Freshwater Animals
**Time Allotment**
40 minutes. 10-minute lesson, 30-minute craft time.

**Grade Level**
K - 5

**Objectives**
Children will compare saltwater and freshwater animals, identify distinguishing characteristics of mammals, reptiles, fishes, birds, and amphibians, and construct a freshwater creature of their own.

**Mississippi Standards**
L.K.1A, L.K.1A.1, L.1.1, L.2.4, L.2.4.1, L.3.1, L.3.1.3, L.4.2, L.4.2.1

**Next Generation Science Standards**

**Conservation Message**
When you make conservation (protection of animals and habitats) a way of life, all life will benefit.

**Materials and Resources**
- Craft Supplies (Yarn, Popsicle Sticks, Scissors)
- Freshwater Animals Printouts
- Markers/Pens/Pencils

**Background Information**
Three major points must be discussed before students are able to begin their craft animals.

- How freshwater differs from saltwater.
- Review of the characteristics of birds, mammals, reptiles, and fish.
- Introduction of what amphibians are and their characteristics.

Some of the same challenges are faced in freshwater and saltwater, the main difference is that in freshwater temperature changes much more rapidly than saltwater and there is a major lack of salt in the environment (very important for nerve function). To overcome these obstacles, animals in freshwater can withstand a wide range of temperatures, and they retain as many ions (salt) as they can while excreting as much water as possible.

So What’s the Difference?
• **Saltwater** – tons of living spaces, more than 70% of earth is covered in saltwater. This means there are larger predators such as sharks and whales. Almost all saltwater is also connected across the globe. Because of this the world does have some global populations of animals, such as whale sharks. The saltwater itself is a challenge and if animals are not adapted to it, they will die from too much salt. To overcome this, marine animals can rid their bodies of as much salt as possible through excretion and retain as much water as possible. Changes in temperature in oceans and seas are very gradual and occur every season change. It takes a lot of energy to change the temperature of the oceans and typically changes in temperature will last all season. The ocean is the deepest place on the planet and the deepest trench is in the Marianas Trench at Challenger Deep 36,070 feet below sea level.

• **Freshwater** – less living space, less than 1% of earth is covered in livable freshwater. This means there are smaller predators in freshwater systems. The waters are also disconnected, meaning there are many divided populations of the same species all over the world, especially in ponds and lakes. There are no world-wide populations. Being surrounded by freshwater all the time will kill animals that are not adapted for this environment (same as saltwater), so these animals retain as much salt in their bodies as possible while expelling as much water as possible. The changes in temperatures are also very rapid in streams and rivers, most notably when trees fall or are removed, areas that used to be cool and shaded suddenly become hot and sunny. Seasonal changes also occur causing the water to mix in ponds and lakes (because cooler water sinks while warmer water floats). On average freshwater systems are much more shallow than saltwater environments, the deepest lake is Lake Baikal in Siberia at 5,387 feet.

The major classes of animals that live in freshwater include mammals, birds, reptiles, fish, and amphibians. There are also a lot of invertebrates, but we will not be covering them here.

**Mammals** – freshwater mammals include river dolphins, river otters, hippos, beavers, manatees, Lake Baikal seals, and several others. All these animals have hair (at some point in their lives), are endothermic (warm blooded), breath with lungs, have flippers/webbed feet, and they give live birth to their young (except for the platypus and echidna).

**Birds** – freshwater birds include geese, ducks, herons, storks, cormorants, egrets, and many others. All have feathers (some are waterproof others are not, but all coat their feathers in oil from an oil gland by their tail feathers), are endothermic (warm blooded), have webbed talons or predatory talons, breath with lungs, and lay eggs.

**Reptiles** – freshwater reptiles include crocodilians, water snakes, and many, many species of turtles. They are covered in scales, are ectothermic (cold blooded), breath with lungs, have webbed feet (not all have feet though), and lay eggs (a lot of water snakes do give live birth).
**Fish** – freshwater fish include perch, gars, bowfins, sturgeons, 2 species of sharks, and many others. Most are covered in scales, they are ectothermic (cold blooded), breath with gills (some can breathe on land too), swim with fins, and give birth to both eggs and live young.

