Observing/Determining Limiting Factors of an Ecosystem

Competencies

Student can observe and describe a local ecosystem.

Student can determine potential limiting factors for specified populations in a local ecosystem.

Focus of this assessment:

- ☐ Declarative knowledge
- ☑ Procedural knowledge
- ☐ Problem solving

Evidence

Students are provided two or more color photographs depicting a particular ecosystem. The photographs show some of the biotic and abiotic factors, with which students are familiar, within the ecosystem. Students are asked to describe biotic and abiotic factors within the ecosystem. They are also asked to identify potential limiting factors for a population of organisms in the photographs. Students are scored with respect to how thorough and complete their descriptions are of (1) how organisms' physical characteristics are adapted for life in the ecosystem, (2) the organisms' niches, and (3) the impact of abiotic factors on the ecosystem. Students are also scored with respect to how reasonable their explanations of potential limiting factors for an organism's population are.

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Example Task

The following photographs were taken in Florida by the Gulf of Mexico. They provide two views of a coastal marsh ecosystem. You will be writing about components of this ecosystem.

Photograph 1. At the Gulf of Mexico coast, south of Tallahassee

Photograph 2. At the Gulf of Mexico coast, south of Tallahassee

Example Task (continued)

Part 1

1st Organism:

Name one living organism in at least one of the photographs: _____

Describe **how** one physical characteristic of this organism is adapted for its reproduction or survival in this ecosystem:

Describe this organism's **niche** or **role** within this ecosystem:

2nd Organism:

Name a second living organism in at least one of the photographs: _____

Describe **how** one physical characteristic of this organism is adapted for its reproduction or survival in this ecosystem:

Describe this organism's **niche** or **role** within this ecosystem:

3rd Organism:

Name a third living organism in at least one of the photographs: _____

Describe **how** one physical characteristic of this organism is adapted for its reproduction or survival in this ecosystem:

Describe this organism's **niche** or **role** within this ecosystem:

Example Task (continued)

Part 2

1st Abiotic Factor:

Name an abiotic (nonliving) factor in at least one of the photographs: _____

Describe its role or how it affects organisms within this ecosystem:

2nd Abiotic Factor:

Name a second abiotic (nonliving) factor in at least one of the photographs: _____

Describe its role or how it affects organisms within this ecosystem:

Part 3

Identify **limiting factors** that might limit the size of a population of organisms in this ecosystem. The organism **must be visible** in at least one of the photographs, but the limiting factors may or may not be visible.

Choose only one living organism in the photographs and **write its name** in the space below:

_____

Now, list five limiting factors and explain how or why each factor might affect this organism's population.

1st limiting factor:	How might this limiting factor affect this organism's population?
2nd limiting factor:	How might this limiting factor affect this organism's population?
3rd limiting factor:	How might this limiting factor affect this organism's population?
4th limiting factor:	How might this limiting factor affect this organism's population?
5th limiting factor:	How might this limiting factor affect this organism's population?

Scoring Plan for the Example Task

This assessment is not to be scored if it becomes apparent the student is familiar with fewer than three animals and/or plants shown in the photograph.

Biotic Factors

For the **first** biotic factor, student identifies a physical characteristic and explains how it is adapted for the organism's reproduction or survival in the ecosystem. • The organism must be visible in the photograph, but the presence of the indicated physical characteristic can be reasonably inferred. For instance, a wading bird's webbed feet may be hidden beneath the surface of the water. • The student's response must explain how the physical characteristic is adapted for this organism. For instance, all birds have feet, but some birds have *partially webbed feet* that are specialized for wading.	1 pt.
For the **first** biotic factor, student describes the organism's niche or role within this ecosystem. • For instance, "butterflies eat nectar" does not describe an ecological role, whereas "butterflies are pollinators" does.	1 pt.
For the **second** biotic factor, student identifies a physical characteristic and explains how it is adapted for the organism's reproduction or survival in the ecosystem.	1 pt.
For the **second** biotic factor, student describes the organism's niche or role within this ecosystem.	1 pt.
For the **third** biotic factor, student identifies a physical characteristic and explains how it is adapted for the organism's reproduction or survival in the ecosystem.	1 pt.
For the **third** biotic factor, student describes the organism's niche or role within this ecosystem.	1 pt.

