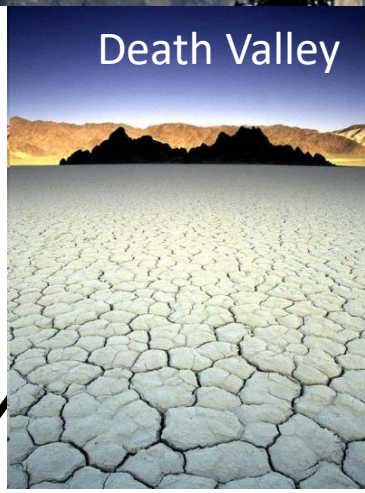
University of California
Agriculture and Natural Resources

UC California Naturalist

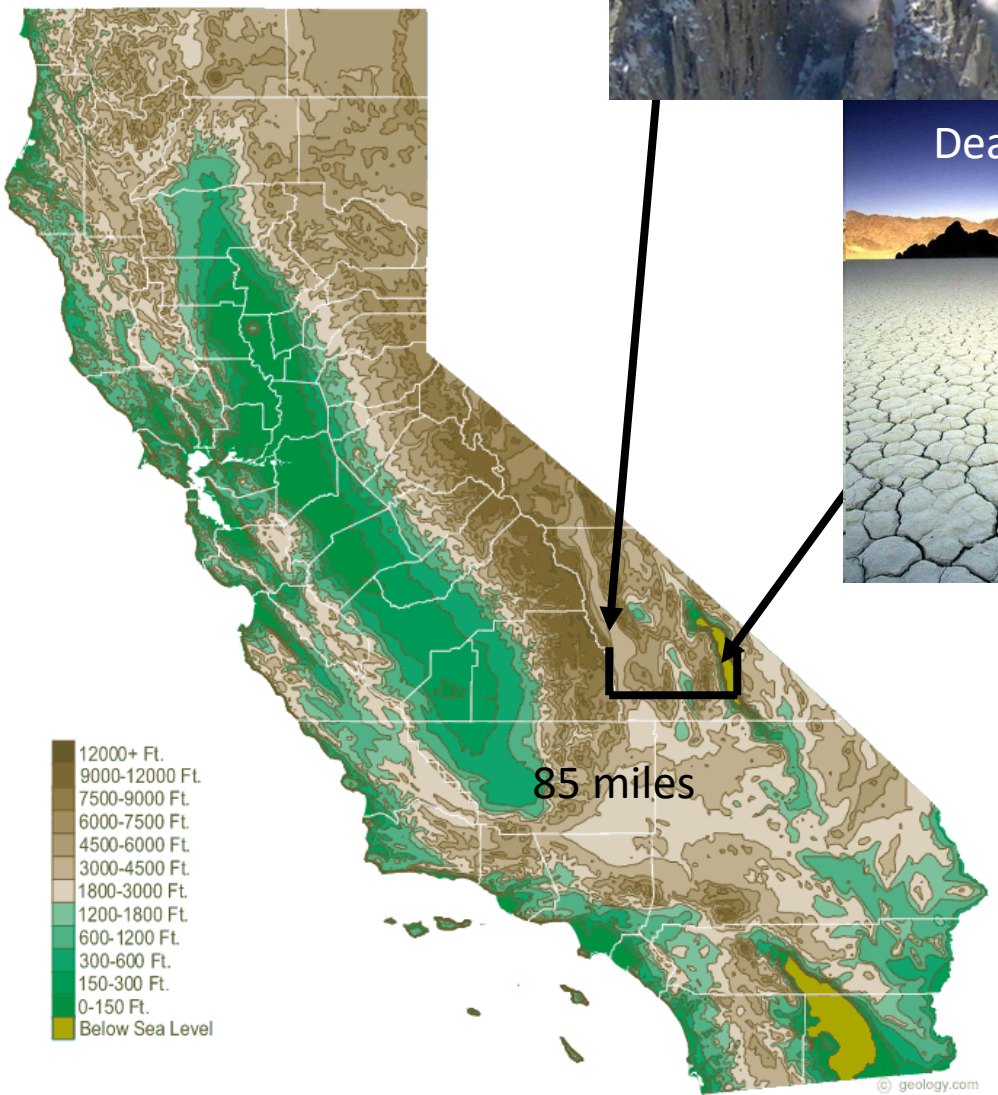
Chapter 1 – biodiversity & bioregions

California's Biodiversity in Context

a. CA is a state of extremes



- Mt Whitney and Badwater in Death Valley are the highest and lowest points in the contiguous 48 states, respectively



