Salinity Currents

Overview

An **estuary** is an exciting, dynamic place where fresh water, gathered into rivers and streams from rain and snow falling in the mountains, meets salt water from the ocean. As these two very different bodies of water come together in a semi-enclosed area, currents are set in motion, creating a rich, diverse habitat supporting many different kinds of organisms. These **salinity** or **density currents** as they are called, are formed due to the *differences* in the salinity (saltiness) and temperature of the fresh and salt water as they meet in the estuary.

In Session 1, students participate in a Thought Swap to share what they know about currents and then have a brief content introduction about currents as they watch the teacher make currents using a dish of water on the overhead projector. Students in small groups make observations and participate in discussions about how to determine the difference between two bottles of water – one salty and one fresh. Their observations and discussions are facilitated by questions leading to further observations. They then participate in a Think Pair Share to design an investigation to determine the difference between the salty and fresh water bottles, using only the limited materials given to them on a tray. Finally, students do a free exploration as they try out their investigation.

In Session 2, students use the materials from Session 1 to do a structured exploration of salty and fresh water with a small group of students. Students use data sheets, make predictions, answer questions designed to facilitate their discoveries, and compare their results with other groups. A teacher demonstration then helps students understand the concept of salinity currents and apply their results to the real world.

In Session 3, students review what they discovered about currents in the hands-on activity. They then make a mini-book to share what they have learned. Students learn that salinity is a measure of the amount of salt dissolved in a liquid. They

discover that fresh water will float on top of saltier water because it is less dense than the salt water. They also discover that salinity currents can form when fresh water from the land and salt water from the ocean meet in an estuary.

What You Need

For Session 1:
Content Introduction
For the class:

- ☐ overhead projector
- ☐ clear glass pie plate or deli container
- ☐ water to fill pan
- ☐ drinking straw
- ☐ globe or world map showing currents

Inviting Observations
For each small group:

- ☐ 2 glass 12-16 ounce carbonated water bottles (could be same bottles as below) and lids (See Getting Ready)
- ☐ water to fill bottles
- ☐ kosher salt to make salt water

For Session 1 Free Exploration and Session 2 Making Currents
For each pair of students:

- ☐ 1 3x5 card cut in half
- ☐ 2 glass 12-16 ounce carbonated water bottles
- ☐ 1 Tablespoon salt
- ☐ 3 ounce tasting cup (for salt)
- ☐ cafeteria tray or pie pan to catch spills
- ☐ water to fill 2 bottles
- ☐ 1 vial food coloring (small groups could share)
- ☐ paper towels
- ☐ 1 sheet white paper

For Session 2
Making Currents
For the class:

- ☐ Predictions data sheet and Results data sheet made into transparencies
- ☐ transparency pens and an overhead projector
- ☐ "How Salty Dogs Make Currents" Poster (See Getting Ready)
- ☐ "How Fresh Cats Make Currents" Poster (See Getting Ready)

- globe or world map showing currents

For each student:
- 1 copy of Predictions data sheet
- 1 copy of Results data sheet
- pencil or pen for each student
- 1 colored marker or crayon

Session 3
For each student:
- 2 sheets of writing paper
- 1 sheet of large white paper (11 x 17" or so)
- pen or pencil

For the class:
- Key Concepts written on chart paper (see Getting Ready)
- copy of mini-book pattern

Getting Ready

1. Obtain Kosher salt. Kosher salt dissolves without cloudiness so that the students will not be able to tell the difference between salty and fresh water just by looking. Regular table salt is fine to use for Session 2 where the students do the hands-on activity in **Making Currents.**

2. Obtain enough 12-16 ounce glass bottles and tops to give each pair of students two identical bottles. Rinse the bottles, remove the labels and for safety, be sure the mouths of the bottles are undamaged and smooth. Glass carbonated water bottles work well; plastic bottles do not work as the students tend to squeeze the water out during the **Making Currents** activity. This unintentionally changes the experimental results and also creates water spills in the process. The tops are useful when shaking the bottles to mix the salt and food coloring.

3. Set up the demonstration bottles for the Inviting Observations activity, filling one bottle with salty water and one with fresh for each table group.

4. For the **Making Currents** activity, you may want to fill the students bottles before the start of the activity especially if you only have one faucet

available for the students to use. Alternatively, you might have pitchers available at each table so the students can fill their own bottles without creating a "bottleneck" at the sink.

5. Set up trays with materials for the **Think Pair Share** activity in Session 1 and the **Making Currents** activity in Session 2 so that you will be able to distribute one tray per table group. Have enough sets of materials on each tray so pairs of students at each table will have the materials they will need. Tasting cups (3 oz.) are a good way to distribute the salt they will need for the experiment.

6. Write out the Key Concepts for the activity on chart paper with large bold letters using wide-tip marking pens.

   Salinity is a measure of the amount of salt dissolved in a liquid.

   Fresh water will float on top of saltier water.

   Fresh water is less dense than salt water.

   Salinity currents can form when fresh water from the land and salt water from the ocean meet in an estuary.

7. Make "How Salty Dogs Make Currents" and "How Fresh Cats Make Currents" posters using the examples that follow. Use chart paper and colored markers and display the posters prominently at the front of the room. Alternatively, you could make them into transparencies and then duplicate the written directions to distribute to each table group.

