Chapter 6
Population and Community Ecology

Nature exists at several levels of complexity

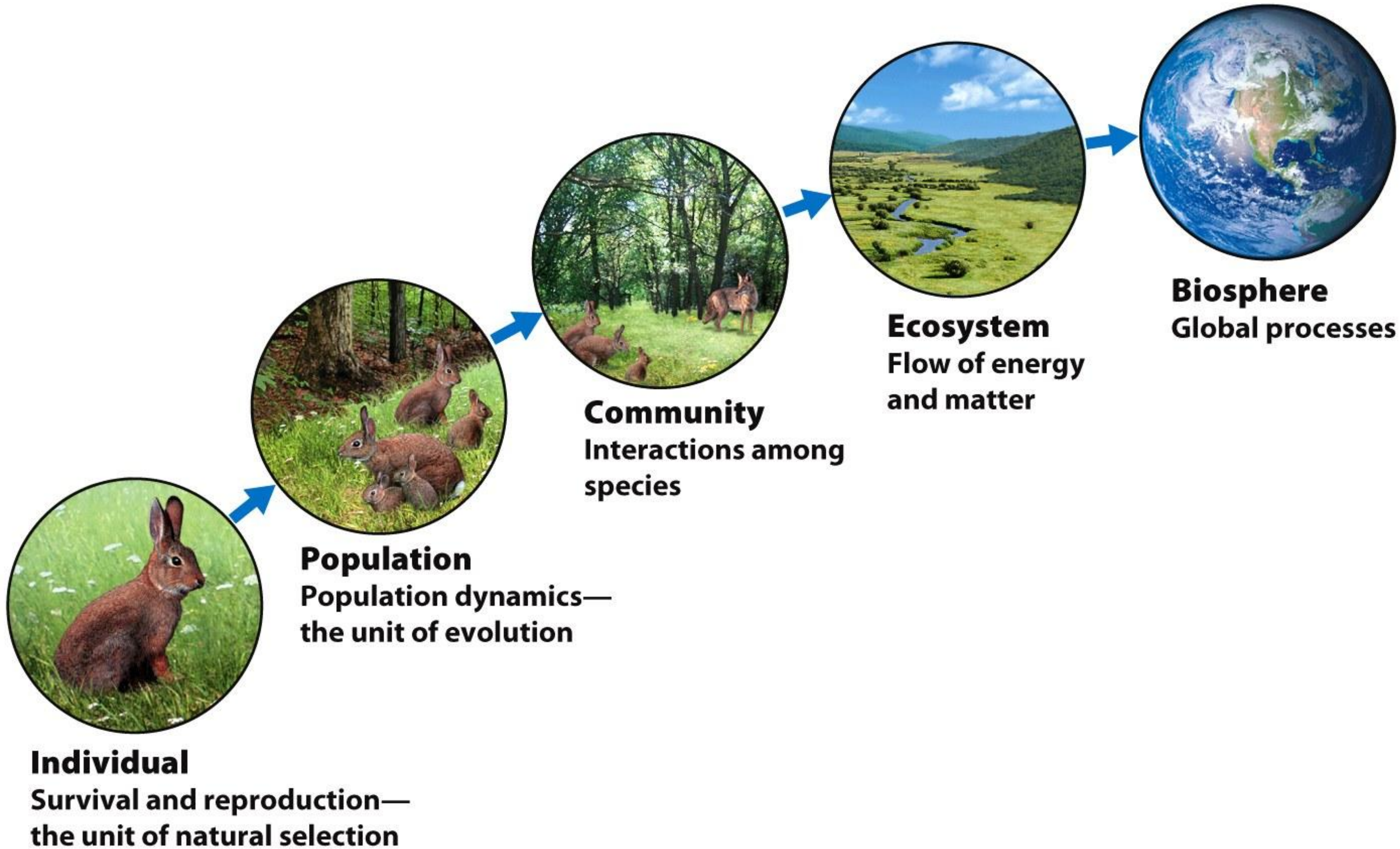
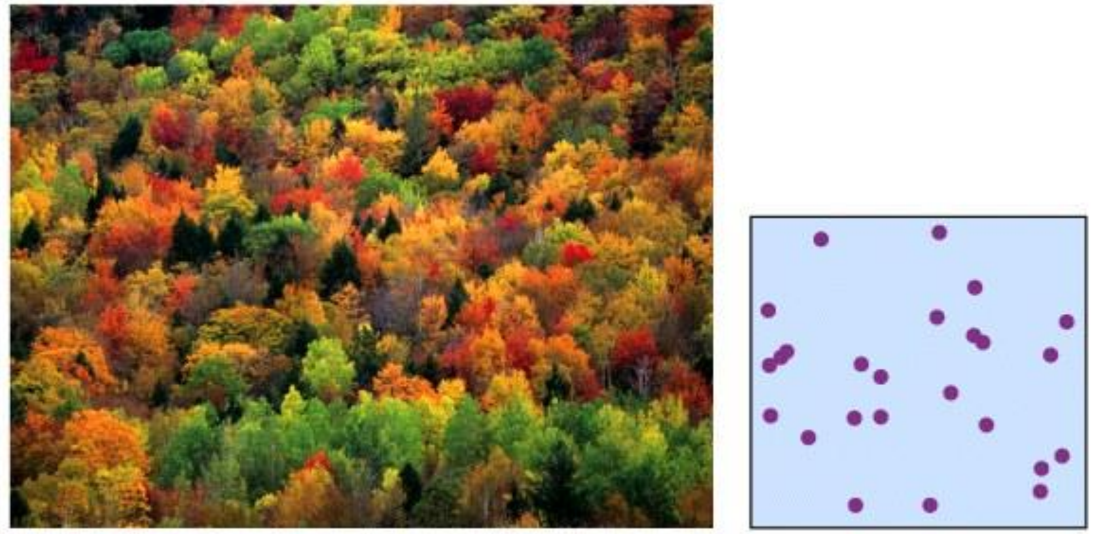


