

Lecture: Central Valley

Geology

- 2 large valleys, drained by rivers:
 - Sacramento River (northern Sacramento Valley)
 - San Joaquin River (southern San Joaquin Valley)
- Basin of sediments
- Oldest sediments are marine (~145 mya)
- Newer sediments (~5 mya) washed down in Sierra rivers ("alluvial")
 - most several 1000 ft deep, may reach up to 10,000 ft deep
 - provide highly fertile soils

Physical Characteristics

- Seasonal flooding with poor drainage
- Summer soils dry & alkaline
- High amounts of boron & sodium limit evergreen bushes and trees
- Short-lived perennials, grasses & wildflowers adapted by:
 - flourishing in spring after winter rains have diluted the salt content
 - as soil dries out, getting saltier, these plants shut down and go dormant
 - Conditions favor:
 - rushes, sedges in winter
 - wildflowers in late spring
 - bunch grasses in summer

Central Valley Communities

- Grasslands
- Riparian Woodlands
- Fresh Water Marshes
- Vernal Pools

Global Distribution of Grasslands:

- too dry for trees
- too wet to be deserts
- often maintained as open habitat by fires

Fires

- stimulates regrowth of herbs & grasses by:
 - removing litter
 - providing more nutrients
 - preventing woody plants from becoming established

Valley Grassland

- Originally dominated by perennial bunchgrasses
 - grow upright in dense tufts of stems that arise from a perennial root crown
 - Growth resumes with onset of winter rains
 - Rapid growth, flowering, & maturity normally occur from April to June
 - Grasses rely on wind for pollination, so very reduced flowers
 - Deep root systems
 - help anchor plants
 - extract underground water (drought tolerant)
 - store nutrients (recover from drought, fire, grazing)
- Also contain abundant wildflowers
 - annual species
 - Geophytes (perennials bulbs)

Threats to California Grasslands

- Of the original 22 million acres of perennial bunchgrasses, 99% gone
- Threats:
 - Over-grazing
 - Invasive species
 - Fire suppression
 - Development

Loss of Native Valley Grasslands

- historically grazed by native large mammals, but these mammals migrated with seasons, so impact was light
- 1700's non-native livestock introduced & overgrazed
- Non-native annual grasses invaded the areas left open from overgrazing by domestic livestock
- introduced grazers preferred native perennial grasses, so introduced annual grasses flourished
- annual grasses & forbs avoid grazing
 - grow fast
 - Set seed fast
 - Dry & in seed bank by May, so livestock focus only on green grass left (native bunch grasses), leading to overgrazing

Yellow Starthistle

- Poisonous to horses
- No nutritional value for grazers
- Increases fire danger
- Crowds out natives

Prong Horned Antelope

- Historically, widespread throughout Central Valley
- By 1875, hunting & agriculture reduced populations so considered rare
- Gone from Central Valley completely by 1954 (Carrizo Plain NM re-introduced)
- Avoid predators by hiding young in vegetation, then as older (2+ days) can outrun them; adults reach speeds of 65 mph

Tule Elk

- smallest N. American Elk
- herbivorous
- endemic to California (~500,000 used to roam CA)
- Almost went extinct
 - reduced due to habitat loss, fur trade & hunting for food
 - By 1895, only 28 remained in 1 herd
 - Today herd protected and now 22 herds (~2,000-3,000) exist
- Today, as populations grow larger than sustainable in some habitats, so land managers encouraging interactions with native predators (e.g. coyote)

Riparian Woodlands

- Bordered large rivers of Central Valley
- Characterized by water-loving shrubs & trees that often winter-deciduous (relics of past, cooler time)
 - Willow
 - Cottonwood
 - Sycamore
 - Valley Oak
- Originally 830,000 acres, 89% gone

Wood Ducks

- Used to be very common, nearly driven to extinction by deforestation & hunting
- ~10% of historical forested wetlands remain in California's Central Valley—most important wintering & nesting area for wood ducks in Pacific Flyway
- cavity-nester: requires a natural cavity or nest box to raise its young
- Prefer nests near water

Freshwater marshes

- Occur where winter runoff from Sierra
- Characterized by water with emergent vegetation
- Distinct bands of vegetation
- Important stopovers for migratory birds
- 4 million acres, 94% gone now

Muskrats

- semi-aquatic rodents
- musk glands found at the base of tail
- cause of several levee breaks

Vernal Pools

- Reduced ~90%
- Unique habitats:
 - Underlain by hardpan, so water pools in wet season
 - Winter: saturated soil leaves plant roots without oxygen
 - Flooded long enough so that grasslands can't establish
 - As water evaporates, unique rings of vegetation form around pool
 - Summer: dry, shallow topsoil with no deeper wet layers to tap into
- Isolated habitats with harsh conditions so have concentration of unique species

Vernal Pool Tadpole Shrimp

- "living fossils" (same as 300 mya)
- 18 populations exist, only in deep pools
- found near bottom of pools
- use their shield-like carapace to dig in mud for food,
- eat almost anything (e.g. fairy shrimp, freshly-molted tadpole shrimp)

- 45 day life cycle
 - tadpole shrimp produce cysts instead of eggs
 - prevents embryo inside from drying out during summer
 - With winter rains, embryos complete their development & hatch

Solitary Bee *Andrena (Diandrena) submoesta*

- entire life cycle revolves around goldfields (*Lasthenia californica*)
- bees over-winter in underground tunnels, emerge in early spring when goldfields bloom
- Males wait near flowers to mate with emerging females
- After mating, female digs a main tunnel with 6-8 side tunnels, each ending in a brood chamber
- she stocks each chamber with a goldfields pollen ball, lays a single egg on it and seals the chamber
- In a few days, egg hatches & larva feed on stored pollen
- After reaching adulthood in fall, bees go underground for winter
- Relationship may be synchronized by soil temperature & moisture--in drought years, plants do not flower & bees remain waiting underground (up to 4 years)

Delta Green Ground Beetle *Elaphrus viridis*

- First described in 1878 from a single specimen, not seen again until 1974
- Found only in 10 square miles surrounding Jepson Prairie Preserve (listed as federally threatened)
- Excellent eyesight & speed make it an effective predator of fly larvae & small invertebrates.
- Unlike most members of its kind:
 - emerges in winter rather than spring
 - active during day, not night.

Western Spade-foot Toad *Spea hammondi*

- nocturnal toads
- spend most of their life underground, using their flattened, spade-like hind feet to burrow

- re-surface when they detect the sound of the first rains pounding the hard soil above, and enter vernal pools to breed and eat
- Adults can eat 11% of their body mass in a single feeding. Within a few weeks they have enough energy reserves to survive the annual dormancy period.

Tiger Salamander

- depends on water for reproduction
- habitat limited to vicinity of large, fishless vernal pools or similar water bodies
- occurs at elevations up to 3200 ft
- Live 10-11 years
- Adults spend most of their time underground

Turkey vulture

- up to 32 inches long, with 6-foot wingspan
- excellent digestive system, kills any bacteria or disease from the carrion they eat
- droppings are disease-free
- excellent sense of smell

Valley Pocket Gophers

- live in burrows with many connecting tunnels (can be 200 feet long)
- May form mounds that surround vernal pools
- help to maintain optimal soil conditions
 - Reduce runoff during winter rains by aerating soil & increasing water infiltration
 - Mix soil nutrients--bring nitrate, phosphorus & potassium from deeper soils; rotate seed banks