

The Gulf Loop Current

Key Concept

The Gulf of Mexico is a dynamic, almost landlocked body of water dominated by prevailing south east winds and influenced by the Gulf Loop Current and Mississippi River flow.

Summary

Grades: 2 to 5

Disciplines:

- Earth Science

TEKS Science Strands:

- Patterns of Change
 - Stability
 - Systems & Interactions
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This lesson was developed by Susie Parkinson and Pam Stryker.

Background information by Dr. Rick Tinnin & John Williams, The University of Texas Marine Science Institute, Marine Education Services.

Synopsis

Students will conduct experiments and explore wind driven currents, determining patterns of current flow in a body of water.

Teacher Background Information

The Gulf of Mexico is a large body of water almost completely surrounded by land. It is bordered on the east by the Florida peninsula, to the north by Alabama, Mississippi and Louisiana and to the west by Texas. Mexico and the Yucatan peninsula make up the southern border. A plow shaped island, Cuba, juts into the opening between the Florida Keys and Yucatan and separates the Gulf from the Caribbean Sea (Figure 1).

Prevailing winds blowing from the southeast move Caribbean water through the pass between Yucatan and western Cuba, forming the Gulf Loop Current. This current moves north towards the Mississippi and Alabama coast lines then curves south along the west coast of Florida and exits the Gulf between the Florida Keys and the north shore of Cuba (Figure 2). It moves north along the east coast of Florida and joins the Antilles current, forming the Gulf Stream. The Gulf Stream is one of the five major ocean currents found around the world. The Gulf Stream travels north up the east coast of the United States then curves east towards Europe. It carries warm, tropical water north and is one of the reasons that commercial fisheries off the Grand Banks in New England are so productive.

Prevailing south east winds break off warm core eddy's from the Gulf Loop Current and carry this warm tropical water further west along the Texas and Louisiana coast lines. The water carries with it planktonic larvae of tropical species along with sea beans and, unfortunately, all of the floating trash and debris that wash ashore along the Texas Gulf coast.

Gulf of Mexico

- Bordered and nearly landlocked by North America and Mexico
- Connects to Atlantic Ocean via Florida Straits north of Cuba
- Connects with Caribbean Sea via Yucatan Channel between Mexico and Cuba
- Area of 615,000sq. miles
- Sigsbee Deep at 3804 meters deepest point
- Site of 65 million year old Chicxulub crater



Figure 1

Gulf Loop Current (Blue)
Southeast Winds (Orange)
Mississippi River Flow (Brown)

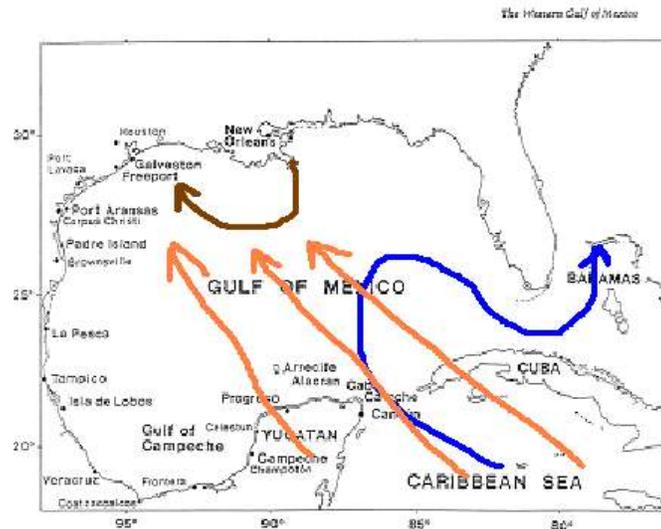


Figure 2

Riding the Gulf Loop Current

- or -

How did that get on our beach?

Goal

The students will discover that much of the litter on the Texas beaches is carried in by wind driven currents.

Synopsis

Students will participate in a relay where they blow a Styrofoam peanut or cotton ball across the classroom floor. They will explore the motion of Styrofoam pieces that are floating in a clear pie pan of water simulating the Gulf Loop. Students will compare their pie pan model with a map of the currents. Students will map the trip of several different types of beach debris as it travels to the Texas coast.

Engage

Wind Power Relay

Materials

- Masking tape to mark race starting and finish lines
- Styrofoam peanuts or cotton balls – 1 per person

Procedure

Ask the students to brainstorm all the ways that they could move a Styrofoam piece across the desk. Discuss how each of these is a type of force. If they do not mention it, ask how they could use air as a force. Tell the class that they will be having a relay race to move Styrofoam pieces. Place two strips of masking tape on the floor to mark the starting and ending lines or use the edges of a classroom rug. Divide the class into equal teams (3 or 4 per team). Have the teams line up behind the starting line.

