



Some Answers to Your Questions about the ILLINOIS STATE WATER SURVEY

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ILLINOIS STATE WATER
SURVEY

What is the Illinois State Water Survey?

The Water Survey is a state agency that carries out research and services in the field of water resources. *We examine and study the water resources of the state in all aspects and furnish information fundamental to their conservation and development.* The state created and supports this fact-finding research agency as a means to assure a dependable supply of good water for all of its people.

Where do we fit in?

On January 1, 1979, the Water Survey became one of three scientific divisions of the Illinois Institute of Natural Resources. The other two divisions are the State Geological Survey and Natural History Survey. All three are directed by the Board of Natural Resources and Conservation and are located on the University of Illinois Urbana campus where there is mutual exchange of information, staff, and facilities.

What is the scope of Water Survey activities?

We gather facts and conduct investigations to assess the *quantity* and *quality* of the atmospheric, surface, and underground water resources of the state. We make related studies of water use and conservation, development of water supplies, water resource planning and management, and the meteorologic factors that affect water resources. The Water Survey is the central data repository and research coordinator for the state in matters related to water resources. These activities are carried out by technical sections for *atmospheric sciences, chemistry, hydrology, and water quality.*

Who uses, or may use, Water Survey information and services?

Other state or federal agencies, municipalities, industries, professional groups, well drillers, consulting engineers, and private citizens of Illinois. We often cooperate with the state and federal agencies concerned with water and the environment. We make special studies to meet the research needs of planning and environmental agencies. Also, because of some of our unusual data collections and research capabilities including staff expertise, we often conduct special research under contracts or grants from federal groups or national associations.

What kinds of information and services are available?

On the next two pages we have listed items on which the Water Survey can furnish basic data, research findings, expert advice, or special services. On the last page we have listed the titles of current research projects.

- We gather basic data, conduct research, and publish the results. We also furnish expert advice and other services upon request. We do not regulate. We serve both the regulators and the regulated.

- The 'water survey' was started in 1895 in the U of I Chemistry Department. Our records of water supplies and quality date from that time. Few states have comparable background data.

- We do a lot of measuring and counting — and then analyzing. This is a continuing process because water is constantly moving and changing, or being changed. The more people we have, the more water used, the more accurate our 'quantity and quality' measurements must be.

- Cooperation and exchange of data are common. Here's one example. Long-standing cooperation with the U.S. Geological Survey in collecting streamflow data allowed us to calculate 7-day 10-year minimum flow values for streams, which are used by the Illinois Environmental Protection Agency as a basis for stream water quality standards and in turn by engineers to design wastewater treatment plants to meet those standards.

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Information and Services Available from Illinois State Water Survey

ATMOSPHERIC WATER Precipitation and Related Weather as They Affect Water Resources

Basic data records of precipitation measured on dense raingage networks. This unique data bank includes records from 11 networks of closely spaced gages varying in size from 19 acres to 4000 square miles operated by the ISWS for varying time periods and in various parts of the state.

Basic weather records from National Weather Service stations in Illinois for 1901-1978 (about 2.5 million daily observations)

Complete weather records from Urbana Weather Station (Morrow Plots) from 1888 to date (a continuing service)

Climate and weather data summaries for representative Illinois cities

Extensive analyses of natural variability of rainfall in Illinois

Thunderstorm-precipitation relations

Impacts of weather and climate on man and the biosphere

Analyses of selected severe rainstorms in Illinois

Tornado data and analyses

Hourly distributions of rainfall, glaze, snow, sleet, thunderstorms, hail, smoke, and fog

Extensive hail data, plus special studies such as analyses of historical records, time-space variations, damages, hail measurement techniques, hail suppression potential

Agriculture and rainfall, including relation of weather factors and crop yields

Drought data and analyses

Lake Michigan Basin precipitation

Extensive data on the use of weather radars to measure precipitation and hail

Raindrop size distribution for various types of storms (drop sizes measured by special cameras)

Mechanisms of raindrop and cloud formation

Efficiency of rain in cleansing pollutants from air

Design and use of special instruments for meteorological measurements (rain and hail gages, surface and airborne rainwater samplers, raindrop cameras, thunder detectors, radar data processors, and others)

Effects of urban-industrial areas on precipitation

Weather modification potential for water supply and agriculture

Design and evaluation of weather modification experiments

Potential effects on atmospheric conditions of added heat and moisture from cooling towers or ponds

