

# Climate change impacts on CA biodiversity: are there ‘good’ and ‘bad’ responses?

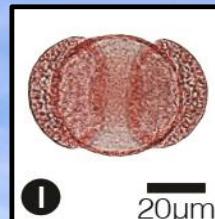
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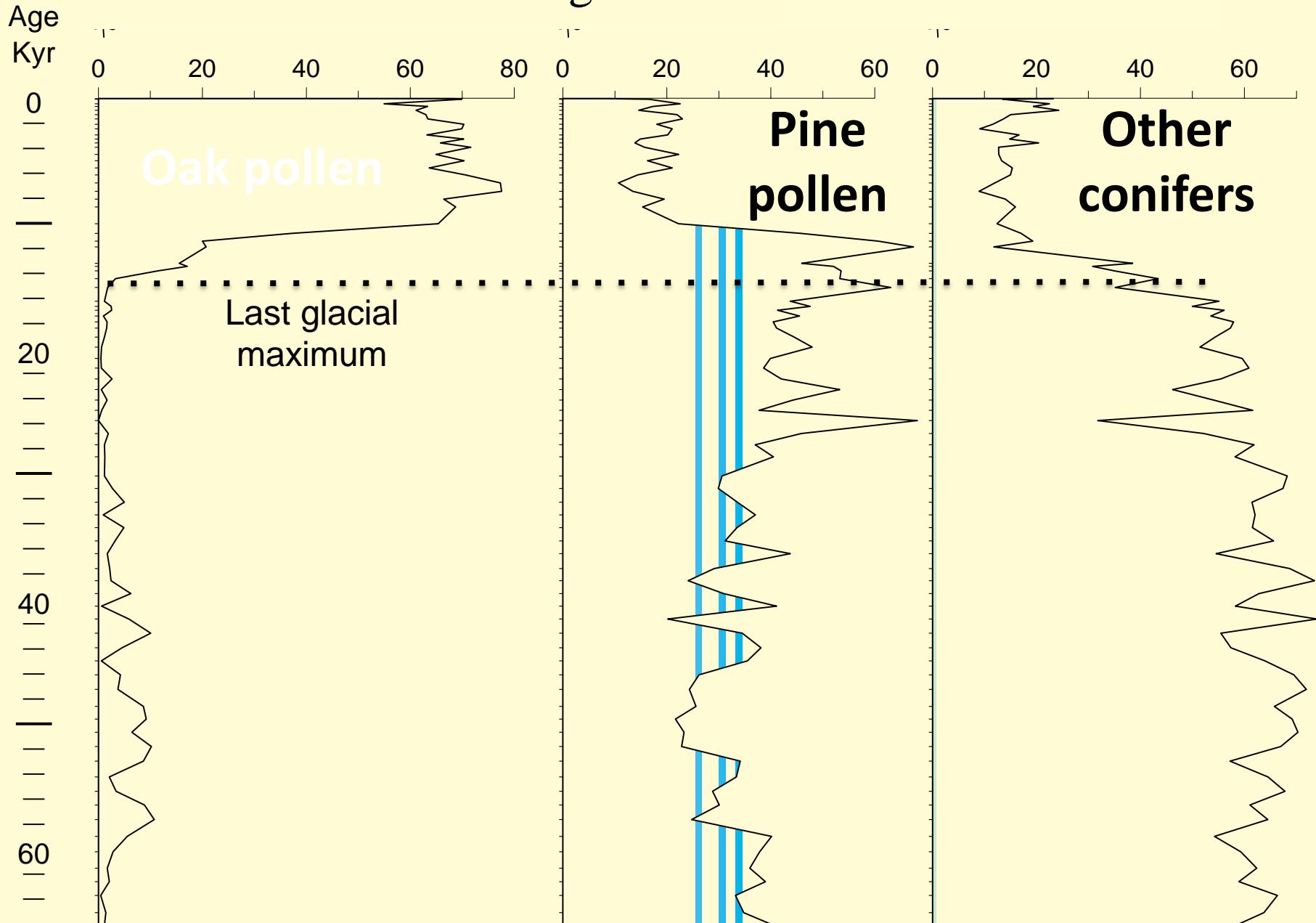
Oct 8, 2022

