U.S. GEOLOGICAL SURVEY
WATER RESOURCES ACTIVITIES IN FLORIDA, 1986-87

BY MILDRED E. GLENN, EDITOR

U.S. GEOLOGICAL SURVEY
OPEN-FILE REPORT 87-244

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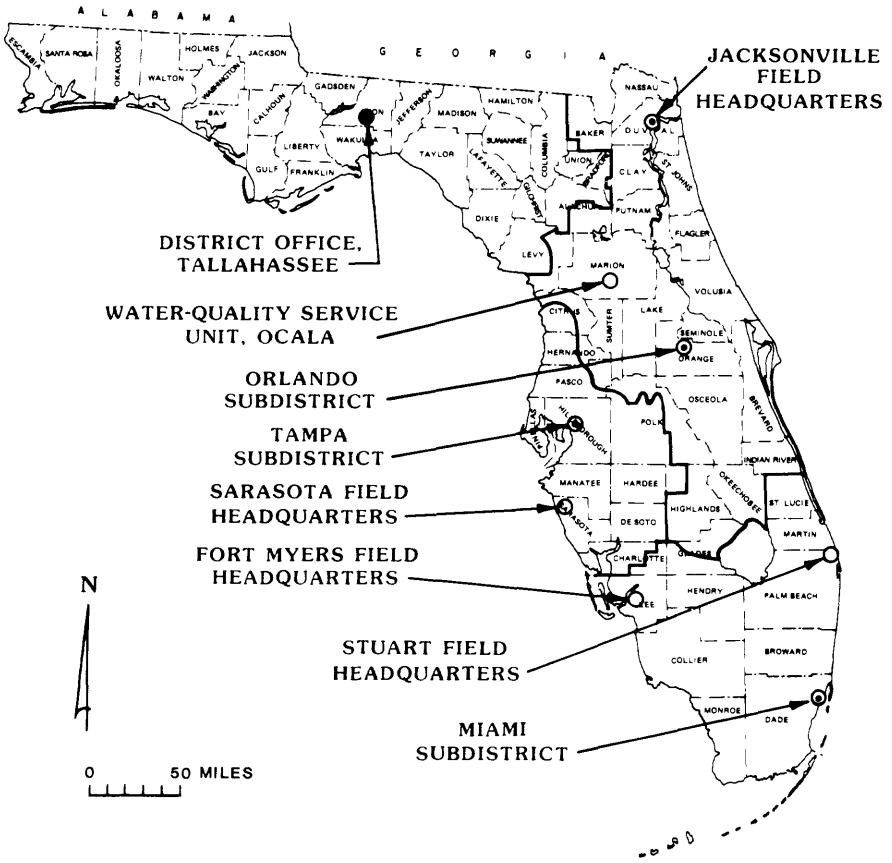

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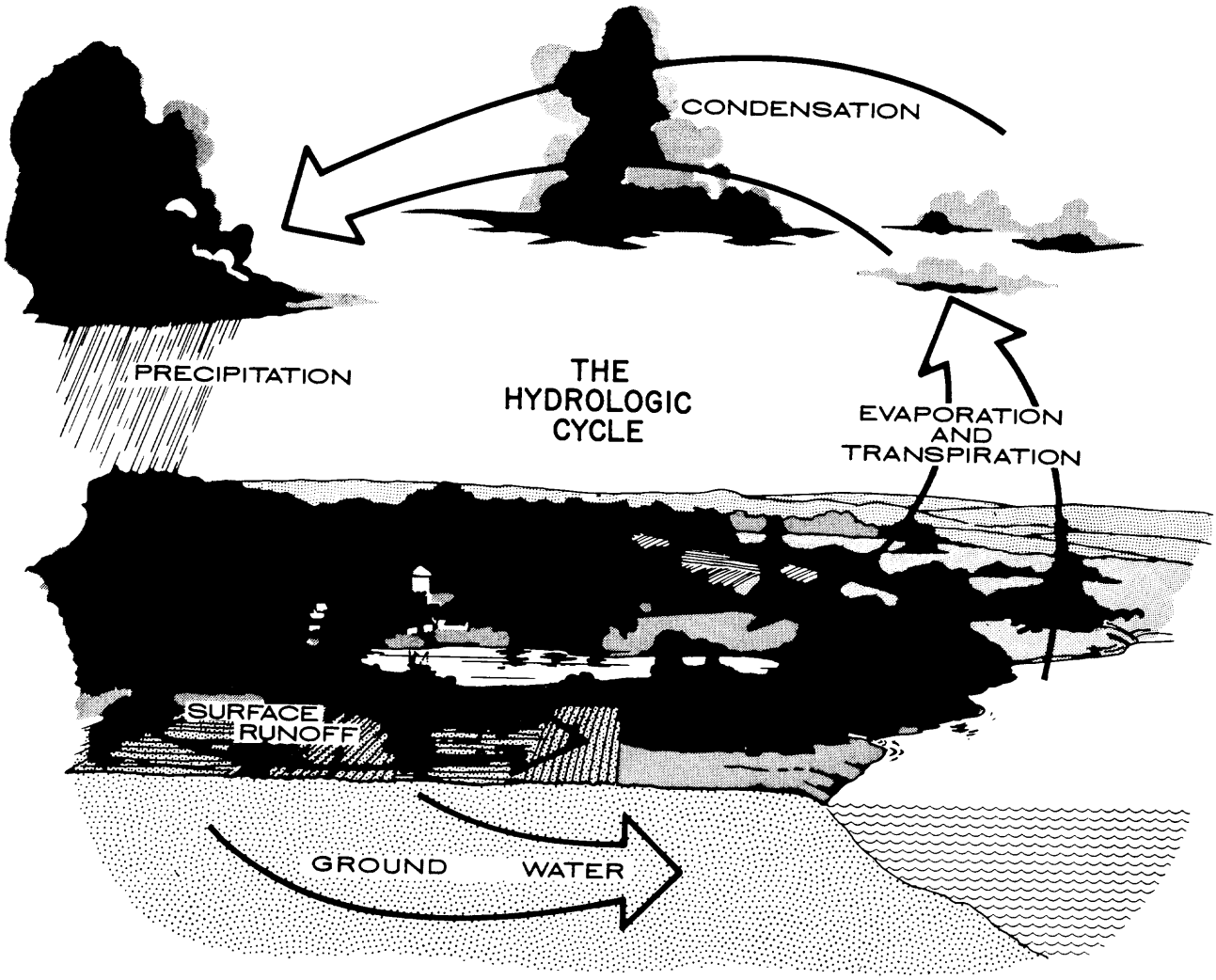
FOREWORD

The U.S. Geological Survey was created by Act of Congress in 1879, as a bureau of the Department of the Interior, to classify public lands and to examine the geologic structure, mineral resources, and products of the national domain. Since then, the Survey's responsibilities have expanded to include topographic mapping, geochemical and geophysical studies, and the assessment of the quantity, quality, and distribution of water resources. Thus, during the past 100 years, the Survey has become the Nation's principal factfinding and research agency concerned with our physical resources. The mission of the Water Resources Division of the Survey is to provide hydrologic information needed for the development, management, and use of the Nation's water resources.

Although stream gaging began in 1884 as part of a study to identify irrigatable land, the water-resources program of the Survey began in 1894 when a small appropriation was obtained for the specific purpose of "gauging streams and determining the water supply of the United States." In the years following 1884, the need for water resources information grew rapidly but the inability of the Survey to meet the demand was hampered by restricted budgets. Many states initiated water resource programs to fill the deficiency and the Survey worked closely with the various State agencies. However, these efforts did not satisfy the need of the states and the Nation for a comprehensive water resources information program. Accordingly, Congress, in 1928, established the cooperative matching program by which the Survey's water resources programs with state agencies may be funded on a 50/50 basis. This cooperative water resources program has grown over the years into the primary source of water information for the Nation. In cooperation with State and local governments and other Federal agencies, the Water Resources Division --

- Collects data on a systematic basis to determine the quantity, quality, and use of surface and ground water.
- Conducts interpretive water-resource appraisals to describe the consequences of alternative plans for developing land and water resources.
- Conducts basic and problem-oriented research in hydraulics, hydrology, and related fields.
- Develops information on water-related natural hazards such as floods, landslides, volcanoes, mudflows, and land subsidence.
- Coordinates the activities of all Federal agencies in the acquisition of water data.
- Disseminates data and findings through reports, maps, and other forms of public release.
- Provides scientific and technical assistance in the hydrologic fields to other Federal agencies, to State and local agencies, and, on behalf of the U.S. Department of State, to international agencies.

Water Resources, National Mapping, and Geologic Divisions are the three operating Divisions of the Survey. General information pertaining to these divisions may be obtained from the Information Office, U.S. Geological Survey, 119 National Center, Reston, VA 22092. Circular 777, "A Guide to Obtaining Information from the U.S. Geological Survey" can be obtained free from the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225.


CONDENSATION
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WATER

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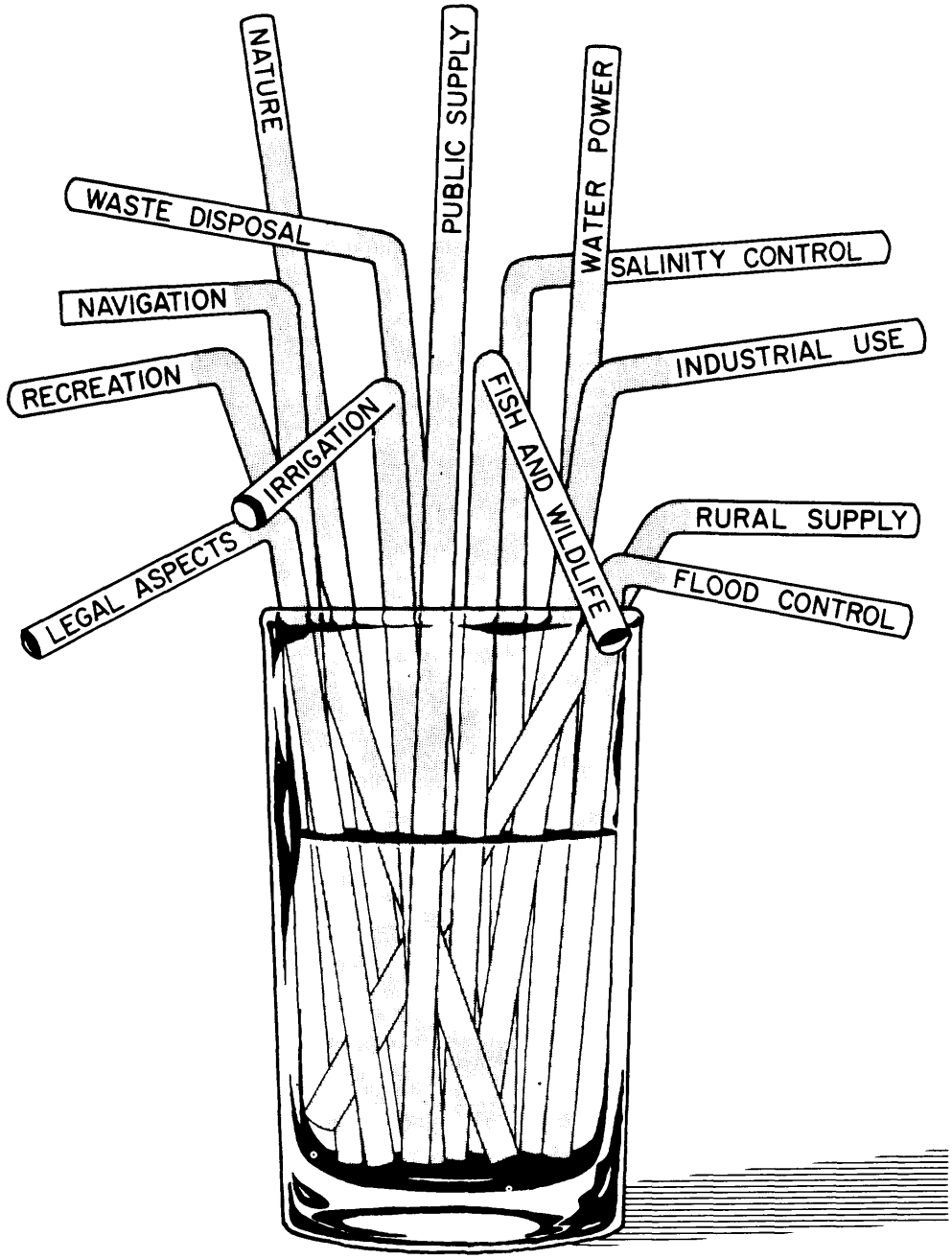
COMPETITION FOR WATER



Competition for water is growing. Adequate information and analysis are keys to effective development, protection, and management of a common water resource.

WATER RESOURCES ACTIVITIES IN FLORIDA, 1986-87

By Mildred E. Glenn, editor

INTRODUCTION

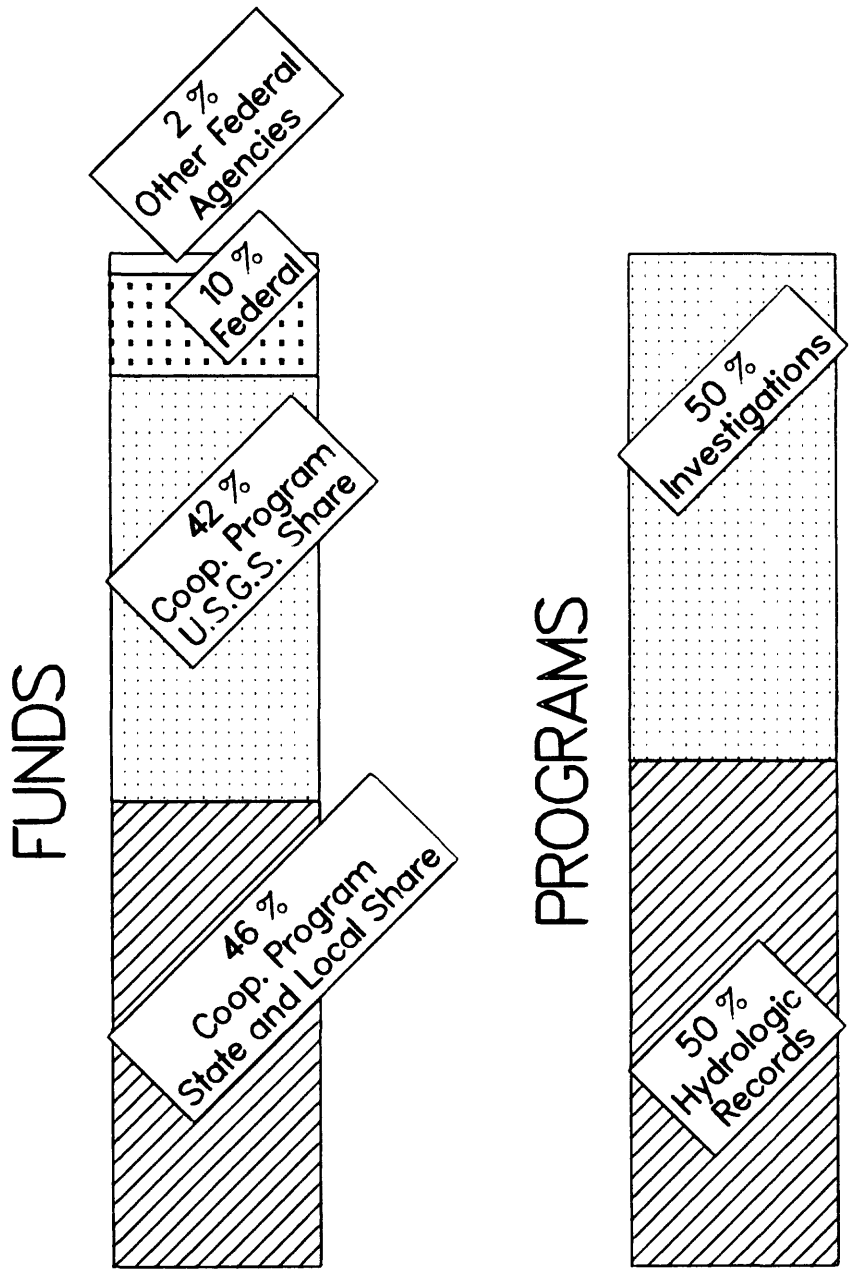
This report contains summary statements of water resources activities in Florida conducted by the Water Resources Division of the U.S. Geological Survey in cooperation with Federal, State, and local agencies during 1986-87. These activities are part of the Federal program of appraising the Nation's water resources. Included are brief descriptions of the nature and scope of all active studies, summaries of significant results for 1986 and anticipated accomplishments during 1987.

Florida is a water oriented State which for many years has experienced a mushrooming increase in population, attendant urban growth, and all the problems associated with such growth, particularly problems of protecting and preserving environmental quality. As the Florida environment is largely water sensitive, most environmental problems are water related. The Florida District of the U. S. Geological Survey has the principal responsibility at the Federal level for appraising water resources and for providing basic hydrologic data on both surface and ground water in the State.

Water resources appraisals in Florida are highly diversified, ranging from hydrologic records networks to interpretive appraisals of water resources and applied research to develop investigative techniques. Thus, water resource investigations range from basic descriptive water-availability studies for areas of low-intensity water development and management to sophisticated cause and effect studies in areas of high-intensity water development and management. The interpretive reports and records that are products of the investigations are a principal hydrologic foundation upon which the plans for development, management, and protection of Florida's water resources may be based.

The need for water resources information is especially great in urbanized areas, where concern is being expressed that the "carrying" capacity of the land and water resources is being exceeded. Increasingly intensive and sophisticated water-management programs will have to be implemented in these urban areas to meet the increasing needs for water and to maintain good water quality. Water data and information required to implement sound water-management programs in highly urbanized areas relate to the quantity and quality of storm runoff, sources of aquifer contamination, injection of wastes into deep strata, underground storage of freshwater, artificial recharge of aquifers, environmental effects of reuse of water, and effects of land development on changes in ground- and surface-water quality. In some parts of the State broad areas are largely rural. Future growth is anticipated in many of these. However, recognition is given to the need for planned development tailored to the environment. The need for water information in these rural areas is related to a large extent to the need to provide for primary water development and provide information on effects of development.

This report is intended to inform those agencies vitally interested in the water resources of Florida as to the current status and objectives of the U.S. Geological Survey cooperative program. The mission of this program is to collect, interpret, and publish information on water resources. Almost all of this work is done in cooperation with other public agencies.



Source of funds and makeup of program, Florida District 1986-87.

U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION PROGRAMS

Program development in the Water Resources Division is an evolving activity. Programs are reviewed regularly and future needs for water-data and hydrologic investigations are projected. Water problems and data needs brought out by State and local agencies and the public make up a major part of the planning process; thus, program development is a grassroots effort which is strongly influenced by changes in data needs and water problems.

Water Resources Division programs are of three major types: (a) data collection and dissemination, (b) problem-oriented water-resources appraisals, and (c) research. The programs are strongly interrelated; for example, theories arising from research are the foundation of data collection and problem-oriented water-resources appraisals, and data collection is a major component of all water-resources appraisals and most of the research studies.

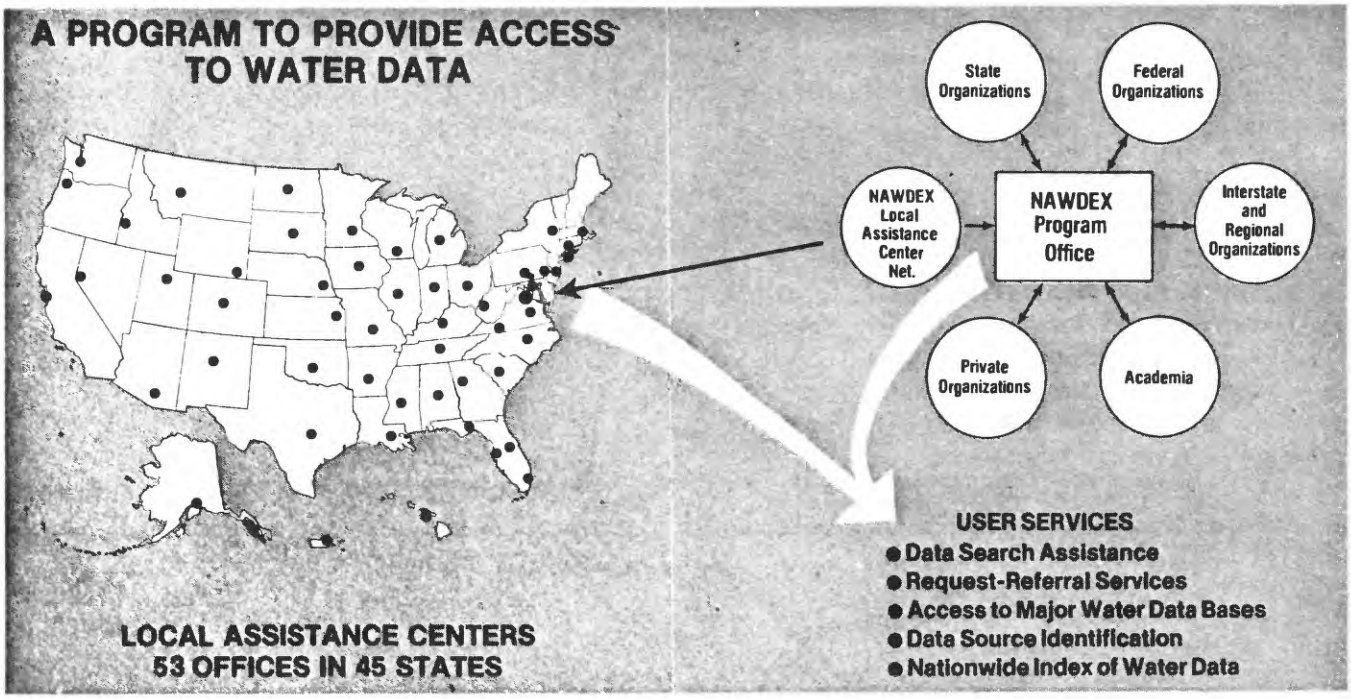
The Division's activities may be described under three headings: long-term programs, technical-assistance programs, and topical programs.

Long-term programs include the Federal-State cooperative program; coordination of Federal water-data acquisition; assistance to other Federal agencies; the National Research Program; the National Water-Data Exchange; the Water Resources Scientific Information Center; the National Water-Use Information Program; the hydrologic data-collection program, including the national stream quality accounting network and the national benchmark program; and the international hydrology program. These programs are fundamental to the Division's mission and they provide the data and research needed for the topical programs.

Topical programs are designed to provide critically needed information on issues of major and immediate concern to the Nation. These programs include hazardous waste hydrology, including high- and low-level nuclear and toxic-chemical wastes; coal and oil-shale hydrology; regional aquifer systems analysis; acid rain; volcano subsidence, and flood hazards; and a nationwide water-quality assessment.

Technical-assistance programs include the instrumentation program, a central water-quality laboratory, and the national training center. These programs are internal to the Division but contribute significantly to the continuing development of hydrologic capabilities and thus to the success of the Division's mission.

