

OKLAHOMA WATER RESOURCES BOARD

REPORT OF 1980 ACTIVITIES



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OKLAHOMA WATER RESOURCES BOARD

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Kingfisher

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Okemah

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Member
Oklahoma City

James R. Barnett
Executive Director

Michael R. Melton
Assistant Director

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General Counsel





OKLAHOMA
WATER
RESOURCES BOARD

STANDING, LEFT TO RIGHT:

Earl Walker
Vice Chairman
Okemah

Gerald E. Borelli
Chairman
Kingfisher

L.L. Males
Secretary
Cheyenne

SEATED LEFT TO RIGHT:

Ernest R. Tucker
Member
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Ralph G. McPherson
Member
Altus

John B. Jarboe
Member
Tulsa

R.G. Johnson
Member
Clinton

Gerald E. Borelli
Chairman

"Oklahoma is so much more fortunate than some western states in having enough water to meet the beneficial needs of all her people.

"The water is there. It's just inequitably divided. Our water problems are those of financing the treatment and distribution systems critical to growth in the east, as opposed to a lack of water in the west.

"Surely, our people will see that if the economy of one area suffers, the entire state will feel the repercussions. It's time for the east and west to meet at the bargaining table, the east trading its surplus water for the support of the west in financing treatment and distribution systems in eastern Oklahoma.

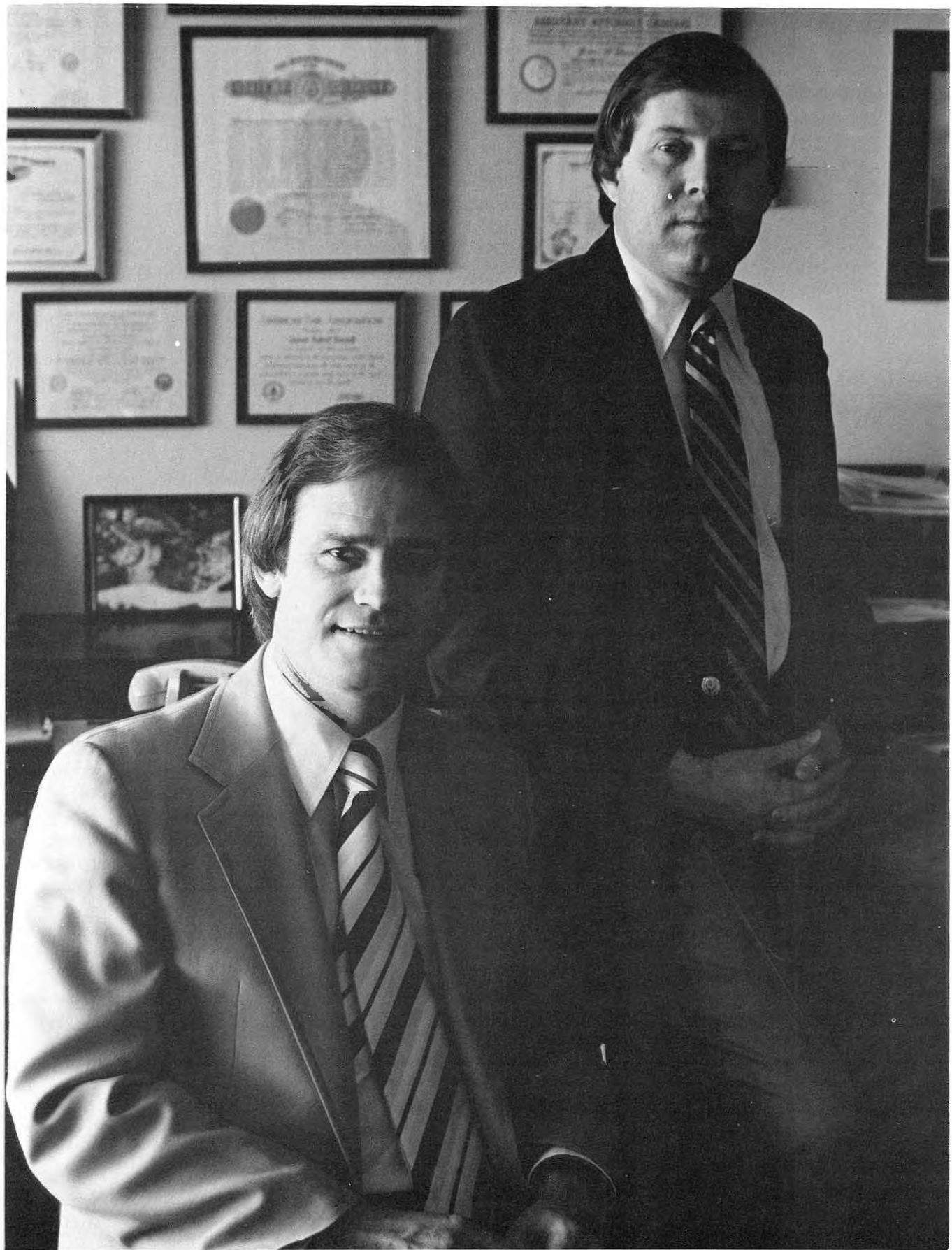
"If the state is to continue to grow, to maintain its exceptional productivity in agriculture and petroleum, to attract new people and new industry, her people will have to unite in a plan for equitably sharing the state's water resources."

With vivid recollections of the devastating Dust Bowl which swept across the plains 50 years ago, Oklahomans are very concerned about present and future supplies of water. As we enter the 1980s—the Decade of Water—Oklahomans are becoming even more concerned about water-related issues.

Even in the early days of Oklahoma Territory, water was a vital issue. The recurring periods of flooding and drought magnified the need for a regulatory authority. Oklahoma's first water law was enacted in 1905 by the Eighth Legislative Assembly for Oklahoma Territory. That law outlined procedures for acquiring water rights and regulating the use of water, and created the post of territorial engineer. The engineer was in charge of implementing the new law. When Oklahoma gained statehood in 1907, these duties were transferred to the state engineer.

While many sections of the original law are still in effect, the law has been expanded to include irrigation, municipal and industrial water supply, water resources planning, data collection and stream flow regulation. Most of Oklahoma's early water laws were patterned after South Dakota's water legislation.

In the 1920s the Conservation Commission was created by the legislature to serve the increasing number of water users



**James R. Barnett
Executive Director**

"There's not a person at the Water Resources Board who does just one job. Everyone has had to tackle a job-and-a-half in order to remain responsive to the public and to accomplish all the new programs and expanded services mandated by the Legislature and the Congress.

"It's simply dedication to the mission of the agency that has allowed our people to achieve the results they have.

"Water is a bigger issue in Oklahoma and the nation than ever before. New awareness of the environment fosters countless new efforts in water quality protection and pollution abatement every day. A new attitude recognizing water as a priceless and finite natural resource demands accelerated planning and management strategies.

"At the same time, state financial restrictions, inflation and federal budget cuts tie our hands in accomplishing the increased workload. We continue to work toward our goals with the same number of people we had in 1974.

"It's frustrating. Our staff people are the best there are, but how can I ask them to do more than a job-and-a-half?"

and related problems. In the 1930s the Planning and Resources Board was formed. Water, parks and forestry were included in the jurisdiction of this agency.

House Joint Resolution 520 in 1955 provided for a water study committee. The committee, comprised of legislators and citizens representing agriculture, industry, municipalities and recreation and wildlife, studied Oklahoma's water problems and recommended the establishment of a separate agency. Such an agency would be responsible for administering water rights, negotiating federal contracts and development of state and local projects to ensure the most effective use of Oklahoma's water resources.

The Twenty-Sixth Oklahoma Legislature, under Senate Bill 138, created the Oklahoma Water Resources Board in 1957. The bill declared that the Oklahoma Water Resources Board would include seven members, one from each of the six 1950 Congressional districts and one at-large member.

The statutes stated, "Each shall serve seven years, one appointed each year. The Board shall have represented on it at least one member well versed in each of the following major types of water use: recreational, industrial, municipal, agricultural and soil conservation work..."

The Board's first meeting was held June 14, 1957. The original Board members were L.L. Males, Cheyenne; Dr. Lloyd E. Church,

Wilburton; Joe Sykora, Stroud; George R. Benz, Bartlesville; Glade R. Kirkpatrick, Tulsa; John R. Curry, Antlers, and Guy James, Oklahoma City. James served as first Board chairman.

In 1972, two additional at-large seats were added to the Board, bringing the total number to nine. Currently the Board is represented by one member from each of the six Congressional districts as they existed in 1957 and three members-at-large, equitably representing recreation, industry, agricultural, irrigation, municipal and soil conservation interests.

The first executive director of the Oklahoma Water Resources Board was Francis J. Borelli of Okarche. Borelli served from the Board's inception until 1959.

Frank Raab assumed the directorship in September 1959, and held the post until 1967. Raab was assistant director of the Planning and Resources Board, the predecessor to the Oklahoma Water Resources Board, from 1955 to 1957.

Forrest Nelson served as acting executive director and executive director from 1968 until his retirement in 1976. He had previously served as assistant director since 1957.

James R. Barnett is currently executive director of the Oklahoma Water Resources Board.



Leslie Epie
Receptionist

"I enjoy being the first voice most people hear when they call the Oklahoma Water Resources Board.

"I try very hard to let our callers hear my smile and to direct every caller to the person who can answer his question or help with a problem.

"In a state agency it's very important to let every member of the public who calls or comes to our office know that we're working very hard to represent him fairly in conducting the water business of the state.

"I like to greet visitors in the OWRB reception area with the same friendliness I'd receive them in my own home.

"I enjoy being 'on the front lines' at the Oklahoma Water Resources Board."

The present Board members and the area of interest each represents are Gerald E. Borelli, agriculture; Earl Walker, municipal; L.L. Males, soil conservation; Ernest R. Tucker, industry; R.G. Johnson, irrigation; Ralph G. McPherson, industry; Boyd Steveson, recreation; John B. Jarboe, agriculture, and James H. Norick, municipal.

Gerald Borelli is the current Board chairman and is the nephew of the first executive director of the Oklahoma Water Resources Board, Francis Borelli.

The Oklahoma Water Resources Board functions with two complementary parts. The 9-member Board sets the policy and acts as the final authority for the agency, while the staff carries out the day-to-day business of maintaining and protecting the state's water supplies.

Within the agency, five specialized Divisions—Ground Water, Stream Water, Water Quality, Engineering and Planning and Development—plus an administrative section, conduct the state's water business under the supervision of an executive director, assistant director and five division chiefs.

The mission of the Oklahoma Water Resources Board is to:

- Establish and promote water quality standards, and to

classify the waters according to their best present and future use.

- Inspect dams to insure their safety and to require correction of any deficiencies.

- Record and administer stream water and ground water rights.

- Make hydrologic surveys and investigations of stream systems and ground water basins.

- Compile all available water resources data.

- Negotiate agreements with the federal government for water resources development and for the storage and distribution of water.

- Develop statewide and local plans for the most effective use and control of water.

- Coordinate its activities with all other agencies in the use and development of water resources.

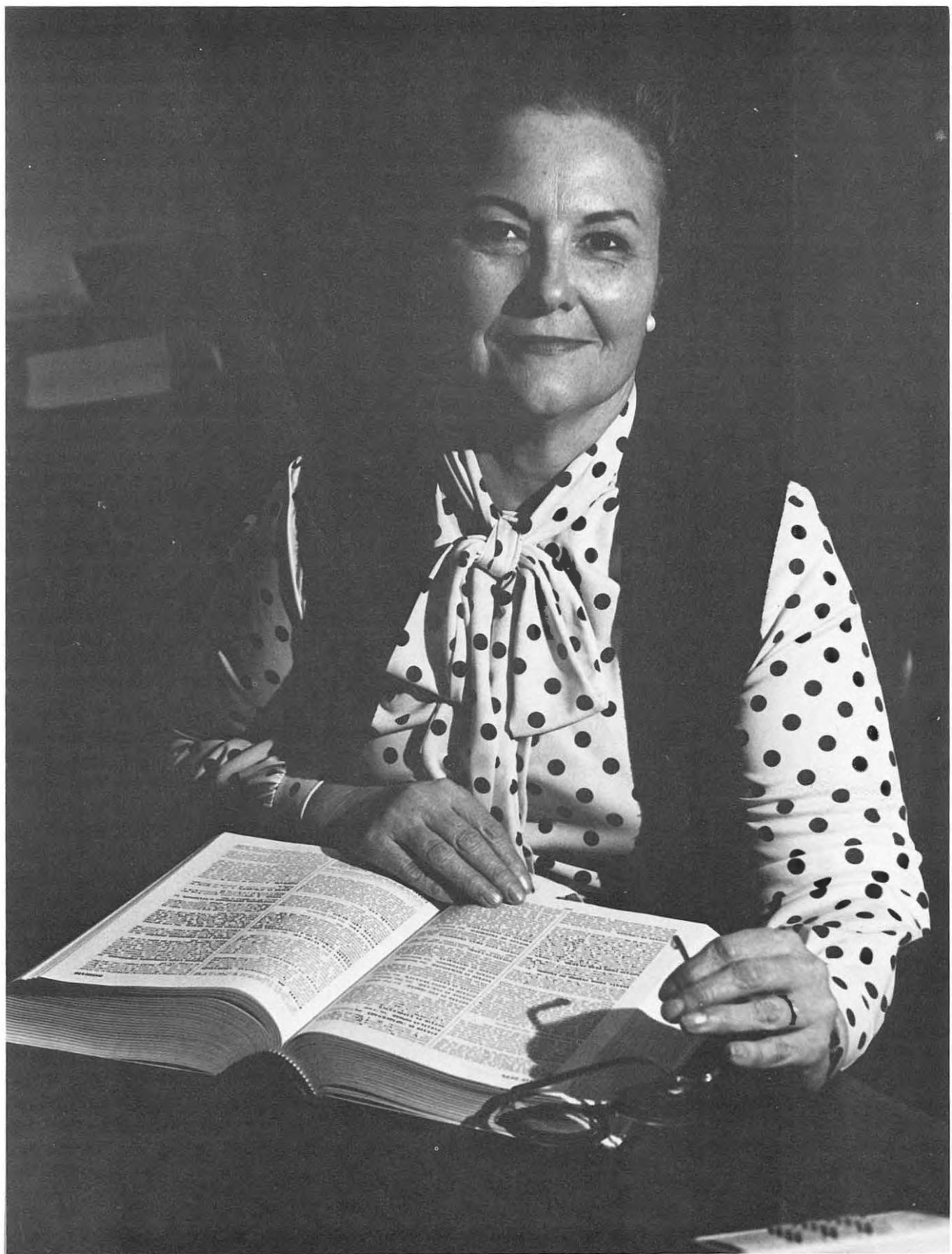
- Administer the Weather Modification Act.

