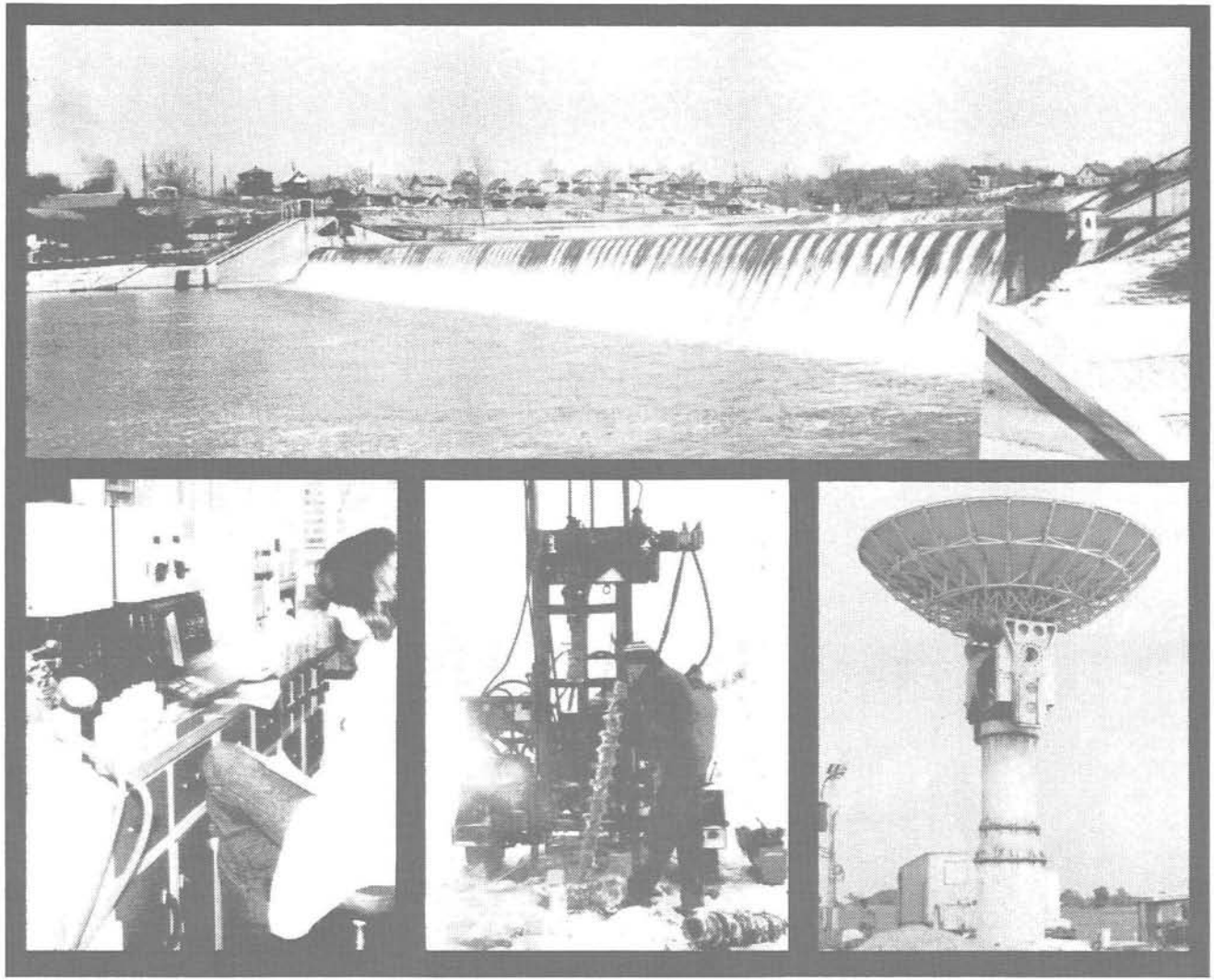
The Illinois State Water Survey

Stanley A. Changnon, Jr., Chief



- Institutional Charge
- Goals and Objectives
- Functions:
  - Research
  - Data Collection
  - Services to Illinois
- Organizational Dimensions

Champaign, Illinois

Introduction

The Illinois State Water Survey represents a unique institution in Illinois, both as to its charge and as to its institutional structure within state government. The State of Illinois since 1895 has made, through the auspices of the Water Survey, a long-term commitment to understanding the water and atmospheric resources of the state. As a result, Illinois stands alone nationally with the best data and information about these resources. The uniqueness of this state commitment to its hydrospheric resources and the institution that provides this service is revealed in an examination of its legislative mandate and the resulting historical development.

Legislative Mandate

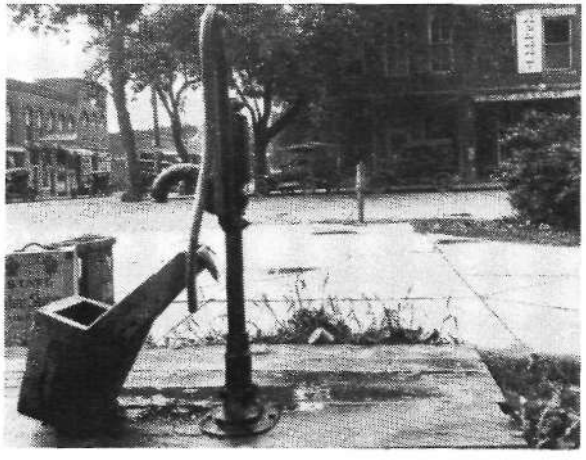
The key portions of the enabling legislation relevant to the Illinois State Water Survey include the following charges:

- **To investigate and study the natural resources of the state and to prepare printed reports and furnish information fundamental to the conservation and development of natural resources.**
- **To cooperate with and advise departments having administrative powers and duties relating to the natural resources of the state, and to cooperate with similar departments in other states and with the United States government.**
- **To cooperate with the United States agencies in the collection, recording and printing of water and atmospheric resource data, including streamflow measurements, and to collect facts and data concerning the volumes and flow of underground, surface, and atmospheric waters of the state, and to determine the mineral qualities of water from different geological formations and atmospheric waters for the various sections of the state.**
- **To publish, from time to time, the results of its investigations of the mineral qualities, volumes and flow of underground and surface waters of the state, to the end that the available water resources of the state may be better known, and to make mineral analyses of samples of water from municipal or private sources.**