How Salty Dogs Make Currents

1. Fill 1 bottle to top with fresh water. Place bottle in pan.

2. Fill 2nd bottle almost to top with fresh water. Leave room in bottle to add salt.

3. Add 1 tablespoon salt and 4 drops food coloring to 2nd bottle. Screw on lid and shake. Remove lid.

4. Fill second bottle to top with fresh water.

5. Place card on top of colored salty water bottle. Turn bottle upside down. Place the colored salt water on top of the clear fresh water bottle. Slide card out from between bottles.

6. Observe what happens!

How Fresh Cats Make Currents

1. Fill 1 bottle <u>almost</u> to top with fresh water. Leave room in the bottle to add salt. Place bottle in pan.

2. Add 1 tablespoon of salt and 4 drops food coloring to bottle. Screw on lid. Shake it up. Remove lid.

3. Fill second bottle to top with fresh water.

4. Place card on top of clear fresh water bottle. Turn bottle upside down. Place clear fresh water bottle on top of colored salty water bottle. Carefully slide card out from between bottles.

5. Observe what happens!

8. Make the Predictions data sheet and the Results data sheet into transparencies.

9. Duplicate the Predictions data sheet and the Results data sheet for each student.

Into the Activity

Session 1: What's a Current?

Invitation to Thinking about Currents (Accessing Prior Knowledge)
Thought Swap

1. Tell the students that in Thought Swap they will get a chance to talk with different classmates about questions or topics posed by the teacher. To have a good discussion, each partner should be a good listener and speak clearly when it's her or his turn. They also need to cooperate, follow directions, and talk quietly with each of their partners.

2. Have students stand shoulder to shoulder to form two parallel lines, so each person is facing a partner. Students standing side by side should be at least 6" apart. If you have an odd number of students, either join a line yourself or make the pair on the end into a threesome.

3. Tell students you will be asking a question or giving them an idea to talk about with their partner who is facing them. They will have about a minute to talk.

4. Pose the first question for students to discuss from the list, which follows Step 7 below. Walk around the two lines and help shy or resistant partners get started and listen to their conversations. When you call time, have a few students report something that their partner told them.

5. Record the students' responses to the question in a cluster diagram or list on a sheet of chart paper and post it at the front of the room.

6. Before the next question, tell students the line needs to move along. Have one of the lines move

one position to the left so that everyone is facing a new person; the person at the end of that line walks around to the beginning of the line. Everyone now has a new partner.

7. Repeat steps 4, 5 and 6 until you've asked all these questions:
   - Tell your partner about an experience you have had with swimming or wading. When and where did you have the experience? Was the water fresh or salty?
   - Did you feel the water moving past you when you were swimming or wading? Describe what it felt like.
   - What do you think causes the water to move like this?
   - Describe all of the ways you can think of to make water move in a swimming pool, or a bathtub or even in a glass of water.

8. Have students return to their table with their new partner based on their last position in line.

Content Introduction about Currents

1. Debrief the students' responses to the Thought Swap questions.

2. Place a dish of water on the overhead projector and use a straw to blow over the surface of the water. Ask the students to describe what they see. [The water appears to move as ripples on the surface of the water]. Tell the students that this movement of water is called a **current.**

3. Write the word **current** on the board.

4. Hold up a globe or display a world map showing currents in the ocean. Point out the currents and how they occur all over the world in all oceans.

5. Depending on your students' experience, you may need to spend more or less time discussing currents. Be sure to include some of the following information in your discussion:

- currents are the equivalent of flowing blood in our arteries – they are the means by which food, energy and wastes are transported throughout any liquid, whether in our bodies, a lake or the ocean.

• currents can be caused by wind blowing over the surface of the water (like we just demonstrated), or by gravity as water flows down hill (like in rivers and streams) or even by a pump like the heart. Another very important cause of currents in the ocean is because the ocean is not the same everywhere. The temperature and amount of salt in the water is different in different parts of the ocean. **Use the globe to point to cold and warm places on the earth and where the water would be saltier and fresher.**

• currents are set in motion when water of different temperatures or with different amount of salt comes in contact with each other.

• The amount of salt in the water is called the **salinity** – that's why this activity is called Salinity Currents.

Inviting Observations

1. Place one bottle filled with fresh water and one with salt water in the center of each small group of four students. Tell the students that one of the bottles is fresh water and the other is salt water –but don't tell the students which is which. Ask the students to describe to a partner what they observe or notice about the liquid in the bottles. Ask them if they are able to determine which is which just by looking at the water in the bottles. **Remind them that there is no tasting allowed.**

2. Give the students a few moments to discuss their observations. Then ask for volunteers to share their observations and ideas about which is which with the class.

Sidebar: *This activity provides a good opportunity to focus on questions to facilitate observations and discussions. Some questions at this point in the learning cycle (invitation) might include: What did you observe? Did you notice ....? What do you mean by....? Can you compare this with something else? How is this the same or different from ... ? Can you say/explain that in a different way? Can someone else explain that using different words?*

Salty or Fresh? How Can you Tell?

1. After debriefing students' observations about the liquid in the bottles, ask them what investigations or experiments could we do to find out which is which.