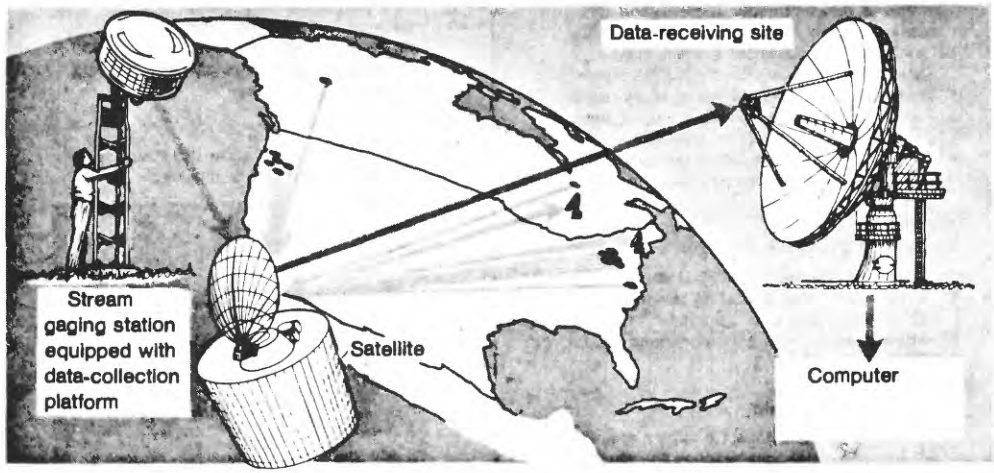
NATIONAL WATER-DATA EXCHANGE (NAWDEX)

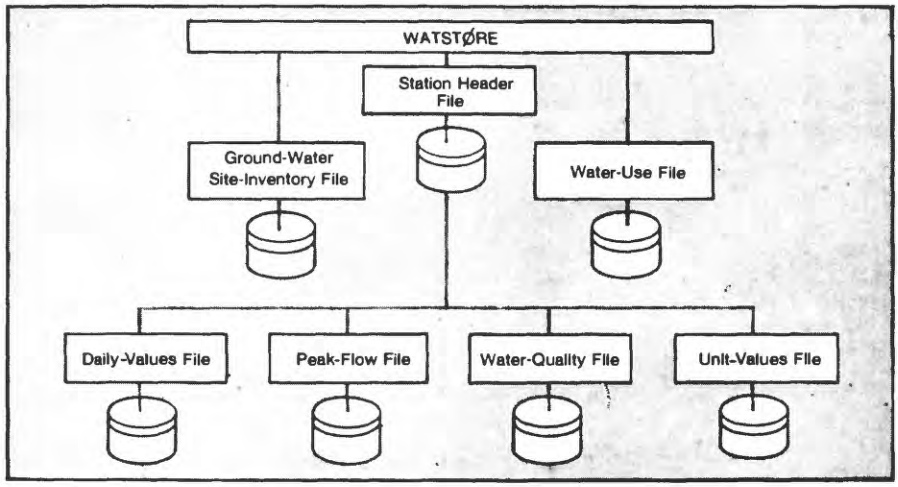


The National Water-Data Exchange (NAWDEX) is a nationwide program managed by the U.S. Geological Survey to assist users of water data or water-related data in identifying, locating, and acquiring needed data. NAWDEX is a confederation of water-oriented organizations working together to make their data more readily accessible and to facilitate a more efficient exchange of water data.

A variety of user services are provided by NAWDEX. These include assistance in identifying and locating needed water data and referring the requester to the organization that retains the data required. A Water Data Sources Directory is also maintained that identifies organizations that are sources of water data and locations within these organizations from which data may be obtained. NAWDEX services are available to any organization or individual. Further information can be obtained from the NAWDEX Program Office, MS-421, National Center, Reston, VA 22092 (703)648-6848.

NATIONAL WATER-DATA STORAGE AND RETRIEVAL SYSTEM (WATSTORE)



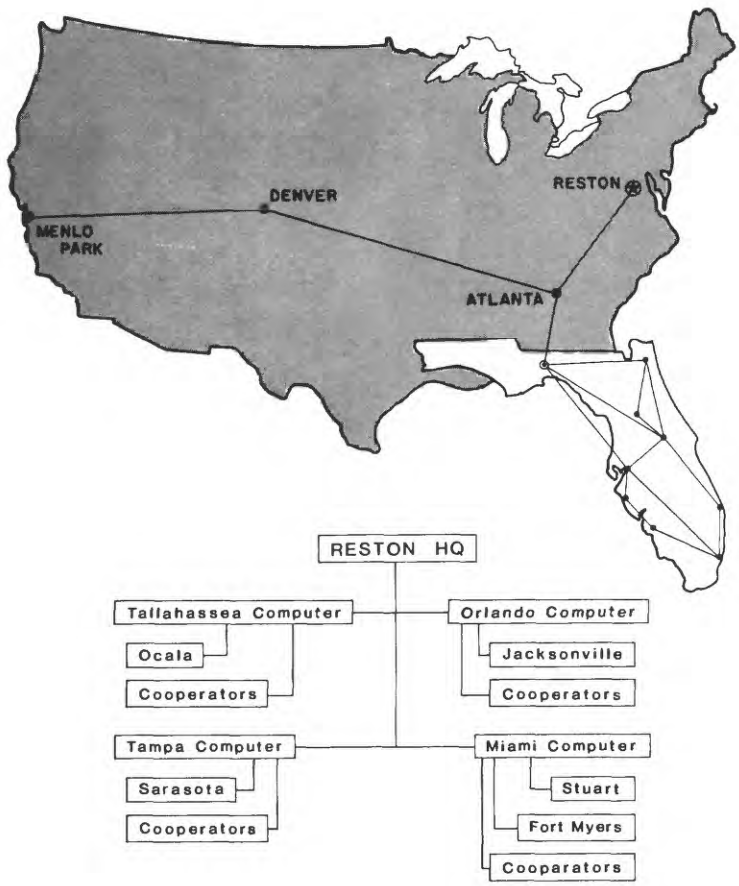


As part of the Geological Survey's program of releasing water data to the public, a large-scale computerized system has been developed for the storage and retrieval of water data collected through its activities. The National Water Data Storage and Retrieval System (WATSTORE) was established in 1971 to modernize the Geological Survey's existing water-data processing procedures and techniques and to provide for more effective and efficient management of its data-releasing activities. Data are transferred monthly from WATSTORE to the Environmental Protection Agency's storage and retrieval system (STORET). In Florida, WATSTORE data products may be obtained through the Survey's District and Subdistrict offices listed on the inside front cover. A minimal fee plus the actual computer cost incurred in producing a desired product is charged to the requester.

DISTRIBUTED INFORMATION SYSTEM (DIS)

The Survey has developed a Distributed Information System (DIS) to enhance the management and availability of water resources data. The DIS is a nationwide network of 75 computers located in major Water Resources Division offices and linked by a telecommunication network. The Florida DIS consists of computers in Miami, Orlando, Tallahassee, and Tampa and a telecommunication network linking 9 Florida USGS offices with Water Management Districts and other cooperating agencies. This system has greatly improved the Survey's data base management, statistical analysis, and modeling capabilities as well as providing unprecedented access to water resources information.

To provide increased flexibility in the use of water resources information, the USGS WATSTORE Program Office is developing a data base using a hydrologic data model designed to enhance data sharing. Residing at DIS sites in Florida, the National Water Data System (NWDS) data base will integrate surface water, ground water, water quality, water use, meteorologic, and operations data giving users a comprehensive view. Statistical, graphical, and simulation procedures will be available to provide additional information.



THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN)

NASQAN is a series of stations at which systematic and continuing measurements are made to determine the quality of the Nation's streams. Design of the network specifies measurement of a broad range of water-quality characteristics selected to meet many of the information requests of groups involved in planning and management on a national or regional scale. The primary objectives are: (1) to account for the quantity and quality of water moving within and from the United States, (2) to depict areal variability, (3) to detect changes in stream quality, and (4) to lay the groundwork for future assessments of changes in stream quality.

Presently in Florida, 22 NASQAN and one hydrologic benchmark sites are strategically located in virtually all major hydrologic accounting units within the State and furnish a regionalized picture of water-quality trends in Florida's surface waters.

NASQAN STATIONS

1. Perdido River at Barrineau Park
2. Escambia River near Century
3. Yellow River at Milligan
4. Choctawhatchee River near Bruce
5. Chipola River near Altha
6. Apalachicola River at Chattahoochee
7. Ochlockonee River near Havana
8. Suwannee River at Branford
9. St. Johns River near Deland
10. Spruce Creek near Samsula
11. Withlacoochee River near Holder
12. Alafia River at Lithia
13. Main Canal at Vero Beach
14. Kissimmee River at S65E near Okeechobee
15. Peace River at Arcadia
16. Fisheating Creek near Palmdale
17. Caloosahatchee Canal at Ortona Lock near Labelle
18. Miami Canal at NW 36th Street, Miami
19. Tamiami Canal-40 mile bend to Monroe
20. Santa Fe River at Worthington Springs
21. Sopchoppy River near Sopchoppy (Hydrologic Benchmark Station)
22. Oklawaha River near Conner

More than 45 reports were released during 1986 and more than 1,000 requests for reports were received.

NEW REPORTS FROM THE U.S. GEOLOGICAL SURVEY, FLORIDA DISTRICT

The results of many of the water resources activities of the U.S. Geological Survey are released in reports for use by water agencies and the public. Survey reports on the water resources of Florida are available for inspection at the offices listed on the inside of the front cover, at the offices of the five water management districts, and at libraries of the State University system. Contact the District Office for information regarding the availability of these publications.

Barr, G. L., and Lewelling, B. R., Potentiometric surface of the upper Floridan aquifer, west-central Florida: U.S. Geological Survey Open-File Report 86-409.

Brown, D. P., Hayes, E. C., and Munch, D. A., Lower saline water-bearing zone monitoring network within the Florida aquifer system, northeast Florida (Abstract).

Brown, D. P., Miller, J. A., and Hayes, E. C., Hydrogeologic data from a test well near Ponte Vedra, northeast St. Johns County, Florida: U.S. Geological Survey Open-File Report 86-410.

Causaras, C. R., Geology of the surficial aquifer system, Dade County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4126.

Duerr, A. D., and Wolansky, R. M., Hydrogeology of the surficial and intermediate aquifers of Sarasota County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4068.

Franklin, M. A., and Orr, R. A., Analysis of water-surface profiles in Leon County, and the city of Tallahassee, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4327.

Franks, B. J., Investigation of the extent of the creosote contamination of a surficial sand aquifer (Abstract).

Fraser, T. H., Long-term water-quality characteristics of Charlotte Harbor, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4180.

Hampson, P. S., Water-quality reconnaissance of two stormwater detention ponds receiving highway surface runoff in Jacksonville, Florida, July 1980-July 1983: U.S. Geological Survey Water Resources Investigations Report 86-4151.

Henderson, S. E., Hydrology of Island Ford Lake, Hillsborough County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4315.

Hickey, J. J., Saltwater circulation during subsurface injection of liquid waste, St. Petersburg, Florida (Journal Article).

Howie, Barbara, Chemical characteristics of water in the surficial aquifer, Broward County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4330.

_____, Effects on ground-water quality in Dade County, Florida (Conference Paper).

Howie, Barbara and Waller, B. G., Chemical impacts of highway runoff on shallow subsurface water, Broward County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4200.

Hunn, J. D. and Seaber, P. R., Effects on ground-water quality of seepage from phosphatic clayey waste settling pond, north-central Florida: U.S. Geological Survey Water Resources Investigations Report 86-4107.

Kantrowitz, I. H., Field methods for studying contaminated ground water: A U.S. Geological Survey perspective (Symposium Proceedings).

Kimrey, J. O. and Anderson, Warren, Reconnaissance of geohydrologic areas and low-flow conditions, Withlacoochee River Basin, southwest Florida: U.S. Geological Survey Water Resources Investigations Report 86-4203.

Klein, Howard, Potentiometric surface of the Biscayne aquifer, northwest well field, Dade County, Florida, May 24, 1984: U.S. Geological Survey Open-File Report 86-60.

_____, Potentiometric surface of the Biscayne aquifer, northwest well field, Dade County, Florida, October 16, 1984: U.S. Geological Survey Open-File Report 86-59.

Leve, G. W., Water for Florida Cities: U.S. Geological Survey Water Resources Investigations Report 86-4203.

McPherson, B. F. and Miller, R. L., The vertical attentuation of light in Charlotte Harbor, a shallow, subtropical estuary, southwestern Florida (Journal Article).

Miller, W. L., Lithology and base of the surficial aquifer system, Palm Beach County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4067.

Phelps, G. G. and Rohrer, K. P., Hydrogeology in the area of a freshwater lens in the Floridan aquifer system, Seminole County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4078.

Rosenau, J. C. and Meadows, P. E., Potentiometric surface of the Floridan aquifer system in the Northwest Florida Water Management District, Florida, May 1985: U.S. Geological Survey Water Resources Investigations Report 86-4183.

_____, Potentiometric surface of the Floridan aquifer system in the Suwannee River Water Management District, Florida, May 1985: U.S. Geological Survey Water Resources Investigations Report 86-4184.

Rutledge, A. T., Effects of land use on ground-water quality in central Florida--preliminary results: U.S. Geological toxic waste--ground-water contamination program: U.S. Geological Survey Water Resources Investigations Report 86-4163.

Ryder, P. D. and Mahon, G. L., Potential for seawater intrusion into the upper Floridan aquifer, Hernando County, Florida (Abstract).

Schiffer, D. M., Hydrology and water quality of East Tohopekaliga, Osceola County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4081.

Schiner, G. R., Potentiometric surface of the Upper Floridan aquifer in the St. Johns River Water Management District and vicinity, Florida, May 1986: U.S. Geological Survey Open-File Report 86-408.

Seaber, P. R., Evolution of classification and nomenclature of hydro-geologic units (Abstract).

Seaber, P. R. and Thagard, M. E., Identification and description of potential ground-water quality monitoring wells in Florida: U.S. Geological Survey Water Resources Investigations Report 85-4130.

Sonenshein, R. S., Causaras, C. R., and Fish, J. E., Index of hydrologic data for selected sites in Palm Beach County, Florida, 1928-80: U.S. Geological Survey Open-File Report 86-54.

Thagard, M. E. and Seaber, P. R., Location of potential ground-water quality monitoring wells, Apalachicola, 1^{o} x 2^{o} quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4131.

_____, Location of potential ground-water quality monitoring wells, Daytona Beach, 1^{o} x 2^{o} quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4132.

_____, Location of potential ground-water quality monitoring wells, Fort Pierce, 1^{o} x 2^{o} quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4133.

_____, Location of potential ground-water quality monitoring wells, Gainesville, 1^{o} x 2^{o} uadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4134.

_____, Location of potential ground-water quality monitoring wells, Jacksonville, 1^{o} x 2^{o} quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4135.

_____, Location of potential ground-water quality monitoring wells, Key West, 1^{o} x 2^{o} quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4136.

Thagard, M. E. and Seaber, P. R., Location of potential ground-water quality monitoring wells, Miami, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4137.

_____, Location of potential ground-water quality monitoring wells, Orlando, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4138.

_____, Location of potential ground-water quality monitoring wells, Pensacola, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4139.

_____, Location of potential ground-water quality monitoring wells, Tallahassee, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4140.

_____, Location of potential ground-water quality monitoring wells, Tampa, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4141.

_____, Location of potential ground-water quality monitoring wells, Tarpon Springs, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4142.

_____, Location of potential ground-water quality monitoring wells, Valdosta, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4143.

_____, Location of potential ground-water quality monitoring wells, West Palm Beach, 1° x 2° quadrangle, Florida: U.S. Geological Survey Water Resources Investigations Report 85-4144.

Waller, B. G. and Cannon, F. L., Water-quality data for the ground-water network in eastern Broward County, Florida, 1983-84: U.S. Geological Survey Open-File Report 86-313.

Woodham, W. M., Hydrologic data from small rural and developing watersheds in west-central Florida, 1981-84: U.S. Geological Survey Open-File Report 86-55.

Yurewicz, M. C. and Rosenau, J. C., Effects on ground water of spray irrigation using treated municipal sewage southwest of Tallahassee, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4109.

HOW TO OBTAIN REPORTS PREPARED BY THE FLORIDA DISTRICT

The Florida District has been preparing reports on water resources for several decades. Beginning in 1974, titles of Open-File Reports and Water-Resources Investigations Reports, two series frequently used for reports prepared by the Florida District, were added to the catalog "Publications of the Geological Survey." Most titles of reports prepared in Florida water resources are included in that catalog. For information on availability of reports, please write to the District Chief, U.S. Geological Survey, Suite 3015, 227 North Bronough Street, Tallahassee, Florida 32301.

New reports are announced monthly in "New Publications of the Geological Survey," subscriptions to which are available free upon request to the U.S. Geological Survey, 582 National Center, Reston, VA 22092

PUBLICATION SERIES	CONTACT
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FLORIDA GEOLOGICAL SURVEY Bulletins Map Series Reports of Investigations Information Circulars	Florida Geological Survey 903 W. Tennessee Street Tallahassee, FL 32304

FLORIDA WATER RESOURCES RESEARCH CENTER

The Florida Water Resources Research Center, funded by the Department of the Interior, was established in 1964 as a result of the passage of Public Law 88-379--The Water Resources Research Act of 1964--"to stimulate, sponsor, provide for, and supplement present programs for conduct of research, investigation, experiments, and the training of scientists in the fields of water and of resources which affect water." Late in 1983, management of this program was transferred to the U.S. Geological Survey.

Under the administration of the Center, current water resources research pertaining to the achievement of adequate statewide water resource management, and water quality and quantity is being conducted by faculty at the University of Florida and at other universities in the State. For further information concerning the Center, contact Dr. James P. Heaney, Director, Florida Water Resources Research Center, 424 A.P. Black Hall, University of Florida, Gainesville, FL 32611 (904) 392-0840. A list of new publications resulting from the center projects is presented below:

No. 90 ARCHITECTURAL AND FUNCTIONAL DESIGN OF AN ENVIRONMENT INFORMATION NETWORK by Shamkant B. Navathe, Stanley Y.W. Su, T. Sashidhar, and Aloysius Cornelio, Department of Computer Information Sciences, and Wayne C. Huber, James P. Heaney, Bonnie W. Proefke, David F. MacIntyre, and David L. Miracle, Department of Environmental Engineering Sciences, 1986, 116 pages.

No. 91 BIOLOGICAL FLOCCULATION OF WASTE GROWN ALGAL CULTURES by Ben Koopman, Edward P. Lincoln, Ho Kang and Sang-III Lee, Departments of Environmental Engineering Sciences and Agricultural Engineering, 1986, 110 pages.

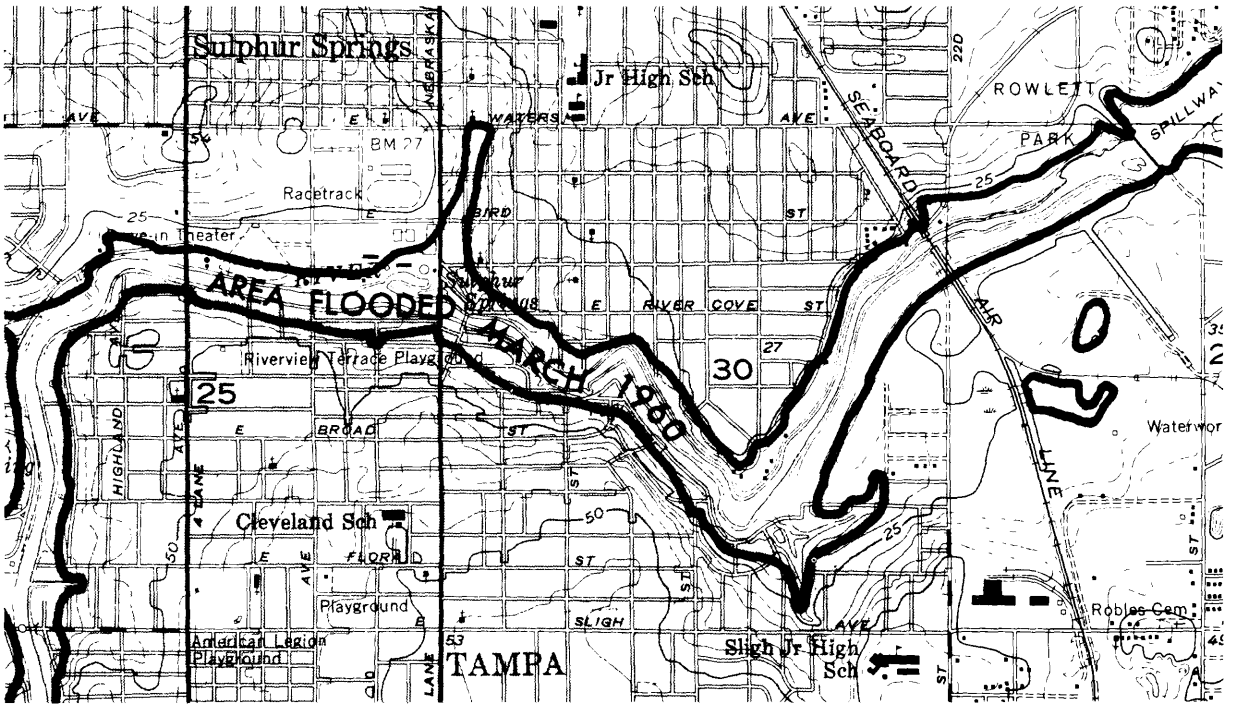
No. 92 ANALYSIS OF WATER RESOURCES PROBLEMS USING ELECTRONIC SPREADSHEETS by Michael Curtis Hancock, 1986, 198 pages.

No. 93 DEVELOPMENT OF A NUMERICAL MODEL OF INJECTION INTO A THREE-DIMENSIONAL DENSITY-STRATIFIED AQUIFER by Steven J. Laux, 1986, 125 pages.

No. 94 TECHNICAL FEASIBILITY OF CENTRIFUGAL TECHNIQUES FOR EVALUATING HAZARDOUS WASTE MIGRATION by Gary F. E. Goforth, 1986, 158 pages.

No. 95 EFFICIENCY/EQUITY ANALYSIS OF WATER RESOURCES PROBLEMS--A GAME THEORETIC APPROACH by Elliot Kim Ng, 1986, 165 pages.

