

Ecology II

The scientific study of homes

“When we try to pick out anything by itself, we find it hitched to everything else in the universe.”

John Muir, My First Summer in the Sierra

Adaptations are genetic traits that help a living thing fit into its environment.

- for example, curved toothed leaves

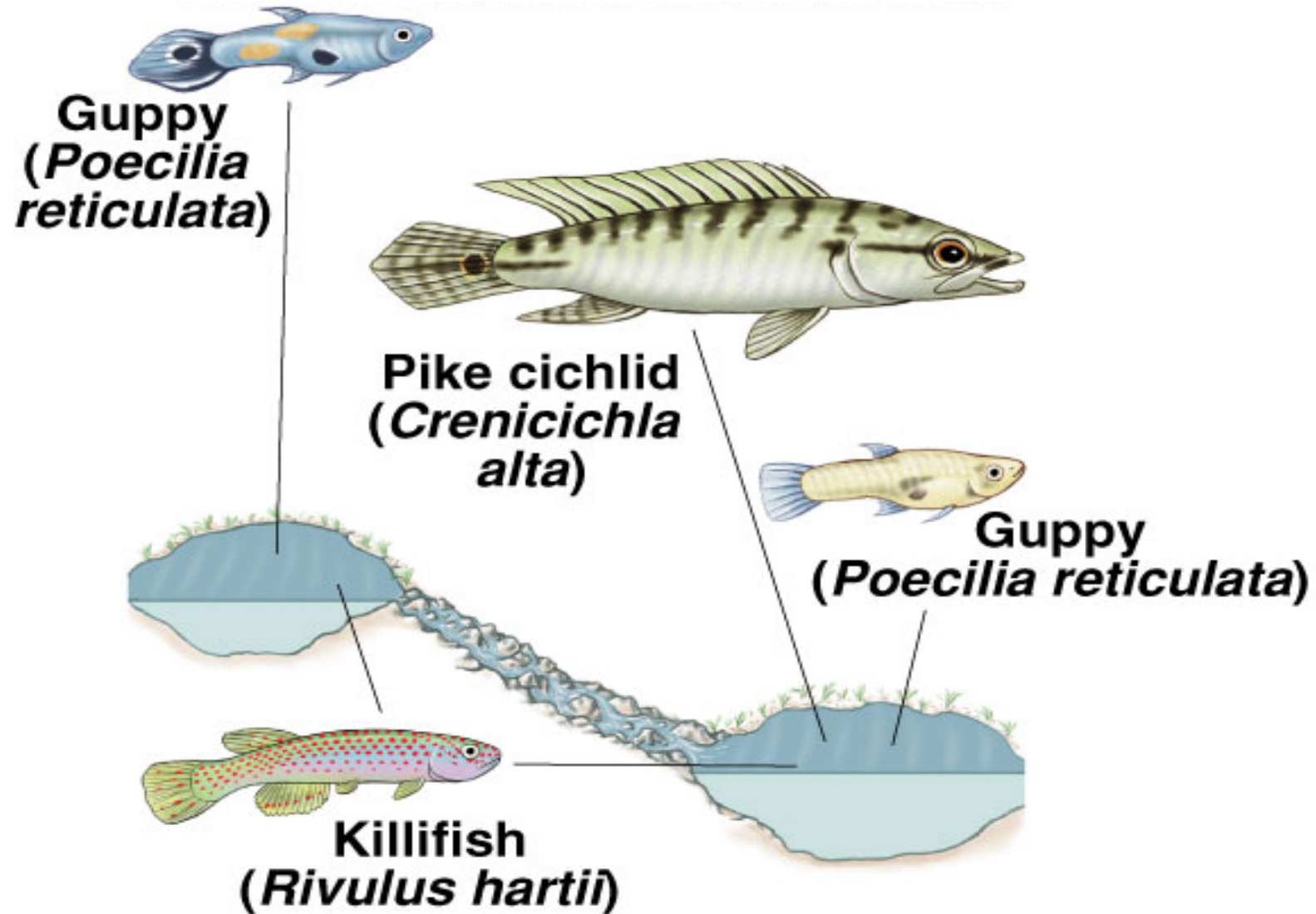


Barn Owl

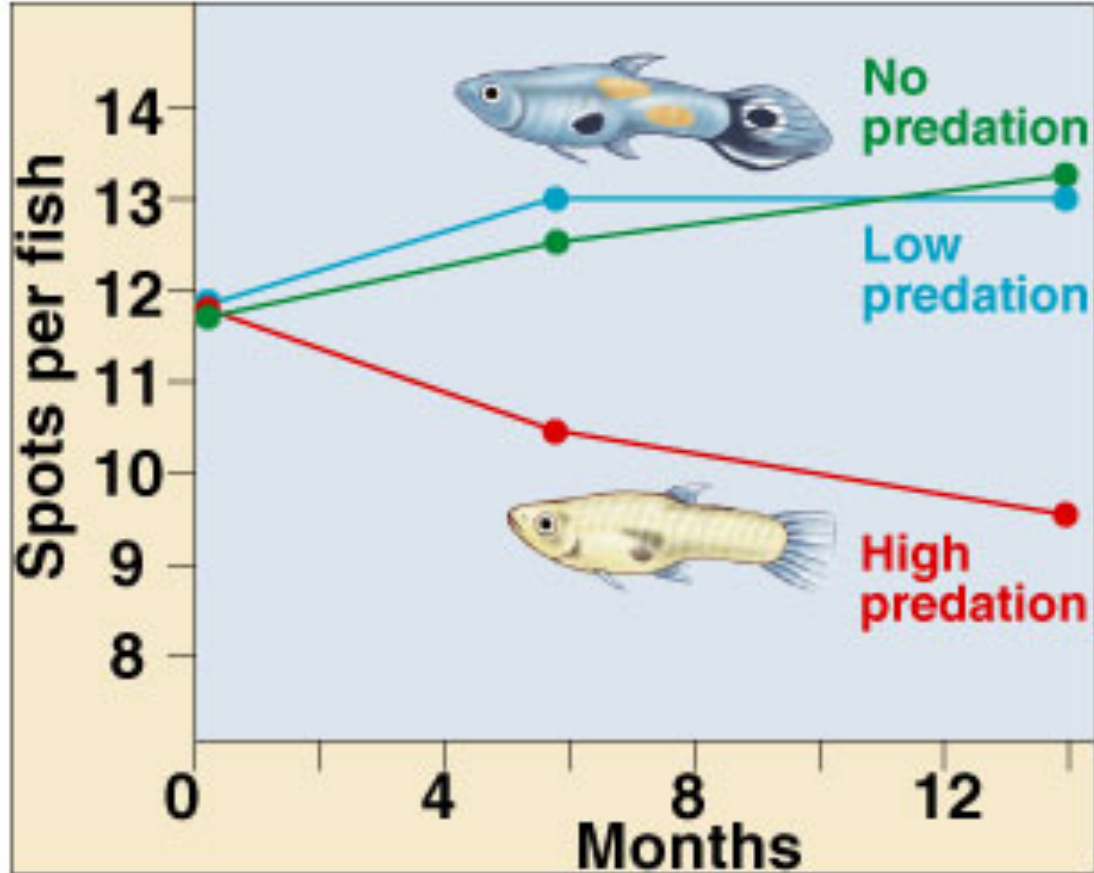
What adaptations do you see?



