

BIODIVERSITY

Wednesday, February 10th



What is *Biodiversity*?

- Variety and variability of life from genes to ecosystem
 - Measure of variation at genetic, species, and ecosystem level

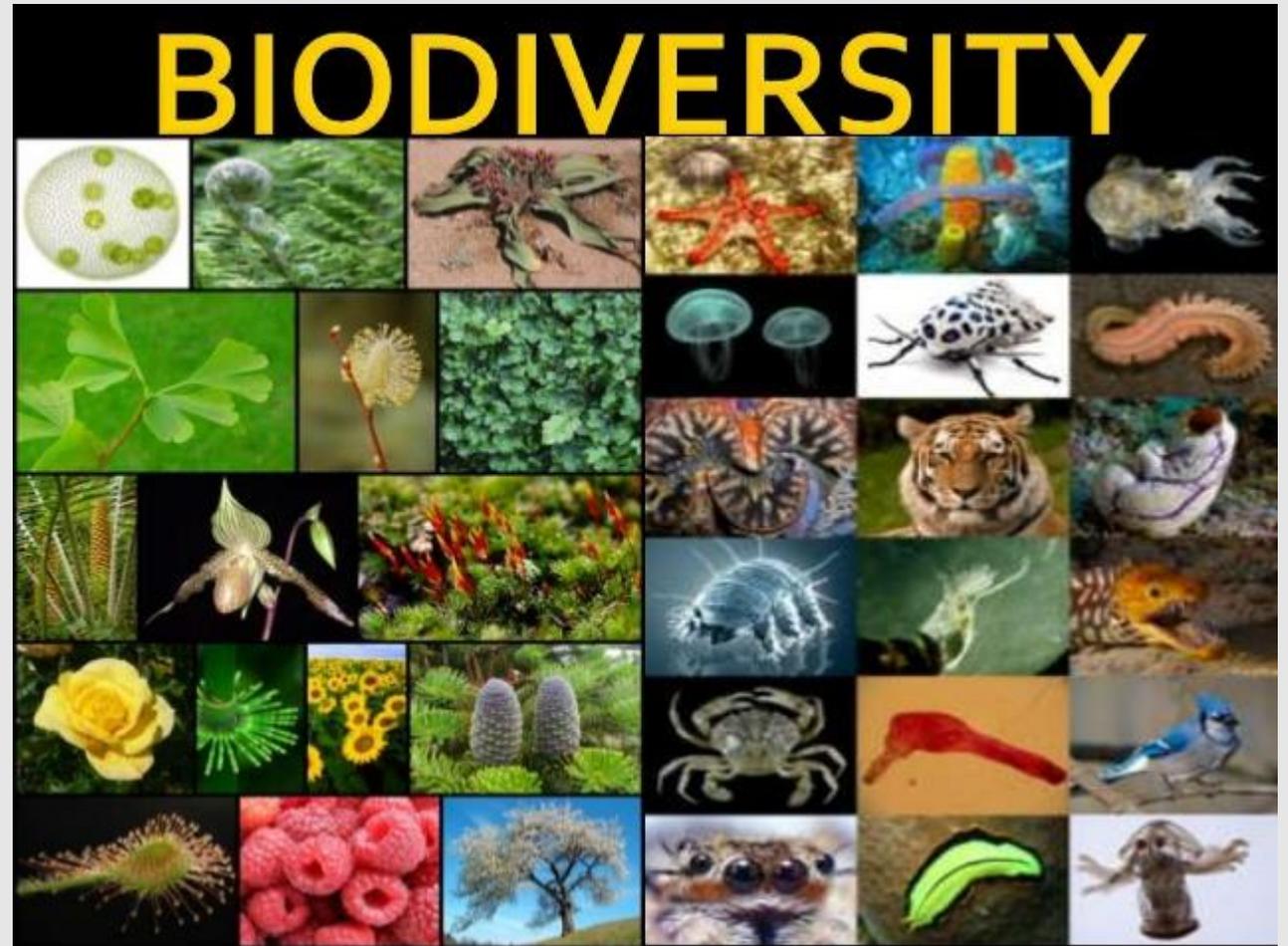
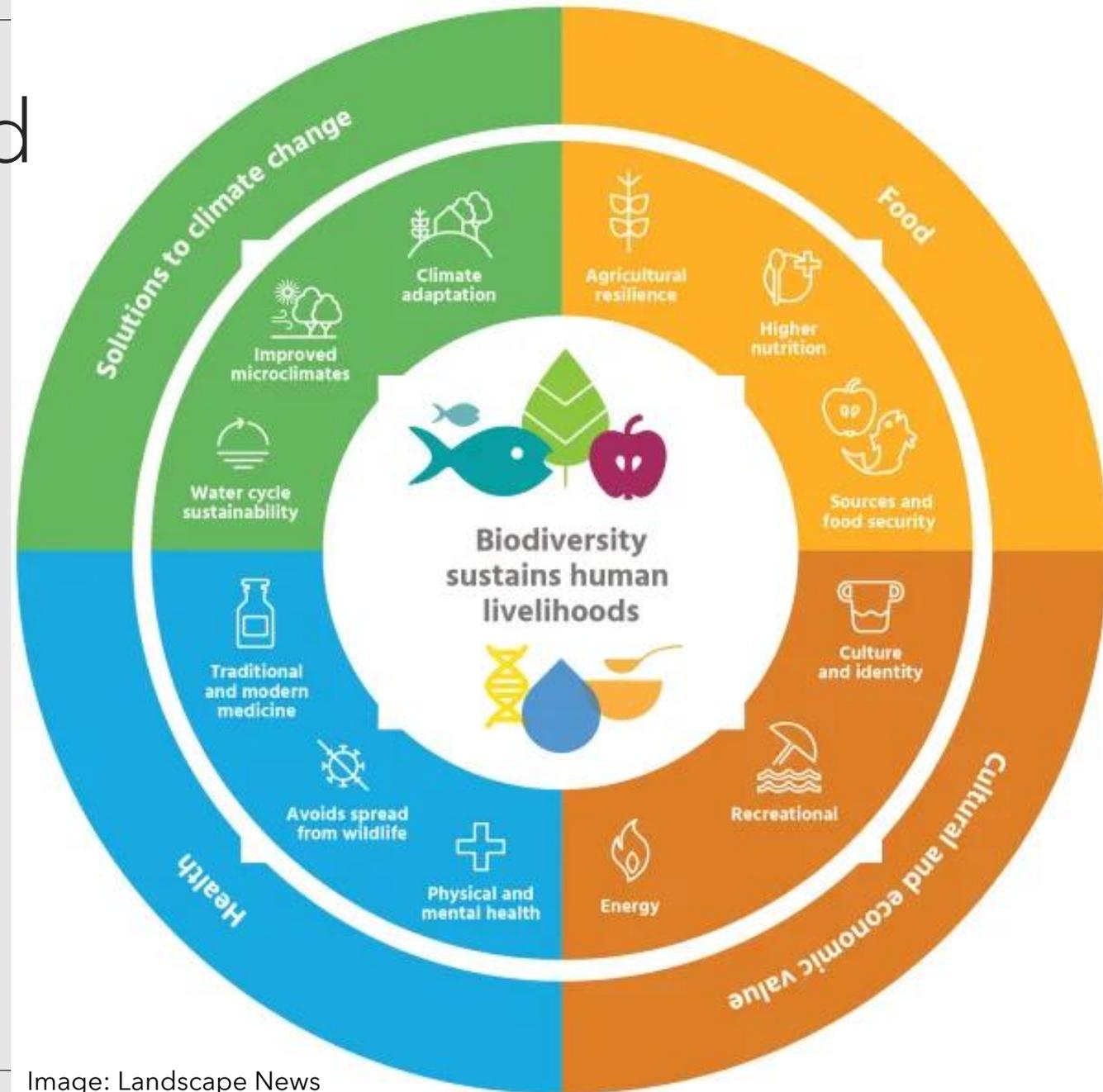


