Strand 6.4: Stability and Change in Ecosystems

Module 10 Introduction

The study of ecosystems includes the interaction of organisms with each other and with the physical environment. Consistent interactions occur within and between species in various ecosystems as organisms obtain resources, change the environment, and are affected by the environment. This influences the flow of energy through an ecosystem resulting in system variations. Additionally, ecosystems benefit humans through processes and resources such as the production of food, water and air purification, and recreation opportunities. Scientists and engineers investigate interactions among organisms and evaluate design solutions to preserve biodiversity and ecosystem resources.

Strand 4: Stability and Change in Ecosystems

Standard 6.4.3

Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Emphasize food webs and the role of produces, consumer, and decomposers in various ecosystems. Examples could include Utah ecosystems.

Scientific and Engineering Practices (SEP): Developing and using models

Developing and using models are helpful tools for representing ideas and explanations. These tools can include diagrams, drawing, physical replicas, mathematical representations, analogies, and computer simulations. Modeling tools are used to develop questions, predictions and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineering systems. Measurements and observations are used to revise models and designs.

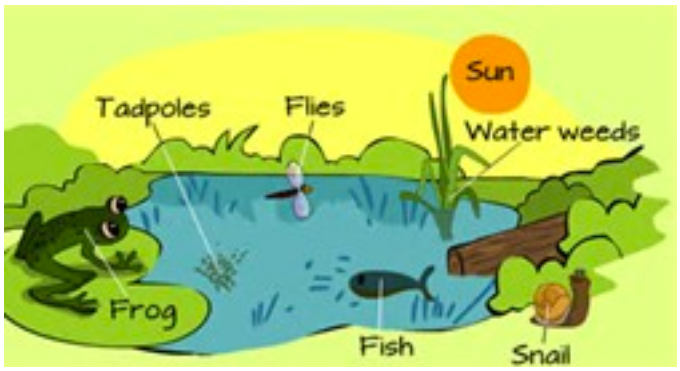
Crosscutting Concepts (CCC): Energy and Matter: Flows, Cycles, and Conservation

- Matter is conserved because atoms are conserved in physical land chemical processes.
- Within a natural or designed system, the transfer of energy drives the emotion and/or cycling of matter.
- Energy my take different forms (e.g., energy in fields, thermal energy, energy of motion).
- The transfer of energy can be tracked as energy flows through a designed or natural system
- Tracking flux of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.

Course Objectives:

- Familiarize yourself with the disciplinary core ideas science and engineering practices, and crosscutting concepts associated with Standard 6.4.3
- Develop and identify additional learning episodes that identify and emphasize 3 Dimensional Science Instructions associated with Standard 6.4.3

Module 10 Content



Task 1:

- Review all of Strand 6.4 and write down three important points about stability and change in an ecosystem.

- Review the SEP "Developing and Using Models" and write three important points of the importance of developing a model.

- Watch the Bozeman YouTube video about Practices Developing and Using Models: https://www.youtube.com/watch?v=Gn26g5RFXpQ.

  When you are done, write your impressions on what type of model would work well in helping understand stability and change in an ecosystem.

Task 2:

- Engage students in the crosscutting concept matter and energy transfer. Watch the Bozeman YouTube video on Matter and Energy transfer in an Ecosystem: https://www.youtube.com/watch?v=x37DJLcJ0dI.

  Write down a few ideas of how matter changes and why it has to change within an ecosystem. Think of models that could show how matter changes.

- One of the important ideas to learn about matter and energy transfer is to understand producers and composer. Click on the URL below. Describe what is happening at each picture. Why would this be a good model to use or not to use?

  https://www.bing.com/images/search?q=food+chain+models&view=detailv2&id=BF25923F58AE14A616A9D4AF35E03E9B425332D5&selectedindex=40&ccid=Vc5uFm0f&simid=608007330908604011&thid=OIP.M55ce6e166d1f1c25d8311eebdf7d0d2ao0&mode=overlay&first=1

Task 3:

In this standard we are focusing on the recycling of matter and energy using models. Consider how matter has to keep changing from nonliving to living things to keep life going.

- Read the condensed article below. (Taken from the Bozeman YouTube video Cycles of Matter and Energy Transfer.) Underline important ideas that you would like to discuss.

  The matter and energy transfer process is how an ecosystem functions moving matter in and out of life so matter and energy can be used and recycled by all organisms on earth. There are two connecting parts that make the recycling of matter and energy work: organisms and the environment. Organisms are all the living plants and animals around us. The environment is the water, air, and soil.

  Organisms require matter, therefore, getting it from the environment. Plants grow from matter that is found in the soil such as water, nitrogen, and nutrients; carbon dioxide found in the air; and energy from the sun. The combination of this matter becomes living matter or life. When living matter dies, bacteria break down the matter and the matter is moved back to the environment of soil and air ready to be used by new living organisms. Food webs and food chains create the movement of matter and energy beginning from the environment and ending back into the environment.

