NATURAL HISTORY CRASH COURSE

Nature Bowl 2026

PRESENTED BY:

Julia Sisneros

California Department of Fish and Wildlife

North Central Region

Welcome!

Please make sure your mics are **off** as you join. If you have questions during the presentation, please use the chat, or raise your hand to be called on.

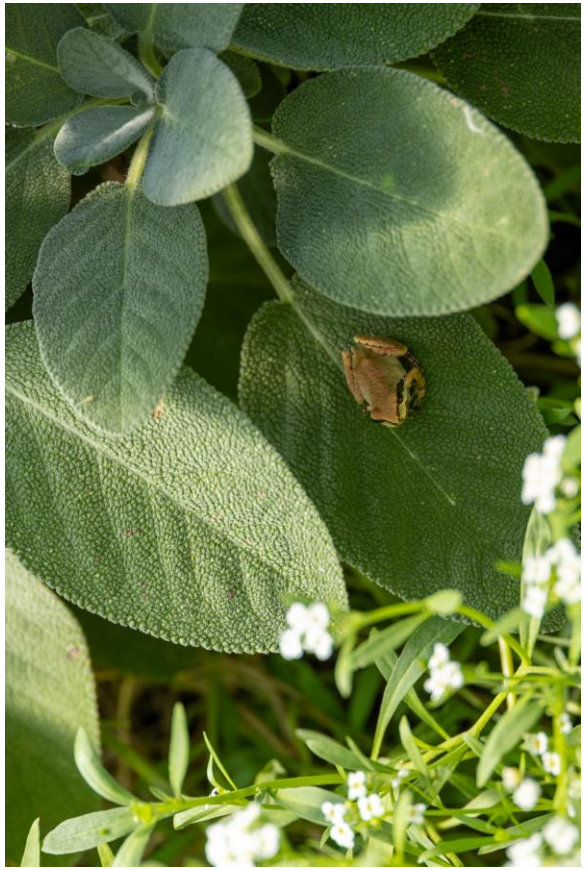
What is Natural History?

Critical thinking, curiosity, relationships and connections

At its most basic, Natural History is the scientific study of living organisms (animals, fungi, plants) and their natural environment. The Natural History of an ecosystem includes the cultural history of that place, the abiotic processes that have shaped the landscape, and the diversity of organisms that call that place their home.

In practice, Natural history is focused on the careful observation and inquiry into each piece of an ecosystem; the interconnectedness of species and habitat in both space and time.

It is more than just being able to identify organisms and their scientific names. Natural history involves attention to detail, curiosity, inquiry, patience and appreciation for the natural world.



The more you know, the more you care

"a living thing cannot be understood until it is known by all four aspects of our being: mind, body, emotion, and spirit."

- Robin Wall Kimmerer, *Braiding Sweetgrass*

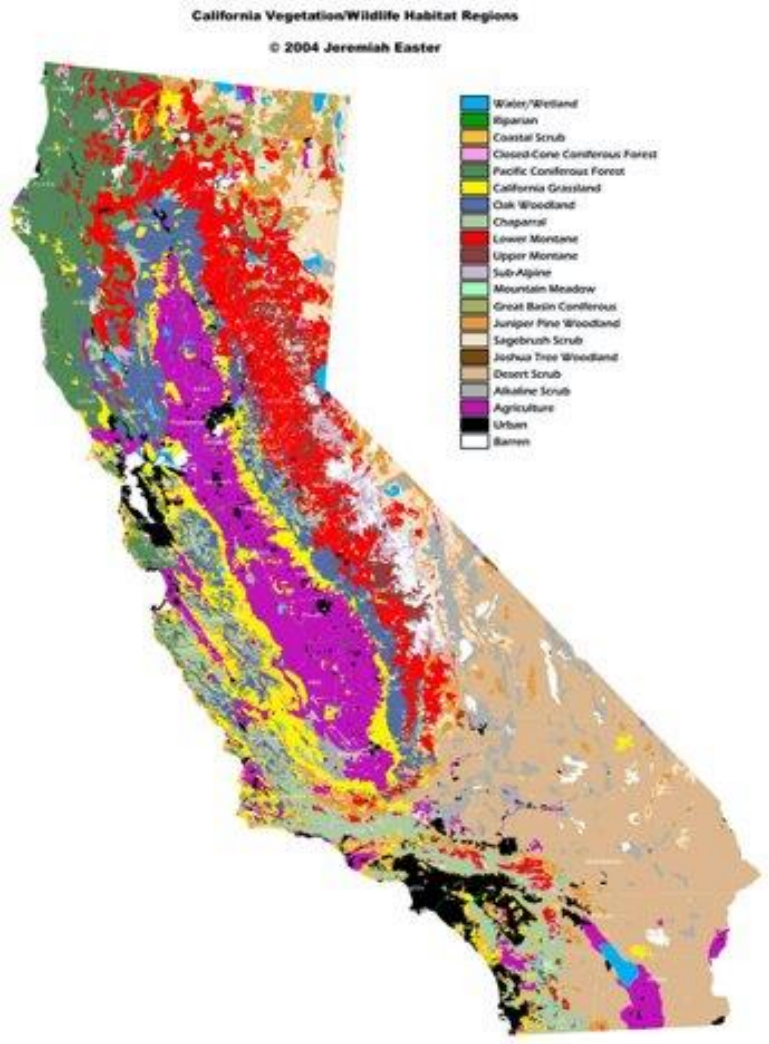
California is Biodiverse!

- Biodiversity (Biological Diversity) refers to the variety of life on earth. This includes everything from the smallest bacteria to the largest redwood tree!
- CA is a hotspot for biodiversity, and is one of the most biodiverse regions in the world
- In the US, CA has the largest number of biotic zones and greatest diversity of species.
- CA is also one of the few places in the world where 5 major climate types occur in close proximity (Desert, Cool Interior, Highland, Steppe, and Mediterranean). *Atlas of the Biodiversity of California - Climate and Topography*

CA Biodiversity by the Numbers

In a state that is 800 Miles long and 250 miles wide….

- Highest elevation in the lower 48 – Mt Whitney (14,495 ft)
- Lowest elevation in the world – Death Valley (-282 ft)
- Over 30% of all plant & vertebrate species in the US occur in CA
- 1000+ species of vertebrates (65% of which are endemic – they only occur in CA)
- 6,500+ types of plants (2000+ endemic)
- 30,000+ species of insects
- 1,600 species of native bees!
- 52 types of conifers (14 that are endemic!)



California Biodiversity Day – California Biodiversity Network

Our Biodiversity at Risk

In 2022, the NYT reported CA as being the state where biodiversity was the most at-risk – more than 30% of our species are threatened with extinction. *California Tops NYTimes List as Most Biodiverse and Most Threatened | Audubon California*

- Continued threats to our biodiversity include
  - Habitat loss
  - Non-native and invasive species
  - Climate change
  - Changes to our natural cycles (fire, water, carbon, nitrogen)
  - Human population growth

30x30 California

In 2020, Gov. Newsom signed an executive order to **conserve 30% of CA's lands and waters by 2030.**

As of July 2025, 26.1% of CA's lands and 21.9% of coastal waters are under long-term conservation and care!