Natural and man-made sources of atmospheric pollution and their deposition in Illinois

SURFACE WATER Water-Supply Reservoirs, Lakes, and Streams

Potential reservoir sites and yields statewide

Existing reservoirs and lakes

Continuous water-level records (since 1958) in representative reservoirs in state

Sedimentation rates for specific reservoirs

How sediment is transported and deposited

Evaporation from lakes, amount and variability through the state

Reduction of evaporation from lakes

Shoreline erosion

Low flow values of streams (for designing reservoirs)

Seven-day, ten-year low flow values (for waste load capacity) for all Illinois streams

Time-of-travel rates (of a contaminant) in streams

Natural streamflow variability and methods of analyzing hydrologic phenomena

Various streamflow records (from cooperative stream-gaging program with U.S. Geological Survey)

Illinois base map showing streams

Hydrologic information with respect to floods and floodplains

Design factors for storm drainage systems

SPECIAL FACILITIES

Hydraulic laboratory facilities' for conducting studies of problems of water flow in structures (spillways, stilling basins, etc.)

UNDERGROUND WATER Wells, Well-Water Supplies, Water-Bearing Formations

Basic records of water wells (over 200,000; since 1895)

Records of results of well yield pumping tests

Continuous records of water levels in wells from a statewide observation well network

Records giving full descriptions (wells, location, construction, pumps, production, water quality, etc.) of all municipal and other public groundwater supplies (updated regularly)

Descriptions and yields of principal aquifer systems (water-bearing formations) in the state

Methods and computer techniques for evaluating wells and water-bearing formations

Detailed evaluations or special studies in areas where groundwater resources are heavily developed or could be (regions of Chicago, Peoria-Pekin, East St. Louis, Havana lowlands, LaSalle-Peru, Champaign-Urbana and buried Mahomet valley in east-central Illinois, Douglas-Menard-Christian Counties, Rockford and northwestern Illinois)

Continuing tabulations of water levels in wells and pumpage in Chicago, Peoria, and East St. Louis areas

Methods of rehabilitating wells

Design criteria for screened wells finished in sand and gravel

How to plan a home or farm well-water supply

Artificial recharge of water-bearing formations

Sanitary landfills (cooperative with State Geological Survey)

SPECIAL SERVICES

Information on the availability and quality of groundwater at a specific site anywhere in the state (call or write giving legal description of the location)

Assistance with pumping tests to find out how dependable a well will be

Assistance to municipalities or industries in a program monitoring well performance

Assistance in designing screened sand and gravel wells

Information and Services (Continued)

WATER QUALITY

Mineral Content and Quality Problems

Basic records of chemical analyses of mineral content of well water and surface water samples (over 90,000; since 1895)

Mineral quality of municipal and other public groundwater supplies

Mineral quality of water from selected wells (municipal, industrial, domestic) in areas of special groundwater studies

Mineral quality of surface waters, from monthly sampling at more than 60 stations on principal streams analyzed for 5-year periods (some date from 1945)

Minor elements in selected streams (cadmium, chromium, copper, lithium, lead, nickel, strontium, zinc)

Some long-term trends in water quality of streams and lakes

Natural radioactivity in well waters and surface waters

Natural temperatures (means and extremes) of streams and lakes

Various information on analytical techniques for determination of elements in water, including methods of determining active chlorine and active bromine in water for disinfection

Disinfection of sewage effluents

Nitrates and phosphates in surface waters and well waters

Various information on interrelationships between nutrients (nitrates and phosphates) and other water quality factors (turbidity, dissolved oxygen, etc.) in streams

Various information on algae in streams and lakes, including factors affecting algal growth, a method for predicting algal growth in specific streams or lakes, and ways to remove algae

Water quality variations (location, depth, time) in reservoirs

Extensive data on water quality of the Upper Illinois Waterway

How to assess the waste assimilative capacity of streams

How to use air and water temperature records from one location to predict river water temperatures at a new site

Quantity and characteristics of water pollutants from rural sources (erosion-sediment, animal wastes, fertilizers, pesticides)

Quality characteristics of discharge from storm sewers (plus costs to prevent pollution)

Case studies of groundwater pollution, involving nitrates, road salt, barnyard wastes, and waste disposal sites

Corrosion and tuberculation of water pipes (various metals) and municipal water treatment

Chemical control of corrosion

Measurement of boiler steam purity

Water treatment for boiler feedwater

Water treatment for cooling towers

Municipal and home water softening

Quality deterioration in water distribution systems

Selection of materials of construction for water systems in institutions and for domestic use

SPECIAL SERVICES

An analysis of the mineral content of a water sample from any location in state [This is not a sanitary analysis.]

