

Title: Food Web Invasion

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Lesson Overview

Students model food chains and food webs within the Great Lakes and coastal ecosystems, demonstrating the impact of invasive species, and design methods to prevent their introduction or control or reduce those that are present.

Introduction/Teacher Background Knowledge

Invasive species are non-native species that have arrived accidentally or have been brought intentionally from their native ecosystem to a new ecosystem and cause harm to the new ecosystem. Hundreds of examples of non-native species (also called exotic species) appearing in new ecosystems are known around the world. When a new species arrives in an ecosystem, the balance among native organisms may be altered, and competition is high until a new balance is achieved. Non-native species are not always invasive: sometimes the new species cannot survive in these new ecosystems; in other cases they cause no harm or may even be beneficial. However, if the new species survives and reproduces well, one or more native species populations can suffer, altering the ecosystem. A non-native species that causes harm to the environment, ecosystem, or people is known as an invasive species. There are hundreds of examples of invasive species (also known as damaging or nuisance exotic or nonnative species) around the world. See student pages for additional information.

According to the United Nations Convention on Biological Diversity about 1.4 trillion dollars a year is spent globally to control invasive species and to help repair the damage they cause. Invasive species may arrive in their new ecosystem by many means: waterborne commerce, organisms in trade, and intentional introductions with unexpected consequences are among the sources. Waterborne commerce moves millions of tons of cargo annually through the Great Lakes. Shipping is an economically efficient method of transporting raw materials, finished goods and agricultural products. However, the ballast water of ships (water in special tanks that help stabilize the ship when it doesn't have cargo) can accidentally introduce nonnative species when the ballast water is pumped out when taking on cargo. "Organisms in trade" are organisms that are sold for ornamental gardens, pets, food, bait for fishing, and other uses for which live plants or animals are sold to ordinary citizens but may escape or be released into the environment intentionally or non-intentionally. Disease organisms or agricultural pests accompanying these "organisms in trade" can also cause problems for native organisms. Intentional introductions with unexpected consequences include organisms imported for specific commercial or other beneficial purposes (e.g., for aquaculture or pollination) but unexpectedly cause ecosystem problems if they escape into the environment. Examples include Asian carp, which were brought in to benefit aquaculture but which escaped during floods of the fish farms.

Generally, invasive species can cause significant change to their newly adopted ecosystems. Food chains that show feeding relationships in an ecosystem are part of large and complex food webs. By exploring these relationships, students become familiar with the concept of food webs, as well as the different plants and animals that inhabit coastal habitats along the Great Lakes. There are many ways to model a food web. It is important that the information on organisms is accurate. Students may be creative with this project – it might be a two-or three-dimensional model. It may take the shape of a puzzle, a web, a mural, a graphic computer-design, or visual model. Students will use their models to determine how invasive species may affect a Great Lakes ecosystem and to predict the effect of control methods that they may design.

Target Grade & Subject

High School Science

Duration: # Class Periods (assuming 50 minute periods)

2 class periods + time for student presentations

Instructional Setting:

Advance Preparation:

- Print extra copies of Creature Cards
- Print student pages for each student

Learning Objectives:

At the end of this lesson, students will be able to:

- List at least 10 connections between Great Lakes coastal organisms in a food web
- Explain the impacts of changes on a Great Lakes coastal habitat food web
- Design or implement methods for controlling invasive species or preventing their introduction

Michigan Science (or Social Studies) Performance Expectation Addressed

HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*

SEP: Science & Engineering Practices

Constructing Explanations and Designing Solutions:

Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)

DCI: Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

Anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.

LS4.D: Biodiversity and Humans

Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).

Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

CCC: Cross-Cutting Concepts

Stability and Change

Much of science deals with constructing explanations of how things change and how they remain stable.

List Materials & Quantities Needed per class and per student group

- Creature Cards – *see list of Creature Cards with habitats labeled*
- Great Lakes food chain and food web images
- paper
- pencils
- drawing supplies

Guiding Question(s):

- How can the introduction of invasive species be prevented or when already present, how can they be controlled.?

5E Model

ENGAGE:

- 1) Students read the background information and draw a simple food chain on their student page, relying on prior knowledge of any habitat or ecosystem. NOTE: This does not need to be a Great Lakes food web.
- 2) On the student page, students write an initial response to the question about the impact of invasive species.
- 3) Teacher shows the Great Lakes ecosystem food chain and food web without the arrows as models. Discuss and point out the multiple levels. Discuss how energy is transferred throughout the food web.

EXPLORE:

- 1) Assign or have each student select a coastal habitat: sand dune, wetland or prairie. Each student will create a food chain of organisms within that coastal habitat. This food chain should include one autotroph (producer) and at least two heterotrophs (consumers): one primary consumer and one secondary consumer. Students can review the Creature Cards for their habitat to create this food chain.
- 2) Students then form groups based on their habitat to combine each of their food chains to create a food web (e.g. students who created a sand dune food chain gather with other students who created a sand dune food chain). Each group will combine organisms and connections from their food chains to create a food web with at least 10 organisms from their habitat.
- 3) Students then “introduce” an invasive species (from the background information on the student pages) into their habitat’s food web and discuss the impacts in a group. Students should be specific about how their selected invasive species was introduced into their food web (e.g. From ballast water? From someone’s released pet? Seeds blown from a garden? Attached to a boat trailer? Transported on wood carried to a campsite?)
- 4) Then students explore ideas about how the invasive species introduction have been prevented (e.g., not just “don’t release pets” but campaigns designed to convince people in general not to release pets; in other words what prevention or control methods should be explored that might work broadly for society).

Supporting students during exploration: *Questions that the teacher could ask to guide the exploration.*

- What type of impact does the invasive species have on the habitat’s food web?
- How does it affect other species: Does it eat something that is a food source for another species? occupy the same habitat or niche as another species? or eat other species?
- Is the means by which the invasive organism was introduced something that could be controlled or prevented?

EXPLAIN:

- 1) Each student then re-draws the food web to show the effect that these invasive species could have on other organisms in the habitat. All of the students’ food webs might not look exactly the same, as the invasive species may have different effects on the ecosystem. Students are expected to make predictions based-on learned facts, as scientists do; these should not be considered correct or incorrect, but rather as possible implications to the invasion of a non-native species.
- 2) Students return to their food web groups to research potential prevention or control solutions that might reduce the damage caused by their species.
- 3) Have students research by looking for articles on their species on the following web site: <http://www.glerl.noaa.gov/res/Programs/glansis/glansis.html> or <http://www.great-lakes.net/envt/flora-fauna/invasive/invasive.html>. Each group should read at least two articles on their species and one article on another species.
- 4) After reading the articles and doing additional research as necessary, students should brainstorm a list of potential solutions. Have each group choose one solution from their list on which to expand.

Discuss the following questions with your students. Help them to be inquisitive and to problem-solve:

- What is the difference between the short- and long-term time scales? *The imbalance in ecosystems caused by invasive species may be corrected through evolution, but this happens over a very long period of time (thousands of years). In the more immediate future, invasive species may cause considerable damage to an ecosystem.*
- What is the answer to problems caused by invasive species? Is it best to let the food web take its own course in finding a new balance or to try to control the invasive species?
- What are the possible ways in which the introduction or spread of aquatic invasive species might be controlled?

- *Preventative measures include: washing off a boat so it does not transport invasive species, electric barriers, regulations on shipping ballast water, separation of waterways.*
- *Measures to reduce existing numbers of invasives in the Great Lakes include selective poisoning, introducing predators and interfering with reproduction.*
- *What are the possible ways in which invasive species might be controlled on land? Examples of ideas that might be brought up in discussion include: Remove plant seeds and fragments from clothing, hiking boots, and equipment after enjoying outdoor activities. Learn to identify common invasive plants in your backyard and in the natural areas of your neighborhood, and report these plants to the local Department of Natural Resources.*

ELABORATE:

- 1) Student groups each take five minutes to present their issue and the proposed solution to the class.

Supporting students during elaboration: *Questions that the teacher could ask to clarify student thinking.*

- What can be done to bring about these proposed solutions?
- What parties (organizations or individuals) in their community or state would be able to affect change?

EVALUATE:

- 1) Students each write a one-page essay explaining the impact of the invasive species they have chosen and a possible solution to the problem.
- 2) **EXTENSION:** Students can turn their essays into proposal letters to send to the local, state or federal political officials who are in the best positions to affect change. *NOTE: If you choose to do this, it is important to first discuss with students that while they are capable of making change, people are not always successful on their first attempt.*

Supporting students during evaluation: *Questions the teacher could ask to tie student ideas to big idea.*

- How are the native species that live in and around the Great Lakes connected to and reliant upon each other?
- How important is biodiversity in this ecosystem?
- What negative effects might removing an invasive species cause? How can those negative effects be prevented?
- How have human actions affected these species?

New Vocabulary List new terms and definitions

- *Autotroph:* an organism that can synthesize its own food by photosynthesis, usually a green plant; can also be chemosynthetic
- *Biodiversity:* the number, variety and genetic variation of different organisms found within a specified geographic region
- *Decomposer:* organisms that break down dead or decaying organisms
- *Food Chain:* a series of organisms each dependent on the next as a source of food
- *Food Web:* the whole group of interacting food chains in a living community
- *Heterotroph:* consumer; an organism that cannot synthesize its own food and consumes other organisms in a food chain
- *Invasive (non-native) species:* plant or animal that enters an ecosystem to which it is not native and competes with one or more native species for food, shelter, and/or reproductive opportunities. A non-native species is considered invasive if it causes harm to the environment, to humans, or to the economy.
- *Primary Consumer:* the organism that eats the producer
- *Producer:* organisms that synthesize organic materials from inorganic materials
- *Quaternary Consumer:* an organism that eats tertiary consumers
- *Secondary Consumer:* the organism that eats or derives nutrients from the first-order consumer
- *Tertiary Consumer:* an animal that feeds on secondary consumers in a food chain, usually the top predators in an ecosystem or food chain
- *Ballast water:* Water pumped in and out of special tanks in ships that are used to keep the ship stable and upright with different amounts of cargo
- *Organisms in trade:* Life plants and animals that ordinary people buy and use for various purposes such as pets, fishing, gardens, etc.

Safety Considerations

n/a

Sources

Alliance for the Great Lakes. 2012. "Food Web Invasion." Great Lakes in My World 9-12. Chicago, IL.

United States Department of Agriculture. Pathways. <https://www.invasivespeciesinfo.gov/subject/pathways>

RIPPLE: Reduce Invasive Pet and PLant Escapes: Web site at https://www.michigan.gov/invasives/0,5664,7-324-68000_75850---,00.html

Classroom and Community Resources. Invasive Species Education and Outreach. Website:

<https://www.michigan.gov/invasives/0,5664,7-324-68000---,00.html>

Appendix**Supporting Materials:**

Creature Cards

Creature Cards Habitats List

Coastal Habitat image w/ creatures

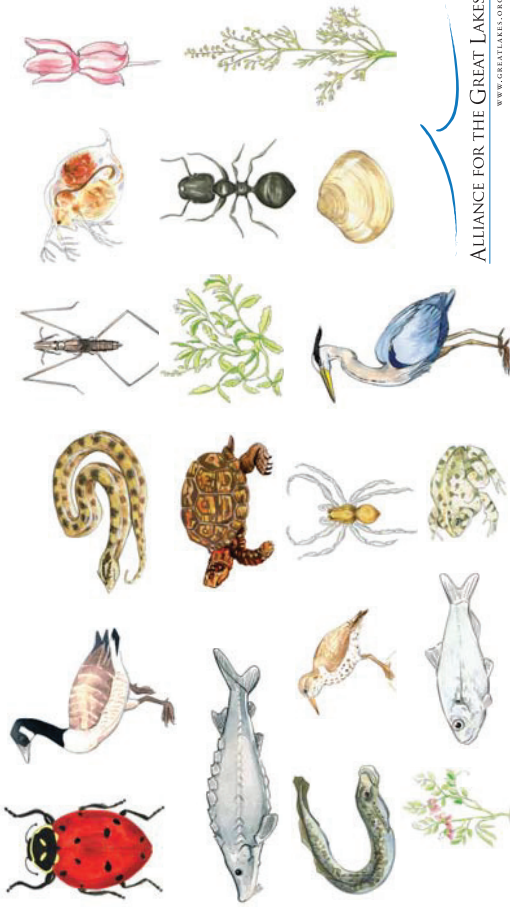
Great Lakes Food Chain

Great Lakes Food Web for Teachers

Pathways of introduction

Great Lakes in My World Creature Cards

Over 60 illustrated information cards featuring Great Lakes plants and animals



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Name: Species' common and scientific names are provided.
*: Indicates that this card can be used in the activities Tangled Web and Web of Life.

who?
description

A description of the species that includes type, physical characteristics and species status (endangered, invasive, etc.)

Scale: A scale conveys the relative size of the species. A darkened column indicates the species place in the size range. The sizes for each column are as follows:

- #1: less than 6 cm / 25 in
- #2: 6 cm / 25 in – 6.3 cm / 2.5 in
- #3: 6.6 cm / 2.6 in – 30 cm / 12 in
- #4: 31 cm / 12.1 in – 61 cm / 24 in
- #5: 63.5 cm / 25 in – 122 cm / 48 in
- #6: 123 cm / 48.5 in – 183 cm / 72 in
- #7: more than 183 cm / 72 in

Size:

where?
environment

An explanation of the species' general environment and specific habitat

Interesting Fact *

Characteristics that make this plant or animal unique

what?
characteristics

Facts about the species role in the food web, reproduction and other distinguishing habits

Creature Card Definitions

- Carnivore:** a flesh-eating animal
- Colony:** a population of plants or animals in a particular place that belong to one species
- Consumer:** a plant or animal that preys on other living things or eating particles of organic matter
- Crustacean:** any of a large class of mostly water-dwelling arthropods (as shrimps, wood lice, water fleas, and barnacles) having an exoskeleton of chitin
- Decomposer:** an organism that lives on and breaks down dead organisms
- Detritus:** particles of decaying organic material
- Diurnal:** active in the daytime
- Endangered species:** a species in immediate danger of extinction
- Flock:** a group of birds or mammals assembled together

- Forage fish:** fish that primarily eat phytoplankton and zooplankton (especially diporeia); they are prey for larger predators such as lake trout and whitefish; they include smaller fish such as herring, alewives, chubs, and smelt.
- Herbivore:** an animal that eats only plants
- Introduced species:** a plant or animal that is intentionally brought into an ecosystem by human beings either to diversify or to control a population within that ecosystem
- Invasive species:** a plant or animal that enters an ecosystem to which it is not native and competes with one or more species for food, shelter, and/or reproductive opportunities.
- Larva:** a young wingless, often wormlike, form (grub or caterpillar) that hatches from the egg of many insects
- Migrate:** to pass from one region or climate to another usually on a regular schedule for feeding or breeding

Creature Card Definitions

- Mollusk:** any of the category (phylum: mollusca) of invertebrate animals (as snails, clams, and mussels) with a soft body lacking segments and usually enclosed in a shell
- Nocturnal:** active in the night
- Omnivore:** feeds on both animal and plant matter
- Phytoplankton:** very small, freely floating plant that drifts with water currents
- Plankton:** small water organisms that exist in a drifting, floating state; is the base of freshwater ecosystems, provides food for larger animals and indirectly for humans, whose fisheries depend on phytoplankton and zooplankton
- Predator:** an animal that lives by killing and eating other animals
- Prey:** an animal hunted or killed by another animal for food

- School:** group of fish that swim together; generally of the same species for protection, feeding and other reasons
- Sepals:** petal-like leaves of flowering plants that lie under and protect the petals, often green in color or share the same coloring as the petals
- Solitary:** growing or living alone; not forming part of a group or cluster
- Spawn:** to produce or deposit eggs
- Species of concern:** a plant or animal that may become threatened
- Threatened species:** a plant or animal needing special action to protect it from becoming endangered
- Toxin:** a substance produced by a living organism that is very poisonous
- Zooplankton:** very small floating or swimming animals that drift with water currents

Alewife*

Scientific Name:
Alosa pseudoharengus

who? description

Type: fish
Length: 15 cm / 6 in
Weight: 113 g / .25 lbs
Coloring: silver with blue or blue green luster on back
❗ **Invasive Species**

where? environment

Habitat: lakes and oceans
Origin: Atlantic Ocean

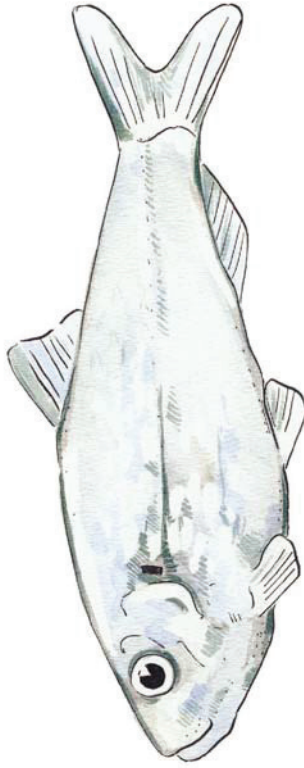
what? characteristics

Feeding:
↳ **Who eats me?** lake trout, salmon
↳ **What do I eat?** phytoplankton, zooplankton and small crustaceans

Interesting Fact *

Alewives are usually a salt-water fish, but they spawn in freshwater. After laying their eggs, many die and wash up along the lake shoreline in the spring and summer.