Learn more about 30x30 here: 30x30 California

Let's dive into a few CA Ecosystems

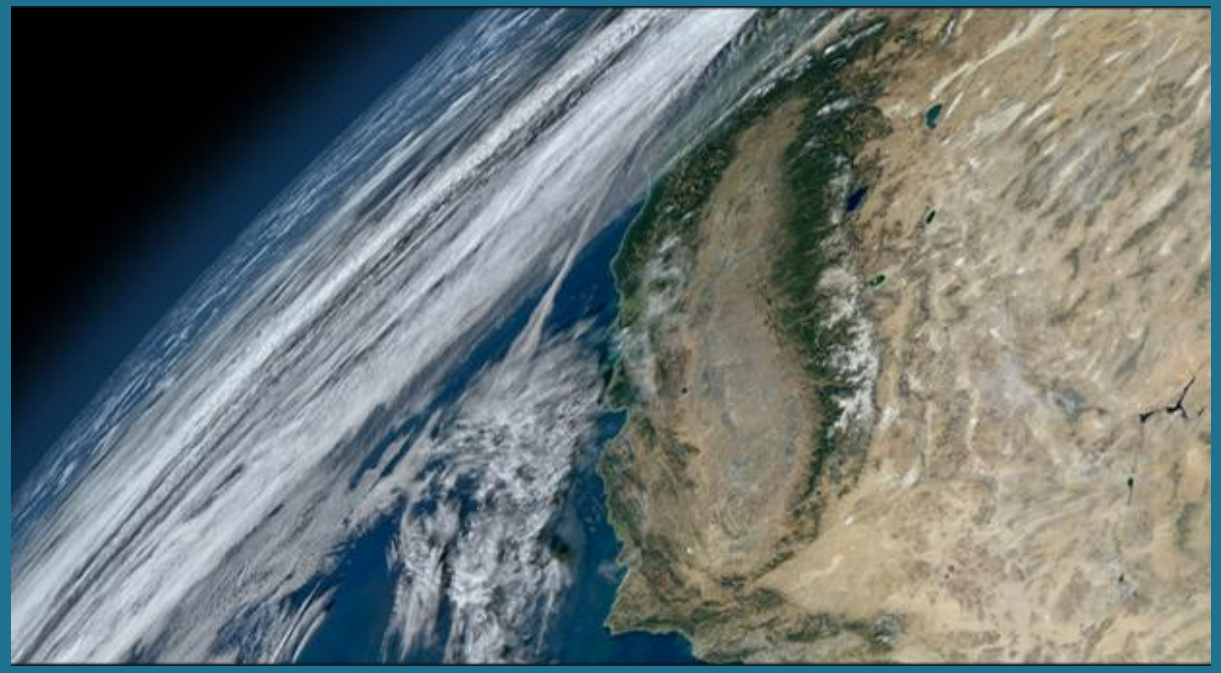
As we explore CA's ecosystems, think of the following:

What do you **notice**?

What do you **wonder**?

- What animals and plants might live here?
- What adaptations are required to exist in these environments?
- How have these ecosystems changed throughout CA history?

What does it **remind you of**?



Teaching Hint!

"I notice, I wonder, It reminds me of" is a fun and effective prompt to use when exploring nature with kids, popularized by nature journaling educator John Muir Laws.

Practicing Observations

Imagine you are walking along a nature trail. You come across this interesting piece of landscape. Take a few minutes to observe it, and type in the chat your responses to the following:

"I notice....."

"I wonder...."

"It reminds me of...."

(If you know what this is, keep the answer to yourself and just add your observations)

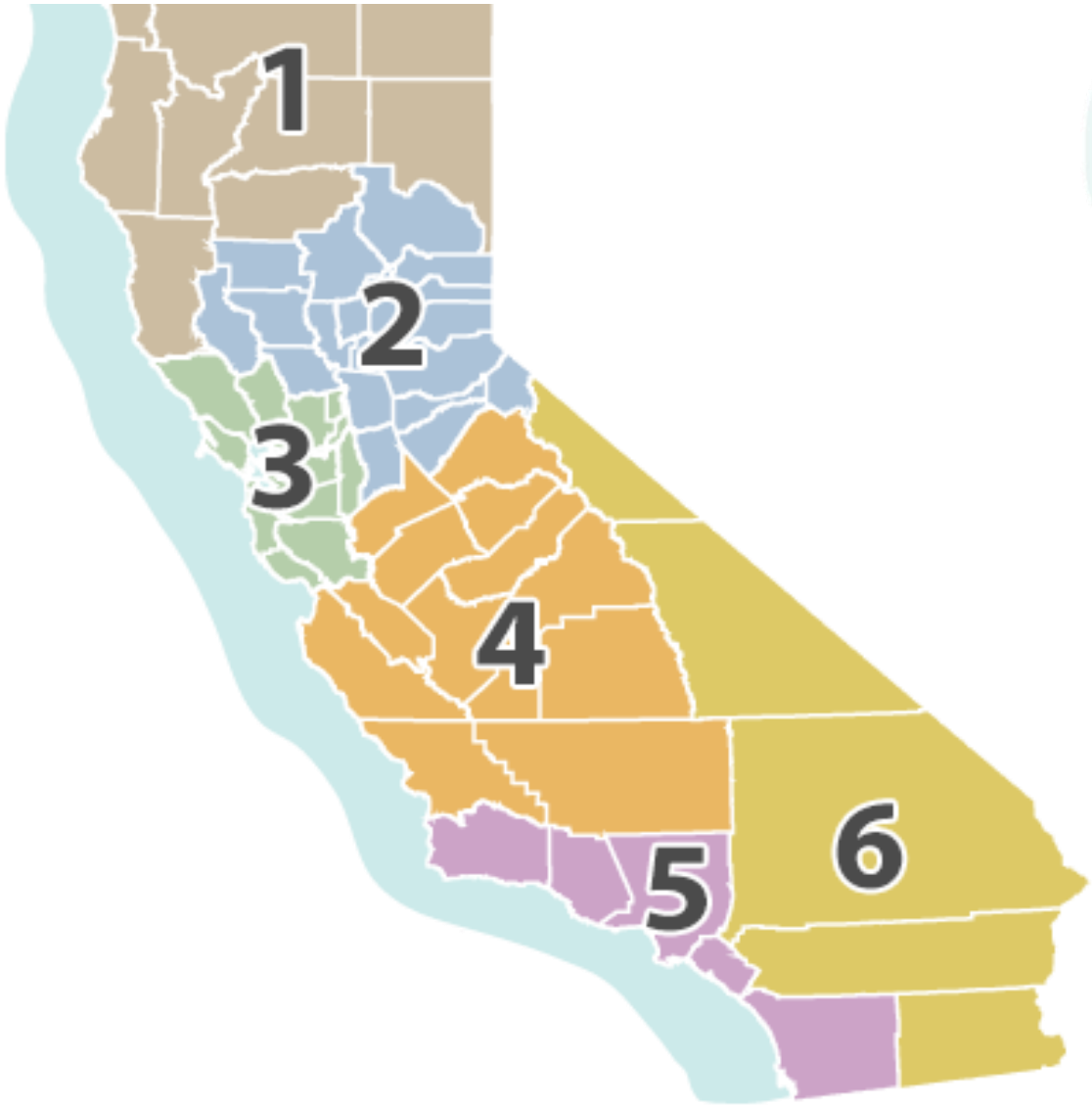
Practicing Observations

These are Tufas, found at Mono Lake!