Evolution of Coloration in Guppies



Evolutionary Change in Spot Number



Symbiosis

Dodder

Parasitism



Yucca Flowers

Mutualism

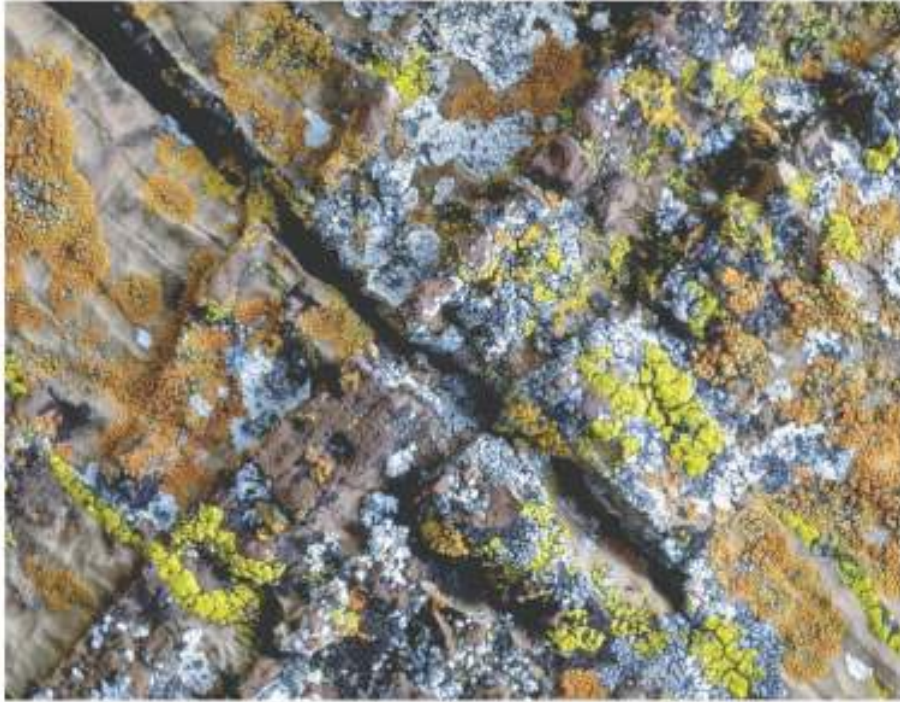


Yucca Moths
and Yucca
Plants need
each other
to reproduce

Mutualism



Mutualism



(a)



(b)

Lichens are a symbiosis between fungi, bacteria and algae. The algae make food by photosynthesis and the fungi protect them from drying out.

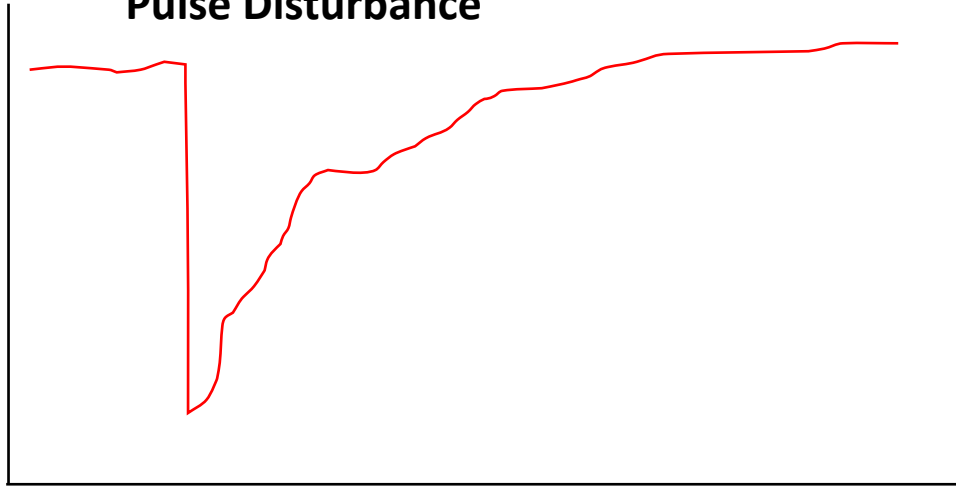


Resistance and Resilience

- Oak woodland is fire resistant. Oaks survive most fires.
- Chaparral is fire resilient. -Burning then regrowing after fires.

