

A GLOBAL VIEW OF THE WET EARTH

9-12

OBJECTIVES

The student will do the following:

1. Locate and label the major bodies of water and the major rivers of Earth.
2. Locate and label the major centers of population in the world.
3. Locate and label countries that are "water scarce" at the present time and those projected to be in future years.
4. Differentiate among various types of water resources.
5. Know the impacts and stresses large centers of population exert on water resources.

SUBJECTS:

Science (Physical), Math,
Art, Social Studies
(Geography, Economics)

TIME: varies

several activities included,
each requiring 1-2 class
periods

MATERIALS:

outline maps
lists of water sources,
population centers
pencils (or colored pencils)
globe(s)
almanac(s)
world map(s)
worksheets

BACKGROUND INFORMATION

Earth is the water planet with 71% of its surface covered by water. Water features define continental, national, and state boundaries and influence climate, productivity, and accessibility for the land. Too often our knowledge of geography is hazy or limited and in need of expansion or review.

U.S. citizens use about 150 gallons of water per day per person for ordinary household use. Europeans use a third of this and citizens of other nations much less. It takes about one gallon per day per person just to sustain life.

Renewable water resources, such as groundwater or lakes, are becoming scarce for many countries experiencing population growth. World Resources Institute has identified 26 countries with less than 1000 cubic meters (m^3) of water available per person annually. The United States has about 10,000 m^3 /person annually. Most of the water-scarce places are located in Africa, the Middle East, or islands. (Note: $1 m^3 = 265 \text{ gal.}$)

Most citizens of developed countries consider water quality as a local environmental problem and have focused efforts on local waterways. Many Americans do not understand the growing world-

wide water crisis. Water, made unsafe by human waste, industrial wastewater, pesticides, and fertilizers, represents a major global health problem as well as contributes to water scarcity. If sources become too polluted, they are often abandoned rather than cleaned.

Over 12 million children die each year because of unsafe drinking water. The United Nations set a goal ensuring that all people would have safe drinking water by 1990. This goal has not yet been attained. Despite progress, many countries still lack sanitation facilities that would prevent organic wastes from polluting drinking water. In addition, affluent nations, such as the United States as well as these developing countries, need stronger measures to preserve groundwater from contamination. Many people rely on groundwater; and groundwater, once contaminated, cannot be decontaminated in the same ways that polluted lakes and rivers can.

Students should have a global conception of water resources and know where the resources lie. We, therefore, face the serious educational challenge of getting water quality and water scarcity to be perceived as central global environmental issues. These activities are steps toward that direction.

Terms

bay: a body of water partly enclosed by land but with a wide outlet to the sea

equator: a great circle of the Earth that is everywhere equally distant from the two poles and divides the Earth's surface into the northern and southern hemispheres

glacier: a large mass of ice formed on land by compacted snow

gulf: large area of a sea or ocean partially enclosed by land

harbor: a waterbody where wave action is reduced or dampened

lagoon: a shallow body of water, especially one separated from the sea by sandbars or coral reefs

lake: a standing body of water which undergoes thermal stratification and turnover by mixing

ocean: the entire body of salt water that covers about 71 percent of the Earth's surface

pond: a still body of water smaller than a lake where mixing of nutrients and water occurs primarily through the action of wind (as opposed to turnover)

river: a large body of flowing water that receives water from other streams and/or rivers

river mouth: where the river empties into a larger body of water

river source: where the river begins

sound: long, broad inlet of the ocean larger than a strait or channel, connecting larger bodies of water

strait: a narrow passage of water that connects two larger bodies of water

tributary: a stream that flows into a larger stream, river, or another waterbody

waterfall: a cascade of water, as over a dam

ADVANCE PREPARATION

- A. Prepare copies of world maps and lists for each student or group of students who will work together.
- B. Gather sufficient atlases, reference materials, maps, globes.
- C. Copy lists of waterways and population centers from an almanac.