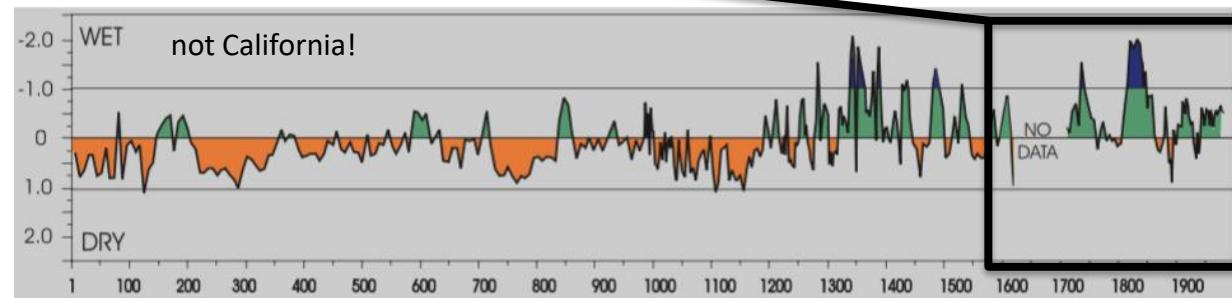
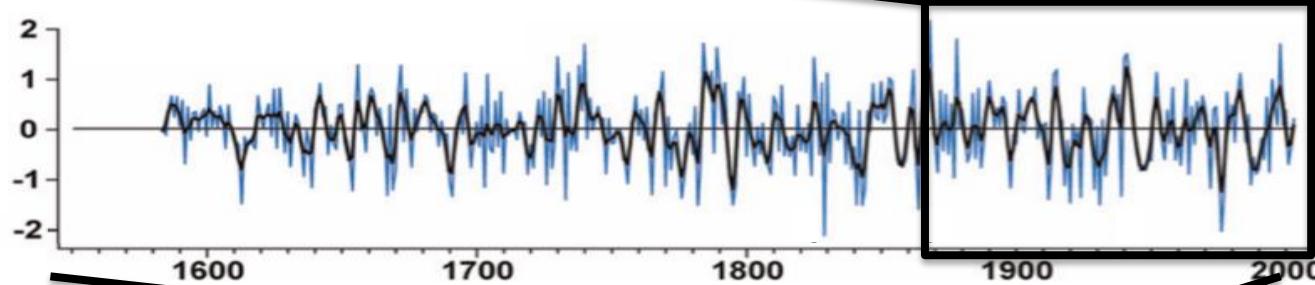
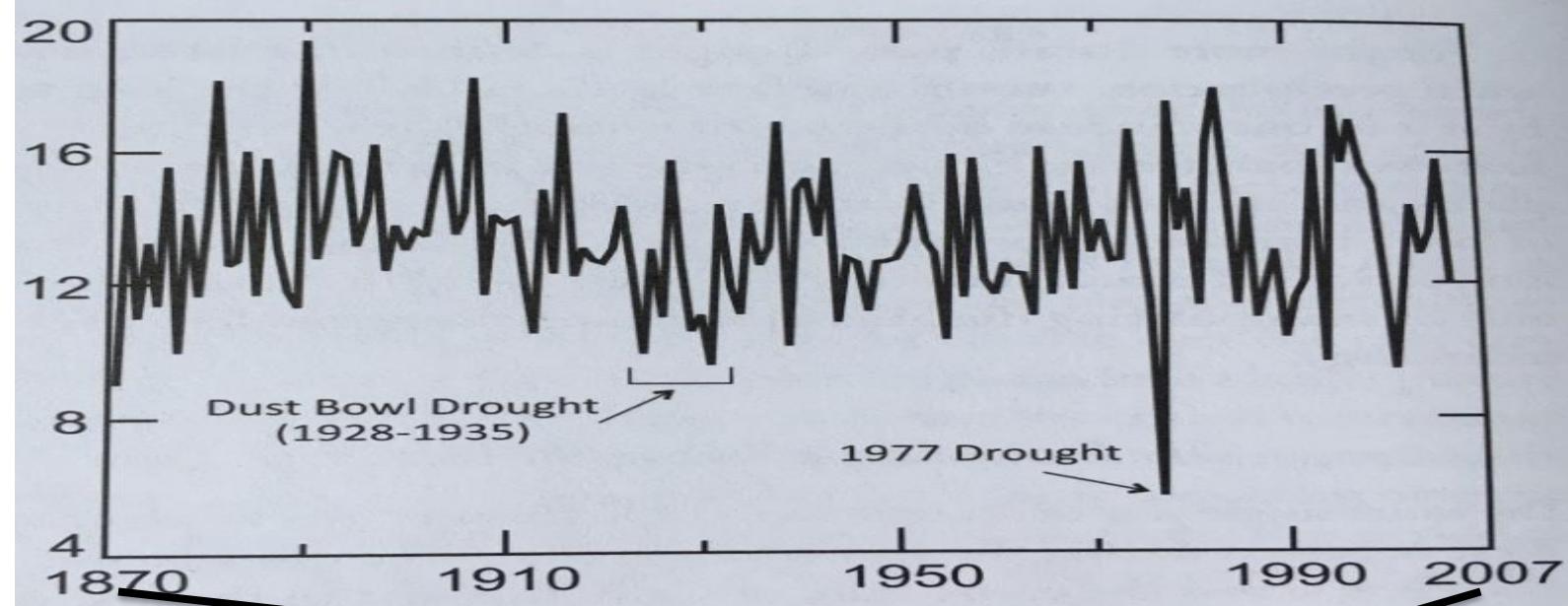