Image: slideshare

Benefits of Increased Biodiversity

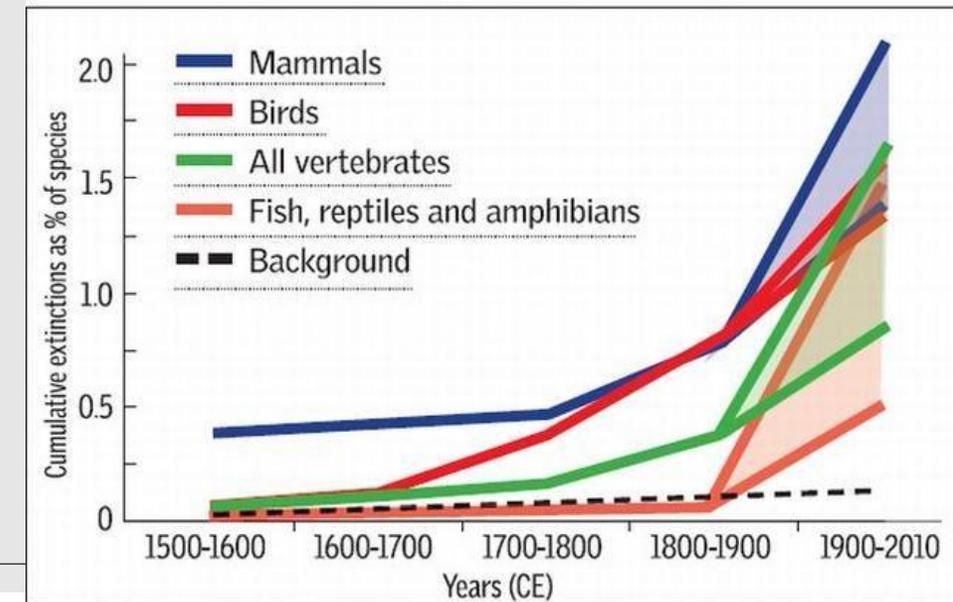
- Healthier ecosystems and ecosystem services
 - Higher water quality, soil formation, nutrient cycling, pollution absorption, higher stability and quicker recovery from disturbances
- Biological resources
 - Food, medicine, wood/lumber
- Social benefits
 - Cultural, recreational



Biodiversity is on the Decline

- In a UN report published in 2019, scientists warned that one million species - out of an estimated total of eight million - are threatened with extinction
- Anthropocene mass extinction
 - Scientists believe we are living in the largest mass extinction event

EXTINCTION RATES OVER TIME



Source: 'The Anthropocene is functionally and stratigraphically distinct from the Holocene'

PRIMARY DRIVERS

HABITAT LOSS

Thinning, fragmenting, or outright destruction of an ecosystem's plant, soil, hydrologic, and nutrient resources

INVASIVE SPECIES

Any nonnative species that significantly modifies or disrupts the ecosystems it colonizes

OVEREXPLOITATION

Process of harvesting too many aquatic or terrestrial animals, which depletes the stocks of some species while driving others to extinction

POLLUTION

Addition of any substance or any form of energy to the environment at a rate faster than it can be rendered harmless

CLIMATE CHANGE ASSOCIATED WITH GLOBAL WARMING

Modification of Earth's climate associated with rising levels of greenhouse gases in the atmosphere over the past one to two centuries

