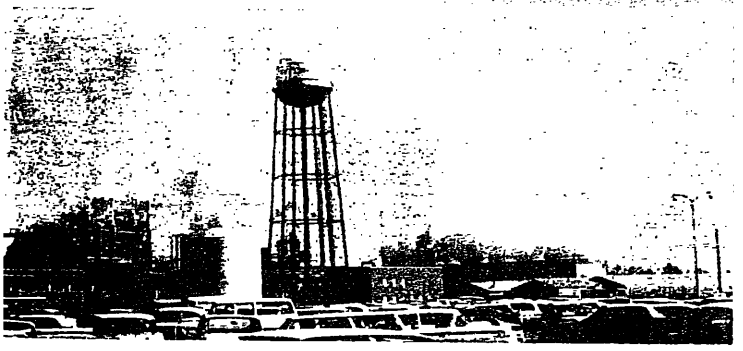
THE

PENSACOLA

AREA'S



WATER

Printed by the Florida Geological Survey
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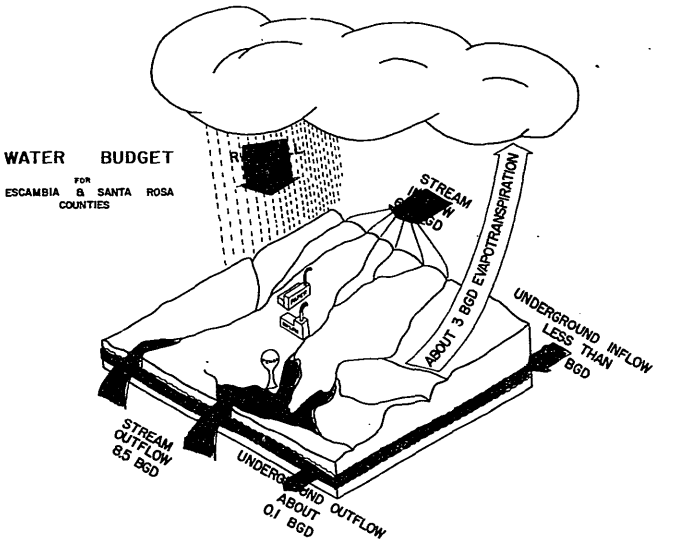

THE PENSACOLA AREA'S WATER

The Pensacola area is endowed with a vital and bountiful natural resource--WATER. The water is available in large quantities. It is easily obtained, is remarkably soft, and contains very small amounts of dissolved minerals. The quality of much of this water is far better than that required for public supplies and by many industries.

To explain the occurrence of this water we must look back into the geologic history of the area. For millions of years part of the Gulf coastal area has been sinking very slowly. This lowered area has been filled to depths of 300 to 1,000 feet with sand, gravel, and clay brought in by streams. The sand and gravel beds form a vast, highly productive water-bearing formation, or aquifer, that supplies almost all the wells and part of the streamflow in the area. This surficial sand-and-gravel aquifer is replenished continually by a bountiful rainfall, which totals more than 5 feet annually. As the rain water seeps underground to recharge the aquifer, it remains almost pure because the sand and gravel is quartz, which is not very soluble in water.

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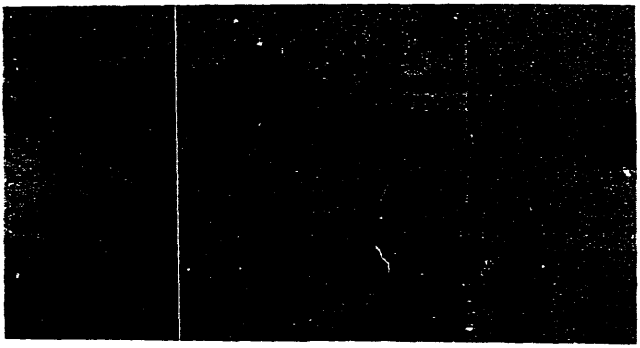
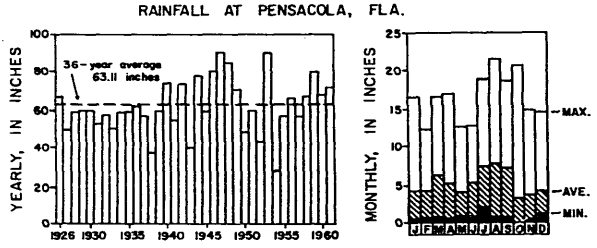