Clear Lake  
Lake County, CA



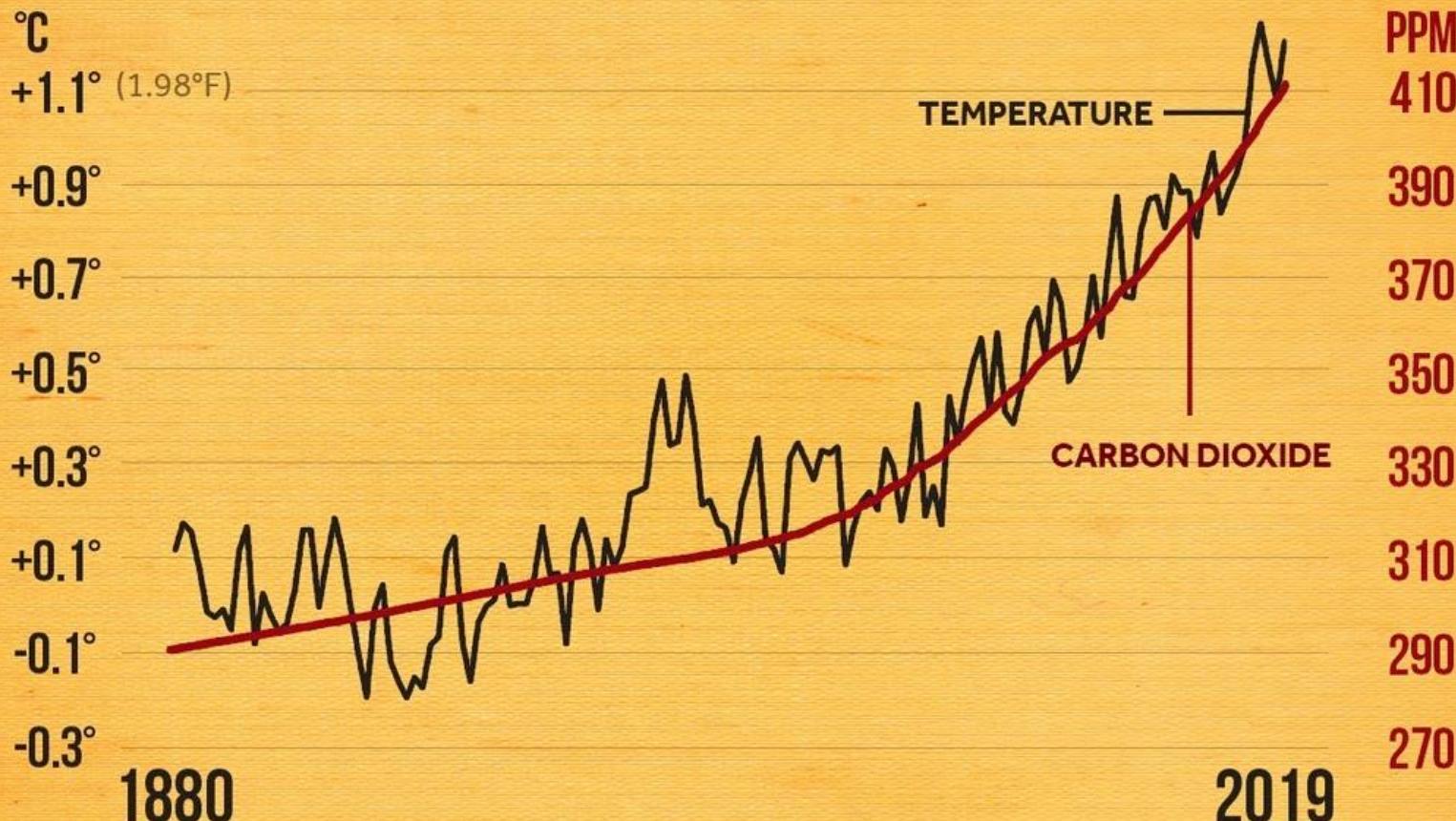
# Clear Lake Pollen Diagram





Figures from Woodhouse and Overpeck 1998; Stahle et al. 2013; Ingram and Malamoud-Roam 2013

