

Class 13 Agenda

- **1:30-2:15**
 - Slides: Biodiversity Crisis
- **2:15-3:20**
 - Activity: Biodiversity Hotspots
 - Activity: ESA Bioblitz
- **Reminders:**
 - Turn in Presentation evaluations if you haven't
 - Turn in Individual Summary: Better late
 - Quiz 2 next Tuesday, Study guide will go on class website soon
 - Final presentation
 - List of sub-topics for each member due next Tuesday

Biodiversity - 2



The Biodiversity Crisis

Why should we care about biodiversity?

Does it have value to us?

How to determine its value?

What type of value?

– ***intrinsic value***

- *Value in and of itself*
- *E.g., Family & friends, health*

– ***Instrumental value***

- Economic value – use it to get something else of value
- E.g., Money, House, Bike, Car



Rosy Periwinkle:
What is its value?

Team Activity 1

- **List 3 instrumental values of biodiversity**
 - Each team write your examples on the white board
 - Make sure it is different from those already on the board
- **List 3 intrinsic values of Biodiversity**
 - Each team write on the white board (same rule as above)
- **Hint: What is at the basis of Biodiversity? Ecosystems!**

Why should we care about biodiversity?

Does it have value to us?

How to determine its value?

What type of value?

– ***intrinsic value***

- *Value in and of itself*
- *E.g., beauty, peace, love of nature*

– ***Instrumental value***

- Ecosystem Services – use it to get something else of value
- Food, wood, fresh air, pollination, pest control
- **\$41 TRILLION a year**



Rosy Periwinkle:
Anticancer compounds

**What do you think is
the value of the
Rosy Periwinkle?**

Human impact on Biodiversity

- **Loss of Biodiversity at all levels**

Why?

- **We only recognized its provisioning services**
- **We took the other services for granted and did not put an economic value on it**



Reduced species diversity



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Reduced ecosystem diversity

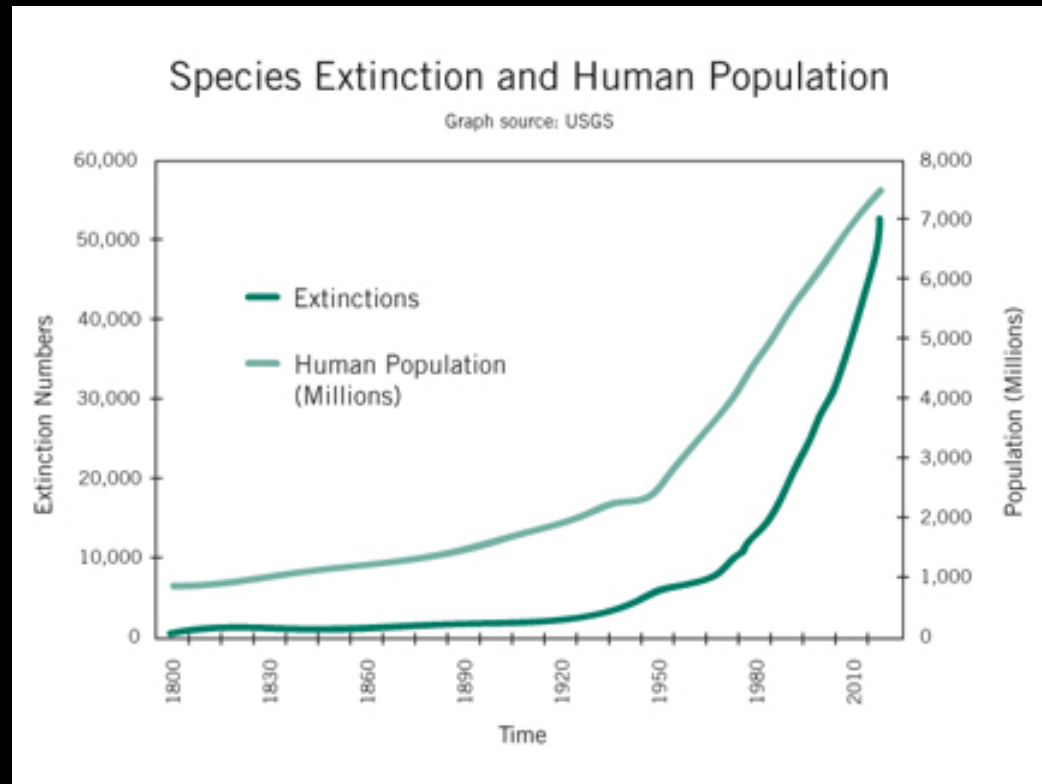
- UN Millennium Ecosystem Assessment 2001 – 05
- **Human well-being depends on intact ecosystems**
- United Nations *Declared* 2011 – 2020 “The Decade of Biodiversity”



United Nations Decade on Biodiversity

Reasons for declines

- **H**abitat loss and fragmentation
- **I**nvasive species
- **P**ollution
- **P**opulation increase
- **O**ver-exploitation
- **C**limate Change



All due to human activities!

