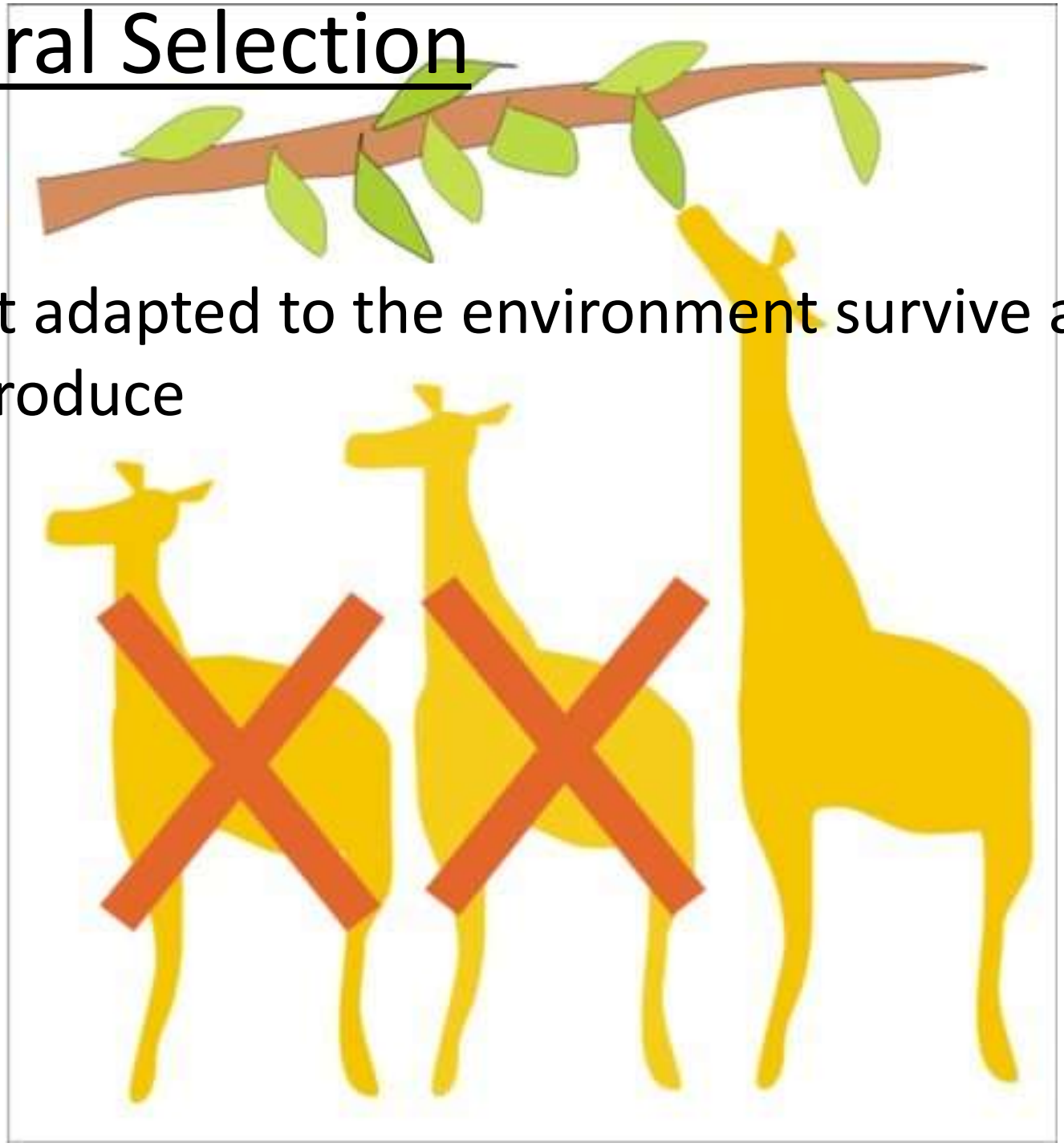
Unit 3 Key vocabulary

- Adaptations =
- <u>Any trait or behavior that helps an organism survive or reproduce</u>

Natural Selection

- best adapted to the environment survive and reproduce



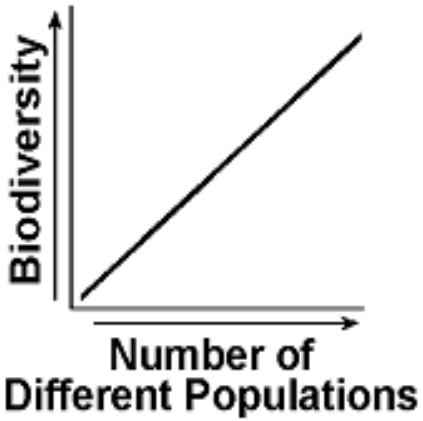
Natural selection → biodiversity

Define biodiversity

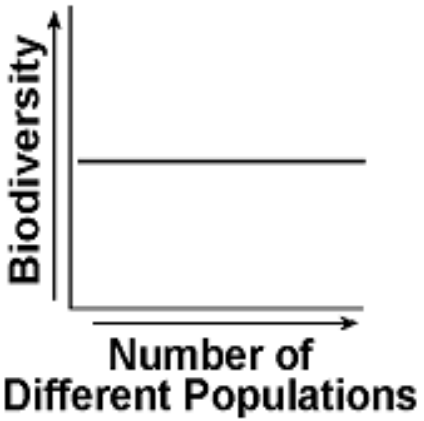
- Variety of life
- Variety of genetic material (DNA)
- more biodiversity = more stability

What is the relationship between biodiversity and number of different populations?

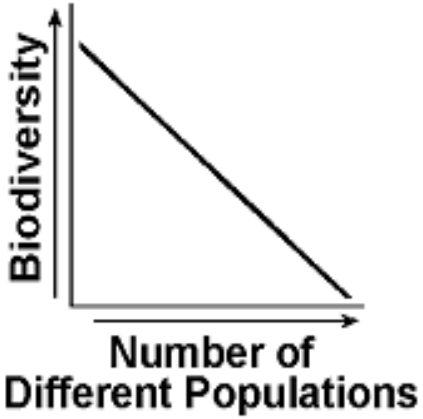
A)



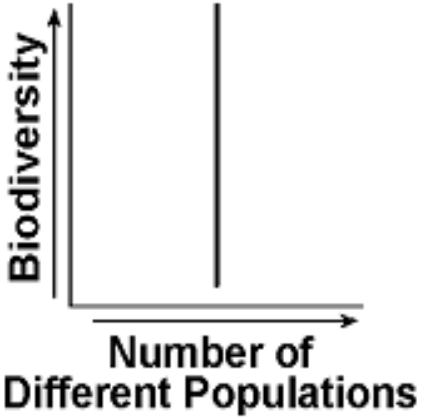
C)



B)

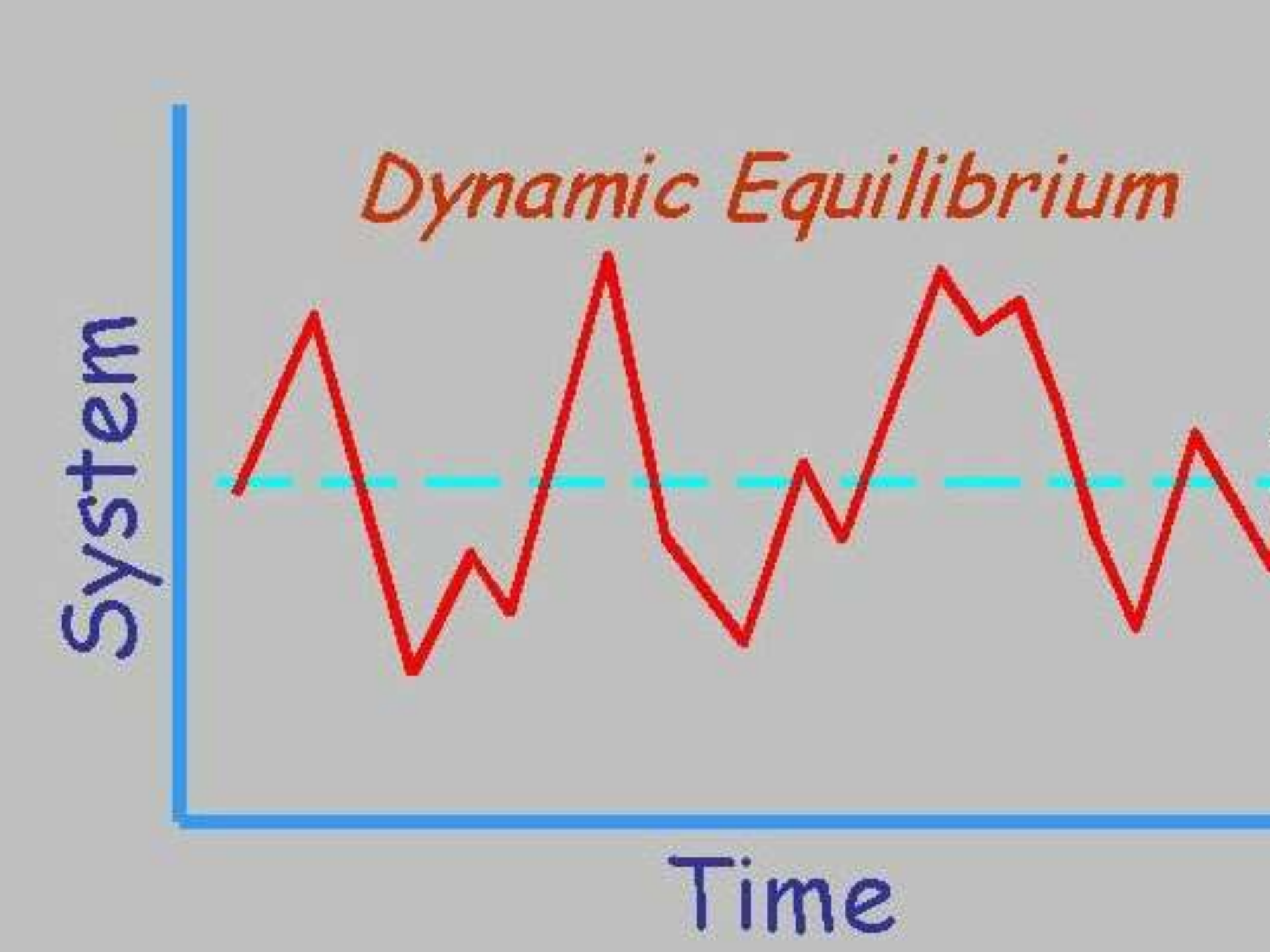


D)



