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REPORTS OF INVESTIGATIONS—SELECTED REFERENCES

Selected references on water resources in Florida are listed below; many of them are available for inspection at one of the offices listed on the title page, at Geological Survey offices in Miami, Tallahassee, Tampa, Orlando, and Jacksonville, at Water Management District offices in West Palm Beach, Brooksville, Palatka, Tallahassee, and White Springs, and at larger public and university libraries. The publications are grouped as follows: (1) U.S. Geological Survey publications that can be obtained from the Geological Survey or purchased from the National Technical Information Service (NTIS), and (2) reports prepared by the Geological Survey in cooperation with various State and local agencies and published by the Florida Bureau of Geology and which can be obtained from that agency. New reports are announced monthly in "New Publications of the Geological Survey." Subscriptions to the monthly list are available free upon request to the U.S. Geological Survey, 329 National Center, Reston, VA 22092.

PUBLICATIONS OF THE U.S. GEOLOGICAL SURVEY

Professional papers, water-supply papers, and bulletins are sold by the U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202 (authorized agent of the Superintendent of Documents, Government Printing Office). Circulars are free upon request to the U.S. Geological Survey, National Center, Reston, VA 22092. Water-resources investigations folders (similar to this one) for each of the 50 States and Puerto Rico also are free upon request. Hydrologic investigations atlases, hydrologic unit maps, and other maps pertaining to Florida are sold by the U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Records of streamflow, ground-water levels, and quality of water have been published for many years as Geological Survey water-supply papers (WSP). Beginning with the 1975 water year, however, these series were replaced by a new publication series, "U.S. Geological Survey Water-Data Reports." This new series combines under one cover for each State: streamflow data, water-quality data for surface and ground water, and ground-water-level data from the basic network of observation wells. For Florida the title will be "Water Resources Data for Florida—Water Year 1975: U.S. Geological Survey Water-Data Report FL-75-1 and FL-75-2." Other publications series of general interest also are explained below. Further information on these publications can be obtained from the District Chief, Water Resources

Streamflow records,—Records of daily flows of streams prior to 1971 were published in the water-supply paper series "Surface Water Supply of the United States," which was released in numbered parts as determined by natural drainage basins. Until 1961 this was an annual series; monthly and yearly summaries of these data were compiled in two reports: "Compilation of Records of Surface Waters of the United States through September 1950" and Compilation of Records of Surface Waters of the United States, October 1950 to September 1960." For the period 1961-70, 5-year compilations were also published. Data for Florida are published in Part 2B. Daily streamflow records also were published on a State-boundary basis during the period 1961-74; these reports are listed in this folder by subject "Water Resources Data." Ground-water records,—Ground-water levels and artesian pressures in observation wells prior to 1975 were reported by geographic

areas in a 5-year water-supply paper series. Data for Florida are in "Ground-Water Levels in the United States, Southeastern

Quality-of-water records.—Data on quality of surface water prior to 1971 were published annually in the water-supply paper series "Ouality of Surface Waters of the United States," which also was released in numbered parts as determined by natural drainage basins. Data for Florida are in Parts 1 and 2. For water years 1964-74, these data also were released annually on a State-boundary

Methods for estimating the magnitude and frequency of floods for selected streams are given in the water-supply paper series "Magnitude and Frequency of Floods in the United States," which is composed of reports released in parts by drainage basins; data for Florida are in Part 2B. At present, the Geological Survey also is outlining flood-prone areas on topographic maps as part of a nationwide Federal program for managing flood losses. Maps of urban areas with flood problems are being extracted from these topographic maps and are published as pamphlets. In Florida, 965 topographic maps and 1 urban-area pamphlet have been completed. Information on these maps and pamphlet is available from the District Chief, Water Resources Division, at the address shown on the cover of this folder.