# GLOBAL TEMPERATURE & CARBON DIOXIDE



Global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910)

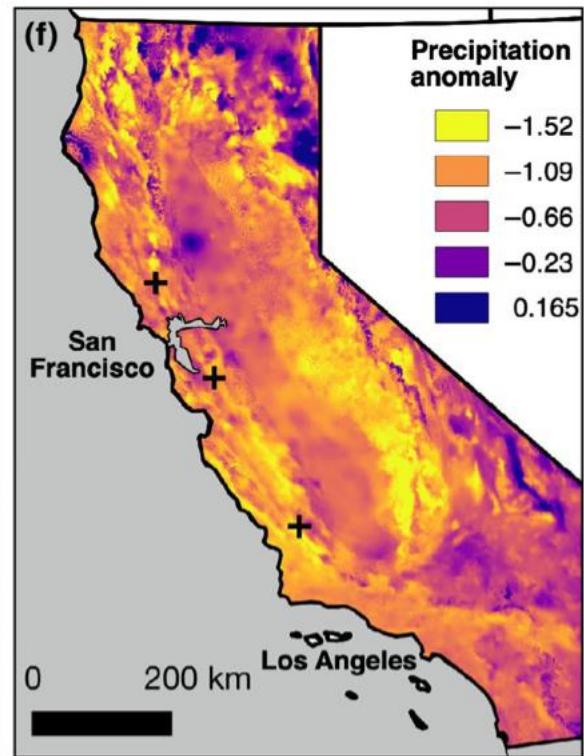
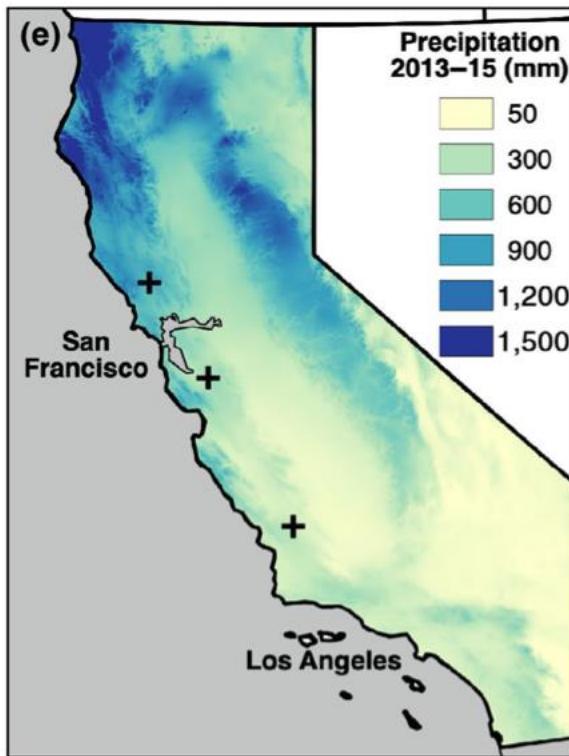
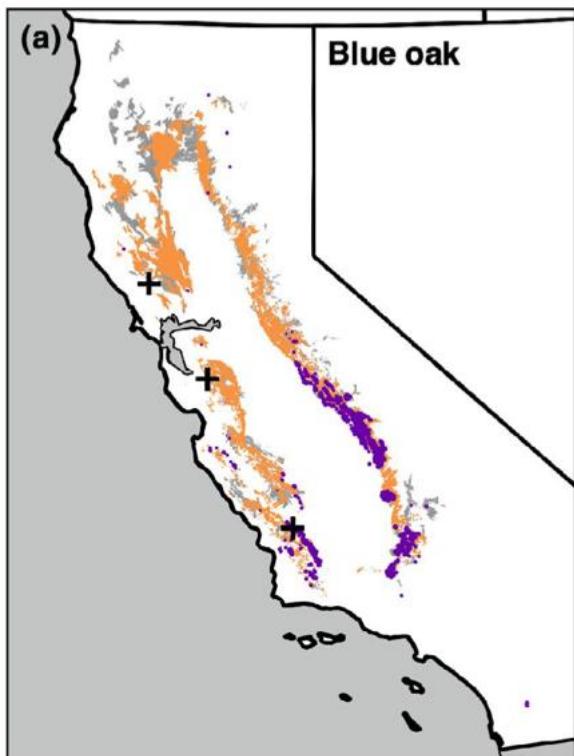
Global annual average carbon dioxide