Abiotic Factors

For the **first** abiotic factor, student describes its role or how it affects organisms in the ecosystem. For instance, the student states that the abiotic factor provides shelter, water, or camouflage. • Abiotic factor must be visible in or reasonably inferred from photographs.	1 pt.
For the **second** abiotic factor, student describes its role or how it affects organisms in the ecosystem.	1 pt.

Limiting Factors

Student explains how a factor is reasonably limiting for selected organism's population. • If an organism is not listed nor explicitly identified within the response, no points are awarded. • If the response identifies limiting factors for more than one population, points are awarded only for limiting factors associated with one population, whichever population will result in the higher score for the student. • Limiting factors such as predation, shelter, disease, or access to food or water may or may not be visible in a photograph, but must be reasonably inferred for the present ecosystem.	1 pt.
Student explains how a **second** factor is reasonably limiting for the same population.	1 pt.
Student explains how a **third** factor is reasonably limiting for the same population.	1 pt.
Student explains how a **fourth** factor is reasonably limiting for the same population.	1 pt.
Student explains how a **fifth** factor is reasonably limiting for the same population.	1 pt.

Procedure for Creating Parallel Tasks

Parallel tasks will reference a different ecosystem and include a different set of photographs. **The directions to the student, however, will remain the same across all tasks.**

- Students will be provided a brief description of the ecosystem pictured in the photographs.
- The photographs must clearly show a number of living and nonliving factors with which students are familiar, but different from those used as illustrations during instruction.
- Biotic factors must be directly visible in a photograph.
- Abiotic factors may be directly visible or reasonably inferred from a photograph.

Scoring Plan for Parallel Tasks

Scoring plan used for the example task	Generic scoring criteria for all parallel tasks	
	Biotic Factors	
Same as generic.	For the **first** biotic factor, student identifies a physical characteristic and explains how it is adapted for the organism's reproduction or survival in the ecosystem. • The organism must be visible in the photograph, but the presence of the indicated physical characteristic can be reasonably inferred. For instance, a wading bird's webbed feet may be hidden beneath the surface of the water. • The student's response must explain how the physical characteristic is adapted for this organism. For instance, all birds have feet, but some birds have *partially webbed feet* that are specialized for wading.	1 pt.
Same as generic.	For the **first** biotic factor, student describes the organism's niche or role within this ecosystem. • For instance, "butterflies eat nectar" does not describe an ecological role, whereas "butterflies are pollinators" does.	1 pt.
Same as generic.	For the **second** biotic factor, student identifies a physical characteristic and explains how it is adapted for the organism's reproduction or survival in the ecosystem.	1 pt.
Same as generic.	For the **second** biotic factor, student describes the organism's niche or role within this ecosystem.	1 pt.
Same as generic.	For the **third** biotic factor, student identifies a physical characteristic and explains how it is adapted for the organism's reproduction or survival in the ecosystem.	1 pt.
Same as generic.	For the **third** biotic factor, student describes the organism's niche or role within this ecosystem.	1 pt.

Scoring Plan for Parallel Tasks (continued)

Abiotic Factors

Same as generic.	For the **first** abiotic factor, student describes its role or how it affects organisms in the ecosystem. For instance, the student states that the abiotic factor provides shelter, water, or camouflage. • Abiotic factor must be visible in or reasonably inferred from photographs.	1 pt.
Same as generic.	For the **second** abiotic factor, student describes its role or how it affects organisms in the ecosystem.	1 pt.

Limiting Factors

Same as generic.	Student explains how a factor is reasonably limiting for selected organism's population. • If an organism is not listed nor explicitly identified within the response, no points are awarded. • If the response identifies limiting factors for more than one population, points are awarded only for limiting factors associated with one population, whichever population will result in the higher score for the student. • Limiting factors such as predation, shelter, disease, or access to food or water may or may not be visible in a photograph, but must be reasonably inferred for the present ecosystem.	1 pt.
Same as generic.	Student explains how a **second** factor is reasonably limiting for the same population.	1 pt.
Same as generic.	Student explains how a **third** factor is reasonably limiting for the same population.	1 pt.
Same as generic.	Student explains how a **fourth** factor is reasonably limiting for the same population.	1 pt.
Same as generic.	Student explains how a **fifth** factor is reasonably limiting for the same population.	1 pt.