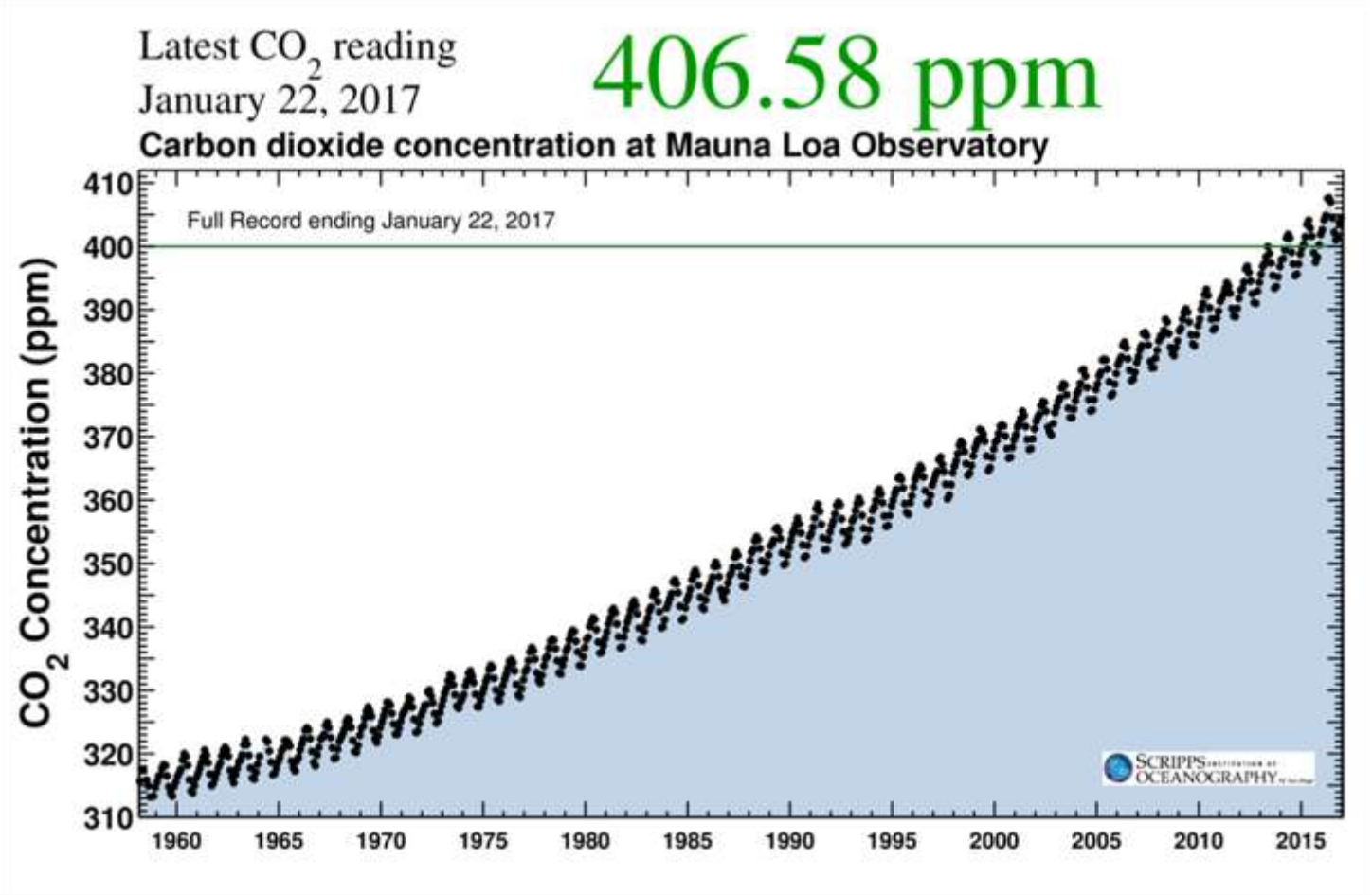
Unit 3 Key ideas

- Biotic and abiotic factors interact → dynamic equilibrium


Dynamic Equilibrium
System
Time

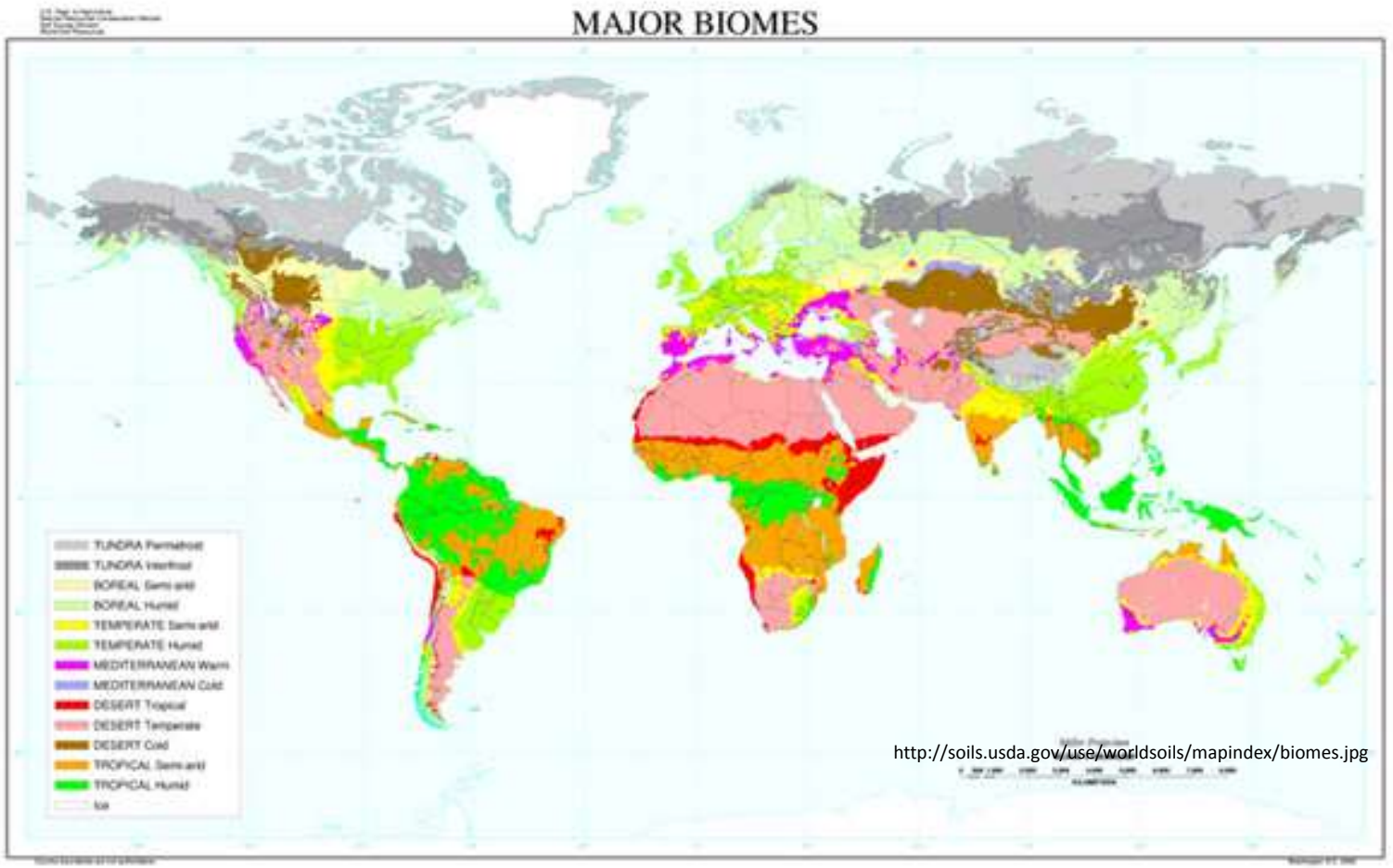
- Human decisions and activities often disrupt dynamic equlibrium

What has happened to the dynamic equilibrium of atmospheric carbon?



Biomes = Large geographic areas having similar ecosystems

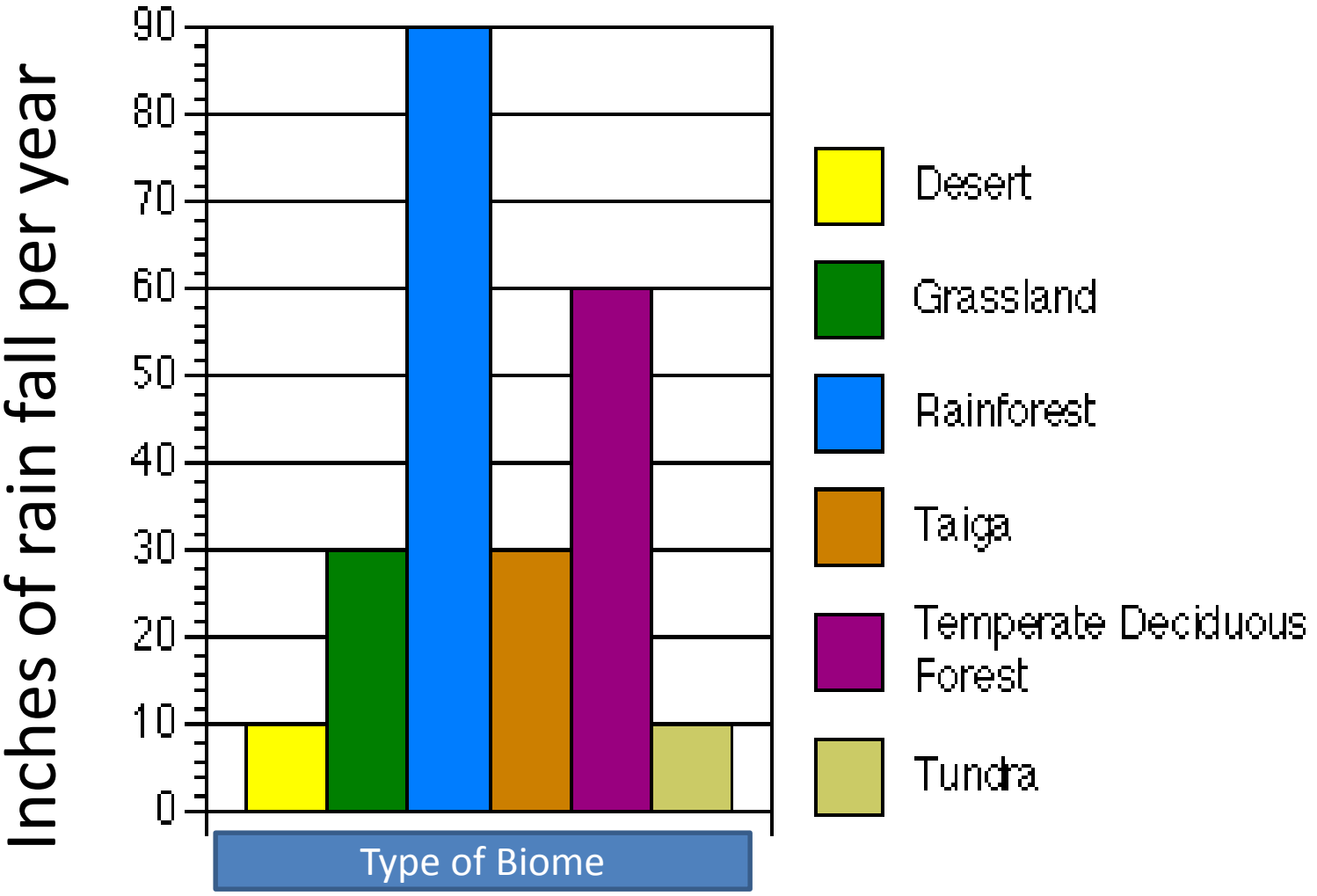
Ex: desert, tundra, grasslands, tropical rainforests…



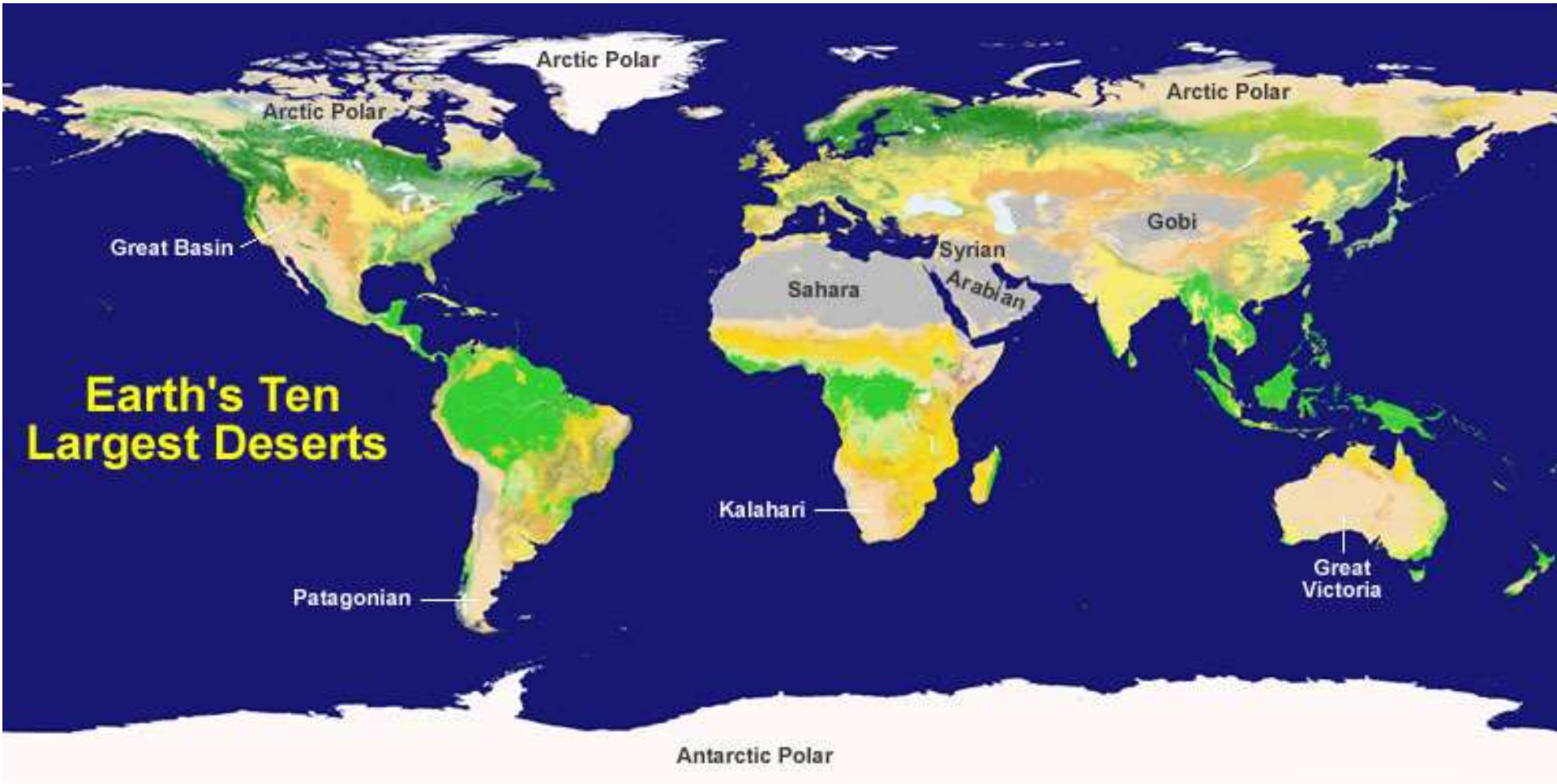
List physical characteristics →the type of biome (community) in an area

- Temperature
- Latitude
- Precipitation
- Altitude

Land Biomes


Inches of rain fall per year
90
80
70
60
50
40
30
20
10
0
Type of Biome
Desert
Grassland
Rainforest
Taiga
Temperate Deciduous Forest
Tundra

Deserts: 0-25 cm precipitation / yr



Desert adaptions

Desert adaptations

- Plants and Animals adapted to
  - Little water
  - Cold nights and hot days

Humans impact deserts

Overgrazing and climate change → desertification

Desertification = useful land converted to deserts

- Human activities → increasing size and number of deserts

Extra heat evaporates water from the ocean and pulls moisture even more quickly from the soil

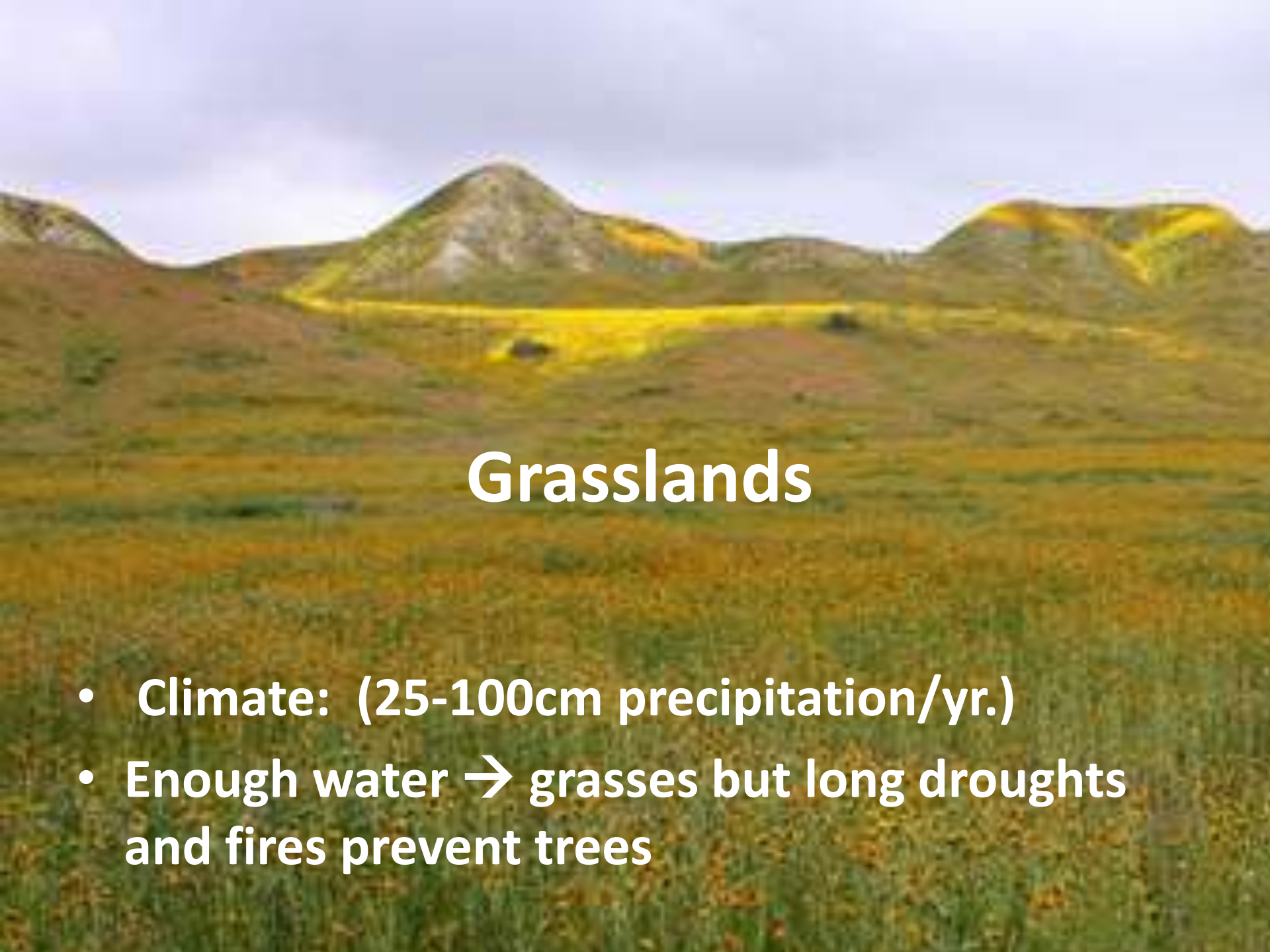
An Inconvenient Truth © 2006 by Paramount Classics, a Division of Paramount Pictures. All Rights Reserved.