2. Encourage students' suggestions and discuss the merits of their ideas. (See sidebar)

Sidebar:
Students will typically mention that they could tell the difference between the salty and fresh water by tasting them. Remind them that they should never taste anything in the science classroom – it might hurt them in some way. They might also mention that they could see the salt in the salty water. Tell them that most kinds of salt would look cloudy when it dissolves, or if we used too much salt, you would be able to see crystals on the bottom. However, you used a special kind of salt that dissolves without cloudiness and were careful to use just the right amount so that all of the salt dissolved.

Students may also suggest the following three ways to tell the difference between the salty and fresh water: weigh them, evaporate them or float something on them and compare the results. Tell them that these are ***great ideas*** *and would certainly work to tell the difference between the two. However, you have another idea in mind that doesn't require a scale or as much time as would be required to evaporate the water.*

Free Exploration of Salty and Fresh Water–
Think Pair Share

Tell the students that this next activity may give them further clues about how to tell the difference between the salty and fresh water without weighing, measuring, tasting or evaporating them.

1. Distribute the trays of materials to each pair of students and hold up and name each of the items one at a time. Ask the students if they have any ideas of how these materials could be used to make currents. Lead a brief class discussion about some of their ideas.

2. Have students join with their partner. Tell them that they will need to work together as a team to make a plan to figure out the difference between the salty and fresh water, without tasting it and using only the materials on the tray. Emphasize that they are **not** to do an experiment yet, just make the plan.

3. They will work together using a technique called **Think Pair Share** as follows:

a. Each person will first be asked to **think** about their plan and write down some of their ideas in words and illustrations.
b. Then after a few minutes, you will ask them to "mind meld" with their partner and **share** their plans with each other. Together they will fine-tune their ideas, add to their drawings and get ready to share their plan with the rest of their small group.
c. Finally, partners will share their plan with their table group and come up with a group plan.

4. Ask if everyone understands the process and then re-state their challenge as follows: How might they use the materials on the tray to tell the difference between salty and fresh water?

5. Remind the students to use drawings and words to describe their plan. Start them off on the Think part of the Think Pair Share as described above in 3a. Continue with 3b-c above until every table group has completed their plan.

6. Have groups share their plans with the rest of the class. As you lead a debriefing session, ask the class to think of at least one pro and one con for each of the group plans.

7. Give the small groups of students 5-10 minutes to actually try their experiment.

8. Have each group briefly share the results with the rest of the class. Were they able to tell which was which?

9. Tell the students that in the next session, they will have the opportunity to do more experiments with currents.

Through the Activity

Session 2: Making Currents

Structured Exploration of Salty and Fresh Water

1. Display the poster **How "Salty Dogs" Make Currents** and the second poster **How "Fresh Cats" Make Currents**. Divide the class in half down the center of the room and tell them that one half of the class will be the "Salty Dogs" and the other half the "Fresh Cats". The Salty Dogs will follow the procedure as described on their poster, and the Fresh Cats will follow the procedure as described on theirs.

2. Describe each of the steps as described on the posters as you pantomime with the materials. Be sure to point out where the two procedures differ – the only difference is in which bottle is placed on top of the other. **The Salty Dogs place the salty bottle on the top, while the Fresh Cats place the fresh water bottle on the top.** After describing the procedure, ask if the students have any questions.

3. Now project the transparency of the **Predictions** data sheet on the overhead projector or draw it on the white board. Ask students if they know what a prediction is. [It is not actually a guess, but rather is based on some knowledge and experience – like weather predictions. It is what the students **think** will happen based on their previous knowledge and experience.]

4. Model how to make predictions by coloring in the data sheet to represent what the experiment looks like at the start. Ask the class to make some predictions while you fill in the transparency prediction sheet based on what they suggest. Elicit a few different predictions and complete the data sheet to show how different predictions would be represented. Emphasize that everyone will make their **own** predictions about what they think will happen in **both** groups (the "Salty Dogs" and the "Fresh Cats.") Distribute a Prediction sheet to each student.

5. After everyone has completed their own Prediction sheet, collect them and show the

students the overhead transparency of the Results data sheet. Tell them that they are to complete it in the same way that they did the Predictions sheet, except in this case they will be showing what actually happened ***after*** they did the experiment.

6. Tell the students that they will also be required to show what the results were for the other group – but not to worry about watching them during the experiment as everyone will have an opportunity to see the results of the other group later during the debrief.

7. Ask if there are any questions, then remind the students to follow the directions for their group very carefully as shown on the posters. Tell them when they are clear about what they are to do, to go ahead and get started. **Also tell them that when they have the experiment all set up, they need to be very careful to hold it steady and to not bump the table. They will want to be sure that the rest of the class can see their results.**

8. Walk around the room helping to answer questions and anticipate problems. Remind partners to help each other. If a pair of students does make a mistake with the procedure, tell them to go ahead and do it again.

Sidebar: Questions to help facilitate discoveries include: What did you find out about…? How is this the same or different from…? Can you say/explain that in a different way? Can someone else explain that using different words? What do you think will happen if… What questions do you have? What could we do to find out?

9. Remind students to compare their results with other student pairs around the room.

Results

1. When every pair has completed their experiment, get the attention of the class and have the two groups look at their respective results. Ask the class what they notice. [**The Salty Dogs group should have had both bottles mix so that the two bottles look identical. The Fresh Cats should**

have bottles that did not mix so that the top bottle is still perfectly clear.]

