

# Oak Planting Overview

Jennifer Benson, November 29<sup>th</sup>, 2017, Guadalupe-Coyote Resource Conservation District



# What we'll cover:

- Point Blue and STRAW introduction and overview
- Oak brief overview: ecology, reproductive strategy, identification
- Oak planting design and considerations
- Get out in the field and try out planting techniques!

# Point Blue Conservation Science

**Our 50 year vision:** *Because of the work we do today, healthy ecosystems will continue to sustain thriving wildlife and human communities in California and beyond, on land and at sea, for decades to come.*

(Science + Education + Restoration)<sup>Partnerships</sup>

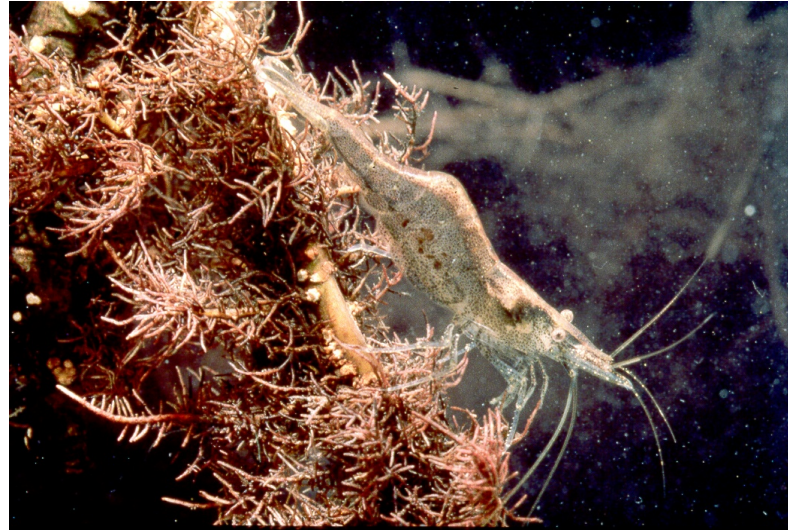
- Founded in 1965 as Point Reyes Bird Observatory
- 160+ scientists, educators, and restorationists
- Manage over 1 billion ecological observations



# Students and Teachers Restoring A Watershed

## Since 1992:

- Over 40,000 Students
- Over 600 Restorations
- 45,000 Native Plants
- Over 35 Miles of Riparian Habitat
- 5 acres of marsh/upland ecotone



# The STRAW Program

## Our Role In Restoration:

1. Revegetation
2. Biotechnical Erosion Control
3. Invasive Plant Control
4. Community Engagement
5. “One-Stop” Project Management
  - Planning/Design
  - Implementation
  - Maintenance
  - Monitoring & Reporting





**Partners!**





# Oak overview: ecology

- Oak woodlands home to more species of plants and animals than any other terrestrial ecosystem in CA.
  - Some oaks considered keystone species
- Oak companion plants: buckeyes, bays, walnuts have similar reproductive strategies as far as highly-resourced seeds.
- What do oaks provide?
  - Shade
  - Food source, habitat
  - Increased water infiltration
  - Increased carbon sequestration

# Oak overview: reproductive strategy

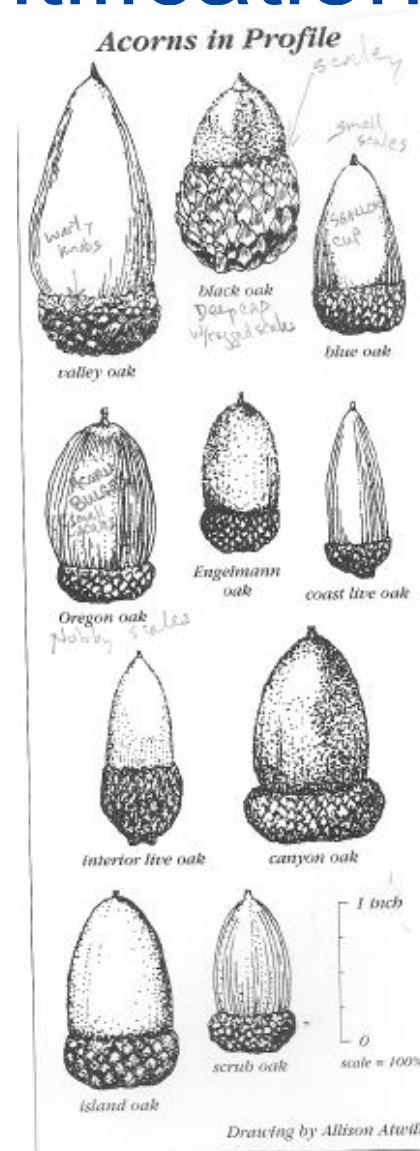
- Wind-pollinated: **catkins are petal-less flowers**. Other plant groups with catkins are willows, cottonwoods, alders, birches.
- Why wind-pollination?
  - Built for it!
  - Flower early in spring, when it's windy, cool...pollinators still dormant at this time.
  - Oaks delay leafing out until catkins released pollen
- Hybridization common
- Seed dispersal mechanism: other animals. Acorns valuable to animals as they have carbs (68%), fat (18%), and proteins (6%).

# Oak overview: identification

- 22 oak species in CA
  - Divided into 3 evolutionary lineages: white, red, and intermediate/golden
    - White: Oregon, valley, scrub, blue, Engelmann
    - Red: Coast live, interior live, black
    - Intermediate: canyon
- Can identify via size/shape, trunk texture, leaf structure
  - Pointy leaf margins vs non-pointy?

