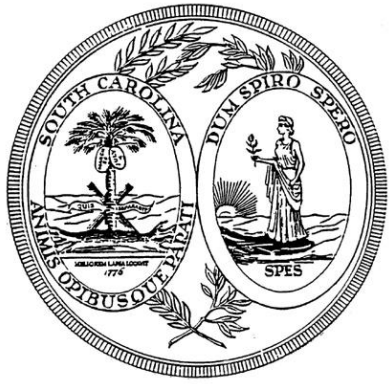
South Carolina Academic Standards and Performance Indicators for Science 2014



Instructional Units Resource

7th Grade

South Carolina Academic Standards and Performance Indicators for Science 2014
Seventh Grade Science Instructional Unit Resource

As support for implementing the *South Carolina Academic Standards and Performance Indicators for Science 2014*, the standards for Seventh Grade have been grouped into possible units. In the Overview of Units below, the titles for those possible units are listed in columns. Refer to the Overview document to note these unit titles and how Standards, Conceptual Understandings, Performance Indicators, Science and Engineering Practices, and Crosscutting Concepts align. Following the Overview of Units, an Instructional Unit document is provided that delivers guidance and possible resources in teaching our new *South Carolina Academic Standards and Performance Indicators for Science 2014*. The purpose of this document is to provide guidance as to how all the standards in this grade may be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students. This document is a living document and instructional leaders from around the state will continuously update and expand these resource documents. These documents will be released throughout the 2016-2017 school year with the intentionality of staying ahead of instruction. Teachers should also note that links to the Standards document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, the SEP Support Document, and the Support Document 2.0 are embedded throughout the Instructional Unit format for reference.

Acknowledgments

Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. “Gratitude is the memory of the heart. Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness.” It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by teachers and instructional leaders across the state that have made and are continuing to make the Instructional Unit Resources possible.

Grade 7 Overview of Units

Unit 1		Unit 2		Unit 3	Unit 4	
PHYSICAL SCIENCE: CLASSIFICATION AND CONSERVATION OF MATTER		LIFE SCIENCE: ORGANIZATION IN LIVING SYSTEMS		LIFE SCIENCE: HEREDITY – INHERITANCE AND VARIATION OF TRAITS	ECOLOGY: INTERACTIONS OF LIVING SYSTEMS AND THE ENVIRONMENT	
Standard		**Standard**		**Standard**	**Standard**	
7.P.2		7.L.3		7.L.4	7.EC.5	
Conceptual Understanding		**Conceptual Understanding**		**Conceptual Understanding**	**Conceptual Understanding**	
7.P.2A	7.P.2B	7.L.3A	7.L.3B	7.L.4A	7.EC.5A	7.EC.5B
Performance Indicators		**Performance Indicators**		**Performance Indicators**	**Performance Indicators**	
7.P.2A.1 7.P.2A.2 7.P.2A.3 7.P.2A.4	7.P.2B.1 7.P.2B.2 7.P.2B.3 7.P.2B.4 7.P.2B.5	7.L.3A.1 7.L.3A.2 7.L.3A.3 7.L.3A.4	7.L.3B.1 7.L.3B.2	7.L.4A.1 7.L.4A.2 7.L.4A.3 7.L.4A.4 7.L.4A.5 7.L.4A.6	7.EC.5A.1 7.EC.5A.2 7.EC.5A.3	7.EC.5B.1 7.EC.5B.2 7.EC.5B.3 7.EC.5B.4
***Science and Engineering Practices**		***Science and Engineering Practices**		***Science and Engineering Practices**	***Science and Engineering Practices**	
7.S.1A.2 7.S.1A.3 7.S.1A.4 7.S.1A.5 7.S.1A.6 7.S.1A.8		7.S.1A.2 7.S.1A.4 7.S.1A.7 7.S.1A.8		7.S.1A.2 7.S.1A.5 7.S.1A.6 7.S.1A.7 7.S.1A.8	7.S.1A.2 7.S.1A.4 7.S.1A.5 7.S.1A.7 7.S.1B.1	
***Cross Cutting Concepts**		***Cross Cutting Concepts**		***Cross Cutting Concepts**	***Cross Cutting Concepts**	
1, 2, 3, 4, 5, 6, 7		2, 4, 6		1, 2, 4, 6, 7	2, 4, 6,	

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Unit Title
Ecology: Interactions of Living Systems and the Environment
Standard http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
7.EC.5 The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.

