

Date: _____

Your Name: _____

Name(s) of Partner(s): _____



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

Released Science Inquiry Task

Ocean Currents

2012

Grade 8

Science

Directions:

In this task, you will be analyzing data from an investigation described in a short story called “Ocean Currents.” You will use the data to make conclusions about the relationship among surface ocean currents, air temperatures, and ocean temperatures and use what you learn to answer a set of questions. Thoroughly explain all of your answers.

This Word Bank defines terms you will need to understand throughout this investigation. You may refer back to this page throughout this session.

Word Bank

Latitude	an imaginary line that circles Earth and is parallel to the equator
Mean (average)	a typical number for a data set; a value that is found by dividing the sum of a set of terms by the number of terms Example: The average of 4, 5, and 9 is $\frac{(4 + 5 + 9)}{3} = 6$.
Ocean current	the steady flow of surface ocean water mostly in one direction
Solar radiation	energy that is given off by the Sun in the form of rays or waves and is measured using Solar Radiation Units (kWh/m ² /day)
Weather buoy	a floating device that measures air temperature, ocean temperature, and wind speed and direction, and reports these data via satellite for use in forecasting weather and studying the climate
Wet suit	a close-fitting suit that divers and swimmers wear to retain body heat in cold water

Ocean Currents

A student lives near the coastal town of Woods Hole, Massachusetts. Every August, she swims in a bay of the Atlantic Ocean near Woods Hole. In August, the temperature of the water in the bay averages 72°F.

Last August, the student visited Crescent City, a coastal city in northern California. The first day she went swimming in the Pacific Ocean, she was surprised how cold the ocean water was. She noticed that other people were putting on wet suits before going in the water.

When she returned home, the student looked up information about Crescent City. She learned that the average water temperature off the coast of Crescent City is 55°F in August. She also learned that Crescent City and Woods Hole are located at approximately the same latitude. She wondered why the water was so much warmer near Woods Hole than near Crescent City.

For a class research project assigned in September, the student decided to investigate the factors that affect the ocean temperatures near both cities. She decided to find data about each city's ocean temperatures, surface ocean currents, and air temperatures. She then decided to investigate the following research question:

During August, why are ocean temperatures near the East Coast of the United States warmer than those near the West Coast in locations at approximately the same latitude?

The student started to investigate where the heat of the East Coast's air and water came from. She found the newspaper article below.

Fish Follow Warm Water

By Tom Mooney
Daily News correspondent
August 25, 2006

Mike Laptew has snorkeled for 45 years and makes underwater photography his profession, but the school of fish that filled his viewfinder Wednesday afternoon in the warm waters off Newport, Rhode Island, mystified him. About 60 to 80 of the six-inch fish darted around, feeding above a bed of eelgrass in eight feet of water.

Curious, Mr. Laptew, of North Kingstown, Rhode Island, snapped some pictures and sent them by e-mail yesterday to a biologist with the Rhode Island Department of Environmental Management. "Mystery fish," read his attachment.

The identification came back soon thereafter: the fish were mackerel scud, a subtropical fish more often found along southern coastal states.

If the scud are lost, at least they're not alone. An unusually large number of tropical fish, as well as southern game fish such as cobia, black and red drum, even tarpon, have been reported in Rhode Island waters this month—not to mention a several-hundred pound manatee, a gentle and endangered mammal that is more than 1,000 miles from its Florida home.

All seemed to have hitched a ride on the Gulf Stream.

The Gulf Stream is a warm and powerful current that originates in the Gulf of Mexico and swings around Florida before flowing north along the eastern United States and Newfoundland. Its strongest current is usually found over the continental shelf that sits about 90 miles off Rhode Island's coast.

