Chapter 5

Populations and Communities

Chapter 5 Section 1: Populations & Communities

Key Vocabulary Terms

Adapted from Holt Biology 2008

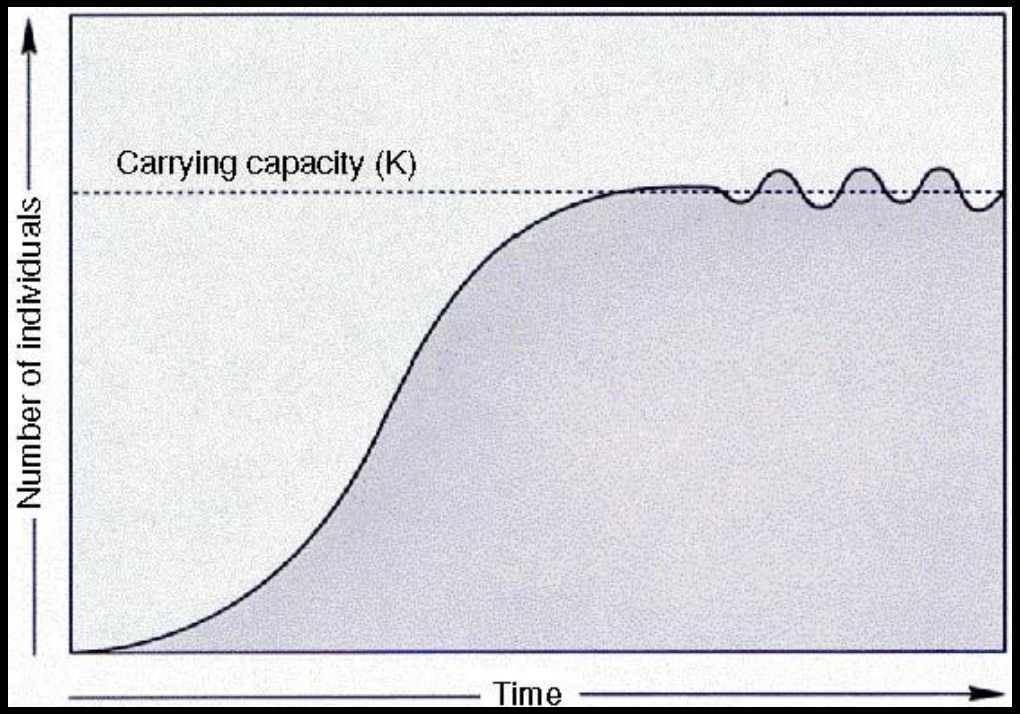
Population

A group of organisms of the same species that live in a specific geographical area

Adapted from Holt Biology 2008

Carrying Capacity

The largest population that an environment can support at a given time



Adapted from Holt Biology 2008

Content Objectives

I will be able to identify:

- The importance of studying populations.
- The difference between exponential & Logistic growth.
- The factors that affect population size.
- How science & technology have affected human population growth.

Adapted from Holt Biology 2008

Chapter 5
Section 1:
Populations & Communities

Notes

Adapted from Holt Biology 2008

Chapter 5
Section 1:
Populations & Communities

What is a Population?

Adapted from Holt Biology 2008

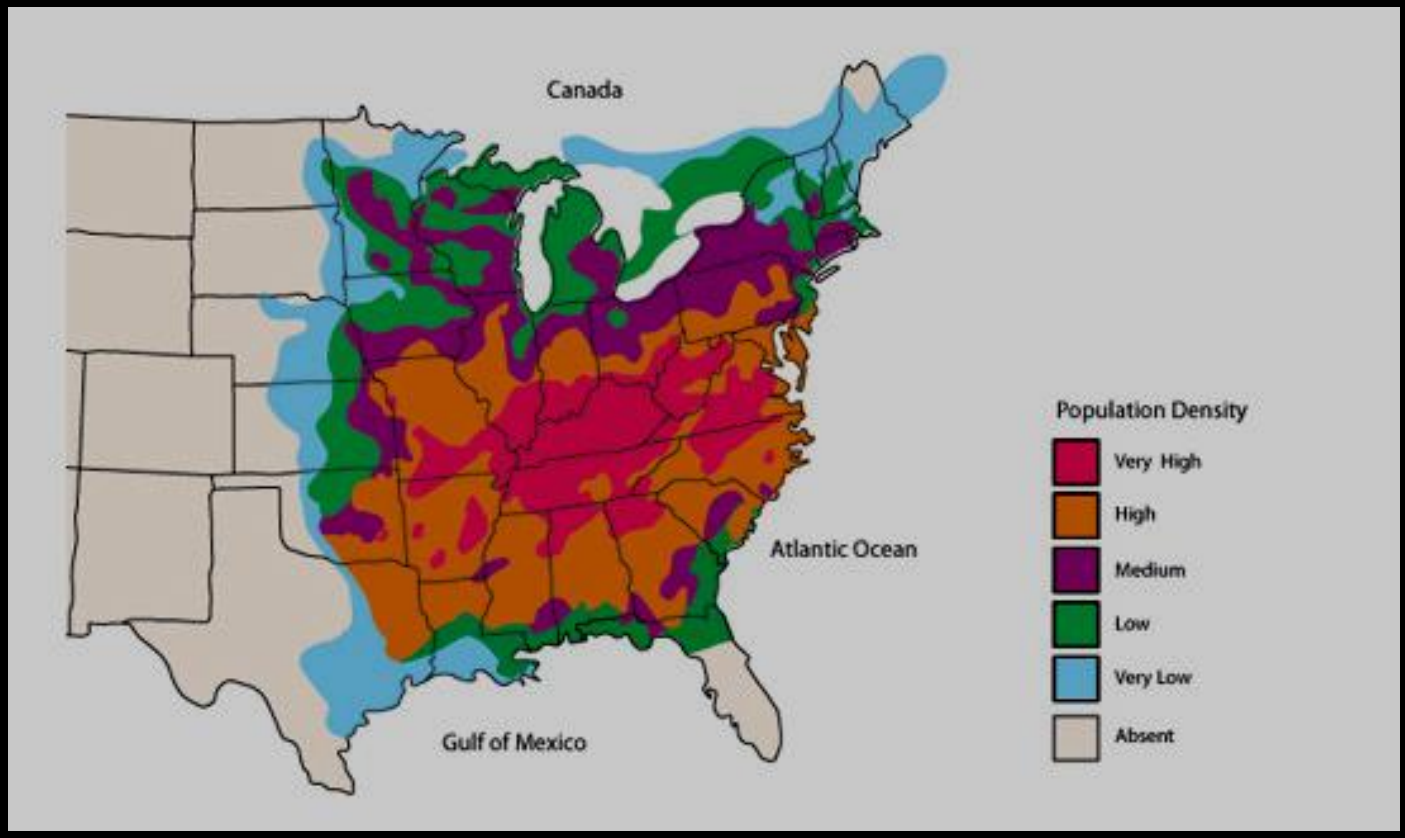
YOUR TURN
Active Reading
Section 1 – Populations?

Characteristics of Populations:

Geographic Distribution (range) : where the organisms live.

Adapted from Holt Biology 2008

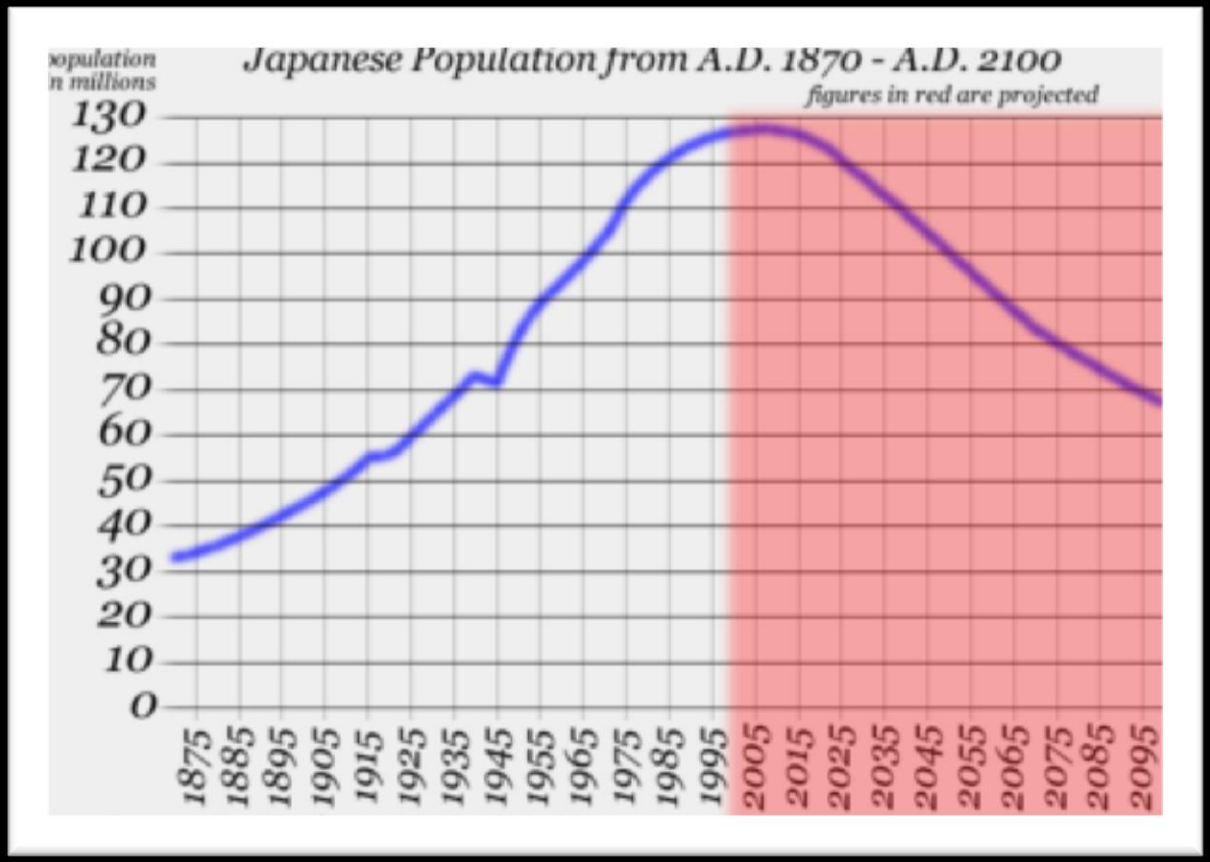
Characteristics of Populations:



Population Density: the number of individuals per unit area.

Adapted from Holt Biology 2008

Characteristics of Populations:



Growth Rate

Adapted from Holt Biology 2008

THINK, SHARE, WRITE
TSW #1

What distinguishes one zebra population from another zebra population?

THINK, SHARE, WRITE
TSW #1

What distinguishes one zebra population from another zebra population?

A Zebra population consists of a group of zebras that live together and interbreed. A different zebra population lives separately from the other population and does not interbreed with that population.

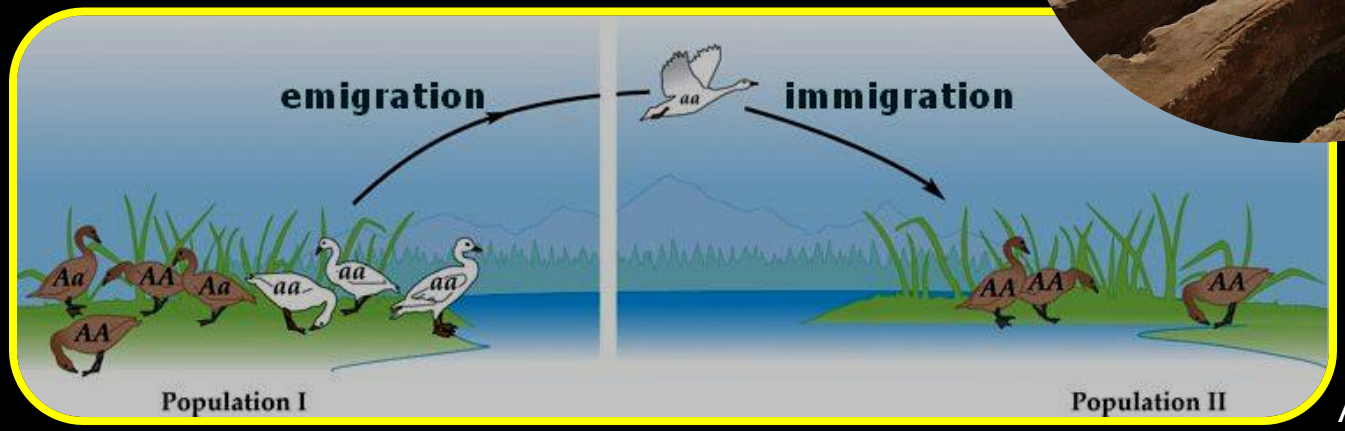
Chapter 5
Section 1:
Populations & Communities

Population Growth

Adapted from Holt Biology 2008

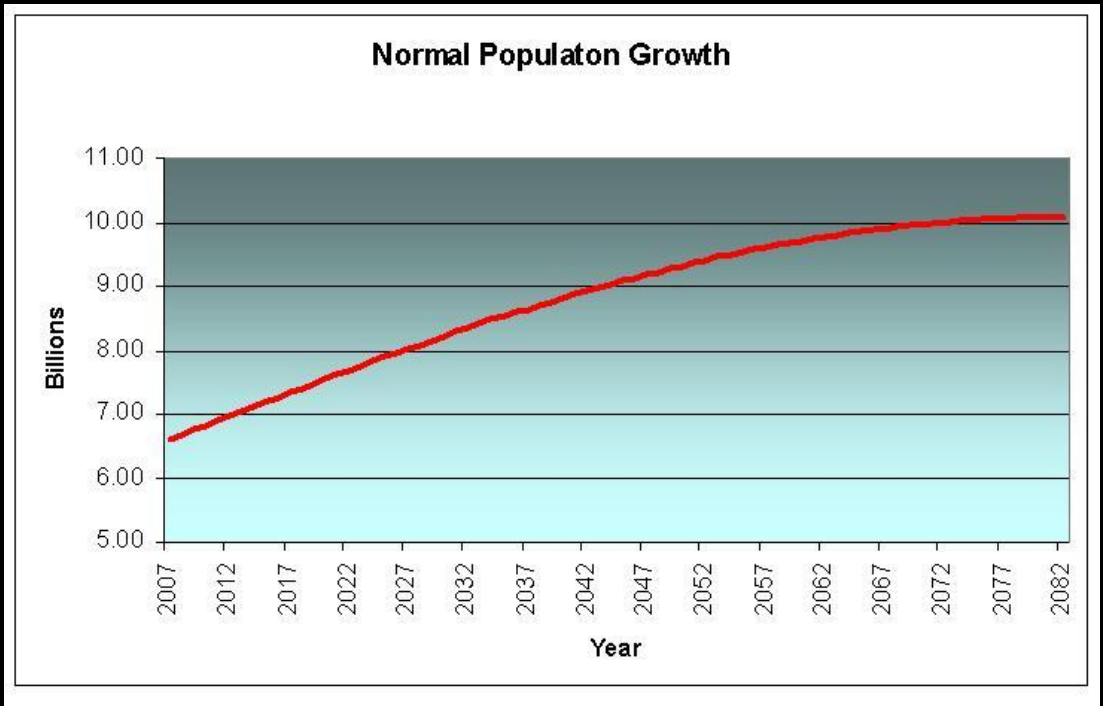
Four factors that affect population size

- Number of births
- Number of deaths
- Immigration
- Emigration



Adapted from Holt Biology 2008

Population Growth

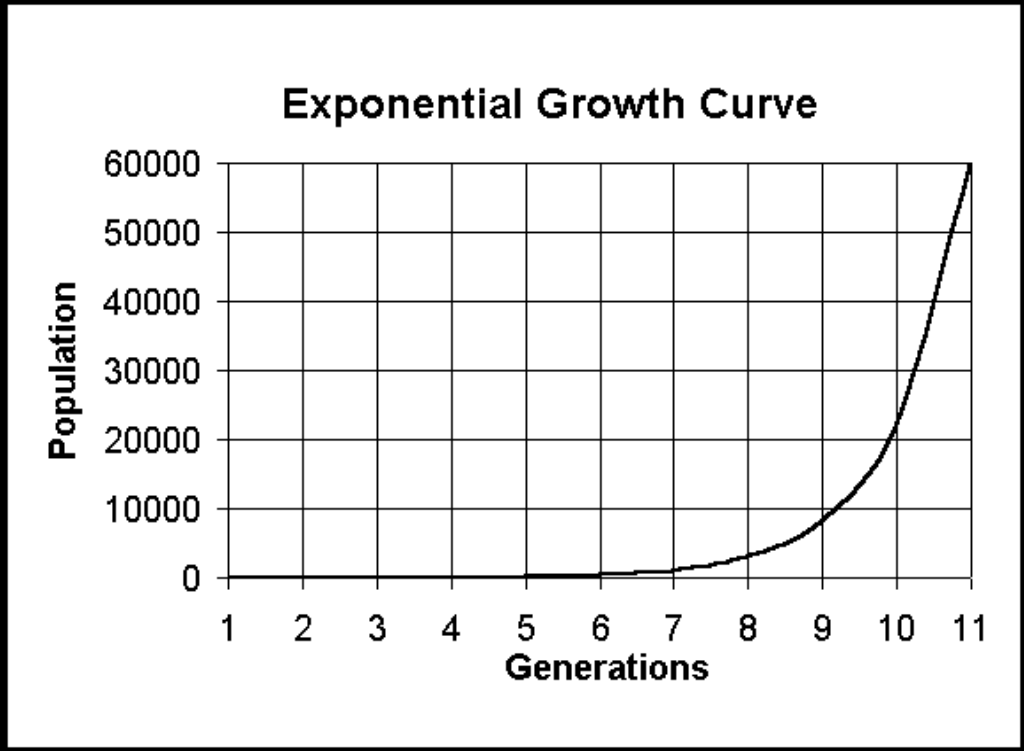


Occurs when the individuals in a population reproduce at a constant rate.