# Oak overview: identification

- Acorn cup architecture gives clues and is accurate means of identification.



# Oak planting design and considerations

- Climate-smart planning in design
- Landowner goals
- Other considerations:
  - Materials to use
  - Upkeep and maintenance
  - Phytophthora

**Climate-smart ecological restoration** is the process of enhancing ecological function of degraded or destroyed areas in a manner that prepares them for the consequences of climate change.

Gardali et al., In prep

# Climate-smart principles

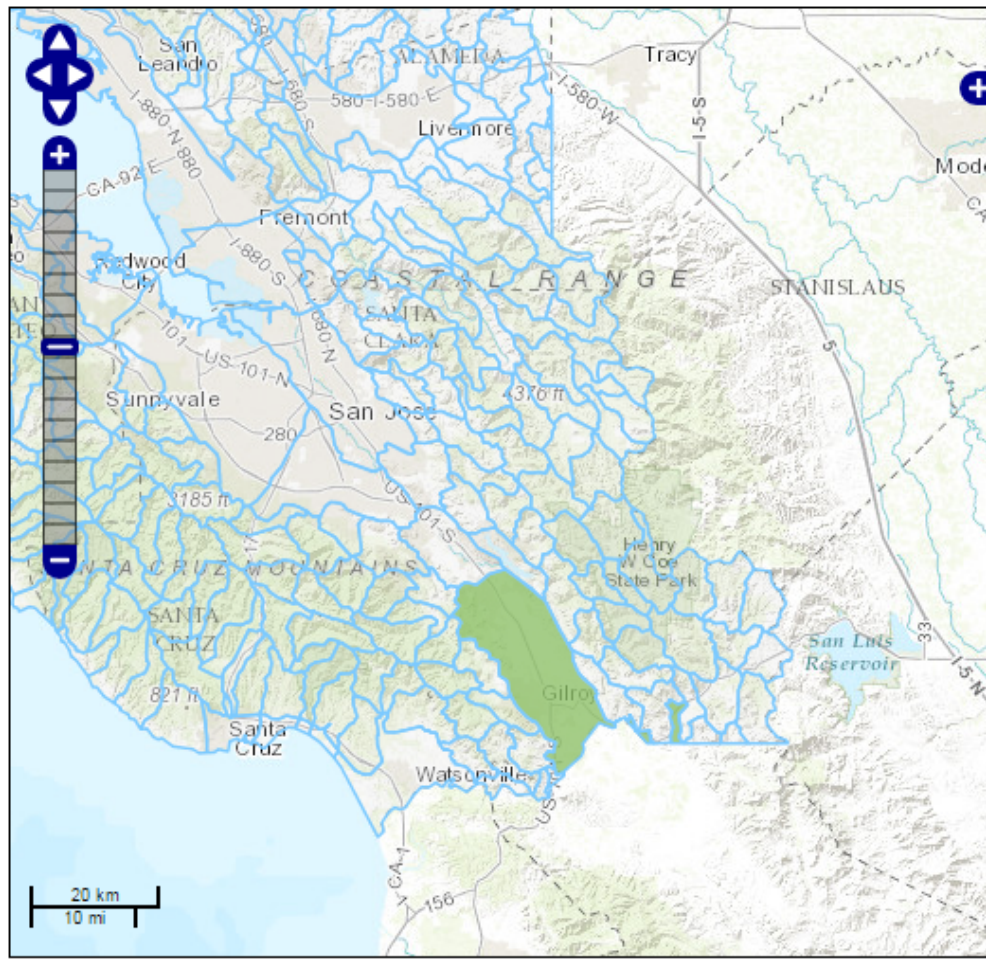
1. Show your work
2. Look forward but don't ignore the past
3. Consider the broader context
4. Build ecological insurance
5. Build evolutionary resilience
6. Include the human community
7. Monitor and Experiment

