

Cattail Check-up

Adapted from: “Wetland Weirdos” in WOW!: The Wonders of Wetlands. The Environmental Concern Inc. and The Watercourse, 1995.

Grade Level: all

Duration: one class period

Setting: classroom

Summary: Students investigate cattail structure and learn about adaptations.

Objectives:

Students will understand that organisms are specially designed to survive in certain areas. They will recognize that plant and animal adaptations can be inferred from physical structures.

Related Module Resources:

- Books and Field Guides
- “Treatment Plants” activity

Vocabulary: adaptation, emergent plant, rhizome, aerenchyma, xylem, phloem

Materials (Included in Module):

- magnifying lenses

Additional Materials (NOT Included in Module):

- cattails
- dissection scopes and tools such as scalpels and probes (optional)
- colored pencils/markers

ACADEMIC STANDARDS (ENVIRONMENT AND ECOLOGY)

7th Grade

- 4.1.7.C Explain the effects of water on the life of organisms in a watershed.
- Explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations
- 4.1.7.D Explain and describe characteristics of a wetland.
- Identify specific characteristics of wetland plants and soils
- 4.6.7.A Explain the flows of energy and matter from organism to organism within an ecosystem.
- Describe and explain the adaptations of plants and animals to their environment
- 4.7.7.A Describe diversity of plants and animals in ecosystems.
- Identify adaptations in plants and animals

10th Grade

- 4.7.10.A Explain the significance of diversity in ecosystems.
- Explain the role that specific organisms have in their ecosystem
 - Identify a species and explain how its adaptations are related to its niche in the environment
- 4.7.10.B Explain how structure, function and behavior of plants and animals affect their ability to survive.
- Describe an organism’s adaptations for survival in its habitat
 - Compare adaptations among species

12th Grade

- 4.6.12.A Analyze the interdependence of an ecosystem.
- Analyze the relationships among components of an ecosystem

BACKGROUND:

Adaptations are specialized characteristics that plants and animals have developed over time in response to environmental pressures. They may be physical features or specialized behaviors. These tools help the organism to survive in specific conditions.

Cattails are **emergent plants**. That is, they stick up out of the water. The part that looks like a cat’s tail or a hotdog on a stick is the female flower structure. There is a male flower structure above it during the early part of the growing season. The wind picks up pollen from this part of the cattail. When the flower is pulled apart, thousands of fluffy white “cotton balls” blow around. Each one contains an ovary which appears as a thin, tan bulb in the center of the fluff halfway up a little stalk. If the ovaries are pollinated they soon become fertilized seeds with a bulb at the tip. Cattails reproduce by seed germination and through use of underground horizontal stems called **rhizomes**.

Long, narrow leaves are attached at the base of each plant, overlapping each other and surrounding the stem. The bundle of leaves and stem near the cattail's roots form the shoot. If you cut a cross section of the shoot, you will see that the leaves overlap each other, making almost a spiral pattern.

The leaves have vertical channels filled with starchy material that is part of the vascular system of the plant. They contain **xylem** and **phloem**, which transport water and nutrients during growth and metabolism. When a mature plant is cut several inches up the leaf, the cut surface will be D-shaped and will show a honeycomb structure that helps strengthen and support the leaves.

The flower structure, including all the reproductive parts, are held above water by a stem. A stem cross section reveals a pattern of holes that have two functions. The holes in the center of the stem, and some in the individual blades, are air-conducting vessels called **aerenchyma**. They transport oxygen down to the roots, since there is little oxygen in wetland soil. Only wetland and aquatic plants have this adaptation. In plants with floating leaves, aerenchyma help make the stems buoyant. The holes arranged around the outside of the stem are water-conducting vessels closely bound with fibers that provide support for the stem.

Cattails provide nesting grounds for many species of marsh birds. Red-winged blackbirds, marsh wrens, least bitterns, and coots all count on this marsh-dwelling plant. But cattails do much more than house birds- geese and muskrats like to eat the shoots and rhizomes. And muskrats not only eat the shoots, but also snip off the leaves and use them to create underwater huts by sticking them together with mud. Sunfish spawn in habitats with submersed cattail stocks.

Invertebrates utilize these structures, too. The cattail mosquito attaches itself to the shoot and siphons oxygen in order to breathe. The seeds of the female part are essential to the caterpillar of the cattail moth. They eat these seeds to produce a silky network of sting hold their cocoons together through the winter months.

It is important that the cattails have natural predators because they tend to take over the swamp. One seed can reproduce up to 100 shoots in one growing season! This is not always a bad thing, though, because humans have many uses for this unique plant, too. Dried cattail leaves can be woven into baskets, mats, and even seats for chairs. Cattail pulp can be pressed into paper. The rhizome cores are edible and can be ground into a high-protein/high-carbohydrate flour. Young shoots can be mixed into salad, while the pollen can be baked into dough. The "cotton balls" that blow in the wind can be captured and used as life preserver stuffing and as wall insulation in homes.

