

Region One-B

Jasper, Newton, Pulaski, and Starke Counties, located in northwestern Indiana, form Region One-B. The region contains approximately 1,716 square miles and is bounded by the Kankakee River to the north; the Illinois-Indiana state line to the west; Benton, White, and Cass Counties to the south; and Marshall and Fulton Counties to the east, as indicated in Figure 63.

The region's population in 1977 was 69,373. The official Indiana County Population Projections for 1975 to the year 2000 estimate that the region's population may increase by thirty-two percent. Population growth is expected to occur uniformly throughout the region. The 1975 population and the population projections for each county are presented below.

Table 39
The 1975 and projected populations for Region One-B.

County	1975	1980	1990	2000
Jasper	22,919	25,700	30,200	34,500
Newton	13,007	14,900	18,000	21,000
Pulaski	12,780	13,200	13,900	14,600
Starke	20,667	22,700	28,500	28,100
Total	69,373	76,500	87,600	98,200

The major urban centers are Rensselaer in Jasper County and Knox in Starke County. These urban centers accounted for eleven percent of the region's 1975 population.

Agriculture is the dominant land use within the region with more than eighty percent of the land area devoted to agricultural purposes. Approximately seven

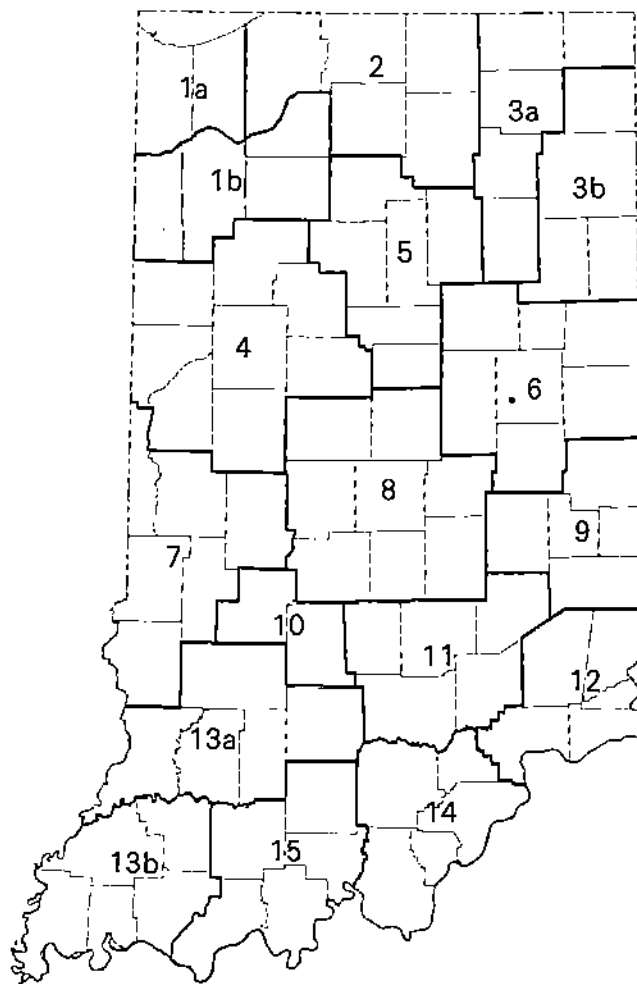


Figure 63
Map of Indiana showing the location of Region One-B.

percent is forested while the remaining thirteen percent is urban and miscellaneous land uses.

Although agriculture is by far the major land use, it employs only sixteen percent of the work force. Non-manufacturing equipment, including wholesale and retail trade, dominates the employment picture with over thirty-five percent of the total. Manufacturing employs almost thirty-five percent of the work force.

The climate of Region One-B is influenced by Lake Michigan. The region receives approximately 36.5 inches of precipitation annually. This varies from a high of 4.0 inches in July to a low of 1.8 inches in February. Of the 36.5 inches of annual precipitation, approximately 11.0 inches appear as streamflow while 25.5 inches are consumed through evapotranspiration. The area has average temperature ranging from 25°F. in January to 73°F. in July. The average annual temperature is 50.5°F. Data from the nearest recording weather station, the South Bend Michiana Regional Airport, indicates the annual prevailing wind is from the south-southwest at 10.6 miles per hour.

THE WATER RESOURCE

Ground Water

All of the region was covered by the continental ice sheets which retreated from Indiana some 20,000 years ago. The deposits left by the glacial ice range in thickness from less than twenty-five to over two hundred feet and include dune sand, lake clays, glacial till, and outwash sand and gravel. In portions of this area thin inter-till sand and gravel zones are found within the glacial drift. The outwash sand and fine gravel deposits are prevalent adjacent to the Kankakee River and are relatively important sources of ground water. Lake clays, glacial till, and wind-blown sand predominate in southern portions of the region.

