

Habitats and Adaptations

3-2 The student will demonstrate an understanding of the structures, characteristics, and adaptations of organisms that allow them to function and survive within their habitats. (Life Science)

3.2.1 Illustrate the life cycles of seed plants and various animals and summarize how they grow and are adapted to conditions within their habitats.

Taxonomy level: 2.2 and 2.4-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have been introduced to major structures and basic life cycle stages of plants in 1st grade (1-2.2, 1-2.4) and to how these structures help plants survive in their habitats (1-2.6). Students have also been introduced to the various stages in the life cycle of animals in 2nd grade (2-2.5). In 6th grade (6-2), students will develop a more in-depth understanding of the structures, processes, and responses of plants that allow them to survive and reproduce.

It is essential for students to know that every plant and animal has a pattern of growth and development called a *life cycle*. As seed plants and animals go through their life cycles, they grow within a *habitat* for which their needs can be met. Plants and animals have *adaptations* that allow them to survive the conditions within habitats in which they live.

- An *adaptation* is a characteristic that improves the organism's ability to survive.
- A *habitat* is a place where an organism or groups of organisms live and obtain the air, food, water, shelter or space, or light needed to survive.

Life Cycle of Seed Plants

It is essential for students to know the stages of growth in seed plants that are part of their life cycle.

Seed

- After *pollination* (the spreading of pollen from flower to flower) occurs, seeds are produced and may be stored in fruits.
- Seeds contain tiny undeveloped plants and enough food for growth to start.
- Seeds need water and warmth to *germinate* (begin to grow).

Seedling

- Seedlings produce the parts of the plant that will be needed for the adult plant to survive in its habitat.
- Roots begin to grow and take in nutrients and water from the habitat.
- The stem starts to grow towards light and the first leaves form on the stem.
- Later, more leaves will form that help the plant make its food.

Mature Plant

- Mature plants have the same structures (for example roots, stems, and leaves) as seedlings, but in addition they develop flowers or cones, which produce seeds.

Life Cycles of Various Animals

It is essential for students to know the stages of growth that are part of the life cycles in a variety of animal types. These stages are not the same for all animals.

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- Some animals give birth to baby animals that look like small adults. As the babies grow, they change in size. Other changes might be color, shape, or type of covering.
- For example, horses give birth to babies that look like small horses. Chickens lay eggs that hatch babies that look like small chickens.
- Some animals begin as an egg and then undergo changes in their life cycle. These changes may be in appearance, color, shape, or growth of new structures. These changes in form are called *metamorphosis*.
- For example, in a beetle the stages of metamorphosis are called egg, larva, pupa, and adult. In a grasshopper, the stages of metamorphosis are egg, young (nymph), and adult.

Chart for teacher information only

Animal Family	Stages of Development	Examples
Mammal	Young—Adult	Dog, squirrel, human, whale
Reptile	Egg – Young – Adult	Snake, turtle, lizard, alligator
	Young – Adult	Rattlesnake (live birth)
Amphibian	Egg – Young – Adult	Frog, toad, salamander
Insect	Egg—Larva—Pupa—Adult	Butterfly, beetle, housefly, mosquito
	Egg—Young—Adult	Grasshopper, cockroach, praying mantis
Bird	Egg—Young—Adult	Chicken, robin, hawk, duck
Fish	Young—Adult	Guppies (live birth), goldfish (live birth), minnows (egg), catfish (egg),
	Egg – Young— Adult	

It is essential for students to know how plants and animals are adapted to their habitats so that their needs can be met.

Adaptations of Seed Plants

Some plants have special structural *adaptations* for meeting their needs in their particular habitat. Some examples of plant adaptations to conditions in their habitat may be:

Roots

- Roots take in water and nutrients from the habitat.
- They may also hold the plant in place and store food and water.
- Each variety of plant will survive where its roots size, length, and spread are adapted to the habitat.
- Some examples of root adaptations may be:
 - Water lilies have long roots that can take in nutrients from the muddy bottoms of ponds or lakes.
 - Cacti have roots that spread out close to the surface for living in dry habitats.
 - Carrots and dandelions have a large, thick root that is longer than its other roots. This long root helps the plant survive by reaching far underground to find water and to firmly anchor the plant.