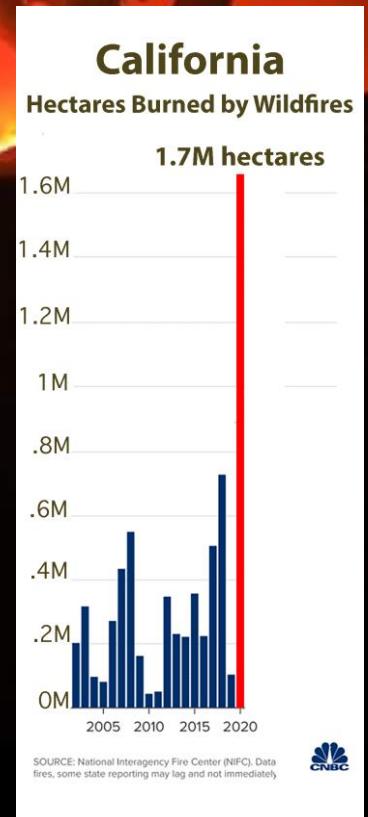
Source: NASA GISS, NOAA NCEI, ESRL

CLIMATE  CENTRAL

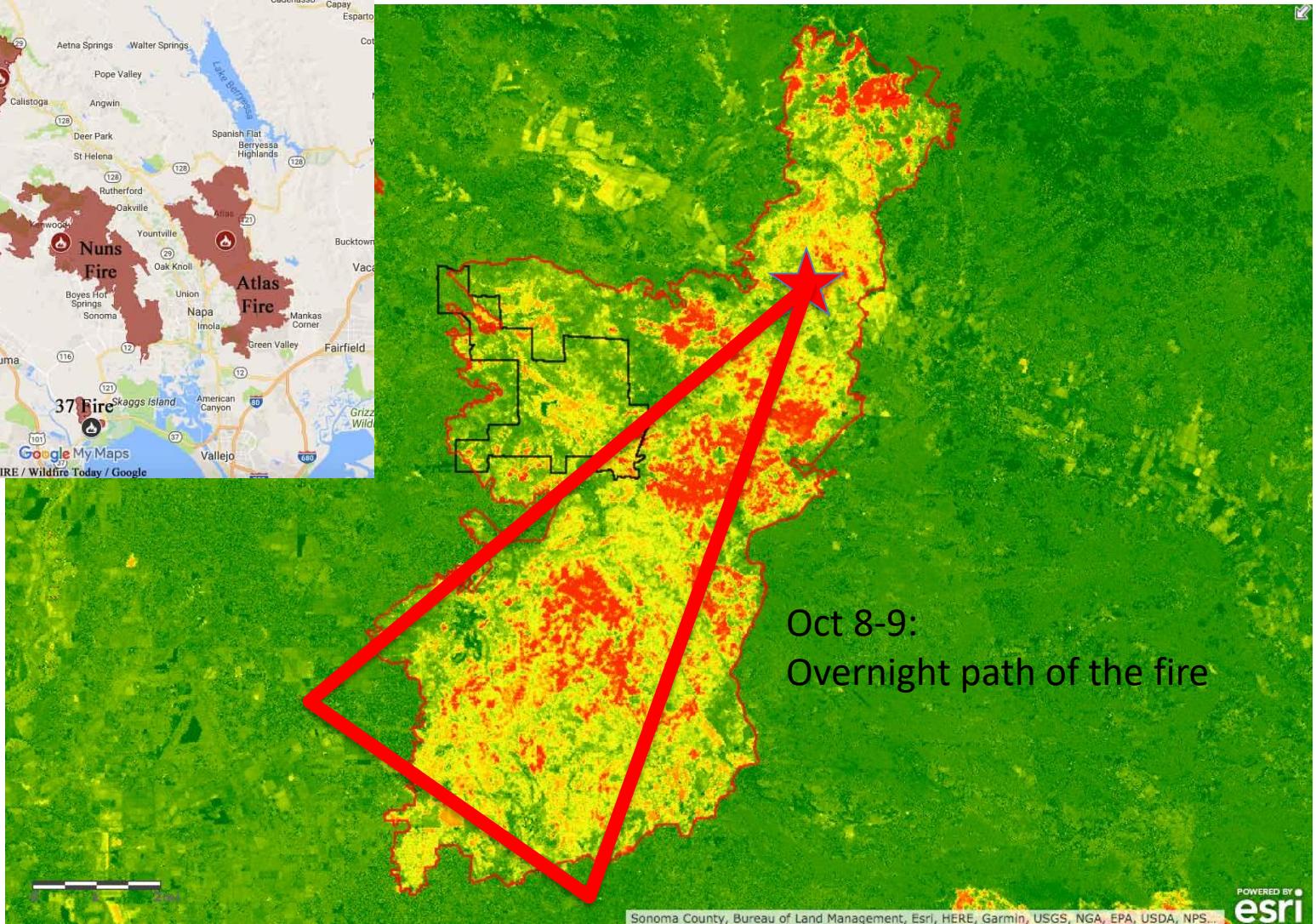
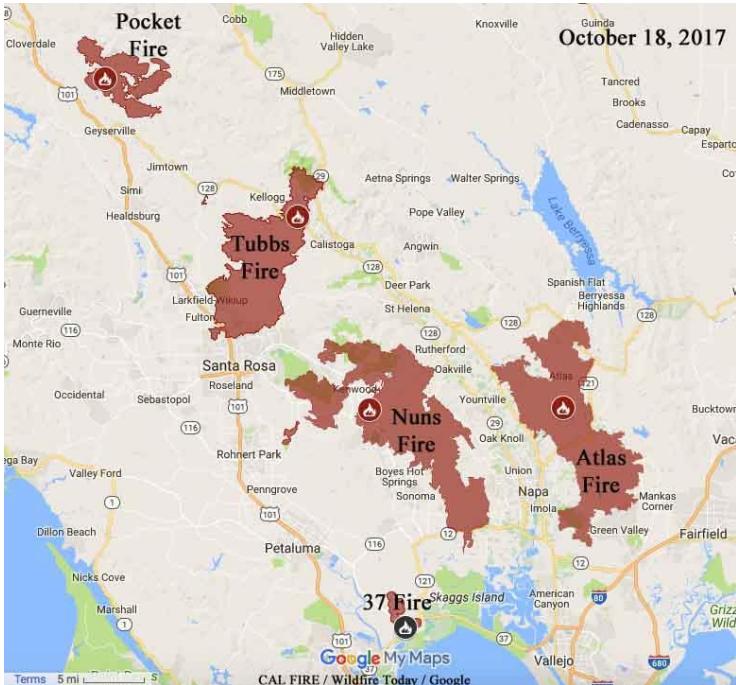


# Blue oak dieback (2015)





## Tubbs Fire: severity map (red = highest)





D. Ackerly



Coast live oak -  
new leaves and flowering (Nov. 18)



Madrone shoot leafing out! – Nov. 21



Coast live oak sprouting – Nov. 18



Oregon oak germinating – Dec. 2



Feb 17, 2018  
D. Ackerly



*Q. agrifolia*  
Topkill in high  
severity patch



*Ceanothus cuneatus* seedling in  
forest understory (heat stimulated  
germination; chaparral shrub)



