CONSERVANCY of Southwest Florida
OUR WATER, LAND, WILDLIFE, FUTURE.

Protecting Southwest Florida's unique natural environment and quality of life ... now and forever.

Wetland Explorers
Pre and Post-Program Activities

Grade Level: 6-8

Next Generation Sunshine State Standards

- SC.6.E.6.2
- SC.7.E.6.6
- SC.8.P.8.8

Program Overview

Become a scientist and explore a working filter marsh. Collect aquatic species for identification, use research instruments to measure water quality, and engage in scientific inquiry activities in the Conservancy STEM Lab. Then explore the Dalton Discovery Center and meet live aquatic creatures up close.

Learning Objectives Students will be able to:

1. Recognize the role of watersheds in south Florida, and that all waterways are connected.
2. Identify the impacts that humans can have on Earth, including water quality and changing the flow of water.
3. Understand that plants and animals are able to survive in aquatic environments based on parameters such as pH and salinity.

Pre-Program Activity 1: Exploring the Water Cycle

Duration of Activity: ~ 1 hour

Materials: Computer & Projector, Exploring the Water Cycle Student worksheet (provided), Exploring the Water Cycle Student worksheet Answer Key (provided)

Background:

Water is found almost everywhere on Earth, from high in the atmosphere (as water vapor) to low in the atmosphere (precipitation, droplets in clouds) to mountain snowcaps and glaciers (solid) to running liquid water on the land, ocean, and underground. Energy from the sun and the force of gravity drive the continual cycling of water among these reservoirs. Sunlight causes evaporation and propels oceanic and atmospheric circulation, which transports water around the globe. Gravity causes precipitation to fall from clouds and water to flow downward on the land through watersheds.

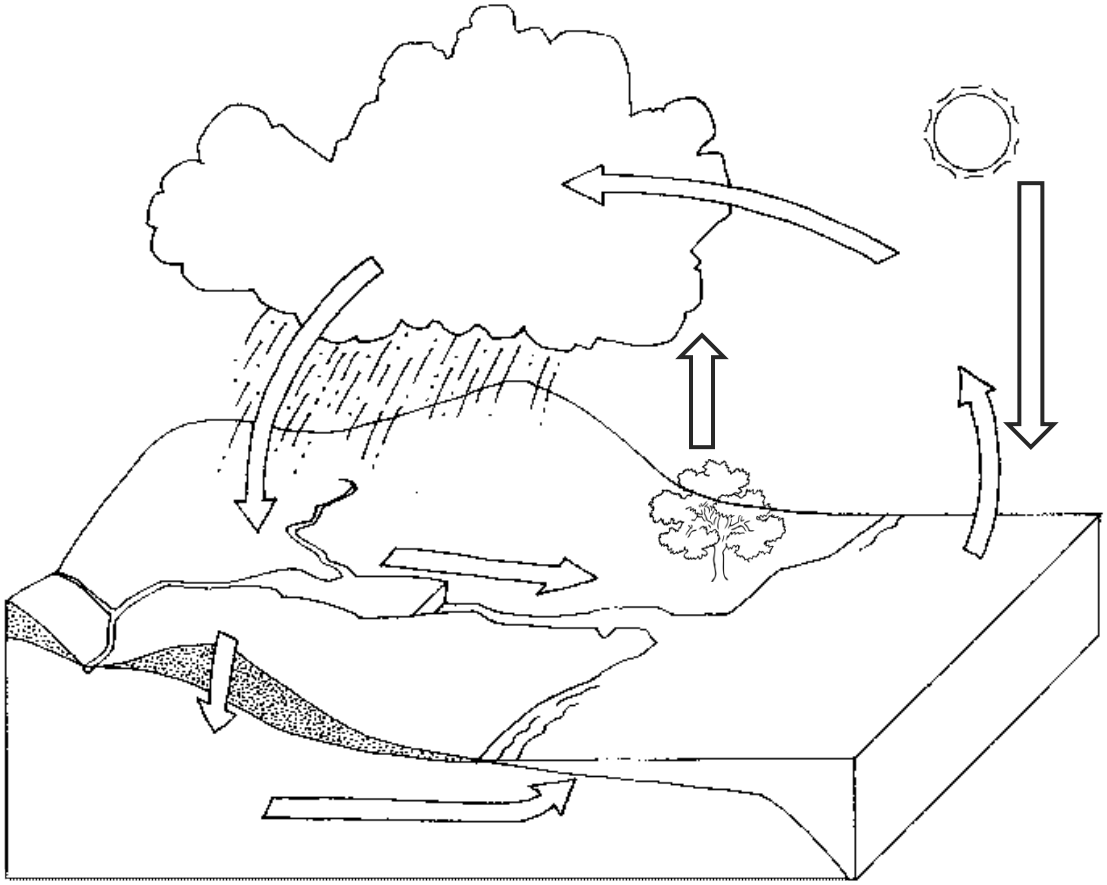
Directions:

1. Engage students by asking the following question: What is precipitation? Have students discuss the question with a neighbor and then discuss with the whole class.
2. Show the video, "The Freshwater Connection" (approx.. 1.25 mins) http://pmm.nasa.gov/video-gallery/what-is-global-precipitation-measurement This video is a good introduction to why it is important to study the water cycle.
3. After the video, have students discuss why it is important to study and understand the water cycle. Students can discuss in pairs first and then as a class.
4. Hand out the Water Cycle Student Worksheet. Have students use this worksheet throughout the rest of the lesson.
5. Show the water cycle video. (approx.. 3 mins) www.youtube.com/watch?v=iohKd5FWZOE Students can label the blank diagram on their student worksheet as they watch the video. The video goes more into detail so students only need to copy the ones from the provided work bank. The video has no narration so you can talk through the video with the calls and pause as necessary for questions or further explanation.
6. For extended learning, ask the following questions:
   - Which stages in the water cycle require energy from the sun? (Evaporation and Transpiration) Have students circle these stages yellow.
   - Which stages requires water to give off heat? (Condensation) Have students circle this stage in red.
   - Which of the stages are driven by the force of gravity? (Precipitation, Runoff,
   - Infiltration, Groundwater Flow) Have students circle these stages in blue
7. Show the video, "Water, Water, Everywhere (approx. 6.5 mins) as the students are finishing their worksheet. This video ties together the concepts from this lesson. http://pmm.nasa.gov/education/videos/water-water-everywhere

Exploring Water Cycle Worksheet

Water Cycle Video

DIRECTIONS: Label the arrows on the water cycle diagram as you watch a video on the water cycle. There is no audio, so be sure to watch carefully as the sun comes up and heats the land and water, and then goes through the whole water cycle. Use the word bank provided.