INFLUENCERS

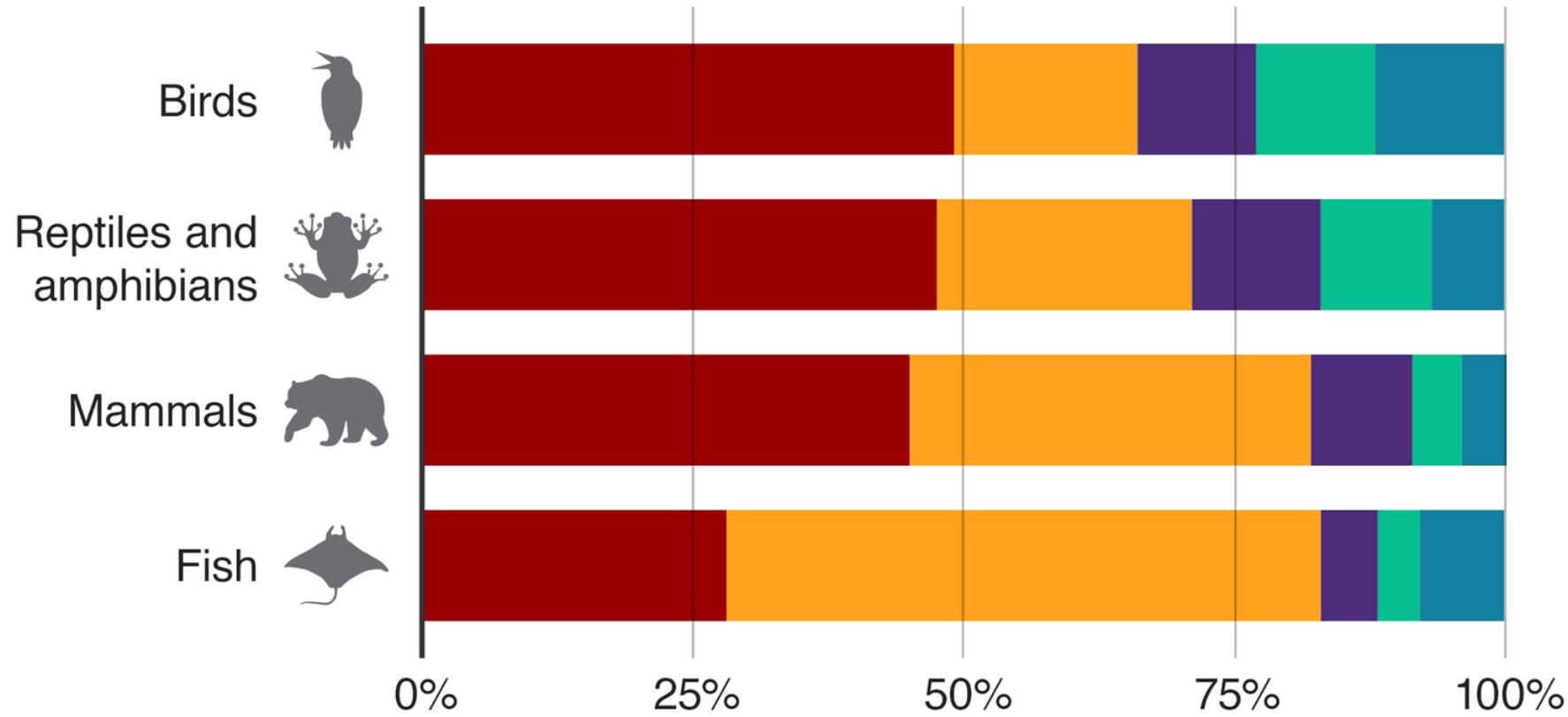
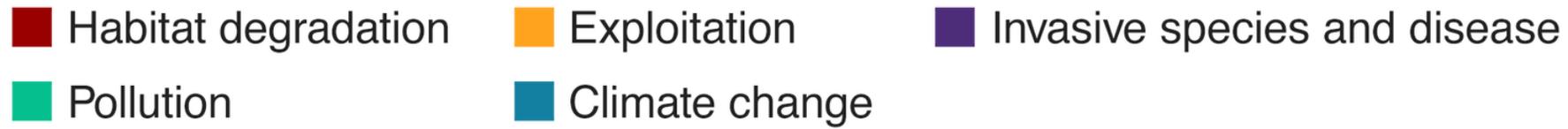
- Human population growth
- Increasing consumption
- Reduced resource efficiency

BIODIVERSITY LOSS

Reduction in the number of genes, individual organisms, species, and ecosystems in a given area

Habitat loss is a major threat to biodiversity

The Living Planet Report assesses key drivers of species decline



Note: A sample of 3,789 populations evaluated by the Living Planet Index

Habitat Loss and Fragmentation

Photo: The Conversation



Photo: USDA Forest Service



Habitat Loss and Fragmentation

Fragmentation of natural ecosystems reduces their sustainability.

Fragmentation is the dividing up of a region into smaller parcels or fragments.



