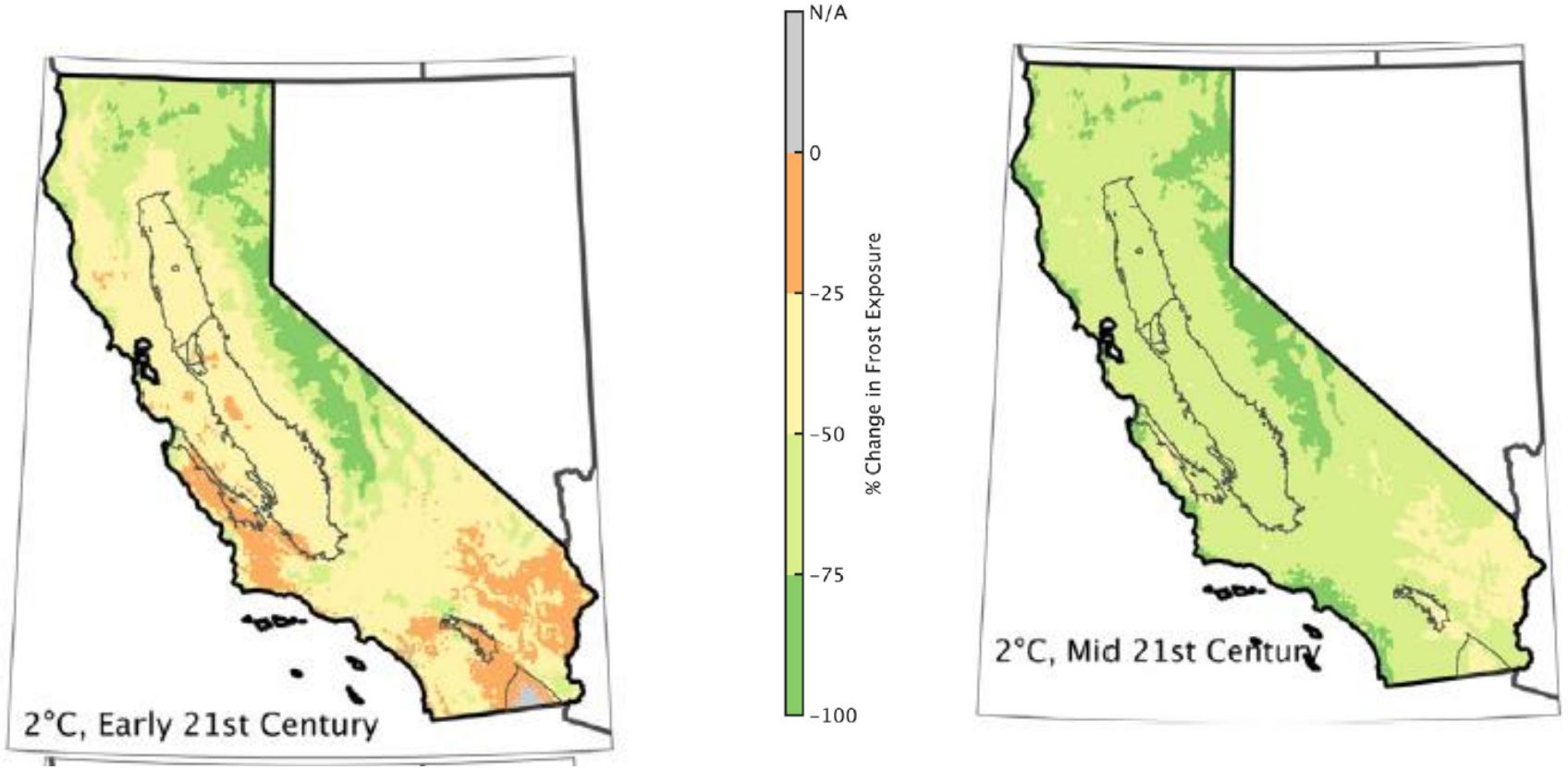
Luedeling et al., 2009



Zhang; Pathak et al., 2021

Reduced frost risk under future climate

Lauren Parker; Tapan Pathak, Steven Ostoja



