



Adaptations: Traits to Thrive in an Environment

Adapting to the Environment

Key Questions

What adaptations do different plants and animals have?
How do adaptations allow organisms to thrive in particular environments?

Objectives

- Students will **understand** that adaptations allow organisms to thrive in a particular environment
- Students will **differentiate** between physical and behavioral adaptations in animals
- Students will **explore** growth and reproduction adaptations of plants
- Students will **identify** key adaptations of organisms in different habitats

Grades: 2-5

Time: 60 minutes

Location: Classroom

Materials

- Journals and pencil
- White board/chalk board
- For Adaptation tag: Orange cones or other boundary markers
- For Adaptation tag: plant cards sheet (attached)
- Computer with Internet access for EOL Collection exploration: <http://eol.org/collections/128386>

Culminating Activity

After learning about and exploring plant and animal adaptations, students will research local organisms with interesting adaptations and share their findings with their class or school and identify adaptations globally by analyzing a documentary.

Directions

Engage: Quickwrite: (5 minutes)

In a journal or notebook, spend 5 minutes responding to these questions: How do humans survive and thrive all over the world? What do we have that allow us to do this? Do the same for another animal (since humans are also in the Animal kingdom) and a plant.

<p>How do humans survive in:</p> <ul style="list-style-type: none"> • Cold weather • Warm weather • Storms/disasters (hurricanes, flood, fire, 	<p>How do lizards (or another animal) survive in:</p> <ul style="list-style-type: none"> • Cold weather • Warm weather • Storms/disasters 	<p>How do pine trees survive in:</p> <ul style="list-style-type: none"> • Cold weather • Hot weather • Storms/disasters (hurricanes, flood, fire,
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drought, etc.) <ul style="list-style-type: none"> • Places without natural resources 	(hurricanes, flood, fire, drought, etc.) <ul style="list-style-type: none"> • Places without natural resources 	drought, etc.)
How do humans find: <ul style="list-style-type: none"> • Shelter • Food • Water 	How do lizards (or another animal) find: <ul style="list-style-type: none"> • Shelter • Food • Water 	How do pine trees find: <ul style="list-style-type: none"> • Protection • Minerals/food • Water

Or.. how would these organisms survive in:

- Florida
- Alaska
- Arizona

We call these **adaptations**: Physical characteristics or behaviors that allows an organism to survive and thrive in its environment. Because humans have advanced tools and ability to make synthetic materials, there is almost no limit to environments they can adapt. However, most other organisms are limited to certain environments for which they are specially adapted. Let's explore adaptations more.

Explore (15 minutes)

Ask students to brainstorm some adaptations. On the board, make a list of these adaptations. Circle all physical adaptations in one color, and behavioral adaptations in another color. Or, write them in two columns and ask students to examine the lists and guess what the differences are between the two lists. Add to the list and share some examples of well-known physical and behavioral adaptations.

You can either have a separate table for plant adaptations or put into the "physical adaptations" category. Plant adaptations can be organized many ways; in particular for growth (out-competing other plants, defense against predation, gathering nutrients/water) or reproduction (seed dispersal, pollination, etc.).

Animal Adaptations

Physical Adaptations	Behavioral Adaptations
<p>Specialized/modified body parts (animals):</p> <ul style="list-style-type: none"> • Claws • Teeth • Eyes • Ears • Stomachs • Bird beaks <p>Defense</p> <ul style="list-style-type: none"> • Poison • Spray • Hard shells <p>Mimicry</p> <ul style="list-style-type: none"> • Body coloring/patterns to mimic poisonous animals (viceroy/monarch butterfly, coral/king snakes) • Body patterns to mimic larger animal (caterpillars with eye patches) <p>Camouflage</p> <ul style="list-style-type: none"> • Ability to change color (chameleon, green anole) • Color blends into surroundings (nighthawks, countershading in seabirds/marine mammals) • Body structure mimics environment (stick insects/praying mantis) 	<p>Food:</p> <ul style="list-style-type: none"> • Carnivore • Omnivore • Herbivore • Scavenger <p>Activity:</p> <ul style="list-style-type: none"> • Nocturnal • Diurnal • Crepuscular <p>Temperature/seasonality:</p> <ul style="list-style-type: none"> • Hibernation • Estivation • Migration • Tolerate <p>Symbiosis</p> <ul style="list-style-type: none"> • Mutualism • Commensalism • Parasitism <p>Shelter</p> <ul style="list-style-type: none"> • Dig burrows • Nest in cavities and/or structures • Use other animal burrows <p>Predator/prey interactions</p> <ul style="list-style-type: none"> • Prey: hiding, playing dead, running • Predator: stealthy, sit and wait, etc. <p>Communication</p> <ul style="list-style-type: none"> • Bird songs/calls <p>Territorial behaviors</p> <ul style="list-style-type: none"> • Marking territory • Fighting for territory

