





Preparation Guide

Level 5 Module 2 ECOSYSTEMS

Materials: This section lists the quantity of each material necessary for the lesson. Lesson materials may be from a *PhD Science*® Texas materials kit, or the materials may be school-supplied items. In addition to having the listed materials, teachers should have access to the following common classroom items: sticky notes, chart paper, pencils, a whiteboard, and markers.

Resources: This section lists module resources (from the Module Resources section in the Teacher Edition) and core texts used in the lesson. Classrooms also need daily access to the module's Teacher Edition, Science Logbooks, and, if applicable, digital slides. A symbol () identifies resources that appear in the digital slides. Additional supports and Spanish resources are available in the Implementation Resources and Level Overview sections of the digital platform.

Preparation: This section identifies preparation teachers should complete before the lesson, including media teachers must cue before the lesson and activities that require setup. This section also describes advance preparation for upcoming lessons. For example, if teachers need to prepare 1 day in advance for an activity in Lesson 11, an advance preparation note appears in the Preparation section for Lesson 10. A symbol () identifies lessons with advance preparation notes.


Ecosystems | Advance Preparation

Several activities in this module require advance preparation. A version of this list appears in the Module Overview of the Teacher Edition. The expanded version in this guide identifies all lessons for which preparation may take longer than a planning period. A symbol (†) identifies preparation that can be done earlier than the suggested time.

Lesson	Time in Advance †	Investigation	Description
5	6 days†	Teacher Plant Growth Investigation	Leave 50 g potting soil out to dry.
5	5 days†	Teacher Plant Growth Investigation	Prepare green onion plants.
10	1 day†	Model Bird Beak Stations	Prepare materials for Model Bird Beak Stations.
13	10 days	Mold Growth on Raspberries Investigation	Purchase 1 carton of raspberries, and transfer the raspberries to a sealed container.
13	6 days	Mold Growth on Raspberries Investigation	Purchase 2 cartons of raspberries. Transfer 1 carton to a sealed container, and prepare the other carton for Lesson 15.
13	2 days	Mold Growth on Raspberries Investigation	Purchase 1 carton of raspberries, and transfer the raspberries to a sealed container.
15	8 days	Decomposing Raspberries in Sand and Soil Investigation	Transfer raspberries to containers filled with sand and soil. Note: This preparation is concurrent with the preparation for Lesson 13.
16	1 day	Nutrient Testing	Prepare sand and soil water mixtures.
21	2 weeks	Radish Growth Investigation	Plant radish seeds.

Ecosystems | Lesson Preparation



Lesson 1

Materials	Kit Items None School-Supplied Items <input type="checkbox"/> Scissors (1) Item Reuse <input type="checkbox"/> Lesson 2 requires the prepared class notice and wonder chart.
Resources	<input type="checkbox"/> Lesson 1 Resource A: Tree Photograph (optional) <input type="checkbox"/> Lesson 1 Resource B: Mangrove Tree Ecosystem Organism Cards <input type="checkbox"/> <i>The Mangrove Tree: Planting Trees to Feed Families</i> (Roth and Trumbore 2011)
Preparation 	<input type="checkbox"/> Select an outdoor tree for student observation. Alternatively, display or distribute color copies of Lesson 1 Resource A. <input type="checkbox"/> Prepare organism cards. Print and cut out enough copies of the cards in Lesson 1 Resource B so that each student receives one card. Consider printing on cardstock and laminating for future use. Advance Preparation for Lesson 5 <input type="checkbox"/> 6 or More Days Before: Leave 50 g potting soil out to dry for teacher plant growth investigation. (See Lesson 5 Resource A.) <input type="checkbox"/> 5 or More Days Before: Prepare green onion plants for teacher plant growth investigation. (See Lesson 5 Resource A.) Reveal results to students during Lesson 5.

Lesson 2

Materials	Kit Items None School-Supplied Items <input type="checkbox"/> Glue sticks (24) <input type="checkbox"/> Scissors (24) Prepared Items from Previous Lessons <input type="checkbox"/> Class notice and wonder chart started in Lesson 1
Resources	<input type="checkbox"/> Lesson 1 Resource B: Mangrove Tree Ecosystem Organism Cards <input type="checkbox"/> <i>The Mangrove Tree</i>
Preparation	<input type="checkbox"/> Prepare to distribute a copy of Lesson 1 Resource B to each student.


