

Region Five



Cass, Fulton, Howard, Miami, Tipton, and Wabash Counties, located in north-central Indiana, form Region Five. The region contains approximately 2,136 square miles and is bounded by Marshall and Kosciusko Counties to the north; Huntington, Grant, and Madison Counties to the east; Hamilton County to the south; and Clinton, Carroll, White, and Pulaski Counties to the west as shown in Figure 122.

The 1975 population was 239,500, of which thirty-seven percent resided in Howard County. The official Indiana Population Projections indicate that the region's population may increase to approximately 283,300 by the year 2000. The 1975 population and the population projections for each county are tabulated below.

Table 91
The 1975 and projected populations for Region Five.

County	1975	1980	1990	2000
Cass	40,800	41,300	42,000	42,500
Fulton	17,900	18,900	20,400	22,000
Howard	89,200	96,200	111,000	124,200
Miami	40,500	41,700	43,500	43,600
Tipton	15,800	15,300	14,800	14,500
Wabash	35,300	35,600	36,300	36,500
Total	239,500	249,000	268,000	283,300

The major population centers within the region are Kokomo in Howard County, Logansport in Cass County, Peru in Miami County, and Wabash in Wabash County.

Agriculture is the dominant land use within the region with more than eighty-two percent of the area

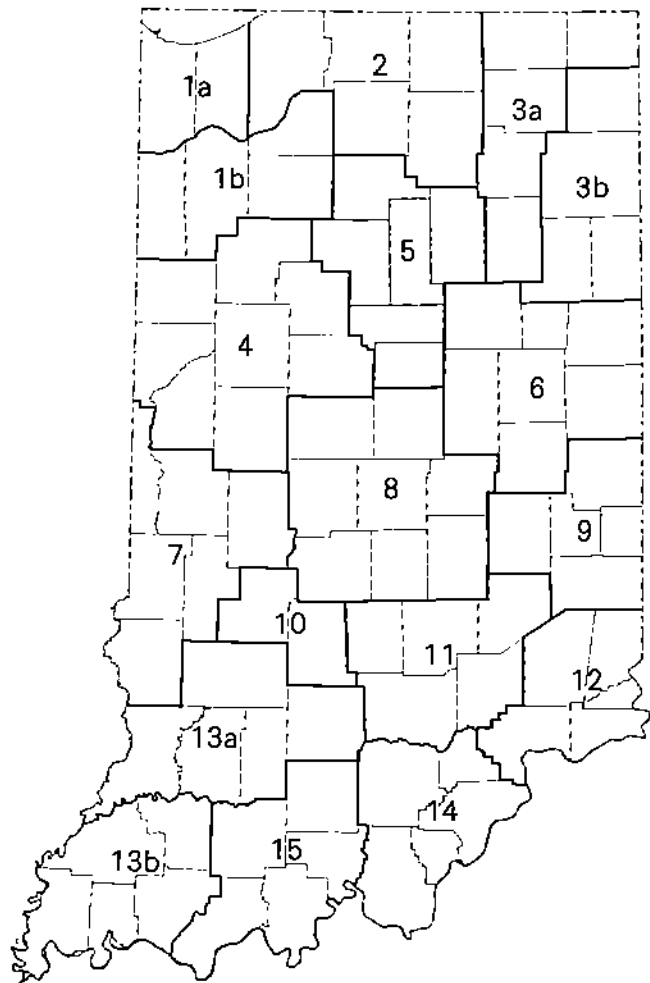


Figure 122
Map of Indiana showing the location of Region Five.

devoted to that purpose. Approximately seven percent of the land is forested and eleven percent is devoted to urban and miscellaneous uses.

Although agriculture is the major land use, it is not the major source of employment. Manufacturing employs approximately fifty-three percent of the work force. Electrical machinery, transportation, and primary metals are the major industries. Nonmanufacturing business employs approximately forty-six percent of the work force. Wholesale and retail trade employs almost half of the nonmanufacturing work force, followed by services, transportation, communications, and utilities.

The region has a diverse topography. Howard and Tipton Counties, southwestern Fulton and northwestern Cass Counties are flat, relatively treeless, and contain intensive agriculture. The remainder of the region has considerable local relief.

The region receives approximately 38.0 inches of precipitation annually. This varies from a high of 4.5 inches in July to a low of 2.0 inches in February. Of the 38.0 inches of precipitation, approximately 11.0 inches appear as streamflow while 27.0 inches are consumed through evapotranspiration. The area has average temperatures ranging from 26°F. in January to 73.5°F. in July. The average annual temperature is 51.5°F. The annual prevailing wind at the Baer Field Airport in Fort Wayne is from the southwest at 10.3 miles per hour.