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Stems

- Stems move and store water and nutrients in the plant. Stems also provide support and protection for the plant. Some examples of stem adaptations may be:
 - Vines have stems that can climb and stick to various surfaces to ensure that the leaves are exposed to light.
 - Corn and sunflowers have stems that grow thick and strong but remain green and flexible so that they can grow toward the sun.
 - Trees develop woody stems to support their size and provide protection during their long life cycles.
 - Cacti have thick stems that store water when the habitat does not provide it.
 - Some stems have thorns that provide protection.

Leaves

- Leaves produce food for plants in the presence of light.
- Each variety of plant will survive where its leaf size, texture, thickness, and shape are adapted to the habitat.
- Some examples of leaf adaptations may be:
 - Water lilies develop wide leaves that allow them to float on the water to capture sunlight to make food.
 - Evergreen trees have leaves that are thin, waxy needles to protect them from freezing and from losing water.

Flowers

- Flowers often have special sizes, smells, shapes, or colors that attract organisms for pollination.

Fruit

- Fruits are formed around the seed to protect it. Some examples of fruit adaptations may be:
 - Some fruits are moist and fleshy (tomatoes, grapes, or peaches). Fleshy fruits attract animals that eat them helping to disperse the seeds.
 - Others fruits are dry and/or hard (coconuts, walnuts or pea pods).

Seeds

- Some seeds begin to grow as soon as conditions allow for germination.
- Seeds have adaptations that allow them to be dispersed and also to have enough food for the plant until it begins making its own food.

Adaptations of Animals

Some animals have special adaptations for living in their particular habitat. Some examples of animal adaptations to conditions in their habitat may be:

- In habitats where the temperature is cold, animals may have blubber or thick fur for warmth.

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- In a water habitat, some animals have special structures that allow them to live as air-breathing animals in the water.
- In habitats where food is scarce, some animals may have long necks to obtain food (giraffe) or special storage structures for food and water (camel).
- In habitats where the temperature is very hot, animals may seek food at night (nocturnal) or seek shelter in the shade during the day.

It is not essential for students to know the parts or types of leaves, the specific structures of flowers, or how seeds are produced, as this will be further developed in 6th grade (6-2). Students do not need to know the term incomplete metamorphosis.

Assessment guidelines:

One objective of this indicator is to *illustrate* the life cycles of seed plants and a variety of animals; therefore, the primary focus of assessment should be to give or use illustrations to show the stages in the life cycles of seed plants and a variety of animals. However, appropriate assessments should also require students to *summarize* the steps of a seed plant life cycle; or *compare* life cycles of a variety of animals.

Another objective of this indicator is to *summarize* how seed plants and animals are adapted to their particular habitats; therefore, the primary focus of assessment should be to generalize the major points about how the structures of plants and animals assist those organisms in meeting their needs for survival within their habitats. However, appropriate assessments should also require students to *match* a plant or animal with its habitat based on its structural adaptations; or *identify* structures of plants and animals that allow them to survive in a habitat.

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3-2 The student will demonstrate an understanding of the structures, characteristics, and adaptations of organisms that allow them to function and survive within their habitats. (Life Science)

3.2.2 Explain how physical and behavioral adaptations allow organisms to survive (including hibernation, defense, locomotion, movement, food obtainment, and camouflage for animals and seed dispersal, color, and response to light for plants).

Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have been introduced to how environments throughout the world support different plants (1-2.5) and animals (2-2.4). In 6th grade (6-2), students will develop a more in-depth understanding of the structures, processes, and responses of plants that allow them to survive and reproduce.

It is essential for students to know that plants and animals have special traits or characteristics that allow them to survive in their particular habitats. These special traits or characteristics, called *adaptations*, are necessary for a plant or animal to survive if its surroundings change.

- *Physical adaptations* can be a body structure that an organism has that allows it to meet its needs in its habitat.
- *Behavioral adaptations* can be an activity or action that helps an organism survive in its habitat.

Physical and Behavioral Adaptations of Animals

Some adaptations of animals can help them find food or water, protect them from danger, or help them survive when conditions in the environment change. These adaptations include:

Hibernation

- A resting state that helps animals survive in winter.
- During hibernation, the animal's body processes, like breathing, slow down, and they survive on stored food or fat.
- Many animals, for example insects, birds, reptiles and some mammals, eat a lot of food in the autumn months to store up fat.
- Then they burrow into the ground or curl up under leaves, or hide themselves in dens, safe from the winter cold and enemies.
- When the temperature rises in the spring, the animal wakes up and leaves its hiding place.

