

## Unit 6.6, Lesson 9 (L-UC): Culminating Experience



Teaching Time: 3 Class Periods (assuming 50 minute periods)



Instructional Setting(s):

- Classroom with a computer and a projector

### 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, and why is it important to us?

### Unit Big Ideas:

- Organisms interact with one another (both within and between species) and the environment in consistent patterns across different ecosystems.
- Seemingly small changes to the environment and/or the species found in an ecosystem can cause drastic changes.

### Compiled Gotta Have Check List

- [6.6\\_CompiledGottaHaveChecklist](#)



[Unit Summary Table \(teacher version\)](#)

### NGSS Connections

All of the three dimensional primary subcomponents of the unit may be summatively assessed in this lesson. The primary subcomponents for this lesson are located in the [Unit 6.6 NGSS Connections](#) document.

Semester Unifying CCC: Patterns / Cause and Effect

## Lesson Introduction:

In the previous lesson students used a decision matrix to consider various strategies that can be used for managing an invasive species in their team's ecosystem.

In this lesson, students synthesize their learning from the entire unit into a final culminating activity. Students begin by revisiting the bubble map from the unit opener (Lesson 1). This helps them to focus their thinking on the lesson questions. The Unit Challenge asks students to explain changes in Michigan ecosystems and to recommend a single ecosystem that should be the highest priority for invasive species management. To accomplish this task, students work in their ecosystem teams to review their organism models, ecosystem information, invasive species fact sheets, and predictions for the impact that a given invasive species might have on their ecosystem. Using this information, teams develop presentations to inform their classmates about their ecosystem, the invasive species threatening it, the predicted impact of the invasive species on their ecosystem, and their recommended management strategy including their evidence and reasoning. During each presentation, individual students use information provided by each team to fill in a decision matrix. These decision matrices will be used to inform a consensus discussion to determine which ecosystem would benefit most from state management of the invasive species.



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

## Advance Preparation:

- Prepare copies of student resources as needed (see phase summaries).



## Safety Considerations

- None

## Mi-STAR Lesson Structure

### Anchoring Experience

#### Phase Summary:

Students revisit the Unit Bubble Map and reflect on what they have learned throughout the unit. [Optional] Students consider the impact of invasive species on the ecosystems and people of Michigan by watching a video that describes the devastating impact of the emerald ash borer, an invasive insect that is killing trees in the Great Lakes region.

#### Resources Needed for this Instructional Phase:

- Unit Bubble Maps from Lesson 1
- [L09 Anchor Video 1](#) [Optional]

#### Student Steps:

1. Students individually revisit the Unit Bubble Maps that they have been working on throughout the unit. Students review the supporting questions around the Unit Challenge Question and write any answers they have for these questions. Students may decide that some of the questions are not relevant to the Unit Challenge and cross them out. As a whole group students discuss and reflect on what they have learned.
2. (Optional) Students watch [L09 Anchor Video 1](#) and then as a class discuss the impact of invasive species on ecosystems in Michigan. Students consider their ideas through a line of questioning similar to the following:
  - In what ways can an invasive species affect the lives of people living in Michigan?
  - Why is it important to address invasive species, not just for the plants and animals that live in ecosystems, but also for the people of Michigan?

### Uncover Your Ideas

#### Phase Summary:

As part of the Unit Challenge, students complete their presentations to their state legislator. The challenge asks for teams to provide background information on their

assigned ecosystem and the invasive species by which it is being threatened. Students present predictions for how the invasive species will impact their ecosystem if left unabated as well as a strategy for managing the invasive species. Students support their suggested strategy with evidence and reasoning that they have gathered in previous lessons.

**Resources Needed for this Instructional Phase:**

- **Per Student**
  - [6.6 UnitChallenge Student FactSheetVirtualBinder](#)
  - [6.6 UnitChallenge Student OrganismModel](#)
  - [6.6 UnitChallenge Student InvasiveSpeciesFactSheets](#)
  - [6.6 UnitSummaryTable StudentVersion](#)
  - [6.6 CompiledGottaHaveChecklist](#)
  - [6.6 UnitChallenge Student InvasiveSpeciesPredictionChart](#)
  - [6.6 UnitChallenge Student ManagementDecisionMatrix](#)
  - [6.6 StudentProductChecklist](#)
- **Teacher Resources**
  - [6.6 UnitChallenge Teacher Exemplar OrganismModel](#)