2. Make sure that everyone has had a chance to see all the bottles and then select one Salty Dog pair and one Fresh Cat pair to save their setup for a few more minutes. Have all the other students carefully separate their bottles and set them away from their workspace. Have the students dry off their work area and sit down ready to discuss the results. Carefully move the two remaining set-ups to the front of the room.

3. Distribute the Results data sheet to each student and have them draw in the results from both groups (remind them that one set-up from each group is still available for them to see.) After they have filled in the results, ask if anyone would like to try and describe what they think is going on here. Why would the results in the two groups be so different?

Sidebar: Some questions to use during this concept introduction and application phase of the learning cycle include: Can you compare this to something else? What do you now know about the characteristics of…? Can you say/explain that in a different way? Can someone else explain that using different words? What other factors might be involved?, Can you find a way to…? How can we use what we found out to solve a problem? Have you ever seen this in nature? Accept all responses.

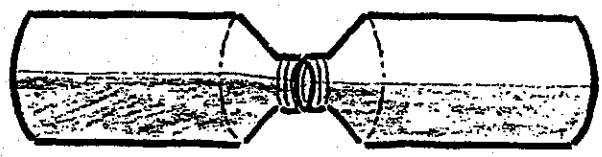
Demonstration

1. Tell the students that you will do a demonstration that may help them to understand what is going on.

2. Hold up the remaining Fresh Cat bottles (the ones with the fresh, clear water on the top). Carefully turn the bottles to the side so that they are horizontal, holding the mouths of the bottles tightly together. Have a student hold a sheet of white paper between you and the bottles so the movement of colored water is more evident.

3. Have the students get up close and look at the bottles at eye level. Ask them what they notice. [They should see the colored (salty) water flow into the fresh water bottle, traveling along the

bottom portion of the neck. The colored water will continue to hug the bottom of the second (originally clear) bottle. At the same time, the clear (fresh) water can be seen to flow in the opposite direction through the top part of the neck and into the salt water bottle. The clear water continues to hug the top half of both bottles. See illustration.]



Demonstration Debrief

1. Have students talk to their partner about what the demonstration can tell them about fresh and salt water. [The salt water is "heavier" or more **dense** than the "lighter" fresh water. This means that fresh water will float on top of saltier water.]

Fresh Cats Debrief

1. Now ask the students to talk with their partner and try to come up with an explanation for what happened in the Fresh Cats experimental set-up. [The Fresh Cats set-up had the fresh water on top of the salt water so no movement of water between the bottles should have been taking place. The less dense fresh water was floating on top of the more dense salt water.]

2. Lead a class discussion and give the students time to add to the ideas they recorded on their Fresh Cats Results worksheet.

Salty Dogs Debrief

1. Now have the students discuss with their partner how they would explain the Salty Dogs results. [Salty Dogs had salt water on the top so that both bottles mixed almost immediately as the salt water sunk.]

3. Again lead a class discussion and give the students time to add to the ideas they recorded on their Salty Dogs Results worksheet.

Content Introduction Connecting Salty and Fresh with Currents

1. Explain to the class that in the demonstration, the bottles turned sideways represent water in an **estuary** (a kind of wetland). An estuary is a place where lots of fresh water from rivers enters an area with lots of salt water from the ocean. This is

a great place for organisms to live and eat because there is abundant food and many different kinds of habitats. Sometimes people fishing in an estuary have actually caught a salt water fish on a long line that reached near the bottom, while when they changed to fishing nearer to the surface they caught a fresh water fish. The same thing could happen during a rainstorm.

2. Currents Around the World
Look at a globe or a world map of currents and have the students discuss where they think estuary wetlands would be located. [The Nile Delta and San Francisco Bay are two huge estuary areas.] Where in the world might density be a big factor in creating currents? [Look for places with large rivers emptying into the ocean or seas such as the Amazon, and the Nile.]

(Beyond the Activity)

Session 3: Application and Assessment about Currents and Salty and Fresh Water

1. Ask the students how they would now answer the original question of how to tell the difference between the fresh and salt water bottles. Have students individually write down their answers in words and illustrations.

2. Then have the students rejoin with their table group of four to compare their new ideas with their original group plan. As a foursome, have them complete this sentence: *At first I thought*____ _____, *but now I know*_____.

3. Hold up the Key Concepts and have one of the students read them aloud. Post the concepts near the Salty Dog and Fresh Cat posters.

Salinity is a measure of the amount of salt dissolved in a liquid.

Fresh water will float on top of saltier water.

Fresh water is less dense than salt water.

Salinity currents can form when fresh water from the land and salt water from the ocean meet in an estuary.

Mini-Book on Currents

1. Have individual students create a mini-book which includes words and pictures of what they learned about currents. Have students fold a large sheet of paper (about 11" x 16" or so) lengthwise and then into thirds. Cut along two of the folds to form a book with three pages that open vertically. (See pattern attached.)

2. With the book folded shut and only the cover showing, have students write a name for their book on the cover. Open the cover and on the first page write the author's name. Turn the title page and label the first section with the word "Our Investigation to Determine the Difference between Fresh and Salt Water," the second section "Key Concepts," and the third section "About Fresh Water, Salt Water and Currents – in my own words." Now they can flip up each section and draw a picture in one section and write about what they learned about the word or topic in the other.