THE WATER RESOURCE

Ground Water

The occurrence of ground water in Region Five has been affected by thick glacial deposits that blanket most of the area. These deposits were left by successive glacial advances and contain permeable zones of sand and gravel which act as storage reservoirs for large amounts of water. The glacial drift is thickest and most productive in Fulton County in the northern part of the region where outwash deposits of sand and gravel occur. The drift generally thins to the south into southern Tipton County where increasing thicknesses are again encountered. The glacial till also contains numerous inter-till sand and gravel units which are utilized as a source of water in many areas.

Underlying the unconsolidated deposits are bedrock formations of Silurian and Devonian ages. The Silurian rocks are primarily dolomitic limestone with some shale members, while the Devonian sequence is composed of black shale, dolomite, and limestone. The shale deposits are not considered to be important ground-water sources, but the Silurian and Devonian limestones and dolomites are significant aquifers.

The availability of ground water is associated with the nature and type of aquifer materials present in a given area. An unusual feature that affects ground-water availability in this region is the buried Teays Valley drainage system which trends almost east to west through Wabash, Miami, and Cass Counties. The Teays consisted of a major preglacial drainage system whose valley was completely filled with glacial material. These glacial deposits contain significant amounts of coarse sand and gravel capable of yielding up to 1,000 gallons-per-minute (gpm). The Indiana Department of Natural Resources is currently involved in a study of the glacial history and ground-water potential of the Teays system statewide.

Ground-water availability within the region is generally very good, as shown in Figure 123. The thick deposits of sand and gravel in Fulton County and along the Wabash River in Miami and western Wabash Counties offer the largest potential with yields exceeding 1,000 gpm. Yields in areas adjacent to the Eel River in Wabash and Miami Counties are as high as 600 gpm, while portions of the Wabash River valley in Cass County can produce up to 200 gpm. In Howard and Tipton Counties, the bedrock represents a significant ground-water source and is capable of producing up to 600 gpm.

Ground-water hardness ranges from 250 to 400 parts-per-million (ppm). The iron content falls within values averaging between 1.5 and 2.0 ppm. Several communities have municipal softening and iron removal treatment. The town of Akron does not remove iron even though its water has one of the highest iron contents in the region. Parts of Miami, Cass, Howard, and Tipton Counties exhibit fluoride levels higher than one ppm. Areas of hydrogen sulfide or "sulfur water" can be encountered in parts of Cass, Howard, and Tipton Counties.

Surface Water

Streamflow The major streams flowing through the region include the Wabash, Salamonie, Tippecanoe, Mississinewa, and Eel Rivers and Wildcat Creek. The surface streams within the region flow from east to west and are included within the Wabash River drainage basin. Fifty-two miles of the Wabash River are located within the region.

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 (mgd) for streams with gaging stations within Region Five are presented in Table 92.