Conceptual Understanding
7.EC.5A In all ecosystems, organisms and populations of organisms depend on their environmental interactions with other living things (biotic factors) and with physical (abiotic) factors (such as light, temperature, water, or soil quality). Disruptions to any component of an ecosystem can lead to shifts in its diversity and abundance of populations.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**

Abiotic	Biomes	Biotic	Carrying Capacity	Community	Ecosystem
Humus	Lime	Limiting Factor	Loam	Permeability	Population
Sandy Clay Loam	Silt	Silt Loam	Soil Composition	Soil pH	Soil Profile
Soil Texture	Species				

Performance Indicators **Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's.**
7.EC.5A.1 *Develop and use models* to describe the characteristics of the levels of organization within ecosystems (including species, populations, communities, ecosystems, and biomes). 7.EC.5A.2 *Construct explanations* of how soil quality (including composition, texture, particle size, permeability, and pH) affects the characteristics

of an ecosystem using evidence from soil profiles.
7.EC.5A.3 *Analyze and interpret data* to predict changes in the number of organisms within a population when certain changes occur to the physical environment (such as changes due to natural hazards or limiting factors).

***Science and Engineering Practices**

Support for the guidance, overviews of grade level progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

7.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.
7.S.1A.4. Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.
7.S.1A.7 Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts.
7.S.1A.5 Use mathematical and computational thinking to (1) use and manipulate appropriate metric units, (2) collect and analyze data, (3) express relationships between variables for models and investigations, or (4) use grade-level appropriate statistics to analyze data.

***Cross Cutting Concepts (http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012). The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

2. Cause and effect: Mechanism and explanation: The National Research Council (2012) states that "events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts" (p. 84). *Changes that occur to the physical environment can cause changes in the number of organisms within a population.*

4. Systems and systems models: The National Research Council (2012) states that "Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering" (p. 84). *The levels of organization within ecosystems are a system in ecology. Abiotic and biotic factors interact to create a dynamic system.*

6. Structure and function: The National Research Council (2012) states that "the way in which an object or living thing is shaped and its substructure determine many of its properties and functions " (p. 84) *Soil quality is a function of composition, texture, particle size, permeability, and pH.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge
• 5.L.4A (Ecosystems) • 5.L.4B (Survival Needs of Organisms) • 6.L.4 (Classification of Organisms)
Subsequent Knowledge
• H.B.6 (Ecosystems)

Possible Instructional Strategies/Lessons

Strategies and lessons that will enable students to master the standard and/or indicator.

- 7.EC.5A.1
  - Exploring the "Systems" in Ecosystems: Students are introduced to ecosystems, and then they will use a systems thinking approach by analyzing data of a hypothetical ecosystem. Then students use what they have learned by applying the same analyzing techniques to a local ecosystem. Through this approach, students are able to construct an argument through empirical evidence as they independently control variables and investigate organisms through the interactives and as they develop their own models. This resource can be found at http://ri.pbslearningmedia.org/resource/lsps07.sci.life.eco.lpexpecosystems/exploring-the-systems-in-ecosystems/ .
  - The 6 Chief Levels of Organization in Ecology: This article has 6 levels of organization. The standard requires the information on the first 5 levels. Students can use this site as a reference to gather information for their models. This resources can be found at http://www.buzzle.com/articles/levels-of-organization-in-ecology.html.
  - Your Cool Facts & Tips On Ecosystems: Students are able to explore diagrams with easy to understand explanations to see and understand the relationships among the different levels of organizations. Students can create, draw, and explain their own models by assimilating themselves as the individual, in the ecological terms, and their relationship as an individual species, in the ecological term of a population, in the ecological term of community, ecosystem, and biome. Extension activity: Have students write about a

goal they may have for the future, connecting the possible contributions or impact of that goal as they consider their role as an individual species; but continue it within the populations, communities, ecosystems, and biomes. These resources can be found at http://eschooltoday.com/ecosystems/levels-of-organisation-in-an-ecosystem.html.

- Explore The Ecosystem: Students will diagram an ecosystem using the pyramid model. This model can also be used to show the similarities between organization within an ecosystem and other systems. This resource can be found at http://www.montanaioe.org/sites/default/files/outreach/exploringecosystems_lesson1.pdf.

