

Endangered Species and their Preservation

for Susquehanna Group Sierra Club

Julian Shepherd, May 21, 2024

Why save biodiversity, I.e. nature?

Utilitarian arguments:

Provisioning: food, materials,
pharmaceuticals

Ecosystem services: Clean water,
clean air, climate regulation,
pest control

Cultural: recreation, ecotourism,
aesthetics

Philosophical arguments:

Edward O. Wilson: 3 kinds of wealth:
material, cultural, natural

“Because it is there”

Religions, especially eastern ones

Aldo Leopold: stewards of the land



Madagascar Periwinkle, source of vinblastine and vincristine, treatments for Hodgkin's Lymphoma

The Problem

We are losing populations of animals:

Bird loss (Cornell Lab of Ornithology 2019): 2.9 billion birds, 30% of total, lost since 1970

Insect loss

German Naturalists' Society 2017: 74 % loss of flying insects 1989-2013

Wagner, Grames, et al 2021: 1-2% per year (PNAS 2021 Vol. 118 No. 2 e2023989118)

Vertebrate animal loss (World Wildlife Fund): 52%

We're also losing species

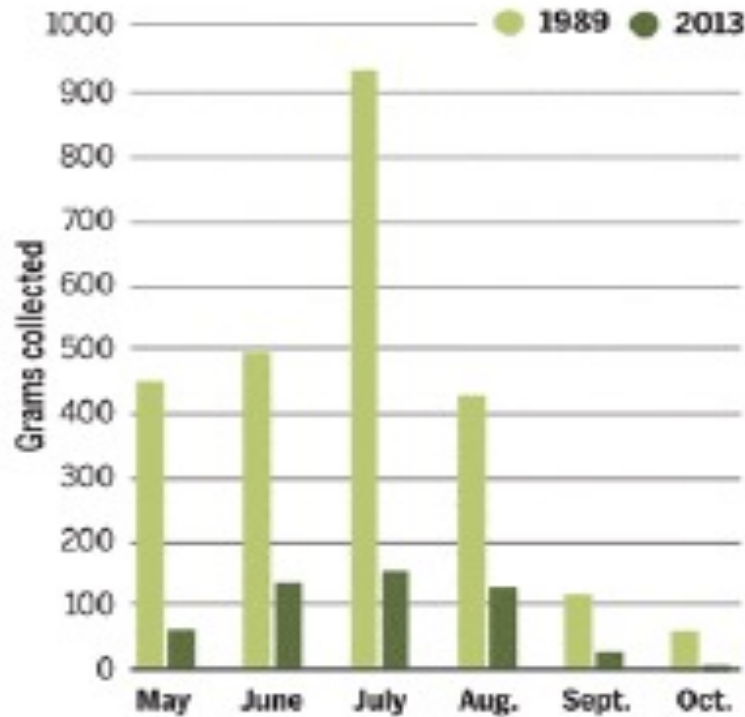
A society of largely amateur German entomologists have been monitoring flying insect diversity since the 1980s.

Use Malaise traps (the “tent” shown on right)

Created a sensation in 2017 when they reported a 78% drop in insect catches.

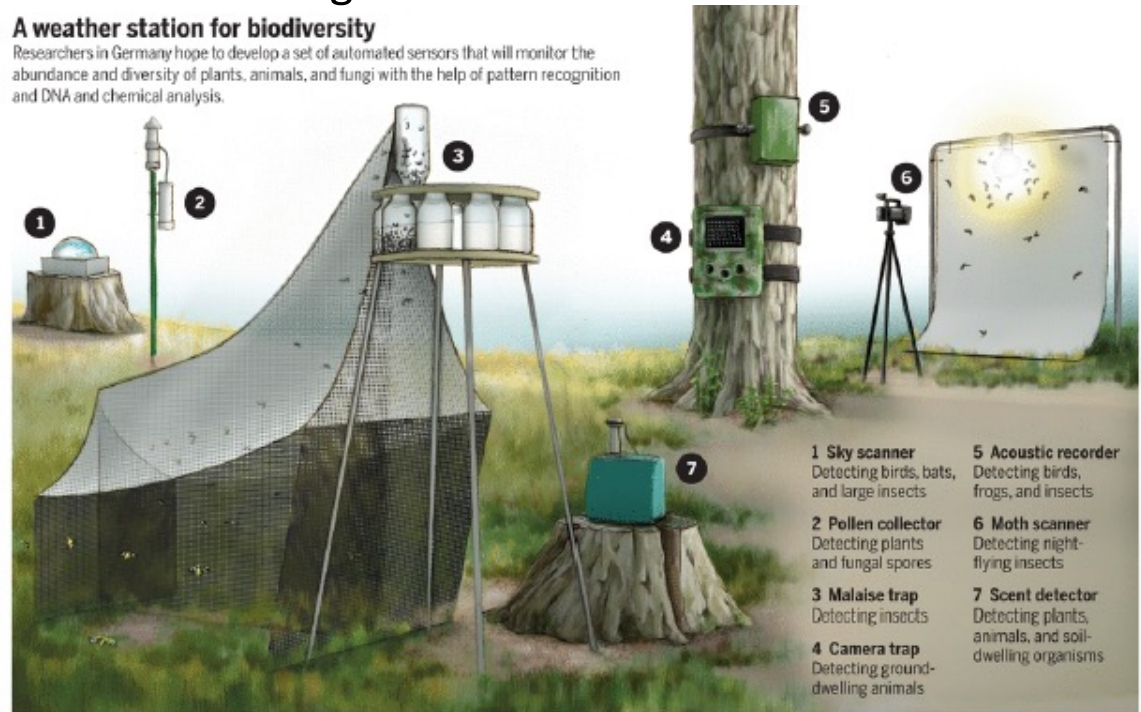
Noticed because of the long-term consistency, reliability, and authority of their data

Suggested reasons for decline: farming practices including insecticides + increased monoculture



A weather station for biodiversity

Researchers in Germany hope to develop a set of automated sensors that will monitor the abundance and diversity of plants, animals, and fungi with the help of pattern recognition and DNA and chemical analysis.



