



The Story of Your State Geological Survey's

SEARCH FOR WATER

... nearly all water comes from the oceans, is drawn
into the clouds and returns to us as rain or snow.

WATER IS VITAL

Your life depends on water—one of the simplest of chemical compounds. **With** water there is life, industry, progress. **Without** water, the Earth would be a barren, lifeless planet.

Water satisfies your thirst. You use it in cooking your food. You bathe in it—wash your clothes. You may use water in heating your house.

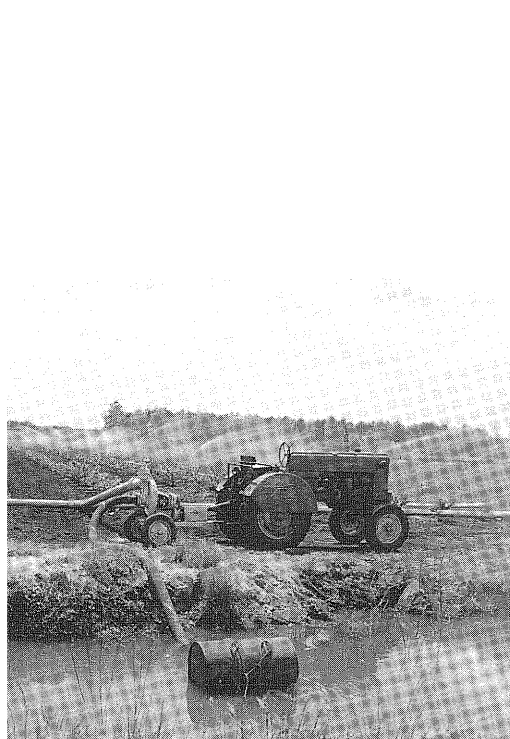
The factory that made your car uses water to cool its giant boilers. And the plants and animals that you use for food depend every bit upon water for their life as you do for yours. Irrigation and livestock watering systems then are important not only to the farmer, but also to the city man, whose food supply comes from the farm.

If there are five people in your family, you need about

250 gallons of water at your house every day—an average of 50 gallons per person. Industrial plants use huge quantities of water. For example, it takes 65,000 gallons to produce a ton of finished steel, and 600,000 gallons to make one ton of synthetic rubber. And more and more farmers are irrigating crops and installing up-to-date water systems in house and barn alike.

Adding up the home, industrial and farm use of water in this country, the total comes to an amazing 1583 gallons per person per day. And with our population growing, industries expanding, and farm use of water increasing rapidly, this figure is rising sharply.

This is a brief story about water and the ways in which the Delaware Geological Survey helps insure that you will always have a plentiful supply of this precious natural resource.



—U.S. Soil Conservation Service Photo

Farmers have a vital interest in a plentiful water supply for such uses as irrigating farm crops.

—Sky Photos

Delaware's fast expanding industrial centers need huge volumes of fresh water for their operations.



SUPPLY OF PURE WATER IS LIMITED

With all of the water in the ocean, and all that falls on the land in the form of rain and snow, you would think that water supply would never be a problem, no matter how large our population should grow, industries expand, or no matter how much water should be used in agriculture. Yet we are faced with a problem of supply of pure, fresh water.