- **To act as a central data repository and research coordinator for the state in matters related to water and atmospheric resources. The State Water Survey Division may monitor and evaluate all weather modification operations in Illinois.**
- **To distribute, in its discretion, to the various educational institutions of the state, specimens, samples, and materials collected by it after the same have served the purposes of the department.**
- **To publish a suitable number of results of the investigations and research in the field of natural science to the end that the same may be distributed to the interested public.**
- **The functions and duties exercised by the State Water Survey shall be exercised at the University of Illinois in buildings and places provided by the trustees thereof. The Survey will cooperate with the University of Illinois in the use of scientific staff and equipment, and cooperate with the various departments in research and investigational and scientific work useful in the prosecution of the work of any department.**

The Illinois State Water Survey, as a Division of the Department of Energy and Natural Resources, is governed by the Board of Natural Resources and Conservation, appointed by the Governor of Illinois. This 8-member board provides administrative guidance, programmatic oversight, and the governing body for the scientific staff of the Water Survey. Its membership includes the Presidents of the University of Illinois and Southern Illinois University, plus eminent scientists and engineers.

The relatively broad and thus complex charge of the Water Survey, as revealed in the enabling legislation, necessitates a review of how the organization was formed and has addressed the water and atmospheric resource problems of the past, today, and the future. As a result of the enabling legislation, the State Water Survey is the primary agency in Illinois concerned with water and atmospheric resources.



A State Water Survey analysis kit (lower left) stands ready by a town pump for a check of the water quality. (Photo is from a glass negative in Water Survey files, circa 1916-1920, location unknown)

History

The Water Survey was founded in 1895 as a unit of the University of Illinois Chemistry Department, After 22 years of data collection and research focusjng largely on water chemistry, the Survey became a Division of the State Department of Registration and Education in 1917; then a Division of the Institute of Natural Resources (now Department of Energy and Natural Resources) in 1979. Since 1917, the Water Survey and its two sister agencies, the State Natural History Survey and State Geological Survey, have been guided by the aforementioned Board of Natural Resources and Conservation.

After concentrating on water chemistry for about 35 years, the central focus became hydrology, and more recently, atmospheric sciences. The Water Survey's research and data collection since 1955 have centered on assessment and evaluation of ground, surface, and atmospheric water resources relating to their quantity, quality, and usage.

Staff and Facilities

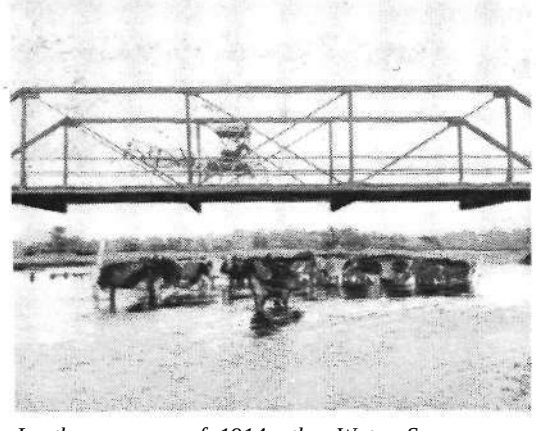
The Water Survey currently has a staff of approximately 200 employees, occupies several buildings, and possesses a large variety of scientific and technical equipment. The staff includes TOO professional scientists and engineers, 50 technical and support staff, and 50 students. The main laboratories and staff quarters of the Water Survey are located in Champaign. The second major facility is located in Peoria, and facilities for small work teams are located in special study areas in northern and southern Illinois.

Extensive attention to subjects such as water quality, cloud physics, and atmospheric chemistry requires considerable laboratory facilities. Computer facilities, which include color graphics, consist of several microcomputers, an ALTOS computer system, a VAX 11/750, and links to the CYBER 175 and IBM 4341 at the University of Illinois and to the new PRIME 750 system. The very sizable data collection activities in both water and atmospheric studies have resulted in an extensive accumulation of field equipment including 5 weather radars, 30 streamgages, 50 water level recorders and more than 400 recording raingages.

The support for the Water Survey programs includes a state appropriation plus income from grants and contracts. Such grant support is provided largely for research projects supported by a variety of federal agencies, state agencies, universities, private organizations, and metropolitan entities.

A Unique Situation

As a state organization, the Water Survey is unique because of its enabling legislation, its institutional structure (including the Board of Natural Resources and Conservation), its employees, and the long commitment to the study of the state's resources. Ninety years of history involving continuous and varied data



In the summer of 1914, the Water Survey undertook a sanitary survey of the Rock River drainage to find the source of odors from 'gas-house wastes,' especially bad during low flows. Photo was taken near sampling station 22 on the Kishwaukee River (a tributary) about 4 miles west of Belvidere, July 9, 1914.

collection have provided Illinois with the nation's most complete water and atmospheric data. Secondly, the enabling legislation allows the research programs to focus on very long-term resource issues.

The Survey's history is sprinkled with illustrations of how our anticipatory research has later provided Illinois with a capability to address emerging problems intelligently and uniquely. An example of this was the pioneering collection of precipitation chemistry data in the 1950's, the first such data collected in the United States. These data and ensuing research allowed us to show that the 1980 values of acid rain are essentially unchanged from those of the early 1950's, a major issue in national environmental concerns. Similarly, early data collection and analysis of the mineral qualities of waters in major aquifers have allowed us to quantify the rate of change in groundwater pollution in key use areas of Illinois.

This ability to consider long-term problems, and in turn, basic and applied research addressing issues, has allowed the delineation of major future issues facing Illinois, as denoted below.

Examples of long, wispy contrails — jet aircraft condensation trails — as they start to spread out over central Illinois. Contrails have been studied because they may alter our weather by reflecting sunlight away from the earth. Studies of clouds, rainfall, and severe storms in Illinois provide extensive data on weather and climate.

Major Future Issues

Major long-term water and atmospheric issues facing Illinois are these:

- **Availability of water quantities desired in high use areas such as northeastern Illinois, East St. Louis area, and other major metropolitan areas.**
- **The lack of understanding of source-to-sink cycles of pollutants in air and water, and their environmental and societal impacts since the hydrosphere and the atmosphere remain as the state's major disposal sites.**
- **Short-term, 3- to 10-year, climate fluctuations and adjustments to them in agriculture, energy, transportation, government, and commerce.**

Scope

The next portion of this booklet addresses the goals and objectives of the Survey, both the short or near-term ones and the long-term ones. This discussion is followed by an analysis of our functions, our structure, and how we plan to perform the activities to satisfy these goals and achieve the objectives.