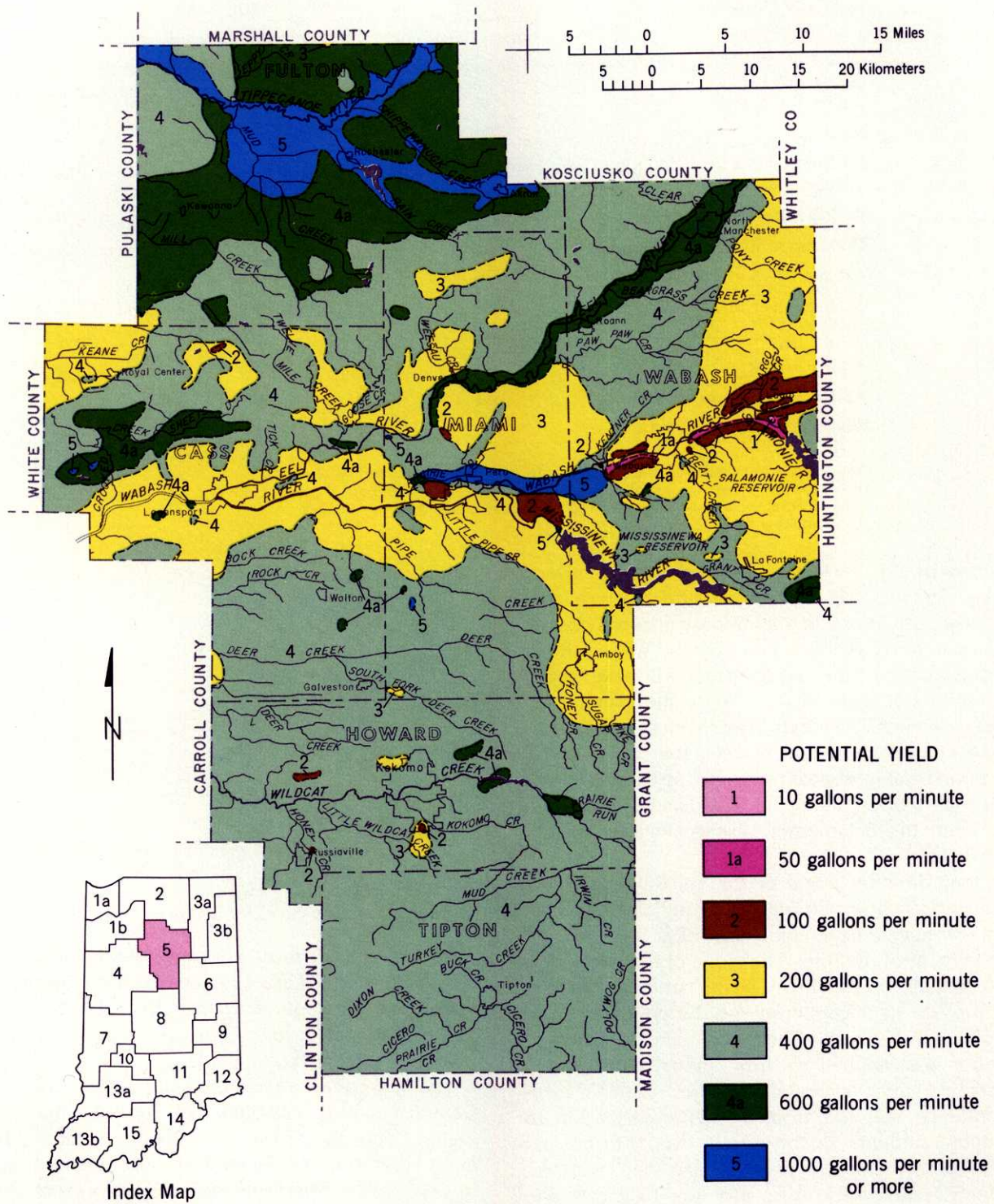


Figure 123
 Map of Region Five showing the general location and potential yield of ground water from properly constructed large diameter wells.

Table 92
Flow characteristics of streams.

Stream	Drainage Area (square miles)	Million-Gallons-Per-Day		
		Average Annual	Q7-10	Q1-30
Chippewanuck Creek near Rochester ^a	44	na	3.2	na
Eel River at Logansport	789	470	63.0	49.0
Eel River at North Manchester	417	230	22.0	12.0
Mud Creek near Windfall ^a	75	na	0.3	na
Tippecanoe River at Ora	856	496	75.0	59.0
Wabash River at Logansport ^b	3,779	2,059	123.0	90.0
Wabash River at Peru ^b	2,686	1,477	59.0	43.0
Wabash River at Wabash ^c	1,768	928	18.0	12.0
Wildcat Creek at Greentown	168	100	1.0	0.6
Wildcat Creek at Kokomo ^a	242	131	6.5	4.3
Wildcat Creek near Jerome	146	77	1.1	0.6

^aFlow characteristics estimated from stream gaging stations with short periods of record.

^bFlows recorded prior to the construction of the Salamonie, Mississinewa and Huntington Lakes.

^cFlows recorded prior to the construction of the Salamonie and Mississinewa Lakes.

na: not available.

Analysis of the low-flow characteristics of surface streams indicates that the largest and most reliable streamflows are those in the Wabash River. The one day, once in thirty year low flows for the Wabash River at Logansport indicate that the river will have a sustained flow of at least 90 mgd, while the average annual flow exceeds 2,000 mgd. These generally excellent low-flow characteristics are a reflection of relatively high ground-water contributions to streamflow from the alluvial aquifers along the river and low-flow releases from the Salamonie, Mississinewa, and Huntington Lakes.

The flow duration curve of the Eel River at North Manchester, as shown by Figure 124, indicates that the stream will have a dependable flow of at least 39 mgd ninety percent of the time. The slope of the curve also indicates that the Eel River basin contains aquifers which provide significant ground-water contribution 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 forty-nine, twenty-three and nineteen percent for dry, average, and wet years, respectively. Conversely, from fifty-one to eighty-one percent of the flow, depending on the year, is due directly to surface runoff from runoff-producing precipitation events or from snowmelt.

Lakes The lakes within the region that are at least 50.0 acres in size or have a storage capacity of 32.5

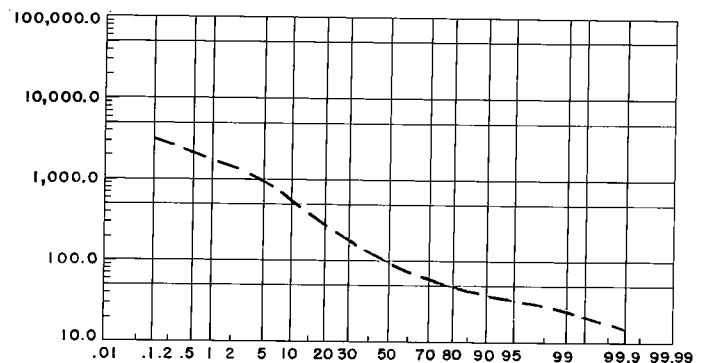


Figure 124

The flow duration curve for Eel River at North Manchester.

million gallons or more are presented in Table 93, and are located on Figure 125. The region's twenty-three lakes have a combined surface area of approximately 7,730 acres and a gross storage capacity of approximately 51,460 million gallons.