Since 1970, we've lost **52%** of the Earth's bird, mammal, fish, reptile and amphibian populations:



39%

for land-based species



39%

for marine species



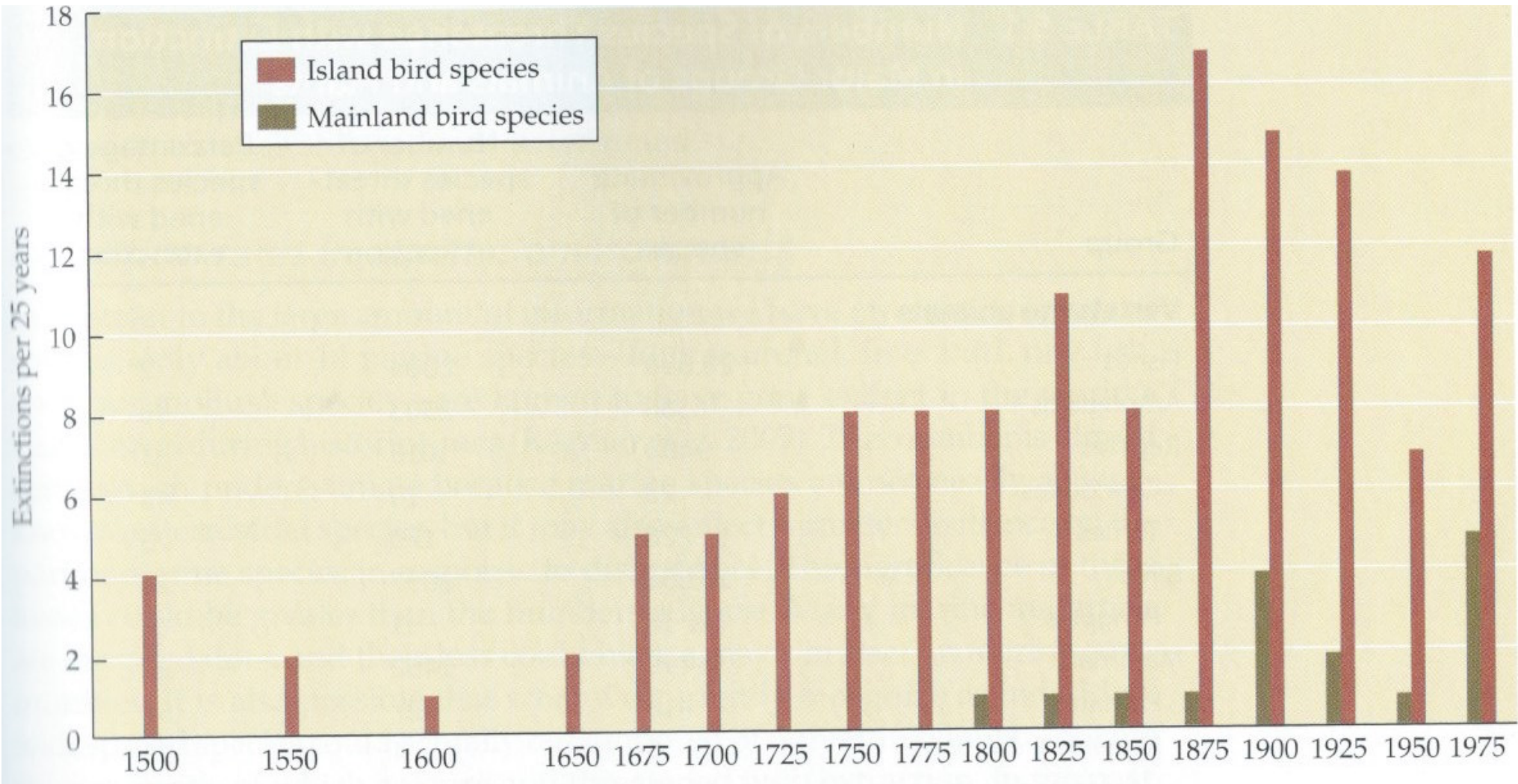
76%

for freshwater species

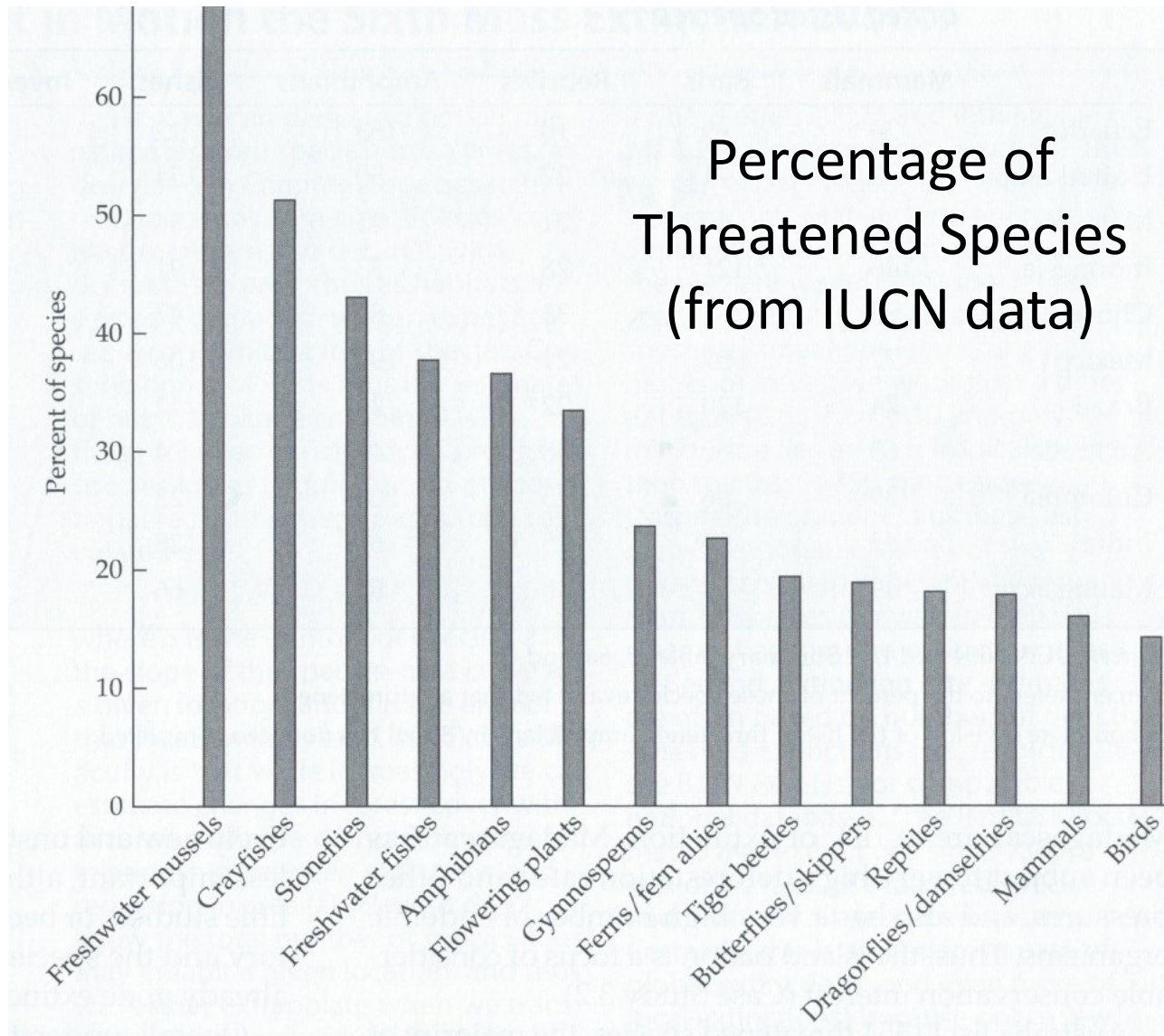
SOURCE: World Wildlife Fund

 **USA TODAY**

We're also losing species:

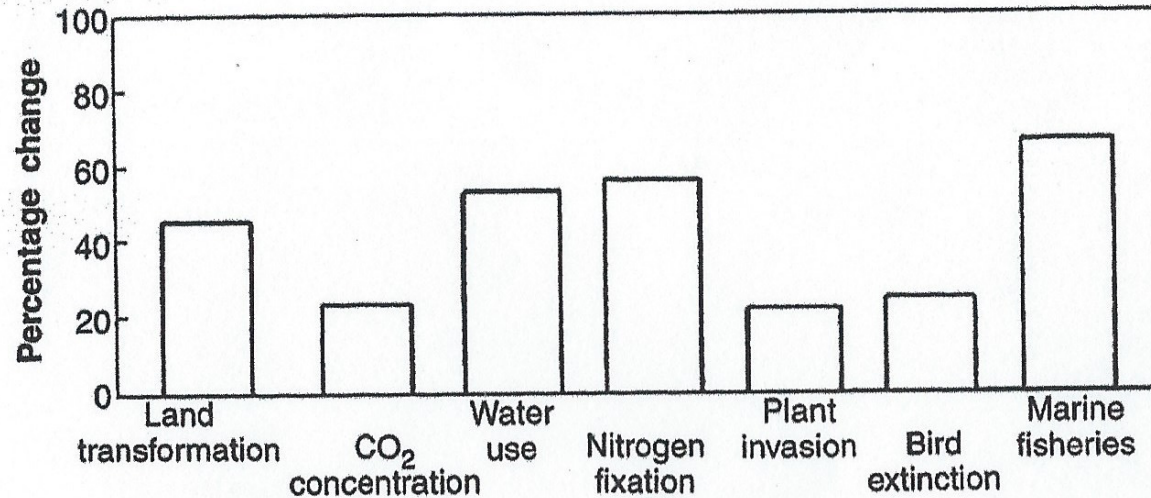


Percentage of Threatened Species (from IUCN data)



Threats

Habitat loss:



Exploitation: fishing , hunting, logging

Climate change

Invasive species (including diseases)

Environmental degradation

White nose disease of bats → decimated populations of many bat species in NE U.S.