Biomass

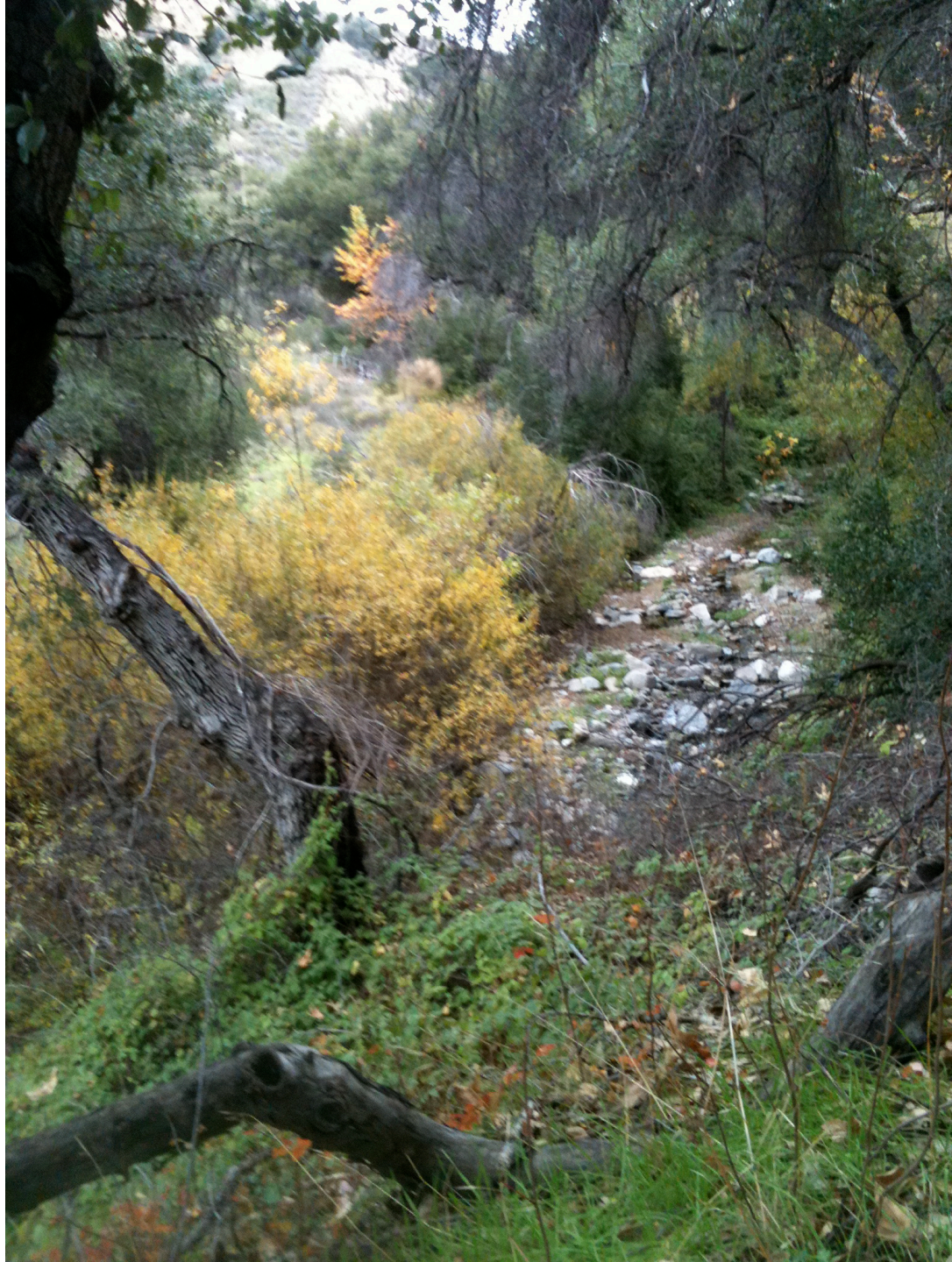
Pulse Disturbance



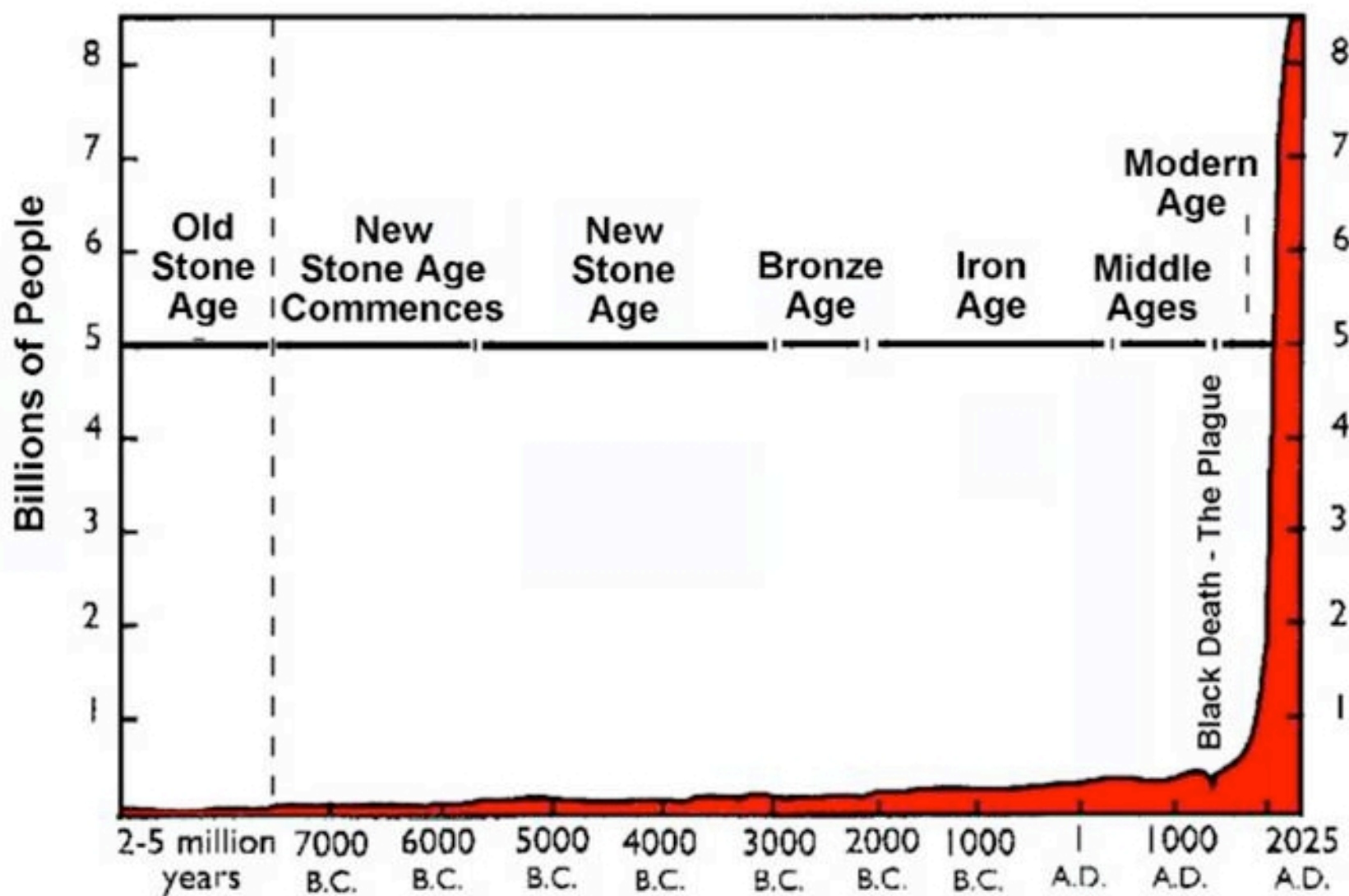
Press Disturbance



Time



World Population Growth Through History



Welcome to the Anthropocene Geological Epoch!