OVERVIEW: Students investigate cattail adaptations through observation, reading, and drawing.

PROCEDURE:

1. Discuss adaptations. Do humans have adaptations? (the ability to walk upright and opposable thumbs) Try to do something without your thumbs. For instance, tape your thumb against your palm and try to write.
2. Name some aquatic organisms and brainstorm about their adaptations.
3. Collect several cattails. Make sure all parts of the plant are gathered and that collection is done from dispersed locations.
4. Perform the *Cattail Investigation* worksheet at the end of this activity.

DISCUSSION:

Although actual observation was used for the cattail investigation, what other methods could have been used to find out the answers? (A visit to the library or a discussion with a plant specialist or wetland scientist would have gotten the correct answers.)

Discuss the adaptations that cattails have. Make a quick list on the chalkboard, if possible. Think about other adaptations that plants and animals might have for living in water.

Discuss other adaptations of other aquatic organisms. (For instance, fish have gills for breathing underwater, whirligig beetles that swim on the surface have two sets of eyes for below and above the water, and birds have multitudes of adaptations, particularly their specialized bills and feet.)

What would happen if you entered a swamp and removed all of the cattails from one area? Discuss how to have as little environmental impact as possible when doing experiments.

If you were to go out and try to plant corn in a wetland or in soil that was always saturated, why might it not survive? *The stem does not have the adaptations to survive in wet conditions like cattails do.*

EVALUATION:

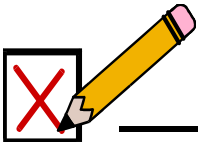
- Identify the main parts of a cattail.
- Describe what aerenchyma are and what their function is. What kind of plants and/or animals have this adaptation?
- What are xylem and phloem? Describe how these starchy materials are really just adaptations.

EXTENSIONS AND MODIFICATIONS:

- Investigate and compare other wetland vegetation.
- Visit a nearby pond or swamp. It is likely that you will find cattails there. What else is living there? Any other emergent plants? Are there birds present? Fish? Insects, aquatic and terrestrial? How about muskrats? Muskrat huts? Make a list of what you see.
- Visit another location where there is permanent water. What's different? What's the same? Which place would you rather be? Why?
- Imagine an organism that lives in a place with a strange climate and unusual landscape. Create a story or drawing about this organism and its environment. Identify ways it is adapted to the environment – include as many details as possible.

NOTES (TEACHERS, PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

Activity Version: January 2002



WORK SHEET : CATTAIL CHECK-UP

Name _____

Cattail Investigation

Collect some cattails to study. You will find them growing in fresh or slightly salty water along creeks, rivers, ponds, lakes, and wet roadside ditches. You will need the whole plant: roots, if possible, stalk, leaves, stem, and the “cat’s tail” at the top. One plant per four to six students will be enough.

Because you will be able to share the plants to study, there is no need to take all of the cattails growing in one area.

PICTURES

1. Carefully examine all parts of the plant and how they are arranged. On the attached *drawing page*, sketch a picture of each part.
 2. Pull off one of the leaves. Where are the leaves attached to the stalk? _____
Are both sides of the leaf the same? _____
If the leaf flat or does it have some thickness? _____
 3. Cut the leaf crosswise (see diagram) and look at the cut edge with a magnifying lens. What’s inside cattail leaves that makes them hard to tear?

 4. Cut a thin slice of the shoot and sketch it the *drawing sheet*. What do you think the white, spongy stuff is for?

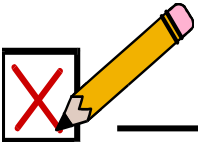
 5. The stem holds the cat’s tail up. Cut the stem crosswise, then cut a thin slice off the cut end. Observe the slice with a dissection scope, if possible. Draw a picture of the slice’s middle, or pith, on the attached sheet.
 6. What do you think the holes in the pith are for? (Hint: wetland plants grow in wet soil that has no oxygen, and plant roots need oxygen.) _____

 7. Carefully pull some of the fuzz from the cat’s tail. These are ovaries and fruits. Are they all the same? ____
What differences can you see? (Use a magnifying glass.) _____

 8. When ovaries are pollinated, they soon become fertilized seeds that will grow into new plants. Why do you think cattails make so many fruits? _____

 9. How might cattail seeds be pollinated? _____

- How are seeds spread? _____



DRAWING SHEET: CATTAIL CHECK-UP

QUESTION 1. DRAW A PICTURE OF EACH PART.

QUESTION 4. DRAW THE THIN SLICE OF THE SHOOT FROM THE CUT PIECE.

QUESTION 5. DRAW THE SLICE'S PITH.