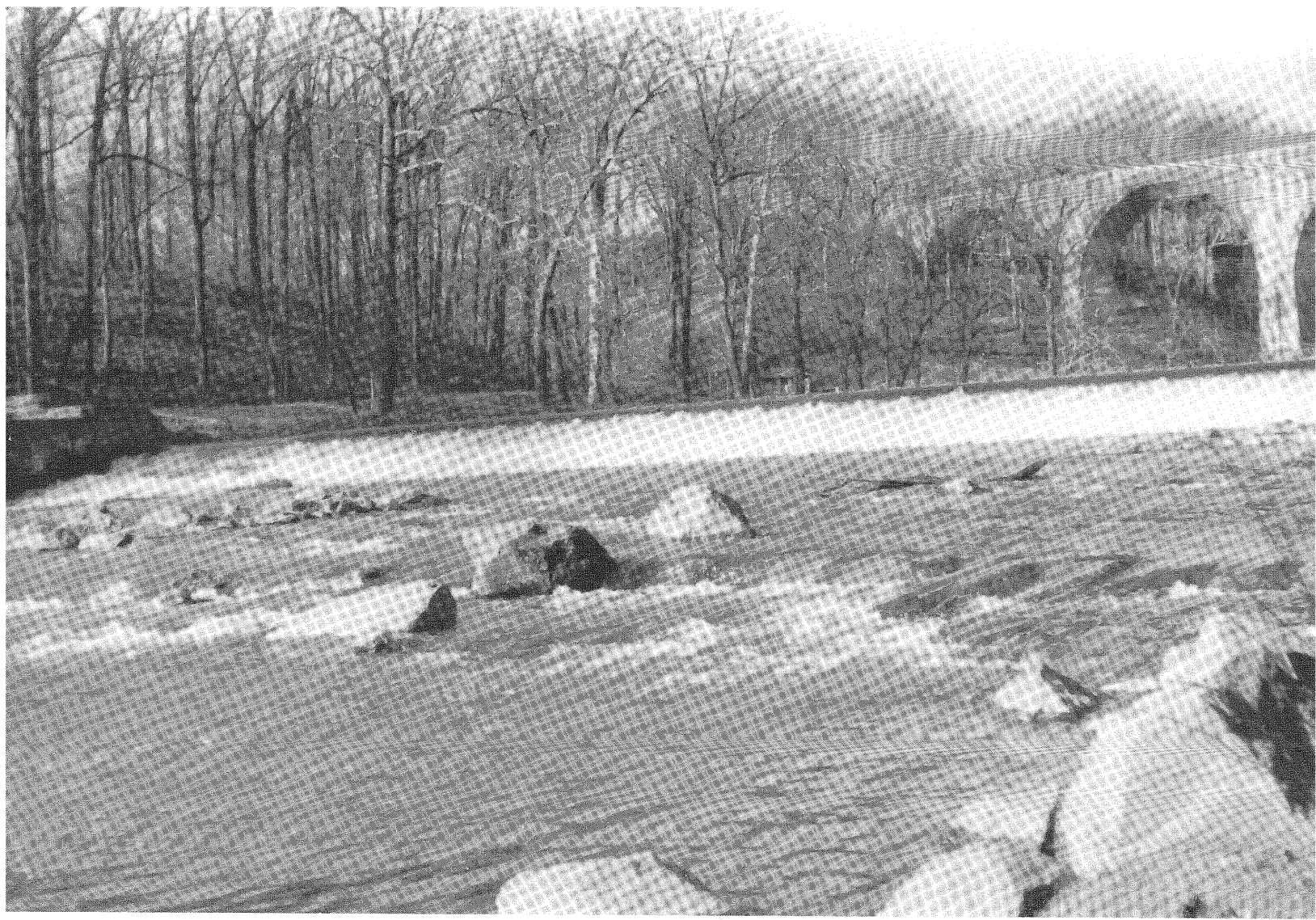
Oceans cover more than 70 per cent of the surface of the earth, so they are our largest natural reservoirs. But we cannot drink ocean water because of the salt it contains. Neither can ocean water be used in irrigation. Some factories do use it for cooling purposes, however. Scientists are working on the problem of converting sea water into fresh water, but methods developed so far are very costly. So we must look for natural supplies of fresh water to fill our needs—streams, lakes, ponds, and underground reservoirs.

Delaware receives about 43 inches of rain each year. Much of this is needed right where it falls, to provide a

drink for thirsty, growing crops and forest trees. We catch and hold a small portion of the run-off water in reservoirs, artificial lakes, and farm ponds. But it would be impossible to save all of it.

Much of the water that falls as rain runs into rivers, and eventually finds its way back to the ocean where it came from. Some is lost through evaporation, particularly in the hot, dry summer months. Some is held in natural lakes and ponds. Still more seeps into the ground where it is stored in natural, underground reservoirs made up of sand, gravel, and other rock materials.

Streams and underground reservoirs are our two major sources of fresh water. In order to know how much fresh water is available, we must keep records on streamflow and ground-water supplies. This is a continuous job. It is the primary task of the Delaware Geological Survey.