Word Bank

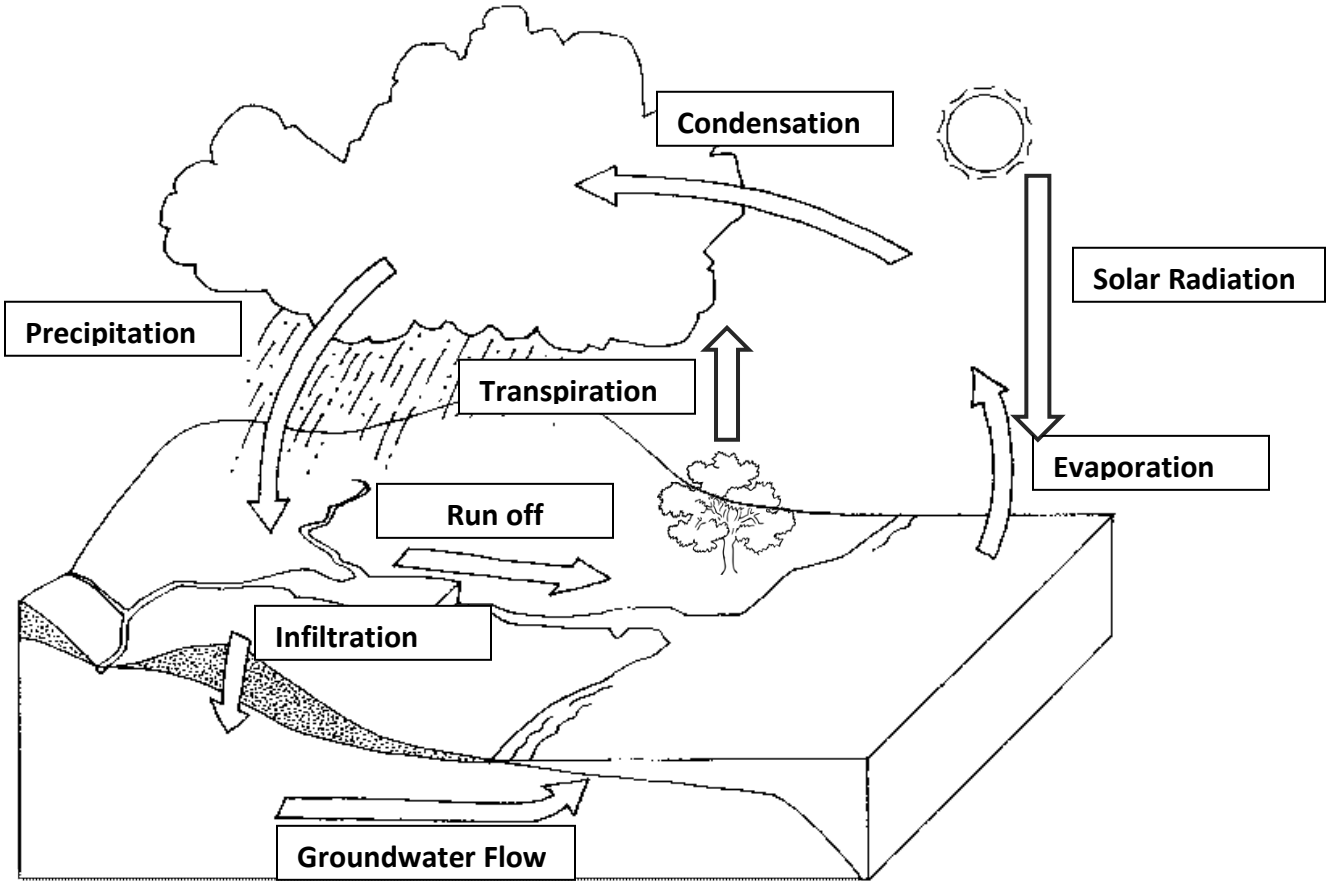
Evaporation	Run off	Infiltration
Condensation	Groundwater Run off	Solar Radiation
Precipitation	Transpiration	

1. Which parts of the water cycle require energy from the sun? _____
2. Which parts of the water cycle require the water molecule to give away heat (cool down? _____
3. What parts of the water cycle are caused by the force of gravity? _____ _____

ANSWER KEY Exploring Water Cycle Worksheet

Water Cycle Video

DIRECTIONS: Label the arrows on the water cycle diagram as you watch a video on the water cycle. There is no audio, so be sure to watch carefully as the sun comes up and heats the land and water, and then goes through the whole water cycle. Use the word bank provided.



Word Bank

Evaporation	Run off	Infiltration
Condensation	Groundwater Flow	Solar Radiation
Precipitation	Transpiration	

1. Which parts of the water cycle require energy from the sun? Transpiration & Evaporation
2. Which parts of the water cycle require the water molecule to give away heat (cool down? Condensation
3. What parts of the water cycle are caused by the force of gravity? Precipitation, Runoff, Infiltration & Groundwater Flow

Pre-Program Activity 2: Aquatic Form and Function

Duration of Activity: ~ 1 hour

Materials: Vocabulary List & Fish Anatomy Reference Sheet, Fish Body Part Shape Reference Sheet, Survival of Fish Worksheet-print double sided (All worksheets are provided)

Background:

Over time, animals have adapted or changed in order to better survive in their environment. Although different fish species have different appearances, the function of their outside body parts (external anatomical features) is similar. The outside body parts of fish can tell us a lot about a species: where it lives in the water, how it finds food, and how it protects itself from predators.