# Climate-smart planning in design

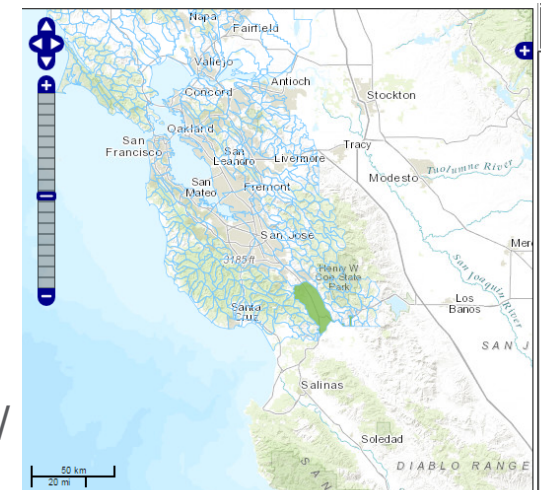
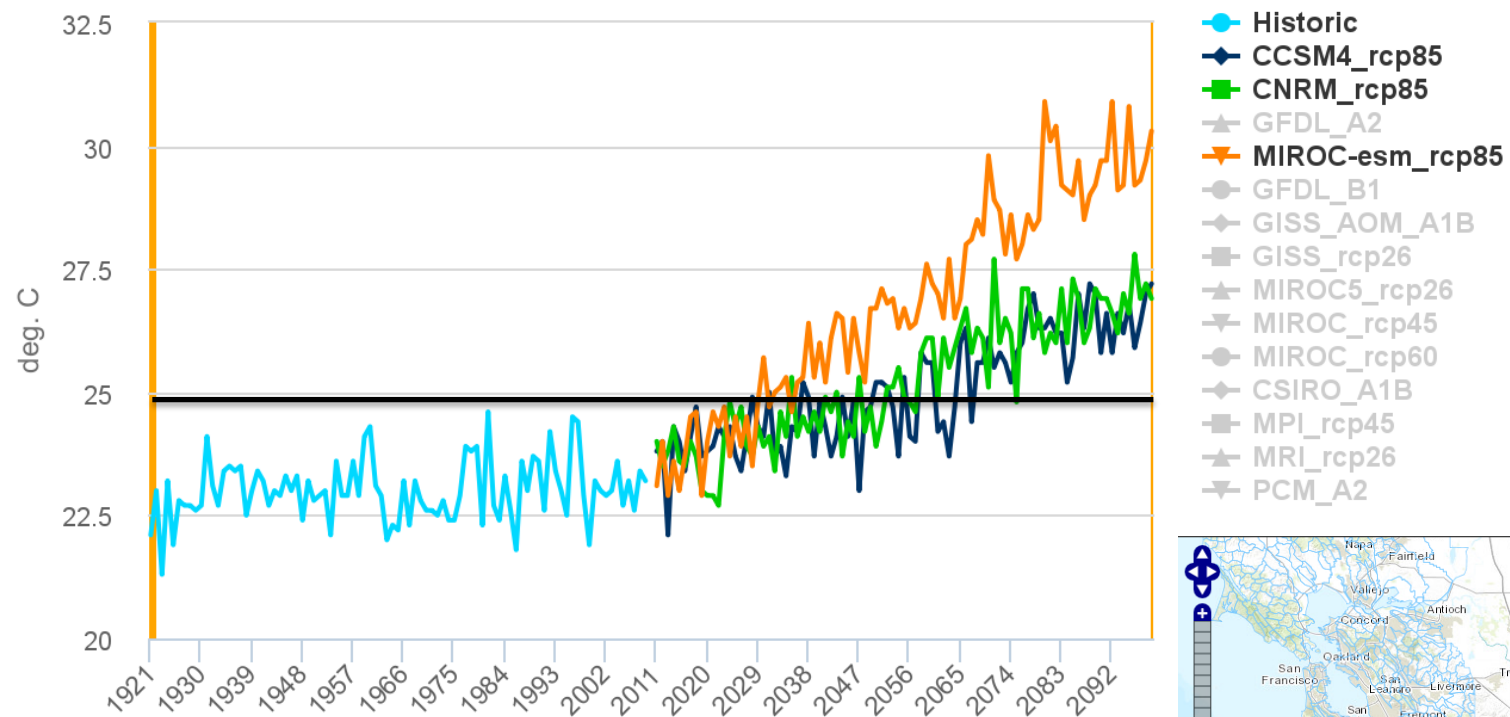
- What are some resources to find future climate projections?
  - Watershed Analyst
  - Climate Analog
  - Cal-Adapt

