

Model Ecosystem Project

Your Goal: To make an ecosystem (diagram/ model) showing how an ecosystem works. It must contain at least three types of each of the following: abiotic elements, plants, herbivores, carnivores, and omnivores. Organism numbers must have the necessary resources in the ecosystem to maintain its carrying capacity.

Overall Expectation(s): Demonstrate an understanding of interactions between and among biotic and abiotic elements in the environment. Specific Expectation(s):

7s9	use appropriate science and technology vocabulary, including sustainability, biotic, ecosystem, community, population, and producer, in oral and written communication
7s10	use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes
7s11	demonstrate an understanding of an ecosystem (e.g., a log, a pond, a forest) as a system of interactions between living organisms and their environment
7s12	identify biotic and abiotic elements in an ecosystem, and describe the interactions between them (e.g., between hours of sunlight and the growth of plants in a pond; between a termite colony and a decaying log; between the soil, plants, and animals in a forest)
7s13	describe the roles and interactions of producers, consumers, and decomposers within an ecosystem (e.g., Plants are producers in ponds. They take energy from the sun and produce food, oxygen, and shelter for the other pond life. Black bears are consumers in forests. They eat fruits, berries, and other consumers. By eating other consumers, they help to keep a balance in the forest community. Bacteria and fungi are decomposers. They help to maintain healthy soil by breaking down organic materials such as manure, bone, spider silk, and bark. Earthworms then ingest the decaying matter, take needed nutrients from it, and return those nutrients to the soil through their castings.)
7s14	describe the transfer of energy in a food chain & explain the effects of elimination of any part of the chain
7s17	explain why an ecosystem is limited in the number of living things (plants, animals, including humans) that it can support
7s7	design and construct a model ecosystem (e.g., a composter, a classroom terrarium, a greenhouse), and use it to investigate interactions between the biotic and abiotic components in an ecosystem. Sample guiding questions: What are some biotic components of this ecosystem? What are some abiotic components? How do these components affect each other (abiotic and abiotic; biotic and biotic; abiotic and biotic)? What are some of the interactions that are occurring in the model ecosystem?

Part A – The Ecosystem

Method

- Choose an ecosystem (forest, desert, coral reef, ocean, rocky shore, grassland, mountain, savanna, prairie and pond etc.) to study independently. Focus your research on the main biotic and abiotic elements in the ecosystem. Do some research as to what plants and animals live in the ecosystem and how they interact with each other (in other words, who eats who!)
- Create a T-chart (sample below) or graphic organizer to help you sort your findings into the following categories: 1) Abiotic; 2) Biotic [Plants and Animals (herbivores, carnivores, omnivores)]. Be as specific as you can when naming your elements (i.e Toucans vs bird, Deciduous Tree vs tree).

Abiotic	Biotic			
	Plants	Animals		
		herbivores	carnivores	omnivores

- You need to find a minimum of **at least 3 abiotic elements, 3 plants, 3 herbivores, 3 omnivores and 3 carnivores** in the ecosystem.
- Once you have gathered all of the information, begin to create your model ecosystem.
- You can start by drawing or creating the landscape. This is best done by coloring in the background or the inside of the box (for the model). You may want to color in paper and cut it out to stick into the model box. Then draw, color in a cut out the various animals and plants. Cut them out and stick them onto the background as they would interact. You must **LABEL** each element in your ecosystem.

Example:



Name: _____

Due Date: _____

Part B – Interactions in the Ecosystem

Throughout this unit, we have been examining how an organism interacts with the living and non-living elements in an ecosystem. We have discussed and investigated predator/prey relationships as well as food chains and webs. Now it is time to put that knowledge into practice and explore some of the interactions between different components in your ecosystem apply it.

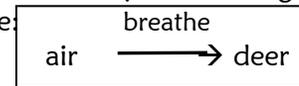
Your Goal: Using the model ecosystem you have just created, you will generate one food chain/web.

Method

1. Using your model, show **1 food web that contains at least 8 elements**. You must include a producer, a primary consumer, and a secondary consumer. They must be realistic feeding relationships! (You may need to add an element to your ecosystem model). Remember, a food web contains many food chains; make sure your consumers have a variety of food to eat.
2. Only for the elements in your food web - add to their labels whether it is a producer or consumer. Each consumer must be labelled as a herbivore, carnivore, omnivore, or decomposer.
3. Begin constructing your food web. Draw all the connections within your web using an arrow between the elements to show there is interaction and pointing to where the energy is going. Write the type of interaction that is occurring on each line. On the diagram you could draw arrows to show the interactions. If you are doing the model you can hang some of the creatures from the roof of the box with fishing line. Example:



Rabbit
Primary Consumer
Herbivore



The Conclusion: Your model ecosystem should include several biotic and abiotic elements and demonstrate the interactions between the biotic and abiotic elements (using arrows).