PROCEDURE

- I. Setting the stage
 - A. Give Background Information and invite discussion about water uses and misuses, types of bodies of water, and problems from water shortages.
 - B. Distribute copies of maps and lists to students.
 - C. Explain the use of globes, almanacs, and other resources that have been provided.
- II Activity
 - A. Identify types of surface water sources in the vocabulary and locate examples on the maps provided.
 - B. Locate water-scarce countries and countries with large population centers on the maps provided.

- C. Relate water scarcity to:
 - 1. topography (runoff).
 - 2. climate (little natural precipitation).
 - 3. economic development (the cost of wells, water treatment).
 - 4. population size or population growth rate (amount available per person).

IV. Follow-up

- A. Watch for current events stories about world water supplies. Keep a current bulletin board of these items.
- B. Have a geography bee to reinforce knowledge of types of surface waters and/or names of surface waters.
- C. Discuss the relationship between population centers and fresh water sources.

IV. Extensions

- A. Convert the amounts of water shown to gallons per person. Compare your own usage to that of an African nation.
- B. Locate large industries, agricultural areas, economic centers, deserts. Note areas that have had recent water shortages.
- C. Do a current events search for these bodies of water.
- D. Assign each student a current event on which to do further research.
- E. Add your state map with its rivers, lakes, bays, and dams to the assignment.
- F. List some possible environmental and cultural factors leading to water scarcity.
- G. Present and defend some possible solutions in terms of expense, time delay, cultural acceptability.

RESOURCES

Arms, Karen, Environmental Science, Holt, Rinehart, and Winston, Inc., Austin, TX, 1996.

Chiras, Daniel D., Environmental Science, High School Edition, Addison-Wesley, Menlo Park, CA, 1989.

Nebel, Bernard J. and Richard T. Wright, Environmental Science: The Way The World Works, 4th Edition, Prentice-Hall, Englewood Cliffs, NJ, 1993.

State or Locally Adapted World History Book; World Almanac

Name _____ Date _____

FOR EACH TERM LISTED BELOW, DEFINE THE TERM AND LOCATE ONE OF THE EXAMPLES GIVEN ON A WORLD MAP. MARK THE LOCATION ON THE MAP WITH THE CORRESPONDING LETTER OF THE ALPHABET FOR EACH TERM.

- A. Canal (Erie Canal, Panama Canal, Suez Canal)
Defined: _____
- B. Gulf (Gulf of Mexico, Persian Gulf, Gulf of Carpentauria)
Defined: _____
- C. River (Mississippi, Rio Grande, Nile, Amazon)
Defined: _____
- D. Reservoir (Lake Mead, AZ or Lake Martin, AL)
Defined: _____
- E. Port (New York, Los Angeles, Mobile)
Defined: _____
- F. Harbor (San Diego, New Orleans, Hong Kong)
Defined: _____
- G. Lake (Superior, Erie, Victoria)
Defined: _____
- H. Coast (Gulf Coast, Pacific Coast, Atlantic Coast)
Defined: _____
- I. Ocean (Atlantic, Pacific, Indian)
Defined: _____
- J. Bay (Chesapeake Bay, Hudson Bay, Bay of Biscay)
Defined: _____
- K. Strait (Bering Strait, Strait of Gibraltar, Magellan)
Defined: _____
- L. Reef (Great Barrier Reef, Great Bahama Bank, Great Sand Barrier)
Defined: _____

