

# Impacts of climate change on California's agriculture and tools for managing risks

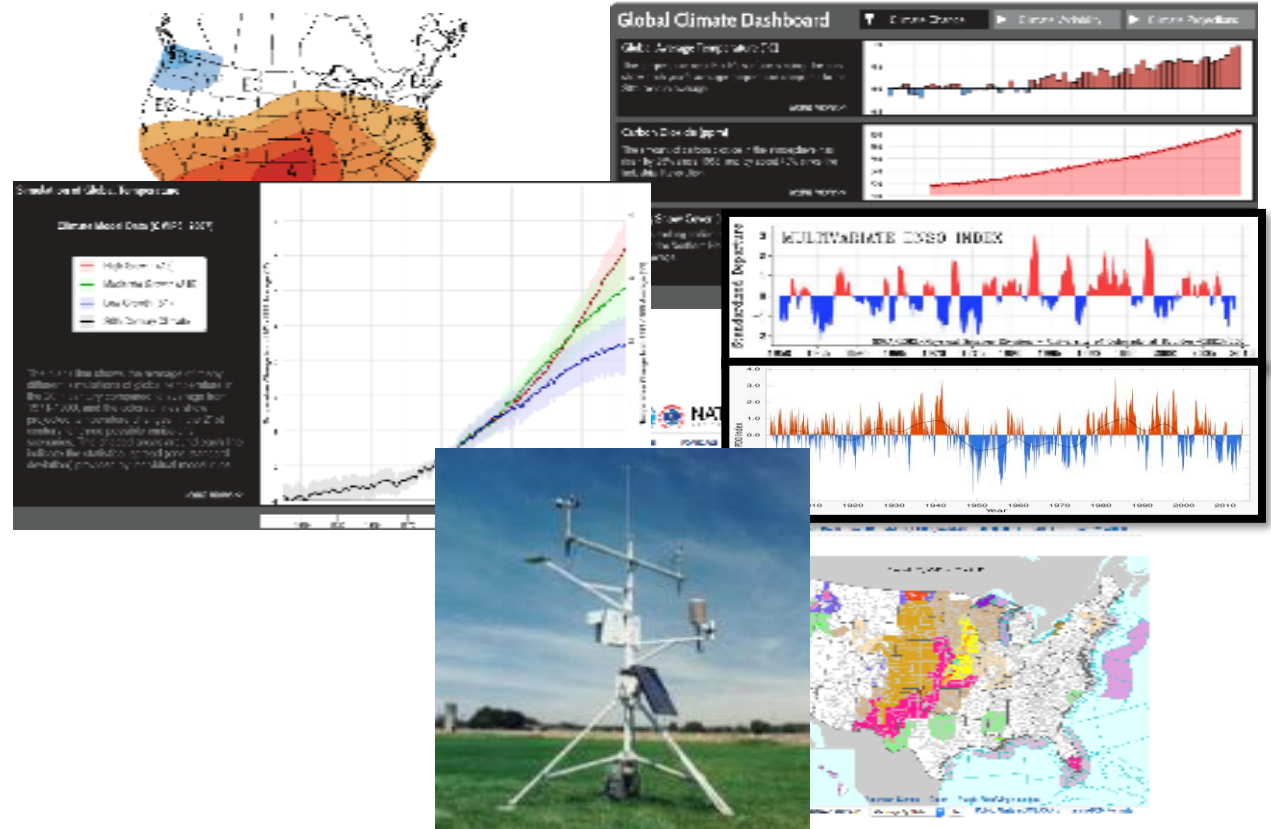
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# Need to Translate Data into Decision Support

- Turning the large amount of technical climate research into readily understandable information is a challenge (USDA 2014)
- CA Dept of Food and Ag has high priority to compiling a list of grower needs for weather information for decision making
- Based on the needs assessments, farmers need crop specific information to enable decision making (Jagannathan and Pathak, 2023)

No shortage of data!



# Farmers Perceptions on Decision Support Tools

## Farmers:

- 47.5% ( $n=142$ ) use decision support tools (DSTs), 46.8% ( $n=140$ ) “do not use”
- 49.7% ( $n=147$ ) indicated using DSTs “within-in-season planning”; 15.5% ( $n=46$ ) in “long-term planning
- 51.9% ( $n=152$ ) interested in using online DSTs

## Technical Service Providers:

- 31.7% ( $n=32$ ) use DSTs
- 74.7% ( $n=71$ ) expressed their interest in using online DSTs

*“In a year like this there was a lot of talk about El Nino so I looked at those and purchased a few more beehives this year, that’s about as long as an outlook as I typically do, it is so difficult to forecast long-term.”*

*“It is just so hard to look out into the future, I am more looking into the next 1–3 years rather than 10–20 years.”*

*“When you really see so much difference in a short amount of time .... 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”*



# CalAgroClimate

Decision Support Tools for Managing Risks



**Tapan Pathak**

Applied climate in agriculture



**Steve Ostoja**

USDA California Climate Hub



**Lauren Parker**

USDA California Climate Hub



**Shane Feirer**

GIS analyses with emphasis on natural resource related topics



**Robert Johnson**

GIS/Web Development



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Project Scientist

<https://calagroclimate.org/>



California Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

UNIVERSITY  
OF  
CALIFORNIA

Office  
of the  
President

UNIVERSITY OF CALIFORNIA  
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National Institute of Food and Agriculture  
U.S. DEPARTMENT OF AGRICULTURE

University of California  
Agriculture and Natural Resources



# CalAgroClimate

Decision Support Tools for Managing Risks

## TOOLS



### Heat Advisory

Maximum temperature forecast.



