

### Unit Summary

#### *Why don't we see alligators in the arctic?*

In this unit of study, students develop an understanding of the idea that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. The crosscutting concepts of *cause and effect* and the *interdependence of science, engineering, and technology* are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *engaging in argument from evidence*. Students are also expected to use this practice to demonstrate understanding of the core ideas.

This unit is based on 3-LS2-1 and 3-LS4-3.

### Student Learning Objectives

Construct an argument that some animals form groups that help members survive. ([3-LS2-1](#))

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. *[Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]* ([3-LS4-3](#))

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Unit Sequence	
<b>Part A:</b> <i>In a particular habitat, why do some organisms survive well, some survive less well, and some not survive at all?</i>	
Concepts	Formative Assessment
<ul style="list-style-type: none"> <li>• Cause-and-effect relationships are routinely identified and used to explain change.</li> <li>• Knowledge of relevant scientific concepts and research findings is important in engineering.</li> <li>• For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.</li> <li>• Organisms and their habitat make up a system in which the parts depend on each other.</li> </ul>	<p><i>Students who understand the concepts are able to:</i></p> <ul style="list-style-type: none"> <li>• Identify cause-and-effect relationships in order to explain change.</li> <li>• Construct an argument with evidence.</li> <li>• Construct an argument with evidence (e.g., needs and characteristics of the organisms and habitats involved) that in a particular habitat, some organisms can survive well, some can survive less well, and some cannot survive at all.</li> </ul>

What It Looks Like in the Classroom
<p>Organisms and their habitats make up a system in which they are interdependent. Environmental factors affect the growth and survival of every type of organism, and organisms in turn affect the environment. The focus of this unit of study is identifying cause-and-effect relationships between the environment and organisms' ability to survive and reproduce.</p> <p>In this unit, students first learn that all organisms have a variety of behaviors and traits that enable them to survive. One of these behaviors includes forming groups. Groups serve different functions and can vary dramatically in size. Animals may form groups to obtain food, to defend themselves, and/or to cope with changes in their environment. Students should have opportunities to conduct research on animals that form groups in order to understand how being part of a group is beneficial to survival and reproduction. Students might begin with studying animals that are indigenous to the local environment (e.g., squirrels, coyotes, deer, birds, or fish), and then investigate other animals of interest, such as (but not limited to) lions, sea turtles, or penguins. For each animal that is studied, students should identify the social structure of the group and how this structure supports individuals in their need to obtain food, defend themselves, and reproduce.</p> <p>Topics to focus on might be the roles of males and females within a group as well as the interactions between parents and offspring. For example, within some groups of animals, the offspring leave the nest or pack early while others remain for longer periods of time. Those that stay within the group for longer periods of time may do so because of the benefits provided by the group structure. As students compare group structures of different animals and the functions that define each, they should also think about how the size of the group and the roles of individuals within the group affect the animals' overall ability to obtain food, defend themselves, and reproduce. Students will construct arguments with evidence, using cause-and-effect relationships to show why some animals form groups and how this is advantageous to survival and reproduction.</p> <p>In this unit, students also learn that for any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. As students explore the components of a given environment, they learn that each environment has a particular climate as well as finite sources of water and space. Each environment will support organisms (both plants and animals) with structures and behaviors that are best suited to the climate and resources available. Students will need opportunities to investigate the organisms (plants and animals) that live in certain environments and determine what traits and behaviors allow these</p>

organisms to survive and reproduce in that environment. In addition, students should identify some examples of organisms that would survive less well, or not at all, in that environment, and give evidence to support their thinking. Students construct arguments with evidence, using cause-and-effect relationships, to show how the needs and characteristics of the organisms are not well suited for the given environment.

### Connecting with English Language Arts/Literacy and Mathematics

#### *English Language Arts*

Students need opportunities use informational text and other resources to gather information about organisms and the environments in which they live. Students should be able to ask and answer questions to demonstrate understanding of content-specific text and be able to cite evidence from the text to support their thinking. For example, after reading an article about wolves, students ask and answer questions such as:

- ✓ How does being a member of a pack help wolves survive?
- ✓ What characteristics do wolves have that enable them to survive in their environment?
- ✓ What characteristics and resources does the environment have that allow wolves to survive and reproduce in that environment?