- oldest
  - Methuselah, a Great Basin Bristlecone Pine is the White Mountains of CA is the oldest living tree in the Western Hemisphere at nearly 5,000 yrs old

- largest
  - the General Sherman Tree, a Giant Sequoia, is the largest tree (by volume) in the world

- tallest
  - the Coastal redwoods are the tallest trees in the world

b. California is one of Earth's 25 biodiversity hotspots
   - 30,000 species of insects
   - 63 species of freshwater fish
   - 46 species of amphibians
   - 96 species of reptiles
   - 563 species of birds
   - 190 species of mammals
   - more than 8,000 species of plants, many of which are found only in CA

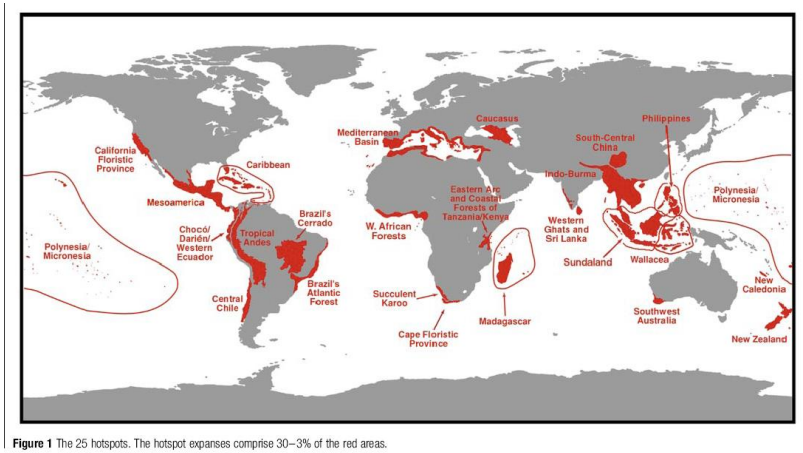


Figure 1 The 25 hotspots. The hotspot expanses comprise 30–3% of the red areas.

NATURE | VOL 403 | 24 FEBRUARY 2000 | www.nature.com

c. California has the largest number of endemic species out of all 50 states

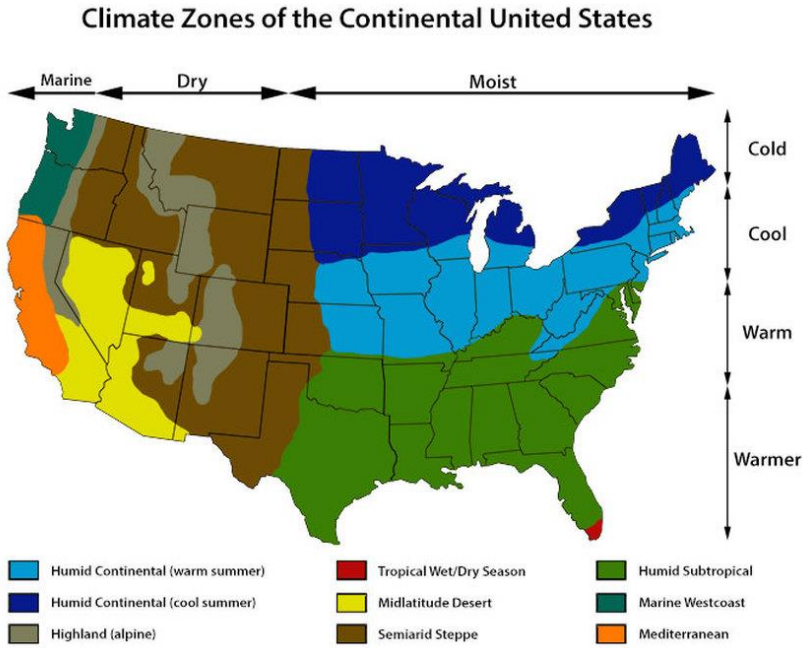
Region	Area (km2)	Native genera	Native spp.	% spp endemic	Intr. Genera & spp.
California	411,000	878	4839	30	188/1023
California Floristic Province (CFP)	324,000	795	4452	47.7	
Alaska	1,479,000	355	1366	5.9	
Texas	751,000	1075	4196	9	
Japan	377,000	1098	4022	34	