Defense

- Some animals have special adaptations to protect themselves from being hurt, killed, or eaten.
- These special defense mechanisms include physical adaptations such as quills and claws, and behavioral adaptations such as taking flight, tricking (mimicry, playing dead), spraying, or fighting.

Locomotion

- In order for animals to find the resources they need for food, shelter, or space, they must be able to move around.

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- Animals have special structures for moving depending on where they live, for example above ground (swinging, climbing and flying), on the ground (crawling, walking, hopping), or in the water (floating, swimming and diving).

Movement

- The movement of animals over the same route in the same season each year is called *migration*.
- This behavior allows animals to take advantage of resources (like food or water) in one location when they run low in another location.

Food obtainment

- Animals have special structures used for getting food, for example the beaks of birds, mouths of insects, teeth, or claws that are shaped in different ways depending on the type of food they eat.

Camouflage

- Camouflage is a color or pattern that allows an animal to blend into its environment and protects it from being seen by its enemies or allows it to sneak up more easily on their food.

Physical and Behavioral Adaptations of Plants

Plants cannot move like animals can, but they can respond to a change in their environment. Some examples of plant adaptations for survival include:

Seed dispersal

- Most plants produce a large number of seeds because most seeds do not survive.
- In order to ensure that seeds will survive, they must be carried away (*dispersed*) from the parent plant.
- Some seeds have hooks on them that allow them to attach to animal fur or clothes.
- Some seeds are able to float in water.
- Some seeds are light and have wings or thin hairs that allow them to be carried away by wind.
- Some seeds are eaten by animals and deposited in areas away from the parent plants.

Color

- Flowers come in a variety of shapes, sizes, and colors.
- Petals are colored and scented to attract insects and other creatures for the purposes of pollination.
- The coloration of parts of some plants (fruits for example berries, or flower petals) makes them attractive to some animals (for example birds or bees).

Response to light

- A plant needs sunlight or some other light source to survive.
- It uses the light for the energy it needs to make its food.

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- A plant always turns its leaves and bends its stems toward the light.

It is not essential for students to understand the concepts of plant defense mechanisms, dormancy, or to explore the various other types of plant tropisms, as they will investigate this in 6th grade (6-2.7).

Assessment guidelines:

The objective of this indicator is to *explain* the effects of physical and behavioral adaptations on survival; therefore, the primary focus of assessment should be to construct a cause-and-effect model of the various ways that survival is affected by physical or behavioral adaptations of plants or animals. However, appropriate assessments should also require students to *exemplify* physical or behavioral adaptations of plants and animals that allow them to survive; *classify* an adaptation based on how it helps the plant or animal to survive; or *summarize* the purpose of a particular adaptation for survival of the plant or animal.

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3-2 The student will demonstrate an understanding of the structures, characteristics, and adaptations of organisms that allow them to function and survive within their habitats. (Life Science)

3.2.3 Recall the characteristics of an organism's habitat that allow the organism to survive there.

Taxonomy level: 1.2-A Remember Factual Knowledge

Previous/Future knowledge: In kindergarten (K-2.1), students identified the specific needs of all living things. In 1st grade, students identified needs specific to plants (1-2.1) and explained how the distinct environments support different types of plants (1-2.5). In 2nd grade, students identified needs specific to animals (2-2.1) and explained how the distinct environments support different types of animals (2-2.3). In 5th grade (5-2.2), students will develop a more in-depth understanding of the abiotic factors in an ecosystem and will explain how limiting factors affect populations.

It is essential for students to know that organisms have needs for survival that are found in their particular habitats. Organisms can only survive in an area where its basic needs (air, food, water, shelter or space, and light) can be met.

A habitat offers a range of conditions, for example water, air, food, shelter or space, or sunlight, which allow some organisms to live there. The specific characteristics of the habitat that allow the needs of energy, growth, and protection to be met are dependent upon the particular plant or animal.

- The habitat for some animals and plants may cover a large area. Some examples may be:
 - grazing animals may need lots of area to get enough food,
 - birds fly from place to place to get food, or
 - large trees will grow in areas where enough water is available for their growth.
- Other animals or plants have habitats that may be a small part of a larger environment. Some examples may be:
 - squirrels may make their nests in one tree in a forest,
 - some small insects may live under a fallen log in the forest;
 - orchid flowers live by hanging on trees found only in warm, wet areas, or
 - water lilies live in ponds in the shallow water.