- 7.EC.5A.2
  - From the Ground Up: The Science of Soil: Once on the website, scroll down to Lesson 2: Properties of Soil to download the lesson plan as well as the corresponding PowerPoint. Students will be introduced to different properties of soil, explore history by looking at the role of soil during the Dust Bowl; and by using a jigsaw cooperative strategy, perform labs that examine and construct explanations about different types of soil and the different components in soil. This resource can be found at http://www.thescienceofsoil.com/teacher-resources.

  - Soil Texture Analysis: Students will use this experiment to construct explanations about how soil texture can be estimated and determined. This resource can be found at http://www.soils4kids.org/files/s4k/soil-texture-experiment.pdf.

  - A Soil Profile: Students will use these directions to create a model of a soil profile. They can use this profile and their interactive notebook to predict how changes to this soil profile can affect an ecosystem. This resource can be found at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308.

  - Perkin Through the Pores: Students will use this experiment to construct explanations about how pore size affects permeability. This resource can be found at http://www.soils4kids.org/files/s4k/perkin.pdf.

  - Soil Texture Using a Soil Sieve: Students will construct explanations about soil particle size and texture of local soil. In order to address the standard, students should bring dried soil samples from their yards to analyze and compare to other soils from their county. Based on the students' analyzation of the soil samples, students will create cause and effect models to describe relationships of the various soil samples. This resource can be found at http://cbsd.org/cms/lib010/PA01916442/Centricity/Domain/1908/soil_sieve.pdf.

- Local Soil Permeability: Students will use local soil samples to explain how the soil type or soil size affects permeability. Cause and effect relationships can be established with this data. This resource can be found at http://www.earthlearningidea.com/PDF/Permeability_of_soils_Final.pdf.

- Soil pH: What it Means: This resource is a brochure explaining soil pH. Students can use this as a reference to construct explanations about soil pH and the effects on an ecosystem. This resource can be found at http://www.esf.edu/PUBPROG/brochure/soilph/soilph.htm.

- Soil Solutions: Students will analyze data on soils of differing quality to determine, based on soil quality, which type of soil will best grow good produce. Students should construct explanations and provide evidence to support their soil preferences. This resource can be found at http://www.cpalms.org/Public/PreviewResourceLesson/Preview/48896.

- 7.EC.5A.3
  - Oh Deer!: Students will play a simulation game to collect data to analyze what happens when there is competition over limited resources such as food, water, and shelter. Students will record the data and can create a graph that shows the population of deer throughout the game. The teacher can ask students to make predictions as to how the deer population will be affected if a resource becomes polluted or disappears. This activity is also included with the next indicator. This activity can be used to address relationships and limiting factors. This resource can be found at https://naturebridge.org/sites/default/files/Oh%20Deer_1.pdf.

  - Limiting Factors of Cedar Glade: Students participate in a simulation that provides different scenarios for students to gather, analyze, and interpret data. The simulation demonstrates how an ecosystem can be affected by limiting factors and how carrying capacity can vary in different circumstances. This activity is geared toward older students but can be adapted for this grade level. This resource can be found at http://www.mtsu.edu/glade-center/teaching/21_Limiting%20Factors%20in%20the%20Glades.pdf.

  - How Many Bears Can Live in the Forest?: Students will be able to define limiting factors and describe how limiting factors affect populations. Students could record data for analysis. Students can create cause and effect relationships between limiting factors and population effects. This resource can be found at https://www.michigan.gov/documents/dnr/WLD_How_Many_Bears_Can_Live_MI_Adaptation_338960_7.pdf.

- Disappearing Frogs-Percentage and Environment: Students will explore and analyze human and environmental factors that have an effect on the yellow-legged frog population of California. Students will then analyze various plans that are attempting to save the frogs in order to select the one that they feel will be most effective. Students can develop and present their own plans as an extension of this activity. Students could give supporting evidence for which plan would work the best. This resource can be found at http://www.cpalms.org/Public/PreviewResourceLesson/Preview/54661.

