

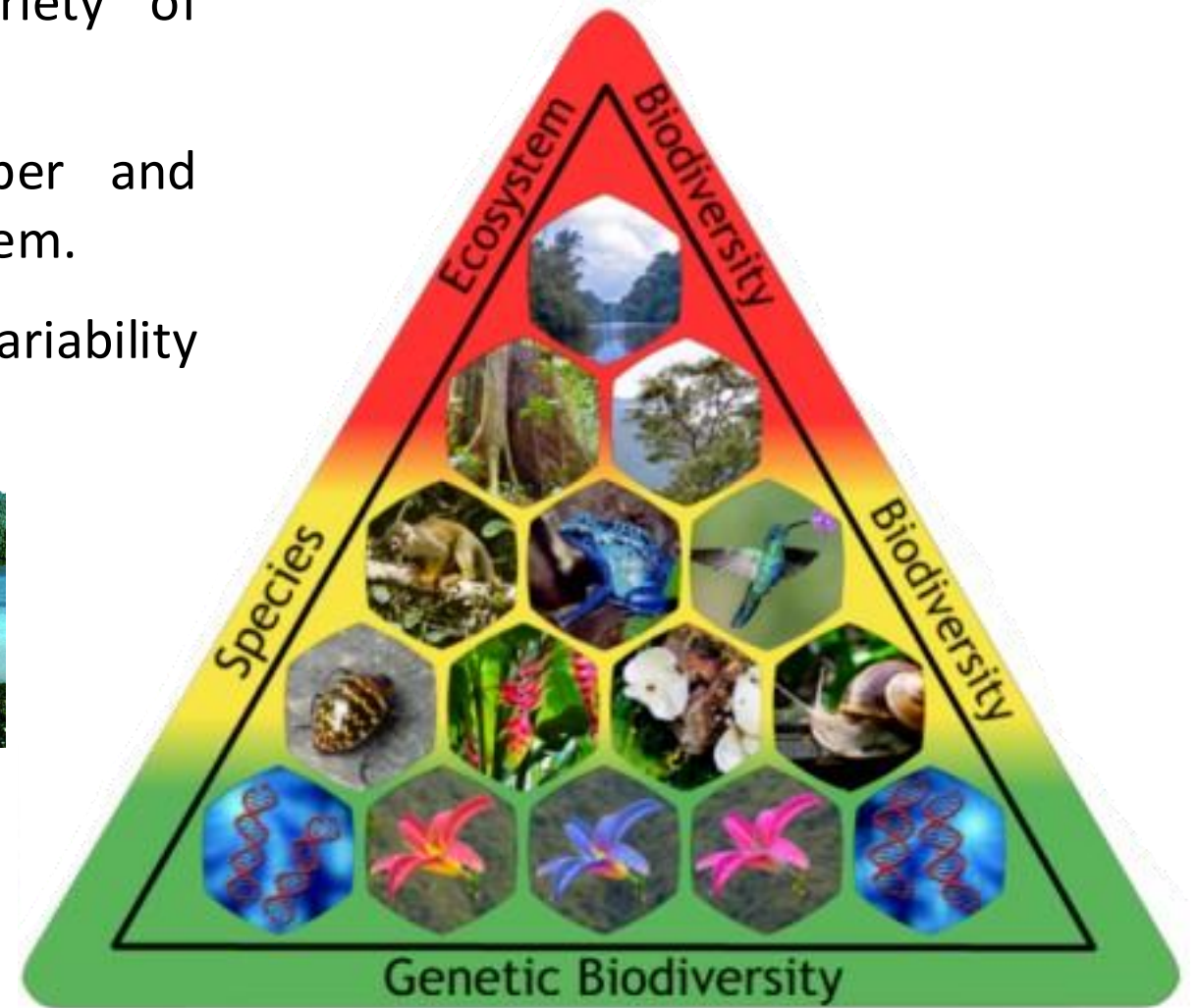


Biodiversity



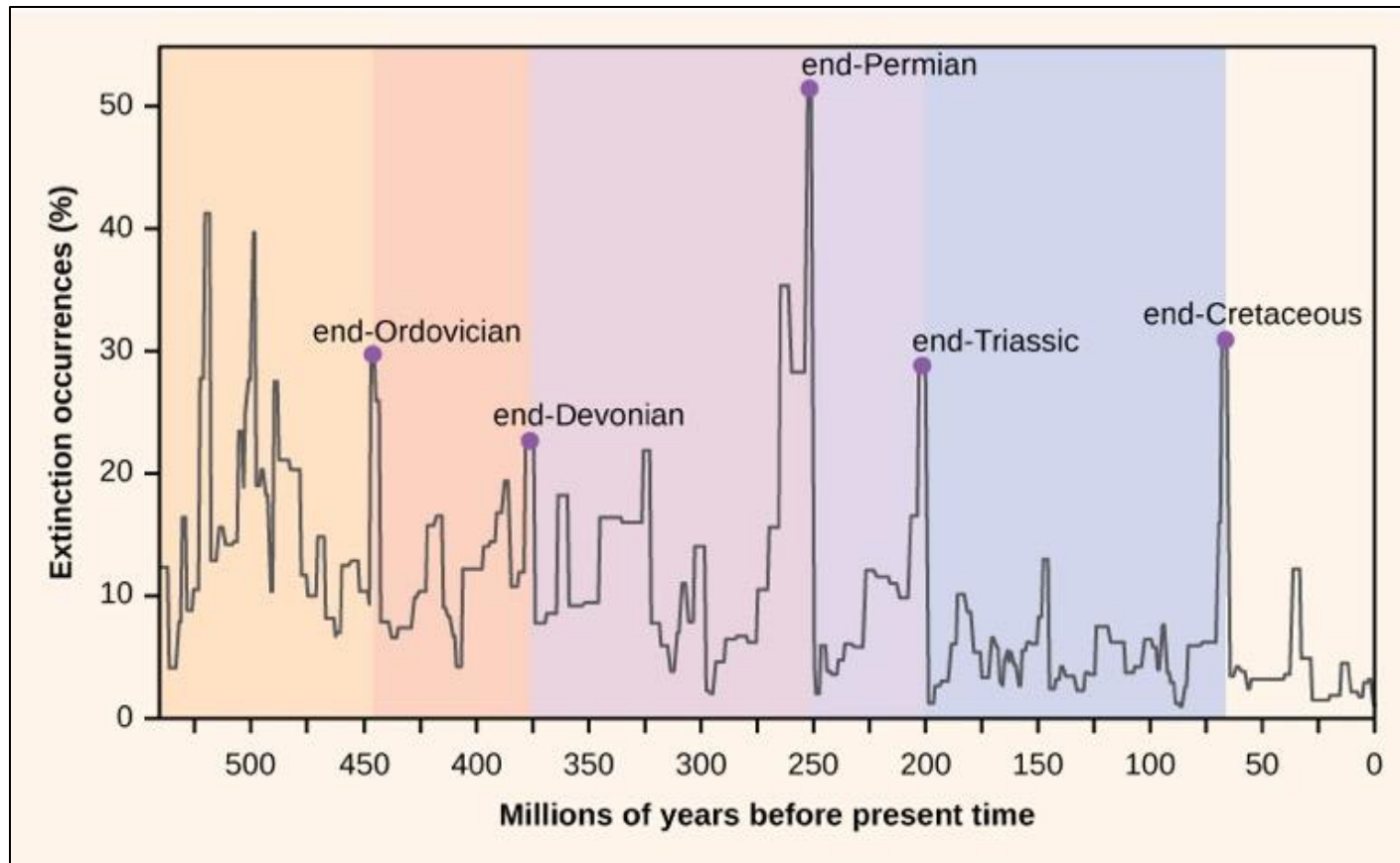
Biodiversity has three components:

- **Ecosystem biodiversity** is about the variety of different habitats in a given area.
- **Species biodiversity** is about the number and distribution of different species in an ecosystem.
- **Genetic biodiversity** is about the genetic variability within a population.



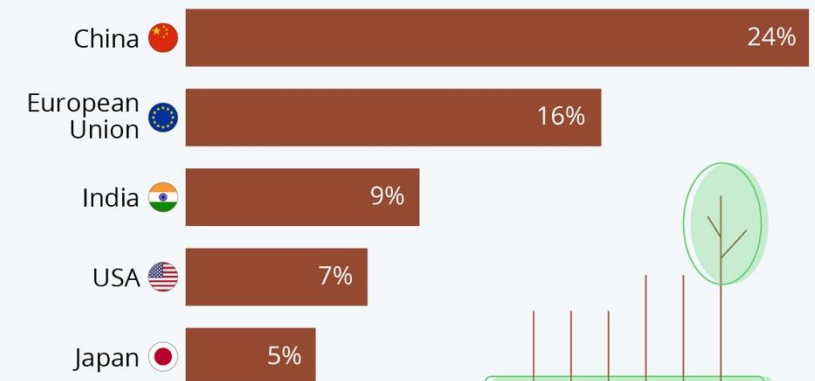
Mass extinctions are not a new phenomenon: The most famous extinction event was the disappearance of the dinosaurs at the end of the Cretaceous about 60 million years ago.

There are concerns that ongoing environmental pressures from human activity increasingly endanger the continuance of vulnerable species of flora and fauna worldwide.



The Biggest Contributors to Tropical Deforestation

Share of tropical deforestation associated with international trade attributable to selected countries/areas 2005-2017*