### Frost Advisory

Minimum temperature forecast.



### Crop Phenology

Calculate growing degree days.



### Pest Advisory

Tool to predict crop pest life stage.



### Agroclimate Indicators

Historical data aggregated by county.

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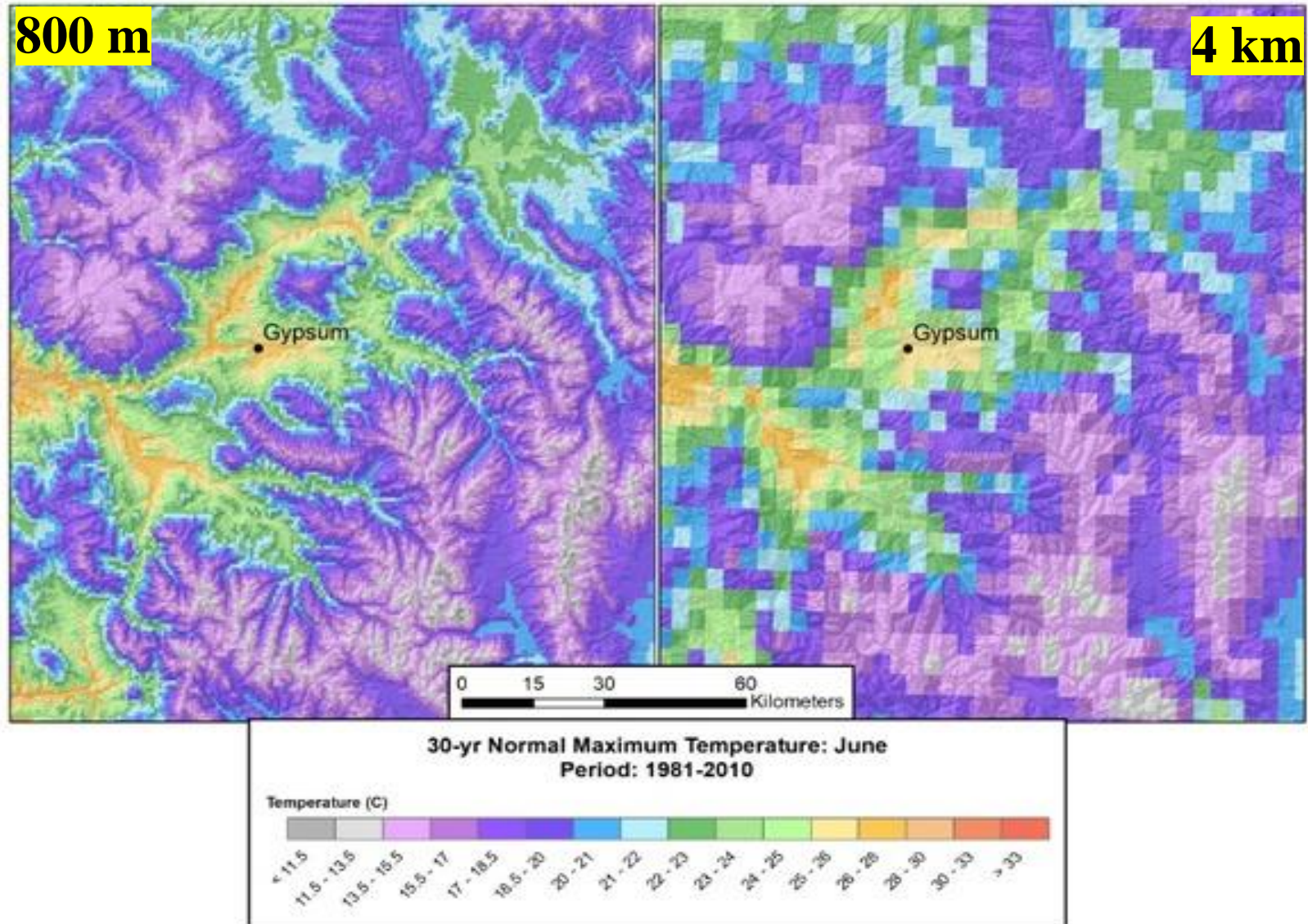
# High-Resolution PRISM Data

## Basic variables:

precipitation,  
maximum  
temperature,  
minimum  
temperature, and  
mean temperature

