

GLOBIO created Learning Activity Guides are designed to simplify integration of Glossopedia based learning into classroom and extra-curricular activities and curriculum. Each activity is designed around the use of Glossopedia articles and subjects, incorporating technology into interdisciplinary instruction. Learning Activities are intended to be fun, inquiry-driven, and interesting; exciting for students and helpful to teachers.

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### Concepts

- Mangrove trees grow in the tropical and subtropical intertidal zones of five continents.
- Mangroves are threatened by human activities, and half are already lost.
- Many special adaptations help plants and animals live in the Mangal environment.
- Mangal are valued for animal habitat, resources, and coastal and reef

### Related Topics

- Wetlands
- Plants
- Fishes
- Animals
- Birds
- Species
- Bald Eagles
- Hurricanes

### Standards



Standards Key available at [www.globio.org/standards](http://www.globio.org/standards)

### Recommended Outside Links

- Mangrove Action Project: [www.mangroveactionproject.org](http://www.mangroveactionproject.org)
- EPA: [www.epa.gov/owow/wetlands/types/mangrove.html](http://www.epa.gov/owow/wetlands/types/mangrove.html)

### Vocabulary

- Salinity
- Glands
- Bacteria
- Silt
- Sediments
- Endangered
- Pollution
- Dredging
- Dikes
- Adaptation

## During the Reading

### Directions:

- Complete the sheet as you read the “Mangroves” article in Glossopedia. Some information can be found in photo captions, Fast Facts, and the Mangrove interactive.

### During the reading:

1. What is a mangrove?
2. Where are mangrove forests, or mangal located? On how many continents?
3. Why is this a tough environment to live in?
4. What are some special challenges?
5. How have plants and animals adapted to live there?
6. Why are mangroves important?
7. What are people doing to the mangroves? Why?
8. What do you think the world would be like if they were all destroyed?
9. Would you like to live in a mangal? Why/why not?
10. How can people like you help save mangroves?

### Time:

- 20 - 30 minutes

### Materials:

- Glossopedia
- During the reading questions
- Pencils

### Glossopedia:

- [www.globio.org/glossopedia/mangroves](http://www.globio.org/glossopedia/mangroves)

## A Salted Carrot

### Directions for teachers:

- Put the scales, measuring cups and rulers, tape, and containers of salt where students can share them.
- Give each student two carrots, a dish, a stirring spoon or stick, tissue paper, a paper towel, directions and data chart, and a pencil.

### Experiment:

#### Day 1

- Ask students to go to the Glossopedia article on Mangroves. Have them read the article section about Mangrove adaptations, a summary of this section can be found in the Fast Facts page, and consider how these trees have developed for life in salt water.

#### Part 1

- Using masking tape, label one dish #1 Fresh Water and the other dish #2 Salt Water.
- Put one carrot in each dish.
- Take the carrots out, one at a time, and measure their:
  - Length - measure in centimeters and millimeters with the ruler.
  - Diameter at its center point - wrap the strip of paper around the carrot, marking where the end meets the paper on the other side; measure that length with the ruler.
  - Weight of each carrot in grams - weigh on the scale.
- Record the data on your chart in the columns for Carrot #1 and Carrot #2.
- Make observations about the carrots and note them on your chart.

### Time:

- (2) 15-20 minute class periods
- not more than 2 days apart

### Materials:

- Small carrots, 2 per student (Note: pieces of potato or celery can be used instead of carrots.)
- Tap water
- Table salt
- Several metric measuring cups
- Small metric scale
- Metric ruler
- Thin strips of paper for measuring diameter
- Shallow dishes or saucers, 2 per student
- Spoons or stirring sticks
- Thin tissue or toilet paper
- Paper towels
- Directions and data chart, 1 per student
- Pencils
- Masking tape for labeling dishes

### Glossopedia:

- [www.globio.org/glossopedia/mangroves](http://www.globio.org/glossopedia/mangroves)

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### Part 2

- Measure 120 milliliters of tap water and pour it into dish #1 - leave the carrot in the dish.
- Remove the carrot from dish #2. Measure 120 milliliters of tap water and pour it into the dish.
- Place a thin piece of tissue paper on the scale. Put a small amount of salt on the paper. Add or remove small quantities until it weighs 15 grams.
- Put the salt into the second dish and stir until it is thoroughly dissolved.
- Place the carrot back into dish #2.
- Write down what you think will happen to the two carrots (your hypothesis). Record your hypothesis on your chart.



### Day 2

- Remove the carrots from the dishes and dry them with the paper towel, being careful not to mix them up.
- Repeat the measurements for length, diameter, and weight and note the data on your chart.
- Repeat your observations and note them on the chart.
- Compare your carrots and the differences you see in your observations and measurements in the **Results** section of the chart.
- Be sure to include a conclusion related to the hypothesis in the results section, noting whether your guess was correct.

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## A Salted Carrot: Data Chart

Day 1	Carrot #1	Carrot #2
Length		
Diameter		
Weight		
Texture		
Color		
Stiffness		
Other observations		
Hypothesis		
Day 2	Carrot #1	Carrot #2
Length		
Diameter		
Weight		
Texture		
Color		
Stiffness		
Other observations		

### Results

Do the carrots look the same?

Has the texture changed?

Has the color changed?

Are the carrots as stiff as they were before?

Do you see any other changes? If so, what?

