BAY-SIC RATIOS

INTRODUCTION:

The land that surrounds the Chesapeake Bay spans 64,000 square miles and includes portions of six states – Virginia, West Virginia, Maryland, Pennsylvania, Delaware, and New York – and the District of Columbia. Remember that a watershed is the area of land that drains into a specific body of water. The rainwater running off the land and going into nearby creeks, rivers, and streams from those six states, plus D.C., is going right into the Chesapeake Bay. Wow! That's a lot of water going into the Bay!

With such a big watershed area draining into the Chesapeake Bay, you would think the Bay is really deep, right? Wrong! Actually, the Bay averages *a depth of only 21 feet*, which means that it is surprisingly shallow considering the large amount of land that drains into it. Unfortunately, being shallow means that the Bay is extremely sensitive to pollution. As pollution enters the Bay, it changes the Bay's water quality, which can mean trouble for some of the Bay's valuable resources.

In this activity, you will use a scale model to illustrate the shallowness of the Chesapeake Bay, and to compare the Bay watershed to other watersheds around the world.

MATERIALS:

- 1 envelope
- 1 sugar cube
- paper squares
- *Land-to-Water Ratios Around the World* chart
- *Chesapeake Bay Watershed* map
- *Watershed of the World* map

VOCABULARY:

drainage basin, ratio, runoff, vulnerable, watershed
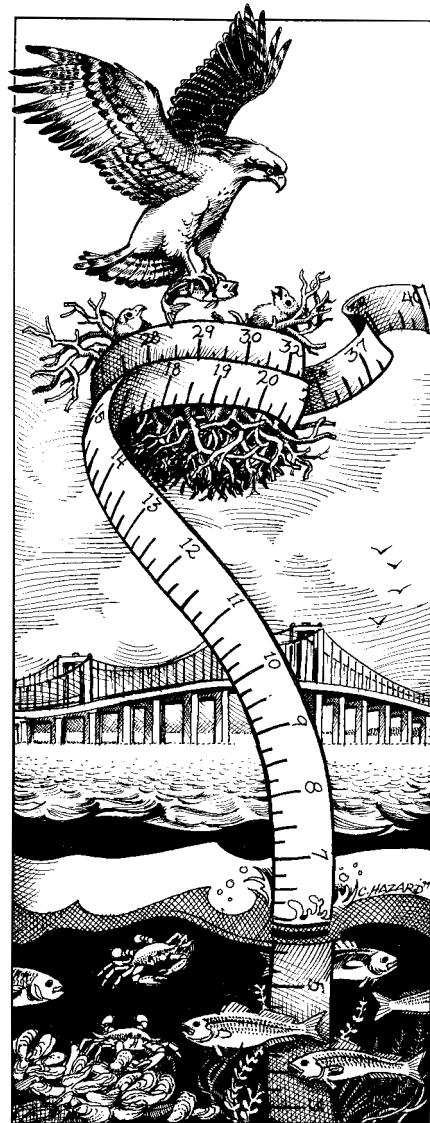
Charles R. Hazard

PROCEDURE:

1. Your teacher will give you an envelope that contains the name of a body of water, numerous squares, and one sugar cube. Without telling any of the other groups what body of water your group has, **locate the name of your body of water** on the chart entitled *Land-to-Water Ratios Around the World*. Write its name in the space below.

   _____

2. What is the land-to-water ratio for your assigned body of water? **Write its ratio below.**

   _____

3. Spread the contents of your envelope onto your desk. You are going to create **a simple model to illustrate your body of water and the land within its watershed.**

4. Using the land-to-water ratio of your body of water, create a model of its watershed. Remember, **each square represents one square kilometer (km^2) of land** and **one sugar cube represents each cubic kilometer (km^3) of water.**

5. If your land-to-water ratio is not a whole number, you will have to **cut one or more of your paper squares into the correct fraction**. (Reminder: A decimal fraction of .5 is equal to $\frac{5}{10}$. This fraction reduces to $\frac{1}{2}$. In the same way, .25 is equal to $\frac{25}{100}$, which can be reduced to $\frac{1}{4}$.)