Lesson 3

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ball, table tennis (1) <input type="checkbox"/> Ball, tennis (1) <input type="checkbox"/> Bottles, clear plastic, 16.9 oz (2) <input type="checkbox"/> Gloves, disposable (1 pair) <input type="checkbox"/> Graduated cylinder, 50 mL (1) <input type="checkbox"/> Meter sticks (2) <input type="checkbox"/> Spoon, plastic (1) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ruler, metric (1) <input type="checkbox"/> Scale, digital (1) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Green onion plants with bulbs (2) <input type="checkbox"/> Paper towels (partial roll) <input type="checkbox"/> Potting soil (100 g) <input type="checkbox"/> Sunlight or grow light (access) <input type="checkbox"/> Tape, masking (partial roll) <input type="checkbox"/> Water (access) <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 4 requires the displayed student plant growth investigation materials and the prepared fair test criteria chart. <input type="checkbox"/> Module 3 Lesson 3, requires the fair test criteria chart.
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 3 Resource: Sequoia Tree and Seed Photographs 
<p>Preparation</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare fair test demonstration. Measure 2 m above the floor and 1 m above a desktop. Mark the wall at each location with masking tape to prepare for fair test ball drop. <p>Advance Preparation for Lesson 13</p> <ul style="list-style-type: none"> <input type="checkbox"/> 10 Days Before: Purchase 1 carton of raspberries. Transfer the raspberries to a sealed container. (See Lesson 13 Resource B.)




Lesson 4

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bottles, clear plastic, 16.9 oz (12) <input type="checkbox"/> Gloves, disposable (24 pairs) <input type="checkbox"/> Graduated cylinders, 50 mL (6) <input type="checkbox"/> Spoons, plastic (6) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Rulers, metric (6) <input type="checkbox"/> Safety goggles, student (24) <input type="checkbox"/> Safety goggles, teacher (1) <input type="checkbox"/> Scales, digital (6) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Green onion plants with bulbs (12) <input type="checkbox"/> Paper towels (partial roll) <input type="checkbox"/> Potting soil (600 g) <input type="checkbox"/> Sunlight or grow light (access) <input type="checkbox"/> Water (access) <p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Fair test criteria chart started in Lesson 3 <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 5 requires the prepared student plant growth investigation plants, the digital scales, and 1 of the graduated cylinders. <input type="checkbox"/> Lesson 8 requires the prepared fair test criteria chart.
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 4 Resource: Sample Student Plant Growth Investigation Plans (optional)
<p>Preparation</p>	<p>None</p>




Lesson 5

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bottles, clear plastic, 16.9 oz (4) <input type="checkbox"/> Gloves, disposable (1 pair) <input type="checkbox"/> Graduated cylinder, 50 mL (1) <input type="checkbox"/> Skewers, wooden (4) <input type="checkbox"/> Spoon, plastic (1) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Rulers, metric (6) <input type="checkbox"/> Scales, digital (6) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Green onion plants with bulbs (4) <input type="checkbox"/> Marker, permanent (1) <input type="checkbox"/> Paper towels (partial roll) <input type="checkbox"/> Potting soil (150 g) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Sunlight or grow light (access) <input type="checkbox"/> Water (75 mL) <p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Student plant growth investigation plants started in Lesson 4 (6 per group) <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 13 requires 3 of the digital scales. Save the remaining digital scales for reuse in Lesson 21. <input type="checkbox"/> Lesson 21 requires the prepared student plant growth investigation plants.
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 5 Resource A: Teacher Plant Growth Investigation Setup Instructions <input type="checkbox"/> Lesson 5 Resource B: Sample Plant Growth Investigation Results (optional) <input type="checkbox"/> Lesson 5 Resource C: Wawona Tunnel Tree Images 
Preparation	None






Lesson 6

Materials	<p>Kit Items</p> None
Resources	<p>School-Supplied Items</p> None
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 3 Resource: Sequoia Tree and Seed Photographs  <input type="checkbox"/> Lesson 6 Resource A: Plant Gas Investigation Diagrams  <input type="checkbox"/> Lesson 6 Resource B: NASA Carbon Dioxide Model Images 