The U.S. Geological Survey's Annual Report provides a comprehensive description of the Federal Government's largest earth-science agency; copies are available for fiscal years 1975, 1976, and 1977. Summaries of research in progress and results of completed investigations are published each fiscal year in the professional paper (PP) series "Geological Survey Research," Recent editions are: fiscal year 1974, PP900; 1975, PP975; and 1976, PP1000. A more complete State List of reports of the U.S. Geological Survey is given in the pamphlet "Geologic and Water-Supply Reports and Maps-Florida." Summary statements about the immediate national water situation are presented in the "Water Resources Review," which is issued monthly. The State List and the Review may be obtained free upon application to the U.S. Geological Survey, 420 National Center, Reston, VA 22092. Indexes to the "Catalog of Information of Water Data" are available free from the Office of Water Data Coordination, U.S. Geological Survey, 417 National Center, Reston, VA 22092. Current editions are as follows: (1) Station listings for streamflow and stage, quality of surface water, and quality of ground water, 1974 [21 volumes by water-resources regions—stations in Florida are listed in volume 3 (South Atlantic-Gulf Region)]; (2) Index to areal investigations and miscellaneous water-data activities, 1970 [one volume]; and (3) Index to ground-water stations, 1968 [one volume]. An index to stations in coastal areas also is available; Florida stations are listed in the Gulf Coast

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Published reports can be obtained from the Chief, Florida Bureau of Geology, 903 West Tennessee Street, Tallahassee, FL 32304. U.S. Geological Survey water-resources investigations reports and open-file reports are available for consultation in the Florida District Office, Water Resources Division, U.S. Geological Survey, 325 John Knox Road, Suite F-240, Tallahassee, FL 32303; information on their availability also may be obtained from the District Chief at the above address. In addition those reports having an alpha-numeric designation in parenthesis at the end of citation may be purchased as hard copy or microfiche from National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161. These numbers are required when ordering from NTIS. Reports are listed under alphabetically arranged subjects or by counties.

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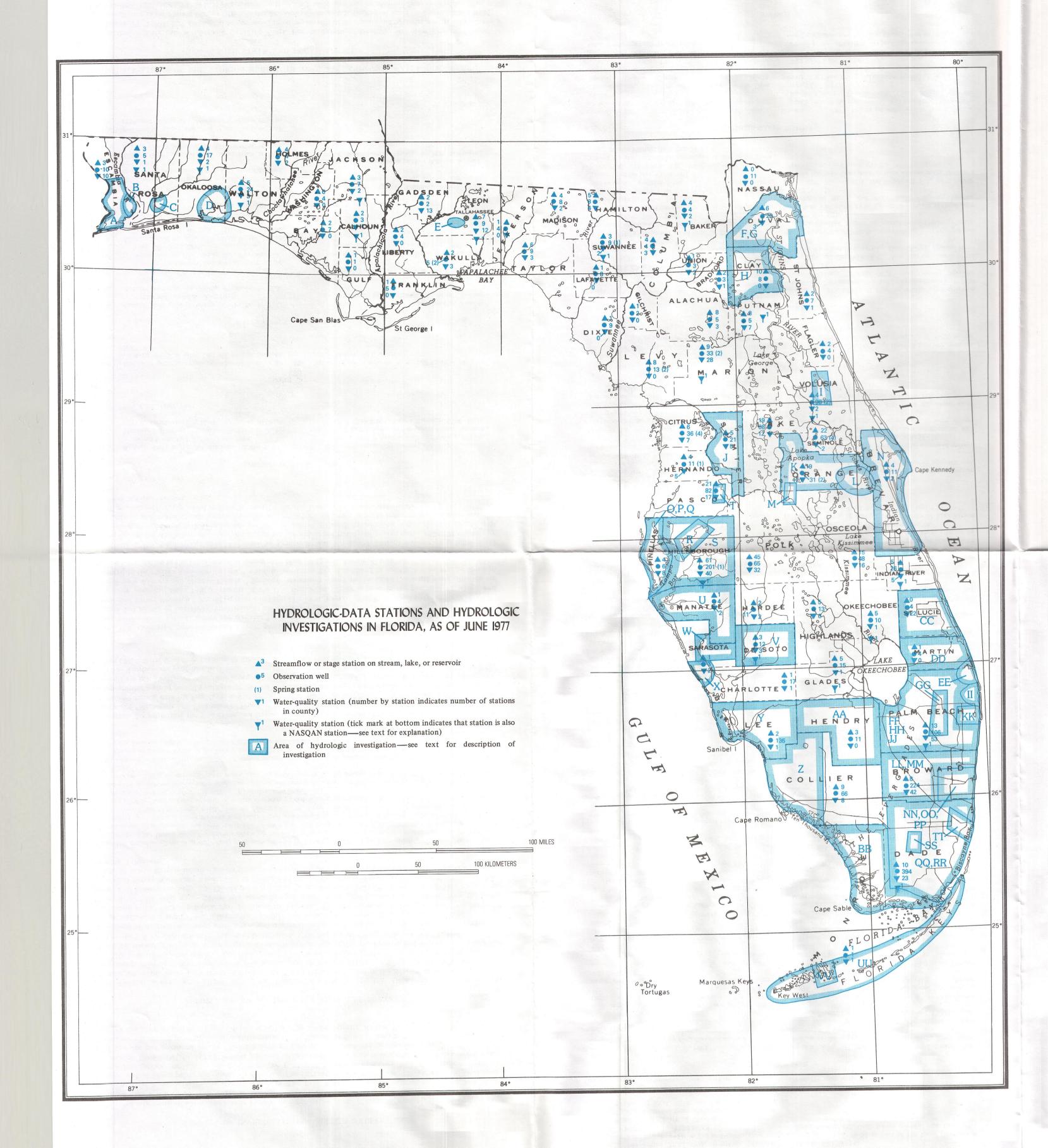
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WATER-RESOURCES INVESTIGATIONS IN FLORIDA, 1977