One student from each team will begin by blowing the Styrofoam piece across the space, then return to his team to tag the next person. This continues until all members have had a turn and are seated on the floor. The team seated first is the winner.

An alternative is to have each team time their relay and compare times.

Have the students discuss what they discovered from the experience.

Materials

Per group:

- One glass pie pan or round clear plastic plant saucer pan
- 9 oz. plastic cup
- 1/2 teaspoon of Styrofoam beads or Styrofoam packing broken into small pieces
- one copy of blackline C1
- Paper towels

Per student:

- one straw
- one copy of blackline C2
- pencil

Per class:

- Transparency C1
- Transparency C3: Gulf of Mexico map with currents

Procedure

Have students place the pan over the blackline C1, then add water until about 2 cm deep. Place the Styrofoam pieces in the pan of water over the arrow. The straw is held at an angle above the arrow. Students take turns blowing across the surface of the water in the direction of the arrow and observe the movement of the pieces. Note: The students should keep the straw still, and aimed at the arrow, not follow the moving pieces. The current should move the pieces. (The Styrofoam pieces should move in a loop from the arrow around the pan.)

Students should record their results by drawing arrows on blackline C2 to show the direction of the movement of the pieces, then describe their observations on the lines.

Have students compare and discuss what they discovered.

Explain

Maps and Pans

Materials

Per class:

- Transparency C1
 - Transparency C3
 - Overhead pen
-

Procedure

Place the transparency C1 on the overhead projector. Ask the students to describe what they observed in their pans. Draw arrows on the transparency to show this motion. Show the students the transparency of the Gulf Currents (C3). Ask them to compare C1 and C3. Explain that the Gulf map shows how water currents travel through the Gulf of Mexico. Tell the students that wind forces drive these currents. Explain that they have built a model that demonstrates wind driven currents and how manmade or natural materials can be carried on those currents. Have students explain how their models compare to the Gulf Currents map (C3). Have students discuss the strengths and limitations of their models.

Evaluate

From There to Here

Materials

Per class:

Real objects labeled:

- Coconut (Origin: Caribbean Islands)
- Sea Hearts (Origin: South America)
- Rubber glove and green bleach bottle (Origin: Mexican shrimp boat)
- Hard hat (Origin: Offshore oil rig)

Or copies of C4 showing pictures of these items

Procedure

Explain to the class that each of these objects was found on the Texas beach. Have them read the labels to determine the origin of each. Locate the origins on a class map or globe. In their journals, have the students describe and illustrate the route these objects traveled to the Texas beach.

Elaborate

Read *Ten Little Ducks*, by Eric Carle and discuss how this book relates to the class investigation. (This book, although a children's picture book, was inspired by a lost container of rubber duckies that is traveling on our ocean currents.)

Have students make an Internet search for information about either the rubber duckies or the Nikes lost at sea from container ships. What can these ducks and Nikes teach scientist?

Make wind direction indicators by attaching crepe paper streamers to rulers or craft sticks. Holding the streams above their heads, students walk around the outside of the school to discover the location of different air currents. Discuss how air currents are similar to water currents.

Participate in local Clean-up Campaign...Note: beach litter is also carried from all over Texas by run-off and rivers to the Gulf.

