WATER RESOURCE AVAILABILITY IN THE KANKAKEE RIVER BASIN, INDIANA

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

1990

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Project Manager/Associate Editor: Judith E. Beaty
Editor/Technical Coordinator: Cynthia J. Clendenon
Cover Design: Eddie Reynolds

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MAJOR ACRONYMS AND ABBREVIATIONS

DOW	Division of Water
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IGS	Indiana Geological Survey
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
cfs	cubic feet per second
°F	degrees Fahrenheit
I.C.	Indiana Code
m.s.l.	mean sea level
gpd	gallons per day
gpm	gallons per minute
MCL	maximum contaminant level
mg	million gallons
mgd	million gallons per day
mg/l	milligrams per liter
ml	milliliter
SMCL	secondary maximum contaminant level
sq. mi.	square miles

SELECTED CONVERSION FACTORS

Multiply	By	To obtain
	AREA	
Acres	43,560	Square feet
	0.001562	Square miles
	VOLUME	
Acre-feet	0.3259	Million gallons
	43,560	Cubic feet
	FLOW	
Cubic feet per second	0.646317	Million gallons per day
Gallons per minute	0.002228	Cubic feet per second
Gallons per minute	0.0014	Million gallons per day

WATER RESOURCE AVAILABILITY IN THE KANKAKEE RIVER BASIN, INDIANA

INTRODUCTION

Water is a vital resource which greatly influences Indiana's socioeconomic development. Ground-water and surface-water supplies serve a diversity of human needs, ranging from non-withdrawal uses such as in-stream recreation to large water withdrawals for public supply, industry, power generation and agriculture.

Demands on the water resource are expected to increase as Indiana's economy and population continue to grow. Effective management of the water resource is possible only through a continuing assessment of the interactions between water availability and use.

BACKGROUND AND APPROACH

Issues concerning water supply and use in Indiana historically have been addressed on a case-by-case basis. The need for a comprehensive approach to conservation and management of Indiana's water resource led to the 1983 enactment of the Water Resource Management Act (I.C. 13-2-6.1).

Under this legislative mandate, the Natural Resources Commission must 1) conduct a continuing assessment of water resource availability, 2) conduct and maintain an inventory of significant withdrawals of surface water and ground water, and 3) plan for the development and conservation of the water resource for beneficial uses.

The legislation further mandates the continuing investigation of 1) low stream-flow characteristics, 2) water use projections, 3) the capabilities of streams and aquifers to support various uses, and 4) the potential for alternative water supply development.

The Indiana Department of Natural Resources, Division of Water, serving as the commission's technical staff, is achieving these legislative directives through ongoing investigations of water resource availability, water use, and conflicts involving limited water supply or competing uses.

Although conflicts between supply and demand typically are of a local nature, ongoing assessments of water availability and use are being conducted on a regional scale using the 12 water management basins designated by the Natural Resources Commission (figure 1).

A *drainage basin*, or *watershed*, is defined by the land surface divide that separates surface-water runoff between two adjoining regions (figure 2). A basin encompasses all of the land that eventually drains to a common river.

One disadvantage of using a drainage divide as the boundary of a water management unit is the potential oversight of factors that influence water resource issues but are located geographically outside of the basin. On the other hand, the basin approach allows local conditions or problems to be evaluated as parts of a unified hydrologic system. This integrated approach to a basin's water resource stems primarily from a recognition of the interrelated elements of the hydrologic cycle (figure 2), a continual exchange of water between the atmosphere and earth.

A comprehensive assessment of a basin's water resource requires an understanding of the socioeconomic setting, physical environment and hydrologic regime (figure 3). The complex interactions among these natural and manmade factors define the availability of a suitable water supply, which subsequently influences urban expansion, economic and agricultural development, and population growth. The