- License water well drillers.

- Participate in the negotiation of interstate stream compacts and their administration.

- Coordinate the Federal Flood Insurance Program in Oklahoma.

- Prepare and update the Oklahoma Comprehensive Water Plan, which was published in 1980.



Joan Wilkerson
Administrative Assistant
to the Board's Legal Counsel

"It's interesting to trace the origin of our water law. For instance, Oklahoma probably has the California Gold Rush to thank for the appropriative water laws still recognized in principle by Oklahoma statutes 131 years later.

"The exuberant cry of 'Gold!' at Sutter's Mill rang through the hills and valleys of California, its seductive call luring thousands of prospectors. To create order from the chaos in the ungoverned public domain, the miners adopted rules to resolve competing mining claims and rights to the use of water for washing the gold from the gravel.

"Under these rules, the discoverer of the mine was protected against claim jumpers, with the first user of the water being protected against later takers. Since there were no precedents, the rough-and-tumble customs of the miners became firmly fixed in the law of the west.

"When the 'gold fever' cooled and the rich lodes dwindled, many stayed on to farm, expanding the useful appropriative doctrine to protect the first settler's right to use water for farming his land."

In conducting the state's day-to-day business of water resources planning, development, administration, management and regulation, the Oklahoma Water Resources Board could not achieve its goals without the cooperation of many state and federal agencies.

The Water Resources Council provides Title III funds for state planning projects. The U.S. Geological Survey assists the Board in geologic and hydrologic surveys and data collection. The Environmental Protection Agency works with the Board in enforcement of pollution control and water quality monitoring.

Among the principal construction agencies, the Corps of Engineers of the Department of the Army, the Water and Power Resources Service of the Department of the Interior and the Soil Conservation Service of the Department of Agriculture have worked closely with the Board in many areas, including preparation of the Oklahoma Comprehensive Water Plan.

The Oklahoma Water Resources Board represents Oklahoma on the Arkansas-White-Red Basins Inter-Agency Committee (AWRBIA), which was created to facilitate the coordination of water and land resources investigations, planning, construction, operation and maintenance.

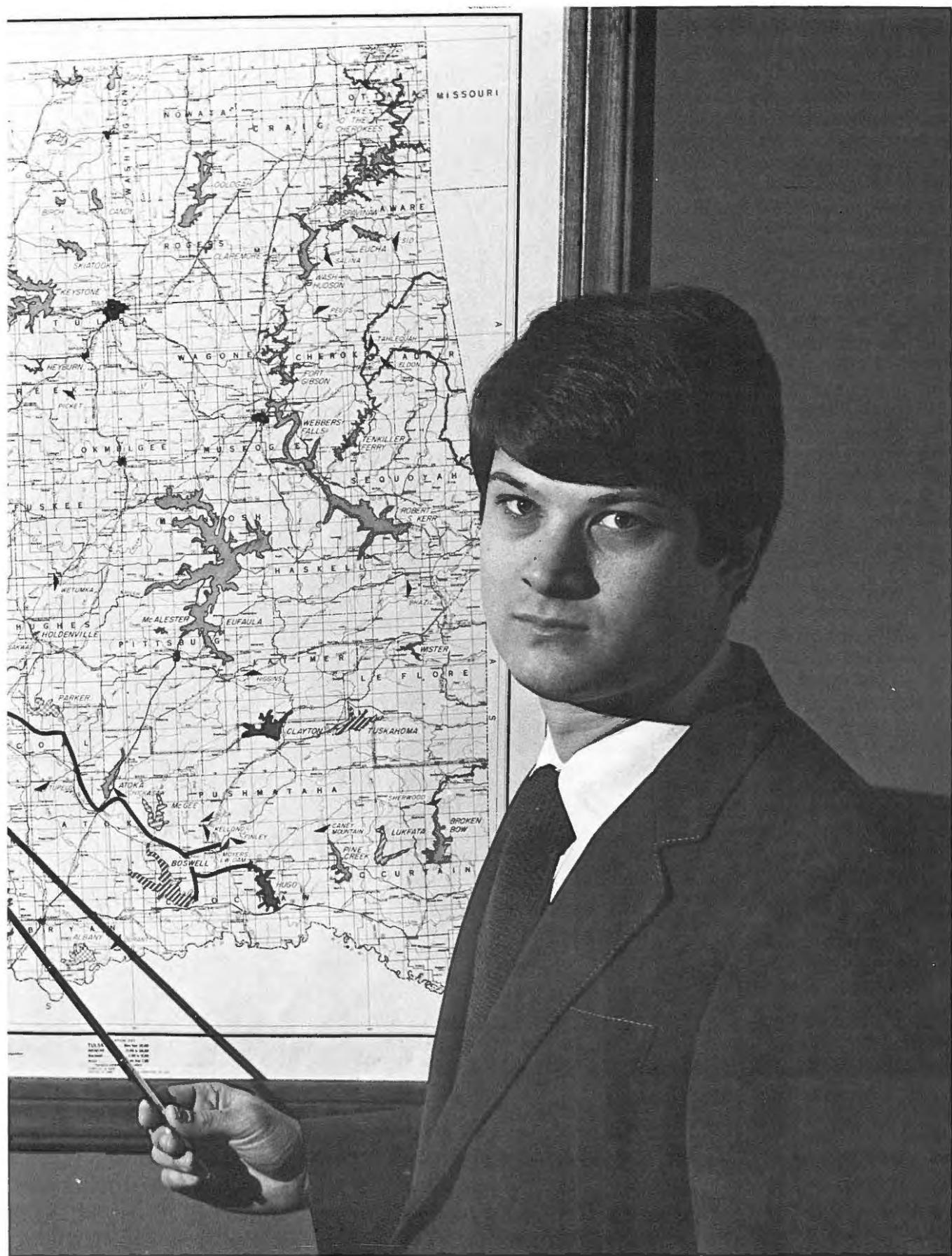
Among the state agencies working with the Oklahoma Water

Resources Board are the Oklahoma Geological Survey assisting in data collection and hydrologic and geologic studies and the Oklahoma Department of Wildlife Conservation working with the Board in fish and game protection. In water quality control, the Board works with the Corporation Commission in abatement of pollution related to oil and gas activities and the Oklahoma State Department of Health in municipal water, waste and sewage disposal problems.

The Department of Pollution Control works with the Oklahoma Water Resources Board in coordinating, monitoring, enforcement and investigation procedures. The Board consults with the Department of Tourism and Recreation on new projects to ensure sufficient water-related recreational facilities are provided.

The Oklahoma Water Resources Board also assists the Grand River Dam Authority in the collection of water resources data.

Other state agencies cooperating with the Oklahoma Water Resources Board are the Department of Agriculture, the Department of Civil Defense, the Conservation Commission, the University of Oklahoma and Oklahoma State University.





Rick Smith
Chief

"In the Oklahoma Comprehensive Water Plan, the state has a valid, long-term strategy for supplying enough good water to meet the needs of all regions. The biggest advantage of a statewide plan is that it recommends optimum development of all local water resources according to a flexible strategy that's compatible with the state's long-range goals.

"Without a plan, future water development will likely be confined to the areas of big populations and big dollars. The cities that can finance new lakes and local water transfer schemes could capture most of the water at the expense of the small towns and rural areas.

"Water rivalry could very well cripple Oklahoma's bright potential for growth and economic development."

Oklahoma Comprehensive Water Plan

Completion of the Oklahoma Comprehensive Water Plan was the major accomplishment of the Planning and Development Division during 1980. The Plan is a flexible guide for the management and development of Oklahoma's water resources through the year 2040. It shows Oklahoma has sufficient water to meet future needs, but its unequal distribution is a serious problem. The Plan includes a statewide water conveyance system consisting of two independent water distribution systems carrying surplus water from southeastern and east central Oklahoma to water-deficient areas in the western and central parts of the state.

A 24-page synopsis of the Plan was submitted to the state Legislature in January 1980 for consideration and approval. The synopsis provides an overview of Oklahoma's water resources and problems, and a proposed strategy for their management.

The extensive, 248-page Oklahoma Comprehensive Water Plan was published in April 1980. The document contains supporting economic and engineering data, an overview of Oklahoma water law, water conservation and a proposed plan to develop water supplies capable of meeting our future water requirements.

The Plan was authorized by the state Legislature in 1974, with the passage of Senate Bill 510. The agencies which assisted the Board in preparation of the Plan include the U.S. Geological Survey, Water and Power Resources Service, U.S. Army Corps of Engineers, U.S. Fish and

Wildlife Service and other state and local agencies.

Statewide Economic Impact Study

Federal agencies identify only direct benefits when evaluating water development projects. However, secondary and tertiary benefits should also be available to decision makers in assessing the final value of a project such as the statewide water distribution system. To identify these indirect effects, the Board contracted with the University of Oklahoma and Oklahoma State University to develop several computer models designed to evaluate total economic benefits under "with" and "without" water transfer assumptions.

Results of the two-year study, which is scheduled for publication in 1981, will show the economic benefits of a statewide water distribution system to the state's eight water planning districts and to areas outside Oklahoma.

Rural Water Survey

"Rural Water Systems in Oklahoma" was published by the Board in September 1980. The publication identifies water problems encountered by Oklahoma's largely rural population and assesses the current status of rural water districts throughout Oklahoma.

Field work on the survey was completed in August 1979. It consists of county-by-county surveys compiled through personal interviews with rural water district operators and managers. The survey results show 398 operational rural water systems in Oklahoma.

The tremendous task of mapping each district's water distribution lines and facilities, indicating location and size of lines, pumping plants and storage facilities, was completed by the division's Drafting Department.

Six-State High Plains-Ogallala Aquifer Area Study

Work has begun on Oklahoma's portion of the Six-State High Plains-Ogallala Aquifer Area Study. Oklahoma is participating in the study along with Colorado, Kansas, Nebraska, New Mexico and Texas to assess the economic, social and environmental consequences of the depletion of the Ogallala aquifer underlying the 225,000-square mile region. The Study, being conducted under the provisions of Public Law 94-587, is being funded by the Economic Development Administration of the Department of Commerce.

The Oklahoma Water Resources Board was designated by Gov. Nigh as the lead state agency in accomplishing Oklahoma's portion of the study. The Board has subcontracted with the Department of Agricultural Economics at Oklahoma State University to conduct agricultural and farm-level research. The Center for Economic and Management Research at the University of Oklahoma will handle the energy production impact research. Oklahoma Water Resources Board staff will evaluate the state's water

resources and general economic, social and environmental impacts required by the Study.

Completion of the Study is expected in July 1982.

Weather Modification

In a cooperative agreement with the Water and Power Resources Service, the Oklahoma Water Resources Board is working to identify cloud seeding potential during periods of drought in Oklahoma.

The Board has a contract with the Oklahoma Climatological Survey of the University of Oklahoma to carry out climatological and cloud seeding feasibility studies. Aeromet, Inc. of Tulsa will be designing an operational program tailored to Oklahoma's precipitation needs and the characteristics of weather systems in Oklahoma. Oklahoma Water Resources Board staff is responsible for a comprehensive review of state organizational arrangements and regulations affecting the use of cloud seeding should a drought occur.

The program's goal is to prepare ourselves with technology and procedures to combat drought before it strikes. The final plan, to be completed in February 1982, will enable Oklahoma to make decisions and implement cloud seeding on a timely and effective basis.

Federal Water Projects Under Construction

During 1980 construction continued on four federal projects in Oklahoma, and construction was initiated on two additional projects. Water supply storage is provided in all these structures and may be used upon proper application to the Board and completion of a repayment contract with the appropriate federal agency. Members of the Oklahoma Water Resources Board staff review and comment on the planning, feasibility and environmental impacts of these projects.

The following projects are currently being built under the authority of the Corps of Engineers, except McGee Creek Reservoir, which is being built by the Water and Power Resources Service.

Candy Lake, on Candy Creek in Osage County, located one mile northeast of Avant and 25 miles northwest of Tulsa, is a unit of the plan for control of floods in the Caney River-Bird Creek Basin. It will provide water supply and recreation facilities. At the conservation pool elevation of 720 feet above sea level, the lake will have an area of 2,170 acres when completed in 1982. By the end of 1980 it was two percent complete.

Clayton Lake, located on Jackfork Creek, is part of a three-lake system for flood control and water supply in the Kiamichi River Basin. Located three miles north of Clayton and five miles northwest of Tuskahoma in

Pushmataha and Latimer Counties, Clayton Lake was 73 percent completed by June 1980. At the conservation pool elevation of 599 feet above sea level, on completion in 1981, the lake will cover 14,360 acres.

Copan Lake, on Little Caney River in Washington County, is another unit in the flood control plan for the Caney River-Bird Creek Basin. The lake will provide recreational facilities and water supply when completed in 1981. Located two miles west of Copan and nine miles north of Bartlesville, the normal pool will have a surface area of 4,850 acres at 710 feet above sea level. The lake was 76 percent complete at the end of 1980.

Skiatook Lake is one of five projects in the Bird Creek Basin plan recommended to meet the comprehensive water resources needs of the area. Already 55 percent complete, the lake is located on Hominy Creek, five miles west of Skiatook in Osage County. On completion, the lake will provide flood control, water supply, recreational facilities and fish and wildlife management. The lake will have an area of 10,540 acres at 714 feet above sea level.

Arcadia Lake, located on Deep Fork Creek, 1½ miles west of Arcadia in Oklahoma County, will provide 12,100 acre-feet of water to the city of Edmond. The

ground was broken for Arcadia Lake on July 19, 1980, and when completed in 1986 the lake will also provide flood control and recreational benefits to the area. The lake will cover 2,470 acres at 1,013 feet above sea level.

McGee Creek Lake will provide 71,800 acre-feet of water to the local area as well as to Oklahoma City upon completion in 1985. Water allocated to Oklahoma City will be transported to Lake Stanley Draper from Lake Atoka through the existing Atoka pipeline. Located 12 miles east of Atoka, the lake will cover 3,350 surface acres at 574 feet above sea level. Acquisition of land for the project was begun in 1980 by the Water and Power Resources Service.