MAPS OF FLOOD-PRONE AREAS



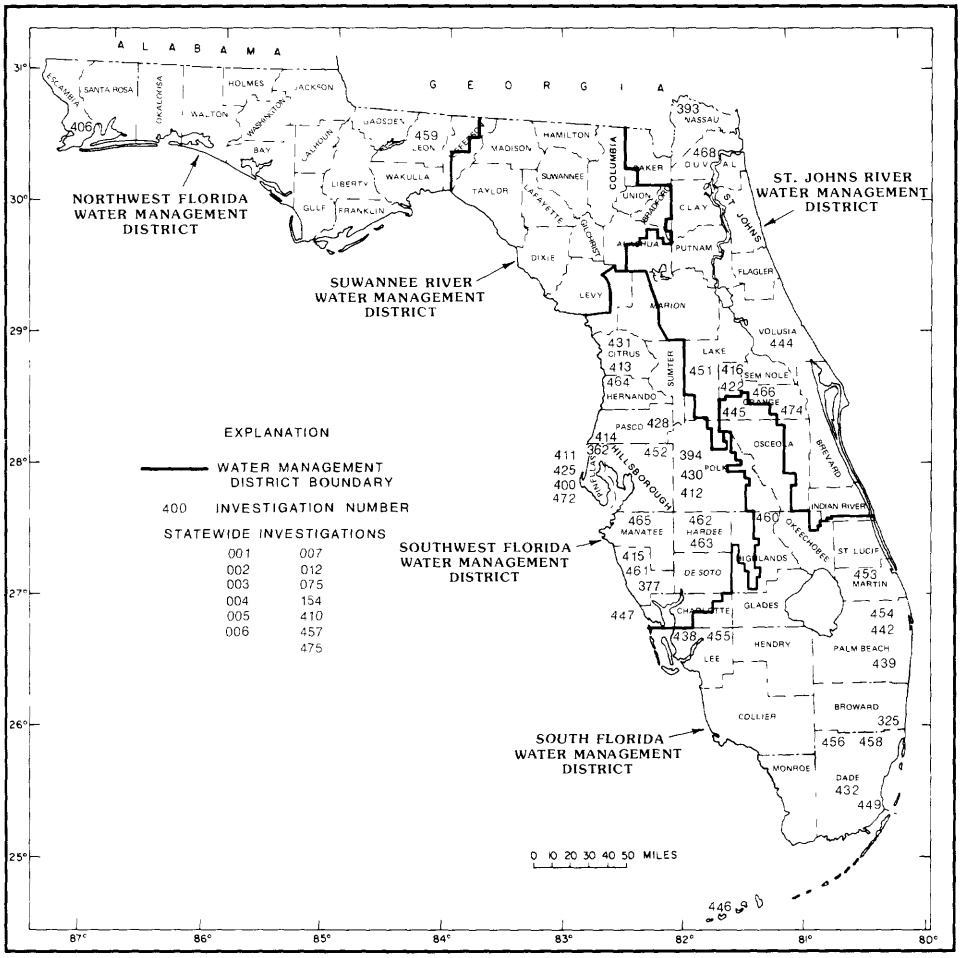
Floods in the United States cause an average yearly loss of about 80 lives and $1 billion. Improvements in flood forecasting and rapid communications have decreased the number of lives lost in recent years, but the dollar loss and the tragedy of damaged or lost homes are increasing.

The flow of a river is usually confined to a well-defined channel that meanders through the river valley. However, at times the river overflows because of heavy rains and uses the wide, flat areas adjacent to the channel to carry a part of the flow. During a major flood, this flood plain may be covered to a depth of many feet with water moving at a high velocity.

The flood plain may appear to be an attractive area for development, particularly in urban communities where land is expensive. Many housing projects and commercial and industrial buildings have been constructed on the flood plains because people tend either to forget past experiences or to be unaware of possible flood danger.

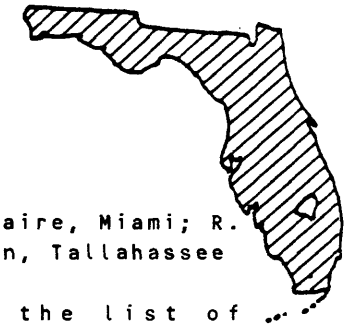
A national program for reducing flood losses was started by the Federal Government in 1966. As a part of this program, the U.S. Geological Survey outlined flood-prone areas on topographic maps to indicate localities that may be subject to flood losses. For Florida, these maps can be obtained through the Florida Resources and Environ-mental Analysis Center, Room 361, Bellamy Building, Florida State University, Tallahassee, FL 32306, Telephone: (904) 644-2883. Flood-prone areas for most counties and cities in Florida have been defined by detailed studies or by approximate methods and maps of these areas are available (free) through: Federal Emergency Management Agency, Flood Map Distribution Center, 6930 (A-F) San Tomas Road, Baltimore, MD 21227-6227, Telephone: (800) 638-6620 (toll free).

LOCATION OF AREAL INVESTIGATIONS AND THE FIVE WATER MANAGEMENT DISTRICTS



WATER RESOURCES ACTIVITIES IN FLORIDA
1986-87

FL-001 SURFACE WATER NETWORK STATIONS



DATE PROJECT BEGAN: 1926

DATE PROJECT ENDS: Continuing

PROJECT COORDINATOR: W. C. Bridges, Tallahassee

PRINCIPAL AREA INVESTIGATORS: L. D. Fayard, Orlando; W. J. Haire, Miami; R. T. Mycyk, Tampa; M. A. Franklin, Tallahassee

COOPERATING AGENCIES: Most of the agencies shown in the list of cooperators.

PROBLEM: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in water-related fields such as water supply, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water resources development. To provide this information, an appropriate data base is necessary.

OBJECTIVE: To obtain and document an unbiased inventory of streamflow, stream and lake stage data for use in the planning and development of the water resources of the State of Florida.

APPROACH: Collect stream discharge, stream and lake stage data from a network of gaging stations that include daily discharge, periodic discharge, daily stage, and periodic stage stations to define streamflow and stage conditions within the State of Florida.

PROGRESS: Streamflow and stage data were collected from 635 network sites and prepared for publication. Streamflow and stage data currently are being obtained at the number of hydrologic data network stations given below.

Station Classification		Number of Stations
Stream stations		501
Continuous record:		
Discharge and Stage	284	
Stage Only	81	
Partial record:		
Peak (maximum) flow	88	
Periodic Streamflow	48	
Lake and reservoir stations		138
Stage and contents	1	
Stage only		
Continuous	64	
Periodic	73	
TOTAL		639

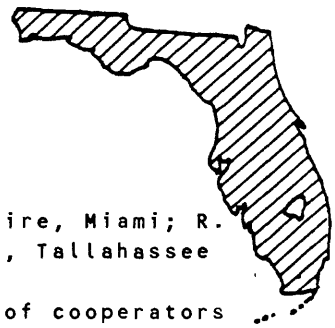
(FL-001)

PLANS FOR THIS YEAR: Continue operations as needs are defined.

REPORTS IN PROCESS:
Water-resources data for Florida, water years 1985 and 1986.

REPORTS RELEASED:
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northeast Florida: U.S. Geological Survey Water-Data Report FL-84-1A.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, south Florida Surface Water: U.S. Geological Survey Water-Data Report FL-84-2A.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, southwest Florida Surface Water: U.S. Geological Survey Water-Data Report FL-84-3A.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northwest Florida: U.S. Geological Survey Water-Data Report FL-84-4.

FL-002 GROUND WATER NETWORK STATIONS



DATE PROJECT BEGAN: 1930

DATE PROJECT ENDS: Continuing

PROJECT COORDINATOR: W. C. Bridges, Tallahassee

PRINCIPAL AREA INVESTIGATORS: L. D. Fayard, Orlando; W. J. Haire, Miami; R. T. Mycyk, Tampa; M. A. Franklin, Tallahassee

COOPERATING AGENCIES: Most of the agencies shown in the list of cooperators

PROBLEM: Long term water level records are needed to evaluate the effects of climatic variations on the recharge to and discharge from the ground-water systems, to provide a data base from which to measure the effects of development, to assist in the prediction of future supplies, and to provide data for management of the resource.

OBJECTIVE: To obtain and document an unbiased inventory of water-level data for use in the planning and development of the water resources of the State of Florida.

APPROACH: Collect water-level data for the various aquifers by a network of observation wells which includes 2530 periodic observations sites and 447 sites where data are recorded continuously.

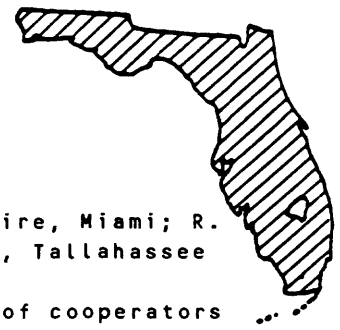
PROGRESS: Water-level data were collected and published as planned.

PLANS FOR THIS YEAR: Collection and publication of data will be continued.

REPORTS IN PROCESS:
Water-resources data for Florida, water years 1985 and 1986.

REPORTS RELEASED:
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northeast Florida: U.S. Geological Survey Water-Data Report FL-84-1B.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, south Florida Surface Water: U.S. Geological Survey Water-Data Report FL-84-2B.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, southwest Florida Surface Water: U.S. Geological Survey Water-Data Report FL-84-3B.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northwest Florida: U.S. Geological Survey Water-Data Report FL-84-4.

FL-003 QUALITY OF WATER NETWORK STATIONS



DATE PROJECT BEGAN: 1939

DATE PROJECT ENDS: Continuing

PROJECT COORDINATOR: W. C. Bridges, Tallahassee

PRINCIPAL AREA INVESTIGATORS: L. D. Fayard, Orlando; W. J. Haire, Miami; R. T. Mycyk, Tampa; M. A. Franklin, Tallahassee

COOPERATING AGENCIES: Most of the agencies shown in the list of cooperators

PROBLEM: Water resource planning and water-quality assessment require a nationwide base level of relatively standardized information. For intelligent planning and realistic assessment of the water resource, the chemical and physical quality of surface and ground waters must be defined and monitored.

OBJECTIVE: To obtain and document unbiased inventory of water-quality data for use in the planning and development of the water resources of the State of Florida.

APPROACH: Collect water-quality data from a network of daily, weekly, and periodic stations which include streams, lakes, springs, and wells to define water quality conditions within the State of Florida.

PROGRESS: Water-quality data are obtained at 274 surface-water network stations. 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 which is used to detect nationwide trends in water quality. The types of data determined at these sites are given below. 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 below will not equal the total number of surface water sites.

Data Classification	Number of Sites
Physical data:	
Temperature, specific conductance or ph	258
Sediment	26
Chemical data:	
Inorganic constituents	147
Organic constituents	73
Pesticides	20
Radiochemical data	3
Biological data	42

(FL-003)

Water-quality data are obtained at network observation wells and springs. The types of data determined at these sites are listed below. 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 below will not equal the total number of ground water sites.

Data Classification	Wells	Springs
Physical data:		
Temperature,specific conductance or pH...	766	7
Chemical data:		
Inorganic constituents.....	261	7
Organic constituents	84	2
Biological data.....	83	1

REPORTS IN PROCESS:
Water-resources data for Florida, water years 1985 and 1986.

REPORTS RELEASED:
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northeast Florida: U.S. Geological Survey Water-Data Report FL-84-1A.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northeast Florida: U.S. Geological Survey Water-Data Report FL-84-1B.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, south Florida Surface Water: U.S. Geological Survey Water-Data Report FL-84-2A.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, south Florida Ground Water: U.S. Geological Survey Water-Data Report FL-84-2B.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, southwest Florida Surface Water: U.S. Geological Survey Water-Data Report FL-84-3A.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, southwest Florida Ground Water: U.S. Geological Survey Water-Data Report FL-84-3B.
U.S. Geological Survey, 1986, Water resources data for Florida-1984, northwest Florida: U.S. Geological Survey Water-Data Report FL-84-4.

FL-005 QUALITY OF PRECIPITATION

DATE PROJECT BEGAN: July 1983

DATE PROJECT ENDS: Continuing

PRINCIPAL INVESTIGATORS: D. Briane Adams, Tampa
George A. Irwin, Tallahassee

COOPERATING AGENCY: Federal Program

PROBLEM: The amount of substances dispersed in the atmosphere and deposited by precipitation, aerosols, and bases is expected to continue to increase throughout North America. Thus, there is a need for careful measurement of the amounts, nature, and effects of these substances. Such measurements are essential for responsible management of the agricultural, forest, and aquatic ecosystems of the United States.

OBJECTIVE: The National Atmospheric Deposition Program (NADP) was created to conduct research on atmospheric deposition and its affect on surface waters and agricultural and forest lands in cooperation with federal, state and private research agencies. The U.S. Geological Survey (USGS) is participating in this program under the title of the National Trends Network (NTN) by establishing up to 40 stations nationwide with coordination and analytical services provided by NADP. These stations are established for the purpose of long term coordinated data collection for use in local, regional and national studies.

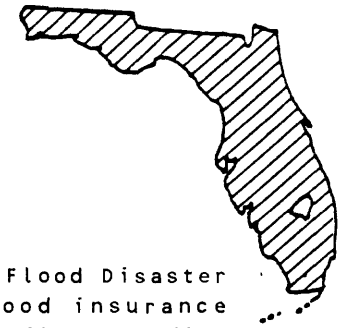
APPROACH: Basic data atmospheric deposition will be collected at a NADP/NTN approved site (N39). Methods of data collection and instrumentation conform to NADP procedures and guidelines. Data collection will be continuous with weekly sample collections in addition to collecting additional samples for non-standard events. All samples will be shipped to NADP Central Analytical Laboratory (CAL) which is operated by the Illinois State Water Survey.

PROGRESS: Data were collected on a weekly schedule.

PLANS FOR THIS YEAR: The data collection sites will be maintained and operated according to National Atmospheric Deposition Program/ National Trends Network (NADP/NTN) standards and schedule.

REPORTS IN PROCESS: No reports planned for this project; data will be stored in WATSTORE data files.

FL-006 LESS-DETAILED FLOOD INSURANCE STUDIES



DATE PROJECT BEGAN: April 1985

DATE PROJECT ENDS: Continuing

PRINCIPAL INVESTIGATOR: Wayne C. Bridges, Tallahassee

COOPERATING AGENCY: Federal Emergency Management Agency

PROBLEM: The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provides for the operation of a flood insurance program. The Federal Emergency Management Agency (FEMA) needs flood studies in selected areas to determine applicable flood insurance premium rates.

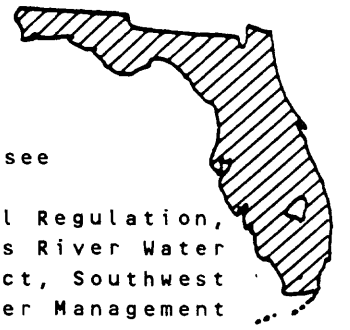
OBJECTIVE: To conduct the necessary hydrologic and hydraulic evaluations and studies of areas assigned by FEMA and to present the results in an appropriate format.

APPROACH: To conduct the necessary evaluations or to conduct surveys by ground or photogrammetric methods. Determine flood-discharge frequency relationships using local historical information, gaging station records, or other applicable information. Determine water-surface profiles using step-backwater models or by other acceptable methods and furnish the results in reports prepared to FEMA specifications.

PROGRESS: As study contractor to the Federal Emergency Management Agency, the USGS completed nine of eleven communities selected for Less Detailed Flood Studies. Studies completed and sent to FEMA were: Calhoun County, Caryville, Chattachoochee, Graceville, Lake City, Lake Wales, Mount Dora, Tavares, and Waldo. Umatilla has been completed and is in review. Work on Baker County has been started.

PLANS FOR THIS YEAR: The Baker County study will be completed and sent to FEMA. The USGS will be represented at the public meetings in each community at such time that FEMA presents the completed study to the community.

FL-007 ANNUAL WATER-USE INVENTORY



DATE PROJECT BEGAN: July 1975

DATE PROJECT ENDS: Continuing

PRINCIPAL INVESTIGATOR: R. Rumenik, District Office, Tallahassee

COOPERATING AGENCIES: Florida Department of Environmental Regulation, Northwest Florida Water Management District, St. Johns River Water Management District, South Florida Water Management District, Southwest Florida Water Management District and Suwannee River Water Management District.

PROBLEM: Florida is undergoing a rapid growth in population and industry. With this growth the competition for water for municipal, rural, industrial, agricultural, and thermoelectric power has become more acute. Although water-use data have been collected every 5 years since 1965 in the State, there is a need to collect the data annually.

OBJECTIVE: The objective of this joint State and Federal effort is to provide a reliable estimate of the annual water use by county, by Water Management Districts (WMDs), and by hydrologic units. This annual evaluation will aid the WMDs in determining water-use trends and in developing water-use plans and issuing water use permits. Water-use data will be updated annually and published every 5 years starting in 1975. In addition, much effort will be expended to research methods of improving techniques for data collection and to standardize the storage and retrieval of water-use information. The collection of site-specific data for use in hydrologic studies will also be intensified.

APPROACH: Collect and compile water-use information annually through the concerted efforts of the U.S. Geological Survey and the State's Water Management Districts from the following sources: public-supply water systems, rural self-supplied domestic and livestock systems, industrial self-supplied systems, irrigation self-supplied systems, and thermoelectric self-supplied systems. Upgrade the quality of data by minimizing estimated values where actual values are attainable by enhancing methods and procedures for collecting data, and by maintaining all data in an automatic data system. St. Johns River Water Management District serves as the lead agency responsible for the coordination of water-use activities within the State; prior to 1985, USGS served in this capacity.

PROGRESS: St. Johns River Water Management District (SJRWMD) served as the lead agency for all Florida Water Management Districts (WMD) in coordinating efforts for collection and computer storage of all categories of water-use data. All water-use data have been collected and compiled. Efforts have begun for entering data into the National Water Use Data System (NWUDS). Research methods were applied for improving techniques for collecting irrigation water-use data in 16 counties in the Southwest Florida Water Management District. Data included total water withdrawn in 1985 and number or irrigated acres by crop type.

PLANS FOR THIS YEAR: Provide 1985 water-use data for Florida for a national water-use report. Compile all categories of water-use data by water management district, by county, and by hydrologic unit; enter data into a State water-use computer system, and prepare state reports of estimated water use in 1985. Continue monitoring benchmark farms for total use of ground- and surface-water and number of irrigated acres by crop type for 16 counties in west-central Florida. Data will be collected and tabulated monthly.

REPORTS RELEASED:

Healy, H. G., Public water supplies of selected municipalities in Florida, 1976: (tables only, open filed).

_____ 1977, Public water supplies of selected municipalities in Florida, 1975: U.S. Geological Survey Water-Resources Investigations 77-53.

Leach, S. D., 1977, Water use inventory in Florida, 1975: U.S. Geological Survey Open-File Report 77-577.

_____ 1978, Source, use, and disposition of water in Florida, 1975: U.S. Geological Survey Water-Resources Investigations 78-17.

_____ 1978, Freshwater use in Florida, 1975: Florida Bureau of Geology Map Series 87.

Duerr, A. D., and Trommer, J. T., 1979, Estimated water use in the Southwest Florida Water Management District, and adjacent areas: U.S. Geological Survey Open-File Report 81-56.

Leach, S. D., and Healy, H. G., 1980, Estimated water use in Florida, 1977: U.S. Geological Survey Water-Resources Investigations 79-112.

Duerr, A. D., and Trommer, J. T., 1981, Estimated water use in the Southwest Florida Water Management District and adjacent area, 1980: U.S. Geological Survey Open-File Report 81-1060.

Leach, S. D., 1982, Estimated water use in Florida, 1980, Florida Bureau of Geology Map Series 103.

Duerr, A. D., and Trommer, J. T., 1983, The benchmark farm program--a method for estimating irrigation water use in southwest Florida: U.S. Geological Survey Water-Resources Investigation 82-17.

Duerr, A D., and Sohm, J. E., 1983, Estimated water use in southwest Florida 1981, and summary of water use, 1970, 1975, and 1977-81: U.S. Geological Survey Open-File Report 83-45.

Leach, S. D., 1983, Consumptive use of freshwater in Florida, 1980: Florida Bureau of Geology Map Series 105.

_____ 1983, Source, use and disposition of water in Florida, 1980: U.S. Geological Survey Water-Resources Investigation 82-4090.

Spechler, R. M., 1983, Estimated irrigation water use in Florida, 1980 Florida Bureau of Geology Map Series 106.

Geiger, L. J., 1984, Water-use computer programs for Florida: U.S. Geological Survey Open-File Report 84-442, 91p.

FL-012 FLOOD ASSESSMENT

DATE PROJECT BEGAN: July 1964

DATE PROJECT ENDS: Continuing

PRINCIPAL INVESTIGATOR: W. C. Bridges, Tallahassee

COOPERATING AGENCY: Florida Department of Transportation

PROBLEM: Local and state governments, highway designers, planners, and zoning commissions have a responsibility to avoid uneconomic, hazardous or incompatible use and development of the state's flood plains. Prime requisites to meet these criteria are a knowledge of the flood-flow characteristics of streams and the ability to make reliable estimates of the flood magnitude and frequency.

OBJECTIVE: To assess the hydraulic and hydrologic characteristics of Florida streams. To collect flood flow data and analyze hydraulic problems for selected stream reaches as well as for hydrologic regions. To document and prepare reports for extreme flood events.

APPROACH: Expand the flood peak data base by maintaining a regional network of crest-stage gages. These data will supplement the statewide gaging station network.

Update and maintain the computer files for basin characteristics and peak flow for use in regional flood frequency analysis.

Respond by letter reports to specific requests for hydraulic and hydrologic information for selected stream reaches.

Assess extreme flood events, including indirect flood measurements, analysis, and preparation of reports to disseminate the flood information.

PROGRESS: A major flood occurred in north Florida in February 1986. A flood summary report was furnished to the Florida Department of Transportation. Work elements continued on the dimensionless hydrograph analysis project. The flood-assessment stream-gaging network was reviewed. It was determined that 18 of 38 flood-crest stations could be deleted from the network. One rainfall/runoff gaging station is scheduled to be discontinued because of excessive storage causing low runoff.

PLANS FOR THIS YEAR: Assessment of floods and flooding potential will be made on a request basis. The hydrograph synthesis project will be completed and a report published which will provide a method for synthesizing a hydrograph and estimating runoff volume at ungaged sites. Small basin rainfall/-runoff modeling sites will be established in four or five urban areas, (Pensacola, Jacksonville, Gainesville, Orlando, and Tampa).

(FL-012)

REPORTS RELEASED:

Bridges, W. C., 1972, Effects of Port Orange Bridge-causeway on flow of Halifax River, Volusia County, Florida: U.S. Geological Survey, Florida District, Open-File Report 72-005.

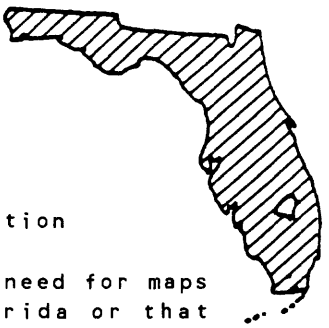
_____ 1974, An analysis of 1972-73 floods on Monroe Street and St. Augustine Branch, Tallahassee, Florida: U.S. Geological Survey, Florida District, Open-File Report 74-023.

_____ 1982, Technique for estimating magnitude and frequency of floods on natural-flow streams in Florida: U.S. Geological Survey, Florida District, Open-File Report 74-023.

_____ 1985, Analysis of water-level fluctuations of the U.S. Highway 90 retention pond, Madison, Florida: U.S. Geological Survey Water-Resources Investigations Report 85-4057.

Bridges, W. C., and David, D. R., 1972, Floods of September 20-23, 1969, in the Gadsden County area, Florida: Florida Dept. of Natural Resources, Bureau of Geology Information Circular 79.

FL-075 FLORIDA WATER ATLAS



DATE PROJECT BEGAN: September 1963

DATE PROJECT ENDS: September 1988

PROJECT COORDINATOR: Walter R. Aucott, Tallahassee

COOPERATING AGENCY: Florida Department of Environmental Regulation

PROBLEM: Water-use planners have repeatedly expressed the need for maps that show the characteristics and availability of water in Florida or that show related information such as climate. Prior to the start of this project only a few maps had been published that give hydrologic data or other data closely related to hydrologic problems in Florida.