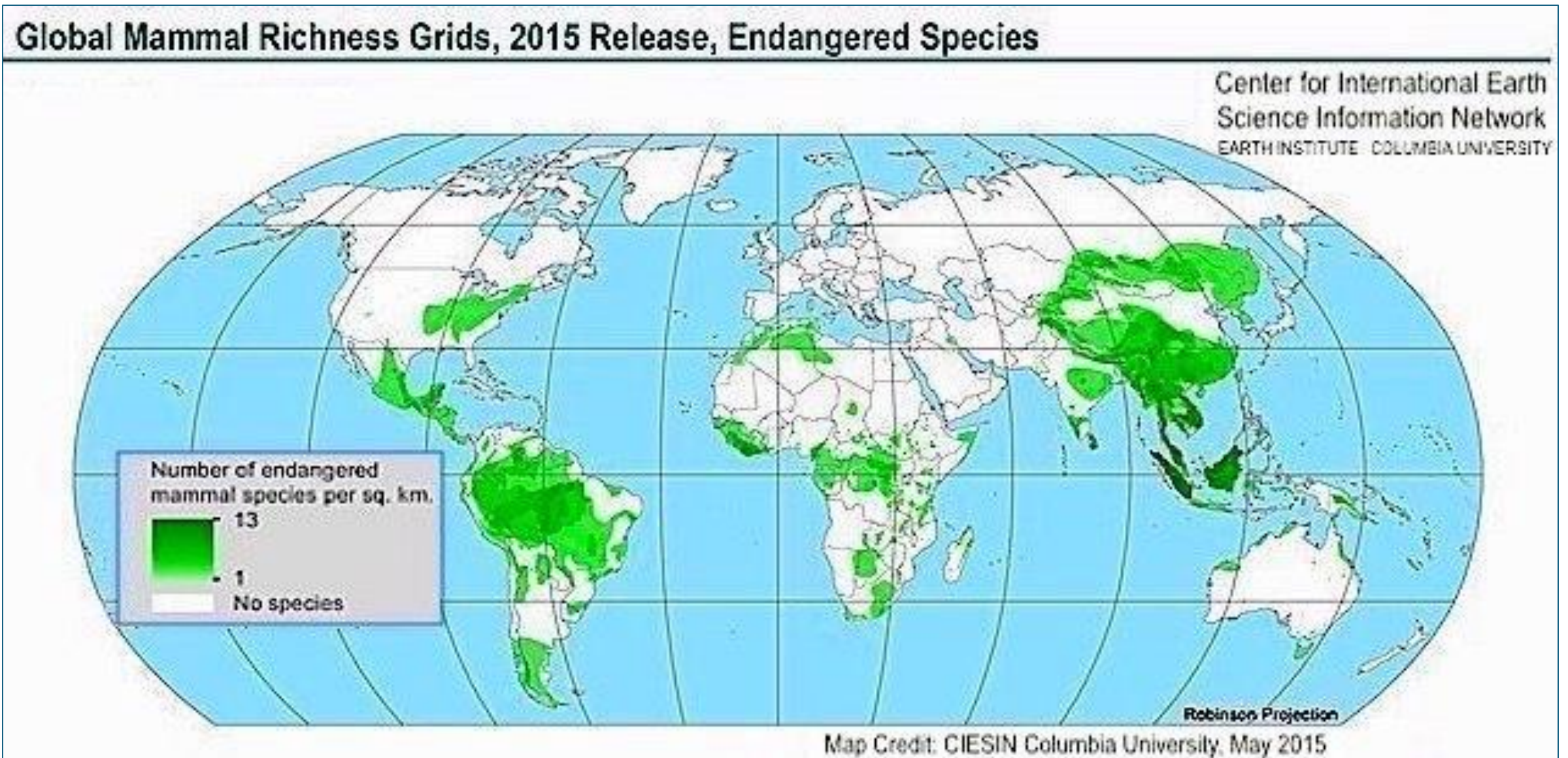
* Based on data and findings from satellite imagery and trade flow analysis.
Source: WWF



statista

Graph on left from “Environmental Issues” by Andrew Frank: <https://openstax.org/books/biology/pages/1-introduction>