Sedimentary rock formations ranging in age from Silurian through Mississippian underlie the glacial deposits. Shales and siltstones of the Mississippian age Borden Group overlie the New Albany shale of lower Mississippian—upper Devonian age in southern Newton and Jasper Counties. These shales and siltstones are relatively poor water producers. Silurian and Devonian limestone and dolomite occur along a line running northwest to southeast across the remainder of the region. These rocks make up the most important bedrock aquifer within the region and are widely tapped by irrigation wells.

Overall ground-water availability in the region ranges from poor to excellent as shown in Figure 64. In southern Newton and Jasper Counties substantial areas of limited ground-water supplies occur, with

wells producing from 10 to 50 gallons-per-minute (gpm) or less of potable water. Wells produce from 100 to 400 gpm throughout the remainder of the region. Yields of 600 gpm to 1,000 gpm are possible in eastern Pulaski County.

In much of southern Jasper and Newton Counties well yields are limited to less than 100 gpm. However, in areas near Brook, Kentland, and Remington, localized sand and gravel aquifers yield up to 400 gpm. In the northern portions of the region deep limestone aquifers from the Silurian-Devonian bedrock yield up to 1,500 gpm.

Limited ground-water conditions and shallow shale bedrock are present in southwest Starke County, northeastern Jasper, and northwestern Pulaski Counties. Deeper wells in these areas often encounter hydrogen sulfide gas. Locally limited areas are also present in north-central Starke County in the vicinity of Knox where shallow fine sand deposits predominate. In eastern Pulaski and Starke Counties and northwest Starke County well yields of 400 to 1,000 gpm are feasible from deposits of inter-till and outwash sand and gravel. Elsewhere in these counties yields of 100 to 200 gpm are possible from properly constructed, large diameter wells.

Ground-water quality ranges from very hard, with nuisance amounts of hydrogen sulfide gas, to fairly soft water with little or no iron and no hydrogen sulfide. In general, however, water hardness ranges between 200 and 300 parts-per-million (ppm), with iron concentrations varying from 0.2 to 1.8 ppm. Some form of iron treatment or removal will be required in most instances. Hydrogen sulfide is commonly encountered in the limestone bedrock in north-central Jasper, western Newton, northwestern Pulaski, and southwestern Starke Counties. The occurrence of hydrogen sulfide is particularly noticeable in those areas where the limestone is overlain by or is in close proximity to the black New Albany Shale.

Surface Water

Streamflow Surface water in the region is primarily located in streams. Significant streams in the region include the Kankakee, Iroquois, Tippecanoe, and Yellow Rivers. The majority of the region is drained by the Kankakee, Iroquois, and Yellow Rivers which ultimately discharge into the Upper Mississippi drainage system. The remaining portion is drained by the Tippecanoe River and its tributaries which flow into the Wabash River, a tributary to the Ohio River.

The Kankakee River may be the most reliable large stream in the state as far as providing a dependable flow. This characteristic dependability is shared, but to a lesser degree, by the Yellow and Tippecanoe Rivers.