© 2010 Julien Goldstein/The New York Times/Redux

Causes of desertification

- Burning fossil fuels → Climate change

- Overgrazing = too many farm animals eat too much plant material



Grasslands

- Climate: (25-100cm precipitation/yr.)
- Enough water → grasses but long droughts and fires prevent trees

Maintained by fire

Seasonal droughts

Herbivores

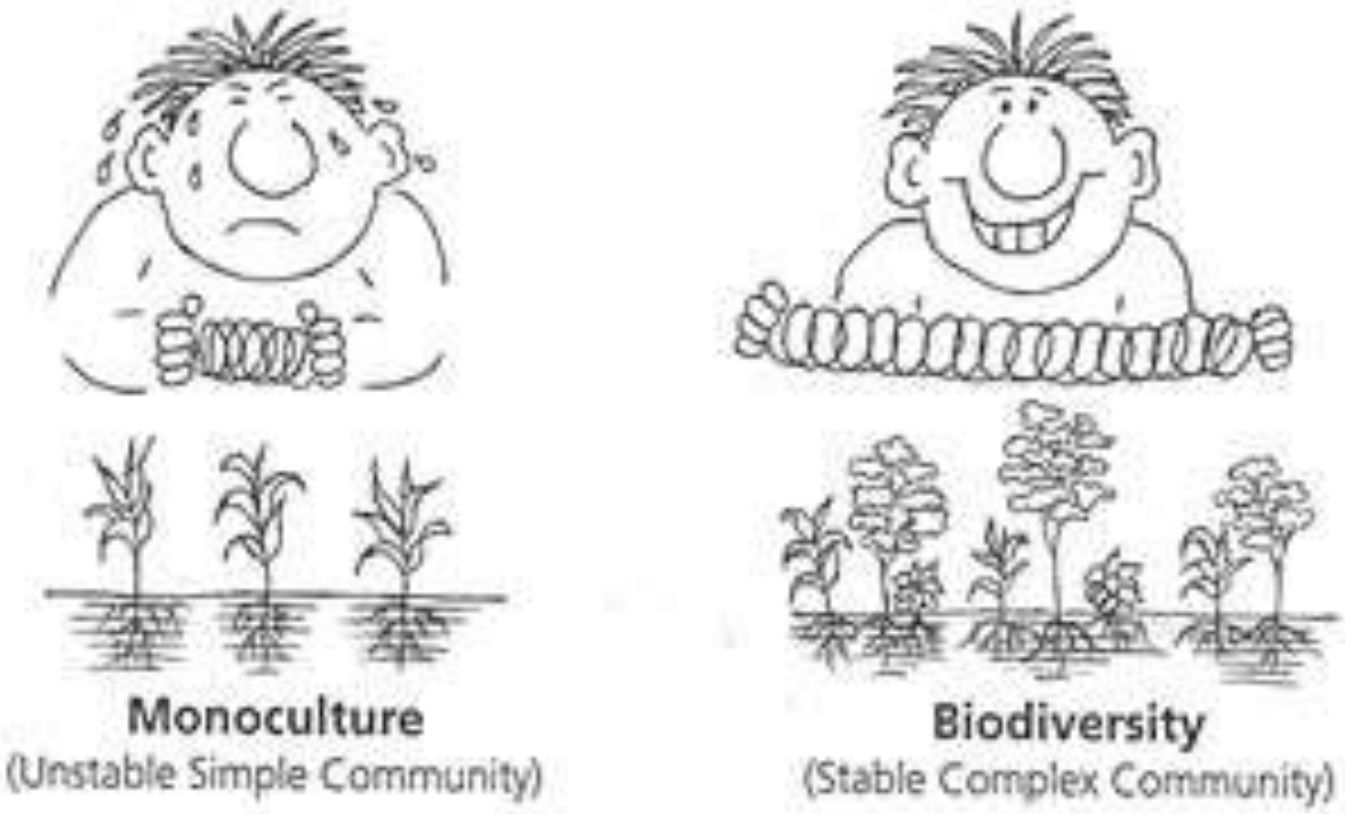
American Prairie

More than 90% of US prairies have been lost → agriculture →

Nebraska

Why is this a problem?

- <u>Loss of biodiversity = loss of stability</u>



Ohio

Oklahoma and Texas

Overgrazing → desertification and

Removal of native grasses → increased erosion and loss of topsoil

- List 2 reasons why the dust bowl happened

- Name 2 ways to prevent a dust bowl

US Dust Bowl of the 1930's

Solutions = plant cover crops

Plant wind breaks (shrub borders)

Tundra

- Found at high latitudes and high altitudes

High altitude → alpine tundra

snow

Permafrost = permanently frozen ground

Climate change → melting permfrost
→ poor drainage → boggy conditions

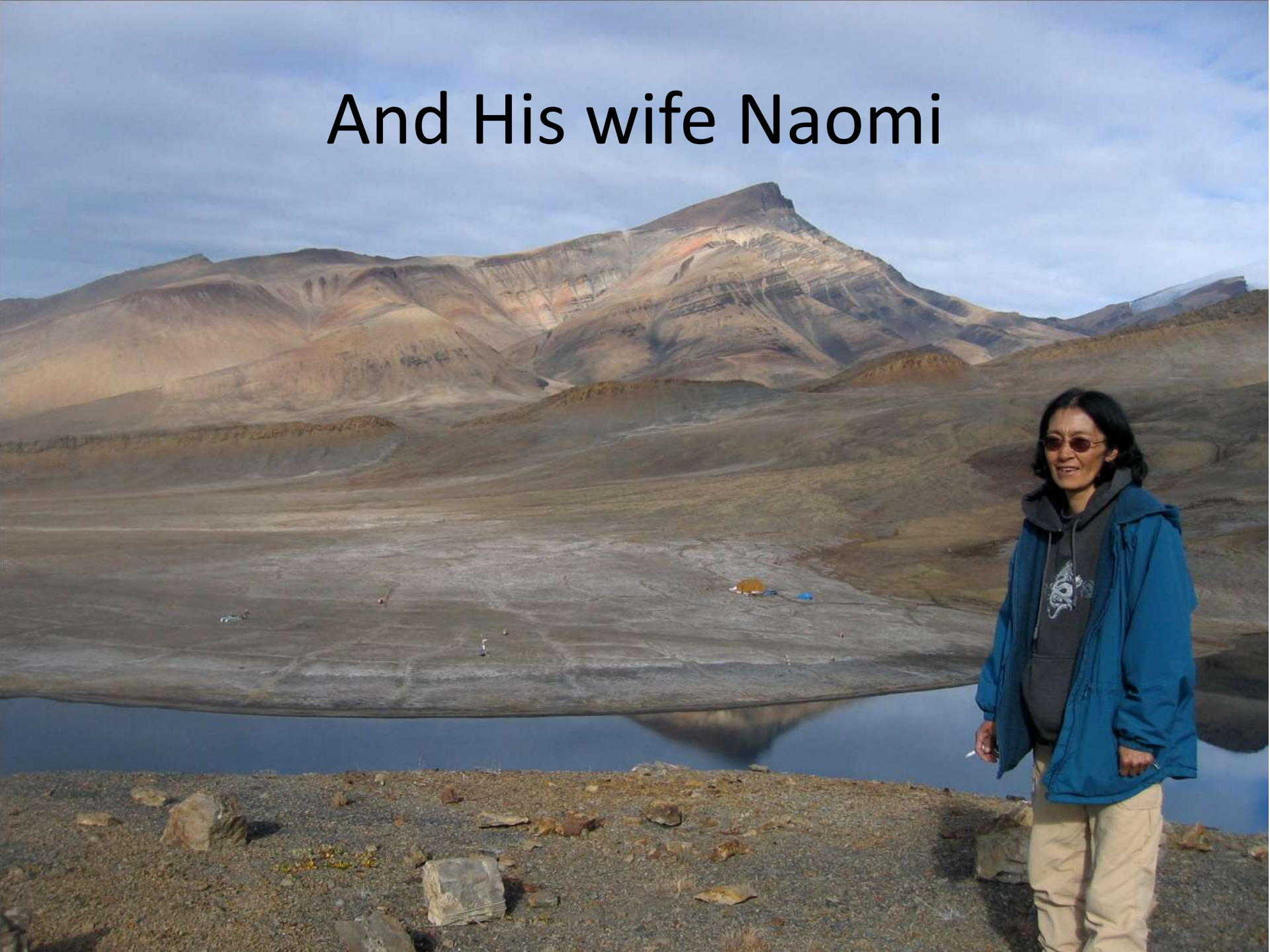
Boggy conditions → <u>methane</u>

Guiding question for slideshow

- Life in the tundra is challenging
- How have Inuit peoples of the Canadian arctic managed to survive for generations

Meet Elijah Tigullaraq

And His wife Naomi



They live in Pond Inlet in the Canadian province of Nunavat

http://www.turtletrack.org/Issues04/Co05222004/CO_05222004_NunavatElders.htm

TUVAQ

MERCURY
MERCURY

FUBU

Tundra Communities

- Autotrophs = Only low lying plants
  - Lichen (mutualistic relationship between a fungus and an algae) are a favorite food of caribou
- Animal kingdom adaptations = often migrate or hibernate underground during the winter
- Lots of insects in summer due to boggy conditions

©2005 Khanjan Mehta

Human Impacts on tundra

- Development and overuse → long lasting effects because the tundra has very slow rates of decomposition and nutrient cycling

©2005 Khanjan Mehta

Ex: Injury from oil drilling

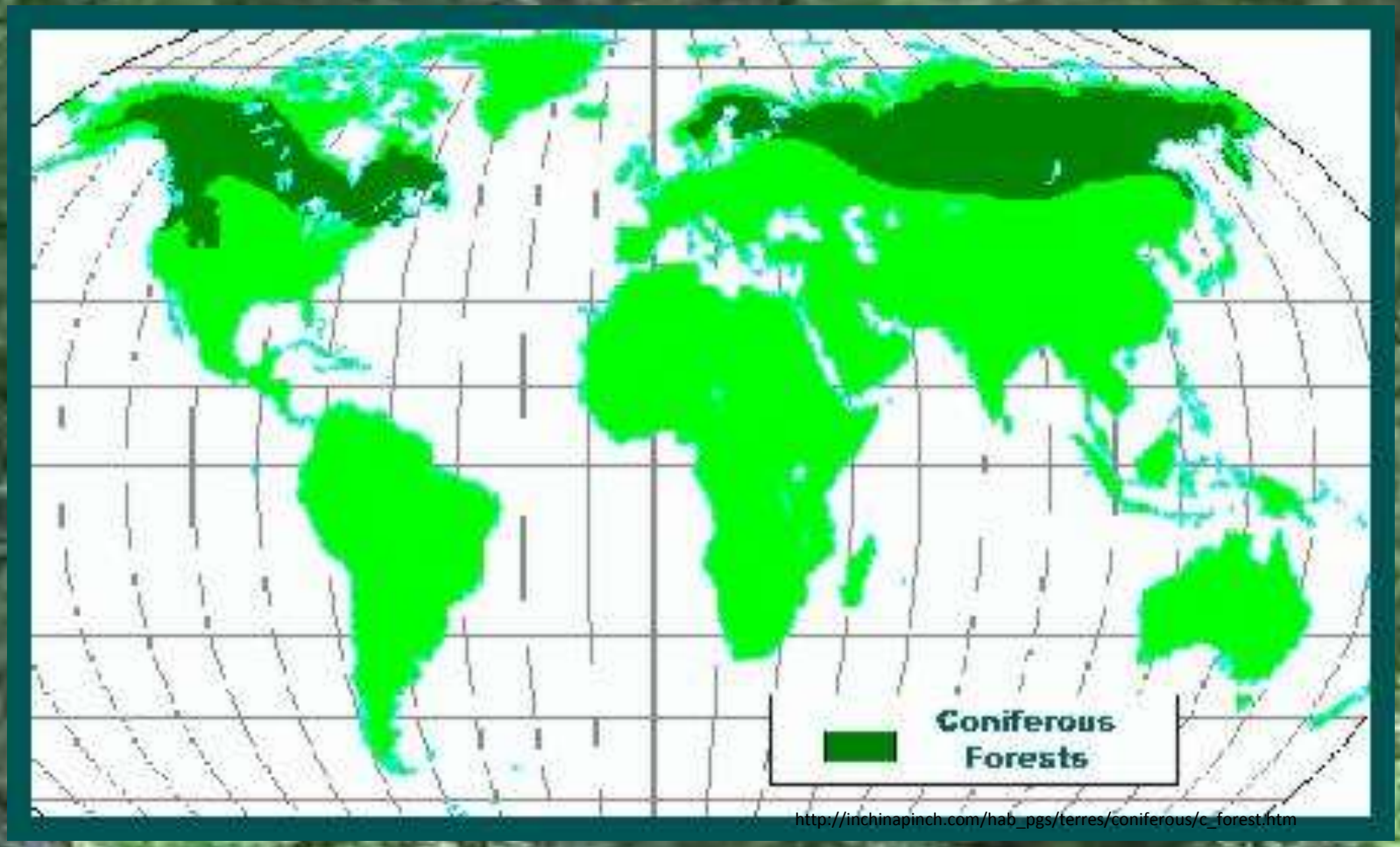
Hiking can destroy alpine tundra

- Global warming → melting permafrost → Releases methane gas → increased global warming (positive feedback mechanism)

