



WETLAND PLANT ADAPTATIONS

Wetlands are a challenging place to live! What specialized structures do wetland plants have that allow them to function and survive here?

LESSON AT A GLANCE

GRADE LEVEL

- Kindergarten - 2nd grades

CORRELATING STANDARDS

- SC.K.7.2.C
- SC.1.6.2.C
- SC.2.7.2.C

ACTIVITY TIME

- 15 min - Warm Up:
 - Living and Nonliving Sort
- 30 min - Main Activity:
 - Design a Wetland

MATERIALS

- 15 sets of living and nonliving cards.
 - In 1 set:
 - 12 organism cards
 - 1 Living word card
 - 1 Nonliving word card
- Blank paper, 1 per student
- Coloring and design supplies
 - Markers
 - Crayons
 - Pens

INTRODUCTIONS

Wetlands are unique aquatic ecosystems in Nebraska. The plants that live there have amazing adaptations that allow them to thrive! Using their special structures like roots, stems, and flowers they are able to function and reproduce, continuing the cycle of life in wetland habitats.

OBJECTIVES

This lesson was designed to be used in partnership with the video "Wetland Plant Adaptations". The video and lesson will allow students to better understand that many organisms, both living and nonliving, can be found in Nebraska wetlands. Students will see that some Nebraska plant species can address the challenges of living in wetlands well by using special structures that meet their needs.

As a result of this lesson:

- Students will understand what living and nonliving organisms can be found in a wetland. They will especially become familiar with some of the plant species found here.
- Students will design a wetland based on what they know can be found there.

BACKGROUND INFORMATION

What is a Wetland?

How do we define wetlands? This type of habitat is made unique by three key characteristics:

1. **Vegetation** - water loving plants adapted to growing in highly saturated conditions grow here
2. **Hydric soils** - soils found here have developed under saturated conditions that limit oxygen (anaerobic conditions), they often carry a rotten egg smell
3. **Hydrology** - wetlands are saturated by water at some time during the growing season (the time when plants are actively growing)

Wetlands in Nebraska include marshes, lakes, river and stream backwaters, oxbows, wet meadows, fens, forested swamps, and seep areas. These wetlands vary greatly in nature and appearance due to physical features such as geographic location, water source, water permanence, and chemical properties. At some points during the year we may find that some wetlands are bone dry while others always contain some amount of water. There are instances where we may come back after a steady rain and the wetland will be filled to the brim with water. Some wetlands receive their water from groundwater aquifers while others are totally dependent on precipitation and runoff. And finally, the water chemistry of wetlands ranges from fresh to saline, and from acidic to basic. These descriptions identify the extremes of wetland characteristics. Nebraska's wetland resources possess these extremes and virtually every combination in between.

The vegetation, soils, and water that make up a wetland provide habitat for the many species found in Nebraska. The plants that depend on these habitats for survival often face challenges while living in such a dynamic environment. Many plant species have incredible adaptations that allow them to grow and reproduce in wetlands, while other species without these specialized structures would not be able to survive as well. Using their unique features these plants are able to function well in floods, droughts, saline conditions and more.

Begin by watching the video Wetland Plant Adaptations found at:

https://youtu.be/rFU21Or_jEo
or scan the QR Code



The Challenges Plants Face in Wetlands - Video Recap

When the Water Dries Up

One thing people don't usually realize is that wetlands go dry. Depending on the year, they might even stay dry all the time. While many plants would not be able to survive without water, there are other species that have adapted specifically to make it through these circumstances. The endangered plant Saltwort lives in Saline Wetlands surrounding the Lincoln, Nebraska area. The salty soil of these wetlands might cause other plants to wither away, but the Saltwort thrives! The succulent-like stem and leaf structures hold in water, much like a cactus does in a desert. Saltwort also has a root structure called a tap root. This single root structure taps deep into the earth, reaching water and nutrients found in the groundwater even when the topsoil is dry and crusted. Though this plant is listed on Nebraska's endangered species list, the Saltwort survives well in these unique saline wetlands found nowhere else in the state.