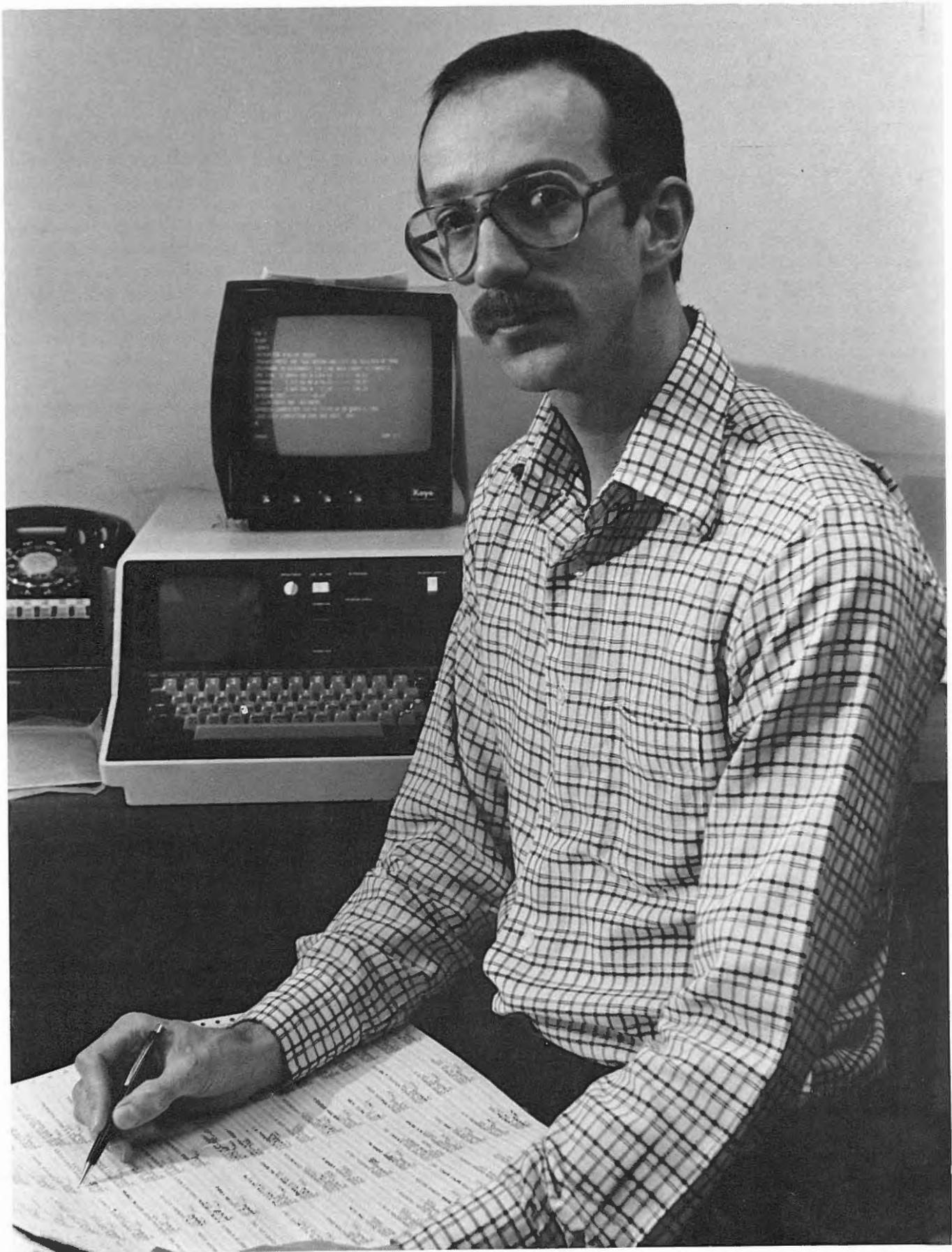
Federal and State Review

The Oklahoma Water Resources Board reviews all local development projects, all proposed federal and state highways, and oil, gas and water pipelines to determine if they will interfere with future development of Oklahoma's water resources. Reports submitted for federal authorization and construction of water projects are also reviewed to make optimal use of Oklahoma's water resources.

Financial Assistance Program

During 1980, the Division of Planning was expanded to the Division of Planning and Development, to reflect the new Financial Assistance Program's purpose and intent. Because many entities in Oklahoma have been deprived of adequate water supplies due to a lack of an appropriate state funding mechanism, a program of financial assistance is now available with passage of Senate Bill 215 by the first session of the Thirty-Seventh Legislature. The bill became effective Oct. 1, 1979, and authorizes the Oklahoma Water Resources Board to issue investment certificates in the form of revenue bonds and to establish a Water Resources Fund from the bond proceeds. The Board may then loan money from this fund to cities, towns, counties, rural water districts and other qualified entities for the development or expansion of local water resource projects.

Although a limit was not placed on the amount of bonds to be issued, a \$1.5 million ceiling was placed on each project loan. The second session of the legislature amended Senate Bill 215 to extend financial assistance to include sewage treatment facilities as projects eligible for loans. It also authorized the Oklahoma



Jim Schuelein
Hydrologist

"Pressed with a growing population, expanded agricultural activities, intense business and industrial development and faced with the ominous potential of drought, ground water depletion and pollution, the state needed a central bank of water information. The Board realized that complete, reliable data were vital in responsible water resource planning, development and management and were critical to the solution of present and potential water problems.

"We needed a statewide inventory of water resources and an accounting of water uses that could be shared with other water-related groups and that would interface with the National Water Use Data System.

"The Water Resources Board, with support from the U.S. Geological Survey and the cooperation of the OSU Computer Center, is collecting and computerizing all useful water information.

"When the Oklahoma Water Use Data System is operational, we'll literally have at our fingertips the means of addressing the water supply and demand dilemmas posed before a growing, progressive state."

Water Resources Board to administer a grant program. A ceiling of \$50,000 per eligible entity and criteria for its use were approved, although no grant monies are yet available.

Oklahoma Water Use Data System

Throughout the year, work continued on development and implementation of the Oklahoma Water Use Data System, a cooperative program with the U.S. Geological Survey, Water Resources Division.

A work plan was completed for the collection, storage and retrieval of water use data. Upon completion in 1982 it will make accessible for the first time detailed information on type of use, location, quantity and quality of water. It will centralize timely information required in resolving critical water use problems and promote understanding of the present and projected demands on water supplies, the design and operation of water projects and the development of alternative water management strategies.

Photographic Processing

Photographs taken and processed by the Oklahoma Water Resources Board provide documentation of protests, complaints and field investigations for presentation to the Board or other authorities monitoring or mediating controversial water activities.

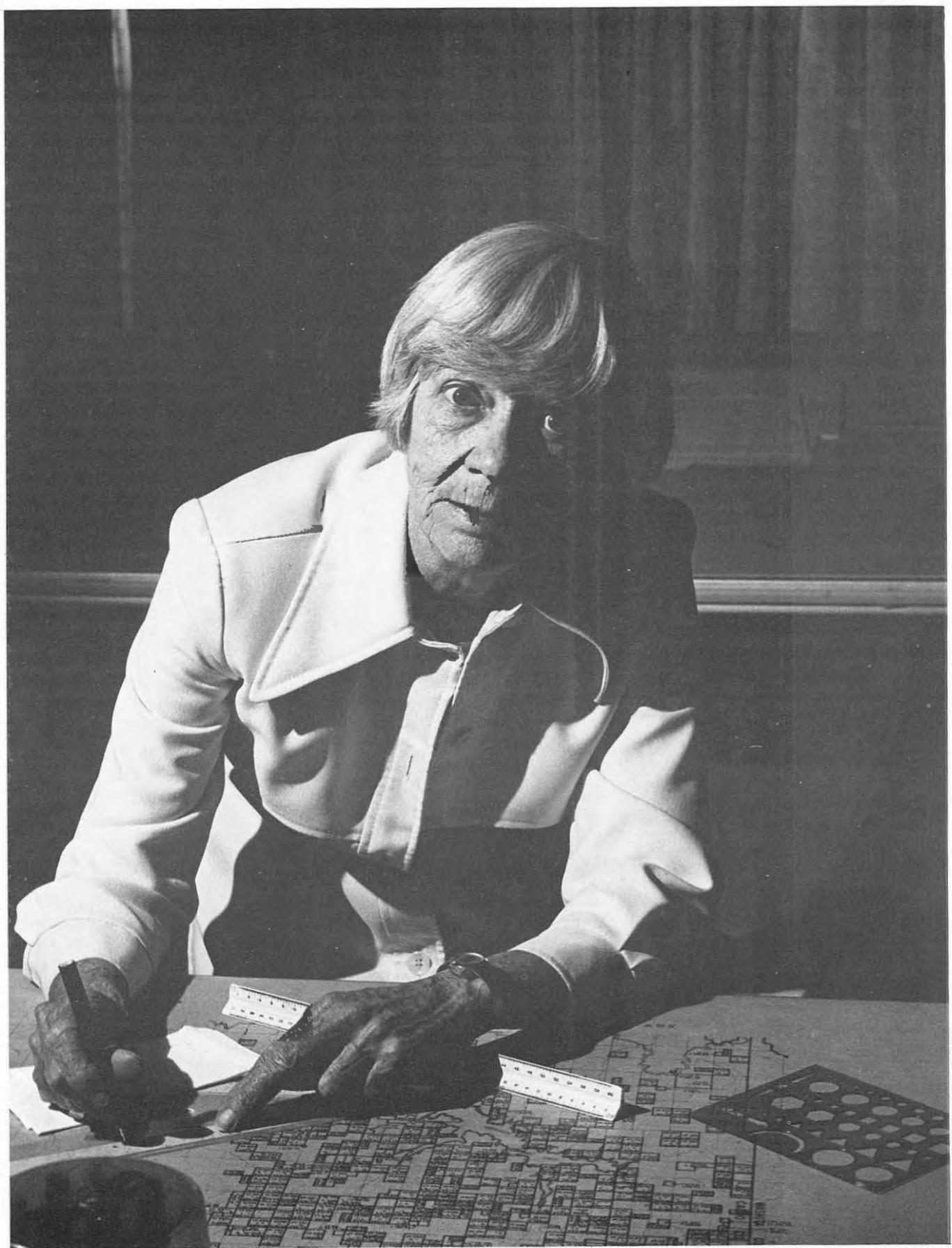
During 1980 approximately 10,224 frames of film were processed, with 2,300 of them mounted for slide projection and 9,276 printed for use in reports, exhibits for hearings and documenting complaint investigations.

Publications and Public Information

The Oklahoma Water Resources Board has a variety of printed materials to keep Oklahomans informed about water resources availability, quality, management and development.

During 1980 the Board completed eight new publications: "Survey of Physical Water Quality in Lake Texoma with Emphasis on Chemical and Thermal Stratification-1975," "Oklahoma Comprehensive Water Plan," "Synopsis of the Oklahoma Comprehensive Water Plan," "Thermal Monitoring on the Arkansas River, Oklahoma: Maximum Water Quality Temperature Standard Development Evaluation," "The Effects of Thermal Heating in Comanche Reservoir, A Public Service Company of Oklahoma Cooling Lake," "Rural Water Systems in Oklahoma," "Oklahoma's Water Quality Standards-1979" and "Reported Water Use in Oklahoma" and reprinted one, "Rules, Regulations and Modes of Procedure-1979."

A complete list of publications is available upon request. Printed materials produced by the Board are made available to schools and libraries throughout Oklahoma.



**Gladys Haywood
Cartographic Drafter**

"It's very satisfying to have a part in a 'first-time-ever' project for Oklahoma. It's really rewarding when the project is accepted and appreciated as much as OWRB's 1980 publication, 'Rural Water Systems in Oklahoma.'

"Two men spent 18 months in the field gathering data, then three of us spent most of our time for 18 months mapping every water line, boundary, well, storage reservoir, treatment plant, water tower, standpipe, storage tank and booster pump utilized by 398 rural water systems in the state.

"All the water supply lines—ranging from two inches or smaller to 10 inches or larger—were plotted in a different color, which required eight separate colors or overlays for each county map.

"It was a giant job, but well worth the effort when rural water officials tell the Board what a valuable tool our book is in their planning for future growth."

In order to foster water awareness, inform Oklahomans on water resource issues of national, regional and local importance, and to promote an understanding of the mission of the Oklahoma Water Resources Board, a monthly newsletter was introduced in June 1980. "Oklahoma Water News" is mailed without charge to approximately 10,000 water rights holders, legislators, state and federal agencies and concerned citizens.