Going Further

Lets Try It Again

Have the students try their alternate ideas of how to tell the difference between the fresh and salt water bottles. Lay out the materials they might need to float objects, evaporate, taste, or weigh the salt and fresh water.

Mix up different salinities of water with different colors of food coloring. Challenge the students to put them in order of salinity using any methods they have learned or discussed. (Be sure to decide whether or not you want them to taste the samples and then use and enforce appropriate sanitary conditions.)

Have the students do the experiment again, but this time use warm and cold water. Be sure to emphasize that they must first make predictions before actually doing the experiment.

Have students monitor how long the layers last in both the salinity and the temperature experiments. Why are they so different?

Field Trips

Start a study of watersheds and investigate how the water from rainfall in your area might find its way to the ocean. Actually follow a watershed, river or stream and look for evidence of currents and changes in salinity. You might want to take some tools such as thermometers and hydrometers (for measuring salinity) to look for differences in the physical factors in water from different areas of the watershed.

Participate in programs such as *Kids in Creeks* that help monitor and restore creeks. Check the internet to find other organizations working in your area that get students out in the field.

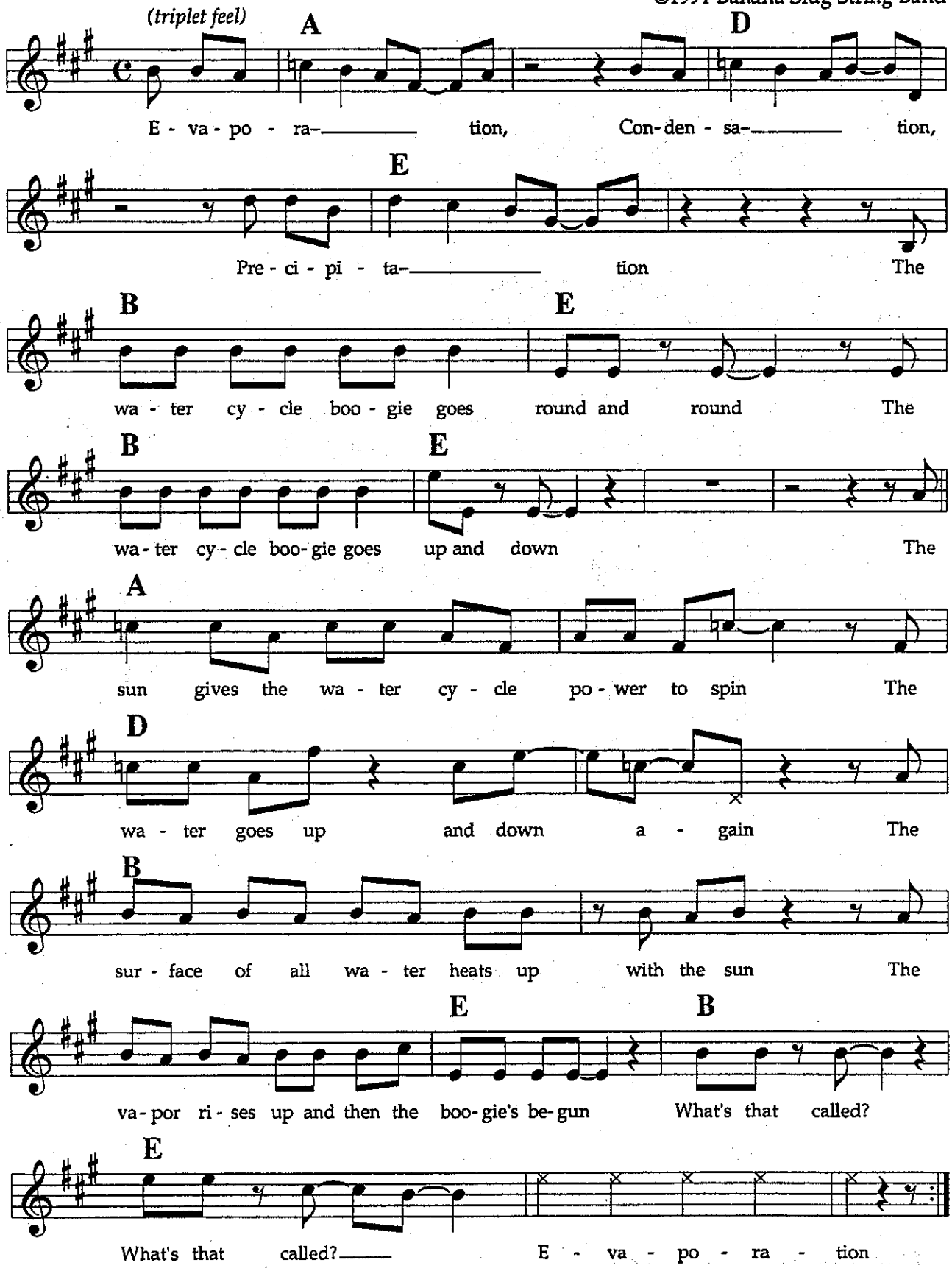
Gone Fishing

Do some internet research, look in field guides or if possible ask fisherpeople about the kinds of fish most often caught in estuaries. What do they have in common? How are they different? See if you can find out where in the estuary each species is usually caught. Can you find a correlation with the salinity of the water and the kind of fish found there?

