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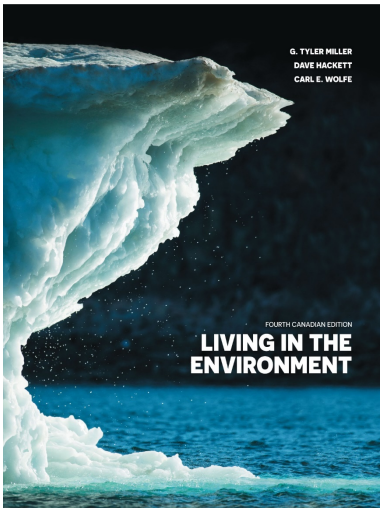

prepared by

Ian Dawe

Chapter 8

Community Ecology

Key Concepts

Community structure

– Roles of different species

– Interactions of predator–prey

– Other interactions

Community changes and ecology

Case Study: Beavers—Keystone Species in Canadian Forests

Significantly change the physical environment in their ecosystem

– Allogenic engineers

– Ecological shapers

– Keystone species

– Foundation species

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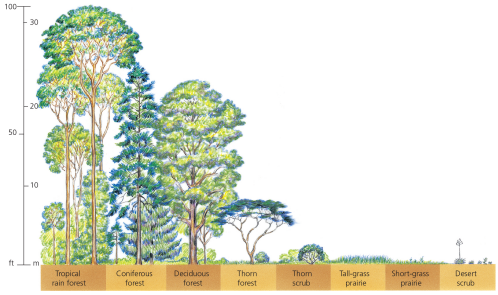
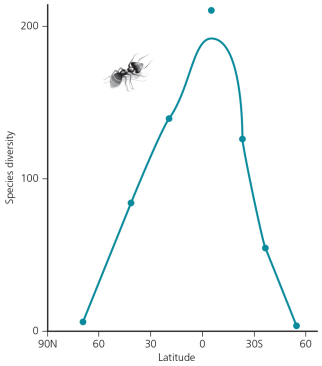
What Is Community Structure?



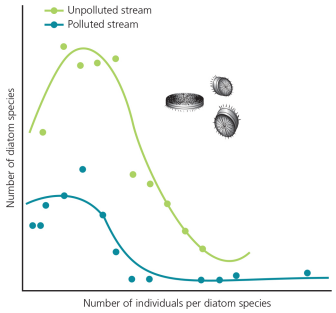
- Physical appearance
  - Edge effects
- Species diversity
  - Richness
  - Evenness
- Niche structure

What Determines Species Diversity? Some Examples

Latitude



Pollution in aquatic systems



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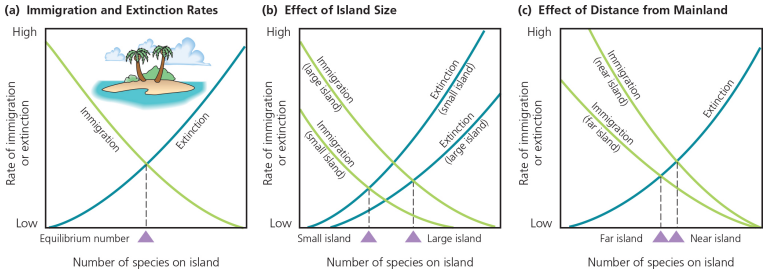
What Determines Species Diversity on an Island?

Theory of Island Biogeography

- Species equilibrium model
- Dependence on **size** and **isolation**



Types of Species and Their Roles

Native

Non-native (including Invasive and Alien)

Indicator

Sensitive to environmental conditions

Keystone

Play critical ecological roles

Foundation

Create and enhance habitats

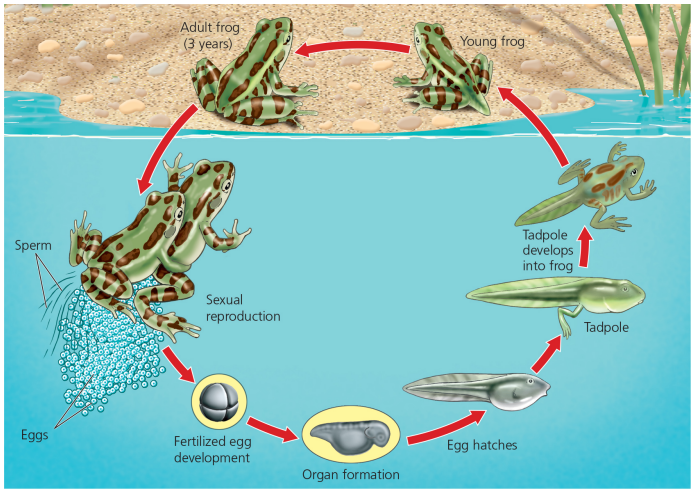
Spotlight: Why Are Amphibians Vanishing? Warnings from Frogs

Life cycle makes frogs particularly susceptible to environmental changes

Vanishing amphibian population may indicate environmental decline

- Habitat loss
- Drought
- Pollution
- Increased UV radiation
- Parasitism
- Disease
- Competition

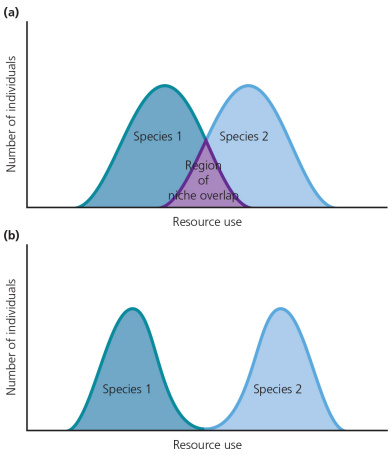
Typical Frog Life Cycle



Species Interactions: Interspecific Competition

Resource Partitioning

- Adapt to reduce competition for resources
- Develop more specialized niches



Resource Partitioning: Sharing the Wealth

Source: After R. H. MacArthur, "Population Ecology of Some Warblers in Northeastern Coniferous Forests," Ecology 36 (1958): 533–36.