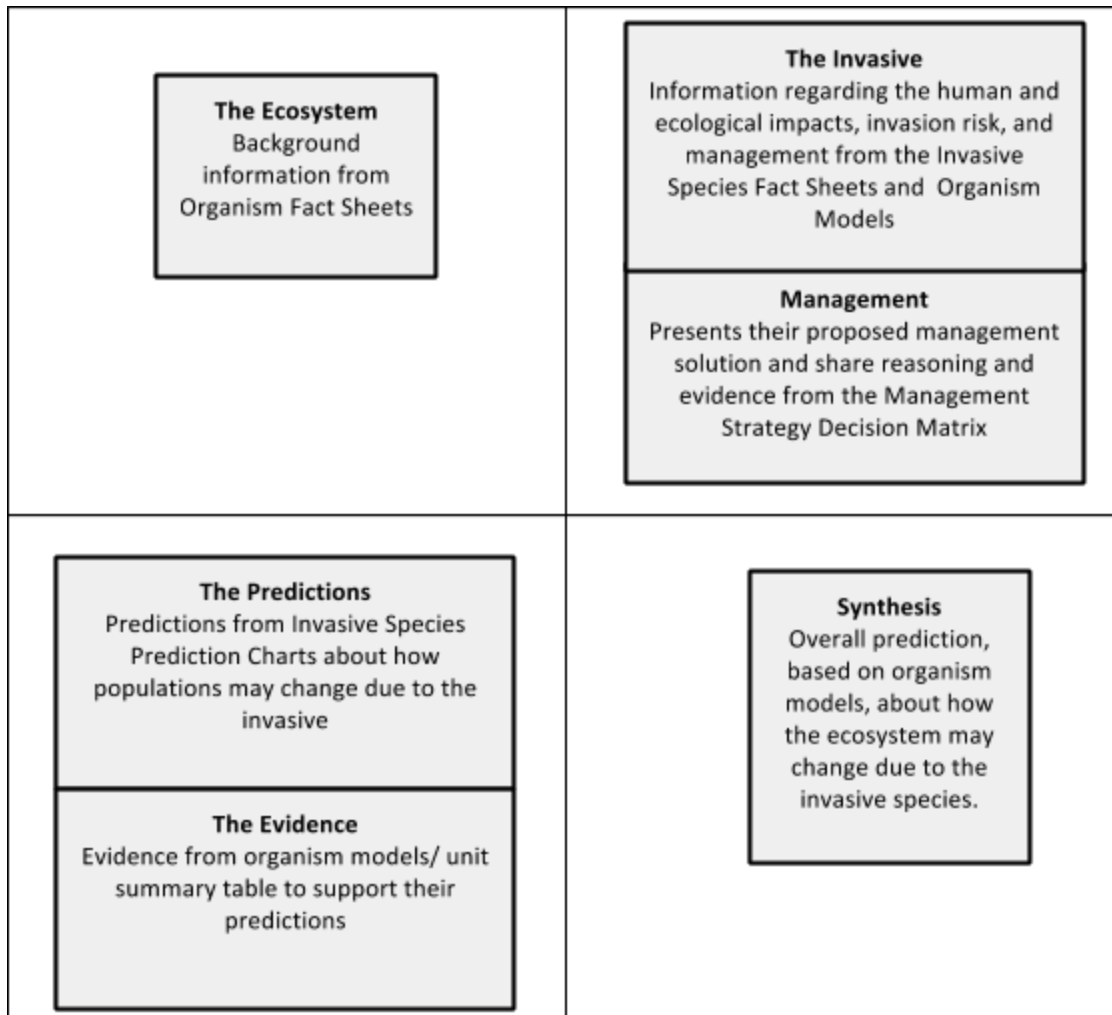
**Student Steps:**

1. Students review the [Unit Challenge Scenario](#) to identify their audience and consider what would be an appropriate format for their final presentation. Students consider their ideas through a line of questioning similar to the following:
  - Who is our presentation for?
  - What is the best way to share all the information we have gathered with them?
  - What things might not be appropriate to include in our presentations?
2. Unit Challenge teams review the information they have collected in their Unit Challenge Student Products. They organize and compile important information from the following documents to construct an argument and create a presentation about predicted changes to their ecosystem due to invasive species and their suggested management strategy:
  - [6.6 UnitChallenge Student FactSheetVirtualBinder](#)
  - [6.6 UnitChallenge Student OrganismModel](#)
  - [6.6 UnitChallenge Student InvasiveSpeciesFactSheets](#)
  - [6.6 UnitSummaryTable StudentVersion](#)

- [6.6\\_CompiledGottaHaveChecklist](#)
- [6.6\\_UnitChallenge\\_Student\\_InvasiveSpeciesPredictionChart](#)
- [6.6\\_UnitChallenge\\_Student\\_ManagementDecisionMatrix](#)

Teacher Note: This phase should go quickly. Students should just be compiling their previous materials into the presentation, not creating new ones. Additionally, students may use the [6.6\\_StudentProductChecklist](#) to assess the completeness of their presentation.

Example Set-up of a Final Poster Presentation:



## Share Your Ideas

### Phase Summary:

Teams share their Unit Challenge presentations with the class. As each team presents, individual students use a decision making matrix to evaluate the presentation. This matrix will also be used by the class to come to a consensus as to which ecosystem would benefit the most from a state sponsored management plan for an invasive species. Students provide a score for each of the ecosystems and the criteria on the matrix. They ask questions of each team to clarify the team's evidence and reasoning. Teams also reflect on how they would revise their presentations.