Photo: Slide Share

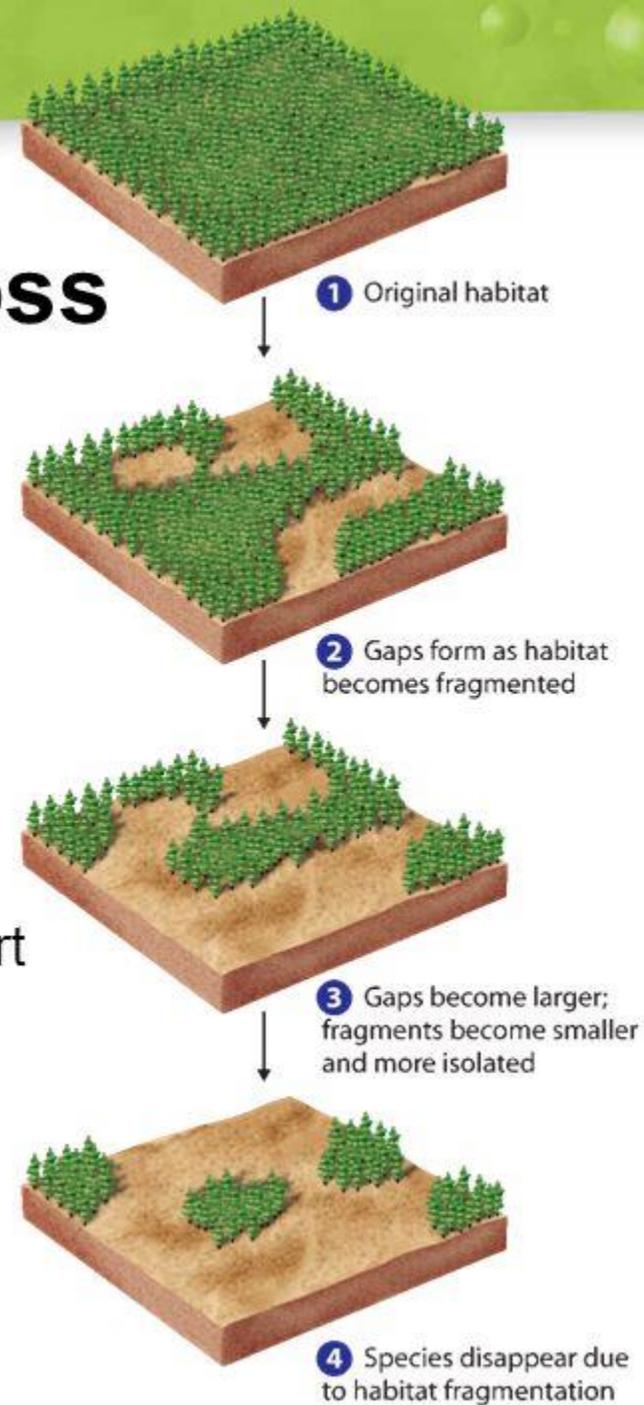
Photo: Swarthmore.edu



Habitat Change and Loss

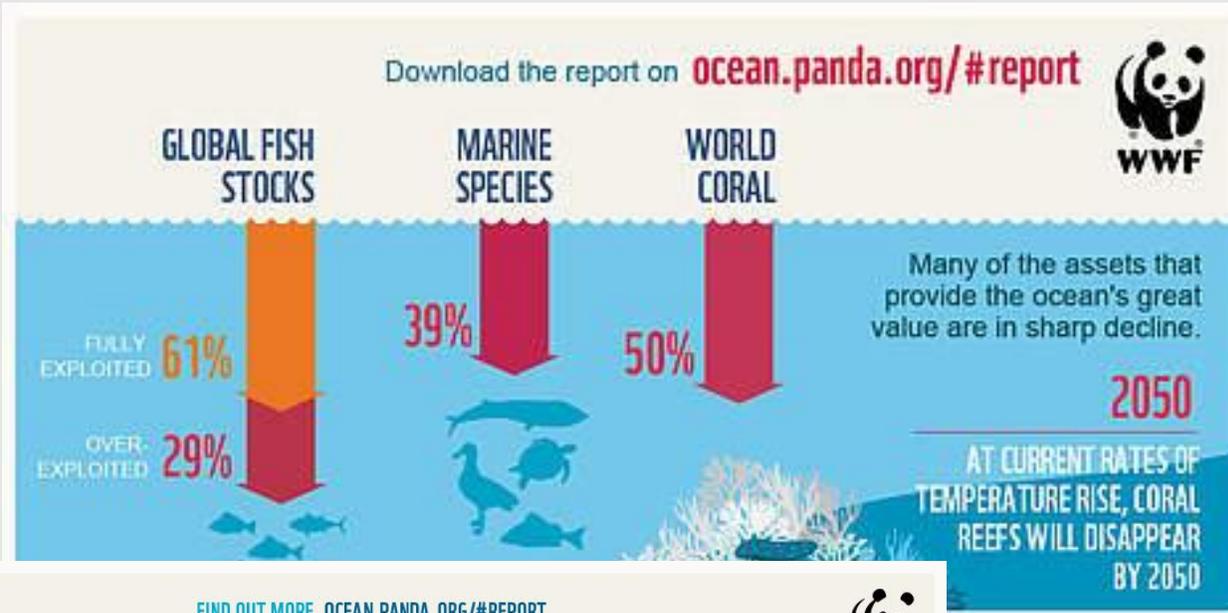
- Greatest cause of biodiversity loss
- Organisms, adapted to their habitat, decline in population when the habitat changes.
- **Habitat fragmentation:** Patches of suitable habitat surrounded by unsuitable habitat
- In general, larger habitat fragments can support greater biodiversity than smaller fragments.

Did You Know? Habitat change or destruction is the primary cause of population decline in more than 80% of threatened birds and mammals.



Exploitation

Photo: Center for American Progress



FIND OUT MORE [OCEAN.PANDA.ORG/#REPORT](https://ocean.panda.org/#report)



FISH POPULATIONS
ESSENTIAL FOR
FOOD AND
JOBS HAVE
CRASHED BY 50%
IN THE LAST
4 DECADES

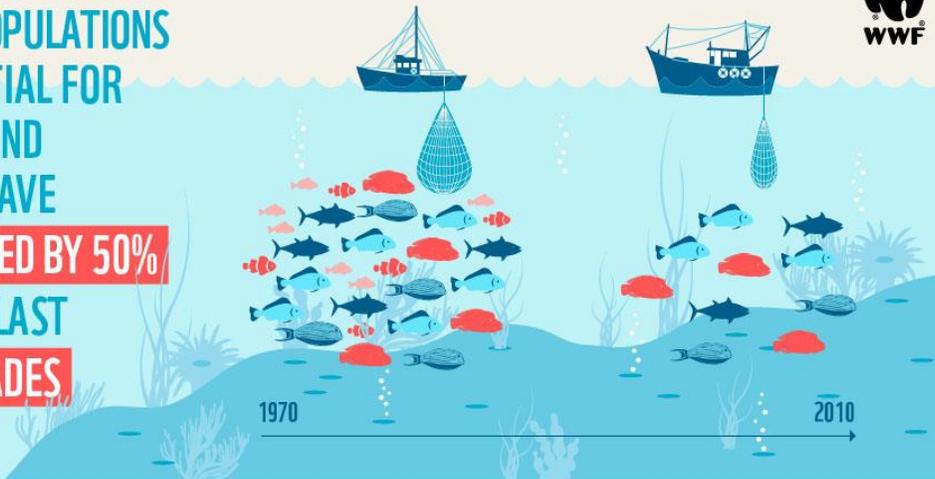
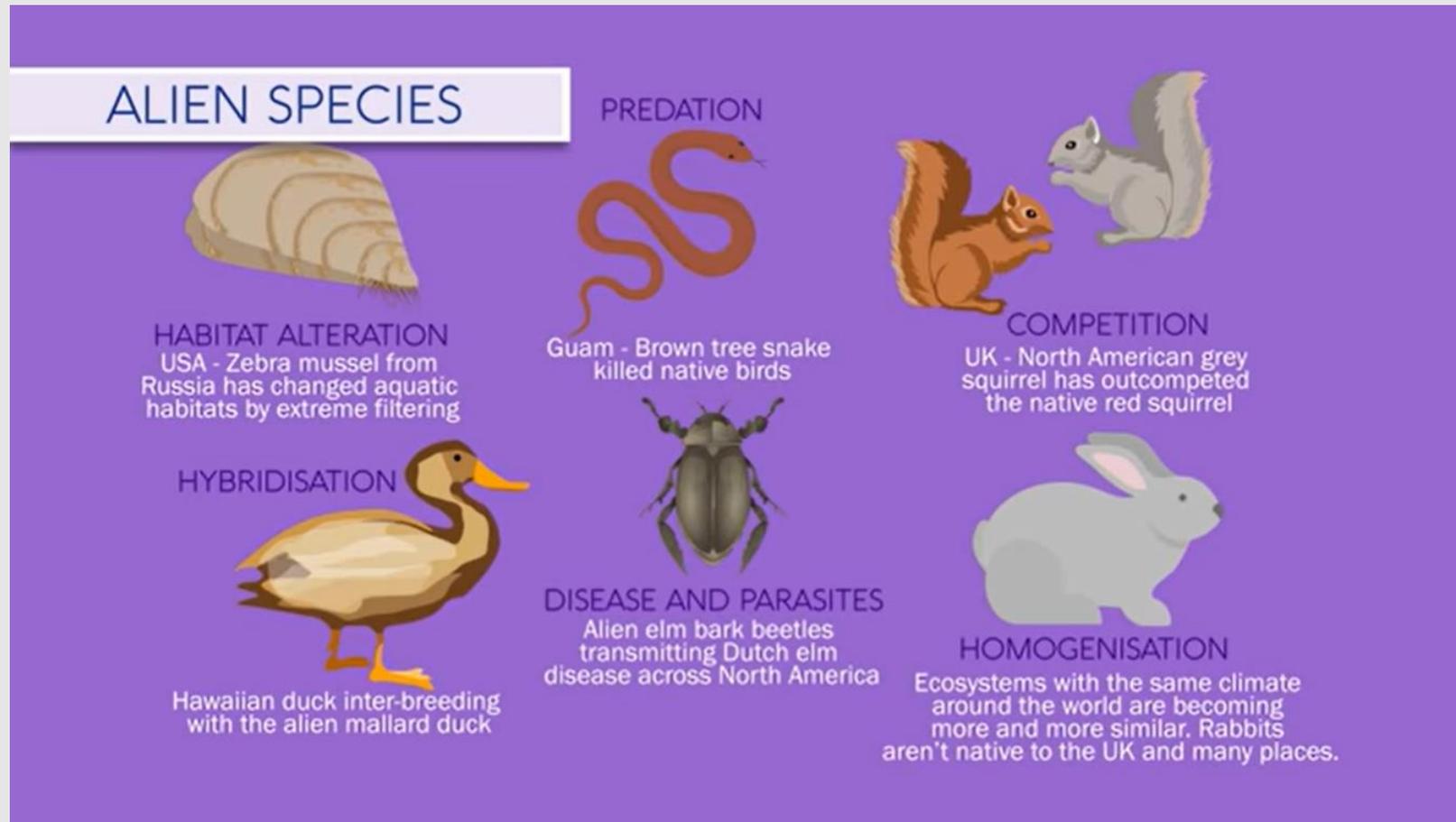