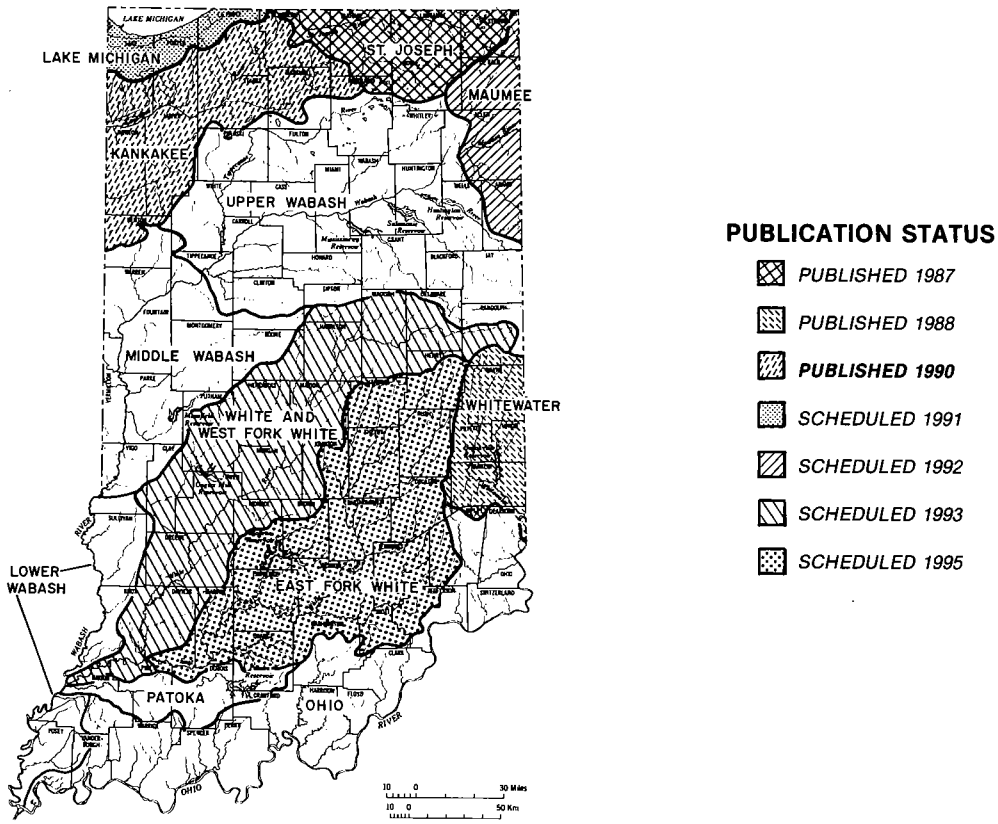


Figure 1. Location of Indiana water management basins and status of water availability reports

water availability reports prepared by the Division of Water address these interactions in an attempt to comprehensively assess the water resource and its potential for further development.

PURPOSE AND SCOPE

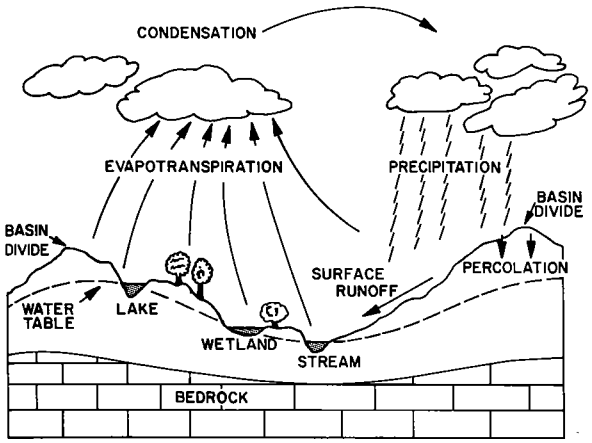
This report describes the availability, distribution, quality and use of surface water and ground water in the Kankakee River Basin, Indiana (figure 4). The third in a series of 12 regional investigations (figure 1), the report is intended to provide background hydrologic information for persons interested in managing or developing the basin's water resource.

The Kankakee River Basin in Indiana is predominantly rural and is one of the state's most productive agricultural areas. The basin's flat to gently rolling landscape is characterized by the broad corridor of the Kankakee River valley, networks of man-made drainage ditches, and small areas of natural lakes and wetlands. About 8 percent of Indiana's land area lies within the Kankakee River watershed.

Thirteen Indiana counties lie wholly or partly within the Kankakee River Basin (table 1). The largest city within the basin is LaPorte. South Bend, except for its far southwestern portions, is located just outside the basin's northeastern boundary (figure 4). Crown Point and Valparaiso, except for their outermost suburbs, are located just outside the basin's northern boundary.

The northern boundary of the Kankakee River Basin lies about 10 to 20 miles south of the Indiana shoreline of Lake Michigan (figure 4). Most areas of the basin are located less than 100 miles from downtown Chicago, Illinois.