# Watershed Analyst

<https://geo.pointblue.org/watershed-analyst/>



# Historic and projected future maximum monthly temperature



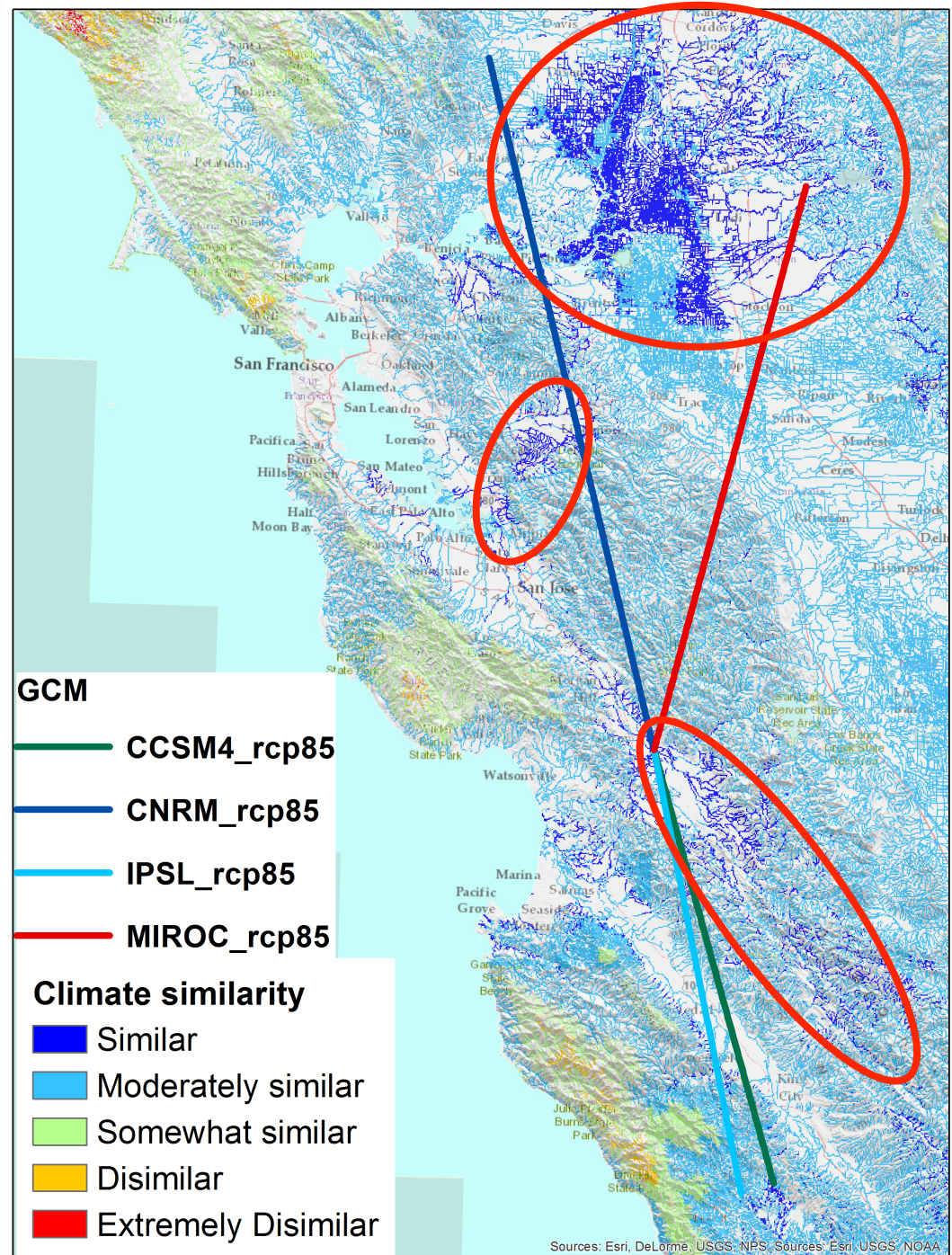
Point Blue

<http://geo.pointblue.org/watershed-analyst/>

# Climate Analogs

- Is there anywhere in California right now that has a similar climate to my project's future climate projections?
- Find the closest climate match for two time periods.

# MIROC 2010 – 2039



# Cal-Adapt

- <http://cal-adapt.org/>

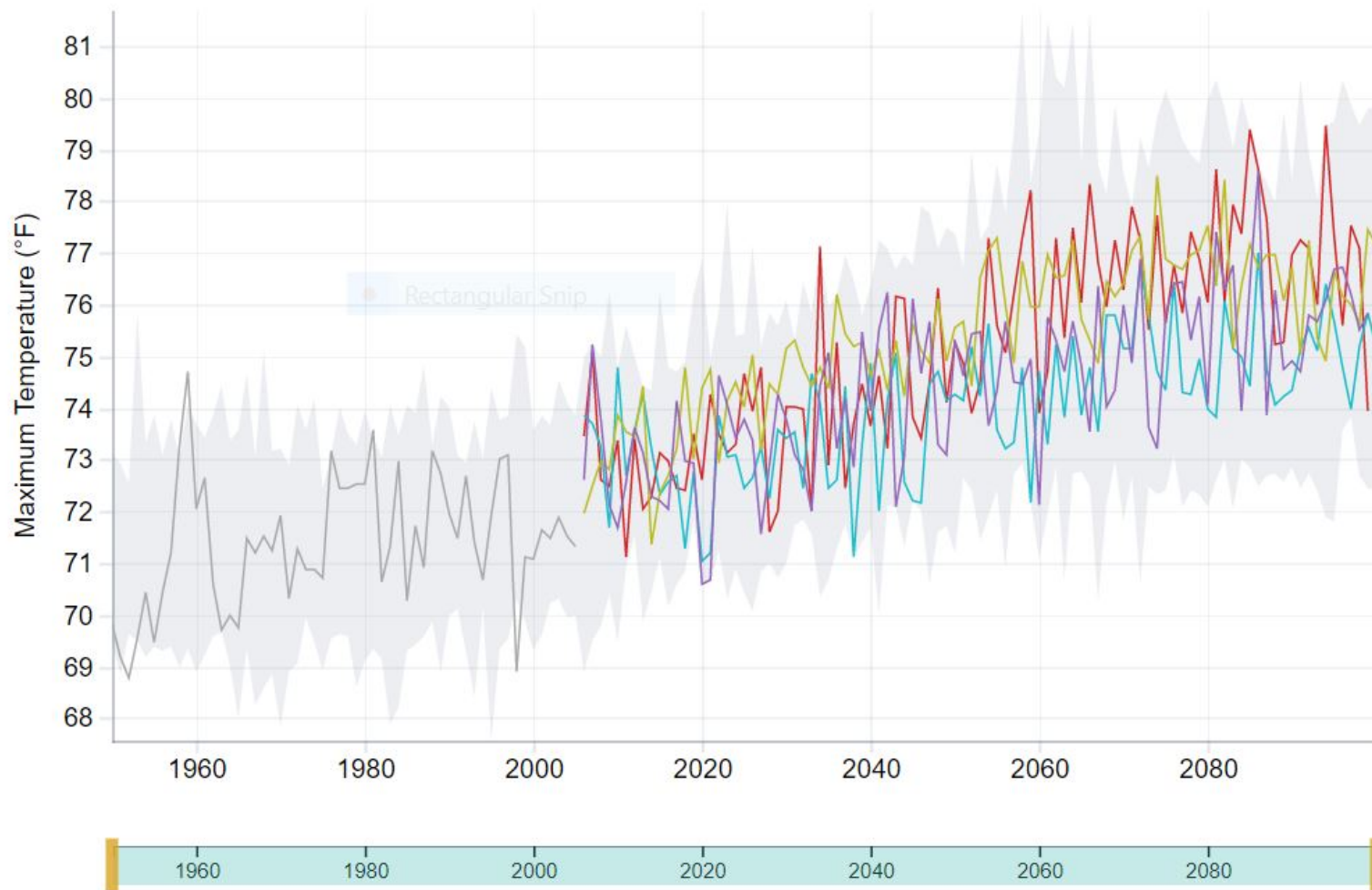
The screenshot displays the Cal-Adapt web application interface. On the left, a map shows the area around Morgan Hill, CA, with a grid overlay. A search bar at the top left contains the address "19665 Hale Avenue, Morgan Hill, CA, USA". A "Map Center" panel at the bottom left shows coordinates "-121.7184, 37.1565" and a "Change" button. A "Legend" panel on the right side of the map shows "Electrical Grid".