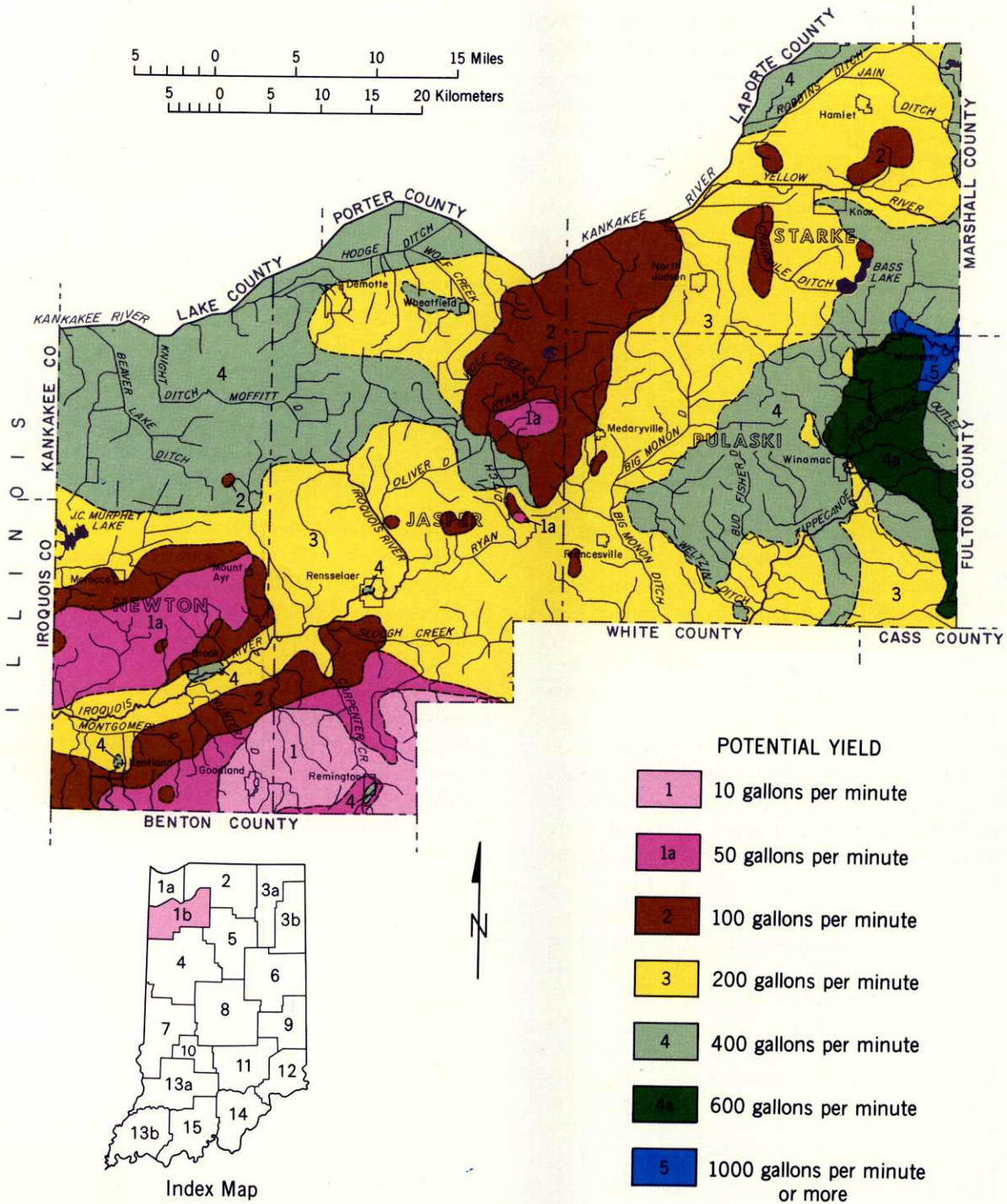


Figure 64
 Map of Region One-B showing the general location and potential yield of ground water from properly constructed large diameter wells.

Because of less favorable geologic conditions, the Iroquois River does not have a dependable flow.

The following table lists the seven day, once in ten

year (Q7-10); one day, once in thirty year (Q1-30); and the average annual flow in million-gallons-per-day for streams with gaging stations in Region One-B.

Table 40
Flow characteristics of streams.

Stream	Drainage Area (square miles)	Million-Gallons-Per-Day		
		Average Annual	Q7-10	Q1-30
Iroquois River near Foresman	449	230	6.5	4.0
Iroquois River at North Meridian	144	79	2.5	1.3
Iroquois River at Rensselear	203	103	3.3	1.9
Iroquois River at Rosebud	36	16	1.2	0.6
Kankakee River at Davis	537	320	120.0	100.0
Kankakee River at Dunns Bridge	1,352	830	210.0	180.0
Kankakee River at Shelby	1,779	1,010	270.0	220.0
Tippecanoe River at Ora	856	520	80.0	63.0
Yellow River at Knox	435	250	46.0	35.0

The flow duration curve for the Kankakee River at Shelby has a minimal slope, as shown in Figure 65. The curve indicates that the stream will have a dependable flow of 400 million-gallons-per-day (mgd) ninety percent of the time.

The slope of the flow duration curve also indicates that the Kankakee River basin contains aquifers which provide significant ground-water contributions to streamflow. To verify this, the technique of hydrograph separation was applied to three annual hydrographs representing "dry," "average," and "wet" years. The results indicate that the ground-water contribution to streamflow amounts to seventy-two, sixty four, and

thirty-two percent for "dry," "average," and "wet" years respectively. Conversely, from twenty-eight to sixty-eight percent of the flow, depending on the year, is due to direct surface runoff from runoff-producing precipitation events or from snowmelt.

Lakes The lakes within the region that are at least 50 acres in size or have a storage capacity of 32.5 million gallons or more are presented in Table 41, and are shown on Figure 66. These nine lakes have a combined surface area of approximately 6,000 acres with a gross storage capacity of approximately 7,700 million gallons.

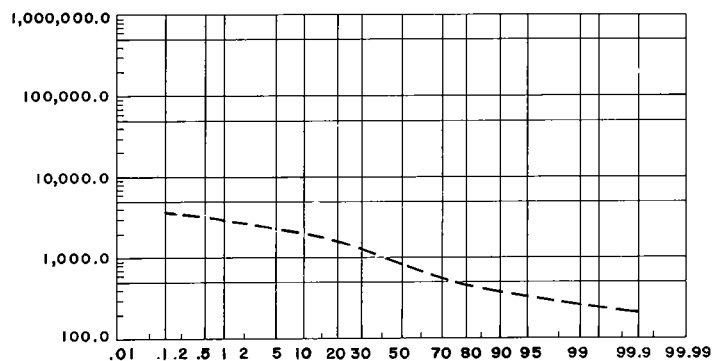


Figure 65
The flow duration curve for the Kankakee River at Shelby.

