

*Holyoke Public Schools  
Middle School Science  
Curriculum Map  
Grade 7*

*Ecosystems  
Unit #3*

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## **Holyoke Public Schools**

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## English Language Proficiency Domains and General Learning Outcomes

**S.1 Vocabulary:** Students will comprehend and communicate orally, using English vocabulary for personal, social, and academic purposes.

**S.3 Academic Interaction:** Students will comprehend and communicate orally, using spoken English to participate in academic settings.

**S.4 Presentation:** Students will present information orally and participate in performances in English that demonstrate appropriate consideration of audience, purpose, and the information to be conveyed.

**R.3 Comprehension:** Students will read English fluently and identify facts and evidence in order to interpret and analyze text.

**R.6 Research:** Students will gather information in English from a variety of sources, analyze and evaluate the quality of the information obtained, and use it to answer their own and others' questions.

**W.2 Writing:** Students will write in English for a variety of purposes with clear focus, coherent organization, and sufficient detail.

**Resources:** *Diversity of Life FOSS kit*

**Prentice Hall Science Explorer, *From Bacteria to Plants & Environmental Science***

Student Text, Student Edition on Audio CD, Teacher's Edition, & Color Transparencies

All-in-One Teaching Resources

- Blackline masters, teaching support, and answer keys are organized by chapter.

TeacherEXPRESS

- (4 CD-ROM Set) contains lesson management software, an Interactive Teacher's Edition, correlates to state and local standards, and instructional tools.

Differentiated Instruction

- *Guided Reading and Study Workbook*, *Adapted Reading Study Workbook*, & *Adapted Tests*

**Big Idea: All Living Things can be classified into Five Kingdoms**

**Massachusetts Science and Technology/Engineering Standards**

LSS # 1. Classify organisms into the currently recognized kingdoms according to characteristics that they share. Be familiar with organisms from each kingdom.

**MCAS item analysis (what do students need to be able to do)**

- ✓ Know or describe the characteristics used to classify organisms onto each Kingdom
- ✓ Know the 5 kingdoms: Animalia, Plantae, Fungi, Protista, and Monera (bacteria)
- ✓ Differentiate between nucleated (eukaryote) and non-nucleated (prokaryote) cells
- ✓ Know or give examples of organisms that belong to each kingdom
- ✓ Visually identify common examples of each

**Essential Prior Knowledge**

- ✓ Recognize that all living things are made of cells
- ✓ Know the difference between plant and animal cells

**Lesson Content Goals**

1. Describe the characteristics used to identify living things
2. Know the five Kingdoms: Animalia, Plantae, Fungi, Protista, and Monera (bacteria)
3. Describe the characteristics used to identify organisms in each kingdom
4. Differentiate between prokaryotes (no nucleus in cells) and eukaryotes (nucleus in cell)
5. Recognize written and visual examples of organisms that belong to each kingdom
6. Give examples of organisms that belong to each Kingdom

**Artifacts**

**Vocabulary:** Animalia, Fungi, Protista, Plantae, Monera, bacteria, kingdoms, organism, characteristics, classify, nucleus, organelles, eukaryote, prokaryote, autotrophic, heterotrophic, living, non-living

**\*\*** Students should make notebook entries (words, definitions, and illustrations) as words are introduced lesson by lesson. In addition, a word wall should be created in the classroom for students to refer to when needed as they speak, read, and write.