Stream Table
Make a simple stream table in a clear plastic tub. Use plasticine modeling clay or sand to form a hill on one side of the tub and flatten an area on the other side to represent an estuary or wetland. Pour salty water into the estuary and then slowly add colored fresh water flowing down from the mountains. Watch the density layers form and how swirling currents occur where the two different salinity waters meet.

Music
Play the Water Cycle Boogie by the Banana Slug String Band from their *Slugs at Sea* recording and have students sing the song. Words and music attached.

Water Cycle Boogie



WATER CYCLE BOOGIE

CHORUS:
Evaporation, Condensation, Precipitation

Water cycle boogie goes round and round

Water cycle boogie goes up and down

The sun gives the water cycle power to spin

The water goes up and down again

The surface of all water heats up with the sun

The vapor rises up and then the boogie's begun

What's that called? What's that called?
(EVAPORATION)

CHORUS: Evaporation, Condensation, Precipitation
Water cycle boogie goes round and round
Water cycle boogie goes up and down

Water holds together chemically
Hydrogen bonding is what you see
All those airborne vapors they squeeze together
To form a cloud that could change the weather

What's that called? What's that called?
(CONDENSATION)

CHORUS: Condensation, Precipitation, Evaporation
Water cycle boogie goes round and round
Water cycle boogie goes up and down

All those dark clouds can't hold together
Water boogies down bringing stormy weather
Fog, rain, hail, flurries, ice, and sleet
Splish, splash, and crunch underneath your feet

What's that called? What's that called?
(PRECIPITATION)

CHORUS: Precipitation, Evaporation, Condensation
Water cycle boogie goes round and round
Water cycle boogie goes up and down

2/3rds of earth is water, it's true
Gives life to every plant and animal too
Respect water's power, only use your share
Don't waste a drop, there's none to spare
Let's do the water cycle boogie again
Let's go for another spin! (REPEAT 1ST CHORUS)

Salinity Currents Home Activities

EXPERIMENTS AT HOME

Challenge your family to think of all the ways to make currents in a glass of water, the bathtub, or a swimming pool. Tell them you have another way to make currents. Have them help you collect the materials you will need to repeat the experiment you did in class. Be sure to have them make predictions first about what they think will happen. Then ask them some of the following questions:

What did you observe?
What do you think happened?
What happened when the salt water bottle was put on top of the fresh water bottle?
What did you discover about fresh and salt water?
Do you have an explanation for what you observed?
What might another explanation be?
What questions do you have?
What could we do to find out?
Where would you see this in nature?

FIELD TRIP

Take a boat out on a bay. Look for places where the water is churned up. This may be a current caused by the mixing of salty and fresh water. Often it will be a place where birds are feeding. These areas are often rich in nutrients and animal life.

WATER ON THE WEB

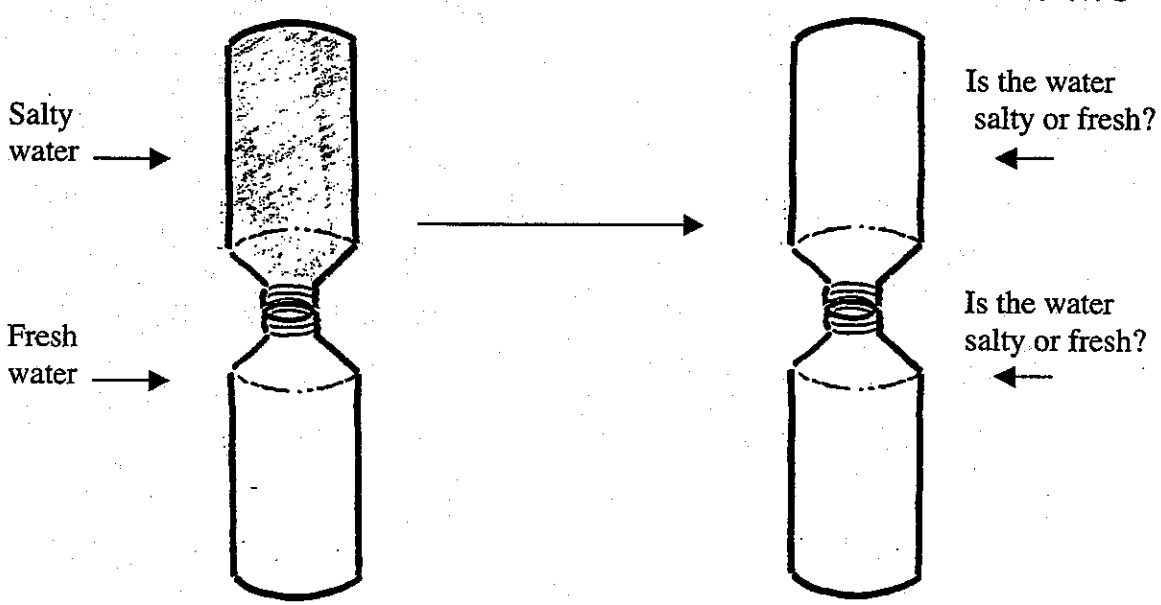
Visit the web site http://ga.water.usgs.gov/edu/index.html. Go to the Activity Center and click on "Questions" to learn more about water.