Numbers of vascular plant taxa (sensu Ornduff et al.; circa 2005)

geographic range: area within which a given species may be found
   - *geographic range* is not static, as plants and animals are constantly probing the boundaries of their range

- *endemic species* are naturally and exclusively restricted to a particular locality or region

- Mediterranean climate



- ex. of CA endemics
  - San Diego Thorn Mint

- Torrey pine

- San Diego Horned Lizard

[| World'Blood-Squirting Lizard s Weirdest - YouTube]

South Coast Bioregion

Rare, Threatened and Endangered San Diego Species

California gnatcatcher

Category	Rare	Threatened	Endangered
Plants	Orcutt's hazardia	San Diego thornmint	San Diego ambrosia
	Brand's phacelia	Peirson's milk-vetch	Del Mar mazanita
	Tecate Cypress	Encinitas baccharis	coastal dunes milk-vetch
	Torrey Pine	thread-leaved brodiaea	Nevin's barberry
	Cuyamaca meadow foam	Otay tarplant	Orcutt's spineflower
	Cuyamaca larkspur	spreading navarretia	salt marsh bird's beak
	Cuyamaca downingia		San Diego button celery
	Parry's tetracoccus		Mexican flannelbush
	Dehesa beargrass		willowy monardella
	Little mousetail		California Orcutt grass
	Otay lotus		San Bernardino bluegrass
	Otay manzanita		San Diego mesa mint
	Otay ceanothus		Otay mesamint
	Gander's pitcher sage		Gambel's watercress
	Cedros island oak		
	Monardella		
Invertebrates	Hermes copper butterfly		San Diego fairy shrimp
	Thorne's hairstreak butterfly		Quino checkerspot butterfly
	Harbison dun skipper butterfly		Laguna Mountains skipper butterfly
			Riverside fairy shrimp
Fish			desert pupfish
			tidewater goby
			unarmored threespine stickleback
			Southern steelhead
Amphibians			arroyo toad
			California red-legged frog
Reptiles		none	none
Birds	mountain plover	Bald eagle	Least Bell's vireo
	yellow-billed cuckoo	California gnatcatcher	Southwestern willow flycatcher
	Belding's savannah sparrow	Western snowy plover	brown pelican
			short-tailed albatross
			light-footed clapper rail
			California least tern
			peregrine falcon
Mammals		Southern sea otter	Stephens' kangaroo rat
			Peninsular bighorn sheep
			Pacific pocketmouse

Harbison's Dun Skipper

Pacific pocketmouse

California brown pelican

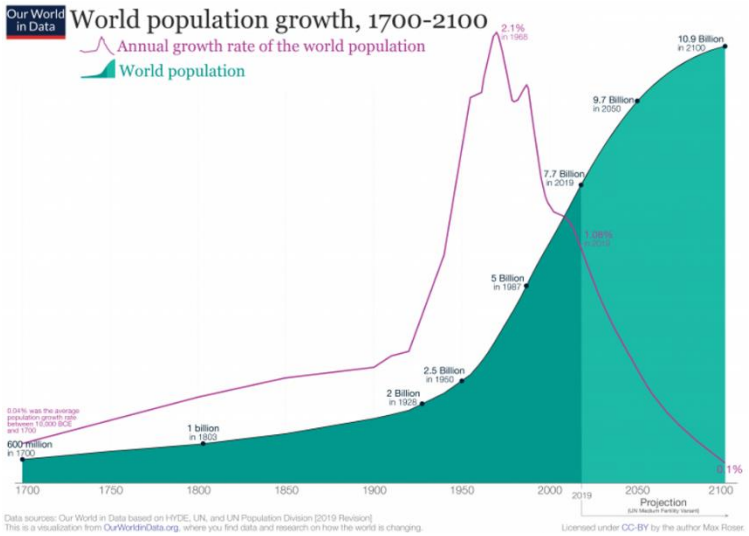
the biodiversity crisis

- biodiversity at all scales of life is currently being threatened
  - genes
  - species
  - natural ecological processes
  - evolutionary processes
  - ecosystems

