



Ecosystems Pacing Guide

Use the information below to assist you in determining the amount of time needed to complete the entire unit. These recommendations assume the **average science class period is 50 to 60 minutes in length**. We recommend teaching science a minimum of three sessions per week in order to maintain consistency and keep students engaged. Many teachers accomplish this by rotating a science unit with a social studies unit, enabling you to teach more science sessions in one week and finish the unit in fewer weeks. We highly recommend that all teachers participate in the Expository Writing and Science Notebooks Program in order to further develop students' science understandings, as well as their scientific thinking and writing skills. To implement the science-writing curriculum requires, for most lessons, a separate 20 to 30 minutes for a science-writing mini-lesson and independent writing time. Time for these mini-lessons are not included in this pacing guide.

Lessons and Common Assessments (see corresponding lesson in Instructional Guide (IG) for lesson planning)	Recommended Number of Periods	GLEs Addressed/Big Idea(s) of the Lesson	Considerations for Planning	Recommended Applications and Extensions
<p>Lesson 1: Thinking About Ecosystems</p> <p>Students share prior knowledge about the relationships between living things and the nonliving things in the environment, while viewing a visual aid.</p>	1-2	<p>GLE 1.2.1: Analyze how the parts of a system go together, and how these parts depend on each other. Big Idea: An ecosystem is a community of organisms and its interaction with its environment.</p>	<p>Students are just beginning to think about the parts of an ecosystem in this lesson. They will construct a definition for ecosystem after observing their model ecosystems in Lesson 4.</p>	<ul style="list-style-type: none"> • Take students into the schoolyard to observe relationships between living things and between living and nonliving things in the environment. • Groups collect dead leaves & 1 twig with lichen on it to add to terrariums.
<p>Lesson 2: Setting Up the Terrarium</p> <p>Students plan a controlled investigation as a class, identifying the 3 types of variables, then construct model terrariums to collect and record data. Students make and record observations of change in the terrariums over time.</p>	2	<p>GLE 2.1.2: Understand how to plan and conduct simple investigations. <i>Generate a logical plan for, and conduct, a simple controlled investigation with the following attributes: prediction, variables kept the same (controlled), one changed (manipulated) variable, measured (responding) variable, gather, record and organize data, multiple trials</i></p> <p>GLE 2.1.4: Understand how to use simple models to represent objects, events, systems, and processes.</p>	<ul style="list-style-type: none"> • This longer, modified lesson includes planning and conducting a controlled investigation. This is excellent practice for the controlled investigation students plan and conduct in Lessons 10-14, as well as effective practice for the science WASL. Follow the IG. • Live materials will arrive early in the trimester for use in the next lesson. • Follow the yellow plant & animal care sheets at the 	

			beginning of the IG.	
<p>Lesson 3: Setting Up the Aquarium</p> <p>Students construct model aquariums; observe, draw, read about, and take notes about 3 producers, which are added to the aquariums. Students make and record observations of change in the aquariums over time.</p>	4	<p>GLE 1.1.4: Understand that energy comes in many forms. GLE 1.2.2: Understand that energy can be transferred from one object to another and can be transformed from one form of energy to another. GLE 1.3.8: Understand that living things need constant energy and matter. Big Idea: Light energy from the sun is transferred to a producer where it is transformed into food energy.</p>	<ul style="list-style-type: none"> • Language Arts integration: nonfiction reading and note-taking in the context of science • Modified lesson includes constructing understanding of a producer as a system with interrelated parts, with inputs and outputs of matter and energy. Follow the IG. 	
<p>Lesson 4: Adding Animals to the Aquarium</p> <p>Students observe, draw, read, take notes and write about 2 consumers (fish and snails), which are added to the aquariums. Observations are recorded over time.</p>	2-3	<p>1.3.10: Understand that an organism’s ability to survive is influenced by the organism’s behavior and the ecosystem in which it lives. <i>Describe the role of an organism in a food chain of an ecosystem (predator, prey, consumer, producer, decomposer, scavenger).</i> Big Idea: These roles indicate how organisms gain energy for survival. Producers use light energy from the sun to make their own food; consumers must consume other organisms to gain energy.</p>	<ul style="list-style-type: none"> • Language Arts integration: nonfiction reading and note-taking in the context of science • Modified lesson includes constructing understanding of a consumer as a system with interrelated parts, with inputs and outputs of matter and energy. Follow the IG. 	Use the multiple copies of the <i>Ecosystems</i> book, which comes with the kit, to read pgs. 6-10, “What is an Ecosystem?” and “Eco Words”.
<p>Lesson 5: Observing the Completed Aquarium</p> <p>Students create a tree map to explain the relationships between living and nonliving components in an ecosystem. Students identify dependent and interdependent relationships between living and nonliving things.</p>	2	<p>GLE 1.2.1 Analyze how the parts of a system go together, and how these parts depend on each other. GLE 1.1.6: Understand how to distinguish living from nonliving and how to use characteristics to sort common organisms into plant and animal groups. Big Idea: Producers and consumers are <u>interdependent</u> because they depend on each other for survival. All organisms are <u>dependent</u> on abiotic environmental components such as sunlight, water, air, and mineral nutrients in soil and water for survival.</p>	Modified lesson includes constructing understanding of the model aquarium as an ecosystem with interrelated parts, with inputs and outputs of matter and energy. Follow the IG.	
<p>Lesson 6: Adding Animals to the Terrarium</p> <p>Students analyze data from the controlled investigation in lesson 2, then observe, draw, read about, take notes and write about 2 consumers (isopods and crickets) before adding them to the terrariums.</p>	2	<p>GLE 1.1.4: Understand that energy comes in many forms. GLE 1.2.2: Understand that energy can be transferred from one object to another and can be transformed from one form of energy to another. GLE 1.2.1 Analyze how the parts of a system go together, and how these parts depend on each other. Big Idea: The model terrarium is an ecosystem which has inputs and outputs of matter and energy, similar to real world terrestrial ecosystems.</p>	<ul style="list-style-type: none"> • Language Arts integration: nonfiction reading and note-taking in the context of science. Follow the IG. • Modified lesson includes constructing understanding of the model terrarium as an ecosystem with interrelated parts, with inputs and outputs of matter and 	Use the multiple copies of the <i>Ecosystems</i> book, which comes with the kit, to read pgs. 11-19, “Generalists and Specialists”, “What Eats What?” and “Dead and Done?”