INTRODUCTION

The U.S. Geological Survey, through its Water Resources Division, investigates the occurrence, quantity, quality, distribution, and movement of the surface and underground waters that compose the Nation's water resources. It is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. This nationwide program, which is carried out through the Water Resources Division's 46 District (State) offices and 4 Regional offices, consists of the collection of basic hydrologic data, areal resource appraisal and interpretive studies, research projects, and the analysis and dissemination of the data and results of its investigations. Much of the work is a cooperative effort in which planning and financial support are shared by State and local governments and other Federal agencies. The Geological Survey also is responsible for the coordination of specific water-data acquisition activities by other Federal agencies. Information on these activities is consolidated into a central file known as the "Catalog of Information on Water Data," which is maintained by the Geological Survey. Many State and local agencies and private organizations that have related water-data acquisition activities also contribute information to this catalog. Indexes to the catalog are published at selected intervals.

This folder contains a brief description of the water-resources investigations in Florida in which the Geological Survey participates and a list of selected references. The map shows the location of hydrologic-data stations and the extent of the hydrologic investigations. Additional or more detailed information can be obtained from the District Chief, Water Resources Division, in Tallahassee, Fla.

COOPERATORS

In Florida, various parts of the Geological Survey program are conducted in cooperation with: Broward County Environmental Quality Control Board, East Central Florida Regional Planning Council, Englewood Water District, Florida Department of Environmental Regulation, Florida Department of Transportation, Florida Division of Parks and Recreation, Florida Keys Aqueduct Authority, Florida Game and Fresh Water Commission, Lake Worth Utilities Authority, Lake County Water Authority, Loxahatchee Environmental Control District, Manasota Basin Board, Northwest Florida Water Management District, Old Plantation Water Control District, Reedy Creek Improvement District, St. Johns River Water Management District, South Florida Water Management District, Southwest Florida Water Management District, Suwannee River Authority, Suwannee River Water Management District, U.S. Air Force, U.S. Army Corps of Engineers, U.S. Bureau of Land Management, U.S. Department of Housing and Urban Development, U.S. Environmental Protection Agency, U.S. Forest Service, U.S. National Park Service, U.S. Navy, Winter Haven Lake Region Boat Course District, Windermere Water and Navigational Control District, the following counties-Brevard, Broward, Clay, Collier, Dade, Escambia, Gadsden, Hendry, Hillsborough, Lake, Lee, Manatee, Marion, Martin, Monroe, Orange, Palm Beach, Pinellas, Polk, Sarasota, Seminole, Sumter, Volusia, Walton; and the following cities-Boca Raton, Bradenton, Clearwater, Cocoa, Deerfield Beach, Fort Lauderdale, Gainesville, Hallandale, Highland Beach, Hollywood, Jacksonville, Juno Beach, Miami, Miami Beach, Pensacola, Perry, Pompano Beach, Riviera Beach, St. Petersburg, Sarasota, Tallahassee, Tampa, Tequesta, and West Palm Beach.

