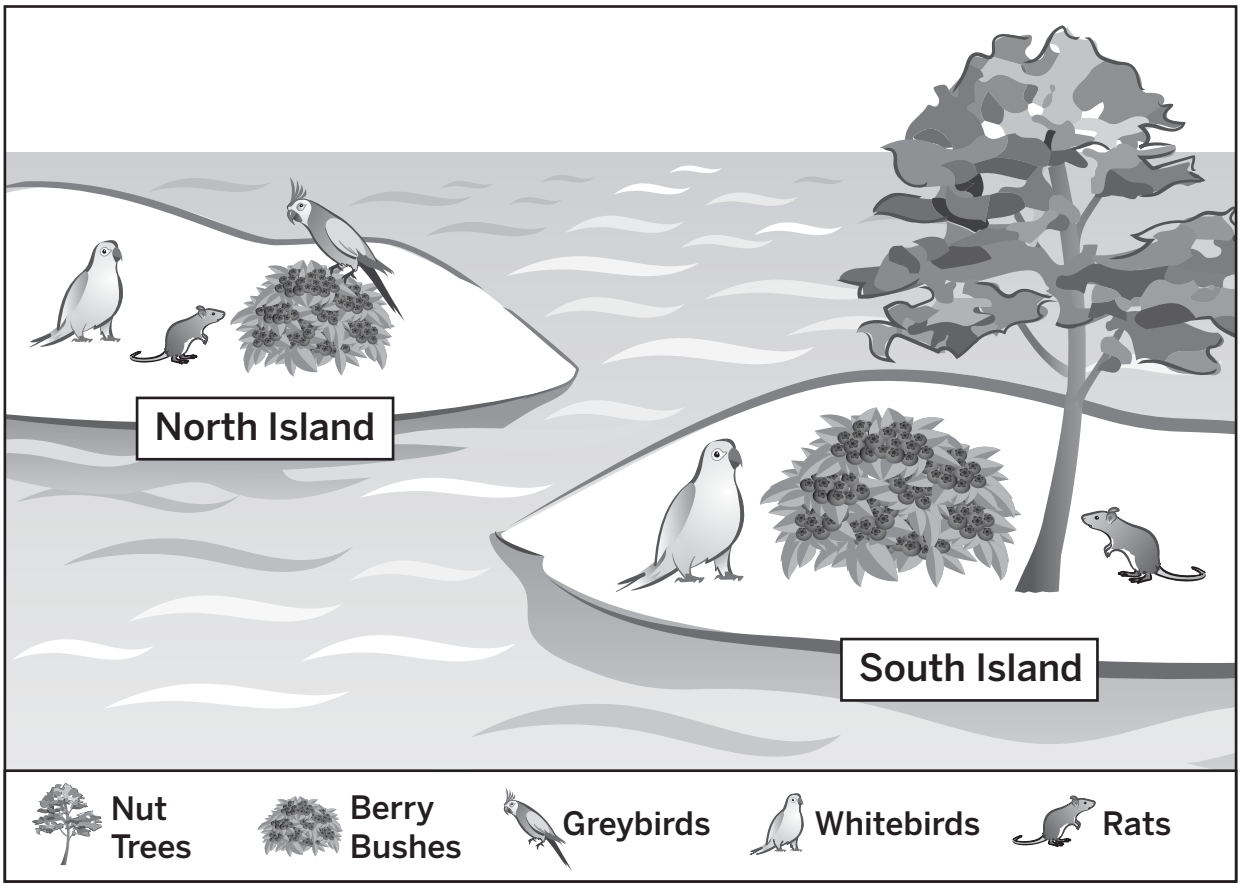
Name _____

Chapter 1 Assessment

1. Graybirds and whitebirds live on North Island. Both types of birds eat the berries of the berry bush. The seeds of the berry bush grow best after the berries are eaten by birds and dropped elsewhere around the island.

Whitebirds are also found on nearby South Island. The whitebirds on South Island eat berries and the nuts of the nut tree.

Rats are found on both islands. The rats eat berries and bird eggs.



Chapter 1 Assessment

Continued

Name _____

1a. Identify examples of competition, predator-prey, and mutualism between species on each island.