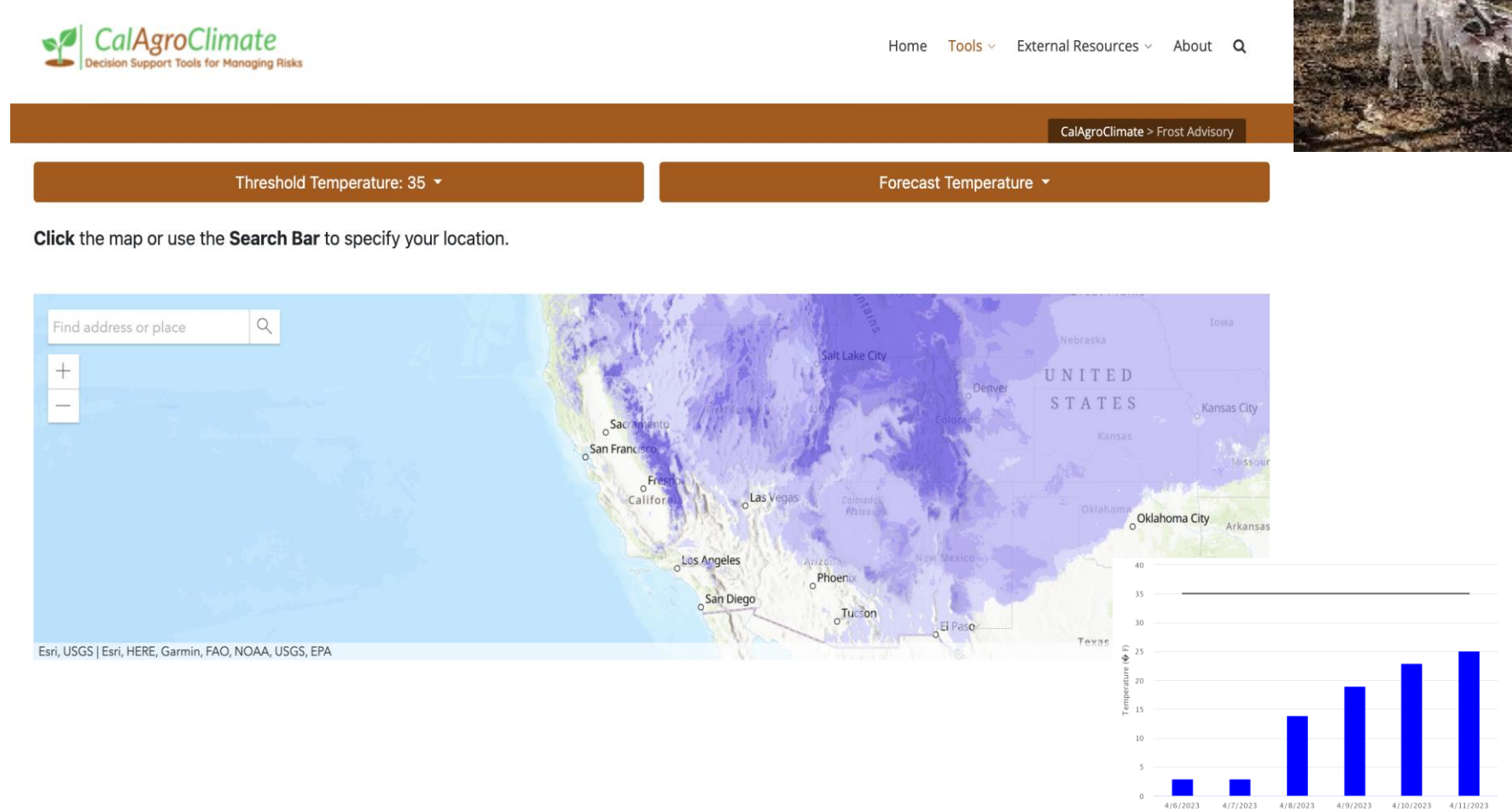
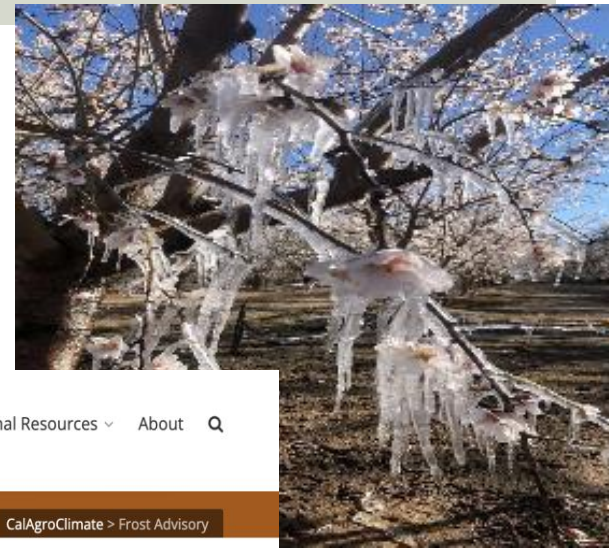
## Humidity variables:

precipitation, mean  
dew point  
temperature and  
minimum/maximum  
vapor pressure deficit