WHAT THE GEOLOGICAL SURVEY DOES

Locating and developing economical supplies of pure water involves the sciences of geology, geophysics, hydrology, mineralogy and paleontology. Sands, gravels and other rock materials serve as ground-water reservoirs. Open spaces between the grains of these materials provide storage space for water. Where are these natural reservoirs? How large are they? How deep? How much water do they contain? At what rate will they yield it? Where is the best place to drill a well? To find answers to these questions requires field and laboratory investigation. This is the job of your state Geological Survey.

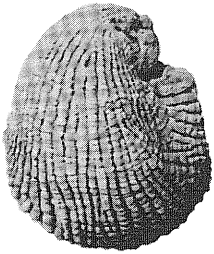
Take for example, the task of determining how extensive a particular underground reservoir is. The sand brought up by the drill may contain fossils of plants or animals which lived millions of years ago. If the sand brought up in other drillings over an area contains the same kinds of fossils, this would indicate the extent of the reservoir. Identifying the fossils is a specialized job in the field of paleontology. Someone on the Survey staff must be acquainted with this

science if it is to efficiently serve the citizens of Delaware.

On the other hand, suppose the sand contains no fossils. It is still possible to measure the extent of the reservoir by comparing the mineral content of drill samples over an area. Identifying and interpreting minerals in terms of their relationship to water supplies is another specialized job, this time for a mineralogist. And it is important that somebody on the staff of the Survey be familiar with this particular branch of science.

These established sciences, as well as new techniques and new equipment are employed in the continuous study of Delaware's water resources. The Survey is now using a combination electric and gamma ray logger to determine the presence and thickness of sands in drill holes, which in turn, may indicate the presence and extent of an underground reservoir. As additional tools and techniques are developed, the Survey will use them in its search for new sources of supply of the state's most important renewable natural resource—water.

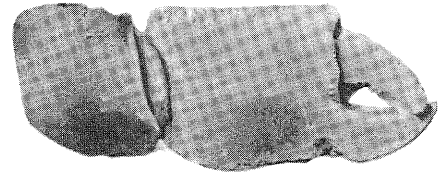
Fossils Aid the Geologist in Identifying Strata



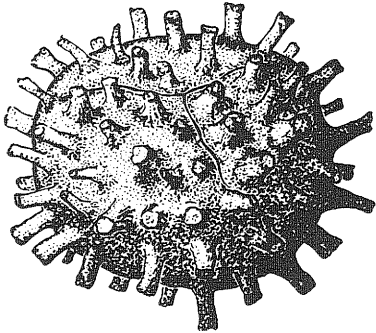
OYSTER



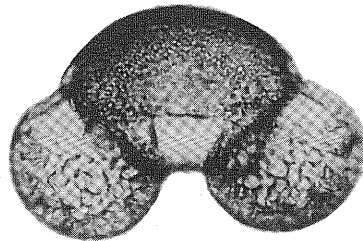
SNAIL



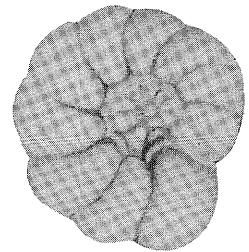
CRAB CLAW



SPORE



PINE POLLEN



FORAMINIFERA

THE SURVEY COOPERATES WITH OTHER GROUPS

In addition to the work described so far, the Delaware Geological Survey cooperates with other groups and agencies in studies and in providing services and making recommendations.