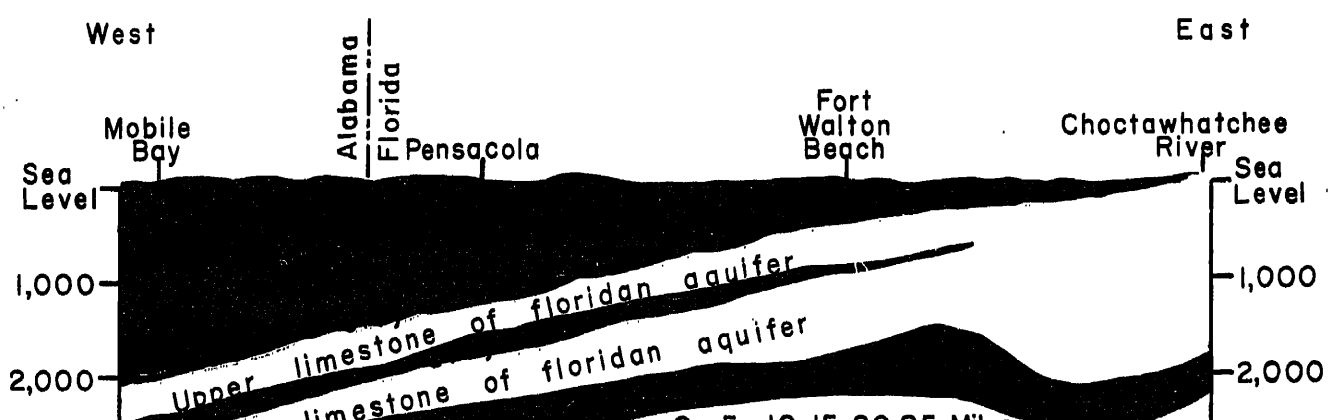
Industry, shipping, and recreation....There's plenty of water for all

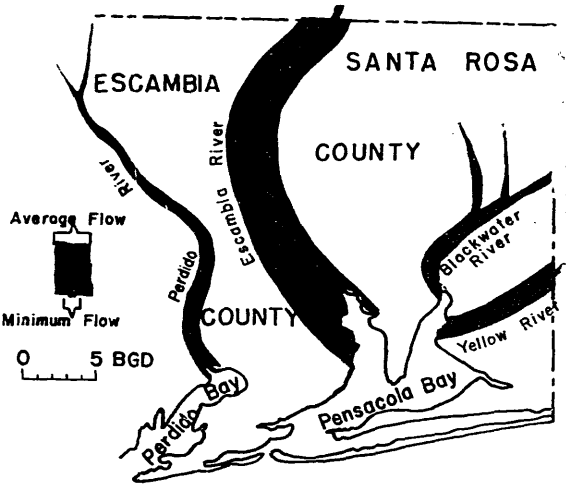
Two limestone formations of the extensive Floridan aquifer lie beneath the sand-and-gravel aquifer and contain large amounts of water. For several reasons, very little water is used from these limestones in the Pensacola area. They are deeper than the sand-and-gravel aquifer, the water contains more dissolved minerals, and the southern parts of the limestone aquifers contain salt water. However, these limestone aquifers lie waiting as a ready reserve of usable water.

