SOIL CONSERVATION SERVICE / U. S. DEPARTMENT OF AGRICULTURE

CONSERVATION AND THE WATER CYCLE

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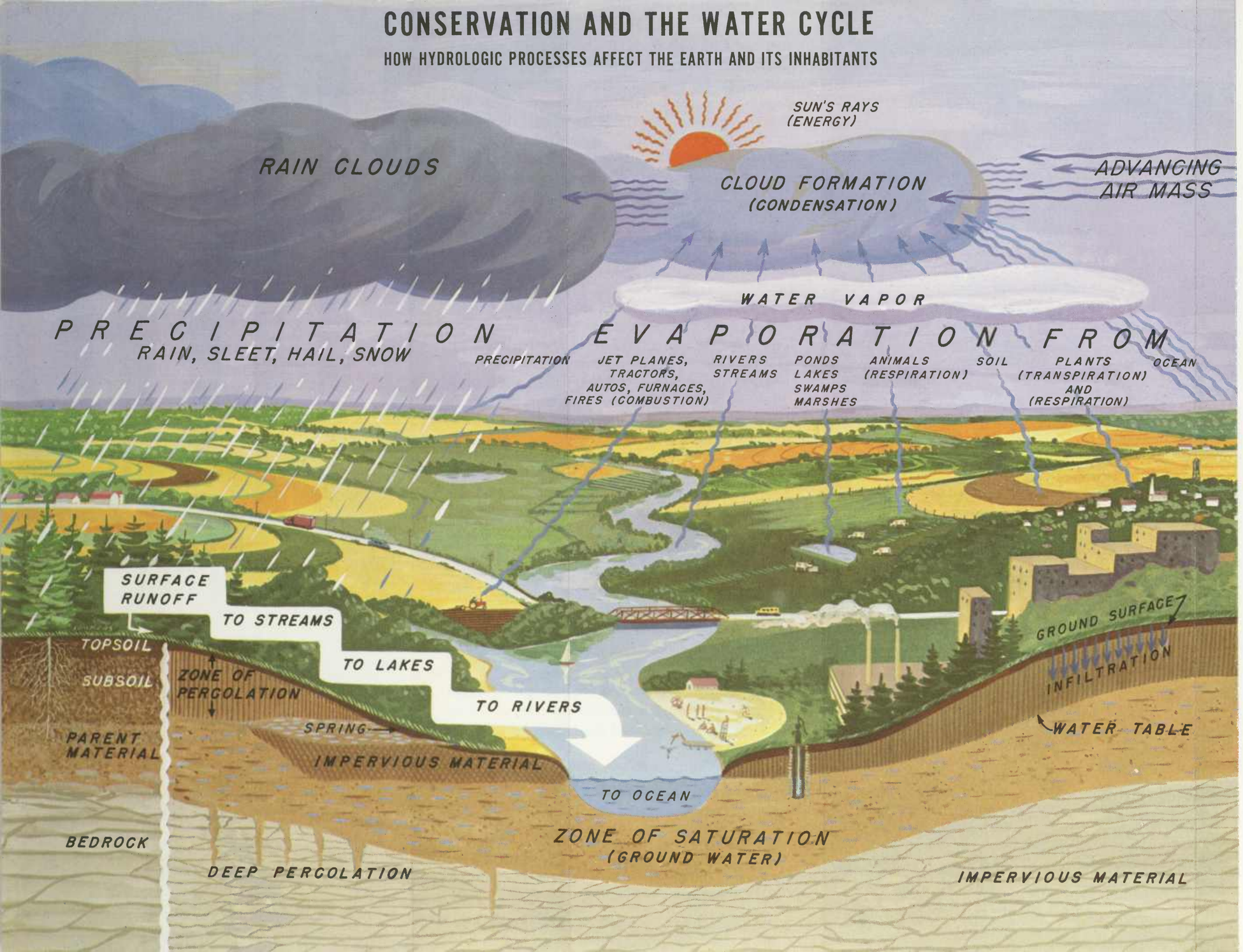
HOW HYDROLOGIC PROCESSES AFFECT THE EARTH AND ITS INHABITANTS



THE WATER CYCLE is an endless process of water circulation going on throughout the world.

To trace the movement of water through the cycle, begin at the far right of the diagram. There the sun's energy is transferring water from the sea and earth to the atmosphere in the form of water vapor. The soil and inland water bodies through *evaporation* and plants through *transpiration* add large amounts of water vapor to the atmosphere, but most of it comes from the oceans. Man, animals, and machines add small amounts by means of *respiration* and *combustion*.

Air masses (top of diagram) carry the water vapor across the earth, and the water vapor condenses into *precipitation*.

At the left, precipitation falls as rain, snow, sleet, hail. Some evaporates while falling and returns to the atmosphere. A small amount is intercepted and held by plants or by buildings, automobiles, and other structures and machines until it evaporates back into the atmosphere.

Most of the precipitation soaks into the soil; the part that doesn't runs to the sea by way of streams and rivers. Ground water gets there more slowly.

Misuse and poor management of the soil will decrease the amount of water that soaks into the soil and increase the amount that runs off over the surface. Runoff on bare land leads to erosion. Grass, trees, and other plants hold the soil in place and slow the runoff, allowing more water to soak into the soil.

