



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

- 3rd - 5th grades

CORRELATING STANDARDS

- SC.3.7.2.C
- SC.4.6.3.B
- SC.5.8.2.B, 5.8.2.C

ACTIVITY TIME

- 10 min - Warm Up:
 - Structure & Function Sheet
- 30 min - Main Activity:
 - Design a Plant Challenge

MATERIALS

- Structure & Function Worksheet
 - Writing utensil
- Challenge Cards - 1 per student
 - Challenges in 1 Set:
 - Drought, Flooding, High Wind, Lack of Oxygen, Water Pollution, Standing Water, Insect Attack, Minimal Sunlight, Spreading Seeds
- Design a Plant Challenge Sheet
 - Writing and coloring utensils

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 plants 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.

Watch the video:

As a result of this lesson:

- Students will understand the types of challenges that a plant may face while growing and living in a wetland.
- Students will understand that plants have specialized structures that function to allow them to survive in a wetland. Plants have adaptations too!

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

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 our 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. Our 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!



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 large 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: Structure & Function (15 minutes)

Setting: Indoors

1. Begin by asking students what the word structure means. How would they define it? Give time for students to answer with their ideas before sharing that a structure can be something physical on the body of a living thing. Refer to the example of a “hand” as seen in the video for review.
2. What does the word function mean? How would they define this? Give time for students to answer with their ideas before sharing that a function directly relates to what a structure can do or what its purpose is. Refer to the video example of how the function of the “hand” can help us grab food, climb, and more!
3. If you feel that students need just a bit more review with this, see if the class can come up with a few more relatable examples of structures and their functions.
4. Some examples include:
 - Beaver Teeth - Used for eating, trimming branches to eat later, and even felling whole trees
 - Milkweed Flower - Uses sweet nectar to attract insects which assist with pollination, or the creation of seeds by spreading pollen
 - Dragonfly wing - assists the dragonfly with flying at high speeds when hunting other insects
5. Pass out the structure and function worksheet containing the image of a plant on one side and 6 total boxes to record structure and function qualities related to the plant pictured. Have them begin with the side titled Structure and Function.
6. Ask students to look at the plant image and observe three different basic structures on that plant. Have students spend 10 minutes naming three structures in each of the boxes under the word “structure”. Using the structures they chose to write down, students should fill out the function boxes across from the word accordingly.
7. For Example:

STRUCTURE	FUNCTION
1. Fluffy Seed	1. Light and easily blown with the wind to grow a new plant



ACTIVITY PROCEDURES CONTINUED

8. Ask students to share the plant structures they wrote down with a partner. Were they similar, or did they choose different structures? Did they choose the same functions?
9. Take 5 minutes to discuss what everyone came up with as a class. In general, students will have chosen leaves, flowers, stems, roots, seeds, and more.

Main Activity:

Design a Wetland Plant Challenge (45 minutes)

Setting: Indoors

1. Ask students what a wetland is. Can they describe the challenges that might be found if you're an organism living in this type of habitat?
2. Pass out a challenge card to each student, explaining that each card represents a very real circumstance that threatens the survival of plants in our Nebraska wetlands and beyond.
3. Explain that students are going to design their own plant that is able to face their assigned challenge and survive.
4. Ask students to find the "design a plant challenge" on the back side of their sheet, or pass it out if not printed double sided with the structure and function sheet.
5. Students should use the blank space to draw and design their plant. It can be inspired by a real plant, but the more unique, the better!
6. Before allowing students to begin, remind them the following:
 - They need to be able to explain two structures on their imagined plant and elaborate on how they structures help the plant survive.
 - At least one structure/function pair should relate directly to the challenge.
7. Allow students 20 minutes to work on the creation of their plant. If they have been spending all their time on the plant design and drawing, give them a reminder towards the end they they have 5 minutes to wrap up.
8. Ask students to share their plant in small groups of 3-5 students each for 5 minutes. They should share their plants' name and the structures it has to withstand the assigned challenge.



ACTIVITY PROCEDURES CONTINUED

9. If students need prompting, ask them to compare and contrast the different structures and functions found on their classmates' plant designs. Could they use some of these on their own plant?
10. Generalize that all plants have very special structures that help them survive in their habitats. These adaptations are unique and have evolved based on the ecosystem that the plant lives in. Discuss this if students seem interested.

Wrap Up:

Discussion Questions

- What is an example of a plant structure?
- What is that structures' function?
- Did this make you think differently about plants?
- If so, how did your thinking change?
- What types of environmental changes do plants face in a wetland? Are these different from some of the challenges an animal would face?
- What allows certain plants to survive well in a wetland?
- What causes plants to be unsuccessful in a wetland?
- What sorts of structures and functions do plants utilize in other habitat types?

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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Challenge Cards

CHALLENGES TO PLANT SURVIVAL FOUND IN NEBRASKA ECOSYSTEMS

Drought	Flooding	High Wind
Lack of Oxygen	Water Pollution	Standing Water
Insect Attack	Minimal Sunlight	Spreading Seeds

Structure & Function

NEBRASKA WETLAND PLANTS

Student Name: _____



STRUCTURE

FUNCTION

1.

1.

2.

2.

3.

3.

Design a Plant Challenge

1. WRITE THE ENVIRONMENTAL CHALLENGE YOU SELECTED IN THE BOX BELOW.
2. DESIGN A WETLAND PLANT THAT CAN SURVIVE THIS CHALLENGE.
3. IDENTIFY AT LEAST 2 DIFFERENT STRUCTURES ON YOUR PLANT AND DESCRIBE HOW THEY FUNCTION. MAKE SURE AT LEAST ONE STRUCTURE HELPS YOUR PLANT SURVIVE WHEN FACED WITH THE CHALLENGE ON YOUR CHALLENGE CARD.

ENVIRONMENTAL CHALLENGE:

(DRAW YOUR PLANT BELOW)

STRUCTURE	FUNCTION
1.	1.
2.	2.