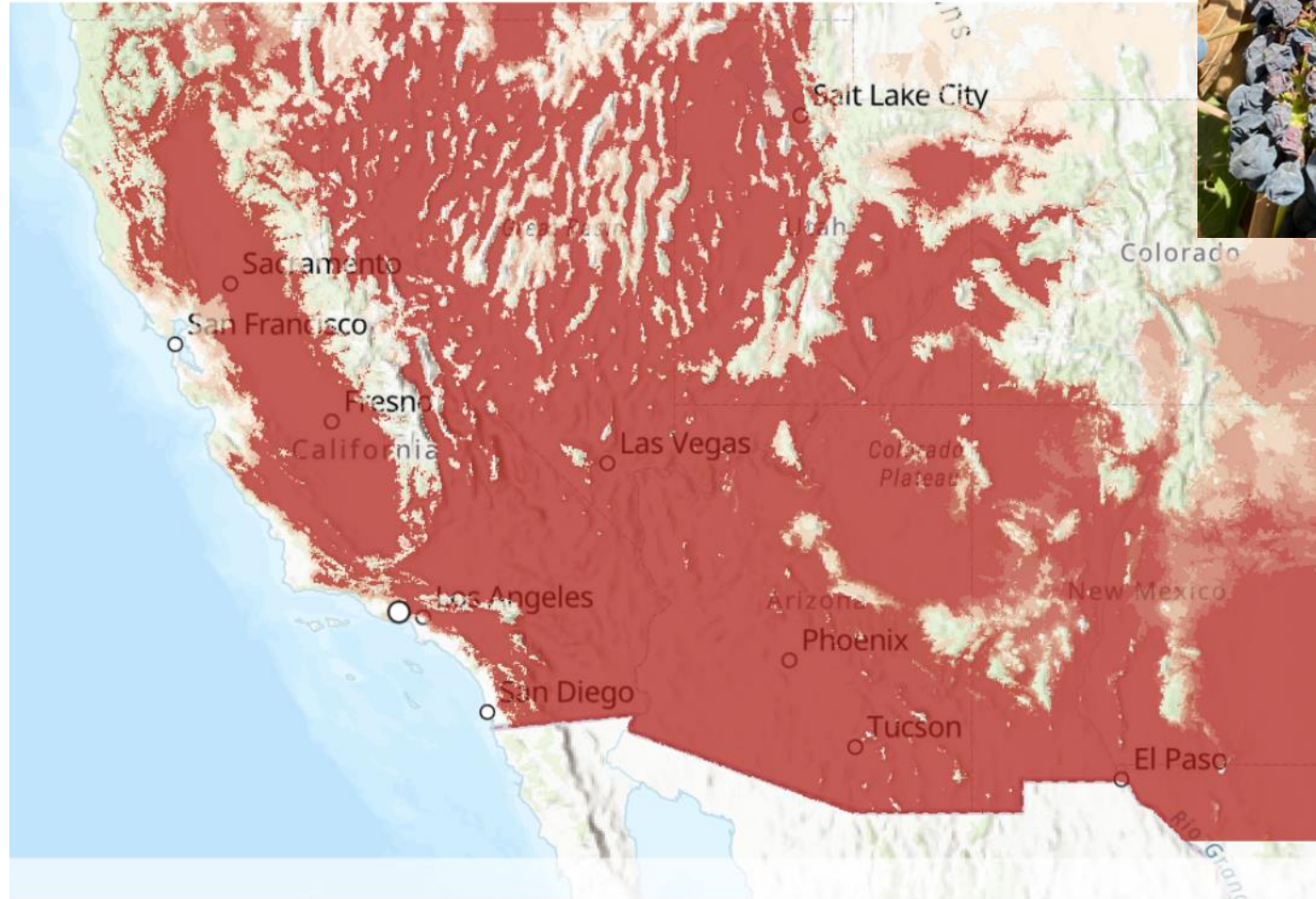
# Frost Advisory Tool

- Frost damages can be devastating to certain specialty crops. Growers need to act ahead of a time to minimize negative impacts
- Tool provides frost risk with number of consecutive days when temperature is below selected temperature threshold and location
- Easy and effective visual tool to assess frost risks across California and US.





# Heat Advisory Tool



- Climate change is increasing frequency and intensity of extreme heat events and consequently impacting California's high value crops
- Heat Advisory tool helps to assess potential heat risk for next 7 days using NWS data
- Implementing strategies to mitigate heat impacts such as irrigation, shading, and reflective coat requires some prior planning and this tool helps with that early indication