HYDROLOGIC-DATA PROGRAM

Hydrologic-data stations are maintained by the Geological Survey at selected key locations throughout Florida to constitute a basic-data network for obtaining records on stream discharge or stage, reservoir and lake storage, ground-water levels, spring discharge, and the quality of surface and ground water. Every year stations are added and others are terminated; thus, the Water Resources Division has both a current and a historical file of hydrologic data. All data collected are stored in the Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) and are available upon request to water planners and others involved in making decisions affecting the State's water resources. These data can be retrieved in machine-readable form or in the form of computer-printed tables or graphs, statistical analyses, and digital plots. Local assistance in the acquisition of services or products from WATSTORE can be obtained from the District Chief, Water Resources Division, in Tallahassee. For information on data reports that are published periodically as part of this program see the "Selected References" section of this folder.

SURFACE WATER

Surface-water discharge (streamflow) and stage (water level) and water-quality data are collected for general hydrologic purposes such as assessment of water resources, areal analysis, determination of long-term trends, research and special studies, or for management and operational purposes. Discharge and stage data currently are being obtained at the number of stations given in the following table.

Station classification		Number of stations
Stream stations		663
Continuous record:	219	
Discharge and stage		
Stage only	120	
Partial record:		
Peak (maximum) flow only	61	
Low (minimum) flow only	101	
Peak and low flow	162	
Lake and reservoir stations		218
Stage and contents	3	
Stage only	215	
		001

Shown on the map are only those stream stations with continuous record of discharge and stage and lake stations. Water-quality data are obtained at 800 of the surface-water stations listed in the preceding table and also at 119 other surface-water sites where discharge and stage are not measured routinely. These stations are used to monitor the quality of surface water in Florida. Some of these stations also are part of a U.S. Geological Survey nationwide network known as the National Stream Quality Accounting Network (NASQAN), which is used to detect nationwide trends in water quality. The types of data determined at these sites are given in the following table. Inasmuch as several types of data may be determined at a particular site, and not all types of data are determined at each site, the number given in the following table will not equal the total number of sights given earlier.

Data classification	sites
Physical data:	
Water temperature	745
Specific conductance	364
pH	179
Sediment data	74
Chemical data:	297
Inorganic constituents	
Organic constituents Pesticides 98	335
Radiochemical data	15
Biological data	237

The map shows the distribution of stations for which data on organic constituents and pesticides are being collected.

GROUND WATER

Water level in wells, discharge of springs, and water-quality data are key parameters for monitoring ground-water trends; however, they must be integrated with other observations and ground-water system studies in order to have the fullest meaning and usefulness. A basic network of observation wells is maintained in Florida for monitoring fluctuations in water levels. Other wells known as "project wells" are used for specific (generally short-term) studies and, although they are not part of the basic observation-well network, data obtained from them also are available. The number of wells and springs currently being measured are given in the following table.