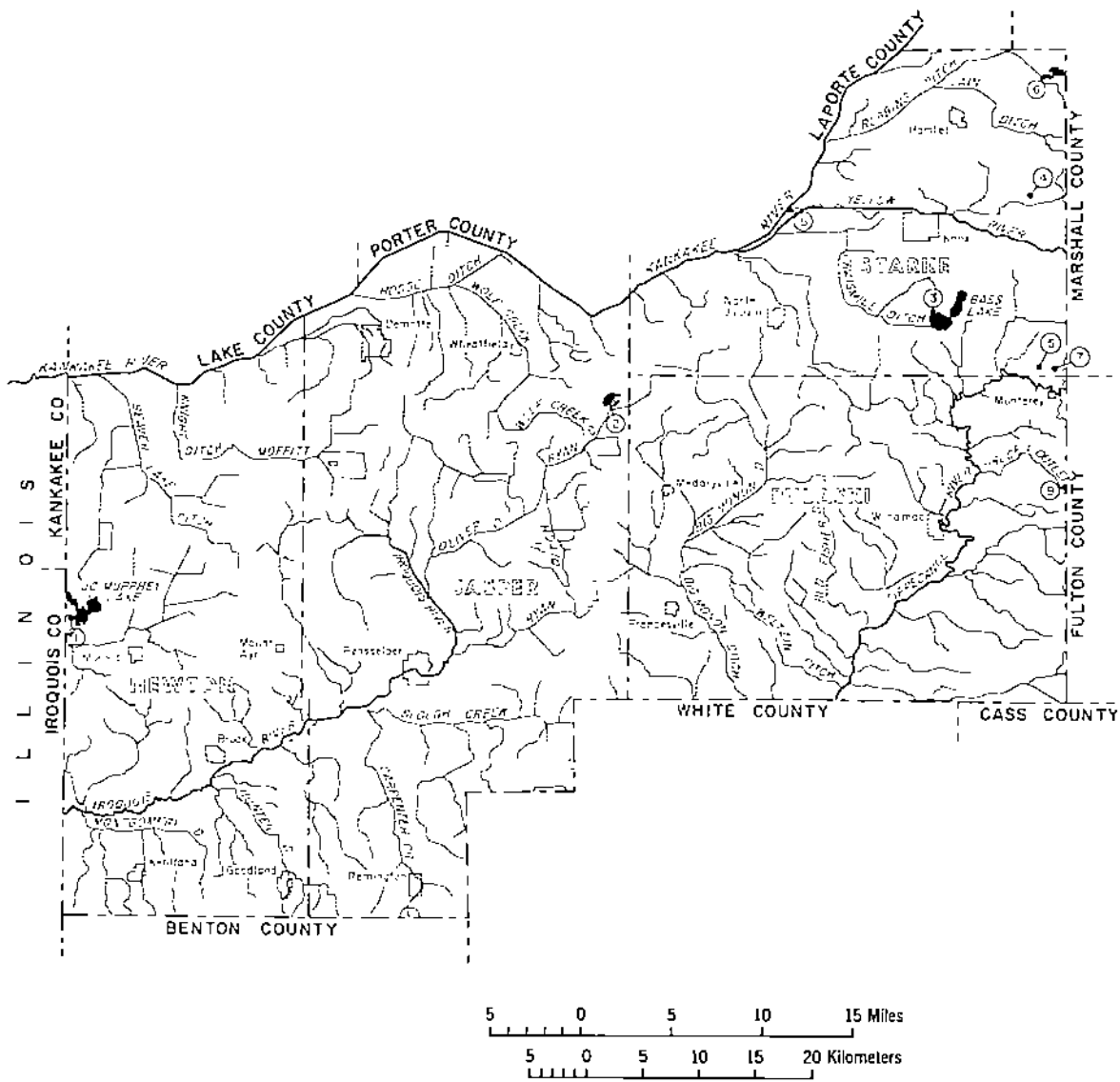


Figure 66
 Map of Region One-B showing the location of lakes that are at least 50.0 acres in size or that have a storage capacity of 32.5 million gallons or more.

Table 41

Lakes at least 50 acres in size or with a storage capacity of 32.5 million gallons or more.