Lesson 7

Materials	Kit Items <input type="checkbox"/> Water, sparkling, clear bottle, unopened (1) School-Supplied Items None
Resources	<input type="checkbox"/> Lesson 6 Resource A: Plant Gas Investigation Diagrams <input type="checkbox"/> Lesson 7 Resource A: Human Oxygen Investigation Diagrams  <input type="checkbox"/> Lesson 7 Resource B: Conceptual Checkpoint 
Preparation 	<input type="checkbox"/> Prepare to distribute a copy of Lesson 7 Resource B to each student. Advance Preparation for Lesson 13 <input type="checkbox"/> 6 Days Before: Purchase 2 cartons of raspberries. Transfer 1 carton to a sealed container. (See Lesson 13 Resource B.) Prepare the other carton for Lesson 15. (See Lesson 15 Resource B.) Advance Preparation for Lesson 15 <input type="checkbox"/> 8 Days Before: Transfer raspberries to containers filled with sand and soil. (See Lesson 15 Resource B.) Note: This preparation is concurrent with the preparation for Lesson 13.




Lesson 8

Materials	Kit Items None School-Supplied Items None Prepared Items from Previous Lessons <input type="checkbox"/> Fair test criteria chart started in Lesson 3 Item Reuse <input type="checkbox"/> Lesson 18 requires the prepared fair test criteria chart.
Resources	<input type="checkbox"/> Lesson 8 Resource A: Grizzly Bear Photographs  <input type="checkbox"/> Lesson 8 Resource B: Yellowstone Garbage Dump Photograph  <input type="checkbox"/> Lesson 8 Resource C: Yellowstone Average Annual Precipitation Graph  <input type="checkbox"/> Lesson 8 Resource D: Adult Grizzly Bear Mass Graph  <input type="checkbox"/> Lesson 8 Resource E: Lizard Photographs 
Preparation	<input type="checkbox"/> Cue bears preparing for winter video (Clemens 2018) (http://phdsci.link/1189).




Lesson 9

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bingo chips: blue, red, yellow (at least 90 of each color) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Glue sticks (24) <input type="checkbox"/> Scissors (24) <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 17 requires 60 of the blue bingo chips and 60 of the yellow bingo chips.
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 9 Resource A: Bear Photographs  <input type="checkbox"/> Lesson 9 Resource B: Food Sources Information
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare to distribute a copy of Lesson 9 Resource B to each student.






Lesson 10

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bottles, plastic, small (4) <input type="checkbox"/> Bowls, 1 qt or larger (8) <input type="checkbox"/> Clay, modeling, nonhardening (1 lb) <input type="checkbox"/> Corks, cylindrical (12) <input type="checkbox"/> Ladles (4) <input type="checkbox"/> Marbles (12) <input type="checkbox"/> Pipettes, disposable (4) <input type="checkbox"/> Rice, uncooked (4 cups) <input type="checkbox"/> Sand (4 cups) <input type="checkbox"/> Tongs (4) <input type="checkbox"/> Tweezers (4) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pie tins (4) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (4) <input type="checkbox"/> Water (access) <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 11 requires the prepared animals class chart.
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 10 Resource A: Whooping Crane and Northern Harrier Photographs  <input type="checkbox"/> Lesson 10 Resource B: Bird Photographs  <input type="checkbox"/> Lesson 10 Resource C: Model Bird Beaks Procedure Sheet <input type="checkbox"/> Lesson 10 Resource D: Model Bird Beaks Setup Instructions <input type="checkbox"/> Lesson 10 Resource E: Wildlife Photographs
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Cue whooping crane video (http://phdsci.link/1859).  <input type="checkbox"/> Prepare model bird beaks stations. (See Lesson 10 Resource D.)


Lesson 11

<p>Materials</p>	<p>Kit Items None</p> <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Computers or tablets (4) <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (1) <p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Animals class chart started in Lesson 10
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 11 Resource A: Black Mangrove Photograph  <input type="checkbox"/> Lesson 11 Resource B: Plant Diagram <input type="checkbox"/> Lesson 11 Resource C: Plant Cards <input type="checkbox"/> Lesson 11 Resource D: Map of Texas Coastline  <input type="checkbox"/> Lesson 11 Resource E: Organism Stations Setup Instructions <input type="checkbox"/> Lesson 11 Resource F: Organism Challenge Cards
<p>Preparation</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare plant cards. (See Lesson 11 Resource C.) <input type="checkbox"/> Prepare organism stations. (See Lesson 11 Resource E.) <input type="checkbox"/> Cue raccoon climbing video (http://phdsci.link/1076). <p>Advance Preparation for Lesson 13</p> <ul style="list-style-type: none"> <input type="checkbox"/> 2 Days Before: Purchase 1 carton of raspberries, and transfer the raspberries to a sealed container. (See Lesson 13 Resource B.) <p>Advance Preparation for Lesson 21</p> <ul style="list-style-type: none"> <input type="checkbox"/> 2 Weeks Before: Plant radish seeds for radish growth investigation. (See Lesson 21 Resource A.)