Station classification	Number of stations
Observation wells:	
Levels	2,144
Project wells	1,901
Springs (discharge)	21
[25] [25] [25] [25] [25] [25] [25] [25]	

Shown on the map are the basic network observation wells and the spring stations. Water-quality data are obtained at 801 of the observation and project wells and 21 of the springs listed in the receding table. The types of data determined at these sites are listed in the following table. The numbers given in the following table will not equal the total number of sites inasmuch as several types of data may be determined at a single

Data classification	Wells	Springs
Physical data:		
Water temperature	801	21
Specific conductance	801	16
pH	288	7
Chemical data:		
Inorganic constituents	326	11
Organic constituents	93	17
Biological data	147	13

The map shows wells for which data on organic constituents are being collected.

HYDROLOGIC INVESTIGATIONS

Hydrologic investigations include areal resource appraisals, data collection other than that which is part of the Hydrologic-Data Program, and research activities. Current investigations in Florida are listed below; generally, the areal investigations are outlined on the principal map and the statewide and topical investigations are not.

DISTRICT PROJECTS (These projects are under the direction of the Florida District Chief)

SHOWN ON MAP

- Water resources, Pensacola area. To determine the quality and quantity of water available from the sand-and-gravel aquifer, and to provide a basis for predicting the movement of contaminants.
- Waste fluid injection wells, Pensacola area. To evaluate some of the hydrologic and geochemical effects of acidic industrial wastes on a limestone
- Deep wells for waste injection, Santa Rosa County. To evaluate the hydrology and geochemistry of the saline aquifer system and the fate of injected liquid
- Hydrology, Ft. Walton area. To determine the effects on the Floridan aquifer water levels by various pumping patterns or by a
- connector-well system on water levels, or by limiting or reducing pumping rates. Spraying treated effluent, Tallahassee.
- To assess the hydrochemical effects of sewage effluent disposal on land by spray irrigation. Water resources, Duval County.
- To evaluate the potential water resources and to monitor changes in the quality and quantity of ground and surface waters.
- To determine the yield, transmissivity, storage coefficient, and recharge potential of the shallow aquifers.
- Water resources, Clay County. To describe and make a preliminary assessment of the surface- and ground-water resources in the county. Hydrology, central Volusia County.
- To provide management with information necessary for the withdrawal of water from central wetlands by the most beneficial method.
- Water resources, Jumper Creek area. To describe the general surface-water hydrology of this watershed, in west-central Sumter County. Water resources, Orange County.
- To evaluate the water resources with emphasis on areas of natural and artifical recharge and the disposal of liquid waste by deep wells.
- Hydrology, Cocoa well field. To investigate interconnection between the fresh and salty zones of the Floridan aquifer in the well field.
- Urban hydrology, Bay Lake area. To evaluate hydrologic effects being brought about by the urbanization of virgin territories.
- Hydrology of the shallow aquifer, Brevard County. To evaluate the potential yield of existing well-field area and two areas in northern Brevard. Subsurface liquid-waste disposal, Pinellas County.
- To determine if transmissive zones exist at depth on the peninsula and whether or not these zones can safely dispose of waste-treatment plant effluent. Subsurface storage of storm and waste waters, Pinellas County.
- Geohydrology of landfill area, Pinellas County. To determine the effects on water resources of land disposal of solid waste in a coastal area having a high
- water table overlying a limestone aquifer. Water-supply assessment, Hillsborough River. To make an areal water-supply assessment of the Hillsborough River basin under both current and future

To determine the hydrological effects of injecting storm runoff and waste-treatment plant effluent on the

- S. Solid-waste disposal, Hillsborough County.
- To determine the effects on water resources of landfill operations in sandy areas with a high water table overlying a limestone aquifer. Ground-water use, Dade City area, Pasco County.
- To evaluate the effect of pumpage on ground-water levels, the hydraulic characteristics of the Floridan aquifer, and the potential for additional yield from the aquifer.
- Hydrology, Manatee County. To establish an adequate hydrologic data base to permit evaluation of regional effects of development on the hydrologic system.
- V. Geohydrologic studies, DeSoto County. To evaluate the aquifer system and test hydrologic conditions and to determine effects associated with
- artificial recharge to the artesian aquifer. W. Hydrology, west-central Sarasota County.
- To assess areas suitable for the development of public water supplies and monitor effects of sanitary landfills on the shallow aquifer.
- X. Urban hydrology, Englewood area, Sarasota County. To monitor the fluctuations in water level and in chemical quality of water in the area.
- Water resources, Lee County. To delineate potential water-supply sources and to provide data necessary to reclaim contaminated
- sources of supply. Water resources, western Collier County. To delineate areas of potential water sully and to monitor salt-water movement.