Coniferous forests

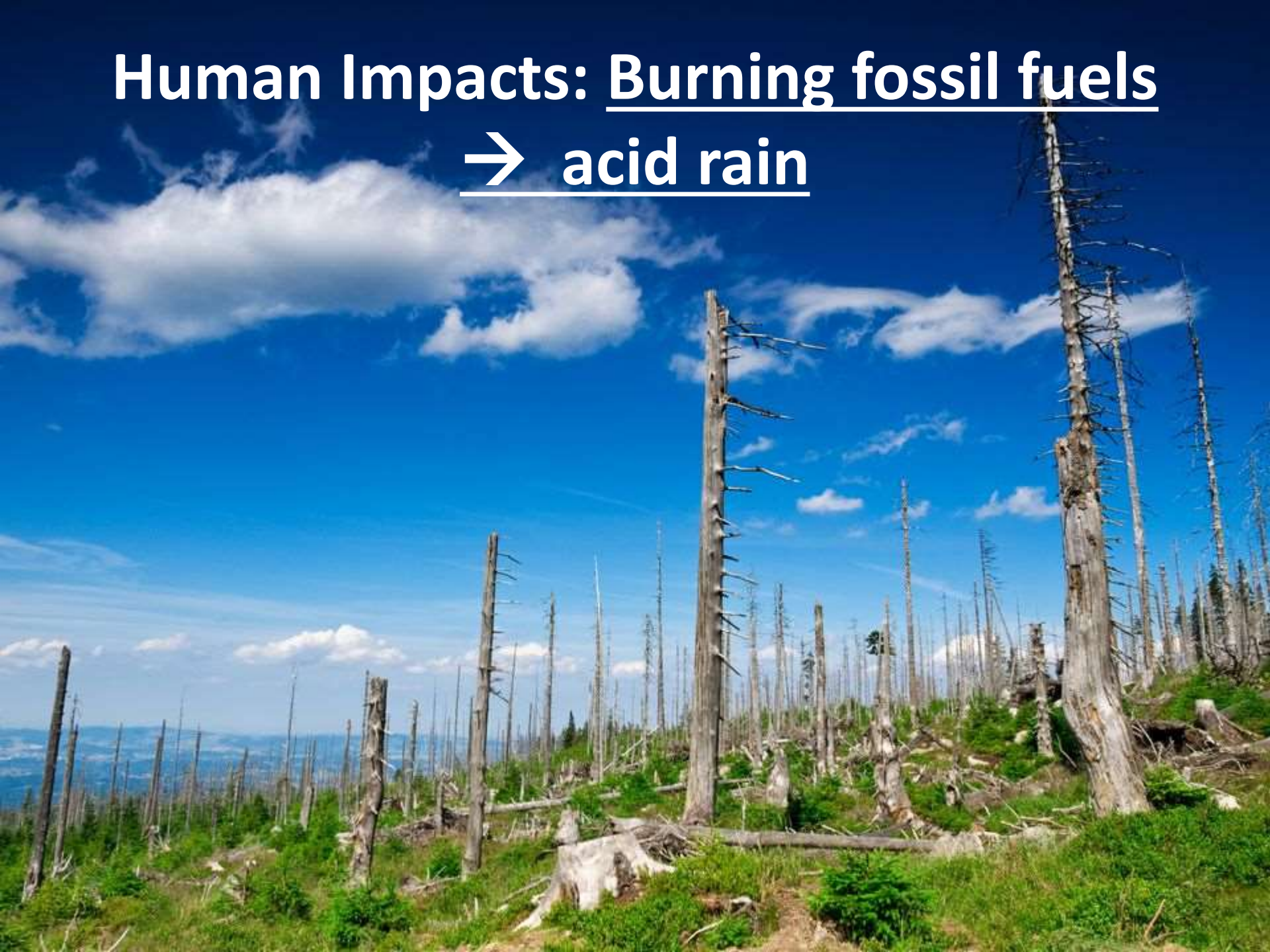
- Also called taiga or boreal forests
- Plants: Fir, spruce, pine, larch, and other short growing trees and shrubs
- Animals/Fauna:
  - Large herbivores (moose, elk),
  - small herbivores (snowshoe hare, squirrels),
  - predators (wolves, foxes, bears, lynx, weasels, owls),
  - many insects and birds in the summer

Largest land biome



http://inchinapinch.com/hab_pgs/terres/coniferous/c_forest.htm

Human Impacts: Burning fossil fuels → acid rain



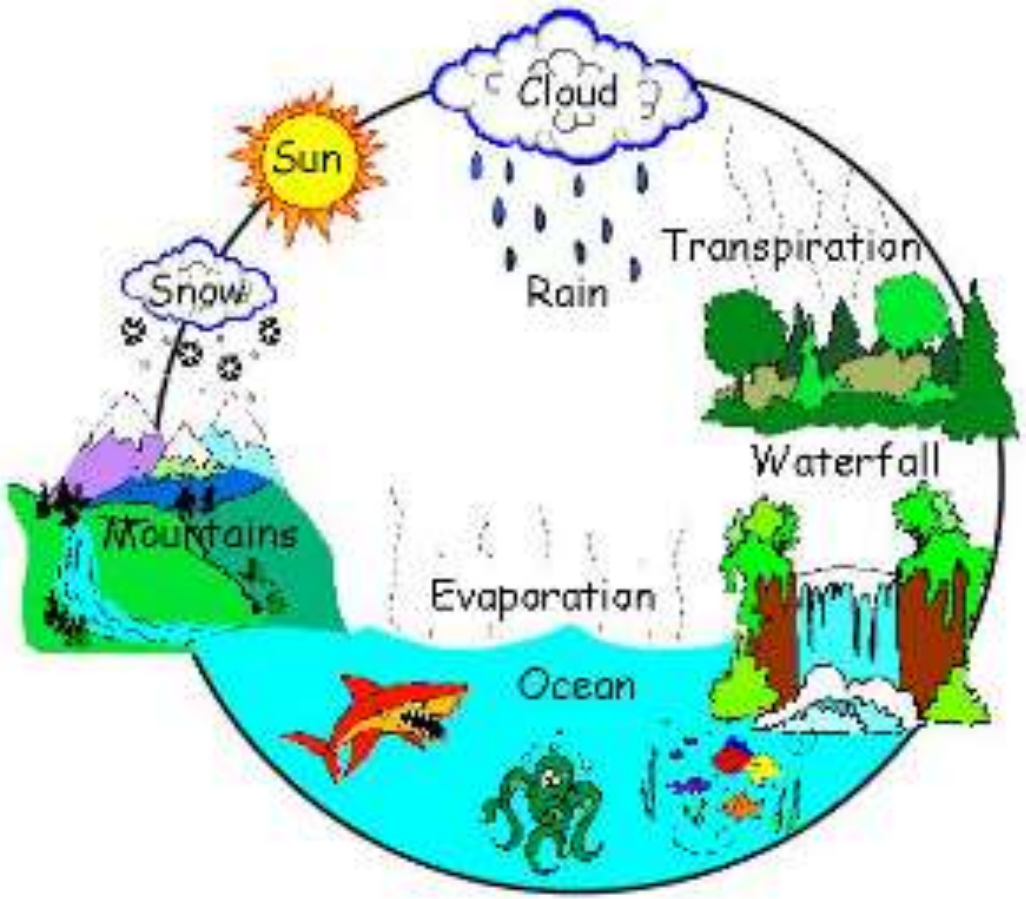
Deforestation → loss of habitat and climate change

Deciduous Forests

- Plants: Broad leafed plants (maple, beech, birch, oak…)
- Animals: adapted to seasons (hibernation, migration)
- Human Impact: acid rain, logging, most carnivores eliminated by over-hunting

Deciduous trees play a major role in the water cycle

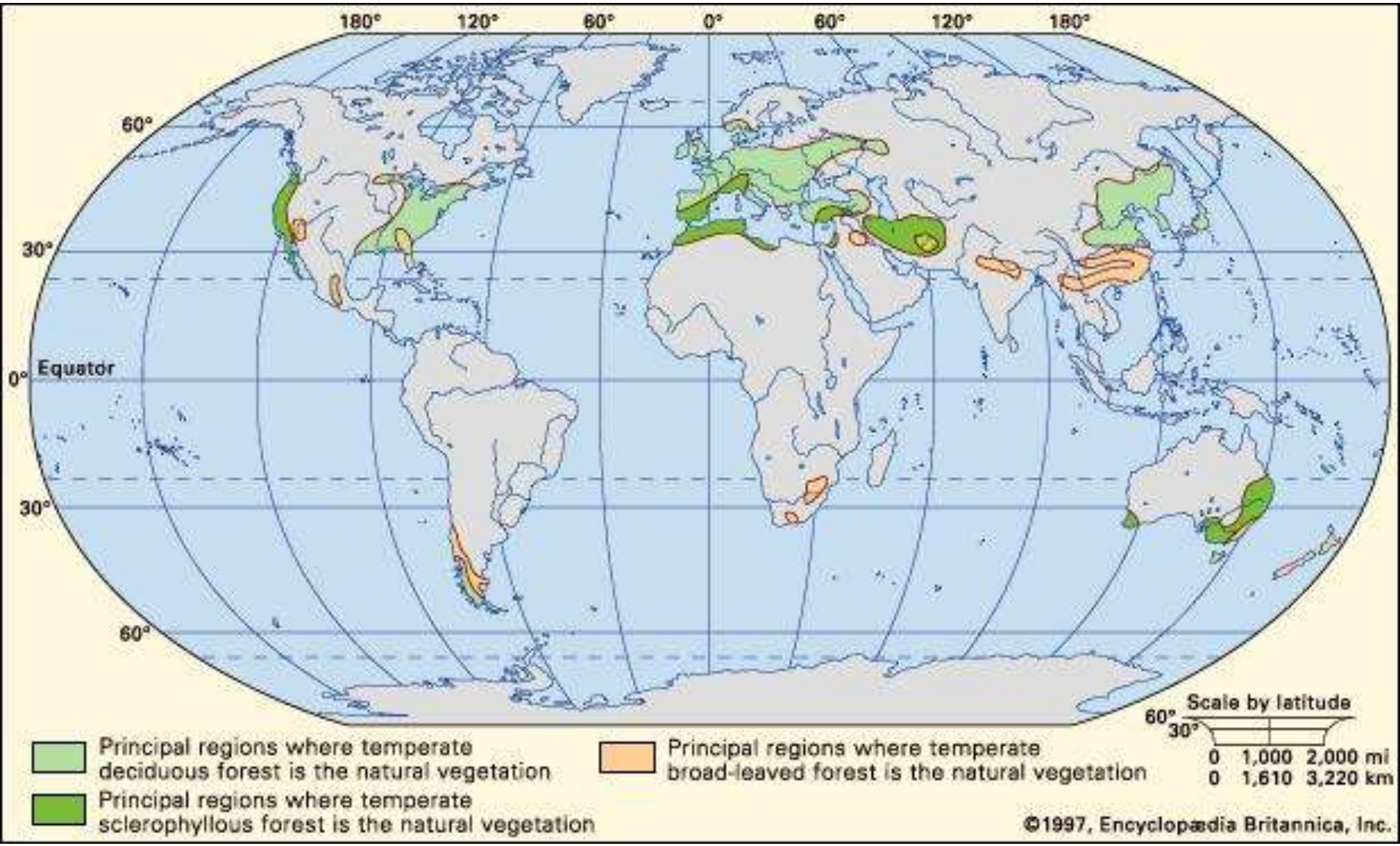
water loss from plants = _____



http://water.tamu.edu/watercycle.html

Beak adapations

Temperate rainforests of the world

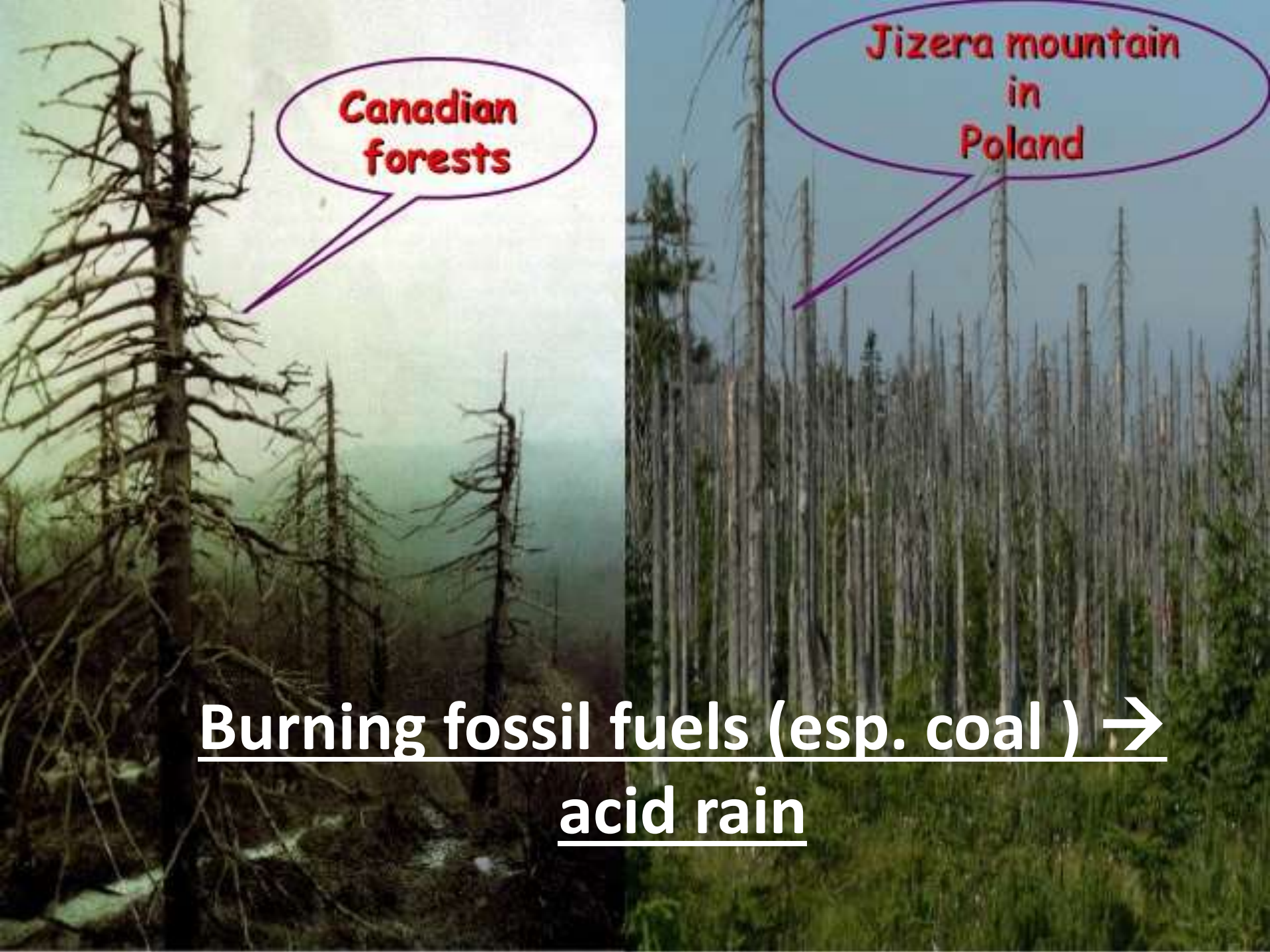


Temperate Rainforests (NW coast)