Goals and Objectives

The major water and atmospheric issues being addressed during the 1980-1985 period under the objectives of the Survey's program have been assessed according to the three major activities of the Survey: 1) research, 2) data collection, and 3) services. The following listing identifies the major scientific objectives and related activities of the 1980-1985 period.

Scientific Objectives of 1980-1985

Research

Atmospheric

- Define climate change — both trends and variability.
- Understand major extremes including floods and droughts.
- Delineate man's effects —urban influences, acid rain, jet contrails, and land use.
- Develop means to adjust and ameliorate effects — better information systems and planning, use of climate predictions, modifying the weather, suppressing evapotranspiration, and better weather forecasting.
- Study impacts of climate and weather events.

Hydrospheric

- Define conjunctive uses of water in northeastern Illinois — future water demands from Lake Michigan and various aquifers.
- Study major new water uses — irrigation and energy.
- Delineate extent of groundwater pollution and means to address it.
- Assess all possible options for increasing supplies — reuse, recharge, desalination, diversion, conservation, and atmospheric solutions.
- Develop techniques to improve surface water quality of existing lakes, wetlands, and storm and sewage treatment facilities.

Data Collection

Maintain and establish benchmark networks to provide permanent monitoring of water quantity, water quality, and atmospheric conditions.

Perform intermittent intensive regional surveys of certain hydrologic conditions (i.e., groundwater levels, storm rainfall) to obtain areal dimensions.

Develop new techniques to collect, transmit and store field data.

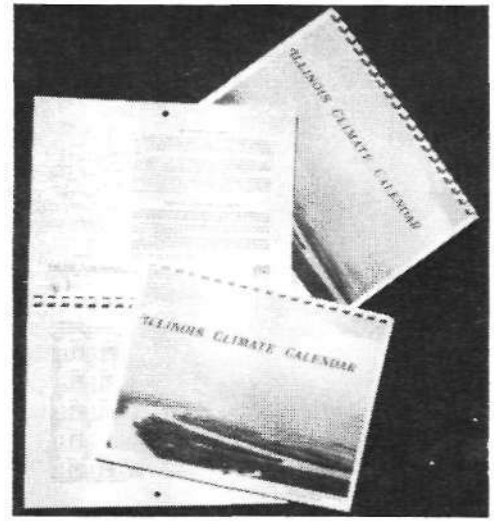
Services

Improve and maintain public awareness of water and atmospheric issues through:

- **Educational efforts in school and university system**
- **Strong program of public information — brochures, news media, and talks**
- **Development of a basic constituency**

Assist private sector, scientific community, and local-state government with data and information to plan and to solve their problems — technology transfer — through:

- **Publications**
- **Workshops**
- **A data and information management center to provide faster, cost effective, and more comprehensive data/information services to clientele.**



Climate Calendars giving daily highs, lows, and means of temperature and precipitation, plus other climate facts, are available for 20 'climate regions' of Illinois — an information service of the Water Survey.

The short and long-term programs of the Illinois State Water Survey have been addressed through an analysis of basic goals, key issues, and problems envisioned for the next 20 years (1983-2002). This analysis led to the identification of the real and potential solutions to these problems, and to the needs for monitoring, services, and research.

This problem-solution approach to planning our long-term programs has been addressed both for water resources in Illinois and for atmospheric resources in Illinois. The following two sections present the goals and plans that provide the framework for the present and foreseeable future of the Water Survey programs. In essence, it is based on an attempt to forecast the water and atmospheric issues that Illinois must face, within the mandates of the State Water Survey.

Water Resources in Illinois — Today-2000

Basic Goal

To have sufficient water of a desired quality to protect health and to allow the goals of society to be achieved in an economically and environmentally sound manner.

Issues

- Water is basic to life, health, and happiness.
- Uses of water are varied and cut across all facets of life including public supplies, food and energy production, industrial processing, transportation, and recreation.
- Water availability limits growth and production.
- Factors affecting availability of desired water are the basic sources, water quality, conservation and reuse, and modification of the hydrologic cycle.
- Competition for water affects price and produces social and institutional conflicts.
- The scientific principles relating to water are well established.

Problems of Next 20 Years

- General problem is to provide sufficient water, at a desired quality, to meet state needs. Key specific problems are:
  - □ **Water quality degradation from human activities which affect most desired uses of water (municipal, industrial, recreational) and environmental goals. There are short- and long-term horizons in quality of surface water, groundwater, and atmospheric water.**
  - □ **Local area overuse and mining of resources.**
  - □ **Excessive consumptive use and competition for water from rapid growth of energy facilities and/or irrigation.**
  - □ **Lack of public awareness based on belief that water is not limited and is cheap.**
  - □ **Change in quantity and/or quality of water due to changing climate.**
- A major problem is protection against natural extremes, floods and droughts, that affect life and water quality, and available water resources.
- An integral problem is lack of public awareness and lack of user access to data and information on water, plus continuing collection of data to supply this information.
  - □ **The federal agencies are reducing data collection.**
  - □ **Increasing conflicts over water issues will develop.**

Real and Potential Solutions to Problems

There are two general classes of solutions to the central issue: supply of adequate water of desired quality

1) Use of existing techniques and technologies, often involving social acceptance and institutional adjustments.

- Carefully monitor usage of water, identify potential shortages, and delineate potential areas and sites of energy and irrigation growth.
- Conservation — pricing, education and developing awareness.
- Reuse of water — perception and acceptance, adequate waste treatment.
- Better management — develop more storage, better water treatment, integration of surface and groundwater sources, and wiser uses of natural water bodies.
- Control of pollution — at source, during transport, at treatment facilities, and removal — all relying heavily on public awareness and payment of costs, with polluters correctly involved.
- Diversion of water from natural areas — relocation of surface waters to other basins, institutional conflicts and water law, high costs.
- Public and user education on water resources, the problems, and water costs, with water legislation implemented when needed.

2) Development of innovative techniques and technologies to control the hydrologic cycle, requiring research and developments that will be economically and environmentally sound.

- Precipitation modification — to increase or decrease precipitation — needs scientific research.