# Impacts on Crop Growing Season/maturity

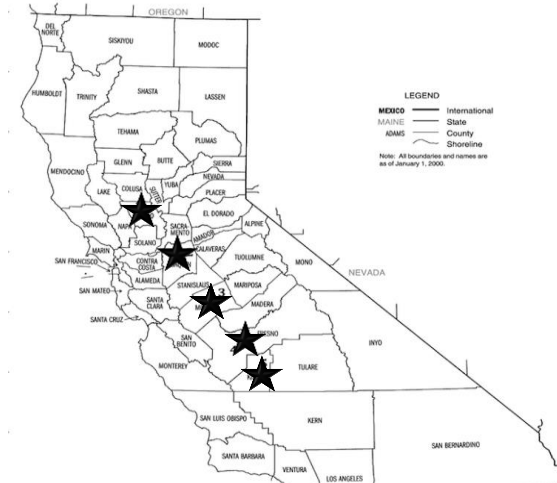
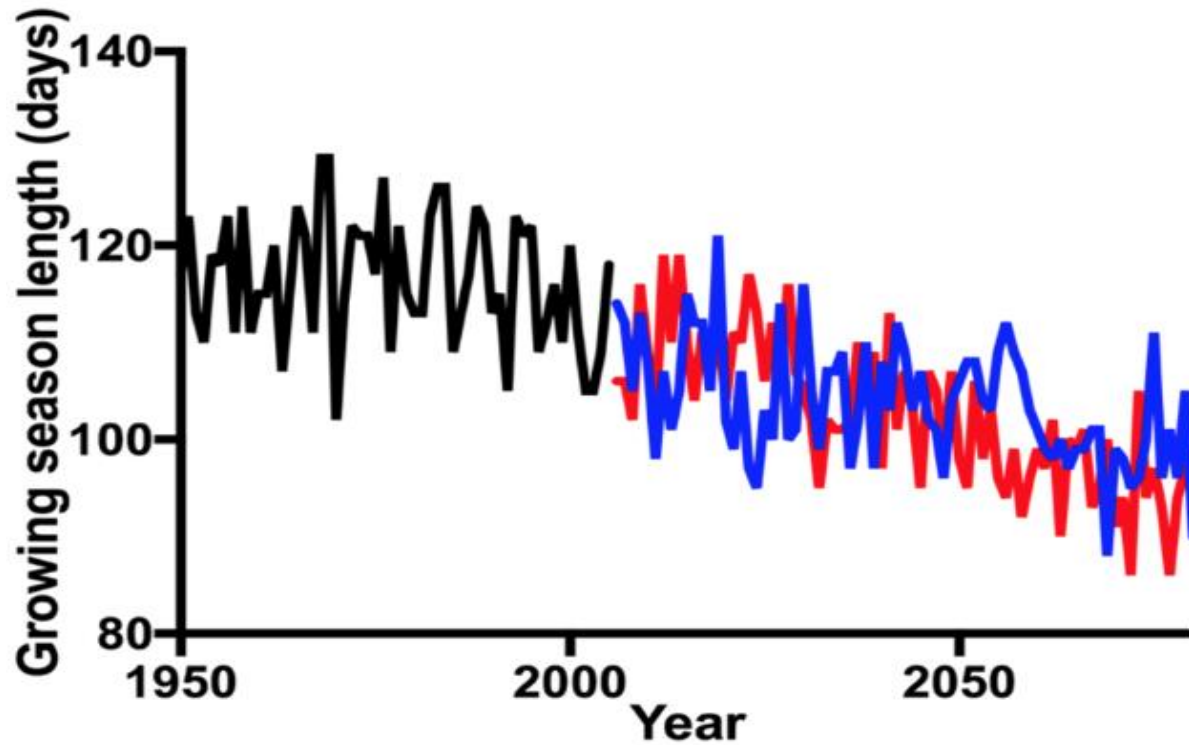


Photo credit: California Tomato Growers Association

# Crop Phenology Tool



Home Tools External Resources About

- 1 Select a commodity
- 2 Select a variety
- 3 Select a date to start GDD accumulation
- 4 Select the number of years used to calculate the historical average
- 5 Launch the map to specify your location
- 6 Select minimum temperature for GDD accumulation
- 7 Select maximum temperature for GDD accumulation (if applicable)
- 8 Select temperature units
- 9 Select threshold type for GDD calculation