Adapted from Holt Biology 2008

Population Growth Curves

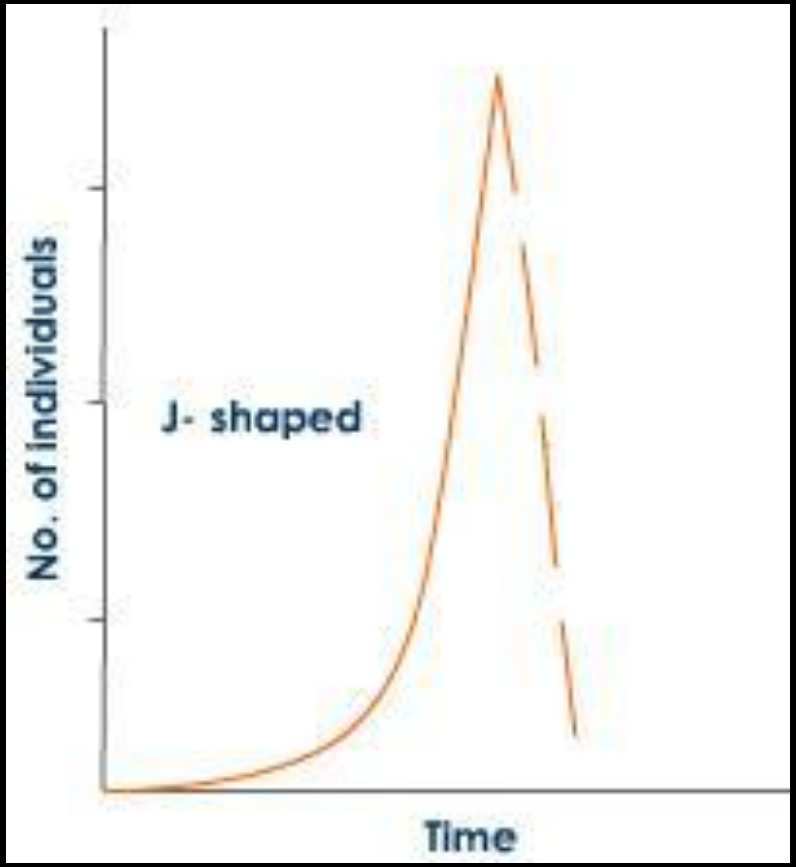
Under *ideal conditions* with *unlimited resources*, a population will grow exponentially.



Adapted from Holt Biology 2008

Population Growth Curves

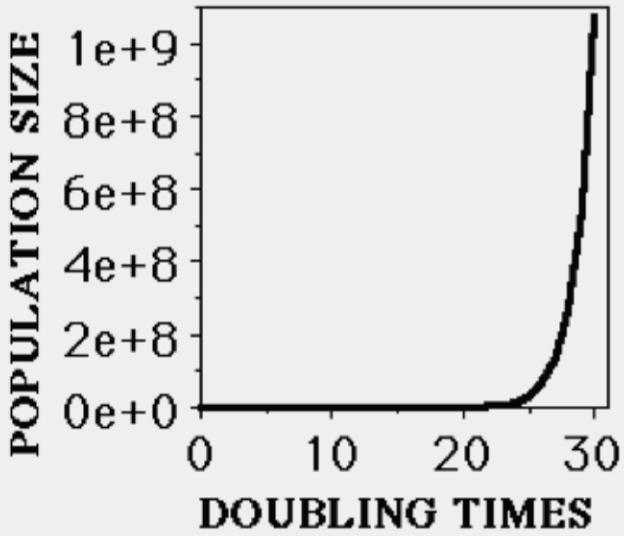
Exponential growth is also known as *J-shaped*.



Adapted from Holt Biology 2008

Exponential Growth

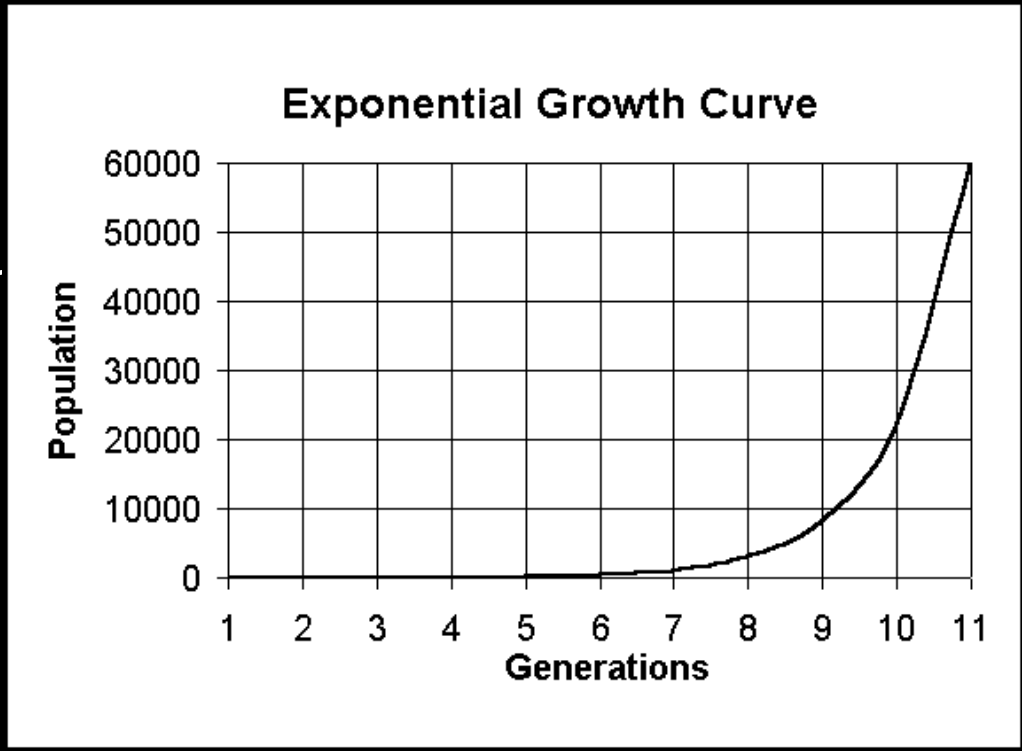
Doubling Times	Population Size
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1,024
11	2,048
12	4,096
13	8,192
14	16,384
15	32,768
16	65,536
17	131,072
18	262,144
19	524,288
20	1,048,576
21	2,097,152
22	4,194,304
23	8,388,608
24	16,777,216
25	33,554,432
26	67,108,864
27	134,217,728
28	268,435,456
29	536,870,912
30	1,073,741,824



Adapted from Holt Biology 2008

THINK, SHARE, WRITE, (TSW) #2

What are the characteristics of a population that grows exponentially?

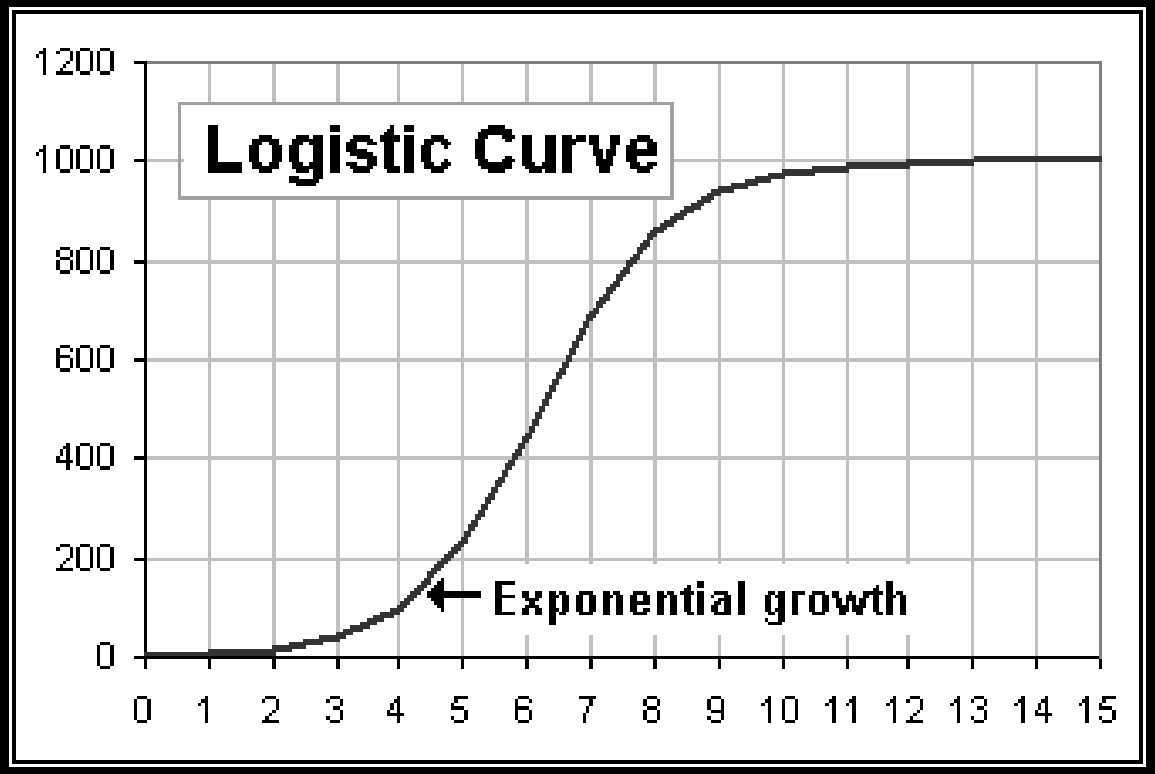


THINK, SHARE, WRITE, (TSW) #2

What are the characteristics of a population that grows exponentially?

A population that grows exponentially grows slowly when it is small but grows quickly as it gets larger. An exponential growth curve is kind of in a “J” shape

Logistic Growth



Occurs when a population's exponential growth slows or stops.

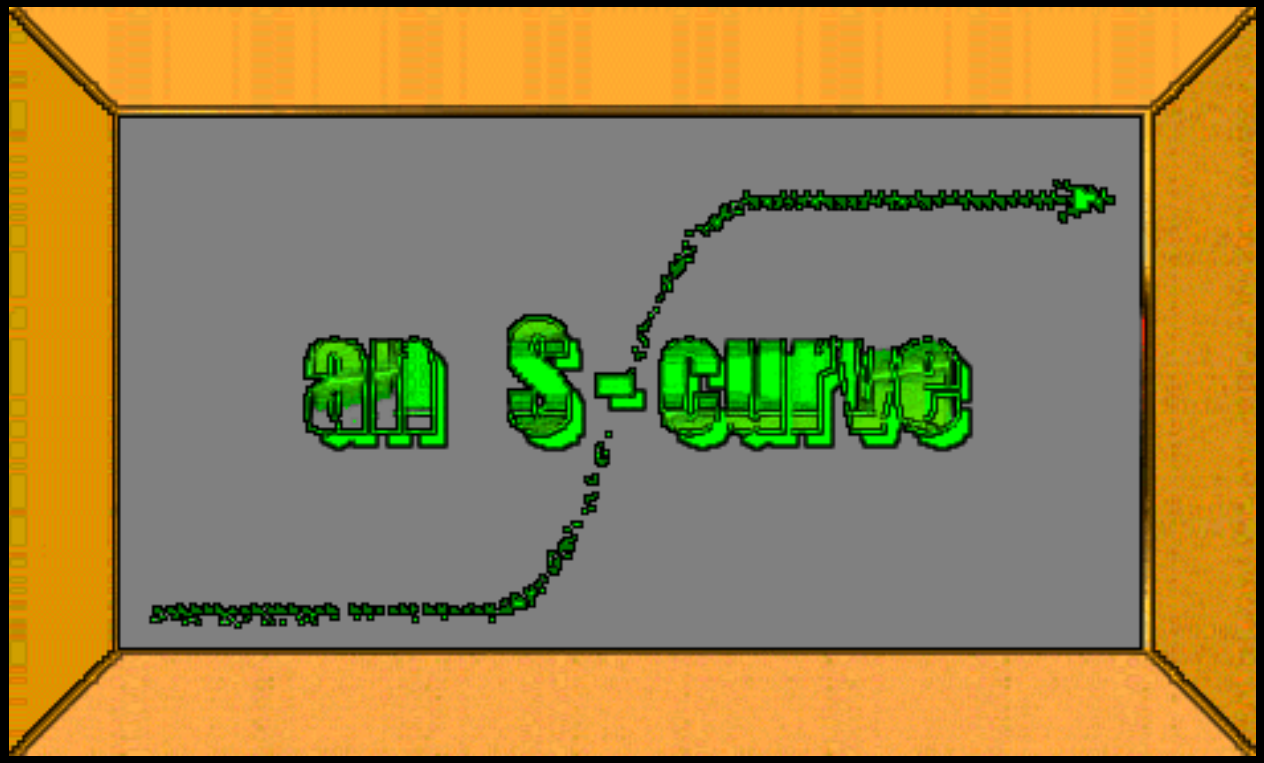
Adapted from Holt Biology 2008

WHY Logistic Growth ?