**Amphibians** – Amphibians are a special class of freshwater animal as they cannot be found too far away from freshwater as it is a necessity to complete their life cycle (eggs must be laid in water). They are a cold-blooded class, or ectothermic. Breathing for these animals is complex. When they are young, they breath with gills, and as they age and metamorphosize they develop lungs and they breathe through their skin, some species still retain their gills as adults. For locomotion they use their webbed feet (not all are webbed or even have feet). These animals lay eggs. All amphibians are freshwater species.

Children will now create their own freshwater creature. They can pick one of the animal outlines from the Freshwater Animal Printouts to color, glue crafts to, and put on a popsicle stick to make a puppet. During this activity children should be encouraged to use their imaginations and try to create an animal that can overcome the challenges of living in freshwater while staying characteristically true to the type of animal it is, fish, mammal, reptile, amphibian, or bird.

**Vocabulary**
Saltwater, freshwater, mammal, bird, reptile, fish, amphibian, conservation.

**Learning Procedure**
Freshwater Animal Craft

1. Introduction and Motivation – This lesson will teach children what it takes to live in an aquatic environment and allow them to create a craft to help them apply this information.
2. Body and Main Activity – Show children the Freshwater Animals Crafts pages for children to pick what kind of animal they wish to create (mammal, reptile, fish, amphibian, bird). Then, spread out the craft supplies and allow children to create their animal how they wish. The animal must overcome the obstacles that come with living in freshwater.
3. Summary and Closure – have children present their animal telling you the name of their animal, what kind of freshwater it lives in, and how it survives in freshwater. After presentations have been completed, discuss with the children possible threats to the animals and/or their habitat and/or environment. You may ask, “What are the threats to the animal’s survival?” “What are some things that make it difficult for these animals to survive in their homes?” After listing some of the threats, then open the discussion for ways in which the children can help maintain a healthy environment for the animals to survive. Encourage the children to draw a fresh water habitat.
Learning Extension

For more information on this topic check out these videos:
The Basics of Freshwater: Crash Course Kids 14.1
https://www.youtube.com/watch?v=oaQCiwzjnCM&t=91s
Freshwater Biomes
https://www.youtube.com/watch?v=GlrW7t-iWv4

Or check out these books:
Monster Fish! True Stories of Adventures with Animals by Zeb Hogan and Kathleen W. Zoehfeld
Clue Books: Freshwater Animals by Gwen Allen and Joan Denslow
School Specialty in the Small, Small Pond by Denise Fleming
Seasons of the Freshwater Pond Biome by Shirley Duke
Freshwater Animal Printouts

Figure 1 [Link to Image](http://clipart-library.com/outline-of-a-duck.html)
Figure 2 [https://creazilla.com/es/nodes/999-ciguena-silueta](https://creazilla.com/es/nodes/999-ciguena-silueta)
Figure 5 http://amphibianrescue.org/education/4-hiding-in-plain-sight/
Figure 6 http://mister-toad.com/kid_animal_coloring_pages.html
Figure 8 https://patternuniverse.com/download/snake-pattern/
Figure 9 [https://www.freequilt.com/fish-outline-print31.html](https://www.freequilt.com/fish-outline-print31.html)
Estuary Animals
Estuary Animals

**Time Allotment**
40 minutes. 10-minute lesson, 30-minute craft time.

**Grade Level**
K, 1\textsuperscript{st}, 2\textsuperscript{nd}, 3\textsuperscript{rd}, 4\textsuperscript{th}, 5\textsuperscript{th}

**Objectives**
Children will explain how brackish water is necessary for various species life cycles, arrange various brackish water animals' life cycles, and create their own estuary animal.

**Mississippi Standards**
L.K.1A.1, L.1.1, L.2.4.1, L.3.1.3, L.4.2.1

**Next Generation Science Standards**

**Conservation Message**
When conservation (protection of animals and habitats) becomes a way of life, all life benefits.