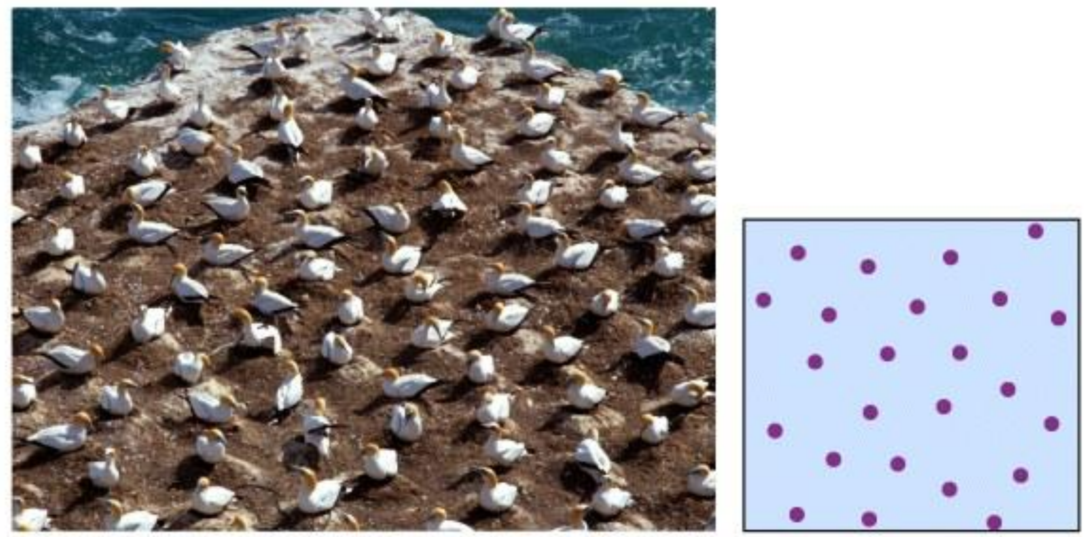
Figure 6.1
Environmental Science

Factors that Regulate Population Abundance and Distribution

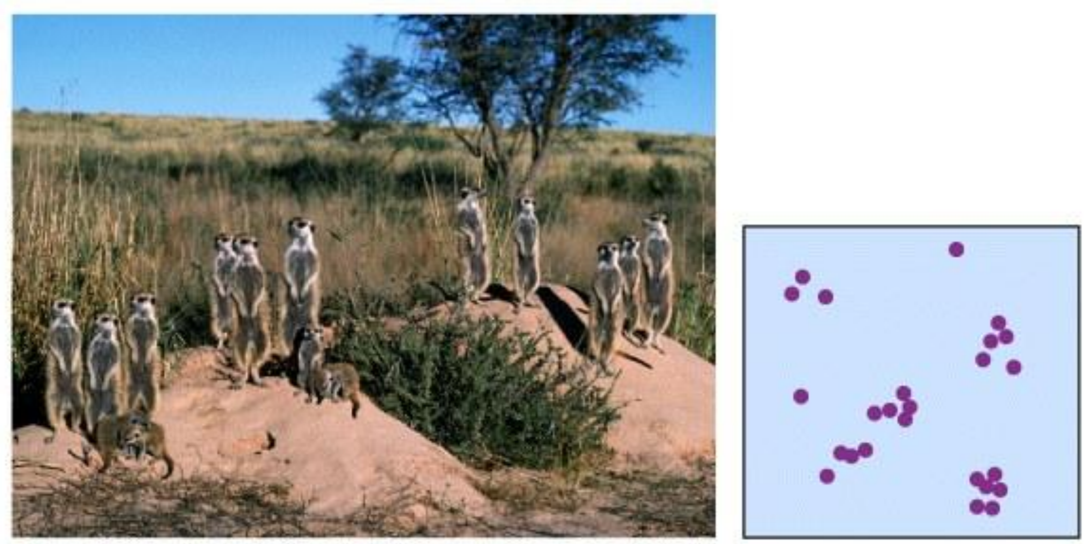
- Population size- the total number of individuals within a defined area at a given time.
- Population density- the number of individuals per unit area at a given time.
- Population distribution- how individuals are distributed with respect to one another.
- Population sex ratio- the ratio of males to females
- Population age structure- how many individuals fit into particular age categories.



(a) Random distribution



(b) Uniform distribution



(c) Clumped distribution

Figure 6.3

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Factors that Influence Population Size

- Density-dependent factors- the size of the population will influence an individual's probability of survival.
- Density-independent factors- the size of the population has no effect on the individual's probability of survival.

Exponential Growth Model

- Growth rate- the number of offspring an individual can produce in a given time period, minus the deaths of the individual or offspring during the same period.
- Intrinsic growth rate- under ideal conditions, with unlimited resources, the maximum potential for growth.

Exponential Growth Model

- J-shaped curve- when graphed the exponential growth model looks like this.

