

Conservation Biology

What is conservation biology?

- It is a goal-oriented science that seeks to counter the biodiversity crisis, the current rapid decrease in Earth's great variety of life.
 - Conservation biology is about trying to understand what is happening to biodiversity, why is it happening, and what we can do about it.

Biodiversity crisis

- Species extinctions and community and ecosystem disturbance have been natural occurring phenomena for a long time
- However, they have reached a crisis level due to the high rate at which they are occurring on recent times. The main culprit: *Homo sapiens*

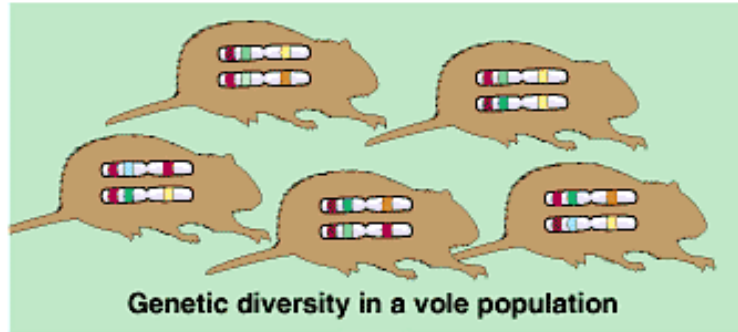
Deforestation of tropical forests



Biodiversity crisis at 3 levels

- Components of biodiversity:
 - Genetic diversity. Loss is due to extinction of populations
 - Species diversity. Loss is due to extinction of species populations within a community (local extinctions) or extinction of all the populations of a species within its range (global extinction)
 - Ecosystem diversity. Loss is due to habitat destruction

Three levels of biodiversity



Biodiversity benefits

- Aesthetic benefits
- Health benefits
- Industry benefits
- Ecosystem services
 - Purification of air and water, reduction of severity of droughts and floods, generation and preservation of soils, detoxification and decomposition of wastes, pollination of crops and natural vegetation, dispersal of seeds, nutrient cycling, moderation of weather extremes

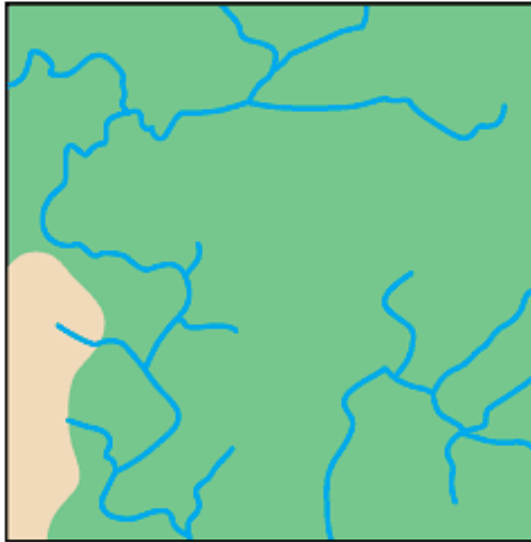
The rosy periwinkle (*Catharanthus roseus*): a plant that saves lives



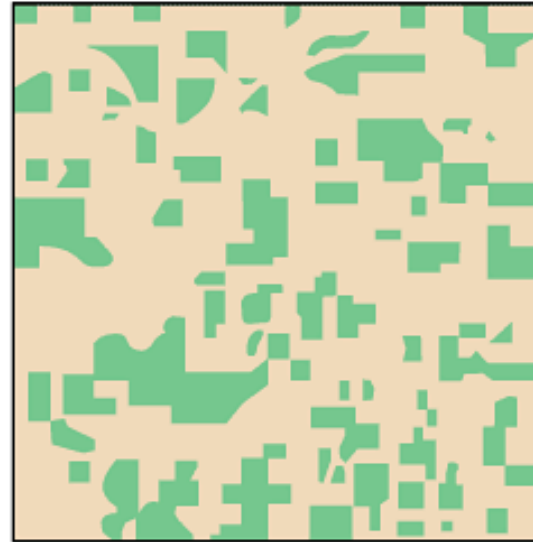
Three major threats to biodiversity

- Habitat destruction
 - Implicated in 73% of species designated as extinct, endangered or vulnerable in terrestrial systems
 - 93% of coral reefs have been damaged by human activities
- Introduced species
 - Have contributed to 40% of extinctions recorded since 1750
- Overexploitation
 - Human harvesting of wild plants and animals at rates exceeding the ability of populations to rebound causing drastic reductions on population sizes