Habitat Loss



Invasive Species

Alexander Vasenin



Brian Sullivan



Ian Barbour



Pampas grass: Larry Ulrich



Ice Plant: Vincent

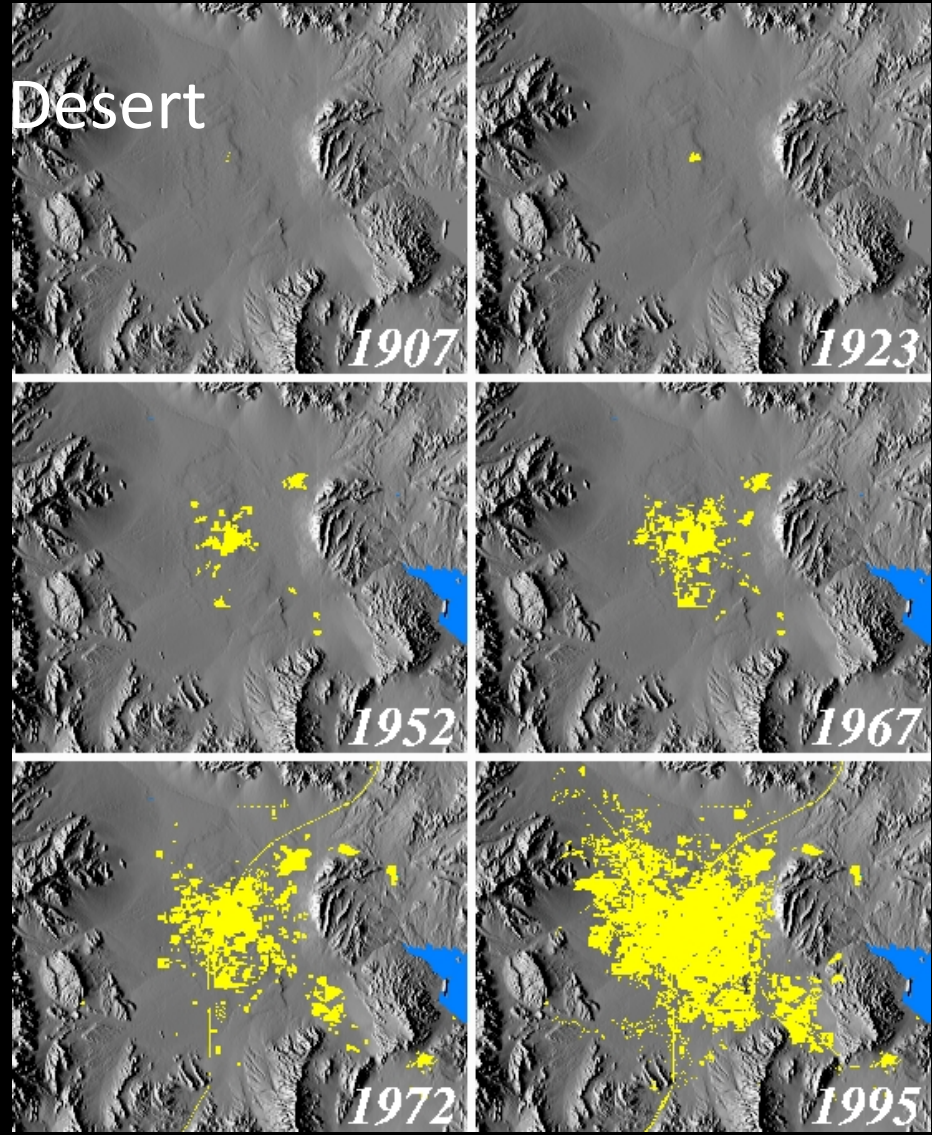
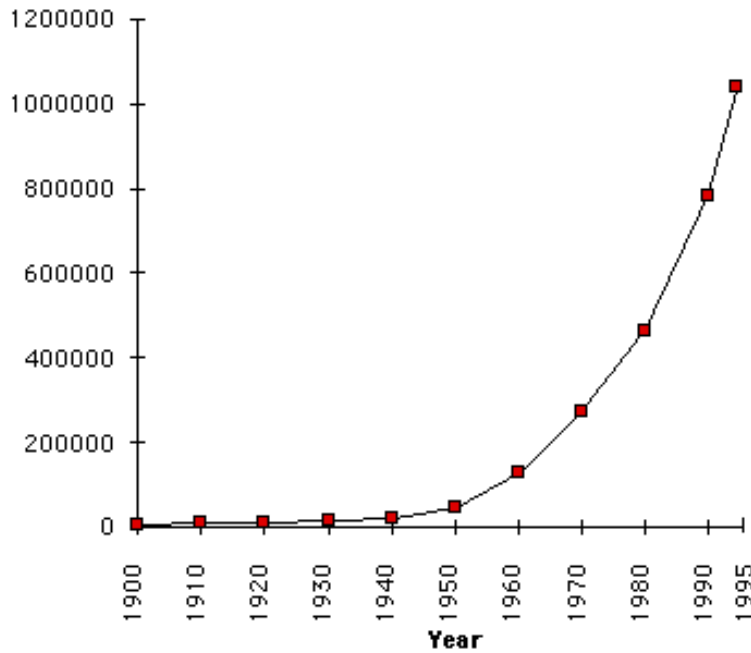


Anachronist

Population Increase

Las Vegas – City Expands into Desert
(US Geological Survey)