https://doi.org/10.1016/j.scitotenv.2020.143971

Impacts on Crop Growing Season/maturity

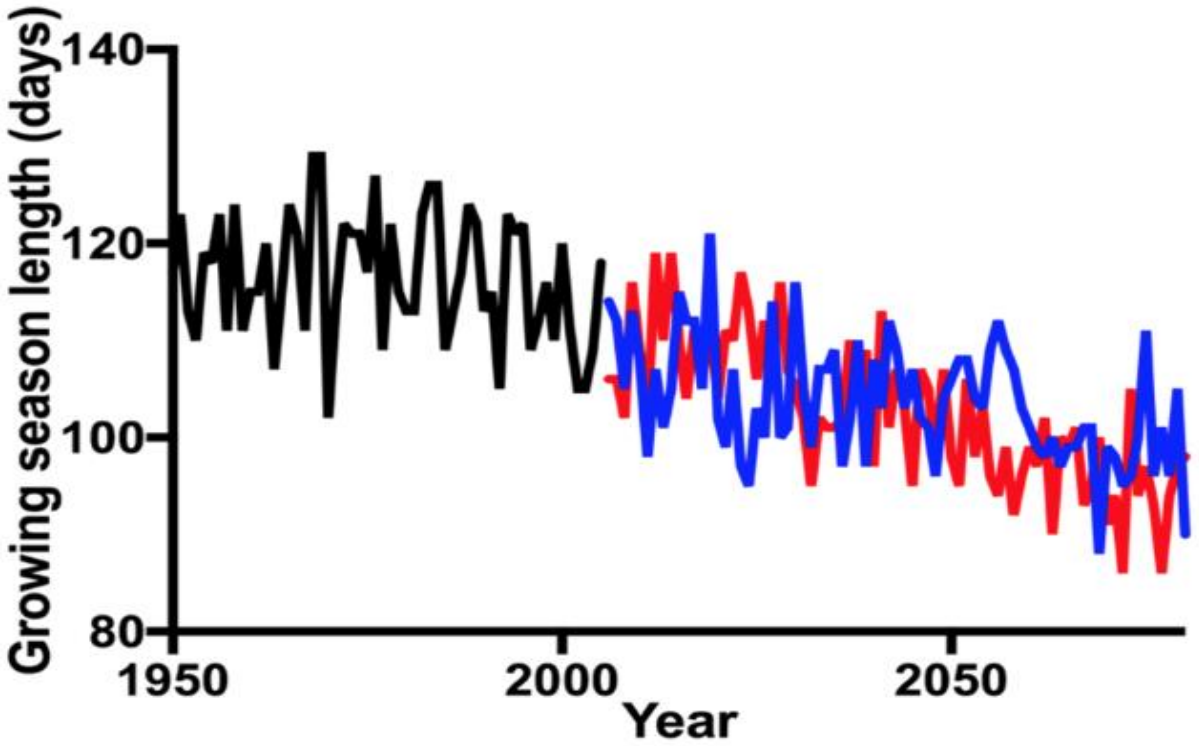
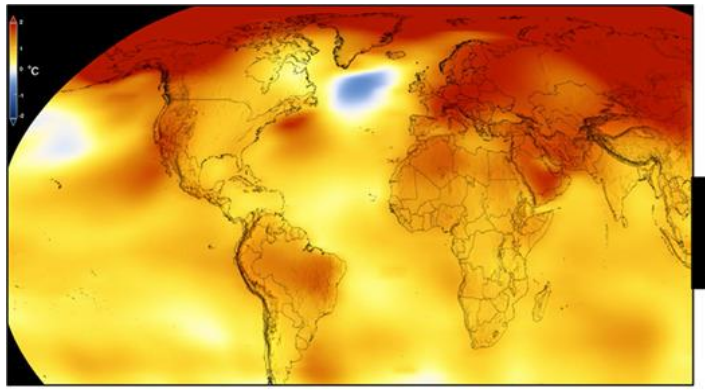