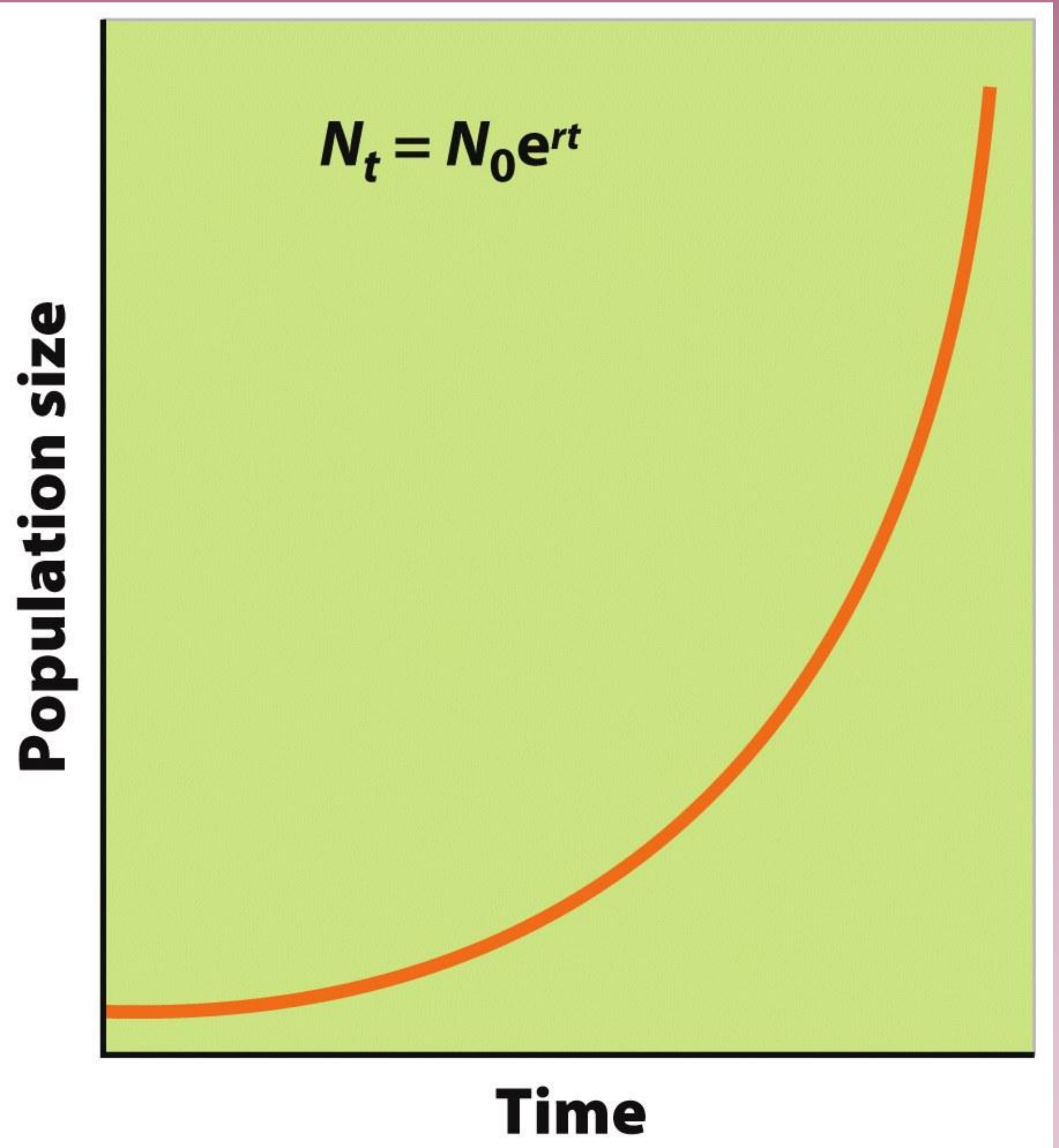

Figure 6.5
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Logistic Growth Model

- Logistic growth- when a population whose growth is initially exponential, but slows as the population approaches the carrying capacity.
- S-shaped curve- when graphed the logistic growth model produces an “S”.

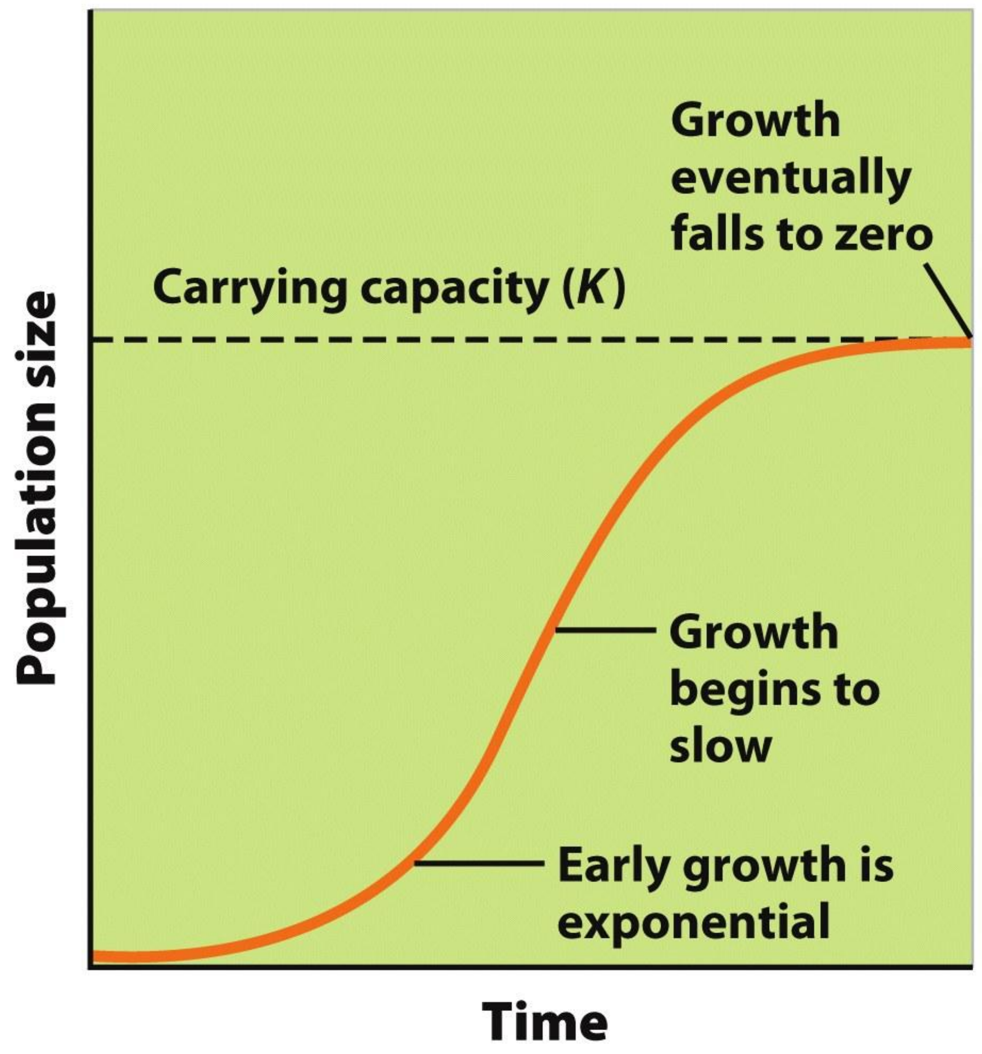

Figure 6.7
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Variations of the Logistic Model

- If food becomes scarce, the population will experience an overshoot by becoming larger than the spring carrying capacity and will result in a die-off, or population crash.