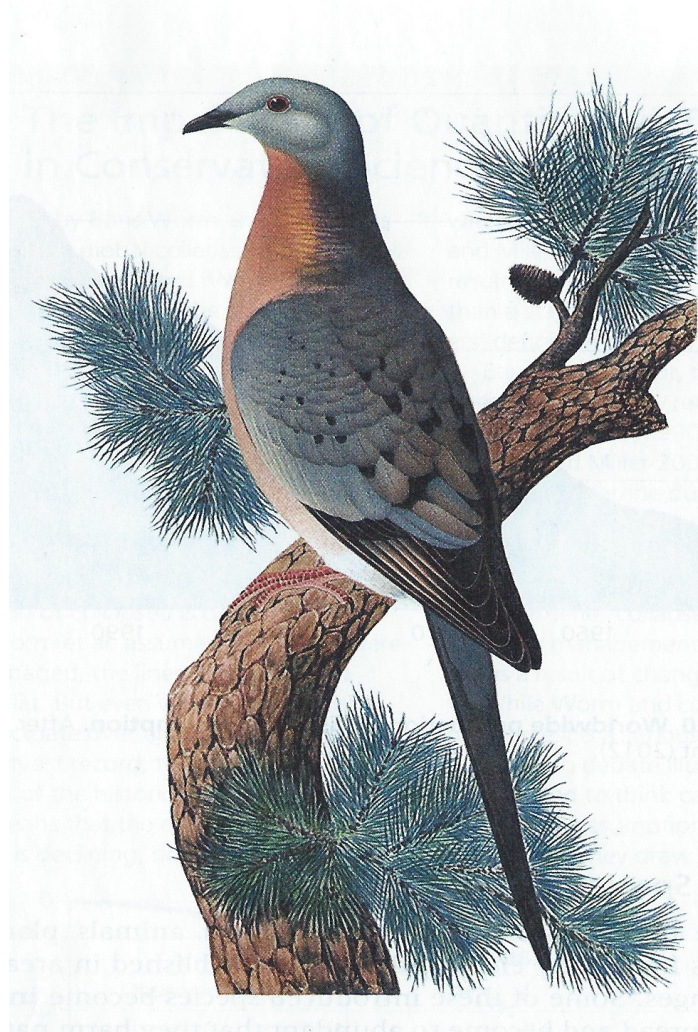
Extinctions

Ivory-billed Woodpecker



Last certain record 1940s
But unsubstantiated reports
since then, so not declared
officially extinct
A dozen years ago in Arkansas a
somewhat convincing report
An intensive effort with
automatic cameras and
recording devices + in-person
observations for several years
→ no convincing evidence

Passenger Pigeon



Last one died in the Cincinnati Zoo, 1914

Reasons:

Vast overexploitation

Loss of habitat: masting oak forests

Figure 1.9 A passenger pigeon (*Ectopistes migratorius*). This species, once among the most abundant birds on the planet, was driven to extinction in the early 1900s by overexploitation.

Current extinction rate: how does it compare?

“Background extinction rate” - occurs naturally What is background rate?

- Paleontologists: average species survival is ~4 million years
- If 15 million species → 4 species per year

Current rate, based on observed extinctions of some obvious groups (like birds):

- Expand that for the estimated total of 15m species → ~500 species per year
- Current rates look low to us, but this rate is 2 orders of magnitude (~100x) higher than background

Extinction debt (“living dead”) = populations become so low → hard to find mates, inbreeding → extinction inevitable, though may still persist for many years.

So counts of extinct species do not include those still extant but fated to become extinct

- Allee effect: reproduction and survival decline as population size decreases. Might think relaxation of competition would counteract and may in some cases.

- Allee effect happens for several reasons:

1. Hard to locate mates:

North Atlantic Right Whale (450 individuals)



Bachman's Warbler (extinct?)



2. Success depends on group cooperation: e.g. wolf packs

3. Plants that pollinators cannot find if sparse

Legal Protection of Nature

A manifestation that our society does care: the Endangered Species Act of 1973

An innovative act novel at its enactment. Why protect species that are often functionally extinct or on the way there? Because we care.

Mandates 3 principal actions:

- Identify threatened species → “listing”
- Protect them and their habitat
- Design a recovery plan

Listing:

What is listed? Species of course but also notable subpopulations of vertebrates

Biology of a species has to be researched and degree of endangerment established before it can be listed. This takes time and effort, and can be subject to political concerns.

Recommendation made to the Secretary of the Interior (Fish & Wildlife Service) for terrestrial and freshwater species, to the Secretary of Commerce (NOAA Fisheries Service) for marine species

If listed, then designation of critical habitat (more research)

Then formulation of a recovery plan

Application:

- All federal agencies must comply by not taking individuals or modifying critical habitat
- Private landowners must do same – this was the truly novel part and that which still incites major controversy
- Fifth amendment to the Constitution:
"No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation."

Violating the last constitutes a “taking”. Problem is that, under the ESA, a private person can’t endanger a species by modifying its environment, e.g. can’t turn a habitat that an endangered species requires into a housing development. So a developer would argue that this requirement constitutes a “taking” of private property.