Mar 31, 2018

D. Ackerly



Jan. 3, 2019  
D. Ackerly

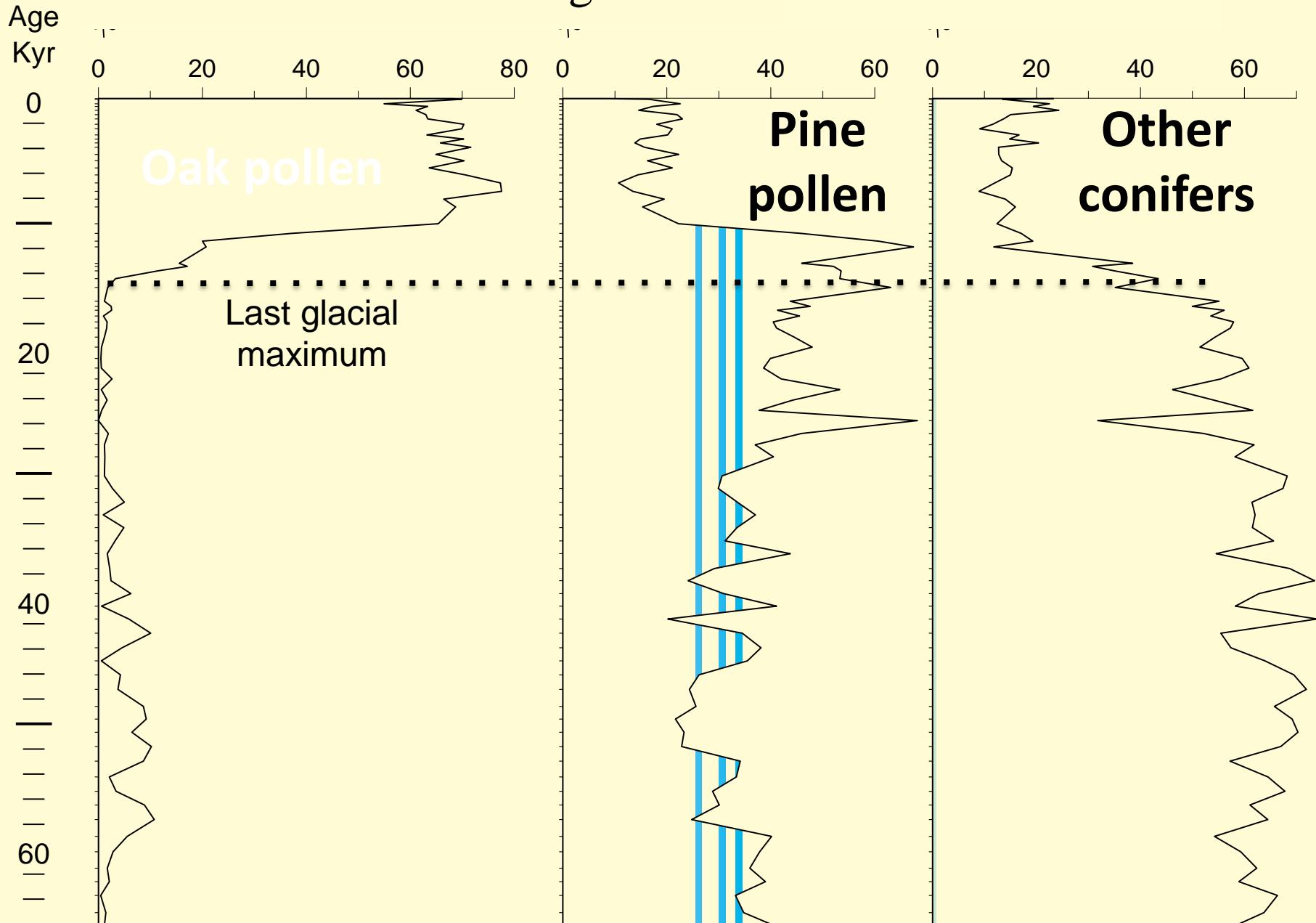


photo D.D. Ackerly





# Clear Lake Pollen Diagram



# Question:

- The impacts of climate change on biodiversity are deeply concerning, and add to the arguments for why we should try to solve the climate crisis – i.e. achieve net zero and negative carbon emissions
- But, the ways in which plants and animals respond to a changing climate are ‘natural’
- How would you communicate with a general audience about biodiversity responses to climate change? Is there ‘good’ change and ‘bad’ change in natural systems?



