Populations and Ecosystems

"Population, when unchecked, increases in a **geometrical** ratio. Subsistence only increases in an **arithmetical** ratio."

Thomas Malthus, "An Essay on the Principle of Population" 1798

Population Size

- ✓ growth
- ✓ limiting factors
- ✓ carrying capacity

Contributions to Growth

Increase **in Size due to:**

→ **Birth**

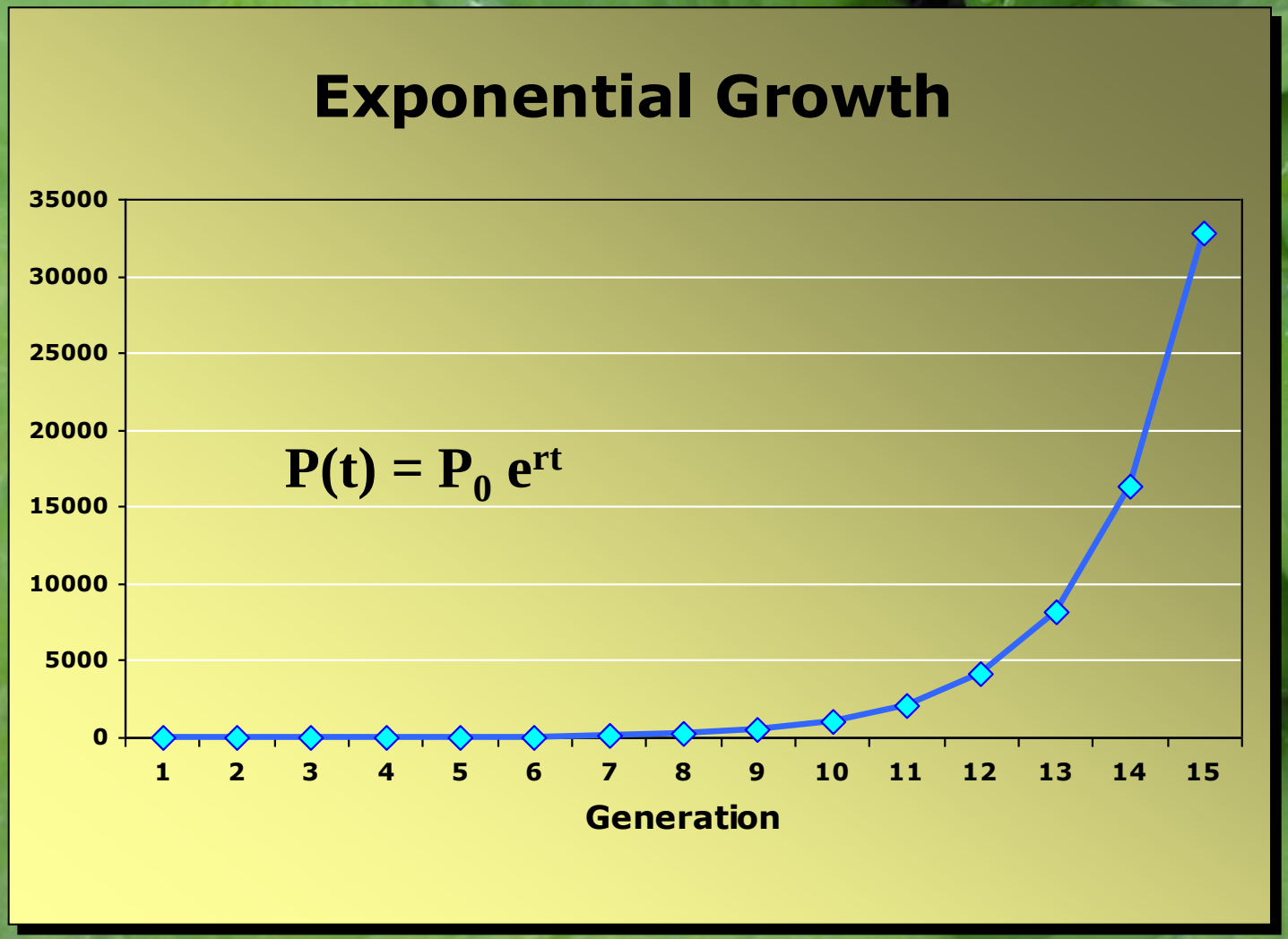
→ **Immigration**

Decrease **in Size due to:**