- Plants:
  - Pine, spruce, fir, vines, mosses, lichen, ferns
- Animals:
  - Herbivores: squirrels, mule deer, elk,
  - Predators: bear and eagle

Human Impacts

Logging → habitat loss and extinctions



Burning fossil fuels (esp. coal) → acid rain

Acidity Effects on Baby Trout

Abnormal

pH 5.0

Normal

pH 5.5

pH 4.6

C. Ophardt, c. 2003

Example of a temperate forest = Tongass National Forest

- 17 million acres
- World's largest temperate rain forest
- Resource use vs. conservation

USDA Forest service tries to balance resource use with conservation

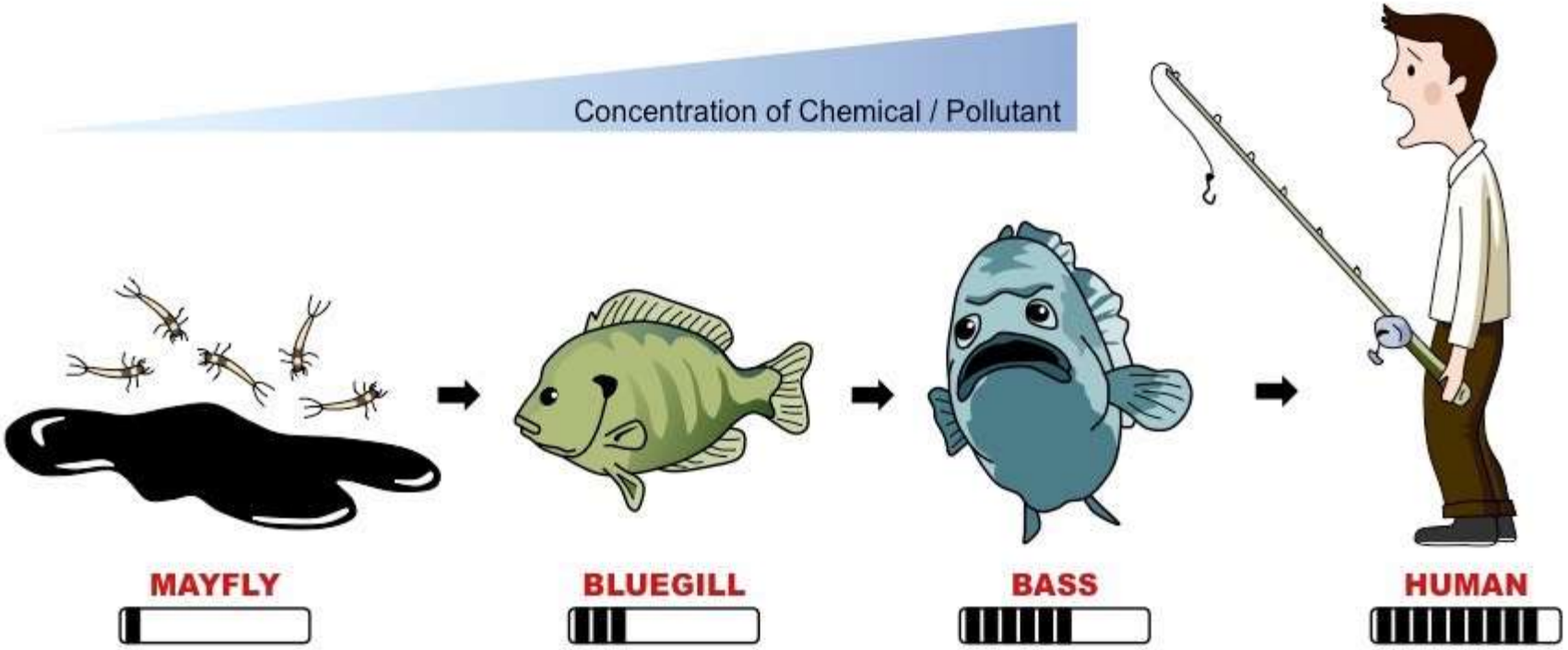
Northeastern's School for Field Studies 1989

Why were eagles extinct in the lower 48 states in the 1980s

Pesticides like DDT

D.D.T.

Problem = Biological Magnification



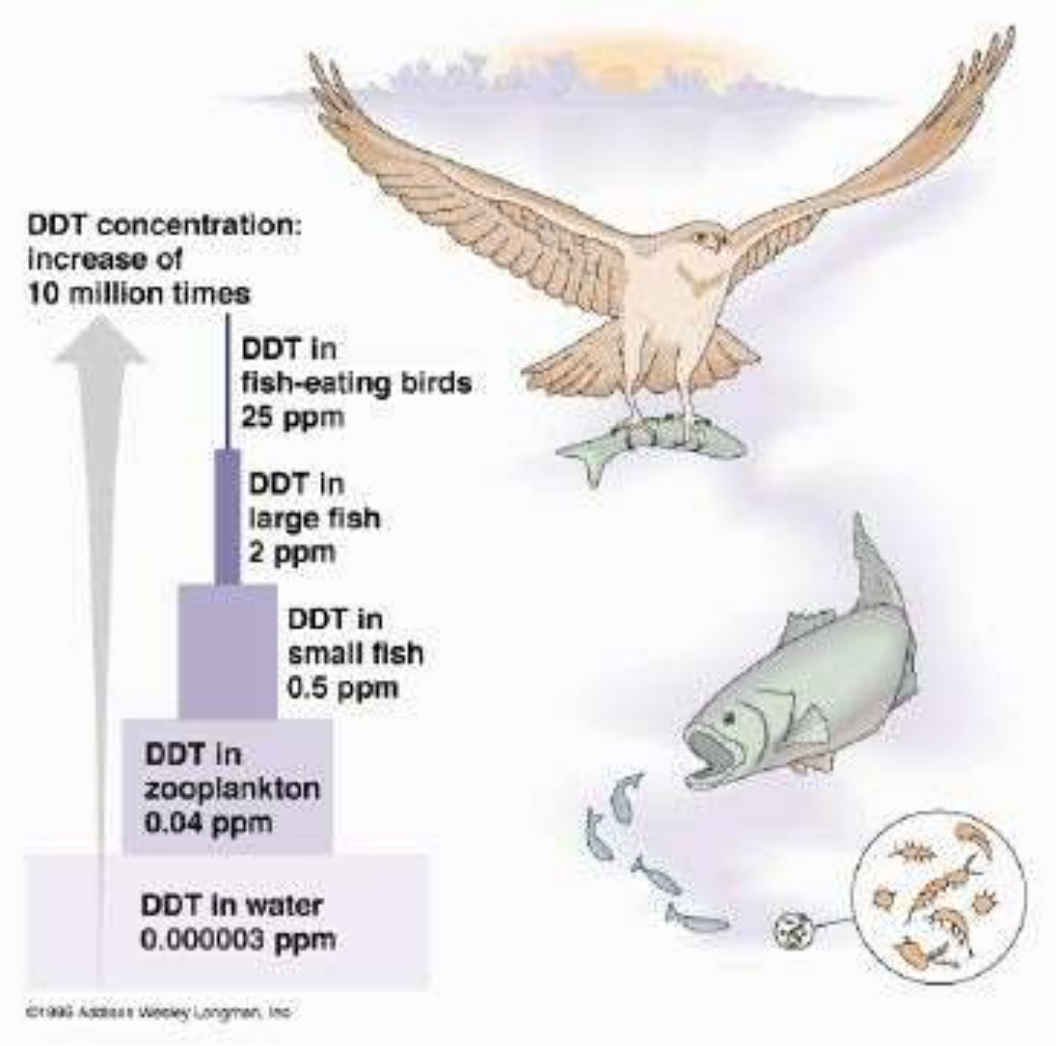
Some pollutants build up as they move up the food chain

Ex: DDT = pesticide that kills insects

- Sprayed to kill mosquitoes
- Mosquito consumers get lots of DDT

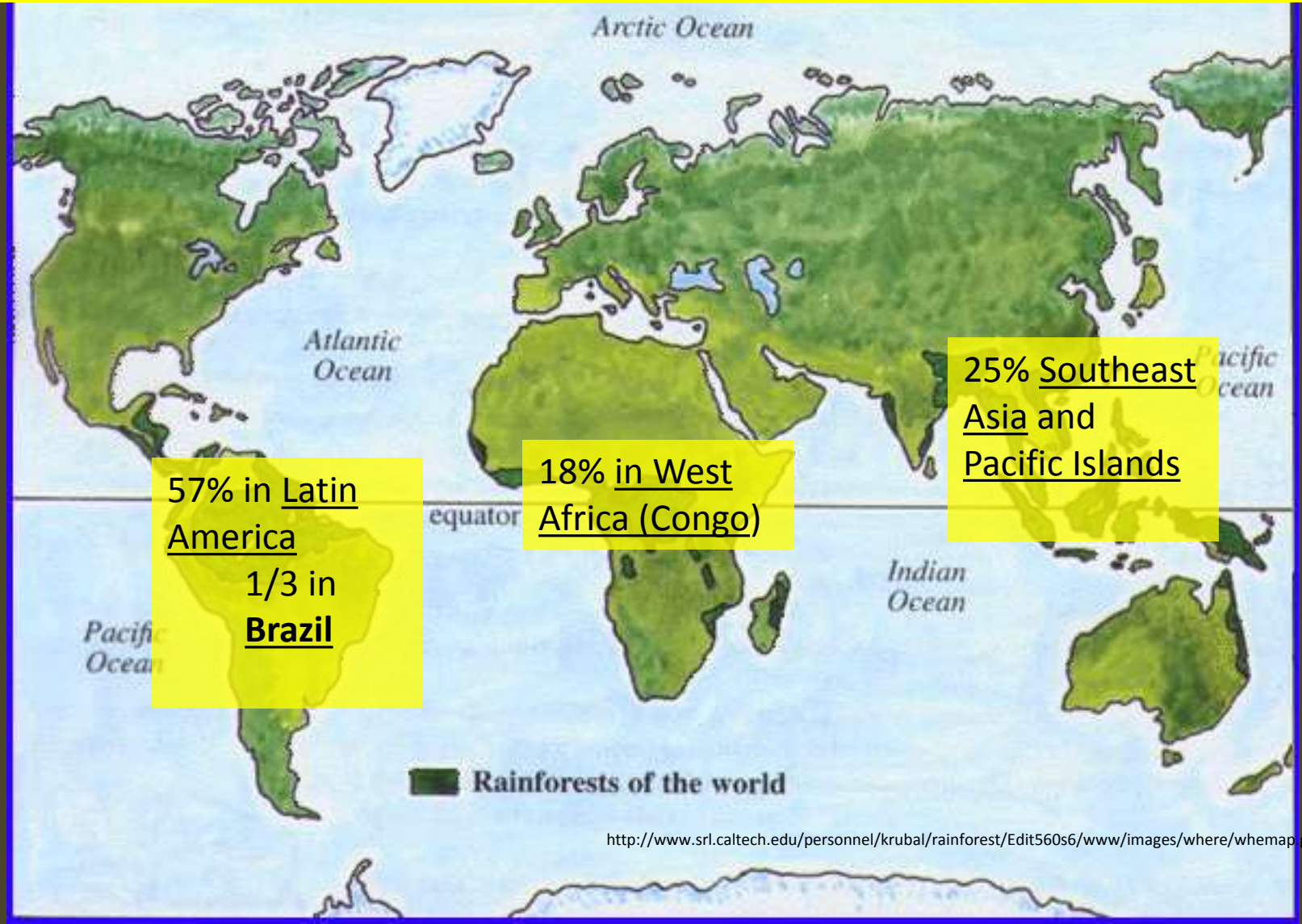
Top predators consume concentrated amounts of toxins
Bald eagles almost went extinct

Title: Biological magnification



READ ARTICLE IN NOTES ABOUT HOW BALD EAGLES WERE SAVED AND ANSWER QUESTIONS

Tropical rainforests of the world



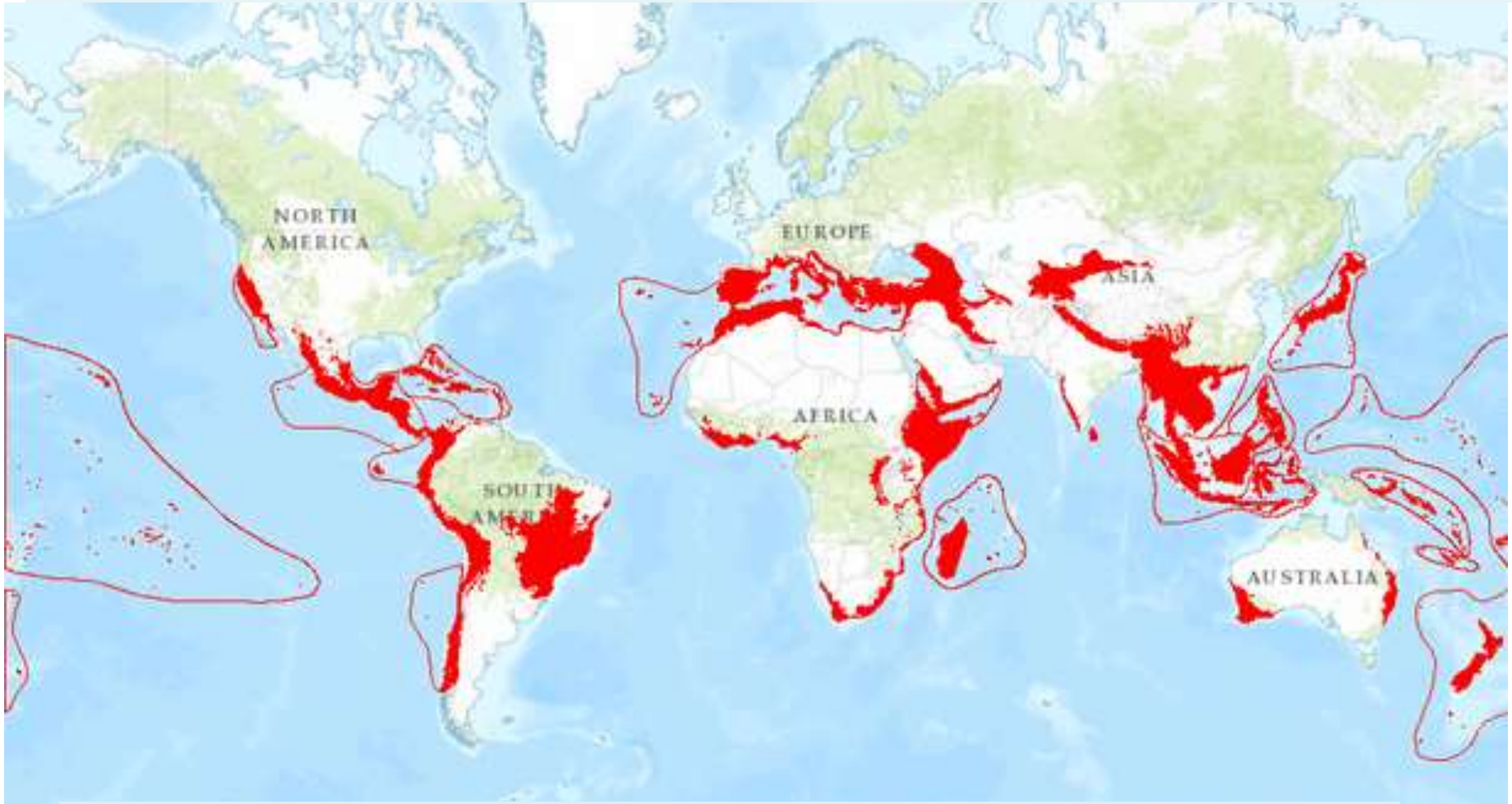
57% in Latin America
1/3 in **Brazil**

18% in West Africa (Congo)