- Catastrophic Events and the Ecosystem: Students will conduct research on various natural hazards and analyze their impact on the environment. You may want to adapt how students will present this material in your classroom. This resource can be found at http://www.dilleyisd.net/ourpages/auto/2012/9/30/52827076/Unit%204%20Lesson%20Plans.pdf.

- Biotic, Abiotic. Alive or not?: Students will analyze how biotic and abiotic factors can play a role on limiting factors within an ecosystem. The formative assessment is to have students work in small groups to construct a convincing argument through research as they work together to produce biodiversity project. This resource can be found at http://www.cpalms.org/Public/PreviewResourceLesson/Preview/76030.

- Carrying Capacity: Students will formulate and test hypotheses to determine the effect of carrying capacity on populations. They will analyze the significance of carrying capacity on populations. Students could then present the different plans in order to determine which plan would work best. Students could then identify what plan they feel is best and defend their selection with evidence. This resource can be found at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5073081.pdf.

- Wilderness Happenings-What the Numbers Tells Us: This is a pre-requisite lesson for Carrying Capacity: What is the Viable Population? -A Lesson on Number and Space. Students will predict trends in wilderness acquisitions and wilderness use. The students will then illustrate these trends with various types of graphs. Students can create bar charts for the total acreage and percentage of federal lands that each of four federal agencies manage as wilderness and then represent how much land is currently set aside as designated wilderness. This resource can be found at http://carhart.wilderness.net/docs/curriculum/8-1.pdf and http://carhart.wilderness.net/docs/curriculum/1-5.pdf .

- Carrying Capacity: What is the Viable Population? -A Lesson on Number and Space: Students will list at least three components that determine the carrying capacity of an area for a particular species. Students will then mathematically conclude minimum range sizes for sustaining a theoretical minimum viable population for three to six animal species. After a reading/listening to one or both passages, they will analyze the data and information provided to decide if there is enough room for the animals. This resource can be found at http://carhart.wilderness.net/docs/curriculum/8-2.pdf .

- Turtle Hurdles: Students will analyze and interpret data from a simulation that will allow students to understand how hazards can be a limiting factor in a population. This resource can be found at http://cpw.state.co.us/learn/Pages/ProjectWildTurtleHurdles.aspx.

Resources

- Alive or Not?: This is a downloadable worksheet for students to apply their knowledge if something is alive (biotic) or not (abiotic).This resource can be found at https://earthref.org/ERDA/1568/ .

- K- 12 Soil Science Teacher Resources: This website sponsored by the Soil Science Society of America provides a variety of information on soil including a bank of lessons and activities based on topics related to soils. This resource can be found at http://www.soils4teachers.org/lessons-and-activities.

- Fungus-Cultivating Termites of the African Savanna — Ecosystem Engineers: This infographic demonstrates the relationship between biotic and abiotic. This resource can be found at http://www.hhmi.org/biointeractive/fungus-cultivating-termites-african-savanna-ecosystem-engineers.

- Soil 4 Kids: This site has a variety of additional experiments and ideas for students in relation to soil. It also connects soil to careers and communities. This resource can be found at http://www.soils4kids.org/.

- A Single Butterfly: Students use an interdisciplinary approach to identify the different levels of organization through different vocabulary strategies and graphic organizers. Although this lesson states it is for tenth graders, the vocabulary strategies and graphic organizers are easily adaptable to seventh-grade students. Be sure to click on the other tabs to see the multitude of resources available. This resource can be found at http://asinglebutterfly-scienceandela.weebly.com/day-0-ecological-levels-of-organization.html.

- Ultra New Fantastic Edu-Toon Levels of Organization in Ecology: This short video introduces the Level of Organizations in Ecology. https://www.youtube.com/watch?v=JPA3Jv9DEdc

- Interactive Ecology Labs: This is an interactive lab in which students make predictions about interactions in the ecosystem. https://www.learner.org/courses/envsci/interactives/ecology/

- Published Soil Surveys for South Carolina: This website can be used to find out what soils are underneath students' feet at school and at home. https://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=SC

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc. (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- 7.EC.5A.1
  - Illustrated Model of Levels of Ecology: Students can research a biome and can create a model similar to the illustration in this set of slides. http://p5cdn5static.sharpschool.com/UserFiles/Servers/Server_42350/File/Staff_Documents/6th%20Grade/L.%20Thomas/Life%20Science/Levels%20of%20Organization%20Illustration%20Activity%202014_web.pdf

  - A Single Butterfly: Students use an interdisciplinary approach to identify the different levels of organization through different vocabulary strategies and graphic organizers. Although this lesson states it is for tenth graders, the vocabulary strategies and graphic organizers are easily adaptable to seventh-grade students. Be sure to click on the other tabs to see the multitude of resources available. There are many different types of models for students to see, use, and continue to develop in this website. This resource can be found at http://asinglebutterfly-scienceandela.weebly.com/day-0-ecological-levels-of-organization.html.