The Kankakee River watershed, which lies within the Illinois River Basin of the Upper Mississippi River drainage system, drains a total of 2989 sq. mi. (square



Water that falls to the earth as precipitation follows many paths on its way back to the atmosphere. Precipitated water may be intercepted and taken up by plants; it may infiltrate the soil; it may be stored in small depressions, wetlands and lakes; or it may flow over the land surface to a nearby stream channel.

Some of the water used by plants returns to the atmosphere through the process of transpiration. Some of the water in streams, lakes and soils returns to the atmosphere through the process of evaporation.

Precipitated water that is not taken up by plants, evaporated, or stored in upper portions of the ground surface can *percolate* through open spaces in soil and rock formations to become ground water. A portion of the slowly moving ground water eventually returns to the surface as seepage to springs, lakes, wetlands and rivers. Some of the discharged water is evaporated from the surface to re-enter the atmosphere, and the hydrologic cycle continues.

Figure 2. Major components of hydrologic cycle

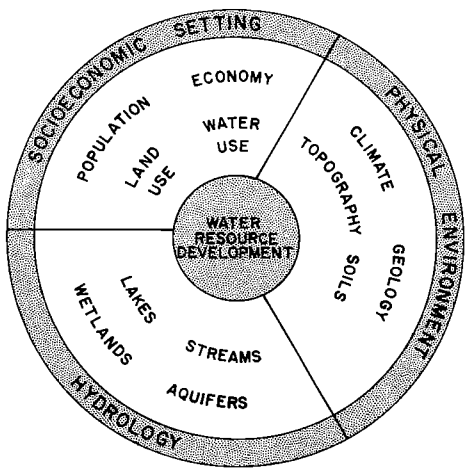


Figure 3. Factors influencing water availability

miles) in northwest Indiana, 2169 sq. mi. in northeast Illinois, and about 7 sq. mi. in southwest Lower Michigan (figure 4). For this report, the portion of the Little Calumet River Basin in Indiana and Illinois that drains artificially to the Illinois River is not considered as part of the Kankakee River Basin study area.

The Kankakee River originates near South Bend, Indiana (as Dixon West Place Ditch), then flows westward for about 104 miles to near Kankakee, Illinois. After being joined by the Iroquois River, the Kankakee River flows northwestward for about 36 miles. The Kankakee River then joins with the Des Plaines River to form the Illinois River (figure 4).

Although the Kankakee River Basin covers parts of three states, this report examines only the Indiana portion unless otherwise indicated. In general, discussions apply to in-basin portions of the nine counties constituting most of the basin's land area in Indiana: namely, Benton, Jasper, Lake, LaPorte, Marshall, Newton, Porter, St. Joseph and Starke Counties (figure 4, table 1).

In studies of the entire Kankakee River drainage system, the term "upper basin" typically refers to areas in Indiana, whereas the "lower basin" encompasses areas in Illinois. This report, however, redefines these terms to include only areas in Indiana. For mapping purposes, the upper basin in Indiana extends from the Indiana-Michigan state line to the LaPorte-Porter and Pulaski-Jasper county lines. The lower basin extends from this line westward to the Indiana-Illinois state line (figure 4).