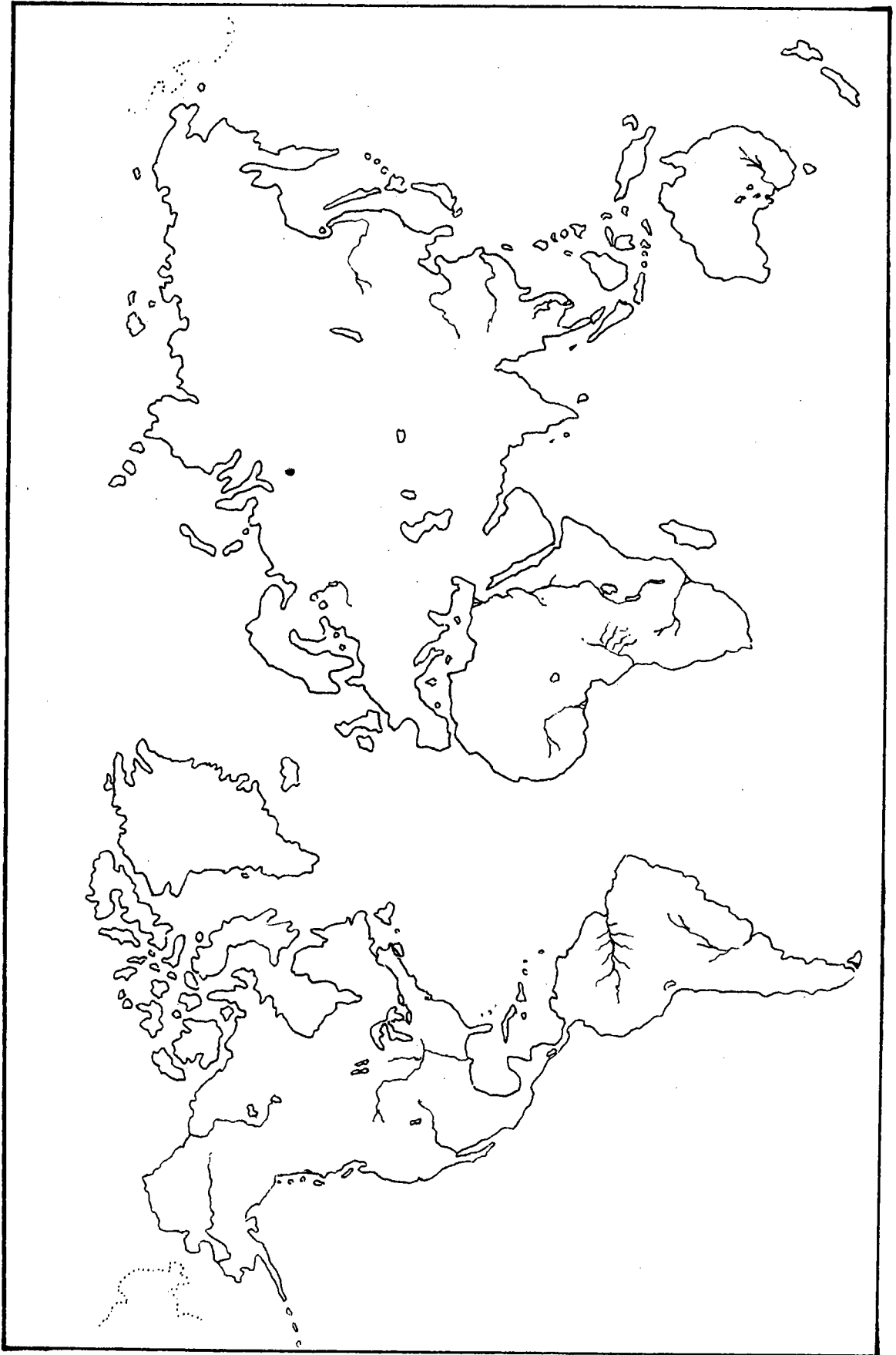
M. Sound (Puget Sound)