It began around 1800, or 900 years earlier, and is marked by changes in geological and chemical patterns worldwide.

NEWS | 06 March 2024 | Correction [06 March 2024](#)

Geologists reject the Anthropocene as Earth's new epoch – after 15 years of debate

But some are now challenging the vote, saying there were 'procedural irregularities'.

By [Alexandra Witze](#)

*International Commission on Stratigraphy

- In sum, the earth today withstands at least 100,000 times the (human) impact it did in 5000 BCE.
- In other words, we have the same impact in five minutes that our ancestors had in a year.
- We have the same impact in one year as our ancestors did in 100,000 years.

- Paul Hawken, Blessed Unrest

Ecological Footprint

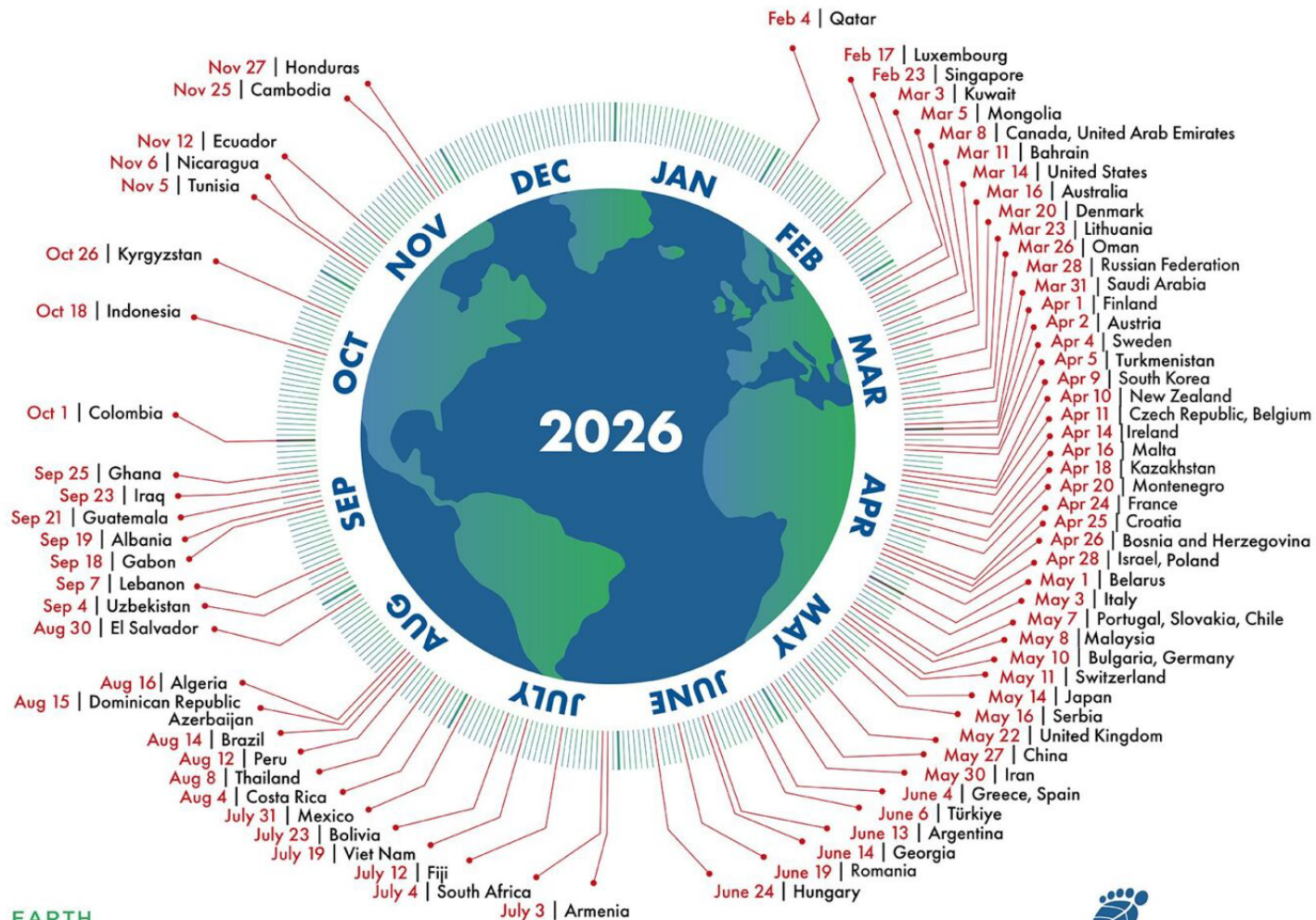
a measure of how much of the surface of the earth is need to support your way of life

www.footprintcalculator.org

*The date by which the annual Earth's capacity to generate natural resources is used.

Country Overshoot Days 2026

When Earth Overshoot Day would land if all the people around the world lived like...



If everyone lived like the average person in the US in 2026, Earth Overshoot Day* would be the day before Saturday, March 14th.