Lack of Oxygen in Wetland Soils

While not all wetlands have salty soil, many of them do have soils that develop in conditions that lack oxygen. It's one of the qualities that make wetlands different from other habitats. And though plants don't have lungs like humans, they still need oxygen to survive. The cattail is an emergent plant, usually found standing in three foot deep water on the edges of wetlands. It addresses this watery challenge by taking in oxygen at the top of the plant and moving air down its stem to the roots and rhizomes underground and often, under water. It's almost like when humans use a snorkel to breathe while their mouth is underwater! This rigid stem structure also provides the cattail great support when faced with heavy floods or wind. Multiple cattail species can be found throughout Nebraska and are highly adaptive.

Flooding

Nebraska's state tree is the Eastern Cottonwood. When the waters rise in a wetland, plants like the Cottonwood tree are the first to become submerged because they usually grow nearby. Oftentimes, this flooding can interrupt the normal exchange of oxygen and carbon dioxide between the tree and its environment, weakening the tree and making it susceptible to diseases. The impact to the tree is usually determined by how long it is covered with water. But the Eastern Cottonwood has a strategy - shallow roots! By keeping its roots close to the earth's surface, they are the first to dry out when flood waters recede. While this isn't a total guarantee that they will survive, it certainly does help!



Ethan Freese / Platte Basin Timelapse

The Challenges Plants Face in Wetlands continued

Fast Flowing Water

In especially harsh flooding conditions, water can move swiftly through an area and cause problems for the plants growing there. That's why you'll notice that many Nebraska wetland plants have narrow and pointed leaves. The Arrowhead is one of these, with its triangular leaves that allow water to pass more smoothly by, therefore sparing the plant from damage.

Reproduction

We know that the ultimate goal of living things is to create more of themselves through various methods of reproduction. Plants have some truly incredible methods to achieve this, dispersing their seeds far and wide. If we take a look at wetland plants, we will notice that there are unique methods of reproduction happening there.

- Cattail plants actually use two methods to spread and create more of themselves. **Rhizomes** are thick branching tubers at the base of the plant that spread horizontally by sending out shoots or nodes. When you look at a giant stand of cattails you may actually be looking at just one plant! Cattails also spread through the seeds that will puff out of the fruit - a long hot-dog looking seed pod. These seeds can be dispersed by wind or water.
- Similarly, the Eastern Cottonwood tree also has wind dispersed seeds. There are actually male trees that produce pollen which is carried on the wind to the female trees and their "catkins" - the flowering body. Once pollinated, the catkin pods will produce millions of white fluffy seeds to be carried away on the wind and water. Hence the name, cottonwood!
- A completely different plant with an explosive reproductive strategy can be found growing in the damp wetland areas surrounding Nebraska streams. Jewelweed, which looks similar to an orchid with its yellow and orange petals - attracts pollinators like hummingbirds. Once this flower is pollinated, it develops into an elongated seed pod structure. When disturbed, this structure undergoes a process called "explosive dehiscence" where the stored energy in the tissues of the pod are transferred to the seeds, thereby launching the seeds into the air in an effort to disperse them.



ACTIVITY PROCEDURES

Warm Up Activity:

Living and Nonliving Sorting Game (15 minutes)

Setting: Indoors

1. Print out copies of the photo cards front/back and cut them out to make a set. Instruct students to work in partner groups of 2 or 3, allowing them time to get situated either in desk groups or on the floor.
2. Hand out 1 set of the Living/Nonliving cards to each group. Each set will include 12 photo cards and 2 word cards.
3. Ask students to first look at the two cards with the words - living and non-living. If needed, talk through these terms with students to make sure that they understand that living things grow and reproduce, while nonliving things do not grow or reproduce.
4. Students should use the word cards to create a system to sort the photo cards into a living area and a nonliving area.
5. Ask students to look through the photos they were given and determine together which images show living organisms and which images show the non-living things. Names of each item shown are on the back of the card.
6. Give students about 10 minutes to organize and sort with their partners.
7. Allow students to present their results first, without giving them feedback on right or wrong answers. They can begin by presenting to another partner group, or you can share out as a large group.
8. Organize for a large group discussion by sitting in a circle on the floor or together or in the format you would regularly do so.
9. Ask students which photos they put under the living card? Why did they choose those photos? Allow time for students to explain their reasoning.
10. Take time to go through which photos should be included in the living category and explaining why to the class.
 - The Beaver, Dragonfly, Great Blue Heron, Leopard Frog, and Canada Goose are all living animal species. They can reproduce and they require energy to grow. They consume to get energy.
 - Jewelweed, Cottonwood tree, Cattail are all living plant species. They reproduce and grow. They use the sun's energy to grow.