Lake Number	Lake Name	Drainage Area (square miles)	Surface Area (acres)	Gross Storage (million gallons)
1	J.C. Murphy Lake	13.00	1,515.0	5,826
2	Ringneck Lake	1.94	1,400.0	na
3	Bass Lake	5.18	1,400.0	na
4	Eagle Lake	25.50	24.0	52
5	Hartz Lake	na	28.0	120
6	Koontz Lake	6.25	346.0	1,032
7	Langenbaum Lake	0.72	48.0	84
8	Skiltz Lake	na	1,000.0	na
9	Bruce Lake	6.38	245.0	583

na: not available.

UTILIZATION OF THE WATER RESOURCE

Instream Uses

The supply and demand analysis for recreational uses of water by the residents of Region One-B is presented in Table 42. The existing supply for recreational activities is expressed as a percentage of the demand. When this percentage exceeds one hundred the supply

exceeds the demand. Conversely, when the supply is less than one hundred it is less than the projected demand.

Boating and Waterskiing The lakes of this region provide surface water to meet the current demand for recreational boating and waterskiing. However, the projected demand for boating is expected to exceed the supply by the year 2000.

Table 42

Outdoor recreation demand and supply analysis.

Activity	Percent of Population Participating	Density Guideline	Approximate Supply	Existing Supply as a Percentage of Projected Demand		
				1980	1990	2000
Boating	26	19.6 boats/acre/year	4,400 acres	100+	100+	91
Waterskiing	11	34.4 skiers/acre/year	1,500 acres	100+	100+	100+
Canoeing	8	585 canoes/mile/year	96 miles	100+	100+	100+
Swimming	51	76,600 swimmers/acre/year	5 acres	83	83	71
Ice-Skating	8	6,678 skaters/acre/year	8 acres	100+	100+	100+
Fishing	42	66 persons/acre/year	8,500 acres	83	75	71

This table is based upon the 1979 Indiana State Outdoor Recreation Plan. Only the supply and recreational demands of residents of the region are displayed. The available recreational opportunities outside the region are not considered, nor are the recreational demands of nonresidents considered.

Bass Lake is the fourth largest natural lake in Indiana and absorbs much of the boating activity in this region. Boating occurs on the Kankakee River, although floating debris can create hazards to boaters and especially waterskiers. Small-craft boating is available on the Tippecanoe and Iroquois Rivers. The proximity and abundance of Lake Michigan as a boating resource may serve to somewhat alleviate the shortages of boating opportunities that are expected in the future.

Canoeing The Kankakee, Iroquois, and Tippecanoe Rivers are all used for canoeing in Region One-B. The

Kankakee offers excellent canoeing due to its steady flow and is accessible from numerous county, state, and federal highways as well as the LaSalle and Kankakee State Fish and Wildlife Areas.

Local canoeing demands are not in excess of the present supply of canoeing streams, and projected figures anticipate no shortage of canoeing opportunities by the year 2000.

Swimming and Ice-Skating The swimming demand generated by the residents exceeds the supply of existing swimming facilities. The demand is projected to exceed supply by over thirty percent by the year 2000.

The ice-skating needs are currently met by existing resources with no future shortage anticipated.

Fishing The quality of the fisheries habitat within Region One-B is shown in Figure 67. The streams in the northern portion of this region are in the Kankakee River drainage basin. Due to channelization of streams, the aquatic habitat values range from low, near the upper ends of tributaries, to high, at the confluence with the Kankakee River. Warmwater fish populations dominate the Kankakee River drainage basin. Northern pike use the tributaries of the Kankakee River for spawning.

The main branches of the Tippecanoe and Iroquois Rivers provide good aquatic habitat for warmwater fish, most notably smallmouth bass. The Tippecanoe River also provides spawning habitat for white bass and other fish from Lake Schafer. Unlike streams in the northern part of the region, these streams have high pool and riffle ratios, especially closer to the Tippecanoe and Iroquois Rivers, which improves the aquatic habitat.

Public access to rivers other than the Tippecanoe is somewhat limited. Tippecanoe River State Park offers public access. Two other public fishing sites on the Tippecanoe are located at the Haschell Bridge northeast of Winamac and four miles south of Winamac. LaSalle and Kankakee State Fish and Wildlife Areas provide access to the Kankakee River, and Willow Slough offers lake fishing. Bass Lake is accessible through the state beach on the east side of the lake and on the west by the dam.

The demand for fishing opportunities by residents of the region exceeds the supply. By the year 2000, only two-thirds of the needed surface waters may be available to fishermen seeking quiet, uncrowded surroundings in the region. The proximity of the fishery resource in Lake Michigan to fishermen from Region One-B may partially alleviate the shortage.

Riparian Habitat The quality of the riparian habitat associated with surface streams is shown in Figure 68. Skitz Lake is entirely wetland, mainly wooded swamp with areas of deep water marsh. It provides excellent habitat for migratory and resident waterfowl, furbearers, (especially muskrat, beaver, and raccoon), and many other wildlife. Round Lake and J.C. Murphy Lake provide large areas of deep water marsh comprised mainly of cattails.