25% Southeast Asia and Pacific Islands

http://www.srl.caltech.edu/personnel/krubal/rainforest/Edit560s6/www/images/where/whemap.gif

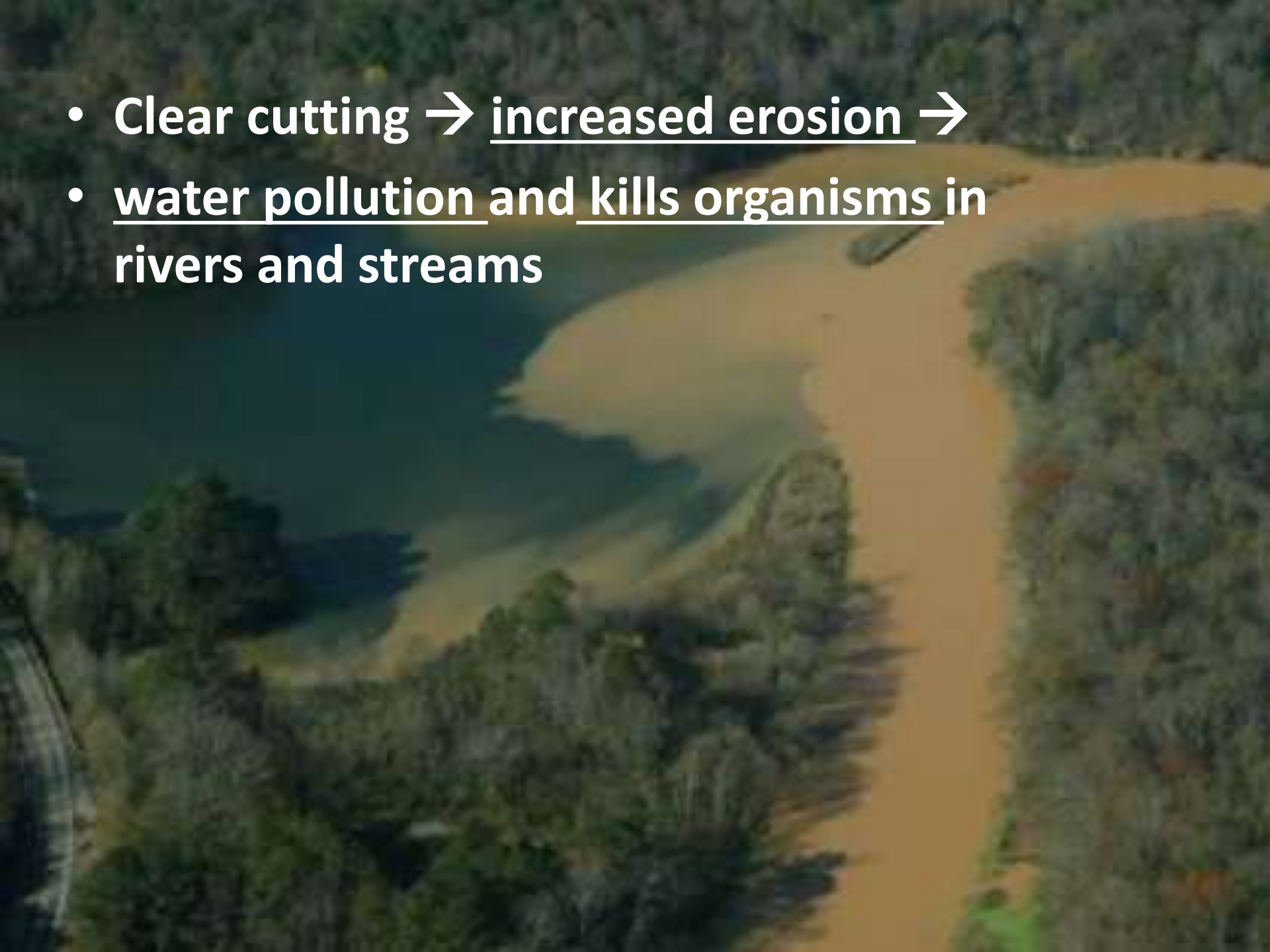
- **Biodiversity** = lots of different species



Tropical rainforests = Biodiversity Hotspots

Human Impacts

- Deforestation and over-harvesting →
  - Most exploited and endangered biome
- Rainforests are cleared for agriculture, logging, and mining →
  - loss of topsoil and depletion of soil nutrients
- Many organisms that live in rainforests are headed towards extinction



- Clear cutting → increased erosion →
- water pollution and kills organisms in rivers and streams

Why we should care about extinction rates

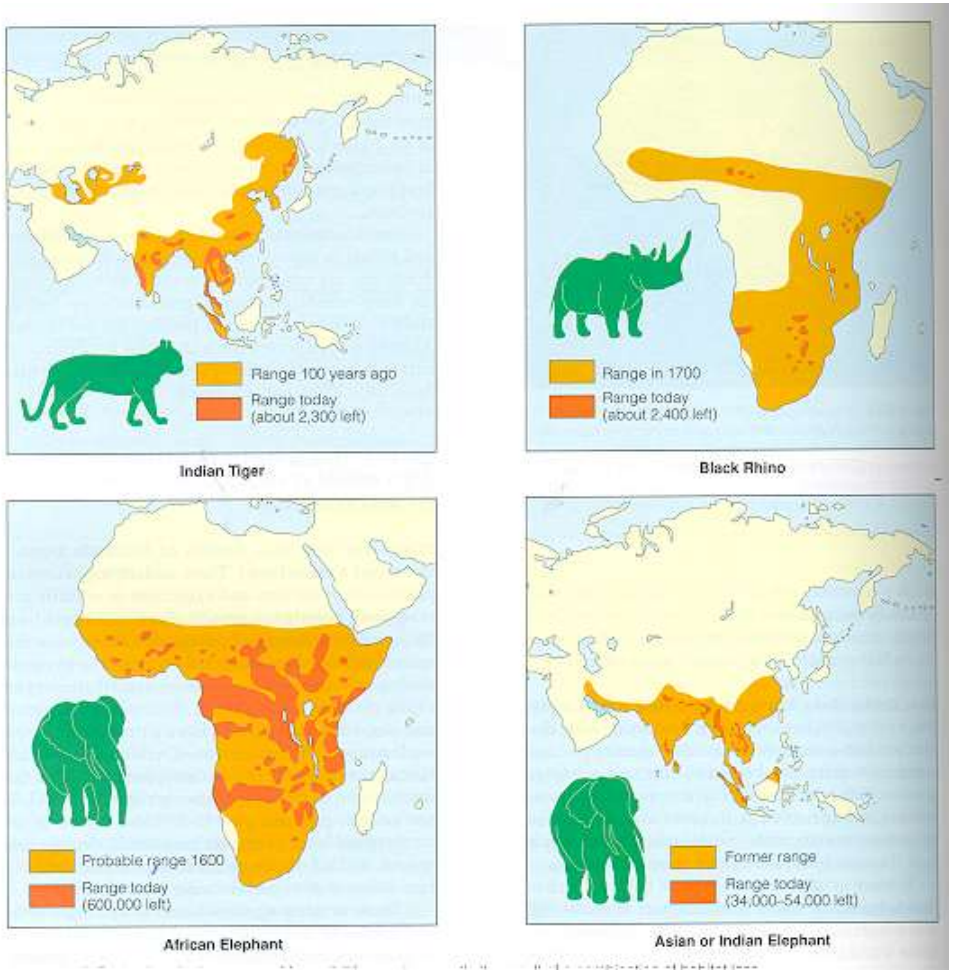
- Diversity → stability
  - Remove one species affect many

- Diversity → resources
  - Ex: different species → medicines, food, building materials…

Human causes → loss of biodiversity

1. Habitat destruction
   - Examples
     - black rhino,
     - African and Asian elephants

Watch planet in peril video clip: searching for black sifaka



Humans → loss of biodiversity

2. Direct harvest or exploitation
   - Example
     - Mountain gorillas shot for bushmeat and trophies
     - Overfishing → loss of many fish species
- *Watch planet in peril clip: victims of the black market*

http://www.zsl.org/zsl-london-zoo/news/shocking-ihttp://www.zsl.org/zsl-london-zoo/news/shocking-images-of-mountain-gorilla-family-shot-dead,377,NS.htmlmages-of-mountain-gorilla-family-shot-dead,377,NS.html

3) Introduction of non-native invasive species

- Non-natives often have no natural predators
- Often reproduce faster or earlier than native species
- Compete with natives → native species to decline

Watch "Protecting the Adirondacks from Invasive Species"

Non-native invasive species

Purple loosestrife

Eurasian water milfoil

Zebra mussels

Phragmites

Gypsy moths

Asian longhorn beetles

Emerald Ashborer

http://nyis.info/images/EAB_9000019b.jpg

http://www.bayweekly.com/year09/issue_26/art-26/Dock-26/Emerald-Ash-Borer-trap.gif

Example: Brown Tree Snake

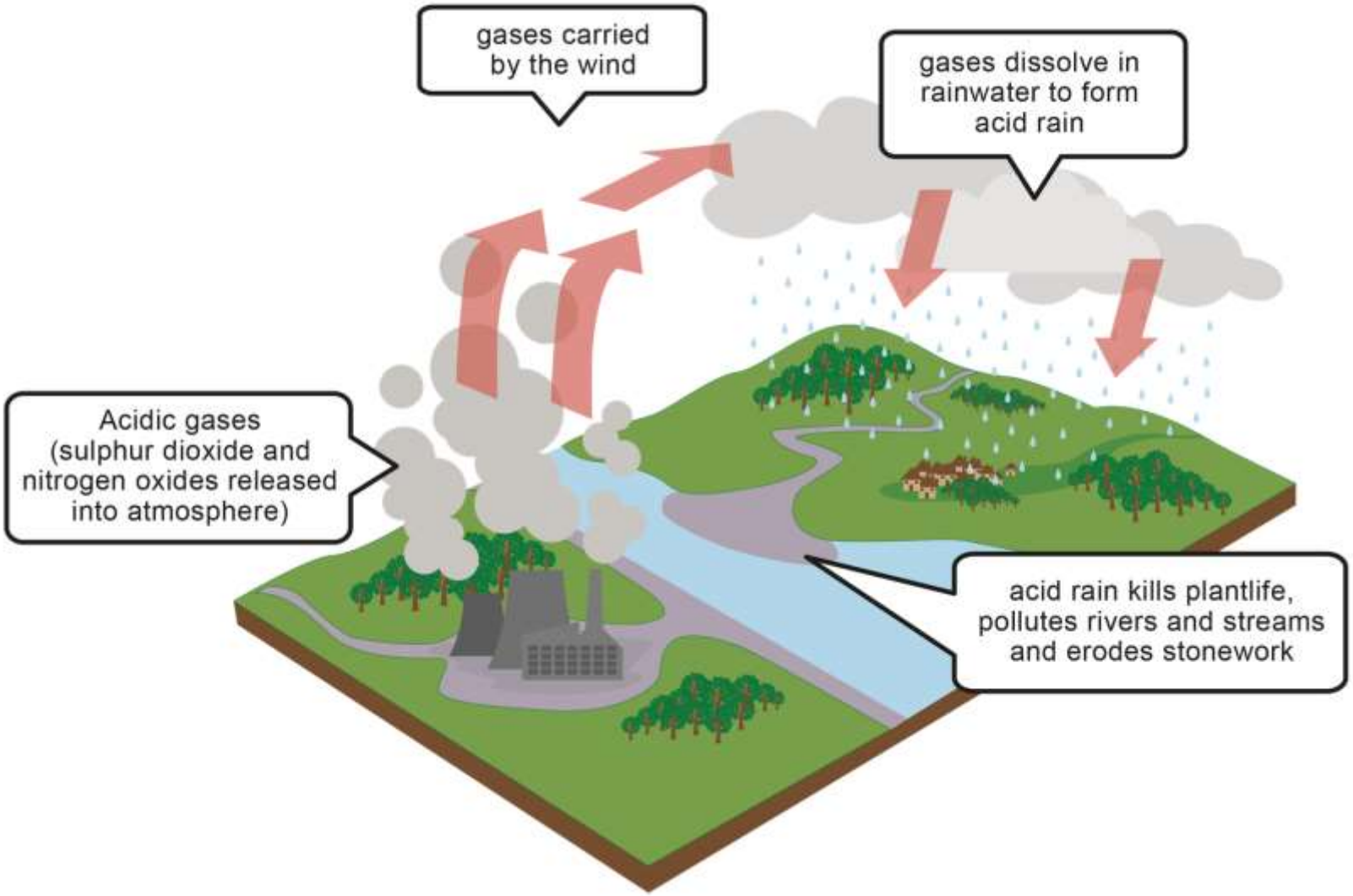
accidentally introduced to Guam → decimated native bird species