			energy.	
Assessment A: Interactions: Dependencies and Interdependencies	1	GLE 1.1.6: Understand how to distinguish living from nonliving and how to use characteristics to sort common organisms into plant and animal groups.		
Application Lesson: Comparing Terrarium Model to Terrestrial Ecosystem Outdoors Students go into the school yard or nearby park to record producers, consumers and abiotic environmental components observed in the real world ecosystem. Then they compare and contrast their model terrarium ecosystems with the real world terrestrial ecosystem.	1-2	GLE 2.1.4: Understand how to use simple models to represent objects, events, systems, and processes. <i>List similarities and differences between a model and what the model represents. Describe reasons for using a model to investigate phenomena (e.g., processes that happen very slowly or quickly, things that are too small or too large for direct observation, phenomena that cannot be controlled).</i>		<ul style="list-style-type: none"> This real world connection of the terrarium model to the ecosystem outside on or near the school grounds should ideally be taught between lessons 6 and 8. Use the multiple copies of the <i>Ecosystems</i> book, to read pgs. 49-52, “Wildlife-Friendly Yards”.
Lesson 7: Joining the Terrarium and Aquarium Students join both models to create a watershed model, in which they observe runoff draining from the terrarium model into the aquarium model. Students construct understanding of how energy flows through a food chain and make inferences about the results of one type of organism, such as producers, dying out on the rest of the food chain.	1	GLE 1.2.2: Understand that energy can be transferred from one object to another and can be transformed from one form of energy to another. 1.3.10: Understand that an organism’s ability to survive is influenced by the organism’s behavior and the ecosystem in which it lives. <i>Describe how an organism’s ability to survive is affected by a change in an ecosystem (e.g., the loss of one organism in a food chain affects all other organisms in that food chain).</i>	Modified lesson includes constructing understanding of the watershed model as an ecosystem with interrelated parts, with inputs and outputs of matter and energy. Follow the IG.	Use the multiple copies of the <i>Ecosystems</i> book to read pgs. 28-30, “Snakes Rule”, which tells about the results of introducing a new organism into an ecosystem in Guam.
Assessment B: Aquarium Food Chain Wheel	1	GLE 1.3.8: Understand that living things need constant energy and matter. GLE 1.3.10: Understand that an organism’s ability to survive is influenced by the organism’s behavior and the ecosystem in which it lives.		
Lesson 8: Upsetting the Stability Students describe their model ecosystems as stable or disturbed and differentiate between natural disturbances, such as birth/death, and human-induced disturbances, such as pollutants. Students read about human disturbances to real world ecosystems.	1	GLE 3.2.4: Understand how humans depend on the natural environment and can cause changes in the environment that affect human’s ability to survive. <i>Describe the effects of humans on the health of the ecosystem. Describe how humans can cause changes in the environment that affects the livability of the environment for humans.</i>	<ul style="list-style-type: none"> Language Arts integration: nonfiction reading and creation of flow maps to illustrate cause and effect . Follow the IG for this modified lesson. 	Use the multiple copies of the <i>Ecosystems</i> book to read pgs. 40-42, “Something’s in the Air”.
Lesson 9: Reporting on Pollutants Students communicate information they read	1-2	Same as Lesson 8 above	Language Arts integration: reporting and communicating	