Commodity ▾

Variety ▾

Start Date  
03/01/2022

Historic Average (Years)  
5

Launch map

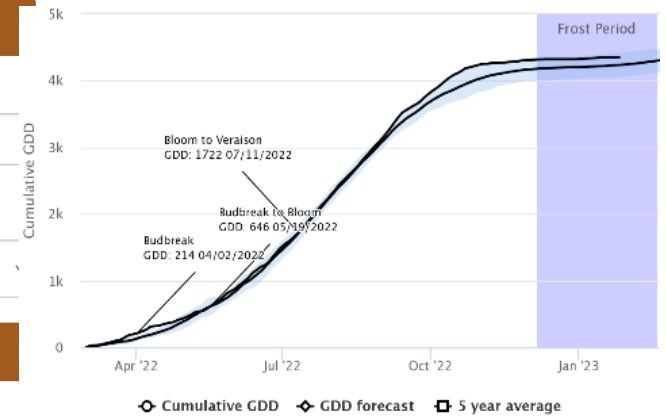
Min Temp

Max Temp

Unit  
 F  C

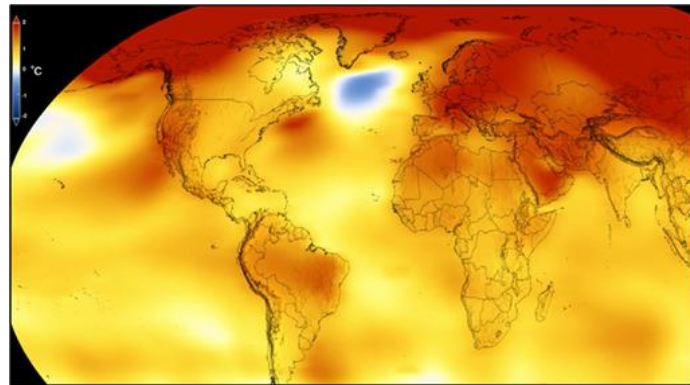
Threshold ▾

Submit

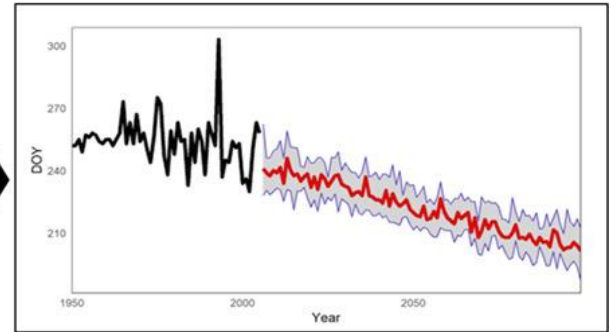
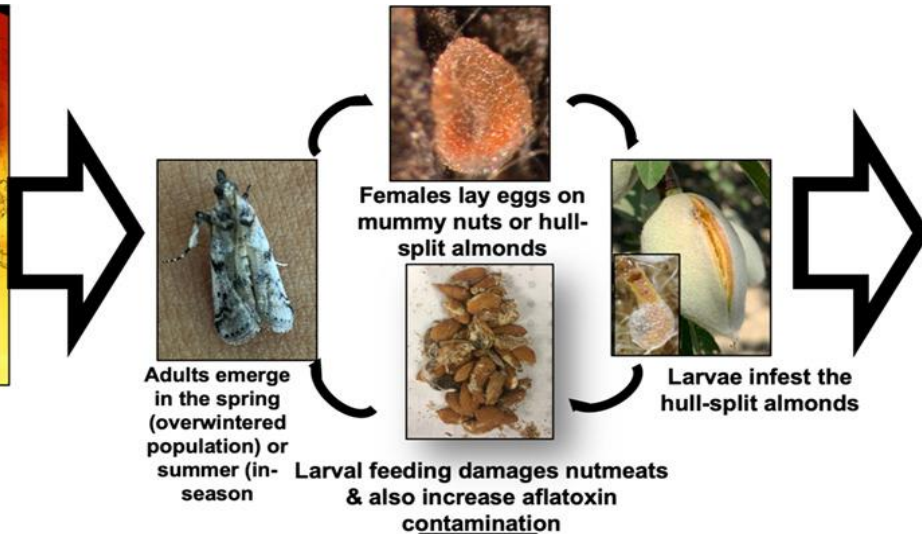


- Almond
- Citrus
- Common Bean
- Olive
- Peaches
- Pistachio
- Potato
- Sunflower
- Table Grape
- Tomato
- Walnut
- Wine Grape

