

Science

NEBRASKA K9  
Science Standard

Law of Matter and Energy in Ecosystems SC 12.3.3

- Explain how the stability of an ecosystem is increased by biological diversity SC 12.3.3a

Materials:

- Pen/Pencil
- Rain garden or bioswale

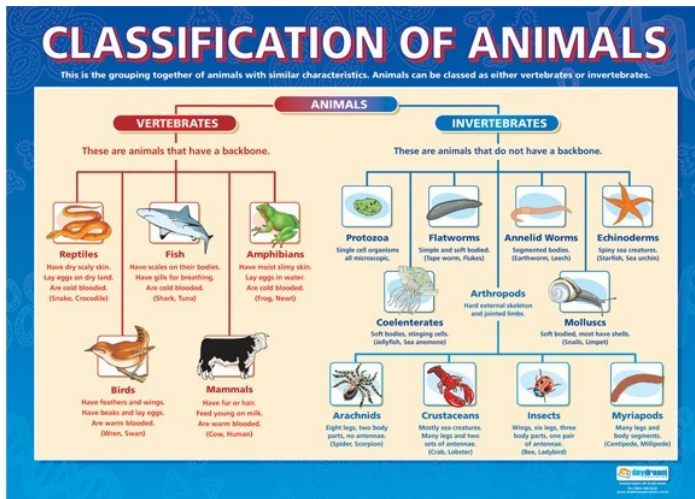
Objective: Understand the importance of diversity in an ecosystem. This lesson will give students the opportunity to observe the biodiversity present within different green infrastructure practices and understand why biodiversity makes the system as a whole more stable.

Anticipatory: This lesson plan should come after teaching the Taxonomic Ranks of organisms, and the class should be familiar with the Taxonomic Ranks of organisms and their specific order (Domain, Kingdom, Phylum, Class, Order, Family, and Genus). Basic information about the separation of domain such as the difference between prokaryotes and eukaryotes should be discussed in a previous class so students will have a foundation. This will show students the different classifications that help to increase biodiversity in an ecosystem. Briefly, discuss some of the differences within the Taxonomic Ranks and explain that the main focus of today's class will be on Kingdom (specifically Animal and Plant). Students will then take a trip to the predetermined rain garden or bioswale that will be the ecosystem that they will observe. While there, students will try and identify as many organisms as possible and place them in the appropriate classification. After students explore the ecosystem a follow-up lecture on what they observed should be held in class.

Procedure:

Today's lesson should follow the introduction to Taxonomic Ranks of Organisms, so attention should be turned to the animal kingdom as this will be the main focus of the class. Students should be provided with a breakdown sheet of the animal kingdom similar to the one shown below. After students are familiar with the Animal Kingdom, the class will go on a field trip.

Sample lessons were developed by students from the University of Nebraska–Lincoln and funded through an EPA Urban Waters Grant.



(Image used from Pinterest)

During the hands-on portion of the class, students will take a field trip to the designated rain garden or bioswale. There, the students will try to identify as many organisms as possible within the ecosystem (rain garden/bioswale) and attempt to place them in the correct category within the Animal Kingdom. Students will also try and identify as many plant species as possible, however, due to the difficulty of breaking them down students will only be asked to identify them to show how many are present in the ecosystem. Allow students roughly 20 minutes to explore around and within the ecosystem, then return to the classroom.

Once the class has returned to the classroom, allow students to compare their findings to that of their peers. Class discussion should then turn to the different types of biodiversity including:

- Genetic Biodiversity- the variation of genes that exists within a species (NWF)
- Ecological Biodiversity- the diversity of ecosystems, natural communities, and habitats (NWF)

At this time students should be asked: “Why is biological diversity important and how does it help to make an ecosystem more important?” Teachers should then lead a discussion into the importance of biodiversity as it makes an ecosystem more stable. Students observed many different organisms within the rain garden or bioswale, however, there was more than meets the eye. Organisms such as bacteria and fungus present within the ecosystem all play a vital role in the biodiversity that makes an ecosystem more stable. Environmental and man-made threats all threaten biodiversity and cause the ecosystem to be less stable.