Size:



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American Beech

Scientific Name:
Fagus grandifolia

who? description

Type: tree
Height: 26.6 m / 80 ft maximum
Leaves: alternate, coarsely serrated, wavy edges
Flowers: separate male / female flowers, early spring
Other: deciduous, holds the dead leaves all winter

where? environment

Sunlight: partial sunlight
Habitat: forested backdune, woodlands, moist, well-drained soils

what? characteristics

Feeding:
↳ **Who eats me?** mammals and birds eat the nuts in autumn
↳ **What do I use to make food?** sunlight

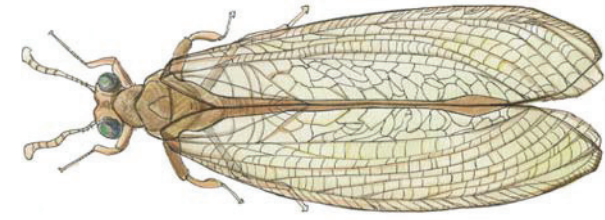
Interesting Fact *

The American beech holds onto its dead leaves all winter. Beeches keep their smooth bark as they get older.

Size:



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Antlion

Scientific Name:
Myrmeleon immaculatus

who? description

Type: insect
Length: 4 cm / 1.5 in
Coloring: brown body
Body Features: 4 clear wings with a netlike pattern

Size:



where? environment

Habitat: foredune, sandy areas with shelter, such as a wooded dune



Interesting Fact *

Antlions dig cone-shaped pits in which they trap ants to eat. When they create the pits, they make spiral shapes in the sand, which is why they are also called "doodlebugs."

what? characteristics

Feeding:
↳ **Who eats me?** birds and spiders
↳ **What do I eat?** ants and other insects
Role: consumer, carnivore
Reproduction: lays eggs
Grouping: solitary

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Bald Eagle*

Scientific Name:
Haliaeetus leucocephalus

who? description

Type: bird
Length: 76-94 cm / 30-37 in
Weight: 7 kg / 15 lbs
Coloring: dark brown body, white head and tail
Body Features: yellow eyes, beak, and feet

Size:



where? environment

Habitat: forested backdune, lakeshore and seacoast, nests in trees (especially conifers) or on cliffs near water; nests are 182 cm / 6 ft wide and 91 cm / 3 ft high



Interesting Fact *

Bald eagles can see 3 or 4 times as far as humans and eat one pound of fish in four minutes. They have a 182 cm / 6 ft wingspan!

what? characteristics

Feeding:
↳ **Who eats me?** scavengers eat dead eagles
↳ **What do I eat?** dead or wounded fish, aquatic birds, and mammals
Role: consumer, carnivore
Reproduction: 2 eggs in spring
Grouping: solitary or in pairs, live in groups in winter
Activity: diurnal

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Beach Pea

Scientific Name:
Lathyrus japonicus

who? description

Type: plant
Height: 30-60 cm / 1-2 ft
Leaves: green, in pairs
Flowers: purple or pink in clusters at the end of the stem
Other: a vine that can climb or lay on the ground, seed pods are like pea pods

Size:



where? environment

Sunlight: full sun
Habitat: beaches along lakes and oceans

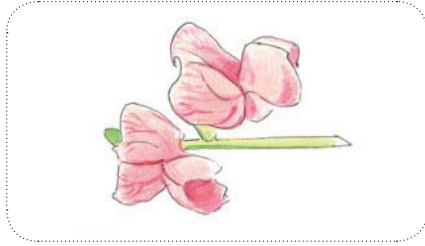
what? characteristics

Feeding:
↳ **Who eats me?** deer and mice
↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: peas are seeds



Interesting Fact *

The beach pea can be poisonous to some animals. It has tough roots and adds nitrogen to the sand.



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Beach Wormwood

Scientific Name:
Artemisia campestris

who? description

Type: shrub
Height: 1-1.5 m / 5 ft
Leaves: grayish green
Flowers: yellow

Size:



where? environment

Sunlight: full sunlight
Habitat: foredune, dry or rich soil

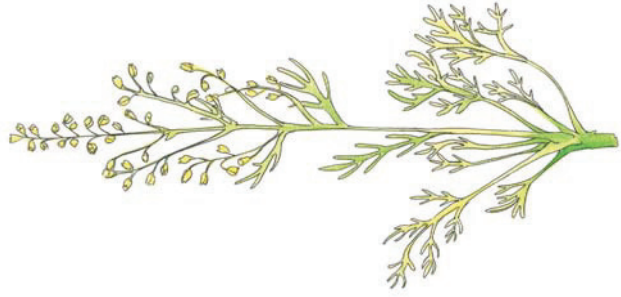
what? characteristics

Feeding:
↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: perennial



Interesting Fact *

The oil and flowers from wormwood have been used as a medicine as well as an insect repellent. When used incorrectly, it can also be a poison.



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Bighead Carp*

Scientific Name:
Hypophthalmichthys nobilis

who?
description

Type: fish
Length: 76 – 102 cm / 30-40 in (as big as 4 ft)
Weight: up to 50 kg / 110 lbs
Coloring: silvery white abdomen, black dorsal and upper lateral sections, black spots on the side of their bodies, fins are a shade of grey

⌘ **Invasive Species**



where?
environment

Habitat: lakes, rivers and reservoirs
Origin: China

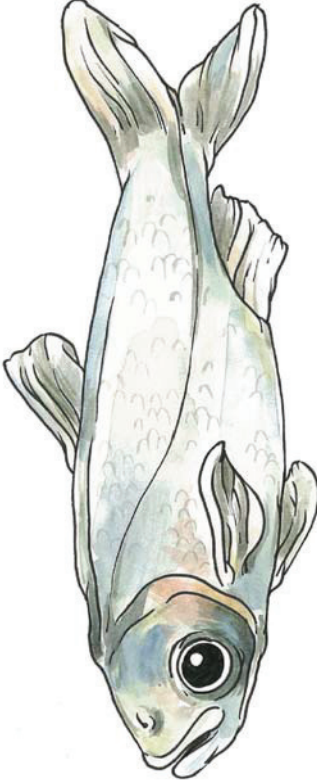
Interesting Fact ★

Bighead carp eat up to 20% of their body weight per day. Carp are currently in waterways connected to the Great Lakes and humans are trying to ensure that the fish do not establish a permanent presence in this ecosystem.

what?
characteristics

Feeding:
↳ **Who eats me?** humans
↳ **What do I eat?** zooplankton, algae
Role: consumer, omnivore
Reproduction: lay semi-buoyant eggs in warm, current-driven water during the summer
Grouping: travel alone or in small groups
Activity: more active in warmer waters

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Black Oak

Scientific Name:
Quercus velutina

who?
description

Type: tree
Height: 46 m / 150 ft
Leaves: deeply lobed
Flowers: separate male / female flowers are single or in multi-flowered spikes
Other: deciduous



where?
environment

Sunlight: bright sunlight
Habitat: forested backdune, woodlands, rich, moist, well-drained soil to poor, sandy soil

Interesting Fact ★

The underside of the leaves are covered with tiny hairs. Native Americans used parts of the black oak as medicine for many things including: fever, chills, and sore eyes.

what?
characteristics

Feeding:
↳ **Who eats me?** mammals, insects, and birds eat the nuts in autumn
↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: nuts (acorns) mature in 2-3 years after tree is 20 years old

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Bloodworm*

Scientific Name:
Family: Chromiidae

who? description

Type: insect (in larval stage)
Length: 2.5-3.8 cm / 1-1.5 in
Coloring: red
Body Features: distinct head, segmented abdomen, prolegs (leg-like projections), and gills

Size:



where? environment

Habitat: muddy, bottom areas of ponds, lakes and rivers; the worms build tubes of mud around themselves that are attached to objects in the water



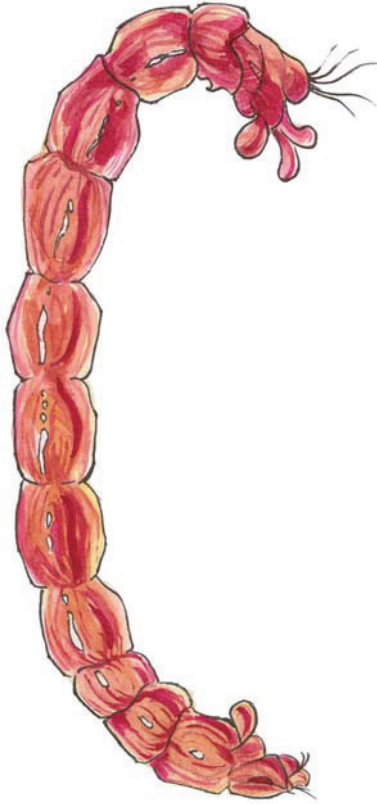
Interesting Fact *

A bloodworm is in the larval stage of its lifecycle. When it becomes an adult, it turns into a midge, an insect that looks like a mosquito. Freshwater bloodworms and humans both have hemoglobin which allows red blood cells to carry oxygen.

what? characteristics

Feeding:
↳ **Who eats me?** fish, aquatic insects
↳ **What do I eat?** phytoplankton, detritus
Role: consumer, omnivore
Reproduction: lay eggs as adults
Grouping: often found in groups
Activity: mainly nocturnal

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Blue-Green Algae (cyanobacteria)*

Scientific Name:
Anabaena, Microcystis

who? description

Type: bacteria
Size: microscopic
Color: some, but not all are blue-green; can be yellow-green, green, grey-green, grey-black, and even red
Other: microcystis colonies look like tiny grey-green clumps

ANABAENA



MICROCYSTIS

Size:



where? environment

Sunlight: varies - direct and dim sunlight
Habitat: water; attach to surface of rocks, stones and plants in water, or on the bottom sediment of lakes



Interesting Fact *

Blue-green algae movements can be seen under a microscope as they glide, rotate and jerk. Their fossils have been identified as over three billion years old!

what? characteristics

Feeding:
↳ **Who eats me?** daphnia, copepod
↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: can grow individually as single cells or in colonies; when algae reproduces quickly it is called a "bloom"

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Bronze Tiger Beetle

Scientific Name:
Cicindela repanda

who? description

Type: insect
Length: 10-13 mm / .4-.5 in
Coloring: brown with copper and red; other types can be black or green
Body Features: long legs and antennae

Size:



where? environment

Habitat: beaches, foredune, sand dunes, open woods, near water; live in burrows



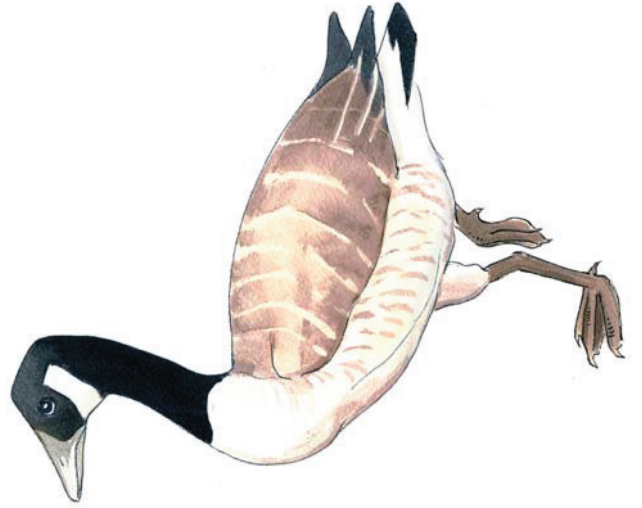
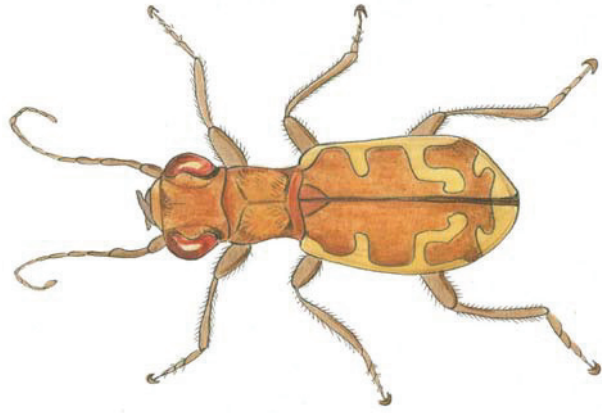
Interesting Fact *

Larvae build tunnels in the ground and wait on top for passing insects to eat. The bronze tiger beetle is frequently found on beaches.

what? characteristics

Feeding:
 ↳ **Who eats me?** birds, spiders, wasps
 ↳ **What do I eat?** insects, including ants
Role: consumer, carnivore
Reproduction: life cycle is egg, larva, pupa and adult, has 2 year life
Activity: diurnal

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Canada Goose*

Scientific Name:
Branta canadensis

who? description

Type: bird
Length: 63.5-114 cm / 25-45 in
Weight: 1-8 kg / 2-17 lbs
Coloring: black head and neck, white cheek patches, mottled grey-brown body
Body Features: brown webbed feet

Size:



where? environment

Habitat: interdunal pond, freshwater lakes, wetlands, ponds; builds a nest on the ground, near water



Interesting Fact *

Canada geese fly in a "Y" formation during migration. They use their large, strong wings as weapons when protecting their young.

what? characteristics

Feeding:
 ↳ **Who eats me?** coyotes eat geese; eggs are eaten by fox, raccoons and coyotes
 ↳ **What do I eat?** Plants and insects
Role: consumer, omnivore
Reproduction: lays 5-7 eggs
Grouping: pairs and flocks
Activity: diurnal, migrate south in the winter

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Chinook Salmon*

Scientific Name:
Oncorhynchus tshawytscha

who?
description

Type: fish
Length: 50 – 90 cm / 20-35 in
Weight: 6.8 – 13.6 kg / 15-30 lbs
Coloring: green/blue-green on back, silver sides and white/silver underneath; reddish color during spawning

♣ **Introduced Species**

MALE FEMALE

Size:

where?
environment

Habitat: lakes, rivers, oceans and estuaries
Origin: Pacific Ocean – from Asia to North America and the Arctic

! **Interesting Fact ***

Chinook Salmon were introduced into Lake Michigan on purpose, to control alewife populations and to be part of the sport fishing economy.