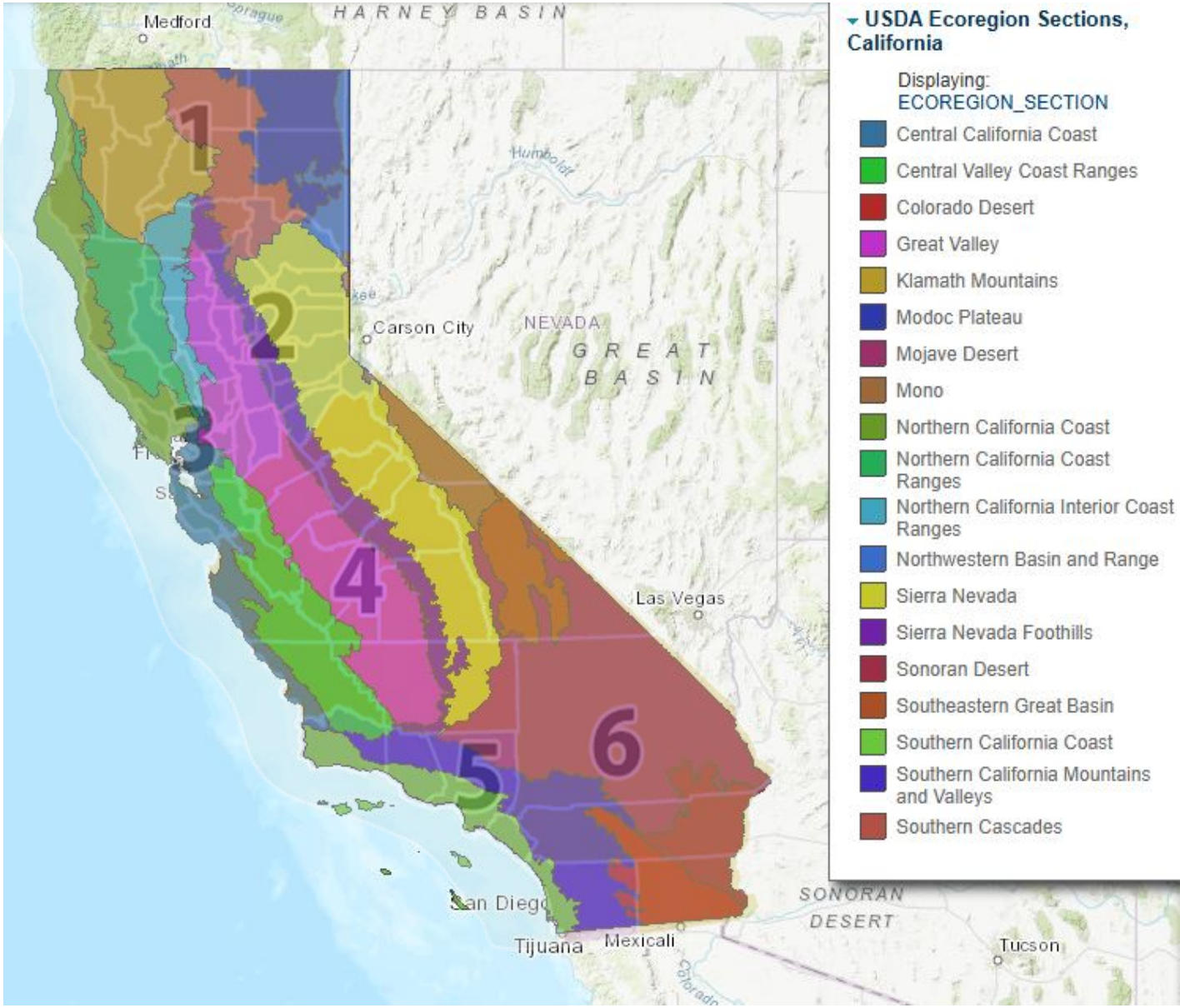
They are formed through a chemical reaction that occurs when fresh, calcium rich spring water from the bottom of the lake mixes with the salty, rich-in-carbonates lake water, forming limestone. They grow over the course of decades and centuries. They are important nesting ground for osprey, owls, and alkali flies.

Read more about the natural history of Mono Lake and the Tufas here!

Where Are We?



[CDFW Region Map](#) (we are in Region 2)



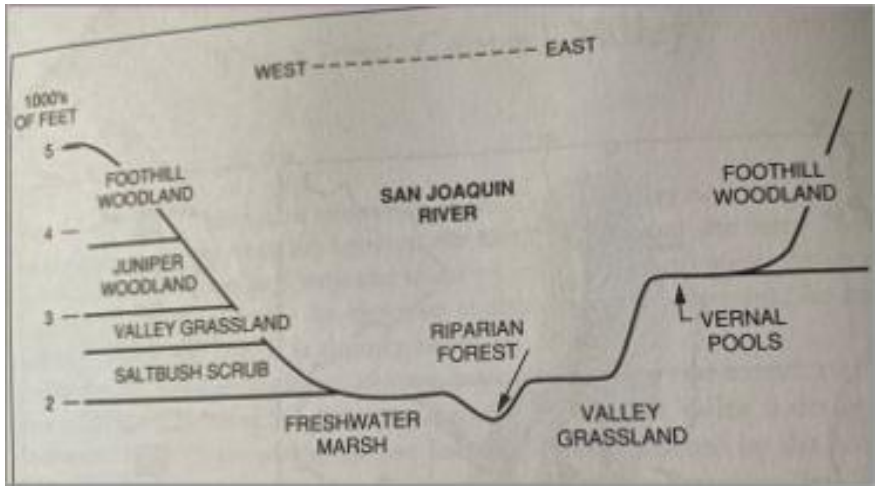
[USDA Ecoregion Map](#)

Great Central Valley

- 430 miles long, 75 miles wide, 0-400 ft elevation
- Second largest valley in the world!
- Two major rivers – Sacramento and San Joaquin
- Features a mosaic of habitats (grassland, wetland, forest, woodland, and savannah)

- Prehistorically, the valley was an inland, saltwater sea. Later in our history, it became a seasonal, rushing freshwater lake.

- Flooding is part of the Central Valley's natural history
  - Acts as a giant catch basin for the surrounding mountain ranges
  - Every form, of life in the valley is flood adapted



Great Central Valley

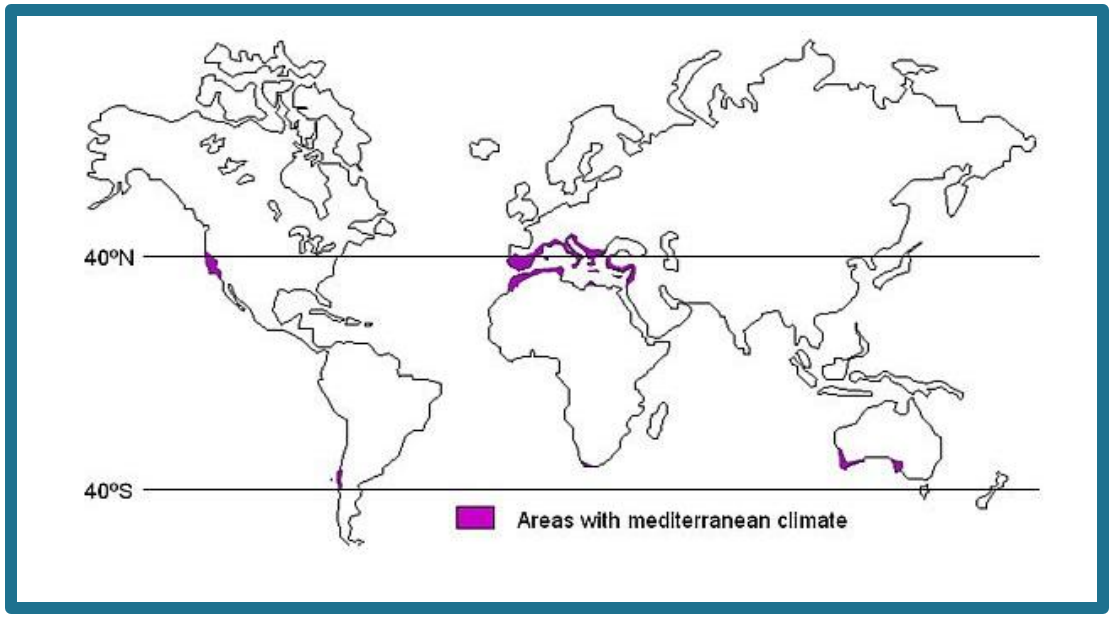
- Prior to 1850, this was a pristine valley with 22-25 million acres of native grassland and oak savannah, and 5-10 million acres of wetland and riparian forest
- In just 170 years, 99% of the valley has been altered