Potential Solutions *(Continued)*

- Recharge of groundwater — potential seems limited, needs breakthroughs.
- Desalination —needs research to develop economically acceptable techniques.
- Suppression of evaporation and transpiration — must discern new chemical and mechanical techniques.
- Prediction of future long-term weather conditions — develop physical understanding and statistical techniques to allow discernment of future precipitation, leading to better management of and use of water.

Solutions to problems produced by natural weather extremes.

- Development of more adequate municipal supplies, typically in small communities.
- Utilize on-farm solutions — more retention in ponds and soils, irrigation, cost factors and acceptance.
- Long-range prediction of onset and end of droughts and wet periods — needs research.
- Short-range prediction of severe rainstorms — needs research and information system.
- Retention storage in rivers, lakes and urban areas to jointly satisfy flood control and water quality requirements — develop facilities, optimize management.
- Better institutional arrangements to deal with extremes—short-term water sources, financial assistance, and communicating information.

Solutions to problems of public awareness, access to information, and data needed to satisfy information needs

- Well planned and continuous program of education and constituency awareness.
- Collection of key data <water quantity, water quality, atmospheric) sufficient in space and time to define statistical properties of conditions.
- Credible provider of information and data quality.
- Easy access to data and information — requiring centralized system (clearing house and data banks) involving experts and modern computer technology.

Monitoring Needs

- Maintain long-term statewide networks measuring
  - □ **Groundwater levels (shallow and deep)**
  - □ **Groundwater quality**
  - □ **Surface water flow**
  - □ **Surface water quality (including sediment)**
  - □ **Soil moisture and temperature**
  - □ **Atmospheric conditions (see Atmospheric Resources section)**
- Utilize innovative means of collecting these water data in cost effective ways, some in real-time.
- Employ intermittent but large-scale field sampling efforts of various water conditions to provide areal detail.
- Conduct specialized monitoring and data collection in water problem areas.

Service Needs

- Develop a communication-education program to educate public and user communities on water issues.
- Develop a water-climate data and information center with computer system allowing real-time user access.
- Put all available water data in computer formats.
- Investigate standard and innovative means to resolve policy issues and to address conflicts through institutional adjustments and water use laws.
- Do multidisciplinary research to ascertain impacts and costs of water problems and their solutions to collect critical information for educational applications and policy decisions.

Research Needs

- Pollution budget — definition and understanding of
  - □ **Source and transport controls**
  - □ **Treatment facilities (and reuse)**
  - □ **Removal methods**
- Competitive uses of water
  - □ **Urban demands**
  - □ **Energy production**
  - □ **Agricultural — irrigation**
  - □ **Industrial needs**
  - □ **Instream flow maintained for environment and transportation**
- Study of water sources developed through better management, using existing technologies
  - □ **New storage and use of natural water bodies**
  - □ **Diversion alternatives**
  - □ **Water supply treatment and conservation**
  - □ **Retention storage**
- Innovative concepts to increase available water supplies
  - □ **Groundwater recharge**
  - □ **Desalination**
  - □ **Suppression of evaporation and evapotranspiration**
  - □ **Precipitation modification**
  - □ **Prediction of future long-term precipitation**

Illinois Atmospheric Resources — Today-2000

Basic Goal

To understand the atmosphere sufficiently to predict and manage it to protect health and public safety, and to allow societal goals to be achieved in an economically and environmentally sound manner.

Issues

* The atmosphere is basic to life, health, and happiness.

- The quantity, or magnitude, of certain atmospheric conditions impact on agriculture, energy usage, water and other natural resources, transportation, state institutions, and commerce and industry.
- The quality of atmospheric properties affects agriculture, water resource quality, health, natural environment, local and state institutions, and business and industry.
- Human activities including certain agricultural practices, land use, energy production, and modes of transportation affect atmospheric properties altering their quantity and/or quality.
- Growing population, lessening resources, and climate changes produce a greater need to understand atmospheric interactions and impacts.
- Understanding of many atmospheric properties is lacking but new technologies of measurement and data management provide opportunities for scientific breakthroughs.
- Atmospheric conditions are limiting or critical to most disciplines (water resources, agriculture, energy, transportation, and industry) and hence there are diverse needs and broad applications for atmospheric data and information, often in real-time.

Problems of Next 20 Years

- Climate change, in terms of trends (cooler-wetter, warmer-drier) and/or variability (more or fewer extremes), is producing major economic, environmental and institutional impacts, and the extent of change due to nature and that due to man is not well established.
- Degrading atmospheric quality by human activities is changing rainfall quality, visibility, the radiation balance, and air quality, but the causes and often the degree of change due to man are unknown or poorly established and cannot be regulated intelligently.
- Development of alternative energy sources related to climate conditions is largely unmet.
- Public understanding of the atmospheric issues is poor, and user adoption of developing techniques and new information is low due to poor communication and lack of credibility.
- Meteorology is an emerging science with many physical processes poorly measured and not well understood, and the impacts of weather and climate are complex and often not quantified.
- Measurements of many critical atmospheric conditions are inadequate, and many ongoing measurements will be reduced, in both quantity and quality, by federal agencies.
- Weather is limiting to agricultural production, and weather modification techniques, often ill-defined, are being used.
- Forecasting of extreme weather events remains inadequate in time and areal specificity.

Real and Potential Solutions to Problems

- Sustain and increase atmospheric measurements, develop new measurement technologies and means to collect, process, and analyze data rapidly and inexpensively.
- Monitor changes in climate and atmospheric quality to detect trends and changing variability.
- Conduct basic and applied research to overcome fundamental unknowns in atmospheric processes including cloud physics, cloud dynamics, and climate control.
  - ○ Develop better prediction capability for severe weather events, and for prediction of future (monthly, seasonal, and annual weather) climate conditions.
  - ○ Study impacts of weather and climate to better guide research, and to deal effectively with user constituency.
  - ○ Develop an information and educational outreach program to increase awareness in public and utilization by specific users of existing and developing capabilities.
  - ○ Make data and information easily accessible in real-time formats.
  - ○ Investigate factors producing climate change including man's influences.
  - ○ Develop capabilities to modify precipitation in a predictive manner.
  - ○ Define the atmospheric cycles of pollutants to develop an understanding of causation of pollutant problems.
  - ● Instigate specialized large-scale meteorological field projects, for one to five years, to obtain basic data on all atmospheric conditions, leading to better understanding of weather to help satisfy predictive and modification needs.
  - ○ Develop new techniques to better measure, often in real-time, rainfall, evaporation, winds, cloud properties, and air motions (relevant to gaining better understanding, better prediction of severe storms, and a capability to modify the weather).
  - ○ Monitor operational weather modification projects.