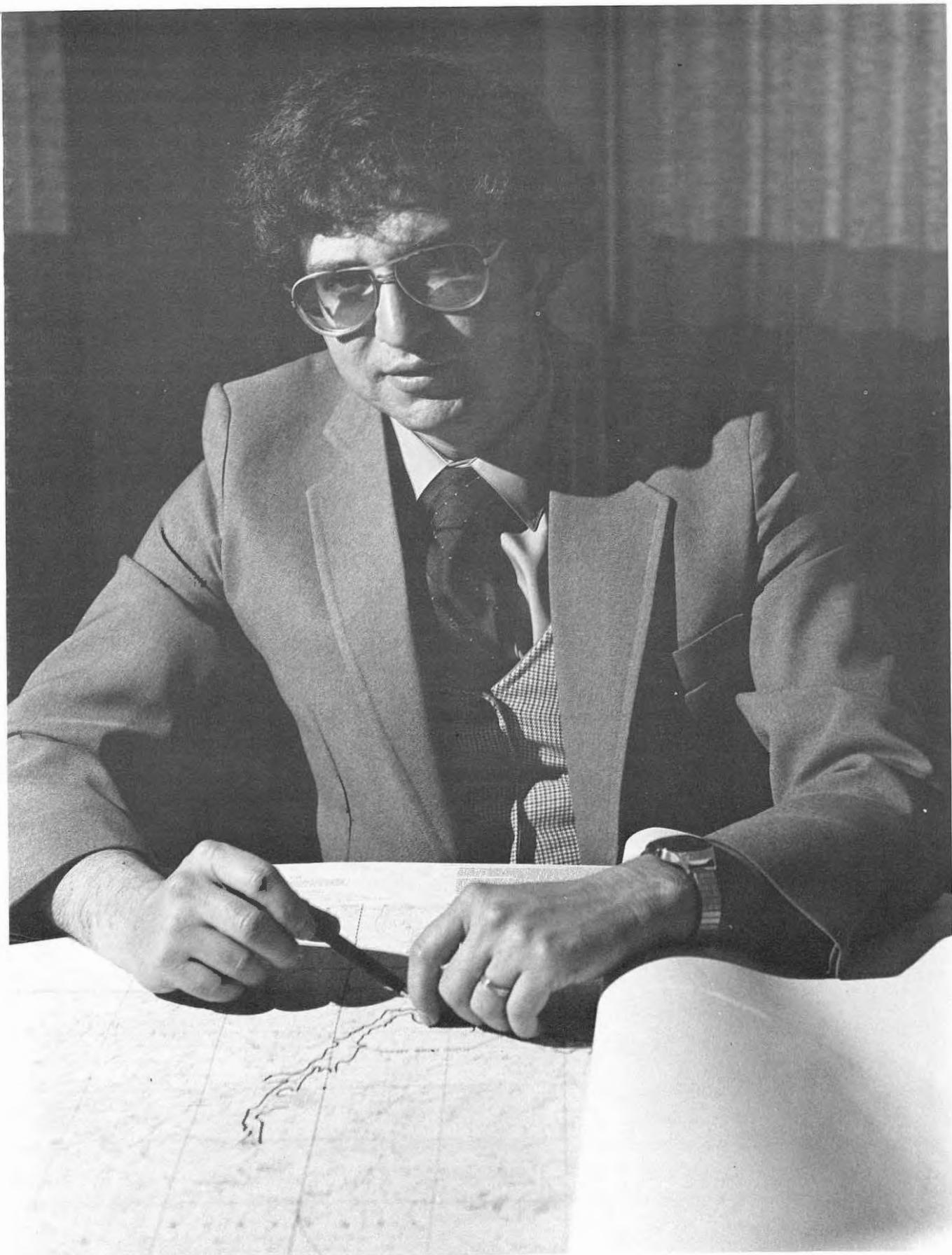
To encourage greater understanding of the state's water supply problems and to solicit public participation in water resources planning, the Board's public information staff produced two slide shows: "The Oklahoma Comprehensive Water Plan" and "The High Plains Study, an Alternative of Hope."

Mapping and Drafting

Members of the Drafting Department of the Planning and Development Division prepare graphic materials used by all divisions of the Oklahoma Water Resources Board, and by other state agencies upon request.

Drafting assignments include plotting stream water and ground water rights; mapping surface waters, ground water basins and water supply facilities; calculating drainage areas; apportioning Soil Conservation Service lakes;

preparing hydrologic cross sections, mapping natural pollution and industrial discharges; identifying stream sampling points and producing graphic materials to illustrate all OWRB publications and to accompany speeches and presentations.





STREAM
WATER
DIVISION

Harold Springer
Chief

"Oklahoma's climate and history of drought challenge us to explore all means of managing and augmenting our water supplies.

"One way we could add to our water supplies significantly and at critical times is by cloud seeding. Weather modification technology has grown so fast and results of field experiments are so encouraging that it excites my imagination.

"I'm convinced it's a viable technology and deserves a place in Oklahoma's comprehensive water resources planning.

"Seeding warm-weather cumulus clouds has great potential for producing beneficial, widespread rains where only scattered showers might have occurred. Increasing normal rainfall by 20 percent could be of immense benefit to crops, ranges and surface water supplies.

"It's appropriate that the Water Resources Board has taken the lead in weather modification activities in the state."

The summer of 1980 was one of the driest ever for the state of Oklahoma. It was followed by even drier fall and winter months, prompting Oklahomans to compare the 1980 drought with the Dust Bowl days of the 1930s. As the drought continued, the Stream Water Division received a significant increase in stream water applications, objections to present allocations, complaints and inquiries concerning weather modification.

Oil well drilling all across Oklahoma created an additional strain on streams and reservoirs normally used for irrigation and domestic use.

Throughout 1980, Oklahomans became painfully aware of the value of an adequate water supply and the importance of having water available for irrigation.

Stream Water Rights Administration

During 1980 a total of 207 new permit applications were processed, allocating 142,172 acre-feet of stream water. Allocations included 102,298 acre-feet for municipal and industrial uses; 39,850 acre-feet appropriated for irrigation, and 24 acre-feet allocated for recreation, fish and wildlife. Five protest hearings were conducted during 1980, and 40 complaints involving stream water were investigated.

A permit is required by persons, firms, corporations or state and federal agencies intending to use stream water for beneficial uses other than domestic purposes. The permit applications are date-stamped as they are received at the Oklahoma Water Resources Board, reviewed by the staff and scheduled for hearing. After consideration of all

pertinent information, the Board approves or denies the application.

Existing water rights in each stream system are regularly reviewed for compliance, and permits adjusted or cancelled if necessary. Water allocated by the Board normally must be used within seven years from the date the permit was issued.

During 1980, 561 permits in 20 stream systems were scheduled for hearings to review compliance, and 618,063 acre-feet per year of stream water reverted back to the public.

Interstate Stream Compacts

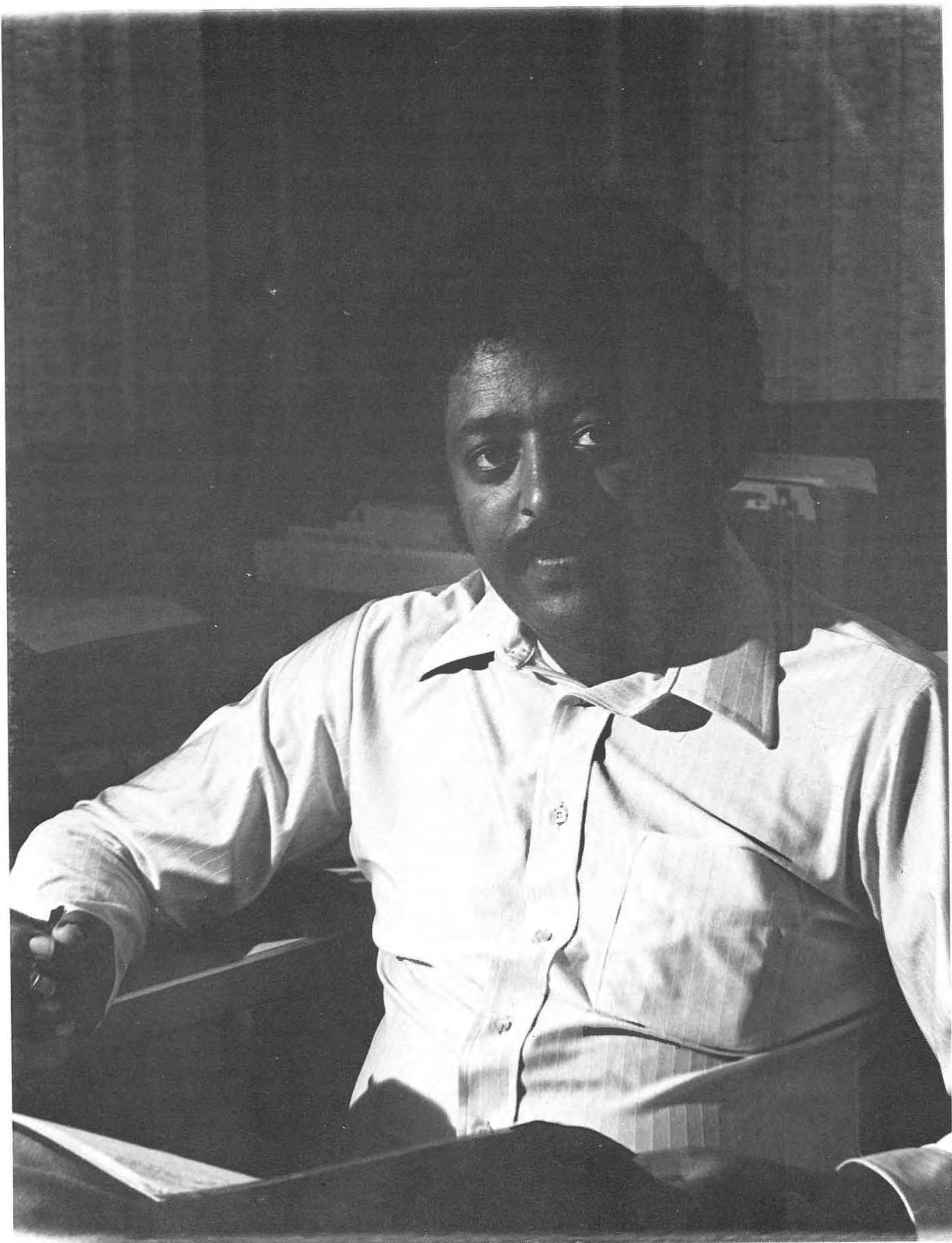
Because each state bordering Oklahoma has an interest in the stream waters that originate or flow through Oklahoma, Congress has authorized the states to enter into compacts to apportion these waters, preventing costly litigation and allowing each state to retain its share for development.

The Stream Water Division provides Oklahoma's representatives to interstate stream compact commissions with background information and water data necessary to negotiate and administer the agreements.

Oklahoma is involved in four interstate stream compacts, the most recent one completed being the Red River Compact between Oklahoma, Texas, Arkansas and Louisiana, which was signed by President Jimmy Carter on Dec. 22, 1980. With the signing of this final compact Oklahoma is assured of the right to develop and use its share of all the major streams flowing into and out of the state.

The Canadian River Compact Commission did not meet in 1980, due to the death of its chairman, Leon W. Hill.

The Kansas-Oklahoma Arkansas River Compact



**Tesfai Ghermazien
Water Resources Engineer**

"Managing the state's stream water resources during a drought such as last summer's can be very difficult. The most water is needed when the least is available.

"In other words, when an irrigator needs his full allocation of water, it is likely that his neighbors in the watershed will have similar needs, and that the demand for municipal water will increase in a nearby town supplied by the same stream.

"Streamflow diminished by drought can work an extreme hardship on water users who depend on it. We try to help when we can by encouraging upstream users to share with those downstream.

"If there's a federal reservoir upstream, we often request an emergency release from the reservoir's water quality storage. We'd like it if Oklahoma's farmers never had to lose a crop to drought or any city, town or rural water district be deprived of adequate water."

Commission met in Fort Smith, Ark., on Sept. 25, 1980, but the meeting was unofficial due to a lack of a quorum.

Hydrological Studies

The Stream Water Division conducts appraisal types of hydrological studies to make sure Oklahoma utilizes its stream water resources in the best interests of its inhabitants.

The increased demand for water by cities, towns, irrigators and industries urges the Oklahoma Water Resources Board, and in particular the Stream Water Division, to devote more attention to refined hydrological studies. To monitor available water and to ease stream water rights administration, the Stream Water Division divided seven of the existing stream systems into different substream systems.

Four hydrological studies were conducted during 1980. The study of the North Canadian River Basin involving substream systems 2-5-1, 2-5-2, 2-5-3 and 2-5-4, has been completed and published.

The study of the North Fork of the Red River Basin, which includes substream systems 1-15-1 and 1-15-2, is awaiting a draft report.

Data acquisition has been completed and the draft report is pending on a study of the Salt Fork of the Red River, involving substream system 1-16.

A study of the Verdigris River Basin is complete, with the report draft pending. This study includes substream systems 2-15-1 and 2-15-2.

The North Canadian River Basin was just one of the basins previously considered to have no more water available for appropriation upstream from Oklahoma City. The recent

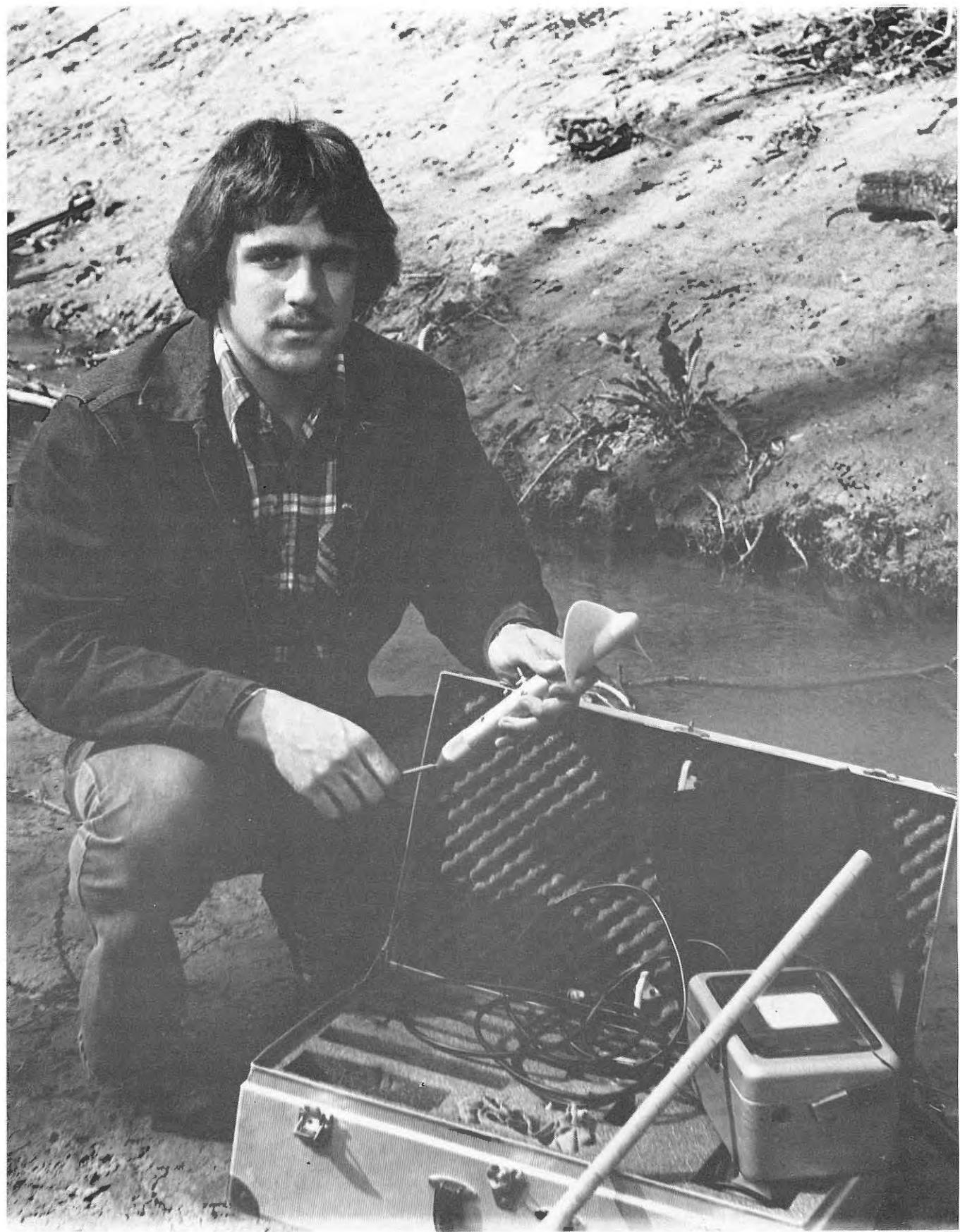
hydrologic study, after reduction or cancellation of stream water rights due to non-use in a given 7-year period, indicated there is some water available for appropriation, although not a substantial amount.