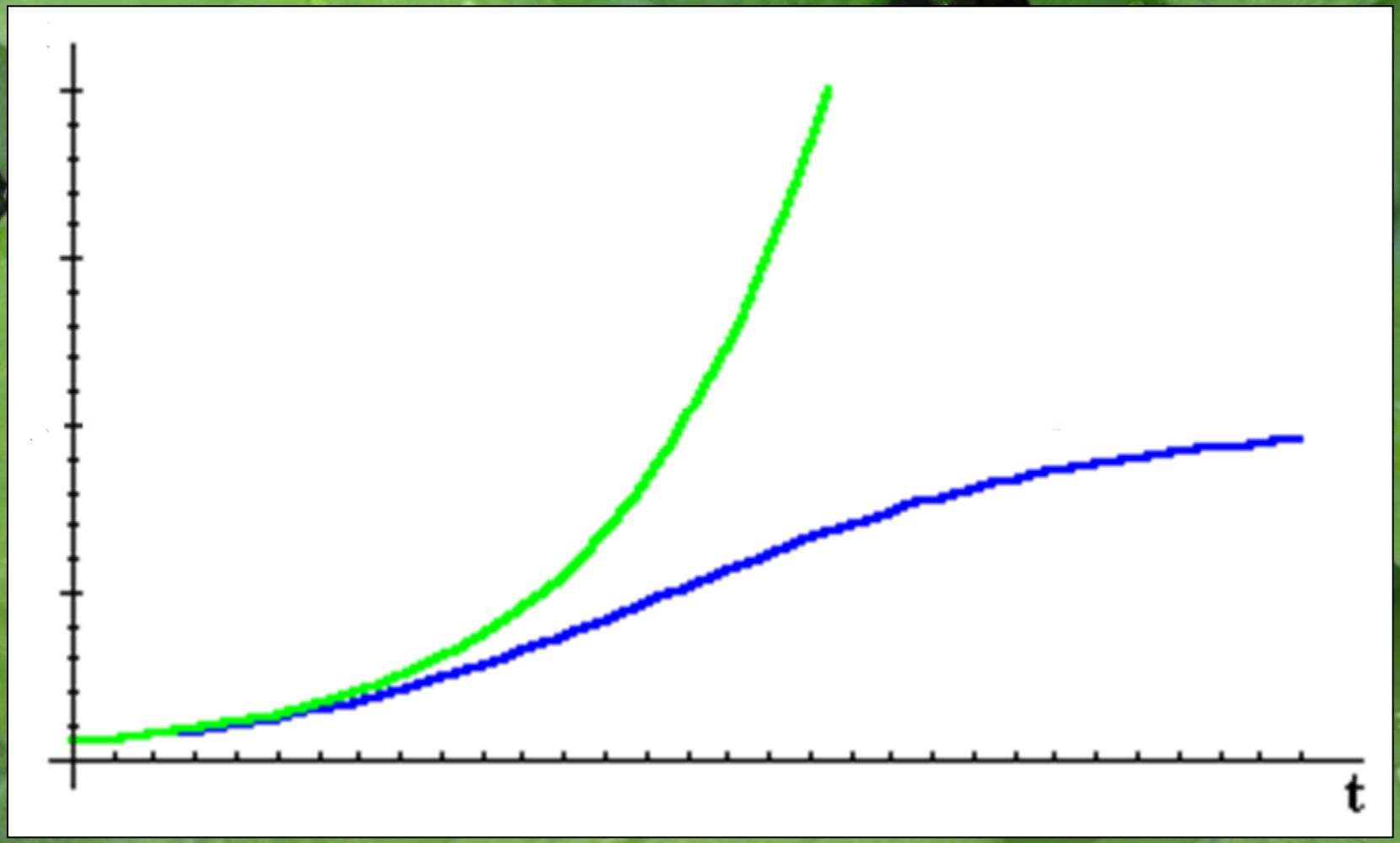
← **Death**

← **Emigration**

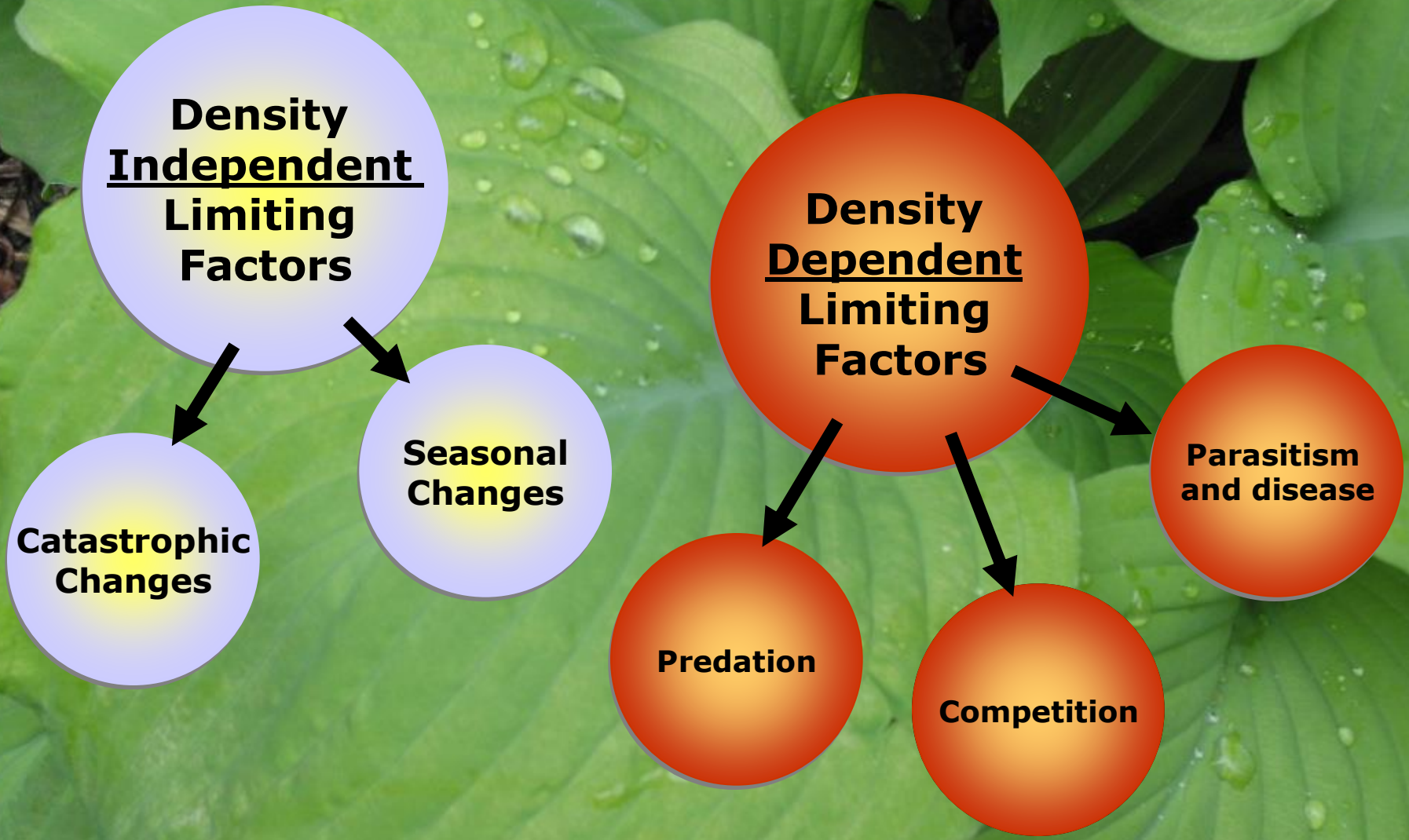
Unlimited Growth



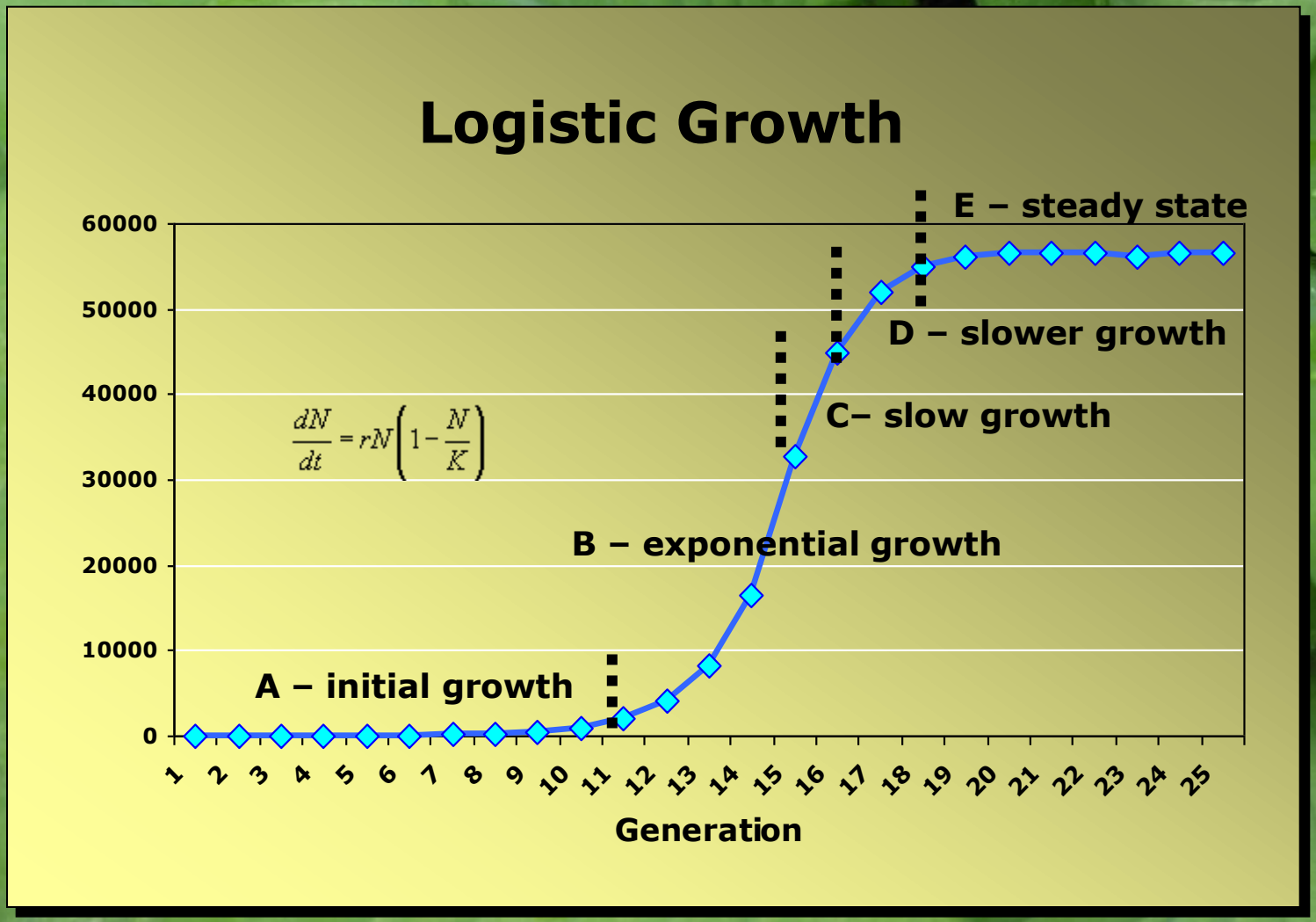
“Real” Growth Curves



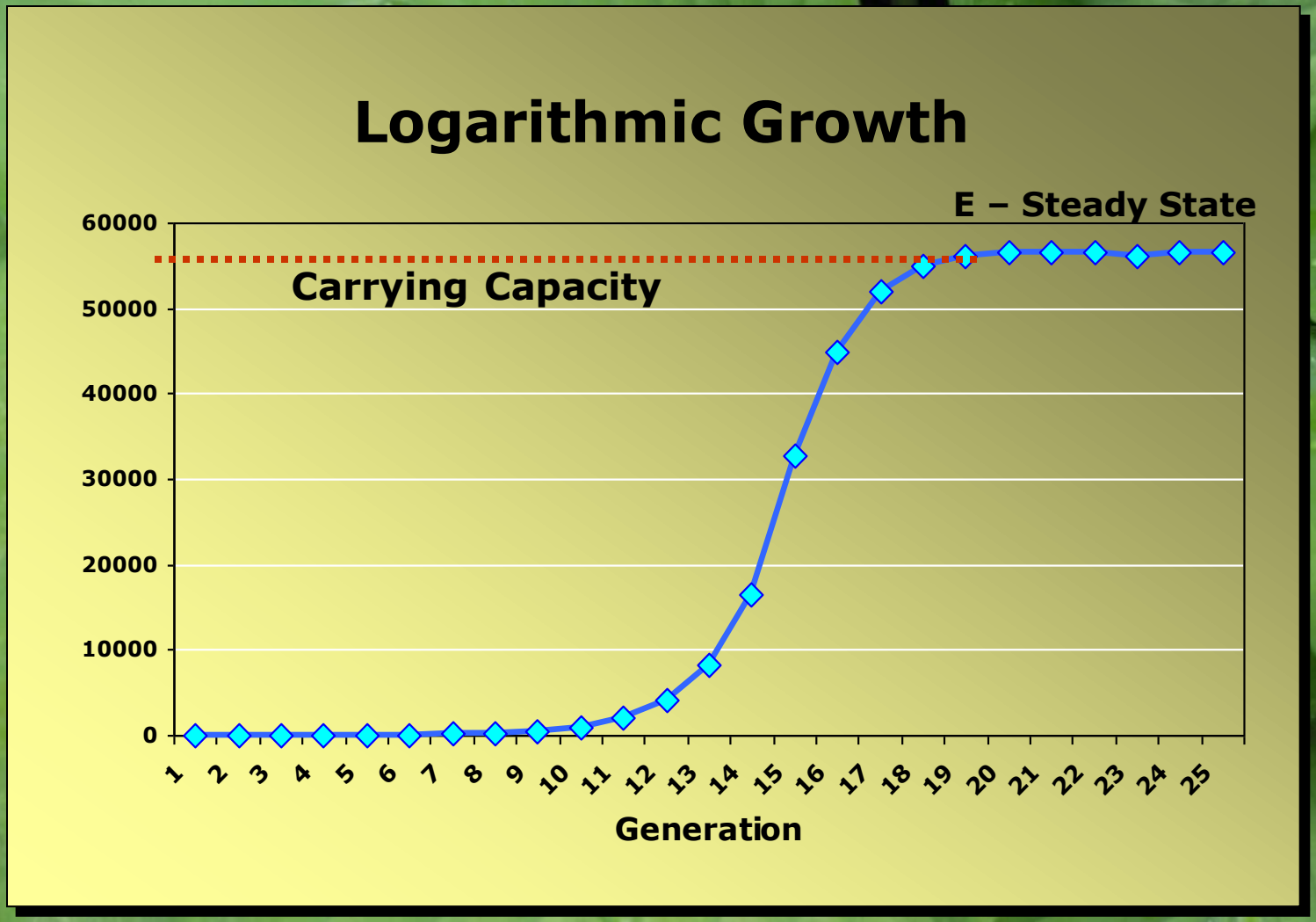