On the right side of the interface, there are three main panels:

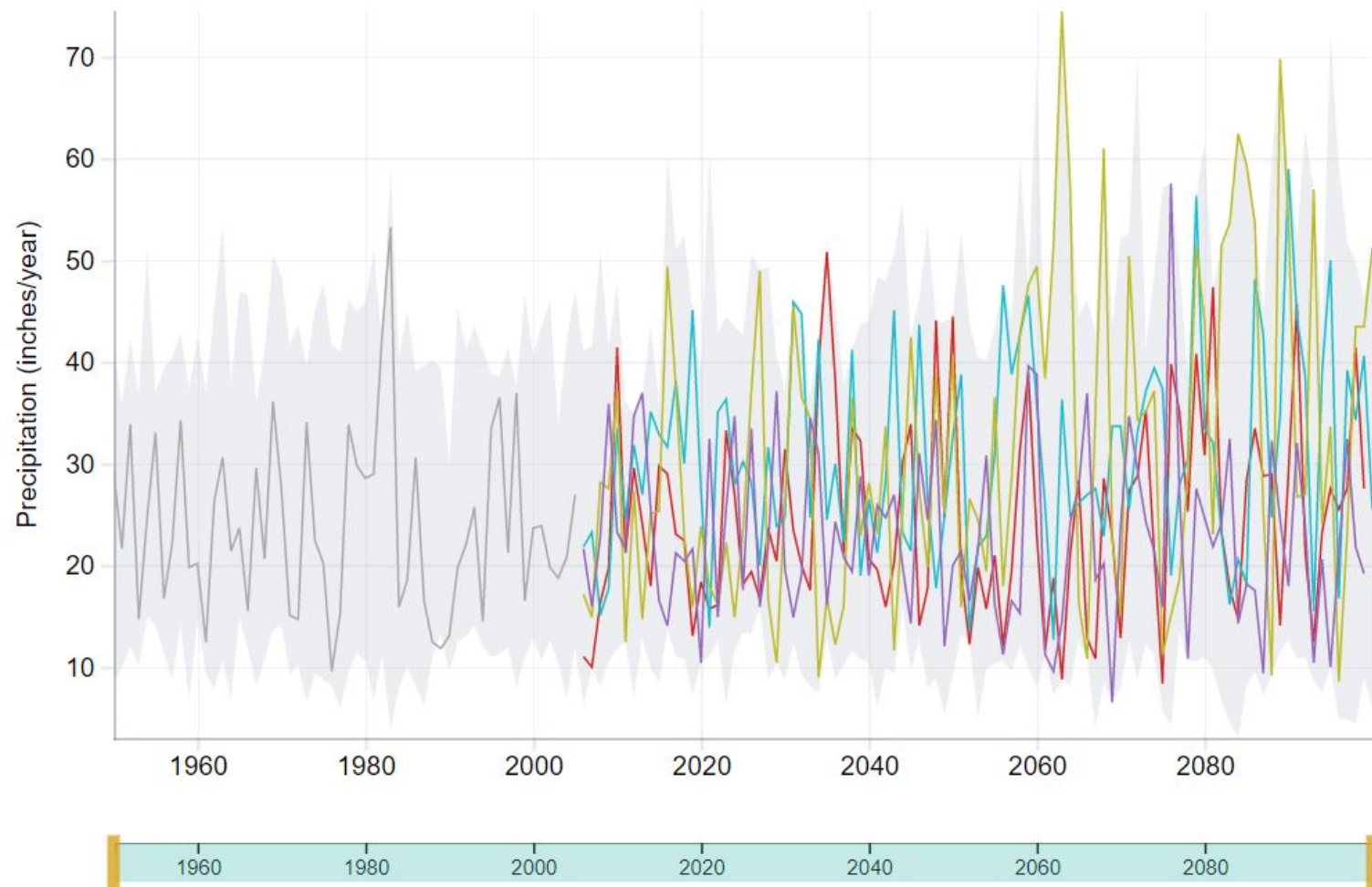
- CURRENT SELECTION**: Displays "Grid Cell (37.15625, -121.71875)".
- AGGREGATE DATA BY BOUNDARY**: Contains a "Select Boundary:" dropdown menu with "1/16° Grid ~ 6x6 km" selected. Below this is an "OR" separator and an "Upload Boundary:" section with a "Choose File" button and the text "No file chosen". A note below states: "Supported formats - Shapefile, GeoJSON, KML, WKT (zip files before uploading). If the file has multiple polygons, the union of all polygons is used for aggregation."
- Buttons**: Two teal buttons labeled "UPDATE CHART" and "CANCEL".