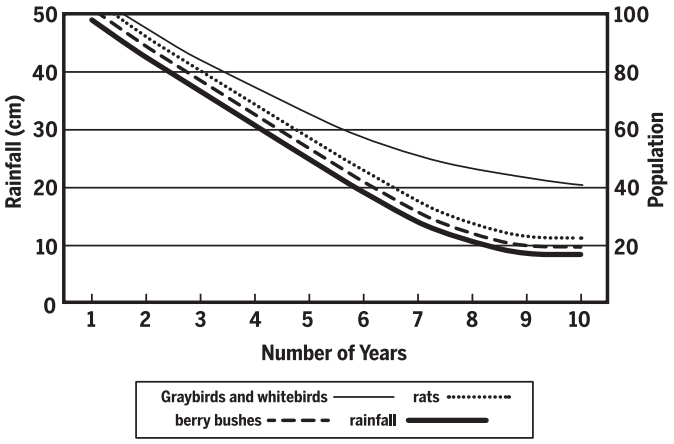
North Island	South Island
Example of competition: Why is this an example of competition?	Example of competition: Why is this an example of competition?
Example of predator-prey: Why is this an example of predator-prey?	Example of predator-prey: Why is this an example of predator-prey?
Example of mutualism: Why is this an example of mutualism?	Example of mutualism: Why is this an example of mutualism?

Chapter 1 Assessment

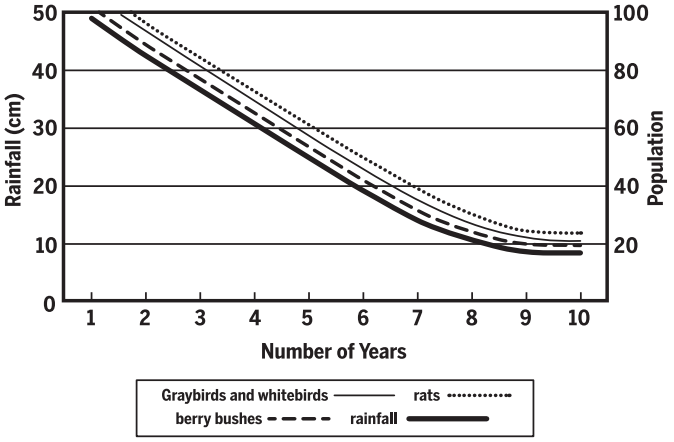
Continued

Name _____

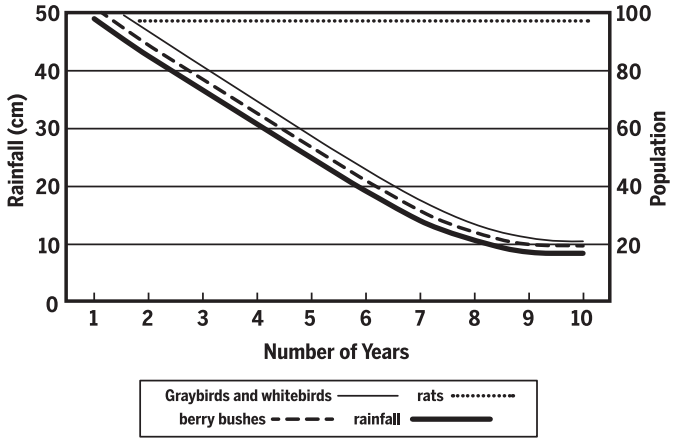
1b. Berry bushes need lots of rainfall. Make an X in the box next to the graph below that best predicts what would happen to the populations on the **North Island** during a 10-year period of decreasing rain. Using the space to the right of the other two graphs, explain why these graphs are not the best predictions of what would happen during the period of decreasing rain. You do not need to write anything next to the graph you chose as the best prediction.