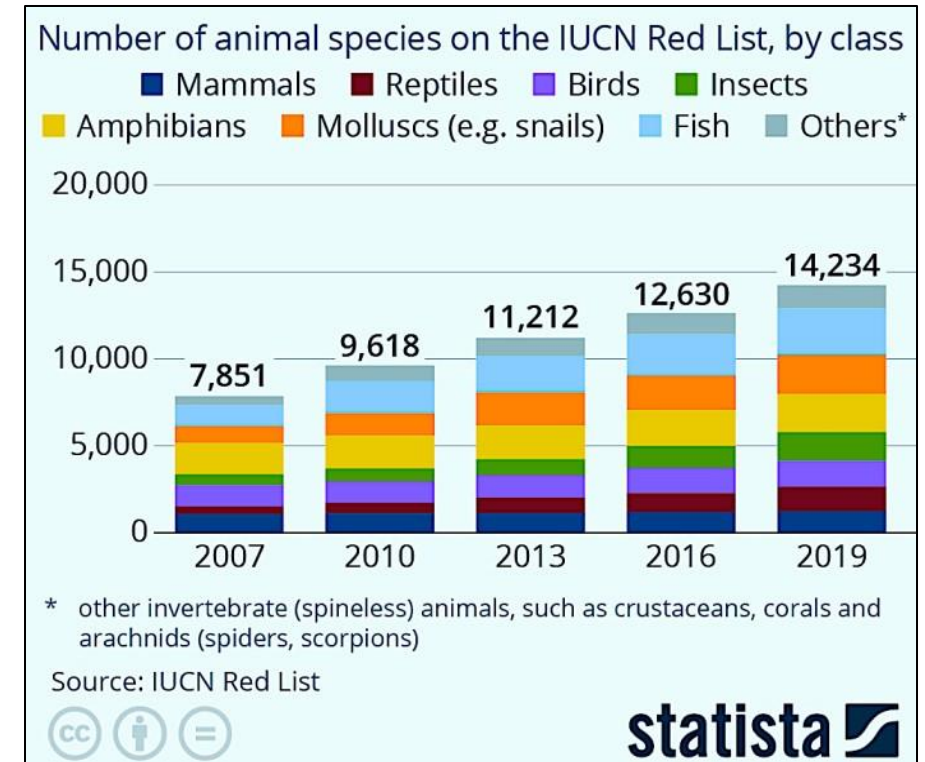
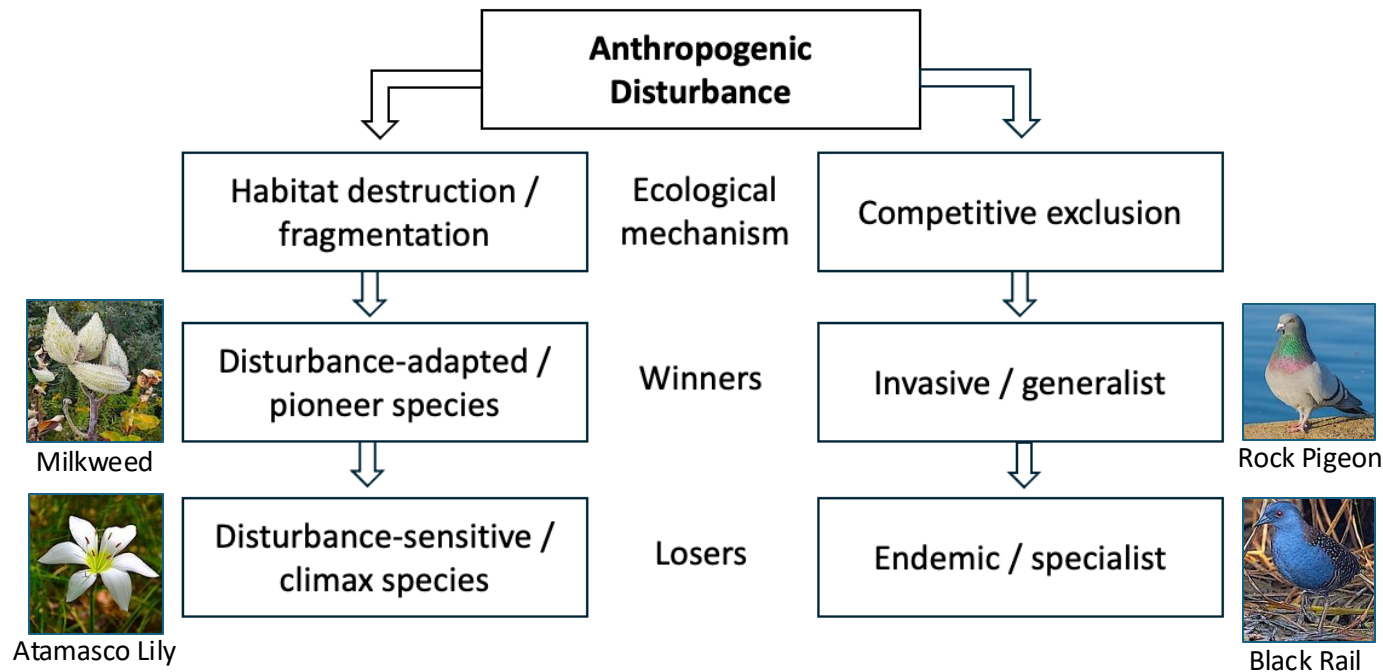
Less affluent nations make up most of the current hotspots for endangered species.



The endangered species list is growing, but not all species respond equally to man-made disturbances:

Habitat fragmentation generates an increasing proportion of “**edge habitats**” that favor disturbance-adapted **pioneer species** over species that are adapted to the more mature **climax ecosystems**.*

Invasive species and **generalists** also thrive at the expense of species that are **specialized** and/or **endemic**.