OBJECTIVE: This project seeks to make available the needed information in the form of a water atlas--a series of map reports designed to furnish to the user generalized hydrologic, geologic, and related information, portrayed graphically on a standard size map. These maps are most useful for broad planning to aid legislators, planners, industrialists, laymen, and others as well as hydrologists to provide readily available hydrogeologic information for decision making.

APPROACH: Using available information and knowledge from other statewide studies, maps portraying aspects of the hydrologic cycle will be prepared by the U.S. Geological Survey and published by the cooperating agency.

PROGRESS: "Long-term lake stations in Florida" has received Director approval and final drafting is in progress. "Runoff in hydrologic units in Florida" has been completed and is currently in review.

PLANS FOR THIS YEAR: Complete and publish map reports currently in review and preparation. Begin work on two additional map reports; "Recharge to the Floridan aquifer" and "Water use in Florida, 1985".

REPORTS IN PROCESS:

Foose, D. W., Long-term lake stations in Florida, 1984

Rumenik, R. P., Runoff in hydrologic units in Florida

REPORTS RELEASED:

Healy, H. G., 1962, Piezometric surface of the Floridan aquifer in Florida, July 6-17, 1961: Florida Bureau of Geology Map Series 1.

_____ 1962, Piezometric surface and areas of artesian flow of the Floridan aquifer in Florida, July 6-17, 1961; (Revised 1975): Florida Bureau of Geology Map Series 4.

Calver, J. L., 1965, Mineral resources and industries of Florida: Florida Bureau of Geology Map Series 8.

Shampine, W. J., 1981, Chloride concentration in water from the upper part of the Floridan aquifer in Florida: (Revised 1975), Florida Bureau of Geology Map Series 12.

REPORTS RELEASED:(Continued)

Shampine, W. J., 1965, Hardness of water from the upper part of the Floridan aquifer in Florida, (Revised 1975): Florida Bureau of Geology Map Series 13.

_____ 1965, Dissolved solids in water from the upper part of the Floridan aquifer in Florida, (Revised 1975): Florida Bureau of Geology Map Series 14.

_____ 1965, Sulfate concentration in water from the upper part of the Floridan aquifer in Florida; (Revised 1975): Florida Bureau of Geology Map Series 15.

Hyde, L. W., 1965, Principal aquifers of Florida; (Revised 1975): Florida Bureau of Geology Map Series 16.

Vernon, R. O., Puri, H. S., 1964, Geologic map of Florida: Florida Bureau of Geology Map Series 18.

Kenner, W. E., 1966, Runoff in Florida: Florida Bureau of Geology Map Series 22.

Kenner, W. E., Pride, R.W., Conover, C.S., 1967, Drainage basins in Florida: Florida Bureau of Geology Map Series 28.

Kenner, W. E., 1969, Seasonal variation of streamflow in Florida: Florida Bureau of Geology Map series 31.

Visher, F. N., Hughes, G.H., 1969, The difference between rainfall and potential evaporation in Florida, (Revised 1975): Florida Bureau of Geology Map Series 32.

Kaufman, M. I., 1969, Generalized distribution and concentration of orthophosphate in Florida streams, (Revised 1975): Florida Bureau of Geology Map Series 33.

Kenner, W. E., Hampton, E. R., Conover, C. S., 1969, Average flow of major streams in Florida, (revised 1975): Florida Bureau of Geology Map Series 34.

Kaufman, M. I., 1969, Color of water in Florida streams and canals: Florida Bureau of Geology Map Series 35 (revised 1975).

Pride, R. W., 1970, Estimated water use in Florida, 1965, (Revised 1975): Florida Bureau of Geology Map Series 36.

Kaufman, M. I., 1970, The pH of water in Florida streams and canals: Florida Bureau of Geology Map Series 37.

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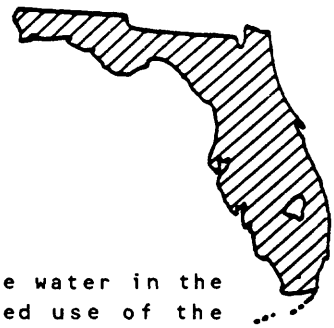
FL-154 SUBSURFACE WASTE STORAGE, FLORIDA



DATE PROJECT BEGAN: October 1970

DATE PROJECT ENDS: Continuing

PRINCIPAL INVESTIGATOR: J. J. Hickey, Tampa

COOPERATING AGENCY: Federal Program

PROBLEM: Liquid wastes are now being injected into saline water in the deeper zones of the Floridan aquifer with indication of expanded use of the aquifer waste-storage capacity, especially in regard to storing-disposing of secondary treated sewage effluent. The hydrologic and geochemical characteristics are not adequately known to effectively evaluate the potentialities and possible consequences of subsurface waste storage. Based on the present state of knowledge, reliable prediction of the movement, chemical interactions, and ultimate fate of liquid wastes underground is uncertain.

OBJECTIVE: To provide the needed scientific information base and guidelines for a comprehensive evaluation of the lithology, hydrology and geochemistry of the deep saline parts of the aquifer systems, and for planning-management decisions among a multiplicity of possible uses of the saline aquifers, including subsurface liquid waste storage. The investigation is coordinated with the geologic research phase being conducted by the Florida Bureau of Geology.

APPROACH: Assessment and synthesis of available hydrologic and geochemical data into a regional appraisal of the deep saline-water part of the aquifer system; inventory, assessment and evaluation of active and planned subsurface waste disposal systems in Florida, compilation of data, field investigations, and preparation of summary report including case studies, and establishment of a foundation for expanded effort in subsequent years via liaison with regulatory agencies, consultants, companies, the Florida Bureau of Geology and WRD research personnel.

PROGRESS: Three reports were approved for publication by the Director. Two of these were published. The remaining one is in the review process at a national journal. Three papers were presented at national meetings of the GSA, AGU, and ASCE. A national symposium on multiple uses of aquifers and an international symposium on subsurface injection of liquid waste was planned and moderated by a member of the project.

PLANS FOR THIS YEAR: Guide drainage well report through the approval process. Begin reports on data at subsurface injection sites in southeast Florida, convective circulation during subsurface injection, and an approach to the field study of variable density ground-water flow.

REPORTS IN PROCESS:

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McKenzie, D. J., 1976, Injection of acidic industrial waste into the Floridan aquifer near Belle Glade, Florida: Upward migration and geochemical interaction 1973-75: U.S. Geological Survey Open-File Rept. 76-626, 54 p.

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Pascale, C. A., and Martin, J. B., 1977, Hydrologic monitoring of a waste injection well near Milton, Florida: U.S. Geological Survey Open-File Rept. 77-368, 46 p.

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Pitt, W. H., Meyer, F. W., and Hull, J. E., 1977, Disposal of salt-water during well construction: Problems and solutions: Ground-water, vol. 15, no. 4, p. 276-283.

Pascale, C. A., and Martin, J. B., 1978, Hydrologic monitoring of a deep-well waste injection system near Pensacola, Florida, March 1970-March 1977: U.S. Geological Survey Water Resources Inv. 78-27, 61 p.

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McKenzie, P. J., and Irwin, G. A., 1984, Quality of water recovered from a municipal effluent injection well in the Floridan aquifer system, Pompano Beach, Florida: U.S. Geological Survey Water Resources Investigations Report 84-4100, 23 p.

Merritt, M. L., 1984, Digital simulation of the regional effects of subsurface injection of liquid waste near Pensacola, Florida: U.S. Geological Survey Water-Resources Investigations Report 84-4042, 73 p.

Hickey, J. J., 1986, Saltwater circulation during subsurface injection of liquid waste, St. Petersburg, Florida (Journal Article).

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FL-325 APPRAISAL OF THE SURFICIAL AQUIFERS OF THE LOWER EAST COAST OF FLORIDA

DATE PROJECT BEGAN: October 1979

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: Leo Swayze, Miami

COOPERATING AGENCY: South Florida Water Management District

PROBLEM: Southeast Florida relies on ground-water sources for nearly all of its potable water supply. Hydrologists and water managers need geologic and hydrologic data for the study and management of the water resources in southeast Florida. There is a lack of sufficient information on the geologic and hydraulic characteristics of the surficial aquifer to delineate the aquifer and evaluate the total water resources.

OBJECTIVE: (1) Assess the areal and vertical hydraulic conductivity of the surficial aquifer of eastern Palm Beach County; (2) Produce an areal transmissivity map; and (3) improve understanding of ground-water flow system in three dimensions.

APPROACH: Test well sites located in the high permeability zones of the surficial aquifer in Palm Beach County. Aquifer test wells drilled and developed in productive zones. Step-drawdown and drawdown-recovery aquifer tests conducted as well as multiple well tests to determine aquifer anisotrophy. Tests to determine vertical and horizontal hydraulic conductivity conducted in surficial sands. The Hvorslev method of aquifer analysis used for calculating horizontal hydraulic conductivity of the sands.

PROGRESS: Seventeen aquifer test sites have been selected in Palm Beach County to drill. Aquifer testing using the step-drawdown and Hantush I method of aquifer analysis has been completed at all sites. Hydraulic conductivities have ranged from 60 to 1400 feet per day. Lithologic logs have been worked up for five sites. Report preparations for work in Dade County continues. The analysis and documentation of the Dade County step-drawdown and specific capacity tests are nearly completed and the permeability profiles are completed for 27 wells drilled in Dade County.

PLANS FOR THIS YEAR: Continue with aquifer testing and analysis, and lithologic descriptions in Palm Beach County. Complete the final map report which will present the aquifer analysis and data. Complete analysis of data for the Dade County ground-water report and enter it into the review process.

REPORTS IN PROCESS:

Fish, J. E., Hydrogeology, transmissivity, and ground-water flow of the surficial aquifer system, Broward County, Florida: U.S. Geological Survey Water Resources Investigation.

Sonntag, W. H., Chemical characteristics of ground water in the surficial aquifer system, Dade County, Florida: U.S. Geological Survey Water Resources Investigation.

(FL-325)

Reports Released:

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Sonenshein, R. S., Fish, J. E., Causaras, C. R., and Poore, D.M., 1982, Index hydrologic data for selected sites in Broward County, Florida, 1939-1980: U.S. Geological Survey Open-File Report 82-920.

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Howie, Barbara, 1986, Chemical characteristics of water in the surficial aquifer, Broward County, Florida: U.S. Geological Survey Water Resources Investigations Report 86-4330.

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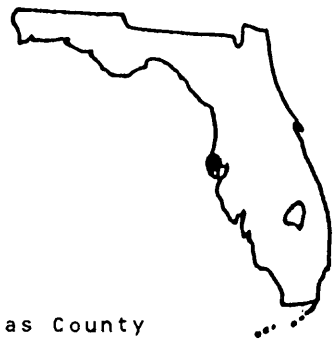
FL-362 EVALUATION OF STORMWATER DETENTION BASINS IN WEST-CENTRAL FLORIDA



DATE PROJECT BEGAN: October 1980

DATE PROJECT ENDS: September 1990

PRINCIPAL INVESTIGATOR: Miquel A. Lopez, Tampa

COOPERATING AGENCIES: Cities of Clearwater and Tampa and Pinellas County

PROBLEM: Pinellas County is one of the most densely populated counties in Florida, and serious water quality problems in the Gulf of Mexico and Tampa Bay are caused by the increase in urban runoff. There is a need for data to evaluate the cost-effectiveness of the pollution control measures being planned to satisfy receiving water quality standards.

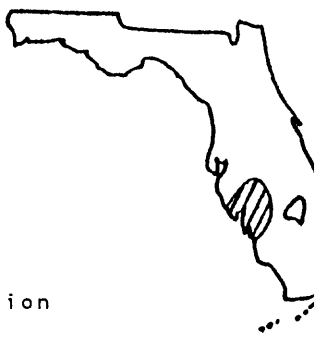
OBJECTIVE: To determine the effectiveness of runoff detention ponds in reducing suspended solids, nutrients, metals, BOD, and coliform loading entering receiving waters from urban areas in Pinellas County.

APPROACH: Runoff quantity and quality of an urban watershed will be monitored for a year before the construction of a stormwater detention pond just upstream from the monitoring station. This will provide background information to compare with data after the completion of the pond in the second year. After completion of the pond, an additional monitoring station will be operated at the inflow. Loads entering and leaving the pond will be compared. An interpretive report will be written in the third year after at least one complete year of inflow and outflow data have been analyzed.

PROGRESS: A streamflow gaging station and automatic water quality sampler were installed at the inflow to St. Joes Creek detention area. Daily discharge, quarterly baseflow and storm runoff water quality data are collected at 29th Street storm drain in Tampa, two inflow channels and the outflow of Alligator Creek detention area in Clearwater, and inflow and outflow to St. Joes Creek detention area 3 near Pinellas Park. Constituent loads of nutrients and metals are computed at inflow and outflow of the detention areas.

PLANS FOR THIS YEAR: Stormwater loads of total solids, total nitrogen, total phosphorus, chloride, lead, zinc, chromium, and copper during six storms will be sampled at the inflow and outflow of Detention Area 3 on St. Joes Creek. Quarterly baseflow samples for these same constituents will also be collected. Stormwater loads of lead, zinc, chromium, and copper during two storms will be sampled at two inflow and the outflow of the Alligator Creek detention area.

FL-377 ENVIRONMENTAL ASSESSMENT STUDY OF THE CHARLOTTE HARBOR ESTUARINE SYSTEM AND SURROUNDING AREA, SOUTHWEST FLORIDA



DATE PROJECT BEGAN: July 1982

DATE PROJECT ENDS: June 1989

PRINCIPAL INVESTIGATOR: B. F. McPherson, Tampa

COOPERATING AGENCY: Florida Department of Environmental Regulation

PROBLEM: The area surrounding the Charlotte Harbor estuarine system is undergoing rapid development and population growth. As development occurs, surface-drainage features will be modified, and area water resources will undergo increased stress from water-supply withdrawals and waste disposal. Consequently, the magnitude of freshwater inflow to the estuarine system will be reduced and the inflow patterns altered. Saltwater may move upstream on principal tributaries and into surficial and intermediate aquifer systems, and salinity in the estuarine system may increase. Altered inflow patterns and increased chemical constituent loads will affect physical, chemical, and biological processes in the estuarine system.

OBJECTIVE: To determine existing conditions and evaluate the impact of future development on water-related resources of the Charlotte Harbor estuary. Specific objectives are to evaluate - (1) Freshwater runoff in the major tributaries and salinity distribution in the estuary. (2) Land and water use in the basin. (3) Material transport and water-quality characteristics in the major tributaries. (4) Circulation, flushing, and transport characteristics of the estuarine system. (5) Water-quality characteristics of the estuarine system, including physical, optical, chemical, radiochemical, and biological properties. (6) Relationships between freshwater runoff, nutrient loading, and water-quality characteristics in the estuarine system.

APPROACH: Information will be gathered from the existing literature and from field data collected to define and describe the estuarine system so as to meet the objectives listed above. Available information includes - (1) numerous scientific and technical reports, maps, etc.; and (2) rainfall, temperature, streamflow, water-quality, stream channel cross-sections, tide stage and velocity, water-use, land-use, topography, and hydrologic data. However, much additional biologic and hydrologic data will be required to meet study objectives. Evaluation will require application of various engineering and hydrologic methods including digital models that simulate hydraulic and water-quality conditions in streams and estuaries.

PROGRESS: Information on basic characteristics, including land use, water use, freshwater inflow, and water quality have been compiled and analyzed. Work continues on the analysis of salinity distribution and flow in the tidal rivers. Data on velocity, tidal stage, salt flux and 24-hour tidal discharge of the inlets were collected in July. These data will be used to calibrate and verify a two-dimensional hydrodynamic model of the harbor system. Compilation and analysis of physical, chemical, radiochemical, optical and biological data continues.

PLANS FOR THIS YEAR: Complete analysis of (1) phytoplankton taxonomy, (2) radium isotope sources and distribution, and (3) flow and salinity in the tidal Peace River. Compile and analyze the 24-tidal discharge data, and the stage and velocity data in the harbor system. Begin calibration and verification of two-dimensional hydrodynamic circulation model. Analyze nutrient limitation data. Continue analysis of light attenuation. Continue to measure phytoplankton productivity, including productivity measurements at different depths and light conditions.

REPORTS IN PROCESS:

Hammett, K. M., Landuse, water use, and hydrologic characteristics of the Charlotte Harbor inflow area, Florida.

Miller, R. L., McPherson, B. F., and Kraemer, Sources of radium-226 in ground water and surface water near Charlotte Harbor, Florida.

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Fraser, T. H., 1986, Long-term water-quality characteristics of Charlotte Harbor, Florida: Water Resources Investigations Report 86-4180.

McPherson, B. F. and Miller, R. L., 1986, The vertical attenuation of light in Charlotte Harbor, a shallow, subtropical estuary, southwestern Florida (Journal Article).

FL-393 FLOW CHARACTERISTICS OF NASSAU RIVER BASIN AND ESTUARY

DATE PROJECT BEGAN: October 1981

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: John E. Coffin, Jacksonville

COOPERATING AGENCY: St. Johns River Water Management District

PROBLEM: To evaluate the impact of future development in the Nassau River Basin, basic hydrologic data are needed. Modifications to biological systems may occur because of changes in salinity distributions. These modifications could have long-term, detrimental effects on the ecological balance of estuarine systems. To properly manage and conserve freshwater resources and to maintain an ecological balance, an understanding of the relation between saltwater movement and freshwater inflow to estuaries is needed. Specifically needed are continuous records of discharge, volume, direction of flow, velocity, water temperature, specific conductance, dissolved oxygen, and pH.

OBJECTIVE: The possibility of making maximum use of the land and water areas without upsetting the ecological balance hinges upon sufficient knowledge of the system. This study will provide information on the surface-water movement and water quality in the Nassau Estuary. The comprehensive information gained from the study will afford us the opportunity to begin to understand the processes of work in an estuary system. Most importantly this baseline knowledge can be transferred to neighboring estuaries.

APPROACH: The first phase is a basin reconnaissance, temporary gage installation, data collection and evaluation. Phase two includes equipment installation, basic data collection and evaluation, development and calibration of a one-dimensional flow model, and preparation of an interpretive report.

PROGRESS: During FY86, stage data were collected at six stations, discharge data were collected at three stations, rainfall data were collected at four stations and velocity, temperature, and conductance were collected at two stations in the Nassau Basin. A velocity probe was also installed at Mills Creek near Italia. Preliminary tests of the Branch Model show mean daily discharges to be within five percent of those obtained with the velocity probe at the Nassau River at Hedges gage.

PLANS FOR THIS YEAR: Data collection will continue during FY87. Testing of the Branch Model will continue and the final report describing the flow model will be completed.

FL-394 WETLAND ECOSYSTEM RECLAMATION AFTER PHOSPHATE MINING WEST-CENTRAL FLORIDA

DATE PROJECT BEGAN: May 1982

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: T. H. Thompson, Tampa

COOPERATING AGENCY: Florida Institute of Phosphate Research

PROBLEM: Approximately 15 percent of Florida's phosphate reserves lie beneath wetlands. Current regulations prohibit mining wetlands. Data are not available on the potential for successful reestablishment of a wetlands ecosystem in an area that has been mined. A 25-acre wetlands test site has been selected for mining and restoration. The U.S. Bureau of Mines is developing various mining schemes for removing overburden and restoring the land. The U.S. Fish and Wildlife Service is developing revegetation methods to restore the wetlands flora. The U.S. Geological Survey (USGS) will define the pre- and post-mining hydrologic and biologic conditions at the site.

OBJECTIVE: (1) To develop, test, refine, and implement an integrated hydrologic and biological monitoring system that is sensitive enough to detect differences between pre- and post-mining conditions in a wetlands area that has been carefully reclaimed; (2) to use the monitoring system on an unmined and a reclaimed wetland site to determine hydrologic and biological variables that may affect the initial success or failure of a wetlands revegetation effort; and (3) to provide a base for evaluating long-term evolution of the wetlands hydrology and biology following reclamation and revegetation.

APPROACH: Seven major field activities will be coordinated to define pre- and post-mining conditions. They include (1) Botanical - aerial and field inspection of major vegetative groups; (2) Soil survey and analysis - define areal variation in soil horizons, (3) Topographical - land elevation contouring to define slopes and major changes from mining, (4) Ground water - define aquifers' thickness, extent, hydraulics, and water levels, (5) Surface water - gage streams and define high- and low-flow characteristics and percent of time soil is saturated, (6) Water quality - sample surface and ground water, and (7) Atmospheric data - measure quantity and quality of rainfall.

PROGRESS: Hydrologic data collection continued at control site. The wetlands portion of the test site (14 acres) that was mined was regraded and top soil that had been stored was spread to encourage revegetation. A network of four wells and a stage recorder was installed following regrading.

PLANS FOR THIS YEAR: Submit final report for review, respond to comments, and obtain Director's approval for release and publication. Publish and distribute final report.

FL-400 SALTWATER-INTRUSION MODELS FOR SELECTED AREAS, WEST-CENTRAL, FLORIDA

DATE PROJECT BEGAN: October 1982

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: G. L. Mahon, Tampa

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: Pumpage from the Floridan aquifer has caused lowering of the potentiometric surface and has created a high potential for saltwater intrusion into the aquifer along Florida's Gulf Coast. With Florida's population expected to rise 30 to 50 percent between 1980 and 2000, an analysis of mechanisms for saltwater intrusion along the densely populated coastal area is necessary to plan for and manage the fresh-water resources.

OBJECTIVE: The overall objective of the study is to better define the physics of coastal ground-water flow systems. Specific objectives are to (1) evaluate capability of cross-sectional digital models to simulate the saltwater-freshwater interface at two coastal sites; and (2) simulate movement of the interface under various stress conditions and evaluate impact of the movement on inland freshwater resources.

APPROACH: Existing geologic and hydrologic data will be evaluated. Additional wells will be drilled, accompanied by borehole geophysical logging, packer tests and water sampling. These data, together with lab tests of core samples, will provide information on the location and nature of the interface and porosity, water-level, and water-density data needed for the modeling effort.

PROGRESS: Data collection continued at the Hunters Lake well TR18-3 and the Rubonia well TR-8-1 by recording fluid conductance simultaneously with water level in the well and tidal fluctuations in the Gulf of Mexico. The data from the Hunters Lake well showed that there is a slight, lagged tidal influence on the water level in the well, and the conductivity changes are indistinguishable. At the Rubonia well, the conductivity and water-level recording equipment was installed on the monitor well open from 847 to 1017 feet. It was found that there is a tidal influence on water levels, but pumpage fluctuations overshadow those caused by the tides. Fluctuations in fluid conductance were not caused by tides, but pumpage effects were evident in the plot of conductance data. To better define the transition zone, the well was reconstructed and a monitor tube screen was placed at the interval from 900-940 feet below LSD.

Water samples were collected from 11 Upper Floridan aquifer wells in the Rubonia area at times corresponding to seasonal high and low water levels. Digital modeling based on a simplified conceptual model has continued at the Manatee County site. Four layers are being modeled, including an uppermost, low-permeability layer as part of a specified pressure boundary condition. The other three layers correspond to the Tampa/Suwannee permeable zone, the Ocala semi-confining zone, and the Avon Park permeable zone.

(FL-400)

PLANS FOR THIS YEAR: Simultaneous collection of conductivity and water-level data will continue at the Manatee County site. Cross-sectional, pre-development solute transport modeling in coastal Manatee County will continue. A final report is being prepared to discuss the results and analysis of data collection and model development at the Hernando and Manatee County sites.