Las Vegas Valley Population



Pollution

Study Blames Roundup for Monarch Butterfly Deaths

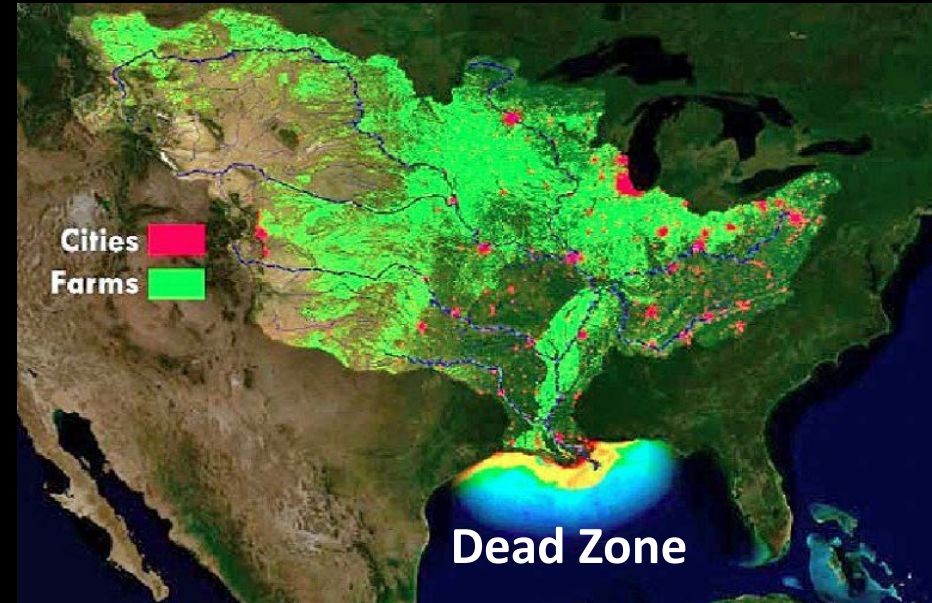
MAY 18, 2017 BY STAFF

MakeWayForTheMonarchs.org



A group of Michigan State University researchers say there is a nexus between large-scale deaths of Monarch butterflies and the application of the widely applied herbicide glyphosate.

Forest & Kim Starr



Dead Zone

NOAA

2002-09, 63 dolphin deaths a year.

BP Oil Disaster 2010

Seven months after: 125

All of 2011: 335

Since Disaster: Over 200 per year

Reuters in 2015



Daily Post, Sep 15, 2016

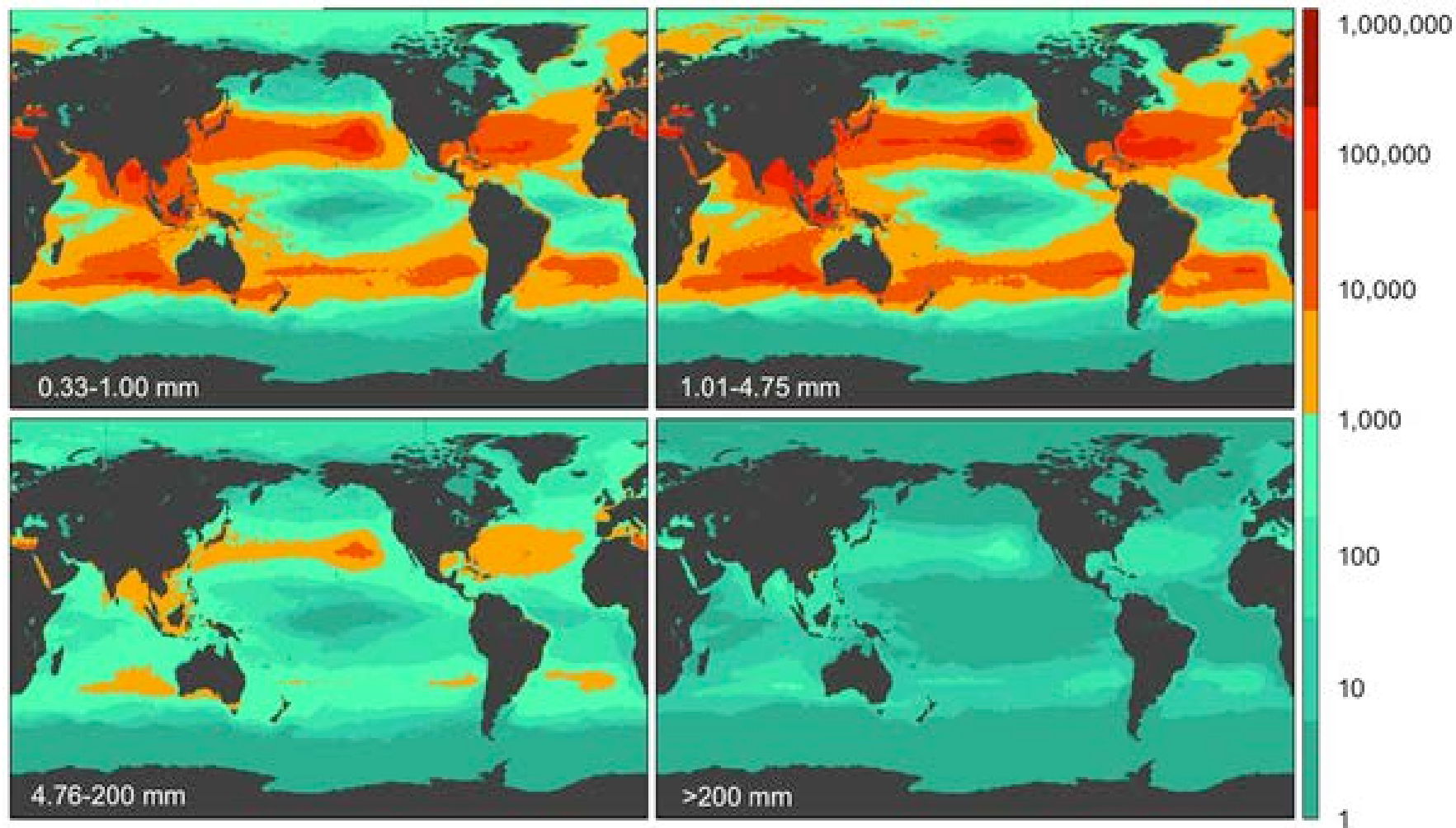
Loss of Sea Ice – CO₂ Pollution

Plastic Pollution in the Oceans

News.UN.org



Figure 2. Model results for global count density in four size classes.