Defined: _____

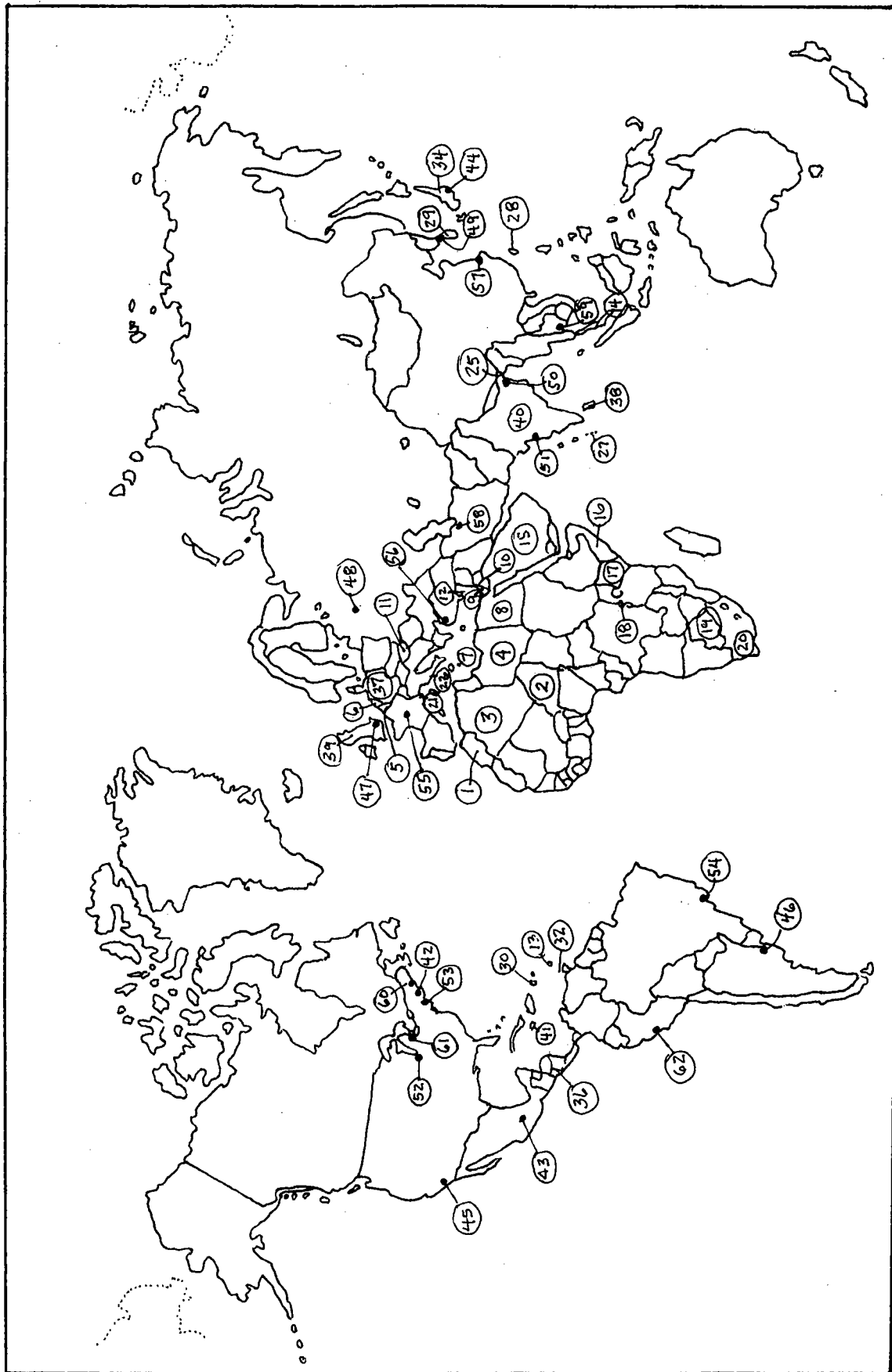
N. Swamp (Okefenokee)