At the bottom of the map area, there is a footer: "Leaflet | Data: OSM, Map Tiles: CartoDB, Geocoding: Mapzen, Climate: Cal-Adapt".

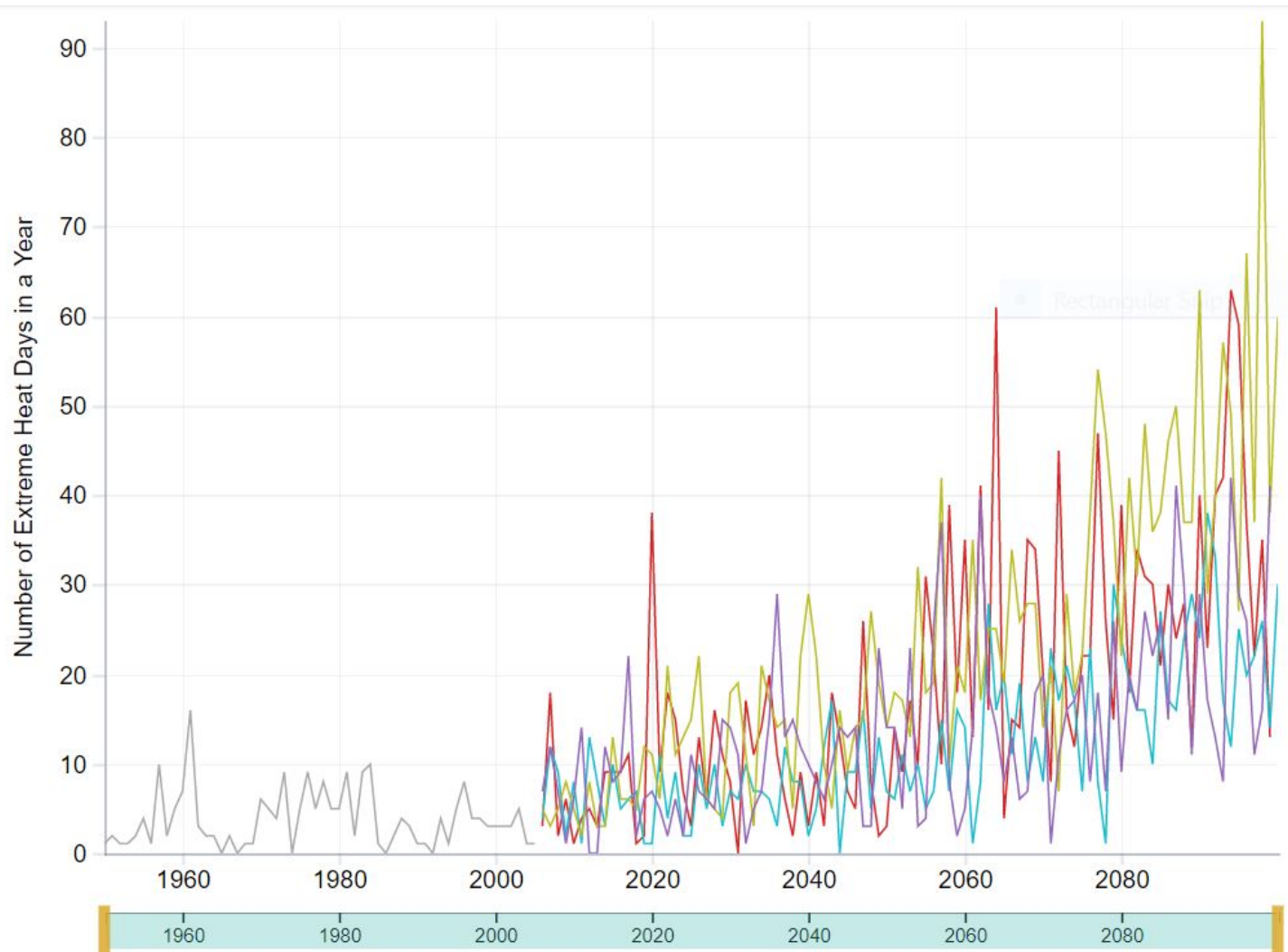
# Cal-Adapt



# Cal-Adapt



# Cal-Adapt



# Cal-Adapt

	Scenario RCP 4.5	Scenario RCP 8.5
Annual avg max temperature (71.4 degrees F)*	76.1 degrees F	79.1 degrees F
Annual avg min temperature (49.0 degrees F)*	53.7 degrees F	57.1 degrees F
Annual total precip (24.2 inches)*	26.6 inches	30.3 inches
Extreme heat threshold (96 degrees F, 3.9 days)*	15 days	28 days

# Climate-smart planning in design

- What to do with this information?
  - Consult plant tolerance characteristics
  - Adjust planting palette
  - Consider climate-related vulnerabilities (i.e., heavier rain events, hotter temperatures, etc.)
  - Consider broader context (land-use changes, water tables, etc.)
- Possible climate-considered actions:
  - Collect acorns on-site
  - Build wildlife connectivity and resources
  - Increased extreme rain events – flood mitigation
  - Include human community

# Landowner goals

- Considerations:
  - Scale and cumulative impacts
  - Current land use: cattle operation, city park, your own backyard
  - Browse protection, foot traffic, public outreach
  - Which plants and wildlife already thrive
- Goals:
  - Beautification
  - Erosion control or water quality improvement
  - Increase water infiltration, carbon sequestration
  - Increase pollinator habitat