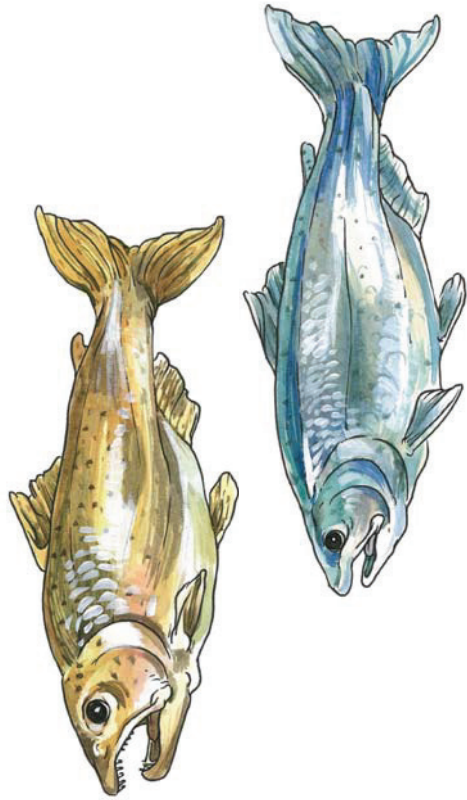
what?
characteristics

Feeding:
 ↳ **Who eats me?** humans and sea lamprey
 ↳ **What do I eat?** alewives, smelt, bloaters

Role: consumer

Reproduction: spawn eggs once in a lifetime in freshwater during summer/fall in a nest called a redd, usually located on a rocky bottom

Grouping: solitary



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Common Loon*

Scientific Name:
Gavia immer

who?
description

Type: bird
Length: 91 cm / 3 ft
Weight: 3-6 kg / 6-13 lbs
Coloring: black and white checkered body, black head, white belly and underwing, white collar

Body Features: large webbed feet

WINTER SUMMER

Size:

where?
environment

Habitat: freshwater lakes, sleep on deep water areas away from land, nest on small islands

! **Interesting Fact ***

Many bones of the loon's body are solid, rather than hollow like those of other birds. These heavy bones help loons dive for food.

what?
characteristics

Feeding:
 ↳ **Who eats me?** large fish, snapping turtles, gulls, eagles, crows
 ↳ **What do I eat?** fish, crayfish, frogs, snails, salamanders, leeches

Role: consumer, carnivore

Reproduction: 2 eggs in summer

Grouping: pairs
Activity: diurnal



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Common Milkweed

Scientific Name:
Asclepias syriaca

who? description

Type: plant
Height: 60-80 cm / 2-6 ft
Leaves: opposite, oval shaped, hairy
Flowers: pink to lavender, clusters at top of stems

Size:



where? environment

Sunlight: full sun to light shade
Habitat: foredune, grasslands and open areas in rich sandy or gravelly soil



Interesting Fact *

The milkweed has poisonous sap. When the caterpillar that becomes the monarch butterfly eats the sap, it is unharmed but becomes poisonous to other animals. It remains poisonous as a butterfly.

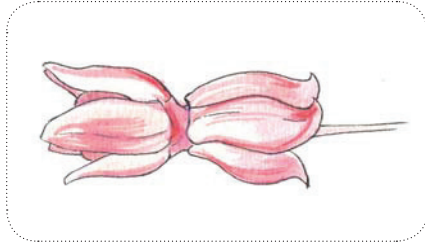
what? characteristics

Feeding:
↳ **Who eats me?** monarch butterflies and caterpillars
◁ **What do I use to make food?** sunlight

Role: producer

Reproduction: flowers in summer, seeds in fall, warty seed pods that burst in fall are filled with seeds with downy parachutes; spread by wind

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Copepod (cyclops)*

Scientific Name:
Cyclops strenuus

who? description

Type: zooplankton, crustacean
Length: 2-3 mm / .08-.1 in
Coloring: clear, tan
Body Features: single eyespot and curved body

Size:



where? environment

Habitat: quiet waters of ponds, lakes, and rivers



Interesting Fact *

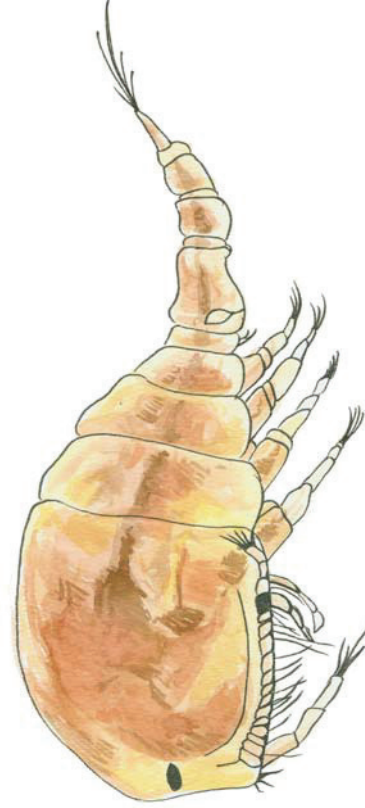
Copepods are difficult for scientists to catch to study because they dart so quickly! It is sometimes called a cyclops because the single eyespot reminds people of the one-eyed monster in Greek mythology.

what? characteristics

Feeding:
↳ **Who eats me?** insects and small fish
◁ **What do I eat?** algae, bacteria, dead plant and animal matter

Role: consumer, omnivore

Reproduction: females carry twin egg sacs



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Daphnia*

Scientific Name:
Daphnia pulex

who? description

Type: zooplankton, crustacean
Length: less than 3 mm / .1 in
Coloring: clear body tissue shows organs inside
Body Features: 5 pairs of legs used to capture food, large antennae are pushed downward for swimming

Size:



where? environment

Habitat: near the surface of lakes, ponds, and quiet streams



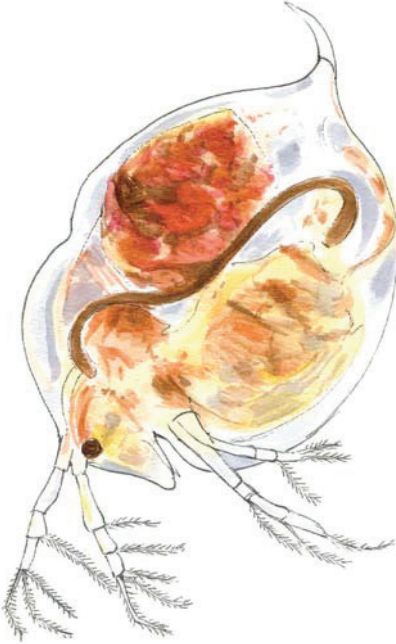
Interesting Fact *

Dozens of daphnia can fit on a single fingernail.

what? characteristics

Feeding:
 ↳ **Who eats me?** fish
 ↳ **What do I eat?** phytoplankton
Role: consumer, herbivore
Reproduction: lays eggs in lake bottom sand, young hatch in spring

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Diatoms*

Scientific Name:
Asterionella, Cyclotella, Fragilaria, Synedra

who? description

Type: phytoplankton
Height: microscopic – less than 1 mm / .04 in
Color: golden brown
Other: no leaves or flowers; single-celled organism



FRAGILARIA



CYCLOTELLA



SYNEDRA



ASTERIONELLA

Size:



where? environment

Sunlight: direct sunlight
Habitat: freshwater lakes and pond, and on the surface of oceans

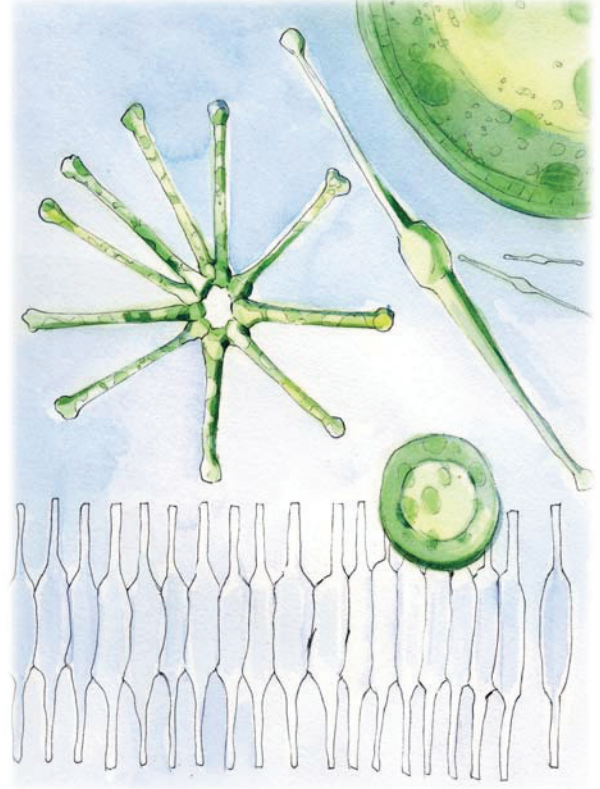


Interesting Fact *

More than 8000 kinds of diatoms exist. They are a major food source for fish. Diatoms have a shell or cell wall that has a pattern that lets scientists know what type of diatom it is.

what? characteristics

Feeding:
 ↳ **Who eats me?** zooplankton, water fleas, copepods, snails, mollusks, fish
 ↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: divide in half (cell division)



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Diporeia*

Scientific Name:
Diporeia hoyi

who? description

Type: crustacean
Length: 1.27 cm / .5 in
Weight: .1 oz / 2.8 g
Coloring: clear, yellow
Body Features: 5 pairs of legs

where? environment

Habitat: freshwater lakes, spends time in the water column, lives in mud on lake bottom

what? characteristics

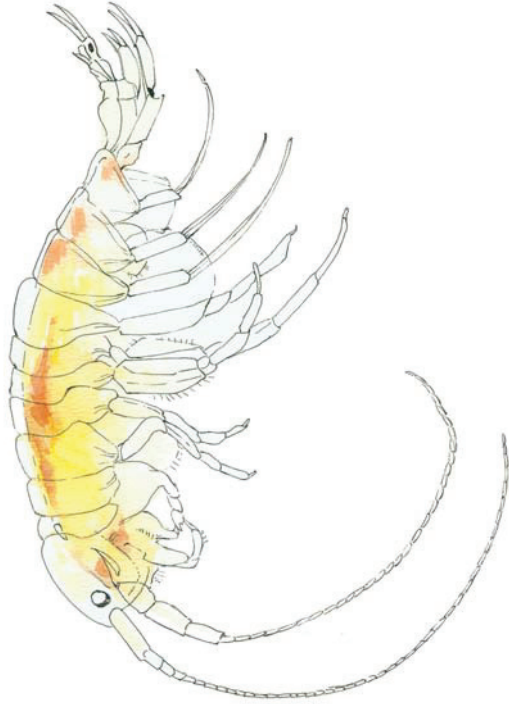
Feeding:
↳ **Who eats me?** whitefish, chub, sculpin
↳ **What do I eat?** algae and bacteria
Role: consumer, herbivore
Reproduction: lay eggs
Grouping: colonies
Activity: nocturnal



Interesting Fact *

Diporeia is a very important food source for forage fish. Even though they are small, they are high in fat and calories when eaten by fish.

Size:



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Dragonfly (blue damer)*

Scientific Name:
Aeschna constricta

who? description

Type: insect
Length: 5-8 cm / 2-3 in wing-span
Coloring: primarily blue and green
Body Features: four wings operate independently

where? environment

Habitat: interdunal pond, in and around wetlands; under water for first stage of life

what? characteristics

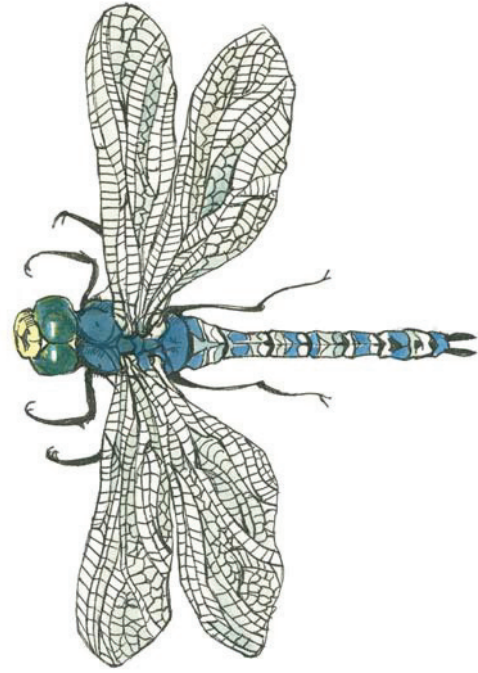
Feeding:
↳ **Who eats me?** fish
↳ **What do I eat?** mosquitoes, midges and other small, flying insects
Role: consumer, carnivore
Reproduction: lay eggs in water; first stage of life under water; adult stage on land and in flight
Grouping: solitary
Activity: diurnal



Interesting Fact *

Dragonflies are a living fossil; they have not changed for over 300 million years. They can hover, fly backwards, loop, and speed up to 56 km / 35 mi per hour.

Size:



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Eastern Box Turtle

Scientific Name:
Terrapene carolina

who? description

Type: reptile
Length: 12-15 cm / 5-6 in
Coloring: black with yellow and orange spots and stripes
Body Features: high, domed shell with hinged bottom

where? environment

Habitat: interdunal pond, wooded dunes and moist fields and forests; lives in mud and leaves

what? characteristics

Feeding:
 ↳ **Who eats me?** raccoons, foxes
 ↳ **What do I eat?** berries, mushrooms, earthworms, slugs, snails, and insects

Interesting Fact *

When box turtles are 4-5 years old, they can pull in their legs and head to completely close their shell for protection. Some box turtles grow to be over 100 years old.

Size:



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Eastern Gray Squirrel

Scientific Name:
Sciurus carolinensis

who? description

Type: mammal
Length: 38-52.5 cm / 16-20 in,
 tail length ranges from 15-25 cm / 6-10 in
Weight: 340-630 g / .75-1.5 lbs.
Coloring: dark to pale gray, may have red or brown tones, tail is light gray

where? environment

Habitat: forested backdune, areas with trees; live in trees (mainly oak), have 2 types of homes, a hole in tree trunk and a nest of leaves and twigs on a tree branch above the ground

what? characteristics

Feeding:
 ↳ **Who eats me?** mink, weasel, red fox, fisher, lynx, bobcat, and wolf;
 young eaten by raccoons, snakes, hawks, red squirrels
 ↳ **What do I eat?** nuts, seeds, fungi, plants, insects, bird eggs

Interesting Fact *

Eastern gray squirrels can swim. They bury food during the winter, and then relocate these hiding places using their sense of smell.