Service Needs

- ○ Develop a multi-dimensional communication-educational program to alert users and the public to existing and developing capabilities to predict and modify weather and climate.
- ○ Develop and operate a state weather and climate data and information center to handle data collection-evaluation, and to transfer data and information (often in real-time) to users at ail levels. This would include a computerized system and a capability to both summarize past and current weather conditions and predict future climate conditions.

Monitoring Needs

- ○ Networks and benchmark sites maintained for long-term operations measuring
  - □ **Precipitation**
  - □ **Temperature (air and soil)**
  - □ **Evaporation and transpiration**
  - □ **Solar radiation and sunshine**
  - □ **Winds**
  - □ **Humidity**
- Use innovative means for collecting atmospheric data inexpensively, often in real-time, involving latest techniques for collection and transmission of data.

Research Needs

- ○ Studies of emerging capabilities to predict climate.
- ○ Investigation of the budget of atmospheric pollutants to define their sources, transport, transformation, and deposition.
- ○ Innovative research concerning means to modify the weather.
- ○ Studies of means to detect, measure, and forecast rainfall and severe storms.
- ○ Basic research in cloud processes.
- ○ Studies of weather and climate impacts involving social, economic, legal, and environmental disciplines.

Functions: Getting the Job Done

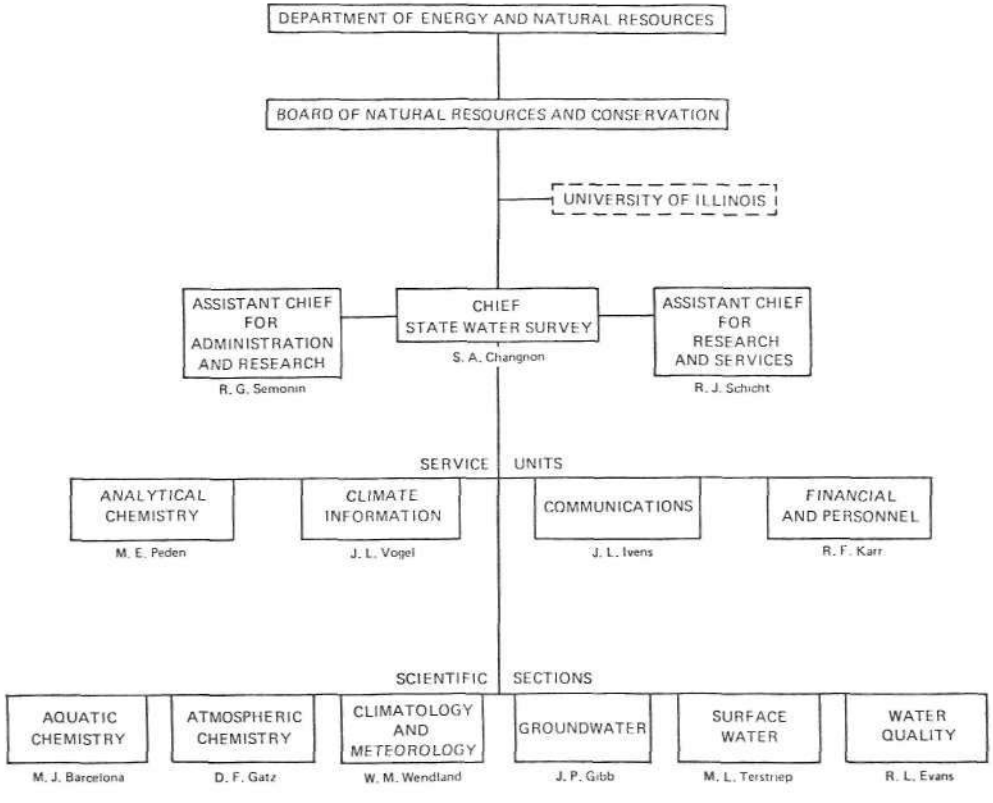
Primary Activities

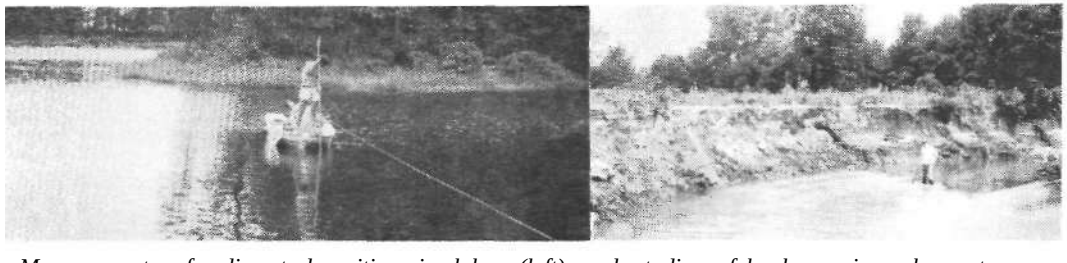
The Water Survey pursues the goals and objectives that have been outlined through activities in four major areas: data collection, research, services, and administration. To address the problems foreseen and our services requirements, we have developed our *data collection* and *research* programs. The *services* activity area in essence helps drive the research and data collection effort, particularly as they relate to the near-term problems such as those described for the 1980-1985 period. Our expertise and awareness of potential long-range future problems also drives the research and data collection activities. The research activity area comprises both basic and applied research, with primary emphasis on problem-solving applied research.

The fourth activity area relates to administration which provides the planning, the monitoring of the programs, and the interactions necessary, internally and externally, to successfully achieve the objectives of our programs.

Organizational Structure

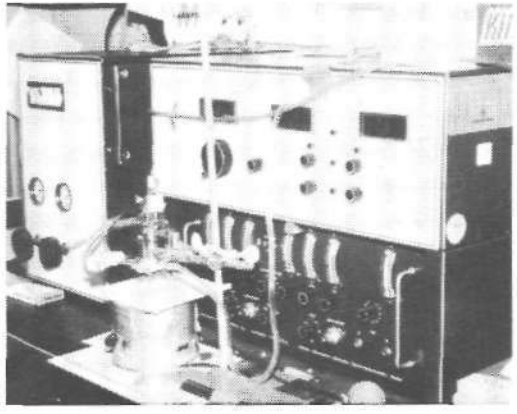
To achieve these activities, the Water Survey is organized into six scientific sections, largely based on scientific disciplines, and into four service units. The organizational chart of the Water Survey is shown on this page. The service units essentially support external as well as internal needs for instrumentation, data, and information. The chart on the next page shows the six scientific sections and indicates the major research, service, and data collection efforts occurring in each section.