6. When you have finished, invite another group to guess which body of water you've modeled. Then, use the *Watersheds of the World* map to guess their body of water. **Below, describe how you were able to determine which watershed they modeled.**

   _____

   _____

   _____

7. Join another small group and **create a model representing the land-to-water ratio of the Chesapeake Bay.**

   a) Do you have enough land squares to complete the model?
   b) If you don't, how will you solve this problem? Be creative!

8. If you used a different method to create the model of the Chesapeake Bay **explain the new method below.**

   _____

   _____

   _____

9. Write a sentence explaining what makes the **Chesapeake Bay different from other watersheds in the world.** In your explanation be sure to consider the data on the *Land-to-Water Ratios Around the World* chart and the models you have created.

    _____

    _____

    _____

10. Refer to the *Watersheds of the World* map to **predict** which body of water is most easily polluted. Explain your answer in the space below.

    _____

    _____

    _____

11. **Read the excerpt below,** which describes the shallowness of the Bay:
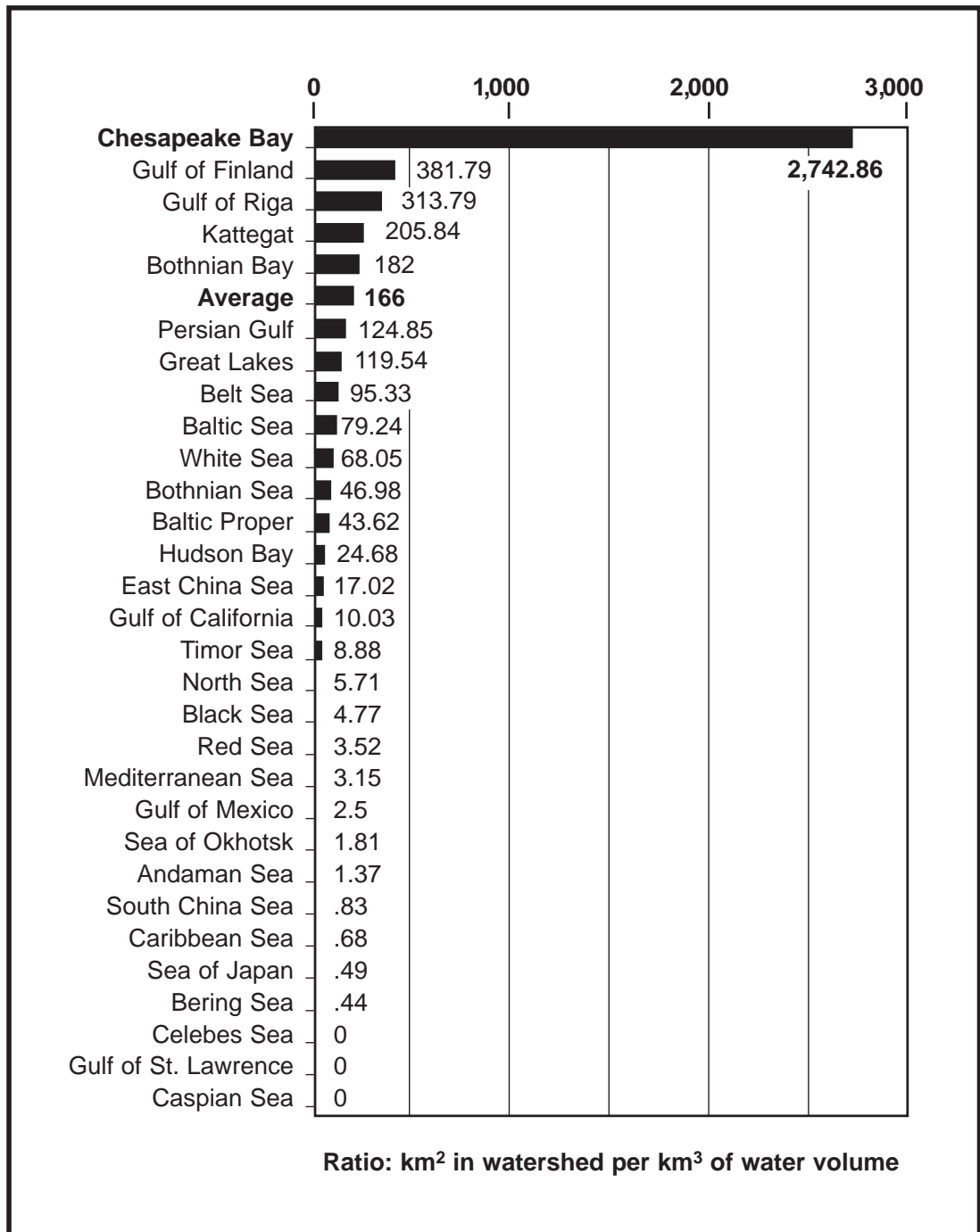
    The Chesapeake Bay is quite shallow. Nearly 200 miles (333 km) long and up to 30 miles (50 km) wide, it looks like a lot of water out there; but that water is spread thin. The average depth of this huge bay is around 21 feet (7 m) – less than halfway from home plate to first base. In this simple fact – that its bottom lies very near its top – lies much of the bay's uniqueness and also its vulnerability to modern pollution.