This led to such major controversy that amendments were made:

E.g. Habitat Conservation Plan 1982 → can destroy or modify habitat, but only if protect or remediate elsewhere. Also added a “no surprises” clause: no additional future restrictions

Problems:

- Since the Act is strong enough to limit business and landowners’ interests, get continuous legal efforts to dilute or eliminate the Act
- Or illegal ones: “Shoot, shovel, and shut up” if an endangered species is found on a property
- Getting species listed: favors vertebrates, many fewer invertebrates and plants listed
- Need a lot of data and time. E.g. Monarch: an “endangered biological phenomenon” petition led by Lincoln Brower was answered by the US Fish & Wildlife Service in December 2020, saying effectively: “yes, this is worthy but we have other more important issues now, but will keep it in mind.”
- Focus is species, not ecosystems. But idea of “umbrella species” helps.
- Listing often happens only when populations < 50 individuals → “living dead” problem
A solution: “Pre-listing Conservation” efforts
- Funds (always!) especially for recovery plans
- Act doesn’t actually mandate that a recovery plan be implemented, so many exist only on paper

Some Successes



Have been
clocked at up to
200 mph

Peregrine Falcon



California Condor



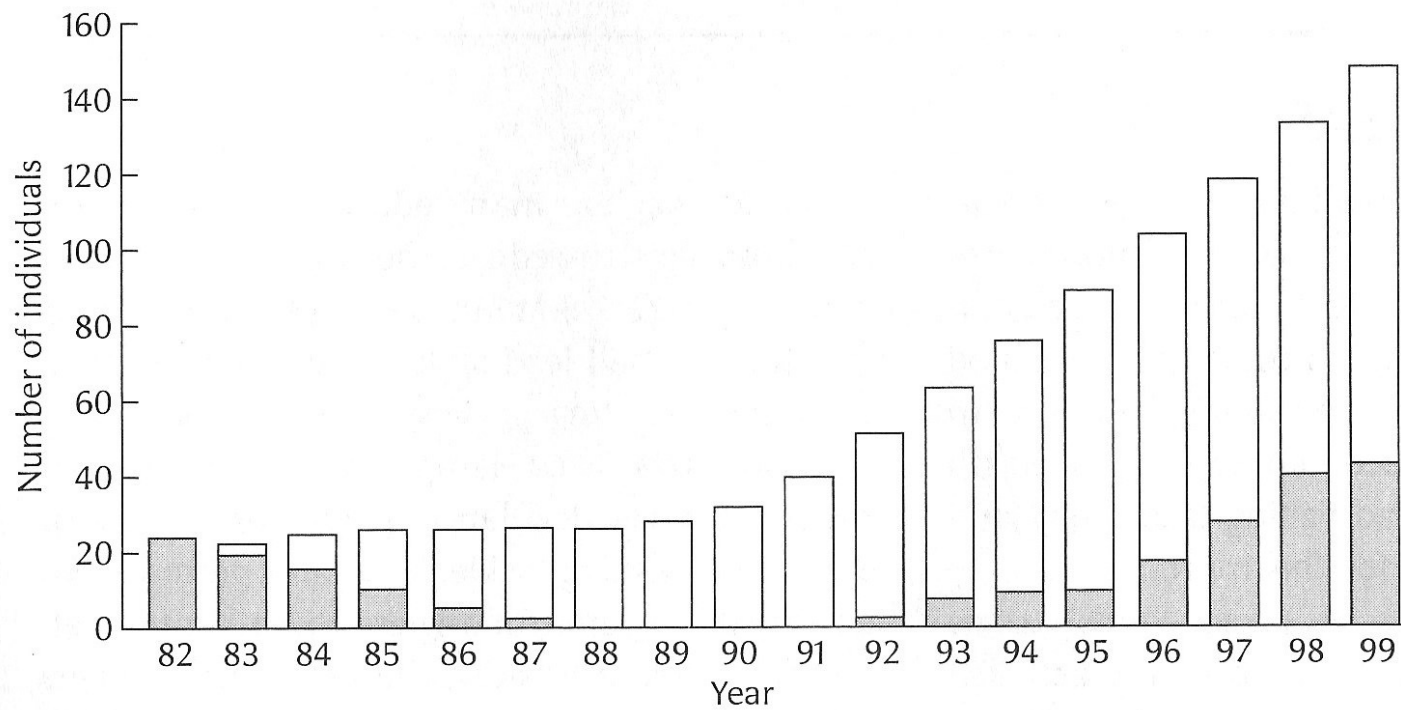
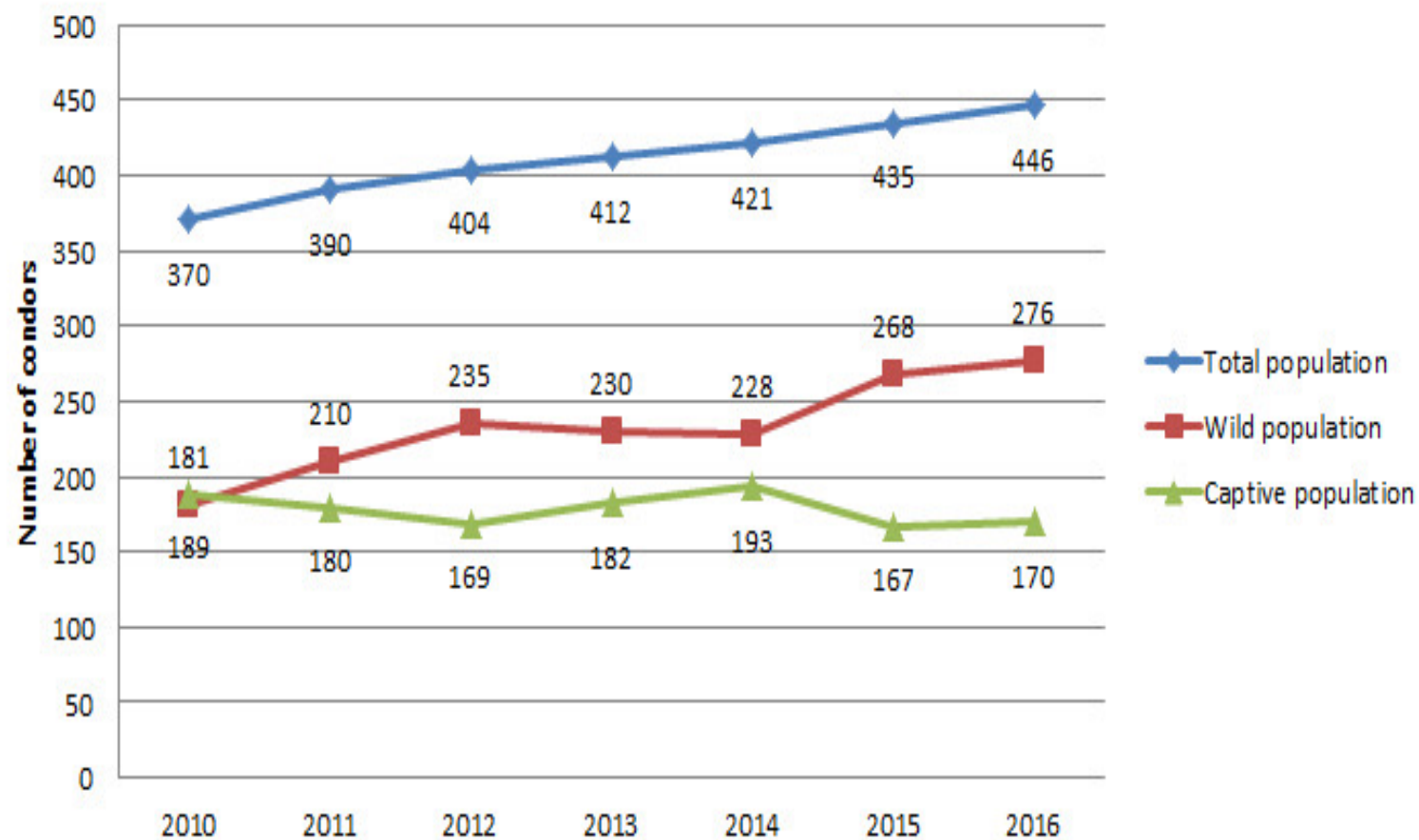