**Materials and Resources**
- Life Cycle Worksheets & Pencils
- Craft Supplies & Animal Printout/Drawing

https://www.pinterest.com/pin/274649277250042802/?lp=true
https://www.education.com/worksheet/article/color-life-cycle-17/
https://www.pinterest.com/pin/291748882103110541/?lp=true

**Background Information**
There are some species that do not exclusively live in either freshwater or saltwater some can live in both. These animals are called euryhaline animals. They can be mammals, reptiles, birds, fish, or invertebrates. However, most amphibians live in freshwater, except for cane toads which can habituate saltwater areas. Mammals, birds, reptiles, and fish have various ways that they reproduce. Some lay eggs and others give birth to live young.

**Vocabulary**
Mammal, reptile, fish, bird, insect.
Learning Procedure
Brackish Water Animal Craft

1. Introduction and Motivation – This brief overview of brackish water animals and their life cycles should be completed AFTER the brackish water introduction lesson. Children will be able to organize life cycles and create their own animal to help them better understand the different life strategies of various animals.

2. Body and Main Activity – For older kids allow them to work through the worksheet on their own.
   a. Life Cycle Worksheet – Using the background information help the child(ren) fill out the worksheet starting on page 4. You can either print it out and draw the answers in the boxes or use the computer and copy and paste the answers in the boxes.
   b. The following examples should be talked about step by step with children while they fill out their worksheets.

   - **Mammal** – these animals give birth to live young. One example is the bottlenose dolphin, the mammals that live in the Mississippi Sound give birth in shallow areas to keep their young safe from large predators. Dolphons start as an embryo in their mother’s bellies, they develop, are born, and called a calf. The calf then grows into an adult and the cycle starts all over again.

   - **Reptile** – many of these animals lay eggs on land, the eggs then hatch and move to the water. The alligator is one example. North American alligators lay their eggs in a nest on land, in an estuary. The mother alligator protects her eggs until they hatch. Once hatched the young are called hatchlings. These hatchlings then begin to grow, swimming in estuaries with a lot of vegetation for hiding. Juveniles then go off on their own and grow into adults, starting the cycle over.

   - **Fish** – these animals often lay eggs in the water during an event called spawning, and typically leave the eggs after they are laid. The eggs then hatch, and the newly hatched fish are called a fry. The fry then ages and turns into an adult that then spawns, starting the cycle over again. Salmon are one example. Salmon live in saltwater as adults, spend a few weeks in estuaries preparing for the spawning event and then travel upriver to spawn (lay eggs) and die.

   - **Bird** – these animals lay eggs in nests. These birds will sit on and care for these eggs while in the nest. Cormorants are one example of these types of birds. Cormorants live in estuaries and lay their eggs in nests located in trees. In the estuary, adults find fish to feed to their newborns called
hatchlings. As the hatchlings mature, they are called a chick. The chick will stay in the nest until all of their flight feathers have developed and the chick is prepared to leave the nest. The chick leaves to become an adult, starting the cycle again.

- **Insect** – these animals have a multitude of various life cycles, the example used here is the dragonfly. A dragonfly adult will lay eggs near water, and once the eggs hatch a larva emerges. The larva lives in either a stream or estuary with very low salinity, feeding on plankton and small fish. As the larva ages, they begin molting. Once molting is over, they have metamorphosed into their adult form. The life cycle then starts over.

3. **Estuary Animal Craft** – Have all your supplies printed out and ready for the crafting portion of the activity or have the child(ren) draw a copy of the animal they wish to make on their own on some paper. Then allow the child(ren) to use crafts of colored pencils/crayons/markers to create their own animal.

3. **Summary and Conclusion** – Once finished have the child(ren) present their animal telling you the name of their animal, what kind of wetland it lives in, and how it survives. **Reiterate the message: When you make conservation a way of life, all life benefits.**

**Learning Extension**
For more information on this topic check out these videos:
What is an estuary?
https://www.youtube.com/watch?v=emVVG7dSaA
What’s An Estuary? Now You Know.
https://www.youtube.com/watch?v=XLumSN4G5P4

Or check out these books:
*Life in an Estuary* by Sally M. Walker
*Biome Beasts Estuary Animals* by Lisa Colozza Cocca
*A Journey into an Estuary (Biomes of North America)* by Rebecca L. Johnson
*Estuaries (Av2 Ecosystems)* by Simon Rose
**Brackish Water Animals Worksheet**

For the following animals draw their lifecycles in the correct order with 1 being the youngest stage in their life cycle and 4 being the oldest.