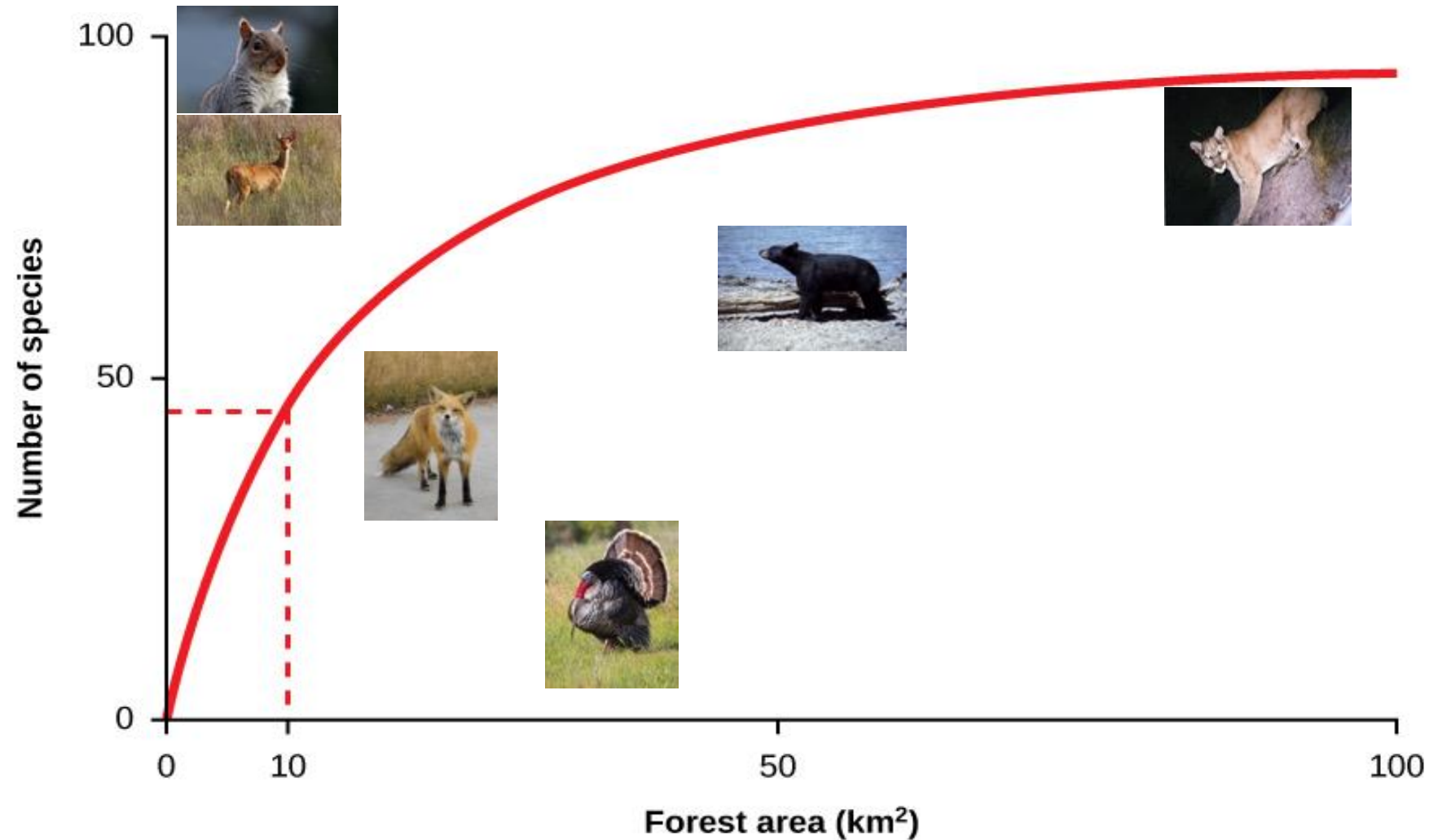
*Chart adapted from “A World of Winners and Losers: How Habitat Fragmentation Leads to Loss of Endemic Species” by Jesse Passman <https://conservationbiologynews.wordpress.com/2012/09/17/a-world-and-winners-and-losers-how-habitat-fragmentation-leads-to-loss-of-endemic-species/> based on research by Tabarelli et al. (2012) <https://www.sciencedirect.com/science/article/abs/pii/S0006320712002893>

Rate from 0-10 the likelihood of you seeing one of these species on a weekly basis:



Unsurprisingly, biodiversity is largely a function of ecosystem size.