- the current rate of species extinction exceeds the background extinction rate prior to the emergence of modern humanity

- if the current rate of biodiversity loss continues, we will experience the most extreme mass extinction event since the K-T extinction event that ended the age of the dinosaurs

- land use change is the primary driver of habitat loss and ecosystem degradation-it greatly exacerbates most of the other threats to the environment
  - accelerated rates of land use change can be attributed to geometric growth of human population, which has increased six-fold since the 1800s



- overall, the human footprint is detectable across 83 percent of the land area in the world, excluding Antarctica

- synergistic effects between habitat loss, habitat fragmentation, and climate change can compound the effects of habitat loss on biodiversity

- Key Objectives
  - 1 Protect & restore biodiversity
  - 2 Expand access to nature
  - 3 Mitigate & build resilience to climate change

- Pathways to 30x30 Cailfornia Accelerating Conservation of California's Nature (s3.us-east-1.amazonaws.com)

- San Diego-page 42-50

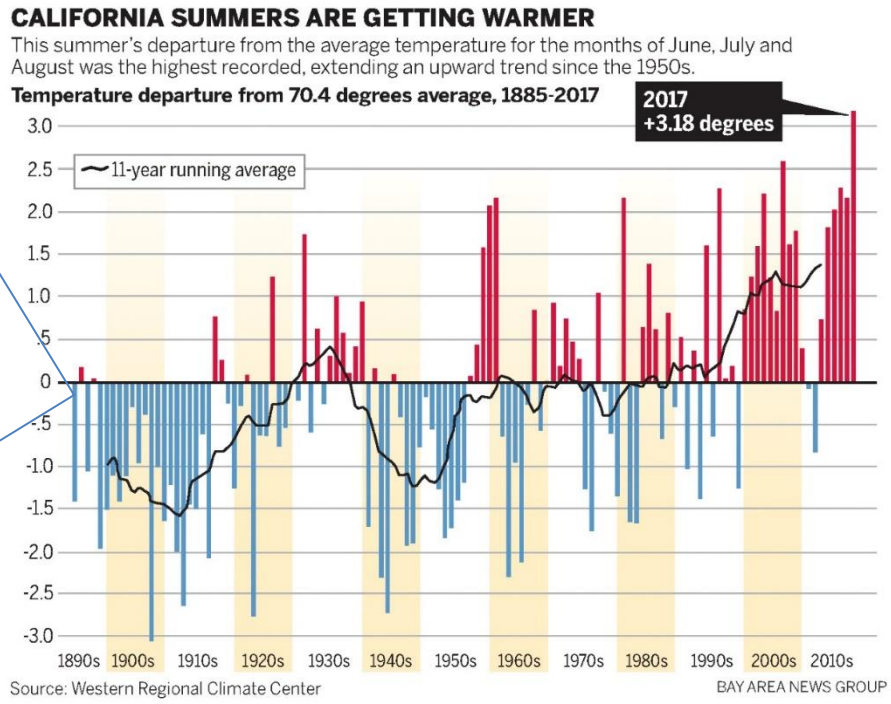
- California 30x30 Final Report Appendix A (s3.us-east-1.amazonaws.com)