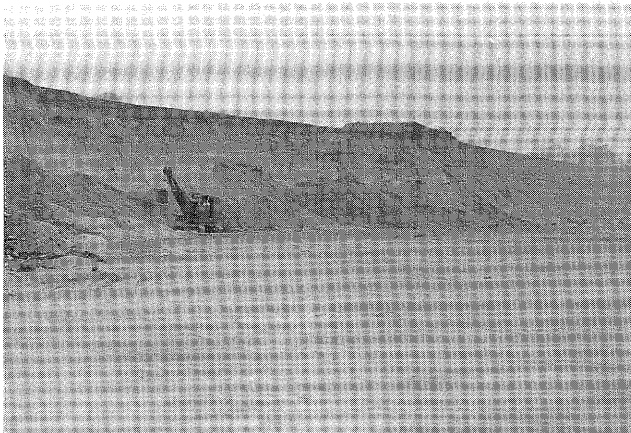
Studies of ground-water reservoirs and streams to determine "safe yield" are conducted in cooperation with the U. S. Geological Survey. Pump tests are made; rates of ground-water infiltration and water losses through evaporation are determined. With this information, it is possible to answer questions that a community might have such as: how much water can be developed safely and under what conditions? How far apart should wells be spaced to avoid shortages? How much water can be taken from streams? How large should storage reservoirs be?

Legal problems involved in water resources development sometimes are as complicated as the physical problems of finding the water. What are the rights of the downstream farmer when his upstream neighbor literally dries up a creek in irrigating his land? What are the rights of property owners when their wells dry up after a new factory begins pumping water from the ground nearby?

The Delaware Water Resources Study Committee is studying these and other problems in an effort to plan for the equitable administration of the State's water resources, which would consider not only the needs and interests of cities, towns, industries and agriculture, but those of navigation, recreation, fish and wildlife as well. The Delaware Geological Survey is cooperating with this committee by supplying information about water resources and other facts related to the geology of the state.

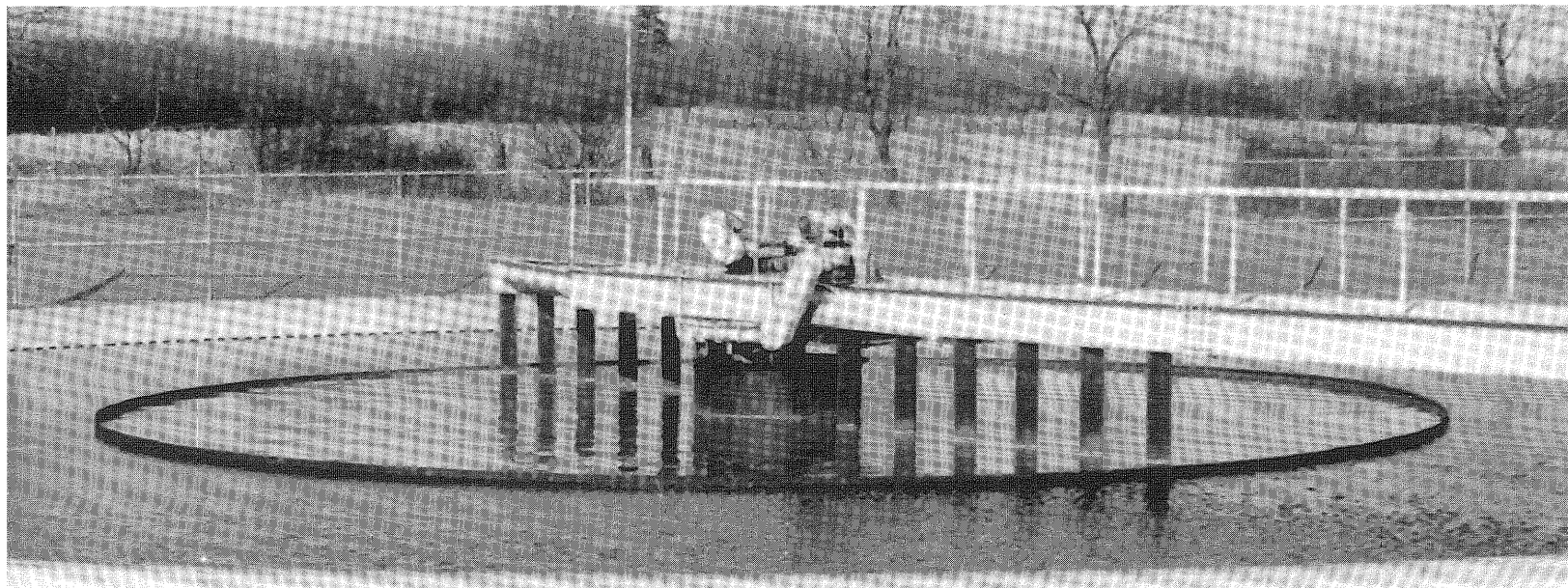
As a means of safe-guarding the Delaware River against excessive salinity, the State Geologist serves as representative to the River Master, appointed by the U. S. Supreme Court to watch over conditions in the river as they are influenced by the water supply of New York City, Pennsylvania and New Jersey.