Supervision of boiler feedwater and cooling water treatment at all state institutions, a continuing service to the state

WATER MANAGEMENT

Use and conservation, Planning, Alternative Sources and Costs

Municipal water use

Industrial water use

Use of water for irrigation

Recirculation of water by industry

Water hauling by trucks

Forecasts of water demands and systems capabilities for 1200 incorporated communities for 1980-2020

Statistical analyses of factors (population, socio-economics, etc.) that affect water use

Economic design of central water-supply systems for medium-sized towns

Alternative plans for meeting water requirements in the Kaskaskia River Basin for 1970-2020

Systems analysis of alternative resources and least cost factors versus projected demands to 2020 for northeastern Illinois

Feasibility of desalting groundwater from the Mt. Simon formation in northeastern Illinois (a water-supply alternative)

Feasibility of artificial groundwater recharge with treated sewage effluent (a water-supply alternative)

Cost studies for comparisons of alternatives as a guide to planning, for the following: costs of reservoirs, municipal and industrial wells and pumps, domestic wells and pumps, pumping water, water transmission lines, water treatment, municipal sewage treatment plants

Information on water institutions and agencies in Illinois and the United States

PUBLICATIONS

Reports on all Water Survey research projects are published so that the results may be available for public use. Summaries from some of the basic data collections are also published from time to time. For a listing of these, write for our *Annotated List of Publications*. Single copies of publications are distributed free of charge.

FACILITIES AND STAFF

Main laboratories and headquarters of the Water Survey are located on the U of I campus in the Water Resources Building, 605 East Springfield, Champaign 61820. We also have a research laboratory near the Illinois River in Peoria and field offices for the Chicago region at Warrenville and for the East St. Louis area at Edwardsville. There is a field station for weather-radar research at the U of I Airport.

The Water Survey currently has a professional staff of approximately 100 chemists, engineers, hydrologists, meteorologists, and statisticians. There is a support staff of about 60 administrative personnel and technicians. Dr. William C. Ackermann is chief.

Current Research Projects at the Illinois State Water Survey

ATMOSPHERIC SCIENCES SECTION

S. A. Changnon, Jr., Head of Section

- I. *Inadvertent Weather and Climate Modification (Water Survey efforts are designed to understand and evaluate man-made changes with respect to the quantity and quality of Illinois water resources)*

Impacts of Inadvertent Weather Modification

Causes and Impacts of Urban Influences on Precipitation*

Studies of Atmospheric Aerosols and Their Scavenging and Deposition*

Participation in METROMEX and CAP, Cooperative Programs to study the Inadvertent Modification of Precipitation by an Urban-Industrial Complex, Sited at St. Louis and Chicago*

Atmospheric Effects from Waste Heat Discharges

Possible Climatic Shifts Caused by Man

- II. *Weather Modification Research Program (Water Survey efforts are designed to understand the processes, to evaluate experimental and operational projects, and to measure the impacts)*

Investigation of the Characteristics of Convective Clouds*

Potential of Precipitation Modification in Illinois and Its Impacts*

Short-Term Forecasts for Summer Convective Rainfall

Development of Techniques to Evaluate Operational Seeding Projects*

Cloud Physics Studies*

- III. *Severe Weather Studies*

Severe Rainfall Studies

Planetary Boundary Layer Studies

Development and Detection of Hail in Storms

Utilization of a Dual Wavelength Radar System in Severe Storms Studies*

Development of New Techniques for Meteorological Understanding and Forecasting of Severe Weather

- IV. *Hydro-Climatological Research*

Hydrometeorological Studies Addressing Urban Water Resources*

Development of Statistical Techniques for Climatology and for Estimating Future Climate Trends*

Illinois Weather Research for Solar Energy

Climate Change and Unusual Weather Periods (Dry or Wet)