The history of habitat reduction and fragmentation in a Wisconsin forest



1831



1882



1902



1950

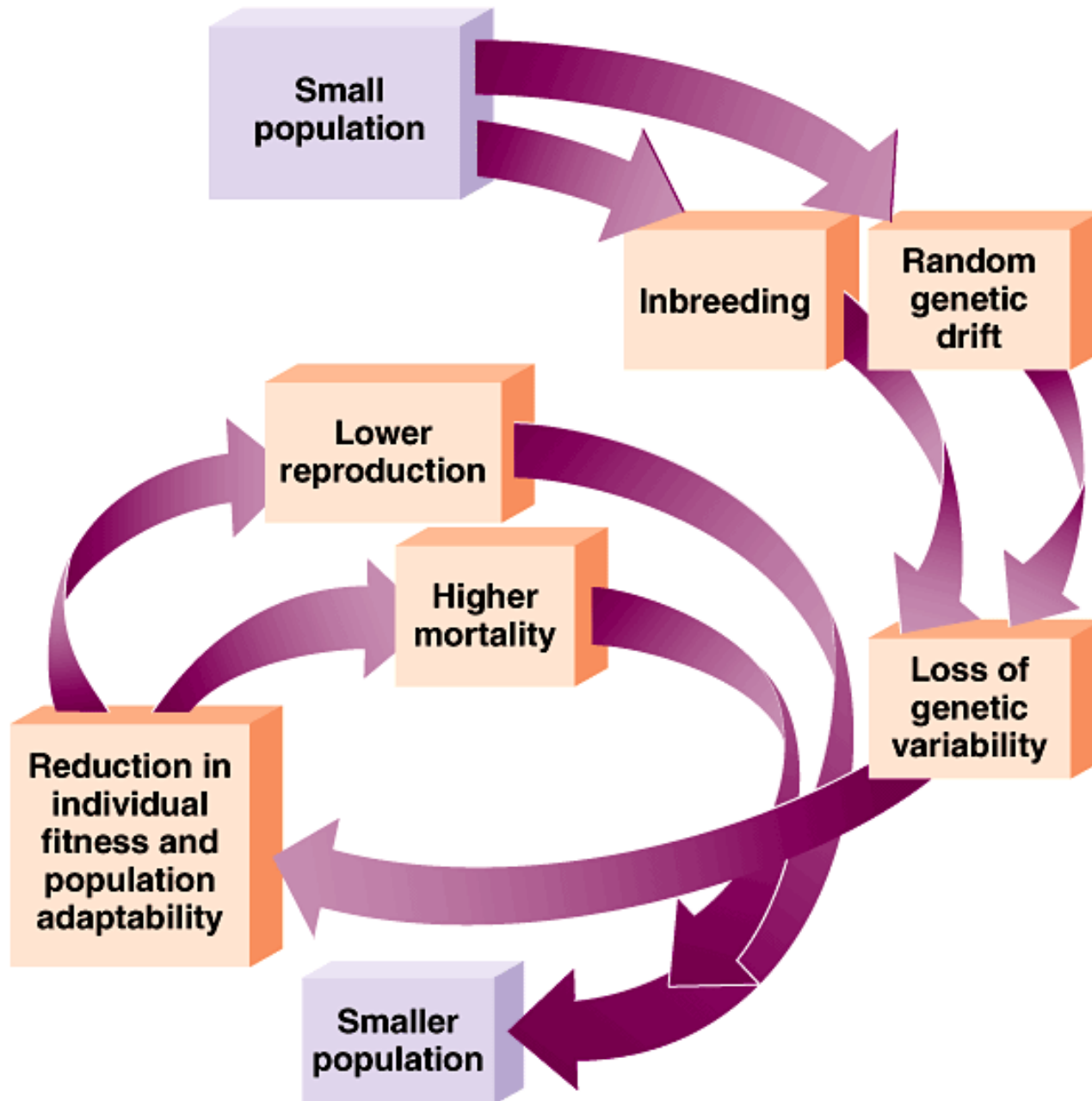
Disastrous species introductions: Nile perch (top left), brown tree snake (top right), Argentine ants (bottom left), seaweed *Caulerpa* (bottom right)



North Atlantic bluefin tuna auctioned in a Japanese fish market



The extinction vortex of the small-population approach



Conservation at the population and species level

- Small population approach
 - Goals: sustain populations at the minimum viable population size (MVP) and the effective population size (N_e) above the MVP
- Declining population approach
 - Goals: detect, diagnose and halt population declines before they reach the extinction vortex