Size:



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Eastern Hognose Snake

Scientific Name:
Heterodon platirhinos

who? description

Type: reptile
Length: 51-84 cm / 20-33 in
Coloring: Can be tan, yellow, brown, and olive. Large dark blotches behind the head.
Body Features: uses upturned nose a shovel for burrowing and foraging for food

Size:



where? environment

Habitat: foredune, in sand dunes, lives in burrows in sandy areas

Interesting Fact *

This harmless snake defends itself by flattening its head and neck, then hissing and striking with a closed mouth. If this does not repel the threat, the snake goes into convulsions, opens its mouth, rolls over and "plays dead."

what? characteristics

Feeding:

- **Who eats me?**
raccoons, hawks
- **What do I eat?**
toads, frogs, mice, and insects

Role: consumer, carnivore

Reproduction: female lays eggs in burrow, and they hatch in August and September

Grouping: solitary

Activity: diurnal, most active in spring and summer



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Eurasian Milfoil*

Scientific Name:
Myriophyllum spicatum

who? description

Type: plant
Height: up to 91 cm / 3 ft
Leaves: 1.5-4 cm / 0.6-1.5 in long, have a feather-like outline, in groups of 4; stem is leafless towards the base, but branches out, the top often turns red
Flowers: lower ones are female, upper ones are male

⊗ Invasive Species

Size:



where? environment

Sunlight: moderate
Habitat: lives in water from 1-3 m / 3-9 ft deep

Interesting Fact *

Eurasian milfoil is an invasive species brought to North America from Europe in the 1940's. It competes with native plants and can impair water quality.

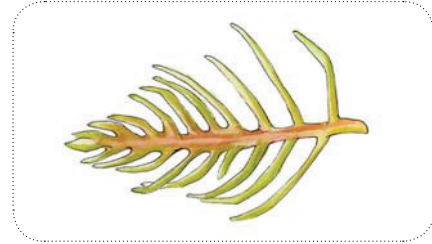
what? habits

Feeding:

- **Who eats me?**
water birds
- **What do I use to make food?**
sunlight

Role: producer

Reproduction: stems release fragments that develop roots, new stems and leaves, then sink and grow from the bottom; can also be pollinated



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Fingernail Clam*

Scientific Name:
Sphaeriidae

who? description

Type: mollusk
Length: 1.3 cm / .5 in
Coloring: cream, orange, white
Body Features: fine rows of concentric, raised lines

where? environment

Habitat: sandy bottom of freshwater lakes and streams

what? characteristics

Feeding:
↳ **Who eats me?** bottom feeding fish
↳ **What do I eat?** plankton, bacteria
Role: consumer, omnivore
Reproduction: young emerge from parents in adult form
Activity: year-round



Interesting Fact *

Fingernail clams do not have eyes, a nose, or antennae, but they do have a foot they push out of the shell to help them to move.

Size:



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Fowler's Toad

Scientific Name:
Bufo fowleri

who? description

Type: amphibian
Length: 4-7 cm / 2-3 in
Coloring: cream colored front; green-grey back with dark brown spots; males have dark vocal pouches during breeding season
Body Features: each dark spot contains 3-4 warts

where? environment

Habitat: foredune, lives in sand dunes and lakeshore; uses shallow water for breeding, burrows in sand, debris, or leaf litter

what? characteristics

Feeding:
↳ **Who eats me ?** eastern hognose snake, raccoons, skunks.
↳ **What do I eat?** insects
Role: consumer, carnivore
Reproduction: female lays 7000 eggs in shallow water; tadpole-frog life cycle takes 1-2 months
Grouping: gathers in April-June for breeding, otherwise solitary
Activity: juveniles are diurnal; adults are nocturnal



Interesting Fact *

This toad secretes a toxin from the glands on the sides of the neck to protect itself from predators.

Size:



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Great Blue Heron

Scientific Name:
Ardea herodias

who?
description

Type: bird
Length: 1.2 m / 4 ft tall, wing-span is 2.4 m / 7 ft
Coloring: head white with black stripe, back grey-blue, breast white
Body Features: long, yellow bill



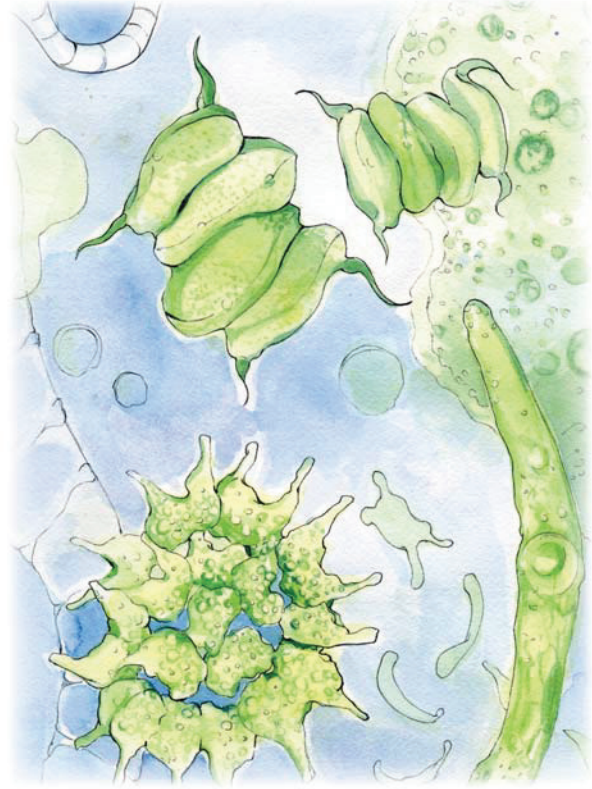
where?
environment

Habitat: interdunal pond, wetlands and lakes, nests in tree-tops made of dry branches, nests are 30 cm / 1 ft deep and 91 cm / 3 ft wide

Interesting Fact *
The great blue heron is the largest heron, and the second largest bird (by height) in the Great Lakes. The largest bird by height is the sandhill crane.

what?
characteristics

Feeding:
↳ **Who eats me?** eggs eaten by crows, ravens, gulls, raccoons
↳ **What do I eat?** small fish, shell fish, frogs, rodents, reptiles, small birds
Role: consumer, carnivore
Reproduction: 3-5 eggs; nest in woodlands in spring
Grouping: colonies
Activity: female is diurnal, male is nocturnal; migrate south for winter

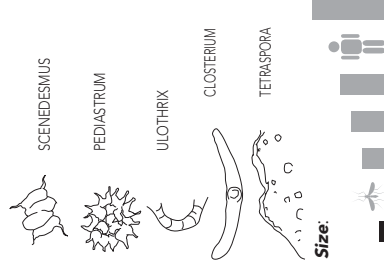


Green Algae*

Scientific Name:
Closterium, Pediastrum, Scenedesmus, Tetraspora, Ulothrix

who?
description

Type: phytoplankton
Size: microscopic - 1000 could fit on the head of a pin



where?
environment

Sunlight: direct sunlight
Habitat: mostly freshwater, found in all 5 Great Lakes

Interesting Fact *
Algae is the base of the lake food web. It produces more oxygen than all of the plants on Earth combined. Of the more than 7,000 types of green algae in the world, cladophora is one type found in clumps along Great Lakes beaches.

what?
characteristics

Feeding:
↳ **Who eats me?** water fleas, copepods, snails, mollusks, fish
↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: can grow individually as single cells or in colonies; some have spores; when algae reproduce quickly, this is called a "bloom"

Hairy Puccoon

Scientific Name:
Lithospermum carolinense

who? description

Type: plant
Height: 45 cm / 18 in
Leaves: alternate, narrow, hairy with smooth edges
Flowers: 5 parts, orange and yellow
Stem: multiple, hairy stems

Size:



where? environment

Sunlight: moderate
Habitat: foredune, dry open woods, thickets, dry grasslands, rocky soils

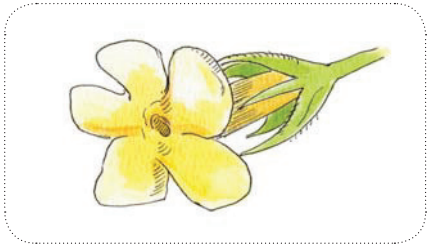
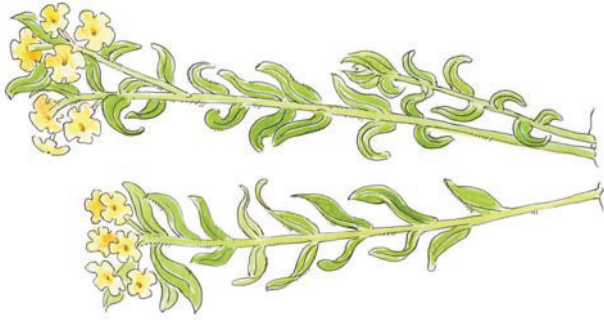


Interesting Fact *

'Puccoon' is a Native American term applied to plants used to make red pigment.

what? characteristics

Feeding:
 ↳ **Who eats me?** deer, butterflies eat nectar
 ↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: perennial, 4 nutlets from each flower



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Herring Gull*

Scientific Name:
Larus argentatus

who? description

Type: bird
Length: up to 61 cm / 24 in
Weight: 1.1 kg / 2.5 lb average
Coloring: white, grey wing backs, yellow bill with red spot
Body Features: pink legs
Note: The ring-billed gull is also commonly found in the Great Lakes region. It has a black line around its beak and has similar characteristics to the herring gull.

Size:



where? environment

Habitat: beach, lakeshore and seacoast, grass nests on flat ground



Interesting Fact *

Herring gulls will travel up to 40 miles from home for food.

what? characteristics

Feeding:
 ↳ **Who eats me?** other gulls, eagles eat young
 ↳ **What do I eat?** clams, small fish, small mammals, garbage, birds, dead animals
Role: consumer, omnivore, scavenger
Reproduction: 3 eggs in spring
Grouping: colonies
Activity: diurnal



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Human*

Scientific Name:
Homo sapien

who? description

Type: mammal
Length: adults average 152-182 cm / 5-6 ft
Weight: adults average 50-91 kg / 110-200 lbs
Coloring: skin shades range including, white, pink, beige, tan, light-dark brown
Body Features: 2 arms, 2 legs, 10 digits on hands and feet
Note: rely on sense organs (eyes, ears, mouth, nose) and opposable thumb
Size:



where? environment

Habitat: homes in a variety of ecosystems, rural-urban; homes vary in shape, size, and material depending on culture and location



Interesting Fact *

Humans do not have natural predators and are able to live in many different types of environments.

what? characteristics

Feeding:
 ↳ **Who eats me?** not a primary food source for animals, but may be eaten by large carnivores
 ↳ **What do I eat?** depends on culture - various vegetables, fruits, nuts, fish (including lake trout and yellow perch), cows, pigs, chickens
Role: consumer, omnivore
Reproduction: live young which is generally raised by both parents

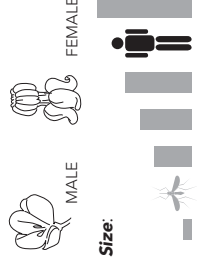


Hydrilla*

Scientific Name:
Hydrilla verticillata

who? description

Type: plant
Height: up to 8 m / 25 ft
Leaves: green with red ribbing, saw-toothed, four to eight around the stem
Flowers: transparent or white (female) or green (male), with three petals and three sepals
 ✘ **Invasive Species**



where? environment

Sunlight: require less than 1% of full sunlight or less
Habitat: any partially submerged body of water with a salinity level of less than 7%
Origin: Africa

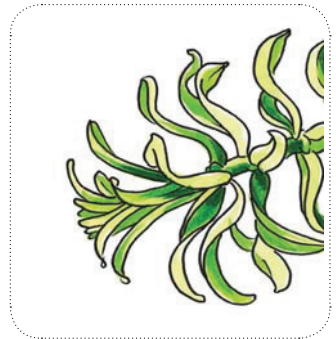
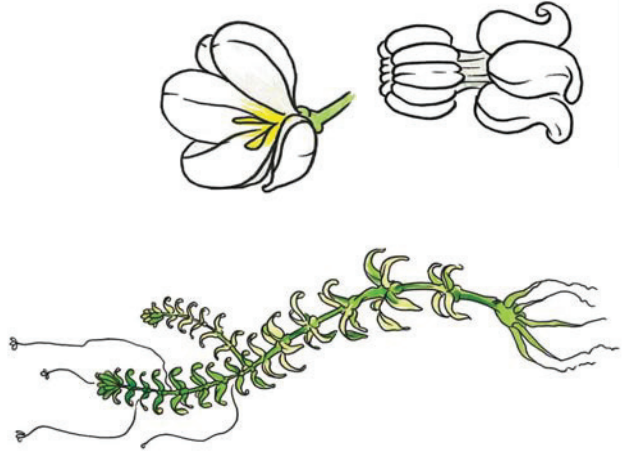


Interesting Fact *

Hydrilla, not yet in the Great Lakes, is anticipated to "invade" the system due to its presence in nearby aquatic ecosystems. It is made up of nearly 95% water, which allows for rapid growth.

what? characteristics

Feeding:
 ↳ **Who eats me?** coots and other bird species
 ↳ **What do I use to make food?** oxygen and sunlight
Role: producer
Reproduction: re-growth of stem fragments and by auxiliary buds (tubers) that can each produce up to 6,000 new plants in 4 years
Other: male and female flowers produced separately on a single plant





Ladybug (convergent ladybird beetle)

Scientific Name:
Hippodamia convergens

who? description

Type: insect
Length: 4-8 mm / .15-.30 in
Weight: 68 g / .15 lbs
Coloring: bright red with black spots
Body Features: round body shaped like a half pea, 6 pairs of jointed legs
Note: Asian lady beetles are an invasive species that look just like ladybugs, but are more orange in color. They are often found along shorelines.