Resources get used up…

Adapted from Holt Biology 2008

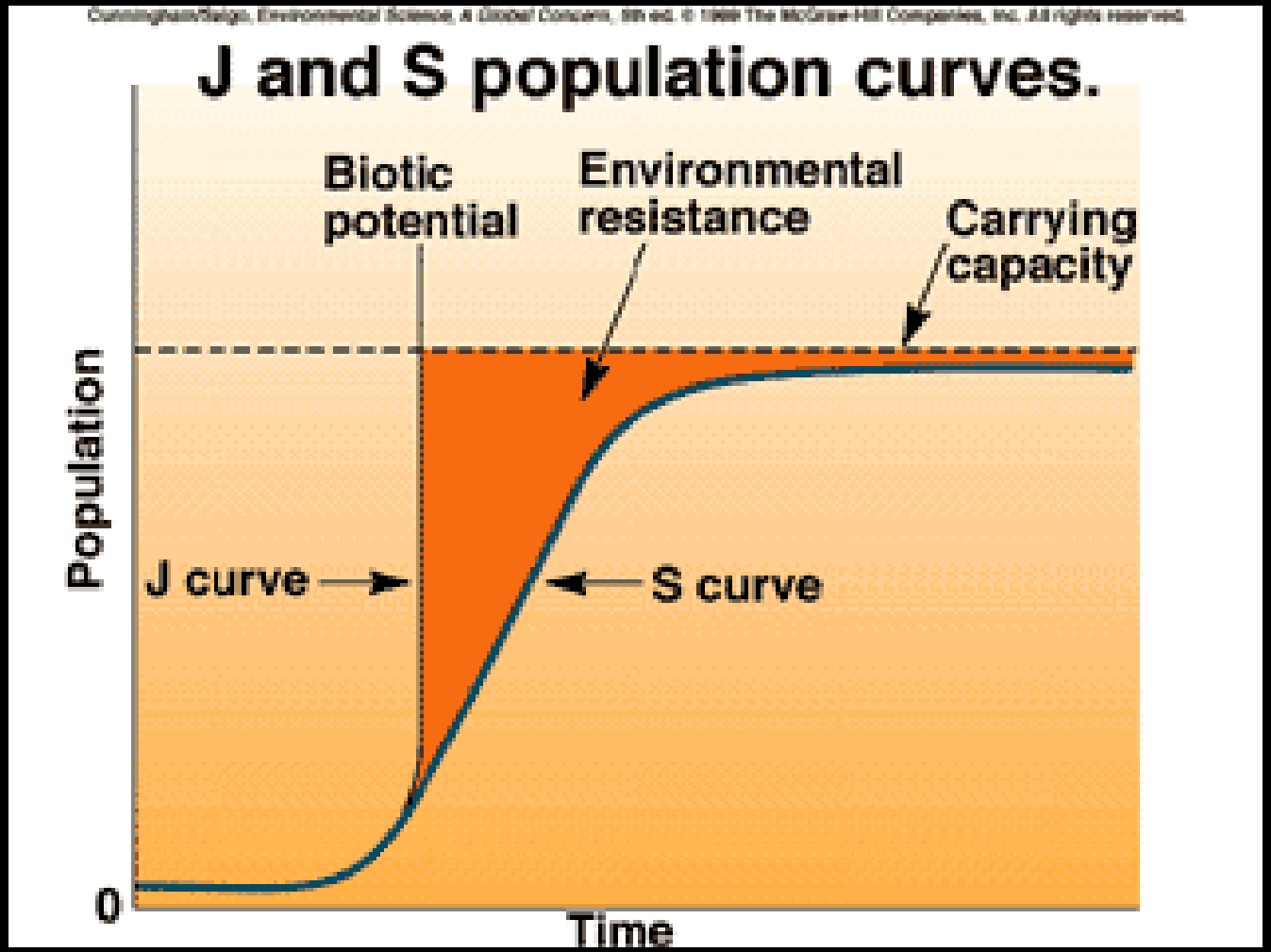
Population Growth Curves



Logistic Growth – S Curve

Adapted from Holt Biology 2008

Population Growth Curves



Adapted from Holt Biology 2008

Complete the “analysis for the Quick Lab - “Population Growth”

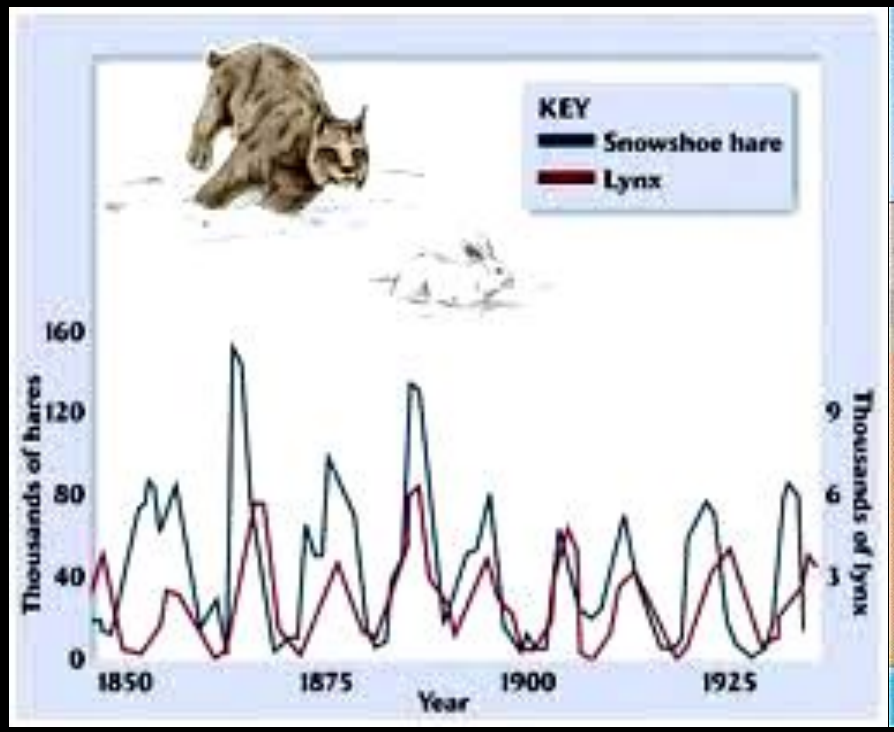
Chapter 5
Section 1:
Populations & Communities

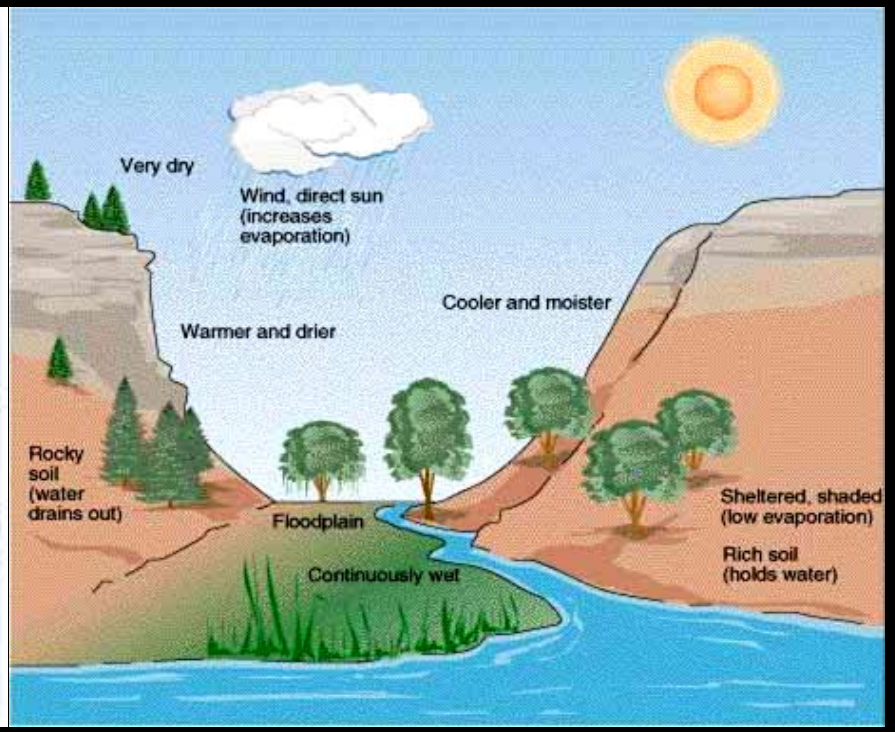
Factors That Affect Population Size

Adapted from Holt Biology 2008

GROWTH LIMITS

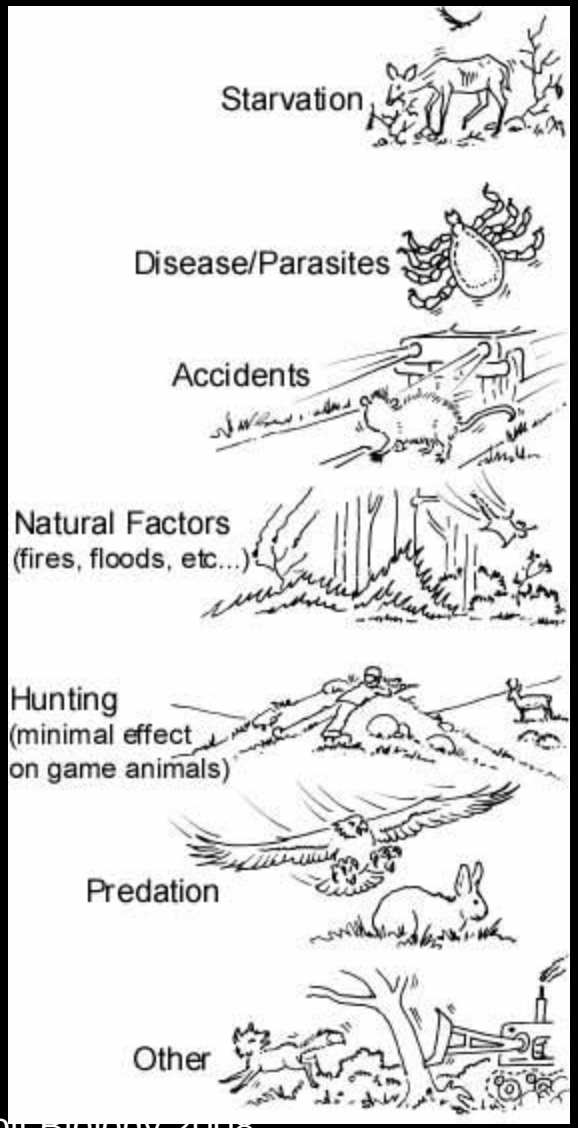
Different factors limiting population growth: BIOTIC or ABIOTIC.





GROWTH LIMITS

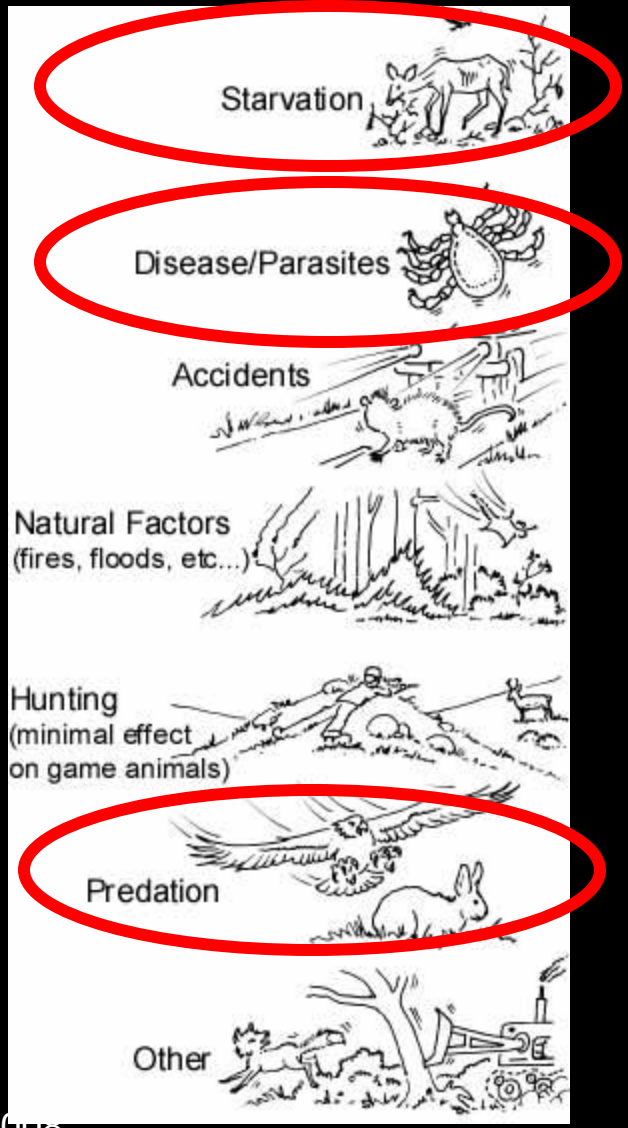
Limiting Factors: a situation that causes a decrease in population growth.



Density-dependent limiting factors:

Factors that depend on population size.

Examples: competition, predation, disease

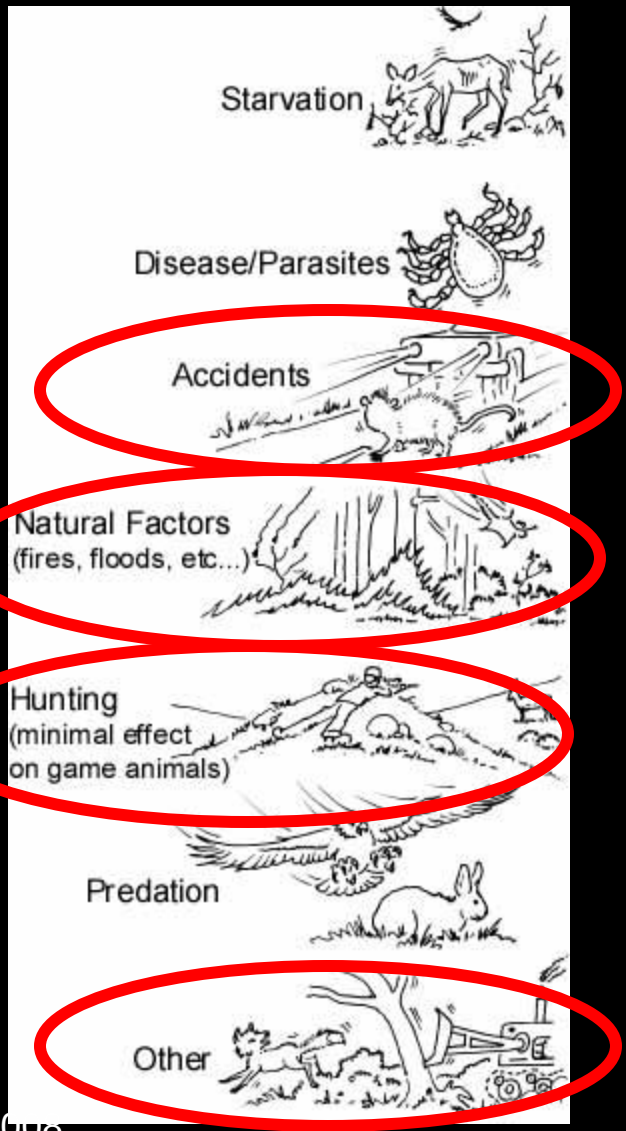


Adapted from Holt Biology 2008

Density-independent limiting factors:

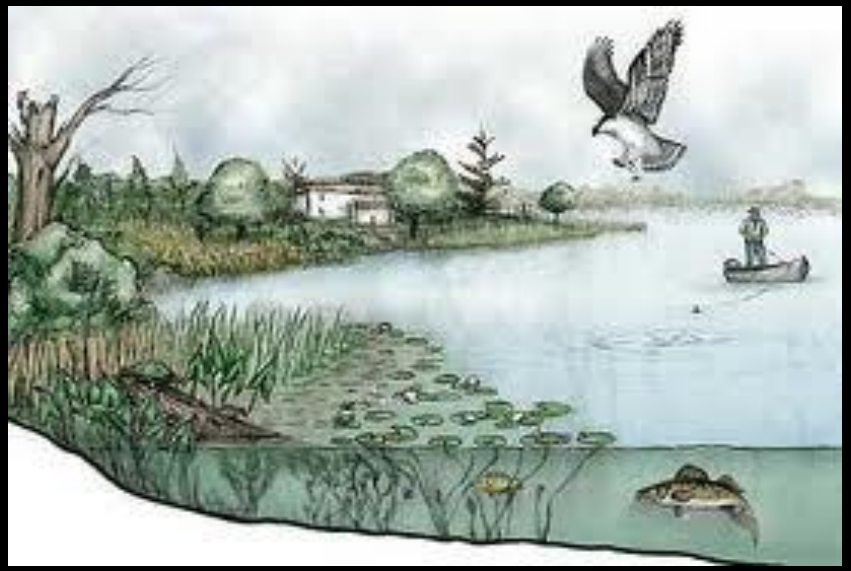
Factors that affect ALL populations, regardless of size.

Examples:
weather, natural disasters, humans



THINK, SHARE, WRITE, (TSW) #3

Describe the differences between biotic and abiotic factors.



THINK, SHARE, WRITE, (TSW) #3

Describe the differences between biotic and abiotic factors.