**Mammal:**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Bird:**

1. Egg

2. Adult

3. Hatchling

4. Duckling
Insect:

1. [Adult]
2. [Larva]
3. [Eggs]
4. [Molt]
Fish:

1

2

3

4
Figure 2 https://creazilla.com/es/nodes/999-ciguena-silueta
Figure 3 [http://www.supercoloring.com/coloring-pages/otter-outline](http://www.supercoloring.com/coloring-pages/otter-outline)
Figure 5 [http://amphibianrescue.org/education/4-hiding-in-plain-sight/]
Figure 6  https://i.pinimg.com/originals/30/ec/5c/30ec5c51932eaf1cba6b5f22a2cf37f1.jpg
Figure 7 https://patternuniverse.com/download/snake-pattern/
Introduction to Brackish Water
Introduction to Brackish Water

Time Allotment
40-minutes. 10-minute introduction, 30-minute activities.

Grade Level
K, 1st, 2nd, 3rd, 4th, 5th

Objectives
Children will define brackish water, identify where brackish water can be found on earth, articulate the basic properties of brackish water, and conduct an activity to identify brackish water.

Mississippi Standards
P.K.5A.2, E.1.9B.1, P.2.5.3, P.5.5A.4

Next Generation Science Standards
K-ESS3-1, 2-PS1-2, 2-ESS2.C, 5-ESS2.C

Conservation Message
When you make conservation (protection of animals and habitats) a way of life, all life will benefit.

Materials and Resources
- Water
- Salt
- Reusable 12oz cups
- Reusable 2 oz cups
- Reusable stirring sticks/spoons
- Paper & writing utensil
- A tablespoon
- Egg
- Plastic jewels
- Grapes
- Pebbles
- Wood
- Carrot
- Ping pong ball
- Potato
- Bandanas
- Open Area for Gameplay

Background Information
Brackish is defined as “somewhat salty” – Merriam-Webster. Begin the lesson asking children what is 'brackish water', where it's found, and what some of its elements are, write down their answers on a paper. Once you have collected enough answers discuss with the children which answers are correct and incorrect explaining why as you go. Discuss the following talking points:
• Brackish water contains medium amounts of salt – the amount of salt needed for water to transition from freshwater to brackish water is a **salinity** >1psu (practical salinity unit). To transition from saltwater to brackish water is a salinity <30psu. We can measure salinity with a refractometer or salinity probe.
• Brackish water is found in **estuaries** – around the world there are places where brackish water is found, and these places are called estuaries and wetlands. These are areas where freshwater meets the saltwater along coasts. Show students on a map or globe where some estuaries are.
• Brackish water is undrinkable – because of the salt in the water, humans and many other animals are unable to drink brackish water. Drinking brackish water will result in dehydration and death. However, many animals have learned to make these areas of water, containing less salt, their homes through adaptations!
• Brackish water is heavier than freshwater but lighter than saltwater – because saltwater has salt mixed in with it, the weight of it increases. If there were equal volumes of freshwater and saltwater the extra part in saltwater makes it heavier. Because of this, brackish water has a density between freshwater and saltwater. Explain: If two same-size classmates were standing next to each other and one had rocks hidden in their pocket who would weigh more?
• Brackish water makes some objects float – the extra salt in brackish water causes the water to be denser than freshwater. As a result, objects that might sink in freshwater float in brackish water. However, brackish water is less dense than saltwater, so objects that might float in saltwater sink in brackish water.

By the end of the discussion children should know that brackish water has the following properties: medium amounts of salt, found in estuaries and wetlands, cannot be drank (unless by adapted animals), weighs more than freshwater, and makes some objects more buoyant.

**Vocabulary**
Brackish, salinity, estuary.

**Learning Procedure**

Buoyancy Activity

1. **Introduction and Motivation** – Here children will observe how objects interact with brackish water in a controlled environment.
2. **Body and Main Activity** – Fill a large bowl with water and ¼ cup of salt, stir until the salt is dissolved. Line up items to be dropped into the water next to the freshwater bin (eggs, plastic jewels, grapes, pebbles, wood, carrot, ping pong ball, potato, random). Ask children if brackish water would make it easier or harder for objects to float in than saltwater? Freshwater? Then have children hypothesize which objects are going to float
in the water and which are going to sink. Record which objects children think will float and which they think will sink. Begin dropping objects into the brackish water bin, recording which objects floated and which objects sank. [How many did they guess correctly? How many did they guess incorrectly?]