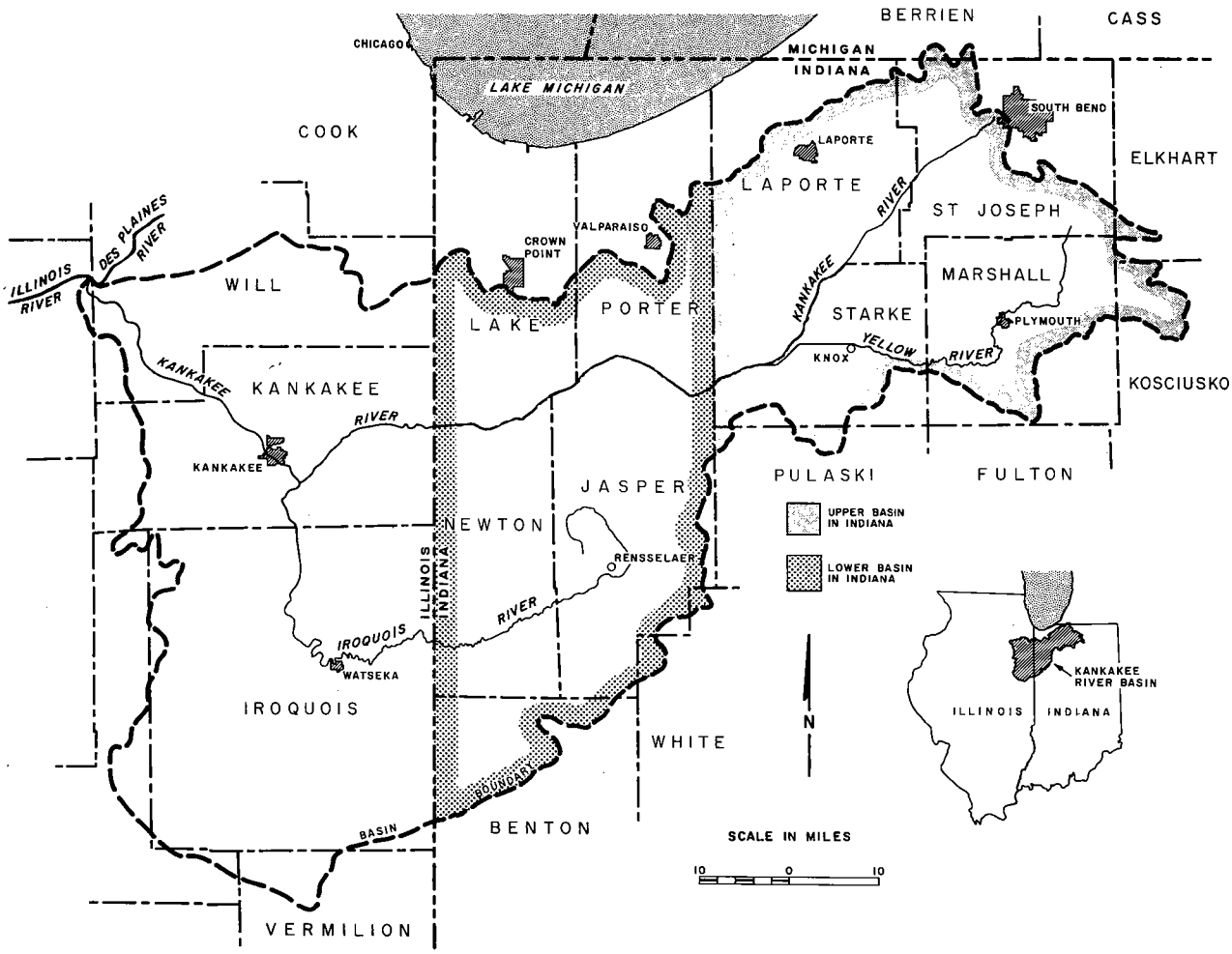


Figure 4. Location of Kankakee River Basin

The information presented in this report should be suitable as a comprehensive reference source for governmental, agricultural, commercial, industrial, recreational and other public and private interests. However, the report is not intended for evaluating site-specific water resource development projects. Persons involved in such projects should contact the Division of Water for further information.

The contents of the report follow the generalized scheme shown in figure 3. An overview of the population, economy, land use, and categories of water use is followed by a discussion of climate, geology and soils. The report then describes the basin's surface-water and ground-water hydrology, including water quality. The final section of the report summarizes current and potential water use, and examines areas of past or potential conflicts between water demand and available water supply.

Unless otherwise noted, data in this report are compiled only for areas lying within the basin boundary. However, some economic, land use and agricultural information are for entire counties.

Because the report is written for a wide spectrum of readers, key technical words within the text are italicized the first time they appear, and where appropriate thereafter. Brief definitions are given in the glossary. An appendix includes data tabulations and illustrations which supplement the information found within the body of the report.

Table 1. Area of Indiana counties within the Kankakee River Basin

County	Total area (sq mi)	In-basin area (sq mi)	Percent of total basin area
Benton	407	165	5.5
Elkhart	466	12	0.4
Jasper	561	536	17.9
Kosciusko	540	51	1.7
Lake	501	237	7.9
LaPorte	600	466	15.6
Marshall	444	324	10.8
Newton	402	402	13.5
Porter	419	222	7.4
Pulaski	435	20	0.7
St. Joseph	459	274	9.2
Starke	309	260	8.7
White	506	20	0.7
Total	6049	2989	100

Water-use information presented in this report was derived from data compiled by the Division of Water on a continuing basis. Water-well records and other data on file at the division were used to define the hydrogeologic conditions of the basin.