FIGURE 21-10 California Condor numbers in the wild (gray part of bar) and in captivity (white part of bar) from 1982 to 1999. [After Kiff 2000]

California Condor Population Trends 2010 - 2016



State Laws and Regulations – these trump national laws and regulations if more stringent than national versions. SEQRA, Freshwater Wetlands Act, Natural Heritage Inventory (DEC and TNC) – catalogs all species in NYS and lists threatened spp.

International agreements protecting biodiversity:

Convention on International Trade in Endangered Species, (CITES), 1975. Lists threatened species to be monitored and/or controlled by restrictions in trade and destruction. As a signatory, U.S. has laws supporting CITES (controlled by Customs and Border Protection),

International Union for the Conservation of Nature (IUCN). Supply information, notably the “Red List of Threatened Species”, based on scientific sources. Based in Geneva, Switzerland and has over 1000 staff

Confiscated CITES Items

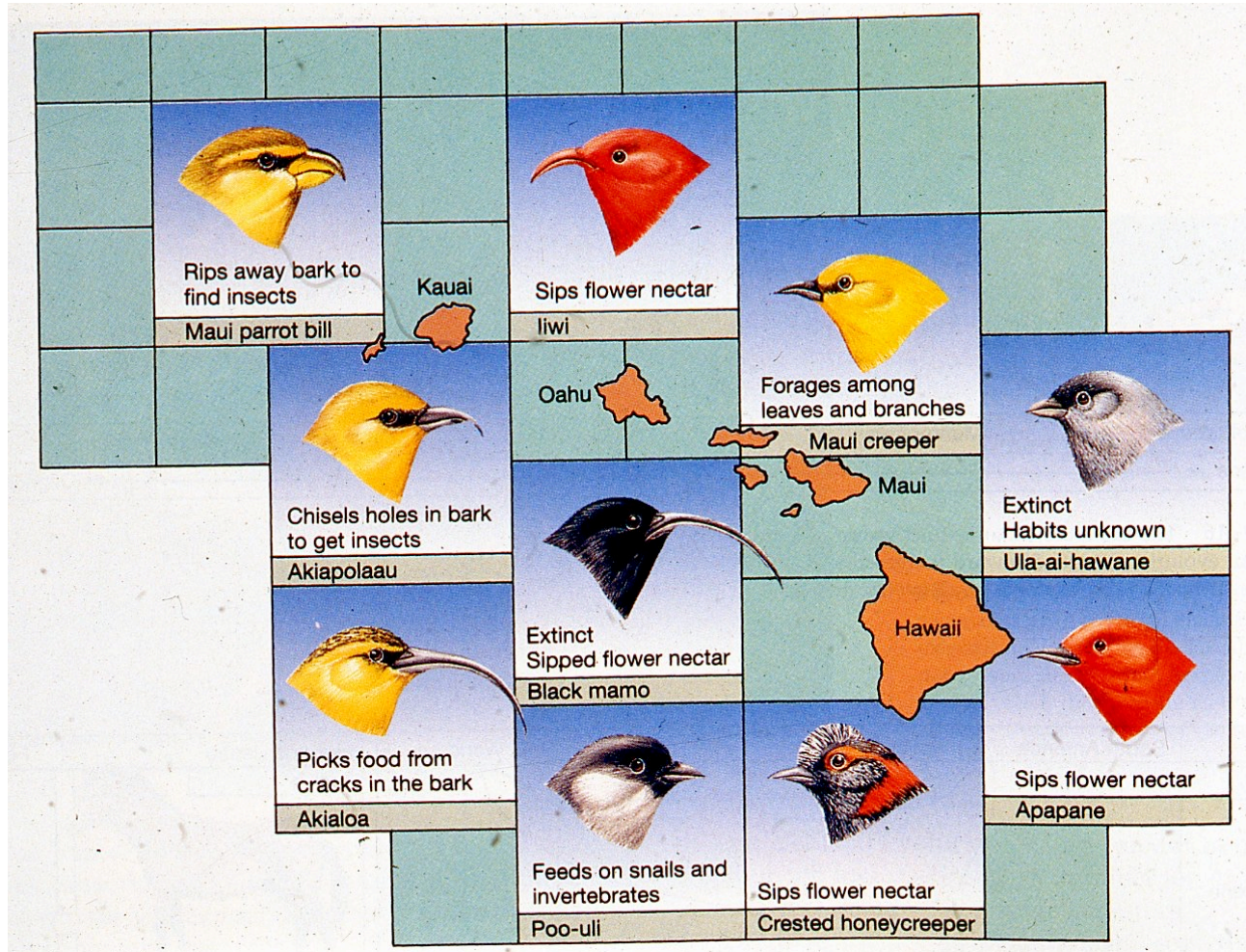


Convention on Biological Diversity, 1992

- . Participants agree to establish protected areas, restore degraded habitats, eliminate exotic invasive organisms, and use information from traditional lifestyles.

Recurring meetings of the “parties”, (“COP 15”) started November 2021 in Kunming, China and finished last November in Montreal. Agreed to stop biodiversity loss by 2030, aim to protect 30% of Earth’s natural areas, cut food waste in half, and eliminate/phase out subsidies that harm biodiversity.