Plant Adaptations

Growth	Reproduction
<p>Defense</p> <ul style="list-style-type: none"> • Thorns • Spikes • Poisonous and/or bad tasting • Irritating • Bark <p>Competition</p> <ul style="list-style-type: none"> • Chemical secretion (tannins) <p>Nutrients</p> <ul style="list-style-type: none"> • Carnivorous plants • Mutualism with fungi in root systems 	<p>Pollination</p> <ul style="list-style-type: none"> • Flower odor • Flower color <p>Seed dispersal</p> <ul style="list-style-type: none"> • Seed structure for wind transport (maple seeds fly like helicopters, dandelion seeds fly through air) • Seed structure for animal transport (burs or sticky substance that sticks to animal fur/feathers) • Seed/fruit palatability (animals eat fruit, spreading seed)

Explain (15 minutes)

Play Adaptation Tag. The purpose of this game is to reinforce the concepts of behavioral and physical adaptations, and to release some energy!

Set-up: If possible, transport your list of animal and plant adaptations to your playing area. You could ask students to draw these on a few posters or butcher block paper to bring if you cannot transport whiteboard.

Round 1: Animals

- The game: Choose one or two students to be biologists studying an ecosystem. Everyone else chooses to be an animal (or have them pull from a hat), but they do not share their animals. The animals line up shoulder-to-shoulder across one side of the rectangle. The biologists stand in the middle.
- The biologists are trying to study animals with different adaptations. Using the list of adaptations as a guide, biologists will call out a different behavioral or physical adaptation that they want to investigate and any animal with that adaptation must run to the other side of the habitat. Biologists will try to tag the animals. If they tag an animal, the animal must freeze in place. Once captured, an animal can tag other animals as they go by. You can plan that if they tag another animal they get back into the game or they must stay in place. If an animal is not sure about a particular adaptation, students can use their best judgment to run or not.
- The biologists will call another adaptation and any animal with that adaptation must run to the other side. Animals must run every time an adaptation they have is called, back and forth across the playing field.
- Example: Biologists call out the adaptation “sharp teeth.” Students who chose wolf, weasel, and raccoon run across the field, everyone else stays in place. The next round, the biologists call out anything that is a carnivore, the wolf and weasel will run, and raccoon will stay in place (raccoons are omnivores).
- Check for understanding: After the round, students should share their animal and *three adaptations* that they chose to run back and forth.

Round 2: Plants

- Repeat the activity, but instead have students pick a plant card* from a hat. Give students a few minutes to look at the adaptations of their plants.
*Cards created for southeastern U.S. region
- This time, botanists are coming to study the adaptations of plants. The botanists will call out growth and reproduction adaptations from the plant list.
- Check for understanding: After the round, students should share their plant and *two adaptations* that they chose to run back and forth.

Elaborate (20 minutes): Brainstorm some local organisms with interesting adaptations

What are some unique characteristics about your local environment? What might make your area a challenging place to live for other animals and plants (temperature, humidity, fires, precipitation, drought, humans, etc.)? Check out the [EOL Collection of species with interesting adaptations](#). Spend time in small groups researching one of the organisms and share out to the class

- Name
- Taxon Group
- Range
- Habitat(s)
- Adaptation(s)
- Can the species be found in your area? If not, what different adaptations might help it to survive there?