ACTIVITY PROCEDURES CONTINUED

11. Ask students which photos they put under the Nonliving card. Why did they choose those photos? Allow time for explanation and reasoning first.
12. Take time going through which photos should be included in the nonliving category
 - The sun, water, clouds and soil are nonliving things. Each are essential parts of the ecosystem, but they do not grow or reproduce like a living thing.

Main Activity:

Design a Wetland (30 minutes)

Setting: Indoors

1. Ask students what a wetland is. Can they describe the key features of this type of habitat? Who lives there?
 - Remember that wetlands usually have special soils that tend to be unique in color, aquatic plants, and the presence of water at least some times of the year
2. Remind students what a wetland in Nebraska looks like by referencing or re-watching the video associated with this lesson. Looking at images from the wetlands project would also be helpful visually for students. Visit nebraskawetlands.com to access images of Nebraska wetlands.
3. Hand out blank pieces of paper, crayons and any other preferred drawing or coloring utensils to each student.
4. Encourage students to “design” their own wetland based on what they know can be found there. Remind them that some things in a wetland are living, while other things found there are not living.
5. Ask students to show at least 2 living things in their wetland and 2 nonliving things. However, more is welcome!
6. Give students 20 minutes to work on designing their wetland. Encourage creativity and unique design.
7. Come back together as a class. Ask students to share their wetland with a partner and explain it. What are the different things found in their wetland? Why are those things found there?
8. A wetland habitat is a place where animals and plants are able to meet their needs.



ACTIVITY PROCEDURES CONTINUED

Wrap Up:

Discussion Questions (5 minutes)

- What are some examples of living things you can find in a wetland habitat?
- What are some examples of nonliving things you would find in a wetland habitat?
- What makes a wetland habitat unique?
- How do nonliving and living things interact?

Check out the entire Wetlands of Nebraska Project:

Take a deep dive into Nebraska's best wetlands resources, including expanded website content, documentaries featuring Nebraska's five main wetland types, printed guides and more!

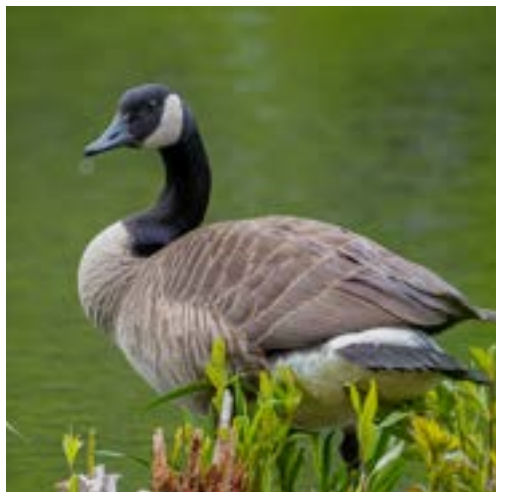
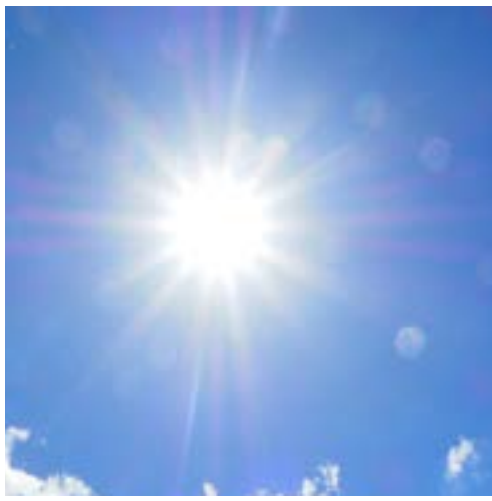
Find it at www.nebraskawetlands.com, or scan the QR code.



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Dragonfly

Beaver

Sun

Cottonwood

Jewelweed

**Great
Blue
Heron**

Clouds

**Leopard
Frog**

Water

Goose

Mud

Cattail

Living

Nonliving

Living

Nonliving

Living

Nonliving

Living

Nonliving

Living

Nonliving

Living

Nonliving