A. ☐



B. ☐



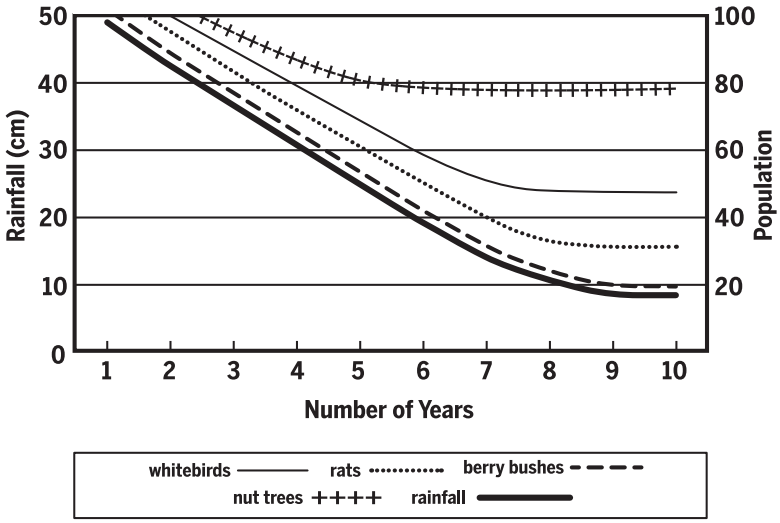
C. ☐

Chapter 1 Assessment

Continued

Name _____

1c. The graph below shows how the populations on the South Island changed during the same 10-year period of decreasing rain. Nut trees do not need a lot of rain. Construct a complete scientific explanation that answers the question, "Why did the population of whitebirds decrease to about half of what it was before?"



Your explanation should include the following:

- The scientific question
- Your claim
- The relevant evidence that supports your claim
- The science concepts that support the evidence
- Your scientific reasoning that links the evidence and science concepts to the claim

Student Checklist for Performance Task

1a. Describe 3 relationships for North Island ☐

Describe 3 relationships for South Island ☐

1b. Put an X in the box of the correct graph ☐

Write an explanation next to one of the incorrect graphs ☐

Write an explanation next to the other incorrect graph ☐

1c.

Claim ☐

Evidence (numbers or trends from graph) ☐

Science Concept ☐

Reasoning (logic statement that uses if, then, because, therefore) ☐

2a.

Claim ☐

Evidence (numbers from table) ☐

Reasoning (connects claim to evidence) ☐

2b. Rebuttal (why you don't agree with the other claim) ☐

Performance Task Scoring Rubric

Note: The rubrics below are drafts. They are intended as guides for assessing whether your students are achieving learning goals. We encourage you to use a scoring system that works in your classroom context and that is appropriate for the level of your students. So, for example, students may be able to earn a "full credit" score for a "Level 2: Developing" response.

1a. Predict the patterns of types of interactions between species on each island.

Include the following:

- competition
- predator-prey
- mutually beneficial

Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Describes all 6 relationships accurately: <u>On the North Island:</u> A **predatory** relationship between the rats and the graybird and whitebird (eggs) A **mutually beneficial** relationship (or mutualism) between the birds and the berries A **competitive** relationship between the two kinds of birds *and* between the birds and the rats for berries <u>On South Island:</u> Rats are **predators** of the whitebird (eggs) **Competition** between rats and whitebirds for berries A **mutually beneficial** interaction (mutualism) between the whitebirds and berries	Describes at least 4 relationships correctly	Describes at least 2 relationships correctly	Describes at least 1 relationship correctly	Does not describe the relationship between the species on the islands

Performance Task Scoring Rubric Continued

1b. Make an X in the box next to the graph below that best predicts what would happen to the populations on the North Island during a 10-year period of decreasing rain."

Explain why the other two graphs are not the best predictions of what would happen during the period of decreasing rain.

Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Selects Graph B AND Explains that A can't be correct because the birds should follow the same pattern as the rats and bushes, since birds also eat berries AND Explains that C can't be correct because rats would decrease as the birds decreased, since rats eat bird eggs	Selects Graph B AND Partially explains what is wrong with Graphs A and C	Selects Graph A AND Partially explains what is wrong with Graph C	Selects Graph C OR Selects any graph but does not explain anything	Student does not select a graph or provide an explanation

Performance Task Scoring Rubric Continued

1c. The graph below shows how the populations on South Island changed during the same 10-year period of decreasing rain. Nut trees do not need a lot of rain. Construct a complete scientific explanation focused on the question, "Why did the population of whitebirds decrease to about half of what is was before?"

	Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Claim	Student advances a claim that includes *all* of the ideas: **1.** There aren't as many berries for birds to eat **2.** Bird eggs are the only food available to the rats so the rats need to eat more bird eggs [or, rats eat more bird eggs] **3.** The whitebirds can also eat nuts, so their population does not crash to zero	Student advances **one or two** of the following claims: **1.** There aren't as many berries for birds to eat **2.** Rats eat more bird eggs **3.** The whitebirds can also eat nuts, so their population does not crash to zero.	Student advances a partially correct claim about either fewer berries or more rats or availability of nuts	Student advances a claim that does not relate to fewer berries (less food) or more rats (more predators) or availability of nuts	Student does not advance a claim
Evidence	Student offers evidence to support all parts of the claim: **1.** The berries decrease a lot on the graph **2.** Rats decrease quite a lot on the graph **3.** Nuts decrease somewhat on the graph	Student offers clear but incomplete evidence to support the claim they offered. *E.g.* The berries decrease on the graph (supports the claim that there are fewer berries)	Student identifies evidence from the graph, but it is unclear or does not completely support the claim	Student offers ideas taken from the prompt that may partially support their claim (*e.g.* "the animals eat berries and nuts.")	Student does not offer evidence

Performance Task Scoring Rubric Continued

	Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Science Concepts	The concept of the **food web** helps me figure out what is going on and/or **Competition** and/or **Predator-prey relationship**	Student describes the scientific concept but does not use the specific terminology (*e.g.* the concept is that animals are connected in the ecosystem—some animals eat plants, other eat other animals and when they eat the same thing they are fighting for that thing)	Student describes he scientific concept vaguely, without using specific terminology (*e.g.* the concept is that everything is connected)	Student describes an unrelated scientific concept (*e.g.* the concept that relates is mutualism)	Student does not include science concepts
Scientific Reasoning	Student clearly demonstrates logical reasoning: *e.g.* **Since** the rats need to eat berries or bird eggs, their population will go down as the berries drop. The rats that are left will eat more bird eggs. There won't be enough bird eggs for all the rats, **so** their population drops. The birds can eat nuts, and the evidence shows the nut tree population has dropped some, **so** the birds are surviving on nuts. Even though the rats are hungry for bird eggs, there aren't so many rats any more, **so** there aren't enough to eat all the birds	Student attempts to link claim and evidence (*e.g.* **because** the berries went down **then** the rats must have eaten more bird eggs because they needed more food)	Student does not adequately link claim to evidence (*e.g.* since everything is connected, the berries will affect the whitebirds)	Does not include logic statements (*e.g.* simply restates claim or evidence)	Does not include scientific reasoning

Performance Task Scoring Rubric Continued

2a. Construct a scientific argument that answers the question: "Do increases in human population cause negative impacts on an ecosystem?"

	Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Claim	Not applicable	Claim completely answers the question. (*e.g.* Increasing human population has a negative impact on Earth OR Increasing human population does not have a negative impact on Earth)	Claim partly answers the question (*e.g.* "yes" or "no.")	Claim doesn't answer the question	Does not make a claim
Evidence	Appropriate and sufficient evidence In the table, the human population increases from 503 to 1088 during the last twenty years. At the same time, Graybird populations have decreased from 1742 to 1350	Some appropriate evidence In the table, the Graybird population decreased	Some appropriate evidence; insufficient to support claim The data table shows that humans affect the Graybird population	Inappropriate and insufficient evidence (*e.g.* "the data table.")	Does not include evidence

Performance Task Scoring Rubric Continued

	Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Scientific Reasoning	Uses relevant science concepts to evaluate the evidence and support the claim Reasoning will depend on initial claim *E.g.* "when the human population increases, there is likely to be more hunting (more predator-prey interactions). The recovery of the birds when hunting is limited confirms my reasoning that humans were having a negative impact on an ecosystem. More people usually means more hunting, and hunting impacts the ecosystem." Or "Even though the Graybird decreases, it is not possible to see the impact of that decrease on the rest of the ecosystem with only the data table. Also, since the Graybird population went back up when hunting licenses were limited, we know that hunting is the problem for the birds (and not, say, habitat destrubtion). So we cannot say that human population increase is the problem; we only have evidence that more hunting is a problem for the Graybirds."	Uses science concepts to evaluate evidence and support claim. May include inappropriate evidence or science concepts	Uses inappropriate science concepts to evaluate the evidence provided	Evaluates the evidence provided without mention of science concepts	Does not include reasoning/ evaluate evidence

Performance Task Scoring Rubric Continued

2b. Write a rebuttal stating why you did not argue for the other claim.