**Thinking skills required:** know, differentiate, recognize, identify, describe

Lesson Content Goal: Describe the characteristics used to identify living things

- **Guiding Question:** *What is a living thing?*

- Investigation 1, Part 1: **Living or Nonliving?** Diversity of Life FOSS kit, page 43-51. Students observe the mysterious substance (camphor) when placed in water and record their observations in their notebooks. Students sort pictures of objects and organisms into living and nonliving groups, defining the characteristics that qualify objects as living.
- *Inquiry-based Activity.* Investigation 1, Part 2: **Is anything alive in here?** Diversity of Life FOSS kit, page 52-63. Students place five unidentified materials (sand, yeast, polyacrylate crystals, radish seeds, and brine shrimp eggs) in different environments and observe what happens after a day. Students determine if materials are living and record the evidence that supports their determinations. Students are introduced to the distinction between living, nonliving, dormant, and dead. Lab Notebook pages 3, 4, and 5. Compile whole class data, analyze the data, discuss results, and define living, dormant, dead, and nonliving.
- Students work in groups to make list of living things they know. *Most likely they will list all kinds of plants and animals, which is fine as we plan to introduce them to fungi, protist, and bacteria.*
- Students learn the MRS GREN Mnemonic, to help them identify the seven life processes that characterize life: M = movement, R = respiration, S = stimuli (reaction to), G = growth, R = reproduction, E = elimination of wastes, and N = nutrition (acquiring of making food). Here are the seven activities of all living things. If you remember that someone has an auntie called MRS GREN you will be able to remember all seven activities. <http://sambal.co.uk/mrsgren.html>
- Classifying Activity: Students use a dichotomous key to sort Norns, see appendix. This activity is an example of how scientists classify things. <http://www.biologycorner.com/worksheets/dichoto.html>

Lesson Content Goal: Know the five Kingdoms: Animalia, Plantae, Fungi, Protista, and Monera (bacteria)

- **Guiding Question: What are the Five Kingdoms of living things?**

Lesson Content Goal: Describe the characteristics used to identify organisms in each kingdom

- **Guiding Question: What characteristics are used to sort living things into the five Kingdoms?**

Lesson Content Goal: Differentiate between prokaryotes (no nucleus in cells) and eukaryotes (nucleus in cell)

- **Guiding Question: What is the difference between a prokaryote and a**

*eukaryote?*

- Students read the article "Kingdoms of Life", page 65-70 in the Diversity of Life Resources book. Students read about how scientists have created 5 large categories called kingdoms, to classify all living things. The five Kingdoms are Monera (bacteria), Protista, Fungi, Animalia, and Plantae. Students make a table listing the 5 kingdoms in the first column, characteristics for each kingdom in the second column, and examples of organism for each kingdom in the third column.
- Formative Assessment:  
If a new organism were discovered, which of the following would **most likely** be used to classify it into the appropriate kingdom?
  - A. the color of the organism
  - B. the organism's natural habitat
  - C. the structure of the organism's anatomy
  - D. the location where the organism was found

Lesson Content Goal: Know the five Kingdoms: Animalia, Plantae, Fungi, Protista, and Monera (bacteria)

- *Guiding Question: What organisms belong to the Protist Kingdom?*
- Protist Lab Activity: Students use microscopes to view live Protozoa mix...use the Demoslides tubes we purchased...Protozoa mix must be ordered 10 days in advance. See Diversity of Life Resource Book pages 4 to 7 for microorganism guide.

Lesson Content Goal: Know the five Kingdoms: Animalia, Plantae, Fungi, Protista, and Monera (Bacteria)

- *Guiding Question: What organisms belong to the Fungi Kingdom?*
- Show students a mushroom and/or bread mold (several different examples of fungi). Ask students if mushrooms and bread mold are living things? Have them use the characteristics of living things to help them make their decision.
- Students read in small groups: "What is mold, anyway?" See appendix. Students record notes in their notebooks.

Lesson Content Goal: Describe the characteristics used to identify organisms in each kingdom

- *Guiding Question: What are the characteristics of organisms that belong to the Fungi Kingdom?*

- Students read about, write about, and draw about Fungi. Obtain a suitable fungi book from your school or local library. Hold a general, short discussion about what fungi are, where they may grow and the climatic type of condition they would need to grow. Encourage students to participate in the discussion and gauge what students know about fungi before any fungi books are read. Once students have read about fungi they are to write an assignment about fungi using illustrations.
- Formative Assessment:  
While hiking through Granville State Forest, a student finds an unusual plant-like organism that appears to lack chlorophyll. When the student examines a sample using a microscope, he sees many cells with cell walls and no chloroplasts. This organism is **most likely** a member of what Kingdom?
  - A. Animalia
  - B. Eubacteria
  - C. Fungi
  - D. Protista

Lesson Content Goal: Describe the characteristics used to identify organisms in each kingdom