Limiting Factors Affecting Growth



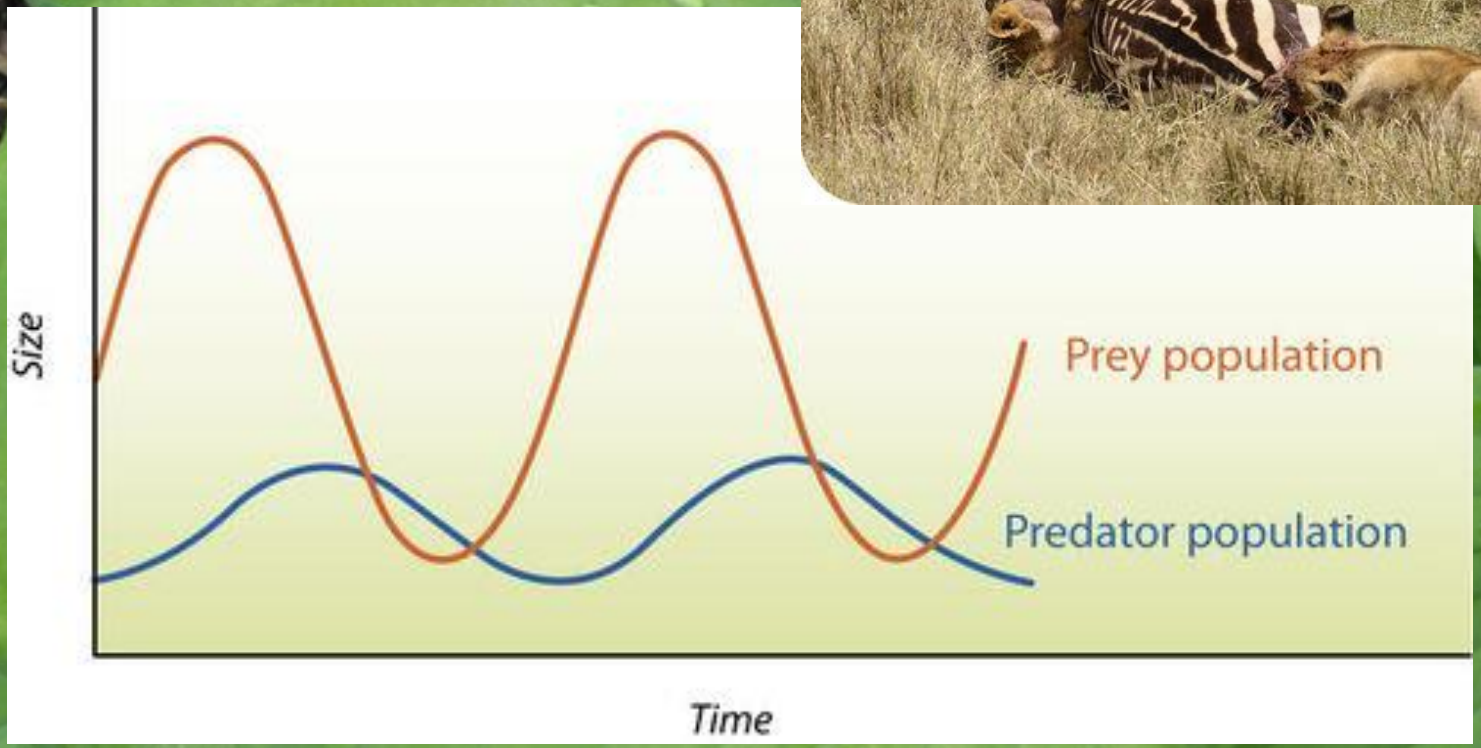
Limited Growth = Logistic Growth



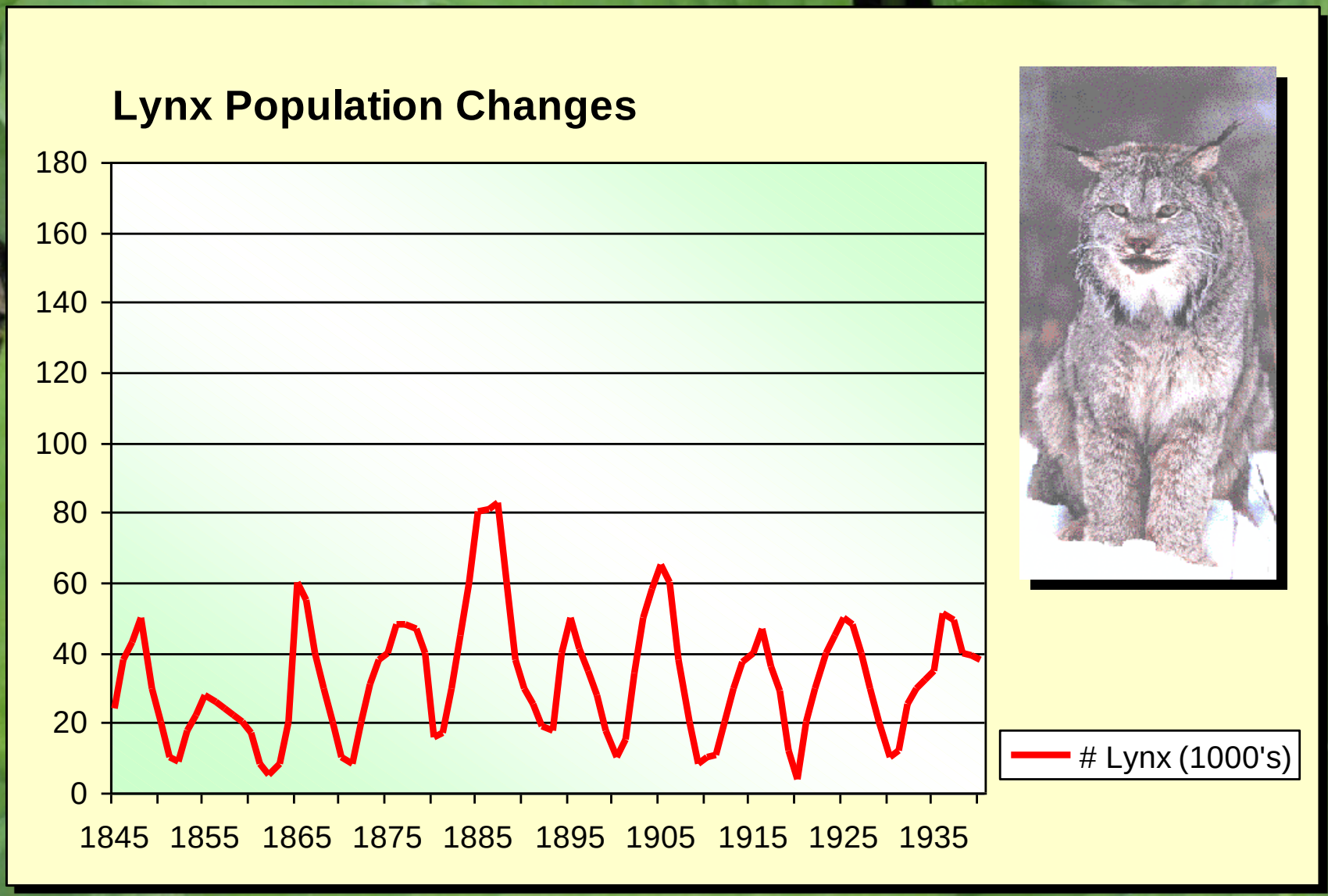
Carrying Capacity



Predation - *a Density Dependent Factor*