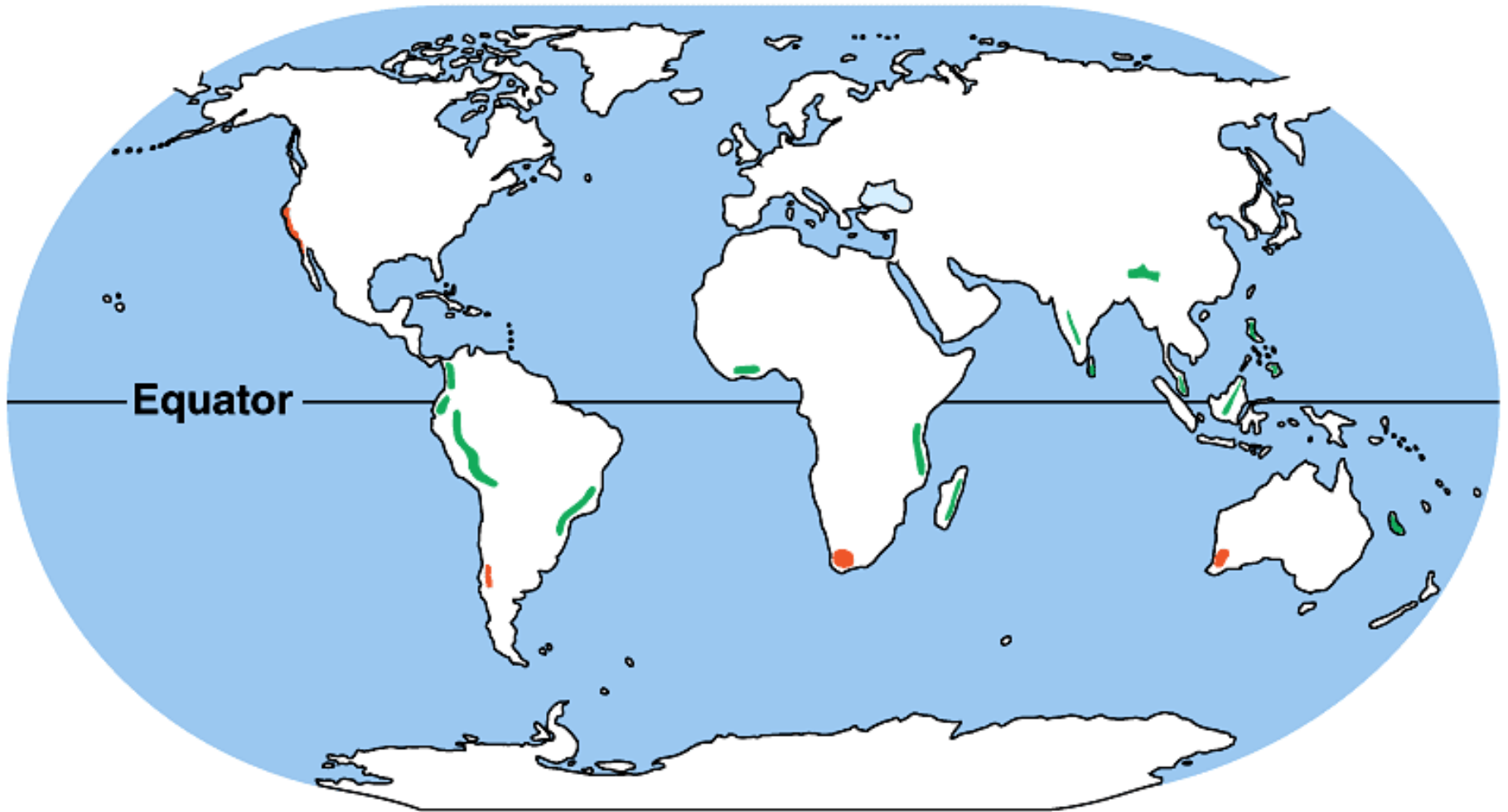
Conservation at the community, ecosystem and landscape level

- Landscape ecology
 - applies ecological principles to the study of human land-use patterns
- Setting up reserves and protected areas
 - applies ecological principles to the design and management of protected areas
- Restoration ecology
 - applies ecological principles in an effort to return degraded ecosystems to conditions as similar as possible to their predegraded state
- Sustainable development
 - Long-term prosperity of human societies and ecosystems that support them

Figure 55.15 Edges between ecosystems



Figure 55.17 Some biodiversity hot spots



 **Tropical forest hot spots**

 **Chaparral hot spots**

Figure 55.19 Zoned reserves in Costa Rica



Figure 55.21 The size-time relationship for community recovery from natural (salmon-colored) and human-caused (white) disasters