It is not essential for students to know features about specific biomes.

Assessment Guidelines:

The objective of this indicator is to *recall* characteristics of a habitat that allow an organism to survive there; therefore, the primary focus of assessment should be to recognize that organisms could only survive in a habitat where their needs can be met. However, appropriate assessments should also require student to *identify* habitats that are appropriate for some common plants and animals; or *recognize* when a habitat is not appropriate for some common plants and animals.

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3-2 The student will demonstrate an understanding of the structures, characteristics, and adaptations of organisms that allow them to function and survive within their habitats. (Life Science)

3-2.4 Explain how changes in the habitats of plants and animals affect their survival.

Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have been introduced to distinct environments for plants in 1st grade (1-2.5) and animals in 2nd grade (2-2.3). In 5th grade (5-2.2), students will develop a more in-depth understanding of the abiotic factors in an ecosystem and will explain how limiting factors affect populations.

It is essential for students to know that *resources* (basic needs) within a habitat can keep only a certain number of plants and animals alive. This depends on how well the habitat provides for the needs of the plant or animal. Changes in a habitat can affect the survival of a plant and animal. There are many changes that can occur within a habitat that would force the animals or plants to change or adapt to survive.

- Habitat change can occur naturally. Some changes occur rapidly, for example, disease, fire, hurricanes, landslides, volcanoes, earthquakes, or changes in temperature or amount of rainfall (drought or flood) can change a habitat. Some changes occur slowly, for example, the changes in a plant life due to changes in sunlight (grasses to shrubs to trees), or if erosion occurs, causing the soil to wear away, fewer plants will be able to survive. When these events happen, the habitat usually cannot provide the needs for the animals or plants to survive there anymore.
- Humans can also cause habitat changes. For example, clearing land to build homes, buildings, or farmland can cause the animals in that area to have to move to another location for food or shelter. Plants that normally grow there would not find the conditions for their growth available anymore.
- Other animals or plants could also move into a habitat taking up needed space and food.
- If animals or plants cannot adapt to changes in the environment, *extinction* (loss of an entire group of organisms) of that type of animal or plant can occur.

It is not essential for students to know the underlying reasons why or the causes for the natural events.

Assessment Guidelines:

The objective of this indicator is to *explain* how changes in a habitat can affect the survival of a plant or animal; therefore, the primary focus of assessment should be to construct a cause-and-effect model of the way a change in a habitat effects the survival of a plant or animal. However, appropriate assessments should also require student to *summarize* major points about changes in habitats affecting plant and animal survival; or *identify* the change as caused by natural events or caused by living things.

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3.2.5 Summarize the organization of simple food chains (including the roles of producers, consumers, and decomposers).

Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have been introduced to energy in 2nd grade (2-2.1) as it relates to the food that plants and animals need to survive. In 5th grade (5-2.4), students will develop a more in-depth understanding of roles that organisms serve as they interact and depend on one another using food chains and food webs.

It is essential for students to know that all organisms need energy to survive. Energy gives the organism its ability to move and do the things it needs to survive. In most habitats, the Sun provides the initial energy which is passed from plants to animals.

- When scientists describe the way that energy is passed from one organism to another they use a model called a *food chain*.
- A food chain uses arrows to show the direction in which energy is passed and usually contains no more than six organisms.

Food chains have three types of organisms. The role of an organism can be described by how it obtains its energy.

Producers

- Any green plant, which uses sunlight to make food for energy.
- Producers are the first organisms listed in a food chain, understanding that the Sun provides the initial energy for the plants.

Consumers

- An organism (usually an animal) that obtains its energy by eating other organisms (plants and/or animals).

Decomposers

- An organism (for example worms, mold, or mushrooms) that obtains its energy by feeding on and breaking down dead plants and animals.
- Decomposers are often not listed in a food chain even though they are always the final link.

It is not essential for students to know specific types of consumers (herbivores, carnivores, omnivores) or to understand the concept of food webs.

Assessment Guidelines:

The objective of this indicator is to *summarize* the organization of simple food chains; therefore, the primary focus of assessment should be to generalize information about the roles of organisms in food chains. However, appropriate assessments should also require students to *identify* the role of an organism based its location in the food chain; *recall* how an organism obtains its energy in the food chain; or *illustrate* parts of a food chain using words, pictures, or diagrams.