



## Biodiversity Unit

**Grade Level:** Middle School 6-8

**Number of Lessons:** 11

### Essential Question:

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

### Processes and Skills

At the end of this unit:

- Students will understand how the cycling of materials such as carbon, water, and nitrogen affect populations of organisms.
- Students will investigate predatory relationships, competitive relationships, dispersal, disturbance, organism identification, food webs, and human impacts on biodiversity.
- Students will have gone through the scientific process of asking questions, making a hypothesis, collecting and analyzing data to presenting their information on a specific species and a local ecosystem.

### Assessment opportunities:

- Students will create a prairie poster.
- Students will reflect on their field trip and be able to define Biodiversity.
- Students will be able to articulate relationships in ecosystems, disturbances on ecosystems, changes in local biodiversity and impacts of invasive species to a system.
- Students will complete a field guide entry through a detailed species account.
- Students will enter observations into citizen science database on WyoBio website.

### Prior Knowledge:

- Understanding of the abiotic factors that influence the local ecosystems, including water, soil, air and organic material, and how these materials cycle through the system.
- Understanding of how food webs work and the vocabulary associated with the roles within the food web system is helpful but can be taught during this series of lessons through supplemental lessons.



# Biodiversity: A Middle School Unit

## Disciplinary Core Ideas: Next Generation

### Science Standards: *MS-LS2 Ecosystems: Interactions, Energy, and Dynamics*

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

#### *LS2.A: Interdependent Relationships in Ecosystems*

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

#### *LS2.B: Cycle of Matter and Energy Transfer in Ecosystems*

- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. 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. (MS-LS2-3)

#### *LS2.C: Ecosystem Dynamics, Functioning, and Resilience*

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)

- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)

#### *LS4.D: Biodiversity and Humans*

- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

#### *ETS1.B: Developing Possible Solutions*

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5)

## Wyoming State Science Standards:

#### *SC8.1.4. Diversity of Organisms*

- Students investigate the interconnectedness of organisms, identifying similarity and diversity of organisms through classification system of hierarchical relationships and structural homologies.

#### *SC8.1.5. Behavior and Adaptation*

- Students recognize behavior as a response of an organism to an internal or environmental stimulus and connect the characteristics and behaviors of an organism to biological adaptation.

#### *SC8.1.6. Interrelationships of Populations and Ecosystems*

- Students illustrate populations of organisms and their interconnection within an ecosystem, identifying relationships among producers, consumers and decomposers.





# Wyoming Biodiversity Citizen Science Initiative

## Lessons Progression and Overview:

### **Lesson 1: Prairie Ecosystem Brainstorm**

- Examine what we know about our local system.
- Brainstorm organisms and design a food web with these organisms.

### **Lesson 2: Visit the Berry Center: (Optional)**

Take a trip to the Berry Center and investigate the resources available there.

- Explore what biodiversity means.
- Determine species that comprise the prairie ecosystem and explore research being done on ecosystem interactions.
- Examine what possible vertebrate classification group might be studied for a citizen science project, and how to identify local species within the group.

### **Lesson 3: Citizen Science**

- Choose a vertebrate group to focus investigation on in your area. (Herps, Birds, Mammals, etc.)
- Set up plan to gather and input data in your citizen science project.
- What can we learn about the biodiversity of one vertebrate classification group?

### **Lesson 4: Local Study Site Investigation**

- Define your local school study site and gather abiotic data about your area.

### **Lesson 5: Biodiversity Determination**

- As a class, develop a list of possible species that might be found in your study site.
- Refer to the WyoBio online resource.

### **Lesson 6: Species Account Creation**

- How does one species operate in the local ecosystem?
- Individual student research projects on a local species chosen from the species list.
- These projects will be combined into a local field guide after subsequent lessons.

### **Lesson 7: Relationships in Ecosystems**

- How does your local system work?
- Determine relationships within the system for your local species.

### **Lesson 8: Disturbances in Ecosystems**

- How does your local system react to disturbance?
- Determine how various disturbances disrupt the relationships within your system.

### **Lesson 9: Changes in Local Biodiversity**

- Are there rare, endangered or threatened species in your area?
- Investigate what species in your area require special attention.

### **Lesson 10: Alien Invasions**

- What invasive species exist in your area and how have they affected the local ecosystem?

### **Lesson 11: Conclusion**

- What have we learned about how our local system operates?
- How can this information transfer to another ecosystem?