Hastings Natural History Reservation, Carmel Valley

photo D.D. Ackerly

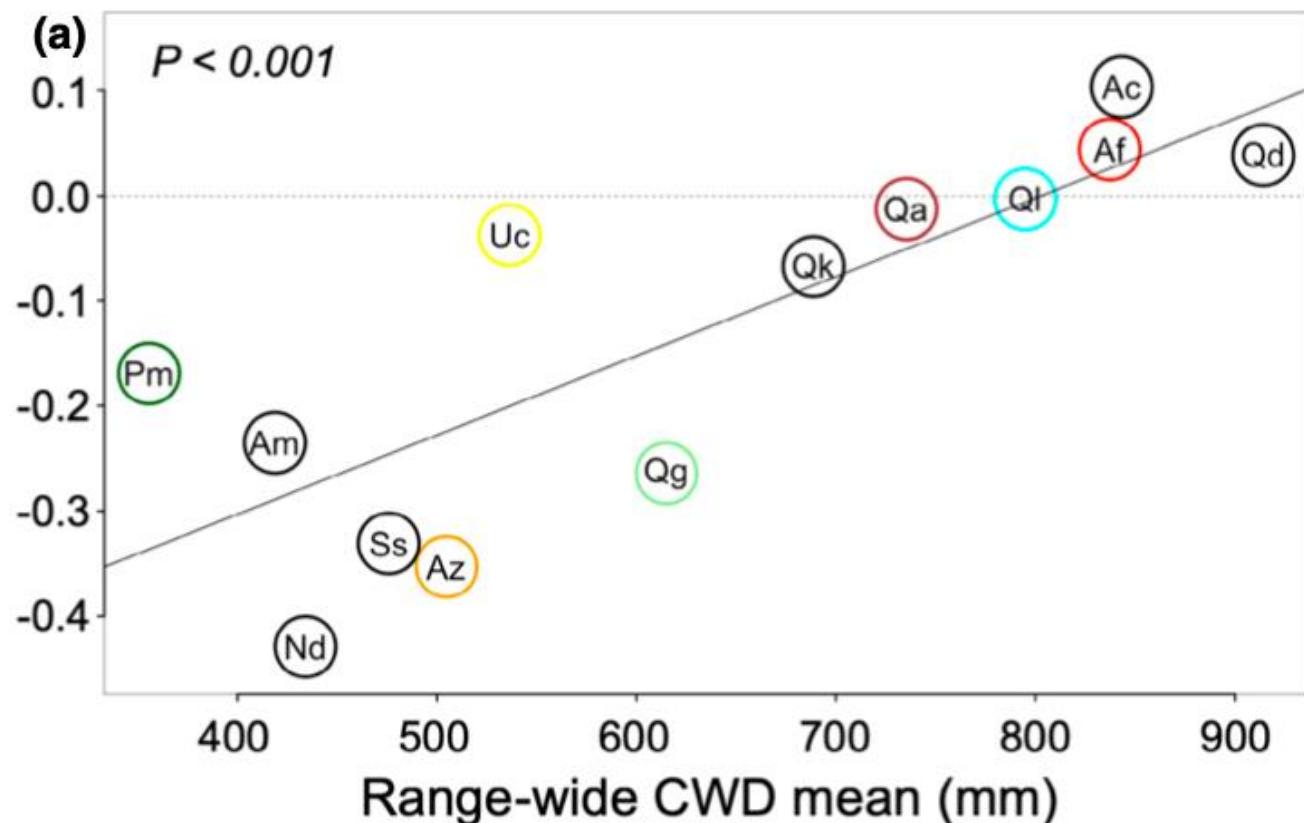
# **“Conserving the stage”**

- Diverse landscapes support diverse communities
- Rugged landscapes may provide refugia, sites buffered from climate change
- Heterogeneous landscapes allow species to reach future, suitable sites within short dispersal distances



# Range wide distribution and the projected response to a drier climate

Sensitivity to  
increasing CWD  
(change in suitability  
@ Pepperwood)



**Figure 6.** Sensitivity of each species measured as an increase in suitability in response to a 120-mm increase in CWD (holding other factors constant), in relation to (a) regional or (b) local topographic CWD niche.  $P$  values are for slope of the linear regressions. See Table 1 for species abbreviations. Colors match those described in Figure 3b.