REPORTS RELEASED:

Ryder, P. D. and Mahon, G. L., 1986, Potential for saltwater intrusion into the Upper Floridan aquifer, Hernando County, Florida (Conference Paper) and selected papers in the hydrologic sciences, WSP 2350, Seymour Subitzky, editor.

FL-406 OCCURRENCE, MOVEMENT, AND FATE OF ORGANIC CONTAMINANTS IN GROUND WATER NEAR PENSACOLA, FLORIDA

DATE PROJECT BEGAN: October 1986

DATE PROJECT ENDS: September 1989

PRINCIPAL INVESTIGATOR: Bernard J. Franks, Tallahassee

COOPERATING AGENCY: Federal

PROBLEM: American Creosote Works, Inc. (ACW), located in northwest Florida within the city limits of Pensacola, presents an opportunity to investigate the biodegradation of hazardous wastes and the feasibility of enhancement of aquifer restoration processes under one set of hydrogeologic conditions. During the 70 years of continuous operation, wastewaters generated from the use of creosote and PCP in the wood-treatment process were discharged into two unlined surface impoundments which are in direct contact with the sand-and-gravel aquifer, the principal source of water in western panhandle Florida.

OBJECTIVE: 1. To define the chemical constituents in the subsurface and the extent of contaminant movement in the aquifer. 2. To simulate solute transport in the aquifer, including movement of both conservative and non-conservative constituents. 3. To investigate impacts of organic contaminants on the nearshore environments in Pensacola Bay. 4. To continue field testing of analytical methods useful in defining organic contamination in ground water.

APPROACH: 1. Continue data collection from wells in the monitoring network. 2. Evaluate flow model results and geochemical data for applicability in transport simulations. 3. Develop and test a solute transport model of contaminant movement. 4. Continue field studies of analytical methods useful in plume delineation. 5. Continue coordination of concurrent multidisciplinary research efforts concerned with geochemical and microbial processes affecting contaminant distribution and movement.

PROGRESS: A 3-D finite-difference ground-water flow model was developed and calibrated, and a professional paper documenting the hydrogeology of the contaminated site and model area was completed and placed in review. Provided field support for continuing NRP research efforts. The project objectives and approach were updated to include revised research interests of Florida District and National Research Program personnel involved in the multidisciplinary investigation at the site.

PLANS FOR THIS YEAR: Begin work on solute transport, synthesizing geochemical data and the GW flow model. Continue geochemical investigations, including coordination of NRP research efforts related to processes affecting contaminant transport. Coordinate the Third Annual GW Toxic Waste Meeting in Pensacola, March, 1987.

REPORTS IN PROCESS:

Franks, B. J., 1986, Evaluation of a sand-and-gravel aquifer contaminated by wood-preserving compounds, Pensacola, Florida--Part I, Hydrogeology: USGS Prof. Paper (in process).

(FL-406)

REPORTS RELEASED:

Franks, B. J., Goerlitz, D. F., and Baedecker, M. J., 1985, Defining a contaminant plume using on-site analytical techniques in Petroleum hydrocarbons and organic chemicals in ground water: Prevention, detection, restoration: Second Annual Conference, November 1985, Houston, Texas), p. 265-275.

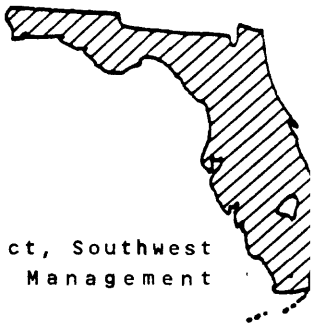
Goerlitz, D. F., Troutman, D. E., Godsy, E. M., and Franks, B. J., 1985, Migration of wood-preserving chemicals in contaminated groundwater in a sand aquifer at Pensacola, Florida: Environmental Science and Technology, v.19, no. 10, p. 955-961.

Kantrowitz, I. H., Field methods for studying contaminated ground water: A U.S. Geological Survey perspective: ASTM Special Technical Publication.

Mattraw, H. C. Jr., and Franks, B. J., editors, 1986, Movement and fate of creosote waste in ground water, Pensacola, Florida: U.S. Geological Survey toxic waste ground-water contaminated program: U.S. Geological Survey Water-Supply Paper 2285, Chapters A-I, 63 p.

Ragone, S. E., 1986, U.S. Geological Survey Toxic Waste--Ground-Water Contamination Program, Fiscal Year 1986. Program overview and selected abstracts presented at the Toxic Waste Program Techanical meeting: Cape Code, Mass., October 1985: U.S. Geological Survey Open-File Report 86-481.

FL-410 ADAPTATION OF FLORIDAN AQUIFER SYSTEM RASA MODELS FOR WATER-MANAGEMENT NEEDS, FLORIDA



DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: Continuing

PRINCIPAL INVESTIGATOR: C. H. Tibbals, Orlando

COOPERATING AGENCIES: South Florida Water Management District, Southwest Florida Water Management District, St. Johns River, Water Management District, and Suwannee River Water Management District

PROBLEM: From 1950 to 1980, the population of Florida grew from about 2.8 million to about 9.8 million, an increase of 350 percent. By 2000, the population is expected to grow to about 17 million. Population growth, plus that of industry and the increased use of ground water for crop irrigation has placed great demand on the ground-water resource. The principal source of fresh ground water is the Floridan aquifer system which underlies all of Florida and parts of Alabama, Georgia, and South Carolina. The effects of increased pumping of ground water have been responsible, in part, for lower pressure heads in the Floridan which, in turn, are responsible for intrusion of salty water along both the east and west coasts of peninsular Florida and along the Gulf coast of north-central Florida; lower lake levels; lower water levels in the surficial aquifer; reduced streamflow; and, to some degree, increased potential for sinkhole activity.

OBJECTIVE: The overall objective is to provide the basis for long-term liaison and, thus, coordination between the U.S. Geological Survey (USGS) and the five State Water Management Districts as regards refinement and uses of the regional and subregional Floridan aquifer computer models constructed during the now-completed Floridan Regional Aquifer Systems Analysis (RASA) projects; to provide information on new modeling techniques; and to provide, on an as-needed basis, general guidance and advice on matters that relate to ground-water modeling in general and ground-water hydraulics. Other, more specific, objectives are: (1) Identify data and investigate needs on an areal basis; (2) Suggest and help implement changes to existing models; (3) Help provide results of specific-purpose modeling runs done in cooperation with the Southeastern Region staff that maintains the regional model; (4) Participate in the development of a high resolution (small grid block), multi-District ground-water model data base; (5) Develop techniques to access that data base at any location so as to provide "moveable models," small models for any area that are, for the most part, already calibrated and that can be quickly constructed.

APPROACH: Liaison and coordination will be accomplished by means of both formal and informal meetings and discussions between the USGS District project leader, the Water Management District staffs, and the USGS Southeast Regional staff. Data and investigative needs will be assessed on a continuing basis by the USGS and the Water Management District staffs as the Districts implement their respective water-management plans. Some of these needs will be identified as the USGS regional RASA model is called upon to furnish results of specific purpose modeling runs to determine various

stress-effect relations. The high-resolution data base will be constructed by adapting and incorporating the data bases generated for the regional and subregional models. The USGS Trescott-Larson three-dimensional source code will be the first to be modified to access the data base. Later, the USGS McDonald-Harbaugh three-dimensional modular model will be modified. Programs will be written in Fortran 77 to be executed in interactive mode.

PROGRESS: "Moveable model" operational for use by WRD personnel via netlink between Prime computers. Color 3D graphics program developed to display data from master data files, model input data, model output data, or user-supplied data. Work begun on digitize program to facilitate input of historical data from potentiometric or other thematic maps. Continued to update water table master file. Conducted 2-day aquifer test training course for SJRWMD staff.

PLANS FOR THIS YEAR: Adapt "moveable model" for use with modified McDonald-Harbaugh 3D modular model. Continue to refine master data files. Input discretized historical potentiometric maps to master database.

REPORTS IN PROCESS:

Rutledge, A. T., A program for converting rectangular coordinates to latitude-longitude coordinates.

FL-411 HYDROGEOLOGY OF THE INTERMEDIATE AQUIFER SYSTEM, SOUTHWEST FLORIDA

DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: A. D. Duerr, Tampa

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: West-central Florida is experiencing an explosive growth of population. To meet increased demands for water, there is a need to define the hydrogeology and water quality in the southern half of the Tampa Subdistrict. A recently completed study identified areas where data were too limited to adequately simulate the ground-water system. One area was to better define the hydrogeology and flow systems of the intermediate aquifer. The intermediate aquifers are the principal water-bearing units that contain radium-226 at levels that exceed five picocuries per liter. The hydrologic and geochemical factors that control the occurrence and distribution of radium-226 is not understood.

OBJECTIVE: To systematically evaluate the hydrogeologic characteristics of major water-bearing units of the intermediate aquifer system in southwest Florida. This will include the definition of ground-water basin boundaries, identification and quantitative evaluation of water use and discharge and recharge areas, and the definition and description of each water-bearing unit.

APPROACH: Lithologic and geophysical logs will be examined to define the top, bottom, and thickness of the intermediate aquifer system throughout the study area. A water-level monitoring network will be established for recording water levels in September 1985, May 1986, and September 1986. Potentiometric surface contour maps will be constructed to show seasonal water levels in the intermediate aquifer for September 1985 and May 1986. Existing aquifer test data will be compiled and applied to well construction data to estimate quantities of water withdrawn from the intermediate aquifer system.

PROGRESS: Potentiometric surface maps of the intermediate aquifer system were constructed for September 1985 and May 1986. Maps were constructed showing the top and thickness of the intermediate aquifer system and six geologic sections were drawn. Water use estimates were completed. A geophysical log index was compiled. Water-level hydrographs were prepared for 10 wells. A first draft of the final report was completed.

PLANS FOR THIS YEAR: Continue with report preparation, including review and revisions as needed.

FL-412 SIMULATION APPROACHES TO UNDERSTANDING GROUND WATER-SURFACE WATER RELATIONSHIPS AND WATER BUDGETS IN FLORIDA LAKES

DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: D. Briane Adams, Tampa

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: Water managers' responsibility to administer all water resources is hampered by multi-water use from residential and recreational use of surface water to agricultural-municipal-industrial use of water. With a mandate for equitable allocation of water resources, water managers need quantitative information that indicates the relationship between the lakes-surficial aquifers and the Floridan aquifer to manage the public resource.

OBJECTIVE: (1) To define the influence of head in the Floridan aquifer on lake levels. (2) To gain a better understanding of the recharge process in the surficial aquifer. (3) To provide an accurate determination of evaporation and evaporation processes. (4) To provide a realistic water budget with error estimates for Lake Lucerne.

APPROACH: In cooperation with the National Research Program (NRP) Lake Hydrology Project headed by T.C. Winter, a detailed ground water-surface water-atmospheric-water relationship will be studied. Methods of analysis will include two-dimensional digital modeling of the lake-ground water system in cross-section for steady state and transient flow, and, depending upon results of the two-dimensional model, a three-dimensional model may be applied. The applicability of saturated-unsaturated model will be evaluated for future work. Evaporation will be calculated using energy budget techniques and compared to methods more generally used such as pan and mass transfer methods. The study of wind and vapor pressure profiles over the lake will also be studied as they relate to the evaporation process. Determination of the surface water component of the water budget is limited to overland flow and processes in this closed basin lake.

PROGRESS: Collection of data for energy budget and mass transfer analysis of evaporation continued at the land climate station and the mid-lake climate station. Other data collection during FY86 included lake stage, ground-water levels in 36 observation wells, monthly lake water quality and weekly precipitation water quality. Geochemistry of shallow, intermediate, and deep well water samples show chemical similarities between lake and shallow aquifer. A high resolution seismic survey of the sublake geology of Lake Lucerne showed evidence of subsidence of underlying limestone followed by infilling of surficial materials. A complete description of the local geology was completed including mineralogical analysis of drill cuttings. A baseline report is being prepared.

(FL412)

PLANS FOR THIS YEAR: Use PSTAT and ad hoc FORTRAN programs to tailor climatological data into data sets for energy budget and mass transfer calculations. Perform energy budget and mass transfer analyses and produce a water budget for Lake Lucerne with error estimates. Ground-water modeling of the local ground-water basin with the McDonald Harbaugh model will resume. Maintain minimal data collection activities at Lake Lucerne, including observer-maintained climate station and weekly precipitation chemistries. Prepare final interpretive report.

FL-413 IMPACT OF REDUCED FRESHWATER INFLOW ON THE SALINITY CHARACTERISTICS OF THE WITHLACOOCHEE RIVER ESTUARY AND THE COASTAL RIVERS ESTUARINE ZONE OF CITRUS AND HERNANDO COUNTIES, FLORIDA

DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: D. K. Yobbi, Tampa

Cooperating Agency: Southwest Florida Water Management District

PROBLEM: Proposals are being considered by the management district to develop the water resources of the study area for water supply. Insufficient data exist to establish relationships between stream-flow tidal stage, and salinity distribution in the area. Such relationships are needed to determine streamflow requirements necessary to maintain healthy and productive estuaries.

OBJECTIVE: Determine salinity changes that may occur in selected estuaries if freshwater inflow is reduced by spring or aquifer pumpage.

APPROACH: Recording streamflow, tidal stage, and salinity stations will be installed on rivers and spring discharge streams. Field measurements will be made to define the location of isohaline lines as a function of salinity at a reference station. Regression analyses will be used to relate locations of the saltwater wedge to streamflow and tide stage. Model analyses will be applied to de-fine potential changes in ground-water and spring flow as a result of ground-water withdrawals for water supply.

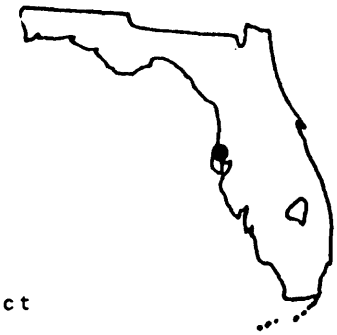
PROGRESS: Salinity runs were made on Withlacoochee, Crystal, Homosassa, Chassahowitkza, and Weeki Wachee Rivers to define longitudinal salinity distributions. Collection and processing of daily conductivity, stage, and streamflow were completed. Equa-tions for prediction of salinity interfaces for Withlacoochee, Weeki Wachee, and Crystal Rivers were finalized. Draft copies of the Weeki Wachee and Withlacoochee Rivers section of the report were completed. Draft copy of the ground-water flow model report was completed.

PLANS FOR THIS YEAR: Prepare final project reports.

REPORTS IN PROCESS:

Yobbi, D. K., Simulation of steady-state groundwater movement and spring flow in the Upper Floridan aquifer of coastal Citrus and Hernando Counties, FL: U.S. Geological Survey Water Resources Investigation.

FL-414 IMPACT OF ALTERED FRESHWATER FLOW ON THE SALINITY CHARACTERISTICS OF THE ANCLOTE RIVER ESTUARY, FLORIDA



DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: M. Fernandez, Jr., Tampa

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: Growing demands for freshwater supplies and proposals for diversion of streamflow for agricultural, industrial and municipal purposes has generated concern that estuarine and coastal biological resources may be adversely affected by significantly altered salinity distribution. Adequate data are not available to evaluate the effects of reduced streamflow on salinity distribution for the Anclote River estuary. Also, adequate background biological data do not exist on which to base estimates of expected impacts of salinity changes within the river.

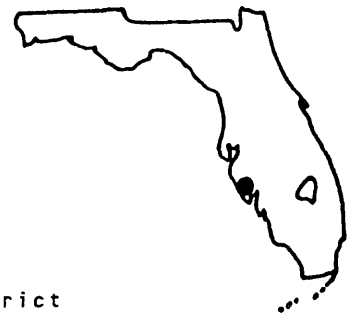
OBJECTIVE: To collect and analyze data to define the impact of altered freshwater inflow on the salinity distributions of the Anclote River. To establish salinity distributions in the river as a function of freshwater inflow conditions and astronomical tides using regression analysis to relate streamflow to precipitation in the Anclote River Drainage Basin prior to and after the well fields in the basin began pumping.

APPROACH: Measurements will be made of streamflow, salinity, and tidal variation within the estuary. Data collected will be analyzed using regression analysis. The location of the 0.5, 5, 18, 25, and 30 parts per thousand salinity will be identified. Inflow, tidal stage and salinity relationships will be developed by applying multiple linear regression techniques to continuous time-series recordings. A relationship between precipitation and streamflow in the basin prior to and after the well fields began pumping will be attempted using regression analysis.

PROGRESS: The data evaluation phase has been completed and a draft report was started. Results based on multiple regression analysis of field salinity measurements under various high tides and discharge indicates that the location of the 0.44 ppt is more effected by discharge than tide. The 5.0, 10.0, and 18.0 ppt isohalines show increasing effects of tide with decreasing effects of discharge.

PLANS FOR THIS YEAR: Prepare final report.

FL-415 ASSESSMENT OF HYDROGEOLOGICAL CONDITIONS AND ALTERNATIVES FOR SAFEGUARDING WATER QUALITY IN SOUTHWEST SARASOTA COUNTY, FLORIDA



DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: C. B. Hutchinson, Tampa

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: An assessment needs to be made of hydrogeologic conditions and measures that might be employed to maintain or improve water quality in southwest Sarasota County. Problems to be addressed include determining aquifer parameters and water quality, describing the ground-water flow system, and constructing digital models of ground-water flow and solute transport. The models will be used to better understand historical and future changes in water levels and quality due to expanding pumpage for municipal supply, an ongoing program to identify and plug or repair improperly constructed wells, the movement and dispersion of liquid waste injected into the Floridan aquifer.

OBJECTIVE: (1) To determine aquifer hydraulic parameters and water quality; (2) To provide a description of the ground-water flow system including effects of pumping, injection and circulation between zones; and (3) To use digital models experimentally to understand the flow system and the transport of chemical constituents.

APPROACH: The hydrogeologic system will be conceptualized using available and field-collected data. This conceptual model will form the basis for digital models of ground-water flow and solute transport. The models will increase the understanding of ground-water movement and transport of a single water-quality constituent in the complex hydrogeologic system. They will be applied to simulate: (1) hydrogeologic conditions under various rates of wastewater injection; and (2) lateral and vertical movement of injected sewage effluent and brine from reverse-osmosis facilities.

PROGRESS: Continuous water-level records were collected at nine ROMP wells. A report was written explaining use of a computer model for analysis of a pumping test. The model was calibrated by adjusting hydraulic characteristics of the semiconfining unit overlying the Avon Park wastewater injection zone. A solute transport model, with hydraulic characteristics derived from the pumping test, was used to simulate potential effects of injecting one Mgal/d of treated sewage or reverse osmosis reject water. Preliminary results indicate that after one year of injecting sewage in the Venice-Englewood area, the front would move radially about 600 feet from a single well, it would be buoyed upward due to the density contrast between native saltwater in the injection zone and fresh wastewater, and confining units would effectively restrict upward movement into freshwater aquifers. Drilling, logging, and sampling of multizone monitor wells at ROMP TR3-3 was coordinated.

(FL-415)

PLANS FOR THIS YEAR: During FY87 continuous water-level recorders will be maintained on nine wells at ROMP sites TR 3-1 and TR 5-2. Five wells at ROMP TR 3-3 will be instrumented with electronic equipment such as pressure transducers. An experimental pumping test will be conducted to test feasibility of an electronic monitoring system. Minimal effort will be allotted to computer modeling and report writing in FY87.

REPORTS IN PROCESS:

Hutchinson, C. B., Assessment of hyrogeologic conditions with emphasis on ground-water contamination, SW Sarasota and west Charlotte Counties, FL

FL-416 EFFECTS OF HIGHWAY RUNOFF ON THE WATER QUALITY OF WETLANDS AND GROUND WATER

DATE PROJECT BEGAN: October 1983

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: Donna M. Schiffer, Orlando

COOPERATING AGENCY: Florida Department of Transportation

PROBLEM: The Florida Department of Transportation (FDOT) is legally responsible for attenuating peak discharges and treating stormwater originating on State and Federal highways, and on commercial areas attached to these highways. Stormwater is treated by using three different structures--detention ponds, swales, and French drains; and in a nonstructural manner through the use of natural wetlands. Several problems concerning the treatment of highway runoff are known to exist. First, it is unknown whether any sites exist in Florida where the local ground-water quality has been degraded by highway runoff. Second, although specific studies have been performed on the utilization of wetlands for improving water quality, none has documented the effects caused by Florida's highways. Third, a potential problem exists in that the wetlands may reach some equilibrium state with respect to bed-sediment accumulation, and a high recurrence-interval event could flush out the bed sediments, thereby placing a shock loading on the receiving water.

OBJECTIVES: (1) To evaluate the quality of the ground water in the vicinity of FDOT structures used for treating highway runoff, and to quantify constituent loads entering and leaving wetlands used for handling highway stormwater. (2) To define spatially, any ground-water constituent plumes found, and to define spatially, and possibly seasonally, the constituent uptake by the vegetation and the distribution of constituent mass within the bed sediments. (3) To analyze, using inference techniques, statistical procedures, and deterministic modeling, the speciation, movement, and effect of selected constituents as they move through the soil and wetlands. (4) To estimate the general effects on the water resources, both ground water and wetlands, which might be felt at other locations throughout the State of Florida due to the presence of highway runoff.

APPROACH: At selected sites (detention ponds, swales, and French drains), several wells will be drilled to obtain water levels for defining the ground-water gradient, and to allow for ground-water sampling. If the water-quality analyses indicate significant concentrations of any constituent, additional wells will be drilled to define the location and extent of the constituent plume. Two wetlands will be chosen for study. Constituent loads entering and leaving the wetlands will be estimated using water quality and quantity data collected during storm events. The necessary data will be collected using portable, battery-powered samplers and standard stream-gaging procedures. Bed sediment samples will be collected and analyzed so that estimates of constituent loads within the sediment can be made. These data will describe the rate of movement and fate of the constituents within the wetlands.

PROGRESS: Ground water was sampled during the year at both swale locations and both detention ponds under study. Bed sediments were collected from one detention pond and one wetland site. Soil samples were collected at both swale locations. Results of the soil sampling indicated a decrease in lead, zinc, and organic nitrogen from the land surface to six inches below land surface. One wetland was sampled during three storm events, with samples collected where the highway runoff enters the wetland, and at several locations in the wetland, including the outlet. Data collected at this site indicate the quality of water leaving the wetland is similar to the quality of water at a distance away from the point of discharge of highway runoff into the wetland. Other data collected during the year included dissolved oxygen, specific conductance, and temperature at one wetland, rainfall at two sites, and stage at one detention pond site. Samples were collected at all but one study site for an organic screening (FID scan). Preliminary report work was started, and a data base established, to be updated as more recently collected samples are analyzed by the laboratory.

PLANS FOR THIS YEAR: Data will be analyzed, and a report on the findings will be written.