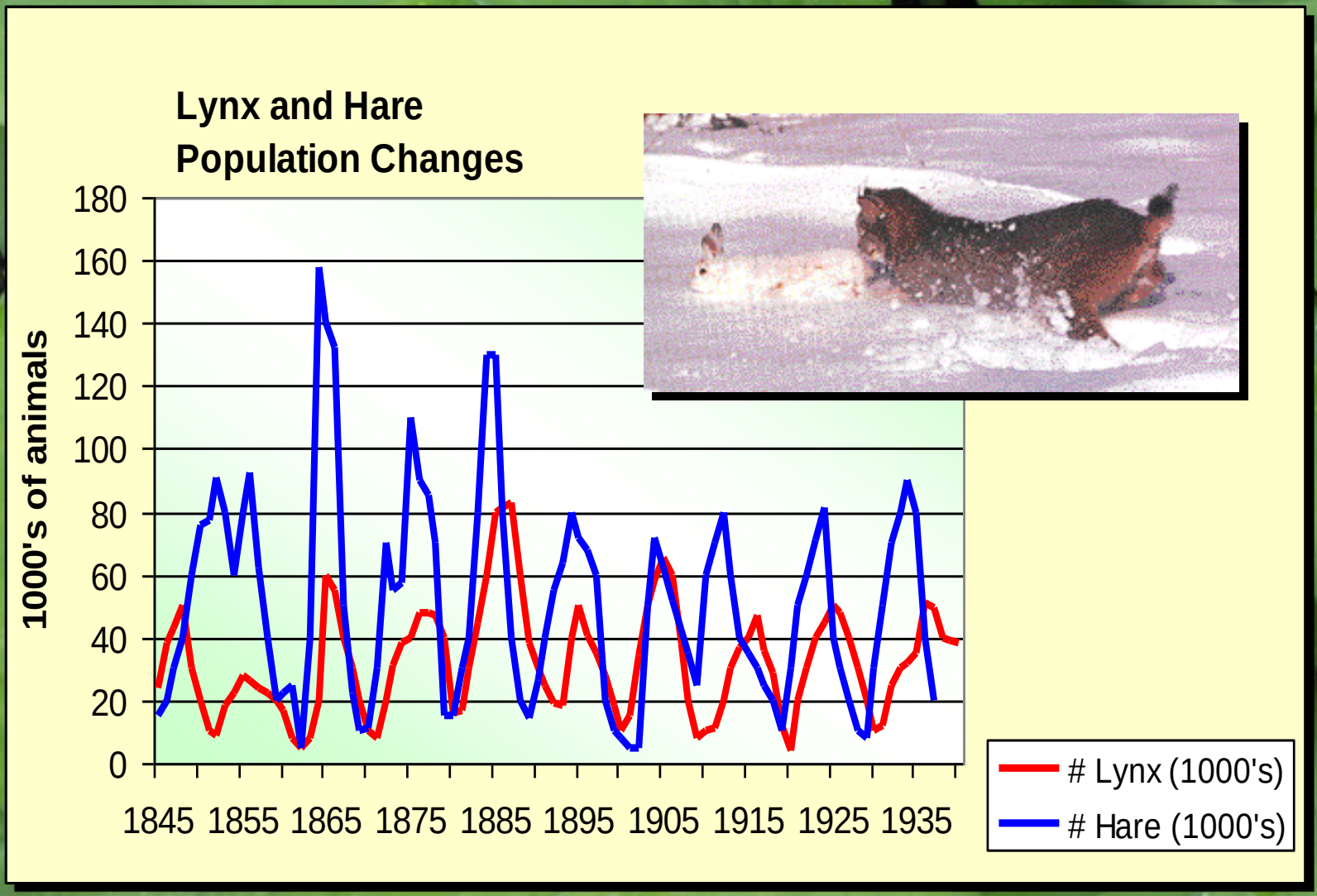


Predation – *a textbook example*



Predation continued

Predation – *predator-prey combined*



Predator – Prey Game

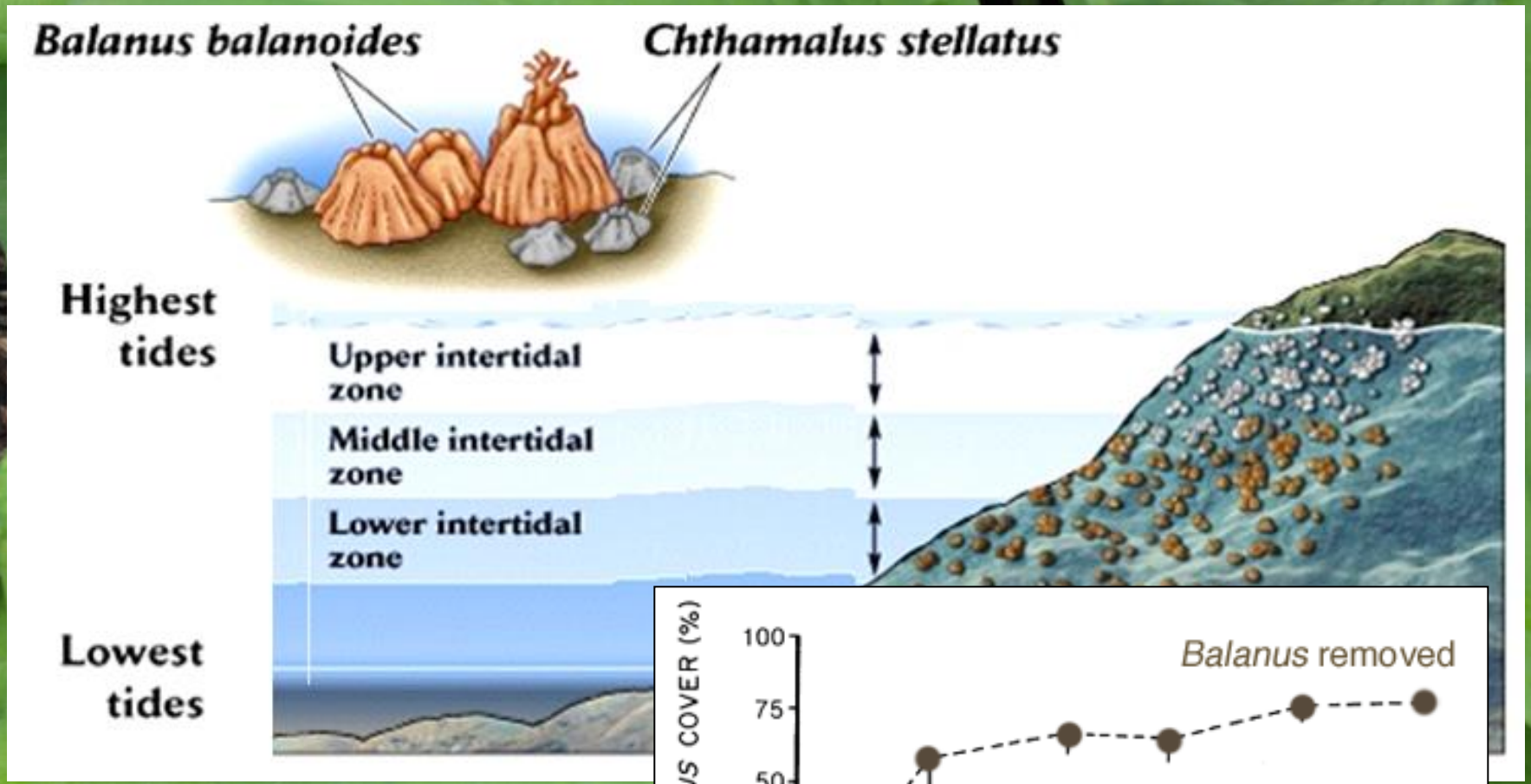
Predator-Prey Simulation