The study also indicated that an adequate water appropriation for the irrigation of alfalfa would vary from two acre-feet per acre in the western part of Oklahoma to 1.2 acre-feet per acre in eastern Oklahoma, instead of two acre-feet per acre previously allocated throughout the basin. This is just one step toward efficiently managing water resources in the best economic interests of the State by releasing water that may be unnecessarily tied up at present.

National Flood Insurance Program

The Oklahoma Water Resources Board is the coordinating agency between the Federal Government and Oklahoma communities for implementation of the National Flood Insurance Program. The program makes flood insurance available to property owners in areas where such insurance was previously unavailable through private companies. In return, state and local governments are required to adopt and enforce land use and control measures to guide development in flood-prone areas in order to mitigate future flood damage.

Flood hazard boundary maps identifying flood-prone areas are prepared and estimates of the likelihood of flood damage and flood insurance rates are established. The Federal Insurance Administration allows a flood-prone community one year from the date identified on its flood hazard boundary map to



**Marc Pulley
Engineering Aide**

"To administer water rights fairly, the Board relies on hydrologic studies of each stream system. Long-term data collected at gaging stations all over the state tell us how much water is available and how dependably.

"We ask only that an applicant put his allocation of water to beneficial use. When the Board grants a permit to use water from a stream, river or reservoir, we carefully determine that the additional water right will not diminish the supply available for domestic use or infringe on the right of any other permitted water user."

"I suppose you could say that we're the state's water accountants. We regularly check each stream system's water 'balance' against its 'debits,' then adjust our 'ledgers' as supplies or demands change."

qualify for the program. Federal financial assistance in the flood-prone areas is unavailable unless a community is qualified.

Gov. George Nigh signed the Oklahoma Floodplain Management Act on May 13, 1980. It affords those Oklahoma communities desiring to participate in the National Flood Insurance Program the opportunity to participate and make flood insurance available to its citizens. The Act also authorizes the Oklahoma Water Resources Board to adopt and publish criteria and regulations which will aid municipal and county floodplain boards in implementing sound floodplain management practices.

The Board entered into agreement with the Federal Emergency Management Agency (FEMA) on Sept. 17, 1980, to participate in the State Assistance Program of the National Flood Insurance Program. A total of \$62,500 was funded for this project.

"Emergency Rules and Regulations for Building and Construction on State-Owned or State-Operated Property Within Floodplains" were approved by the Board on Nov. 12, 1980.

At the close of 1980 there were 194 Oklahoma communities participating in the National Flood Insurance Program. Application for state participation in the program was made on Dec. 1, 1980.

Weather Modification

Weather modification means attempting to change or control by artificial means the natural development of atmospheric cloud forms or precipitation forms which occur in the troposphere.

The 1972 Weather Modification Act was amended in 1973, assigning the Oklahoma Water Resources Board the responsibilities of administering the act,

approving all weather modification permits and the licensing of all operators. During 1980 the Board issued one license to operate and two permits to operate under the license.

A 10-member Weather Modification Advisory Committee assists the Board in matters of policy, administration, research and legislation. The Board, in cooperation with private and public agencies, promotes and encourages research and development in the field of weather modification.

Operators of generators in Oklahoma and surrounding states affecting Oklahoma submit monthly reports to the Board concerning the weather modification activities on each project. These reports include the number of hours operated, locations, type of modification agent used and type of cloud phenomenon modified.

The Oklahoma Water Resources Board has embarked on an effort to expand weather modification activities in the state by means of a unique and comprehensive evaluative program designed to benefit diverse groups of water users in Oklahoma. During a December 1979 meeting of the Weather Modification Advisory Committee, the findings of a contract study evaluating the future actions were presented by its principal author, Dr. John McCarthy of MCS Inc., Norman, Okla. The final report of these findings, entitled "The Expansion of Weather Modification in Oklahoma—A Time for Action," was accepted by the Committee.

On Aug. 1, 1980, the Board and the Water and Power Resources Service entered into an agreement for the purpose of developing a contingency plan and performing background studies to apply weather modification during drought periods in Oklahoma.





ENGINEERING DIVISION

Paul Wilson
Chief

"One of the ways we located dams for our inventory was with Landsat Satellite Imagery.

"Some of the small dams in Oklahoma were built by the Civilian Conservation Corps or the Works Progress Administration back in the 1930s. Since those days the areas in which some of these dams are located have changed, and it's hard to find each one. The satellite helped us locate many small dams.

"The only drawback to using the satellite was its fine perception. It would pick up cooling systems located on large buildings, while entirely missing a body of water such as Lake Atoka, because of its muddy appearance. The satellite just completely missed several big lakes that are muddy.

"The Landsat Satellite Imagery did the job that could have taken a team of engineers months or even an entire year to do."

Dam safety is a very complex and continuing problem for Oklahoma. New dams are constructed every month, and each has a potential for creating a hazardous situation to downstream inhabitants.

When the Engineering Division was formed in 1978, it assumed the responsibility for all matters of dam safety in Oklahoma. The Division staff, with expertise in engineering, hydrology and geology, carries out the dam inspections where a hazard potential exists, updates the inventory of non-federal dams 25 or more feet in height and/or impounding 50 acre-feet or more of water, and reviews construction sites and plans for proposed impoundment structures.

Most dams in Oklahoma are earthfill, designed by a state-of-the-art method at the time of construction. Such construction means there is a potential for seepage and possible failure that could threaten life and property downstream. The Oklahoma Water Resources Board dam safety program strives to reduce dam failures and attain mitigation of such failures in relation to life and property. Authority for the Board's dam safety program is provided in 82 Oklahoma Statutes Annotated, Section 105.27, Stream Water Act.

Dam Safety Inspections

Dam-related disasters in West Virginia and South Dakota

brought about passage of the National Dam Safety Act in 1972.

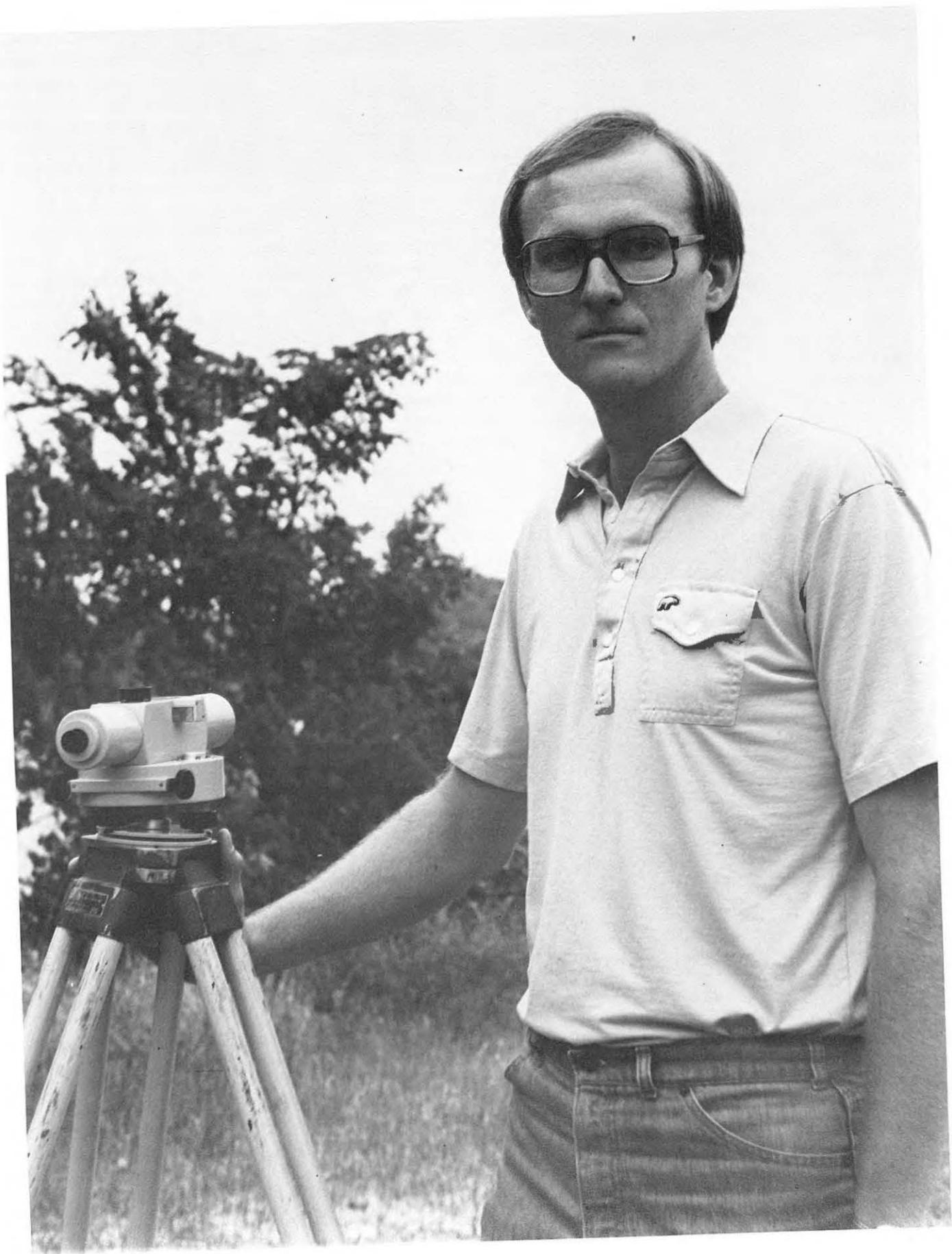
As the state agency responsible for dam safety, the Board entered into contractual agreement with the U.S. Army Corps of Engineers to carry out this legislation. From January through December of 1980, the Engineering Division and the Corps of Engineers inspected and issued reports on almost 45 dams, and presented recommendations to ensure the safety of those living downstream.

Evaluating an existing dam includes reviewing the records; a field inspection; studies of hydrology, hydraulics, geology and seismology; seepage; monitoring systems; structural stability, history of maintenance and records of rehabilitation performed. Since the program was instituted, the Board has issued nearly 170 dam safety reports.

Through this dam safety program, the Oklahoma Water Resources Board will help ensure that the state's dams and lakes are safe for all Oklahomans to enjoy.

Non-Federal Dam Inventory

A sound dam safety program includes a complete and accurate



**Mike Mathis
Hydrologist**

"When the Oklahoma Water Resources Board inspects a dam for safety, there are usually three Engineering Division staff members at the site, as well as representatives of the Corps of Engineers. Generally, an inspection takes a full day to complete.

"The inspection involves assembling a profile of the dam, including its characteristics, drainage, slopes and evaluating its suitability for the purpose for which it was designed.

"It's a question of checking all these things carefully and making sure the dam owner and the people downstream are aware of any problem with a dam."

inventory of all jurisdictional size dams in the state. The Corps of Engineers, working in conjunction with the Board, undertook a program to inventory all such dams. Using Landsat Satellite Imagery along with field investigations and other means, dams were located and identified for inclusion in the Board's inventory. Each dam was categorized according to physical characteristics and downstream hazards.

The inventory, completed on Sept. 30, 1980, showed Oklahoma has 4,123 dams of jurisdictional size.

Surveillance of Existing Structures

The Engineering Division responds to all complaints and inquiries concerning the safety of existing dams and investigates all reports of dam failure. It is part of the Division's responsibilities to supervise compliance with safety recommendations and if an inspection reveals a hazard which poses an immediate threat, the Board will move promptly to have the necessary corrections made.

Review of Proposed Dam and Reservoir Sites

During 1980, 32 Soil Conservation Service watershed sites and 21 private sites were approved by the Oklahoma Water Resources Board Engineering Division. Plans for construction or

modification of impoundment structures were reviewed and coordinated with other state agencies for conflict with other improvements. Plans were also assessed for compliance with Board rules and regulations pertaining to reservoir requirements and safety of dams.





J.A. Wood
Chief

"The most important work of this Division is to help each landowner or legitimate lessee who has a beneficial need for ground water—for uses other than domestic—to establish a claim to his rightful share of the water under his land.

"Oklahoma's water is her most precious natural resource. I believe the day will come when a barrel of good water will bring the price of a barrel of oil. Maybe we lived too long believing the supplies of water and oil were infinite. We know better now—and we know that there's no more water now than at the beginning of time.

"Other energy sources could possibly relax our dependence on oil, but our needs for water will continue to grow. There's no substitute for good clean water."

Ground Water Rights Administration

Processing of new ground water applications and maintaining the existing ground water rights are handled by the Ground Water Division. The staff assists individuals in filing ground water applications both in the office and in the field. Each application is reviewed and assigned to the proper ground water basin according to its legal description.

If the application meets the requirements of the statutes and the Board's Rules and Regulations, the Board begins public hearing procedures, which are required on all applications except 60-day permit applications. After the permit is approved, a copy is sent to the applicant, a copy is filed at the Oklahoma Water Resources Board, and the information is coded and entered on a master computer tape. The permit file material is also microfilmed and filed at the State Library.

During 1980 there were 647 temporary, special, provisional temporary and regular permits approved, allocating 65,230.4 acre-feet of ground water.

A file of approximately 10,000 existing long-term use ground water rights is maintained at the Oklahoma Water Resources Board.

Permits issued as of July 1, 1973 include special permits which expire six months after issuance, provisional temporary permits which expire two months after issuance and temporary permits which require revalidation each year. Temporary permits approved for long-term use require annual revalidation and are changed to regular permits only after the ground

water basin study for that area is complete and the maximum annual yield determined. Then each holder is allowed his proportionate share of the water.