Possible discussion of importance could include:

- Biodiversity makes an ecosystem more self-sustainable in that it can help prevent disease and helps species adjust to changes.

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Threats to Biodiversity include:

- Habitat Loss
- Climate Change
- Pollution
- Overexploitation
- Disease
- Spread of non-native species/invasive species

## SCIENCE

### NEBRASKA K10

#### Science Standard: 12.3.3

#### Law of Matter and Energy in Ecosystems

- Analyze factors which may influence environmental quality SC 12.3.3.d

#### Materials:

- Green Infrastructure Fact Sheets (provided by the Omaha Stormwater Program)
- Any Green Infrastructure Practice
- 5-gallon container of water

**Objectives:** Understanding factors that both negatively and positively influence environmental quality. Understand how green infrastructure practices help to improve environmental quality.

**Anticipatory:** This class will be dedicated to understanding the different sources of pollution and how they influence the environment. Today's class will be a great time to introduce green infrastructure and how they help to impact the environmental quality in a positive way. Fact sheets provided by the Omaha Storm Water Program will be used as they describe how each green infrastructure practice helps to improve environmental quality. Students will identify sources of pollution as well as types of pollution (air, water, etc.).

**Procedure:** Today, the class will begin as a lecture and end on a field trip to a green infrastructure site. Students should be asked what sources they think contribute to negative environmental quality. The class should spend roughly 20 minutes discussing the factors that negatively influence the environment and the sources they come from. Once students have a solid base of factors that negatively affect the environment class discussion should turn to factors that help to positively influence the environment. Green infrastructure helps to create positive environmental quality, and students can see it first-hand at one of these sites.

Utilizing the designated green infrastructure site located within walking distance from the school, students should be able to see first-hand how green infrastructure helps to positively influence the environment. Depending on which type of practice is utilized, the lesson will be different. However, they all work similarly. Fact sheets provided by the Omaha Stormwater Program, which are also available online, should be utilized while teaching. Teachers are encouraged to bring a 5-gallon container of water and pour it into the green infrastructure system so the students can see the water being captured rather than contributing to runoff and poor water quality.

Now that the class has a foundation on factors that both negatively and positively affect the environment and students have seen one such example, students should discuss ways in which

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they can get involved to help the environment out in a positive manner!

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# SCIENCE

## Nebraska K11

### Science Standard: 12.1.1

#### Earth structures and Processes:

- Recognize how Earth materials move through geochemical cycles resulting in chemical and physical changes in matter SC 12.4.2.a

#### Materials:

- Bioretention system or rain garden
- Pencil and paper

**Objectives:** Students should be able to identify several chemical and physical changes in matter happening at a bioretention system or a rain garden.

**Anticipatory:** Class should be broken down into a lecture, introducing chemical and physical changes in the environment and a hands-on field trip. The field trip will be to a bioretention system or rain garden as these will have the majority of changes taking place. Students should be able to identify and classify the changes as chemical or physical.

**Procedure:** Today's class should be divided into a lecture and time for a field trip to a rain garden or bioretention system. Students should spend roughly half of the class period discussing what a chemical change in matter is vs. a physical change. At this time, the teacher should ask for examples of each allowing for roughly 15 minutes of discussion. After the class has identified several different examples of chemical and physical changes of earth's materials, the class as a whole should take a trip to a bioretention garden or rain garden to identify these changes in the natural environment.

Once the class has arrived at the site, the instructor should help point out both chemical and physical changes in the environment. Whether they be the water in the rain garden evaporating into a gas, the leaves changing colors and eventually breaking down, etc. they all are great ways to show students the changes first hand. The class should be given roughly 20 minutes to identify as many changes as possible and share with the class. As students are sharing their discoveries, they should be breaking them down by chemical or physical changes and explaining why they are either chemical or physical changes.