Eriksen M, Lebreton LCM, Carson HS, Thiel M, Moore CJ, et al. (2014) Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea. PLOS ONE 9(12): e111913. <https://doi.org/10.1371/journal.pone.0111913>
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913>

Overexploitation

NEREUS PROGRAM: Ask an Expert:
Why is the global fishing industry given
\$35 billion in subsidies each year?

Image: "The Richard Arnold" by Marcy
Leigh, (CC BY-NC-ND 2.0)



Artisanal fishers are on the frontline of the
overfishing crisis (Mauritania, UN)



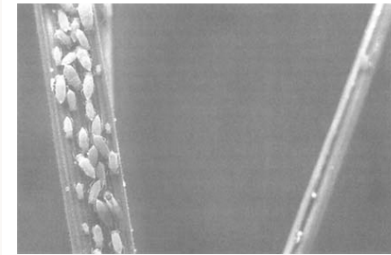
- **Subsidies encourage overexploitation**
 - E.g., Industrial vs subsistence fisheries
- **Can lead to extinction**
 - E.g., Bluefin Tuna in the Mediterranean is threatened
- [Video: UN Conference on Trade and Development - Fisheries Tragedy](#)
- [Articles: PEW Trust: Fisheries Subsidies, NEREUS PROGRAM: Fisheries Subsidies](#)

GMOs: Biodiversity & External Costs

- Direct impact on human health
 - **As of now, none, but...**
- x Encourage widespread use of herb- and pesticides
- x Encourage monoculture
- x Encourage industry monopoly
- x Triple whammy on Biodiversity
 - **Reduced genetic diversity of crops**
 - **Reduced population of related Wild Species**
 - **Kills other organisms: cascading effects! (Milkweed, Monarchs)**
- x Environmental Justice
 - **People who spray it have higher risk of cancer**

The Role of Monoculture

Intensive and continuous cultivation of uniform crop varieties enhances opportunities for pathogen or pest evolution and the natural selection of new strains able to attack their hosts successfully. In a monoculture of a single variety or genetically uniform group of



As Russian wheat aphids feed, the wheat leaves tend to roll around them, making them difficult to kill with conventional pesticides. Credit: U.S. Department of Agriculture, Agricultural Research Service.

Monsanto parent company Bayer faces thousands of Roundup-cancer cases after \$2 billion verdict

"We're not suing them for the fact that their product causes cancer. We're suing them because they didn't tell people that it causes cancer."



Climate Change and Ocean Acidification

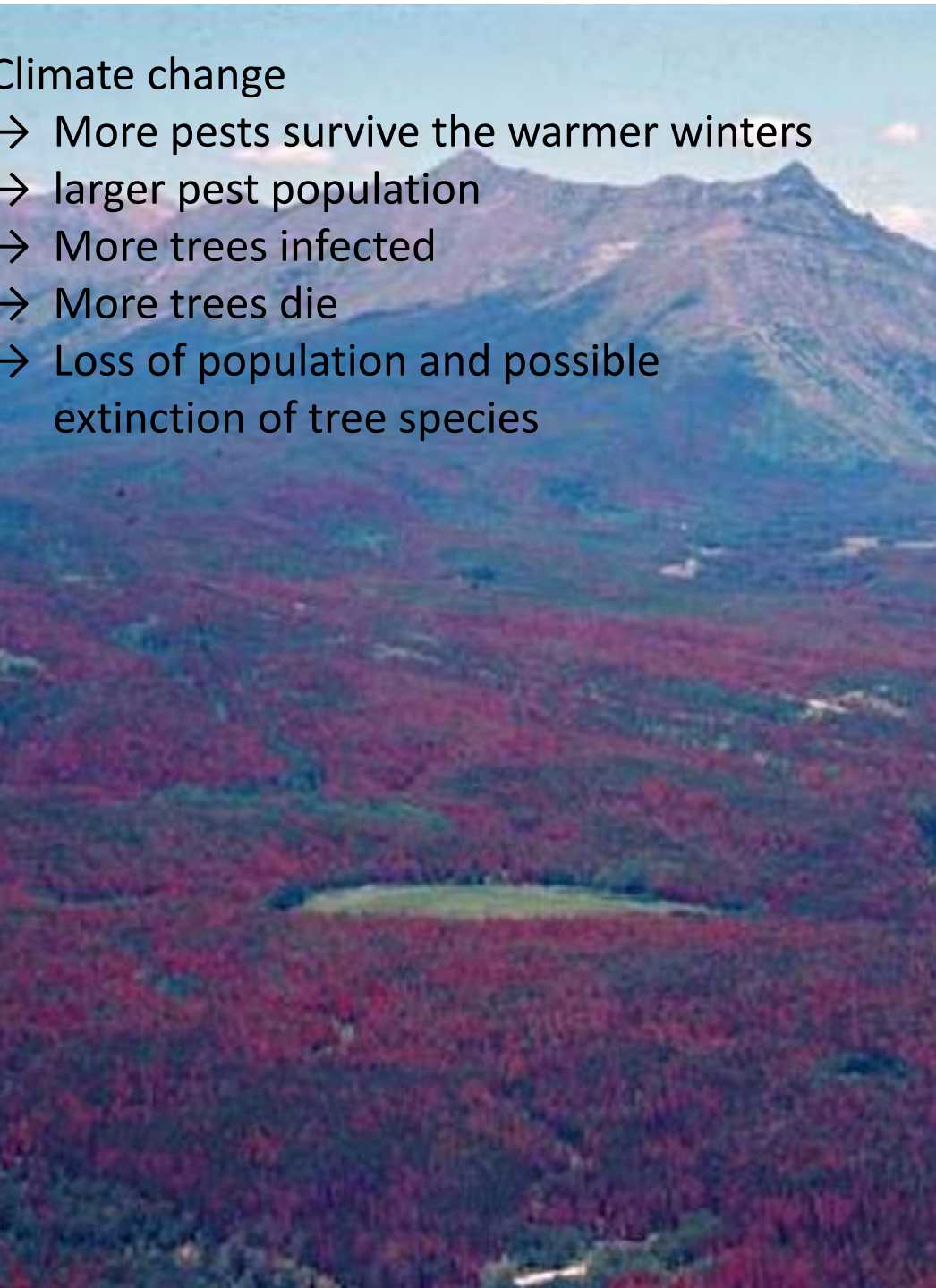
An underwater photograph showing a diver on the right side of the frame, swimming towards a large, healthy coral reef on the left. The water is clear and blue, with sunlight filtering through from above, creating a bright, sunlit area on the reef. The diver is wearing a black wetsuit and a blue BCD. The overall scene is vibrant and healthy, contrasting with the text about climate change and ocean acidification.