The Mississinewa Lake in Miami, Wabash, and Grant Counties and the Salamonie Lake in Wabash and Huntington Counties are two large flood control and recreation reservoirs whose control structures are located in Region Five. Mississinewa Lake has a gross storage of about 24,500 million gallons and a summer surface area of about 3,180 acres. Salamonie Lake has a gross storage of about 19,800 million gallons and a summer surface of about 2,855 acres.

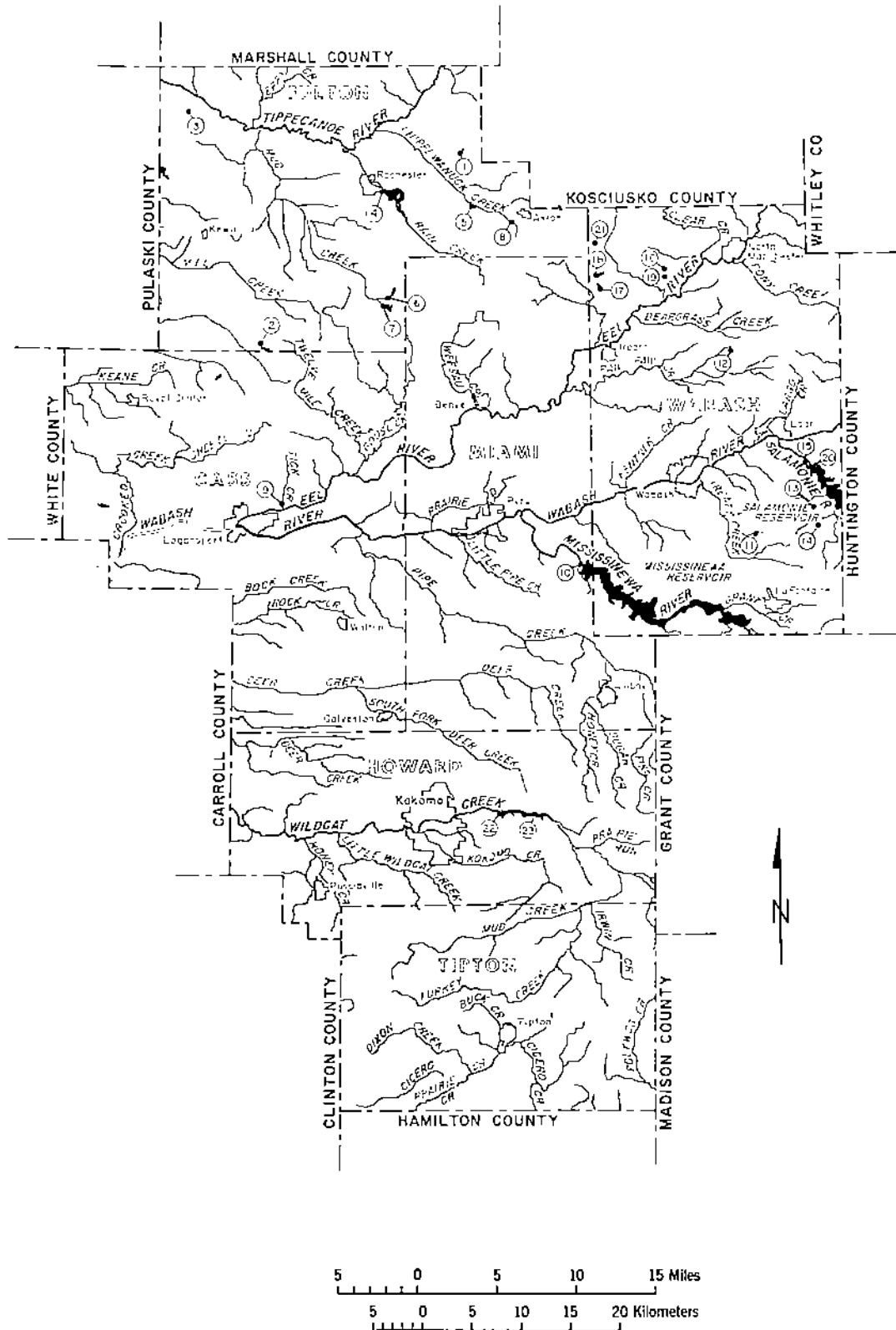


Figure 125
 Map of Region Five showing the location of lakes that are at least 50.0 acres in size or that have a storage capacity of 32.5 million gallons or more.