3. Summary and Closure – Have children come to conclusions about how different materials interact with brackish water. Talk with them about why the objects behaved the way they did when dropped in the brackish water. Remind the children that by learning about the properties of the brackish water environments children are preparing to expand their knowledge about these environments, what animals live there, and how they can be protected.

**Learning Extension**
For more information on this topic check out these videos:

What is density?
https://www.youtube.com/watch?v=kE8l_M2pyg8
Sink or Float?
https://www.youtube.com/watch?v=eQuW8G2QV_Q

Or check out these books:

*What Float’s? What Sinks? A Look at Density* by Jennifer Boothroyd
*Things That Float and Things That Don’t* by David Adler
*What is Density?* By Joanne Barkan
*The Magic School Bus Ups and Downs: A Book About Floating and Sinking* by Joanne Cole
Brackish Water – Part 2
Time Allotment
40 minutes. 10-minute lesson, 30-minute activity.

Grade Level
K - 5

Objectives
Children will describe how oil spills effect coastal communities, test different techniques to clean oil spills, and rate the most effective ways of handling oil spills.

Mississippi Standards

Next Generation Science Standards

Conservation Message
When you make conservation (protection of animals and habitats) a way of life, all life will benefit.

Materials and Resources
- Water
- 1 Small Container
- 2 3oz Cups
- 2 Cotton Balls
- Sponge Piece
- Food Dropper
- Feather
- 1 Tbsps. of Oil
- 1 tsp of Soap
- Paper Towels

https://www.marineinsight.com/environment/10-methods-for-oil-spill-cleanup-at-sea/

Background Information
For this lesson children need to first understand what oil spills are, various techniques on how to clean them up, and the wildlife they affect. To begin this lesson first, ask children some sources of pollution for our brackish water systems. After “oil spill” has been said, begin reviewing the following information:

- Oil Spill Sources – oils, in aquatic environments, are always present. Oil is a naturally occurring material that is produced from centuries of dead organic matter. It naturally seeps from the ocean floor into the water and because these levels of oil seepage are normal the environment has adapted. Specifically, there are bacteria that feed exclusively on natural oils. Oil spills come from oil rigs, oil ships, or land oil spills that
have typically released very large amounts of oil at once. The oil covers animals and plants with slick coats of oil that cannot be removed without human assistance.

- **Cleaning Oil** – to help clean oil off the animals, soaps, such as dawn dish soap, must be used. Oil clings to the soap which allows for safe removal from the animals. To clean oils from the environment there are many different ways to pull oil from the water. Discuss the following four oil cleaning techniques:
  
  o **Dispersants** – this technique uses chemicals. The chemicals are sprayed onto the oil and the chemical then bonds with the oil. The oil then bonds with the water making it easier for microbes to break the oil down. This technique is typically used on large areas, creating tar balls, which can be picked up or washed onto shore.
  
  o **Skimming** – this technique uses booms and scoops to pull oil from the surface of the water. It is beneficial as the oil that is collected can still be used, but skimmers get clogged regularly. Used for large spills.
  
  o **Sorbents** – this technique uses material that soaks up the oil. The oil, once it has been recovered, can still be used, but the sorbents can get very heavy and become difficult to retrieve. Mostly used for small spills.
  
  o **In-situ Burning** – This process may be the most effective at removing oil from an aquatic environment (98% of oil can be removed). However, the fumes that are produced can drastically effect people and animals in the surrounding areas. Mostly used on really thick oil spills that are fresh.

**Vocabulary**

Oil, dispersants, skimming, sorbents, in-situ burning, conservation.

**Learning Procedure**

**Oil Spill Activity**

1. **Introduction and Motivation** – Children will experiment with various oil clean-up techniques and come to conclusions about which technique they believe is the most efficient.