- ***Guiding Question: How are organisms in the Fungi Kingdom similar and different than organisms in the Plant Kingdom?***
- Fungi discussion question - For a long time, fungi (mushrooms, etc.) were classified in the plant kingdom. Eventually, they were placed into their own kingdom (Kingdom Fungi). List some reasons that they are similar to plants. Then list some reasons that they are different from plants. [Possible Answers: \*Similarities - both fungi and plants are multi-cellular and have cell walls; neither move from place to place. \*Differences - cells walls in each are made from different materials; plants make their own food (autotrophic), while fungi can't (heterotrophic)]
- Formative Assessment:  
A mushroom is a member of the Kingdom Fungi. Members of Kingdom Fungi are unique because they digest their food outside their bodies and then absorb the nutrients.  
*You may organize your answer for parts a, b, and c in a chart.*
  - a) Name **two** other Kingdoms of living organisms.
  - b) Give **one** example of an organism that is classified into each Kingdom you described in part a.
  - c) For each Kingdom that you selected, describe **two** characteristics that are used to classify organisms into that Kingdom.

Lesson Content Goal: Recognize written and visual examples of organisms that belong to each kingdom

- **Guiding Question: What Kingdom do organisms belong to?**

- Students identify the kingdom that 20 organisms belong to. They write at least one characteristic that places the organism into its kingdom (Monera, Protista, Fungi, Plantae, or Animalia), see appendix.

<http://www.schools.utah.gov/curr/science/sciber00/7th/classify/sciber/kinglab.htm>

The answer page

<http://www.schools.utah.gov/curr/science/sciber00/7th/classify/sciber/kinglab2.htm>

Lesson Content Goal: Know the five Kingdoms: Animalia, Plantae, Fungi, Protista, and Monera (Bacteria)

- **Guiding Question: What organisms belong to the Monera Kingdom?**

- Bacteria may eventually be divided into more than just the one kingdom Monera because there are some very different groups of bacteria. Algae pose an entirely different problem. Earlier classification schemes classified algae as plants. However, current schemes include the unicellular algae within the kingdom Protista, while keeping the multi-cellular algae within the plant kingdom. Classification is a constantly changing, dynamic science! This means that you can still learn by discovery, not just memorization!

Lesson Content Goal: Recognize written and visual examples of organisms that belong to each kingdom

- **Guiding Question: What Kingdom do organisms belong to?**

Lesson Content Goal: Give examples of organisms that belong to each Kingdom

- **Guiding Question: What organisms belong in each Kingdom?**

- **Five Kingdom Card Game**

1. Have students go through old magazines, and/or use the internet to print some pictures to make a collection of pictures of living things from the five Kingdoms. Encourage students to look for microscopic living things as well as large, easily recognizable living things.
2. Each student makes 5 cards. Have students glue their pictures onto index cards, one image per card. Have students write the name of the organism on the card. *Laminate the pictures so that you can reuse them next year.*

3. Pass out 5 to 10 cards to each team, leaving a small class pile in the center. Explain the object of the game is for each team to get rid of all its cards by correctly classifying the item pictures.
  4. The teacher calls out a Kingdom. Each team must select a card that fits that Kingdom and hold it up. If their classification is correct, they discard the card to the central pile. If their classification is wrong, they have to draw another card from the pile and they can't discard. Allow the teams time to come to a decision among themselves about which card to hold up.
  5. The first team to discard all their cards wins.
- Formative Assessment: Have students make a bar graph of the Five Kingdoms of Living Things. Have them use 5 or more of the index cards we produced for the game above and sort them according to the kingdoms.

**Big Idea: Organisms interact and have different functions within an ecosystem that enable the ecosystem to survive.**

**Massachusetts Science and Technology/Engineering Standards**

LSS # 14. Explain the roles and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

**MCAS item analysis (what do students need to be able to do)**

- ✓ Explain the role of each organism in an ecosystem
- ✓ Identify producers, consumers, and decomposers and explain why they would be classified that way
- ✓ Read and interpret a food web diagram for the following: producer, consumer, decomposer, effects of elimination of an organism
- ✓ Understand and /or explain how elimination of one organism affects the population of other organisms in a food web
- ✓ Draw a food chain or food web from a list of organisms in an environment
- ✓ Identify which organisms have the greatest or least impact on ecosystems
- ✓ Understand and draw "arrows" in a food web as the direction of energy flow
- ✓ Identify organisms that produce energy from sunlight