The Board issued its first regular ground water permits in 1978 in the Alluvium and Terrace Ground Water Basin in Tillman County and has continued to do so for all new long-term ground water uses in Tillman County.

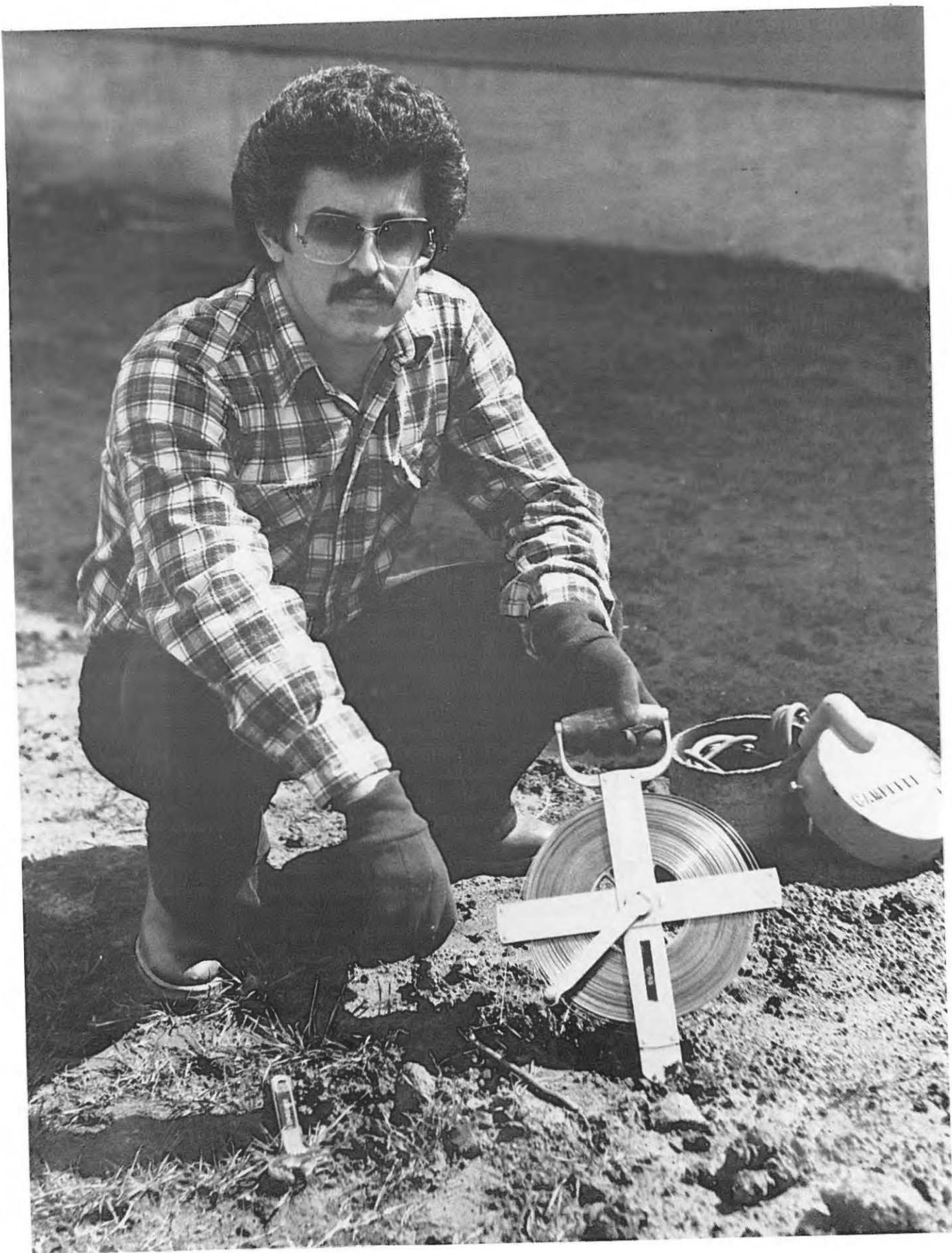
In March 1980 the Board mailed approximately 10,000 water use report forms to holders of ground water rights for long-term use. The completed forms show 1980 ground water use and any changes in ownership during the year. Information from each returned report is individually coded, entered on master computer tape, used in the printing of the Oklahoma Water Resources Board's annual water use reports and filed in the ground water rights file.

According to information submitted on water use reports in 1980, there were 79 transfers of ground water rights to new owners.

Prior Ground Water Rights

Title 82 (O.S. Section 1020.14) gives any individual who used ground water under the requirements of the law before June 1, 1973, the opportunity to establish a prior right for such uses.

To accomplish this, the Board makes a thorough review of all ground water use files in the area, and holds a public hearing and work sessions in the area to gather information. The staff then re-evaluates all files and information on record, compiles a list of applicants and claimants and designates those, who in the staff's opinion, are entitled to a prior right. The Board members then consider all the information, and determine



Walid Maher
Engineer

"Hydrologic surveys of Oklahoma's ground water basins are essential to responsible management of the state's water resources. Information collected in the basin studies provide the guidelines for all ground water allocation.

"So many factors must be considered in fairly dividing the water among all the people with legitimate claims. How much land area overlies the basin? How much water is available for use? At what rate is nature replenishing the aquifer? What are the demands on the ground water basin? What are the possibilities of pollution? How many have a prior right to use the basin's water?

"There's so much to learn about each basin. Usually, the studies require two years or more. But we must have all those answers before we can apportion the ground waters equitably."

and approve all prior rights in each county. The final order approved by the Board lists those who have established a prior right, the amount of water, the parcel of land connected, and the location of prior rights wells.

The total amount of ground water that can be withdrawn from each basin under the present law is called the maximum annual yield. Before a determination of the maximum annual yield can be made, prior rights must be determined and approved by the Board and those rights considered in fixing the maximum annual yield.

The prior rights program is important in determining the amount of ground water available for allocation to those water users issued permits after July 1, 1973, the effective date of the present ground water law. The law also assigns the Oklahoma Water Resources Board responsibility for determining each applicant's proportionate share of the ground water stored within the basin beneath his land. The proportionate share is based on the amount of land owned or leased (with specific rights to withdraw ground water), or in the case of a municipality, the platted land overlying the basin. Equal proportionate shares are determined on the basis of the maximum annual yield, which is the amount of ground water that can be withdrawn annually to allow a basin a minimum life of 20 years.

In 1980 the Board worked on prior ground water rights determination in 10 counties. In the past few years the Board has determined prior rights in 19 central and western Oklahoma counties.

The Board has completed some work in other counties and is now

in the process of determining prior rights for the remaining counties in Oklahoma.

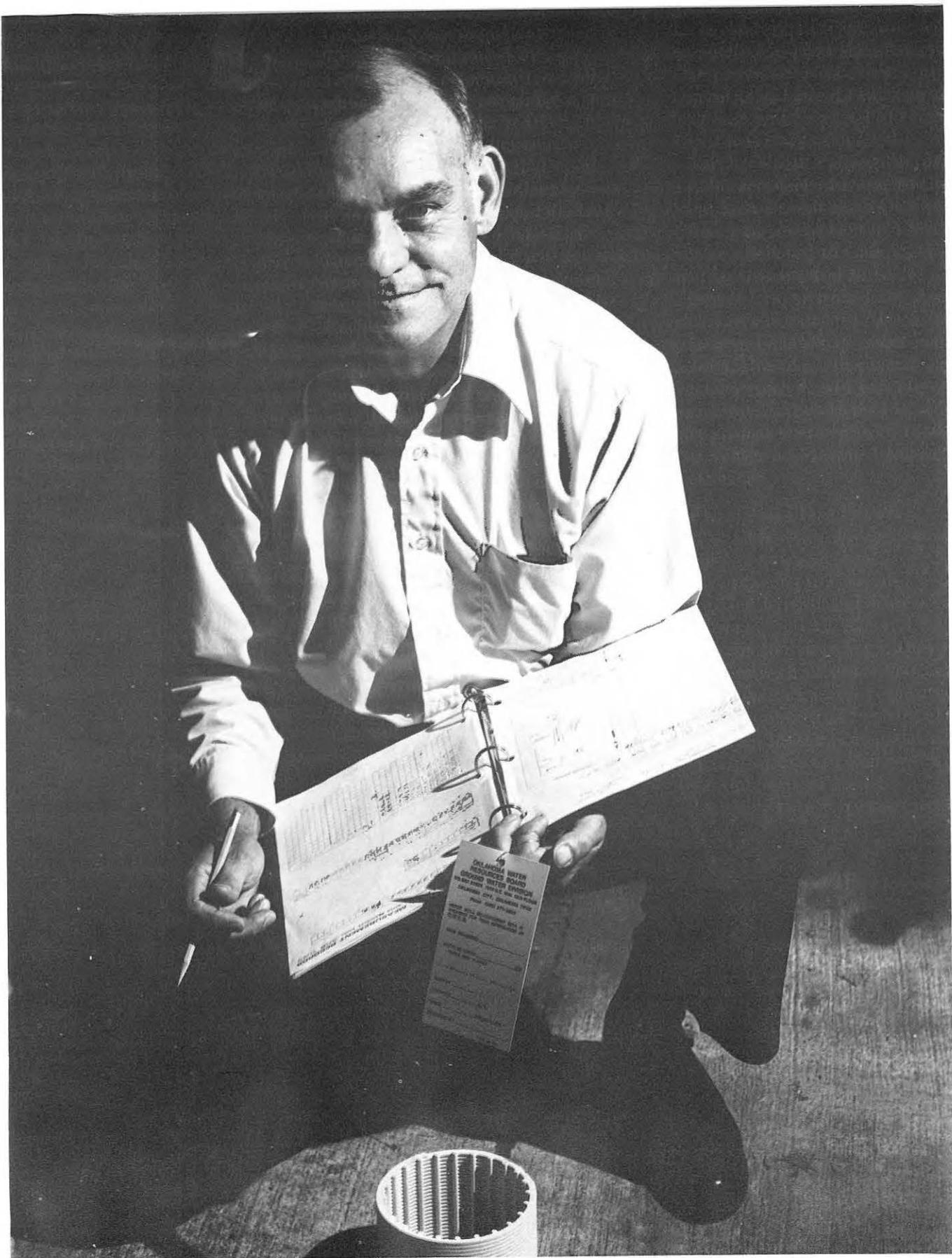
Hydrologic Surveys of Ground Water Basins

Hydrologic surveys produce information concerning the amount of fresh ground water available in each basin for allocation under the requirements of the law, taking into account the total amount in storage on July 1, 1973; recharge and discharge for at least the next 20 years; transmissibility; total land overlying the basin and possibility of pollution of the basin's water.

The Ground Water Division assisted with studies contracted to Oklahoma State University concerning the North Fork of the Red River Alluvium and Terrace Basins in parts of Beckham, Greer, Kiowa and Jackson Counties; Elk City Sandstone Basin in Beckham, Roger Mills, Custer and Washita Counties; Isolated Terrace Basins in the Enid area of Garfield County and the Alluvial and Terrace Basins along the Washita River reach from the western edge of Oklahoma through Roger Mills, Washita, Custer and Caddo Counties to Alex, Oklahoma in Grady County.

During 1980 the Board assisted the Association of Central Oklahoma Governments/Garber-Wellington Association with a study of the Garber-Wellington Ground Water Basin in Oklahoma, Cleveland, Pottawatomie, Logan, Lincoln, Canadian, Kingfisher and Payne Counties. The study was funded by the Environmental Protection Agency.

The Board also assisted the United States Geological Survey



Dannie Spiser
Geologist

"While we monitor wells all over the state through our annual well measurement program, we're most concerned about the regions of high pumpage like the Panhandle. Wells we've measured in the area show water levels are declining.

"Droughts like last summer's increase irrigation, and wind and heat steal water in evaporation. But drought's not new to this country.

"Every year there are new wells and deeper wells — new demands on the ground water basin all the time.

"Measuring the same wells year after year leads us to believe that some areas of the Ogallala may go dry in 20 years. What will become of the irrigation farmers and cattlemen when the land's lifeblood is gone?

"Then who will we look to for the nation's food?"

with a study of the alluvium and terrace basin of the North Canadian River. Phase I consists of a detailed hydrologic investigation from the Harper-Beaver County line through Harper, Woodward, Dewey, Major and Blaine Counties. Phase II reaches from Canton Reservoir in Blaine County through Blaine, Canadian and Oklahoma Counties to Lake Overholser.

Also under contract with the USGS, the Board assisted with data collection for the Oklahoma portion of the Regional Aquifer Study Analysis (RASA) for a 5-year computer model study on the entire Ogallala aquifer.

Water Level Data Collection Program

In cooperation with the USGS the Oklahoma Water Resources Board hand-measured 1046 water wells during 1980 to determine water level below the land surface. There were 623 wells in western Oklahoma, 269 in the Panhandle and 154 in eastern Oklahoma.

The wells are measured annually to monitor changes in the water table in counties where ground water resources have been developed for municipal, industrial, agricultural, domestic and other purposes.

The Oklahoma Water Resources Board also monitored four continuous water level recording devices and the USGS monitored 37, for a total of 1077 wells monitored during 1980.

After the data are collected, the information is computer coded and submitted to the USGS for publishing.

These measurements help to determine the amount of ground water available, its location and its potential for further development. The Board also utilizes the data to estimate life of the ground water supply, to identify areas of depletion and to monitor depletion problems.

Enforcement and Licensing Of Water Well Drillers

All individuals, partnerships, firms and corporations drilling wells in fresh ground water basins in Oklahoma (with the exception of domestic water well drillers) must be licensed by the Oklahoma Water Resources Board. Further, they must comply with the Board's standards for new water well construction, proper plugging of abandoned water wells and test holes, proper capping of water wells not in use and proper filing of information logs at the Board within 30 days of completion of work.

An applicant is required to file a bond of at least \$5,000 with the state and pass a water well driller's examination prepared and administered by the Board before being eligible for licensure.

The Board approved licenses in 1980 for 13 new water well drilling firms and water well drilling operators for these companies. Since 1973, the Board has received 142 applications for licenses, of which 87 applicants currently hold valid licenses.

There are licensed water well drillers with business locations in 45 Oklahoma counties and two adjacent states.