Size:



where? environment

Habitat: beach, fields, sand dunes, forests, grasslands, and gardens



Interesting Fact *

A ladybug beats its wings 85 times per second when flying. There are nearly 5,000 kinds of ladybugs in the world.

what? characteristics

Feeding:
 ↳ **Who eats me?** birds
 ↳ **What do I eat?** small insects, including aphids
Role: consumer, carnivore
Reproduction: lays a group of small yellow eggs
Grouping: alone or in a group

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Lake Huron Locust

Scientific Name:
Trimerotropis huroniana

who? description

Type: insect
Length: 2-4 cm / 1-1.6 in
Coloring: silver to ash gray with darker brown and white markings
Body Features: males have noisier flight and smaller body size than females

⚠ **Endangered species in Wisconsin**

Size:



where? environment

Habitat: foredune, Great Lakes sand dunes, will not live near human developed areas



Interesting Fact *

Lake Huron locust is a member of the grasshopper family. During courtship dances, males try to get the female's attention with the cracking noise made when they snap their wings together.

what? characteristics

Feeding:
 ↳ **Who eats me?** birds
 ↳ **What do I eat?** marram grass, Pitcher's thistle, wormwood, dead insects
Role: consumer, herbivore
Reproduction: mid-summer females lay their eggs in sand, where they remain over winter; nymphs hatch in late spring.
Activity: diurnal

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Lake Sturgeon*

Scientific Name:
Acipenser fulvescens

who? description

Type: fish
Length: 91-183 cm / 3-6 ft
Weight: 4-91 kg / 10-200 lbs
Coloring: olive brown to grey, white belly
Body Features: long, pointed snout with four barbels, or feelers, under the front of the snout

⚠ **Endangered in Illinois, Indiana, and Michigan**

Size:



where? environment

Habitat: freshwater lakes, lives on lake bottom



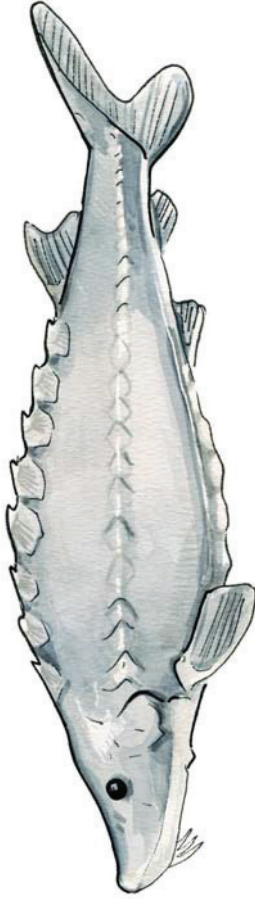
Interesting Fact *

The female sturgeon takes 20 years to mature and can live for 100 years. The sturgeon uses its barbels to find food on the lake bottom.

what? characteristics

Feeding:
 ↳ **Who eats me?** humans and other fish eat eggs
 ↳ **What do I eat?** crustaceans, mollusks, insects
Role: consumer, omnivore
Reproduction: eggs; spawns every 4-6 years in swift water
Grouping: solitary
Activity: diurnal

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Lake Trout*

Scientific Name:
Salvelinus namaycush

who? description

Type: fish
Length: 43-69 cm / 17-27 in
Weight: 1344-4032 g / 3-9 lbs
Coloring: light spots on dark background, color can vary greatly from fish to fish

Size:



where? environment

Habitat: freshwater lakes, in cold, clear, deep water



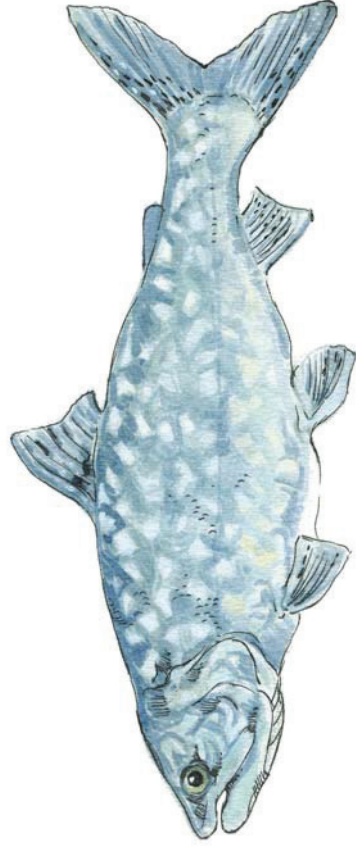
Interesting Fact *

Lake trout are a popular food for humans and the invasive sea lamprey. This has caused overfishing and reduced fish population. The United States and Canada worked together to reduce lamprey numbers. Namaycush is a Native American word that means "dweller of the deep."

what? characteristics

Feeding:
 ↳ **Who eats me?** sea lamprey, humans
 ↳ **What do I eat?** chub, sculpin, smelt, alewives
Role: consumer, carnivore
Reproduction: female lays up to 15,000 eggs; spawns in shallow areas
Activity: year-round

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Lake Whitefish*

Scientific Name:
Coregonus clupeaformis

who? description

Type: fish
Length: 43-56 cm / 17-22 in
Coloring: silver sides, greenish brown back
Body Features: two clear fins on the back and a blunt nose

Size:



where? environment

Habitat: found in all five Great Lakes; prefer deep waters of up to 61 m / 200 ft, deeper in hot weather



Interesting Fact *

The whitefish population seems to be making a comeback after years of over-fishing and bad environmental conditions had reduced their population.

what? characteristics

Feeding:

↳ **Who eats me?** lake trout, walleye, pike, humans; eggs eaten by other fish

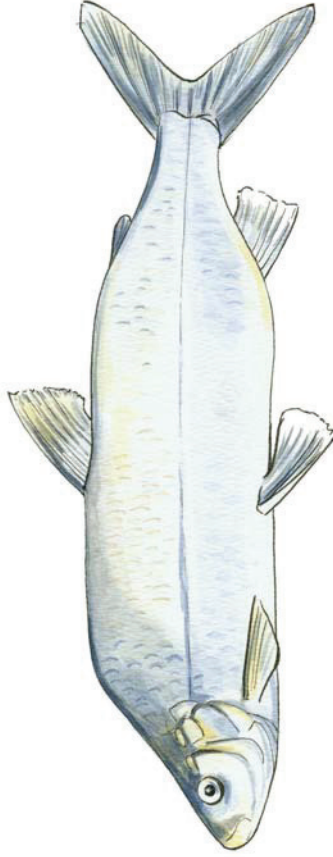
↳ What do I eat?

diporeia, insects, freshwater shrimp, small fish, fish eggs

Role: consumer, carnivore

Reproduction: eggs laid in early winter in shallow sandy or rocky water 7 m / 25 ft deep; young hatch in spring

Grouping: swims in schools



Little Black Ant

Scientific Name:
Monomorium minimum

who? description

Type: insect
Length: 2 mm / .25 in; the queen is twice as long
Coloring: black, queen is dark brown or black
Body Features: large jaw, bent antennae, queen and fertile ants have 4 wings

Size:



where? environment

Habitat: foredune, underground in most North American terrestrial habitats



Interesting Fact *

The little black ant is the most abundant life form in the ecosystems surrounding the Great Lakes

what? characteristics

Feeding:

↳ **Who eats me?** birds, spiders, raccoons, woodchucks

↳ What do I eat?

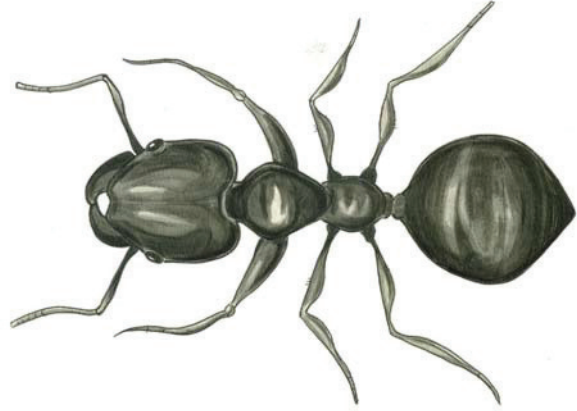
flower nectar, sap, small insects

Role: consumer, omnivore

Reproduction: queen ants mate once, then produce eggs for the rest of their life

Grouping: colonies

Activity: diurnal, spring and summer



Mallard Duck*

Scientific Name:
Anas platyrhynchos

who? description

Type: bird
Length: 50-60 cm / 19-23 in
Weight: 1.24 kg / 3 lbs
Coloring: male-green head, white neck ring, brown breast, yellow bill; female-all brown/white mottled, greenish bill, white patch around wing
Body Features: orange webbed feet



where? environment

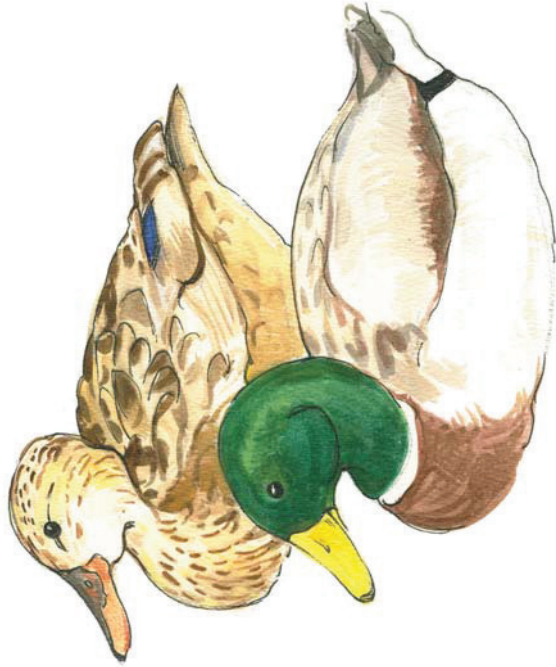
Habitat: interlunal pond, freshwater lakes, ponds, swamps, grass nest on the ground

Interesting Fact *

The mallard is the most commonly recognized wild duck in the world.

what? characteristics

Feeding:
 ↳ **Who eats me?** muskellunge, humans, coyotes, snapping turtle
 ↳ **What do I eat?** emergent weeds, small invertebrates, larval insects, grains
Role: consumer, omnivore
Reproduction: 8-12 eggs in spring
Grouping: pairs or flocks
Activity: diurnal



Marram Grass

Scientific Name:
Ammophila breviligulata

who? description

Type: plant
Height: up to 1 m / 3 ft
Leaves: narrow, spike-like
Other: scaly underground stems extend 10-12 m / 30-45 ft, forms an underground web with its roots



where? environment

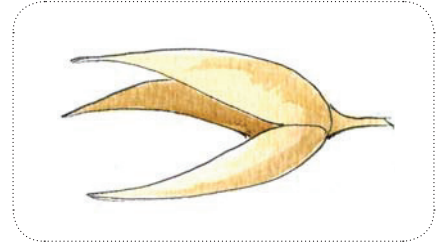
Sunlight: full sun
Habitat: foredune, in sand dunes

Interesting Fact *

Marram grass uses its roots to stabilize the soil for its own survival. This also enables other vegetation to take hold in the dunes.

what? characteristics

Feeding:
 ↳ **Who eats me?** fungi and nematodes
 ↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: perennial, new shoots grow from spreading roots



Monarch Butterfly

Scientific Name:
Danaus plexippus

who? description

Type: insect
Length: wingspan is 8.6 - 12.4 cm / 3.5- 4.9 in; caterpillars are 5 cm / 2 in long

Coloring: orange wings with black veins and black margin with small white spots on each wing

Body Features: 6 legs and 4 wings

Note: Females have larger veins and males have a dark spot on the hindwing.

Size:



where? environment

Habitat: foredune, fields where common milkweed grows



Interesting Fact *

A monarch butterfly is a poisonous snack. The toxins from the monarch's milkweed diet make the caterpillar and butterfly stages poisonous to predators.

what? characteristics

Feeding:

↳ **Who eats me?**
eggs eaten by insects, spiders, birds, mice; some insects eat adults

↳ What do I eat?

caterpillars eat common milkweed, adults eat nectar of milkweed and other plants

Role: consumer, herbivore

Reproduction: life cycle is: caterpillar, cocoon, butterfly; lay eggs on the bottom of milkweed leaves.

Grouping: migrate in groups

Activity: migrate to Mexico each year

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Mosquito

Scientific Name:
Aedes stimulans

who? description

Type: insect
Length: 6.4-12.7 mm / .125-.5 in

Coloring: brown

Body Features: 6 long legs

Size:



where? environment

Habitat: interdunal pond, lake or pond, anywhere with standing water



Interesting Fact *

Mosquitoes can travel up to one mile from their breeding spot to find a meal. The adult female (only!) seeks a blood meal so she can produce a new patch of eggs.

what? characteristics

Feeding:

↳ **Who eats me?**
fish, birds, frogs, other insects

↳ What do I eat?

organic matter in water, human and animal blood

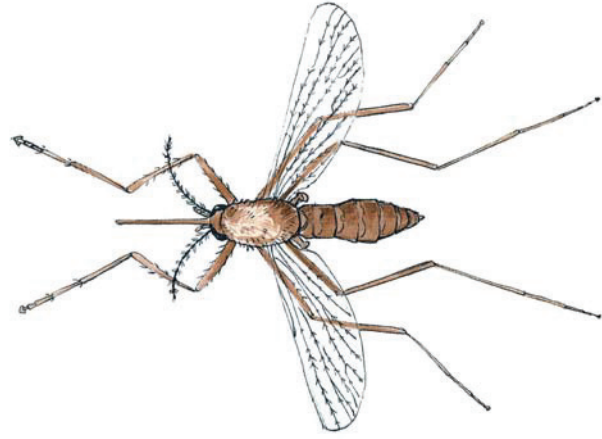
Role: consumer, omnivore, parasite

Reproduction: females lay 50-500 eggs

Grouping: singly or in swarms

Activity: most active at dawn and dusk

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Muskellunge*

Scientific Name:
Esox masquinongy

who? description

Type: fish
Length: up to 152 cm / 5 ft
Weight: 18-31 kg / 40-70 lbs
Coloring: silver green to light brown with dark bars, cream belly with small brown spots
Body Features: long head and snout, and a large mouth

Size:



where? environment

Habitat: freshwater lakes, near weed beds and shore



Interesting Fact *

Muskies were often caught by fishermen as prize fish, but now fishing of muskies is regulated to protect the population.

what? characteristics

Feeding:
↳ **Who eats me?** humans
↳ **What do I eat?** other fish, ducklings, frogs, rodents
Role: consumer, carnivore
Reproduction: lay eggs in shallow water
Grouping: solitary
Activity: most active in warm weather

Opossum Shrimp*

Scientific Name:
Mysis relicta

who? description

Type: crustacean
Length: 2-3 cm / .8-1 in
Coloring: clear, beige
Body Features: 10 pairs of jointed legs

Size:



where? environment

Habitat: freshwater lakes, deep cold water

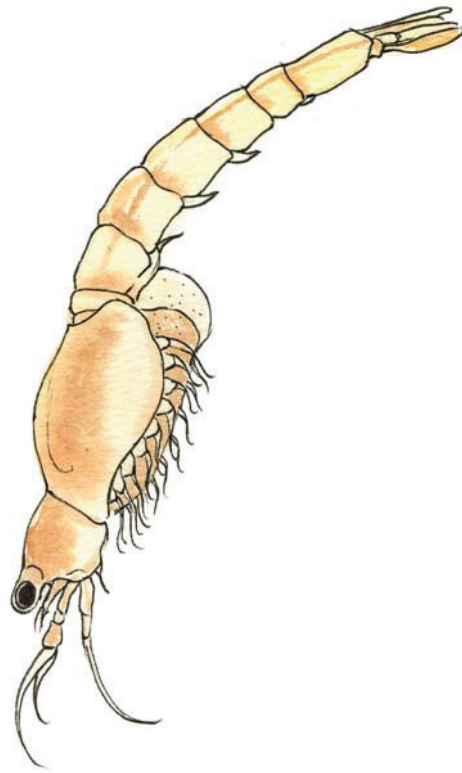


Interesting Fact *

Opossum shrimp look like a miniature crayfish. They are not actually shrimp.

what? characteristics

Feeding:
↳ **Who eats me?** lake trout, alewife
↳ **What do I eat?** Phytoplankton, zooplankton, copepods, detritus
Role: consumer, omnivore
Reproduction: female carries eggs in a pouch
Activity: diurnal movement and nocturnal feeding