    (The Bay's) shallowness means that sunlight, the first essential for plant growth, can penetrate a large part of the bay's waters. This light and warmth combined with a continuous flow of nutrients, supports vast stocks of phytoplankton and huge underwater meadows of grasses. Collectively, these grasses are known as submerged aquatic vegetation (SAV). They are not only food for waterfowl but are high-quality habitats – nurseries, hiding places, breeding grounds – for shrimp, crabs, seahorses and a host of less familiar life forms in the food web.

    (adapted from *Turning the Tide*, p. 22-23, Horton and Eichbaum, 1991).

12. Does the information from this passage **change your answer to question 10**, or does it **justify your answer to question 10**? Use the space below to explain why.

    _____

    _____

    _____

    _____

LAND-TO-WATER RATIOS AROUND THE WORLD

Body of Water	Ratio
Chesapeake Bay	**2,742.86**
Gulf of Finland	381.79
Gulf of Riga	313.79
Kattegat	205.84
Bothnian Bay	182
Average	**166**
Persian Gulf	124.85
Great Lakes	119.54
Belt Sea	95.33
Baltic Sea	79.24
White Sea	68.05
Bothnian Sea	46.98
Baltic Proper	43.62
Hudson Bay	24.68
East China Sea	17.02
Gulf of California	10.03
Timor Sea	8.88
North Sea	5.71
Black Sea	4.77
Red Sea	3.52
Mediterranean Sea	3.15
Gulf of Mexico	2.5
Sea of Okhotsk	1.81
Andaman Sea	1.37
South China Sea	.83
Caribbean Sea	.68
Sea of Japan	.49
Bering Sea	.44
Celebes Sea	0
Gulf of St. Lawrence	0
Caspian Sea	0