Measurements of sediment deposition in lakes (left) and studies of bank erosion along streams or lakes (right) work toward solutions for key problems of soil erosion and sedimentation.

PROGRAMS AND ACTIVITIES OF THE SCIENTIFIC SECTIONS



- Water Treatment Programs
- Scale and Corrosion Phenomena
- Sediment and Groundwater Chemistry
- Aquatic Organic Chemistry
- Environmental Chemistry Processess

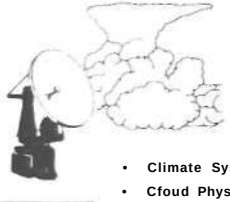
AQUATIC CHEMISTRY

- Sampling & Methods Development
- Scavenging & Atmospheric Reactions
- Atmospheric Deposition
- Pollutant Studies
- Aerosol Composition and Sources

ATMOSPHERIC CHEMISTRY

SURFACE WATER

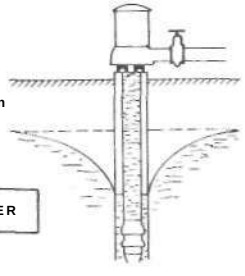
- Flood Hydrology and Information
- River Hydraulics and Sediment Studies
- Surface Water Information
- Urban Stormwater
- Water Resources Assessment



CLIMATOLOGY AND METEOROLOGY

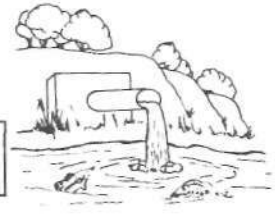
- Climate Systems
- Cfoud Physics and Dynamics
- Climate and Weather Impact Assessment
- Dynamics and Prediction of Weather
- Weather Modification

- Groundwater Resource Evaluation
- Groundwater Quality & Contamination
- Data Collection & Management
- Groundwater Information
- Water Use Program



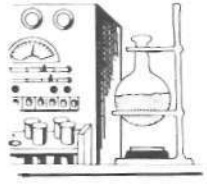
GROUNDWATER

- Lake and Stream Studies
- Eutrophication Studies
- Waste Water Treatment
- Biological Monitoring
- Aquatic Toxicant Assays



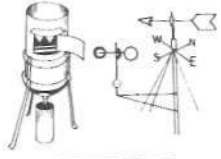
WATER QUALITY

SERVICE UNIT PROGRAMS



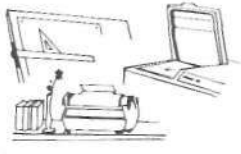
ANALYTICAL CHEMISTRY

- Public and Private Water Supply Analyses
- Water Quality Consultations
- Sediment and Materials Characterizations
- Precipitation Chemistry Analyses



CLIMATE INFORMATION

- Illinois Climate Center
- Hydroclimatology
- Climate Data and Information
- Weather Instrumentation and Shops
- Statistical/Programming Techniques
- Radar Engineering



COMMUNICATIONS

- Extension Services
- Public Information Services
- Publication Production and Distribution
- Internal Information Exchange
- Graphic Arts Services
- Library Services

FINANCIAL AND PERSONNEL

- Water Survey Fiscal Activities
- Buildings and Grounds
- Personnel Actions and Records
- Inventory
- Vehicles

Program Areas

To focus and prioritize our research, data collection, and service activities of the sections and units, we have defined 28 program areas. Each program area has stated goals and objectives, issues to be addressed, problems to be solved, and a plan for future solutions and activities (over 10 to 20 years) needed to achieve the program goals. We have extensive program area documents available for those who desire them.

The program areas under each of the sections and units of the Water Survey appear below.

WATER SURVEY PROGRAM AREAS

Aquatic Chemistry Section

- **Aquatic Organic Chemistry**
- **Corrosion and Deposition Studies**
- **Institutional Water Treatment**
- **Aquatic Chemical Processes**

Atmospheric Chemistry Section

- **Atmospheric Chemistry**

Climatology and Meteorology Section

- **The Climate System**
- **Impacts of Climate**
- **Cloud Physics and Dynamics**
- **Weather Systems**
- **Weather and Climate Modification**

Groundwater Section

- **Groundwater Quality and Contamination Studies**
- **Groundwater Resource Evaluation and Management**
- **Groundwater Information Services — Data Collection and Management**

Surface Water Section

- **Surface Water Resources**
- **Surface Water Information and Flood Studies**
- **Hydraulics and Sediment Studies**

Water Quality Section

- **Lake Eutrophication and Restoration**
- **Aquatic Toxicant Assays**
- **Wastewater Treatment Assessment**
- **Quality of Surface Waters**

Office of the Chief and Financial and Personnel Unit

- **Administrative Programs**
- **Computer/Data Processing**
- **Instrumentation**

Analytical Chemistry Laboratory

- **Chemistry Laboratory Program**

Climate Information Unit

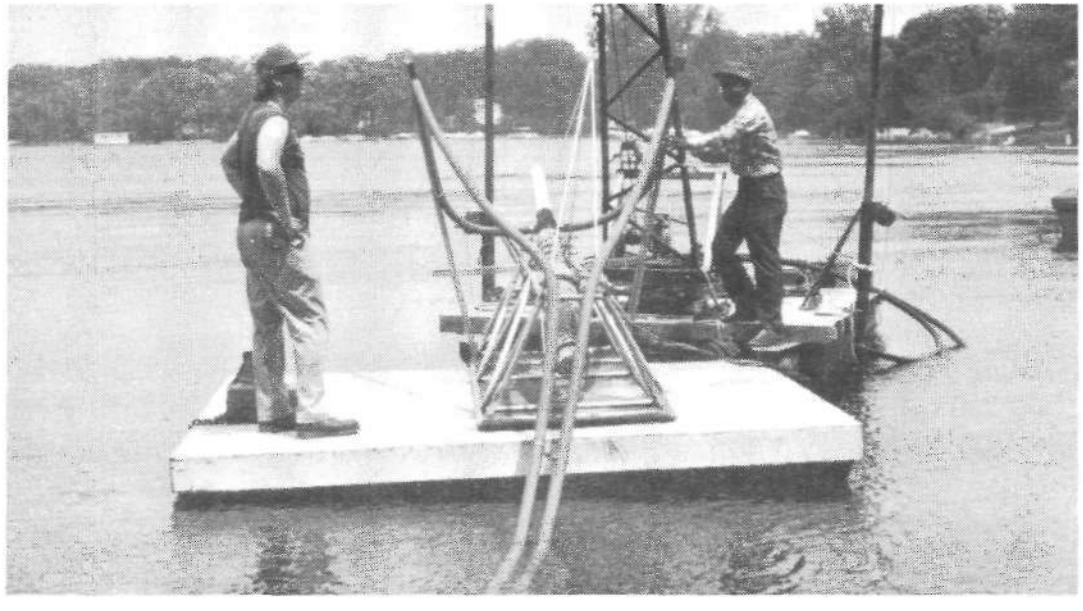
- **Illinois Climate Center**
- **Hydroclimatology**
- **Research Facility**