People and Nature

Colonization (the CA Missions, Rancheros, Gold Rush and other development) had a drastic impact on CA's nature, but we weren't the first ones here. Our ecosystems have been stewarded by CA Indigenous tribes since time immemorial. Oak woodlands were tended, prescribed burns were practiced, and so much more. The pre-colonial landscape was shaped in large part due to indigenous relationships with the land.

Discussion prompt: *Think about the area where you live or teach. What is a positive way that people and nature interact, such as a local restoration project or a community garden, that would make a great focus for an Enviromercial?*

Mediterranean Climate



- Unique and rare
- Cool, wet winters with 10-20 inch of annual rainfall (snow and frost are rare)
- Dry, relatively hot summers
- Two optimal growth periods (spring and fall)

People and Nature

Not only is our Mediterranean climate great for biodiversity – it is also great for agriculture! Today, the Central Valley comprises of 1% of all US farmland but produces 25% of the nation's food.

How do you think agriculture has changed the Central Valley? Looking at your own community, how has it harmed or helped our biodiversity?

How the Central Valley Feeds the Nation - Serving Agriculture Since 1907

Central Valley Ecosystems
Grasslands

- Perennial native bunch grasses and wildflowers
- Fire dependent: 1 to 2-year fire cycle (increases soil nutrients, limits non-grass vegetation)
- Plants adapted to both seasonal flooding and seasonal grazing
- Between 1860-1880: Valley grassland destroyed by overgrazing (1 million cattle, 6.7 million sheep, 170,000 horses & mules)
- Introduced plant species, especially annual grasses, continue to outcompete natives
- Today, less than 1% remains

Organisms in the Grasslands

Red-tailed hawk

Western meadowlark

Western toad

Tufted hairgrass

Ithurial's spear

Savanah sparrow

California ground squirrel

Pronghorn antelope

Burrowing owl

Coyote

Tule elk

Purple sanicle

Purple needle grass

Central Valley Ecosystems
Permanent Wetlands

- Freshwater marshes, sloughs and lakes associated with rivers
- Extensive prior to 1850: marshes commonly extended 1-3 miles wide along rivers
- Pacific Flyway: avian migratory route. Central Valley used as stop-over and/or overwinter destination for 70% of birds using this flyway
- Water adapted plants, primarily emergent vegetation: tule, rush, water primrose, duckweed, willows, cottonwood


Tule Marsh


Slough

Central Valley Ecosystems
Seasonal Wetlands

Wetland Wildlife


Western terrestrial garter snake


Tricolored blackbird

Various waterfowl –
tundra swans, snow geese, northern shovelers


Dragonflies and Damselflies


Red-winged blackbird


Sandhill crane

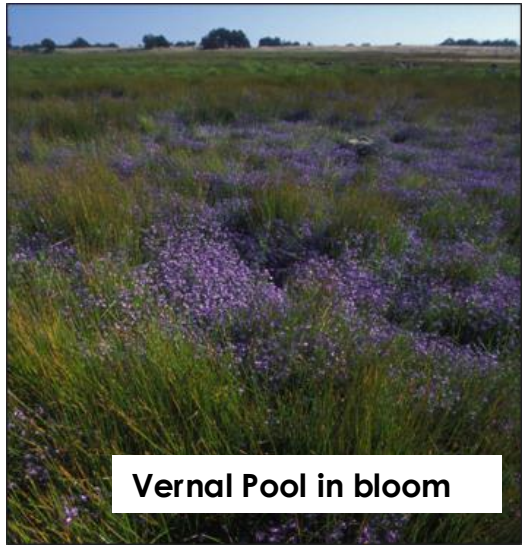

Beaver


White-faced ibis


Snowy egret

Spotlight on Vernal Pools

- Temporary wetland – depressions in the ground with a hard, underground layer that collects water in the winter
- Home for highly adapted species like fairy shrimp and other insects and amphibians that depend on the wet phase
- In the spring, the pools dry up and become blankets of wildflowers and other specialized plant species
- Many seeds (and even fairy shrimp eggs!) can lay dormant for years, to survive periods of drought.
- Low percentage of non-native species
- Learn more about Vernal Pools here!
- Vernal pool teeming with life!


Vernal Pool in bloom


Kellogg's monkey-flower


Fairy Shrimp


Tidy tips


Greater Yellowlegs


CA Goldfields

Central Valley Ecosystems

Riparian Forest

- Riparian means riverside, or streamside.
- California's real jungle! Multi-layered.
- Prior to 1850, nearly impenetrably dense and miles wide fringing the rivers and streams. Called a “Gallery Forest.” Few remnants remain.

Riparian Wildlife


Salmon


Mule Deer


Bobcat


Red Shouldered Hawk


Skunk


Racoon


Scrub Jay


Wood duck

Spotlight on Beavers

Beavers are a keystone species and ecosystem engineers! They play a large role in the natural history of our rivers, creeks, and wetlands.

How do you think beaver behavior shapes aquatic ecosystems?