Loss of Terrestrial Life

Loss of Ocean Life

Climate change

- More pests survive the warmer winters
- larger pest population
- More trees infected
- More trees die
- Loss of population and possible extinction of tree species



The mountain pine beetle has thrived in interior B.C. thanks to warmer winters, recent droughts and an excess of mature lodgepole pines.

PINE BEETLE INFESTATION [VIEW](#)

As the outbreak spreads, the beetle is eating itself out of its traditional habitats and into new ones.



2001 2004 2006

PINE TREE REDUCTION [VIEW](#)

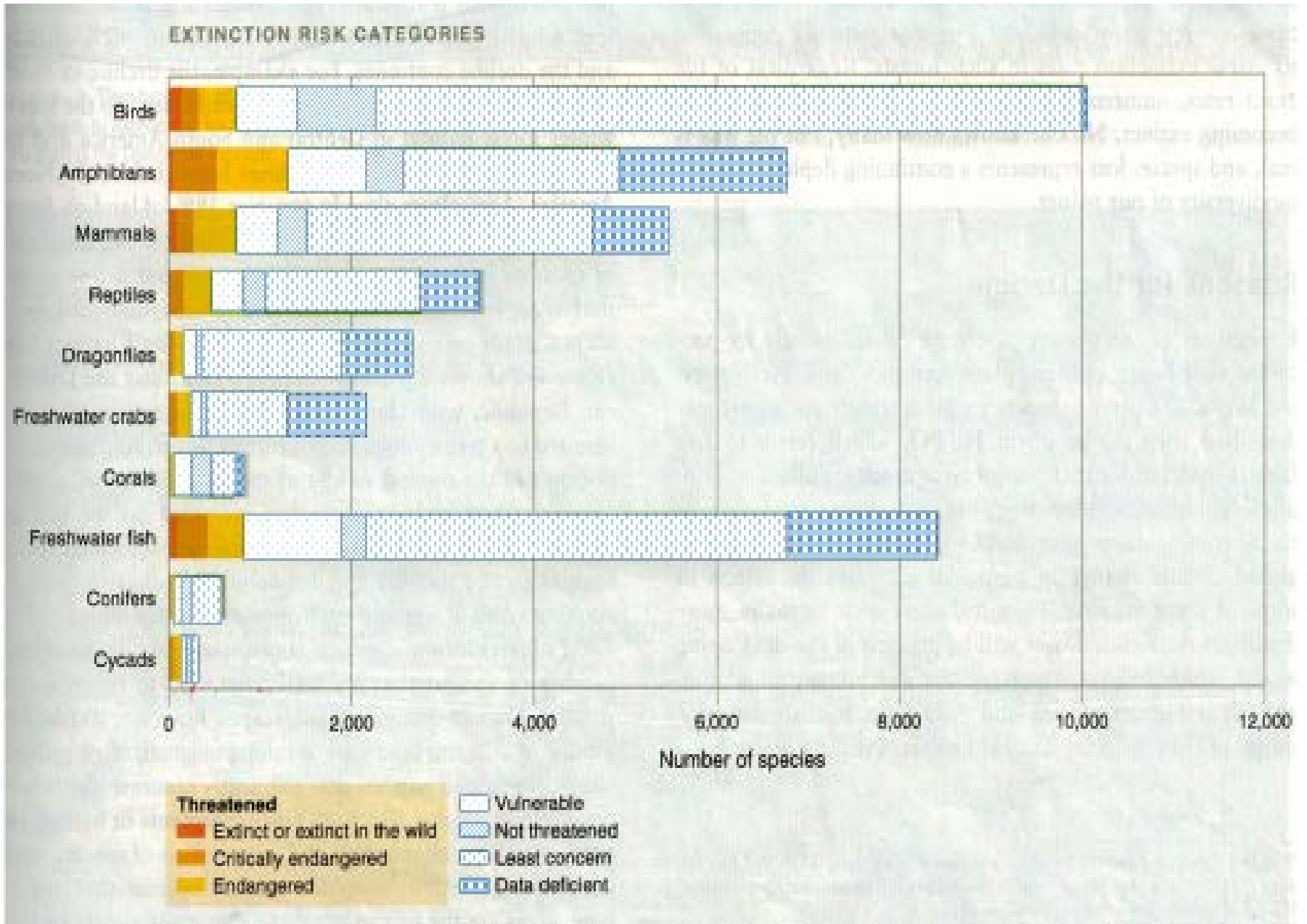
As the beetle sweeps across the province it leaves a trail of dead and dying trees in its wake, creating a rush to cut and process the trees before they lose their economic value.