External Anatomy

- *Fins:* Fins provide fish with the ability to balance, steer, propel, and protect itself. Fins are either single, along the centerline of the fish such as the dorsal fin, anal fin, and tail fin; or paired, like the pectoral fins and pelvic fins. The **pectoral fins** also help fish balance, and at times move backwards. The top fin or **dorsal fin** is used for balancing but its main function is usually protection, having sharp spines within the fin. The **pelvic fins** and **anal fin** are located on the bottom or belly of fish and help with steering as well as balance. The tail fin, also called the **caudal fin**, helps propel a fish forward.
- *Gills:* Located on either side of the "head" area, **gills** remove oxygen taken from the water. A fish "breathes" by opening its mouth to take in water. The water is then forced through the gill chambers, over feather-like gill filaments that absorb oxygen from the water and remove carbon dioxide from the fish's blood. The water then flows out through the gill slits. Some fish have spines located on the **operculum** (harder protective covering of the gill) as a defense mechanism to protect them from predators.
- *Lateral Line:* Running down the length of a fish's body is the **lateral line**. This organ is used to feel vibrations in the water.
- *Nares:* All fish can smell. Located on a fish's snout are paired holes, or **nares**, used for detecting odors in the water. Some fish, like catfish and eels, have a heightened sense of smell.
- *Eyes:* Almost all fish have eyes that have an adjustable lens that moves back and forth to focus, like a camera lens. Some fish can even see in color. Studies have found that Pacific salmon and rainbow trout have color vision similar to a human's.

- *Scales and Slime:* **Scales** protect fish from injury, much like skin on the human body. The colors, shapes, and patterns of scales can help a fish **camouflage** with its surroundings. On top of these scales is a mucus coating known as slime. **Slime** protects fish from bacteria and parasites in the water
- *Body Shape:* The body shape can indicate where that fish lives in the water column, and what type of swimmer it is. A "torpedo" shaped body can indicate a faster swimmer or a rounder shaped body most likely is a slower swimmer. And flatfishes, like flounder, live on the sea bottom.
- *Tail Shape:* A fish's tail shape can tell you about its swimming abilities. For example, a deeply forked tail usually indicates a fast swimmer like a tuna or bluefish, whereas a more rounded tail means the fish is good at turning like a trout or sunfish.
- *Mouth:* The mouth parts of a fish will vary in size and may or may not contain teeth, depending on what that fish eats. The location of the mouth on a fish's body can also give us a clue as to what may be the fish's diet. A **superior mouth**, a mouth pointing upward, means the fish will usually eat food located above it. A fish with an **inferior mouth**, a mouth pointing downward, will usually eat food located below it. A **terminal mouth**, a mouth typical of most fish, is at the end of the head and usually indicates a mid-water column feeder.

Directions:

1. State that fish may look different from one another but their external anatomy features serve similar functions. Pass out the lessons Vocabulary Words sheet or project this sheet for the entire class to see.
2. Following the Vocabulary word list, discuss various external anatomical features and discuss differences on mouth shape, body shape and tail shape.
3. Show pictures of various fish species to show that even though the fish look very different from one another due to various adaptations, their body parts server similar functions. You can use the following examples or look on the FWC species profile for other fish species examples: http://myfwc.com/wildlifehabitats/profiles/freshwater/
    - **Flounder**: When hatched though, flounder look like most other fish, swimming upright in a vertical position. Around 3 weeks to 3 months into its life, one eye begins to move over toward the other side of its head! This amazing adaptation allows adult flounder to lie flat on the bottom so it can wait unseen for their prey to swim by. Flounder also have many sharp teeth which allow it to snatch smaller fish that swim above it. Although this group of flatfish looks different than most "vertical swimming" fish, the fins still have the same functions.
    - **Largemouth Bass:** Largemouth bass live near the bottom of freshwater lakes, ponds, and streams. Their greenish brown coloring blends well with the surrounding aquatic vegetation and tree stumps which protects them from predators. When swimming through the water, their white bellies also help to camouflage them with the sky above. The teeth of a largemouth bass are brush-like with a texture of sandpaper. Their teeth are suited for gripping, not tearing, and to swallow prey whole. Adult largemouth bass can easily consume smaller fish, frogs, and even baby ducks in one big gulp!

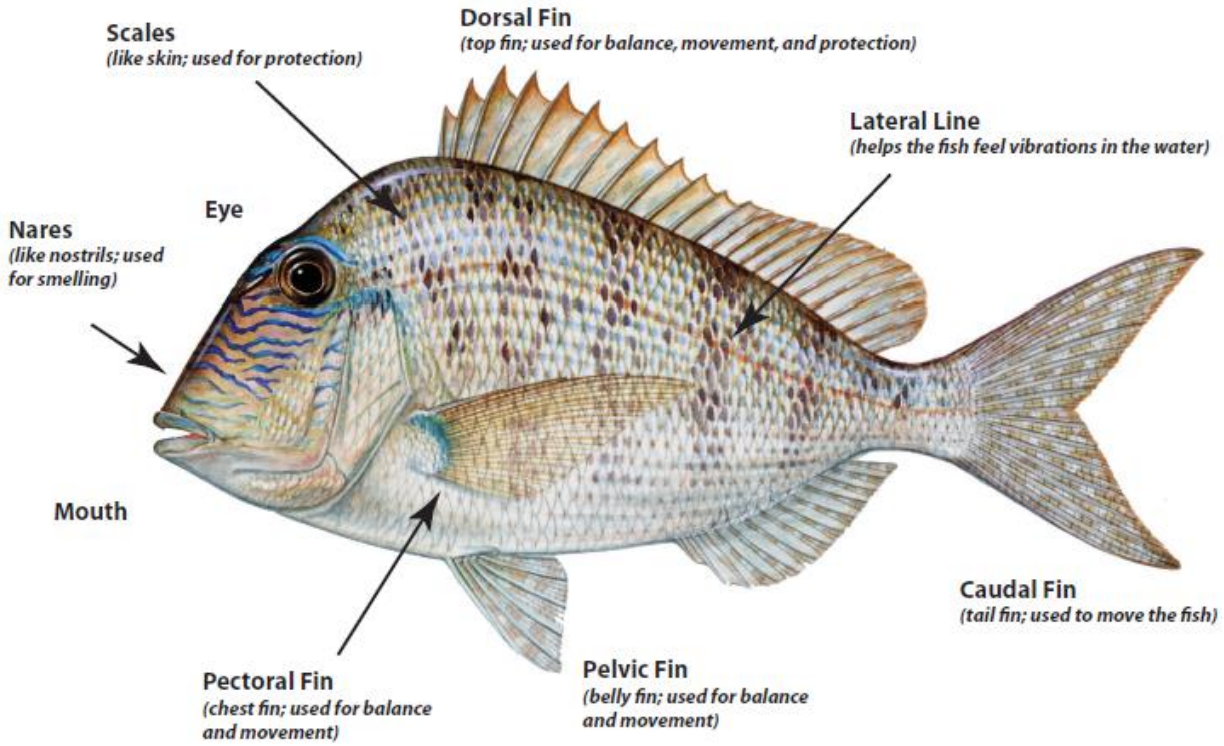
- *Sea Robin:* Sea Robins are a bottom dwelling fish with very large pectoral fins. These large pectoral fins make the sea robin look much larger to passing predators. As an additional defense against predators, sea robins have a very sharp dorsal fin and spines on its gill covers. Sea robins can also make a barking or croaking sound that scare off predator. Its large fins help to balance its body, steer through the water, and protect it against predators.