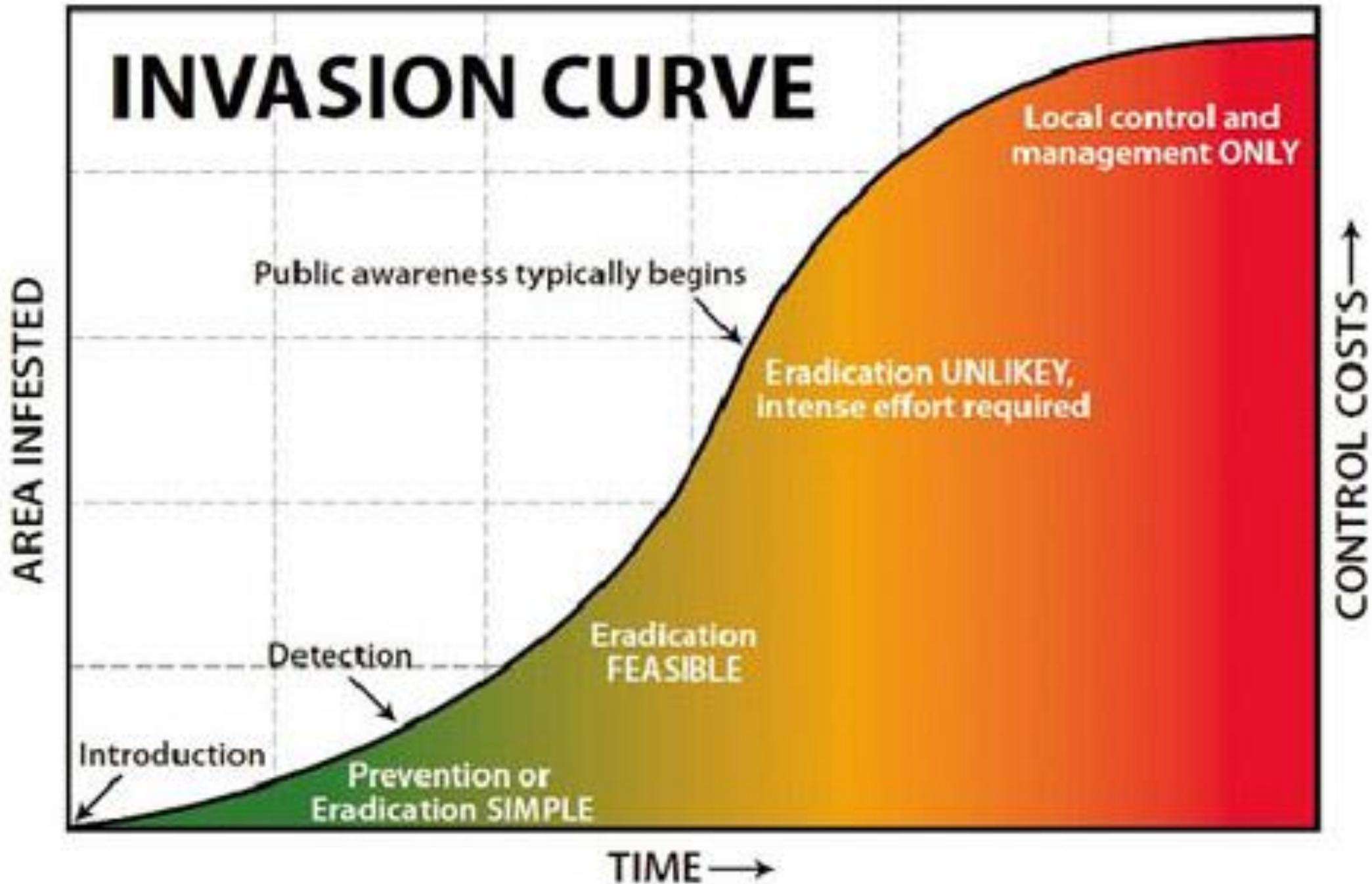
Photo: Iberdrola

Invasive Species



On any given day, there are 3,000 species aboard a ship vessel, making the incidence of invasive species introduction more likely