Biotic factors are living factors that affect a population's growth. Abiotic factors are nonliving factors that affect a population's growth.

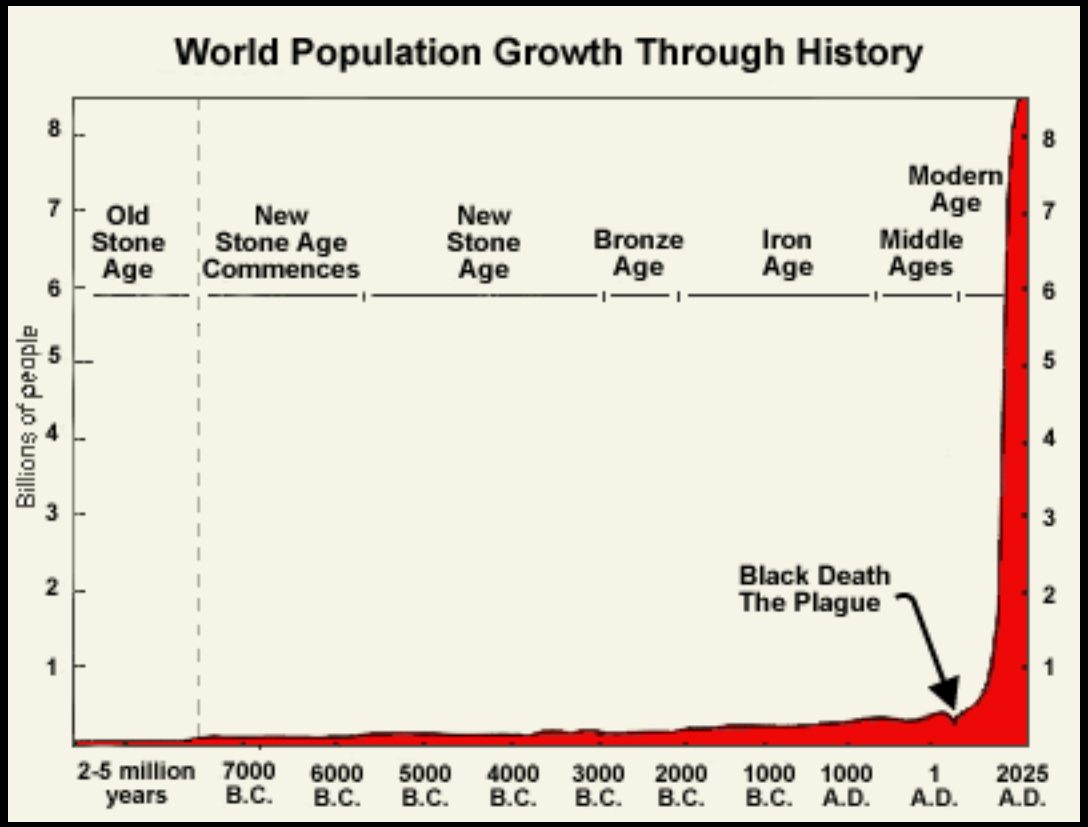
Chapter 5
Section 1:
Populations & Communities

Human Population

Adapted from Holt Biology 2008

Historical Overview of Human Population Growth

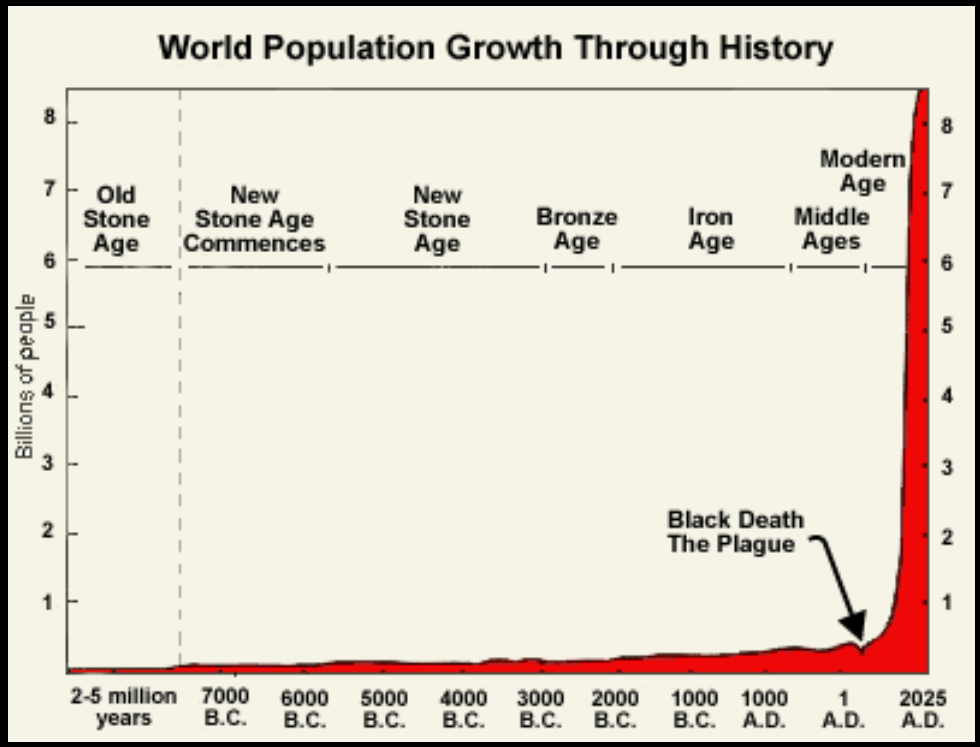
For much of human history, the population grew very SLOWLY.



Adapted from Holt Biology 2008

Historical Overview of Human Population Growth

About 500 years ago, the human population started growing MUCH FASTER.



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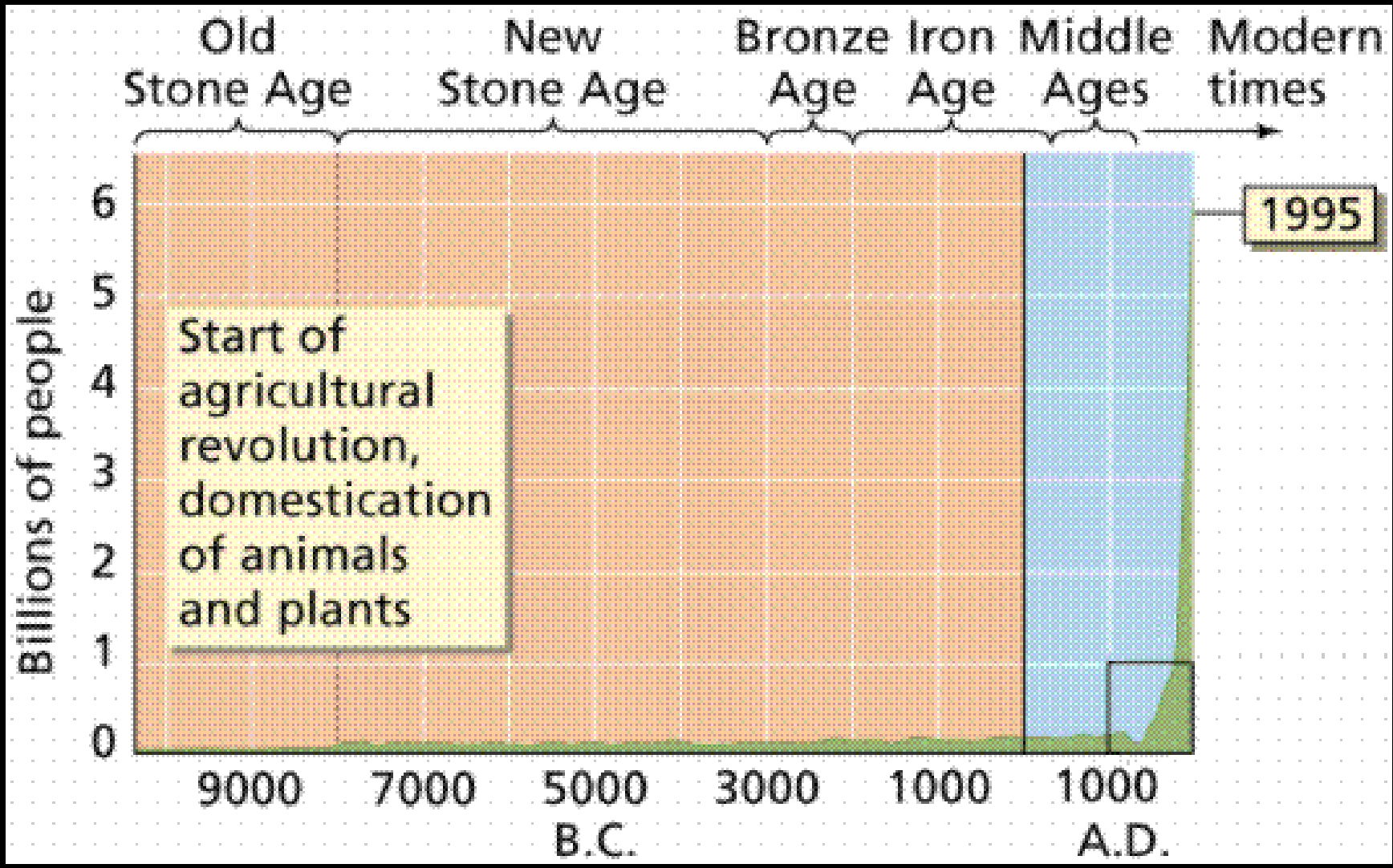
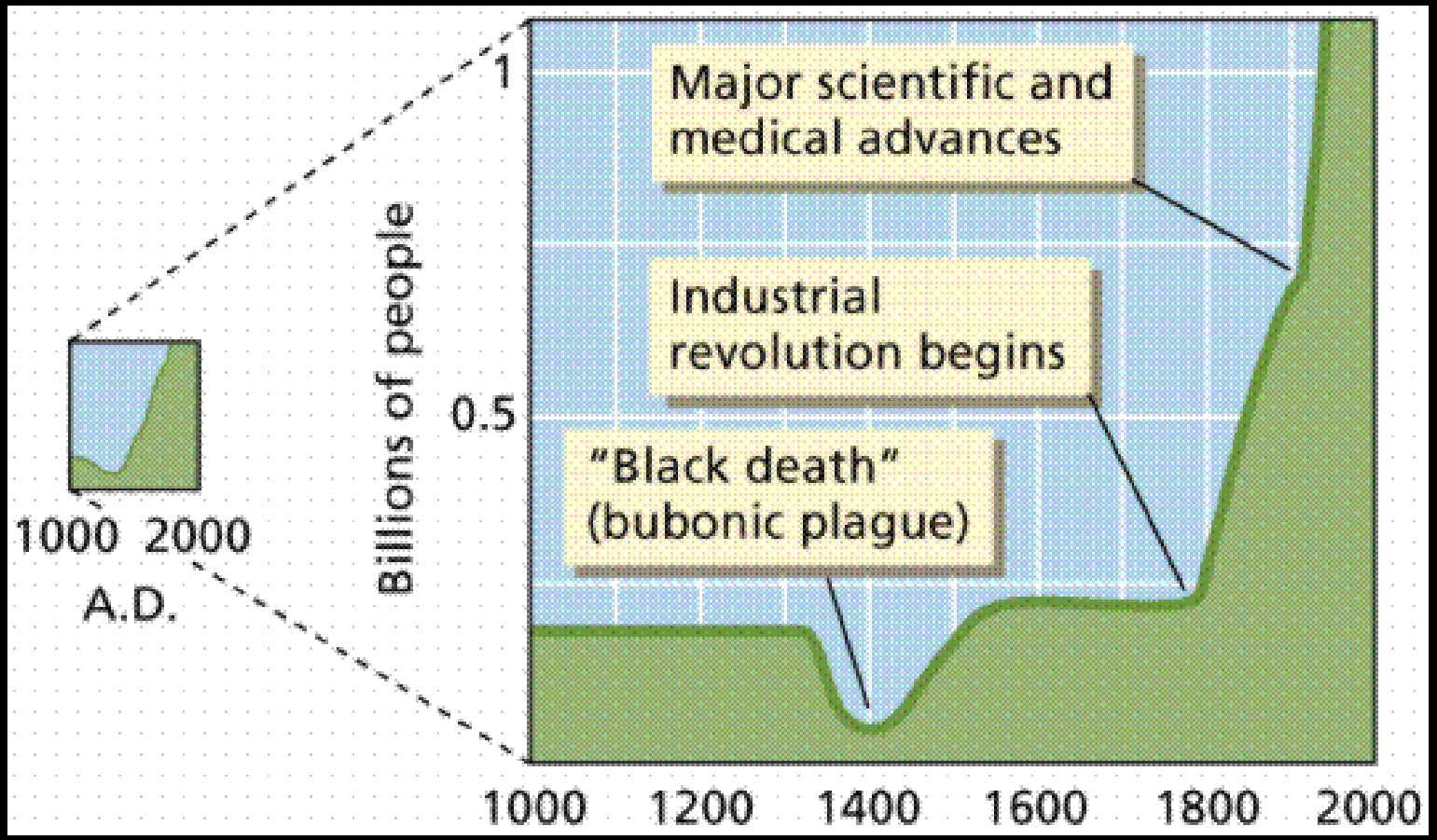
HUMAN POPULATION