Some Helpful Websites to Explore:

- <http://www.windows.ucar.edu/tour/link=/earth/ecosystems.html&edu=elem>
- <http://www.teachersdomain.org/collection/k12/sci.life.oate.human/>

Use the following questions to help you develop a good project.

- Is your name on the front of the project?
- Is the ecosystem type identified?
- Is the model a 2D/3D representation of an ecosystem?
- Are all the elements included?
 - (at least 3 abiotic, 3 plants, 3 herbivores, 3 omnivores and 3 carnivore)
- Are the elements correctly labelled? Each element must be labelled with its name.
- Are the food web elements correctly labelled? Each element must be labelled with its function.
- Are the relationships between the parts (if any) shown correctly? Are there connections within your web using an arrow between the elements to show there is interaction?

You could be awarded with a bonus (5 extra credit points) if your project is selected to be the Most Scientific, Most Attractive, or Most Disgusting. Students will vote to decide the winner in each category.

Name: _____

Due Date: _____

Model Ecosystem Rubric (Part A, B, C)

	1	2	3	4
Knowledge and Understanding (Knowledge of model or prototype)				
A	Is missing either abiotic or biotic elements in the ecosystem.	Includes a few biotic and abiotic elements in the ecosystem. Elements may be unbalanced/unnecessary	Includes a balance of biotic and abiotic elements in the ecosystem.	Includes a balance of biotic and abiotic elements in the ecosystem and includes only necessary items.
B	Several required elements are missing.	All but 1 of the required elements are included in the food web.	All required elements are included in the food web.	The food web includes all required elements as well as additional information, 5 or more food elements are displayed on the food web.
Thinking and Investigation (Use of critical/creative thinking processes, skills, and strategies: Creativity, Application of prior knowledge and skills)				
A / B	- Few or no labels were present on the model/web.	- All required organisms are labelled with a name. - Most web organisms are labelled as producer or consumer.	- All required organisms are labelled with a name. - All web organisms are labelled as producer or consumer. Most web consumers are labelled as an herbivore, carnivore, omnivore, or decomposer.	- All required organisms are labelled with a name. - All web organisms are labelled as producer or consumer. All consumers are labelled as an herbivore, carnivore, omnivore, or decomposer.
B	There are producers and consumers in the ecosystem but not in ample quantity to be self sustaining.	There are producers and consumers in the ecosystem and is should sustain itself for 2 weeks.	There are many producers in the ecosystem - enough to support the needs of the consumers comfortably for 2 weeks.	The energy needs of producers and consumers have been carefully considered and both will survive easily beyond 2 weeks.
Communication (Expression and organization of ideas and information in oral, visual, and/or written forms)				
C	Student uses vocabulary and terminology of the discipline with limited effectiveness	Student uses vocabulary and terminology of the discipline with some effectiveness	Student uses vocabulary and terminology of the discipline with considerable effectiveness	Student uses vocabulary and terminology of the discipline with a high degree of effectiveness
A / B	The model is distractingly messy or very poorly designed. It is not attractive.	The model is acceptable attractive though it may be a bit messy.	The model is attractive in terms of design, layout and neatness.	The model is exceptionally attractive in terms of design, layout, and neatness.
Application (Transfer of knowledge and skills to unfamiliar contexts: Creativity, Application of prior knowledge and skills)				
B	Cannot accurately illustrate or illustrates a few interactions between the biotic and abiotic elements in the ecosystem.	Can accurately illustrate some of the interactions between the biotic and abiotic elements in the ecosystem.	Can accurately illustrate the interactions between the biotic and abiotic elements in the ecosystem.	Can accurately illustrate the interactions between the biotic and abiotic elements in the ecosystem using technical terms.

Name: _____

Due Date: _____

Part C – Explanation Writing Piece

Your Goal: Compose an Explanatory writing piece that explains model ecosystem and food web.

Method

1. You need to include an Explanatory writing piece that provides the following information:
 - a. Title (Name of Ecosystem)
 - b. Definition – What it is (A Grassland ecosystem is...)
 - c. Components or parts – What it consists of (elements in your ecosystem)
 - d. Operations – How it works (the food web)
 - e. Application – What it's used for

Explanation Writing Checklist

	Met	Not Yet Met
Content		
Title is interesting and appropriate.		
Does my first paragraph provide a definition?		
Does my second paragraph explain the operation?		
Details are logically developed and specific.		
Does my final paragraph give the applications?		
Ending leaves the reader with a clear understanding.		
Style and Organization		
Is it all written in an impersonal third person style without using 'I'?		
Nouns are specific.		
Format is clear and easy to read.		
Conventions		
Information is easy to read, with clearly marked divisions.		
Sentences are complete.		
Punctuation is appropriate.		