Case Study: Why Are Sharks Important Species?

Apex predators
– Cull sick and injured animals from population

Possess a highly effective immune system
– Research immune disorders and cancers

Vulnerable species
– Populations of commercially valued species declined by over 90%

How Do Predators Increase Their Chances of Getting a Meal?

Predator strategies:
– Pursuit
– Stalk and ambush
– Immobilization

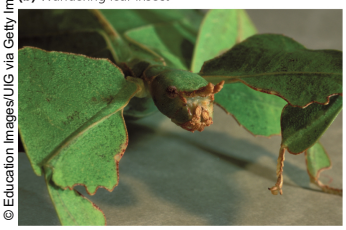
How Do Prey Defend Themselves Against or Avoid Predators?

Camouflage

(a) Span worm

© Vassiliy Vishnevskiy/Thinkstock

(b) Wandering leaf insect



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How Do Prey Defend Themselves Against or Avoid Predators?

Chemical Warfare
Warning Colouration

(c) Bombardier beetle

© johannviloria/Shutterstock

(d) Foul-tasting monarch butterfly

© Paul Reeves Photography /Shutterstock

(e) Poison dart frog

© Kletr/Shutterstock

How Do Prey Defend Themselves Against or Avoid Predators?

Deception

(f) Viceroy butterfly mimics monarch butterfly

© Paul Reeves Photography /Shutterstock

(g) Hind wings of moth resemble eyes of much larger animal

© StevenRussellSmithPhotos/ Shutterstock

(h) When touched, snake caterpillar changes shape to look like head of snake

© Evgeny Parushin/Shutterstock

Species Interactions: Parasitism

Feeding on part of another organism while living in or with it

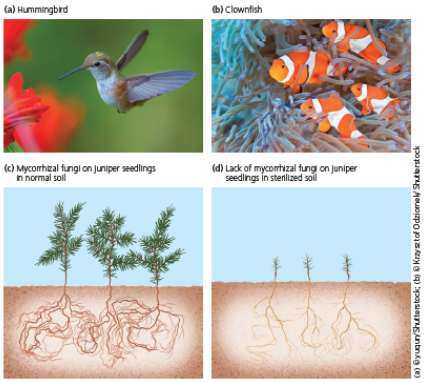
- Endoparasites or ectoparasites

Why are parasites important?

- Help hold community together
- Promote biodiversity

Species Interactions: Mutualism

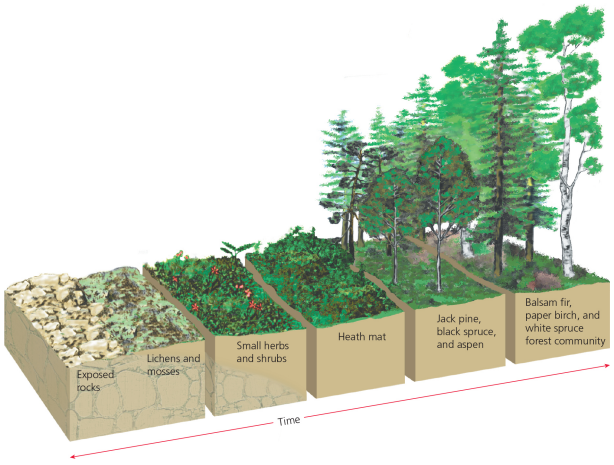
Both parties benefit
Pollination, nutritional, or gut-inhabitant mutualism



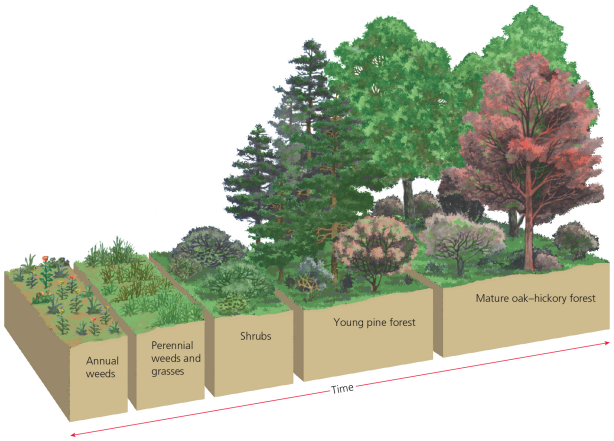
Species Interactions: Commensalism

Species interaction that benefits one and has little or no apparent effect on the other
– Epiphytes

What Is Primary Succession?



What Is Secondary Succession?



Factors Affecting Succession

Rate of succession

– Facilitation

– Inhibition

– Tolerance

Disturbances

Periodic disturbances, such as forest fires, are important for maintaining and replenishing community structure.

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Ecological Stability, Complexity, and Sustainability

Stability = Sustainability

- **Inertia** or persistence
- **Constancy**
- **Resilience**
  - ***Climax community***
- Is complexity a required trait?
- This forest patch is very vulnerable.

© Timothy Epp/Shutterstock

Precautionary Principle

Just because a system is not in balance does not mean it can't be harmed.

Can't predict results of actions

Based on common sense and a respect for ecological complexity

Conclusion

- Communities are made up of different species.
- Species interact in several ways, including predation, parasitism, commensalism, and mutualism.
- Also function as keystone and foundation species
- Communities change over time by disturbance and succession.