For more information, visit:
<https://overshootday.org/newsroom/country-overshoot-days>

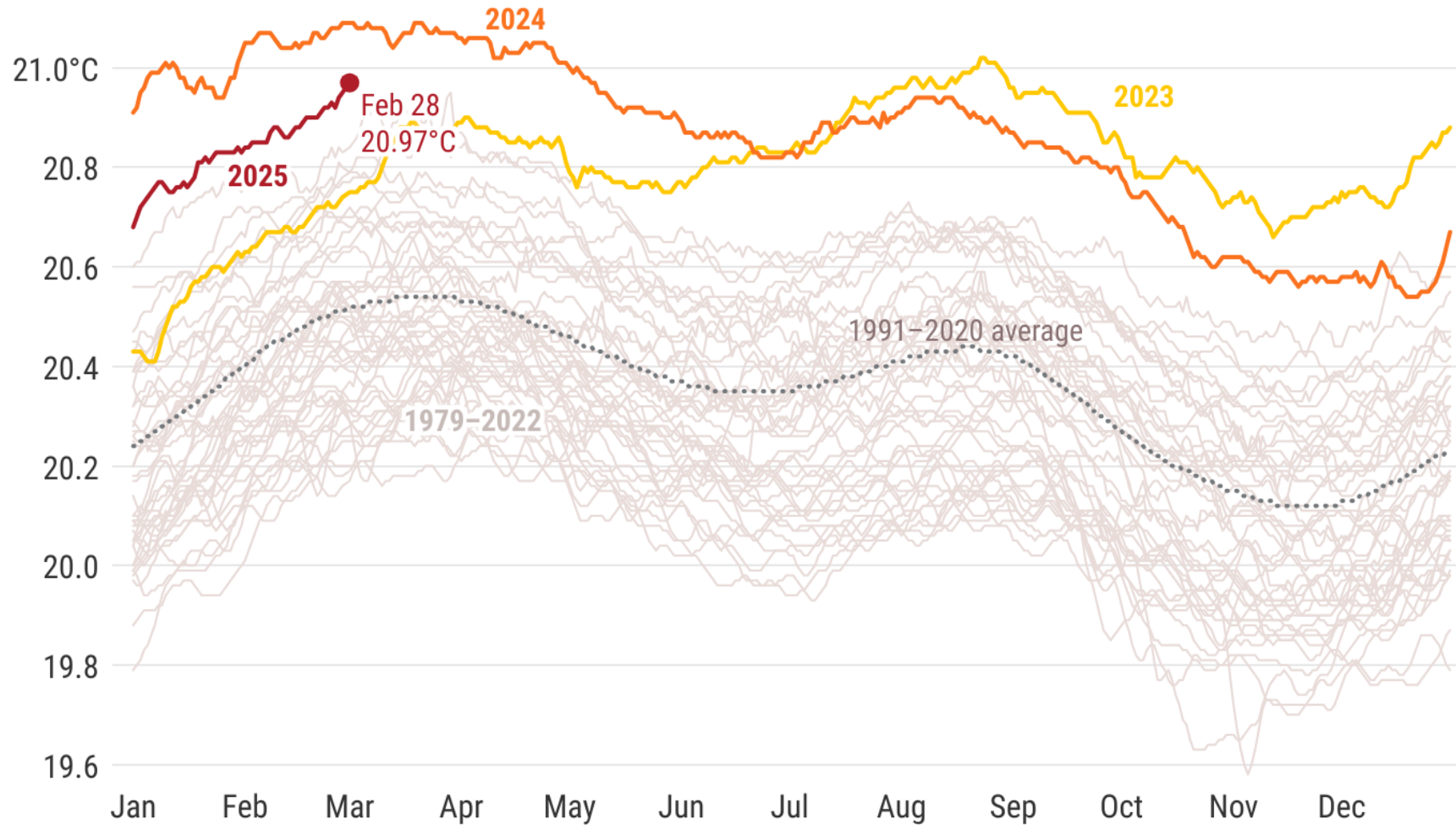


Source: Country Overshoot Days 2026 are calculated using the National Footprint and Biocapacity Accounts' 2025 Edition (Lo et al. 2025), produced by York University for FoDaFo and Global Footprint Network, available at data.footprintnetwork.org



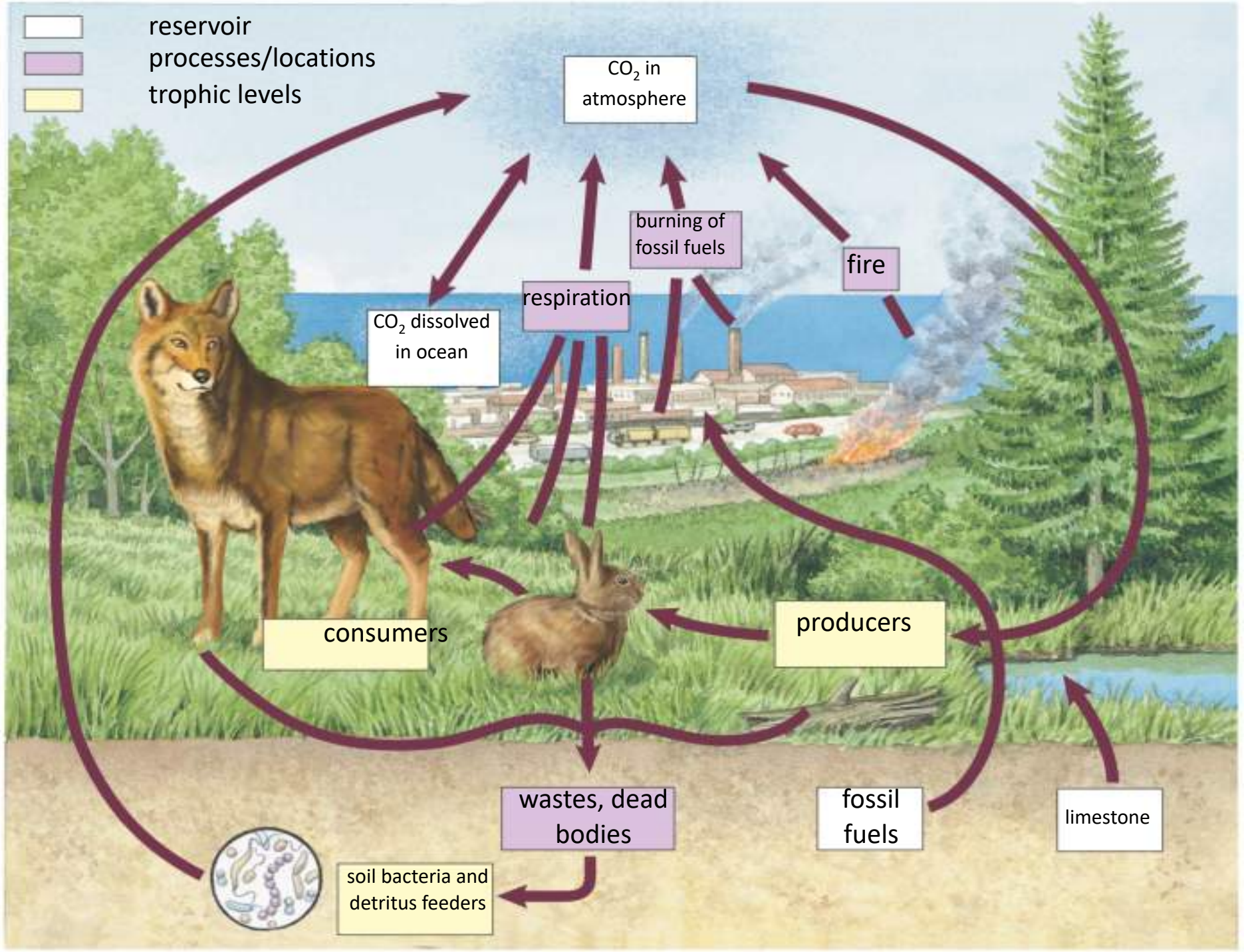
Daily sea surface temperature for 60°S–60°N