INVASION CURVE



Invasive Species in the Northeast US



Invasive Rusty Crayfish in Lake Wisconsin

Before crayfish removal:



After crayfish removal:



Images: National Science Foundation

Pollution



Photo: The Medium

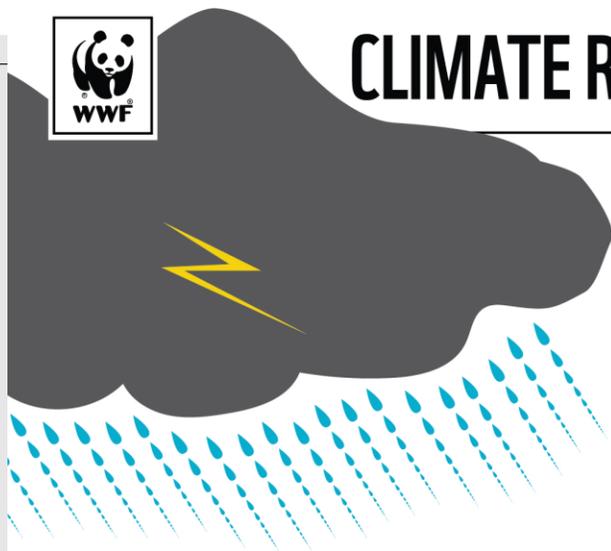


Photo: New York Times

Climate Change



CLIMATE RISKS: 1.5°C VS 2°C GLOBAL WARMING



EXTREME WEATHER

100% increase in flood risk. | vs | **170%** increase in flood risk.

SPECIES

6% of insects, **8%** of plants and **4%** of vertebrates will be affected. | vs | **18%** of insects, **16%** of plants and **8%** of vertebrates will be affected.

WATER AVAILABILITY

350 million urban residents exposed to severe drought by 2100. | vs | **410 million** urban residents exposed to severe drought by 2100.

ARCTIC SEA ICE

Ice-free summers in the Arctic at least once **every 100 years.** | vs | Ice-free summers in the Arctic at least once **every 10 years.**

PEOPLE

9% of the world's population (700 million people) will be exposed to extreme heat waves at least once every 20 years. | vs | **28%** of the world's population (2 billion people) will be exposed to extreme heat waves at least once every 20 years.

SEA-LEVEL RISE

46 million people impacted by sea-level rise of 48cm by 2100. | vs | **49 million people** impacted by sea-level rise of 56cm by 2100.

OCEANS

Lower risks to marine biodiversity, ecosystems and their ecological functions and services at 1.5°C compared to 2°C.

CORAL BLEACHING

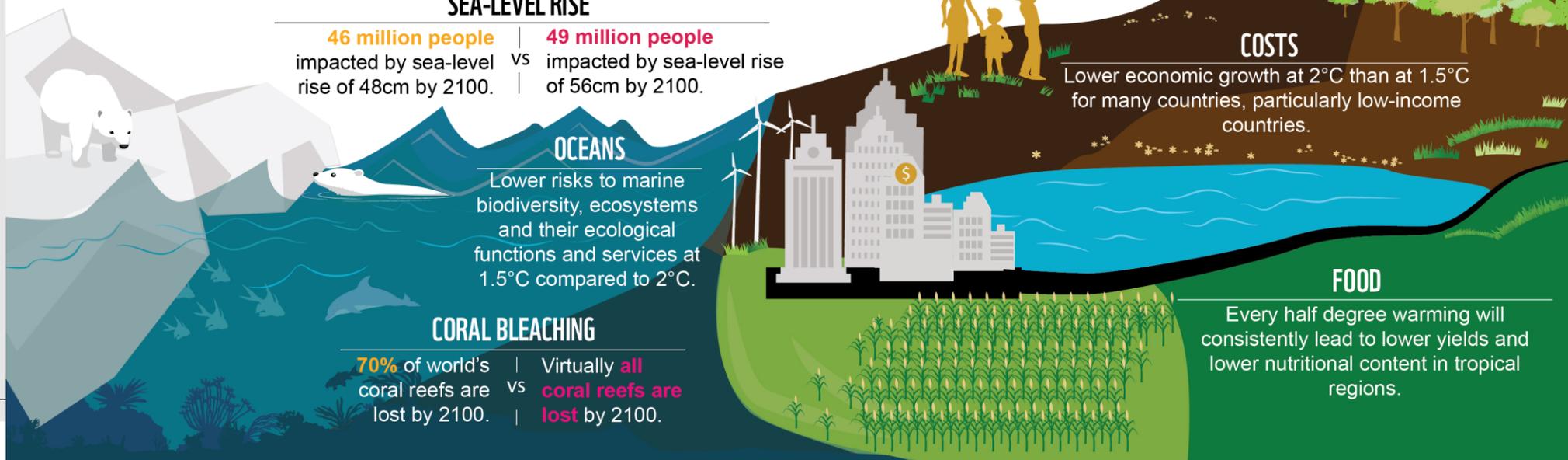
70% of world's coral reefs are lost by 2100. | vs | Virtually **all coral reefs are lost** by 2100.

COSTS

Lower economic growth at 2°C than at 1.5°C for many countries, particularly low-income countries.

FOOD

Every half degree warming will consistently lead to lower yields and lower nutritional content in tropical regions.



Discussion

Do you think the pace and scale of biodiversity protection efforts
enough?