Climatic Impacts on Agriculture, Water Resources, and Energy

Climatological Relationships of Hail Loss in the United States*

Climatic Studies of Severe Weather Events including Rainstorms and Winter Storms

CHEMISTRY SECTION

R. W. Lane, Head of Section

Analyses of Minor Elements in Illinois Surface Waters

Nitrates and Phosphates in Surface Water and Groundwater

Mineral Elements Carried by Illinois Streams

Analysis of Surface Water Quality Data

Corrosion Inhibition by Silicate Treatment of Domestic Hot Water

Development of an Alkalinity Controller and Calculator

Evaluation of Sampling Frequency for Accuracy of Assessments of Water Quality Changes and Water Quality Modeling

Identification of Polynuclear Aromatic Hydrocarbons in Water

Removal of Fluoride from Potable Water

Development of a Relationship between Water Quality and the Corrosivity of a Water Supply

Development of Electrical Conductivity Methods for Determining Anions in the 1-10 µg/L Range for Determining Steam or Feed Water Purity or Detecting Condenser Leakage in Power Plants

Investigation of the Effects of Deposits in Municipal Distribution Systems on Water Flow and Quality and Means of Correction

Investigation of Various Analytical Methods of Water Analysis and Analysis of Water-Caused Deposits

Investigation of Scale and Corrosive Tendencies of Waters Used in Distribution, Cooling and Boiler Systems, the Effects of Various Water Treatments, and the Formation of Guidelines for Treatment

Developing Means for Decreasing the Need for Chemical Cleaning of Boilers and Investigating In-Service Chemical Cleaning of Boilers

Development of Program for Measuring Trace Organics in Water

Studies of Metal Speciation in Water

HYDROLOGY SECTION

Richard J. Schicht, Head of Section

Hydrologic Studies of Floodplains*

Systems Analysis of Water Resources in Northeastern Illinois*

Statewide Observation Well Program to Provide Data on Natural Fluctuations of the Water Table in Illinois

Variability of Wastewater Effluent Flow

Shore Erosion on Water Supply Lakes and Rivers and Remedial Measures

Digital Computer Modeling of Groundwater Quantity and Quality Problems

Description of Public Groundwater Supplies in Illinois (being updated)

Hydrologic Studies of Special Environmental Problems as an Aid to Management (example: Horseshoe Lake, Madison County)

Aquifer Testing Program

Effects of Urban Storm Runoff on Water Quality*

Flood Insurance Studies*

Floodplain Information Service*

Groundwater Resource Assessment of Public Groundwater Supplies*

Hydraulic Geometry and Carrying Capacity of Floodplains*

Kaskaskia River Studies (hydraulics, bed materials distribution)*

Soil Loss and Sediment Yield in Illinois Watersheds

Statewide Water Use Survey*

Computer Assisted Urban Drainage Design

Effects of Increased Lake Michigan Diversion on Sediment Transport, Groundwater, and Bank Erosion along Illinois River*

Groundwater Sampling Procedures for Monitoring Wells*

Artificial Recharge Pilot Project*

WATER QUALITY SECTION (Peoria)

Ralph L. Evans, Head of Section

Water Quality Restoration and Management Techniques for the Fox Chain of Lakes*

Acute Toxicity Studies on Fishes Native to Illinois

Evaluation of Dam Aeration on Illinois Waterway*

Performance Evaluation of Wastewater Treatment*

Quality and Quantity of Wastes from Water Treatment Plants

Nature and Causes of Taste and Odor in Water

Biological Monitoring of Illinois Waterway

Water Chemistry Assessment of Illinois Waterway*

Sediment Oxygen Demand of Lakes and Streams

Classification of Lakes Based on Bottom Characteristics*

Assessment of the Aquatic Environment of Horseshoe Lake*

Sources and Characteristics of Sediment being Transported in Illinois Streams

Water Quality Evaluations of Impoundments

- * Supported in part by grants or contracts from agencies such as Crop-Hail Insurance Actuarial Association, Electric Power Research Institute, Illinois Department of Conservation, Illinois Division of Water Resources, Illinois Environmental Protection Agency, Illinois Institute of Natural Resources, National Oceanic and Atmospheric Administration, National Science Foundation, Northeastern Illinois Planning Commission, Office of Water Research and Technology, U.S. Army Corps of Engineers, U.S. Department of Energy, U.S. Department of Housing and Urban Development, U.S. Department of Interior, U.S. Environmental Protection Agency, U.S. Geological Survey.

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A Division of the Illinois Institute of Natural Resources