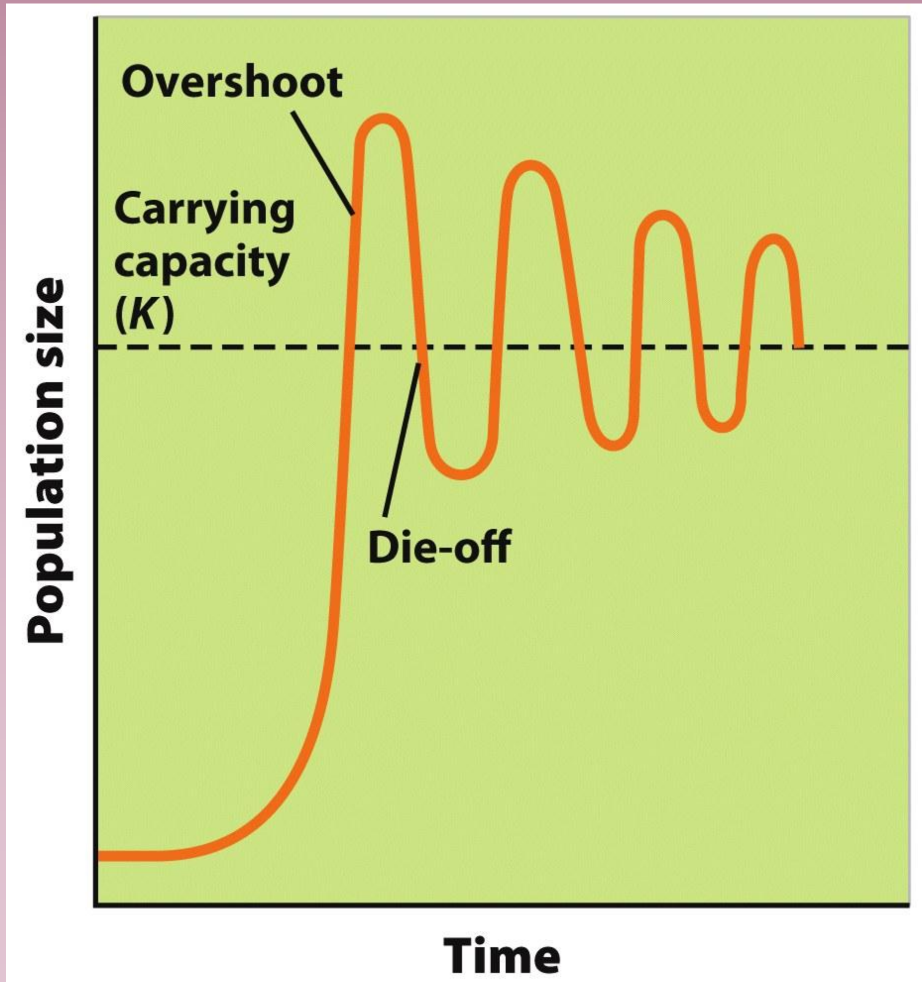

Figure 6.9
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Reproductive Strategies

- K-selected species- the population of a species that grows slowly until it reaches the carrying capacity. Ex. elephants, whales, and humans.
- R-selected species- the population of a species that grows quickly and is often followed by overshoots and die-offs. Ex. mosquitoes and dandelions

TABLE 6.1 Traits of *K*-selected and *r*-selected species

Trait	*K*-selected species	*r*-selected species
Life span	Long	Short
Time to reproductive maturity	Long	Short
Number of reproductive events	Few	Many
Number of offspring	Few	Many
Size of offspring	Large	Small
Parental care	Present	Absent
Population growth rate	Slow	Fast
Population regulation independent	Density dependent	Density
Population dynamics	Stable, near carrying capacity	Highly variable

Table 6.1
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Survivorship Curves

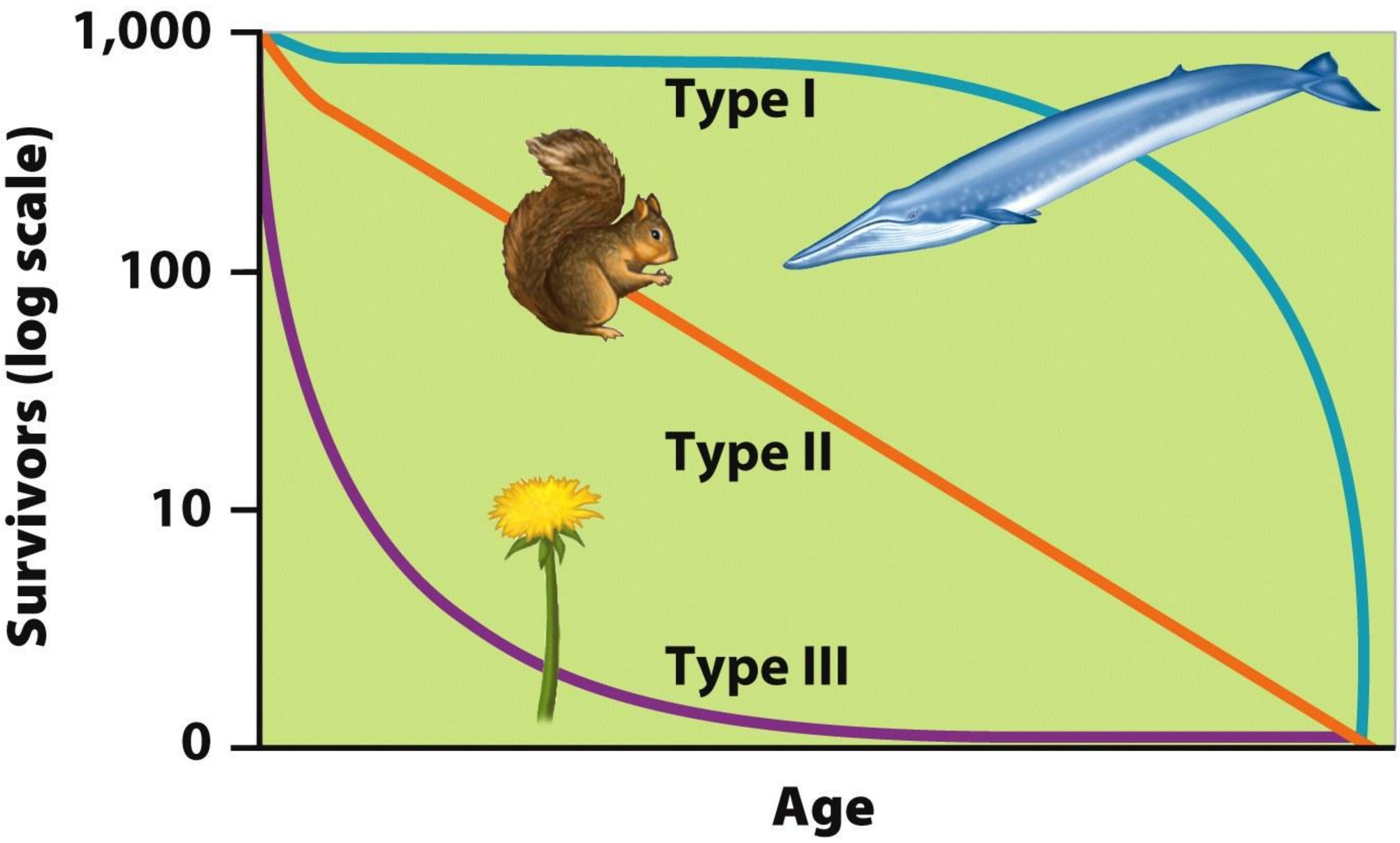

Figure 6.12
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Metapopulations

- Metapopulations- a group of spatially distinct populations that are connected by occasional movements of individuals between them.