Table 93
Lakes at least 50.0 acres in size or having 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	Barr Lake	na	22.0	153
2	Fletcher Lake	0.67	45.0	286
3	King Lake	1.98	18.0	58
4	Lake Manitou	44.20	1,156.0	3,311
5	Lake 16	na	27.0	71
6	Nyona Lake	7.59	104.0	436
7	South Mud Lake	4.53	94.0	332
8	Town Lake	2.77	23.0	71
9	Lake Perry	7.75	17.0	43
10	Mississinewa Lake	807.0	3,180.0	24,498
11	Baer Pond	na	na	87
12	Dean Gifford	na	na	49
13	Dick Thomas Pond	na	na	78
14	George Barlow Lake	na	na	53
15	Hominy Ridge Lake Dam	na	13.0	52
16	Long Lake	0.55	48.0	247
17	Lukens Lake	1.76	46.0	329
18	McColley Lake	na	28.0	133
19	Round Lake	na	48.0	175
20	Salamonie Lake	556.0	2,800.0	18,980
21	Twin Lakes	na	18.0	61
22	Kokomo Waterworks Reservoir No. 1	na	na	259
23	Kokomo Waterworks Reservoir No. 2	179.0	40.1	1,699

na: not available.

UTILIZATION OF THE WATER RESOURCE

Instream Uses

The supply and demand analysis for recreational uses of water within Region Five is presented in Table 94. The existing supply for recreational activity is expressed as a percentage of the demand. Therefore, when this percentage exceeds one hundred the supply exceeds the demand. Conversely, when the percentage is less than one hundred the supply is less than the projected demand.

Boating and Waterskiing Region Five contains three of the fourteen largest lakes in Indiana, including Mississinewa Lake, Salamonie Lake and Lake Manitou. These lakes, in conjunction with the Wabash and Tippecanoe Rivers, comprise the major recreational sites for boating and waterskiing in the region.

The demand for boating by residents of the region slightly exceeds the available supply. It is estimated that the supply of open water for boating in 1980 will meet ninety-six percent of the demand. By the year 2000, the boating demand will be met by recreational facilities within the region. A surplus of waterskiing

Table 94
The 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	27	19.6 boats/acre/year	12,700 acres	96	100+	100+
Waterskiing	9	34.4 skiers/acre/year	3,300 acres	100+	100+	100+
Canoeing	8	585 canoes/mile/year	152 miles	100+	100+	100+
Swimming	35	76,600 swimmers/acre/year	18 acres	100+	100+	100+
Ice-Skating	10	6,678 skaters/acre/year	7 acres	54	54	54
Fishing	49	66 persons/acre/year	13,700 acres	54	55	55

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.

opportunities exists within the region and may continue through the year 2000.

Canoeing A total of 152 miles of streams and rivers is available for canoeing in the region. The Wabash, Tippecanoe, and Eel Rivers are the best canoeing streams. The availability of canoeing miles exceeds the demand, and the surplus of canoeing opportunities is expected to continue through the year 2000.

Swimming and Ice-Skating Swimming areas, including both beach and pool acreage, are capable of meeting the demands generated within the region through the year 2000.

The current demand for ice-skating generated by residents within the region exceeds the supply by approximately fifty-four percent. The shortage of ice-skating opportunities is expected to continue through the year 2000.

Fishing The quality of the fisheries habitat is shown in Figure 126. Excellent aquatic habitat is located along the Tippecanoe, Eel, Wabash, Salamonie, and Mississinewa Rivers. The Eel and Tippecanoe Rivers have excellent fishing for smallmouth bass, rock bass, and channel catfish. All streams support a variety of warmwater fish common to Indiana; however, some have lower aquatic habitat from poor water quality, a lack of aquatic vegetation, or altered drainage systems in intensively farmed areas.

Most of the natural lakes are located in Fulton and northern Wabash Counties. The wetlands on Lake Manitou provide spawning habitat for the northern pike population. Bass Lake, Fletcher Lake, and Hominy Ridge Pond are recommended for largemouth bass and other sunfish fishing. The highly-rated, aquatic habitat in Salamonie and Mississinewa Lakes supports such warmwater fish as crappie, striped and white bass, channel catfish, largemouth and smallmouth bass, and northern and walleye pike.

Public access to the streams is limited to state fishing sites on the Eel, Wabash, and Tippecanoe Rivers in Fulton and Wabash Counties or to bridges and private facilities. Several of the lakes in Fulton County have public access sites. Salamonie and Mississinewa Lakes are accessible from state recreation areas and boat ramps. City and county parks may also provide lake access.