Photo credit: California Tomato Growers Association

Pathak and Stoddard, 2018 https://link.springer.com/article/10.1007/s40808-018-0460-y

Climate change impacts on pests



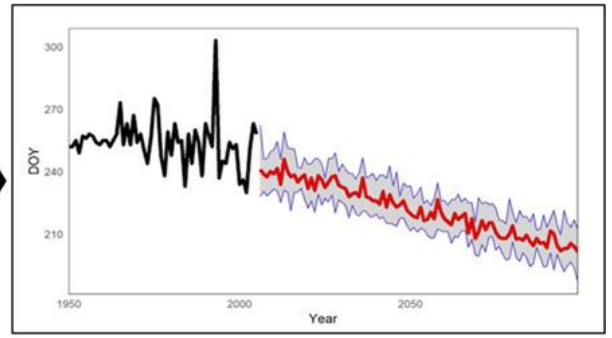
Climate change will affect the lifecycle of navel orangeworm

Adults emerge in the spring (overwintered population) or summer (in-season

Females lay eggs on mummy nuts or hull-split almonds

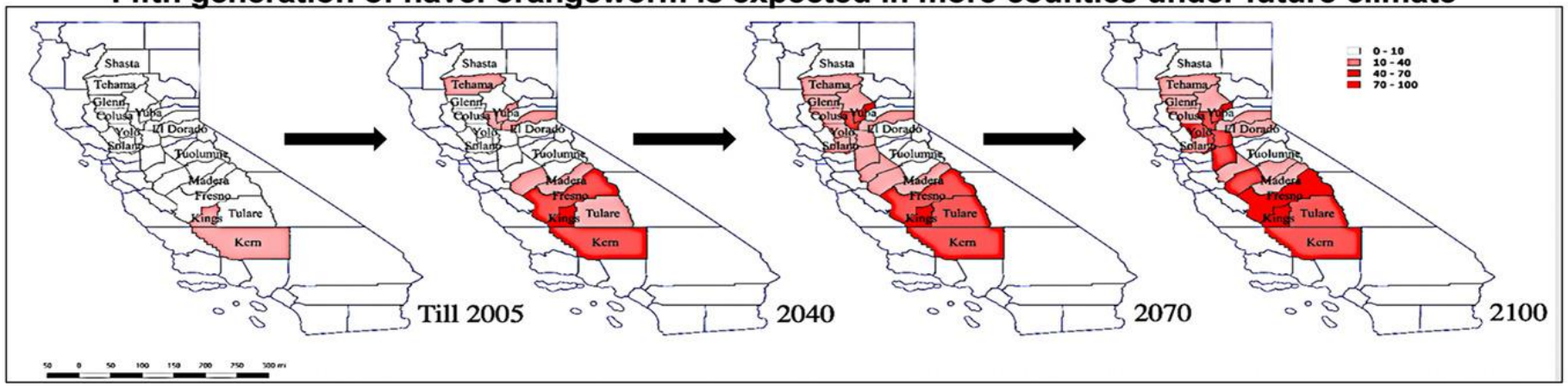
Larval feeding damages nutmeats & also increase aflatoxin contamination