Communications Unit

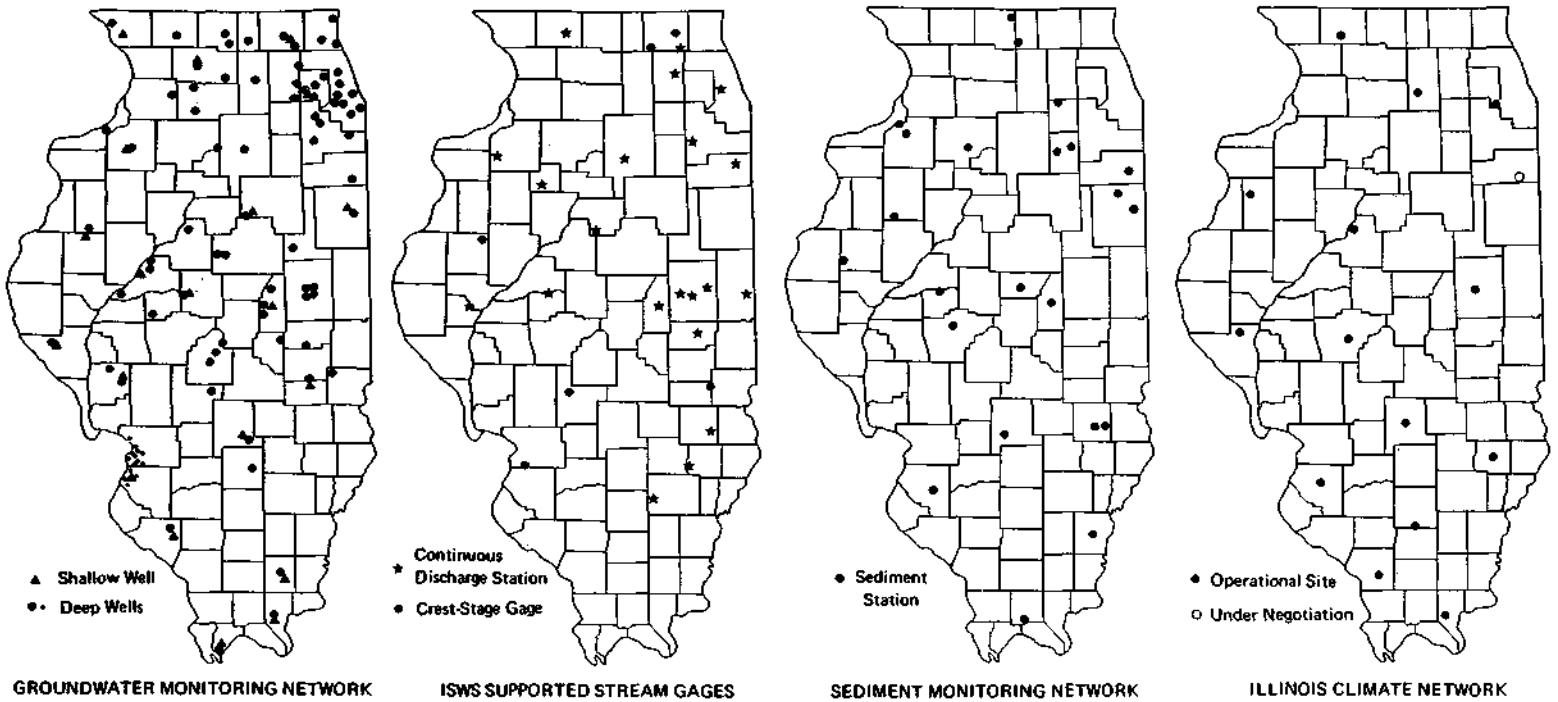
- **Communication Program**

SOCIETY BENEFITS SURVEYS

The Society for the Illinois Scientific Surveys, *a not-for-profit corporation, was formed in June 1983 "to promote, foster, and encourage" the welfare and programs of the three Illinois scientific Surveys — the Water Survey along with the Geological and Natural History Surveys. The Society offers personal and corporate/business memberships in several classes, and will handle gifts, grants, awards, or endowments for the benefit of programs and special needs of the Surveys.*



Survey staff get ready to install an aeration device into Lake Catherine in the Fox Chain of Lakes, site of successful experiments to restore lake water quality by mechanical mixing of oxygen-poor bottom water with oxygen-rich surface water, combined with chemical treatments. These methods, developed in the late 1970's, are proving useful in restoring water quality in water supply lakes and reservoirs in other Illinois communities.



Assessment of Status and Activities in 1983

Special reports that provide the highlights of the Survey's data collection, research, and services activities in 1983 (and 1980, 1981, and 1982) are available. However, a very short summary of the activities is provided here to enable a quick assessment.

The maps above show the major data collection sites of the Illinois State Water Survey in 1983. We serviced routinely a groundwater level network involving 109 sites, and a groundwater quality sampling network at 12 sites.

Streamflow was measured at 27 streamgages in Illinois, based upon joint support of the Water Survey and U.S. Geological Survey. The sediment sampling stations in operation in **1983** existed at 23 sites around the state. The Survey was operating a network of 14 climate stations where most atmospheric variables including soil moisture were measured continuously.

The Survey also operated routinely two national benchmark stations including the Morrow Plots Weather Station in Urbana, and one of the nation's benchmark atmospheric chemistry stations at Bondville in central Illinois.