4. Introduce the word "adaption". Describe that organisms adapt or change in order to better survive in an environment. Adaptations can be acquired over dozens to thousands of years. Ask students to use this concept of adapting in relation to organisms. Can they name a few animals (or plants) that have "adapted" to its environment or habitat?
5. For further exploration, have students discuss the following questions:
    a. Describe 3-5 external anatomical features of a fish.
    b. Name the three species of fish that we discussed.
    c. If a fish has a forked tail, is it a fast or slow swimmer? Fast.
    d. Why do some fish have a spiny dorsal fin? For protection from predators.
    e. If a fish has an inferior mouth, where does it get its food? On the bottom of ocean, rivers, ect).
6. Pass out the *Survival of Fish Worksheet*. Students will use the information they just learned to create their own fish to best survive their new chosen environment. Students should use a mouth shape, a body shape and a tail shape from the *Fish Body Parts* reference sheet. ***Students can be creative with the other fin shapes and defense mechanisms.***

VOCABULARY LIST & FISH ANATOMY

- **External Anatomy -** The outside body parts.
- **Caudal/Tail Fin -** Fin on end of fish; used to propel the fish.
- **Dorsal Fin –** Backside (top) fin on a fish; used for balance and protection.
- **Pectoral Fin –** Side ("chest") fins on a fish; used for balance and steering.
- **Anal Fin -** Last bottom fin on a fish located near the anal opening; used for balancing and steering.
- **Pelvic Fin –** Paired bottom or belly fins on a fish; used in balance and steering.
- **Gills -** Organ a fish uses to obtain oxygen from the water.
- **Operculum -** Flexible bony plate that covers the gills.
- **Lateral Line -** Organ a fish uses to "feel" low vibrations; tiny microscopic pores.
- **Nares -** Organ a fish uses to smell; similar to nostrils but not used for breathing.
- **Scales -** Protective cover on a fish; similar to skin.
- **Slime -** Covers scales; layer protects from bacteria, parasites, etc.
- **Vertebrate -** Organism with a backbone.
- **Superior Mouth -** A mouth that opens upward (usually surface feeders).
- **Inferior Mouth -** A mouth that opens downward (usually bottom feeders).
- **Terminal Mouth -** A mouth located at anterior end of fish's body (mid water feeder).
- **Camouflage** – The ability to blend in with the background or habitat.
- **Adaptation -** The adjustment or change in behavior or body to become better suited for survival in a particular environment.

External Anatomy of a Bony Fish



Fish Body Part Shape Reference

MOUTH SHAPES

SUPERIOR MOUTH
- Eats food above it
- May eat at the water's surface

TERMINAL MOUTH
- Eats food in front of it

INFERIOR MOUTH
- Eats food below it
- May eat off of the bottom

BODY SHAPES

OVATE BODY
- Slow swimmer
- Difficult for predators to swallow

FUSIFORM BODY
- High speed swimmers

ELONGATE
- Hides in rocks and weeds

CAUDAL / TAIL FIN SHAPES

HETEROCERCAL TAIL
- Fast swimmer
- Constantly moving

FORKED TAIL
- Fast swimmer

LUNATE TAIL
- Long distance swimmer

POINTED TAIL
- Slow swimmer
- Bottom wriggler

ROUNDED TAIL
- Good at turning
- Fast for short distances

TRUNCATE TAIL
- Good at turning
- Slower swimmer

Survival of the Fish

Background: The earth has gone through some changes. It is your job to adapt a fish to live and survive in a new environment. Pick one of the environments below.