The area receives fresh water from three sources--rain falling directly on the area, streams flowing in from adjacent areas, and flow through the underground system. Escambia and Santa Rosa counties receive an average yearly rainfall of 62 inches, which amounts to 5 billion gallons of water per day. Streams bring in 6½ billion gallons per day from adjacent areas. About 0.1 billion gallons per day of ground water flows underground into the Pensacola area through the aquifers that are fed by rain falling on the northern parts of



GEOLOGIC SECTION ALONG THE GULF COAST



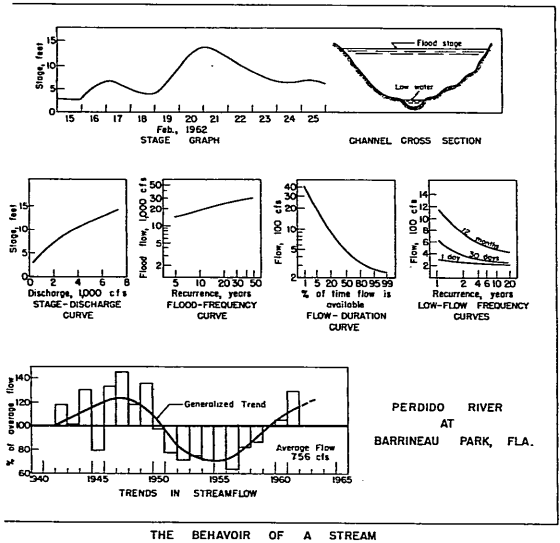


8.5 BGD Flows into Bays from 4 major Rivers

Escambia and Santa Rosa counties and southe Alabama. The sand-and-gravel aquifer, recharg by local rainfall, supplies most of the grou water being used.

About 3 billion gallons of water per d that falls as rain on Escambia and Santa Ro counties is returned to the atmosphere throu the processes of evaporation and transpirati (water given off by plants and trees). T billion gallons of this rain water enters t streams as overland flow or as seepage fr the ground and runs off into the estuaries. O a small part of the rain water leaves the ar as underground flow. Streams receive abc two-thirds of their flow from the ground, resulti in stable flows even during dry seaso

Although huge quantities of water are us every day, vast amounts remain untapped. M of the 87 million gallons of ground water use each day is taken from the sand-and-gravel aquifer in the southern half of the area. Also, in this area, water from streams is used for