Lesson 12

<p>Materials</p>	<p>Kit Items None</p> <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Glue stick (1) <input type="checkbox"/> Scissors (1)
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 12 Resource A: Hummingbirds Photograph  <input type="checkbox"/> Lesson 12 Resource B: Animal Cards
<p>Preparation</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare animal cards. (See Lesson 12 Resource B.) <input type="checkbox"/> Cue <ul style="list-style-type: none"> <input type="radio"/> hatching sand lizard video (http://phdsci.link/2386),  <input type="radio"/> raccoon climbing video (http://phdsci.link/1076),  <input type="radio"/> coyote pups video (http://phdsci.link/1801),  and <input type="radio"/> coyote hunting video (http://phdsci.link/1802). 





Lesson 13

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Containers with lids, clear plastic, 12 oz or larger (3) <input type="checkbox"/> Gloves, disposable (24 pairs) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Safety goggles, student (24) <input type="checkbox"/> Safety goggles, teacher (1) <input type="checkbox"/> Scales, digital (3) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Raspberries, 6 oz cartons (3) <p>Item Reuse</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesson 21 requires the digital scales.
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 13 Resource A: Raspberry Bush Photograph  <input type="checkbox"/> Lesson 13 Resource B: Mold Growth on Raspberries Investigation Setup Instructions
Preparation	None




Lesson 14

Materials	<p>Kit Items</p> <p>None</p> <p>School-Supplied Items</p> <p>None</p>
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 14 Resource A: Mushroom Article Excerpts (Bardoe 2011)  <input type="checkbox"/> Lesson 14 Resource B: Decomposition Article Adaptation (Kowalski 2014)  <input type="checkbox"/> Lesson 14 Resource C: Bacteria Illustration 
Preparation	None



Lesson 15

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Containers with lids, clear plastic, 12 oz or larger (14) <input type="checkbox"/> Gloves, disposable (24 pairs) <input type="checkbox"/> Sand (3 $\frac{1}{2}$ cups) <input type="checkbox"/> Spoons, plastic (6) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Magnifiers, handheld, plastic (6) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Paper towels (6 sheets) <input type="checkbox"/> Potting soil (3 $\frac{1}{2}$ cups) <input type="checkbox"/> Raspberries, 6 oz carton (1)
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 15 Resource A: Human Mummy Photograph  <input type="checkbox"/> Lesson 15 Resource B: Decomposing Raspberries in Sand and Soil Investigation Setup Instructions <input type="checkbox"/> Lesson 15 Resource C: Sand and Soil Photographs 
<p>Preparation</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Cue time-lapse composting video (van Egmond 2017) (http://phdsci.link/2387).  <input type="checkbox"/> Prepare containers for sand and soil observation. Add half a cup of sand to each of six 12 oz clear plastic containers. Add half a cup of soil to each of six 12 oz clear plastic containers. <p>Advance Preparation for Lesson 16</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 Day Before: Prepare sand and soil water mixtures. (See Lesson 16 Resource A.)

Lesson 16

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Jars with lids, clear plastic, 8 oz (2) <input type="checkbox"/> Gloves, disposable (24 pairs) <input type="checkbox"/> Pipettes, disposable (2) <input type="checkbox"/> Sand (3 tbsp) <input type="checkbox"/> Soil test kits <ul style="list-style-type: none"> ○ Test tubes, color-coded, blue, orange, purple (4 of each color) ○ Blue capsules for phosphorus (4) ○ Orange capsules for potassium (potash) (4) ○ Purple capsules for nitrogen (4) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Markers, permanent (2) <input type="checkbox"/> Potting soil (3 tbsp) <input type="checkbox"/> Scissors (1) <input type="checkbox"/> Water (access)
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 14 Resource B: Decomposition Article Adaptation  <input type="checkbox"/> Lesson 15 Resource A: Human Mummy Photograph  <input type="checkbox"/> Lesson 16 Resource A: Nutrient Testing Setup Instructions <input type="checkbox"/> Lesson 16 Resource B: Nutrient Testing Procedure Sheet <input type="checkbox"/> Lesson 16 Resource C: Plant Nutrient Comparison Chart 
<p>Preparation</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare materials for nutrient testing. (See Lesson 16 Resources A and B.)