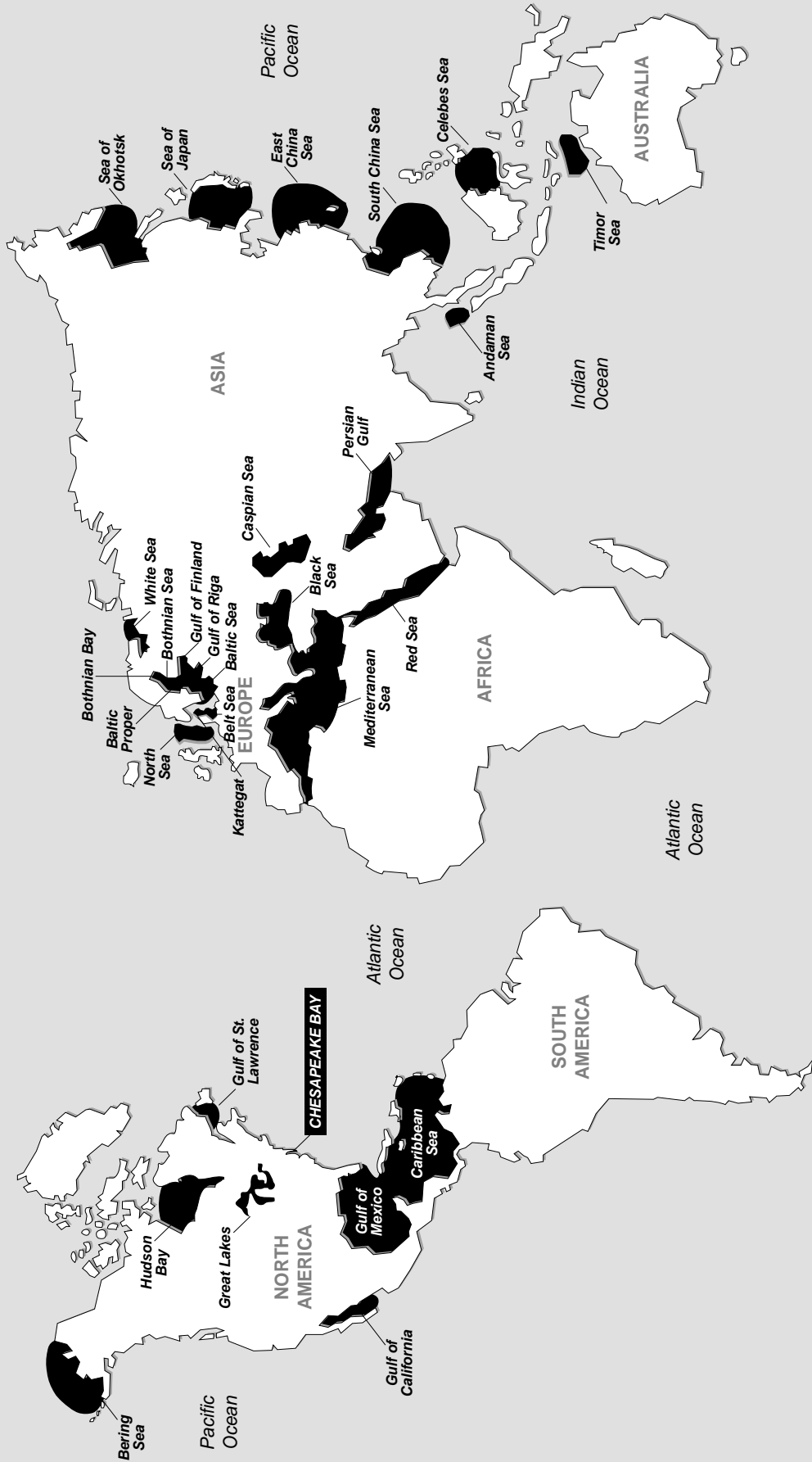**Ratio: km² in watershed per km³ of water volume**

THE SHALLOW, VULNERABLE BAY

The Chesapeake Bay, compared to other coastal and inland bodies of water, has a huge drainage basin for the amount of water it contains, a ratio of 2,742.86 square kilometers of land for every cubic kilometer of water. The principal reason is the Chesapeake's extreme shallowness – its average depth is less than 22 feet.

SOURCE: R. Costanza, Chesapeake Biological Laboratory, University of Maryland

WATERSHEDS OF THE WORLD

THE CHESAPEAKE BAY WATERSHED

NEW YORK

PENNSYLVANIA

W. VA.

MARYLAND

DELAWARE

VIRGINIA

Chesapeake Bay