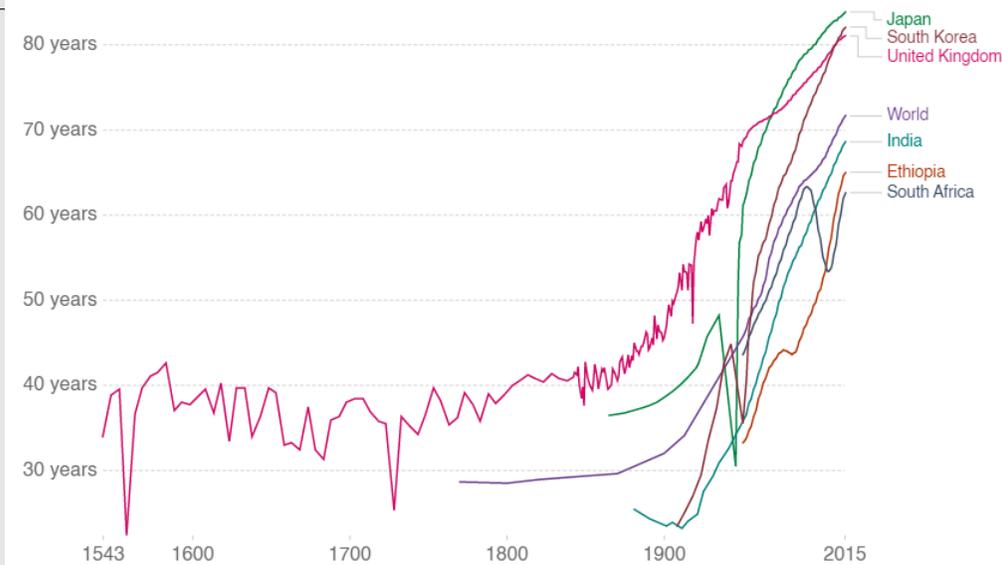
Why?

Human Action and Societal Influences
Affect Biodiversity

Life Has Changed

- Increased population
- Higher life expectancy
- Increase in wealth
- Gains of 20th century came at expense of the environment
 - Face challenges in nature, climate, and human development

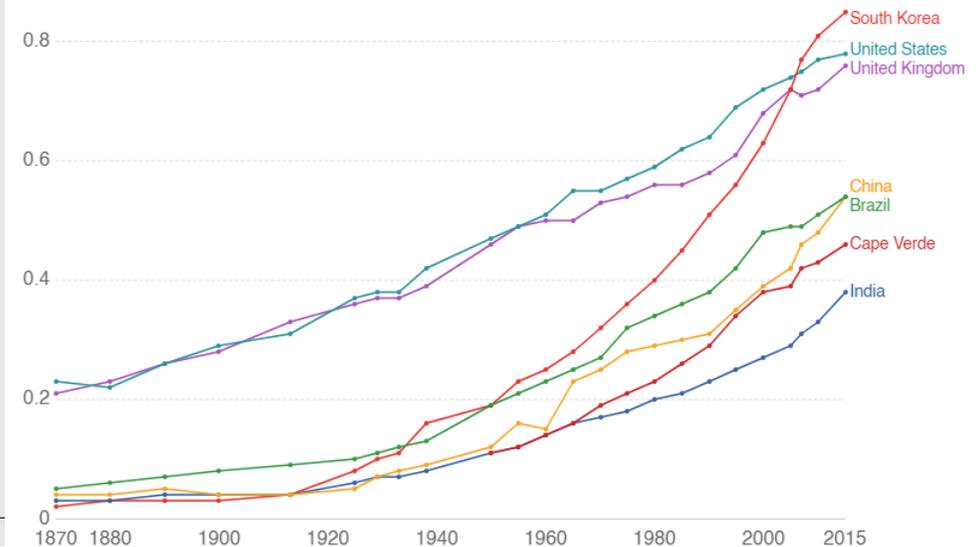
Life expectancy, 1543 to 2015



Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019)
OurWorldInData.org/life-expectancy • CC BY
Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.

Historical Index of Human Development

The Historical Index of Human Development (HIHD) is a summary measure of average achievement in three key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living.



Source: Prados de la Escosura (2018)
OurWorldInData.org/human-development-index • CC BY

Drivers of Biodiversity Loss

Direct

- Habitat loss
- Climate Change
- Pollution
- Invasive species
- Over exploitation
- Other threats

Indirect

- Demographic
 - Population growth, density
- Economic and technological
 - The financial drivers of deforestation (subsidies and investments) are 140 times greater than the financial drivers of forest protection and restoration
 - Globalization, trade, markets, policy
- Institutions and governance
 - Biodiversity protection is not reflected in most policies
- Conflicts and epidemics

How Does Biodiversity Loss Affect Us?

- Increase in food insecurity
- Decrease in overall health
- Decrease in water and air quality and other resources
- Decrease economic wellbeing
- Increases vulnerability

Solutions

- Systematic changes in society
- More education of the root of biodiversity loss
- Stronger policies in conservation and environmental protection
- More efficient technology and practices



Discussion

- What do you think is the greatest social driver of biodiversity loss?
- How does society have to change to increase biodiversity?

Career Highlight: Community Engagement

- Environmental Education
- Communications and Marketing
- Photography and Filmmaking
 - Freelance
- Ecotourism
 - Scuba instructor, tour guide, travel agent
- Advocacy and Lobbying
 - Government and nonprofit
- Park Ranger (Law Enforcement)

Career Highlight: Science

- Conservation Scientists, Ecologists, Naturalist
 - Private, government, nonprofit sectors
- Ecological Consultant
 - Private sector
- GIS Spatial Ecology
 - Government, private, nonprofit
- Animal Husbandry and Welfare

Career Highlight: Technical

- Environmental Economics
 - Government and nonprofit
- Conservation Policy and Advocacy
 - Government and nonprofit
- Project and Program Management
 - Private, government, and nonprofit
- Fundraising and Development
 - Government and nonprofit

ConservationJobBoard.com

 My Jobs

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Categories

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- Marine Biology (17)
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Latest Conservation Jobs Relevance ▾

Digital Marketing Manager
The Nature Conservancy
 Lansing, MI
The Nature Conservancy is the leading conservation organization working to make a positive impact around the world in more than 79 countries, all 50 U...
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Assistant Conservation Forester (3 Positions)
Nebraska Forest Service
 Ord, Concord, and North Platte, NE
Focus program area(s) for this position will be rural forestry and forest management assistance to landowners. Improve the health, sustainability and...
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Phipps Conservatory and Botanical Gardens
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Preserve Steward, Supervisory (Apr-Nov), 2 Positions Available

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Cinnabar Foundation
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Long Live the Kings
Seattle, WA


