

## Unit 6.6, Lesson 1: Introduction to Ecosystems



**Teaching Time:** 2 Class Periods (assuming 50 minute periods)



**Instructional Setting(s):**

- Classroom with a computer and projector
- Computer lab (Uncover Your Ideas)

### Unit Challenge Questions:

- What can cause the number of organisms in an ecosystem to increase, decrease, or disappear over time?
- How and why do ecosystems change?

### Learning Performances

1. Students will communicate their prior knowledge and experience of what constitutes an ecosystem.
2. Students will communicate their prior knowledge and experience of how and why ecosystems can change.
3. Students will use a model to communicate their understanding of the component parts and interactions of an ecosystem.

### NGSS Connections

All of the three-dimensional primary subcomponents of the unit may be formatively assessed in this lesson; however, students' knowledge will not be summatively assessed. Those subcomponents listed below are the focus of formative assessment in this lesson:

**Semester Unifying CCC:** Patterns / Cause and Effect

**Science and Engineering Practices**

**Disciplinary Core Ideas**

**Crosscutting Concepts**

<p><b>Developing and Using Models</b></p> <ul style="list-style-type: none"> <li>Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.</li> </ul>	<p><b>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</b></p> <ul style="list-style-type: none"> <li>Ecosystems are dynamic in nature; their characteristics can vary over time. (MS-LS2-4)</li> </ul> <p><b>LS2.A: Interdependent Relationships in Ecosystems</b></p> <ul style="list-style-type: none"> <li>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)</li> <li>Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)</li> </ul>	<p><b>Stability and Change</b></p> <ul style="list-style-type: none"> <li>Small changes in one part of a system might cause large changes in another part. (MS-LS2-4).</li> </ul> <p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>Patterns can be used to identify cause and effect relationships. (MS-LS2-2)</li> </ul>
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## Lesson Introduction:

A system has parts that are related to one another in very specific ways. The parts must be organized in a very specific way or the system does not function. For example, a bicycle has wheels, a frame, handlebars, brakes, pedals, and a seat. How these parts are organized and related to each other affect how the bicycle functions as a mode of transportation. In nature, a system of interacting organisms and their nonliving surroundings is referred to as an **ecosystem**. Similar to the bicycle, an ecosystem has parts that are organized in a specific way, and changing these relationships will change how the ecosystem functions.

In this unit, students examine ecosystems and the various ways in which their living things (e.g. plants and animals) interact with each other, and also with their non-living environments (e.g. sun, soil, and atmosphere). Students already have a sense of ecosystem interactions from a previous unit in which they learned about food chains and food webs and the feeding relationships between organisms. In this unit, they build on this knowledge as they look at how ecosystems can change, by natural events or by human actions. They will see that when certain living factors (e.g., a new organism) and/or nonliving factors (e.g., a rise in temperature) are introduced to an ecosystem, the interaction of the living and nonliving parts can change, potentially leading to drastic changes in the ecosystem.

Students build their understanding of ecosystem dynamics within a Michigan context. They identify and study a variety of Michigan's many ecosystems, including forest, lake, wetland, dune, and river. They see that these ecosystems provide a range of benefits to humans, including food, water, flood control, and recreation.

This lesson serves as the opener for the unit. Students demonstrate their prior knowledge and experience of ecosystems and the interactions between their living and nonliving parts. Students express what they know about how ecosystems can change and the factors that cause these changes. They present their ideas within the context of ecosystems that exist within Michigan. Students are introduced to the Unit Challenge scenario and questions, make observations and ask questions, and develop a Unit Bubble Map to help elicit what information might be needed to address the Unit Challenge Questions.



[Additional Resources to Support Teacher Background Knowledge](#)

## Advance Preparation

- Prepare copies of student resources as needed (see phase summaries).
- Obtain computer stations with internet access and set them up for group work.
- Prior to beginning Lesson 1 of Unit 6.6, you may have students complete the Unit 6.6 pre/post assessment (See Unit Overview) which includes a series of 3-dimensional performance-based tasks. This will give you a baseline for assessing student knowledge, skills, and abilities in relation to the primary DCI, SEP, and CCC PE subcomponents covered in this unit. At the conclusion of the unit you may administer the assessment again and use the results to assess student growth over the unit.



## Safety Considerations

- None

## Mi-STAR Lesson Structure

### Anchoring Experience

**Phase Summary:**

To engage students and foster a connection with Michigan ecosystems, students watch a video that portrays a variety of Michigan landscapes and ecosystems throughout the year.