Picture taken by Michael Murphey
In Costa Rica

4) Pollution

A) ex: burning fossil fuels →

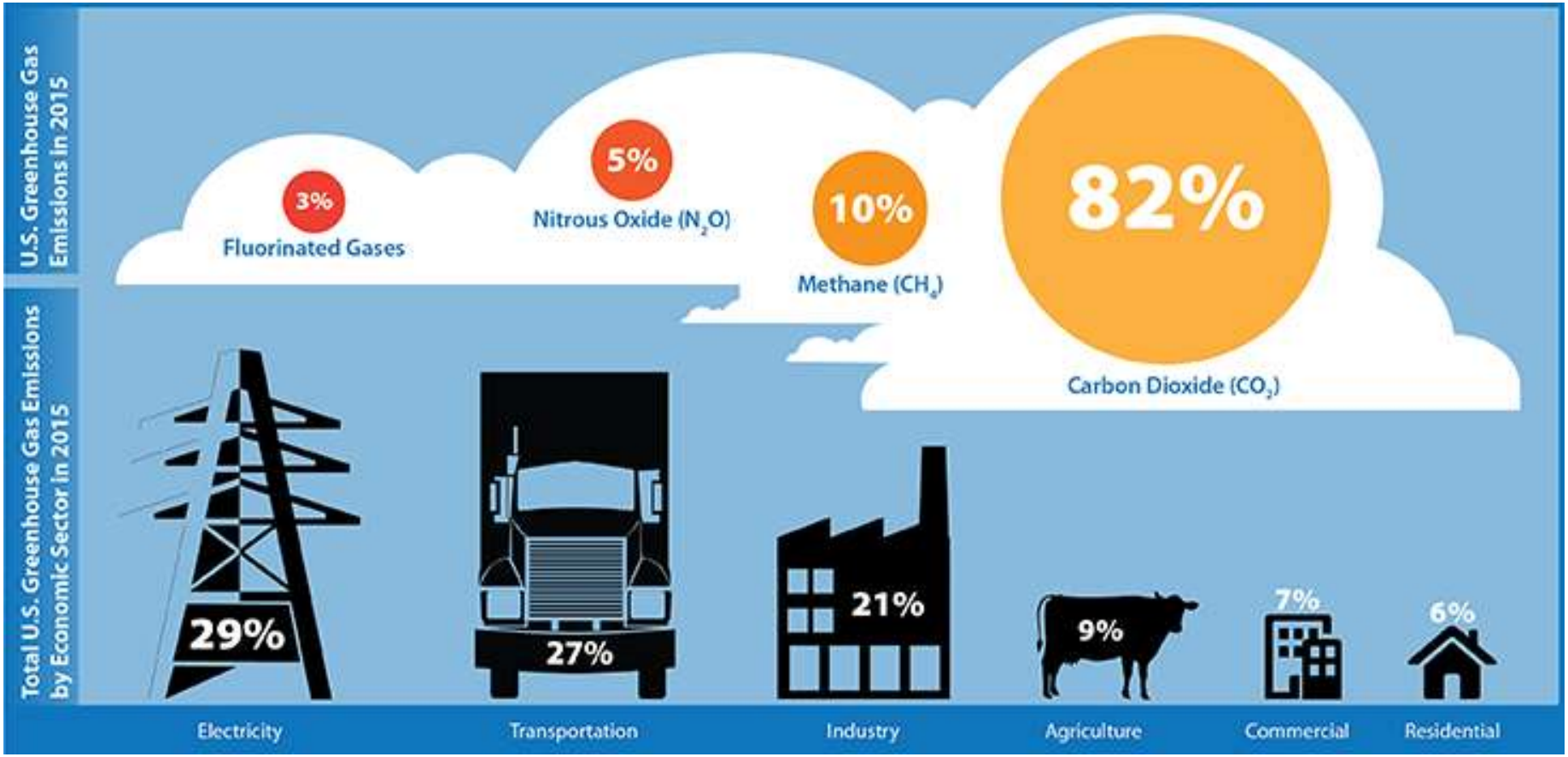
Sulfur and nitrogen oxides → <u>acid rain</u>
Affects water and forest ecosystems



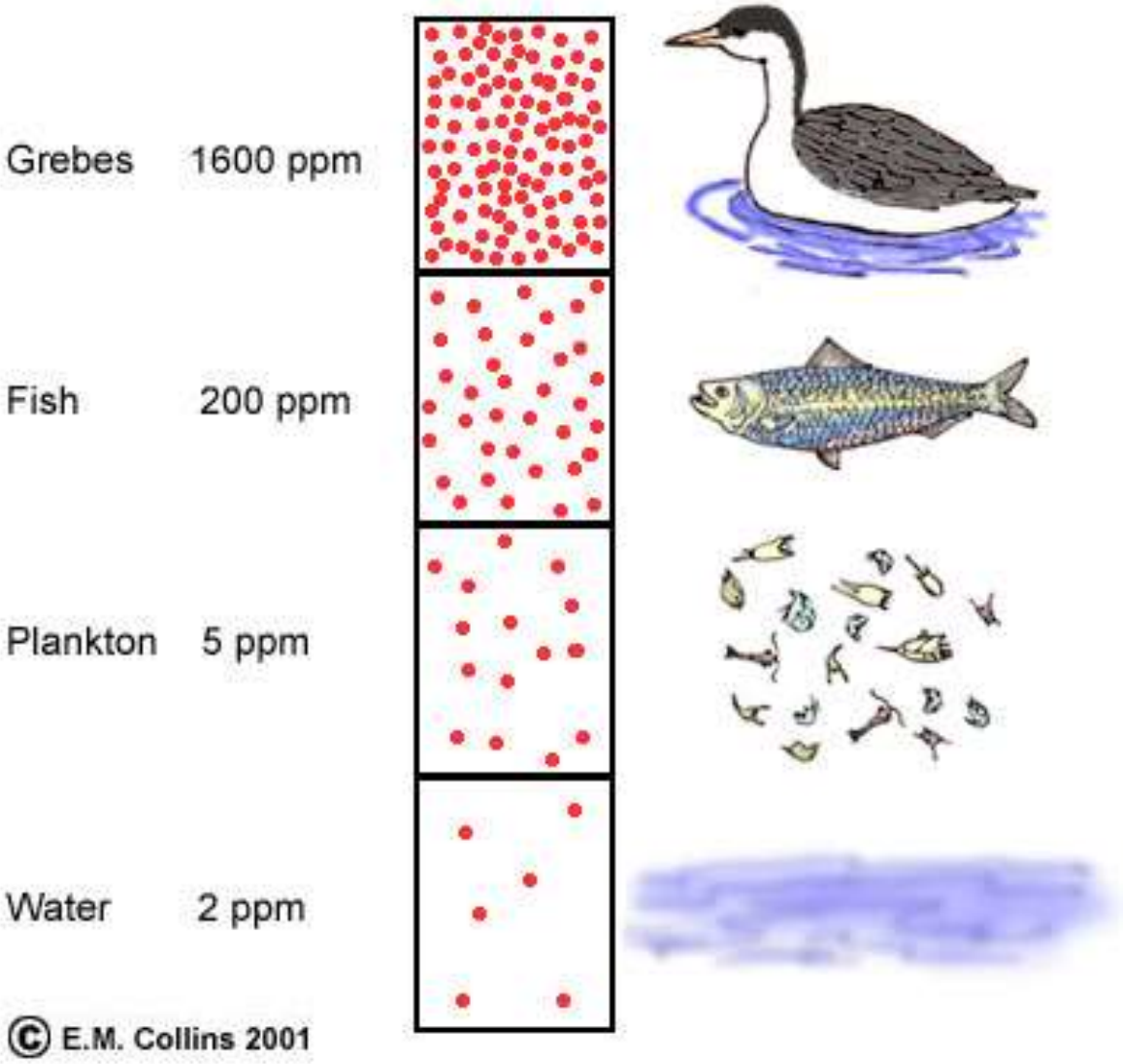
Particulate matter → smog →
decreased photosynthesis and respiratory problems

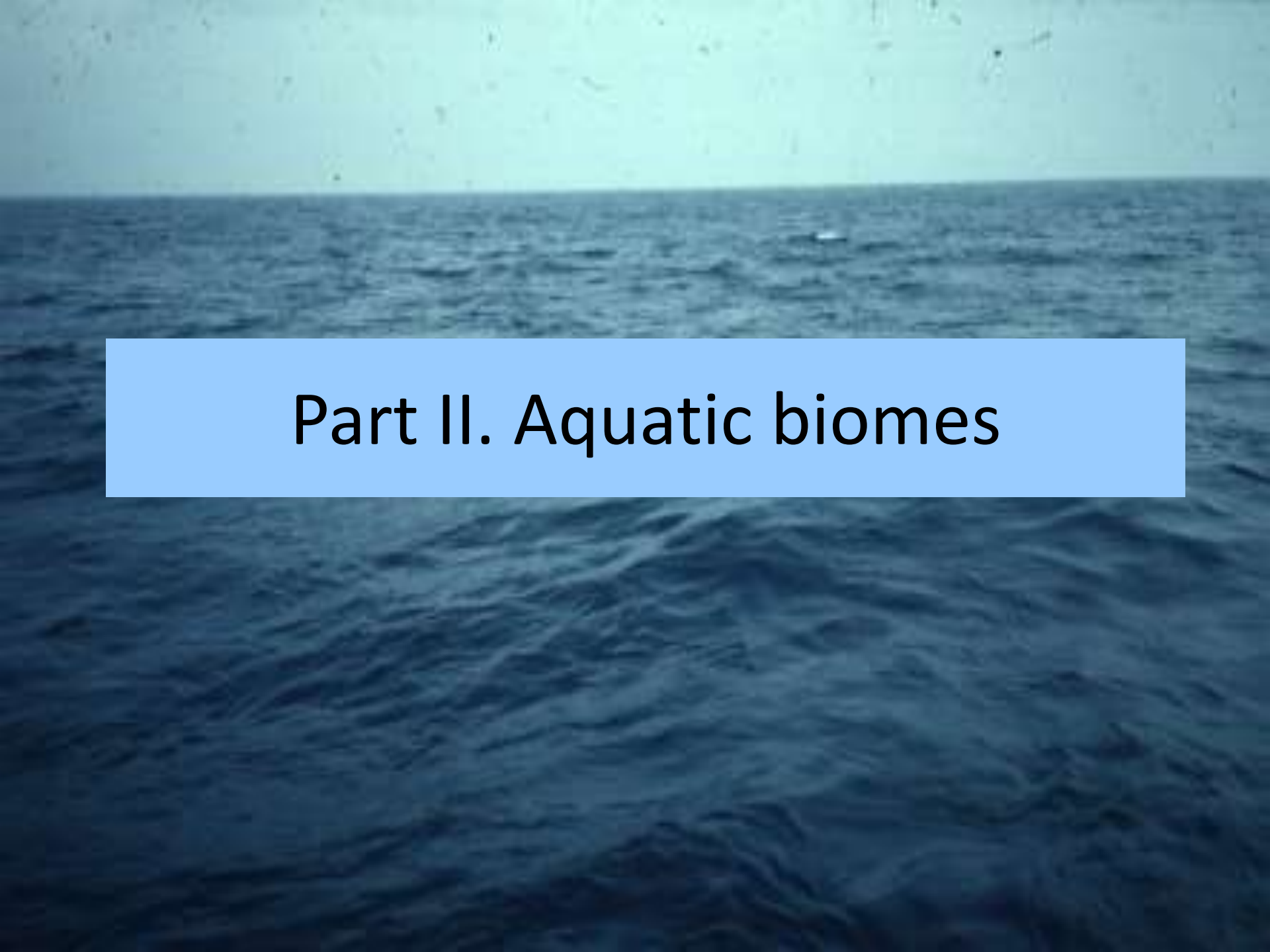
CO_2 = greenhouse gas → global climate changes →

- Changing weather patterns and rising sea levels → changes habitats



B) ex: Biological magnification of toxins





Part II. Aquatic biomes

Aquatic biomes

- Affected by salt, pressure, light, nutrients, pH
- Light and nutrients = limit algae growth
- 71% earths surface = water
  - 3% is freshwater (less than 1% salts / vol. of water)

Human Impacts on lakes and rivers

Aging of lakes (Eutrophication)

- Runoff water → <u>adds nutrients to lake = eutrophication</u>

- Human activities increase the rate of eutrophication
  - Ex: fertilizer runoff and sewage contamination
  - Inc. nutrients → increased algae →
  - Algae run out of sunlight → die
  - increased decomposition → dec. oxygen

Human impacts

- Overfishing → major cause of declines in worldwide fish populations recently
- https://www.natureworkseverywhere.org/resources/fishing-for-a-future/
- Loss of biodiversity = loss of stability in aquatic ecosystems

Define Ecological Succession

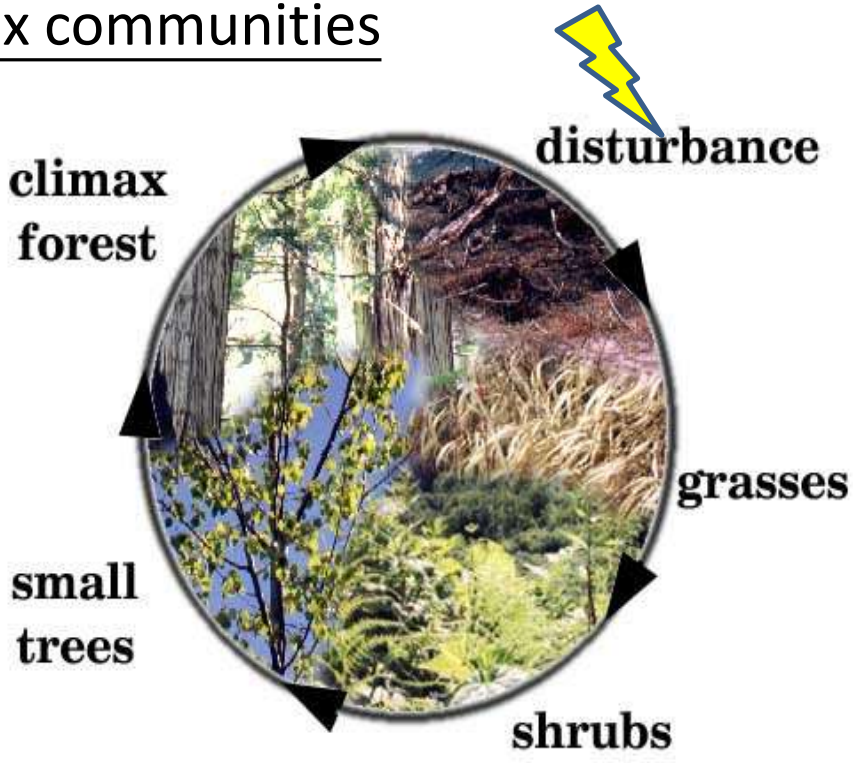
One year later

10 years later

One hundred years later

Ecological succession

- Succession = Change in an ecosystem after a disturbance over time
- One biotic community gradually → another
- Pioneer communities → climax communities



http://library.thinkquest.org/17456/diagram3.html

Pioneer organisms

- First to establish after a disturbance

Lichen on a rock
(lichen = algae and fungi = mutualism)