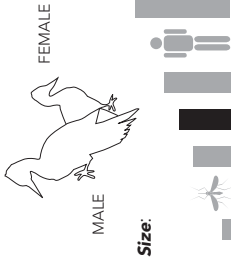
Pileated Woodpecker

Scientific Name:
Dryocopus pileatus

who? description

Type: bird
Length: 40-48 cm / 16-19 in
Coloring: black body with white neck stripes, white wing lining

Body Features: red crest on top of the head, chisel-shaped bill, male has red mustache



Size:

where? environment

Habitat: forested backdune, mature forests; create holes in already hollow trees

Interesting Fact *

The pileated woodpecker uses its long, pointed, sticky tongue to eat ants from their tunnels. This woodpecker has a loud, ringing call. They will make up to 16 holes in a tree which allow them to escape from predators.

what? characteristics

Feeding:
↳ **Who eats me?** snakes eat eggs, hawks
↳ **What do I eat?** ants and other insects living in wood, berries, and nuts

Role: consumer, omnivore
Reproduction: 3-8 white eggs in a tree cavity. Both parents incubate eggs

Grouping: can live in groups
Activity: diurnal, strong flyer, climbs on trees; hops on the ground, sleeps in tree at night

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Piping Plover

Scientific Name:
Charadrius melodus

who? description

Type: bird
Height: 14 cm / 5.5 in
Coloring: sandy grey with dark bands across head and breast, orange legs
Body Features: short bill

⚠ **Endangered species in the Great Lakes**



Size:

where? environment

Habitat: beach, sand and gravel shores of rivers and lakes, sand bars

Interesting Fact *

The piping plover is a threatened species in the United States and an endangered species in Canada, which means it is protected because there are not many left.

what? characteristics

Feeding:
↳ **Who eats me?** coyotes and crows
↳ **What do I eat?** insects, crustaceans, mollusks
Role: carnivore

Reproduction: 2-4 eggs laid in sand in May, both parents care for young

Grouping: pairs and groups
Activity: migrate yearly to Gulf of Mexico and Caribbean

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Pitcher's Thistle

Scientific Name:
Cirsium pitcheri

who? description

Type: plant
Height: up to 91 cm / 3 ft
Leaves: finely and deeply lobed and can be up to 30 cm / 1 ft long
Flowers: cream or pink flowers - when not in flower, it is a cluster of silvery leaves
Other: stem and leaves covered with fine white hairs

⊗ **Threatened species in the Great Lakes**

Size:



where? environment

Sunlight: full sunlight
Habitat: foredune, open sand dunes and low beach ridges and often found near shore



Interesting Fact *

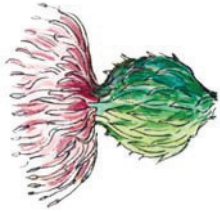
The fine white hairs on the thistle help the plant retain water and reflect the sun's strong rays. The taproot can be 6 feet long. Shoreline development destroys this plant and its habitat.

what? characteristics

Feeding:
 ↳ **Who eats me?** butterflies and bees eat nectar
 ◁ **What do I use to make food?** sunlight

Role: producer

Reproduction: grows 5-8 years before flowering; pollinated by insects, mainly bees, seeds are spread by wind



Poison Ivy

Scientific Name:
Toxicodendron radicans

who? description

Type: plant
Height: can grow to 3 m / 10 ft or more
Leaves: clusters of 3 asymmetrical leaves
Flowers: greenish-white
Other: yellowish-white berries; plant can be a small shrub or a vine

Size:



where? environment

Sunlight: partial sun
Habitat: forested backdune, forest floor, climbing on trees



Interesting Fact *

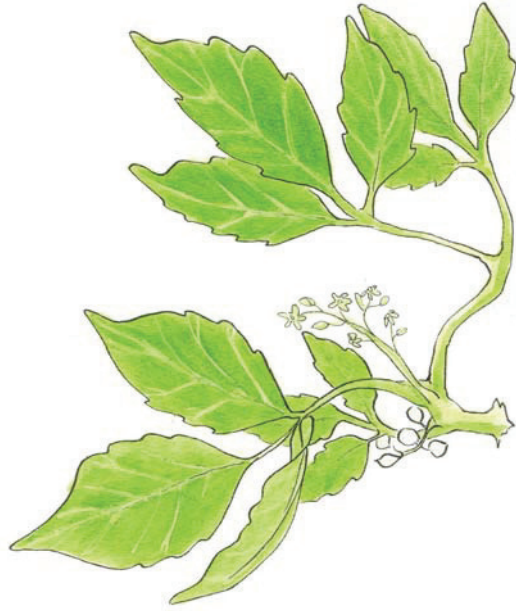
Poison ivy can cause an itchy allergic reaction on the skin if it comes in contact with the plant. If there is contact, as quickly as possible, wash with cold water and soap.

what? characteristics

Feeding:
 ↳ **Who eats me?** birds eat the berries
 ◁ **What do I use to make food?** sunlight

Role: producer

Reproduction: seeds in berries



Quagga Mussel*

Scientific Name:
Dreissena rostriformis bugensis

who?
description

Type: mollusk
Length: 28 mm / 1+ in
Coloring: tan and blackish pattern to all black depending on location

Body Features: a connecting tissue holds the two shell halves together, often with the animal in between, this tissue helps connect to hard surfaces and other mussels

☞ **Invasive Species**



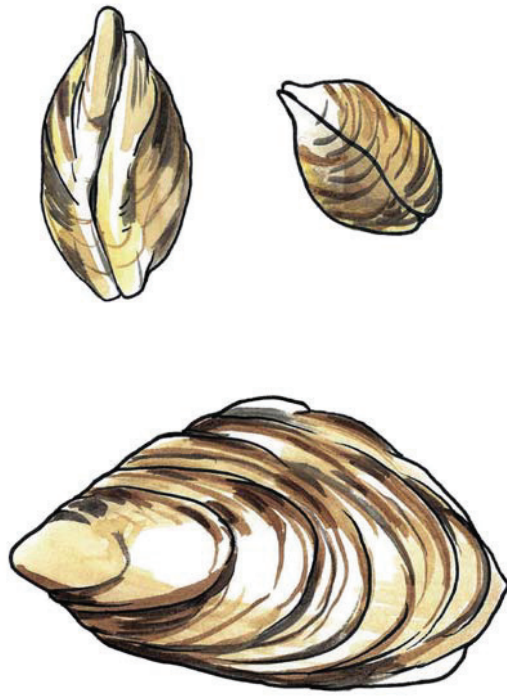
where?
environment

Habitat: freshwater
Origin: Eastern Europe

Interesting Fact *
The quagga mussel can live at any depth as long as oxygen is present, while the zebra mussel, a relative, can only survive at depths less than 12 meters.

what?
characteristics

Feeding:
↳ **Who eats me?** ducks, crayfish and lake whitefish, gobies, sculpins
↳ **What do I eat?** phytoplankton, diatoms
Role: consumer, omnivore
Reproduction: up to one million eggs per year expelled by females and fertilized outside of the body by males in spring / summer
Grouping: singly or in colonies



Red Fox

Scientific Name:
Vulpes vulpes

who?
description

Type: mammal
Length: 94-97 cm / 37-38 in
Weight: 4-5 kg / 10-15 lbs
Coloring: usually red / yellow or red / brown yellow, white underside, tail has white or black tip

Body Features: feet and legs are black



where?
environment

Habitat: forested backdune, forest, prairie, farmland, and sometimes in suburbs, live in dens in the ground

Interesting Fact *
The red fox usually has two entrances to a den and other dens nearby. This allows them to move to safety when needed. A red fox can jump as high as 2 meters / 6.5 feet.

what?
characteristics

Feeding:
↳ **Who eats me?** bobcats, eagles eat pups
↳ **What do I eat?** rodents, rabbits, insects, birds, turtles, berries, fruit, and dead animals
Role: consumer, omnivore
Reproduction: one litter per year, 4-9 young born in a den, usually in the ground
Grouping: solitary, except when raising a litter and mating
Activity: nocturnal, active at dusk



Riverbank Grape

Scientific Name:
Vitis riparia

who? description

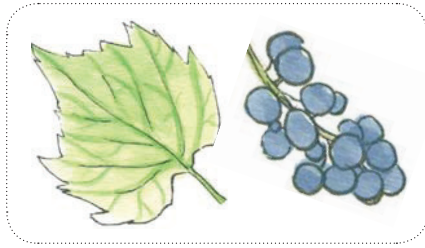
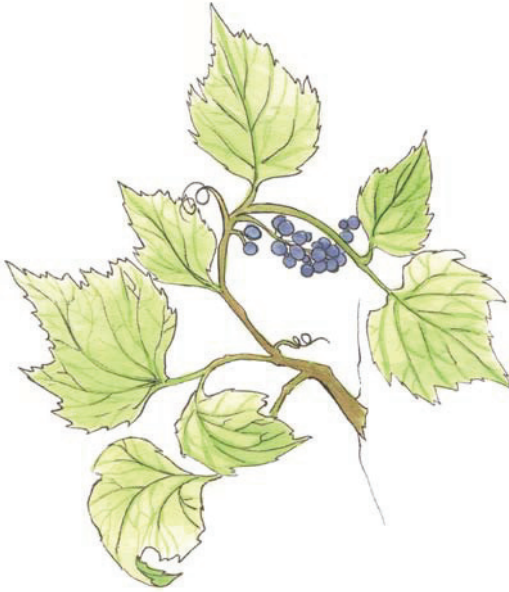
Type: plant

Height: rises up to 61 cm / 2 ft off the ground, but can have vines up to 15 m / 50 ft long

Leaves: green

Flowers: green

Other: produces grapes



where? environment

Sunlight: full sun

Habitat: foredune, along lakeshores, in sand forests, sand dunes



Interesting Fact *

Birds use the bark of the riverbank grape to make nests.

what? characteristics

Feeding:

↳ **Who eats me?**
pileated woodpecker and other birds, deer, fox, squirrel eat fruit, insects seek pollen

↳ **What do I use to make food?**
sunlight

Role: producer

Reproduction: seeds in grapes

Size:



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Round Goby*

Scientific Name:
Neogobius melanostomus

who? description

Type: fish

Length: under 18 cm / 7 in

Coloring: slate gray or black body with black or brown spots

Body Features: raised, frog-like eyes; have thick lips, front fin has a black spot, body is covered with fine scales

⚡ Invasive Species



MALE

FEMALE

Size:



where? environment

Habitat: lake bottom, found in all the Great Lakes and some nearby lakes

Origin: Black and Caspian Sea regions of Eurasia



Interesting Fact *

The round goby has a very active sensory system which allows it to find prey and also avoid becoming prey. They have become too numerous to bring under control.

what? characteristics

Feeding:

↳ **Who eats me?**
bass, pike, walleye

↳ **What do I eat?**
small fish, zebra mussels, and fish eggs

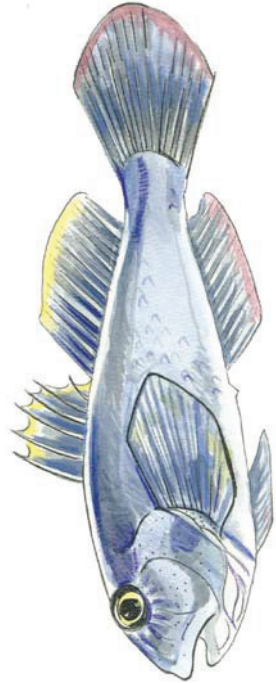
Role: consumer, carnivore

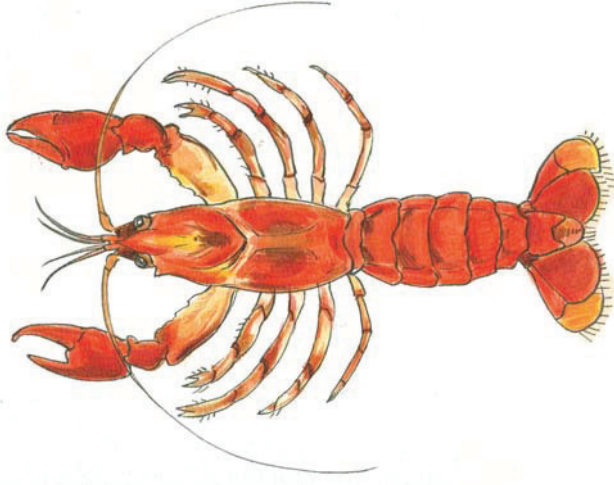
Reproduction: spawns up to five times per mating season; builds nests in rocky areas for eggs

Grouping: found in dense populations

Activity: diurnal

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Rusty Crayfish*

Scientific Name:
Orconectes rusticus

who? description

Type: crustacean
Height: 8-10 cm / 3-4 in
Coloring: red / brown color
Body Features: large claws and rusty colored spots on each side of the main body section

⚠ Invasive Species

Size:



where? environment

Habitat: lakes, ponds, and streams in areas where there is debris on the bottom
Origin: Ohio River basin

! Interesting Fact *

Rusty crayfish are an invasive species that have been spread when used for bait by fishermen. They have also been spread by science classes who have released them after being classroom pets.

what? characteristics

Feeding:
↳ **Who eats me?** predator fish, birds, raccoons
↳ **What do I eat?** aquatic plants and insects, fish eggs and small fish

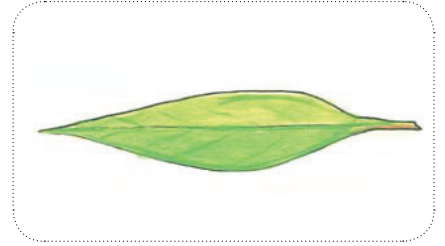
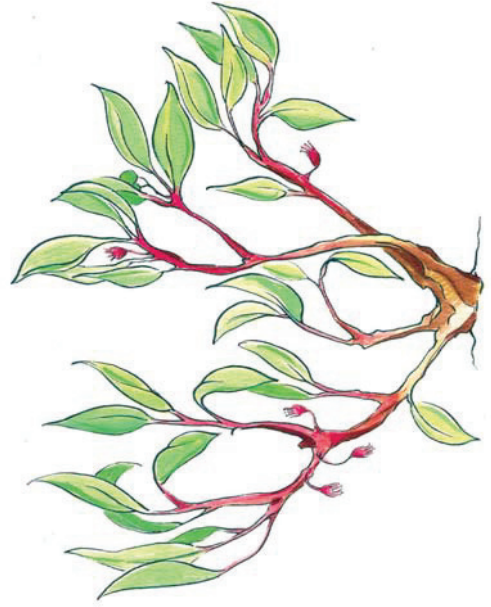
Role: consumer, omnivore and scavenger

Reproduction: eggs are usually laid in the spring by the female

Grouping: young crayfish stay with their mother for several weeks. After they tend to live independently

Activity: nocturnal

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Sand Cherry

Scientific Name:
Prunus pumila

who? description

Type: shrub
Height: 1.8 m / 6 ft
Leaves: silvery green
Flowers: white flowers and purple – black fruits

Size:



where? environment

Sunlight: full sun
Habitat: beach, coastal dunes, typically in the foredune

! Interesting Fact *

The sand cherry helps to stabilize sand dunes with its root system.

what? characteristics

Feeding:
↳ **Who eats me?** birds
↳ **What do I use to make food?** sunlight

Role: producer

Reproduction: seeds in cherries

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Scud*

Scientific Name:
Gammarus

who? description

Type: crustacean
Length: 2.54 cm / 1 in
Coloring: most are gray and tan; some are shades of green, blue, orange, and purple
Body Features: shrimp-like with an arched, flat body; two pair of antennae and nineteen paired legs

Size:



where? environment

Habitat: shallow water in lakes, ponds, and slow moving rivers with abundant vegetation and debris on the bottom



Interesting Fact *

Scud populations may be declining because of competition with the zebra mussel for phytoplankton.

what? characteristics

Feeding:

↳ Who eats me?

insects, amphibians, shore birds and fish like sculpin, smelt and chub

◁ What do I eat?