The supply of fishing water in Region Five is capable of fulfilling only fifty-four percent of the demand by residents of the region. By the year 2000, fifty-five percent of this demand will be met.

Riparian Habitat The quality of the riparian habitat associated with lakes and streams is indicated in

Figure 127. Many streams in Howard, Tipton, northwestern Cass, and southwestern Fulton Counties are channelized to improve agricultural drainage. When vegetation is removed from their banks, these streams provide little riparian habitat. However, muskrat production is high on those streams that have been sufficiently revegetated. The wooded streambanks of less altered streams such as the Tippecanoe, Wabash, and Eel Rivers, provide habitat for beaver, deer, squirrels, raccoons, and other upland game, and a variety of birds.

Wetlands on the natural lakes, such as Lake Manitou, offer valuable habitat for migratory and resident waterfowl, shorebirds, furbearers, and upland game. The well vegetated shores of Mississinewa and Salamonie Lakes provide upland game habitat, and the wooded swamps in the backwaters are especially attractive for waterfowl and shorebirds. Limited wildlife habitat is offered around heavily developed lakes like Kokomo Lake. Public hunting is allowed on public land located on Salamonie and Mississinewa Lakes.

Withdrawal Uses

Public Water Supplies Cass, Fulton, Howard, Miami, Tipton, and Wabash Counties are served by twenty-six public utilities. Data on public water supply systems follows.

Table 95
The public water supply systems as of 1975.

<i>Counties</i>	<i>Number of Systems</i>	<i>Service Population</i>	<i>Total Average Daily Use in Million-Gallons-Per-Day</i>
Cass	5	22,300	3.8
Fulton	3	6,000	1.2
Howard	4	60,500	14.1
Miami	4	16,400	2.5
Tipton	4	6,500	1.2
Wabash	6	20,600	4.5
Total	26	132,200	27.3

Twenty-two of the public water utilities primarily serve cities or towns, while four public water utilities serve suburban developments near or within existing municipalities. Cass, Howard, Miami, and Wabash Counties each have one subdivision system.

Public water supply systems in Howard County withdrew the largest amount of water in the region, accounting for 14.1 mgd in 1975. Water withdrawals in Wabash County averaged 4.5 mgd. Withdrawals in Fulton and Tipton Counties averaged less than 1.2 mgd. Approximately ten percent of the water withdrawn is consumed. Figure 128 shows the water service areas within Region Five.