Other Ecosystems in Region 2

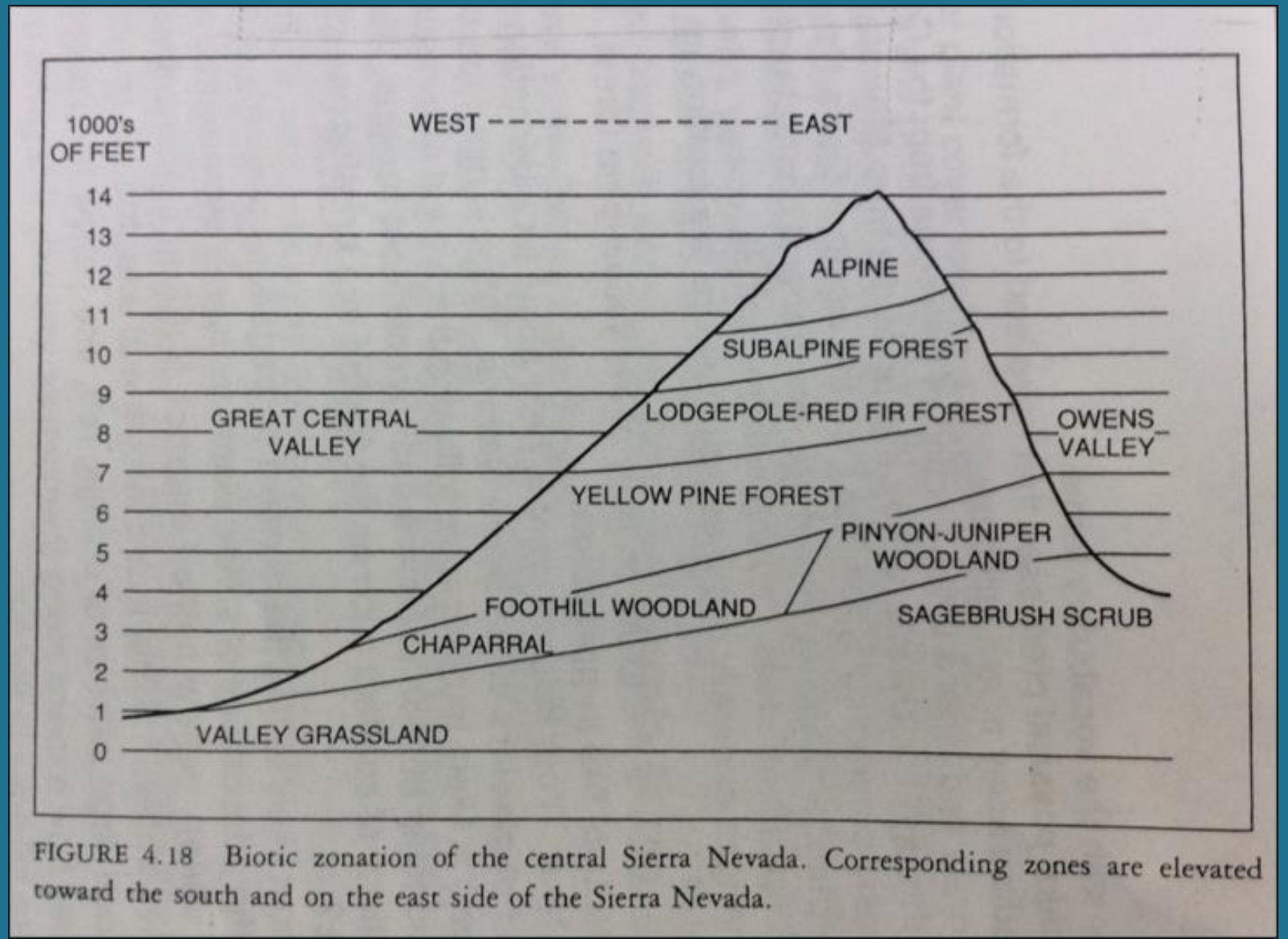


FIGURE 4.18 Biotic zonation of the central Sierra Nevada. Corresponding zones are elevated toward the south and on the east side of the Sierra Nevada.

Foothills

- 100-3,000 feet elevation
- Mixture of oak woodland and chaparral
- Rings the Great Central Valley, 10 million acres


Western Redbud


Coffeeberry


Blue Oak

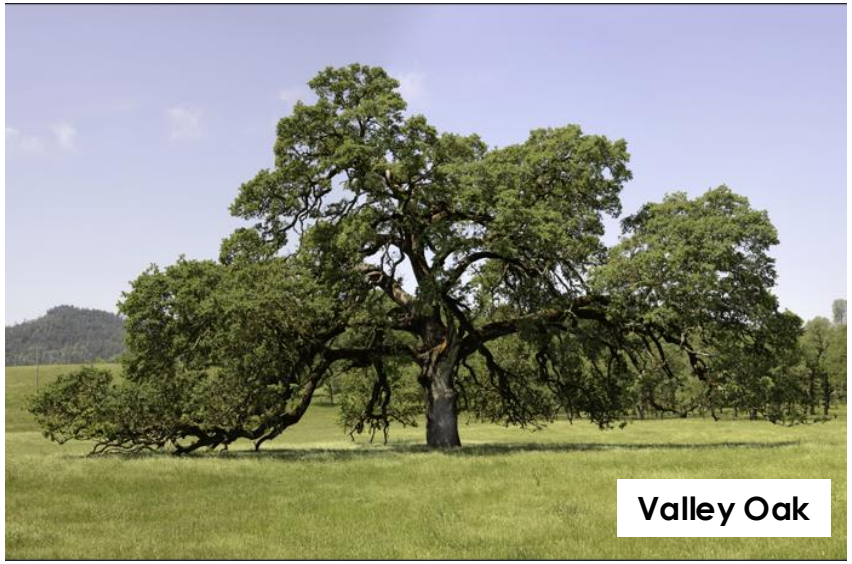

Mixed Oak Woodland


Blue dicks and Foothill Poppy

Oak Woodland

- Changes with elevation from oak savannah (<20 trees per acre) to oak woodland (>60 trees per acre)
- Dispersed with foothill pine, California buckeye, California sycamore
- A patchwork community of trees, scrub, forbs & grasses
- Drought and fire adapted

Spotlight on Oak Trees


Valley Oak

CA is home to **20 native species of oak** (plus another 20 hybrid species!)

- Valley oak (*Quercus lobata*): deciduous, largest oak, valley and low foothills
- Blue oak (*Q. douglasii*): deciduous, foothills
- Interior live oak (*Q. wislizenii*): non-deciduous, valley and foothills
- Black oak (*Q. kellogii*): deciduous, lower montane with mixed conifer edge
- Coast live oak (*Q. agrifolia*): non-deciduous, eastern coastal ranges
- Canyon live oak (*Q. chrysolepsis*): most widespread in CA, can be found in canyons, forests, woodlands, chaparral – and even the desert
- Oak Woodlands play an important role in our ecosystem – from soil development and watershed protection to sustaining air quality
- All parts of the tree support biodiversity – from the roots to the leaves.
  - Oak trees support thousands of species of animals and insects

  –including acorn woodpeckers, foxes, scrub jays, racoons, deer, bears – and of course people!

People and Nature

How have humans interacted with oak trees throughout history?

Oak Woodland Wildlife


Mountain Lion


Gilbert Skink


Acorn Woodpecker


Northern Flicker


Ringtail


Black Bear


CA Kingsnake

Chaparral

- Mostly occurs on steep slopes with southern exposure
- Dense, tightly intertwined, closed canopy scrub, with few, if any, trees
- Drought adapted
- Unique soil chemistry: shallow and high in metals, like serpentine and gabbro
- Allelopathy common

Chaparral and Fire

- Highly fire adapted and dependent, with 20 to 25-year fire cycle, naturally occurring late summer and fall
- Hot, all-consuming fires. Surface soil temperatures can reach 1000+ degrees F (versus Central Valley grassland fire at 300 degrees F). Subsurface soil temperatures remain habitable
- Hard coated seeds require fire to crack open. Some plants also need the chemicals from ash and the eradication of allelopathic materials to regenerate
- Quick recovery (succession) from seed bank and root crowns. Mature scrub community with full canopy in 6 years