# Climate change impacts on pests

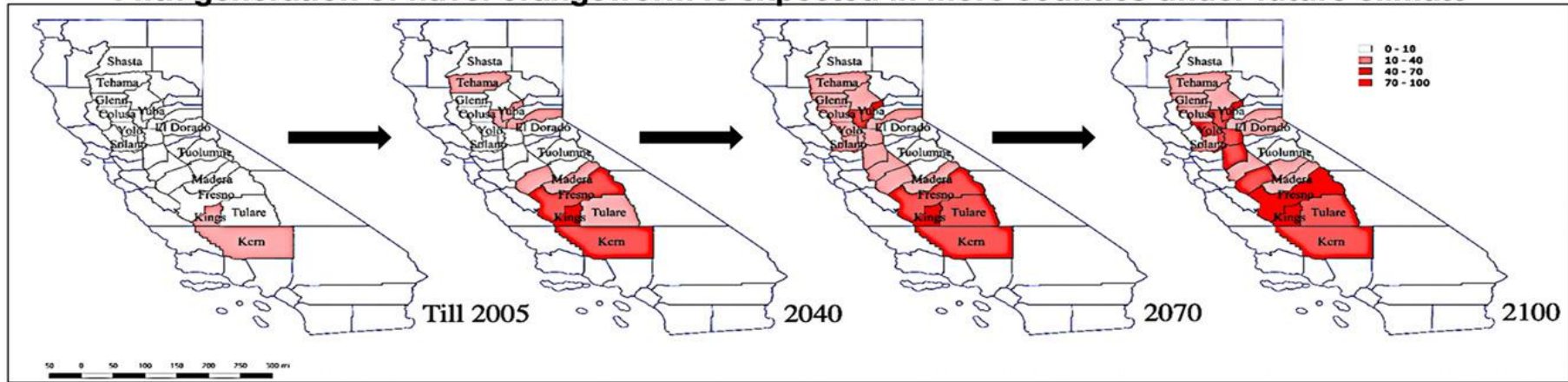


Climate change will affect the lifecycle of navel orangeworm



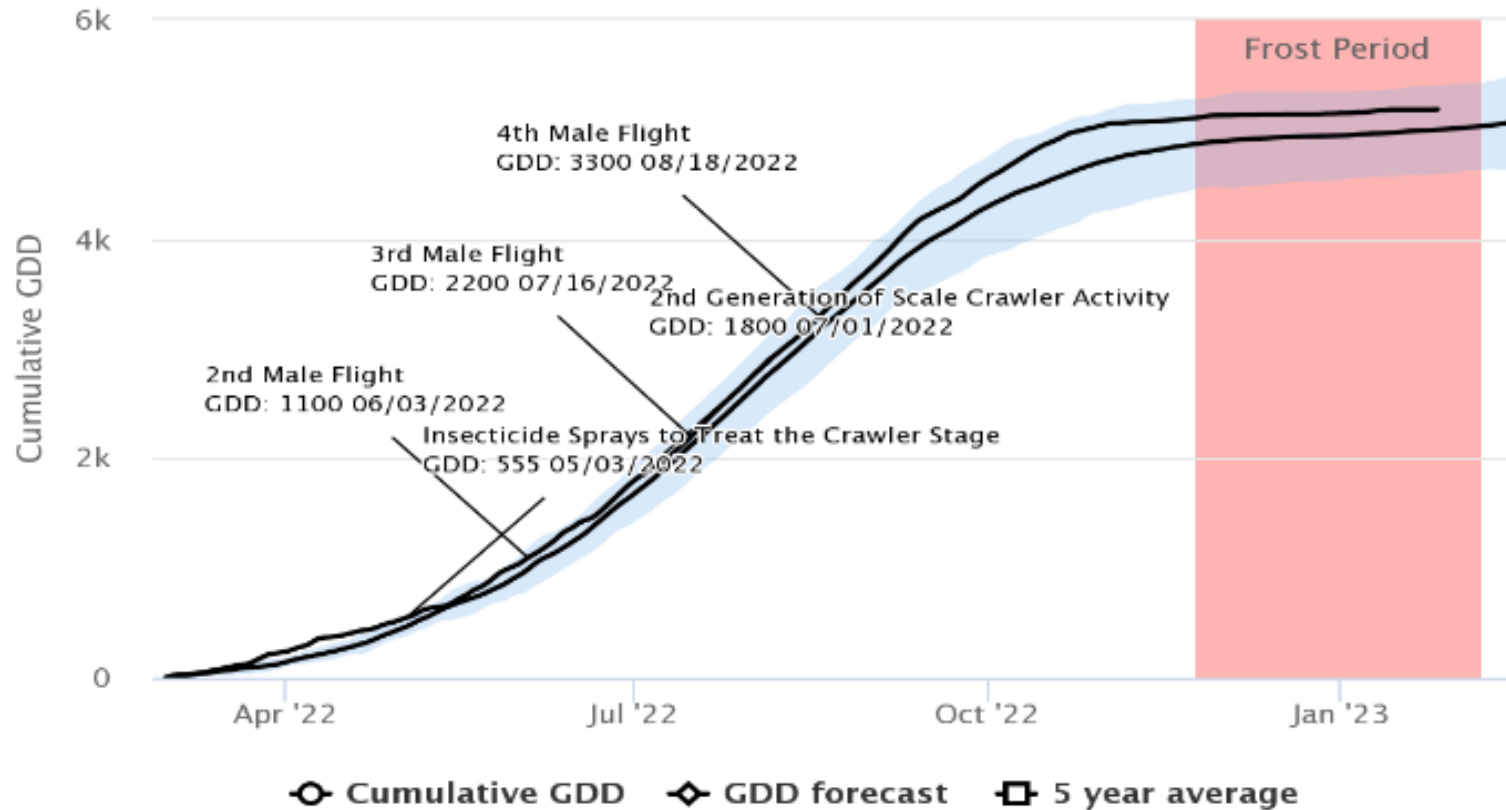
Duration to complete navel orangeworm generations will be reduced in the future

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





# Pest Advisory Tool



Highchart:

- Managing pests is one of the biggest challenges for growers. Climate change is expected to increase pest pressure
- This tool allows users to keep track of crop specific pests based on the GDD accumulations (information derived from UCIPM)
- Helps growers in taking necessary actions to implement integrated pest management practices