On a county-wide basis, Cass County derives

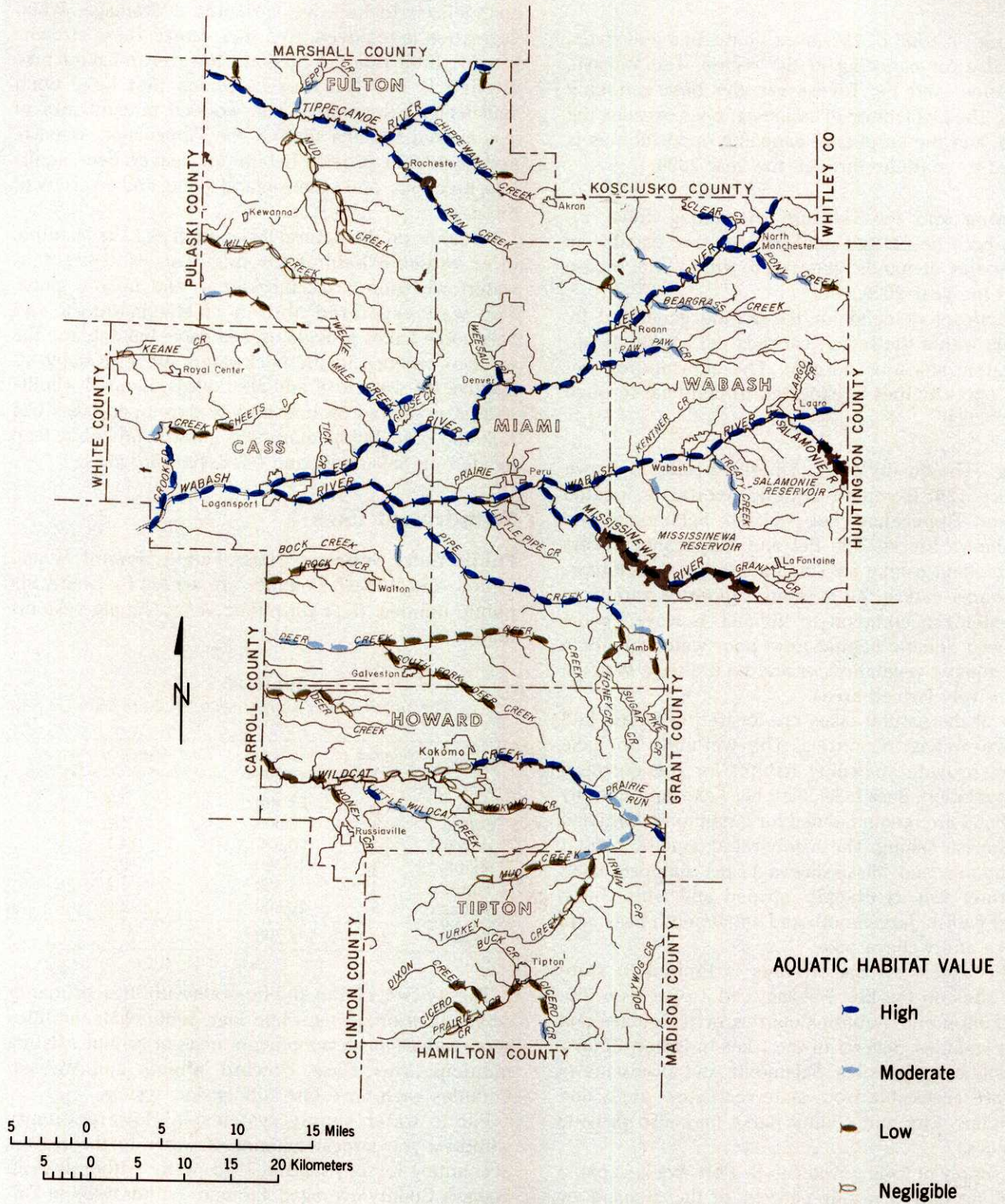


Figure 126
Map of Region Five showing the quality of the fisheries habitat.