The Survey also studies rock, sand and gravel deposits to determine whether or not they are suitable for highway building purposes. These studies have shown that there are considerable amounts of these materials in Delaware and that productive new quarries could be opened.



Surveys help locate sand and gravel deposits.

Many towns in Delaware are outgrowing their present water supplies and water storage facilities.



SERVICES TO THE PEOPLE OF DELAWARE

The services of the Geological Survey to the people of Delaware are of three main types—consultation, reports, and educational talks and discussions.

1 CONSULTATION ON WATER SUPPLIES AND OTHER GEOLOGICAL PROBLEMS:

The Survey staff is available for consultation on any water or geological problem you may have. The Survey has data on most areas of the state, and this information is available free.

To get information, write, phone, or better still, visit the

Survey office at the University of Delaware in Newark. Your state geologist will discuss the data with you and will make an interpretation of the available information as it relates to your problem.

2 REPORTS, MAPS, AND OTHER PUBLISHED MATERIAL RELATED TO THE GEOLOGY OF DELAWARE:

These publications are available without charge:

Bulletin No. 1 Ground-Water Problems in Highway Construction and Maintenance, by William C. Rasmussen and Leon B. Haigler, 1953

**Bulletin No. 2 Geology and Ground-Water Resources of the Newark Area, Delaware*, By Johan J. Groot and William C. Rasmussen, 1954

**Bulletin No. 3 Marine Upper Cretaceous Formations of the Chesapeake and Delaware Canal*, by Johan J. Groot, Donna M. Organist, and Horace G. Richards, 1954

Bulletin No. 4 Preliminary Report on the Geology and Ground-Water Resources of Delaware, by I. W. Marine and William C. Rasmussen, 1955

**Bulletin No. 5 Sedimentary Petrology of the Cretaceous Sediments of Northern Delaware in Relation to Paleogeographic Problems*, by Johan J. Groot, 1955

***Water Level Report No. 1 Water Levels and Artesian Pressures in Delaware—1952, by I. W. Marine, 1954**

***Water Level Report No. 2 Water Levels and Artesian Pressures in Delaware—1953, by D. H. Boggess and O. J. Coskery, 1954**

***Water Level Report No. 3 Water Levels and Artesian Pressures in Delaware—1954, by D. H. Boggess and O. J. Coskery, 1955**

Water Level Report No. 4 Water Levels and Artesian Pressures in Delaware—1955, by O. J. Coskery, 1956

***First Annual Report, 1951-1952**

Second Annual Report, 1952-1953

***Third Annual Report, 1953-1954 (Included in Bulletin No. 3)**

*On file in the Delaware Geological Survey office, but not available for general distribution.

Additional publications are being prepared, including a report on the water resources of northern Delaware, a report on the geology and ground-water resources of Sussex County, and a special report for the State Highway Department on rock, sand and gravel resources.

3

TALKS AND DISCUSSIONS ON WATER RESOURCES AND RELATED PROBLEMS:

Members of the Survey staff frequently are invited to give talks to service clubs and other groups about the water resources of Delaware. These invitations usually are

accepted in the spirit of bringing about a better understanding of the problems related to Delaware's water supply.

TEAMWORK AND THE JOB AHEAD

Delaware is going through a period of rapid population growth and industrial expansion. This will mean increasingly better living for the citizens of the state. But it also means that problems will arise, some of them related to water supply.

Ultimately these problems will have to be solved if the people of Delaware are to enjoy to the fullest, the better living that an expanding economy can afford. Solving these

problems will take teamwork—cooperative planning and effort by cities and town, industries, agriculture, public institutions, and state government.

Your Delaware Geological Survey, as a member of this team, already is at work on some of these problems, as it studies the state's water resources and makes recommendations for their efficient and economical development.

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