- 7.EC.5A.2
  - Students can use this website to look at different soil profiles and construct explanations about how soil quality affects an ecosystem. Relationships between depth of topsoil and type of ecosystem can be inferred. Students can also see soil sizes and composition in each biome. http://scetv.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.soils/soils-around-the-world/

- 7.EC.5A.3
  - Provide students with data on a population and a card that would describe a change that occurs to the physical environment (natural hazards or limiting factors). Students should interpret the provided data and predict what the data will look like as a result of the physical environment change. Students should explain their reasoning.

  - Limiting Factors Homework: This resource contains six real-world scenarios relating to limiting factors. These questions could be broken up to use as a carousel, jigsaw, or exit slips. The questions require that students to read and analyze the scenarios to identify the correct limiting factor that is being assessed. This resource can be found at http://studylib.net/doc/6943209/limiting-factors-homework-below-is-a-list-of-scenarios-re….

Unit Title
Ecology: Interactions of Living Systems and the Environment
Standard http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
7.EC.5 The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.

Conceptual Understanding
7.EC.5B Organisms in all ecosystems interact with and depend upon each other. Organisms with similar needs compete for limited resources. Food webs and energy pyramids are models that demonstrate how energy is transferred within an ecosystem.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**

Biological Control	Chemical Control	Commensalism	Competition	Emigration	Food Chain
Food Pyramid	Food Web	Immigration	Invasive Species	Mutualism	Native Species

Niche	Parasite	Parasitism	Physical Control	Predation	Predator
Prey	Symbiosis				

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's.

7.EC.5B.1 *Develop and use models* to explain how organisms interact in a competitive or mutually beneficial relationship for food, shelter, or space (including competition, mutualism, commensalism, parasitism, and predator-prey relationships).

7.EC.5B.2 *Develop and use models* (food webs and energy pyramids) to exemplify how the transfer of energy in an ecosystem supports the concept that energy is conserved.

7.EC.5B.3 *Analyze and interpret data* to predict how changes in the number of organisms of one species affects the balance of an ecosystem.

7.EC.5B.4 *Define problems* caused by the introduction of a new species in an environment and *design devices or solutions* to minimize the impact(s) to the balance of an ecosystem.

***Science and Engineering Practices**

Support for the guidance, overviews of grade level progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

7.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

7.S.1A.4. Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

7.S.1B.1 Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.

***Cross Cutting Concepts** **(http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012). The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

2. Cause and effect: Mechanism and explanation: The National Research Council (2012) states that "events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts" (p. 84). *There is a causal relationship that results from the interactions of organisms within an ecosystem.*

4. Systems and systems models: The National Research Council (2012) states that "Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering" (p. 84). *System models can explain how varying factors affect the balance within an ecosystem.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge

- 5.L.4A (Ecosystems)
- 5.L.4B (Survival Needs of Organisms)
- 6.L.4 (Classification of Organisms)

Subsequent Knowledge

- H.B.6 (Ecosystems)

Possible Instructional Strategies/Lessons

Strategies and lessons that will enable students to master the standard and/or indicator.

- 7.EC.5B.1
  - Symbiotic Relationships: Through a combination of videos and class discussions, students will describe the different types of symbiotic relationships and apply their learning to real world examples. Students can develop models to understand interactions of organisms. This resource can be found at http://www.cpalms.org/Public/PreviewResourceLesson/Preview/131012.
  - Exploring Symbiosis: Students will play a game to determine organisms that are in a symbiotic relationship and to explain the cause and effect relationships between organisms. In order to meet the requirements of this indicator, have students explain how these relationships enable organisms to meet their needs. This resource can be found at

http://oimb.uoregon.edu/Documents/GK12/GK12-Fourth-Symbiosis.pdf.