**Essential Prior Knowledge**

- ✓ Know producers, consumers and decomposers
- ✓ Understand energy transfer in a food web

**Lesson Content Goals**

1. Understand that each organism in an ecosystem fills the energy role of either a producer, a consumer, or a decomposer
2. Recognize and describe the role of organisms in a food web (producer, consumer,

decomposer)

3. Draw arrows on a food web to demonstrate understanding of the flow of energy
4. Explain the consequences of removal of any 1 organism from a food web

### Artifacts

**Vocabulary:** ecosystem, producer, consumer, decomposer, herbivore, carnivore, omnivore, decomposition, micro-organisms, organism, recycled, scavenger, flow of energy, food web

**Thinking skills required:** Understand, recognize, describe, draw, demonstrate, explain, identify, interpret, roles, relationships, energy transfer

Lesson Content Goal: Understand that each organism in an ecosystem fills the energy role of either a producer, consumer, or decomposer

- **Guiding Question: What is the energy role of each organism in an ecosystem?**
- Students read about the Flow of Energy in Ecosystems, pages 42-47, *Environmental Science*. Students record definitions in their notebooks.
- **Formative Assessment:**  
Which of the following organisms produces energy from sunlight?  
A. worm  
B. rabbit  
C. hawk  
D. grass
- **\*\*\*\*Students design, and build an ecosystem (aquarium, terrarium, or eco-bottle). Students construct a table of the organisms in their ecosystem and identify the organisms as producers, consumers (herbivore, carnivore, omnivore, or scavenger), or decomposers (bacteria). \*\* Teachers should have available for students a model of one of the ecosystems a student could create in a bottle: terrestrial habitat, compost habitat, aquatic habitat, or a combination of all three: terr-aqua (eco) column. See project description at end of unit for more information.**

Lesson Content Goal: Recognize and describe the role of organisms in a food web (producer, consumer, decomposer)

- **Guiding Question: How can you tell if an organism in a food web is a consumer, producer or decomposer?**

Lesson Content Goal: Draw arrows on a food web to demonstrate understanding of the flow of energy

- **Guiding Question: How does energy flow in the food web?**

- Students make a diagram with labels of a food web using the picture on page 45, *Environmental Science*. Students record their observations in their notebooks.
- Students complete the Food Web activity, "Weaving a Food Web" on page 44, *Environmental Science*. This activity demonstrates the importance of each organism in a food web. Students record their observation in their notebooks.
- On-line Activity: Students create a meadow, pond and arctic food webs [http://www.harcourtschool.com/activity/food/arctic\\_activity.html](http://www.harcourtschool.com/activity/food/arctic_activity.html)
- Students label the animals (producers, consumers, herbivores, carnivores, omnivores) that are part of a food web (see appendix) [http://www.harcourtschool.com/activity/food/arctic\\_activity.html](http://www.harcourtschool.com/activity/food/arctic_activity.html)
- Formative Assessment: Draw a food web using the following organisms (grass, mushroom, mouse, hawk, snake, fox, rabbit, and corn). Label each organism as producer, consumer, or decomposer. Use arrows to represent the flow of energy.

Lesson Content Goal: Explain the consequences of removal of any 1 organism from a food web

- **Guiding Question: What happens to a food web when any 1 organism is removed?**

- Students complete the Activity: Analyzing Interaction Among Organisms, page 69, in the *All-in-One Teaching Resources Environmental Science* book. Students record their observations in their notebooks.

- Formative Assessment:

The population of which of the following organisms would **most likely** decline if small animals like rats, rabbits, and snakes were eliminated from an ecosystem?

- A. earthworms
- B. grasses
- C. hawks
- D. mushrooms

**Big Idea: Dead plants and animals are broken down by other living organisms**

**Massachusetts Science and Technology/Engineering Standards**

LSS #15. Explain how dead plants and animals are broken down by other living organisms and how this process contributes to the system as a whole.