Tip: If you want to utilize **RAFT** writing method:

Role: Play the role of a local organism (i.e. I am a coyote)

Audience: Local residents

Format: Print or web media of choice

Topic: What are the challenges for your species to thrive in the area? How have you adapted? Include:

- Name
- Taxon Group
- Range
- Habitat(s)
- Adaptation(s)

Evaluate: Watch [BBC Life: Episode 1 Challenges of Life](#) - watch in entirety (58 minutes) or pick short clip and have kids make two columns to make a list of the physical adaptations and behavioral adaptations they see in the video. Here are some good clips to use:

0:00-4:22 - Introduction and dolphins in Florida

8:27-10:42: Chameleon camouflage and hunting

10:42-15:24: Crabeater seals, orcas

15:24-17:10: Flying fish

17:11-21:48: Monkeys using rocks as tools

21:49-23:35: Venus fly traps

23:45-27:12: Stalk-eyed fly actively building long eye stalks

30:56-33:01: Grebe courtship dancing on water

35:53-40:26: Poison arrow frogs laying eggs

Field Extensions

Go outside, have everyone find a quiet space, and

- A. Make observations for 5 minutes about the adaptations of the things around them. Focus on 2-3 different things to observe, and draw, or write about the organism.

OR

- B. Write a story about what kind of adaptations they would want to have if they lived in different ecosystems (ocean, desert, tundra, rainforest).

Next Generation Science Standards

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.

3-LS2-1. Construct an argument that some animals form groups that help members survive.

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.



Encyclopedia of Life
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Plant Adaptation Cards

Print and put into a hat or pass out to students for reference during adaptation tag or other activities.

<p>Slash Pine <i>Pinus elliotii</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Grows quickly in areas that were clear-cut/disturbed • Deep root system <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Have winged seeds for wind dispersal • Can hybridize with other pine species 	<p>Sand Live Oak <i>Quercus geminata</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Most of tree is below surface, can resprout after fire • Thick bark <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Produces acorns, dispersed by animals, especially squirrels, who cache the seeds 	<p>Cinnamon Fern <i>Osmundastrum cinnamonea</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Has two types of leaves: sterile leaves on outer edge of plant, fertile leaves in middle <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • After a fire, can regenerate quickly because of minerals in soil 	<p>Narrowleaf Silkgrass <i>Pityopsis graminifolia</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Has hairs on stem to help stop water from escaping plant <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Has rhizomes in roots that can sprout new plants • Wind-dispersed seeds
<p>Woody Goldenrod <i>Chrysoma pauciflosculosa</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Releases chemicals (allelopathy) to keep fire-prone grasses from growing around plant <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Blooms late in season so less flowers on other plants for pollinators • Wind-dispersed seeds 	<p>Black Cherry <i>Prunus serotina</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Leaves + twigs produce bad-tasting toxin to protect from herbivory <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Fragrant flowers for pollinators • Tasty fruits for other animals to eat and disperse seeds 	<p>Eastern Prickly Pear <i>Opuntia humifusa</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Has spines for protection • Waxy cuticle to prevent water loss • Stores water <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Can spread from a detached piece of plant above or below ground 	<p>Wiregrass <i>Aristida stricta</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • After fire, bud develops very quickly below soil surface <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Produce more flowers and seeds following a fire • Reproduce by rhizomes

<p>Sea Oats <i>Uniola paniculata</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Tolerant of salt spray, wind, brief seawater flooding, burial • Beneficial fungi to increase nutrients • Extensive root system <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Reproduce via rhizomes, stimulated by changing sands 	<p>Yellow Pitcher Plant <i>Sarracenia flava</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Pitchers (leaves) with fluid in bottom that can digest insects, insects land on top and slide in <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Flower held high above leaves so pollinators don't fall in • Seeds waxy for water dispersal 	<p>Bald Cypress <i>Taxodium distichum</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Deciduous conifers, shed leaves in fall to conserve energy • Roots allow growth in wetlands and swamps <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Seeds dispersed by foraging animals or by water 	<p>Wild Sarsaparilla Vine <i>Smilax glauca</i></p> <p>Growth Adaptations:</p> <ul style="list-style-type: none"> • Prickles on stem to protect against herbivory • Climbing vine • Thick, waxy leaves to prevent water loss <p>Reproduction Adaptations:</p> <ul style="list-style-type: none"> • Plants have either male or female flowers
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