Environments:

ICE AGE

The Earth has just emerged from an Ice Age and it is dark and cold. The ocean floor is very mountainous. Because of the cold, dark conditions, only a few plants grow in the shallow water. Other marine animals on this planet include swimming crabs, large nocturnal sharks, giant squids, small dark colored fish, and a variety of aquatic insects. Polar bears have survived and enjoy eating the small dark colored fish.

MELTDOWN

The Earth has just emerged from a Meltdown. The climate is tropical, wet and hot. Most of the ocean is covered by large kelp forests. Spiny algae grows thickly on the ocean floor. The spines of this plant are poisonous, and any animal which touches it is sure to die. Marine animals include sea snakes, three varieties of jellyfish, silver-bluefish, bottom clams, crabs that hide in the kelp forests, and dolphins. The tropical birds have survived and live on a diet of silver-blue fish and sea snakes.

Environment Chosen: _____

To help your fish adapt, you need to consider the following:

- What your fish is going to eat? _____
- Where it is going to live? _____
- How it is going to defend itself? _____
- How it is going to move about in its new environment? _____

Based on the environment you choose, *describe* how your fish will adapt its:

Body Shape:	Eyes (number, vision type, ect):
Fins (number, shape, function, ect.):	Predator/Prey Relationship Predators: Prey:
Habitat (top, middle, bottom of water):	Defense Mechanisms:
Mouth (teeth, shape, ect):	Color:

How does your fish look after its adaptations?

Based on the adaptations you chose, create your fish in the space below.

Post-Program Activity 1 : Exploring Wetlands

Duration of Activity: ~ 45 mins

Materials: Pictures of wetlands, Items to create a wetland model: large tray, clay, sponge and water, recording of sounds found in wetlands (YouTube has many different sound bit videos that can be used), foods that grow in wetlands

Background: Wetlands are an integral part of the local ecosystem, and many migratory species rely upon them. R.L. Smith (Ecology and Field Biology, 3 rd edition, Harper and Row, New York, 1980) described wetlands simply as "a half-way world between terrestrial and aquatic ecosystems and exhibit some characteristic of each." Wetlands are defined differently by scientists, conservationists, developers, government, and countries. However, most definitions generally agree that wetlands share traits from all three of these categories:

- The wetland is saturated with water either permanently or intermittently.
- The wetland has 'hydric soils' – soils that hold water for all or part of the year, which creates an anaerobic (low oxygen) state. *f*
- Water-tolerant plants are found in the wetlands. These plants are able to grow in the low oxygen conditions formed by the hydric soils.

Directions:

1. Ask students to give the definition of a habitat. A habitat is the natural environement of an animal, plant or other organism. Explain that there are many different types of habitats and ask the students if they can describe a wetland habitat.
2. Explain to students that they will explore the wetland habitats using their "senses. You can be creative about adapting the following activities to meet your space and time requirements.
3. SIGHT: Show students a few pictures of different types of wetlands and ask them to describe the similarities and differences between the types of wetlands shown and other habitats (forests, meadows, deserts ect.). This website has several great photos of different types of wetlands including mangroves, peat swamps, swamps, marshes, rivers, lakes, floodplains, flooded forests and more! http://www.wetlands.org/Whatarewetlands/tabid/202/AlbumID/11392-86/Default.aspx Feel free to use other images that can be found online.
4. TOUCH: If able, construct a model of a wetland for the students in a large tray. Begin by using clay to represent land. Build a slope with the clay on one end of the tray. Use the clay to create features such as streams and hills. Place large sponge (or several sponges depending on size of tray) in the middle of the tray to represent the wetland. Leave the remaining end of the tray open to represent a lake or ocean. Raise the clay land end of the tray up to create a slope. Demonstrate how water might flow through a watershed by using the water to make it 'rain' on the land. Ask the students to observe how the water

flows through the model and then give them an opportunity to feel the differences between land, a body of water and the wetland.