Figure 6.13
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Competition

- Competition- the struggle of individuals to obtain a limiting resource .

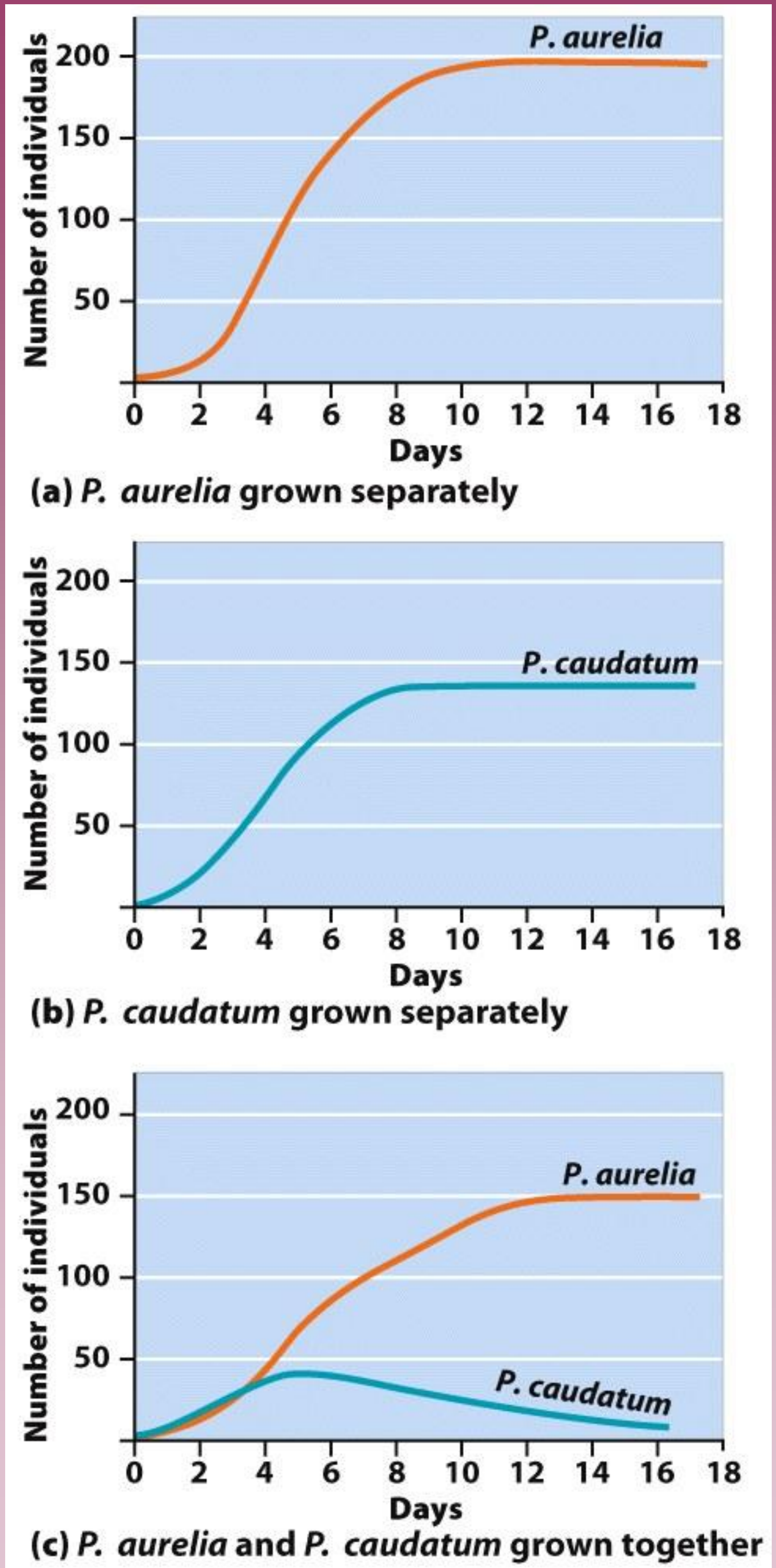

Figure 6.14
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Resource Patitioning