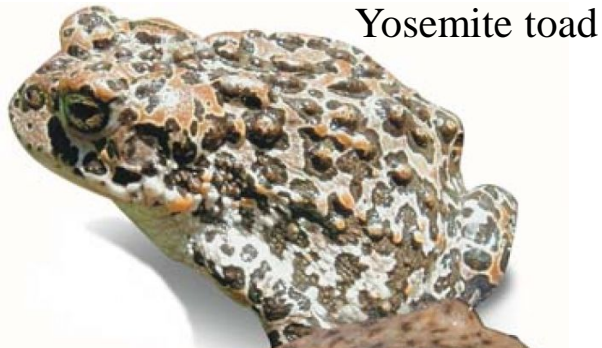
2004 2007 2010

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Who is going extinct?



Amphibians - Indicator Species



Yosemite toad



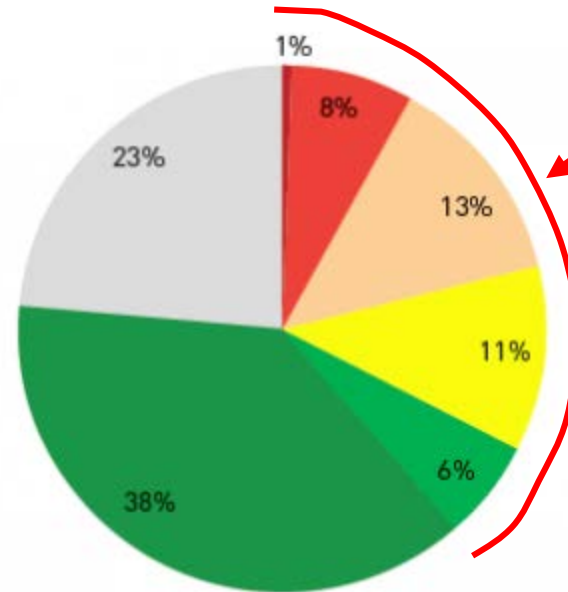
Yellow-legged frog



Siskiyou salamander



California Red-legged frog



About 40%
amphibians
in trouble!

Red List Category	Number of Species
Extinct	34
Extinct in the wild	1
Critically Endangered	455
Endangered	768
Vulnerable	670
Near Threatened	369
Least Concern	2236
Data Deficient	1382
Total Number of Species	5915

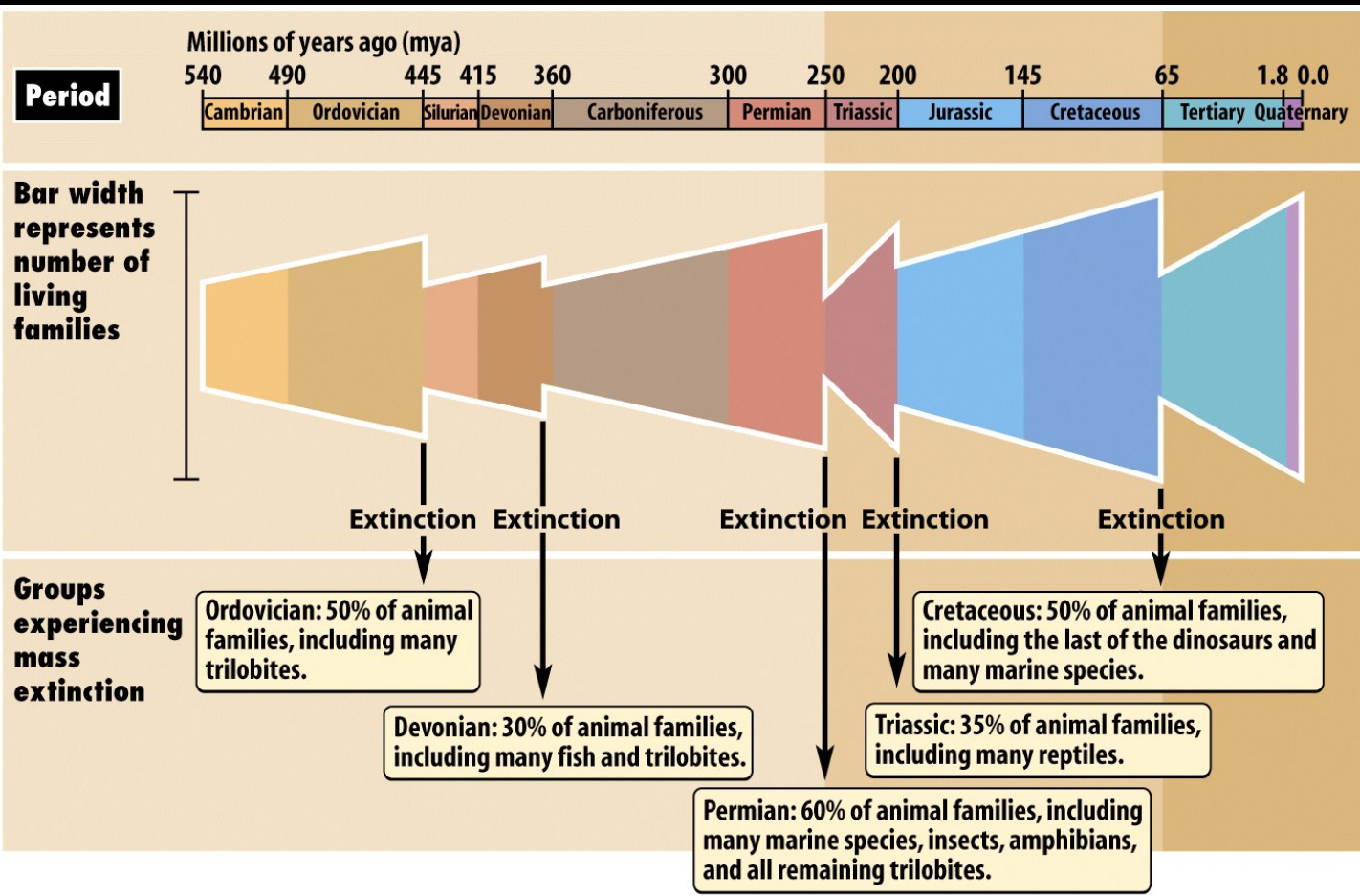
Summary of Red List categories for all amphibians. The percentage of species in each category is displayed on the pie chart (from Stuart et al. 2008)