Several of the research-related and direct service activities performed during FY83 are listed below. These provide a numerical expression of the services performed, articles and publications written, and persons assisted throughout the state. It is estimated that through the 91 radio and television interviews taped and distributed statewide, every citizen in Illinois had several opportunities to be served by data and information from the Water Survey during 1983.

Research-Related Activities in 1983

Technical reports prepared = 95
Scientific papers published = 92
Talks presented at scientific meetings = 83
Contract/grant research projects = 103
Laboratory analyses and total determinations = 14,911
Data acquisition = 8,098 site visits to make measurements
Field activities (man days) = 1,611

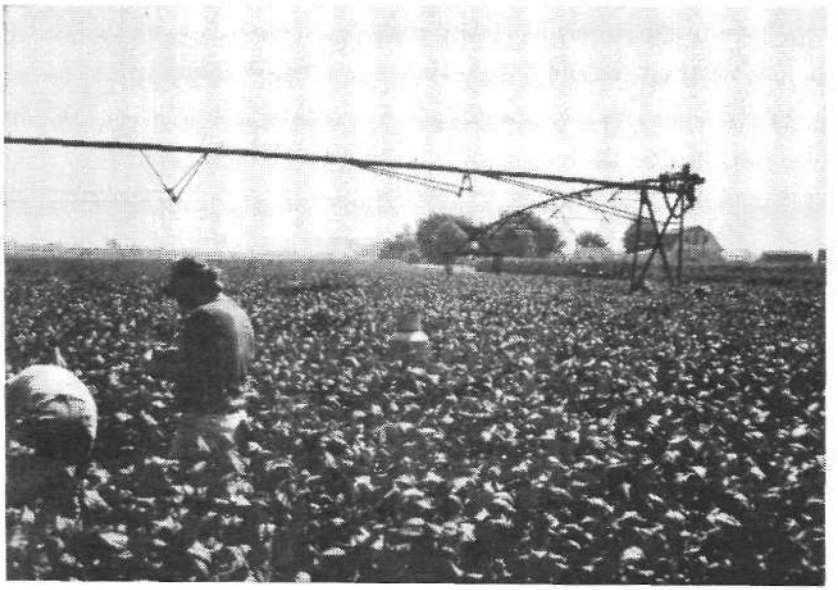
Direct Service Activities in 1983

Publications distributed = 37,800
Popular talks = 235
Press releases = 66
Television and radio interviews = 91
Correspondence letter-type reports = 2,420
Telephone call responses
Official local = 7,800
Long distance = 11,700
Specimens or samples distributed = 5,510
Specimens or samples identified = 1,250
Persons contacted in short courses = 1,830
Visitors served = 2,500
Workshops conducted = 22

The 1983 report assessing the research highlights of the Survey was used to extract the headings that we consider to be the major research accomplishments in 1983. The following listing of these provides some quick information from the major research achievements.

Planned Precipitation Modification Research Progresses
Climate Information Needs for Agribusiness Ascertained
Long-Range Precipitation Predictions Become Reasonably Accurate
Urban and Lake Effects on Lake Michigan Rainfall Defined
Impacts of Changing Climate Now Recognized
Increased Flooding Tied To Climate F luctuations
National Assessment of Research Needs for Flooding Completed
Research on Weather and Pests Started
Severe Rainstorm Research Reveals Importance of Surface Weather Conditions
Relation between Surface Winds and Convective Precipitation 'Complex'
Model for Short-Range Prediction of Mesoscale Wind Fields Useful
Data Sets Constructed for Understanding Midwestern Precipitation Factors
Tree-Rings Used to Study Historical River Flows

Irrigation has been identified, along with energy, as one of the major new water uses for the future that will require extensive scientific research. Competition for water will be heightened in some areas by rapid growth of irrigation water use.



Hydrologic Design of Illinois Reservoirs Completed
Dam Breach Models, Parameters, and Simulations Completed and Tested
Illinois River Flow System Model Useful in Forecasting/Planning
Kankakee River Research Continues
Urban Runoff Study Completed
Lands Unsuitable for Mining Program Begins
Study Water Quality Restoration for Two Recreation Lakes
Field Work for Impact of Combined Sewer Overflows at Peoria Scheduled
Optimal Lake Michigan Withdrawals Studied
Court Creek Watershed/Water Quality Study Completed
Duckweed Found Useful in Toxicity Testing
RBC Process for Waste Treatment Evaluated
Groundwater Tracer Experiment at Sand Ridge Forest Under Way
Models Used in Detecting Potential Nitrate Contamination of Groundwater
Sangamon Basin Study Integrates Groundwater/Surface Water Management Strategies
Soil Coring and Monitoring Well Techniques Define Retention of Metals by Geologic Materials

Corrosivity of Potable Water and Potential Health Effects Studied
Manual Written to Help in Monitoring Hazardous Wastes in Groundwater
Develop Computer Library for Aquatic Chemistry
Impact of Precipitation Chemistry on Soil Water Chemistry Studied
Broad Patterns of Precipitation Chemical Composition Mapped for North America
Methods for Calculating Average Precipitation pH Compared
Measurement of Beryllium-10 in Precipitation Under Way
Assess Role of Alkaline Aerosols in Acid Precipitation
Study Effects of Street Sweeping on Urban Airborne Dust Concentrations
Study Apportionment of Sources of Rain Water Impurities
Determine Heavy Metal Solubility in Rain Water
Soil-Blowing Wind Tunnel Constructed
Investigate Visibility/Air Quality Relationships at St. Louis
Use Element Ratios to Identify Crustal Aerosol Sources

PARTIAL DIRECTORY - ILLINOIS STATE WATER SURVEY - OCTOBER 1983

OFFICE OF THE CHIEF		
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Principal Scientist	Bernice Ackerman	217/333-1702
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River Studies	Donald H. Schneppert	309/671-3196
River Studies	Donald P. Roseboomt	309/671-3196
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Aquatic Biology	Davis B. Beuschert	309/671-3196
Chemist	David L. Hullingert	309/671-3196
Aquatic Toxicity	Paula J. Reedt	309/671-3196
Chemist	Dana Shacklefordt	309/671-3196
Chemist	Brent Gregoryt	309/671-3196
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University Accounts	Becky A. Rohl*	217/333-6901
Accounting System	Martha Barnett*	217/333-6901

Sampling doesn't stop for winter. Water Survey engineer takes a Secchi disk reading to check clarity of the lake water after cutting through the ice.

ADDRESSES

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