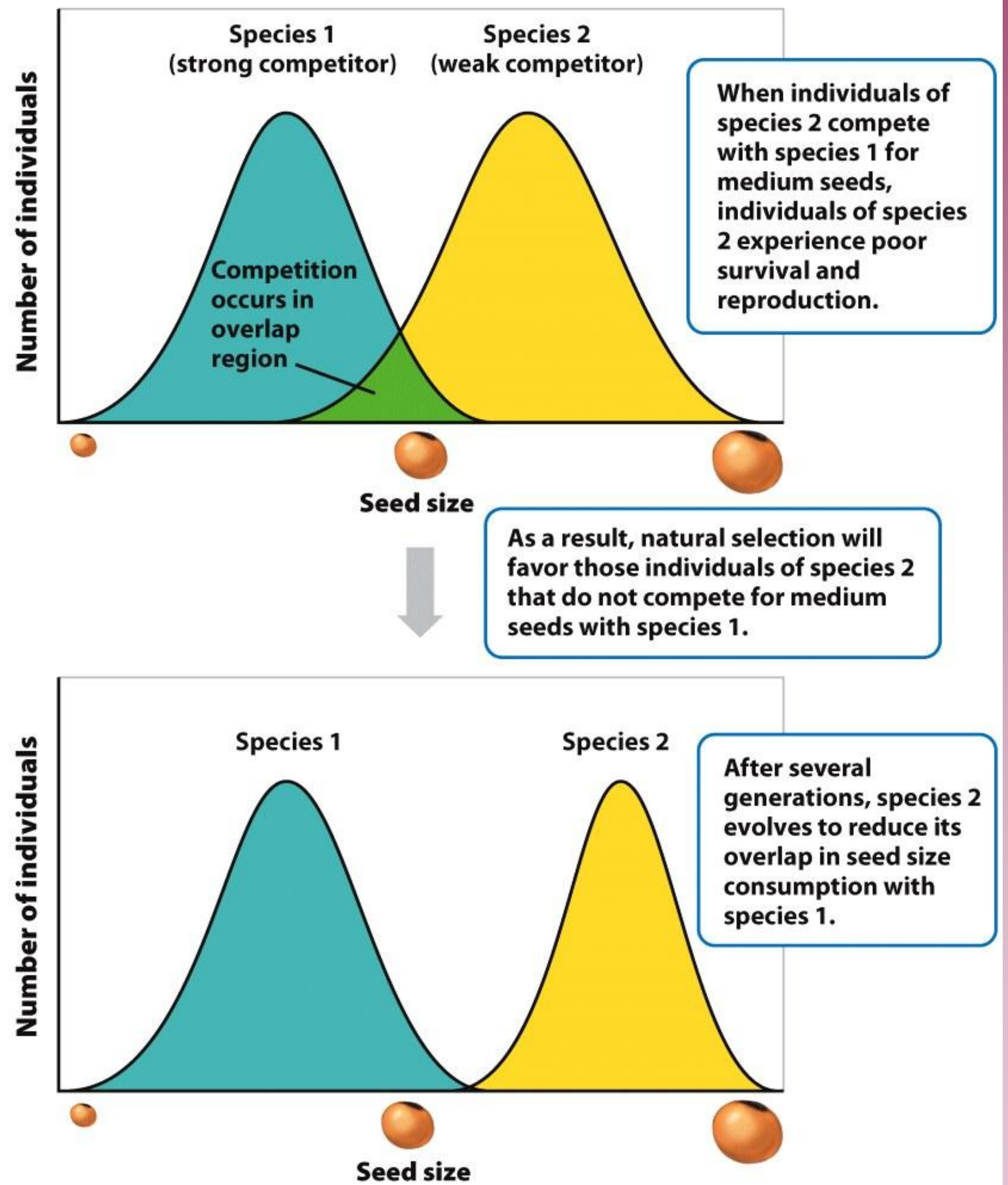

Figure 6.15
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Predation

- Predation- the use of one species as a resource by another species.
- True predators- kill their prey.
- Herbivores- consume plants as prey.
- Parasites- live on or in the organism they consume.
- Parasitoids- lay eggs inside other organisms.

Mutualism

- Mutualism- A type of interspecific interaction where both species benefit.

Figure 6.18
Environmental Science

Figure 6.18 (inset)
Environmental Science

Commensalism

- Commensalism- a type of relationship in which one species benefits but the other is neither harmed nor helped.

TABLE 6.2 Interactions between species and their effects

Type of interaction	Species 1	Species 2
Competition	–	–
Predation	+	–
Mutualism	+	+
Commensalism	+	0

Table 6.2
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Keystone Species

- Keystone species- a species that plays a role in its community that is far more important than its relative abundance might suggest.

Figure 6.22 (inset)
Environmental Science

Figure 6.22
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Primary Succession

- Primary succession- occurs on surfaces that are initially devoid of soil.

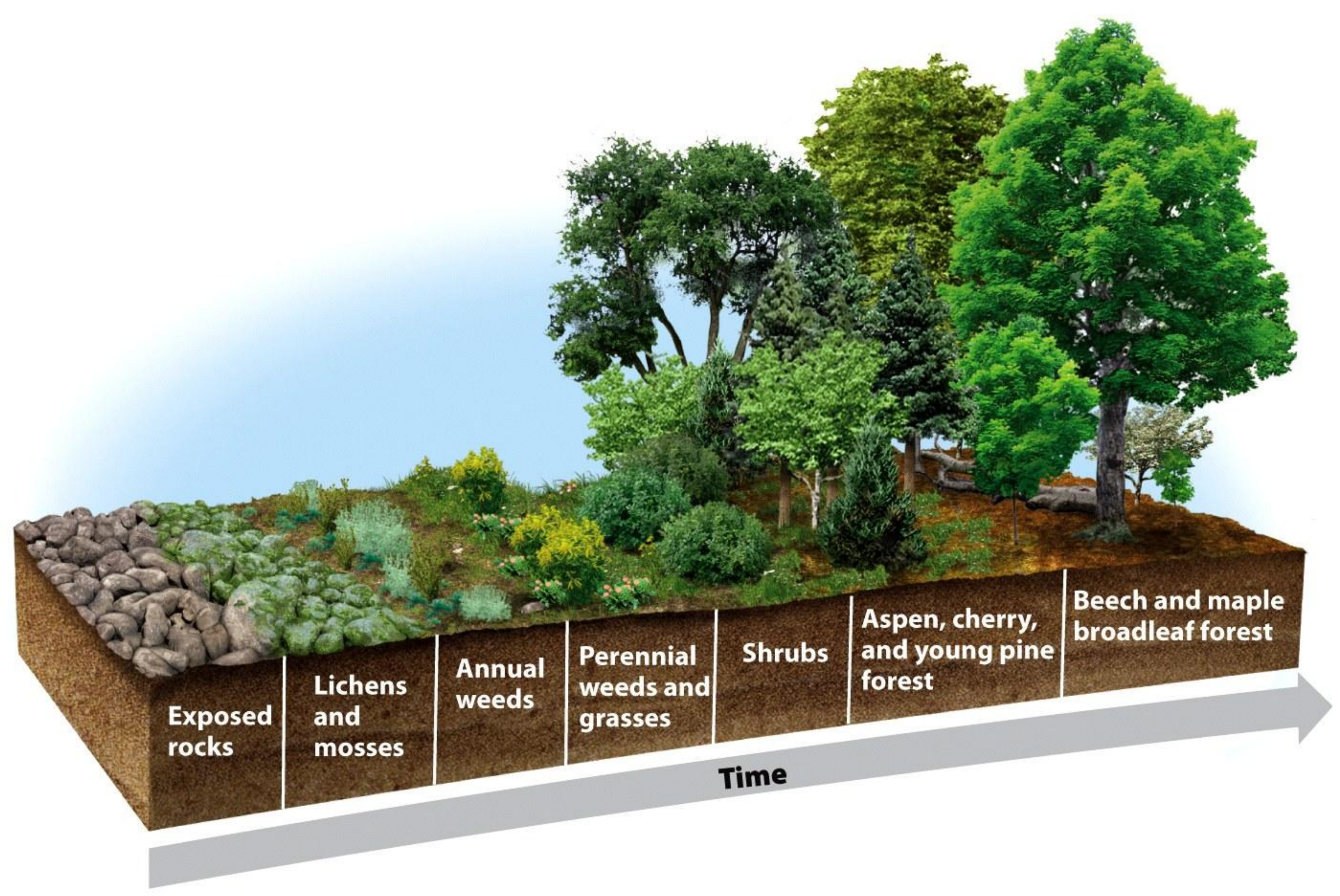

Figure 6.23
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Secondary Succession

- Secondary succession- occurs in areas that have been disturbed but have not lost their soil.