During 1980, 779 new water well, test hole or plugging forms completed by the licensed drillers were received at the Oklahoma Water Resources Board





Ron Jarman
Chief

"By far the most important work of the Division is developing and maintaining water quality standards for the state. After all, the standards are the base upon which we build all our water quality management programs. They touch everyone in Oklahoma. The standards are the bottom line."

"Refining the standards is a job that's never finished. Populations shift, needs and uses for water change, so protection of our waters requires constant vigilance."

"Through the standards we advance the Board's goal of maintaining the quality of the water throughout the state and improving it where we can."

"Oklahoma is a 'water' state, richly endowed with natural rivers and streams and man-made reservoirs. If the quality of our water is not adequate for all beneficial uses, we're guilty of waste of a precious natural resource."

Water Quality Standards

The Oklahoma Water Resources Board determines water quality standards for the state and classifies all Oklahoma waters with respect to their present and future uses.

The standards for water quality were revised and upgraded in 1979 and published in 1980. Stricter standards for pollutants such as polychlorinated biphenyls (PCBs), radioactive materials and pesticides were adopted for the 1979 Water Quality Standards.

The Standards were organized into separate sections for narrative and numerical standards, and the readability was simplified and improved.

Other standards revisions were due to changes in laboratory analytical techniques and the addition of certain streams.

Additional revisions of the standards will be considered in 1982. Such revisions might include stricter standards for toxic pollutants, establishment of standards for ground water, improving the mixing zone standard, standards for defined or selected regional areas or hydrologic basins, identifying National Resource Waters deserving additional protection and revising standards for water supplies.

Other revisions which may be considered include adjustments to beneficial use designations, development of sediment standards, addition of historical data for mineral components for selected streams, integrating water quantity goals with water quality objectives and recommendations based on state and 208 planning efforts and development of water quality goals.

Waste Discharge Permits and Monitoring

The Board issues permits to totally retain industrial wastewater in treatment lagoons, and to discharge industrial wastewater into the state's waters.

An industry's permit specifies the nature and amount of pollutants it may discharge into a stream. This information is reviewed and amended as necessary.

Self-monitoring analyses performed on a predetermined schedule by a Board-certified laboratory are submitted to the Oklahoma Water Resources Board to assure compliance with permit limits. In 1980 there were 1,136 discharge monitoring reports reviewed and this information is being computerized to provide a compliance history on each permitted industry.

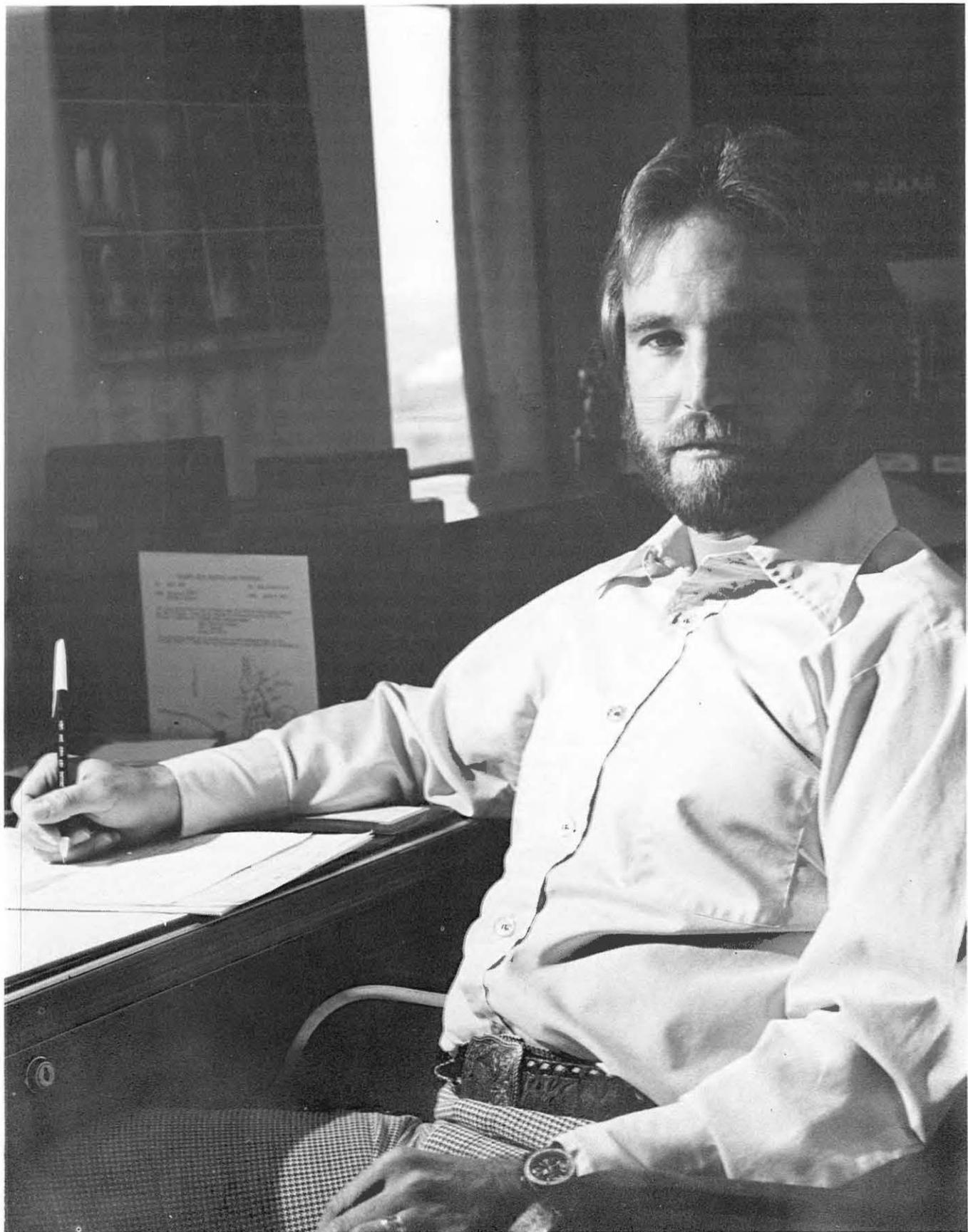
To do this more effectively, the Division has accelerated its inspection program of industries which hold permits. During 1980, 527 active permits were on file and 50 applications for permits were received.

National Pollutant Discharge Elimination System Permits

In cooperation with the EPA, the Board drafts and certifies National Pollutant Discharge Elimination System (NPDES) permits. A total of 31 permits were certified and 27 permits drafted during 1980. Certification of the NPDES permit ensures that discharges are compatible with Oklahoma's Water Quality Standards.

Laboratory Certification Program

To achieve certification, a laboratory must meet certain criteria established by the Board. Further, the laboratory must demonstrate its ability to accurately analyze various parameters of interest in



**Ken Morris
Limnologist**

"The federal Clean Lakes program and state funds allowed us to identify publicly owned lakes where poor water quality threatened or diminished the lakes' recreational potential.

"An interesting lake that qualified for diagnostic studies is Northeast Lake—or 'Zoo Lake'—in Oklahoma City's Lincoln Park. Natural erosion and sedimentation choke the lake, runoff from animal enclosures and trash pollute its waters and the blemishes of neglect spoil its former beauty.

"Old timers can remember when the first warm weather of the season brought crowds to its banks and summer lured hundreds of swimmers to its sandy beaches. They tell me a trolley brought families from town to enjoy afternoons on the lake.

"Water sampling and other studies at 'Zoo Lake' will determine the costs of cleanup. If the lake could be restored, it again could be a source of pleasure to hundreds of thousands of visitors to the park each year."

"New austerity in Washington and cuts in the federal budget may jeopardize the funds Oklahoma and other states expect to be available for the 'Clean Lakes' program in FY 82.

"That would be a shame because there are a lot of Oklahomans enthusiastic about these projects."

unknown samples provided by the Board twice each year. There are currently 86 Board certified laboratories, a list of which is available from the Board.

**Water Quality Data
Base Management**

Computer-based systems are being developed for the storage, analysis and retrieval of industrial point source discharge data including location, type and volume of waste treatment methods and self-monitoring information.

The system design aids Division personnel in water quality planning, permit development, compliance monitoring and investigating pollution incidents.

Compliance and Enforcement

When the Oklahoma Water Resources Board has reason to believe an industry has violated the terms of its permit, the water quality standards, the Pollution Remedies Act or any Board order, a written notice is issued specifying the cause of the complaint. This notice requires the alleged violation to be corrected or charges answered by the company at a violation hearing. The Board conducted 85 public hearings and seven violation hearings during 1980.

Industrial dischargers are classified as major or minor, depending on the volume of discharge and/or the type and number of the pollutants in the discharge. Thirty-two major and approximately 200 minor industries hold permits for the discharge of wastes into state waters. Industries are periodically subject to a compliance evaluation or a 24-hour compliance sampling inspection.

Compliance is measured by how conscientiously industry is following the requirements of its permit. Checks are made of the

methods of sample collection and preservation, flow monitoring practices, laboratory procedures, spill prevention and counter-measure plans, facilities, effluent quality and quality control practices in general.

Regulated activities of primary concern are wastewater treatment efficiency and the quality of the industries' self-monitoring reports.

Among the 16 sampling inspections conducted by the Board in 1980, 12 were performed on major industries. A total of 109 inspections were made in 1980.

An additional 78 special inspections were conducted as a result of the investigation of PCBs in Pryor Creek.

When the Board receives a complaint from any citizen concerning pollution or a report of a fishkill or chemical or oil spill, investigation of such complaints takes priority over all other Division activities.

In 1980 the staff responded to 147 complaints, an increase of 44 over 1979.

208 Areawide Waste Treatment Management Program

As part of ongoing Environmental Protection Agency 208 Planning, the Oklahoma Water Resources Board continues studies in areas not completely addressed in the initial waste treatment management plan adopted by the state.

One such area involves a method for allocating waste to a receiving stream. A technique is being devised to estimate the maximum allowable wasteload a stream can assimilate at a given point. This information will be used in determining the permit limits for the discharge of conservative parameters (non-degrading chemicals) such as heavy metals.



Nancy Cain
Water Resources Engineer

"An aspect of my job that I particularly enjoy is talking to young people about water pollution and the state's water quality problems."

"Most of the kids I talk to are very conscious of the environment and they're interested in keeping Oklahoma's waters clean. They listen when I talk about the threat of pollution in the Illinois River. They've followed the investigation of PCBs in Pryor Creek and toxic metals in Tar Creek right here in the state."

"They're real smart and bright and love to learn."

"They're fascinated and they ask lots of questions. They can't believe we've got old timers as stakeholders in the water."

"They're a good audience because they're bright with an interest in what's happening in their community. They're interested in what's happening in their community."

Another area involves identifying toxic metals and polychlorinated biphenyls in specific locations, a project which has brought Oklahoma Water Quality Standards under review.

Beneficial uses for individual stream segments are being examined, and new approaches to developing standards for certain bio-accumulating toxics are under study.

Ground water quality is being examined in a study underway in Woodward in western Oklahoma where high nitrate levels are being investigated.

Certification of 404 Permits and A-95 Projects

Section 404 of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, allows the Corps of Engineers to issue permits for certain dredge-and-fill activities which may adversely affect the state's navigable waters. The Board reviews these projects to assess their effects on water quality. Thirty such permits were certified during 1980, for an accumulated total of 270 certifications issued by the Oklahoma Water Resources Board.

The State Clearinghouse implements the federal Office of Management and Budget (OMB) Circular No. A-95 and the Oklahoma Executive Order 9-8-76, by administering the Review and Comment System on Applications for federal/nonfederal funding and technical assistance. The Oklahoma Water Resources Board reviews municipal sewage treatment systems and certain construction projects to assess their effects on the quality of surface and ground water.

During 1980, there were 94 A-95 projects examined, achieving a total of 581 such reviews since January 1976.

Tar Creek Investigations

A 1978 U. S. Geological Survey study revealed that abandoned mines in Ottawa County would begin discharging highly mineralized water into the drainage basins of the Neosho River and Grand Lake.

After reports of such discharges the Oklahoma Water Resources Board investigated and confirmed the discharges in the Tar Creek basin in February 1980. During the investigation, high levels of zinc, iron, sulfates, dissolved solids and low pH values were discovered in and around Tar Creek, which flows into the Neosho River. By April, mine discharges erupted in the form of artesian wells and from leaky and open mine shafts.

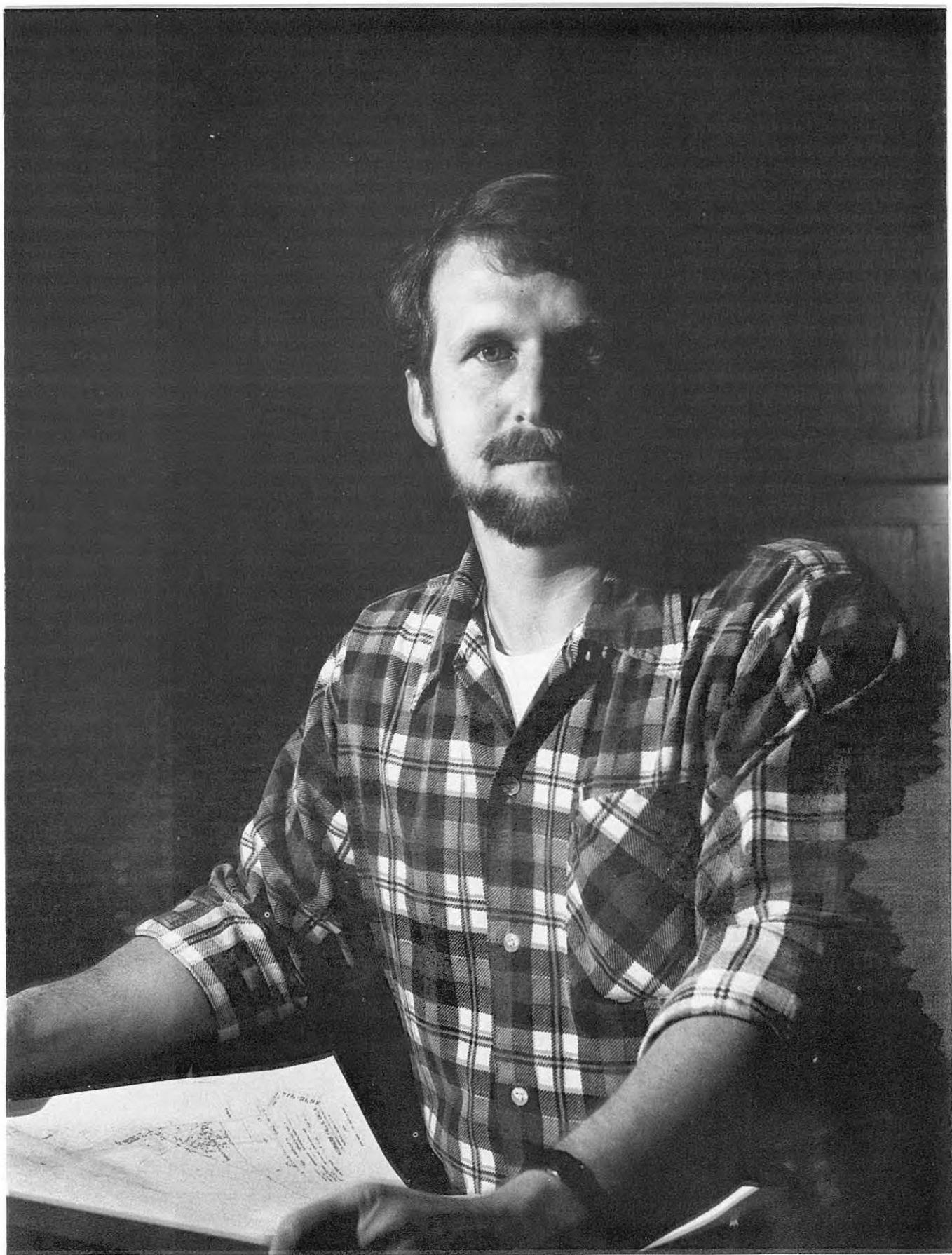
Gov. George Nigh formed the Tar Creek Task Force, consisting of 23 state and federal agencies. Representatives from each agency will continue to assess the extent of contamination in the waters of the state, search for possible solutions, then direct reclamation efforts recommended by contract consultants.