FL-422 IMPACTS OF SELECTED DEVELOPMENTAL ACTIVITIES ON THE QUALITY OF GROUND WATER, CENTRAL FLORIDA

DATE PROJECT BEGAN: April 1984

DATE PROJECT ENDS: September 1990

PRINCIPAL INVESTIGATOR: Edward R. German, Orlando

COOPERATING AGENCY: Federal Program

PROBLEM: There is a need to appraise the quality of ground water in relation to major developmental activities prevalent in recharge areas of the Floridan aquifer system. Many studies have dealt with ground-water quality, although most have not emphasized organic chemicals or trace metals. The three developmental activities of concern are: (1) use of drainage wells for stormwater disposal in urban areas, (2) use of pesticides and fertilizers in citrus groves, and (3) use of various chemicals in processing of phosphate ore and use of interconnector wells for drainage in phosphate mining areas.

OBJECTIVES: Determine the impact of citrus growing, phosphate mining, and urban storm water disposal on ground-water quality. Test the transferability of findings to other areas of similar land use and hydrology. Determine surface loadings of potential contaminants and evaluate contaminant potentials based on chemical properties and transport models. Determine vertical patterns of flow and quality in the surficial aquifer underlying the citrus area.

APPROACH: Design and install a network of wells representative of the land-use types. Sample the wells for selected constituents with a ground water contamination potential. Compile data on pesticide usage, including type and application quantities. Evaluate pesticide contamination potential based on chemical properties and transport, using simple unsaturated-zone flow models. Install and sample nests of wells in a typical cross-section of the citrus area to determine vertical patterns of flow and quality. Statistically examine data for evidence of ground water contamination and for factors affecting ground-water quality in each land-use type. Test conclusions by sampling in different areas of similar land use.

PROGRESS: A report describing phase I (reconnaissance) of the investigation was completed and approved. This reconnaissance showed a possibility of ground-water contamination associated with land-use activities as follows: Phosphate-mining, metals; urban area, volatile organics. Contamination of ground water under the citrus area by pesticides seems possible due to the heavy usage of pesticides, but the reconnaissance did not find pesticides to be common in the ground water. Sampling of additional wells for metals, nutrients, and major ions was done to expand the ground water data base. A work plan for phase II of the investigation was prepared.

(FL-422)

PLANS FOR THIS YEAR: Start phase II activities. These activities include design of a well network to be representative of ground water under each land-use category, a quantitative survey of pesticide usage in the citrus area, and preparation of a cross section site in the citrus area to study vertical and horizontal movement of water within the aquifer. Also, sampling of network wells in all land-use types for metals, major ions, and nutrients will be done.

REPORTS RELEASED:

Rutledge, A. T., 1986, Effects of land use on ground-water quality in central Florida--preliminary results: U.S. Geological Survey Water Resources Investigation Report 86-4163.

FL-425 RECONNAISSANCE OF WATER QUALITY DEPARTMENT OF ENERGY SITE, PINELLAS COUNTY, FLORIDA

DATE PROJECT BEGAN: January 1985

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: Mario Fernandez, Jr., Tampa

COOPERATING AGENCY: U. S. Department of Energy

PROBLEM: In April 1984, the Department of Energy commissioned the U.S. Geological Survey to perform an initial or Phase I water-quality study at the U.S. Department of Energy's Pinellas Plant. The result of the study was a report titled "Reconnaissance of water quality at a U.S. Department of Energy site, Pinellas County, Florida" by Mario Fernandez, Jr. (WRI 85-4062). The study included 1) a literature search, 2) an electromagnetic survey, 3) the drilling of 4 test holes and installation of monitoring wells, 4) collection and physical analysis of cores from a test hole, 5) collection of water samples from the monitor wells and two ponds, and collection of bottom material from the ponds for inorganic and organic constituent analyses. As a result of the reconnaissance study, seven areas were found to need further evaluation.

OBJECTIVES: The objective of this study, phase II, is to evaluate the plant site for water quality and hydrogeological properties and monitor the site for possible changes that could occur due to plant operation. The study will, 1) determine the rate of ground-water migration at the plant site, 2) identify the direction of ground-water movement, 3) monitor ground and surface water at the plant site for select chemical constituents, and 4) sample bottom material from the ponds and identify indicator constituents in order to monitor migration of contaminants from the ponds. The study will monitor the quality of ground water moving from beneath the building site. In addition, the Geological Survey will be available for technical assistance as the need may occur.

APPROACH: The following tasks will be accomplished to meet the objectives of the study.

1. An electromagnetic device will be used to survey the ground conductivity in a 36-acre undeveloped area of the plant site. A 25-foot grid will be used. The survey will complete the investigation for buried metallic debris and containers in the site.

2. The ground and surface water quality of the undeveloped area of the plant site will be sampled and analyzed semi-annually for nutrients major constituents, total organic carbon, manganese, and zinc.

3. A water-table contour map will be prepared of the plant site and adjacent area. The map will be used to determine the direction of groundwater movement.

4. Aquifer test--An aquifer test of the surficial aquifer, using the recovery method, will be performed on two 4-inch diameter wells screened over the entire thickness of the aquifer to determine the hydraulic conductivity. The hydraulic conductivity, along with the hydraulic gradient and porosity, will be used to estimate the rate of ground-water movement in the area of the plant site.

5. Surface water, groundwater beneath stormwater detention basins, and sediments will be sampled semiannually and analyzed for inorganic and organic constituents.

6. Shallow aquifer monitor wells will be installed near the building in order to collect water samples for analysis of inorganic and organic constituents that may originate from leakage within the building.

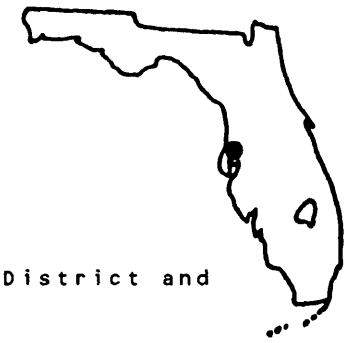
PROGRESS: The scope of the project was modified due to the extended work on ground conductivity requested by the cooperator. The aquifer test and installation of a network of shallow aquifer monitor wells for water-level measurements planned for FY86 were moved to FY87. Surface geophysics was used to locate a chemical burial or spill site. Analyses of groundwater verify the existence of volatile organic priority pollutants.

PLANS FOR THIS YEAR: Install network of shallow aquifer monitor wells and perform aquifer test. The planned monitoring of ground-water quality at the DOE site is being discussed.

REPORTS RELEASED:

Fernandez, Mario, Jr., 1985, Reconnaissance of water quality at a U.S. Department of Energy site, Pinellas County, Florida: U. S. Geological Survey Water-Resources Investigations Report 85-4062.

FL-428 SURFACE GROUND WATER RELATIONSHIPS IN NORTHWEST HILLSBOROUGH, NORTHEAST PINELLAS, AND SOUTH PASCO COUNTIES



DATE PROJECT BEGAN: October 1984

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: Miguel A. Lopez, Tampa

COOPERATING AGENCY: Southwest Florida Water Management District and Pinellas County

PROBLEM: Well-field pumpage from the Floridan aquifer system that underlies the rapidly developing study area has been blamed by residents for contributing to excessive, long-term lowering of water levels in lakes and the surficial aquifer. A need exists to define the degree of interaction between water levels in lakes, the surficial aquifer, and the Floridan aquifer system so that regulatory decisions can be based on a realistic understanding of the hydrologic system and how the system may react to pumpage and locations of pumpage centers.

OBJECTIVE: (1) To determine the relationship between water levels of selected lakes and ground-water levels in the surficial aquifer and the Floridan aquifer system, (2) To develop methods for evaluating the effects of well-field development on the levels of lakes and the surficial aquifer, and (3) To determine the effects of well-field pumping on lake levels.

APPROACH: This study will evaluate the effects of ground-water withdrawals on lake levels by use of stochastic and deterministic models. Multiple regression is the primary tool that will be used in the investigation to take advantage of the availability of extensive lake-level and pumpage data in the area. Levels of individual lakes, the dependent variable, will be regressed to help define lakes that are significantly related to ground-water withdrawals from the well-fields. Independent variables of pumpage, water levels in the Floridan aquifer system and surficial aquifer, and some measure of recharge by use of rainfall and estimated evapotransporation will be used.

PROGRESS: Preliminary regression analysis has related the change in monthly average lake stage to monthly rainfall, potential evaporation the previous month, previous monthly average lake stage, and monthly average ground-water level at a nearby monitor well. Standard error of estimate is lower for the fall and winter months (November through May), and varies from 0.10 ft. to 0.20 ft. Standard error of estimate for the wetter summer months (June through October) varies from 0.20 to 0.40 ft.

PLANS FOR THIS YEAR: Complete regression analysis for the 25 lakes in the study area. Develop regressions for change in monthly average level in the eleven regulatory ground-water monitor wells using well field pumpage, month rainfall, and potential evaporation. Prepare interpretive report relating change in lake levels to climatic factors and ground-water level.

FL-430 GEOLOGICAL CONTROLS ON GROUND-WATER MOVEMENT AND CONTAMINATION IN POLK COUNTY, FLORIDA

DATE PROJECT BEGAN: October 1984

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: G. L. Barr, Tampa

COOPERATING AGENCIES: Southwest Florida Water Management District and Polk County

PROBLEM: Polk County in central Florida has a diversity of water-quality problems that are apparently related to geologic structure. The principal aquifer (Floridan Aquifer System) consists of carbonate rocks that have actively-developing sinkholes. Localized incidents of ground-water degradation emphasize the vulnerability of the aquifer system to natural hazards and to man's activities. The need exists for a comprehensive study that will provide water managers and environmentalists with an effective program for understanding water-quality problems.

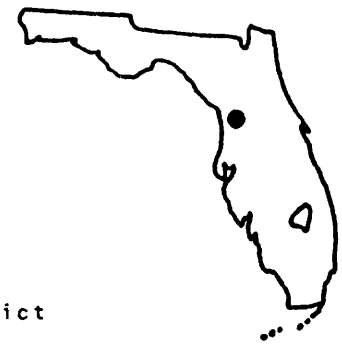
OBJECTIVE: Access water-quality problems both site specific and areally. Define areas that are susceptible to water-quality degradation. Define surface lineations utilizing aerial photos. Document and map known sinkholes. Delineate framework; and prepare Phase II proposal for intensive hydrologic and water-quality evaluation.

APPROACH: The reconnaissance phase would involve compilation of existing water-quality data and reported incidents of ground-water contamination. Aerial and satellite photographs will be evaluated as reconnaissance tools for defining surface lineations. Defined lineations will be related to water-quality problems or as areas of potential water-quality degradation. Available geophysical logs of test wells will be used to define cavities in the limestone. Surface geophysics will be applied to enhance the understanding of suspected geologic anomalies. Closed depressions will be defined and related to potential sources of contamination. Data on definition of the hydrogeologic framework will be extracted largely from published reports and updated based on readily available data.

PROGRESS: During FY86, a network of 44 ground-water monitoring wells was established. Sites used were based upon geologic information and factors contributing to ground-water contamination gathered from the state and local sources. Water samples were collected and sent to USGS and Polk County labs and analyzed for major ions, trace metals, organics, and radio chemicals. Field measurements were also made. Evaluation of lab results were started. Preliminary draft of the final report was begun. A preliminary map was compiled to show the ground-water quality monitoring network, sinkholes, fracture traces, drainage, basin boundaries, and the FL DER's ground-water monitoring system.

PLANS FOR THIS YEAR: Evaluate FY86 lab results. Resample wells with contamination potential. Inventory and schedule new wells to be sampled. Sample well network. Send water samples to lab and evaluate results. Continue report preparation.

FL-431 SURFACE WATER HYDROLOGY OF THE FLORAL CITY POOL OF TSALA APOPKA LAKE WEST-CENTRAL FLORIDA



DATE PROJECT BEGAN: October 1984

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: L. A. Bradner, Orlando

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: Tsala Apoka Lake can be divided into three parts--the Floral City Pool, Inverness Pool, and Hernando Pool. The Floral City Pool behaves hydraulically differently from the others, although it is the most upstream and overflows into the others at high water. During the drought of 1981, much of the Floral City Pool was dry, while the others retained significant amounts of open water.

OBJECTIVE: To document water levels of surface-water and ground-water sites, estimate direction and quantity of flow at selected locations in the Floral City Pool, and to determine to what extent the fluctuations of the surface-water elevations can be explained in terms of surface-water hydrology.

APPROACH: Surface-water gaging station and flow meters will be used to determine flow into and out of the lake. Water-level recorders will be placed on upper Floridan aquifer wells for collection of simultaneous data of water-level fluctuations. A water-quality input/output analysis will be performed.

PROGRESS: Completed data collection and most of data analysis. Report is 80 percent complete. Some work on illustrations remains.

PLANS FOR THIS YEAR: Process report for approval.

FL-432 EFFECTS OF SLUDGE ON GROUND WATER QUALITY, DADE COUNTY, FLORIDA

DATE PROJECT BEGAN: October 1984

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: Barbara Howie, Miami

COOPERATING AGENCIES: South Dade Soil and Water Conservation District, and Florida Department of Environmental Regulation

PROBLEM: Because nutrients used in agriculture are rapidly lost by leaching from south Dade's Rockdale soils and by runoff from marl soils, growers want to use domestic wastewater treatment sludges as a soil conditioner and organic nitrogen source. There is a growing concern about what effect sludge application may have on ground-water quality in the Biscayne aquifer.

OBJECTIVE: To determine the effects of sludge application on ground-water quality, to compare the effects of sludge application with the effects of current practices of using fertilizers and soil conditioners and to develop a conceptual model explaining the fate of sludge constituents and the variations in effects on water quality.

APPROACH: Study elements will include determinations of the chemical contaminants present in ground-water and soil before and after sludge application to test plots comprised of south Dade's two soil types and two crop types. The migration of sludge contaminants will be investigated by determining the lithologic units where contaminants are most likely to move and by monitoring water levels in the vicinity of test plots. Records of rainfall, irrigation, fertilizers and sludge application at each plot will be maintained.

PROGRESS: Sludge was applied to three test fields. Multidepth wells at these fields were sampled for sludge related contaminants. Soil samples were taken from each test field prior to sludge application. The ambient groundwater quality data collected during the first year of the investigation was interpreted and summarized. A paper on this phase of the investigation was presented at an ASCE conference "Water Forum '86"

PLANS FOR THIS YEAR: A WRI report on Phase I of the study will be prepared. Sludge application and groundwater monitoring will continue.

REPORTS RELEASED:

Howie, Barbara B., 1986, Effects of agriculture on ground-water quality in Dade County, Florida (Conference Paper).

FL-438 TIDE-INDUCED CIRCULATION IN CANALS, CAPE CORAL, FLORIDA

DATE PROJECT BEGAN: June 1985

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: Carl R. Goodwin, Tampa

COOPERATING AGENCY: Florida Department of Environmental Regulation

PROBLEM: Complaints about environmental quality of man-made finger canals abound in Florida and other coastal states. Poor water-quality conditions and public health hazards have been documented. The rapidly growing city of Cape Coral, Florida, has more than 400 miles of residential canals, 130 miles of which are tidally influ-enced. With a potential population of about 400,000 residents, water-quality degradation and eutrophication of the canals is expected to be rapid. The results could be both reduced viability of the canal system as a beneficial water resource and a reduced quality of life for Cape Coral residents and visitors.

OBJECTIVE: (1) Combine existing field and computer techniques to develop methodology for predicting the degree of increased water circulation and constituent flushing that can be induced within the coastal canal system by various combinations of canal interconnections, tide-gate installations, and additional openings to tidal water; (2) Determine circulation and flushing increases that could be expected in a section of the Cape Coral system if some of these physical changes were implemented, and (3) Estimate the over-all water-quality benefit to the canal system resulting from increased circulation and flushing.

APPROACH: (1) Develop, calibrate, and verify computer simulation models of water flow and conservative constituent transport in a suitable section of the Cape Coral canal system. The Branch flow model and Lagrangian Transport Model will be used. Data collection for model validation will include tides, bathymetry, discharge and dye dispersion; (2) Use validated models to test a series of alternatives (involving canal interconnections, tide gates, and additional tidal openings) for inducing greater circulation and flushing by more efficient use of available tidal energy; (3) Estimate probable change in dissolved oxygen (DO) by using model results, measured water column concentrations, and literature values of sediment oxygen demand and reaeration rates.

PROGRESS: Data collection is nearly complete. Canal cross sections have been determined. Tidal-cycle discharge has been measured at five sites. Tidal stage has been collected at nine sites. Dye dispersion measurements have been made. Tidal stage at three sites and water-quality data (DO, pH, temp, cond.) at nine sites are continuing. The Branch model has been modified to accept tide gates. Model validation is underway.

PLANS FOR THIS YEAR: The Branch model will be validated and several tide gate options tested for their effect on increasing overall tidal flushing action in the canal system. The Lagrangian Transport Model will be validated and used to predict possible effects of increased tidal flushing on dis-solved oxygen within the canal system. Reports on results from both models will be written.

FL-439 NUMERCIAL SIMULATION OF THE MIGRATION OF LANDFILL LEACHATE IN A HIGHLY PERMEABLE SURFICIAL AQUIFER, PALM BEACH COUNTY, FLORIDA

DATE PROJECT BEGAN: June 1985

DATE PROJECT ENDS: September 1987

PRINCIPAL INVESTIGATOR: Gary M. Russell, Stuart

COOPERATING AGENCY: Palm Beach County Solid Waste Authority

PROBLEM: Landfills are one of the principal sources of contamination threatening the highly permeable surficial aquifer system of coastal Palm Beach County. Most of the studies of landfills have been based solely on water-quality sampling and generally have descriptive objectives only, and do not attempt to fully define the hydraulic controls on contaminate migration. Responsible agencies recognize the need to progress beyond merely descriptive studies of leachate migration to analytical approaches that describe the physical and chemical processes that govern leachate movement. Needed are deterministic models of the hydraulic regime and transport processes taking place at a landfill.

OBJECTIVES: Describe the process of leachate migration from a landfill in an unconfined, partially-cemented carbonate aquifer using cross-sectional and/or three-dimensional computer models. Use computer models to validate the conceptual model of the migration process, to simulate the actual transport of leachate that has occurred, and to evaluate the likely future migration under long-term normal hydrologic conditions and under short-term high-stress conditions (severe storms). Extrapolate the results of the landfill simulation to other landfills in Palm Beach County as appropriate.

APPROACH: The data-collection effort and its time frame will be designed to answer the needs of the developing interpretative analysis of the landfill site. It will include an effort to improve estimates of hydraulic parameters and to obtain dispersivity parameters. The modeling analysis will include a hydraulic simulation of the site and the simulation of transport of conservative substances in the leachate. If linear hydraulic symmetry prevails along the axis of the leachate plume, a cross-sectional model design will be used for hydraulic analysis. Otherwise, the model will be three dimensional.

PROGRESS: Additional wells were drilled one to two miles east of the landfill to obtain water-level data critical to the modeling effort. Transmissivity and storage coefficients at the landfill site have been obtained from consultants. Detailed water-quality analysis especially organic compounds, were obtained to more accurately defined the chemical composition of the leachate plume.

PLANS FOR THIS YEAR: Continue data collection and development of a solute-transport model representing the land fill area.

(FL-439)

REPORTS IN PROCESS:

Russell, G. M., Assessment of ground-water contamination along the eastern perimeter of the Lantana landfill, Palm Beach County, Florida (Journal Article)

REPORTS RELEASED:

Russell, G. M., 1986, Reconnaissance of landfill-generated plumes in low-relief areas, southeast Florida (Journal Article)

FL-442 EFFECTS OF SEPTIC TANKS AND DOMESTIC WELLS ON WATER QUALITY AND LEVELS, NORTHEAST PALM BEACH COUNTY, FLORIDA

DATE PROJECT BEGAN: October 1985

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: Wesley L. Miller, Miami

COOPERATING AGENCY: Palm Beach County

PROBLEM: Rapid development of residential home sites serviced by septic tanks and private well is anticipated in northeast Palm Beach County. The area of about 250 m^2 is presently undeveloped, but 15,000 to 20,000 homes may be built by the year 2000. Little existing data is available about the surficial aquifer system's water quality, hydraulic characteristics, or geology in the area. Near surface marls and frequent flooding may retard attenuation of septic tank effluent and allow contamination of the area's ground-water.

OBJECTIVES: (1) Determine the location, thickness, and extent of marls in the upper 50 feet of the aquifer; (2) locate aquifer zones containing high chloride concentrations; (3) determine predevelopment ground-water quality; (4) determine attenuation of chemical, bacterial, and viral constituents in septic tank effluent in the hydrogeologic regime of the area; (5) provide ground-water level maps; and (6) provide pre-development ground-water level and quality data bases.

APPROACH: (1) Conduct surface geophysical surveys to locate any portions of the area in which the aquifer contains residual sea water and to determine locations, thickness, and areal extent of marl units in the upper 50-feet of aquifer; (2) select sites, using geophysical data, and drill suites of background water-quality sampling wells to various depths in the aquifer; (3) select existing septic tank sites; (4) drill and sample monitor well to determine attenuation of septic tank effluent; and (5) establish ground-water level measurement network of wells to monitor water-table fluctuations as the area developes.

PROGRESS: Drilling of 27 test wells has been completed along with 88 miles of surface resistivity geophysical survey. Water levels were measured, a preliminary water-table map prepared, and water quality samples were collected. Preliminary correlations of lithologic log data and geophysical data have been prepared.

PLANS FOR THIS YEAR: Select septic tank test sites and continue water-quality sampling and water-level measurements.

FL-444 GEOHYDROLOGY OF THE SURFICIAL AQUIFER SYSTEM, VOLUSIA COUNTY, FLORIDA

DATE PROJECT BEGAN: October 1985

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: G. G. Phelps, Orlando

COOPERATING AGENCY: Volusia County

PROBLEM: The uppermost aquifer in Volusia County is the surficial aquifer system. To date there has been no systematic study of lithology, flow system, rates of recharge and discharge, or water quality of the surficial aquifer system. Salty water occurs in the surficial aquifer from a combination of factors that include: (1) upward leakage from the Floridan system, (2) lateral or vertical encroachment due to ground-water pumping, and (3) lateral or vertical encroachment caused by ditching for surface drainage. As growth continues in Volusia County, the surficial aquifer is destined to play an increasingly important role in the management of the county's ground-water resource with regard to both water supply and solid and liquid waste disposal.

OBJECTIVES: The objectives of the proposed investigation are to: (1) describe the lithology and thickness of the surficial aquifer system in Volusia County, (2) map the thickness of the unsaturated zone, the water table, and the aquifer-flow system, (3) describe the water-quality characteristics and hydraulic characteristics of the aquifer system.

APPROACH: (1) Drill and sample approximately 500 shallow (less than 50 feet) wells and core holes into the surficial aquifer system, (2) conduct 1 or 2 short-term aquifer tests to determine hydraulic characteristics at selected sites, (3) map areas of potential upward leakage by comparing water table map with Floridan aquifer potentiometric maps.

PROGRESS: Initial field reconnaissance completed. Drilled 44 shallow wells at 26 different sites to provide geologic data, water level data, and as sites for future water quality sampling. Established and began water level measurements of a network of 95 shallow wells to coincide with May and September Floridan aquifer potentiometric surface maps. Began computer entry of all well scheduling data.

PLANS FOR THIS YEAR: Continue water level monitoring. Sample 50 wells for major ions, iron, and nutrients. Drill one 6 to 8-inch test well and four two-inch monitor wells in Volusia and run an aquifer test at that site. Plan report and begin report writing.