### Resources Needed for this Instructional Phase:

- Per Student
  - [6.6\\_UnitChallenge\\_Student\\_EcosystemPriorityDecisionMatrix](#)
  - [6.6\\_UnitChallenge\\_Student\\_InvasiveScoreSheet](#)
- Teacher Resources
  - [6.6\\_UnitChallenge\\_Teacher\\_ExemplarEcosystemPriorityDecisionMatrix](#)

### Student Steps:

1. Before ecosystem teams give their presentations to the class, each student is provided a "Decision Matrix" ([6.6\\_UnitChallenge\\_Student\\_EcosystemPriorityDecisionMatrix](#)) and a "Score Sheet" ([6.6\\_UnitChallenge\\_Student\\_InvasiveScoreSheet](#)). Each student will use these resources to evaluate the presentation of each team.
2. Students provide an "importance value" in column two of the Decision Matrix before presentations begin.
3. Student teams communicate to the class their proposed solution to the Unit Challenge, which includes their reasoning and argument from evidence using their final student products.
4. As each team presents its findings, students individually score the criteria for each ecosystem using the Decision Matrix and Score Sheet.

**Teacher note:** Students should be encouraged to ask questions and make comments to each ecosystem team regarding their presentation in order to clarify the information

needed to complete the Decision Matrix. Additionally students should be encouraged to clarify each other's evidence and reasoning.

5. Once students have gathered the scores for all ecosystems, students calculate the rating for each ecosystem on the Decision Matrix, and complete Parts 1 and 2 of the Claim-Evidence-Reasoning student guide found on page 2 of the Decision Matrix.
6. Teams reflect on their presentations and use the following questions to guide their reflection:
  - Did the other team agree with your evidence and arguments? Why or why not?
  - Are you missing any information?
  - What did you learn from the (final product) of another team?

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

### Phase Summary:

The class discusses and comes to a consensus as to which ecosystem is most in need of management. As part of the discussion, students should use evidence to support their arguments for which ecosystem should be given the highest priority for invasive species management. Students use evidence from their Decision Matrices (completed during the Share Your Ideas phase) to support their reasoning. After the discussion, individual students construct an argument for why a specific ecosystem is most in need of management, supported by evidence from the discussion and their Decision Matrix from the Share Your Ideas Phase.

### Resources Needed for this Instructional Phase:

- Per Student
  - [6.6\\_UnitChallenge\\_Student\\_EcosystemPriorityDecisionMatrix](#)

### Student Steps:

1. The class discusses and comes to a consensus as to which ecosystem would benefit the most from an invasive species management plan. Students explore their ideas and opinions based on evidence and reasoning, and use Claim-Evidence-Reasoning and information from the presentations to support their opinions.
2. The class works together to summarize the consensus decision. For example, votes are

counted and analyzed and arguments to support the final decision are summarized including reasoning and evidence.

**Teacher Note:** Although students will come to consensus about which ecosystem should be managed for the invasive species, have students discuss situations or reasons why there could be more than one appropriate management plan based on how importance values are assigned.

## Check Your Progress

**Phase Summary:**  
 (Optional) Students revisit their Unit Question Bubble Map(s) to reflect on if their thinking has evolved after the Unit Challenge solution presentations. Additionally, students demonstrate their understanding of the unifying CCCs by drawing connection between the unit and the unifying CCCs. Students display their learning by individually taking a post-assessment that has them perform a series of 3-dimensional, performance-based tasks.

**Resources Needed for this Instructional Phase:**

- Per Student
  - (Optional) Individual Unit Bubble Maps from Lesson 1
  - [Unit 6.6 Pre-Post Assessment](#)

**Student Steps:**

1. (Optional) Students come back to the Unit Bubble Map and reflect on changes in their thinking following the Unit Challenge solutions are presented.
2. Students explain how the unit topic is connected to the semester’s unifying CCCs: Cause and Effect and Patterns. Students consider their ideas through a line of questioning similar to the following:

Example Guiding Questions	Example Student Answers
How did we use patterns to identify cause and effect relationships in ecosystems?	<i>Patterns in ecosystems can be used to help identify cause and effect relationships. For example, there is a</i>



	<p><i>pattern that shows that when a species can't get enough of the resources it needs to survive, its population will decline. That's what happened with changes in snowfall and the deer population. When there was a lot of snow, the population of deer declined, so we could say that heavy snowfall (cause) will have the effect of a declining deer population. We also saw the size of a predator population (cause) will have an effect on the size of a prey population.</i></p>
<p><b>How did cause and effect relationships help us to predict the effect of an invasive species on an ecosystem?</b></p>	<p><i>We've learned that competition for resources has an effect on the population sizes of the organisms competing for limited resources. If one species outcompetes another, its population will grow (cause) which has the effect of a decline in the competing population. Invasive species often outcompete native species for resources that are needed by both species, so we can use cause and effect to predict that the invasive species population will increase and the other populations will decline.</i></p>

3. Students display their learning by individually taking the [Unit 6.6 Pre-Post Assessment](#) that has them perform a series of three-dimensional, performance-based tasks.

## Sources

**Marcarelli, Kellie. 2010.** *Teaching Science with Interactive Notebooks.* Thousand Oaks, California: Corwin.