- AA. Water resources, Hendry County. To provide adequate information on the water resources for future development and effective water
- BB. Hydrologic studies, Everglades National Park. To determine historical and present water conditions in the Park and to evaluate ecological changes taking
- CC. Water resources, St. Lucie County. To provide information on the water resources so that management may protect hydrologically and
- ecologically sensitive areas. DD. Water resources. Martin County.
- To evaluate the general water resources of the county with emphasis on salt-water encroachment and effects of urbanization. EE. Water resources, Tequesta
- To evaluate the hydrogeology and water quality of the shallow aquifer as a potential source of water FF. Water resources, Palm Beach County. To describe and assess the availability of additional potable ground-water supplies for coastal and inland
- GG. Hydrology of sandy flatlands, Palm Beach County.
- To evaluate the water resources of the Sandy Flatlands and to determine potential problems resulting from an increase in land development. HH. Hydrology of a shallow aquifer, Palm Beach County.
- To define the areal extent, thickness, and hydraulic characteristics of the high permeability zone and to determine the impact of waste disposal leachates on the ground-water system. II. Hydrology, Riviera Beach area.
- To investigate and define the aquifer system and to determine the movement of leachate from a sanitary
- JJ. Injecting liquid wastes in a saline aquifer, West Palm Beach. To provide information necessary for the evaluation of the potential use of a deep saline aquifer for waste
- disposal or storage.
- KK. Ground-water resources, Lake Worth area. To determine the extent, thickness, and water-yielding characteristics of various zones in the shallow
- ground-water system.
- To provide the hydrologic base necessary for intensive management of the water resources of the area. MM. Ouality-of-water studies, Broward County.
- To monitor and evaluate changes in water quality in the primary canal system and the Biscayne aquifer.
- NN. Hydrologic studies, Ft. Lauderdale area. To monitor salt-front and to evaluate the availability of water supplies in central Broward County.
- OO. Ground-water availability, Hallandale area. To evaluate potential areas of water supply and to monitor salt-water intrusion.
- Ground-water availability, Hollywood area. To delineate the areas with the best potentials for the development of ground-water supplies.
- Hydrologic studies, Dade County. To prepare an annual report summarizing hydrologic conditions in Dade County and evaluate salt-water
- encroachment conditions. RR. Storage of fresh water in a saline aquifer, Dade County. To evaluate the hydrologic and geochemical factors pertaining to the storage of fresh water in saline
- aquifers underlying southeast Florida. SS. Interior well field sites, Dade County.
- To evaluate various areas for potential water supplies and to develop analog models to simulate effects of large withdrawals. TT. Infiltration study, Miami Canal.
- To determine the effects of bottom sediments on infiltration rates and on water quality.
- UU. Ground water for desalinization, Florida Keys. To collect data on wells which will help define the availability of brackish water in the Floridan aquifer in
- VV. Fresh-water resources, Big Pine Key. To determine the volume of fresh water in a shallow aquifer during various seasons and to determine the areal boundaries of the aquifer.