FL-445 ASSESSMENT OF WATER-QUALITY PROCESSES AFFECTING NUTRIENTS IN WETLANDS STREAM

DATE PROJECT BEGAN: October 1985

DATE PROJECT ENDS: September 1990

PRINCIPAL INVESTIGATOR: Edward R. German, Orlando

COOPERATING AGENCY: Reedy Creek Improvement District

PROBLEM: Phosphorus concentrations in Reedy Creek are relatively high downstream from Walt Disney World is treated-sewage discharges. Dissolved oxygen concentrations are at times much lower than allowed by state regulations. The low DO may be due largely to natural runoff from swampy areas, or it may be related to nitrogen-conversion processes related to the wastewater effluent. Little is known about how Reedy Creek assimilates and cycles nutrients. A better understanding of the efficiency of wetlands streams in nutrient assimilation, and the effect of nutrient enrichment on such streams is required.

OBJECTIVES: Define the hydrologic environmental of the Reedy Creek wetlands system in terms of water storage capacity, mean depth, stage duration, and water residence time. Evaluate role of wetlands in nutrient cycling and DO variation. Determine loads and speciation of nitrogen and phosphorus at selected points in the basin. Measure the nutrient-retention capacity of the RCID wetlands, and the effect of the wetlands on downstream water quality.

APPROACH: The methods used to accomplish the objectives will require six different types of data collection. These are: sampling of soil cores and sediments from the wetlands; insitu experiments to measure sediment oxygen demand and mechanism of nutrient cycling; aerial and field surveys for determination of flooded area and water depth; operation of continuous DO monitors and streamflow stations; sampling of nutrients at selected load stations under a range of discharge conditions; and collection of samples along Reedy Creek to establish profiles of water quality.

PROGRESS: Ten sets of nutrient samples were collected at six locations on Reedy Creek as part of the nutrient-loading determination. Culverts diverting flow from the Reedy Creek basin to an adjacent basin were instrumented and rated for continuous discharge gaging. Six water-quality monitors were maintained for measurement of specific conductance, dissolved oxygen, and temperature.

PLANS FOR THIS YEAR: Continue to collect water samples and discharge data for determination of nutrient loadings. Continue to operate water-quality monitors. Collect and analyze wetlands sediment samples to determine nutrient uptake and capacity.

FL-446 WATER RESOURCES EVALUATION OF THE FRESHWATER LENS ON KEY WEST, FLORIDA

DATE PROJECT BEGAN: October 1985

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: Donald J. McKenzie, Miami

COOPERATING AGENCY: South Florida Water Management District

PROBLEM: A freshwater lens beneath the island of Key West is used by some residents as a potable water supply. The lens and the saline water beneath it have also become a repository for stormwater and treated wastewater. The freshwater lens needs to be evaluated to determine the water-supply potential and the quality of the water.

OBJECTIVES: (1) Determine the areal extent and thickness of the freshwater lens on Key West, taking into account seasonal and tidal changes in the extent and thickness of the lens; (2) determine the areal variation in water quality of the freshwater lens.

APPROACH: A geophysical survey, if feasible, and wells drilled along transect lines will be used to describe the extent of the freshwater lens. Additional wells will be drilled to determine ambient groundwater quality and contaminants near the injection points of stormwater and wastewater. Tide gages and water level recorders will be used to determine the relation between tidal action and lens thickness.

PROGRESS:
Preliminary evaluation of wet season hydrologic data indicate slight changes in fresh water lens elevations. New shallow wells were drilled to allow water quality monitoring of the fresh water lens.

PLANS FOR THIS YEAR: Determine water quality characteristics of fresh water lens during the dry season, sample key indicators to monitor changes. Use surface geophysical survey to provide additional information to describe lens configuration. Begin evaluation and correlation of all data.

FL-447 SALINITY CHARACTERISTICS AND EFFECTS OF FRESHWATER WITHDRAWALS, MYAKKA RIVER, FLORIDA

DATE PROJECT BEGAN: October 1985

DATE PROJECT ENDS: September 1988

PRINCIPAL INVESTIGATOR: Kathleen M. Hammett, Tampa

COOPERATING AGENCY: Sarasota County

PROBLEM: Demands for freshwater are increasing in coastal areas of southwest Florida. Coastal streams like the Myakka River may be used to augment present supplies. Withdrawal or diversion of freshwater from the stream may result in upstream encroachment of saltwater and elevated salinity levels in the estuarine reach of the stream. Changes in salinity may produce adverse biological changes. Salinity characteristics must be evaluated prior to withdrawal or diversion for water supply.

OBJECTIVES: Describe in detail the salinity characteristics of the Myakka River estuary for a wide range of freshwater inflow and tide conditions. Develop mathematical relations describing salinity as a function of freshwater inflow and astronomical tide. Evaluate water-supply potential of the Myakka River and evaluate alternative plans for water-supply withdrawal. Evaluate projected effects of withdrawal on the salinity distributions using the mathematical relations developed in objective 2.

APPROACH: Tide and salinity will be monitored at three permanent and one temporary stations. Specific conductance will be measured as part of periodic field surveys for a wide range of freshwater inflow and tide conditions. Multiple linear regression analysis will be used to relate salinity to daily mean discharge for selected tidal stages. Low-flow frequency analysis of existing gaging-station records and draft-storage analysis of existing lakes and potential storage areas will be used to evaluate water-supply potential. Regression equations will be used to define the location of the salt front for possible withdrawals or diversions.

PROGRESS: A temporary salinity monitor was installed near the upstream end of the study reach. Data collection continued at three tide and salinity stations. Field surveys of specific conductance were made under various streamflow conditions. There does not appear to be any significant stratification of salinity under most conditions.

PLANS FOR THIS YEAR: Continue field surveys and data collection at existing stations. Proceed with regression analysis of salinity versus discharge for selected tidal stages. Complete annotated outline of final report.

FL-449 SIMULATION OF A SALTWATER PLUME FROM A FLOWING WELL IN A SURFICIAL AQUIFER, DADE COUNTY, FLORIDA

DATE PROJECT BEGAN: January, 1986

DATE PROJECT ENDS: September, 1988

PRINCIPAL INVESTIGATOR: Michael L. Merritt, Miami

COOPERATING AGENCY: Metro-Dade Environmental Resources Management

PROBLEM: Water supply in highly populated southeastern peninsular Florida is obtained almost entirely from the surficial aquifer. The presence of a chloride plume in the aquifer was established in 1979 and traced to a flowing well in Chekika State Park that was constructed in 1944. It was plugged in March 1985. Dade County plans to develop a new wellfield to the northeast of the plume, and concerns exist about possible wellfield contamination and about the future movement and rate of dilution of the plume.

OBJECTIVES: The objectives are to obtain information about the hydrologic regime in the surficial aquifer of south central Dade County and about the local movement and dispersal of pollutants, and to use this information to assess the future migration and attenuation of the chloride plume and the possibility of contamination of water withdrawn from the proposed new wellfield.

APPROACH: Digital models will be constructed to represent flow and transport in the area containing the chloride plume. Information used to design the models will include descriptions of rock samples and cores and the results of hydraulic testing now taking place as part of a separate study. Information used to calibrate the model will include the results of a synoptic QW reconnaissance by the USGS in 1979, a time series of QW data collected by DERM at various sites since 1981, and surface resistivity surveys in 1979 and 1986. The hydraulic regime will be simulated first, to be followed by chloride transport calculations and analyses to predict future plume movement and assess possible wellfield contamination.

PROGRESS: A regional flow model of south Dade County has been constructed to provide information about the flow regime in the area of the plume and boundary value estimates for a transport model. The development of the canal/levee system from the early 1940's was delineated in a series of maps. Historical and current surface water gaging stations and groundwater wells providing daily or monthly values since 1944 were identified and data files of water levels were assembled. A delineation of surficial aquifer stratigraphy and regional variations in hydraulic coefficients was based upon results from a concurrent project. The 3-dimensional regional flow model was designed with seasonally varying boundary conditions and recharge rates, and a layer to represent overland sheet flow. The cooperating agency completed a surface resistivity survey of the plume in 1986.

(FL-449)

PLANS FOR THIS YEAR: The regional flow model will be calibrated to the point where it illustrates the flow regime and hydraulic gradients in the area of the plume during successive stages of canal/ levee development in south Dade County as well as any significant seasonal variations. A cross sectional flow model along the axis of the plume will demonstrate whether vertical flows are of any significance. A pressure-controlling flow-rate model of the flowing well will provide estimates of the varying volume of flow since 1944. An areal, cross sectional, or three-dimensional simulation of the plume movement will be completed.

FL-451 NUTRIENT LOADS IN THE APOPKA-BEAUCLAIR CANAL UPPER OKLAWAHA BASIN, CENTRAL FLORIDA

DATE PROJECT BEGAN: May, 1986

DATE PROJECT ENDS: September, 1988

PRINCIPAL INVESTIGATOR: Edward H. Martin, Orlando

COOPERATING AGENCY: St. Johns River Water Management District and Lake County

PROBLEM: The water entering Lake Beauclair is thought to have high nutrient concentrations. Presently, two sources of nutrient are suspect--Lake Apopka and the muck-farming operations adjacent to the Apopka-Beauclair Canal. The problem is to determine the relative contribution of nutrients from each source.

OBJECTIVES: Collect discharge data and nutrient data for the Apopka-Beauclair Canal in order to determine the nutrient loads leaving Lake Apopka and those entering Lake Beauclair. The difference between the input and output loads of the canal will be considered as the load entering from the muck farms.

APPROACH: The geographic scope of the study will be the uppermost lakes of the upper Oklawaha basin, with the main emphasis on the northern outlet of Lake Apopka and the Apopka-Beauclair Canal. For waters entering the canal from the muck-farm area, flows may have to be estimated. Data will be collected for 2 years; the 3rd year of the study will be devoted to writing and processing the report.

Instrumentation at each site will include an electro-magnetic current meter for gaging purposes, and a microprocessor-controlled water-quality sampling system. The latter will also include continuous monitoring of temperature, specific conductance, and dissolved oxygen.

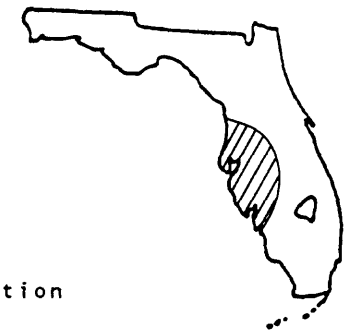
Discharge gaging will be conducted on a continuous basis, limited only by equipment failure and maintenance problems. Water sampling will be carried out as two entities--one covering seasonal flow and one covering stormwater flow.

Analysis of the field-collected data will begin by calculating canal discharge and having nutrient concentrations analyzed in the laboratory.

PROGRESS: New project.

PLANS FOR THIS YEAR: Install gaging and sampling equipment. Collect data for one storm and high-flow condition.

FL-452 DELINEATION OF PROTECTION ZONES AROUND PUBLIC WELLS IN FLORIDA



DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1988

PRINCIPAL INVESTIGATOR: James D. Hunn, Tallahassee

COOPERATING AGENCY: Florida Department of Environmental Regulation

PROBLEM: Aquifers in much of Florida are vulnerable to contamination because they occur at shallow depths and may be overlain by highly permeable materials. The Florida Department of Environmental Regulation (FDER) is developing regulations to protect vulnerable segments of aquifers that are for public supply. FDER requested the U.S. Geological Survey to delineate "protection zones" around public-supply wells and well fields that tap aquifers vulnerable to contamination from the land surface.

OBJECTIVES: Evaluate hydrogeologic conditions at public-supply well sites and calculate the size of individual "protection zones" around each well or well field tapping unconfined aquifers or "leaky confined aquifers."

APPROACH: The first phase of the study will be made in west-central Florida in which all public-supply wells or well fields producting 100,000 gal/day or more will be evaluated. The results and methodology will be applied state-wide the second year. Areas containing unconfined and poorly confined aquifers will be delineated. A list of municipal supply wells will be assembled using water management district data. "Protection zones" around individual wells will be constructed that extend to the radius of a cylinder of aquifer around the well that contains a volume of water equal to 5 years of permitted pumpage. Protection zones of well fields will be determined diagramatically.

PROGRESS: New project.

PLANS FOR THIS YEAR: Delineate protection zones for the west-central Florida area around wells and well fields producing 100,000 gallons per day or more from unconfined or "poorly confined" aquifers.

FL-453 COPROSTANOL AS A TRACER FOR SEWAGE-DERIVED CONTAMINATION IN GROUND WATER, FLORIDA

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1989

PRINCIPAL INVESTIGATOR: Wesley L. Miller, Miami

COOPERATING AGENCY: City of Stuart

PROBLEM: Tracing of sewage-contaminant ground-water plumes in southeast Florida by conventional chemical and geophysical methods is often complicated by interferences from high concentrations of dissolved solids in ground water, multiple sources of naturally occurring organics, fertilizer applications, and saltwater intrusion. In areas where one or more of these interferences exist contaminant plumes often can only be traced in the immediate proximity of the point source of contamination. A tracer material not naturally abundant in the hydrologic system but consistently associated with sewage-contaminants is needed to better define plume migration in these areas. Coprostanol is a promising tracer exhibiting these characteristics.

OBJECTIVES: Determine the effectiveness of coprostanol as a t acer of sewage-contaminant plumes in ground water.

APPROACH: Attenuation of coprostanol in sewage-contaminant plumes will be compared to that of traditional chemical tracers at two sites in Florida. One site is a sludge-disposal area near Stuart, Florida and the other is sewage-effluent spray-irrigation operation near Tallahassee, Florida. The Stuart site will be used to test coprostanol as a tracer where interferences limit other tracer constituents use and the Tallahassee site will compare coprostanol attenuation in groundwater with that of the conservative tracer, chloride.

PROGRESS: New project.

PLANS FOR THIS YEAR: Attenuation of coprostanol in sewage-contaminant plumes will be compared to that of traditional chemical tracers at two sites in Florida. Continue ground-water sampling for coprostanol and conservative chemical tracer constituents.

FL-454 WASTE CONTAMINATION USING A GEOGRAPHICAL INFORMATION SYSTEM

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1989

PRINCIPAL INVESTIGATOR: Bradley G. Waller, Miami

COOPERATING AGENCY: South Florida Water Management District

PROBLEM: The southeast coast of Florida which stretches from Palm Beach County on the north to Dade County on the south which has a population that is projected to increase from 3 to 5.5 million people in the next 15 years. This projected growth in population will increase the demand for drainage and water supply, thereby placing a greater stress on the water resources of the area and requiring more intense water management. Presently, more than 90 percent of the nearly 1 billion gallons per day of water used on the southeast coast comes from ground-water sources, primarily from the sole source aquifer. County agencies are formulating county-wide well-field protection ordinances and are in need of a means to assess risk of ground-water contamination within the cones of influence. At present, there is no method to correlate probable contamination versus land use within these cones of influence.

OBJECTIVES: Develop a procedure to assess the probability of contamination, based on land-use information, flow direction, hydrogeologic characteristics, time-of-travel models, water use, and known contaminant sources, in the cone of influence of wells using a GIS (geographic information system) as a data-base management tool.

APPROACH: Existing data bases would be analyzed to determine how to best enter these data to maintain both accuracy and spatial integrity. Most data bases (coverages) will be digitized, and information tables formatted. Some of the data are already in a digital format, and the spatial coverages and information tables can be processed without digitizing and hand entering data. These data can then be combined to produce various coverages with accompanying information tables for evaluation of waste hazard potential near well fields.

PROGRESS: New project.

PLANS FOR THIS YEAR: Begin entering various coverages into the GIS ARC/INFO System. Set up data base management system. Begin formulating waste hazard evaluation system. Begin work on initial papers.

FL-455 FEASIBILITY OF STORING FRESHWATER IN SUBSURFACE FORMATIONS, CAPE CORAL, LEE COUNTY, FLORIDA

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1989

PRINCIPAL INVESTIGATOR: E. J. Wexler, Miami

COOPERATING AGENCIES: South Florida Water Management District and City of Cape Coral

PROBLEM: Cape Coral is a southwest Florida coastal city, whose fresh-ground-water resources are heavily stressed. The city has a 8.8 MGD reverse osmosis plant that utilizes saline ground water but the current growth rate of 29 percent, will soon stress this resource also. The city has about 300 miles of freshwater canals. It has been proposed that excess runoff during the rainy season should be stored in deep saline aquifers as an additional source of supply during the high-demand dry season. First, the excess freshwater canal runoff must be quantified and an appropriate ground-water aquifer storage site needs to be investigated. Next, digital modelings need to be developed for the Cape Coral area to test the various methods of storage/retrieval and recharge schemes.

OBJECTIVES: To define the runoff pattern of the freshwater canal system, assess quantities of excess runoff occurring during the wet season, and assess the feasibility of conserving this freshwater in Cape Coral by artificial recharge or subsurface storage. Secondarily, to develop a multivariate relation among recovery efficiency, aquifer permeability, and cost, constrained by maximum permitted injection pressure and selected values for native aquifer water salinity.

APPROACH: Excess runoff and pattern of runoff will be determined from surface-water records from selected freshwater canal sites. Geohydrological data will be used as a basis for construction of digital flow and transport models. Digital modeling will be used to evaluate proposed injection, storage, and recovery for recovery efficiency after multiple cycles. Digital modeling will also be used to determine the optimum relationship between aquifer transmissivity, recovery efficiency, and cost of pumping for various values of native water salinity.

PROGRESS: New project.

PLANS FOR THIS YEAR: Install surface water sites and collect data.

FL-456 IMPACT OF PUMPING AT THE NORTHWEST WELLFIELD ON ADJACENT WETLANDS, DADE COUNTY, FLORIDA

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1988

PRINCIPAL INVESTIGATOR: Roy S. Sonenshein, Miami

COOPERATING AGENCY: South Florida Water Management District

PROBLEM: Aside from the need to protect well fields from various land uses, the need to protect the ecological system is paramount. One such ecological system, which is known for aesthetic value in Dade County, are the wetland areas. The northwest well field operated by the Miami-Dade Water and Sewer Authority is sited in a wetland area. Continuous well-field withdrawal could lower the water levels within this wetland and may have detrimental effects on a wide range of fauna and flora.

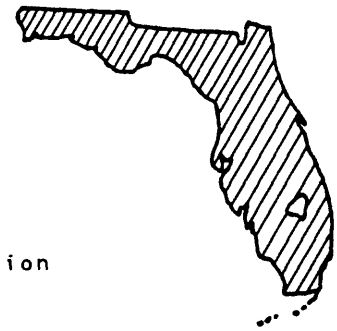
OBJECTIVES: To delineate the area surrounding the wellfield within which water levels are lowered sufficiently to impact the wetland status of the area.

APPROACH: Long term water levels for observation wells in the area will be analyzed. Stage duration and depth below land surface will be compared with criteria which define the limits for wetland vegetation. Water-level contour maps will be produced during dry period recessions for 2 years. Subsurface profiles of the water table will be prepared to indicate the relationship between the water table and the land surface. Maps will be computer generated to delineate the area affected by changes of wetland status.

PROGRESS: New project.

PLANS FOR THIS YEAR: Enter historical record into computer. Analyze historical record. Install additional stations as needed. Prepare contour maps and subsurface profiles.

FL-457 LOW-FLOW CHARACTERISTICS OF FLORIDA STREAMS



DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1990

PRINCIPAL INVESTIGATOR: Roger P. Rumenik, Tallahassee

COOPERATING AGENCY: Florida Department of Environmental Regulation

PROBLEM: A rapid growth in State population and the increased demand for environmental protection has emphasized a need for information on low stream flows. Low-flow frequency information is needed to assess water-supply potential and waste-load assimilation capacity of streams in Florida.

OBJECTIVES: (1) Develop a centralized computer-storage data base for existing miscellaneous measurements. (2) Determine low-flow frequencies (7- and 30-day 2-year, and 7-and 30-day 10-year low-flow) for daily-record stations, and for partial-record stations where data can be correlated with long-term index stations. (3) Prepare a report that describes the data base useage, and presents low-flow data and frequency information.

APPROACH: Enter all miscellaneous streamflow-measurement data in the MEAS/INSP File of the WRD ADAPS (System), selected as the project's data base. Test and select distributions that best define low-flow frequencies for daily-record stations. Evaluate the adequacy of correlation between partial-record stations and daily-record index stations using P-STAT programs on the Prime computer, and determine low-flow frequencies when correlations exist. Prepare final report that describes the data base usages, and presents low-flow data and frequency information in text and map format.

PROGRESS: New project.

PLANS FOR THIS YEAR: Develop a centralized computer data base for all miscellaneous streamflow-measurement data for Florida, and input data. Determine magnitude and frequency of low flows for daily-record streamflow stations.

FL-458 SALTWATER-FRESHWATER INTERFACE IN THE COASTAL AREA OF SOUTHWEST FLORIDA

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1991

PRINCIPAL INVESTIGATOR: Judy D. Fretwell, Tampa

COOPERATING AGENCIES: Southwest Florida Water Management District and West Coast Regional Water Supply Authority

PROBLEM: Increased ground-water development associated with a rapidly growing population along the southwest coast of Florida poses a threat of contamination to major freshwater supplies through the introduction of saltwater into the upper Floridan and intermediate aquifers. To predict and prevent this occurrence, it is necessary to define the present location of the saltwater-freshwater transition zone in the major ground-water production zones along the southwest Florida coast.

OBJECTIVES: (1) To select and monitor 50 to 75 primary wells and up to 250 secondary wells in and near the transition zone in the major ground-water producing areas of the coastal area of southwest Florida, (2) to describe each monitor well by defining the hydro-geologic setting, (3) to recommend frequency of sampling, sampling protocol, and chemical analyses, (4) to describe short- and long-term changes in chloride concentration and specific conductance with time at selected wells, and (5) to use the data collected to define the location of the saltwater-freshwater transition zone.

APPROACH: (1) Compile available data including water-level, water-quality, well-construction and geophysical data. (2) Collect new data as necessary to supplement and update existing data which will include: a) Surface-DC resistivity and/or EM induction surveys; b) Borehole geophysical logging; c) Water-quality analysis for chloride, sulfate, specific conductance, density and temperature, and d) Continuous specific conductance and water-level monitoring at selected sites.

PROGRESS: New project.

PLANS FOR THIS YEAR: Work plan and annotated outline of final report will be prepared. Existing data will be compiled. A monitor well network will be established and instrumented. Water-level and water-quality data will be collected at approximately 50 to 75 primary wells and up to 250 secondary wells. Geophysical logs will be run on selected wells.

FL-459 SOURCES OF NITROGEN IN GROUND WATER FROM AREA SUBJECT TO APPLICATION OF WASTEWATER BY SPRAY IRRIGATION AND COMMERCIAN FERTILIZERS NEAR TALLAHASSEE, FL

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1988

PRINCIPAL INVESTIGATOR: Janet B. Pruitt, Tallahassee

COOPERATING AGENCIES: City of Tallahassee, Underground Utilities

PROBLEM: Nitrate concentrations in water from wells at two wastewater irrigation sites near Tallahassee have exceeded the State maximum contaminant level of 10 mg/L in drinking water. A concurrent rise in concentrations of the conservative tracer, chloride, in water from these wells and high concentrations of chloride and nitrate measured in effluent samples suggests the source of ground-water contamination by these two constituents can be attributed to spray irrigation of municipal treated wastewater. The southeast site also received commercial fertilizers which may contribute to nitrate concentrations in ground-water. Uptake and removal of nitrate by plants and soil may not balance the combined nitrate input from the irrigation water and fertilizers, allowing transport of excess nitrate to groundwater.