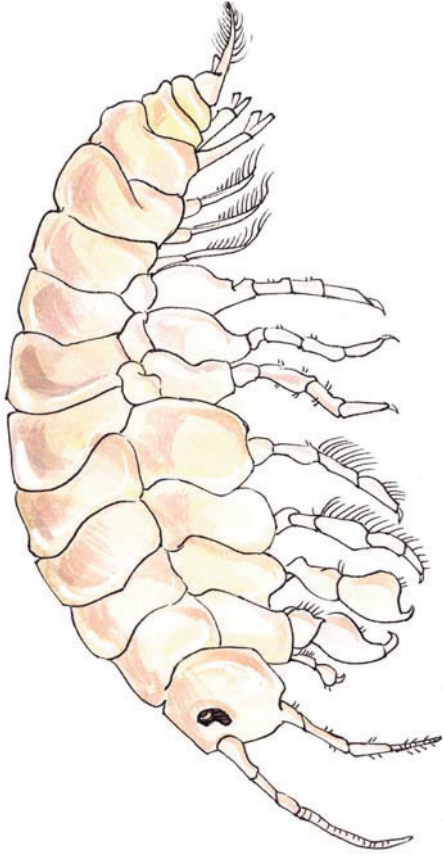
algae, dead plants and animals

Role: consumer, omnivore

Reproduction: reproduces after 5-8 years

Grouping: colonies

Activity: mainly nocturnal



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Sea Lamprey*

Scientific Name:
Petromyzon marinus

who? description

Type: fish
Length: 30-50 cm / 12-20 in
Weight: 226-363 g / .5-.8 lbs
Coloring: grey-blue, metallic purple, and silver
Body Features: long, slender body, mouth with sharp teeth enables it to suck out the fluid and tissue of fish, especially the lake trout

✘ **Invasive Species**

Size:



where? environment

Habitat: freshwater lakes and oceans
Origin: Atlantic Ocean - Europe and North America



Interesting Fact *

Sea lampreys naturally live in saltwater, but came into the Great Lakes through canals. There are efforts to control the lamprey population because they do not have natural predators in the Great Lakes.

what? characteristics

Feeding:

↳ Who eats me?

none in Great Lakes

◁ What do I eat?

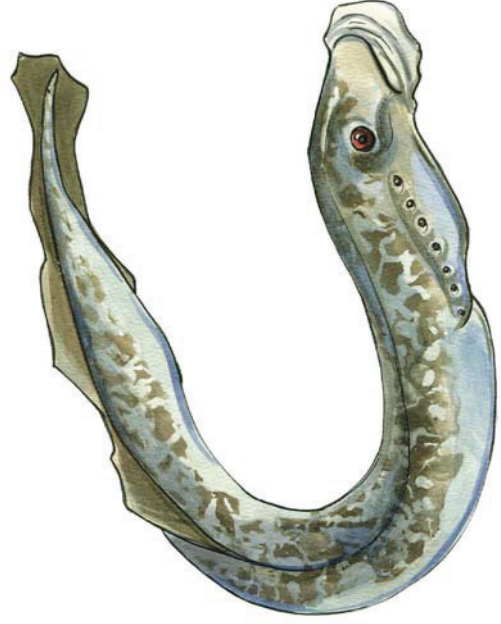
fish, including lake trout

Role: consumer, carnivore

Reproduction: lay eggs

Grouping: solitary

Activity: year-round



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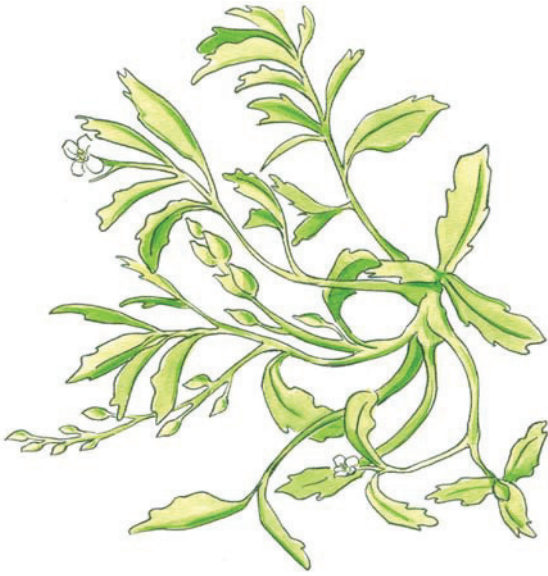
Sea Rocket

Scientific Name:
Cakile edentula

who? description

Type: plant
Height: 15-50 cm / 6-20 in
Leaves: thick and fleshy
Flowers: white - lavender

Size:



where? environment

Sunlight: full sun
Habitat: foredune, sandy beaches, above the water line

what? characteristics

Feeding:
↳ **Who eats me?** deer and mice
↳ **What do I use to make food?** sunlight
Role: producer
Reproduction: flowers are pollinated



Interesting Fact *

Sea rocket lives in areas of bare sand where other plants cannot survive. It has a long taproot to hold it in place and fleshy leaves which help it hold in moisture.

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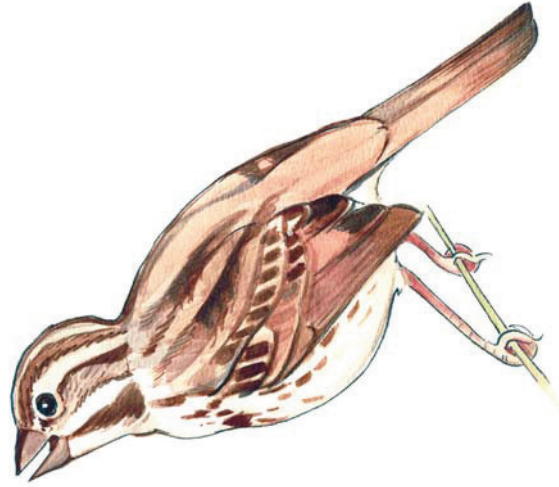
Song Sparrow

Scientific Name:
Melospiza melodia

who? description

Type: bird
Length: 12-18 cm / 5-7 in
Coloring: brown streaked, under parts are whitish with dark streaks, spot in the center of the breast
Body Features: long tail that is pumped up and down to help with flying

Size:



where? environment

Habitat: forested backdune, thickets, pastures, undergrowth in gardens, city parks, make nests on the ground, a later nest is made in a tree or shrub, nests are used more than once

what? characteristics

Feeding:
↳ **Who eats me?** hawks, owls, snakes, cats, some turtles
↳ **What do I eat?** beetles, flies, caterpillars, seeds, grains, berries
Role: consumer, omnivore
Reproduction: Nests in a cup of grass, 3 broods per season
Grouping: pairs remain mates through years, both parents feed young
Activity: most migrate in winter



Interesting Fact *

Song sparrows sing throughout the year, although much less in winter. Each male sings between 6 and 24 different songs. Some song sparrows do not migrate during the winter.

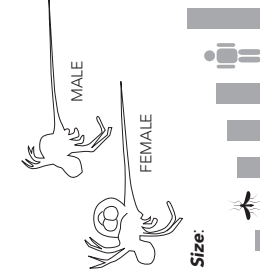
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Spiny Water Flea*

Scientific Name:
Bythotrephes cederstroemi

who? description

Type: zooplankton, crustacean
Length: less than 1.3 cm / .5 in
Coloring: clear
Body Features: crustacean with long, sharp, barbed tail spine
 ✂ **Invasive Species**



where? environment

Habitat: throughout the Great Lakes and some inland lakes
Origin: Eurasia

Interesting Fact *

This creature is not a flea, but a crustacean. Only some larger fish can eat it because the sharp tail spine is hard for smaller fish to swallow. It competes with fish for plankton.

what? characteristics

Feeding:
 ↳ **Who eats me?** some large fish
 ↳ **What do I eat?** plankton
Role: consumer, omnivore
Reproduction: reproduce rapidly; during warm summer temperatures each female produces 10 offspring every 2 wks
Grouping: form clusters with each other

Spotted Sandpiper

Scientific Name:
Actitis macularia

who? description

Type: bird
Length: 15 cm / 6 in
Coloring: brown-olive on top, white belly (sometimes with black spots), yellow or pink legs



where? environment

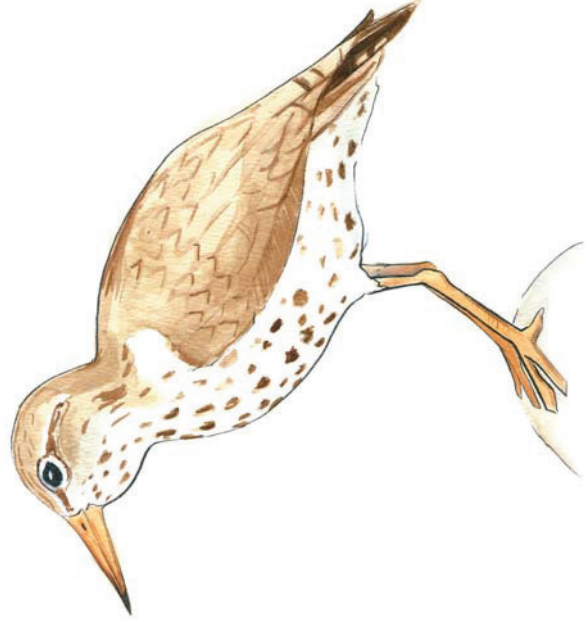
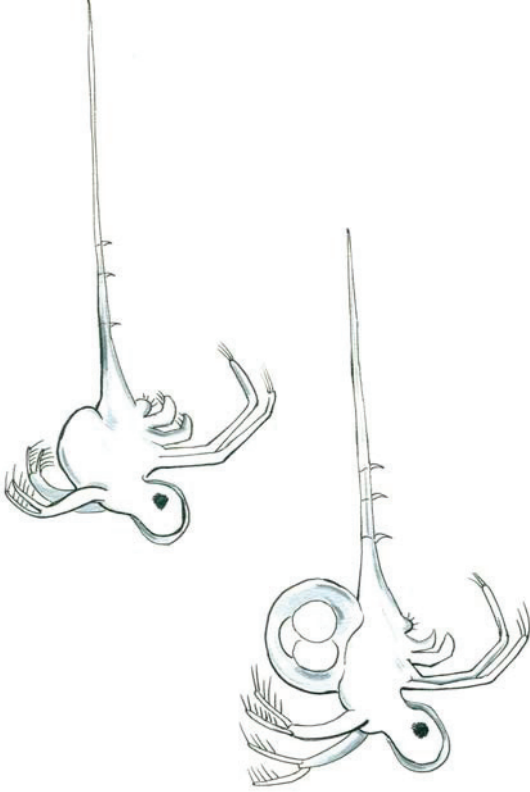
Habitat: beach, shorelines, grasslands, forests, near water

Interesting Fact *

The spotted sandpiper is aggressive about protecting their young and their territory. Males do most of the egg incubation.

what? characteristics

Feeding:
 ↳ **Who eats me?** mice, blackbirds, otters, minks
 ↳ **What do I eat?** insects, worms, small fish, mollusks, crustaceans, spiders
Role: consumer, carnivore
Reproduction: 4 eggs in grass or moss nest, male cares for eggs and young, females mate with multiple males and defend territory
Grouping: family groups
Activity: migrates to Pacific coast in winter



Walleye*

Scientific Name:
Stizostedion vitreum

who? description

Type: fish
Length: 33-63 cm / 13-25 in
Weight: 4-2 kg / 1-5 lbs
Coloring: brown to yellow
Body Features: The young usually have dark blotches across their backs and down their sides

Size:



where? environment

Habitat: freshwater lakes, lives in deep water, near the bottom of the lake in weeds or rocks



Interesting Fact *

Walleyes have large, marble-like eyes that help them see well in dim light.

what? characteristics

Feeding:

↳ **Who eats me?**
humans, muskellunge, largemouth bass

↳ What do I eat?

yellow perch, aquatic insects, crayfish

Role: consumer, carnivore

Reproduction: occurs in spring/early summer, females release up to 612,000 eggs

Grouping: loose but distinct schools

Activity: feeds at dusk



Water Strider*

Scientific Name:
Gerris remigis

who? description

Type: insect
Length: 1.2 cm / .5 in
Coloring: dark brown to black
Body Features: long legs, two legs can fold under front of body

Size:



where? environment

Habitat: interdunal pond, freshwater lakes and wetlands, live under leaves, spend time on surface of water



Interesting Fact *

Water striders communicate with each other through ripples on the surface of the water.

what? characteristics

Feeding:

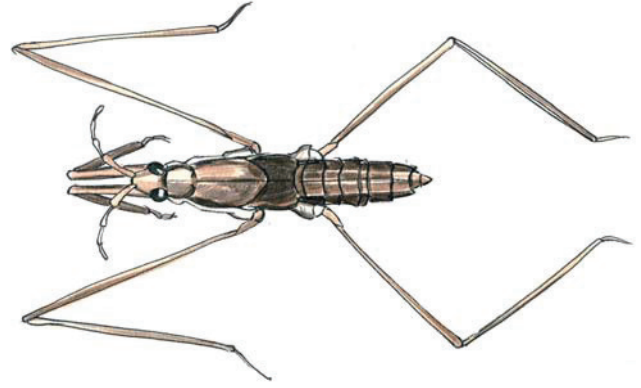
↳ **Who eats me?**
birds, fish, dragonflies

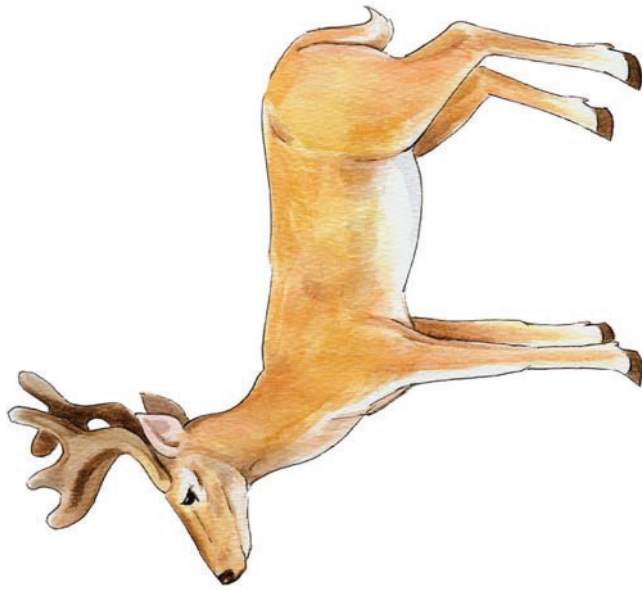
↳ What do I eat?