# Other considerations

- Materials to use
- Upkeep and maintenance
- Phytophthora

# Materials to use

- Materials to use
  - Selecting plants
  - Browse protectors
  - Weed abatement

# Materials to use: selecting plants

- Consider what's on site already
- Calflora: *What grows here?*
- Source locally



# Materials to use: acorn collection

- <http://ucanr.edu/blogs/slomggarden/blogfiles/13336.pdf>
  - Collect acorns
  - Consider onsite collection, location, slope
  - Storing acorns: remove caps, rinse in bleach water, remove floaters, store in Ziploc bag in refrigerator with just a bit of moisture



# Materials to use: browse protectors

- Consider who's on site already: deer, ground squirrels, cattle



# Materials to use: browse protectors

- Cattle-specific protection



# Materials to use: browse protectors

- Cattle-specific protection



# Materials to use: browse protectors

- Cattle-specific protection
- Note trenches
- Used augur to dig 1' deep holes
- Both acted like basins to collect water
- Take-aways with Tubex:
  - Monitor
  - Use baling wire
  - Plant 3x more, replant
  - Wildlife



# Materials to use: browse protectors

- Cattle-specific protection



# Materials to use: browse protectors

- Cattle-specific protection



# Materials to use: irrigation technique

- Land Life Company, The Cocoon



# Materials to use: irrigation technique

- Land Life Company, The Cocoon
- Take-aways:
  - Plant in loamier soils
  - Infill with soil
  - Supplemental hand-watering



# Materials to use: weed abatement

- Burlap
- Cardboard
- Coir mat
- Mulch



# Upkeep and maintenance

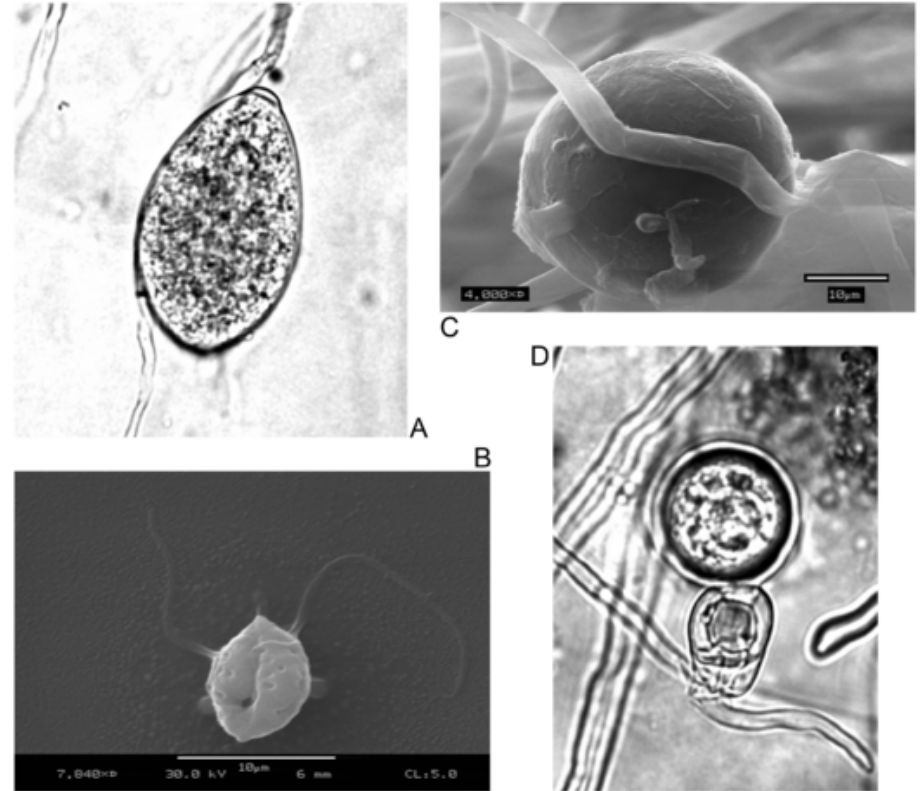
- Water
  - Container plants vs. acorn seedlings
- Weeding
  - Oaks need light!
  - Removal of competing plants
- General maintenance
  - Cages



Credit: 2001 Phytosphere Research

# Phytophthora

- What is it?
  - Similar to diatoms or algae, but not a true algae
  - Parasitic and seeks decaying plant matter
  - Water-loving, swim around
  - Spread through water, stored in soil



Nicholls H: *Stopping the Rot*. PLoS Biol 2/7/2004: e213.

<http://dx.doi.org/10.1371/journal.pbio.0020213>

# Phytophthora

- How does it spread?
  - Via plants (highest concern)
  - Soil
- Why so prevalent now, more species?
  - More species being found on restoration sites
  - Poor nursery practices
  - Improved diagnostic testing
- How does it kill plants?
  - Cambium -> xylem -> cuts off water supply

# Phytophthora

- How to diagnose?
  - Difficult! Can take time for symptoms to appear.



1. *Phytophthora ramorum*: symptoms of leaf blight in *Camelia*. Photo courtesy: S. Ashby, Department of Environment, Food and Rural Affairs, UK



2. *Phytophthora ramorum*: symptoms of bleeding canker in *Quercus* tree. Photo courtesy: M. Garbelotto, UC Berkeley, United States.