Chaparral Organisms


Toyon and CA Thrasher


Alligator lizard


CA Condor


CA Newt


Ceanothus


CA flannel bush


Woodrat


Coyote

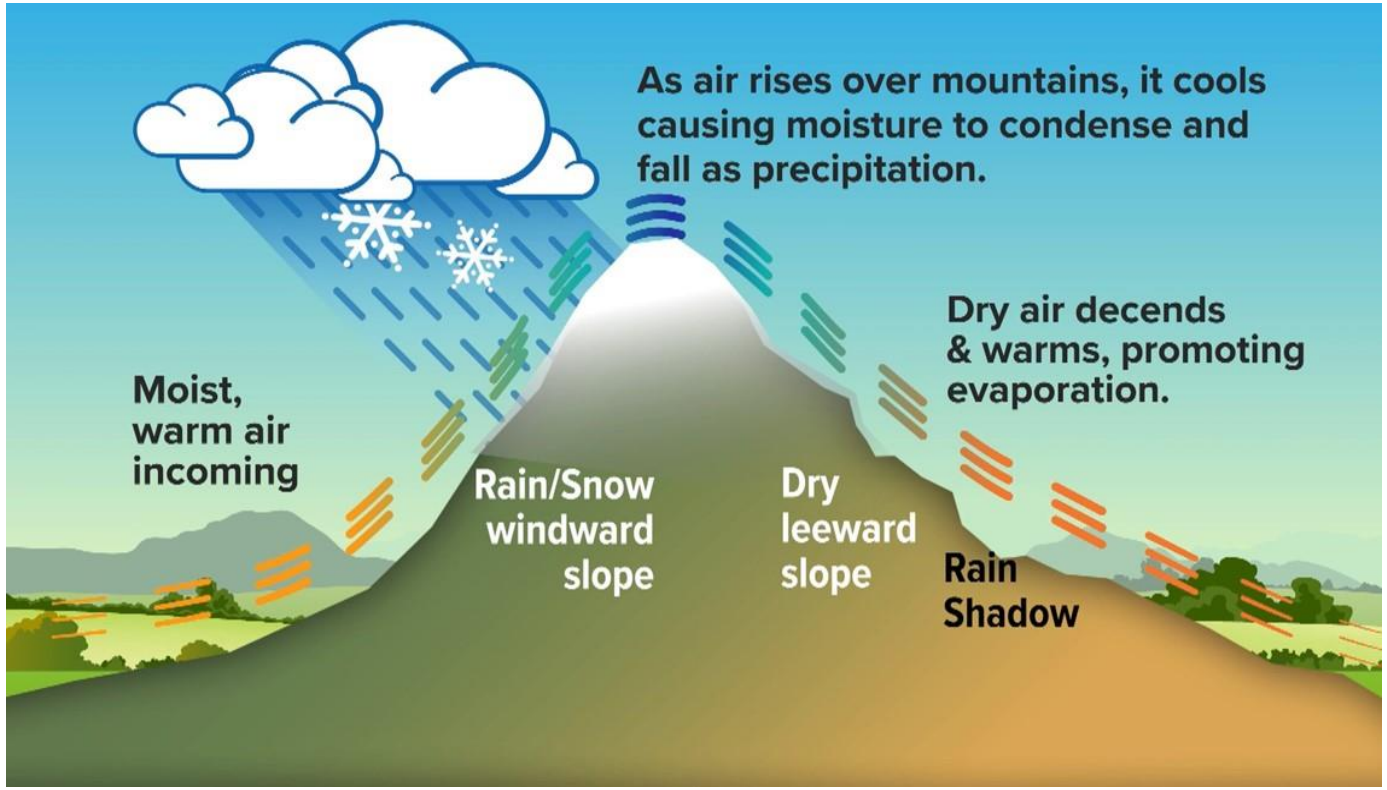

Manzanita

Western Sierra Nevada

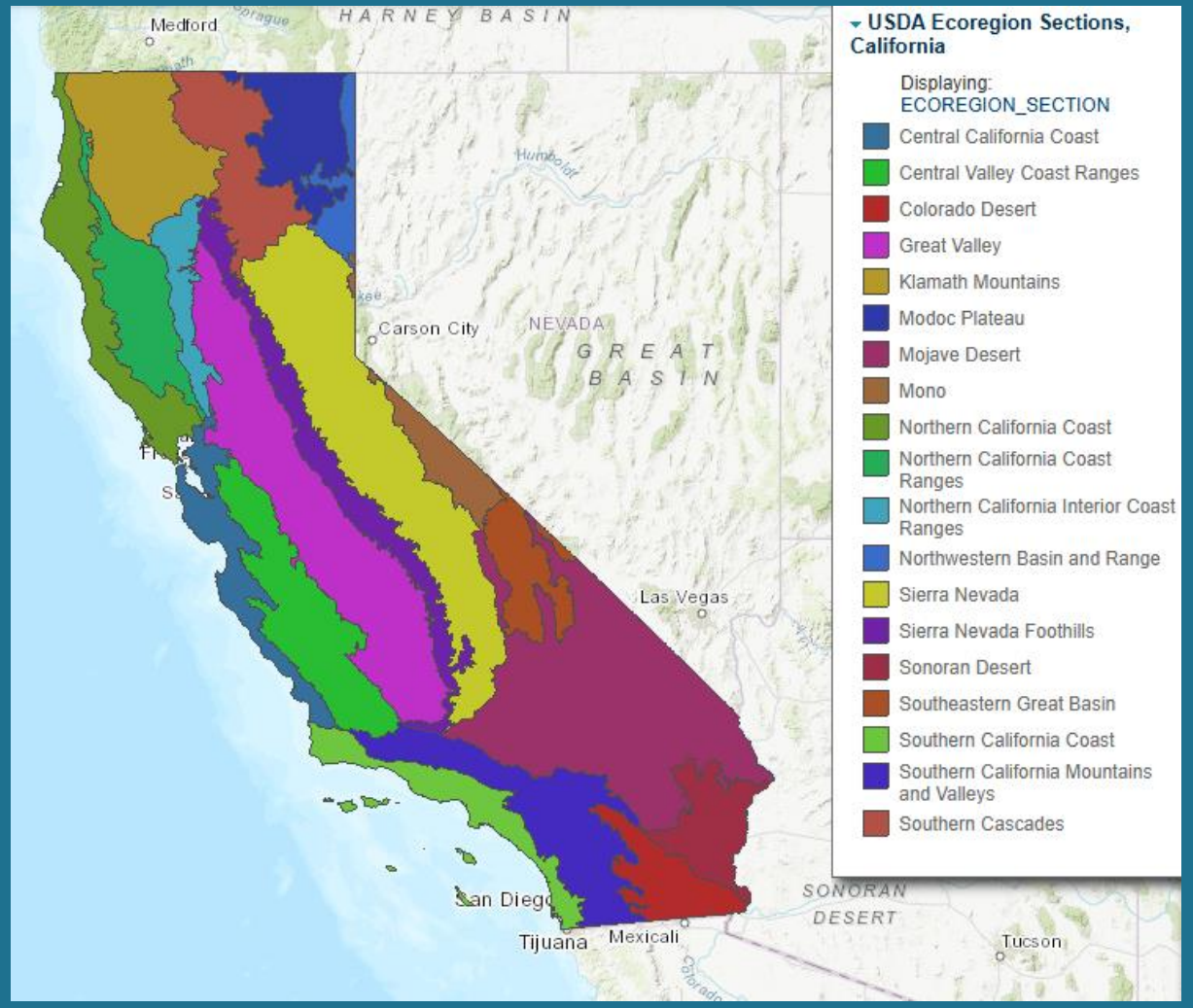
- California's spine
- Primarily granite
- 400 miles long, 50 miles wide
- Tilted fault block uplifting still occurring. Started 80 million years ago, with major uplifting 3 million years ago.
- Mostly glacier carved

Weather Patterns – The Rain Shadow Effect

- With elevation, precipitation rises until 8,000 feet, then decreases
- North to south: precipitation decreases
- West to east: profound rain shadow
- Every 1,000 feet in elevation: temperature drops 3-5 degrees F
- With elevation, soils become swallower, oxygen drops, UV light and radiation increases, and wind amount and speed increases