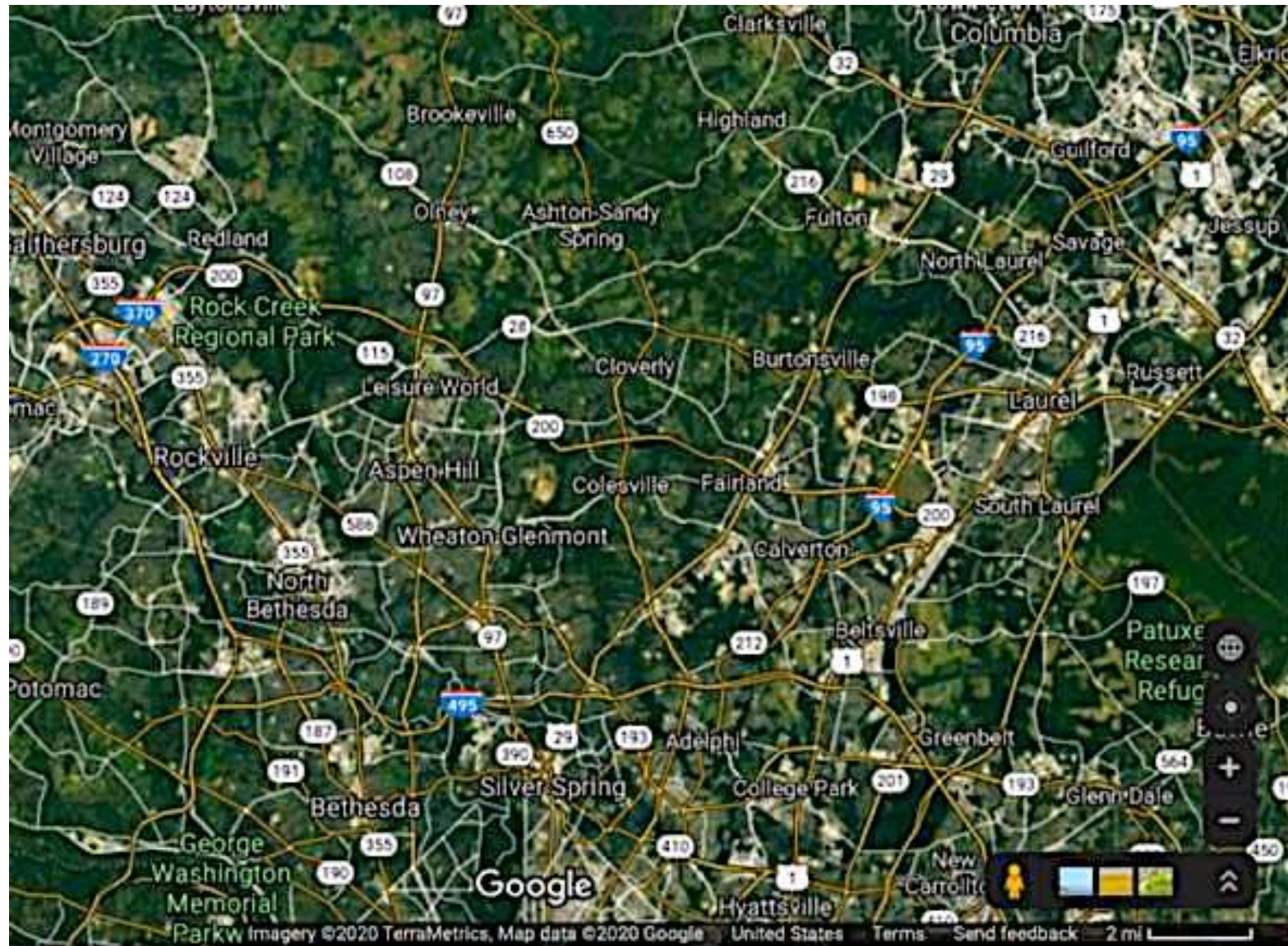
Larger forests have more species because they are able to accommodate top predators that enhance biodiversity by preying upon species that would otherwise dominate the habitat.



Shenandoah National Park is biodiverse because it contains large areas of uninterrupted forest.



The suburbs of Maryland contain many green spaces, but they are fragmented by highways, shopping centers, and housing developments.

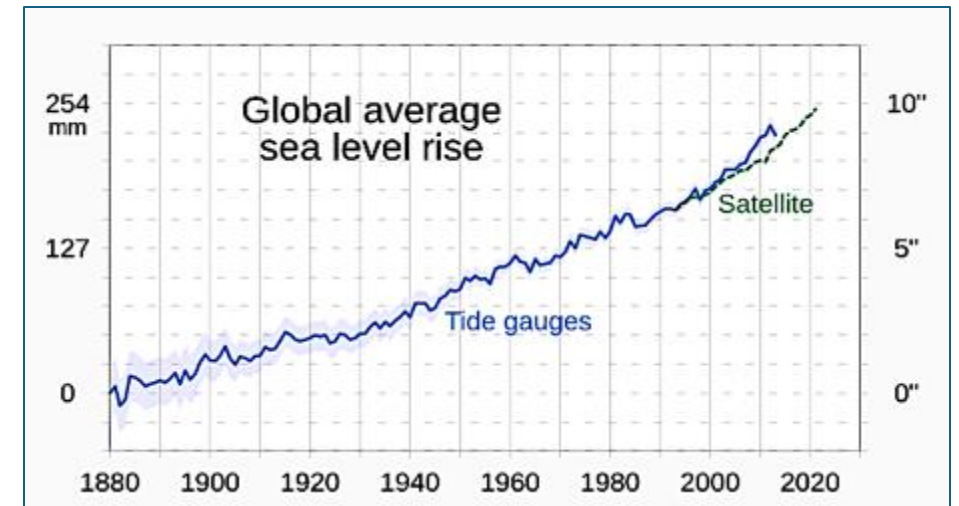


At one time cougars ranged throughout the continental US (yellow), but today the few that remain are found almost exclusively west of the Mississippi River (red).