Credit: PNW Pest Mgmt  
Handbooks



Credit: International Plant Protection Convention.  
**Point Blue**

# Phytophthora

- Connection to climate change?
  - Extreme rain events stimulate reproduction
  - Very wet -> very hot, dry = potentially sick, stressed plants
- What's next?
  - Working groups
  - Integration of BMP's in nurseries
  - Community awareness
  - Prevention!

# Phytophthora

- Along the lines of prevention, what are we at STRAW doing?
  - Sanitizing tools in Quaternary Ammonium bath
  - Power-washing trucks to remove soil
  - Foot baths



# Landowner goals: an example

- Considerations:
  - Current land use: cattle operation
  - Browse protection from cattle, deer, and squirrels
  - Many existing oaks...collect acorns!
- Goals:
  - Increase extent of oak habitat
  - Increase potential for reduced erosion
  - Increase water infiltration, carbon sequestration

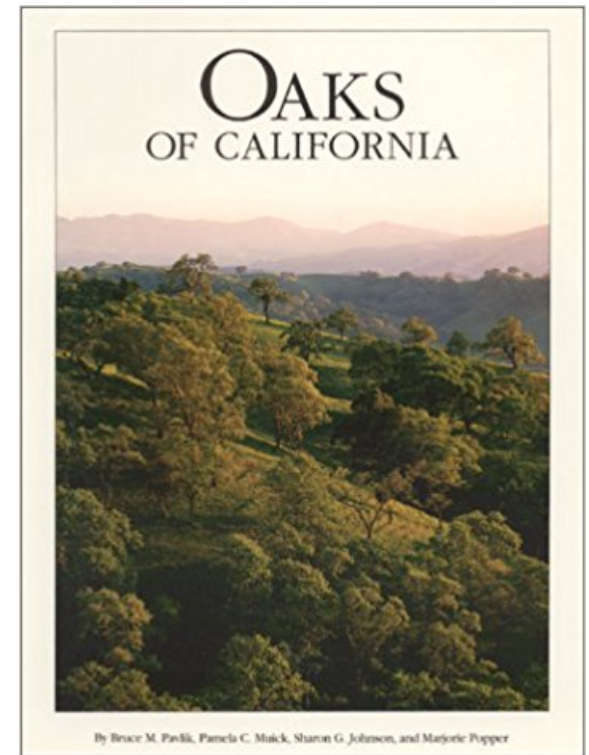
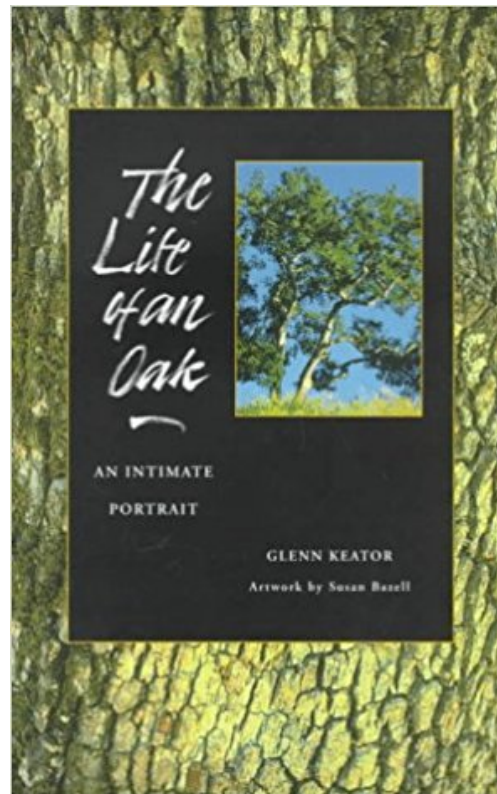
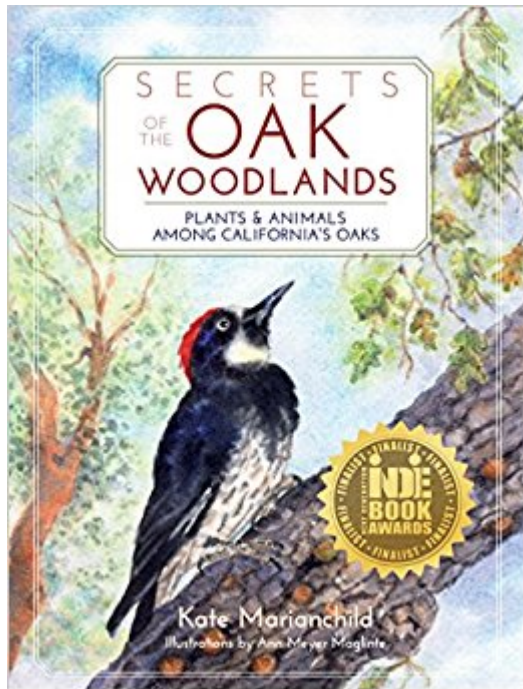
# Next...

- Have lunch!
- Carpool to field site at Tilton Ranch.
- Drive all the way back until you see the big red barn. Staff there to help park and direct you to plant demo staging area.



# Resources

- University of California Division of Agriculture and Natural Resources  
[http://ucanr.edu/sites/oak\\_range/Oak\\_Articles\\_On\\_Line/Oak\\_Regeneration\\_Restoration/How\\_to\\_Grow\\_California\\_Oaks/](http://ucanr.edu/sites/oak_range/Oak_Articles_On_Line/Oak_Regeneration_Restoration/How_to_Grow_California_Oaks/)



Thank you!  
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Conservation  
Science