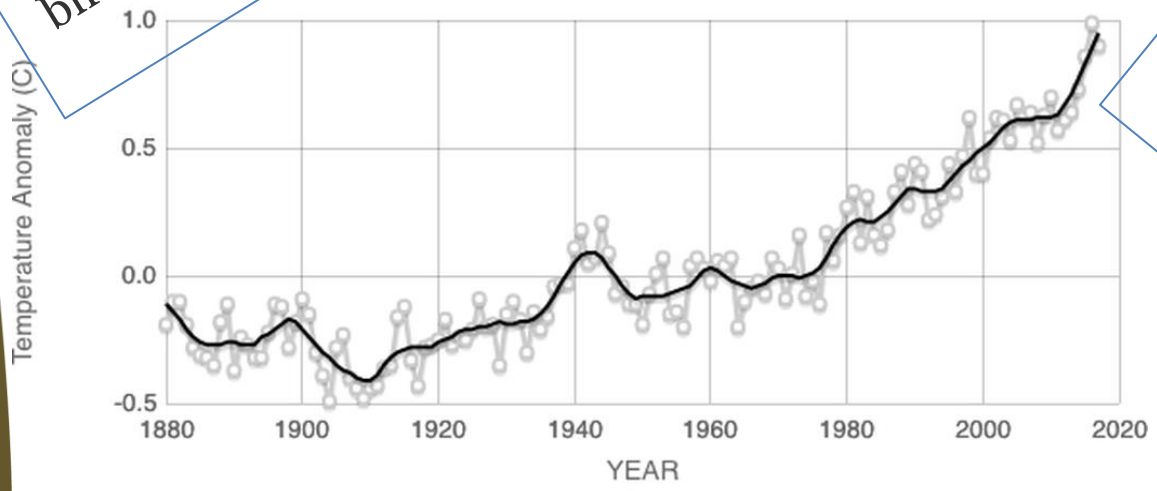
Much has happened recently…

- Record temperatures
- Record ocean temperature
- Bird decline
- Insect decline
- Fire