Extensive areas of wooded swamp are found along the Iroquois River. Stretches along the banks of the Tippecanoe River, Iroquois River, and their tributaries are lined by upland woods which attract deer, rabbits, squirrels, and upland game birds besides waterfowl.

The grassy banks of some tributaries to the Iroquois River offer habitat for gamebirds, especially pheasants. Ryan Ditch, Slough Creek, and Curtis Creek, provide little habitat due to the amount of cropland.

Willow Slough, LaSalle, Jasper-Pulaski, Kankakee, and the Winamac Fish and Wildlife Areas offer public hunting opportunities and habitat for a variety of wildlife.

Withdrawal Uses

Public Water Supplies Jasper, Newton, Pulaski, and Starke Counties are served by twelve public water utilities. Thirty percent of the population of Region One-B was served by a public utility in 1975. There are no rural water utilities in this region.

The largest single utility is located in Rensselaer. The Rensselaer utility withdrew an estimated 0.7 mgd during 1975. Other large utilities are located in Knox and Winamac, which withdrew .05 mgd in 1975. The public water utility in Kentland withdrew 0.2 mgd. Figure 69 shows the water service areas within Region One-B.

The public water utilities withdrew an average of 2.6 mgd in 1975, with a maximum daily use of about 5.0 mgd. Withdrawals by the region's public water utilities should increase to about 3.8 mgd by the year 2000, as indicated in Table 43. The water supply for these utilities is derived from ground-water sources.

Table 43

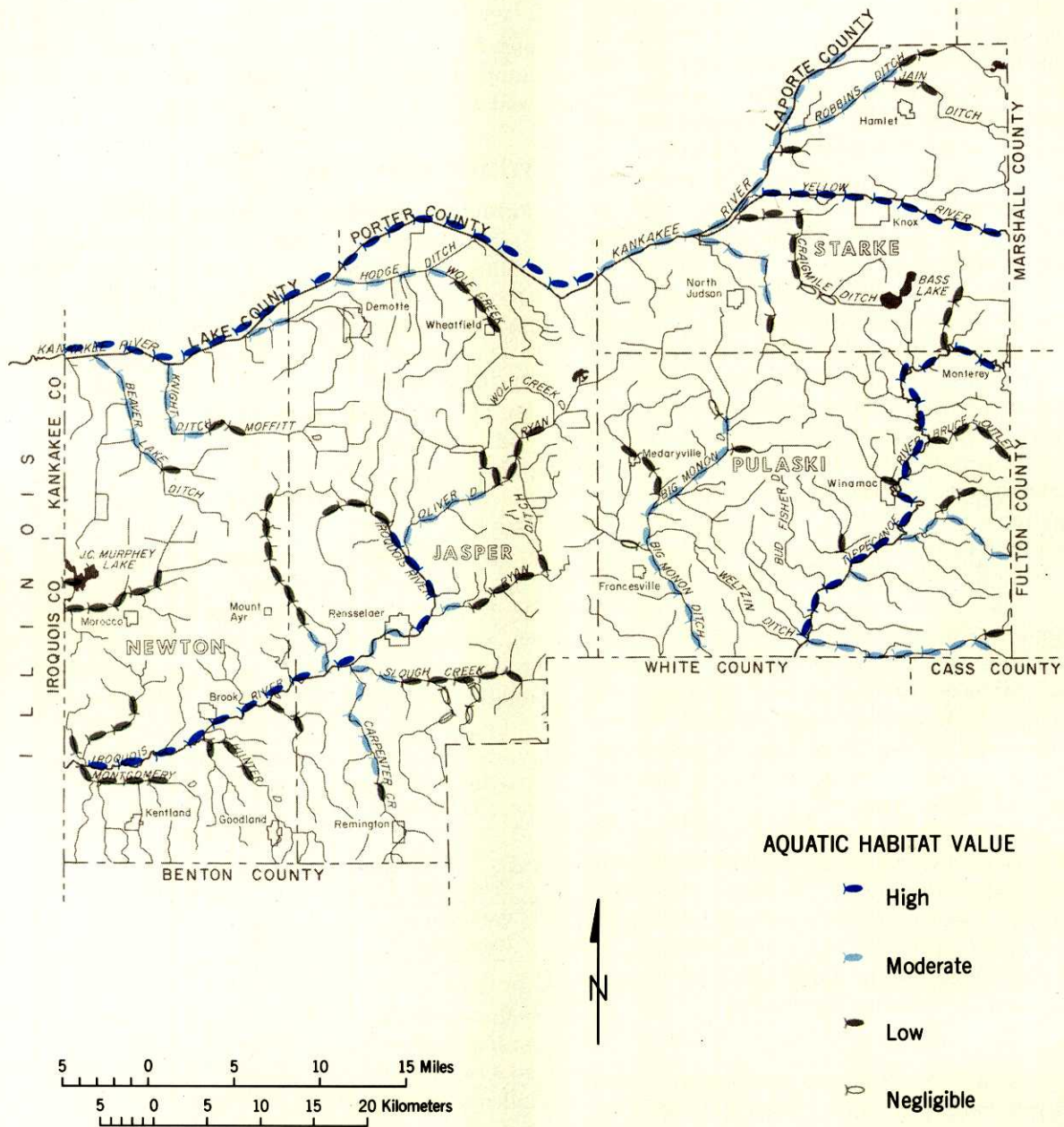
The 1977 and projected water withdrawal and consumption rates of public water supplies by the year 2000, in million-gallons-per-day.