5. SOUNDS: Play recordings of sounds from local wetlands (bird calls, wind blowing, frogs, ect.) and ask students to identify the sounds. Have students think of other animals that may live in the wetlands as well.
6. TASTE: Give or show students samples of some of the foods that are derived from plants grown in the wetlands. Common foods are cranberries, blueberries, crab meat, and mint tea.
7. Conclude by revisiting the definition of what a wetland is, and reinforcing it with the examples they just experienced.

Post-Program Activity 2: Exploring pH

Duration of Activity: ~ 1 hour

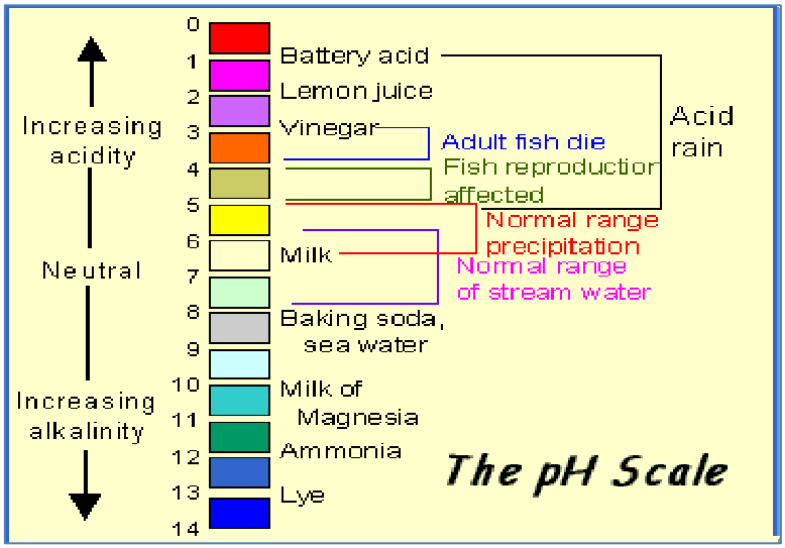
Materials: 12 plastic cups or small test tubes, pH test strips, Acid & Base pH Lab Worksheet (see attached), various household solutions to test, such as:
Lemon juice, Vinegar, Salt and water, Baking soda and water, Tap water, Skim milk, Apple juice, Light-colored soda, Detergent solution, Diluted orange juice, Diluted lemonade, Glass cleaner such as Windex, Bleach, Drain cleaner, Liquid hand soap and/or Shampoo.

Background: Indicators that change color are routinely used to determine whether a solution is acidic, basic, or neutral. A pH scale indicates with numbers the concentration of hydrogen ions in a solution and characterizes a solution as acidic (lower than 7), basic (higher than 7), or neutral (near 7). There are electrodes and electronic instruments that can measure directly the pH of a solution. Some acids and bases are defined other than by their hydrogen ion concentration, but they will be addressed in high school chemistry. Pure water has the same number of hydronium ions (H30+) as hydroxide ions (H0-), so it is considered neutral.

Directions:

1. Divide students into groups of three or four. Have students label 12 plastic cups or small test tubes with numbers 1-10.
2. Have students add a few drops of each substance into the plastic cups or test tubes. Thicker solution should be diluted so that they can be dispensed with a pipette or dropper. Have the different substances numbered beforehand or have students indicate on their worksheet.
3. Dip the pH paper into the solution and record the color. Use the color chart provided with the pH paper to determine the pH of the solution. Record that value on the worksheet table. If the result is between two numbers, estimate to the nearest tenth.
4. Continue step 3 until all substances have been tested and record all results in the data table.
5. Discuss with students using the second chart the effects pH has on the organisms that live in a body of water with a very high or low pH.

Acid & Base: pH Lab



- Hypothesis: Which solution do you think will be the most acidic?

Most Basic?

DATA TABLE		
Solution	**pH Paper**	**Acid/Base/Neutral**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

1. Which solution was the most acidic? Most basic? Neutral?

2. How would the pH of the solutions tested effect organisms that live in a body of water? Which solutions could the aquatic organisms live in? Which solutions could aquatic organisms not live in? Use the chart below.