Why do you think the salted carrot changed?

Was your hypothesis correct?

Draw pictures of your carrots.

Carrot #1

Carrot #2

Go back to the Glossopedia article on Mangroves and re-read the Mangrove Adaptations section. Which adaptations do you think relate to your carrot experiment? How?

## For Teachers:

### Mangroves Follow-up Discussion and Supplement

When students have completed their experiment, discuss osmosis and the effect it had on their carrots and on plants that live in salt water.

Mangrove trees and other plants living in the Mangal have to survive in salty water that would kill most plants. Salt affects plant tissues through a process called Osmosis. Mangal plants have special adaptations to outwit Osmosis and limit the amount of salt in their tissues so they don't die.

#### What is Osmosis?

Osmosis is the passage of water molecules through a membrane (semi-permeable), from an area of purer water, such as tap water (low concentration), to an area of water that has other things dissolved in it, like salt or sugar (high concentration). Think of it as "light" water and "heavy" water. If the light and heavy water were on a balance scale or a see-saw, the heavy water would sink down and the light water would roll into it until all the water was mixed together. Then the water on both sides would weigh the same. Nature is always trying to balance things, including the concentration of seawater and plant sap in relation to each other. If most trees and plants were placed in seawater, their low concentration sap would flow out through their cell membranes into the higher concentration salt water, and they would shrivel and die.

#### Outwitting Osmosis

- 1) Stay Out!: Some trees, like the Stilted Mangrove, exclude salt from entering with a membrane that acts like a gate. Red Mangroves have roots containing a waxy substance that keeps salt out.
- 2) Pass the Salt: Others, like White Mangroves, excrete salt through special glands in their leaves. People do the same thing when they sweat. The salty leaves are washed by rain; we take a bath or shower.
- 3) Game of Concentration: Some Mangroves concentrate salt by storing it in their leaves. When the leaves get old, they die and fall off, carrying away the salt.
- 4) Dilution Solution: Mangroves can also close their leaf pores (stomata) to keep water from evaporating away, helping to dilute the salt that enters through their roots. When the salt gets too concentrated, they can open the pores to release it.

## Mangranimal

### Directions:

- Instruct students to open the Glossopedia article on Mangroves and go to the Interactive.
- Read about animals that live in Mangrove forests.
- Have students write down as many adaptations they read about or observe in the article, interactive, and pictures; pictures are in the article and the image gallery. Tell them they are looking for adaptations that might help the animals survive in the special mangrove environment.
- Have students draw pictures of three animals. Have them label specialized body parts and tell how these are helpful for survival.
- It is now time for students to use what they have learned to create a Mangranimal of their own to live in the Mangrove forest!
- Encourage students to think about the animals they studied. What special adaptations and physical characteristics are most necessary for their way of life? Students may revisit the Mangrove Interactive to get new inspiration.
- Students may now draw their Mangranimal. They must give it a name, label its specialized body parts, and be prepared to tell the class how each one functions to help it survive and thrive in the Mangal.
- Students may act out their Mangranimals for the class. The class can try to guess what activity is being portrayed and how body parts are adapted for that purpose.

### Additional ideas:

- Students may make up and sing a song about their Mangranimal.
- Students may act out one of the animals from Glossopedia for the class and have them try to guess what animal it is. They should demonstrate its special body part usage and any interesting habits.
- Videotape your class and post it on your school web site or blog.

### Time:

- 1 hour

### Materials:

- Paper
- Pencils
- Crayons
- Pens

### Glossopedia:

- [www.globio.org/glossopedia/mangroves](http://www.globio.org/glossopedia/mangroves)



## Extensions

### Seawater Sip

#### Directions for teachers:

- Divide the group into small teams or pairs.
- Give each group a 1 liter container and a piece of tissue paper.
- Put the scales where students can share them.

**Note:** Clean 2 liter bottles can be used, just double the amounts of water and salt.

**Optional:** Give each student a paper cup. Pour in a few drops of salt water and allow them to taste it.

#### Time:

- 15 minutes

#### Materials:

- Several 1 liter calibrated containers
- Tap water
- Table salt
- Metric scale
- Tissue paper
- Small paper cups (optional)

#### Directions for students:

- Fill the container with 1 liter of tap water.
- Place a thin piece of tissue paper on the scale. Put a small amount of salt on the paper. Add or remove small quantities until it weighs 35 grams.
- Put the salt into the liter of tap water and stir until it is thoroughly dissolved.
- This is approximately the same concentration of salt that is in average seawater.
- Taste your “seawater”. Does it taste like the ocean?

### How Does Your Garden Grow?

#### Directions:

- Have students hypothesize what will happen if one plant is watered with salt water and the other with tap water.
  - Reference the osmosis description and explanation in A Salted Carrot activity for background information.
- Water one plant with tap water and the other with salt water. Record the date watered and amount of water used.
- Compare the plants’ health and record your observations and results weekly for four weeks.

#### Time:

- (1 or 2) 10-15 minute sessions over 4 weeks

#### Materials:

- 2 plants of the same kind, age, and size.
- Salt water of the same concentration as seawater - see “Seawater Sip” extension
- Tap water
- Measuring cups

#### Observations and Results:

- Did the plants change?
- Is one healthier than the other? Why?
- Revisit Mangrove adaptations to living in salt water and compare these to your classroom plants.