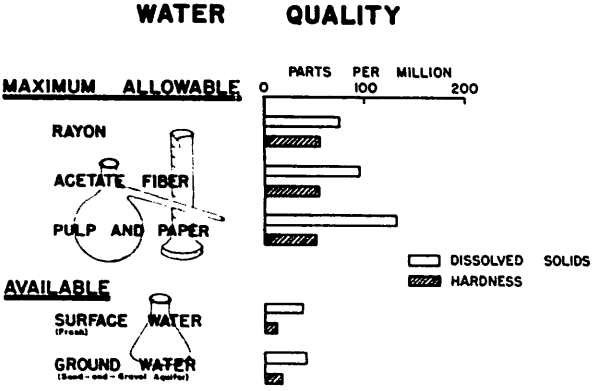


THE BEHAVOIR OF A STREAM

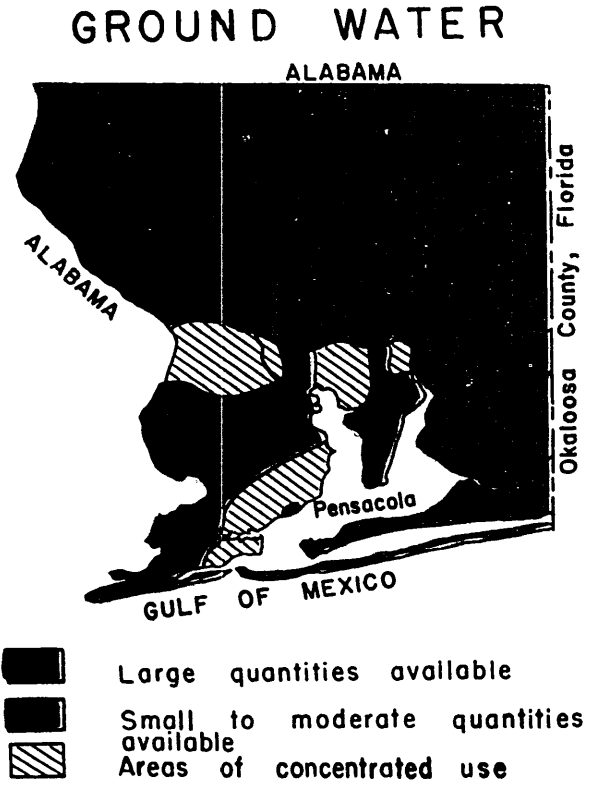
ooling and some wastes are discharged into ne rivers. Even so, the southern half of the rea still has much water that may be used. ensacola, as do other communities, derives s water supply from wells developed in the and-and-gravel aquifer.

Very little water is used in the northern alf of the area. Over a billion gallons of lear, soft water flow from the small tributary treams each day. Many of these streams offer xcellent possibilities for dams and reservoirs. eservoirs would increase the usable supply f the streams and also would make possible esirable and needed recreational areas.

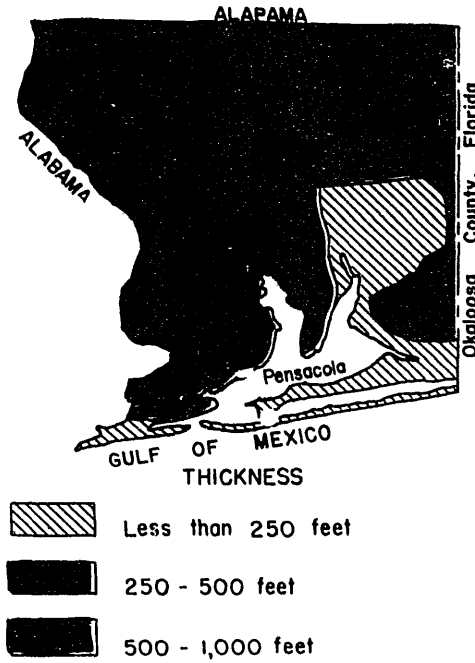
Reservoirs----Water can be stored



Are there any problems associated with developing and using this supply of water? There certainly are. If this water is unwisely developed or misused, problems will be multiplied many times over, both in number



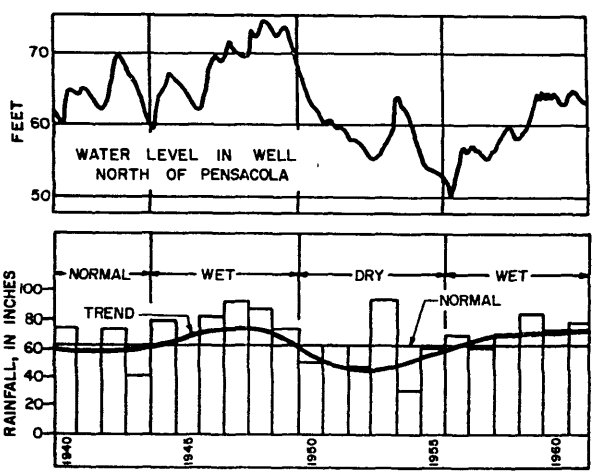
THICKNESS OF SAND-AND-GRAVEL AQUIFER



and severity. At best works of man frequently have detrimental effects on our water resources.

Two abuses of water supply, which can be disastrous, are excessive use and pollution. In an ideally developed water supply there is a balance between supply and demand. That is, the water is not being used at a greater rate than it is being replenished by nature. Often times excess use brings pollution or contamination such as that which results from salt-water encroachment. In several areas around Pensacola, excessive pumping has lowered the level of fresh ground water and allowed salty water to move in. In some areas, ponded industrial wastes may seep underground and contaminate water wells and streams.