Song

Beach Treasures

by Pam Stryker

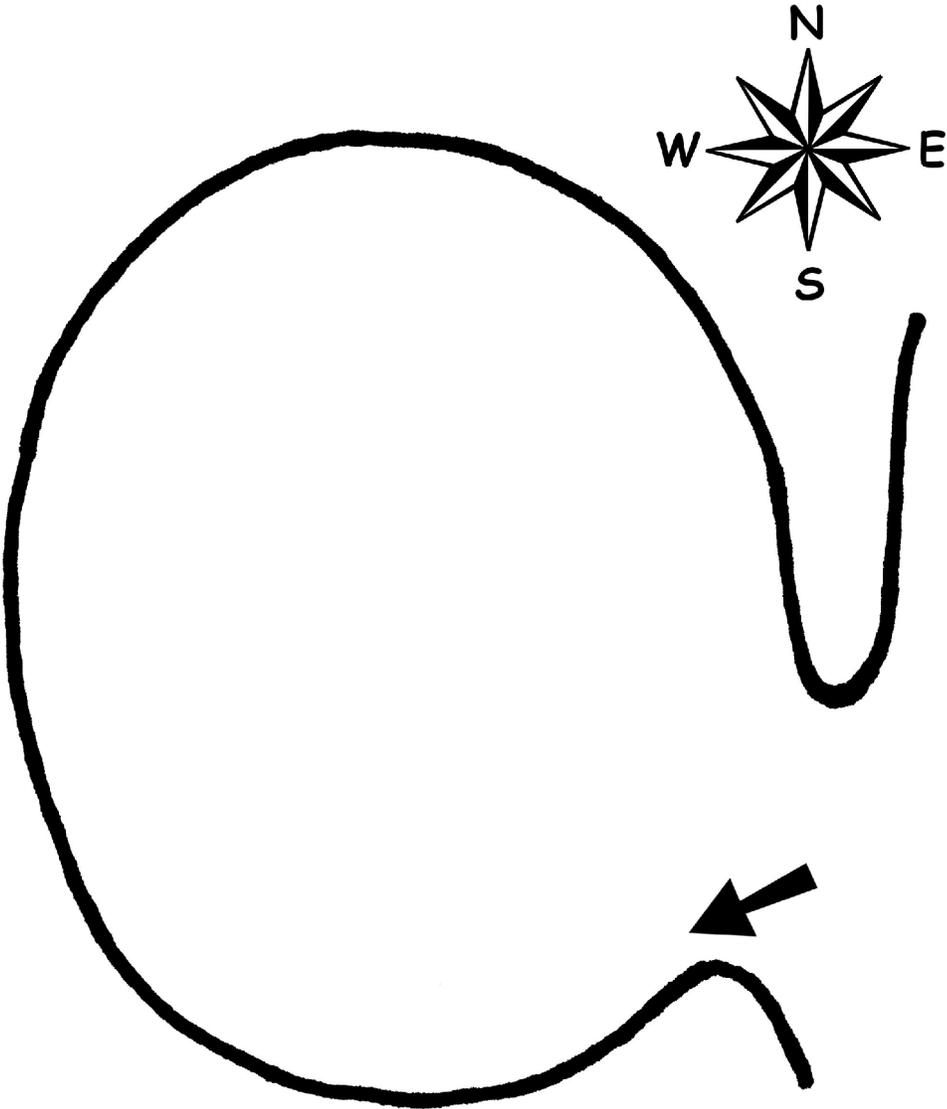
Tune: *Anchors Away*

See them floating on the waves,
Driven by the wind,
Currents flowing around the Gulf loop,
Bring these objects to our beaches.

Sea beans or coconuts,
Plastics or balloons,
Made by man or nature's hand
They'll be arriving on our beaches soon!

Here We Go Round the Gulf

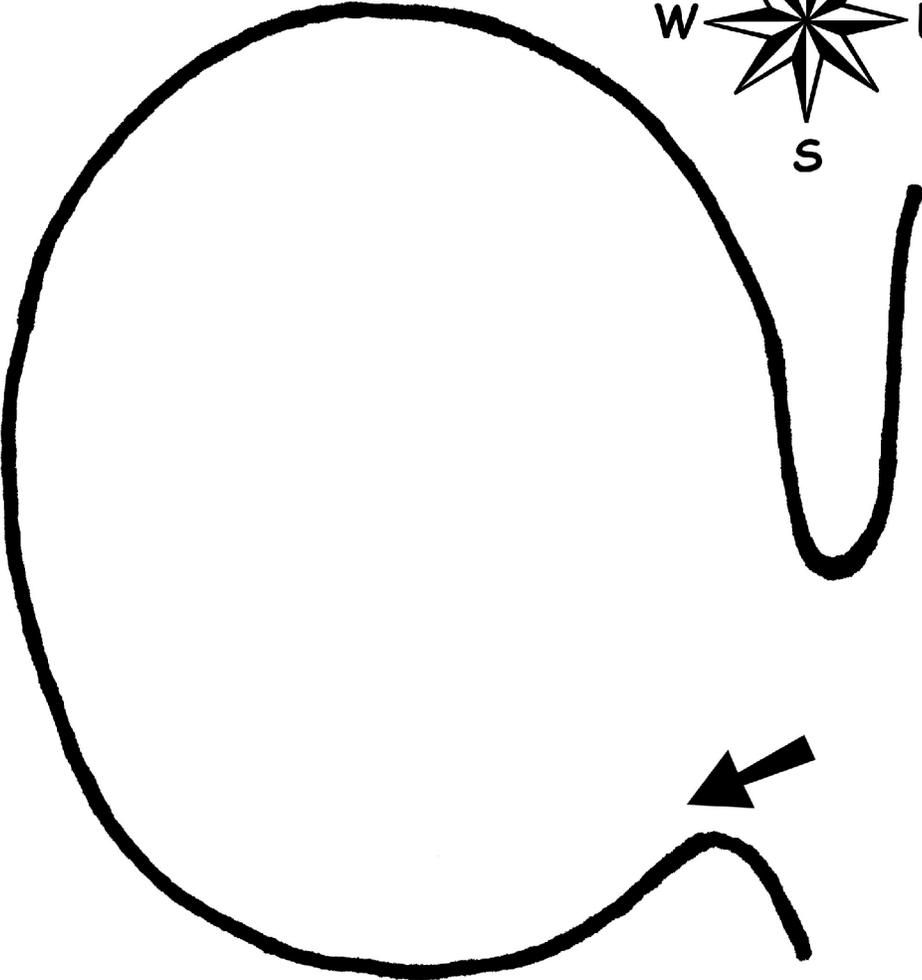
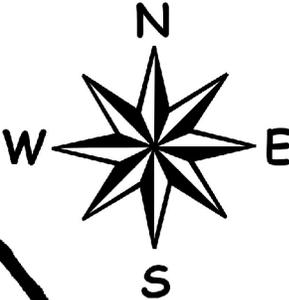
C1