Endangered Species Conservation Biologist

Williston Conservation Trust Internship

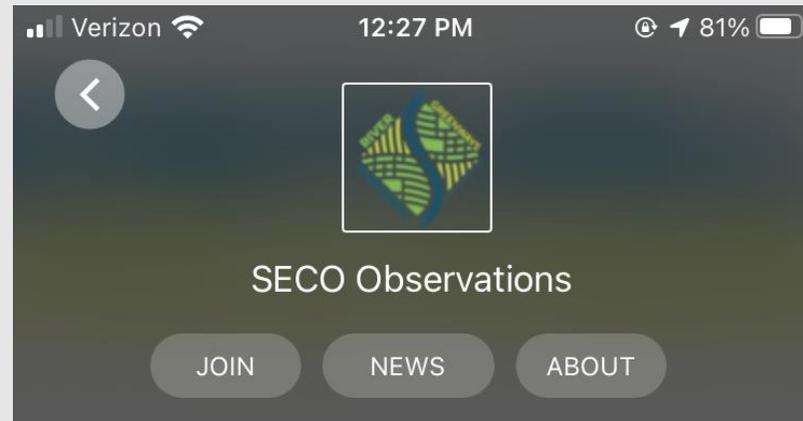
- Conservation Associate Internship
- Summer 2021
- 4 months with stipend
- 2 positions available
- Works with watershed team, land management, community farm, bird conservation, and more

Pinelands Cranberry Farm Internship

- Summer Internship in NJ
- Paid opportunity
- Housing available
- Integrated Pest Management
- Experience in Entomology
 - Scout cranberry bogs for destructive pests

Assignment

- BioBlitz with iNaturalist!
- 10 observations due by Wednesday, March 10th



What is iNaturalist?

- A database with a social media component meant for identifying and recording natural species
- Used for identification, social engagement, and bioblitz activities



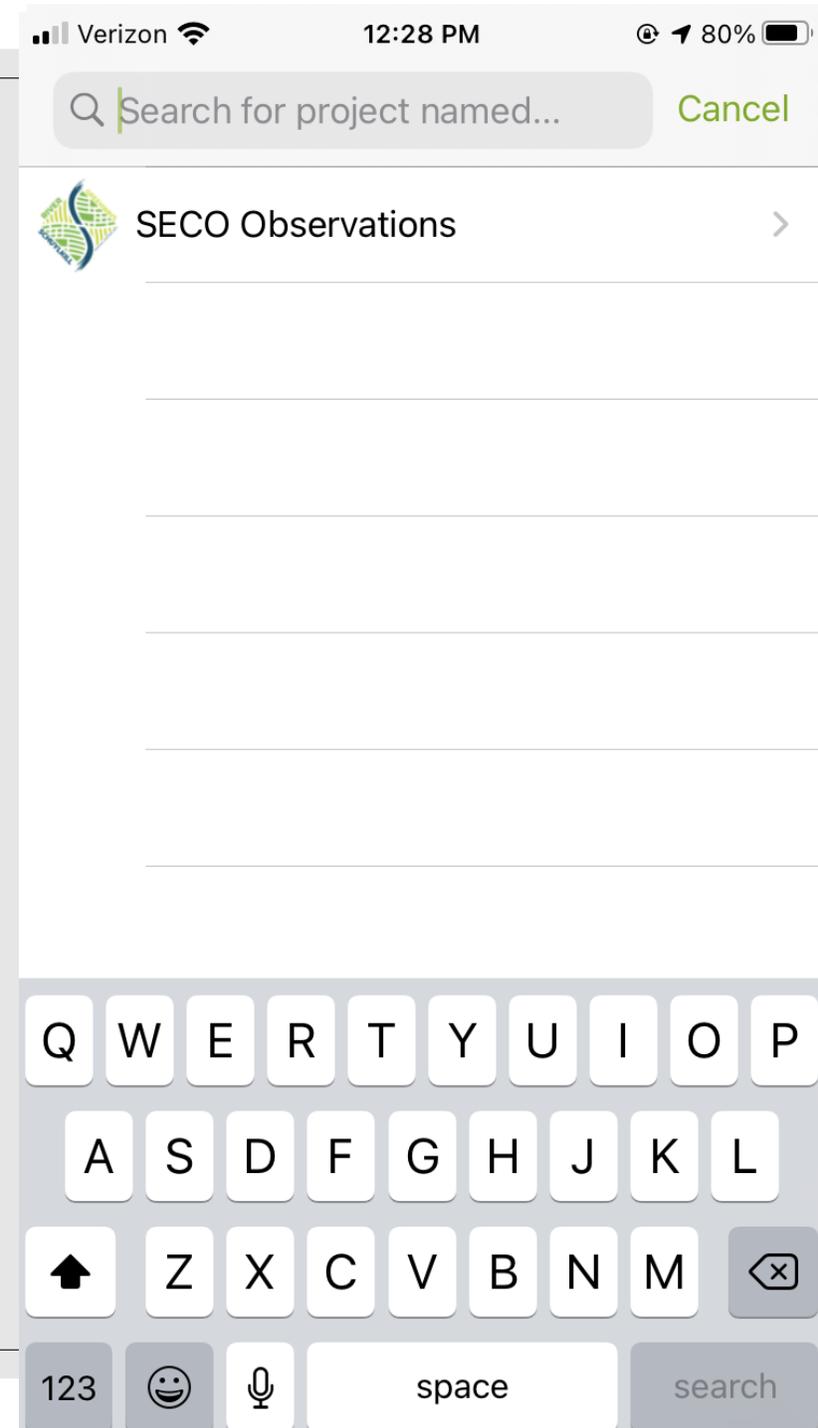
BioBlitz

- A bioblitz is a period of biological surveying by naturalists, scientists, and volunteers
 - Survey as many species as possible in a certain area over a short period of time
- Used to get an idea of the biodiversity in a certain area



How to use iNaturalist

- Explore
 - Shows observations near you from others (map or list format)
- Activity
 - See notifications from other users or view recent news
- Observe
 - Upload or take a picture of your observation to see suggestions, make notes, and input other data
- Me
 - View all observations you have made
- More...
 - View Projects and Guides



Assignment

- Download iNaturalist
- Find our group "SECO Observations"
 - Click on More at bottom right of screen > click Projects > search for SECO Observations in upper right hand corner
- Go outside and find 10 species to identify and share in our group



Next Session: Water Pollution, February 17th 6pm-7pm