Lesson 1: Local Ecosystem Brainstorm:

What do we already know about our local ecosystem?

Grade Level: Middle School 6-8

Essential Question:

How do interactions between abiotic and biotic factors in ecosystems affect the biodiversity of those ecosystems?

Objectives:

At the end of this lesson, you will be able to:

- *assess* prior student knowledge about local prairie ecosystems, specifically how abiotic and biotic factors influence biodiversity in this system.

Assessment opportunities:

At the end of this lesson, you will be able to assess students through:

- Think, pair, share: In a student journal or lab notebook, have the students summarize how they think the local ecosystem operates. Then have each pair discuss what they thought, then offer time to share what they think with the class.

Key Understandings

- Organisms, and populations of organisms, are dependent on their environmental interactions with other living things and with nonliving factors. These interactions may be beneficial or detrimental to an organism. For example, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms.

- Food webs are models that demonstrate how matter and energy is transferred between producers (plants and other organisms that engage in photosynthesis), consumers, and decomposers as the three groups interact—primarily for food—within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. For example, plants transform atmospheric CO2 and water into plant tissues that may be consumed by an animal. When the tissues are metabolized by the animal, some become animal tissue, and some oxygen and water are returned to the atmosphere. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.

Performance Expectations: Next Generation Science Standards:

MS-LS2-2.
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-3.
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

http://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics

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Key Vocab for Students

Abiotic

Biotic

Producer

Consumer

Decomposer

Niche

Adaptations

Dispersal

Ecosystem

Community

Background Information

This lesson is designed to assess students' prior knowledge on how ecosystems function. Students will brainstorm and diagram how they believe their local ecosystem operates. Refer to the attached learning progression table to see the various levels of thinking that may exist in the class (find this on the unit's webpage).

Students may have many misconceptions, but this activity is designed to flush these ideas out and help the teacher to structure the unit. Try not to do too much correction at this point, as the students will review these posters again at the end of the unit, and redo them to show deeper relationships that they have discovered during the course of the unit. After they are completed, save these posters somewhere to be brought out again.

Common Student Misconceptions or Challenges

Using the "Learning progression framework for biodiversity in communities" by Doherty et al. 2011, scales of high achieving students to low achieving students can help guide questions, the scope and scale of the unit. See WyoBio Education page: http://www.wyobio.org/index.php/education/ for a copy of the framework.

Examples are given of what is conserved a low achieving or "1" on the progression framework, realizing that students may be considerably higher than this in their cognitive understanding of the topic and will likely progress up from here.

Biotic Interactions: Sees organisms helping or harming each other; i.e., sees anthropomorphic result of an interaction as good or bad.
Abiotic Interactions: Only sees abiotic environment as scenery or supply of needs.
Dispersal: Dispersal is not acknowledged as happening or necessary for presence.
Community interaction: Community is structured solely by external forces acting upon it (e.g. God, humans, catastrophe).
Taxa Recognition: Common name groups (e.g. birds, insects, etc.)
Grounds for Relatedness: Recognize that one organism is different from others based on outward physical similarities and differences.
Understanding of Ecological Roles and functions: Explain that organisms have human-like roles, like taking care of other organisms.

Lower level students may only mention coarse groups of organisms (e.g birds, bugs), so help them notice finer groups and specific species (e.g., robins, blue jays); and only mention macroscopic organisms, so help them notice the microscopic as well; help students understand that plants are not just scenery, they are living organisms that play roles in the ecosystem (Doherty et al. 2011).

Lesson 1: Local Ecosystem Brainstorm

What do we already know?

Materials:

- Poster Paper
- Pens and Markers
- Local Ecosystem pictures
- Internet access

Time Commitment:

1-2 45-minute class periods.

Preparation:

- Have Internet up and running
- Have poster paper and pens/markers
- Have a local ecosystem picture selected and printed or on projector

Directions:

1. Ask students to work together in pairs or small groups to define ecosystem and abiotic factors. *An ecosystem is all the living/biotic and non-living/ abiotic things in a given area and their interactions*.

2. Show students a picture of the local ecosystem. Discuss the local ecosystem in general terms – location, things the students notice based upon the picture.

3. Give each student group markers and a piece of large white paper (approx. 24 ”x36”). Have each group list as many organisms and abiotic factors that would be located on in their local ecosystem (using the picture for reference). If you are going to have students cut up and use these words to glue and make their food webs, have students write fairly large (not small regular size printing). Alternatively, you can have students re-write the terms in their web (steps 5 and 6).

4. Have a brief discussion of food webs (this should be review from earlier grades). How are the organisms arranged in a food web? How do you show the relationship between the organisms? In what direction do those arrows go? What does this say about energy moving and types of energy (light energy and chemical energy)?

5. Have each group cut out the words on their list. Arrange the cut out words (organisms and abiotic factors) into a food web (plus abiotic interactions) on a new sheet of large paper. Don’t glue yet!

6. After each group has arranged their food web, allow them to send out one “scout.” The scout is allowed to visit other student groups, view their food webs, and to write down what their group is missing. The scout returns to their group. As a group, discuss what the scout has discovered as missing info and decide whether these things should be added to the food web. If they need to be added, the group should write out these new items and include them on their own web. Glue down the items on the food web!

7. As a whole class, discuss the types of feeding relationships (e.g. producer, consumer: predator, prey, herbivore, omnivore, parasite, decomposer) the students know and come to a class consensus.

8. Give the students colored markers – one color for each of the terms you choose for the students to include on their food web. Decide as a class which color and what shape will represent each term (i.e. red circle = carnivore, etc.) At this point Internet access for introducing how to research local species on the WyoBio Website will help students decide how to label each organism.

9. Have the students color code their food web. Don’t forget to have each group draw a key on their food web (so they, and you, don’t forget the colors and shapes you have decided upon)!

10. Refer to the web and ask students:

Did your food webs include trees or other plants?

What happens to the plants at different times of the year? (seasonal discussion)

What happens to the plants when the winter comes?

How do animals get through the winter?

11. Additional optional class discussion questions to introduce topics for next lesson.

1. How do abiotic factors affect what lives in your ecosystem? (light, temp, O2, N, P and S)
2. How do biotic factors affect what lives in your ecosystem? (dispersal, food, competition, predators, diseases, etc.)
3. How might different locations in the ecosystem be different?

Adapted from (Doherty et al. 2011)