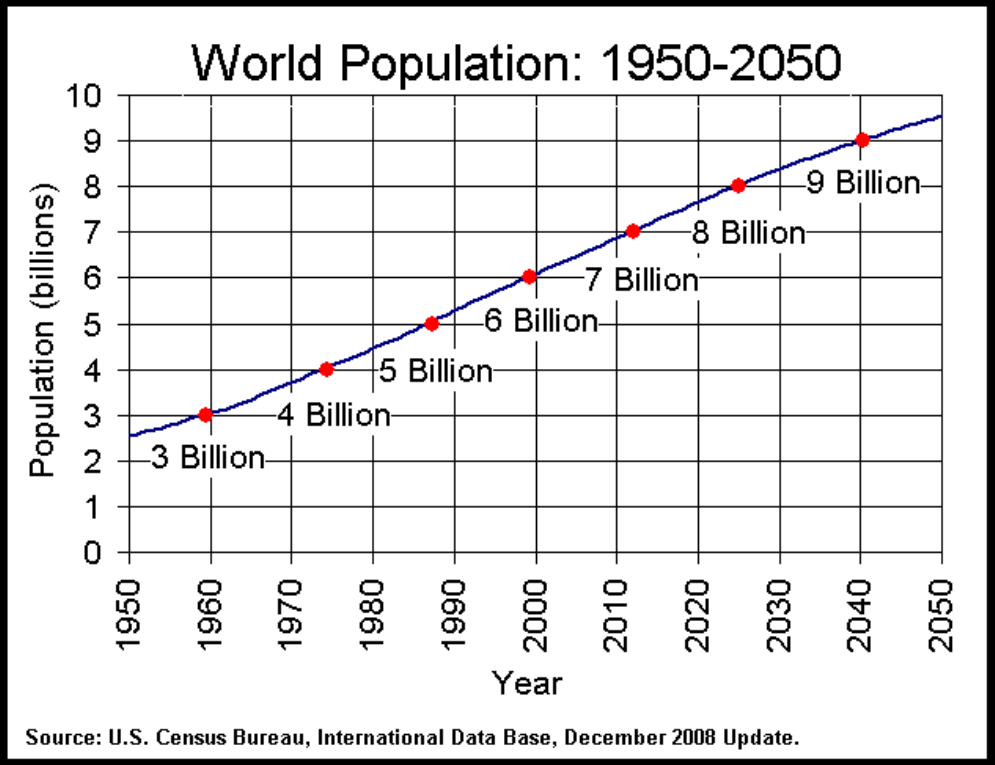
HUMAN POPULATION



Adapted from Holt Biology 2008

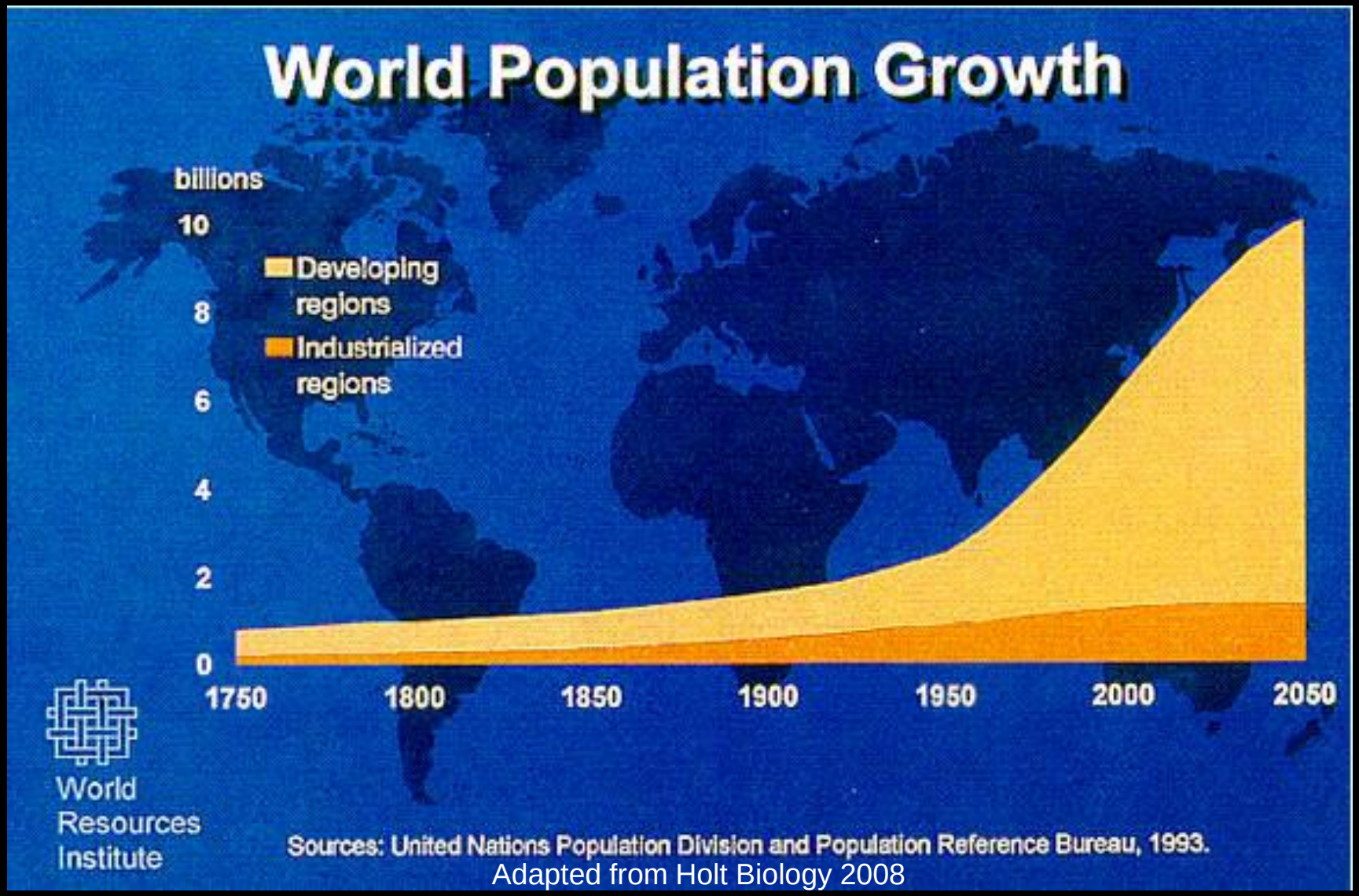
Predictions

Some scientists think that in 50 years, the population will grow to 9 billion.



Adapted from Holt Biology 2008

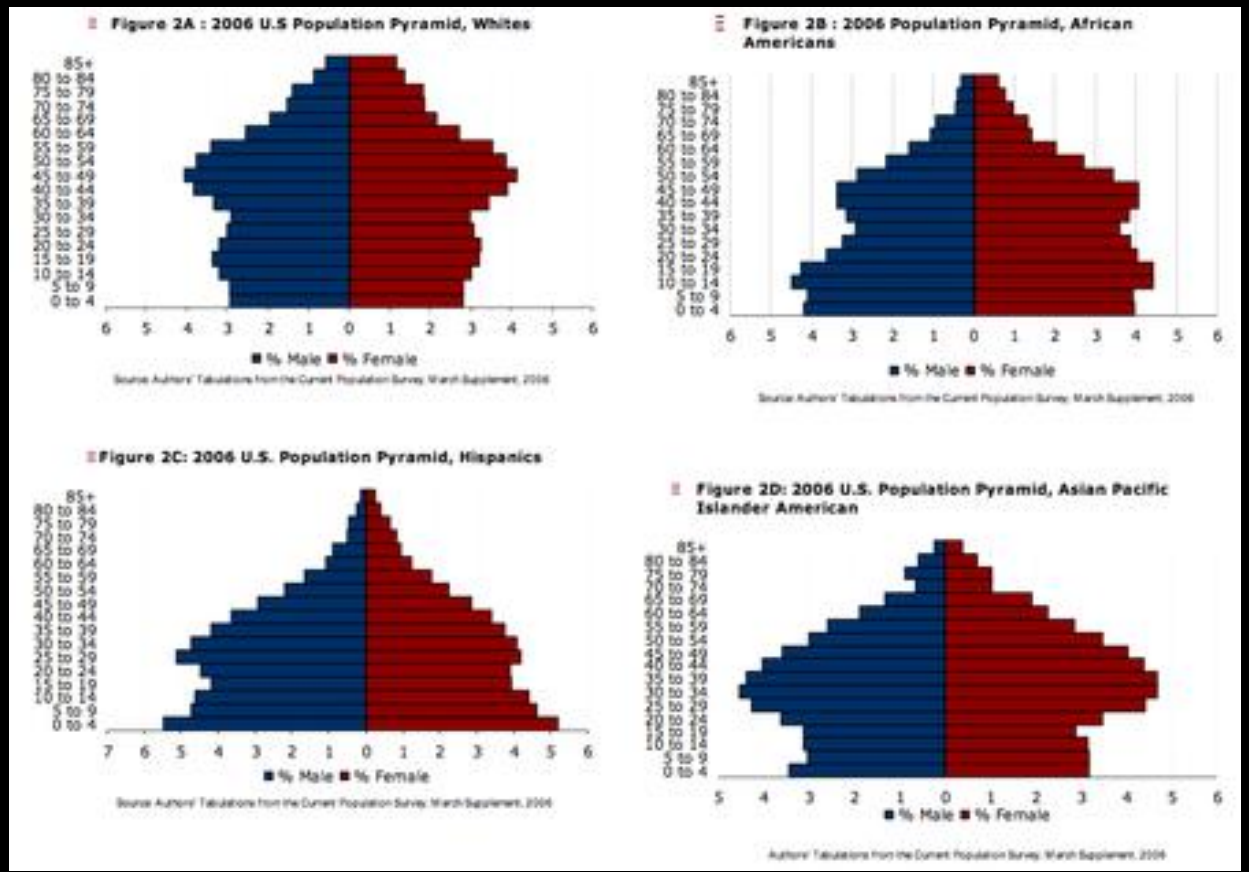
HUMAN POPULATION



Adapted from Holt Biology 2008

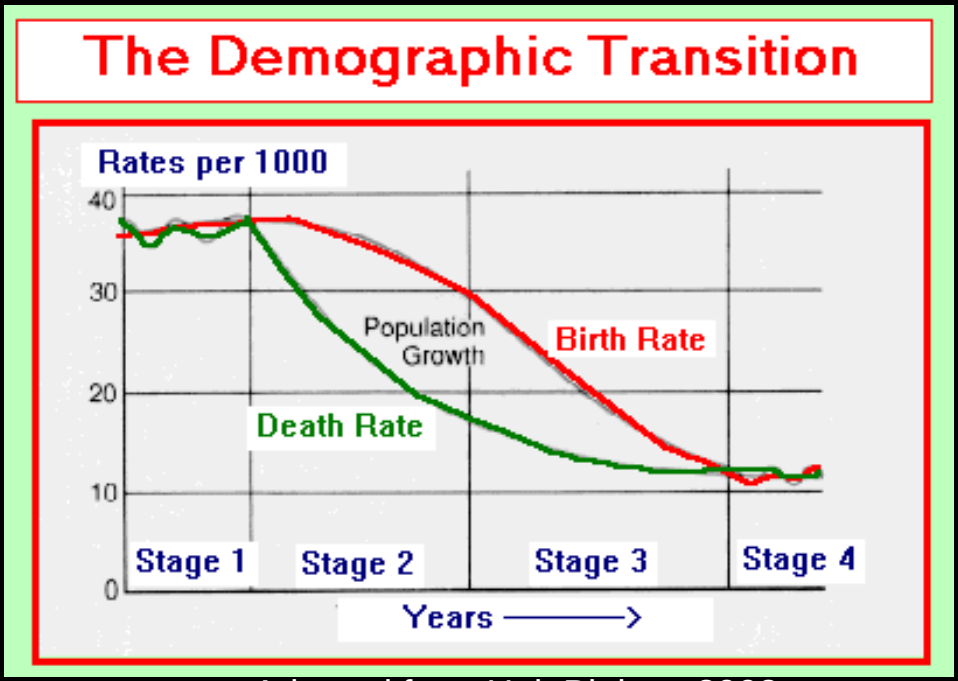
Demography

The statistical study of human populations.



Demographic Transition

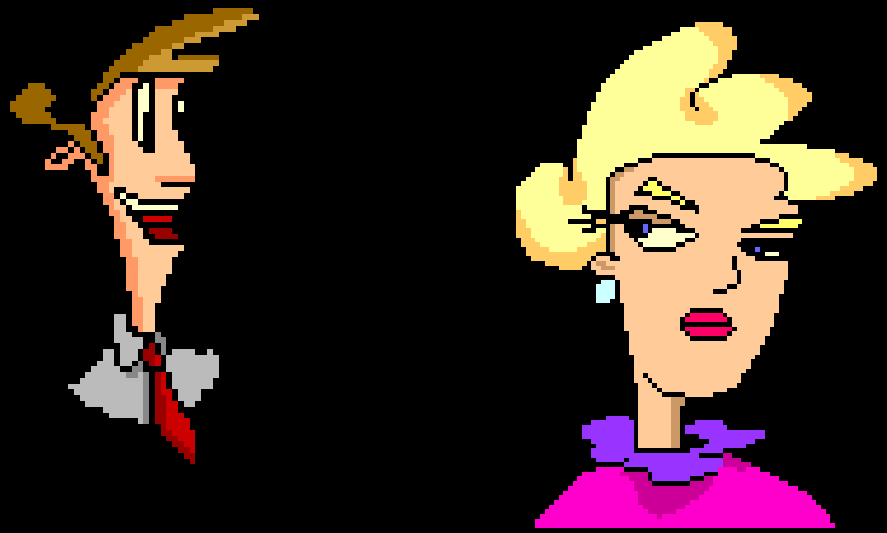
The tendency for a population's birth and death rates to slow down.
CAUSES??



Adapted from Holt Biology 2008

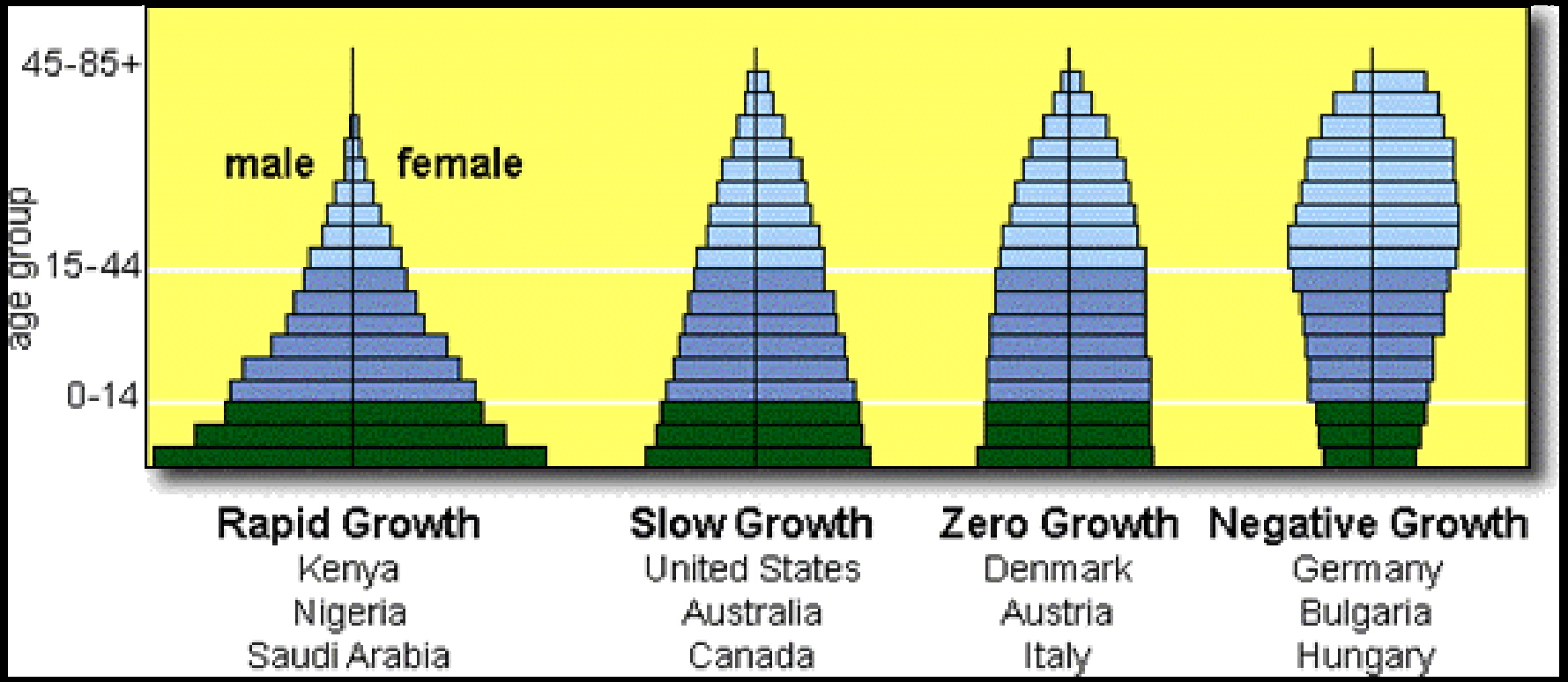
Age Structure Diagrams

(Population profile) This shows the number of *females* and *males* within different age groups.



Adapted from Holt Biology 2008

Demography:
Age Structure Diagram



THINK, SHARE, WRITE, (TSW) #4

How have advances in technology allowed the human population to grow faster ?

THINK, SHARE, WRITE, (TSW) #4

How have advances in technology allowed the human population to grow faster?.

By improving sanitation, controlling disease, and allowing for more efficient production of food.

Chapter 5 Section 2: Interactions in Communities

Key Vocabulary Terms

6

Adapted from Holt Biology 2008

Predation

An interaction between two organisms in which one organism (the predator) kills another (the prey)

Adapted from Holt Biology 2008

Coevolution

The evolution of two or more species that is due to mutual influence

Adapted from Holt Biology 2008

Parasitism

A relationship between two species where one benefits (the parasite) and the other species is harmed (the host)

Symbiosis

A relationship in which two organisms live in close association

Adapted from Holt Biology 2008

Mutualism

A type of symbiosis where both organisms benefit

Adapted from Holt Biology 2008

Commensalism

A type of symbiosis where one organism benefits and the other is neither helped nor harmed

Adapted from Holt Biology 2008

Content Objectives

I will be able to identify:

- How predator-prey interactions influence both predators and prey.
- Five other types of interactions in a community.