about pollutants to the class.				
Lesson 10: Planning Pollution Experiments Students plan controlled investigations to learn about the effects of pollution on their watershed models. They determine variables and controls.	1-2	GLE 2.1.1: Understand how to ask a question about objects, organisms, and events in the environment. GLE 2.1.2: Understand how to plan and conduct simple investigations. GLE 2.1.4: Understand how to use simple models to represent objects, events, systems, and processes. GLE 2.2.4: Understand how to make the results of scientific investigations reliable.		
Lesson 11: Setting Up Our Pollution Experiments Students conduct their investigation plans and begin a data-collection system.	1+	Same as Lesson 10 above	This lesson is spread over several weeks. One period is needed for students to set up pollution investigation, then a shorter period every few days to continue polluting and to make observations.	
Lessons 15-16: Examining a Real Environmental Problem: A Look at Trade-Offs Students define an environment problem of the Puget Sound from different points of view, identify possible solutions and trade-offs.	2-3	GLE 3.2.4: Understand how humans depend on the natural environment and can cause changes in the environment that affect human's ability to survive. <i>Describe the effects of humans on the health of the ecosystem. Describe how humans can cause changes in the environment that affects the livability of the environment for humans.</i>	A minimum of 2 weeks is needed between Lessons 11 and 12. This is an ideal time to do Lessons 15-16, which are real world applications of conceptual understandings learned in the unit to the Puget Sound Ecosystem.	Lang. Arts and Social Studies integration: Use the multiple copies of the Puget Sound reading and citizen perspectives, which come in the kit, to aid students in researching and role-playing various perspectives re/Puget Sound environmental issues.
Assessment C: Understanding Human Impacts	1	Same as Lessons 15-16 above		Use the multiple copies of the <i>Ecosystems</i> book to read pgs. 35-37, "Tale of the Cod". Compare to overfishing of salmon.
Lesson 12: Observing Early Effects of Pollution Students observe, record, and analyze the early effects of pollution on their models by comparing to a control.	1	Same as Lesson 10		Use the multiple copies of the <i>Ecosystems</i> book to read pgs. 45-48, "Growing Crops the Natural Way" and pgs. 26-27, "Hot Enough for You?" (global warming).
Lesson 13: Where Do the Pollutants Go? Students make final observations, collect, and review data. They use data to draw and support conclusions.	1	GLE 2.1.3: Understand how to construct a reasonable explanation using evidence.		
Lesson 14: Drawing Conclusions About Our		GLE 2.1.5: Understand how to report investigations		

Experiment Students pool and analyze data, examines it for discrepancies, and draws conclusions.	1-2	and explanations of events, systems, and processes.		
Assessment D: Interpreting Pollution Experiments		GLE 1.3.10: Understand that an organism’s ability to survive is influenced by the organism’s behavior and the ecosystem in which it lives. GLE 3.2.4: Understand how humans depend on the natural environment and can cause changes in the environment that affect human’s ability to survive. GLE 2.1.3: Understand how to construct a reasonable explanation using evidence.	May be implemented at the end of Lesson 14	
Assessment E: What Is Your Point of View?	1	GLE 3.2.4: Understand how humans depend on the natural environment and can cause changes in the environment that affect human’s ability to survive.		
Optional Extension: Ecosystems Field Investigation in the Schoolyard in partnership with Homewaters Project. Students plan, conduct, and report on a WASL-like controlled investigation outdoors. Teachers must attend a 3-our class in order to receive the lesson plans and support from Homewaters with this field investigation.	3-4	GLE 2.1.2: Understand how to plan and conduct simple investigations. GLE 2.1.3: Understand how to construct a reasonable explanation using evidence. GLE 3.2.4: Understand how humans depend on the natural environment and can cause changes in the environment that affect human’s ability to survive.	Homewaters Project personnel provide support with planning and conducting this field investigation in your schoolyard.	Contact Homewaters Project for inclusion in this Ecosystems Field Investigation. (206-526-0187)
Optional Ocean Ecosystems Extension: Professional development opportunity, which includes free trips for your class to the Seattle Aquarium and the beach at low tide, led by a naturalist. The professional development course involves 4 days in the summer at the Seattle Aquarium. Attendance at this course is required in order to receive the free Aquarium field trip and the free beach trip for students each school year.	Variable, due to how much the resources in the Aquarium kit are used.	GLE 1.3.8: Understand that living things need constant energy and matter. GLE 1.3.10: Understand that an organism’s ability to survive is influenced by the organism’s behavior and the ecosystem in which it lives. GLE 2.1.2: Understand how to plan and conduct simple investigations. GLE 2.1.3: Understand how to construct a reasonable explanation using evidence. GLE 3.2.4: Understand how humans depend on the natural environment and can cause changes in the environment that affect human’s ability to survive	An Aquarium kit, containing books, field guides, and other resources, will be sent on loan to you to reinforce the field trips to the Seattle Aquarium and the beach. These field trips and the resources in the Aquarium kit are a great application of this science unit to real ecosystems outdoors.	Contact Cherie Williams at the Seattle Aquarium for information about registering for this course: cherie.williams@seattle.gov You can also contact Kathryn Show, 252-0185, or Ana Crossman, 252-0172, science coaches, for more information.