Normal or Background extinction rate

Extinction is a natural outcome of Evolution

1 bird species goes extinct every 400 yrs (*Amer Mus of Natural History, 1998*)

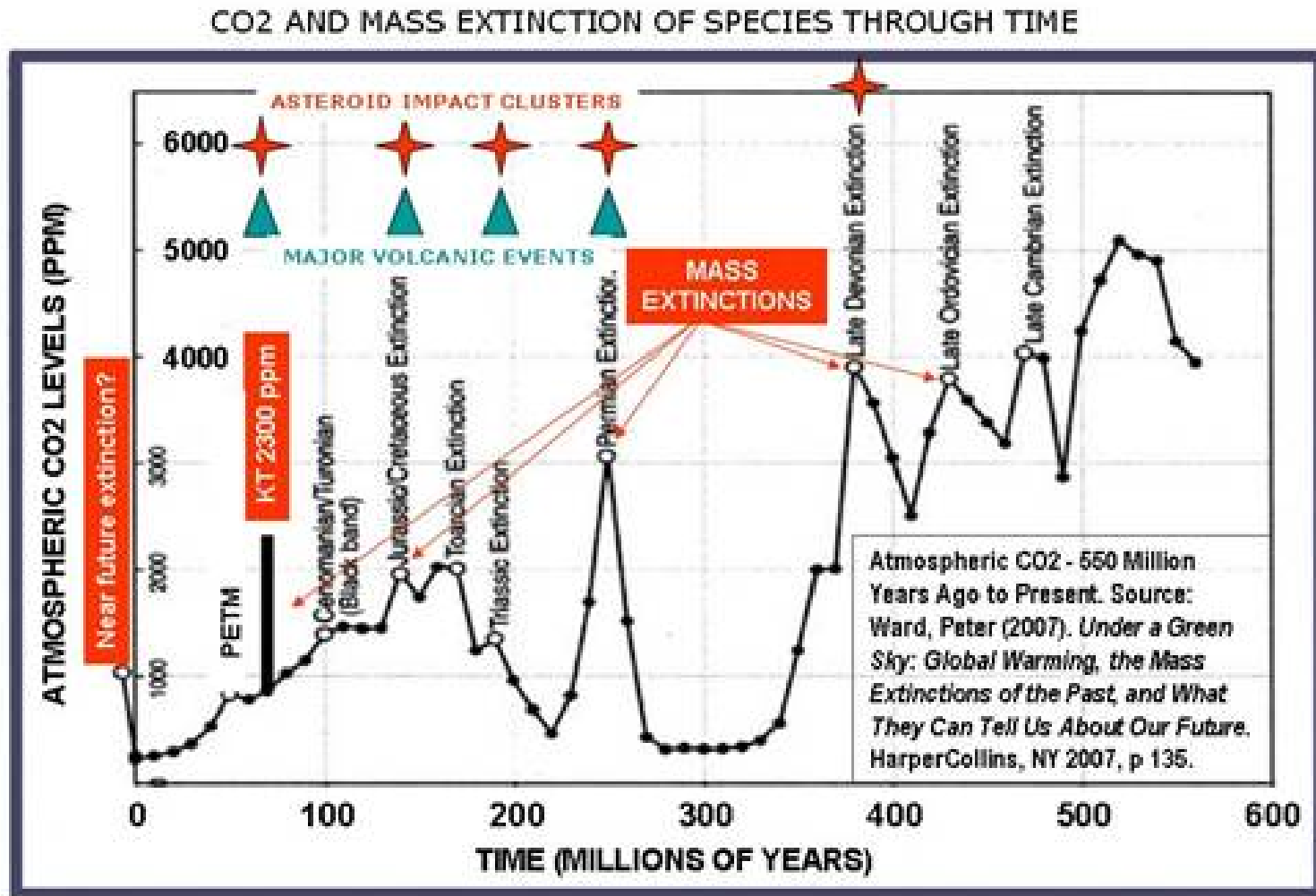
1 species in a million goes extinct every year (*"The Extinction Puzzle", Pimm S*)