Chapter 5 Section 2: Interactions in Communities

Notes

Adapted from Holt Biology 2008

Chapter 5 Section 2: Interactions in Communities

Predator- Prey Interactions

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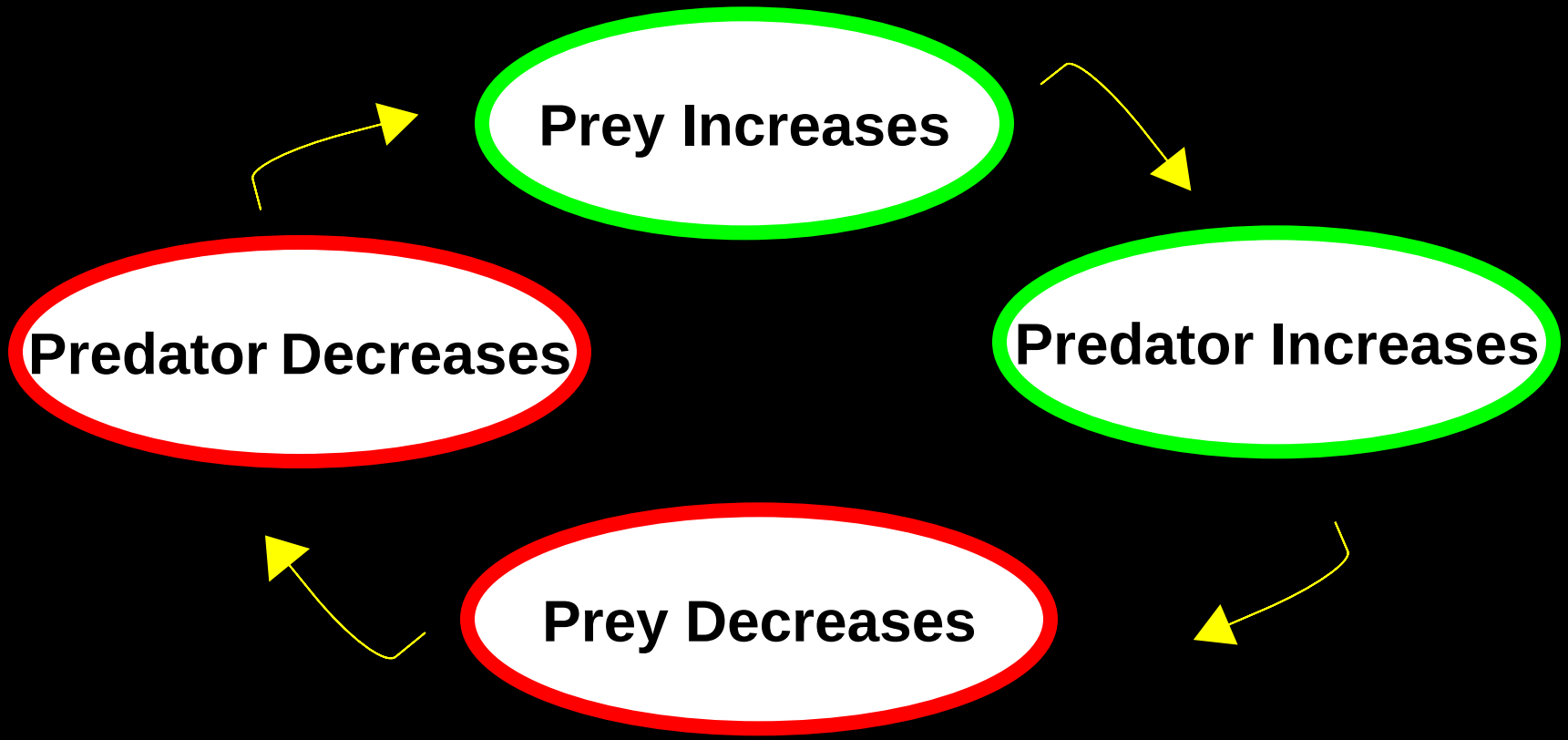
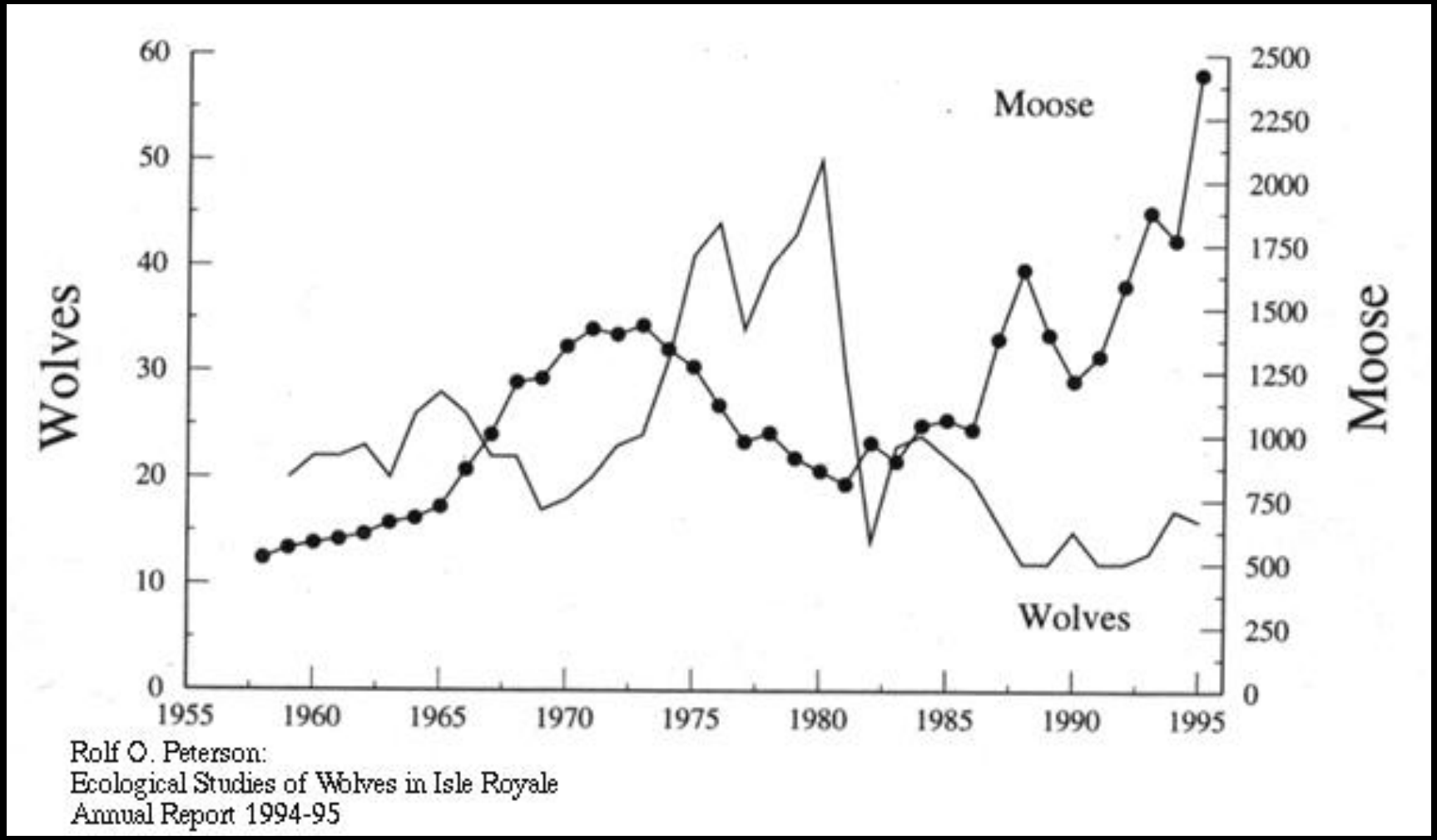
Predator-Prey Relationships

Species in various relationships develop adaptations in response to one another. - coevolution

Adapted from Holt Biology 2008

When prey increases so does the predator, but when this occurs the prey decreases and then again the predators decrease too causing the prey to increase again. This is a negative feedback mechanisms leading to the stability or regulation of the population.





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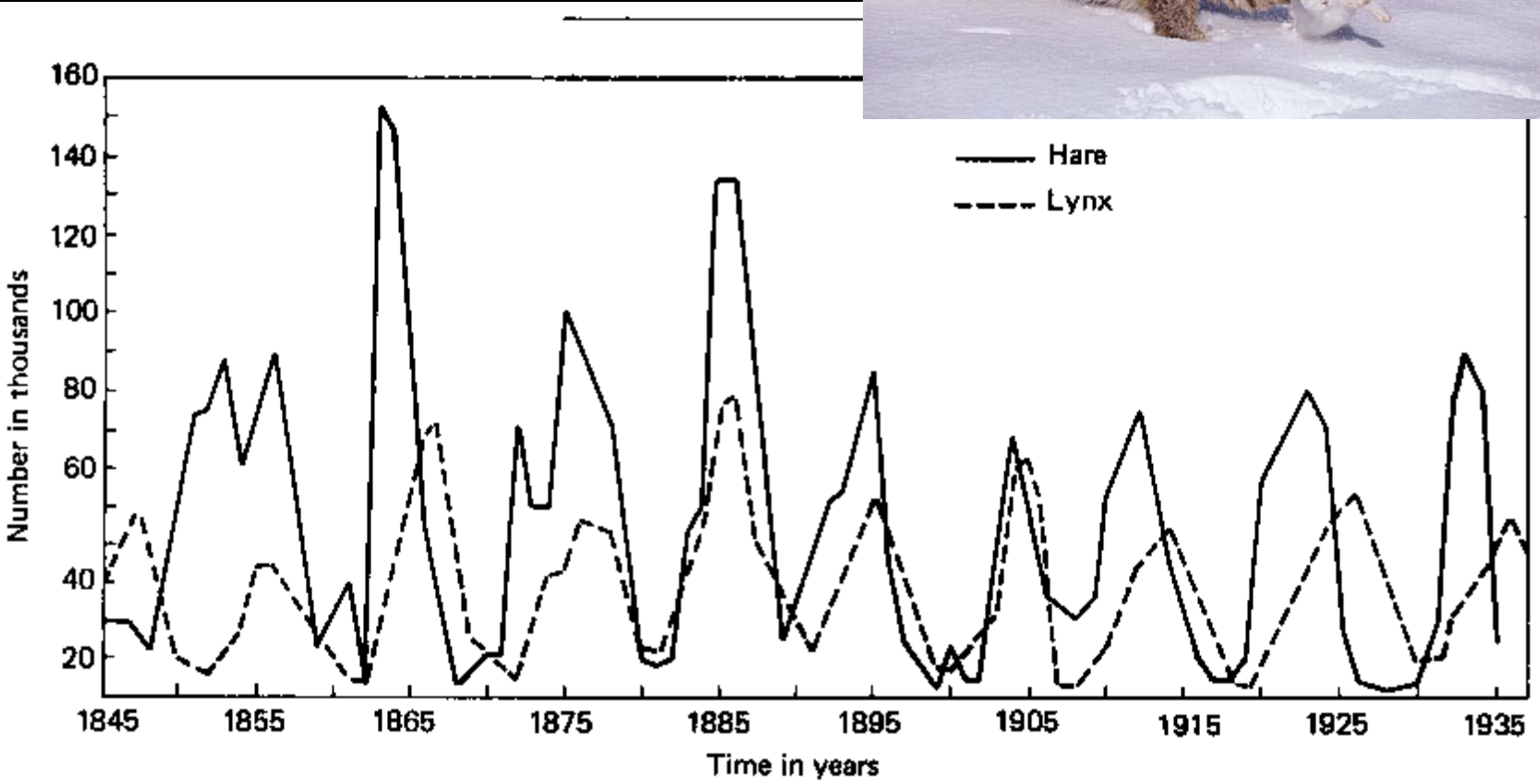


Figure 9-3. Changes in the abundance of the lynx and the snowshoe hare, as indicated by the number of pelts received by the Hudson's Bay Company. This is a classic case of cyclic oscillation in population density. (Redrawn from MacLulich 1937.)

Adapted from Holt Biology 2008

YOUR TURN
Active Reading
Section 2 – Interactions in Communities

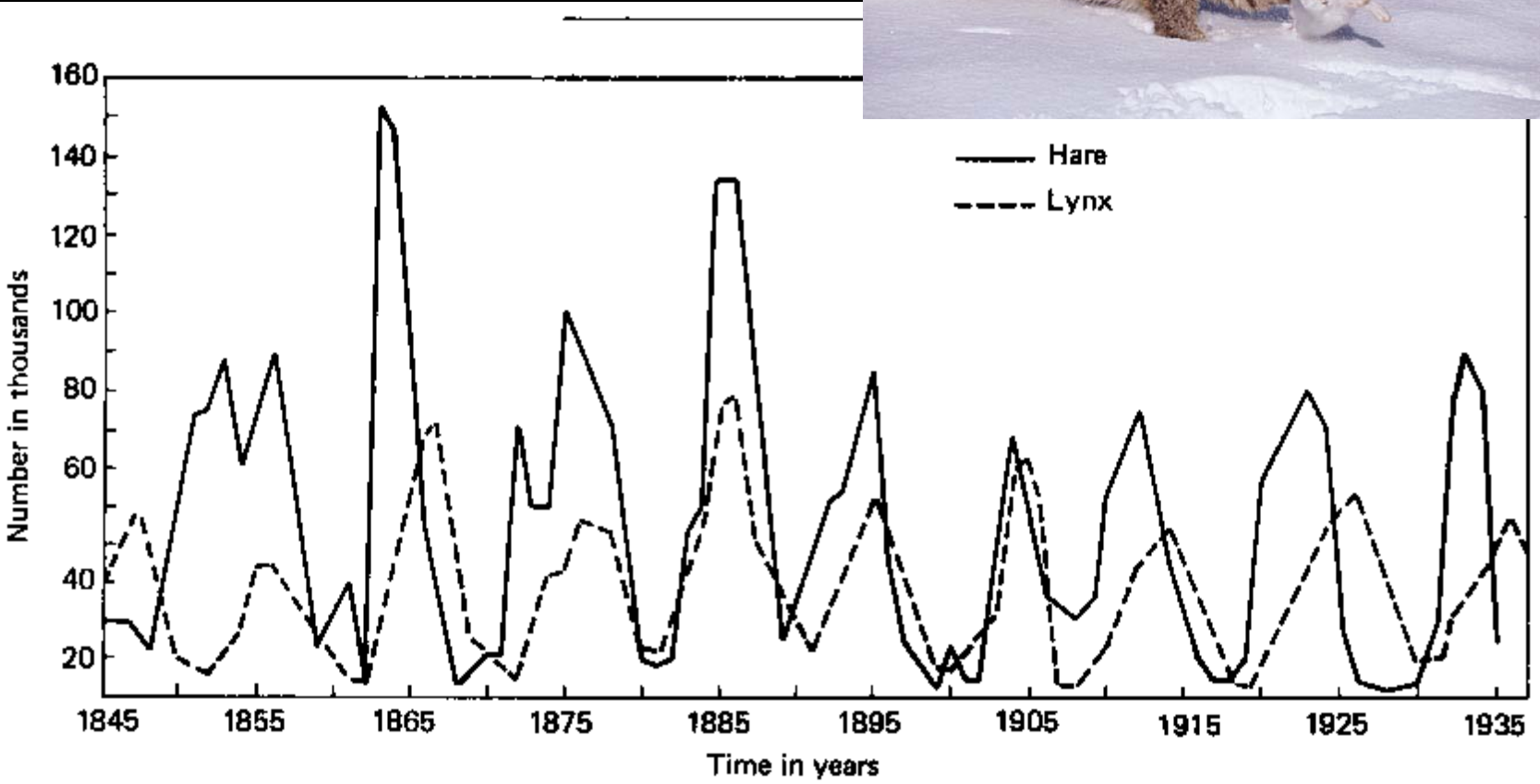


Figure 9-3. Changes in the abundance of the lynx and the snowshoe hare, as indicated by the number of pelts received by the Hudson's Bay Company. This is a classic case of cyclic oscillation in population density. (Redrawn from MacLulich 1937.)