A technical committee of the Tar Creek Task Force consisting of 10 agencies has initiated sampling to pinpoint pollution and determine the extent of the contamination.

Clean Lake Program

The Clean Lakes Program was recently implemented with assistance from the Environmental Protection Agency. The program includes three phases: classification, diagnostic/feasibility and restoration.

The Oklahoma Water Resources Board cooperated with the Oklahoma Pollution Control Coordinating Board in classifying and ranking publicly owned lakes in the state according to their



**James Adams
Limnologist**

"The Tar Creek basin was the site of many lead and zinc mines which were operated between 1920 and 1970. There are about 435 mines under the surface, with 100 miles of underground roads and 80-foot tall caverns.

"When the mines were in operation, they were prevented from flooding by pumping out the waters of the Boone Aquifer. When the mining operations ceased, so did the pumping, and the water that filled the mines eventually took toxic metals into solution.

"In the peak period in the 1940s, the mines produced approximately 15,000 tons of ore each day. A total of 60 billion tons of ore were extracted from the mines during their existence.

"Citizens of the Picher area have a very real interest in the work of the Tar Creek Task Force. Many of them were raised in mining families. They know about the location and size of the mines, and they're very cooperative in providing information.

"They take an interest because their homes are in the area. They are the ones who will suffer most from the effects of the pollution."

need to be cleaned up and/or protected. In 1980 the Oklahoma Water Resources Board received four additional grants for diagnostic studies of Lake Overholser, Lake Atoka, Lake Carl Blackwell and Northeast Lake.

During the next 2½ years, the emphasis will be on diagnosing problems or potential problems that could limit the lakes' recreational uses and to develop a plan to restore or protect the recreational benefits of each lake.

A total of 72 Oklahoma lakes were examined and classified according to trophic conditions. Forty-three qualified as publicly owned and were ranked for future study. LANDSAT satellite technology allowed these 43 lakes to be examined while sampling only nine lakes each month from June through October.

Water samples were collected simultaneously with satellite passes and were analyzed for color, nitrate, nitrite, ammonia, dissolved and particulate orthophosphate, total dissolved solids, chlorophylls a, b, and c, pheophytin, turbidity (NTU), carbonate, bicarbonate and total alkalinity. In situ data were gathered for temperature, pH, dissolved oxygen, conductivity, wind speed and secchi disk transparency.

Completion of this classification makes Oklahoma eligible for future EPA funding for lake diagnostic studies and restoration. This study also evaluated the satellite remote sensing technology in providing Oklahoma with a low-cost statewide reservoir water quality monitoring program.

The final report, "Classification of Oklahoma Reservoirs Using LANDSAT Multi-Spectral Scanner Data" will be submitted to EPA in 1981.

Overall goal of the Clean Lakes Program is to protect or restore at least one publicly owned lake within a 25-mile radius of every metropolitan area in the U.S.

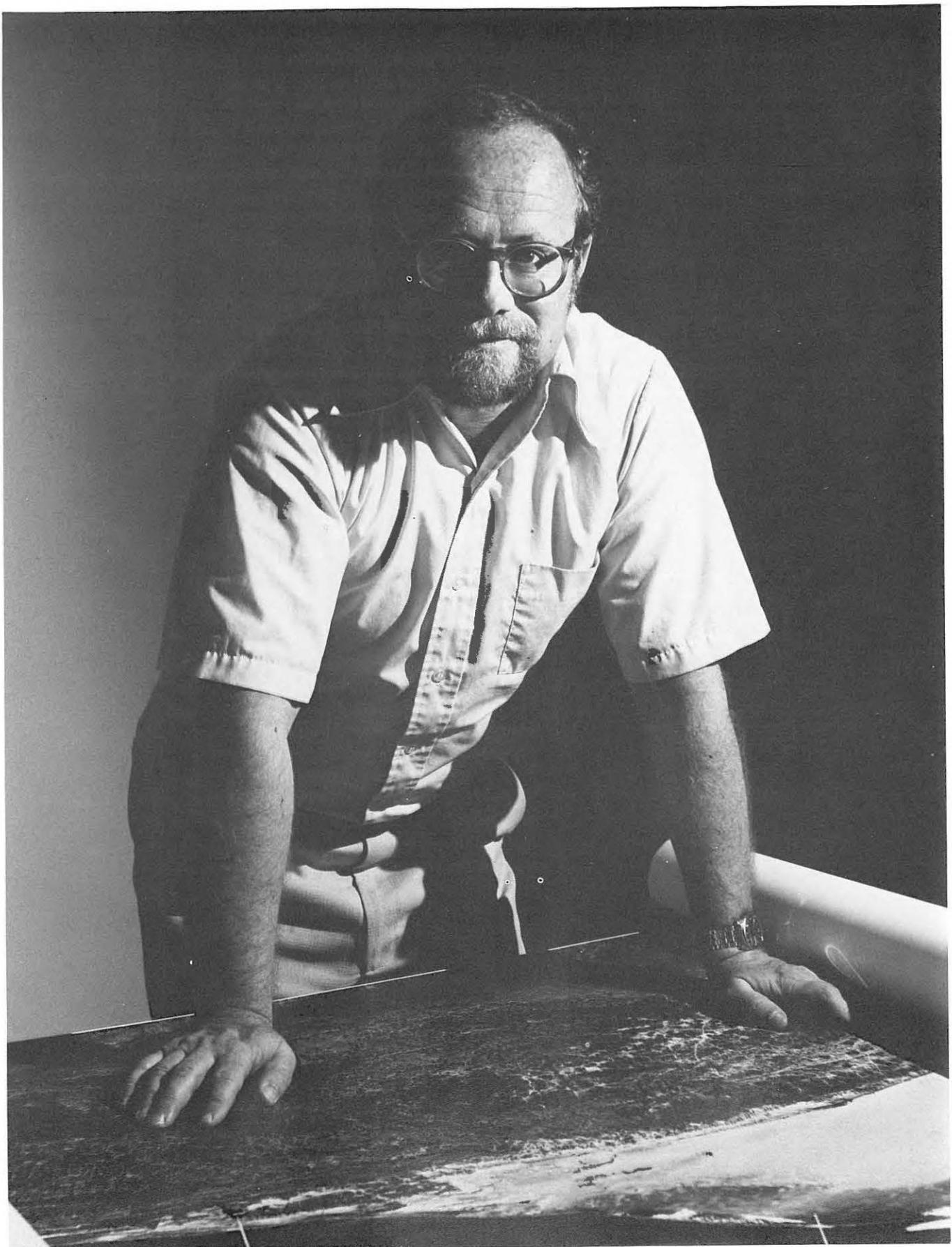
**Arkansas River
Temperature Study**

A 38-mile section of river below Kaw Reservoir was evaluated during the summer for development of a temperature standard. Three continuous recording temperature sites were established in a pertinent section of the Arkansas River. Sites were selected to include tributary and industrial discharge effects on the overall temperature profile of the river and their effects on temperature extremes. Results of this study will provide baseline data to establish a maximum temperature standard to provide allowable limits for discharges.

ENVIRO-POD Coal Mine Study

This project was undertaken to assist in monitoring discharges from active coal mines in Oklahoma. Selection of the Lightning Creek basin was based on water quality problems reported in the watershed and the large number of active mines, abandoned strip mines and reclaimed areas.

Aerial photography was used to generate a series of maps depicting changes in land use from 1971 through 1979. ENVIRO-POD imagery was obtained in November 1979 to identify and delineate active strip mines, areas of recent reclamation, abandoned mines and drainage patterns. Using the ENVIRO-POD imagery and topographic maps, tentative sampling sites were selected



Main Hutcheson

Hydrologist

"Since one major responsibility of the Division is issuing permits for the disposal of industrial wastes into the state's waters, it's critical to know the wasteload capacity of receiving streams. We need to know how pollutants spread and are assimilated under certain hydrologic conditions."

"Over a period of months and under many different conditions, we dispensed harmless fluorescent red dye into three rivers—the Washita, North Canadian and Cimarron. We measured the river's flow velocity and depth, and sampled the water for dye concentrations downstream up to 18 stream widths.

"Using the coefficient developed in the dye studies, we produced the methodology for designing a dispersion model. The computer model will guide us in setting limits on the contents—of pollutants an industry can safely discharge into a receiving stream."

then field surveys were conducted to confirm final selections.

When sampling begins, it is hoped a determination can be made as to which land use contributes most to pollution and if permitted discharges from the active mines meet water quality standards.

Aquatic Plant Control Program

Oklahoma Water Resources Board has been cooperating with the Tulsa District Corps of Engineers in controlling aquatic plant infestations in Oklahoma waters. The Board's main role has been to evaluate the impact of herbicide applications on Robert S. Kerr Reservoir.

Washita River Salinity Study

The impact of discharges from the Foss Demineralization Plant and Foss Reservoir on the chemical, physical and biological aspects of the Washita River were evaluated in this Study.

These discharges significantly increased the brine level in the river, which impacted the benthic organisms and lowered their diversity by one unit. The Washita River is designated for eight beneficial uses, including irrigation which can be adversely affected by the brine levels.

Recommendations from this study could aid in the management of water resources in western Oklahoma and prevent further water quality violations. The final report will be published in 1981.

Lake Texoma

In 1975, 28 sites were sampled for temperature, physical characteristics and chemical quality by depth profile. The Oklahoma Department of Wildlife Conservation had stated the need for a thermal maximum standard of 90° F rather than a temperature of 93° F for protection of least resistant fish species. Analyses of collected data showed temperatures were not above 90° F and thus a 93° F standard was not justified.

Industrial and municipal discharge permit limits are based on state standards derived from such data. Baseline monitoring allows for maintaining water quality by limiting discharges to any activities using the state waters for a waste disposal. With the knowledge of basic water quality in Lake Texoma, the beneficial uses such as recreation and municipal water supplies can be maintained.

A report of study findings was published in 1980, and a copy of that document may be obtained from the Oklahoma Water Resources Board offices.

STATEMENT OF OPERATIONS

(From the Governor's Proposed FY-82 Budget)

FUNDS AVAIL. TO AGENCY	AGENCY				
	Actual FY-79	Actual FY-80	Budget Work Program FY-81	Total Requested FY-82	Estimated FY-82
FY-77 General Revenue Fund	\$ 21,875	\$ 2,412	\$ -	\$ -	\$ -
FY-77 Gen. Rev.-Spec. Proj.*	172,425	24,390	-	-	-
FY-78 Gen. Rev. Fund	80,599	-	-	-	-
FY-78 Gen. Rev.-Spec. Proj.*	-	187,340	-	-	-
FY-79 Gen. Rev. Fund	821,977	54,179	-	-	-
FY-80 Gen. Rev. Fund	-	1,151,851	-	-	-
FY-81 Gen. Rev. Fund	-	-	1,558,073	-	-
FY-82 Gen. Rev. Fund	-	-	-	9,786,603	1,470,957
Stream Gauging Fund	58,863	50,121	55,095	56,000	56,000
Federal Funds	297,667	985,646	1,033,301	783,900	783,900
Water Quality Fund	26,498	50,953	46,497	36,000	36,000
Reimbursement Fund	19,227	80,331	130,694	81,897	81,897
Sales Fund	2,439	-	-	-	-
Total	\$1,329,145	\$2,375,493	\$2,823,660	\$10,744,400	\$2,428,754

*Special Projects funds not included in totals. FY-81 amounts represent new and/or carryover funds available for expenditure.

Recommended amounts do not include adjustments for FY-82 state salary compensation plan.

EXPENDITURES BY ACTIVITY

Administration	\$ 270,667	\$ 397,815	\$ 319,210	\$ 457,912	\$ 417,476
Water Quality Control	218,071	406,525	514,748	1,049,137	473,039
Planning (Includes Comprehensive Water Plan)	88,551	230,816	690,786	7,316,441	407,545
Ground Water Administration	205,699	175,511	330,037	563,905	324,728
Stream Water Administration	104,298	148,506	255,472	582,503	242,989
U.S. Geological Survey	145,997	193,301	211,375	243,000	212,280
Data Processing	15,522	35,141	123,819	205,996	115,899
Engineering	177,628	673,297	378,213	285,506	234,798
Water Develop. & Assist.	-	31,647	-	-	-
Tulsa Field Office	-	-	-	40,000	-
Special Projects*	148,035	211,730	-	-	-
Total	\$1,226,433	\$2,292,559	\$2,823,660	\$10,744,400	\$2,428,754

Full Time Equiv. Empl.	56.5	66	66	101	66
Authorized FTE	59	66	66	-	-