Level 4: Advanced	Level 3: Proficient	Level 2: Developing	Level 1: Beginning	Level 0: Not evident
Offers rebuttal with full justification for why the alternative claim was not selected. The justification should include a critique of the alternative argument. For example, a critique could be the lack of evidence to support the claim, weakness of evidence, or poor connection between claim and evidence <u>Rebuttal to "humans cause a negative impact:"</u> Can't say from the data provided: There are only data for East Island; not all ecosystems on Earth. The bird population responded to the requirement of hunting licenses; so, it's not a problem with the humans, it's the hunting that causes the negative impacts The decrease in Graybirds may not be permanent or the small decrease may not be enough to cause additional negative impacts <u>Rebuttal to the argument "humans do not cause a negative impact:"</u> You can see in the table that when there are more hunting licenses, there are fewer Graybirds and Graybirds are an important link the food web. Increasing human population will probably be accompanied by increases in hunting	Offers rebuttal with partial justification. Student attempts to critique an alternative argument	Offers a rebuttal with minimal justification for why the alternative claim was not selected	Offers an inaccurate or unrelated rebuttal	Does not offer a rebuttal

Aligning the Evidence of Learning Specifications to the Performance Task

Middle School Ecology Unit **MS-LS2 Ecosystems: Interactions, Energy and Dynamics**

Instructional Sequence 1

Performance Expectation MS-LS2-2

Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems

Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.

Performance Expectation MS-ESS3-4

Construct an argument supported by evidence for how increases in human population ~~and per-capita consumption of natural resources~~ impact Earth's systems.

Clarification Statement: ~~Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change.~~ The consequences of increases in human populations ~~and consumption of natural resources~~ are described by science, but science does not make the decisions for the actions society takes.

Evidence of Learning Specifications

1. Construct an explanation that predicts:
    a. consistent patterns of interactions between living and non-living parts of ecosystems
    b. consistent patterns of types of interactions including competitive, predatory, and mutually beneficial
2. Construct an argument that:
    a. is supported by empirical evidence of interactions within the ecosystem (a type of Earth system) and scientific reasoning
    b. supports or refutes how increases in human population cause negative impacts on the Earth

Use the chart below to align each prompt/question in the performance task to an EoLS.

Performance Task prompts/questions	EoL Statements

Graybirds and whitebirds live on North Island. Both types of birds eat the berries of the berry bush. The seeds of the berry bush grow best after the berries are eaten by birds and dropped elsewhere around the island.

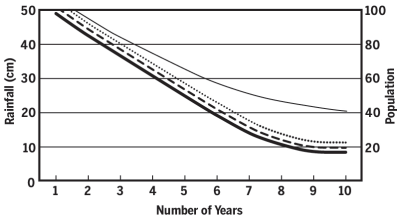
Whitebirds are also found on nearby South Island. The white birds on South Island eat berries and the nuts of the nut tree.

Rats are found on both islands. Berries and bird eggs are favorite foods of the rats.

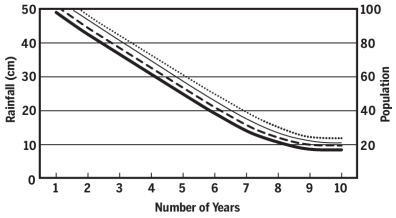
1a. Predict the patterns of interactions between species on North and South Islands. Identify 3 relationships on each island. Use words: competition, predatory-prey, and mutualism. Write a paragraph describing the relationships.

1b. Berry bushes need lots of rainfall. Which graph below best predicts what would happen to the populations on the **North Island** during a 10-year period of decreasing rain. Explain why the other two graphs are not the best predictions of what would happen during the period of decreasing rain.

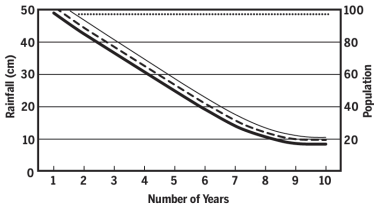
A)



B)

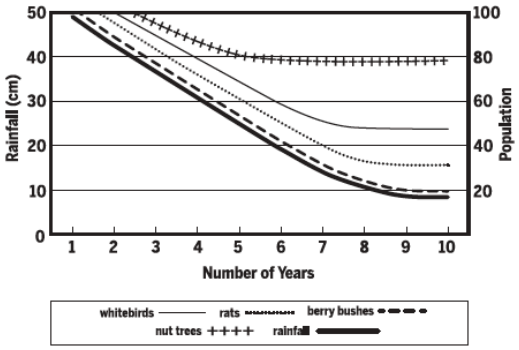


C)



Performance Task prompts/questions	EoL Statements

1c. The graph below shows how the populations on the South Island changed during the same 10-year period of decreasing rain. Nut trees do not need a lot of rain. Construct a complete scientific explanation that answers the question, "Why did the population of whitebirds decrease to about half of what it was before?"