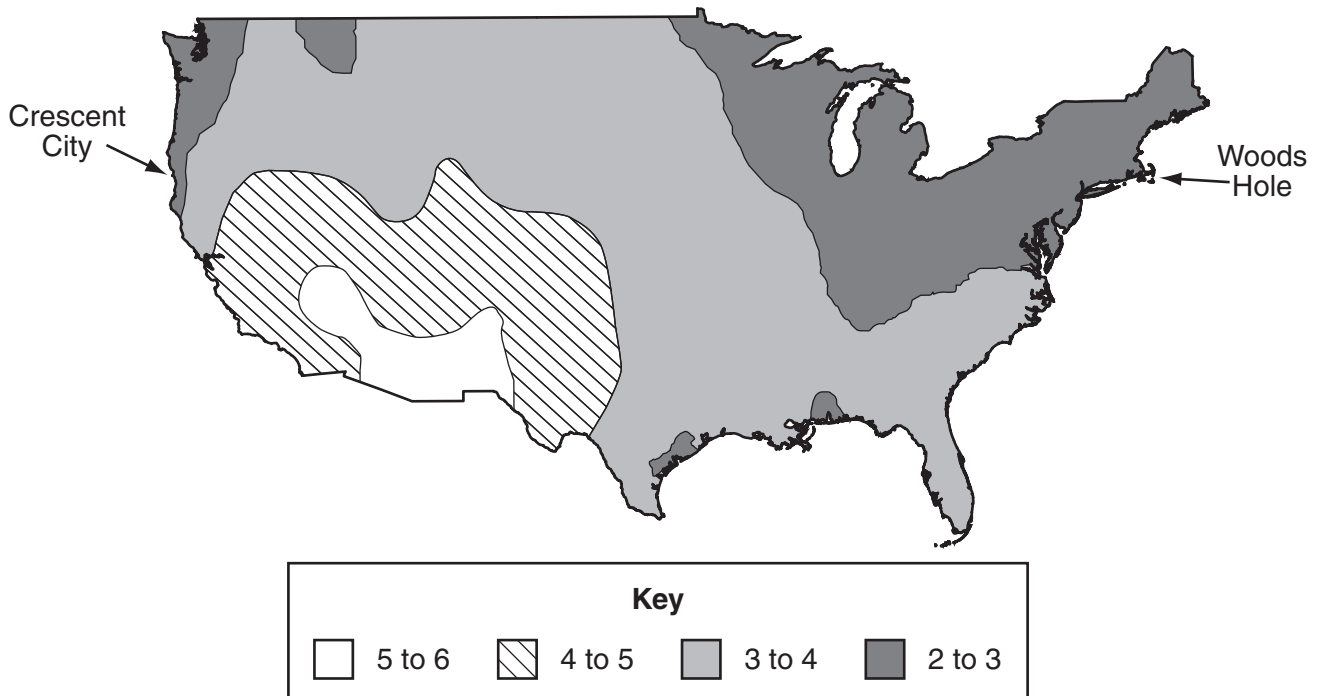
Making a Prediction

Answer question 1 on page 1 in your Student Answer Booklet.

- 1 Write a possible explanation about why ocean temperatures along the East Coast of the United States are warmer than ocean temperatures along the West Coast in locations at approximately the same latitude. Include **one** piece of information from the article and/or what you know about ocean currents in your explanation.

The student wondered whether the East and West Coasts receive different amounts of solar radiation and how that might affect ocean temperatures. She found the map in Figure 1 on the Internet. The map shows the average amounts of daily solar radiation received in the United States each year.

Figure 1: United States Annual Average Daily Solar Radiation (kWh/m²/day)



Answer question 2 on page 1 in your Student Answer Booklet.

- 2 Based on Figure 1, predict how the air temperatures in Crescent City and Woods Hole compare. Explain your prediction.

Analyzing and Presenting Data

Next, the student researched average monthly ocean and air temperatures collected by weather buoys off the coast of each city. These buoys are monitored by the National Data Buoy Center of the National Oceanic and Atmospheric Administration (NOAA). Data Table 1 shows the data the student found about mean monthly air temperatures for Woods Hole and Crescent City.

**Data Table 1: Mean Monthly Air Temperatures (°F)
for Woods Hole, MA, and Crescent City, CA**

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Woods Hole	30	32	38	46	55	64	70	70	64	53	45	36
Crescent City	47	47	48	50	53	55	57	58	57	54	49	46

Answer question 3 on page 2 in your Student Answer Booklet.

- 3 For each city, describe any air temperature patterns in the data listed in Data Table 1.

The student discovered that the NOAA data also included the ocean temperatures shown in Data Table 2.

**Data Table 2: Mean Monthly Ocean Temperatures (°F)
for Woods Hole, MA, and Crescent City, CA**

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Woods Hole	34	35	37	46	55	63	71	72	68	59	50	41
Crescent City	50	51	51	52	55	55	58	59	57	54	53	51

Answer question 4 on page 3 in your Student Answer Booklet.