Insects from water and land, plants

Role: consumer, omnivore

Reproduction: lay eggs at water's edge





White-Tailed Deer

Scientific Name:
Odocoileus virginianus

who? description

Type: mammal
Height: 1 m / 3-3.5 ft tall at shoulder
Coloring: red-brown in summer, gray-brown in winter
Body Features: "white-tailed deer" refers to the white underside of the tail, which is held up like a flag when deer is alarmed or running, male (buck) has antlers

Size:



where? environment

Habitat: forested backdune, open woodland, edges of a forest



Interesting Fact ★

Deer are able to run up to 64 km / 40 mi per hour, jump 3 m / 9 ft fences, and can swim well. Their fur has air spaces in the core which insulates them against the cold. Males lose their antlers and re-grow them each year.

what? characteristics

Feeding:
↳ **Who eats me?** coyotes, humans
↳ **What do I eat?** grass, herbs, leaves, bark, trees, shrubs, fungi and acorns
Role: consumer, herbivore
Reproduction: in May or June, 1-2 fawns born
Grouping: may travel in small herds
Activity: feed in early morning and again in early evening

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Wolf Spider

Scientific Name:
Pisaura mirabilis

who? description

Type: arachnid
Length: 1-8 cm / .4-3 in
Coloring: brown, grey, white, black
Body Features: eight eyes

Size:



where? environment

Habitat: foredune, wooded sand dunes and woodlands; lives in tunnels, under rocks, or in leaf litter



Interesting Fact ★

Wolf spiders can float on water. They often hunt their prey rather than spin webs to catch food.

what? characteristics

Feeding:
↳ **Who eats me?** birds, small reptiles, toads
↳ **What do I eat?** flies, crickets, beetles, ants
Role: consumer, carnivore
Reproduction: 50-200 eggs; female carries egg sac on her back in summer; 40 offspring carried on back; 2-4 egg sacs in lifetime
Grouping: solitary hunters
Activity: diurnal

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Yellow Perch*

Scientific Name:
Perca flavescens

who? description

Type: fish
Length: 15-25 cm / 6-10 in
Weight: 168-448 g / 6-16 oz
Coloring: back is bright to olive green or golden brown, sides are yellow-green; grey to milk-white belly

Size:



where? environment

Habitat: lake bottom, less than 30 feet depth, feeds near the shore and rests on the bottom



Interesting Fact *

Yellow perch are a popular food for humans, but have been overfished and the population has decreased. They lay their eggs in long, jelly-like ribbons.

what? characteristics

Feeding:

- ↳ **Who eats me?** alewife (feed on larva), humans
- ↳ **What do I eat?** minnows, insect larvae, plankton, worms

Role:

consumer, carnivore

Reproduction:

lay eggs April-May

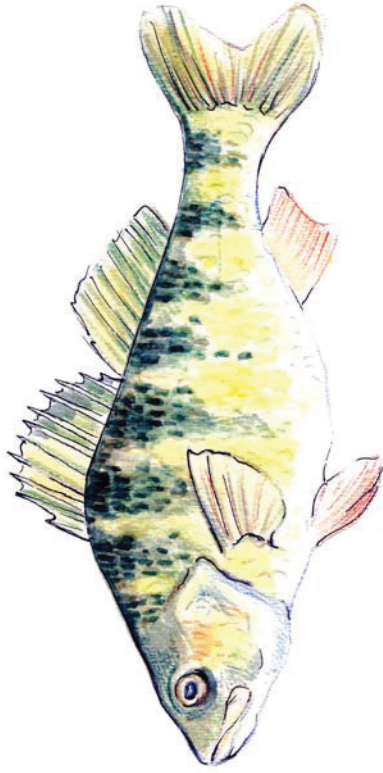
Grouping:

swims in schools

Activity:

diurnal, year-round

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Zebra Mussel*

Scientific Name:
Dreissena polymorpha

who? description

Type: mollusk
Length: up to 5 cm / .75 in
Coloring: tan and blackish stripes (like a zebra)
Body Features: two connected shells hold a small mussel between them, they attach to hard surfaces with byssal threads

☼ Invasive Species

Size:



where? environment

Habitat: freshwater; depths of 2-7 m / 6-23 ft
Origin: Eastern Europe and Western Russia; Caspian and Black Sea



Interesting Fact *

Zebra mussels in some parts of the Great Lake region have been outnumbered by the quagga mussel, a close relative of theirs. Zebra mussels are in all Great Lakes and some inland lakes.

what? characteristics

Feeding:

- ↳ **Who eats me?** round goby
- ↳ **What do I eat?** algae

Role:

consumer, omnivore

Reproduction:

eggs expelled by females and fertilized outside of the body by males in spring / summer

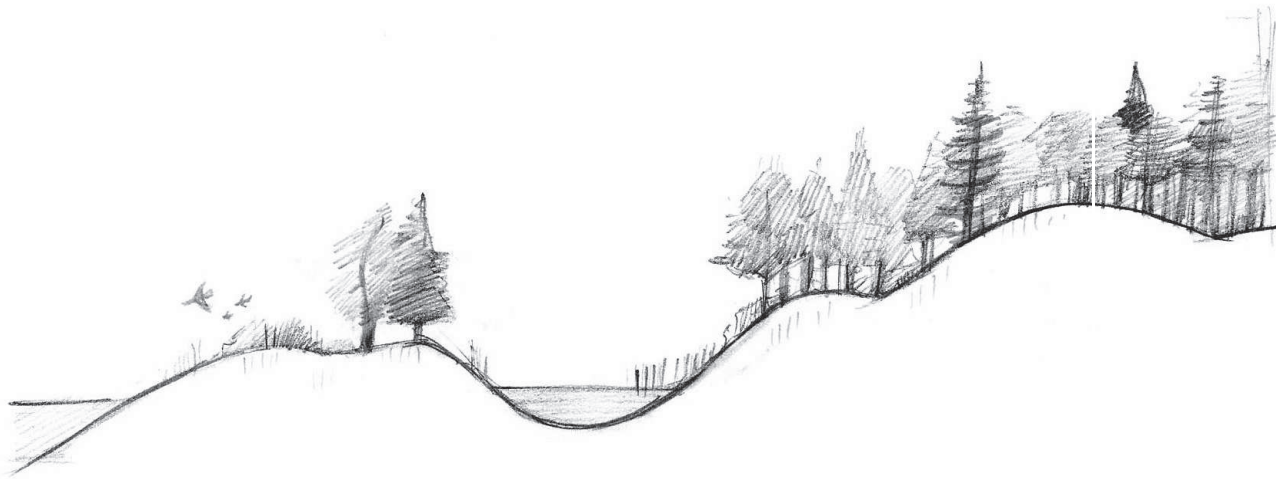
Grouping:

singly or in colonies



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COASTAL HABITATS DIAGRAM



beach



bronze tiger beetle
herring gull
ladybug
piping plover
sea rocket
spotted sandpiper

foredune



antlion
beach pea
beach wormwood
common milkweed
eastern hognose
Fowler's toad
hairy puccoon
Lake Huron locust
little black ant
marram grass
monarch
Pitcher's thistle
riverbank grape
sand cherry
snake
wolf spider

swale



Canada goose
dragonfly
eastern box turtle
great blue heron
mallard duck
mosquito
water strider

forested backdune



American beech
bald eagle
black oak
gray squirrel
pileated woodpecker
poison ivy
red fox
song sparrow
white tailed deer

Card	Category	Invasive?	Habitat				
			Lake	Beach	Dune	Forested Backdune	Wetland
Alewife	Fish	I	X				
American Beech	Tree					X	
Antlion	Insect				X		
Bald Eagle	Bird					X	
Beach Pea	Plant			X			
Beach Wormwood	Shrub				X		
Bighead Carp	Fish	I	X				
Black Oak	Tree					X	
Bloodworm	Insect		X				X
Blue-Green Algae	Bacteria		X				
Bronze Tiger Beetle	Insect			X	X		
Canada Goose	Bird						X
Chinook Salmon	Fish		X				
Common Loon	Bird		X				
Common Milkweed	Plant				X		
Copepod	Crustacean, Zooplankton		X				X
Daphnia	Crustacean, Zooplankton		X				X
Diatoms	Phytoplankton		X				X
Diporeia	Crustacean		X				
Dragonfly	Insect						X
Eastern Box Turtle	Reptile					X	X
Eastern Gray Squirrel	Mammal					X	
Eastern Hognose Snake	Reptile				X		
Eurasian Milfoil	Plant		X				
Fingernail Clam	Mollusk		X				
Fowler's Toad	Amphibian				X		
Great Blue Heron	Bird		X				X
Green Algae	Phytoplankton		X				
Hairy Puccoon	Plant				X		
Herring Gull	Bird			X			
Human	Mammal						
Hydrilla	Plant	I					X
Ladybug	Insect			X	X		
Lake Huron Locust	Insect				X		
Lake Sturgeon	Fish		X				
Lake Trout	Fish		X				
Lake Whitefish	Fish		X				
Little Black Ant	Insect				X		
Mallard Duck	Bird		X				X
Marram Grass	Plant				X		
Monarch Butterfly	Insect				X		
Mosquito	Insect						X
Muskellunge	Fish		X				
Opossum Shrimp	Crustacean		X				
Pileated Woodpecker	Bird					X	
Piping Plover	Bird			X			
Pitcher's Thistle	Plant				X		
Poison Ivy	Plant					X	
Quagga Mussel	Mollusk	I	X				
Red Fox	Mammal					X	
Riverbank Grape	Plant				X		
Round Goby	Fish	I	X				
Rusty Crayfish	Crustacean	I	X				
Sand Cherry	Shrub			X	X		
Scud	Crustacean		X				X
Sea Lamprey	Fish	I	X				
Sea Rocket	Plant			X	X		
Song Sparrow	Bird					X	
Spiny Water Flea	Crustacean, Zooplankton	I	X				
Spotted Sandpiper	Bird			X		X	
Walleye	Fish		X				
Water Strider	Insect		X				X
White Tailed Deer	Mammal					X	
Wolf Spider	Arachnid				X	X	
Yellow Perch	Fish		X				
Zebra Mussel	Mollusk	I	X				

GREAT LAKES FOOD CHAIN



sun



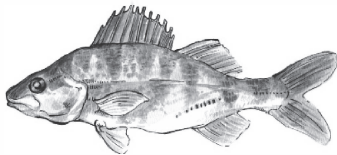
green algae



humans



water strider

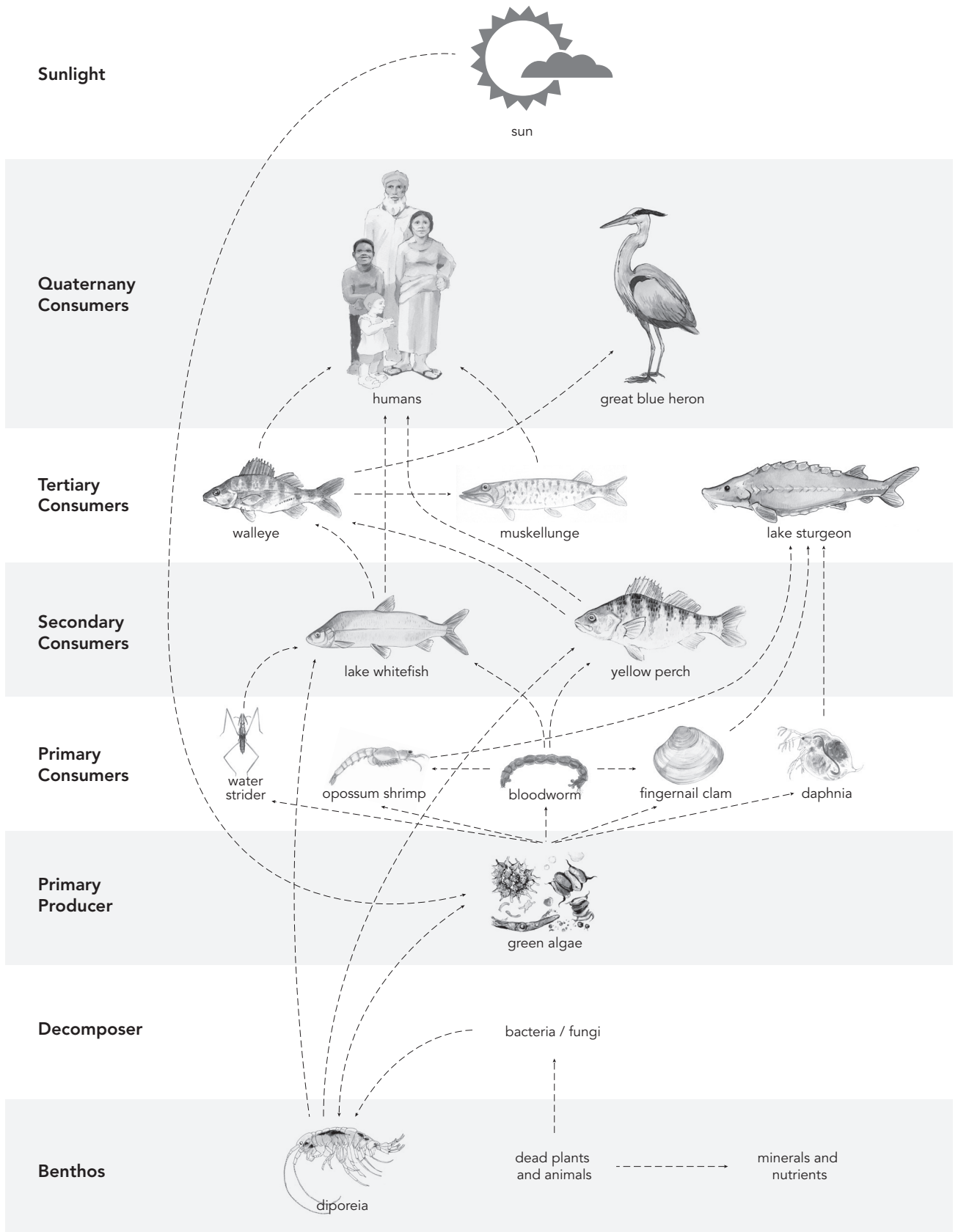


walleye



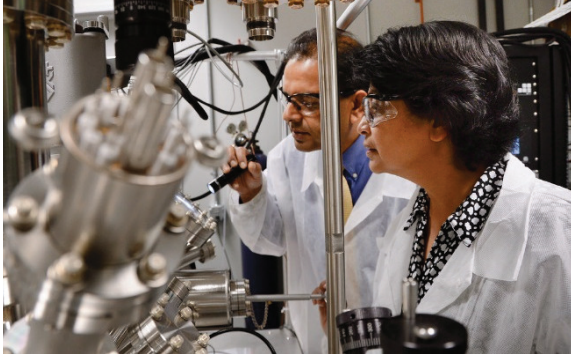
lake whitefish

GREAT LAKES FOOD WEB



Possible source: accidental release by scientists.

1



Possible source: Ballast water from foreign ports

2



Possible source: improper disposal by teachers.
Where to dispose of classroom organisms?

3



Possible source: Inadequately cleaned boats & trailers

4



Possible source: Exotic species bought in pet store.

5



Possible source: Recreational fishing enthusiasts or chefs wanting access to them in the USA

6



Possible source: Escape from aquaculture ponds

7



Possible source: improper disposal of pet fish

8