Some of the water that soaks into the soil is used by plants. Part of it percolates beyond the reach of plant roots to the water table, to underground reservoirs, and to springs and artesian wells.

Runoff on its way to the sea can be intercepted and stored for industrial or household use, and it can be diverted for irrigation.

Little water has been added or lost through the ages. The water cycle prevails in all places and at all times with neither beginning nor end.

A 40- x 28-inch color reproduction of illustration at left is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price 35 cents.

Conservation and the Water Cycle

By the Soil Conservation Service

Water is probably the natural resource we all know best. All of us have had firsthand experience with it in its many forms—rain, hail, snow, ice, steam, fog, dew.

Yet, in spite of our daily use of it, water is probably the natural resource we least understand. How does water get into the clouds, and what happens to it when it reaches the earth? Why is there sometimes too much and other times too little? And, most important, is there enough for all the plants, and all the animals, and all the people?

Water covers nearly three-fourths of the earth; most is sea water. But sea water contains minerals and other substances, including those that make it salty, that are harmful to most land plants and animals. Still it is from the vast salty reservoirs, the seas and oceans, that most of our precipitation comes—no longer salty or mineral laden. Water moves from clouds to land and back to the ocean in a never-ending cycle. This is the water cycle, or the hydrologic cycle.

Ocean water evaporates into the atmosphere, leaving impurities behind, and moves across the earth as water vapor. Water in lakes, ponds, rivers, and streams also evaporates and joins the moisture in the atmosphere. Soil, plants, people, and animals, and even factories, automobiles, tractors, and planes, contribute moisture. A small part of this moisture, or water vapor, is visible to us as fog, mist, or clouds. Water vapor condenses and falls to earth as rain, snow, sleet, or hail, depending on region, climate, season, and topography.

Every year about 80,000 cubic miles of water evaporates from oceans and about 15,000 cubic miles from land sources. Since the amounts of water evaporated and precipitated are almost the same, about 95,000 cubic miles of water are moving between earth and sky at all times.

Storms at sea return to the oceans much of the water evaporated from the oceans, so land areas get only about 24,000 cubic miles of water as precipitation. Precipitation on the land averages 26 inches a year, but it is not evenly distributed. Some places get less than 1 inch and others more than 400 inches.

The United States gets about 30 inches a year, or about 4,300 billion gallons a day. Total streamflow from surface and underground sources is about 8.5 inches a year, or about 1,200 billion gallons a day. This is the amount available for human use—homes, industry, irrigation, recreation.

The difference between precipitation and streamflow—21.5 inches a year, or 3,100 billion gallons a day—is the amount returned to the atmosphere as vapor. It is roughly 70 percent of the total water supply. It includes the water used by plants.

Man can exist on a gallon or so of water a day for drinking, cooking, and washing though he seldom does or has to. In medieval times he probably used no more than 3 to 5 gallons a day. In the 19th century, especially in Western nations, he was using about 95 gallons a day. At present in the United States, man uses about 1,500 gallons a day for his needs and comforts including recreation, cooling, food production, and industrial supply.

When water hits the ground some soaks into the soil, and the rest runs off over the surface. The water that soaks into the soil sustains plant and animal life in the soil. Some seeps to underground reservoirs. Almost all of this water eventually enters the cycle once more.

Man can alter the water cycle but little, so his primary supply of water is firmly fixed. But he can manage and conserve water as it becomes available—when it falls on the land. If he fails to do so he loses the values that water has when used wisely.

Water management begins with soil management. Because our water supply comes to us as precipitation falling on the land, the fate of each drop of rain, each snowflake, each hailstone depends largely on where it falls—on the kind of soil and its cover.

A rainstorm or a heavy shower on bare soil loosens soil particles, and runoff—the water that does not soak into the soil—carries these particles away. This action, soil erosion by water, repeated many times ruins land for most uses. Erosion, furthermore, is the source of sediment that fills streams, pollutes water, kills aquatic life, and shortens the useful life of dams and reservoirs.

Falling rain erodes any raw-earth surface. Bare, plowed farmland, cleared areas going into housing developments, and highway fills and banks are especially vulnerable.

In cities and suburbs, where much of the land is paved or covered—streets, buildings, shopping centers, airport runways—rainwater runs off as as much as 10 times faster than on unpaved land. Since this water cannot soak into the soil, it flows rapidly down storm drains or through sewer systems, contributing to floods and often carrying debris and other pollutants to streams.

Grass, trees, bushes, shrubs, and even weeds help break the force of raindrops and hold the soil in place. Where cultivated crops are grown, plowing and planting on the contour, terraces, and grassed waterways to carry surplus water from the fields are some of the conservation measures that slow running water. Stubble mulching protects the soil when it has no growing cover. Small dams on upper tributaries in a watershed help control runoff and help solve problems of too much water one time and not enough another time.

Throughout the world the need for water continues to increase. Population growth brings demands for more water. Per capita use of water, especially in industrialized countries, is increasing rapidly.

It is man's management of the precipitation available to him that determines whether or not he has both the quantity and the quality of water to meet his needs.

It is man's obligation to return water to streams, lakes, and oceans as clean as possible and with the least waste.

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