Students should be able to refer specifically to the text when answering questions, articulating the main idea and describing key details in their explanations. Students also need opportunities to write informative/explanatory texts and opinion pieces with supporting evidence to convey their ideas and understanding of cause-and-effect relationships between the environment and an organism's ability to survive and reproduce. For example, after reading text about a given animal, students should be expected to use key details and appropriate facts about that animal to compose an informative piece of writing that describes the animal's characteristics and behaviors that aid in its survival. Students should also have the opportunity to orally report on a given topic, sharing relevant facts and details while speaking clearly and at a reasonable pace.

#### *Mathematics*

Students can model with mathematics by graphing the average number of organisms that make up a group among a variety of species. For example, some species live in small groups of six to eight members, while others live in groups that include thousands of organisms. Students will also reason abstractly and quantitatively as they describe and compare these groups and their ability to survive and reproduce in a given environment.

### Modifications

*(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: [All Standards, All Students/Case Studies for vignettes and explanations of the modifications.](#))*

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple

representation and multimodal experiences).

- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals ([http://www.cast.org/our-work/about-udl.html#.VXmoXcfD\\_UA](http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA))

#### Research on Student Learning

Evidence indicate that poor reasoners tend to retain nonscientific beliefs such as "evolutionary change occurs as a result of need" because they fail to examine alternative hypotheses and their predicted consequences, and they fail to comprehend conflicting evidence. Thus, they are left with no alternative but to believe their initial intuitions or the misstatements they hear ([NSDL, 2015](#)).

#### Prior Learning

##### Kindergarten Unit 4: Basic Needs of Living Things

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

##### Grade 1 Unit 2: Characteristics of Living Things

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

##### Grade 2 Unit 1: Relationships in Habitats

- Plants depend on water and light to grow.
- Plants depend on animals for pollination or to move their seeds around.
- There are many different kinds of living things in any area, and they exist in different places on land and in water.

**Future Learning****Grade 6 Unit 2: Matter and Energy in Organisms and Ecosystems**

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
- Growth of organisms and population increases are limited by access to resources.
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

**Grade 7 Unit 8: Earth systems**

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.

**Grade 8 Unit 2: Selection and Adaptation**

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
- In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.
- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.

**Connections to Other Units****Grade 3 Unit 1: Weather and Climate**

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.

**Sample of Open Education Resources**[Muskox Maneuvers](#)

In this activity, students create a physical model showing how muskoxen work together as a group to protect their young from predators (wolves).

[Musk Ox Save Calf from Wolves Video](#)

In this short video, Arctic wolves attack a musk ox calf on Canada's Ellesmere Island, but the herd rushes to its defense by forming a defensive circle around the calves.

[Insects That Work Together](#)

This nonfiction book summarizes how some insects work together to increase their chances of survival. Details are provided on four types of insects: honeybees, hive wasps (hornets, yellow jackets, and paper wasps), termites, and ants. A short section on insect migration and building a hive model are also included.

[Battle at Kruger: Water Buffalo Save Calf from Lions Video](#)

This short video captures student imagination and elicits ideas about how groups of organisms work together for survival. The video contains real footage of a pack of lions attack on a water buffalo calf. The footage filmed by amateur tourists features a surprising plot twist (featuring a crocodile), and exciting finale with the water buffalo herd rescues the calf and chases off the lions.

[A Walk in the Desert \(Biomes of North America\)](#)

This nonfiction text describes the climate, soil, plants and animals of the North American deserts. It provides detailed information on how plants and animals adapt and survive there.

[A Walk in the Deciduous Forest \(Biomes of North America\)](#)

This nonfiction text describes the climate, soil, plants and animals of the North American deciduous forests. It provides detailed information on how plants and animals adapt and survive there.

[A Walk in the Rain Forest \(Biomes of North America\)](#)

This nonfiction text describes the climate, soil, plants and animals of the North American rain forests. It provides detailed information on how plants and animals adapt and survive there.

[A Walk in the Prairie \(Biomes of North America\)](#)

This nonfiction text describes the climate, soil, plants and animals of the North American prairies. It provides detailed information on how plants and animals adapt

and survive there.

[A Walk in the Tundra \(Biomes of North America\)](#)

This nonfiction text describes the climate, soil, plants and animals of the North American tundra. It provides detailed information on how plants and animals adapt and survive there.