# Agroclimatic Indicators



## Agroclimate Indicators

[CalAgroClimate](#) > Agroclimate Indicators

Select an area of interest

County

Point

Select a county to aggregate data

San Diego County ▾

Submit

Frost Days

Last Spring Freeze

First Fall Freeze

Freeze-Free Season

Tropical Nights

Hot Days

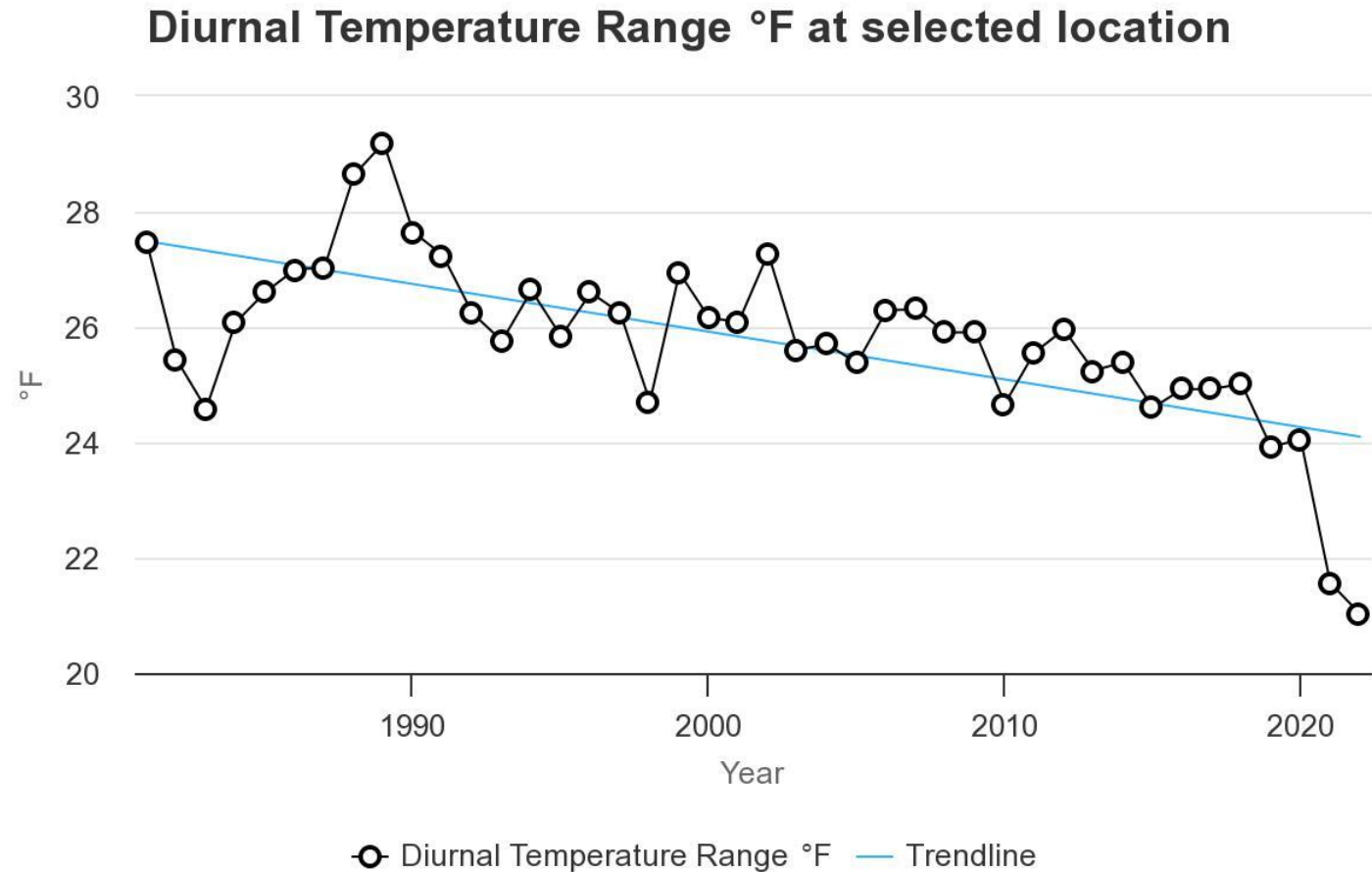
Extreme Heat Days

Heatwaves

Diurnal Temperature Range °F

Diurnal Temperature Range °C

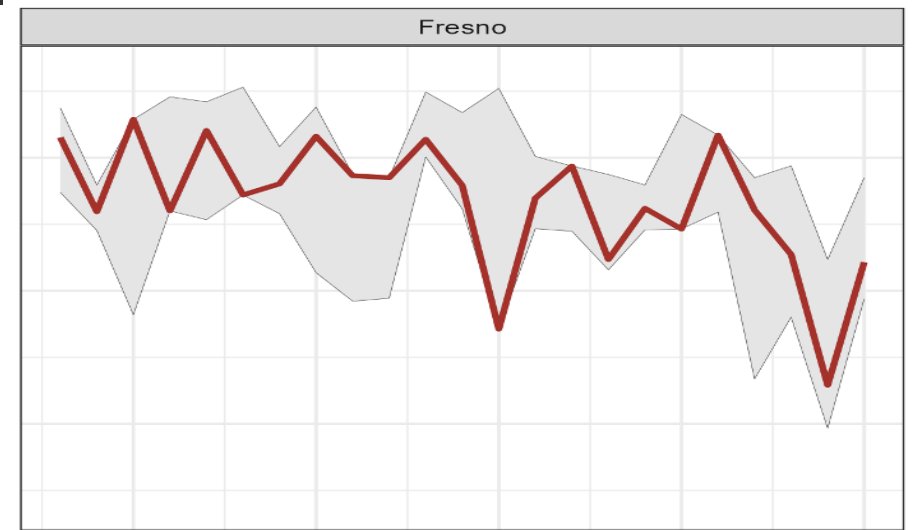
# Agroclimatic Indicators



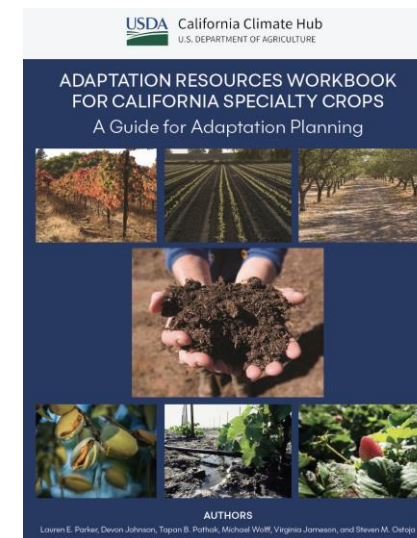


# Work in progress for CalAgroClimate...

- Improving existing tools based on the stakeholders' feedback
- Add predictive tools that can help growers to plan in advance
- Add crop specific adaptation resources for farmers
- Strengthen collaborations to keep CalAgroClimate impactful and sustained long-term



Predicted vs. Observed Chill Portions



Thank You!

Contact Information

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