- Wolf Quest: Students will simulate the interactions between a predator population of gray wolves and a prey population of deer. Students will collect the data, plot the data to make a graphing model, and then predict the populations for several more generations based on the model. This resource can be found at https://www.wolfquest.org/pdfs/Deer%20Me%20Lesson.pdf.

- Oh Deer!: The game can also be adapted by adding predators to the game "wolves" that will try to catch the deer as they are trying to get resources. If a deer is caught, it becomes a wolf. If a wolf doesn't catch a deer, it becomes a resource. You can plot the deer and wolf population on a line graph and can see how predator/prey lines shadow each other. This activity is also a strategy in the previous indicator but can be used to teach the two indicators combining the predator prey relationships and limiting factors. This resource can be found at https://naturebridge.org/sites/default/files/Oh%20Deer_1.pdf.

- Predator Prey Simulation: Students formulate a hypothesis to make predictions how the population of rabbits remain in balance when variables such as reproduction rates and the increase/decrease of prey are manipulated. Students will collect and analyze data, form a conclusion, and write a lab report with this simulation model. This resource can be found at https://www.biologycorner.com/worksheets/pred_prey.html.

- Invasive Species Game: Students will participate in a simulation to identify problems caused by the introduction of a new species in an environment. This activity demonstrates how competition caused by an invasive species alter the balance in an ecosystem. As an extension of this activity, students could research invasive or non-native species that impact the local ecosystem. This resource can be found at https://www.utoledo.edu/nsm/lec/gk12_grant/pdfs/Invasive_Species_Game_Lesson.pdf.

- 7.EC.5B.2
  - Constructing Chains and Webs: Modeling Ecological Relationships: Students will build model food webs using cards and then evaluate how ecological disturbances affect trophic levels. This resource can be found at http://www.hhmi.org/biointeractive/creating-chains-and-webs-model-ecological-relationships.

  - Energy Conservation in Ecosystems: This lesson contains activities that allow students to gather data and analyze it while modeling energy transfer in an ecosystem. This resource can be found at

http://www.cpalms.org/Public/PreviewResourceLesson/Preview/152015.

- Estuary Food Pyramid: Students will create a food pyramid to examine the movement of energy through an estuary ecosystem. This resource can be found at http://estuaries.noaa.gov/teachers/pdf/04_food_pyramid_tg.pdf.

- Pond Water Web: Students will create a food web illustrating the energy flow between organisms. Students will be able to determine how environmental changes may affect the ecosystem-which can be tied to other indicators. In order to meet the requirements of the indicator, the teacher must stress the energy transfer through the food web. This resource can be found at http://sciencespot.net/Media/pondfoodwebinfo.pdf.

- 7.EC.5B.3
  - Web of Life Game: This is a short introductory activity that allows students to see how one population affects all other organisms in the ecosystem. In order to meet the requirements of the indicator, the teacher should have discussions to ask students how other organisms are affected. Discuss why they feel the tug. This resource can be found at http://www.amnh.org/ology/features/stufftodo_bio/weboflife.php.

  - The Wolves of Yellowstone: Students will read about the absence of the wolves in the Yellowstone National Park, the impacts of the absence, the reintroduction of the wolves allowing students to analyze the change in resource availability in YNP, and construct an explanation of the subsequent changes in animal populations. This resources can be found at https://www.natureworkseverywhere.org/asset/Wolves_of_Yellowstone_Teacher_Guide_FINAL_NWE.pdf .

- 7.EC.5B.4
  - Hungry Pests: This set of lessons includes activities for students, premade informational text cards, and a project based learning opportunity at the conclusion of the set of lessons where students define problems caused by pests on wanted posters. This resource can be found at http://www.hungrypests.com/resources/HP_InvadeMS_Curriculum.pdf.

- Aliens in the Everglades-Developing Arguments and Designing Solutions: Students will define problems caused by invasive species in the Everglades. Students will analyze information and data provided to determine the best solution to limit the population of the invasive species. This resource can be found at http://www.myteacherpages.com/webpages/acrouch/files/activity_aliens%20in%20the%20everglades.pdf.

