Title
Fish Out of Water!

Objective: Students will be able to identify the internal and external parts of fish.

Standards:
K-LS1-1, K-ESS3-1, 3-LS4-3, 3-LS3-2, 4-LS1-1, 4-LS1-2, 6-LS1-5

Introduction:
Fish are a valuable resource at Buffalo River, playing a critical role in complex food webs, serving as an indicator of water quality, and providing recreational opportunities for visitors. Discussing the ecological niche that fish fill can help participants see the interconnectedness of wildlife at the river. Participants will gain a picture of life as a fish as they learn about fish anatomy and compare it to their own anatomy.

Audience:
Program is created for kids around ages 6-10 but can be adapted for more or less advanced groups.

Duration:
30 Minutes

Vocabulary:
N/A

Material:
Fish quilt - can be a printout rather than quilt.

Quilted inner body parts - can be a printout rather than quilt.

Anatomy labels

Fish life scenario cards

Main lesson:

- Why do you think fish are important to Buffalo National River and the surrounding area?
    - Leading questions (if needed): What do they eat? What eats them? Do they add anything to the environment? Does anyone have hobbies related to fish?
    - Eat macroinvertebrates, zooplankton, bacteria, algae, insects, worms, etc.
    - Serve as a food source for raccoons, herons, kingfishers, eagles, etc.
    - Are the object of recreational sport – fishing
    - When fish excrete waste (and when they die), this provides nutrients for river plants
- What fish have you seen/caught in your local creeks and rivers?

Activity:
- Activity 1: Fish Anatomy Matching

    - Begin with outside of fish. Give participants labels and have them place the ones they know on their own. Discuss what each part is for.
    - Continue with inside of the fish, giving participants organs and labels, discussing what each part is for.
    - Check for understanding: Collect the labels, redistribute and have participants explain each part.

- Activity 2: Fish Out of Water Relay
    - Objective: Get all of the organs back in the fish in order to help the fish get ready to flop back into the water.
    - Put fish organs in a pile.
    - Divide group into teams, giving each group a few labels. The groups will stand by the pile of organs, with the empty fish about 10 yards away.
    - Shout "Fish Out of Water" to signal the groups to start. They can work together to find one body part at a time; then one person takes the body part and places it in the empty fish with the label.
    - First group to finish their labels first wins!
    - Review the organ placement at the end and review what each part does.
    - Option: Repeat with outer parts or with written descriptions of the body part.

- Activity 3: Think Like a Fish
    - Put all organs back in a pile.
    - Groups will now be given scenarios that fish encounter on a daily basis. Participants will work together to see which body part is needed to complete the task given in their scenario. They will find this body part and send someone to place it in the empty fish.
    - If needed, the laminated key could be placed on the ground 10 yards behind the team. This way, if they needed help, they could go look at the key, but it would put them behind in the race.
    - First group to finish wins!

- Activity #4: Scenarios
  Name the body parts that will help as a fish navigates through life.

1. You need to get under a rock fast! Make sure you are swimming straight!
    - Dorsal
    - Muscle Segments

2. You saw a worm fall into the water, but you cannot see where it went. You want to follow the worm.
    - Eyes: Lense moves in/out to focus
    - Nostrils: Detects odors in the water
    - Brain: Controls automatic functions

3. You are being chased by a big fish. Your brain needs to tell your body to swim faster!
    - Spinal Cord: Connects the brain to the rest of the body, and sends sensory information form the body to the brain.
    - Caudal: Propels the fish.
    - Anal: Provides stability

4. You're swimming past a big rock. You're worried there may be a predator on the other side. You need to sense whether there is a predator there.
    - Lateral Line

5. You are swimming fast. Your muscles need more blood!
    - Brain

6. You ate a big meal and absorbed a lot of nutrients. You need to make sure there aren't any toxins in your blood.
    - Intestines

7. Some of your blood cells are getting old. Time to recycle them!
    - Liver

8. You need nutrients in your blood. Time to move your food into a place where it will be digested.
    - Stomach

9. You finished digesting your food. You need to get rid of the waste.
    - Kidney

10. You see a yummy mayfly floating on the top of the water. You need to get to the surface quickly!
    - Dorsal: Quick directions