<i>Public Water Supply</i>	<i>1977</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>
Withdrawal	2.6	2.8	3.3	3.8
Consumption	0.3	0.3	0.3	0.4

Communities in the region developed well fields within or just outside their corporate limits. The exception is Goodland, which relies on a well field two miles directly north of the town.

Industrial Water Region One-B is a rich, agricultural area, consequently, the largest water demands come from the food processing industry. Metal fabricators and transportation equipment manufacturers in the region use more modest amounts of water.

Industrial establishments had an estimated water intake averaging 1.3 mgd in 1977. Of the total industrial intake, 0.6 mgd is self-supplied by the industries themselves while 0.7 mgd is purchased from the region's public water utilities. Because of the general availability of ground water in the area, most of the



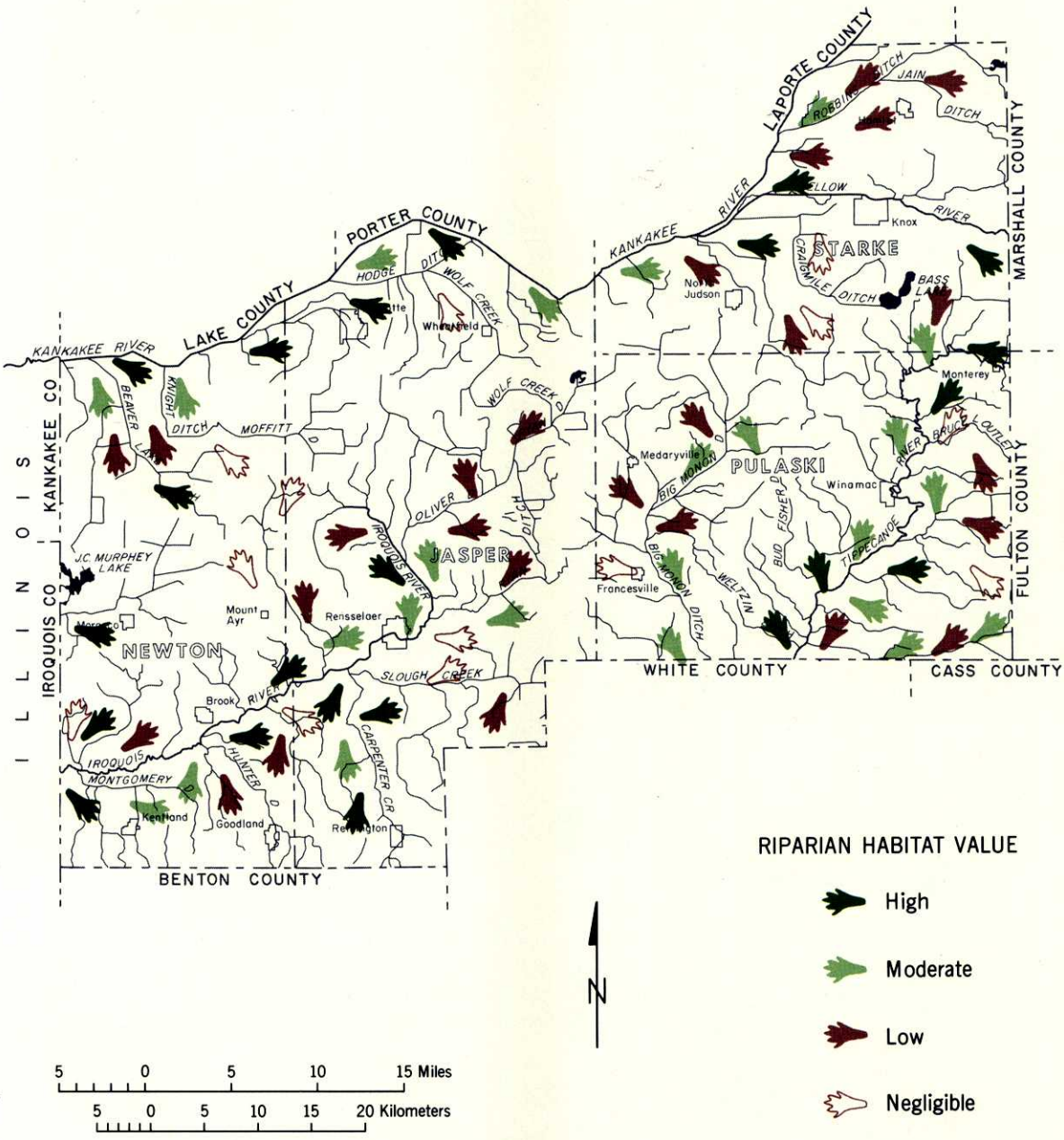


Figure 68
Map of Region One-B showing the quality of the riparian habitat.

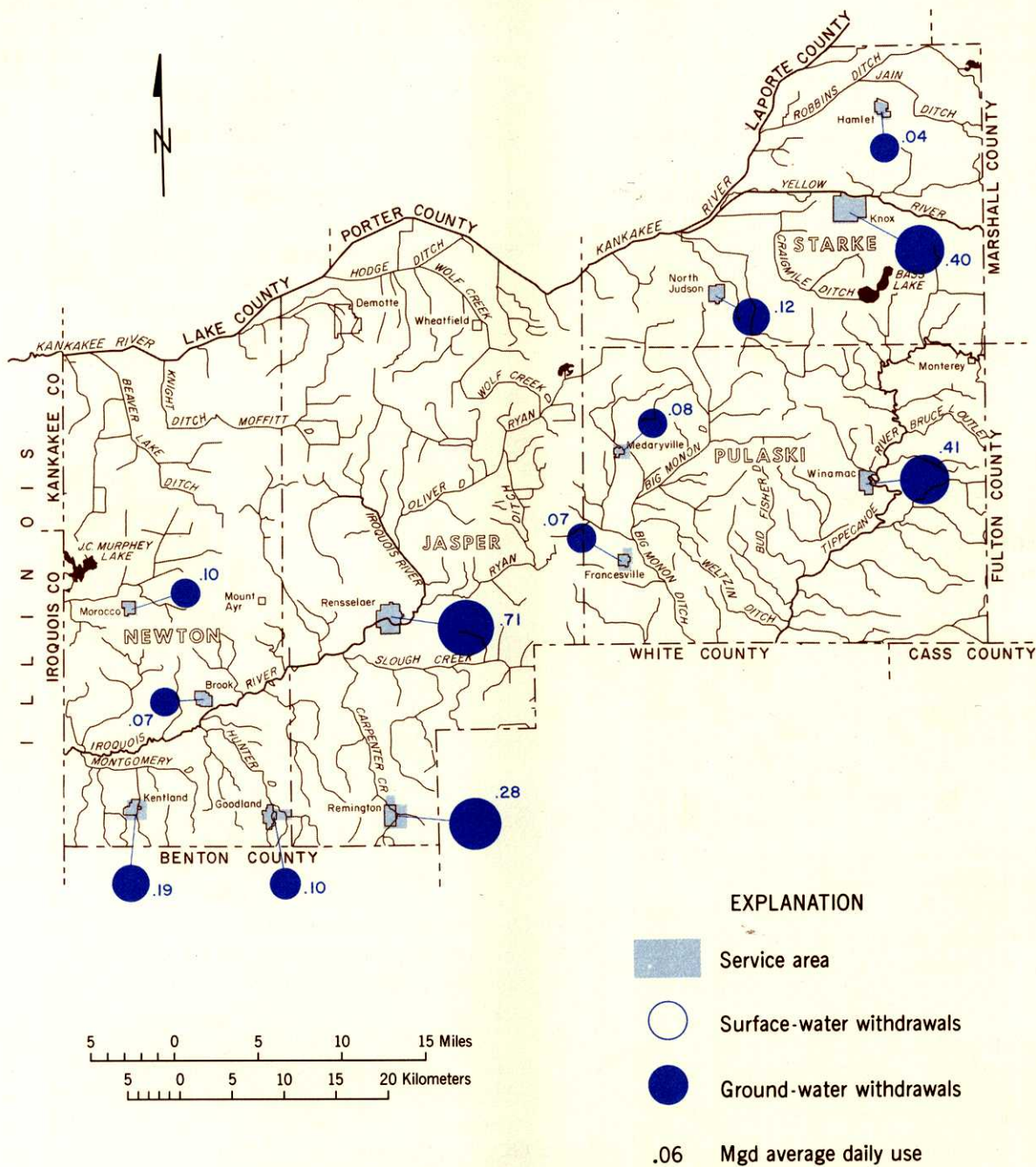


Figure 69
Map of Region One-B showing the service areas of the public water utilities and average daily use in million-gallons-per-day.