  As matter and energy is transferred in the food web and food chain from one living thing to another, the amount of matter and energy is lost. It is noticed that in the food chain, that there are millions of producers such as grasses, flowers, and trees. In the next level of the food chain pyramid there are less such as insects and bugs. There may be a lot but not as many as the producers. In the next level of the food chain pyramid, the consumers that eat the insects and bugs are fewer such as

This all happens because of photosynthesis and cellular respiration. Photosynthesis is taking matter from the environment and making into usable matter becoming a producer. Cellular respiration is an animal eating the plant where it is changed into energy and released. The sugars combine with oxygen where it is broken down into water and carbon dioxide where it is changed and energy is released.

- Go through the slide show "Matter and Energy in Ecosystems" found below:

  http://www.slideshare.net/cmsdsquires/chapter-93-matter-and-energy-in-ecosystems.

  The slide show tells about the importance of food webs and food chains. A very important part that connects to food webs and food chains are the transfer of energy through the ecological pyramid. On the last slide are four questions. Answer these questions.

- For further understanding of food webs and food chains and the diminishing transfer of energy, click on the links below. How are these good models or not good models to use?

  http://www.physicalgeography.net/fundamentals/4e.html

  http://www.vtaide.com/png/foodchains.htm

Task 4:
For a total review for putting everything together about energy transfer in an ecosystem, look at the slide show below. When you are done, pick out one of the areas that is most interesting to you and write about its importance. Discuss how models are used in portraying the information about energy transfer.

http://www.slideshare.net/deawscience/food-webs-photosynthesis-q-and-a?next_slideshow=1

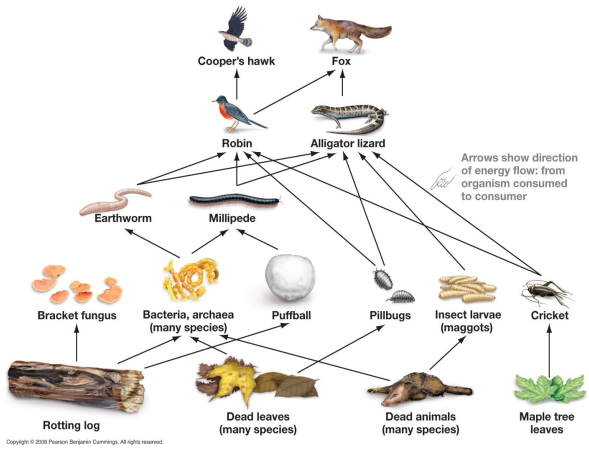
Module 10 Discussion

For this discussion, we will be talking about the lessons you thought and wrote from the content page. Please take some time and post your responses to the prompts below. You will also need to respond to at least two other posts with additional ideas, suggestions, or questions about classroom implementation.

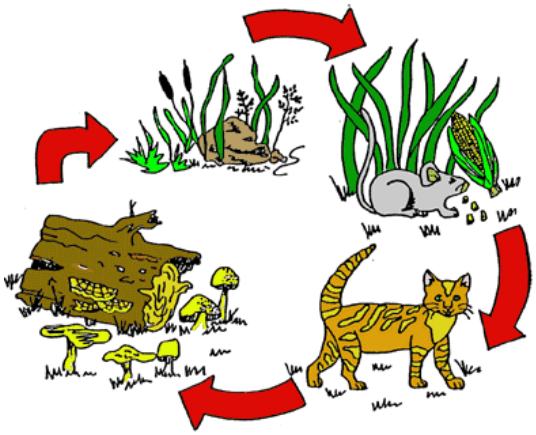
1. Reflect on any one of the tasks (or any of the subtasks in a task) in the content. Identify elements of energy and matter transfer as it relates to an ecosystem and models that could be used to help understand this concept.
2. Identify additional learning events that could be part of a larger event that could be used before or after that larger learning event by using a model.

3. Respond to two other posts with additional ideas, suggestions or questions about classroom implementation.

Module 10: Classroom Application



Food Web



Food Chain

In this lesson students will look at food webs and food chains within ecosystems reading and looking at models.

1. Read the article "Food Chains and Food Webs."
http://www.ecologyedu.com/education_resources/what_is_a_food_chain_what_is_a_food_web.html

Reflect on these questions after you have read it.

1. Record a few ideas of what you learned what food chains are in an ecosystem and how energy is transferred.
    a. Did the model of the food chain help in the explanation?
2. Record a few ideas of what you learned what food webs are in an ecosystem and how energy is transferred.
    a. Did the model of the food web help in the explanation?
3. State which system is best in explaining energy transfer.
    a. Which model is the best to use in showing energy transfer within an ecosystem and tell why.

2. Make of model of your own of a Food Web by going to this website.
http://www.sciencegeek.net/Biology/biopdfs/FoodWebActivity.pdf

Read the directions to make your food web. When you are done answer these questions.

1. Did making a model of a food web help you to understand of the process of a food web better?
2. Why or why not?

3. What would you do differently to make it more useful or more understandable?
4. Discuss how making a model of a food web you might go about helping how energy is transferred and lessened at each level.
5. Cite evidences from the article you read if it helps to create your own food web.