Data: ERA5 1979–2024 • Credit: C3S/ECMWF



PROGRAMME OF
THE EUROPEAN UNION





Most climate models predict severe changes for the southwest U.S., including increased **warming** and **drying, intensification of droughts**, and **increased variability** of precipitation. These changes will result in **less runoff**, reduced snow packs, changes in streamflow patterns, **longer and hotter growing seasons**, **shifts in vegetation** growth patterns, and changes in wildfire regimes. The Intergovernmental Panel on Climate Change (IPCC) model simulations suggest that the hydrologic cycle will become more vigorous, with the possibility of **greater droughts** and/or floods in some regions and reduced occurrences of these phenomena in other areas. Most of these impacts are **already occurring** to varying degrees, but **acceleration** over the next century will make management of land and water resources more complex.

- From EPA report on The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest (2008)

"... a sense of wonder so indestructible that it would last throughout life, as an unfailing antidote against the boredom and disenchantments of later years, the sterile preoccupation with things that are artificial, the alienation from the source of our strength."

Rachel Carson

metamorphosis



Mosquito larva and adult emerging from a pupa
photographed by Jan Hamrsky
www.lifeinfreshwater.net

What's your stream?

Ephemeral streams are channels with distinct stream beds and banks that carry water briefly during and after storms.

Intermittent streams are channels that carry water during the wet season.

Perennial streams are channels that carry flow all year.





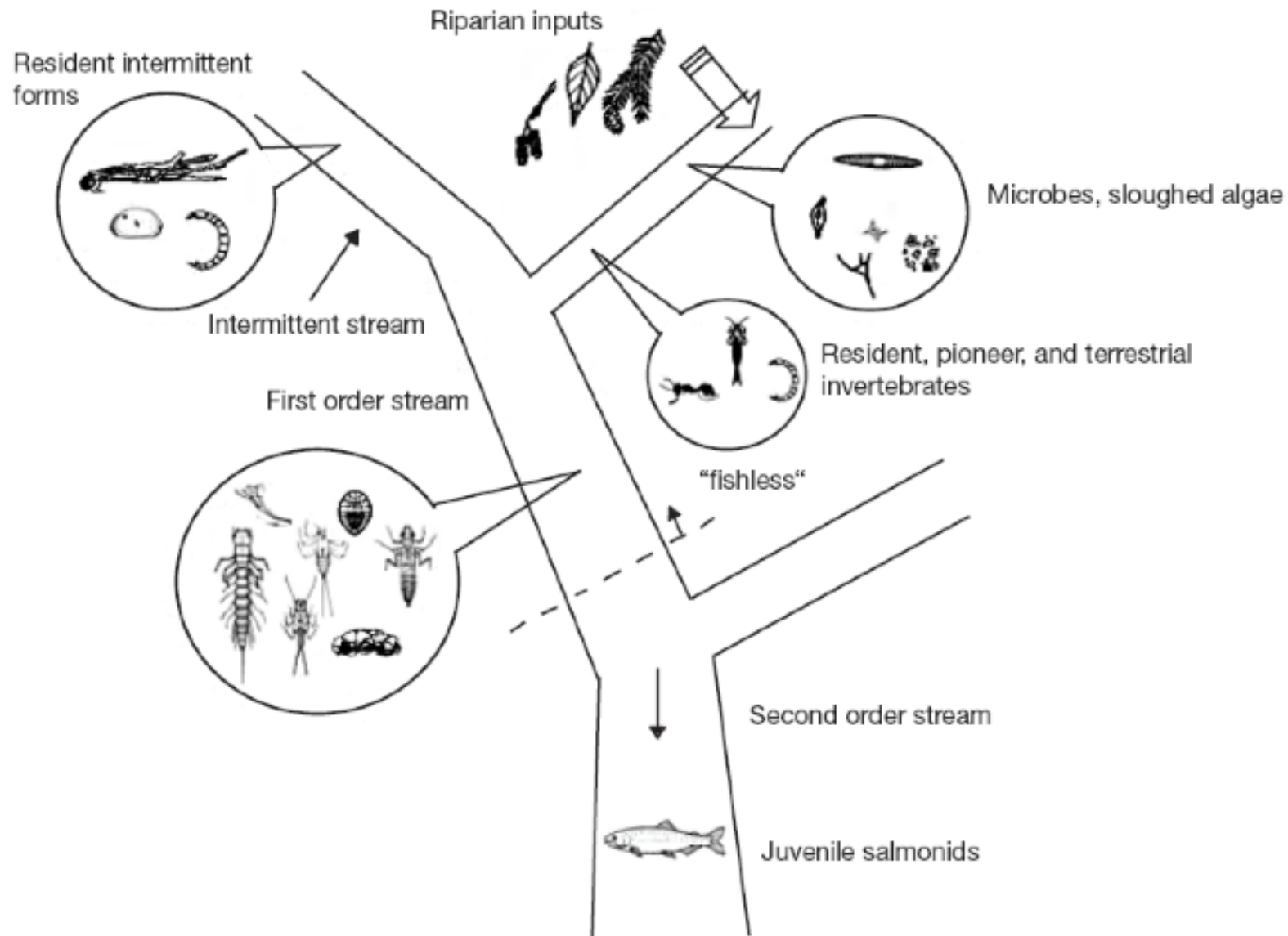
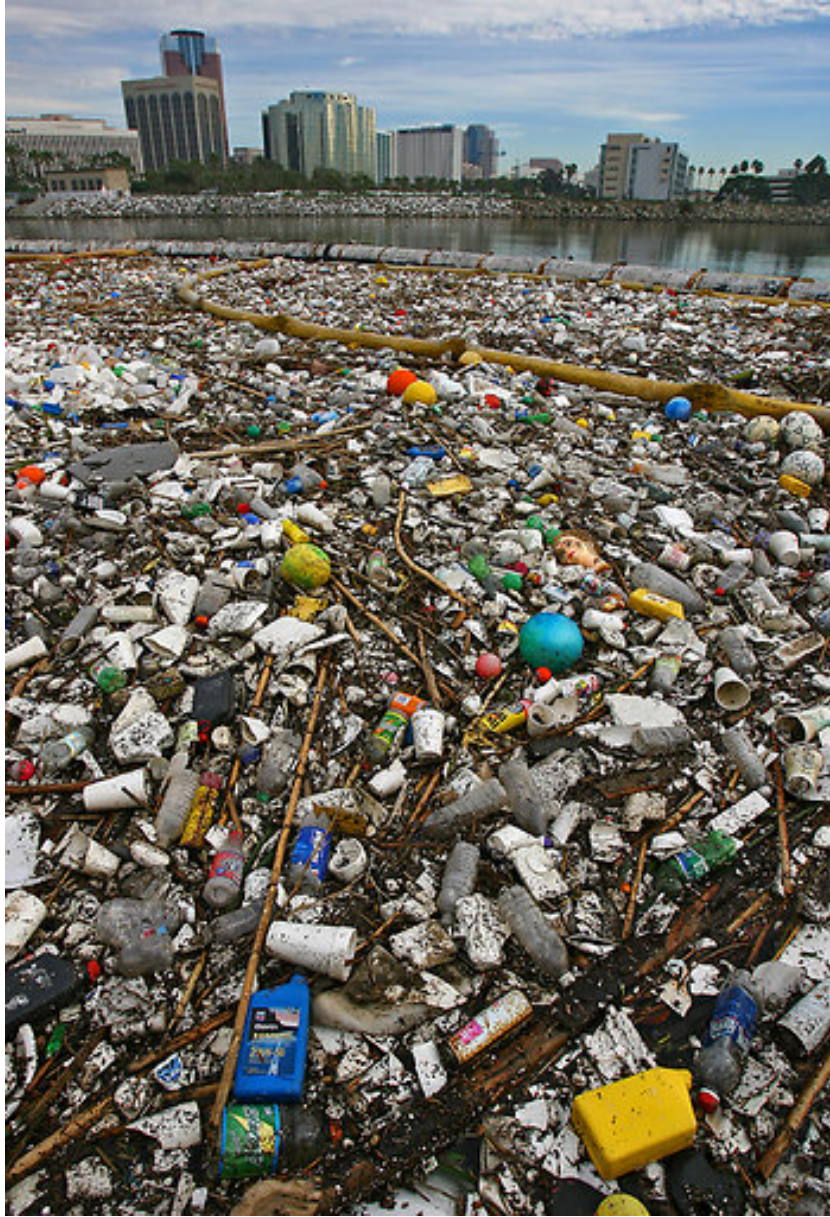