Many years are required for a ground-water supply to freshen after it has been contaminated by salt water. It also takes many years of diligent effort and large sums of money to clean up a stream after it has been used as a receiver of excessive wastes. Limestone aquifers near the coast contain salty water; however, they offer possibilities of being used for disposal of industrial waste.

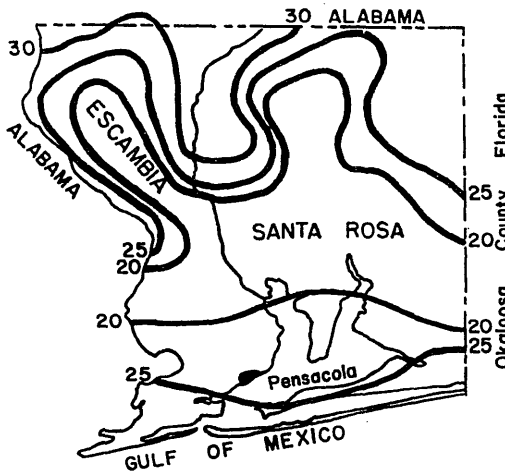


GROUND WATER AND RAINFALL NEAR PENSACOLA

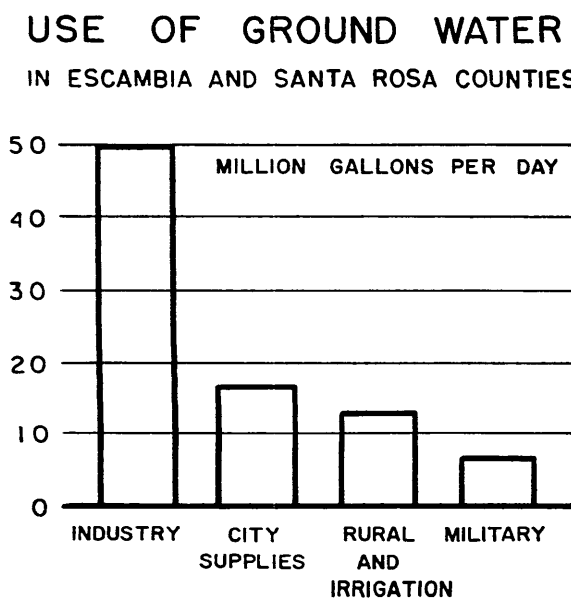
HOW WAS THE WATER RESOURCE MEASURED?

A community must know the answers to many questions in order to plan orderly industrial and urban expansion. What are the sources of water? How much is available? How does the supply fluctuate? What is the quality of the water? What are the effects of use on quantity and quality? There must be a planned program of investigation to answer these and many other questions pertaining to water resources.

Such a study was completed in 1962 by the U.S. Geological Survey with financial cooperation from the Florida Geological Survey, the City of Pensacola, Escambia County, and Santa Rosa County.



MINERAL CONTENT
(Parts per million)
SAND - AND - GRAVEL AQUIFER



Mapping and measuring water-bearing formations: One can only imagine the confusion that would exist if there were no maps or plans of Pensacola's water works showing the source of water and the location and size of the underground pipe system. Community life might go smoothly until a break in a line occurred or an expansion of this system was necessary to take care of a population increase. At that time many questions would have to be answered before progress could be made, some of which are: Where are the pipes? Are they large enough to allow for the expansion? How long has the system been here? Do the pipes leak? From where does the water come and in what amounts?