### MCAS item analysis (what do students need to be able to do)

- ✓ Identify organism responsible for decomposition
- ✓ Identify and match a role to an organism
- ✓ Identify and match a description to a role
- ✓ Explain how removal of decomposers affect an ecosystem

### Essential Prior Knowledge

- ✓ Understand the roles and relationships among producers, consumers, and decomposers
- ✓ Nature has a cycle process in which nutrients are recycled

### Lesson Content Goals

1. Explain the process of decomposition
2. Identify organisms responsible for decomposition
3. Explain how removal of decomposers affect an ecosystem

### Artifacts

**Vocabulary:** producers, decomposers, consumers, decomposition, ecosystem

Lesson Content Goal: Explain the process of decomposition

- **Guiding Question: What happens during decomposition?**
- Classroom demonstration of decomposition. In a closed class container add some food scraps to some soil, and allow students to observe the food scraps breaking down over time. [http://www.bottlebiology.org/investigations/decomp\\_main.html](http://www.bottlebiology.org/investigations/decomp_main.html)  
<http://aggie-horticulture.tamu.edu/extension/compostfacility/les14.htm>

Lesson Content Goal: Identify organisms responsible for decomposition

- **Guiding Question: What organisms are responsible for decomposition?**
- Students design an experiment of compare and contrast decomposition of food scraps with and without worms.
- Students read and discuss the role of bacteria in the environment, page 56, *From Bacteria to Plants*. Students record notes about the role of bacteria in their science notebooks.
- Students read about the organisms (bacteria, fungi, and worms) that are responsible for decomposition <http://www.nhptv.org/NatureWorks/nwep11b.htm>  
<http://www.teachersdomain.org/resource/tdc02.sci.life.oate.decompose/>

- Formative Assessment: What kinds of organisms are decomposers? Give specific examples.

Lesson Content Goal: Explain how removal of decomposers affect an ecosystem

- **Guiding Question:** *What would happen to an ecosystem if all the decomposers were removed?*

- Classroom discussion: What would happen to all the trash people generate if there were no decomposing bacteria in the soil? Students record notes in the science notebooks.

For a graphic display about the composition of American garbage go to <http://www.gmushrooms.com/MushroomInformation/Composting.htm>

- Formative Assessment: Explain why it is important that dead animals and plants in an ecosystem are broken down.

- Bacteria Lab Activity: Students create a **Winogradsky Column**, to demonstrate the growth of microorganisms in a column of mud. The columns are complete, self-contained recycling systems, driven only by energy from light! The column is not a natural environment. All of the organisms are mixed during the preparation and it is merely to study environments that develop over time. When it is sealed and exposed to light, a succession of microbes will develop according to the concentrations of oxygen, nutrients and light available. Depending on the various concentrations of nutrients and the type of soils used, a variety of bacteria will appear over time.

However, it is an excellent model of microbial ecology. Each organism is dependent on the other to set the conditions for development and the entire column is run on the energy of light. The Winogradsky Column is a classic demonstration of the metabolic diversity of prokaryotes. Examine the columns weekly for at least a month, recording changes in color and depth as they occur. (see appendix)

<http://www.biology.ed.ac.uk/research/groups/jdeacon/microbes/winograd.htm>

[http://quest.arc.nasa.gov/projects/astrobiology/fieldwork/lessons/Winogradsky\\_5\\_8.pdf](http://quest.arc.nasa.gov/projects/astrobiology/fieldwork/lessons/Winogradsky_5_8.pdf)

**Big Idea: Organisms in an ecosystem interact**

**Massachusetts Science and Technology/Engineering Standard**

LSS # 13. Give examples of ways in which organisms interact and have different functions within an ecosystem that enable the ecosystem to survive.

**MCAS item analysis (what do students need to be able to do)**

- ✓ Identify characteristics of an ecosystem based on graphical data (read and

interpret a graph)

- ✓ Recognize symbiotic and parasitic relationships
- ✓ Describe ways that organisms help other organisms survive and grow

#### Essential Prior Knowledge

- ✓ An ecosystem is a community of organisms that live in a particular area, along with their nonliving surroundings
- ✓ Living organisms in an ecosystem interact with one another

#### Lesson Content Goals

1. Study and analyze a specific ecosystem over time (aquarium, terrarium, eco-bottle, etc.)
2. Interpret graphical data from the study of an ecosystem
3. Recognize different relationships between organisms in an ecosystem including symbiotic, predator/prey, and parasitic relationships
4. Describe ways that organisms help other organisms survive and grow