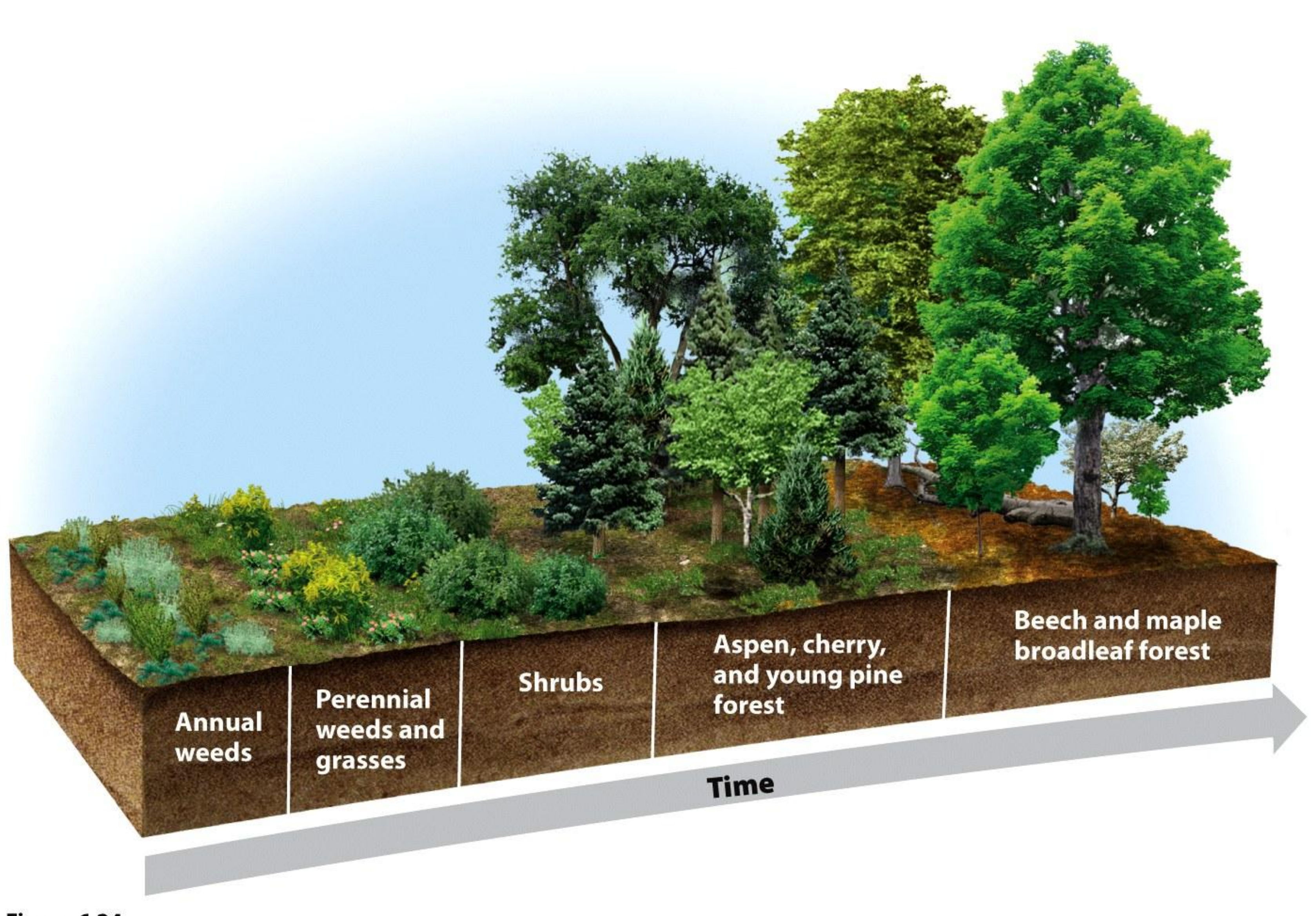

Figure 6.24
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Aquatic Succession