**Resources Needed for this Instructional Phase:**

- Per Class
  - [L01 Anchor Video 1](#)

**Student Steps:**

1. Students watch the video [L01 Anchor Video 1](#) that shows a variety of Michigan ecosystems in different seasons.
2. Individually, students record their responses to the following as they watch the video:

Example Guiding Questions	Example Student Answers
What are the different types of landscapes or environments shown?	<i>Students should be able to identify forest, river, coastline, lake, and dune.</i>
What are the different parts of each of those landscapes or environments?	<i>Forest parts might include large trees, small trees, and bushes. River parts might include river or streams and bordering trees. Coastline parts might include rocks and cliffs, beaches, and lakes. Lake parts might include lake water, lake ice, and lake bottom. Dune parts might include dunes, rocks, small vegetation, and lake or water bodies.</i>
Are there any landscapes or environments that show change?	<i>Students should recognize the seasonal changes shown in some of the environments.</i>

3. Students share their observations with a group and then groups share their common observations with the class.
4. Students discuss with the class the following:

Example Guiding Questions	Example Student Answers
What personal connections can you make to the landscapes and environments shown in this video?	<i>Answers will vary.</i>
What types of environments can be found in Michigan?	<i>Students may refer to some of the landscapes and environments they observed in the videos they watched.</i>

## Uncover Your Ideas

### Phase Summary:

Students virtually explore a variety of environments in Michigan. They examine interactive images of six environments and record their observations of the living and nonliving parts of each one. They also infer, based on their prior knowledge, how the various parts of each environment interact. Students also identify micro or hidden parts of the environment, and look for evidence of change within each environment.

### Resources Needed for this Instructional Phase:

- Per Student
  - Access to the six interactive environments linked in the External Web Links under [L01 Uncover Resource 1](#)
  - [6.6\\_L01\\_Uncover\\_Student\\_ExploreMichiganEcosystems](#)

### Student Steps:

1. Students work in pairs or small groups to explore and make observations of six different environments that can be found in Michigan. The goal is to introduce students to a variety of ecosystems found in Michigan. Students use computers with internet access to examine photographs of each environment. Most photographs were taken using a Google Trekker

360 degree camera that creates panoramic images that can be rotated and provide different vantages for viewing the ecosystems. Students can also move through these environments similar to Google Streetview.

2. Students are provided the student guide [6.6\\_L01\\_Uncover\\_Student\\_ExploreMichiganEcosystems](#). They access the images following the web addresses provided on the sheet.

**Teacher Note:** You may want to demonstrate how Google Trekker images can be rotated and manipulated. If computers are not available for each group, you can take the class on a guided tour of the images using a computer with a projector. The web addresses for the images are found in [L01 Uncover Resource 1](#).

3. Students spend approximately three minutes exploring each environment then answer the following questions. They record their answers on the Student Guide.

List as many living and non-living things as they can.	<b>Teacher Note:</b> <i>Encourage students to include things that might exist in each environment but are not able to be captured by a camera (e.g. air, bugs in the soil or grass, fish in the water).</i>
How might these living and non-living things interact? How do the living things use non-living things such as water, soil and/or sunlight?	
Is there any evidence that this environment has changed over time?	<b>Teacher Note:</b> <i>Students may refer to manmade structures such as a bridge or trails/boardwalks, falling or dying trees, and shoreline change.</i>

**Teacher Note:** You may want to set a timer for each ecosystem to help limit the amount of time spent on this activity.

**Share Your Ideas**

**Phase Summary:**

Students share out their observations to ensure that they are exposed to a variety of observations from the GoogleTrekker experience. They construct explanations for how ecosystems illustrate the unifying CCCs of Patterns and Cause and Effect. They also connect this to the unifying CCC of Systems, which they studied in previous units. As a class, students make a list of reasons that changes in ecosystems might be important to them and people in general. Next, students return to their small groups and develop a model to represent one of the ecosystems they explored.

**Resources Needed for this Instructional Phase:**

- Per Class
  - One set of gallery walk posters (one poster per ecosystem with the title of ecosystem at the top)
- Per Group
  - Materials to make model: paper, markers, crayons, etc.

**Student Steps:**

1. Six large sheets of poster paper are each labeled with the name of one of the ecosystems that students explored in the previous phase. Three columns are drawn on each poster as well. Each column is labeled with the same headings as the tables on [6.6\\_L01\\_Uncover\\_StudentGuide](#). The six sheets of poster paper are taped to a wall. Student groups pass by each poster, one at a time, and copy their observations from their Exploring Michigan Ecosystems through Google Trekker student guide onto the posters. When students reach their original starting position (ecosystem), they identify the observations of other groups that were similar to theirs and those that were different.

**Teacher Note:** This step could be skipped if students have generated sufficient observations during the Uncover Your Ideas Phase.

2. In pairs or small groups, students discuss the following:

Example Guiding Questions	Example Student Answers
How might the living things in each environment change over time?	Answers will vary



What do you think could happen if species in an environment disappeared?	Answers will vary
What do you think could happen if you introduced a new species to an environment?	Answers will vary
How do people benefit from these environments?	<i>Answers will vary</i>
Why is ecosystem change important to you and people in Michigan?	<i>Answers will vary</i>

**Teacher Note:** You may want to record these ideas and add to them throughout the unit.

- In pairs or in small groups, students develop their initial definition for the science word **ecosystem** which will be revisited and more completely defined as the unit progresses. The students initial definitions are shared during a facilitated whole-class discussion.