#### Artifacts

**Vocabulary:** ecosystem, symbiosis, symbiotic, parasitic, predator, predatory, prey, relationship, mutualism, commensalism, parasitism

Lesson Content Goal: Interpret graphical data from the study of an ecosystem

- **Guiding Question:** *What can data about the relationship of organisms within ecosystems tell us about the ways organisms interact?*
- Students do a Predator-Prey Simulation. The student simulates the interactions between a predator population of lynx and a prey population of rabbits in a meadow. After collecting the data, the student graphs the data and then extends the graph to predict the populations for several more generations. (see appendix)  
<http://www.accessexcellence.org/AE/AEPC/WWC/1991/predator.php>
- Students graph and interpret real life data about the predator-prey relationship between snowshoe hare and Canadian lynx. (see appendix)  
<http://www.biotopics.co.uk/newgcse/predatorprey.html>
- **Formative Assessment:** Students complete the Activity: Predator-Prey Interactions, page 27, *Environmental Science*. Students interpret a graph about the wolf and moose populations on Isle Royale, an island in Lake Superior, from 1965 to 2005.

Lesson Content Goal: Recognize different relationships between organisms in an ecosystem including symbiotic, predator/prey, and parasitic relationships

- ***Guiding Question: What are the different types of relationships between organisms in an ecosystem?***
- Students read about Symbiosis, page 30 to 31, *Environmental Science*. Students use a graphic organizer to compare and contrast mutualism, commensalism, and parasitism, and give examples of each type of symbiosis. Students record their observations in their science notebooks.
- Students research different examples of symbiotic relationships using the library, resource books, and the internet. Students record their observations in their science notebooks. Students present their findings to the class and record information on a class chart. In addition, students record the information on the class chart in their science notebooks.
- **Formative Assessment:**  
Lichens are symbiotic organisms made of green algae and fungi. What do the green algae supply to the fungi in this symbiotic relationship?
  - A. carbon dioxide
  - B. food
  - C. protection
  - D. water

## Ecosystem Project

Lesson Content Goal: Study and analyze a specific ecosystem over time (aquarium, terrarium, eco-bottle, etc.)

- **Guiding Question: How do organisms interact in an ecosystem?**

### Ecosystems

- a. Students plan how to construct their ecosystems
- b. Students note materials needed to build their ecosystems
- c. Students must obtain teacher approval, before building their ecosystems
- d. Students observe, collect data, take notes and make drawings of their habitats on a weekly basis
- e. At the end of this unit, students make an oral presentation about their ecosystems.

### **Student Resources:**

*Bottle Biology: An idea book for exploring the world using soda bottles and other recyclable materials, Second Edition, Kendall/Hunt Publishing Company, 2003.*

Website: <http://www.learner.org/channel/courses/essential/life/bottlebio/ecocol/>

### **Students use their notes and observations to:**

Create a poster, Power Point presentation, or pamphlet that must include:

- What an ecosystem is
- Complete list of all the organisms in their ecosystem
- The name of the Kingdom of each organism in their ecosystem
- Students construct a table of the organisms in their ecosystem and identify the organisms as producers, consumers (herbivore, carnivore, omnivore, or scavenger), or decomposers (bacteria).
- A diagram of the food web between the organisms in their ecosystem (including energy flow with arrows)
- Students must present their findings to their classmates orally using some type of visuals.
- Students must write a reflection about their ecosystem. They must answer the following questions: What other things are you still wondering about? Are there any new questions you have about your ecosystem or next steps you would like to investigate? *(The purpose of the reflection is to get students to focus on what they learned, not what they liked or didn't like about the investigation or how they felt about working with other members of the group.)*

○ Formative Assessment:

A forest ecosystem in New Hampshire contains a large area where berry plants grow naturally. The berry plants help some organisms in the forest survive and grow. Other organisms in the forest help the berry plants survive and grow.

Describe **two** different ways that the berry plants help some organisms in the forest survive and grow.

b. Describe **two** different ways that other organisms in the forest help the berry plants survive and grow.