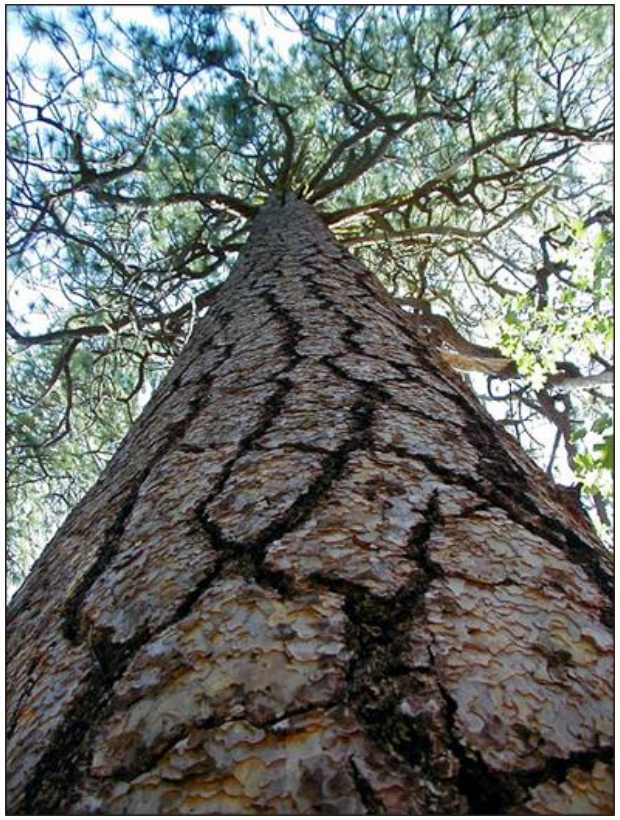


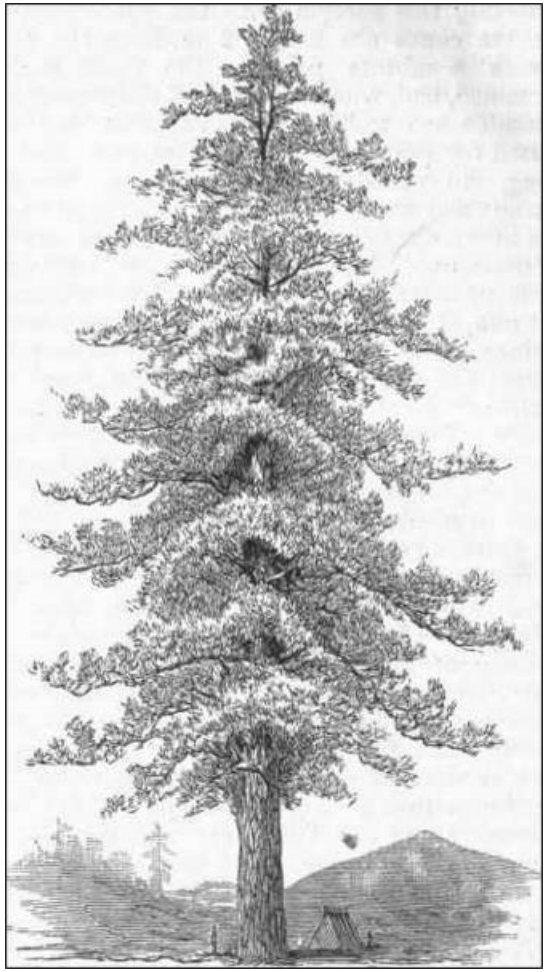
Now let's go up the mountain and around the state



Lower Montane

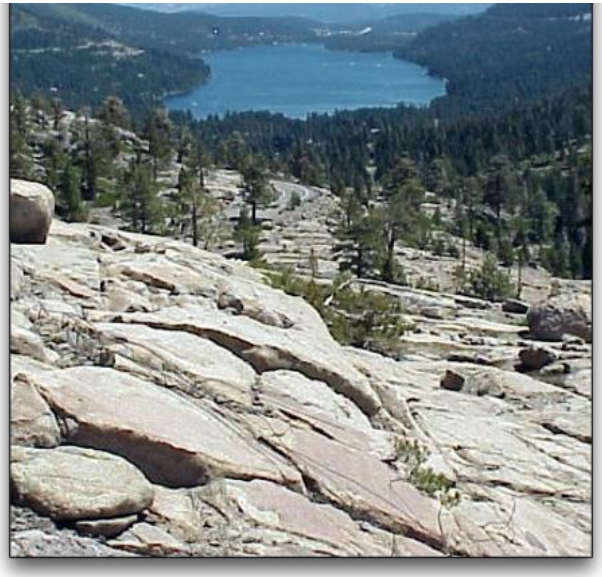
- 3,000-6,000 feet
- Yellow pine (ponderosa) forest, mostly coniferous
- Lots of rain: 25-80 inches
- Great temperature variation, daily and seasonally
- 4-7 month growing season
- 8 to15-year fire cycle
- Relatively open forest
- Many plants are fire adapted and dependent (opens cones/seeds, clears duff and scrub, adds nutrients to soil)
- Ponderosa pine, black oak, giant sequoia, incense cedar, Jeffrey pine, white fir, sugar pine, Douglas fir





Spotlight on Giant Sequoia

- Most massive living organism
- Lives 3,200-4,000 years
- Average size: 225 feet tall, 32 feet diameter
- Very fire adapted: high branches, 2-feet thick bark
- Very fire dependent: only grows from seed, cones opened by fire



Upper Montane

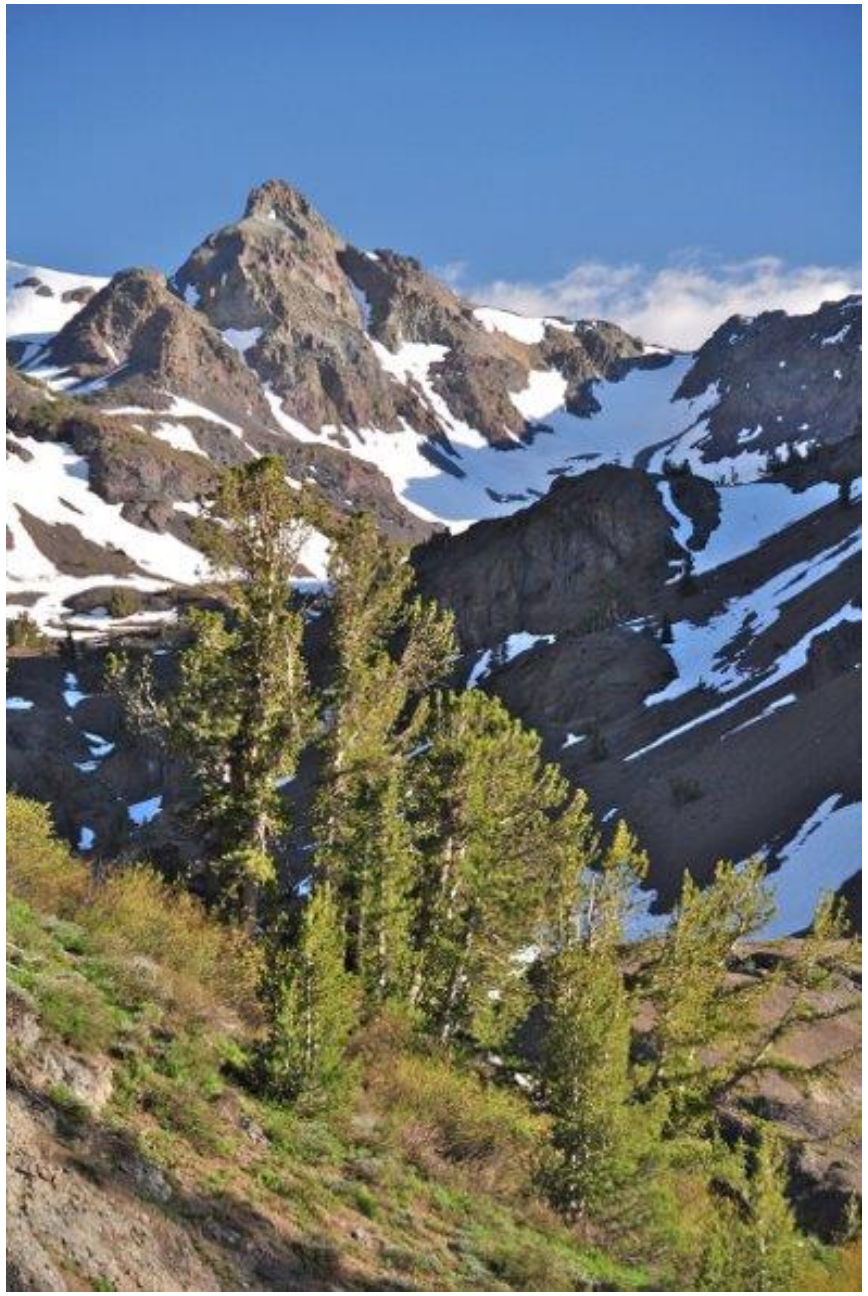
- 6,000-8,500 feet elevation
- Red fir-lodgepole pine forest
- Mixed conifer and wet meadows
- Precipitation 35-65 inches, 80% as snow
- 4 month growing season
- 25 to 60-year fire cycle
- Red fir, lodgepole pine, Jeffery pine