Adapted from Holt Biology 2008

Other Interactions – 5 total

1. Parasitism – parasite is usually smaller than the host and relies on the host for food and shelter

Adapted from Holt Biology 2008

Other Interactions

2. Herbivory – herbivores consuming plants

Coevolution examples

Adapted from Holt Biology 2008

3. Mimicry

Adapted from Holt Biology 2008

Complete Quick Lab - The Effects of Herbivores on a Plant Species

1. Examine the illustrations.
2. Complete the “Analysis”.

THINK, SHARE, WRITE, (TSW) #5

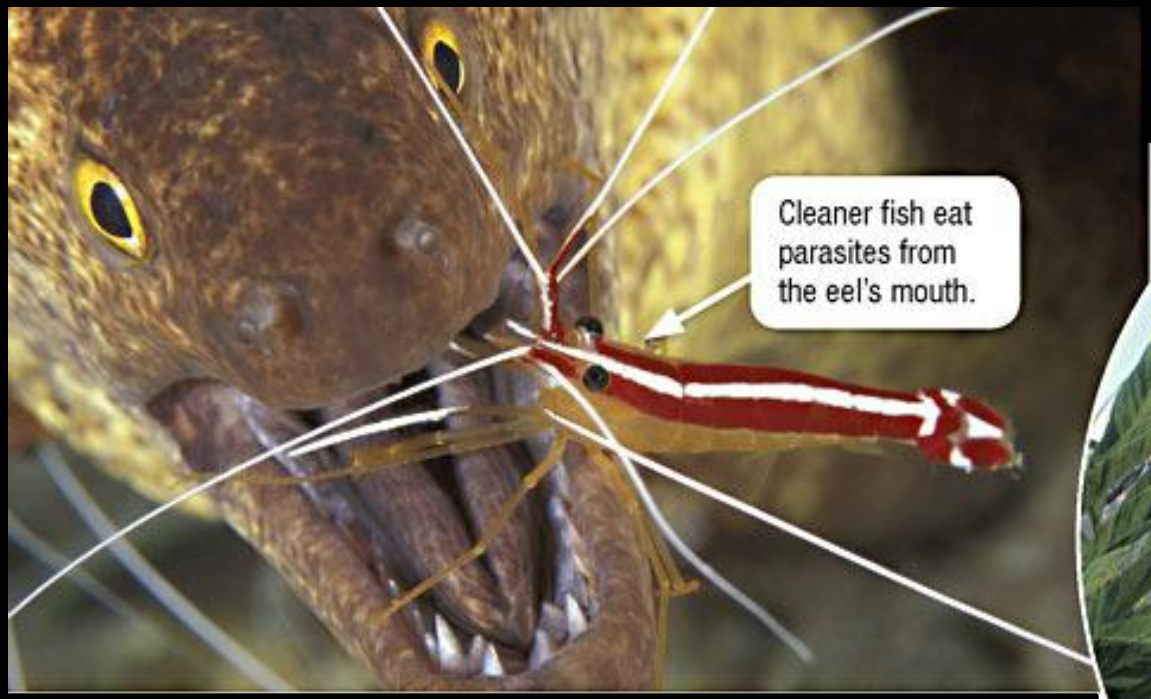
Identify one way in which herbivores and plants coevolve.

THINK, SHARE, WRITE, (TSW) #5

Identify one way in which herbivores and plants coevolve.

Plants develop chemical compounds to make the plants taste terrible to herbivores. The herbivores develop defenses against the toxic compounds so that they may eat the plants.

4. Mutualism & 5. Commensalism



Adapted from Holt Biology 2008

THINK, SHARE, WRITE, (TSW) #6

Compare mutualism and commensalism.

THINK, SHARE, WRITE, (TSW) #6

Compare mutualism and commensalism.

Mutualism is a relationship in which both species benefit. Commensalism is a relationship in which one species benefits and the other species may not benefit but is not harmed

Chapter 5 Section 3: Shapping Communities

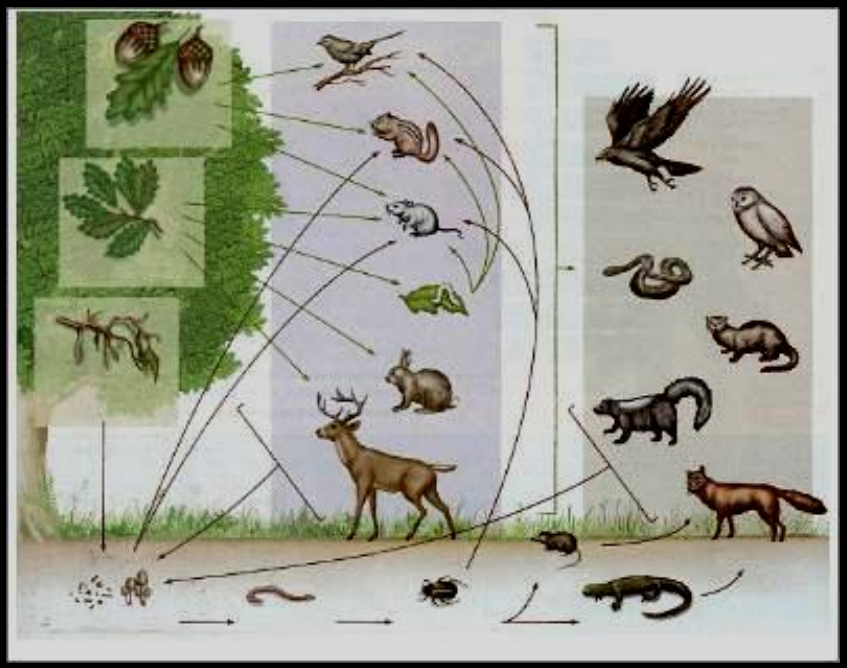
Key Vocabulary Terms

5

Adapted from Holt Biology 2008

Niche

The unique position occupied by a species, both in terms of its physical use of its habitat and its function within an ecological community



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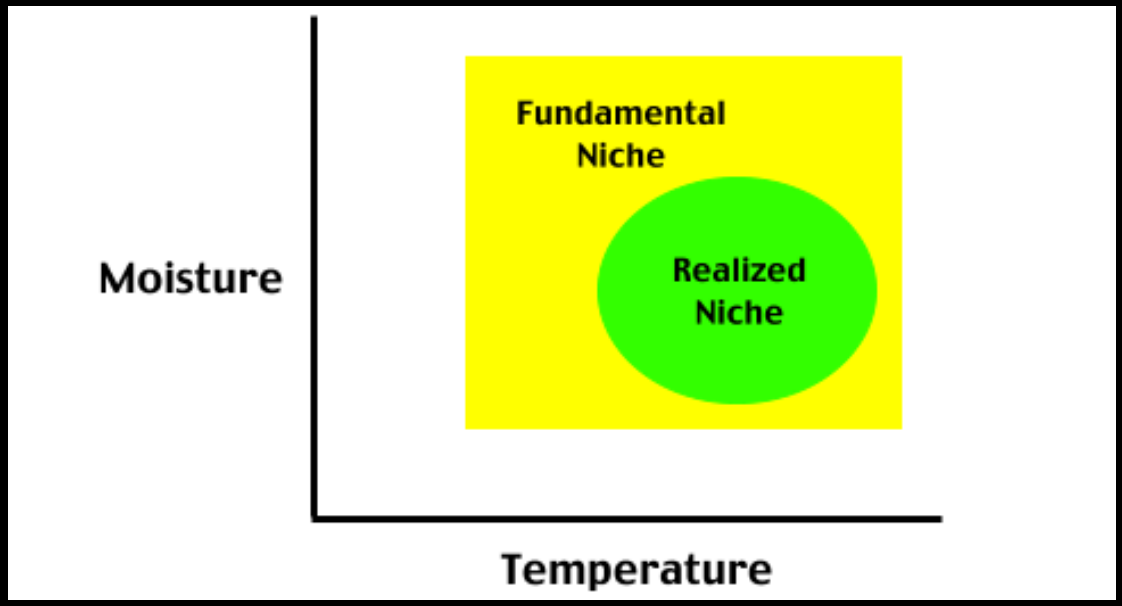
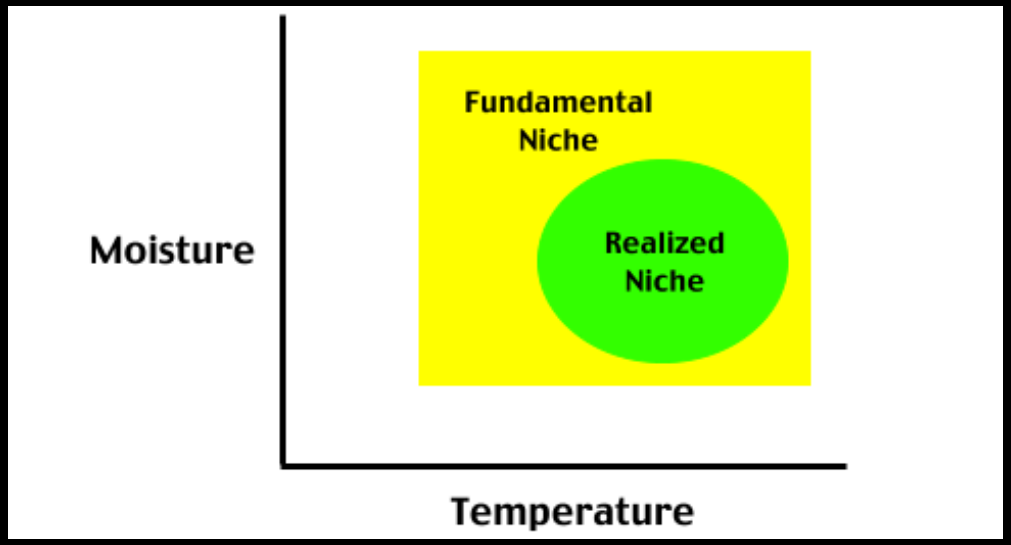
Fundamental niche



The largest ecological niche where an organism or species can live without competition

Adapted from Holt Biology 2008

Realized Niche



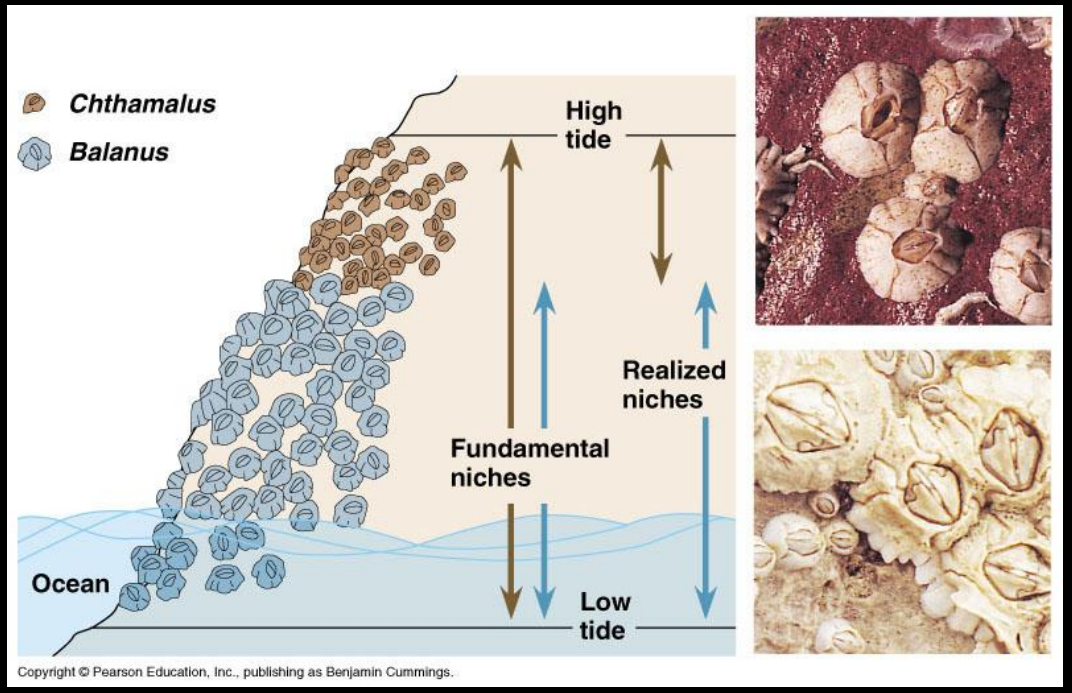
The range of resources that a species uses, the conditions that the species can tolerate, and the functional roles that the species plays as a result of competition in the species' fundamental niche.

The actual niche with respect to other organisms in the community

Adapted from Holt Biology 2008

Competitive Exclusion

The exclusion of one species by another due to competition



Adapted from Holt Biology 2008

Keystone species

A species that is critical to the function of the ecosystem in which it lives because it affects the survival and abundance of many other species in its community

Adapted from Holt Biology 2008

Content Objectives

- I will be able to identify how a species' niche affects other organisms.
- I will be able to identify how competion for resources affects species in a community.
- I will be able to identify what factors influence resiliency of an ecosystem.

Language objectives

- I will complete a vocabulary graphic organizer on key terms associated with the shaping of communities and write definitions “in my own words”.
- I will ponder questions about how communities are shaped, write my thoughts down in my notes, and share/discuss my ideas with a partner and the class.
- I will record notes about interactions in communities based on PowerPoint presentation & class discussion.

Chapter 5 Section 3: Shaping Communities

Notes

Adapted from Holt Biology 2008

Chapter 5 Section 3: Shaping Communities

Carving a Niche

Adapted from Holt Biology 2008

How is a niche different from a habitat?

A niche is a role or function of a species within a community. The habitat is where the species live.

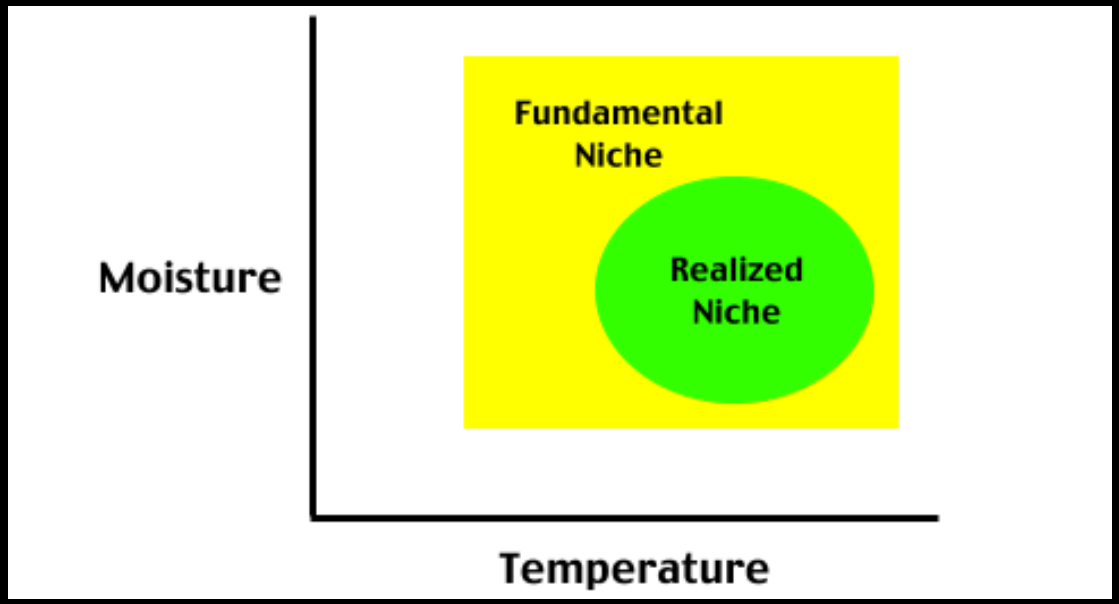
Complete Quick Lab - Changes in a Realized Niche

1. Examine the Graph.
2. Complete the “Analysis”.

Competing for Resources

Why do organisms rarely occupy their entire fundamental niche?

Organisms interact with many others within the environment.



Adapted from Holt Biology 2008

THINK, SHARE, WRITE, (TSW) #7

Why do organisms rarely occupy their entire fundamental miche?

THINK, SHARE, WRITE, (TSW) #7

Why do organisms rarely occupy their entire fundamental niche?

Because they usually have to compete with other species for limited resources.

Competitive Exclusion

What is a non-native or introduced species?