Lesson 17

<p>Materials</p>	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bingo chips: blue, yellow (at least 60 of each color) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pencils, colored (6 sets)
<p>Resources</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 17 Resource A: Whooping Crane Migration Photograph  <input type="checkbox"/> Lesson 17 Resource B: Conceptual Checkpoint  <input type="checkbox"/> <i>The Mangrove Tree</i>
<p>Preparation</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare to distribute a copy of Lesson 17 Resource B to each student.




Lesson 18

Materials	<p>Kit Items None</p> <p>School-Supplied Items <input type="checkbox"/> Pencils, colored, assorted colors (48)</p> <p>Prepared Items from Previous Lessons <input type="checkbox"/> Fair test criteria chart started in Lesson 3</p>
Resources	<p><input type="checkbox"/> Lesson 18 Resource A: Mouse Investigation Description</p> <p><input type="checkbox"/> Lesson 18 Resource B: Mouse Investigation Results</p>
Preparation	<p><input type="checkbox"/> Prepare to distribute a copy of Lesson 18 Resource A to each student.</p>


Lesson 19

Materials	<p>Kit Items None</p> <p>School-Supplied Items <input type="checkbox"/> Scissors (1)</p>
Resources	<p><input type="checkbox"/> Lesson 19 Resource: Animal Cards</p>
Preparation	<p><input type="checkbox"/> Prepare animal cards. (See Lesson 19 Resource.)</p>



Lesson 20

Materials	<p>Kit Items None</p> <p>School-Supplied Items None</p>
Resources	<p><input type="checkbox"/> Lesson 8 Resource A: Grizzly Bear Photographs </p> <p><input type="checkbox"/> Lesson 20 Resource A: Atlas Moth Photographs </p> <p><input type="checkbox"/> Lesson 20 Resource B: Atlas Moth Information</p> <p><input type="checkbox"/> Lesson 20 Resource C: Grizzly Bear Information (National Park Service 2018)</p> <p><input type="checkbox"/> Lesson 20 Resource D: Grizzly Bear Mass by Season Graph </p>
Preparation	<p><input type="checkbox"/> Prepare to distribute a copy of Lesson 20 Resource B to each student.</p> <p><input type="checkbox"/> Prepare to distribute a copy of Lesson 20 Resource C to each student pair.</p>



Lesson 21

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Cups, clear plastic, 3 oz (2) <input type="checkbox"/> Seeds, radish (35) <p>Module 1 Kit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Rulers, metric (6) <input type="checkbox"/> Scales, digital (6) <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Potting soil (1 cup) <input type="checkbox"/> Water (access) <p>Prepared Items from Previous Lessons</p> <ul style="list-style-type: none"> <input type="checkbox"/> Student plant growth investigation plants started in Lesson 4 (2 per group)
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 21 Resource A: Radish Growth Investigation Setup Instructions <input type="checkbox"/> Lesson 21 Resource B: Photosynthesis Video Transcript
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Cue photosynthesis video (http://phdsci.link/2390).  <input type="checkbox"/> Prepare to distribute a copy of Lesson 21 Resource B to each student.


Lesson 22

Materials	<p>Kit Items</p> <p>None</p> <p>School-Supplied Items</p> <p>None</p>
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 22 Resource A: Amazon Rainforest Food Web <input type="checkbox"/> Lesson 22 Resource B: Amazon Rainforest Images  <input type="checkbox"/> Lesson 22 Resource C: Conceptual Checkpoint  <input type="checkbox"/> <i>The Mangrove Tree</i>
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare to distribute a color copy of Lesson 22 Resource A to each student. <input type="checkbox"/> Prepare to distribute a copy of Lesson 22 Resource C to each student.