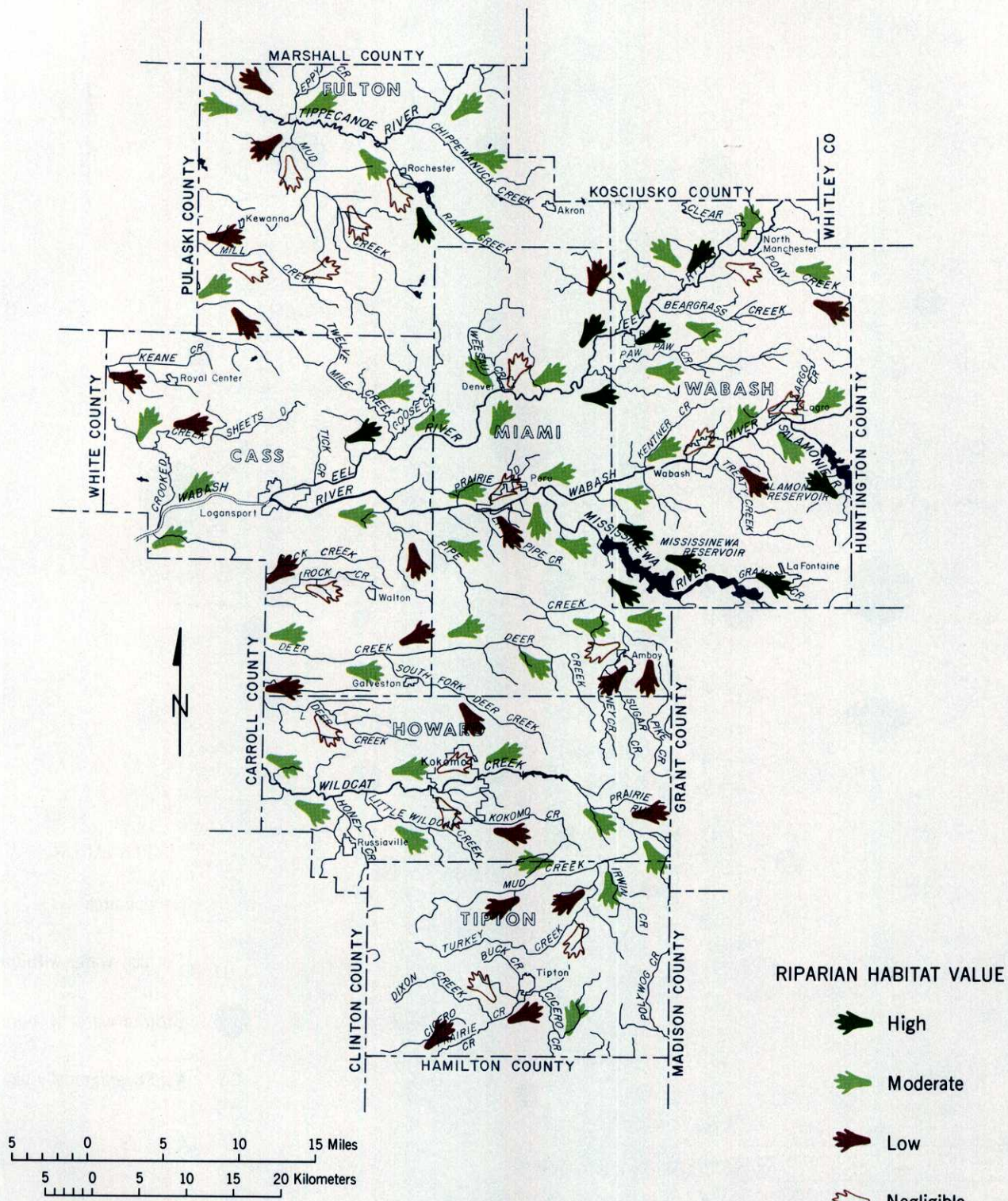


Figure 127
Map of Region Five showing the quality of the riparian habitat.

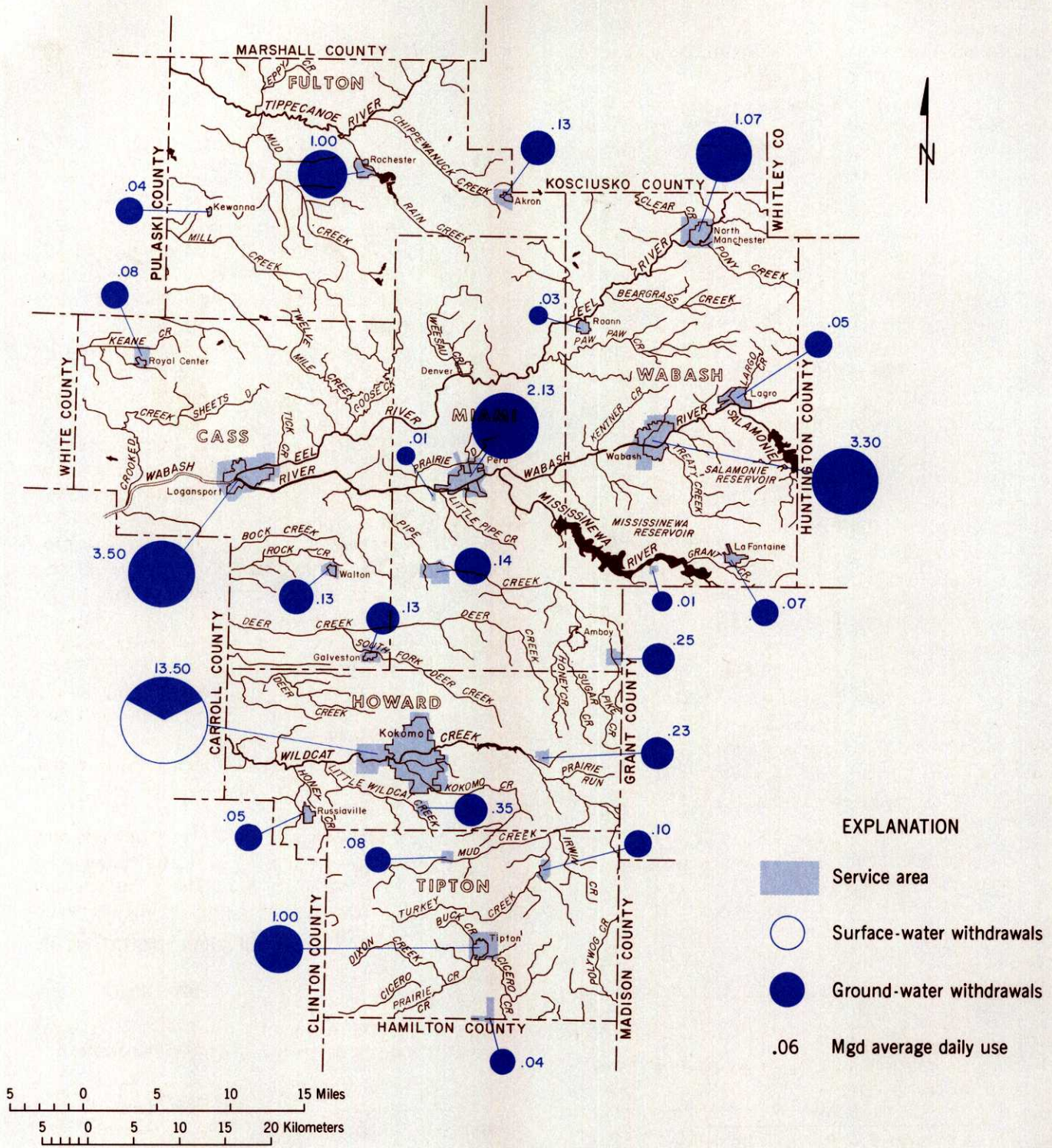


Figure 128
 Map of Region Five showing the service areas of the public water utilities and average daily use in million-gallons-per-day.