Your explanation should include the following:

- The scientific question
- Your claim
- The relevant evidence that supports your claim
- The science concepts that support the evidence
- Your scientific reasoning that links the evidence and science concepts to the claim

2. East Island has had normal rainfall. Like North Island, it has berry bushes, both Graybirds and Whitebirds, and rats, but no nut trees.

About 20 years ago, people started living on East Island and began hunting Graybirds for food. Five years ago, the local government decided to reduce bird-hunting by limiting hunting licenses.

Years Ago	Graybird Population of East Island	Human Population of East Island	Number of Hunting Licenses Issued
20	1,742	503	50
15	1,510	631	69
10	1,213	759	70
5	1,298	962	40
present	1,350	1,088	40

2a. Use evidence from the table above to construct a scientific argument that answers the question: "Do increases in human population cause negative impacts on the Earth?"

The argument should include the following:

- The scientific question
- Your claim (that is best supported by evidence and reasoning)
- The relevant evidence that supports your claim
- The scientific reasoning that links the evidence and science concepts to the claim

2b. Write a rebuttal stating why you did not argue for the other claim.

Tool 5 Template Example – 3D Assessment

Evaluate: Experiences in the Evaluate phase encourage students to assess and reflect on their conceptual understanding and use of the science and engineering practices. The Evaluate phase includes both an activity and performance task that together allow teachers to evaluate student progress toward achieving the performance expectation(s).

Evidence of Learning Specifications

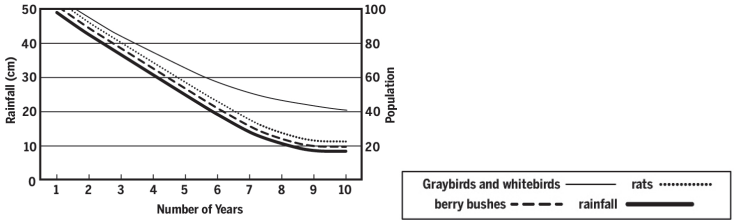
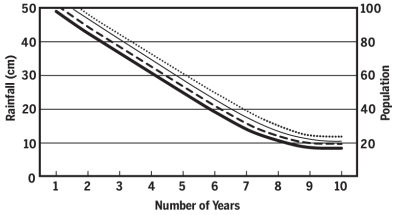
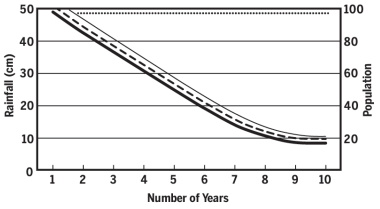
1. Construct an explanation that predicts:
   a. Consistent patters of interactions between living and non-living parts of ecosystems
   b. Consistent patterns of types of interactions including competitive, predatory, and mutually beneficial
2. Construct an argument that:
   a. Is supported by empirical evidence of interactions within the ecosystem (a type of Earth System) and scientific reasoning
   b. Supports or refutes how increases in human population cause negative impacts on the Earth

Alignment with EoLS	**Performance Task to address EoLS** List questions/prompts	**Ideal Student Responses** Use to guide rubric development
EoLS 1b - Construct an explanation that predicts: Consistent patterns of types of interactions including competitive, predatory, and mutually beneficial	Graybirds and whitebirds live on North Island. Both types of birds eat the berries of the berry bush. The seeds of the berry bush grow best after the berries are eaten by birds and dropped elsewhere around the island. Whitebirds are also found on nearby South Island. The white birds on South Island eat berries and the nuts of the nut tree. Rats are found on both islands. Berries and bird eggs are favorite foods of the rats. 1a. Predict the patterns of interactions between species on North and South Islands. Identify 3 relationships on each island. Use words: competition, predatory-prey, and mutualism. Write a paragraph describing the relationships.	*On **North Island**:* • *A predator-prey interaction between the rats and the birds (or, rats are predators, bird eggs are their prey)* • *A mutually beneficial interaction (or mutualism) between the birds and the berries* • *Competition between the two kinds of birds and between the birds and the rats for berries.* *On **South Island**:* • *Rats are predators of the whitebird eggs (or rats are predators, bird eggs are their prey)* • *Rats and whitebirds compete for berries* • *The whitebirds and berries have a mutually beneficial interaction (mutualism)*

Evaluate: Experiences in the Evaluate phase encourage students to assess and reflect on their conceptual understanding and use of the science and engineering practices. The Evaluate phase includes both an activity and performance task that together allow teachers to evaluate student progress toward achieving the performance expectation(s).