Diagram illustrating the dependence of downstream reaches on upstream production (from Cummins and Wilzbach, 2005).



Are you connected to
the Great Pacific
Garbage Patch?

Long Beach Harbor after a rain.



Eutrophication is nutrient pollution in water.

Streams with more species of algae and more diversity of niches are more efficient at cleaning excess nutrients from the water.

Cardinale, Nature 2011



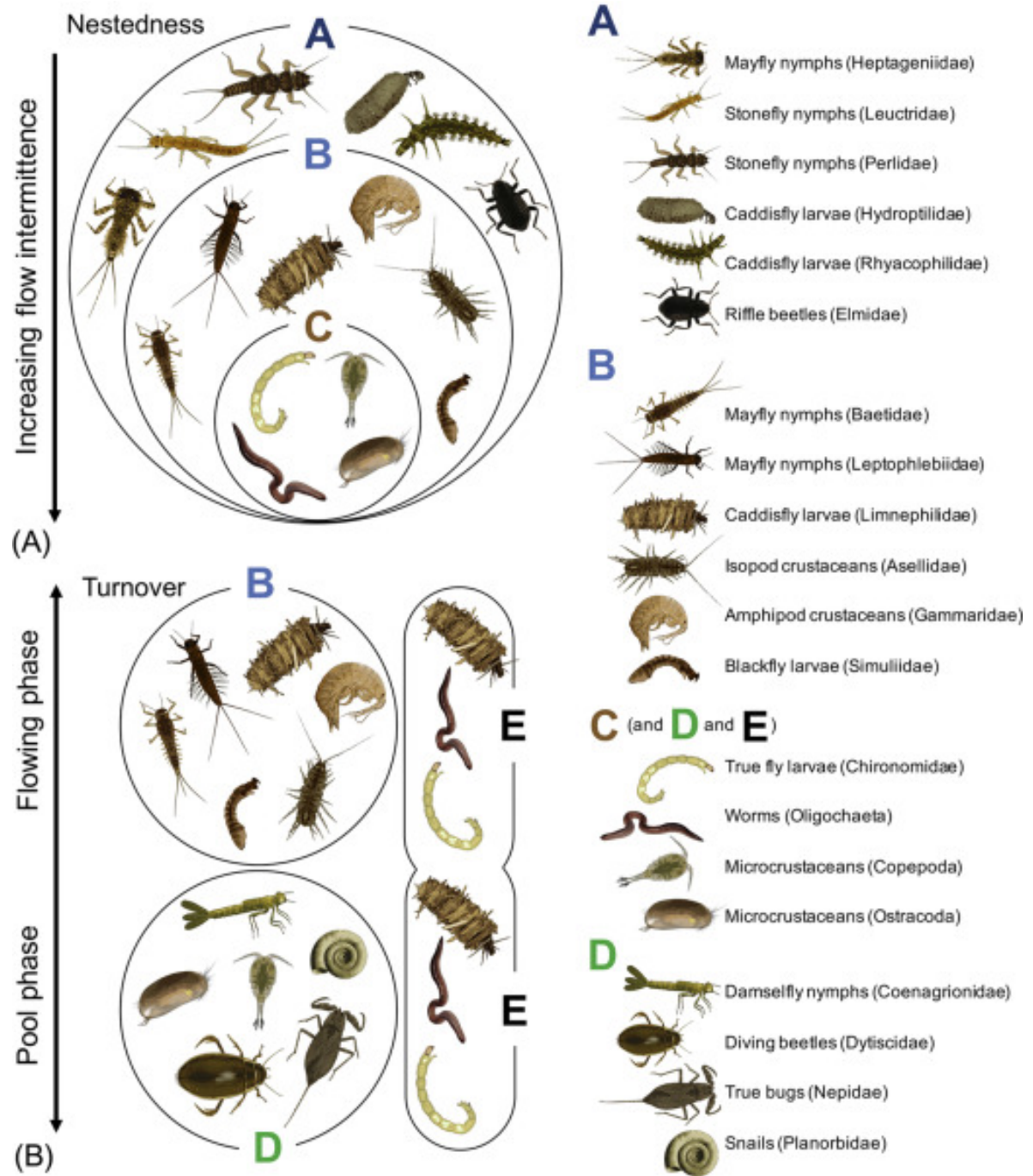
*Left: Photo of macroalgal bloom in the upper San Gabriel watershed;
Right: Microscopic views of algal specimens.*