Silent Skies: Billions of North American Birds Have Vanished

bird populations have declined since 1970 across nearly all habitats



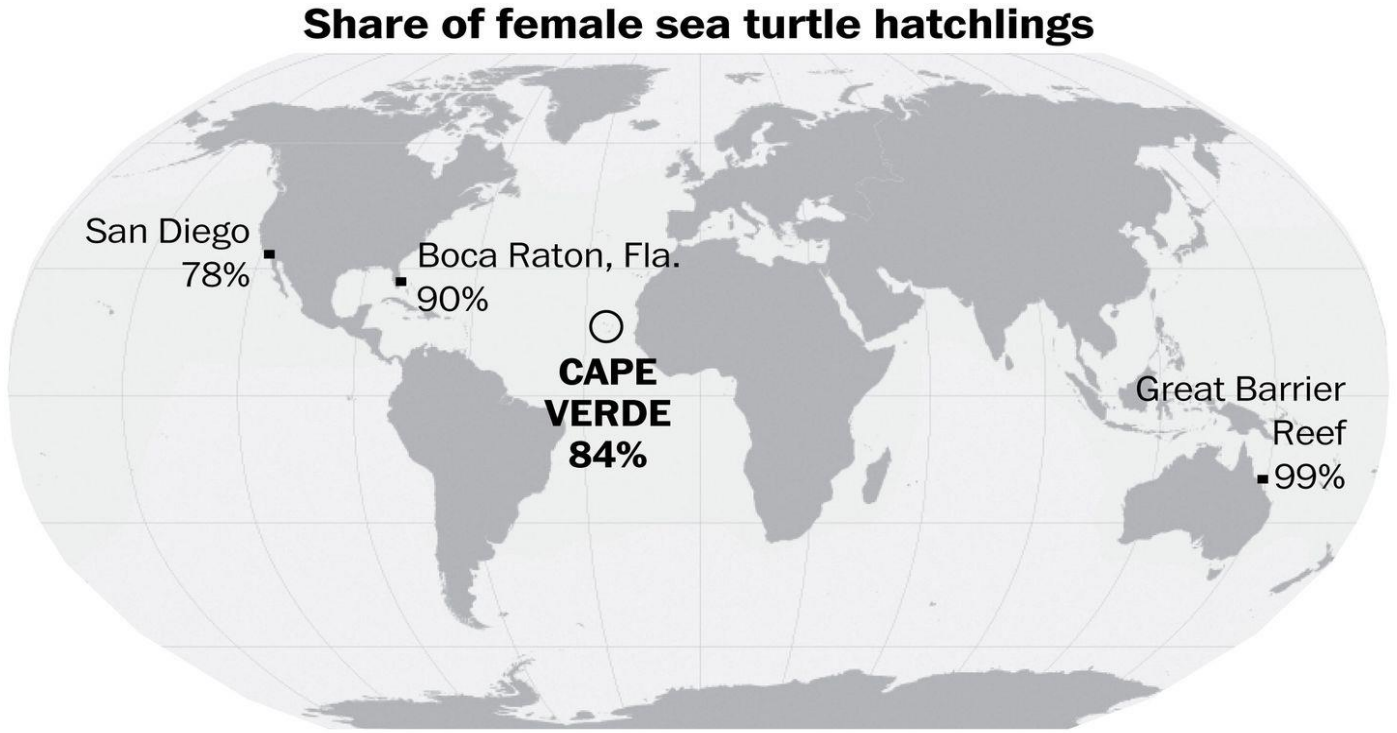


Source: climate.nasa.gov

Insects are going extinct 8 times faster than mammals, birds, and reptiles

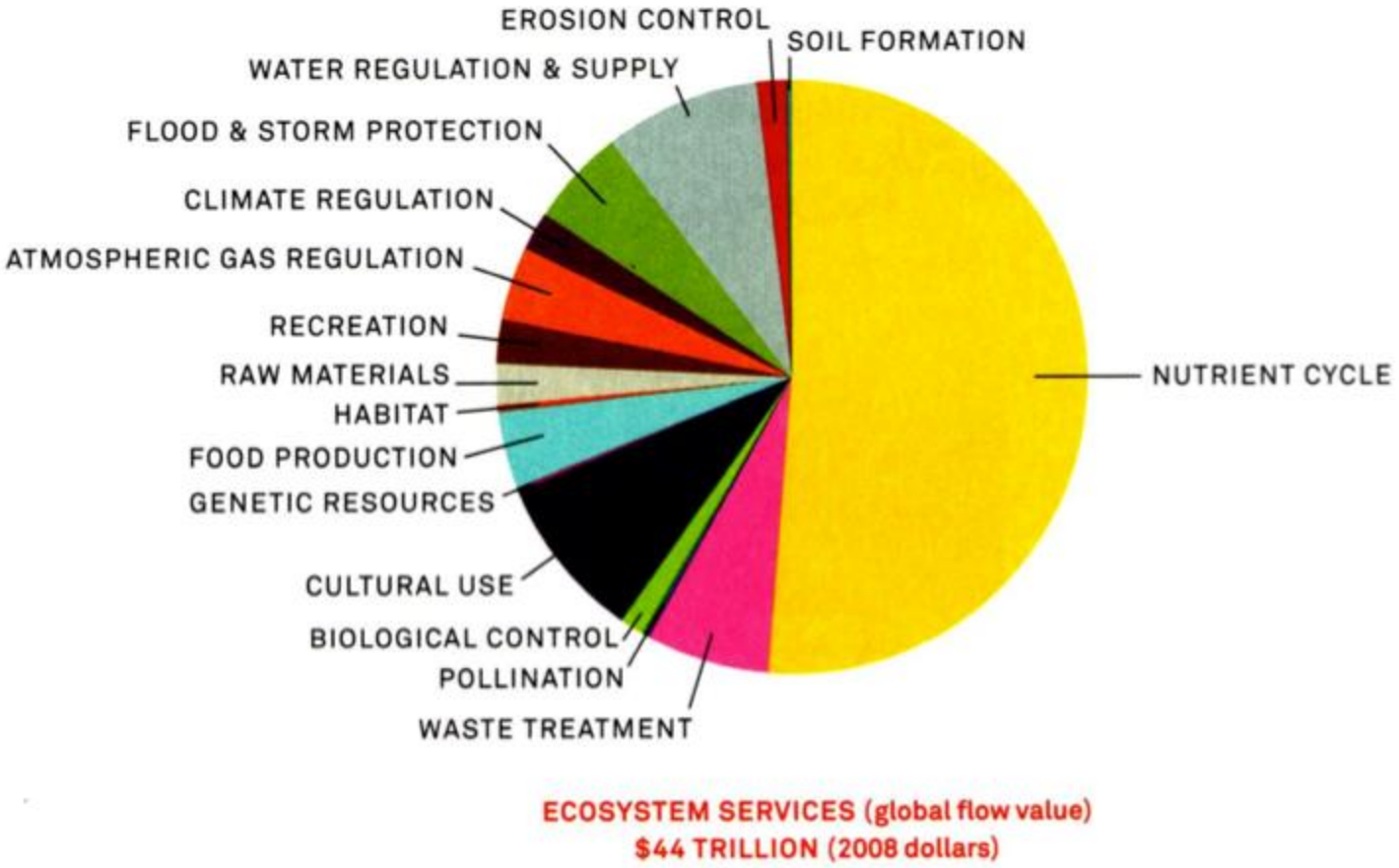
Sea Turtle Hatchlings Trend Female with Warming Temperatures

- Because the temperature of the nesting sand determines the sex of the embryo and the warmer it is produces females coupled with the last 5 years being the hottest on record, 84% of loggerhead hatchings were born female in Cape Verde.