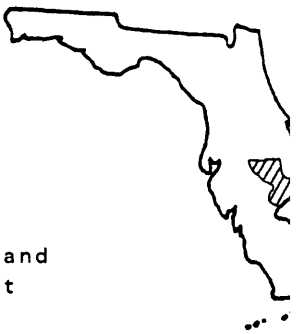
OBJECTIVES: The objectives of this study are (1) to determine the relative significance of the various sources of nitrogen to the southeast wastewater spray irrigation site, and (2) to determine the proportion of nitrate nitrogen contributed to ground water from wastewater, from fertilizers, and from other sources.

APPROACH: Samples will be collected at the southeast and southwest sites from wastewater, crops, fertilizer, water from shallow core samples, water from the unsaturated zone, precipitation and wells in the shallow sediments and the upper part of the Floridan aquifer. Measurements of the major forms of nitrogen (nitrate, nitrite, ammonia, and organic nitrogen) and nitrogen isotope ratios will be the major analytical concern. Conservation tracers of groundwater contamination, such as chloride, sodium and specific conductance will also be measured. Data will be collected monthly for one year. Data analysis will include six years of existing well data.

PROGRESS: New project.

PLANS FOR THIS YEAR: Collect monthly samples from wells in shallow sediments and the upper part of the Floridan aquifer, from irrigation spray heads, and water from shallow core samples for measurement of major forms of nitrogen, nitrogen isotope ratios and conservative tracers. Install lysimeters to measure nitrogen concentrations in the unsaturated zone. Collect samples from precipitation monitoring stations following rain events, for measurement of major forms of nitrogen. Compile historical data on fertilizer application rates.

FL-460 GROUND WATER HYDROLOGY OF THE SURFICIAL AND FLORIDAN AQUIFER SYSTEMS IN OSCEOLA AND OKEECHOBEE COUNTY



DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1990

PRINCIPAL INVESTIGATOR: George R. Schiner, Orlando

COOPERATING AGENCIES: South Florida Water Management District and St. Johns River Water Management District

PROBLEM: Osceola County is undergoing a rapid growth in population, more than doubling in the last 5 years. With this growth, the need for additional water supplies is becoming more acute. Evaluation of water use and water supply potential is particularly needed for the rural areas that have been incorporated or taken over by cities. More than 90 percent of all water used by domestic, municipal, agriculture water users is obtained from the Floridan aquifer system, the rest is supplied by the overlying surficial aquifer system. Overdraft could result in water-quality degradation from saltwater intrusion.

OBJECTIVES: (1) To determine the relations between rainfall and water levels to aquifers, (2) to describe the hydrologic and water-quality characteristics of the aquifers and their individual and collective response to changes in recharge, and to pumping, (3) to delineate areas where water quality or quantity is or may become a problem, (4) to establish a network of hydrologic stations to monitor water level changes in the major aquifers, and changes in water quality in ground waters and (5) to prepare an interpretative report.

APPROACH: (1) Prepare a page size base map showing major drainage, cultural, and political features. (2) Collect and synthesize historical water-resources information from published and unpublished reports. (3) Inventory existing wells. (4) Geophysically log and sample wells for water-quality . (5) Drill 5-12 test observations wells and collect information on water levels, lithology, and water quality. (6) Conduct specific capacity, or short-term aquifer tests. Conduct longer-term aquifer tests on selected wells. (7) Establish a hydrologic network and install instruments.

PROGRESS: New project.

PLANS FOR THIS YEAR: Assimilate presently available data. Develop data-collection network, concentrating on the location of test-drilling necessary to collect geologic data.

FL-461 EVAPOTRANSPIRATION FROM AREAS OF NATIVE VEGETATION IN CENTRAL FLORIDA

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1991

PRINCIPAL INVESTIGATOR: Miguel A. Lopez, Tampa

COOPERATING AGENCIES: Sarasota County, Southwest Florida Water Management District and West Coast Regional Water Supply Authority

PROBLEM: Water availability is becoming a critical issue even in humid, subtropical climates. By understanding and quantifying the components of the water budget in such areas, unique solutions may be developed to manage water resources. Although evapotranspiration is by far the major component of the water budget in humid, sub-tropical climates, very little has been done to obtain reliable estimates of evapotranspiration (ET). Accurate estimates of ET of four common, major native vegetation types in central Florida will be determined by selected energy budget techniques. The results of this investigation will provide a significant new knowledge by developing more accurate ET values for extensive and ecologically important wetland areas.

OBJECTIVES: The objectives of the study are: 1) to develop accurate estimates of evapotranspiration from palmetto prairie, pine flat woods, grass ponds and cypress heads in the Ringling-MacArthur Reserve and the Cypress Creek and Big Cypress swamp area, 2) to estimate total ET from RMR, and 3) to analyze for error in the estimated ET.

APPROACH: The approach to this study will include delineating areas of native vegetation in the study area; and evaluating the use of energy budget techniques, e.g., Penman, Bowen ratio and eddy correlation using two years of field data and estimate ET for the study area using the best applicable techniques. Vegetative cover will be delineated with detailed aerial color photography. Field data collection sites will be selected, assuring that sites are representative for each vegetative type. Periods of monitoring for each site will be (a) permanent-continuous for parameters used in calculating ET by the Penman method and (b) portable short-term for parameters used in energy budget techniques, generally monthly to bi-monthly for 24 to 48 hour period.

PROGRESS: New project.

PLANS FOR THIS YEAR: Select monitoring sites and delineate area of specific vegetation types. Order, assemble, install, and calibrate monitoring equipment.

FL-462 POTENTIOMENTRIC MAPS OF THE INTERMEDIATE AQUIFER SYSTEM, WEST-CENTRAL FLORIDA, SUMMARY OF HYDROLOGIC CONDITIONS FOR HIGH AND LOW WATER

DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1989

PRINCIPAL INVESTIGATOR: Billy R. Lewelling, Tampa

COOPERATING AGENCY: Southwest Florida Water Management District

PROBLEM: In west-central Florida, the intermediate aquifer system occurs in parts of all of an eight county area. The aquifer is an important source of water in three of these counties because water in the deeper Floridan aquifer has a high mineral content near the Gulf coast. Rapid growth has taken place here the past five years and in 1985, this was one of the leading growth areas of the state. Associated with this growth is an increased demand on water for public supply, industrial and agricultural uses. Extremes in water-level fluctuation need to be known to better manage the resources.

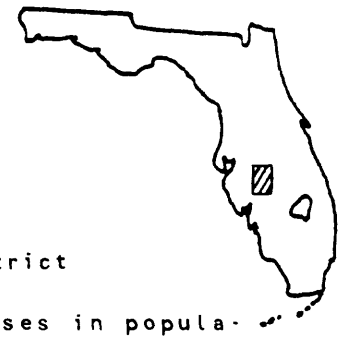
OBJECTIVES: A potentiometric surface map of the intermediate aquifer will be produced in May and September. A list of water level data will be prepared from the potentiometric surface maps. Hydrographs will be prepared for selected wells to show continuous water-level data. A brief text summarizing water-level conditions during the high and low water conditions will be prepared.

APPROACH: The water level monitoring network established for the "Hydrogeology of the intermediate aquifer system" project (FL-411) will be expanded and revised for this project for making semiannual water level measurements and producing a potentiometric map.

PROGRESS: New project.

PLANS FOR THIS YEAR: Enter existing intermediate aquifer well inventory data into FINDEX-INFO for data handling and map plotting. Inventory existing wells and locate additional wells to improve mapping precision of contour lines. Provide a September 1986 contour map of the intermediate aquifer system. Collect data and publish a May 1987 water level contour map. Collect data for a September 1987 water-level contour map.

FL-463 HYDROLOGY AND WATER QUALITY OF THE INTERMEDIATE AND UPPER FLORIDAN AQUIFERS, HARDEE AND DESOTO COUNTIES, FLORIDA



DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1990

PRINCIPAL INVESTIGATOR: A. D. Duerr, Tampa

COOPERATING AGENCIES: Southwest Florida Water Management District

PROBLEM: Hardee and DeSoto Counties are experiencing increases in population and expansion of industry and citrus groves. Because of the increase in population and water use, there is concern about the long-term impacts of increased withdrawals from the intermediate and upper Floridan aquifers. There is a potential for degrading the quality of water in the upper aquifers due to improper well construction, such as open hole in multiple zones containing water of varying quality.

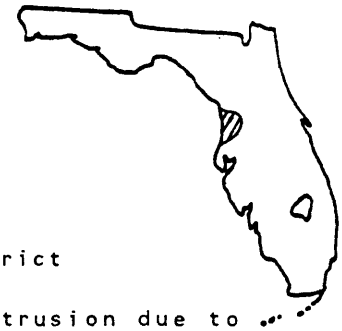
OBJECTIVES: The purpose of the study is to identify the major aquifers, define their lateral extent, identify areas where they are interconnected, and describe the hydraulic and water-quality characteristics of each aquifer.

APPROACH: Field data collection will include an inventory of existing wells, collection of geologic and water-quality samples during drilling of new wells, collection of geophysical data, aquifer tests, and collection of water-quality samples and water-level data from existing wells. Maps will be prepared showing the thickness and lateral extent of the intermediate and Upper Floridan aquifers. Potentiometric surface maps will be drawn and the lateral and vertical variations of selected water-quality parameters will be mapped. A water budget will be computed.

PROGRESS: New project.

PLANS FOR THIS YEAR: Prepare planning document, assemble and evaluate existing data. Conduct field verification of existing wells. Coordinate collection of geologic and water-quality samples during drilling of new wells. Begin compilation of new data. Begin data analysis of the potentiometric surface of the intermediate and upper Floridan aquifers.

FL-464 SALTWATER INTRUSION IN SPRINGS ALONG THE COASTAL MARGIN OF CITRUS AND HERNANDO COUNTIES, FLORIDA



DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1990

PRINCIPAL INVESTIGATOR: A. D. Duerr, Tampa

COOPERATING AGENCIES: Southwest Florida Water Management District

PROBLEM: Because of the potential for increased saltwater intrusion due to expanding use of groundwater, it is important to develop a better understanding of coastal springs and their role and relationship to the hydrology of the area. Insufficient data exist for evaluating the dynamics associated with seawater and the level and quantity of freshwater in coastal springs. Such data collection and development of hydrologic relations are needed to understand coastal spring hydrology and requirements to maintain healthy estuaries.

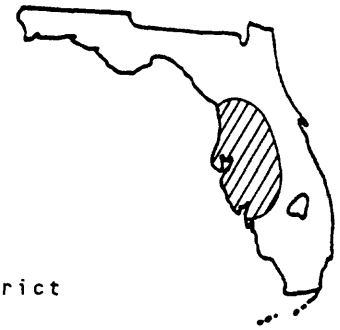
OBJECTIVES: To collect and analyze data to define movement of saltwater in springs along the coastal margin of Citrus and Hernando Counties.

APPROACH: Water quality and streamflow measurements will be made over a range of hydrologic conditions. Continuous recording streamflow, tide-stage, and water quality monitoring stations will be established on selected springs. Near major springs, recording water-level and water-quality stations will be established on selected wells. A well inventory and test-drilling program will be conducted. Ground-water levels will be measured and potentiometric maps prepared. Surface-geophysical techniques will be applied over a range of hydrologic conditions.

PROGRESS: New project.

PLANS FOR THIS YEAR: Water quality and streamflow measurements will be made over a range of hydrologic conditions. Continuous recording tide-stage and water-quality monitoring stations will be established on selected springs and wells. A well inventory and test-drilling program will be conducted. Ground-water levels will be measured and potentiometric-surface maps prepared. Surface-geophysical data will be collected.

FL-465 POTENTIAL FOR CONTAMINATION OF THE FLORIDAN AQUIFER SYSTEM, WEST-CENTRAL, FLORIDA



DATE PROJECT BEGAN: October, 1986

DATE PROJECT ENDS: September, 1990

PRINCIPAL INVESTIGATOR: Craig B. Hutchinson, Tampa

COOPERATING AGENCIES: Southwest Florida Water Management District

PROBLEM: West-central Florida is undergoing rapid growth and in some areas, water is already in short supply. The Floridan aquifer system supplies more than 90% of the freshwater used in west-central Florida. Areas that are particularly vulnerable to contamination occur where the Floridan aquifer system is near land surface or where recharge to the aquifer is rapid. Recently, the pesticide EDB, used only for the past 30 years, has been detected in water from the Floridan aquifer system. In order to safeguard the water supply, the potential for water quality degradation in the Floridan aquifer system must be assessed.

OBJECTIVES: Map hydrogeologic conditions suspected to rapidly convey recharge to the upper Floridan aquifer. Develop data base of existing radiochemical and stable isotopes in the SWFWMD. Evaluate chemical, radiochemical, and stable isotope methods used to indicate relatively recent recharge water. Supplement data base of radiochemical and stable isotopes in the SWFWMD. Use hydro-geologic and chemical data to map qualitatively the potential for contamination of the Floridan aquifer system.

APPROACH: Make a qualitative assessment of susceptibility based on available hydrogeologic information and prepare a preliminary map of pollution potentials. Field test geochemical ground-water age dating methods, such as tritium, deuterium, oxygen-18, partial pressure of CO_2, redox potential, saturation indices and the presence of compounds such as EDB, 24-D, stilbenes and alkyl benzene sulfanate. About 30 wells will be sampled to validate these methods. About 90 additional wells will be sampled throughout SWFWMD in order to identify relatively recent recharge areas. The existing geochemical data base and preliminary pollution potential map will be updated and an interpretive report will be written.

PROGRESS: New project.

PLANS FOR THIS YEAR: Literature review and compilation of all available hydrogeologic information will be made in order to delineate susceptibility of the Floridan aquifer system to contamination. A preliminary map will then be constructed. Well inventory and geophysical logging will be conducted and the selection of sites for future sampling will be made. Some sampling will be conducted in order to test the validity of the preliminary map.

FL-466 FLORIDAN AQUIFER SYSTEM WATER QUALITY IN AN AREA OF DRAINAGE-WELL INFLOW

DATE PROJECT BEGAN: October 1986

DATE PROJECT ENDS: September 1989

PRINCIPAL INVESTIGATOR: Edward H. Martin, Orlando

COOPERATING AGENCY: Florida Department of Environmental Regulation

PROBLEM: The Floridan aquifer system serves as the principle source of drinking water for the area. Because of the dual usage of the Floridan aquifer system, there is a potential for contamination of the area's drinking-water supply by drainage-wells. Studies aimed at investigating the effect of drainage-well inflow on water quality in the Floridan aquifer system have not revealed any widespread water-quality problems. There was no evidence of a direct link between supply water quality and drainage-well proximity. Study of areas downgradient of drainage wells have large inflows is needed to determine if contamination of the aquifer system is occurring.

OBJECTIVE: To determine the impact of drainage well inflow on the quality of water in the Floridan aquifer in the vicinity of drainage wells.

APPROACH: Inventory and evaluate potential sites for intensive investigation. Select 2 to 3 sites for intensive investigation. Drill additional wells at the selected sites as necessary. Use geophysical logging to determine characteristics of the drainage wells and the depth. Install and operate a water level, specific conductance, and temperature recorder on one of the monitor wells at each study site. Sample wells near end of dry season, several weeks after onset of wet season, and after wet season has ended. Sample sediments.

PROGRESS: New Project.

PLANS FOR THIS YEAR: Select 2 or 3 sites for intensive investigation. Drill wells at selected sites as necessary. Prepare tentative report outline. Operate water level, specific conductance and temperature recorders. Collect water samples and complete analysis. Begin report writing.

FL-468 WATER RESOURCES OF DUVAL COUNTY, FLORIDA

DATE PROJECT BEGAN: October 1986

DATE PROJECT ENDS: September 1989

PRINCIPAL INVESTIGATOR: Eugene C. Hayes, Orlando

COOPERATING AGENCY: City of Jacksonville

PROBLEM: Jacksonville is rapidly increasing in population and expanding commercially and industrially. As a result areas that were once rural are now becoming urbanized and stresses are being placed on the physical environment including the quality and quantity of water supplies. A large amount of hydrologic data has been obtained and many technical reports have been prepared as a result of 27 years of investigations. Most of the reports are moderately to highly technical and were prepared mainly for the scientist, engineer, and professional water manager. A non-technical report is needed, prepared from historical data, to help educate the public on vital aspects of the water resources of Duval County. Proper management of the system cannot occur without the cooperation of an informed public.

OBJECTIVE: The principal objectives of this investigation and resulting report are to summarize and interpret some of the major results of the 27-year program of investigation of the water resources of Duval County and northeast Florida in a manner that will be useful to local citizens as well as to the scientific and professional water manager. Specifically, the report will be prepared using STOP FORMAT and present (1) the source, occurrence, and movement of water in Duval County (natural hydrologic system and (2) the effects of man's activities on the system.

APPROACH: (1) Collect, synthesize, and interpret historical information from published and unpublished reports and maps and from records of the U.S. Geological Survey and from other sources as available and necessary; (2) prepare the resulting Water Atlas report using STOP FORMAT. Where possible maps for illustrations will be generated from the GIS ARC-INFO data base. New layers of information will also be generated and stored in a Duval County data base accessible to the cooperator using an IBM PC-XT.

PROGRESS: New Project.

PLANS FOR THIS YEAR: Compile and interpret historical information from published and unpublished reports, maps, and records available for northeast Florida. Complete report contents and start on figures and tables.

FL-472 HYDROGEOLOGICAL ASSSESSMENT OF SPRAY EFFLUENT AND SLUDGE DISPOSAL BASINS AT A DISPOSAL SITE, PINELLAS COUNTY, FLORIDA

DATE PROJECT BEGAN: October 1986

DATE PROJECT ENDS: September 1990

PRINCIPAL INVESTIGATOR: John T. Trommer, Tampa

COOPERATING AGENCY: Pinellas County

PROBLEM: Results of previous water-quality monitoring at the Northwest Pinellas County sewage treatment plant effluent and sludge disposal sites and private wells, have indicated increasing concentrations of some chemical constituents. The treatment plant is located in an area of rapid urban development, and water from private well to the south is beginning to show changes in water quality. Because the general direction of ground-water movement is toward the west, privately owned wells in that direction also may begin to show water-quality changes. The overall effects of the disposal system on the surrounding environment has not been evaluated.

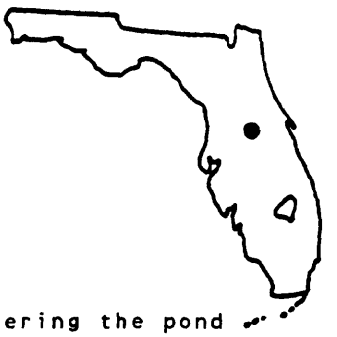
OBJECTIVE: To determine if land application of effluents and fertilizers at a nearby resort to the east is migrating through the groundwater into the site; to determine the extent that effluent and sludge disposal operations have affected ground-water quality at the disposal site and in areas downgradient from the site; to conduct a reconnaissance of downgradient private wells to determine whether they have been, or will be affected by the disposal operations.

APPROACH: All existing water-quality and hydrologic data will be evaluated. A surface geophysical survey will be conducted using resistivity and electromagnetic methods to locate and delineate any plumes. About 20 additional wells will be drilled to monitor water quality and water levels. In addition, three 4-inch wells will be installed in order to determine aquifer characteristics and rate of ground-water movement. Samples will be collected and analyzed for nutrients, metals, herbicides, pesticides, volatile organic compounds, and priority pollutants; standard complete Flame Ionization Detection (FID), gas chromatography and standard lab analyses will be used.

PROGRESS: New Project.

PLANS FOR THIS YEAR: Evaluate existing data. Conduct a surface geophysical survey using resistivity and electromagnetic methods. Evaluate location of existing monitor wells and install about 20 more wells. Collect water quality samples for standard complete flame ionization detection, metals and priority pollutants analyses.

FL-474 EFFECTS OF STRUCTURAL CHANGES ON THE WATER-QUALITY EFFICIENCY OF STORMWATER DETENTION POND



DATE PROJECT BEGAN: January 1987

DATE PROJECT ENDS: September 1990

PRINCIPAL INVESTIGATOR: Edward H. Martin, Orlando

COOPERATING AGENCY: Florida Department of Transportation

PROBLEM: It is reasoned that if the velocity of the water entering the pond is dramatically decreased immediately inside the pond, and if the travel time of the water within the pond is significantly lengthened, that an increased constituent load will settle to the bottom of the detention pond. These two hydraulic conditions can be brought about by constructing a baffle near the entrance culvert, and by placing a wall in the middle of the pond. These structural changes should increase the water-quality treatment ability of this detention facility.

OBJECTIVE: The primary objective of this investigation is to determine the effectiveness of selected structural changes to detention facilities for improving water-quality treatment. secondary objectives include: determine and analyze the increased residence time, or detention time, due to the structural changes; and determine if the hydraulic conditions caused by the structural changes can be modeled, either with an existing model or one that is easily modified.

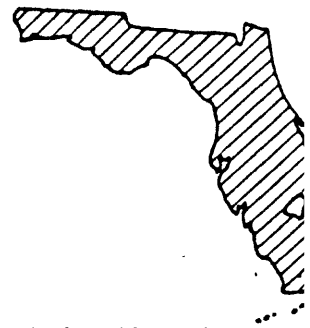
APPROACH: The first task is to perform a hydraulic study of the presently structured pond. Samples will be collected at nine sampling points within the pond. Separate tracer studies will be run at three different steady-state discharges. Analyses of these data will permit the calculation of the pond's hydraulic residence time(s), probably as a function of live storage or discharge.

Once the pond is restructured, about 10 to 15 storms will be gaged and sampled. Task 4 is to perform a hydraulic analysis of the restructured pond, analogous to the study completed in Task 1.

PROGRESS: New Project.

PLANS FOR THIS YEAR: Develop the operational procedures for determining hydraulic residence time of the pond, both before and after restructuring of the pond. Reestablish equipment and ensure that it is operational.

FL-475 EVALUATION OF THE DESIGN OF GROUND WATER QUALITY MONITORING NETWORKS IN FLORIDA



DATE PROJECT BEGAN: March 1987

DATE PROJECT ENDS: September 1989

PRINCIPAL INVESTIGATOR: Brian G. Katz, Tallahassee

COOPERATING AGENCY: Federal

PROBLEM: A greatly increased national level of interest and funding in ground-water quality monitoring has occurred in the past few years. For example, two large data bases have been developed in Florida to determine the extent of EDB (pesticide) contamination of ground water and to survey the quality of rural domestic ground water supplies statewide for a wide range of constituents. Little detailed work has been done in designing these networks to efficiently satisfy the required monitoring task.

OBJECTIVE: Evaluate network design criteria using two large statewide ground water data bases.

APPROACH: The existing data bases will be retrieved from state files, reorganized and additional data collected where necessary. Data bases will be evaluated using various statistical and spacial (GIS) techniques to determine the water quality distributions, geochemical relationships and potentially more efficient network designs.

PROGRESS: New Project.

PLANS FOR THIS YEAR: Staffing and project planning will be completed. HRS and EDB data bases will be retrieved from state files and reorganized for use in this project. Well construction information will be gathered and GIS mapping will begin.