A SCCWRP researcher collects benthic invertebrates from a streambed. Certain biological communities serve as reliable indicators of overall ecological condition of water bodies.



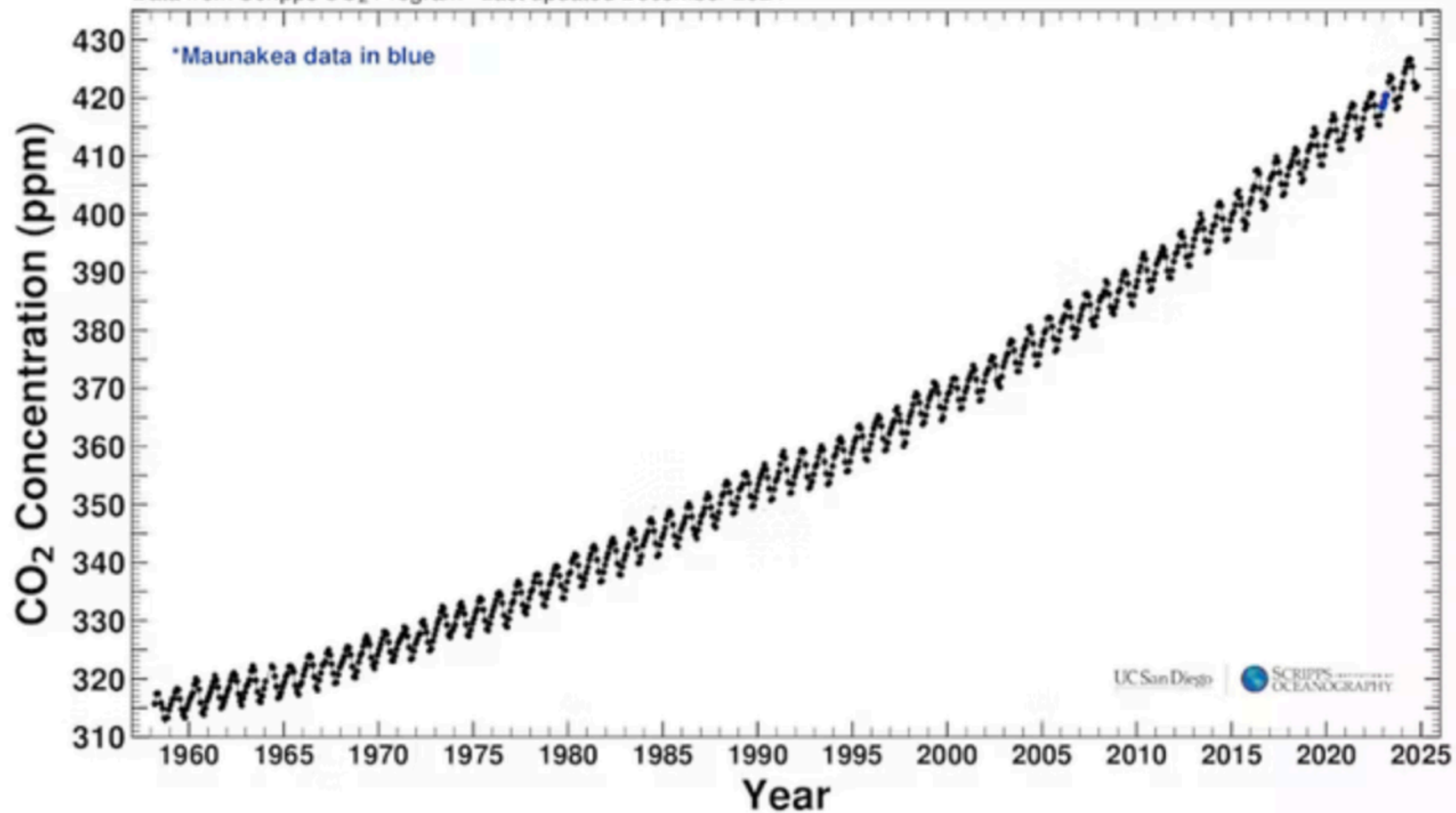
Aquatic invertebrates like the larval dragonfly, above, are sensitive to changes in water chemistry and habitat. SCCWRP analyzes the community composition of such species to quantify a water body's overall ecological health.





Mauna Loa Observatory, Hawaii* Monthly Average Carbon Dioxide Concentration

Data from Scripps CO₂ Program Last updated December 2024



The Keeling Curve tracking steadily rising carbon dioxide levels in the atmosphere came from data gathered at Mauna Loa. Scripps Institution of Oceanography at UC San Diego, CC BY-NC-ND