Hawaiian Honeycreepers





Kīwīkiū – 150 left



l'iwi – few thousand left



Po'ouli – recently extinct



Amakihi

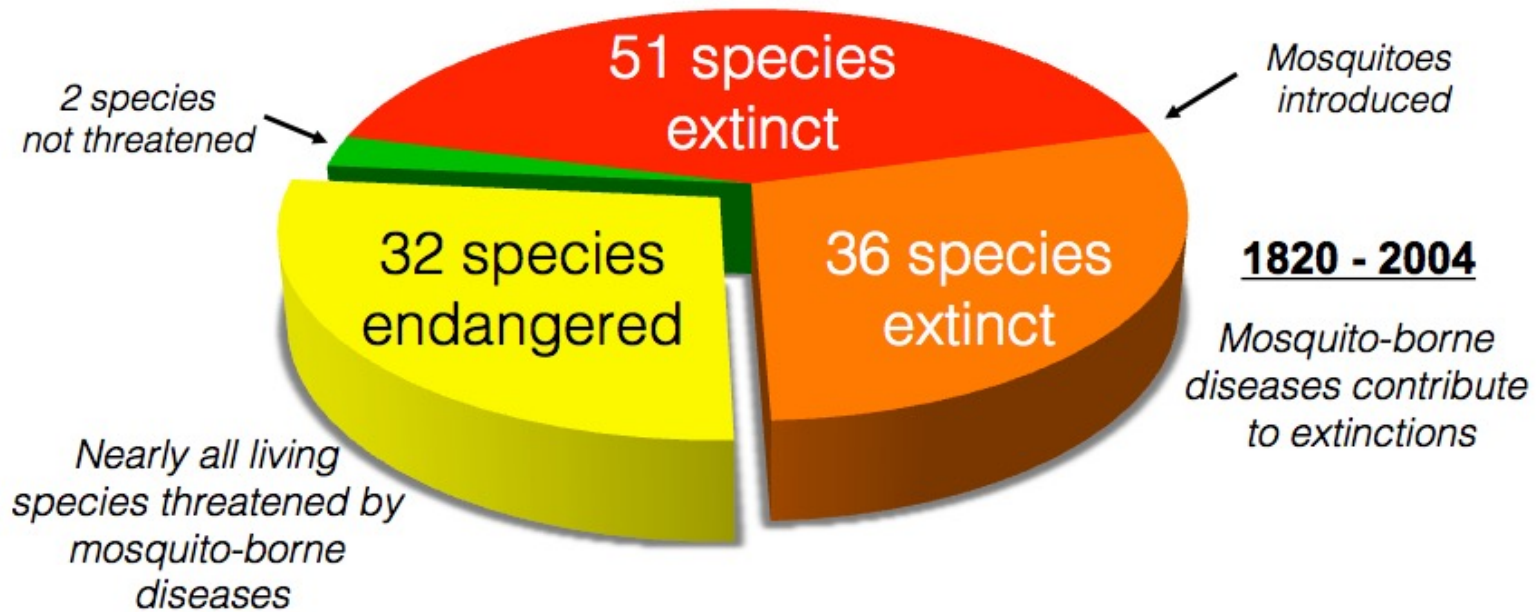


Awapitane

Only two honeycreeper species
resistant to mosquito-borne diseases

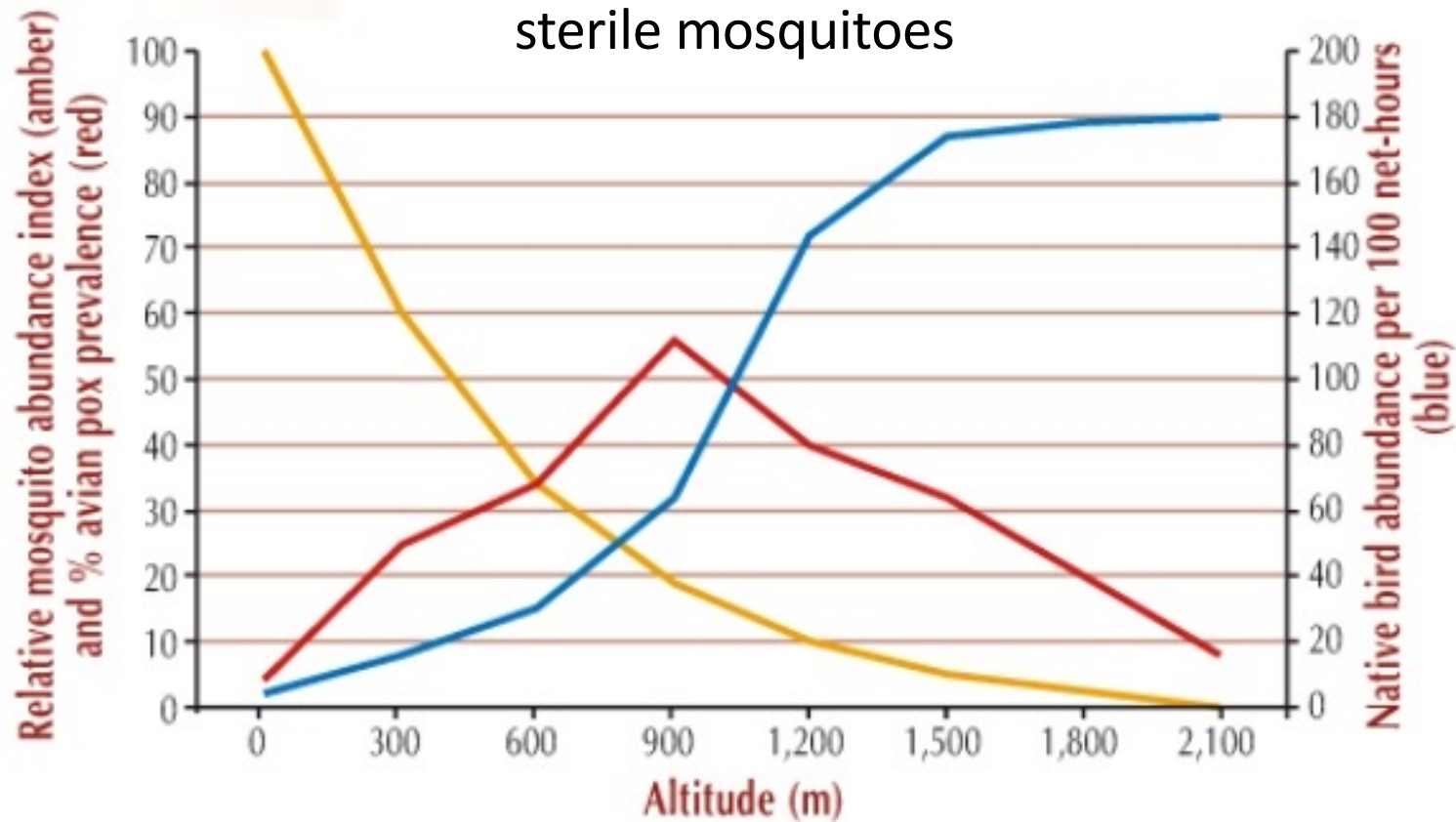
Hawaiian Honeycreeper Status

Prior to 1820



Imported mosquitoes communicate avian malaria and avian pox lethal to almost all honeycreepers.

Solution in progress for 2024: introduction of sterile mosquitoes



Cat and mongoose traps, poison for rats, and fences against feral pigs and goats, to protect high-altitude honeycreepers



What can you/we do?

Practice intelligent, critical, sustainable lifestyles

Educate about ecosystem services, but be realistic

Hold people and institutions to account → legal action if necessary

Experience nature → appreciation

If you have land, consider saving as conservation easements

(Southern Tier Land Conservancy)

Emphasize science-based evidence → decisions

Soft-pedal doom-saying, crisis, catastrophe

Work with economic and social interests as much as possible – less
divisiveness, more environmental justice

Incorporate social justice into conservation decisions

Join the Sierra Club!