NOT SHOWN ON MAP

- Bridge-site studies, statewide. To provide the State Department of Transportation bridge designers with sufficient hydraulic data for the safe
- and economic design of waterway structures. Hydrologic studies, statewide. Short-term special studies including water use, stresses on hydrologic systems, deep-well waste injection, and
- salt-water intrusion. Salt-water studies, Dade County.
- To evaluate salt-water encroachment for existing hydrologic conditions and predict movement of salt water for future conditions. Map representation of hydrologic data, statewide.
- To prepare a series of map reports designed to portray generalized hydrological, geological, and related
- Lake hydrology, statewide. To develop a basic understanding of the nature and causes of lake-level fluctuations and to participate in
- hydrologic investigations involving lakes. Environmental studies, statewide To determine the overall quality of Florida surface and ground waters in relation to controlling environmental
- and geochemical factors. Flood studies in small basins, statewide. To define regionally the magnitude and frequency of floods on selected drainage areas in Florida of less than
- about 20 square miles. River basin modeling, west-central Florida.
- To determine frequency under both current and anticipated levels of development and evaluate digital streamflow models for use in the study.
- To provide the scientific information needed for planning-management decisions on the potentialities and possible consequences of subsurface waste storage.
- Potentiometric mapping and well-field hydrology, west-central Florida. To prepare potentiometric maps of the Floridan aquifer and to evaluate the hydrologic characteristics of
- potential well-field areas. Flood hazard mapping, statewide.
- To prepare flood-prone area maps of the entire State on the topographic 7½-minute quadrangle maps. Hydrology of lakes, west-central Florida.

Subsurface storage of liquid waste, statewide.

- To provide a definitive hydrologic description of specific lake basins.
- Estuarine hydrology, Tampa Bay. To provide background information on hydrodynamics, water quality, sediment quality, bottom configuration,
- and other related factors in Tampa Bay. Water-supply potential, Green Swamp area, central Florida.
- To determine the hydrologic characteristics of the aquifer system and to evaluate potential ground-water withdrawals against surface-water retention and land-use practices.
- Quality of storm water, south Florida. To determine storm-water runoff loads for a wide variety of environmentally important water-quality
- Urban hydrology, Tampa Bay area. To establish an urban runoff data base for the study area including streamflow, physiographic, climatic, and chemical quality of water data.
- Aquifer modeling, west-central Florida. To determine by aquifer modeling the effects of large ground-water withdrawals on the potentiometric surface of
- the Floridan aquifer in west-central Florida. Aquifer mapping, south Florida. To prepare a series of maps showing hydrologic data for the aquifers which are being utilized or which have
- Hydrology, Ochlockonee River basin, northwest Florida. To evaluate the total water resources of the basin through the development of quantitative and qualitative data.
- Hydrology, Santa Fe River basin, north Florida. To evaluate the total water resources of the basin through the development of quantitative and qualitative data. Aguifer characteristics, west-central Florida.
- To conduct controlled aquifer and specific capacity tests on a continuing basis and to evaluate the aquifer
- Remote hydrologic-data acquisition, west-central Florida. To acquire, test, and evaluate a telemeter system composed of one satellite and one landline telemeter. Geohydrology, Osceola National Forest, north Florida.
- To evaluate effects of possible phosphate mining on water resources of Osceola National Forest. Low flow of streams, northwest Florida.
- To provide data on which water-management decisions can be made as they relate to the adequacy of low flows as a source of water supply for various purposes.
- Regional flood-frequencies, west-central Florida. To develop regional flood-frequency information for the Southwest Florida Water Management District.
- Water-use inventory, statewide.
- To provide water-use information for the various categories on an annual basis.
- Summary reporting of hydrologic conditions, west-central Florida. To prepare annual reports providing hydrologic information for planning, management, and regulation of water
- resources by the Southwest Florida Water Management District. Modeling of Loxahatchee River, south Florida. To identify the route of travel of treated waste water and to design a water-quality monitoring network for the
- ground-water system. Technical support of Water Management Districts, statewide.
- To provide the staffs of the Management Districts with expertise, advice, and on-the-job training in the fields of ground-water, surface-water, and water-quality hydrology.

RESEARCH AND REGIONAL PROJECTS (These projects are under the direction of the Assistant Chief Hydrologist for Research and Technical Coordination, Reston, Va.)

NOT SHOWN ON MAP

Summary appraisals of the Nation's ground-water resources. Summary of the distribution, availability, and quality of ground water and its importance in the water supply of 21 water-resources regions. Florida is located in the South Atlantic-Gulf Region (Project Chief: D.J. Cederstrom).