Field investigations conducted by the Division of Water and the Indiana Geological Survey between 1986 and 1988 provided additional data on the geology and ground-water quality of the basin. A series of gamma-ray logs and test borings in areas of sparse geologic data were conducted in order to better define the basin's geology and the hydraulic characteristics of surficial materials. The collection and analysis of 200 water-well samples yielded detailed information on natural ground-water quality throughout the basin.

The remainder of the information in this report was derived, summarized or interpreted from data, maps and technical reports by various state and federal agencies. Specific sources of data are referenced within the report. A list of selected references is included at the end of the report.

PREVIOUS INVESTIGATIONS

Because published and unpublished documents relating to the Kankakee River Basin in Indiana and Illinois are so numerous, only the primary sources used to prepare this report are discussed below. These primary documents and other major references are cited at the end of the report. Additional sources of information are listed within these cited references.

Reports by Campbell (1882), Doggett (1933), Meyer (1936), and U.S. Army Corps of Engineers (1944) are the primary sources of historical information for this report. Other significant historical accounts include Ball (1900), U.S. Department of Agriculture (1909), Andrews and Andrews [1915], U.S. House of Representatives (1916, 1931), U.S. Army Corps of Engineers (1941), State of Illinois (1954), Conway (1964), and Houde and Klasey (1968). Reports by Bhowmik and others (1980) and Machan (1986) also contain historical summaries.

A cooperative federal-state report (U.S. Department of Agriculture, 1976) and its accompanying technical supplement (Chenoweth, 1977) describe the availability, use and development of water and related land resources of the Kankakee River Basin in Indiana. A report by the Governor's Water Resources Study Commission (1980) assesses various aspects of water availability and use for 18 planning and development regions. The Kankakee River Basin lies primarily in three of these regions. Topics addressed in both reports include flood hazard mitigation, land use, soil erosion, sedimentation, water supply, water quality, drainage, irrigation, fish and wildlife habitat, and outdoor recreation.

A report by the Kankakee River Basin Task Force in Illinois (State of Illinois, 1978) contains 11 working papers summarizing the status of technical knowledge concerning the river system. The task force report presents a series of management recommendations for protecting the river and its environment. This report updated an earlier study (Barker and others, 1967) which reviewed water supply, recreation, water quality, flood control, and agricultural drainage for the Kankakee River Basin in Illinois.

Mitsch and others (1979) describe the economic value of wetlands bordering the Kankakee River near Momence, Illinois. Bhowmik and others (1980), Brigham and others (1981), and Gross and Berg (1981) present the results of three investigations dealing with the hydraulics of flow, sediment transport, biology and geology of the Kankakee River system in Illinois and portions of Indiana. Ivens and others (1981) summarize the results of these three investigations. DeMissie and others (1983) supplement the existing data with addi-

tional hydrologic, hydraulic, and sediment transport data.

The geology and ground-water resources of several Indiana counties lying wholly or partly within the basin are addressed in a series of reports by the Indiana Department of Natural Resources and the U.S. Geological Survey (Rosenshein, 1961; Rosenshein and Hunn, 1962a, 1962b, 1964a, 1964b, 1964c, 1964d, 1968a, 1968b; Hunn and Rosenshein, 1969). Maps and reports by the Indiana Geological Survey include descriptions of the surficial and bedrock geology of northwestern Indiana (Wayne, 1956, 1958, 1963; Pinsak and Shaver, 1964; Wayne and others, 1966; Lineback, 1970; Schneider and Keller, 1970; Becker, 1974; Doheny and others, 1975; Hartke and others, 1975; Hill and others, 1979; Gray, 1982, 1983, 1989; Droste and Shaver, 1982, 1983; Hartke, 1984; Shaver and others, 1986; Gray and others, 1987).

The response of the ground-water system to irrigation pumpage in Jasper and Newton Counties is described by Bergeron (1981), Indiana Department of Natural Resources (1982d), Camp Dresser and McKee, Inc. (1983), GeoTrans, Inc. (1983), Basch and Funkhouser (1985), and Cushman and Leap (1986). Irrigation impacts on the ground-water resources of northwestern Indiana and portions of east-central Illinois are discussed by Arihood and Basch (in preparation). The regional ground-water availability and irrigation potential in Kankakee and Iroquois Counties, Illinois are described by Cravens and others (1990).

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