Defined: _____

SURFACE WATERS OF THE WORLD



WORLD MAP - KEY



COUNTRIES OF THE WORLDSOME WATER-SCARCE COUNTRIES

Cubic meters of water/person/year

	<u>Country</u>	<u>1992</u>	<u>2010</u>
1.	Morocco	1150	830
2.	Niger	1690	930
3.	Algeria	730	500
4.	Libya	160	100
5.	Belgium	840	870*
6.	Netherlands	660	600
7.	Malta	80	80
8.	Egypt	30	20
9.	Israel	330	250
10.	Lebanon	1410	980
11.	Hungary	580	570
12.	Syria	550	300
13.	Barbados	170	170
14.	Singapore	210	190
15.	Saudi Arabia	140	70
16.	Somalia	1390	830
17.	Kenya	560	330
18.	Rwanda	820	440
19.	Botswana	710	420
20.	South Africa	1200	600

* population decreasing

HIGH POPULATION DENSITIES

In descending order:

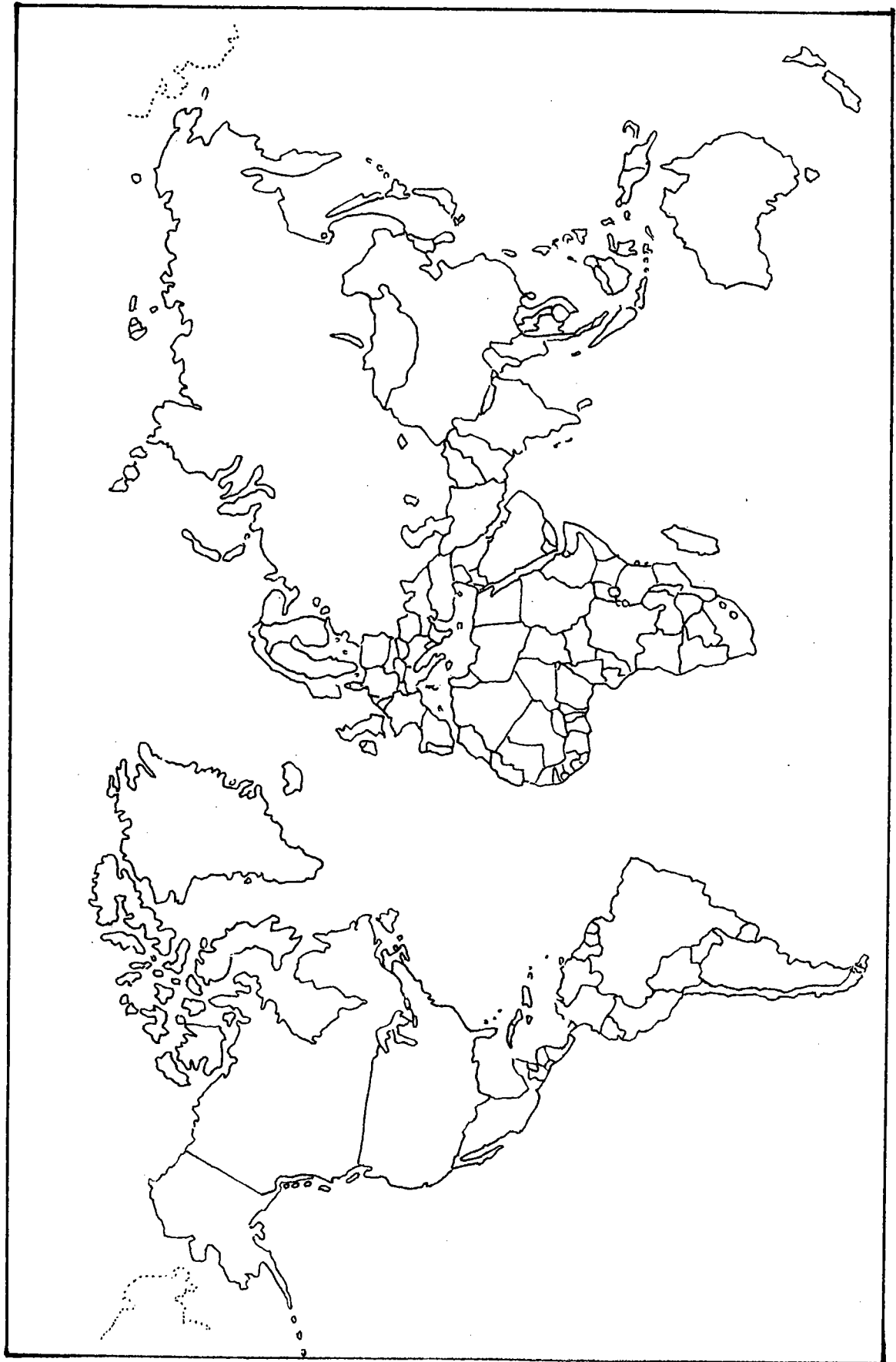
COUNTRIES/TERRITORIES

21. Monaco
22. Singapore (14)
23. Vatican City
24. Malta (7)
25. Bangladesh (13)
26. Barbados (13)
27. Maldives Islands
28. Taiwan
29. South Korea
30. Puerto Rico
31. Netherlands
32. Grenada
33. Belgium (5)
34. Japan
35. Lebanon (10)
36. El Salvador
37. Germany
38. Sri Lanka
39. England
40. India
41. Jamaica