Ecosystem Goods and Services

- purification of air and water.
- mitigation of droughts and floods.
- generation and preservation of soils and renewal of their fertility.
- detoxification and decomposition of wastes.
- pollination of crops and natural vegetation.
- dispersal of seeds.
- cycling and movement of nutrients.
- control of the vast majority of potential agricultural pests.
- maintenance of biodiversity.
- protection of coastal shores from erosion by waves.
- protection from the sun's harmful ultraviolet rays.
- partial stabilization of climate.
- moderation of weather extremes and their impacts.
- provision of aesthetic beauty and intellectual stimulation that lift the human spirit



"Nature underpins all economic activity"

WWF Living Planet Report 2018

TEK-Traditional Ecological Knowledge

a. what a naturalist does
   - observe nature
   - share knowledge
   - protect the earth

- humans have always been naturalists by necessity

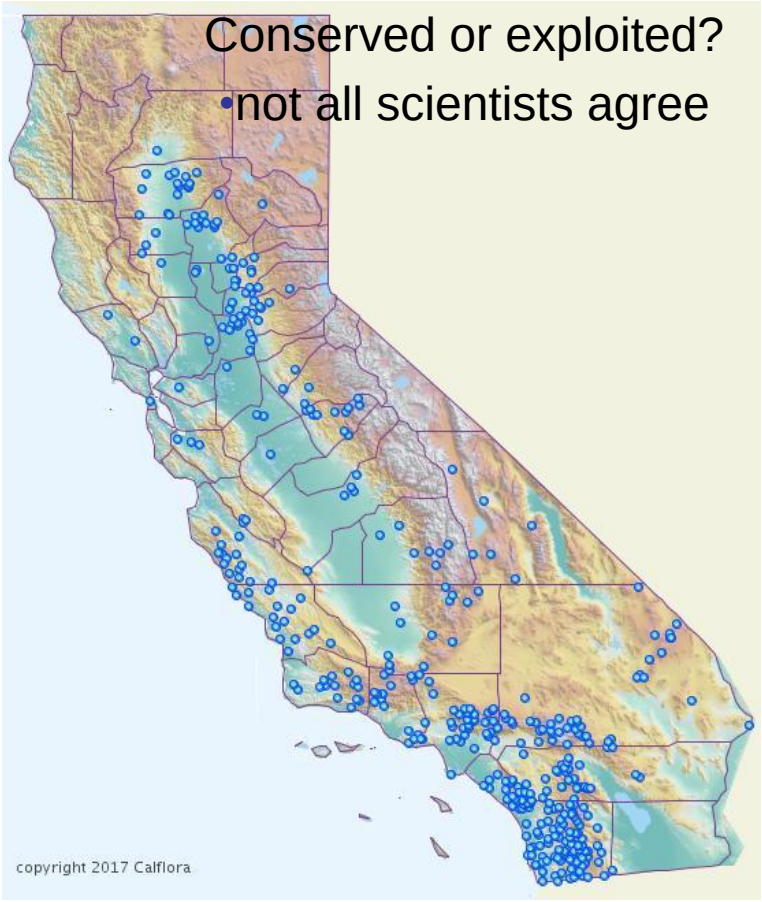
Local TEK practices: use of fire to manage resources

Deer grass-Muhlenbergia rigens

- to drive and concentrate herds
- to open paths for travel
- to alter habitat mosaics
- to protect against enemies
- to protect villages from natural fires

Conserved or exploited?

- not all scientists agree



Payomkawichum-Luiseno

- Ataaxam-the People
- Wiiwish-acorn mush
- Kiicha-home built of willow, Yucca, tule

El Salto Falls-Luiseno sacred site

El Salto Falls-Luiseno sacred site
Buena Vista Creek Valley