**Teacher Note:** The definition of ecosystem should be prior knowledge from prior units and K-5. Student definitions should resemble:

**ecosystem:** all the living and nonliving things that interact in a particular area.

- Students are reminded of the Unifying Crosscutting Concepts for the semester: *Patterns* and *Cause and Effect*. They discuss how their observations of each ecosystem demonstrate these Crosscutting Concepts by answering the following:

Example Guiding Questions	Example Student Answers
What patterns did you observe across several ecosystems?	<i>Answers will vary. All of the ecosystems had living and non-living things. They all had plants and animals. They all had things interacting within the ecosystem. They all had evidence of change, etc.</i>
Was there evidence of any cause and effect in the ecosystems? Where could it be inferred?	<i>Answers will vary. Examples of what students may suggest include the following: The presence of animals</i>

*causes plants to be eaten. Cause and effect can be seen with the sand dunes along the shore because of the wind.*

5. Students are reminded of the previous Unifying Crosscutting Concept of *Systems* and asked to consider the following:
- How could a natural area made up of living and non-living things that interact be considered a system?

**Teacher Note:** Systems and systems thinking will be very important for students when they construct their models later in the unit. This question is designed to get students thinking about how they could use their knowledge of systems to represent an ecosystem.

## Connect Your Ideas (Connection to the Unit Challenge)

### Phase Summary:

Students are presented with the Unit Challenge scenario. They define the problem presented in the Scenario. Students are introduced to the Unit Challenge Question.

### Resources Needed for this Instructional Phase:

- Per student:
  - [6.6\\_L01\\_Connect\\_Student\\_UnitChallengeScenario](#)

### Student Steps:

1. Students receive a copy of [6.6\\_L01\\_Connect\\_Student\\_UnitChallengeScenario](#):

*Your local representative in the Michigan Legislature would like your help. The legislator recently attended a presentation by the Michigan Department of Natural Resources (DNR) that described how many ecosystems across Michigan may change due to the arrival of new species. Somehow these new species cause the numbers of some organisms to disappear while others stay the same or even increase! The DNR said these changes were due to a changing ecosystem, but the legislators do not really understand what that means. The legislator has asked you to explain to the other legislators on the Natural Resources Committee how different organisms fit into the ecosystem and how a changing ecosystem could cause the numbers of some organisms to decrease while some stay the same.*

*The DNR presentation also inspired the legislator to draft a bill to protect Michigan’s ecosystems. There is not enough money to manage all of the ecosystems the DNR talked about. The legislator would like your class to recommend an ecosystem in which managing new species should be a high priority, and the proposed management solution, with evidence and reasoning to support your argument.*

In pairs, students review the Unit Challenge Scenario and identify the problem(s) they are being asked to address. For example:

Example Student Answers
<i>We need to explain how different organisms fit into the ecosystem.</i>
<i>We need to explain how a changing ecosystem could cause some populations to disappear, while others stay the same or increase.</i>
<i>We need to recommend an ecosystem where managing an new species is a high priority, and recommend a way to manage that species.</i>

- Students are introduced to the Unit Challenge Questions:
  - What can cause the number of organisms in an ecosystem to increase, decrease, or disappear over time?
  - How and why do ecosystems change?

<b>Check Your Progress</b>
<p><b>Phase Summary:</b></p> <p>Students reflect on what they need to know to address the Unit Challenge Questions by completing a Unit Bubble Map activity that requires them to brainstorm smaller questions they must answer in order to address the Unit Challenge Questions.</p> <p><b>Resources Needed for this Instructional Phase:</b></p> <ul style="list-style-type: none"> <li>Per Class           <ul style="list-style-type: none"> <li>Large chart paper or similar</li> </ul> </li> <li>Per Student</li> </ul>

- Science notebook or blank paper

**Student Steps:**

1. Students compile a list of smaller, supporting questions they must answer in order to get at the Unit Challenge Questions. This can be achieved using the Unit Bubble Map, outlined below:
  - Individually, students record responses to the following prompt:
    - What questions can we ask and investigate in order to try to answer the Unit Challenge Questions?
  - Individuals share their questions with a group. The group then discusses the questions and comes to a consensus on three questions that are the most relevant to the Unit Challenge Questions.
  - Small groups contribute their three questions to the class Unit Bubble Map that is drawn on a large sheet of paper that can be used as a reference throughout the unit. The Unit Challenge Questions are written at the center and circled. Lines are drawn from the center and outward to other circles in which groups write their questions.
  - Students may individually record the class Unit Bubble Map on blank paper or in their science journal so that they can easily reference these questions throughout the unit.
  - Students individually answer all of the Unit Bubble Map questions that they believe they can answer partially or completely using prior knowledge.

**Teacher Note:** Remind students that they are not expected to know any answers and they will be answering these questions throughout the unit. The students may do portions of this Unit Bubble Map as homework.