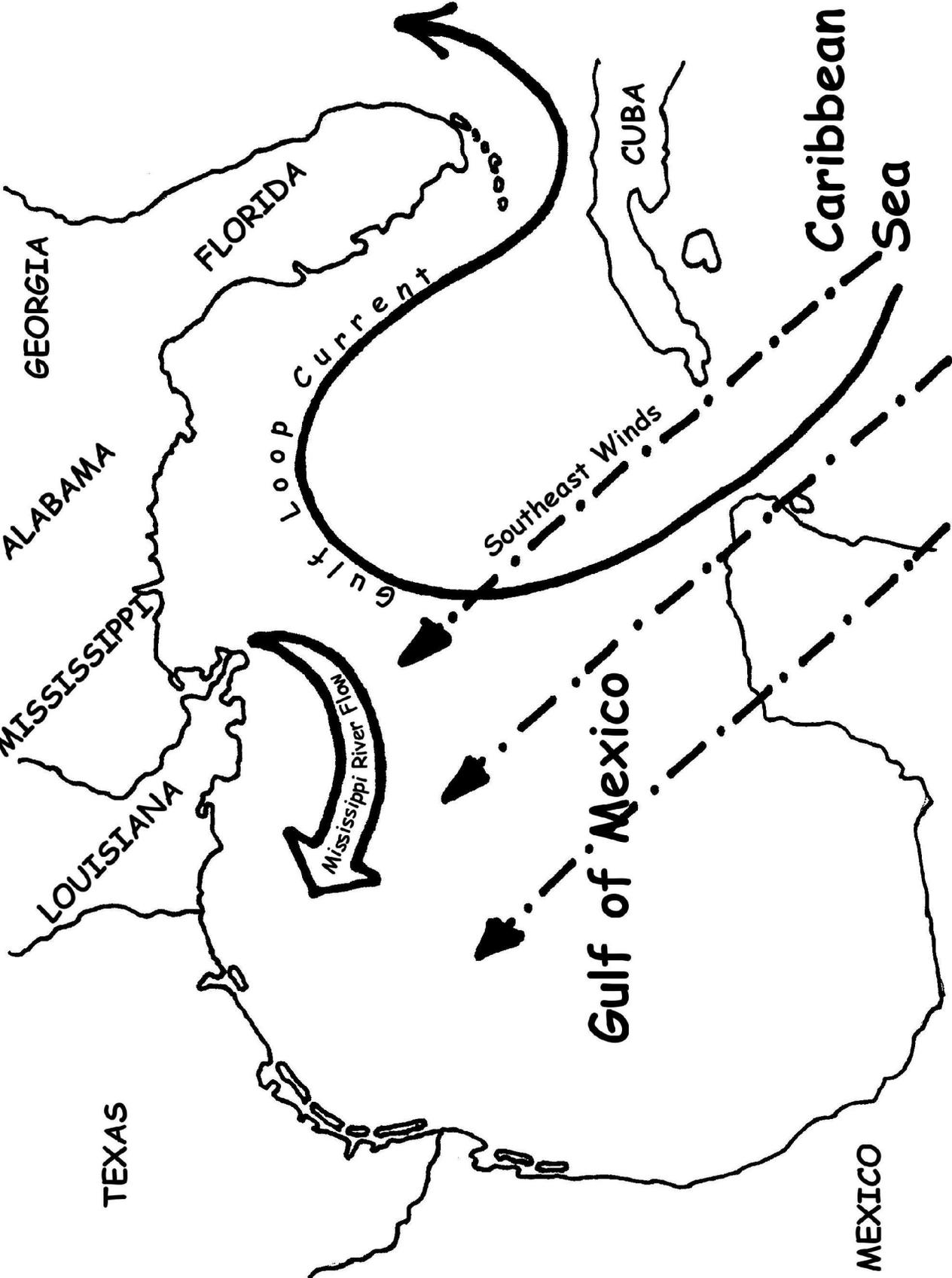
Record Your Results

C2

Name: _____

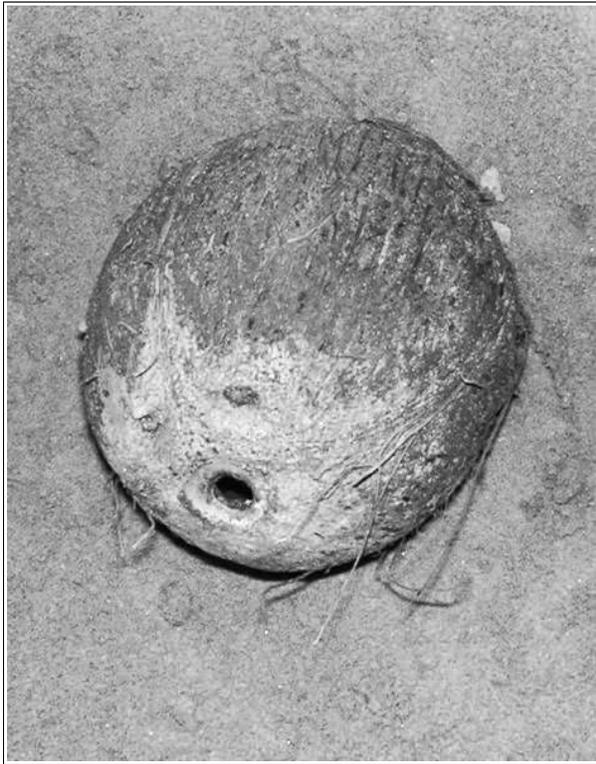


Gulf of Mexico map with currents C3

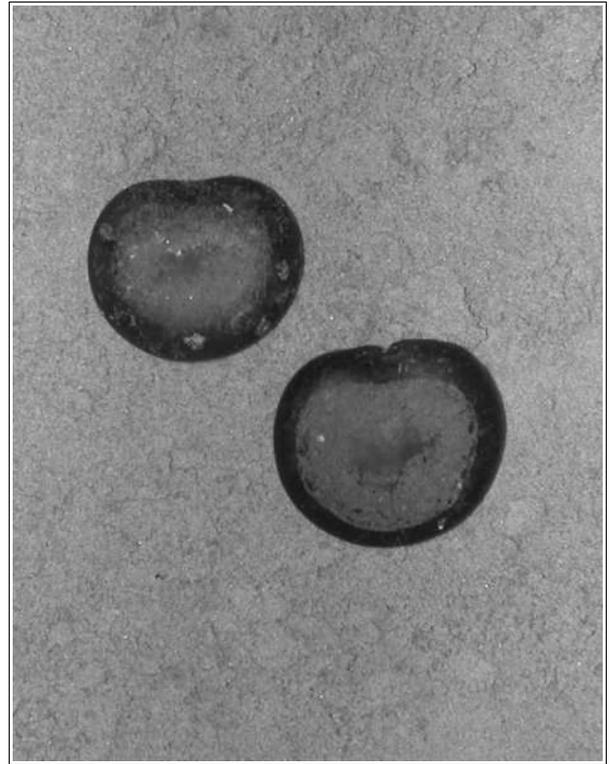


Objects Found on the Beach

C4



Coconut
Origin: Caribbean Islands



Sea Hearts
Origin: South America



Rubber glove & green bleach bottle
Origin: Mexican shrimp boat



Hard hat
Origin: Offshore oil rig