Evidence of Learning Specifications

1. Construct an explanation that predicts:
   a. Consistent patters of interactions between living and non-living parts of ecosystems
   b. Consistent patterns of types of interactions including competitive, predatory, and mutually beneficial
2. Construct an argument that:
   a. Is supported by empirical evidence of interactions within the ecosystem (a type of Earth System) and scientific reasoning
   b. Supports or refutes how increases in human population cause negative impacts on the Earth

EoLS 1a - Construct an explanation that predicts: Consistent patterns of interaction between living and non-living parts of ecosystems	1b. Berry bushes need lots of rainfall. Which graph below best predicts what would happen to the populations on the **North Island** during a 10-year period of decreasing rain. Explain why the other two graphs are not the best predictions of what would happen during the period of decreasing rain. A)  B)  C)  	***Answer A)*** *is not correct because the birds should follow the same pattern as the rats and bushes, since birds also eat berries* ***Answer B)*** *is correct* ***Answer C)*** *is not correct because rats would decrease as the birds decreased, since rats eat bird eggs*

Evaluate: Experiences in the Evaluate phase encourage students to assess and reflect on their conceptual understanding and use of the science and engineering practices. The Evaluate phase includes both an activity and performance task that together allow teachers to evaluate student progress toward achieving the performance expectation(s).

Evidence of Learning Specifications

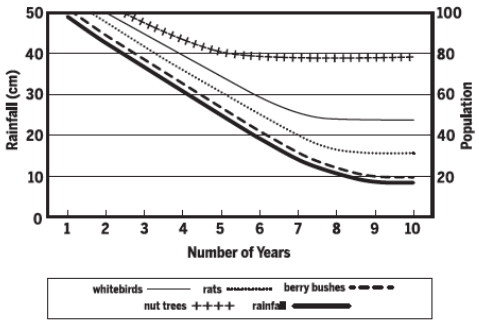
1. Construct an explanation that predicts:
   a. Consistent patters of interactions between living and non-living parts of ecosystems
   b. Consistent patterns of types of interactions including competitive, predatory, and mutually beneficial
2. Construct an argument that:
   a. Is supported by empirical evidence of interactions within the ecosystem (a type of Earth System) and scientific reasoning
   b. Supports or refutes how increases in human population cause negative impacts on the Earth

Alignment with EoLS

EoLS 1b - Construct an explanation that predicts:

Consistent patterns of types of interactions including competitive, predatory, and mutually beneficial

1c. The graph below shows how the populations on the South Island changed during the same 10-year period of decreasing rain. Nut trees do not need a lot of rain. Construct a complete scientific explanation that answers the question, "Why did the population of whitebirds decrease to about half of what it was before?"



Your explanation should include the following:

- The scientific question
- Your claim
- The relevant evidence that supports your claim
- The science concepts that support the evidence
- Your scientific reasoning that links the evidence and science concepts to the claim

1c. The whitebirds decreased because there aren't as many berries for them to eat, and the rats eat more whitebird eggs, because there are less berries. Also, they only decreased to half because the whitebirds can still eat nut trees. My reasoning is based on the feeding relationships in the foodweb and on competition. Since the rats need to eat berries or bird eggs, their population will go down as the berries drop, so the rats that are left will eat more bird eggs. There won't be enough bird eggs for all the rats, so their population drops. The birds can eat nuts, and the evidence in the graph shows the nut tree population has dropped some, so the birds are surviving on nuts. Even though the rats are hungry for bird eggs, there aren't so many rats any more, so there aren't enough to eat all the birds.

Evaluate: Experiences in the Evaluate phase encourage students to assess and reflect on their conceptual understanding and use of the science and engineering practices. The Evaluate phase includes both an activity and performance task that together allow teachers to evaluate student progress toward achieving the performance expectation(s).