Resources

- Interactive Lab: Ecosystems: This simulation allows student to look at the relationships of two plants and try to get the plants to co–exist. In any given ecosystem, most organisms will create a niche for themselves in order to survive. Many times, different species within the ecosystem compete for resources that a niche provides. However, certain species co-exist well together. http://www.learner.org/courses/envsci/interactives/ecology/producers.php

- Invaders Game: PBS offers fun and engaging games, apps, videos, and hands-on activities for online use as well as outdoors. http://pbskids.org/plumlanding/games/invaders/

- Hungry Pests Invade Middle School: This resource provides a set of activities built around a simulation showing the effects of an "invasive species" in a middle school. http://www.hungrypests.com/resources/HP_InvadeMS_Curriculum.pdf

- Wild Things Investigating Invasive Species: This resource provides information and some possible activities dealing with invasive species in the United States. This resource can be found at https://www.fws.gov/invasives/pdfs/wildthingsmanual-1v4.pdf.

- Energy Transfer Article: This resource contains an article on food webs and energy transfer. http://www.cas.miamioh.edu/scienceforohio/wetlands/images/pyramd2c.pdf

- Food Web Game: This is an interactive food web to support learners who might need additional help with food webs. http://www.blue-iceberg.net/rutgersfoodweb/frameset.html

- How Birth, Immigration, Emigration, & Death Affect Populations: This video allows students to visually see how birth, death, immigration and emigration affect the balance of an ecosystem. http://study.com/academy/lesson/how-birth-immigration-emigration-death-affect-populations.html

- Savannah River Ecology Laboratory: This site gives information on educational outreach programs where scientists come to a school (at no cost) and do an "Eco talk" featuring different animals native to South Carolina. They can tailor the talk to the specific standards being covered. They also have other educational resources like ecology fact sheets that are specific to South Carolina. http://srel.uga.edu/outreach/index.html

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc. (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- 7.EC.5B.1
  - Predator Prey Simulation: This site provides students with a simulation on rabbits, with multi variables (i.e. reproductive rate of the prey, number of prey eaten by each predator, and reproductive rate of the predator.) Students would make a prediction, write a hypothesis, run the simulation and collect data, and then write a conclusion that includes how this applies to the real world. This resource can be found at https://www.biologycorner.com/worksheets/pred_prey.html.

  - Deer Predation or Starvation?: Students identify predator/prey relationships as well as how they may or may not effect one another. Students will also examine the changes that populations experience to keep a balance in the ecosystem. Students will also develop a mathematical model to illustrate population changes in a predator/prey relationship. This can be used as a formative assessment to get feedback from students about predator prey relationships. This resource can be found at https://www.wolfquest.org/pdfs/Deer%20Predation%20or%20Starvation%20Lesson.pdf.

- 7.EC.5B.2
  - Got Energy? Spinning a Food Web: Students will develop a diagram of a food web to exemplify how food energy is passed through an ecosystem. Assessment questions are included. This activity is designed for fourth grade but can easily be adjusted for seventh grade. This resource can be found at https://www.teachengineering.org/activities/view/cub_bio_lesson03_activity1.

- 7.EC.5B.3
  - Honeybee Mystery: Why are so many bees dying?: Students will use literacy skills to analyze information in articles and to write a persuasive paper about the need for honeybees and the protection of honeybees. Students will predict how the bee species can affect the balance of an ecosystem. This resource can be found at http://www.ode.state.or.us/wma/teachlearn/subjects/science/assessment/sample_sbperftask_honeybee_mystery.pdf.

- 7.EC.5 B.2 & 7.EC.5B.3
  - Food Web Activity-Investigating an Important Link: Students will explore an estuarine ecosystem by examining the American Shad. The activity asks students to create a food web, identify causes of the decline in population of a species, and explore the restoration practices that may return the species to a stable population. This resource can be found at https://www.fws.gov/chesapeakebay/shad%20activities/pdfs/Form1FoodWebmiddleschool.pdf.

- 7.EC.5B.4
  - Placemat Strategy for Invasive: Students will use the placemat strategy to define problems caused by the introduction of a new species. The description of the placemat strategy is connected to this site: http://www.learnalberta.ca/content/sssm/html/placematactivity_sm.html.

  - Invasive Species Research: Have students research an invasive species of their choice. They should research some of the suggested solutions to the problems. Students should present the information they find including a suggested solution to the problem. Students should include their reasoning for the solution plan.

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