2. **Body and Main Activity** – You will need:
   
   i. 1 container half filled with water.
   
   ii. 1 3oz cup with 1Tbsp of oil.
   
   iii. 1 3oz cup with 1Tbsp of water and 1tsp of soap, mixed.
   
   iv. 2 cotton balls.
   
   v. 1 sponge piece.
   
   vi. 1 pipet/dropper.
   
   vii. 1 feather.
   
   viii. Paper towels.
Now children will replicate an oil spill that has occurred in our waters. Be sure that all participants have the chance to contribute to the experiment. You can use the script with the steps below, if not just follow the steps:

ix. “Oh no! An oil spill has just occurred in the Gulf of Mexico and is now affecting our brackish water areas.” Have children pour their oil into the large container of water.

x. “Now our local animals are being affected!” Have children dip their feather into the oil water mixture. (What happened to the feather?) “Let’s collect the birds and set them aside while we deal with the large spill!” Set the feathers to the side on paper towels.

xi. “Now that the animals are safe, we need to clean up this oil. Let’s begin by trying a technique called skimming.” Direct children to pick up their pipets/droppers and begin collecting the oil as best as they can, depositing the oil into their empty 3oz cup. “Did that work well or not?” Allow children to discuss for a moment.

xii. “Well, let’s try another way!” Have the children pour their collected oil back into the container. “Now, we will try a technique where sorbents are used.” Direct children to pick up their cotton balls or their sponges to absorb the oil and squeeze it out into their empty 3oz cups. Set the sorbent on a paper towel. “Did that work well or not?” Allow children to discuss for a moment.

xiii. “Now, let’s swap sorbents!” Have children pour their collected oil back into the container. “If your group used the cotton ball swap use the sponge and vice versa.” Direct the children to pick up their cotton balls or their sponges to absorb the oil and squeeze it out into their empty 3oz cup. Set the sorbent on a paper towel. “Which sorbent worked better?” Allow children to discuss for a moment.

xiv. “Time for our final collection method!” Have children pour their collected oil back into the container. “This last technique uses a dispersant. A dispersant is a chemical that clumps the oil into smaller groups to it is easier to skim up or allows it to sink to the bottom of the ocean.” Direct children to pour their cup of soapy water into the container and stir it around with their pipet/dropper. Then, use the pipet/dropper to collect the oil into their empty 3oz cup. “Did that work well or not?” Allow children to discuss for a moment.

xv. “Alrighty, now that our environment has been cleaned up, we can turn our attention back to our wildlife.” Direct children to pick up their oily feather. “To clean off our ‘birds’ we need to give them a bath in something that is not too harsh on their skin but is tough on the oil. What could we
use?” Allow children to list off possible items. “We will be using dish soap! It is tough on oil but soft on organic, or living, objects.” Have children bring their feather to clean it off in the container at the front of the room. Once the feather is cleaned hand them a paper towel to dry off their feather. “Is it better or worse?” Allow children to discuss for a moment.

3. **Summary and Closure** – Ask children which technique they believe worked the best? Which one was the least affective? What happened to our feather in the oil? How did we clean the feather off? Would these techniques work in real life oil spills? Do we think that teams on coast lines are prepared to handle oil spills? What are some of the negative effects of oil spills? Are all oil spills bad? After the discussion has been wrapped up have children help clean up their oil spills. Remind the students that by physically demonstrating how oil pollution invades natural environments and its impacts on water and animals, students will understand how response teams clean up oil spills to restore environments.

**Learning Extension**
For more information check out these videos:
How Do We Clean Up Oil Spills?
[https://www.youtube.com/watch?v=3DbSlAg3F3A](https://www.youtube.com/watch?v=3DbSlAg3F3A)
What Happens After An Oil Spill?
[https://www.youtube.com/watch?v=nshSoLw0tdI](https://www.youtube.com/watch?v=nshSoLw0tdI)

Or check out these books:
Oil Spill! By Melvin Berger
*I Can Save the Ocean! The Little Green Monster Cleans Up the Beach* by Alison Inches
Oil Spill! *Disaster in the Gulf of Mexico* by Elaine Landau
*The BP Oil Spill* by Peter Benoit