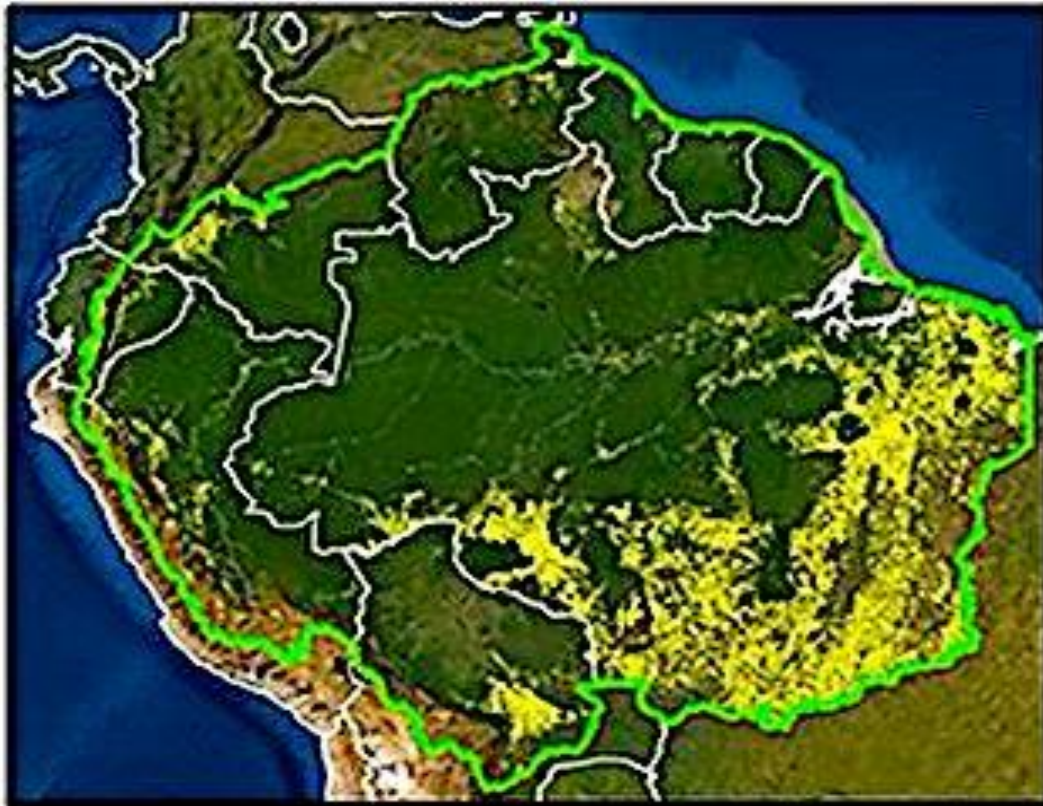
Biodiversity is not only aesthetically pleasing, it also enhances ecological services like soil integrity, pest control, pollination, and sources of future medicines. Anthropogenic threats to biodiversity include:

- Habitat Destruction
- Invasive Species
- Overharvesting
- Climate Change

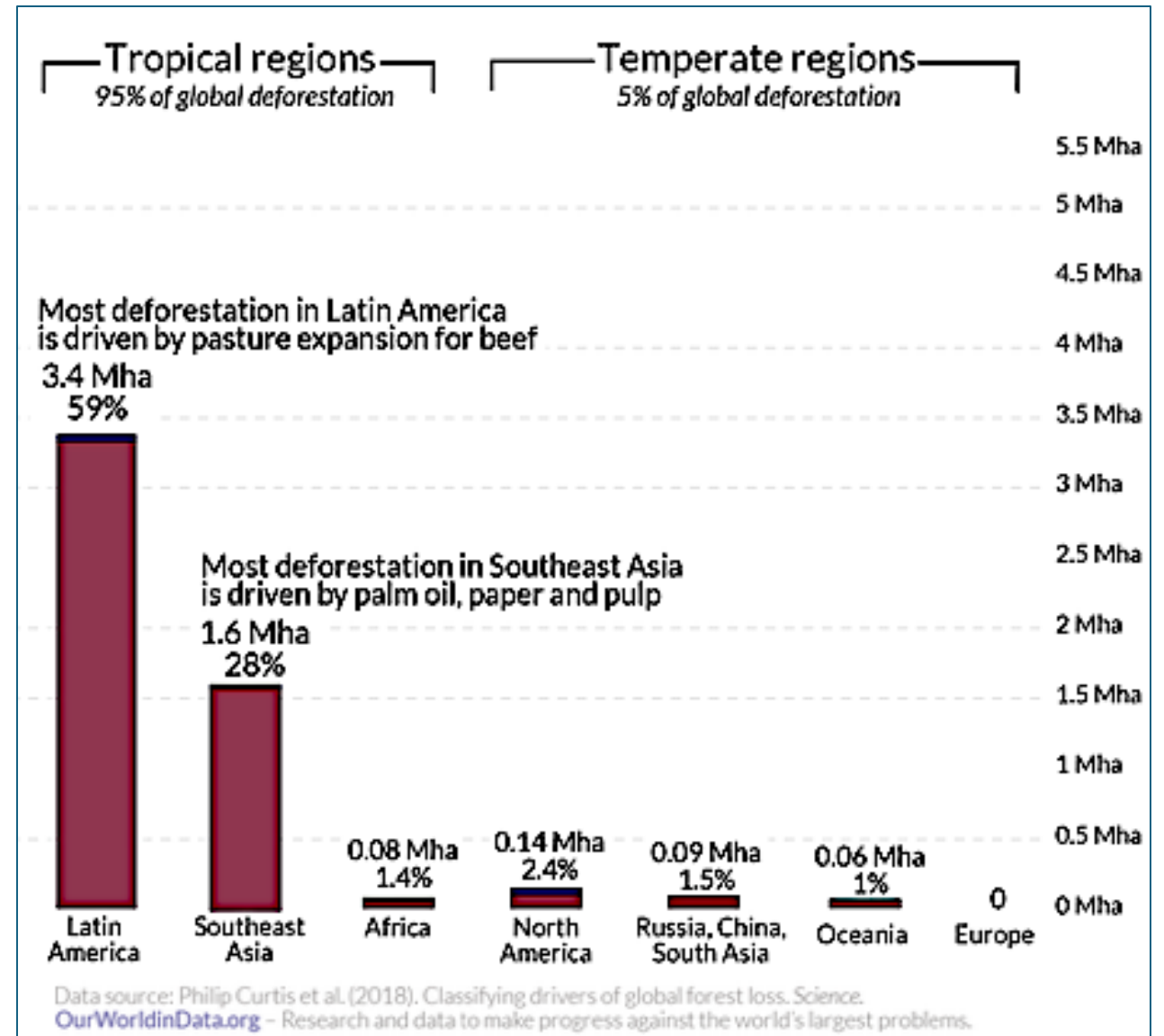


The most common form of **habitat destruction** is **deforestation**.