Lesson 23

Materials	<p>Kit Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Name tags, adhesive (24) <input type="checkbox"/> Yarn balls (3) <p>School-Supplied Items</p> <p>None</p>
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 23 Resource A: Emerald Ash Borer Photograph  <input type="checkbox"/> Lesson 23 Resource B: Emerald Ash Borer Excerpts (Rice and Klooster 2014)  <input type="checkbox"/> <i>The Mangrove Tree</i> (optional)
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare name tags for ecosystem modeling. Write a mangrove tree organism from the anchor model on each name tag. Ensure that all organisms are represented at least once in each group.


Lesson 24

Materials	<p>Kit Items</p> <p>None</p> <p>School-Supplied Items</p> <p>None</p>
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric <input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process  <input type="checkbox"/> Lesson 24 Resource C: Emerald Ash Borer Resources <input type="checkbox"/> <i>The Mangrove Tree</i>
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare research materials for students. (See Lesson 24 Resource C.)

Lesson 25

Materials	<p>Kit Items</p> <p>None</p> <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Markers (6 sets)
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric
Preparation	<p>None</p>



Lesson 26

Materials	<p>Kit Items None</p> <p>School-Supplied Items None</p>
Resources	<p><input type="checkbox"/> Lesson 24 Resource A: Engineering Challenge Rubric</p> <p><input type="checkbox"/> Lesson 24 Resource B: Engineering Design Process </p> <p><input type="checkbox"/> <i>The Mangrove Tree</i></p>
Preparation	None


Lesson 27

Materials	<p>Kit Items None</p> <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Glue sticks (24) <input type="checkbox"/> Scissors (24)
Resources	None
Preparation	None

Lesson 28

Materials	<p>Kit Items None</p> <p>School-Supplied Items None</p>
Resources	<input type="checkbox"/> Lesson 28 Resource: Raine Island Ecosystem Model 
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Prepare to distribute a copy of Lesson 28 Resource to each student.  <input type="checkbox"/> Prepare to distribute a copy of the End-of-Module Assessment to each student.

Lesson 29

Materials	<p>Kit Items None</p> <p>School-Supplied Items</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pencils or pens, colored (24) <input type="checkbox"/> Scissors (1)
Resources	<ul style="list-style-type: none"> <input type="checkbox"/> Lesson 29 Resource A: Module Concept Statements <input type="checkbox"/> Lesson 29 Resource B: Recurring Themes and Concepts <input type="checkbox"/> End-of-Module Assessment Rubric 
Preparation	<ul style="list-style-type: none"> <input type="checkbox"/> Score End-of-Module Assessments and write individual feedback. <input type="checkbox"/> Select End-of-Module Assessment responses to share with students. If selecting student responses, remember to remove identifying information and to choose diverse student responses. <input type="checkbox"/> Prepare visual for student connections between module learning and content standards. (See Lesson 29 Resources A and B.)

Ecosystems | Works Cited

Bardoe, Cheryl. 2011. "Looking at Mushrooms." *Ask: The Fungus among Us*, October 2011.

Clemens, Danny. 2018. "Fat Bear Week: Katmai National Park & Preserve Names Fattest Bear Ahead of Winter Hibernation." ABC 11 News, video, 0:43, posted October 11, 2018. <https://abc11.com/pets-animals/fat-bear-week-watch-these-burly-bears-eat-their-way-to-hibernation/4421356>.

Kowalski, Kathiann. 2014. "Recycling the Dead." *Science News for Students*, September 27, 2014. <https://www.sciencenewsforstudents.org/article/recycling-dead>.

National Park Service (NPS). 2018. "Grizzly Bears." Yellowstone, Learn about the Park, Nature, Wildlife, Mammals. <https://www.nps.gov/yell/learn/nature/grizzlybear.htm>.

Rice, Kevin B., and Wendy Klooster. 2014. "Emerald Ash Borer Invasion of North American Forests." Ohio State University Extension, Ohio Agricultural Research and Development Center. Accessed February 5, 2019. <https://cpb-us-w2.wpmucdn.com/u.osu.edu/dist/b/3829/files/2014/05/EAB-impact-on-forests-2in13le.pdf>.

Roth, Susan L., and Cindy Trumbore. 2011. *The Mangrove Tree: Planting Trees to Feed Families*. New York: Lee & Low Books.

van Egmond, Wim. 2017. "Vermicompost—Life in the Compost Bin." Vimeo video, 1:00, posted December 12, 2017. <https://vimeo.com/246948827>.