Mass extinction
Rarely, extinction rate is much higher

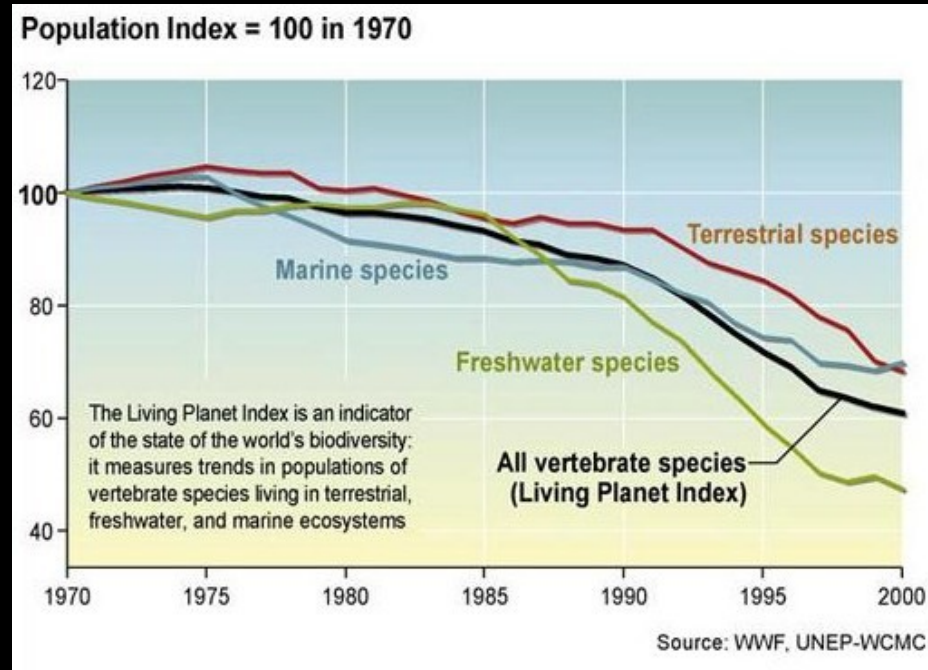
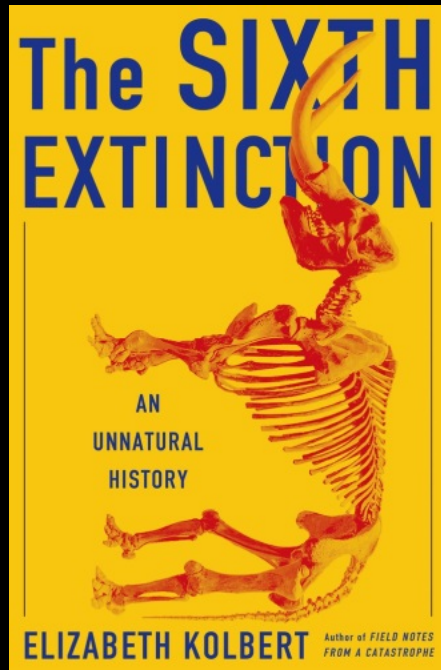
Five Mass Extinctions in Earth's past 540 Myr

Climate Change and Species Extinction



Mass Extinction Event = High atmospheric CO₂ levels

Are we in the 6th mass extinction?



- Species extinctions is at crisis level, why?
 - Adaptation much slower than rate of habitat loss
 - Leads to **cascading extinctions** through ecosystems

[Audio: UN Report on Biodiversity Crisis](#)




Solutions?

- Ecosystem protection and restoration
- Climate Policy
 - Inter-governmental Panel on Climate Change
 - Shift to Low to ZERO Carbon economy
 - Transition to alternate, renewable, zero carbon sources of energy!
 - The Green New Deal

Ecosystem Protection

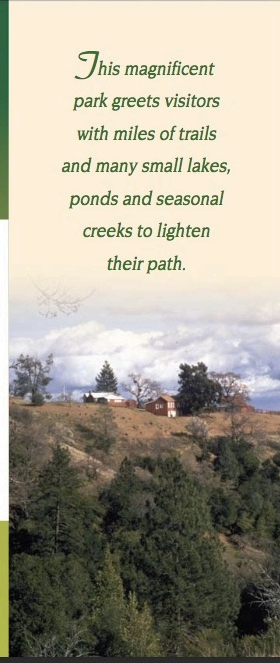


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SANTA CLARA COUNTY PARKS

Map showing various parks and trails in Santa Clara County, including San Francisco Bay, Palo Alto, San Jose, and Morgan Hill. A legend on the right lists park features like trails, lakes, and picnic areas. Contact information for Santa Clara County Parks is provided at the bottom right.

Class 13 Team Activity: Biodiversity Hotspots

<http://www.conservation.org/How/Pages/Hotspots.aspx>

1. How does Conservation International define a “hotspot”?
2. What does your team think of this definition?

<http://www.cepf.net/resources/hotspots/Pages/default.aspx>

Each team pick any one “hotspot”

3. Write the name of the hotspot that you picked.
4. List five species that are threatened or endangered.
5. List three threats that need to be addressed?
6. Discuss with your team and suggest three ways to address these threats.

**Meet back in the class room at 3:00pm
to share your Biodiversity Hotspot**

Topics for Final Presentation

- **Biodiversity Hotspots**
- **Renewable Energy** (focus on one type of renewable energy)
- **Energy Conservation** (e.g., Green building)
- **Pollution prevention** (e.g., air pollution, water pollution, plastic pollution, green chemistry)
- **Waste Management** (e.g., waste water treatment, solid waste management, recycling and its challenges)
- **Environmental Law/s**, regulations; Sustainability management plans (e.g., Toxic Chemical Substances Act)
- **Environmental Organizations** (e.g., EWG.org)
- **Transportation** (in relation to sustainable cities, global warming)
- **Soil** conservation, Sustainable agriculture
- **Food** systems and sustainability
- Or, any relevant topic of your **team's choice**