Snow Forest

- Snow line, highest levels of snow (averages 200 days of snowpack)
- Spire-shaped trees
- Bendable foliage
- Withstand burial in winter
- Young trees require snow insulation from wind chill and freezing night temperatures
- Foliage slows mold from constant wet snow
- Flagging and krummholz growth

Subalpine

- 8,500-11,000 feet elevation
- Precipitation 30 inches, falls as snow
- 7-9 week growing season
- Foxtail pine, mountain hemlock, white-barked pine, bristlecone pine



Stressors

- Soils: thin to none, low in nutrients, doesn't hold water
- Extreme drought: long periods with no precipitation and long periods with non-melting snow
- High icy blast winds
- Snow weight

Adaptations

- Trees multi-trunked instead of tall
- Flagging and krummholz
- Slow growing
- Long-lived
- Plants perennial
- Low ground profiles
- Tap roots
- Most of mass underground

Spotlight on Bristlecone Pine

Eastern Sierra & White Inyo Mountains

Bristlecone Pines

Pinyon-Juniper Forest

Western Bristlecone Pine

- Oldest living organism
- Average life span: 500-1,000 years
- Current oldest recorded tree – Methuselah (4,857 years old!)
- Tree ring data has documented Bristlecones as far back as 8,500 years

Alpine

- 11,000+ elevation
- Above tree line
- 40-70 day growing season
- Many plants considered pre-historic and related to desert plants
- Perennial forbs, grasses, sedges. Few annuals
- Low percentage of non-native species

Stressors

- Frost nightly, year round
- Minus 40 degrees at night
- Intense sunlight
- Poor to no soil
- Endure long and very cold winters
- Constant high winds
- Short cool and dry growing season in the summer.

Adaptations

- Hug ground, matting
- Five times more mass underground, tap roots
- Asexual plant reproduction, self-pollinators
- Succulence, hairy stems
- Flashy flowers

Sky Pilot

Sierra Primrose

Alpine Rock Butterweed

Coastal

- 11,000 miles of coastline
- Maritime climate: mild temperatures without big fluctuations, am/pm fog
- Precipitation: 10"-64" (including 10"+ from fog drip in summer)
- A variety of habitats: sandy beaches, sand dunes, rocky headlands, terraces, estuaries, prairie, forest

On the eastern side of the coastal ranges, you'll once again find foothills, with chaparral and oak woodland

Why do you think the environment is drier on the eastern side of the coastal range?

Coastal Ecosystems
Beaches, Dunes and Headlands

Stressors

- Dynamic environment
- Wave shock
- Salt spray
- Drying wind
- Poor soil
- Intense heat and light, including ultraviolet

Adaptations

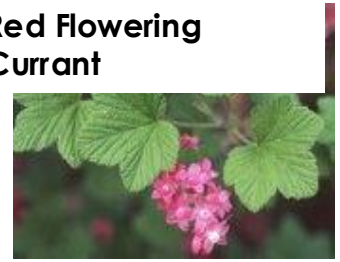
- Succulent leaves, vertical leaves, bumpy leaves
- Salt secretion glands
- Low trailing growth
- Floating fruit
- Asexual reproduction

Black Sage

Coastal Sagebrush

Yellow Bush Lupine

Coastal Forest - *Temperate Rainforest*


Red Flowering Currant


Banana Slug

- Coast redwood (*Sequoia sempervirens*)
- Tallest living organism (369 ft tall)
- Occurs 100-2000 ft elevation, usually in sheltered valleys
- Matures 500 years, lives 2,200+ years
- Can reproduce asexually
- Fire dependent and fire adapted
- Fire cycle: 30-60 years
- Understory: open with ferns, scrub and forbs
- Banana slugs – largest land mollusk in North America!

Losing our redwoods

- In 1848, there were 2 million acres of coast redwood forest
- Today less than 5% of redwoods remain


Western Sword Fern

People and Nature

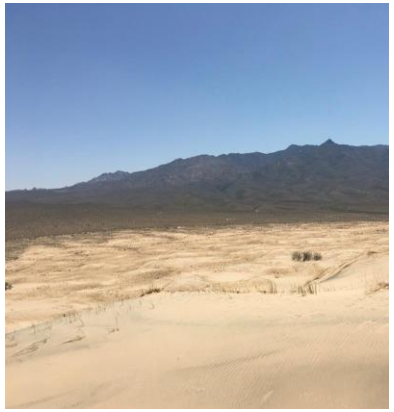
The loss of our redwood forests has been due to a variety of factors, including logging, development, and climate change.

How do you think these actions have impacted our forests? What else might have contributed?

Deserts

Great Basin: Cold, high desert. Plant growth in spring. Sagebrush, saltbush, juniper. No cactus.

Colorado (Sonoran): Hot desert. Plants grow anytime, in response to rain. Giant saguaro, lots of cactus.



Mojave: Warm desert. Granite mountains and sand dunes. Plant growth in winter. Joshua tree, creosote bush, cholla, some cactus.

Joshua Tree

Big Horn Sheep

Desert Tortoise

The Why

At the end of the day, Nature Bowl isn't just a competition...

We want **true connections, inquiry, relationships to nature.**

By participating in Nature Bowl, you are giving your students the opportunity to **practice connecting with the natural world** and to **understand their place in it**.

You don't have to be an expert in Natural History to be a coach. Supporting their natural curiosity, giving them the tools to explore, helping them practice patience and observation is really what being a naturalist is all about.

Don't just teach students about what exists – **teach them how to think critically about the who, what, when, and why.** Teach them to be comfortable not knowing. Teach them to ask questions, use clues, and discover on their own. Help them explore.

Resources

Videos
- Ecosystems of California with Erika Zavaleta (YouTube series)

Books
- *A Natural History of California* by Allan A. Schoenherr
- *Braiding Sweetgrass* by Robin Wall Kimmerer

Podcasts
- Golden State Naturalist with Michelle Fullner
- Smologies (kid friendly science podcast) with Alie Ward
- BirdNote Daily

Websites and Articles
- California Biodiversity Network – California Biodiversity Network
- 30x30 California
- UCSC Center for Natural History - Resources
- John Muir Laws (nature journaling) - Teacher Resources