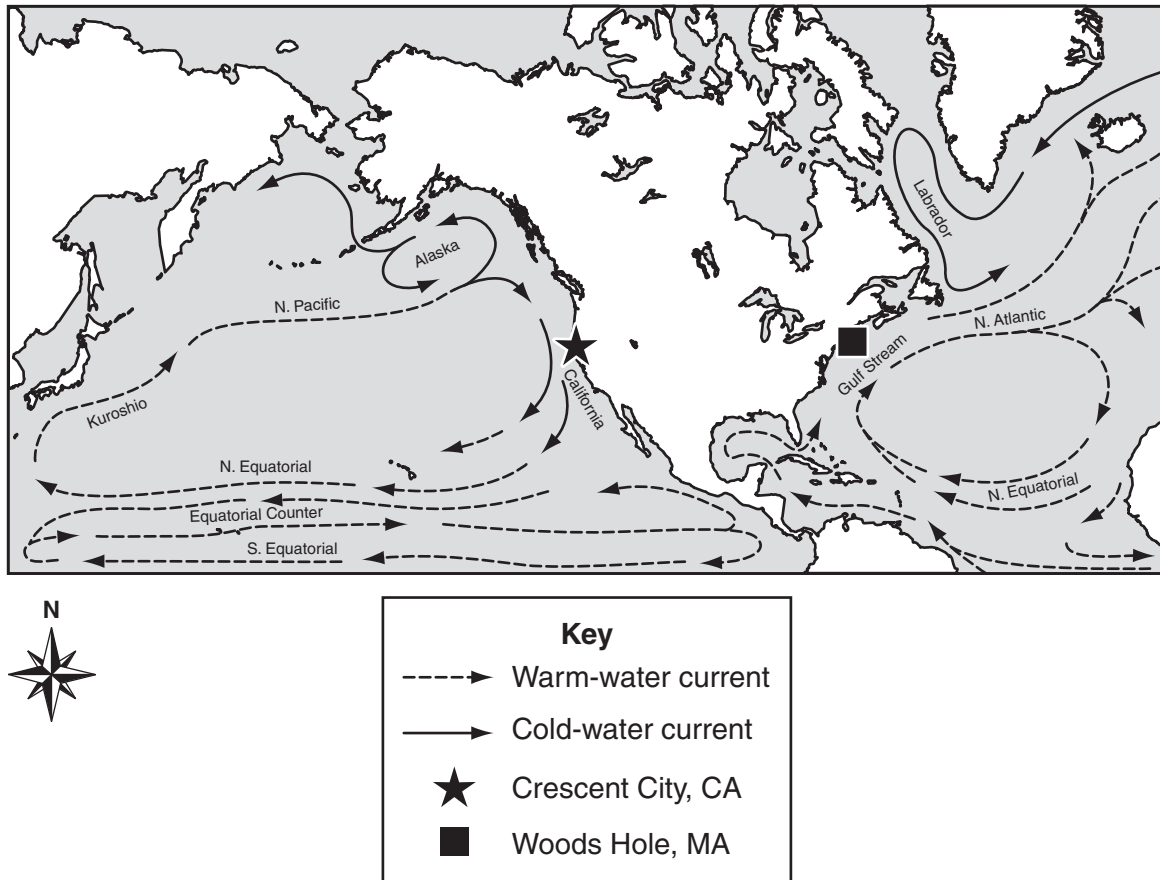
- 4 Use the information in Data Table 1 and Data Table 2 to graph the average monthly ocean temperatures **and** monthly air temperatures for Crescent City. Include a title and all other required elements of a graph.

Answer questions 5 and 6 on page 4 in your Student Answer Booklet.

- 5 Describe any patterns in the ocean temperature data shown in your graph.
- 6 Refer to the air temperature information in Data Table 1 and the ocean temperature information in Data Table 2. Describe any relationships between the ocean temperatures and air temperatures in Woods Hole.

The student located the map of surface ocean currents in the North Pacific and North Atlantic Oceans shown in Figure 2.

Figure 2: North Pacific and North Atlantic Surface Ocean Currents



Answer question 7 on page 5 in your Student Answer Booklet.

- 7 Look at the ocean currents near Crescent City and Woods Hole on the map in Figure 2. Describe the type of ocean current near each location.

Evaluating the Research

The student reviewed the information she had gathered:

- mean daily amounts of solar radiation received by Crescent City and Woods Hole
- mean monthly air temperatures of both cities
- mean monthly ocean temperatures near both cities
- map of surface ocean currents near both cities

Answer question 8 on page 5 in your Student Answer Booklet.

- 8 Read the explanation you wrote for question 1. Identify whether the student's data support or reject your explanation. Use evidence from the student's research in your answer.



Acknowledgments

The New Hampshire, Vermont, Rhode Island, and Maine Departments of Education wish to acknowledge and credit the following author and publisher for use of their work in the *New England Common Assessment Program—2012*.

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