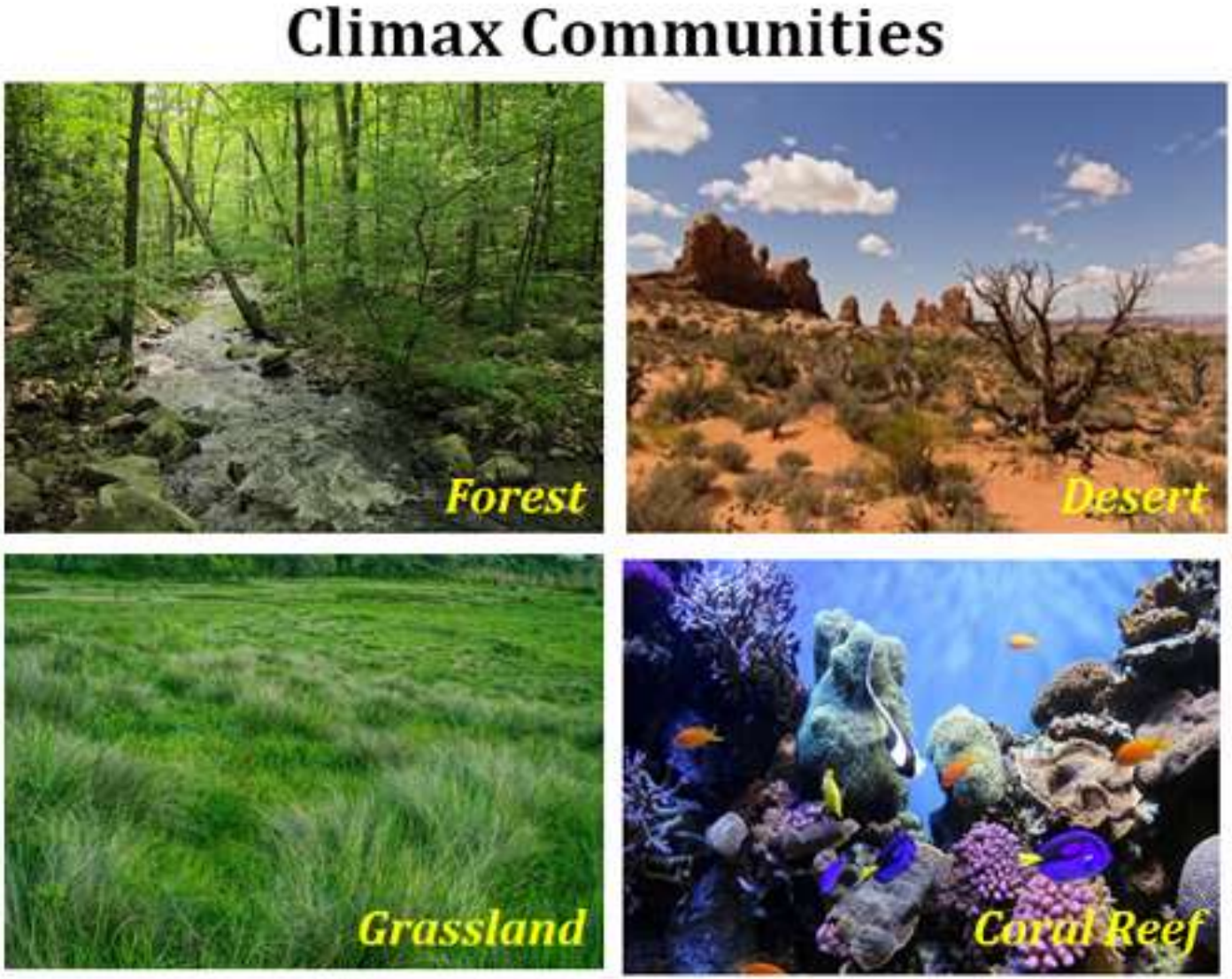
http://www.nickgallery.com/gallery_images/lichen.jpg

I'm really lichen you!
UNEARTHEDCOMICS.COM 2014 ©SARA ZIMMERMAN

Grasses on a sand dune

http://www.livingwilderness.com/patterns/juniper-dunes-grass.jpg

Climax Community = stable community



Climax communities

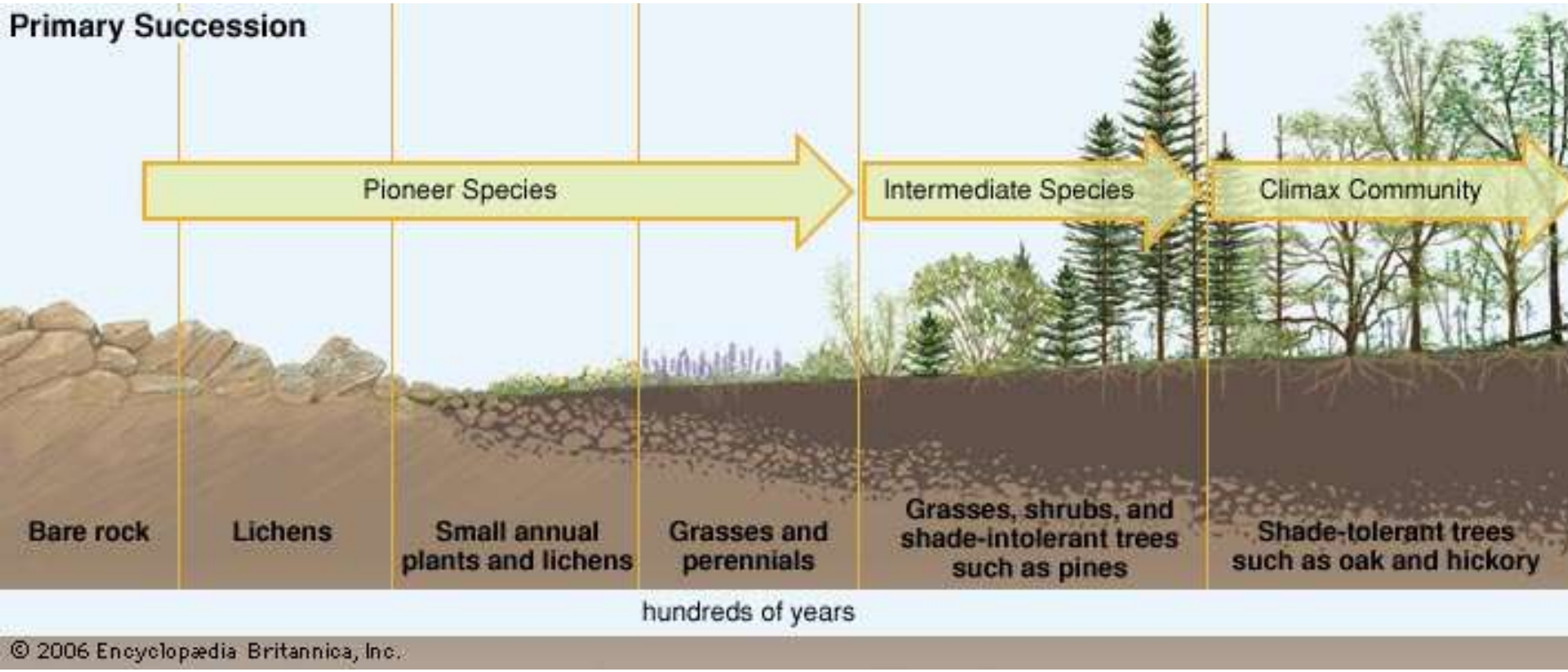
- Climax community = Stable
- Type of climax is determined by climate
  - Latitude, precipitation, and altitude
  - Ex: Coniferous forest in Taiga regions
- Will remain until a disturbance occurs

Until there is a disturbance

- Can be natural
  - Flood
  - Fire
  - Volcanic eruption
- Or manmade
  - Abandoned farm
  - Pollution

http://upload.wikimedia.org/wikipedia/commons/thumb/a/a4/Volcano_q.jpg/250px-Volcano_q.jpg

http://www.wildernessprints.com/library/oldstuff/images/bui0045_old barn.jpg



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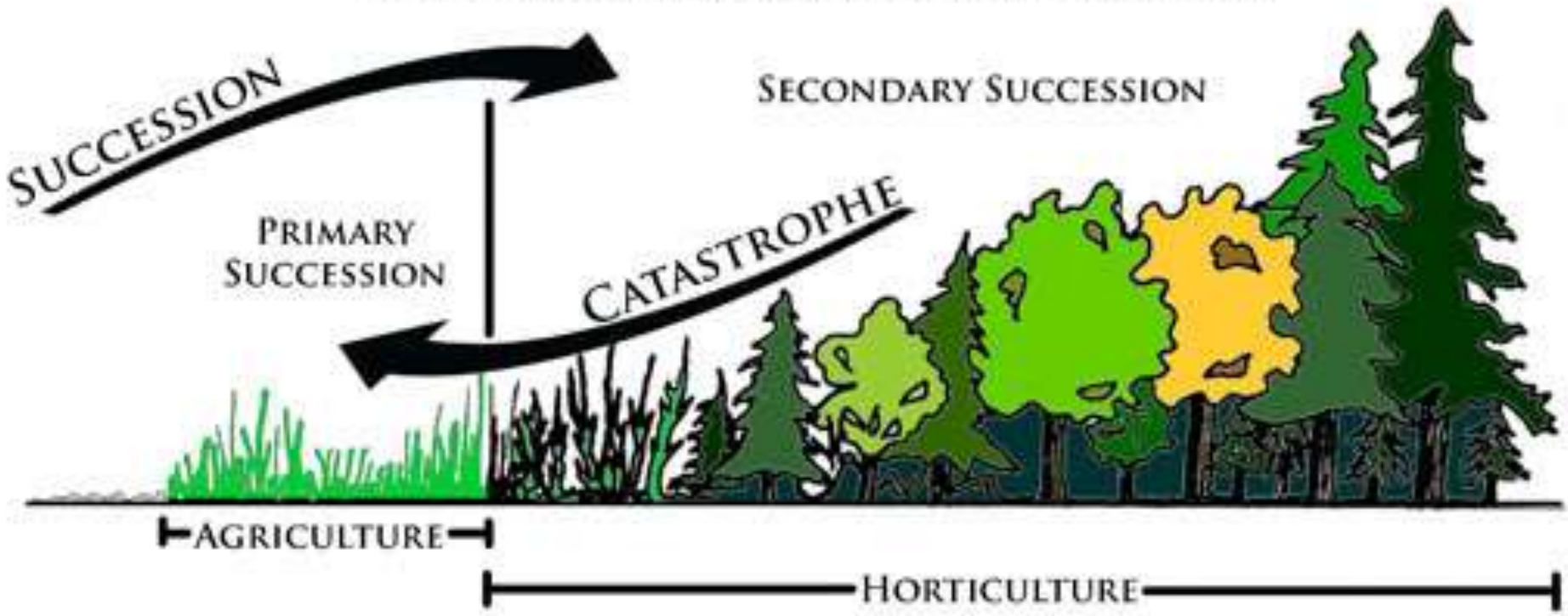
Ecological Succession



Subsistance Strategies

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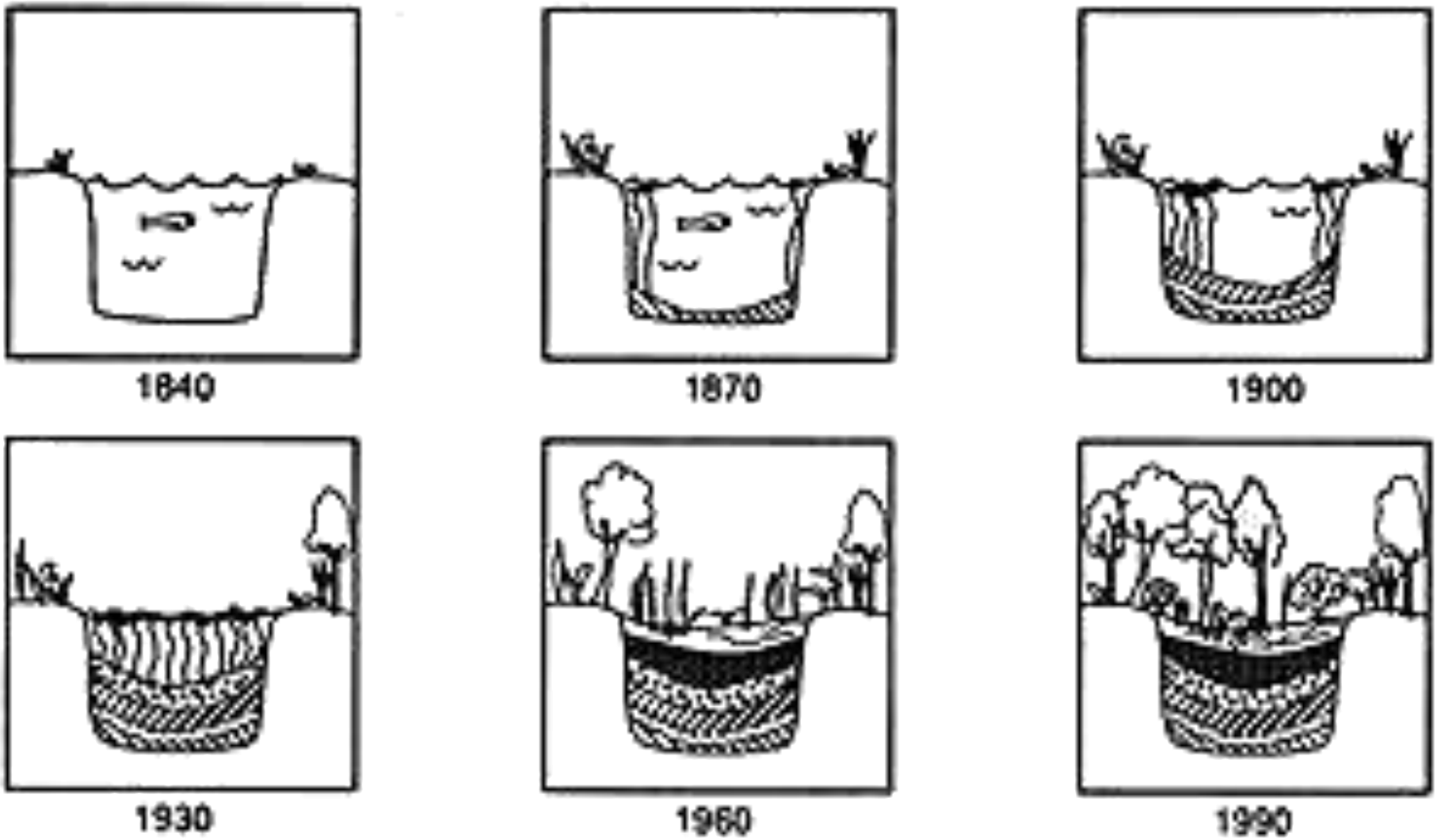
Runoff and eutrophication → Aquatic succession