Larvae infest the hull-split almonds



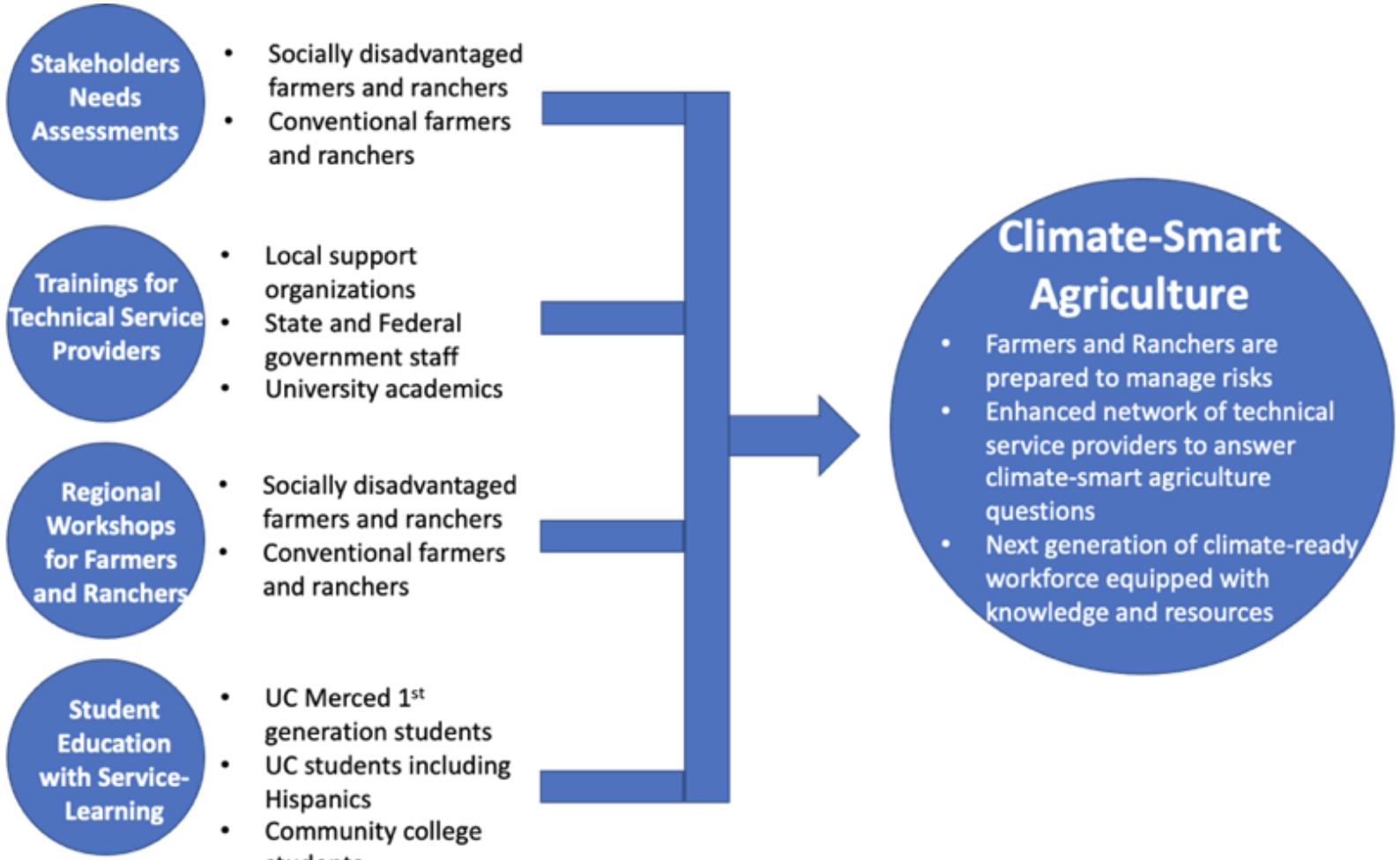
Duration to complete navel orangeworm generations will be reduced in the future

Fifth generation of navel orangeworm is expected in more counties under future climate



Pathak et al., 2021 https://www.sciencedirect.com/science/article/pii/S0048969720361866

Multifaceted pathways to climate-smart agriculture



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Potential Research Needs

- Enhance understanding of crop specific impacts of extreme events and other climate risks
- Need more localized research and innovations that integrate scientific, social, and economic factors that provide viable solutions for grower and industry to use for effective adoption
- Need better parameterization and validation of models to be utilized for optimizing crop performance under limited water supply and future climate scenarios
- Increased skills in weather forecasting and increased agricultural applications for managing risks
- Simply providing the scientific facts is inefficient. Solutions need to integrate stakeholder challenges and help them translate the science into actionable strategies

Thank You!

Contact Information

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