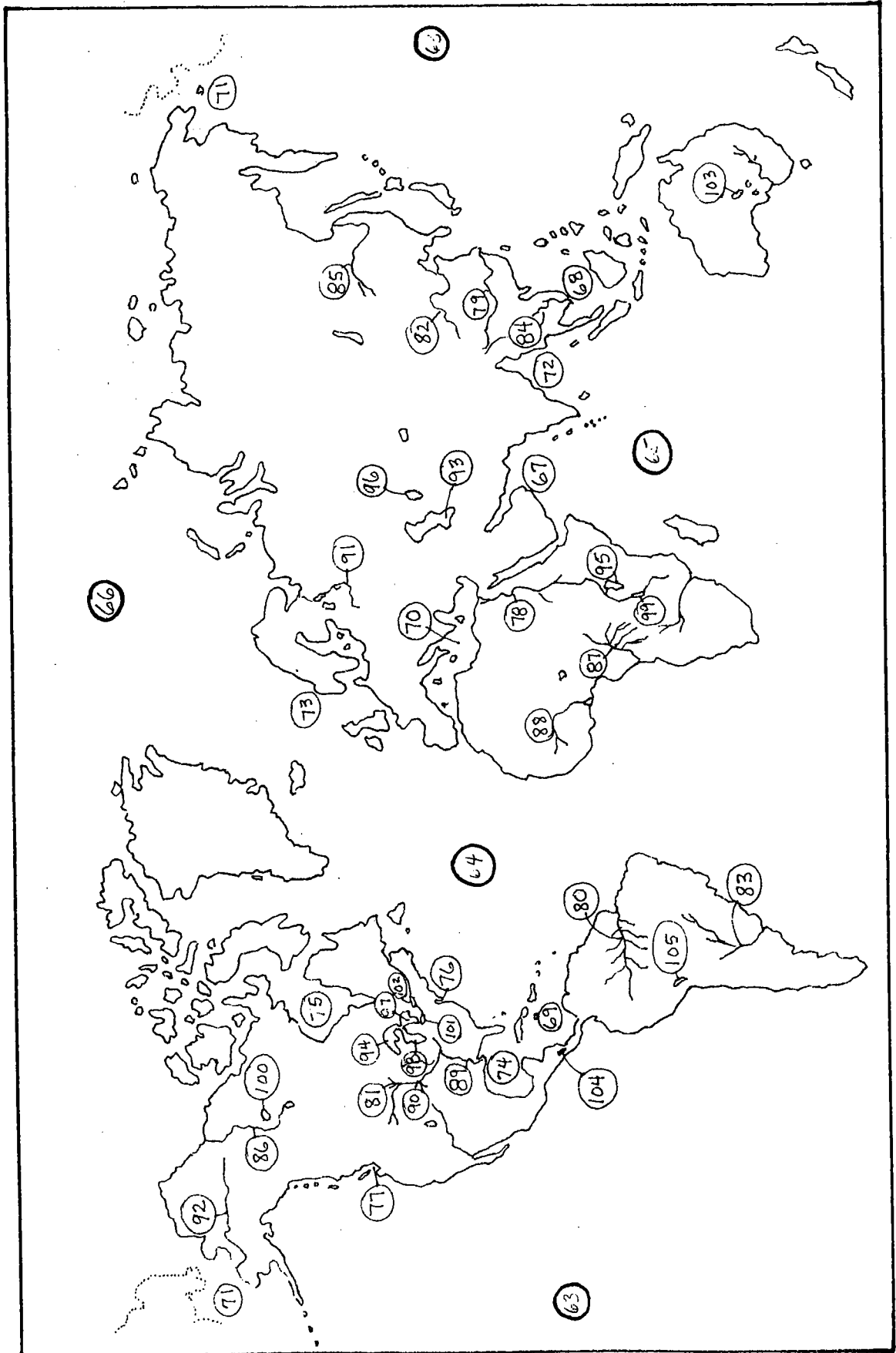
CITIES

42. New York, USA
43. Mexico City, Mex.
44. Tokyo, Japan
45. Los Angeles, USA
46. Buenos Aires, Arg.
47. London, Eng.
48. Moscow, Russia
49. Seoul, Kor.
50. Calcutta, India
51. Bombay, India
52. Chicago, USA
53. Philadelphia, USA
54. Rio de Janeiro, Brz.
55. Paris, France
56. Istanbul, Tur.
57. Shanghai, China
58. Tehran, Iran
59. Bangkok, Thai.
60. Boston, USA
61. Detroit, USA
62. Lima, Peru

WORLD MAP



SURFACE WATERS - KEY



SURFACE WATERS OF THE WORLD**PRINCIPAL OCEANS, SEAS, GULFS**

- 63. Pacific Ocean
- 64. Atlantic Ocean
- 65. Indian Ocean
- 66. Arctic Ocean
- 67. Arabian Sea
- 68. South China Sea
- 69. Caribbean Sea
- 70. Mediterranean Sea
- 71. Bering Sea
- 72. Bay of Bengal
- 73. Norwegian Sea
- 74. Gulf of Mexico
- 75. Hudson Bay
- 76. Chesapeake Bay
- 77. Puget Sound

PRINCIPAL RIVERS

- 78. Nile, Africa
- 79. Yangtze, China
- 80. Amazon, Brazil
- 81. MS-Missouri-Red Rock, USA
- 82. Yellow, China
- 83. Rio de la Plata-Parana, S. Amer.
- 84. Mekong, Asia
- 85. Amur, China
- 86. Mackenzie, Canada
- 87. Congo, Zaire
- 88. Niger, Africa
- 89. Mississippi, USA
- 90. Missouri, USA
- 91. Volga, Russia
- 92. Yukon, Canada-Alaska

PRINCIPAL LAKES

- 93. Caspian Sea, Iran
- 94. Lake Superior, USA-Canada
- 95. Lake Victoria, Africa
- 96. Aral Sea, Uzbekistan and Kazakhstan
- 97. Lake Huron, USA-Canada
- 98. Lake Michigan, USA-Canada
- 99. Lake Tanganyika, Africa
- 100. Great Bear Lake, Canada
- 101. Lake Erie, USA-Canada
- 102. Lake Ontario, USA-Canada
- 103. Lake Eyre, Australia
- 104. Lago de Nicaragua, Nic.
- 105. Lago de Titicaca, Bolivia