Color in the bottles to show how they will look at the start of the experiment and then how you predict they will look after 5 minutes.

"Salty Dogs" Predictions

At the **start** of the experiment the bottles look like this:

5 minutes later the bottles look like this:

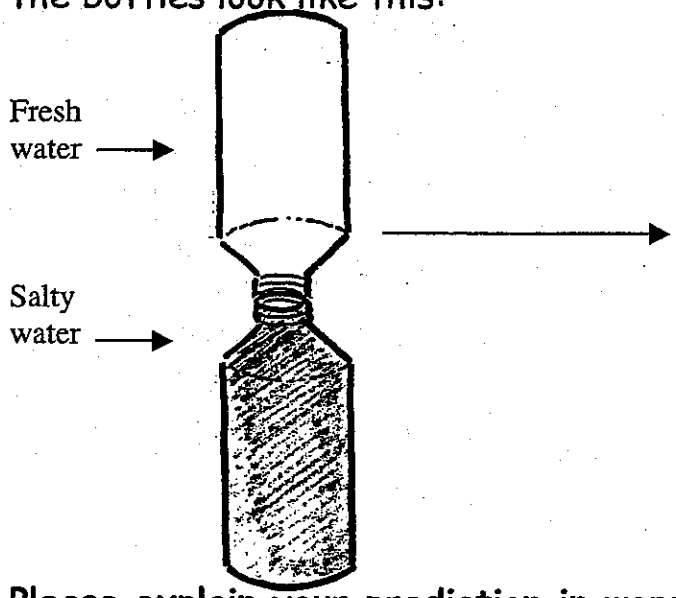


Please explain your prediction in words:

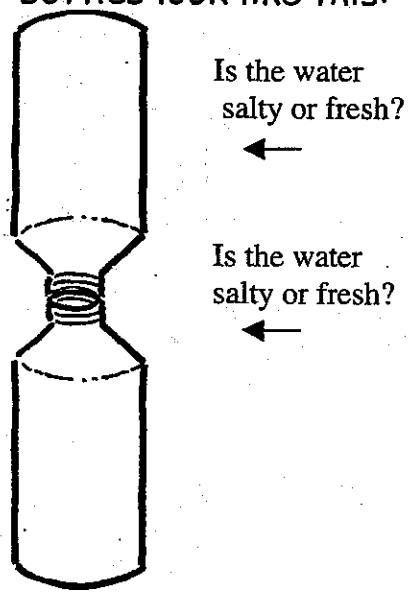
Color in the bottles to show how they will look at the start of the experiment and then how you predict they will look after 5 minutes.

"Fresh Cats" Predictions

At the **start** of the experiment the bottles look like this:



5 minutes later the bottles look like this:



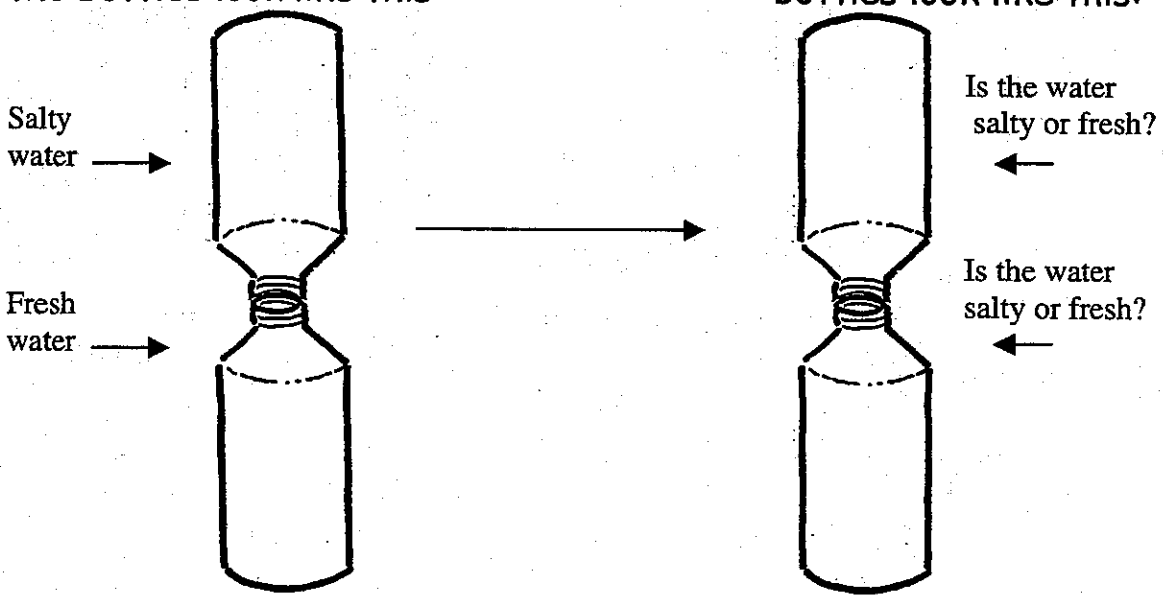
Please explain your prediction in words:

Color in the bottles to show how they will look at the start of the experiment and then how they actually looked after 5 minutes.