[A Walk in the Boreal Forest \(Biomes of North America\)](#)

This nonfiction text describes the climate, soil, plants and animals of the North American boreal forests. It provides detailed information on how plants and animals adapt and survive there.

[A Journey into the Ocean \(Biomes of North America\)](#)

This nonfiction text describes the organisms and features of the ocean environment. It provides detailed information on how plants and animals adapt and survive there.

[Journey Into an Estuary \(Biomes of North America\)](#)

This nonfiction text describes the features and plants and animals of North American estuaries. It provides detailed information on how plants and animals adapt and survive there.

### Teacher Professional Learning Resources

#### **NGSS Crosscutting Concepts: Stability and Change**

The presenter was Brett Moulding, director of the Partnership for Effective Science Teaching and Learning. Mr. Moulding began the web seminar by defining stability and change and discussing the inclusion of this concept in previous standards documents such as the National Science Education Standards (NSES). Participants brainstormed examples of science phenomena that can be explained by using the concept of stability and change. Some of their ideas included Earth's orbit around the Sun, carrying capacity of ecosystems, and replication of DNA. Mr. Moulding then discussed the role of stability and change within NGSS. Participants again shared their ideas in the chat, providing their thoughts about classroom implementation of this crosscutting concept.

#### **NGSS Core Ideas: Ecosystems: Interactions, Energy, and Dynamics**

The presenters were Andy Anderson and Jennifer Doherty of Michigan State University. This was the ninth web seminar in a series focused on the disciplinary core ideas that are part of the Next Generation Science Standards (NGSS). The program featured strategies for teaching about life science concepts that answer questions such as "How do organisms interact with the living and nonliving environments to obtain matter and energy?" and "How do matter and energy move through an ecosystem?"

Dr. Anderson and Dr. Doherty began the presentation by discussing the two main strands of the ecosystems disciplinary core idea: community ecology and ecosystem science. They talked about common student preconceptions and strategies for addressing them. Next, Dr. Anderson and Dr. Doherty shared learning progressions for this core idea, showing how student understanding builds from elementary through high school. Last, the presenters described approaches for teaching about ecosystems and shared resources to use with students.

Visit the [resource collection](#).

Continue discussing this topic in the [community forums](#).

**NGSS Core Ideas: Biological Evolution: Unity and Diversity**

The presenter was Cindy Passmore. The program featured strategies for teaching about life science concepts that answer questions such as "How are the characteristics of one generation related to the previous generation?" and "Why do individuals of the same species vary in how they look, function, and behave?"

Following an overview of the web seminar's main topics to be covered, Cindy Passmore discussed what makes LS4 a "core" idea and how its subsections A, B, C and D should be approached as being related to one another, rather than sequenced elements to be taught one after the other. Cindy then spoke about the concept of using models to explain and make sense of the natural world through two detailed examples about the Peppered moth and the Galapagos finches.

View the [resource collection](#).

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Appendix A: NGSS and Foundations for the Unit		
Construct an argument that some animals form groups that help members survive. (3-LS2-1)		
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. <i>[Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]</i> (3-LS4-3)		
The performance expectations above were developed using the following elements from the NRC document <a href="#">A Framework for K-12 Science Education</a> :		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Engaging in Argument from Evidence</b></p> <ul style="list-style-type: none"> <li>Construct an argument with evidence, data, and/or a model. (3-LS2-1)</li> <li>Construct an argument with evidence. (3-LS4-3)</li> </ul>	<p><b>LS2.D: Social Interactions and Group Behavior</b></p> <ul style="list-style-type: none"> <li>Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size (<i>Note: Moved from K–2</i>). (3-LS2-1)</li> </ul> <p><b>LS4.C: Adaptation</b></p> <ul style="list-style-type: none"> <li>For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)</li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1),(3-LS4-3)</li> </ul>

English Language Arts	Mathematics
<p>Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS2-1), (3-LS4-3) <b>RI.3.1</b></p> <p>Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-3) <b>RI.3.2</b></p> <p>Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS2-1),(3-LS4-3) <b>RI.3.3</b></p> <p>Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS2-1), (3-LS4-3) <b>W.3.1</b></p> <p>Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-3) <b>W.3.2</b></p> <p>Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-3) <b>SL.3.4</b></p>	<p>Model with mathematics. (3-LS2-1),(3-LS4-3) <b>MP.4</b></p> <p>Number and Operations in Base Ten. (3-LS2-1) <b>3.NBT</b></p>