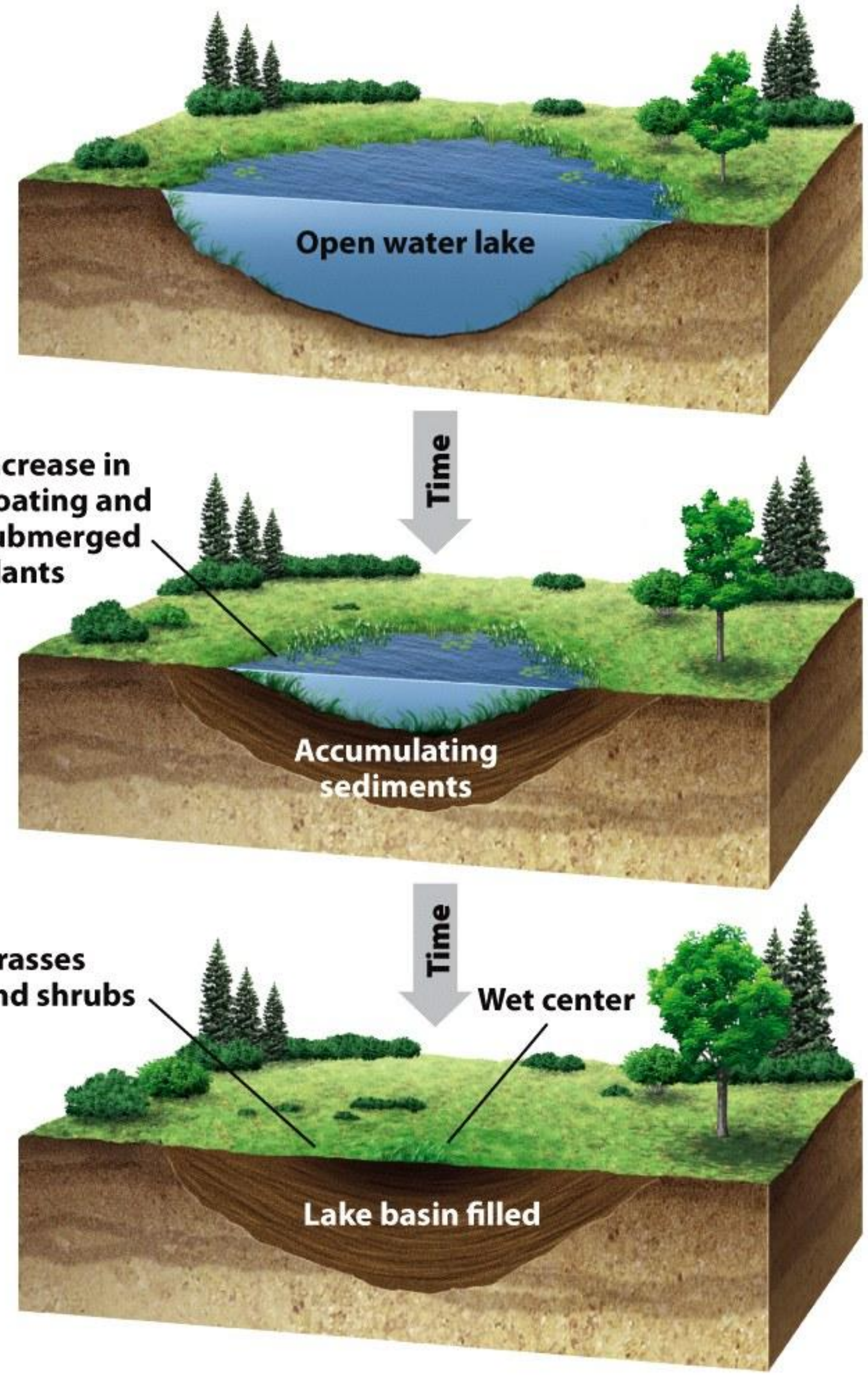

Figure 6.25
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Factors that determine species richness:

- Latitude
- Time
- Habitat size

Theory of Island Biogeography

- Theory of island biogeography- the theory that explains that both habitat size and distance determine species richness.

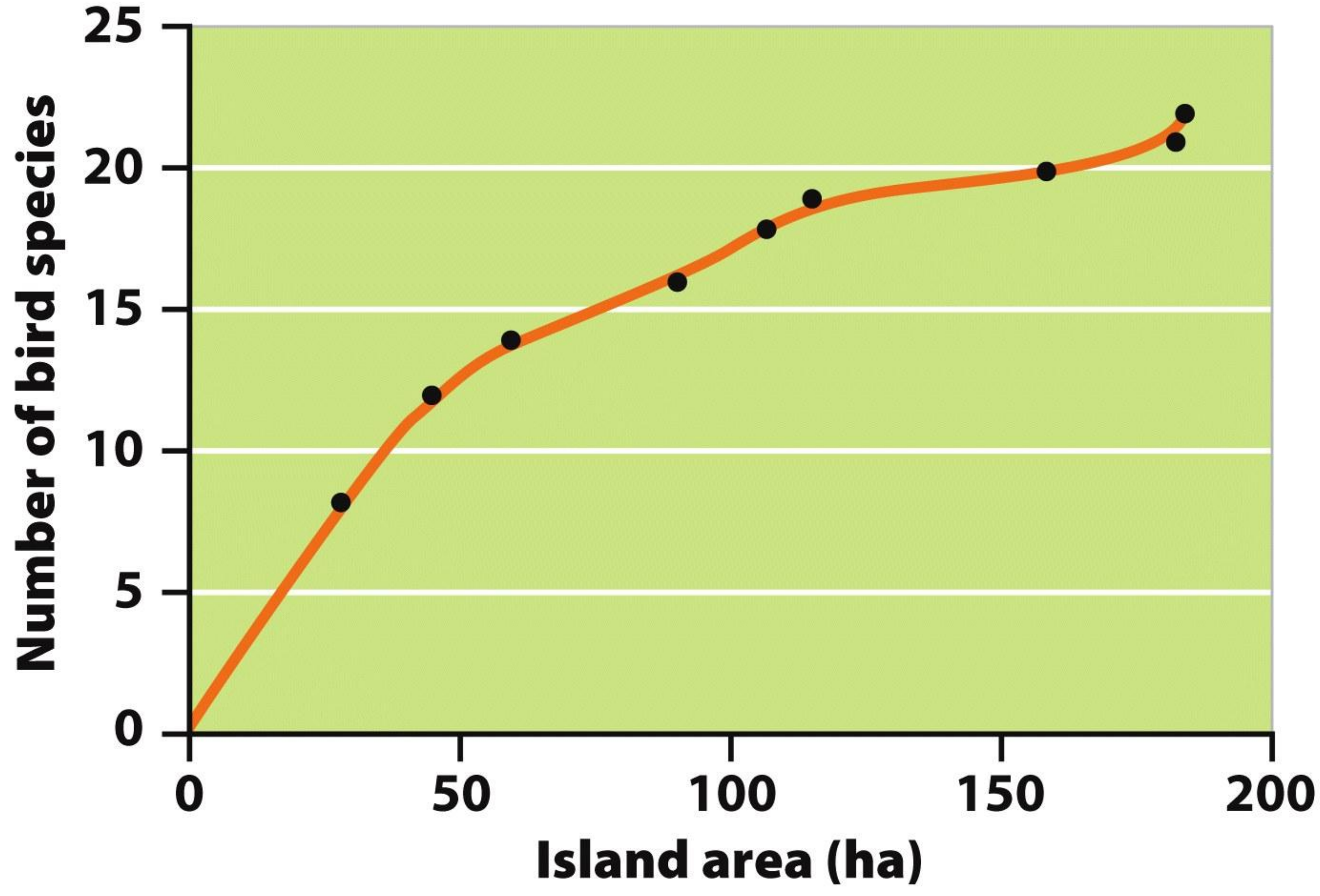

Figure 6.26
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