"Salty Dogs" Results

At the **start** of the experiment the bottles look like this:

5 minutes later the bottles look like this:



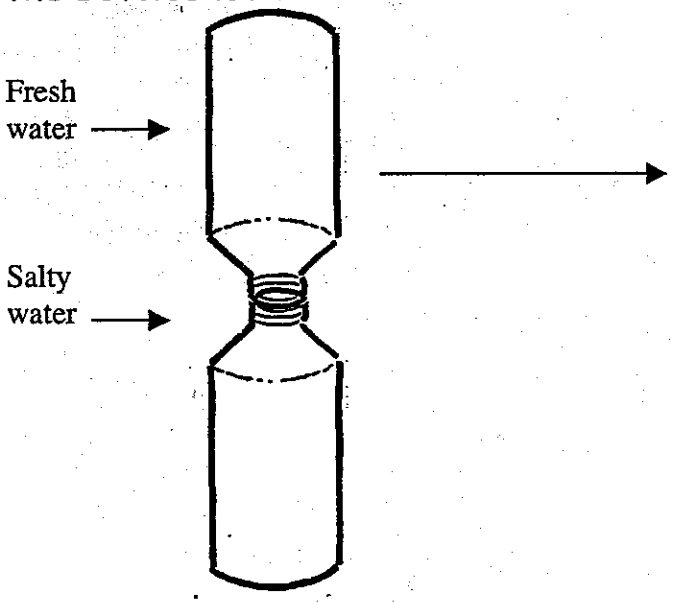
How are the results the same or different from your predictions?

What did you discover about salty and fresh water?

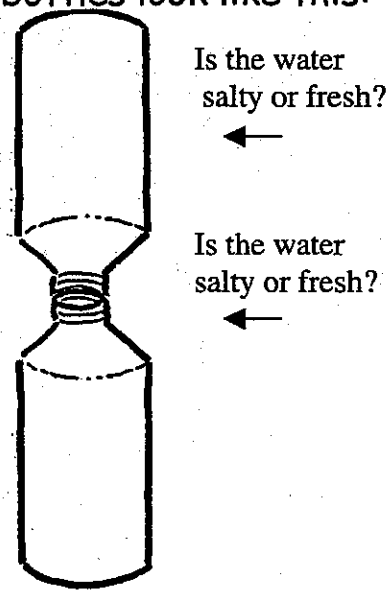
Color in the bottles to show how they will look at the start of the experiment and then how they actually looked after 5 minutes.

"Fresh Cats" Results

At the **start** of the experiment the bottles look like this:



5 minutes later the bottles look like this:



How are the results the same or different from your predictions?

What did you discover about salty and fresh water?

Mini-book (8½" x 11") template

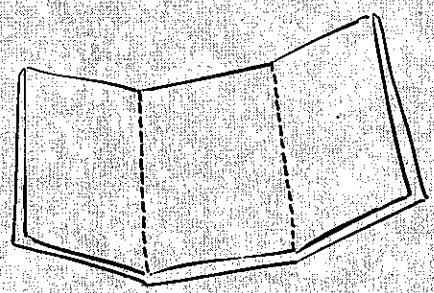
Mini-book *(8 ½" x 11")*

Note: A simple template for folding and cutting this mini-book is on the next page. On the template, dotted lines show where to cut the paper and other lines show where to fold.

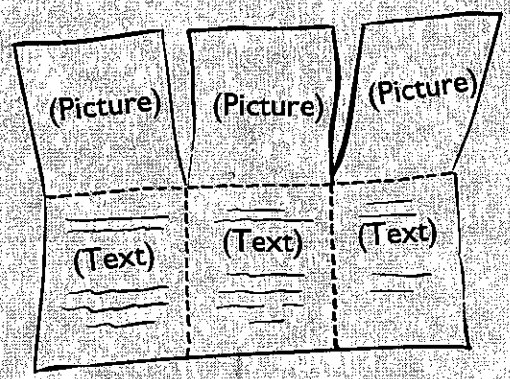
Fold an 8 ½" x 11" piece of plain paper in half lengthwise and then into thirds. Open it up so it is only folded in half lengthwise—with the fold on top. On the top half only, use scissors to cut along the two small folds, to form three flaps that open vertically. Then fold the right third to the center, and the left third on top of that. With the book folded shut and only the "cover" showing, have students write the title of their mini-book on the cover and illustrate it. Then have them open the cover (from right to left) and write their name as the author. Then turn the title page (from left to right) and label each of the three chapters or sections. As they flip up each of the three chapters they can use one panel inside to draw a picture and the other to write about what they've learned.

1. Fold in half lengthwise.

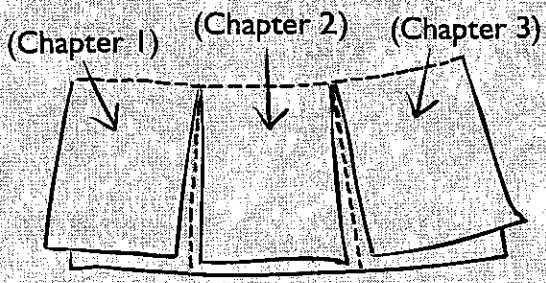
2. Then fold into thirds.



3. Cut only the top half into three sections.



4. It will now look like this.



5. Fold the right third to the center and the left third on top of that.