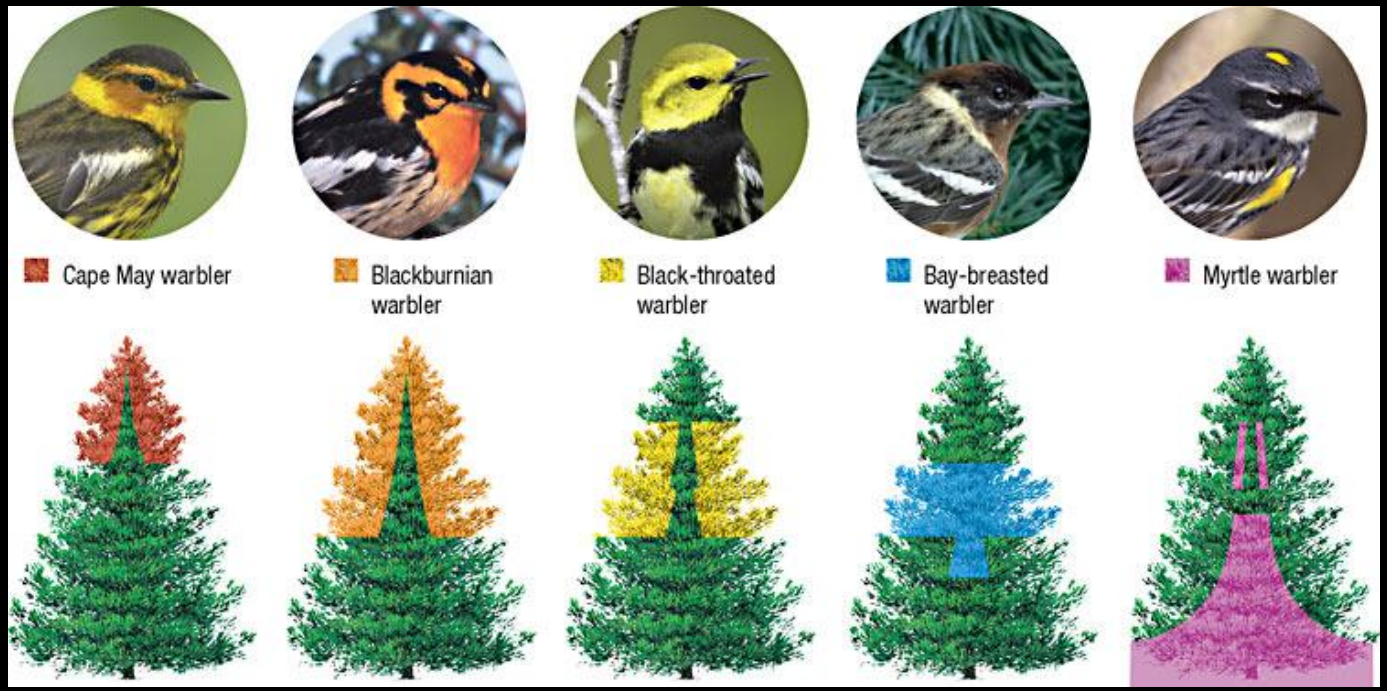
A species that immigrates from another area

Adapted from Holt Biology 2008

Dividing Resources

Resources: food shelter

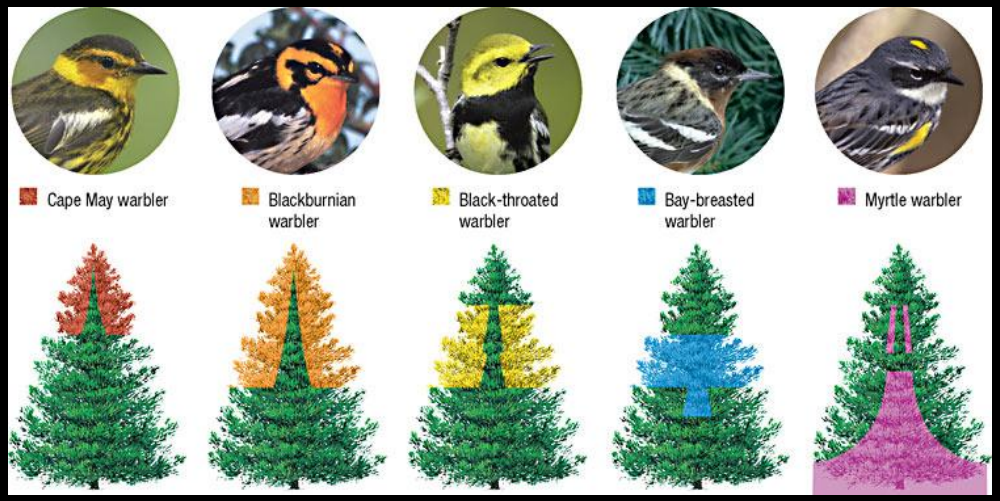
Organisms may feed slightly differently.



Adapted from Holt Biology 2008

THINK, SHARE, WRITE, (TSW) #8

How might two different species divide resources?



THINK, SHARE, WRITE, (TSW) #8

How might two different species divide resources?

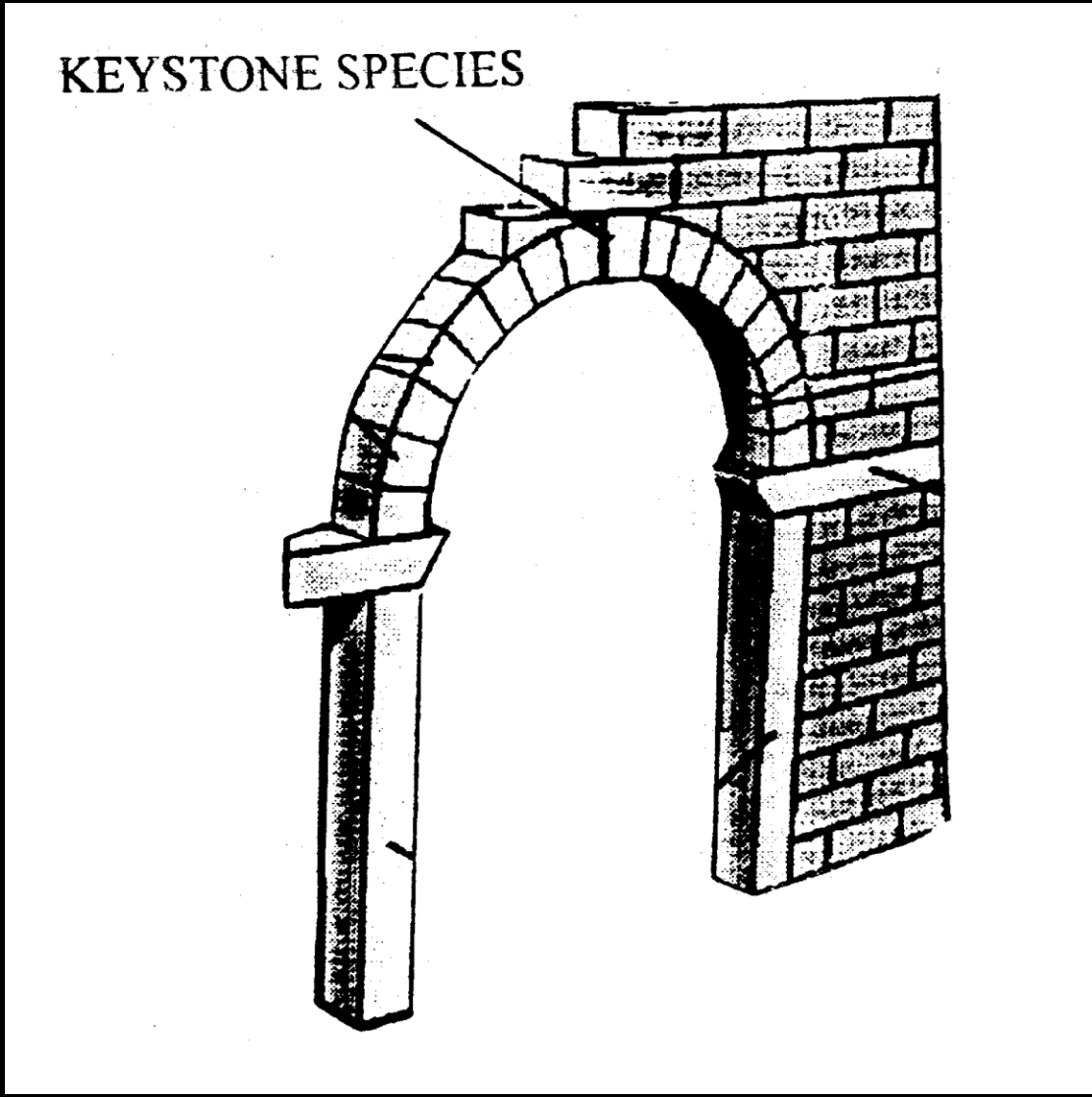
By feeding in slightly different ways or in slightly different areas.

Keystone species

A species that is critical to the function of the ecosystem in which it lives because it affects the survival and abundance of many other species in its community

Adapted from Holt Biology 2008

Keystone



Predation and Competition

Predators can influence more than one prey.

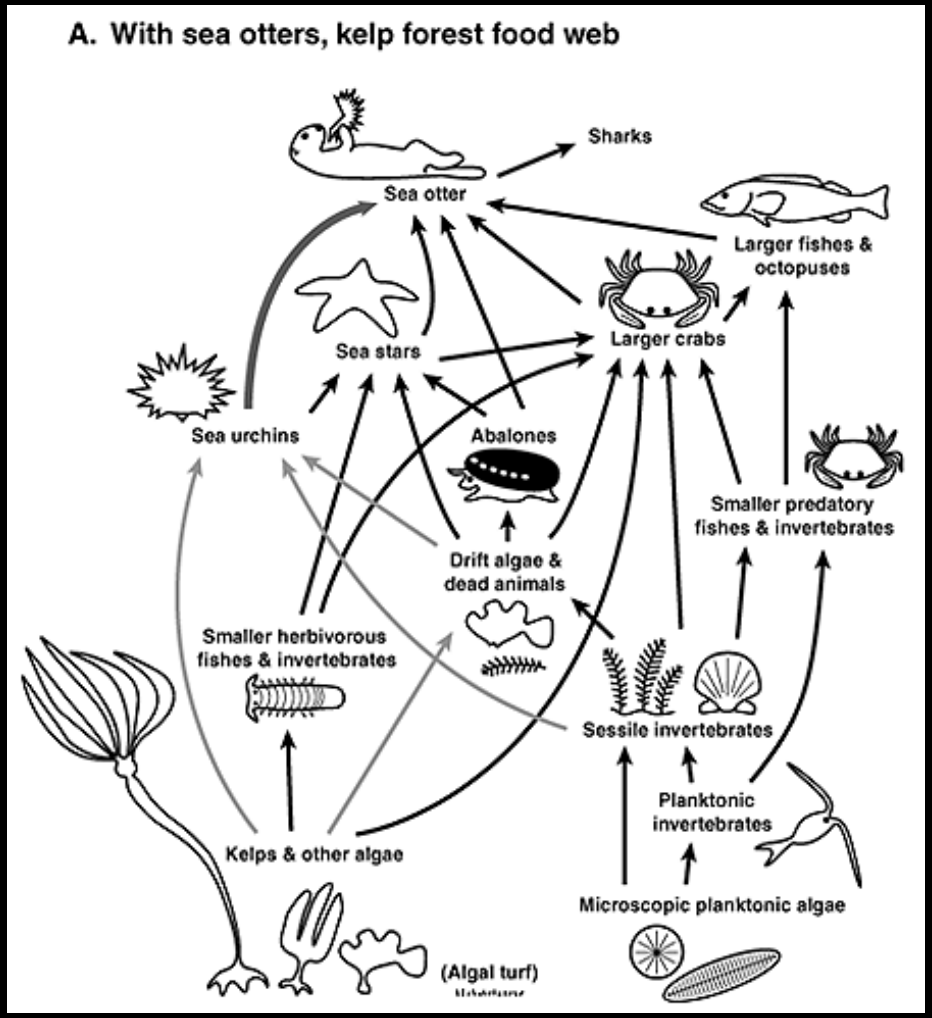
Predation can reduce competition.

Adapted from Holt Biology 2008

Predation and Competition

Interactions between organisms help keep numbers in check.

Why is the otter a keystone species?

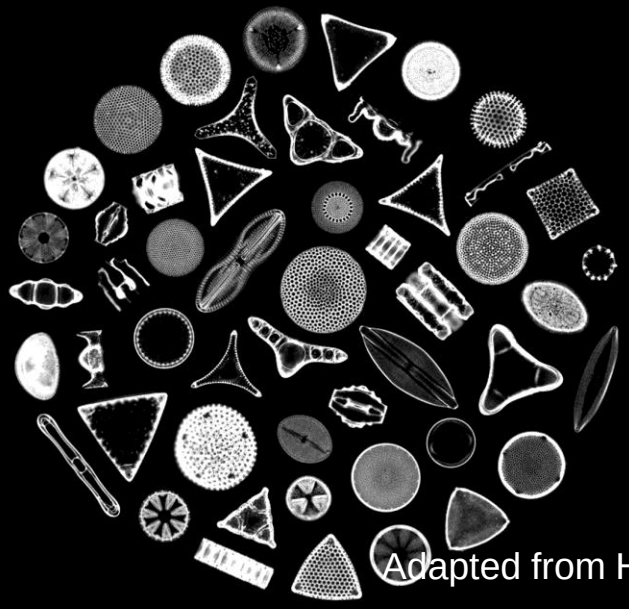


Adapted from Holt Biology 2008

YOUR TURN
Active Reading
Section 3 – Shaping Communities

Biodiversity and Resiliency

Community A has 50 species.
Community B has 100 species.
Which community would be more likely to survive change?

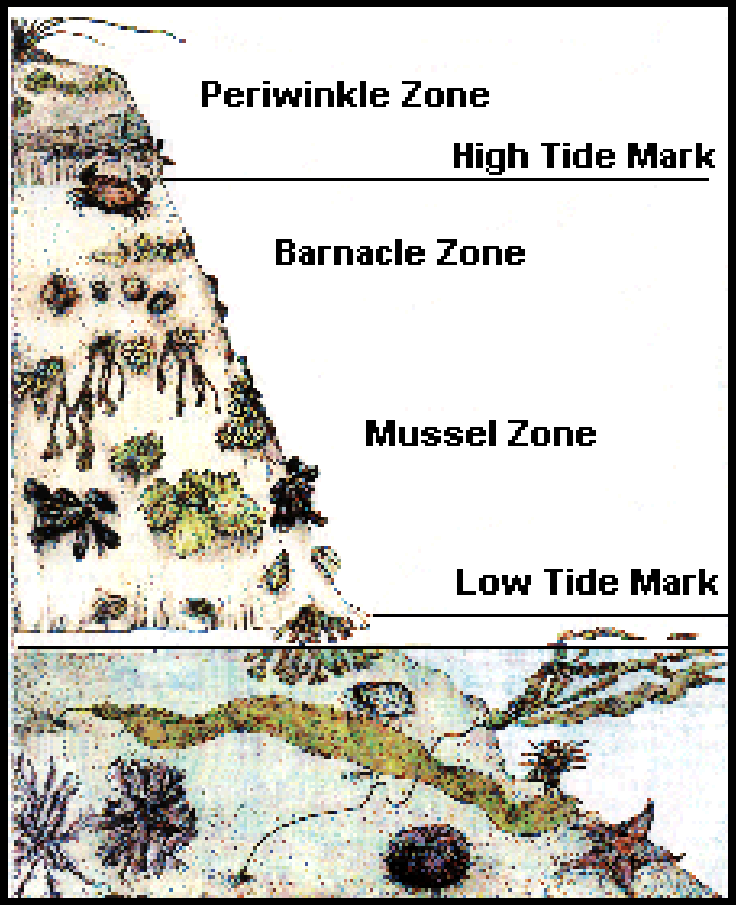


Adapted from Holt Biology 2008

Biodiversity and Resiliency

Predation can help increase biodiversity.

Sea star and mussel



Adapted from Holt Biology 2008

THINK, SHARE, WRITE, (TSW) #9

List two factors that contribute to resiliency of an ecosystem.

THINK, SHARE, WRITE, (TSW) #9

List two factors that contribute to risilency of an ecosystem.

Competition between species (Interaction).

High Biodiversity (Number of Species).