Animals that eat other animals are *predators*. The animals they eat are their *prey*. The Canadian lynx is a predator of snowshoe hares. This simulation lets you observe changes in hypothetical populations of lynx and hares over multiple generations.

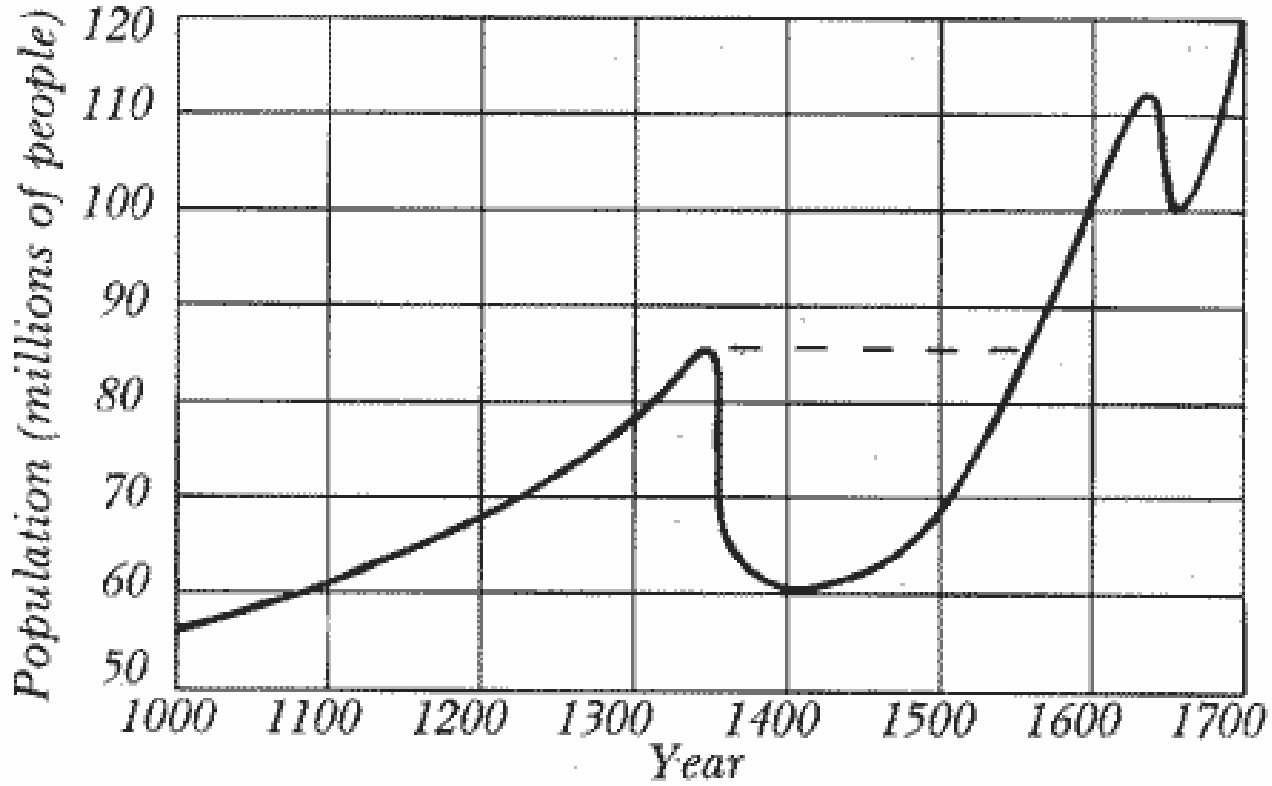
It's easy to imagine how a predator affects the size of the prey population. But watch how the abundance of prey also impacts the number of predators.

Predator Prey Game

Competition – *for space*



Disease



Recovery of European population following the plagues of 1347 was only two hundred years—an insignificant moment in the evolutionary time scale. (After Langer 1964; author)

How Many Worlds to you need?