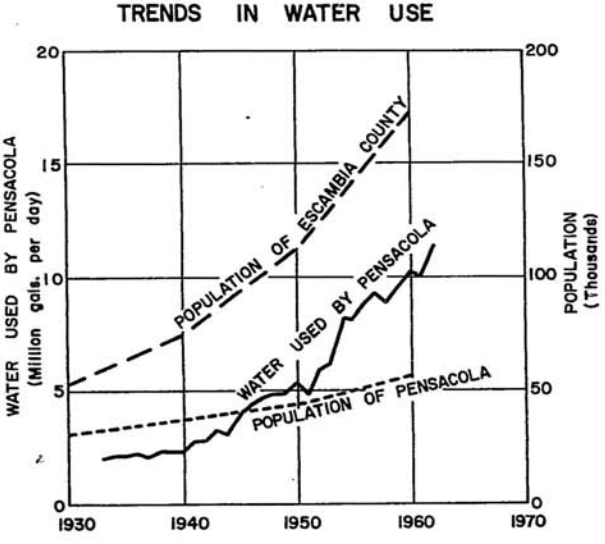
In the case of the natural water resource system that serves a complex industrial society these questions are multiplied many times. The earth structure serves both as a storage reservoir and as a distribution system. This structure is mapped by piecing together information from many sources. The services of experienced geologists, engineers, and chemists are necessary

Cooling towers conserve water by re-use

288-ft well yields 1,300 gpm from sand-and-gravel aquifer with 23-ft drawdown

to identify and measure the extent and water-bearing characteristics of the materials that make up the earth structure.

Most geologic information is obtained from wells. Existing wells must be studied and tested, test wells drilled and logged, drill cuttings examined, water samples analyzed chemically, and water levels measured. Much information is gained by observing the reaction of ground-water levels to rainfall and to pumping. When a well is pumped the water level underground lowers



Measuring equipment

to form a depression, similar in shape to a cone. The rate and amount of this lowering while the well is being pumped at a measured rate and the rate at which the water level recovers after pumping ceases is a measure of the ability of the formation to transmit and store water.

The behavior of a stream: All physical aspects of a stream must be measured several times during a period of years to determine how much water it carries, to ascertain its fluctuations and to determine the quality of the water. The stage of a river is changing continually. It is either rising or falling. Infrequently and for short periods it may be relatively stationary. This fluctuation of a stream has to be measured and recorded continuously for the period of study. Flow measurements are made throughout the range in stage to define the stage-discharge relation. Using the continuous record of stage and the stage-discharge relation, a continuous record of flow is computed. From an adequate record of basic flow data, several essential and useful tools can be produced, such as, flood frequency curves, low-flow frequency curves, flow duration curves, and graphs indicating long-term trends.

Variations in mineral content of water: Samples of water taken daily or sometimes at less frequent but regular intervals are analyzed to determine the seasonal variations in surface water. Ground water is studied by sampling several wells, but often only one analysis per

well is needed. Maps showing mineral content of the water in an aquifer may be prepared from these analyses. In areas of suspected contamination, ground water must be analyzed regularly to determine changes in mineral content.

Additional information on the water resources of the Pensacola area is contained in the following reports of Florida Geological Survey, prepared under the cooperative program with the U.S. Geological Survey:

Interim Report on the Water Resources of Escambia and Santa Rosa Counties, Florida: Fla. Geol. Surv. Inf. Circ. No. 30, by R.H. Musgrove, J.T. Barraclough, O.T. Marsh.

Aquifers and Quality of Ground Water along the Gulf Coast of Western Florida: Fla. Geol. Surv. Rept. of Inv. No. 29, by J. T. Barraclough and O. T. Marsh.

Relation of Bucatunna Clay Member (Byram Formation, Oligocene) to Geology and Ground Water of Westernmost Florida: Geol. Soc. America Bull., v. 73, p. 243-252, by O.T. Marsh.

These reports are available in many libraries and the following offices:

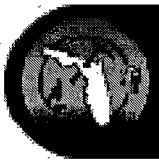
Florida Geological Survey
P.O. Box 631
Tallahassee, Florida

U.S. Geological Survey
244 Federal Building
Ocala, Florida

U.S. Geological Survey
P.O. Box 2315
Tallahassee, Florida

TEXT PREPARED BY:

Musgrove, R.H.; Barraclough, J.T.; and Grantham, R.G., U.S. Geological Survey.



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