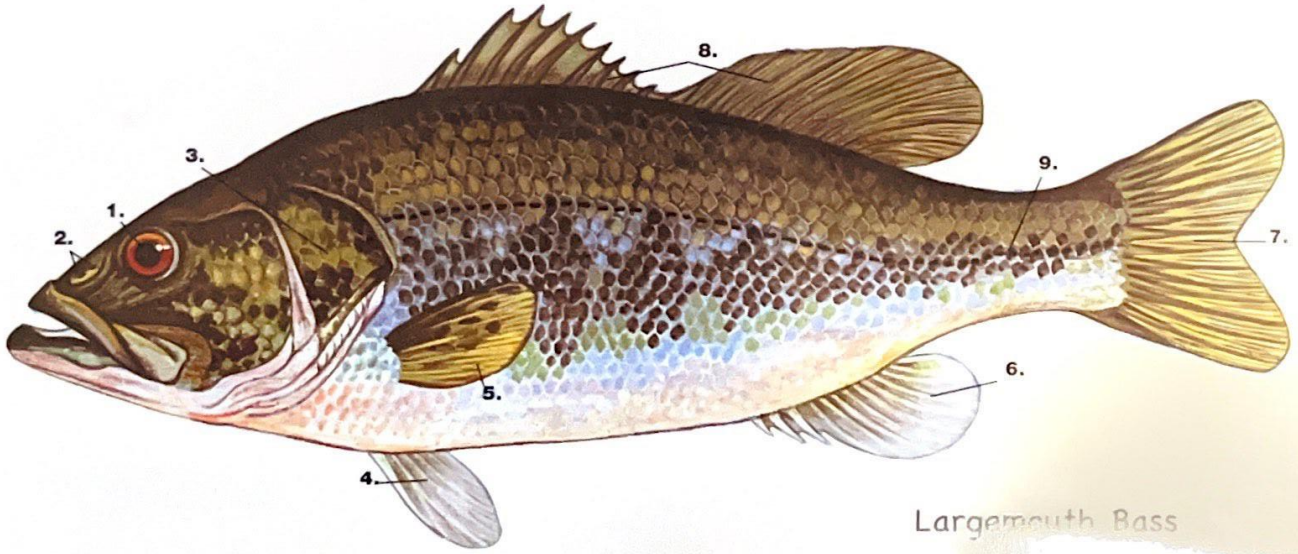
11. You need oxygen in order to power your muscles and organs.
    - Brain: Automatic functions and higher behaviors.

Conclusion:

- Conclusion/Getting the big picture: What are some things that might cause the populations of fish in the Buffalo River to decline?
    - Erosion (sediment impairs water quality…less light, less plants, less macros, less fish)
    - Pollution – trash, improper liquid waste disposal, agricultural runoff, lawn runoff, toxic wastes from sewage plants/factories, acid rain
    - Dams – would increase bottom feeders/low-oxygen tolerable fish (carp/catfish) and would decrease species that thrive in fast-moving/highly-oxygenated water (smallmouth)
    - Overfishing/overharvesting
    - Deforestation – loss of shade; increase in erosion
- What do you think might happen if we took away most of the fish from the Buffalo River? How can we help make sure the fish populations stay healthy?

External

1. **Eye** – Fish are visual predators, and their eyesight is similar to human eyesight. The eyes are round and achieve focus by moving the lens in and out.
2. **Nostrils** – The fish use the sensitive nostrils to detect odors in water. They are not used for breathing.
3. **Gill Cover** – The gill cover is also called the operculum. It is a flexible, bony plate which protects the gills of the fish.
4. **Pelvic Fin** - The pelvic fins aid in the stability of the fish. They also help the fish reduce speed.
5. **Pectoral Fin** - The pectoral fins are used for maneuvering from side to side. They also provide support and power to the fish.
6. **Anal Fin** – The anal fin is used to provide stability for swimming.
7. **Caudal Fin** – The caudal fin is used for propelling the fish.
8. **Dorsal Fins** – These fins help stabilize the fish and aid in quick direction changes.
9. **Lateral Line** – These pored scales connect to the sensory cells and nerve fibers of the fish. They are used in detecting low frequency sounds, water current, pressure and movement in the water.



Largemouth Bass

Internal

10. **Brain** – The brain controls both the automatic functions, like breathing, and higher behaviors. All the sensory information is processed in the brain.
11. **Spinal cord** - The spinal cord connects the brain to the rest of the fish's body. It relays sensory information from the body to the brain, and instructions from the brain to the rest of the body.
12. **Kidney** – The kidney filters liquid waste materials from the blood which are passed out of the body. It also regulates water and salt concentrations within the fish's body.
13. **Muscle Segments** – The muscle segments control movement and locomotion in the fish. This is the section that is eaten.
14. **Vent** – This external opening leads to the digestive, urinary and reproductive tracts.
15. **Intestine** – The fish intestine is used to digest and absorb nutrients. The length of the intestine differs in fish according to what types of food they eat.
16. **Air Bladder** – The air bladder is a hollow organ, filled with gas. It is used to help the fish maintain neutral buoyancy in the water. Species of fish without an air bladder will sink to the bottom of the water if not in motion.
17. **Stomach** – The stomach is used to digest the food and absorb nutrients.
18. **Pyloric Caeca** – Located near the junction of the stomach and intestines, this organ secretes enzymes that aid in digestion. They may also absorb digested food.
19. **Liver** – The liver secretes enzymes that break down fats and serve as a storage area for fats and carbohydrates. It also destructs old blood cells and maintains proper blood chemistry.
20. **Heart** – The heart of a fish has two chambers, which consist of an upper atrium and a lower ventricle. The typical circulation of a fish is single circuit: heart-gills-body-heart.
21. **Gills** – Gills are used to allow breathing underwater. They are feathery and are responsible for oxygen intake and carbon dioxide dispersal. The gills are bright red if the fish is healthy. This is because of high levels of oxygen in the blood. Water flows continuously over the gills in one direction.