Worldwide, most deforestation takes place in **Latin America** and **Southeast Asia**.



Deforestation for agriculture in the Amazon basin 2001-2019



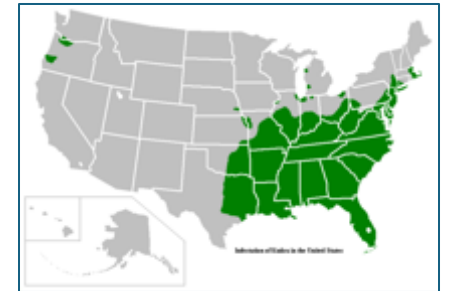
Starlings are native to Europe. They were imported to the US by a literary enthusiast who wanted to import all birds mentioned in Shakespeare plays. Starlings are **invasive** because they are prolific breeders that outcompete many native species in North America.



Nutria are native to South America. They were imported to the Louisiana to raise them for their fur. Nutria are **invasive** because their large burrows and voracious appetite for aquatic vegetation damage shorelines and river banks.



Kudzu is native to Japan. It was imported to the US in the late 19th century as an ornamental plant and later used to control erosion. It is **invasive** because it grows so quickly that it outcompetes native species of plants for sunlight.



Fire ants were accidentally brought to the US through lumber shipments from South America. They are **invasive** because they outcompete other ants and their painful stings displace birds and mammals native to North America.



The **poaching** of endangered species in Africa is driven by the demand for **bushmeat** and **exotic products**.

Overfishing has also become a serious problem due to modern fishing technology. This problem is managed through enforcement of **fishing quotas** based on information derived from the monitoring of fish populations.



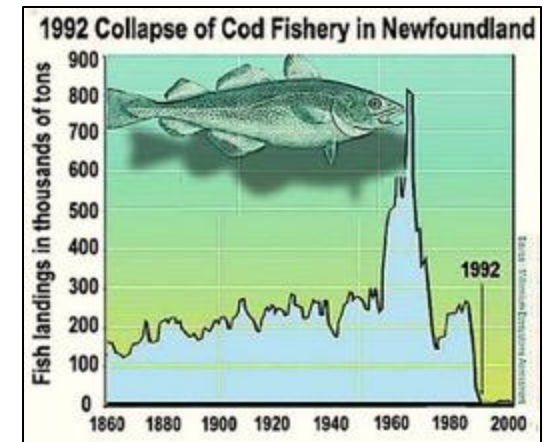
Dried Pangolin Meat



Fresh Lemur Meat



Rhinoceros Horn




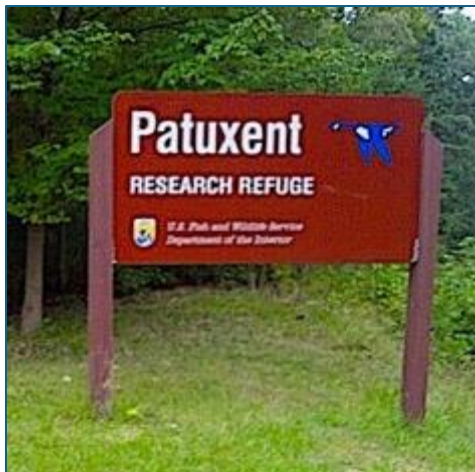
The **Key deer** is endemic to the Florida Keys. Its habitat was greatly reduced through by the growth of waterfront property during the 20th century.

Key deer now face the additional threat of **rising sea levels** attributed to **climate change**.



Strategies for mitigating biodiversity declines include: 

- Wildlife refuges.
- Habitat restoration.
- Seed vaults that keep genetically diverse legacy crops in cold storage.
- Captive breeding of endangered species.
- Legislation to prevent the harming of endangered species such as: 
 - Endangered Species Act (US)
 - Convention on International Trade of Endangered Species (International)



Seed vault in Svalbard, Norway



The captive breeding image shows a California condor chick being fed with a condor puppet to simulate natural parenting.

The **Endangered Species Act** of 1973 addresses biodiversity in the US by **regulating public and private land use** and by developing plans to assist in the recovery of threatened and endangered species.

Kemp's ridley sea turtle populations declined dramatically in the 20th century due to pollution, harvesting of turtle eggs, and habitat destruction. Under the **ESA**, nesting sites are fenced off and monitored to maximize the number of hatchlings successfully returning to the sea.



The **Convention on International Trade of Endangered Species** of 1975 is an international agreement that bans the **trafficking of endangered species** and their associated products. In the US, **CITES** is enforced by US customs.



Endangered species products seized by US customs.



Acknowledgement:



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