Evidence of Learning Specifications

1. Construct an explanation that predicts:
   a. Consistent patters of interactions between living and non-living parts of ecosystems
   b. Consistent patterns of types of interactions including competitive, predatory, and mutually beneficial
2. Construct an argument that:
   a. Is supported by empirical evidence of interactions within the ecosystem (a type of Earth System) and scientific reasoning
   b. Supports or refutes how increases in human population cause negative impacts on the Earth

EoLS 2a - Construct an argument that:

Is supported by empirical evidence of interactions within the ecosystem (a type of Earth System) and scientific reasoning

EoLS 2b - Construct an argument that:

Supports or refutes how increases in human population cause negative impacts on the Earth

East Island has had normal rainfall. Like North Island, it has berry bushes, both Graybirds and Whitebirds, and rats, but no nut trees. About 20 years ago, people started living on East Island and began hunting Graybirds for food. Five years ago, the local government decided to reduce bird-hunting by limiting hunting licenses.

Years Ago	Graybird Population of East	Human Population of East	Number of Hunting Licenses Issued
20	1,742	503	50
15	1,510	631	69
10	1,213	759	70
5	1,298	962	40
present	1,350	1,088	40

2a. Use evidence from the table above to construct a scientific argument that answers the question: "Do increases in human population cause negative impacts on the Earth?"
The argument should include the following:

- The scientific question
- Your claim (that is best supported by evidence and reasoning)
- The relevant evidence that supports your claim
- The scientific reasoning that links the evidence and science concepts to the claim

2b. Write a rebuttal stating why you did not argue for the other claim.

2a. My claim is that increases in human population do cause negative impacts on an ecosystem. My claim is based on evidence that the graybird population of East Island dropped from 20 years ago to 5 years ago, at the same time that the human population was increasing. Every five years, as the human population grew, the graybird population fell. Additional evidence is based on the beginning of an increase in the number of birds when hunting was changed from unlimited hunting licenses to limited licenses. My reasoning is that when the human population increases, there is likely to be more hunting (more predator-prey interactions) between humans and birds, so the drop in bird population is likely to be due to hunting. The recovery of the birds when hunting is limited confirms my reasoning that humans were having a negative impact on an ecosystem. The evidence is pretty strong that more people usually means more hunting, and hunting impacts the ecosystem.

2b. You can see in the table that when there are more hunting licenses, there are fewer Graybirds and Graybirds are an important link the food web. Increasing human population will probably be accompanied by increases in hunting.

Guide to Developing a Performance Task & Rubric

Using EoLS to Develop a Performance Task, Scoring Rubric, and Student Checklist

Step 1: Review your **Evidence of Learning Specifications** (EoLS) developed in Tool 2.

Decide if the EoLs are still pertinent to your performance task. Do the EoLS align with your current learning goals for students and the instruction designed in Tool 4? If not, revise your EoLS.

Record the EoLS in the box at the top of Tool 5.

Step 2: Explore resources (test items, formative assessments, or sample questions from instructional materials) that might be used in whole or in part to meet one or more of the specifications.

Review the phenomena and anchoring events used in Tools 3 and 4 for instruction.

Use the **Evaluate Analysis Guide** to help you determine if any prompts, questions, or lab experiences may be used as part of your performance task.

Step 3: Construct the **performance task** as a set of questions/prompts that can be aligned with EoLS. Be sure to ground the questions/prompts in an anchoring event(s) connected to the phenomenon in your Tool 4 sequence.

For each prompt, prepare an ideal student response. Complete Tool 5 by recording the performance task in the middle column, showing the alignment of each question/prompt with an EoLS in the first column, and recording the ideal student responses to each question/prompt from the task in the third column.

Step 4: Develop a **scoring rubric** for the performance task that includes a component for each part, question, or prompts in the assessment task. Write descriptors for each component that describes the full range of student understanding. Use the steps categories below to construct a scoring rubric

- **High Level of Proficiency**: Answer each prompt with an ideal student response. This response is scientifically accurate, complete and coherent, and consistent with your expectation for student understanding.
- **Low Level of Proficiency**: Revisit each prompt and answer with student response that includes naïve conceptions or misconceptions. This response is not scientifically accurate, may be incomplete/coherent, and is not consistent with your expectation for student understanding.
- **Medium Level(s) of Proficiency**: Revisit each prompt and answer with a student response that includes partial understanding. This response is partially accurate, mostly complete/coherent, and somewhat consistent with your expectation for student understanding.

Step 5: Develop a **student checklist** for the performance task by using the scoring rubric from Step 4 to write out criteria specific to each question/prompt to serve as a checklist for students in helping them to complete the performance task.