



# Region Thirteen-B



Gibson, Pike, Posey, Vanderburgh, and Warrick Counties, located in the extreme southwestern corner of Indiana, form Region Thirteen-B. The region contains approximately 1,879 square miles and is bounded by the East Fork of the White River and Knox and Daviess Counties to the north; Dubois and Spencer Counties to the east; the Ohio River and Kentucky to the south; and the Wabash River to the west, as shown in Figure 227.

The 1975 population was 263,100. The official Indiana Population Projections indicate the region's population will increase to 303,000 by the year 2000, with the major growth in Warrick County. The 1975 population and projections for each county are presented in the following table.

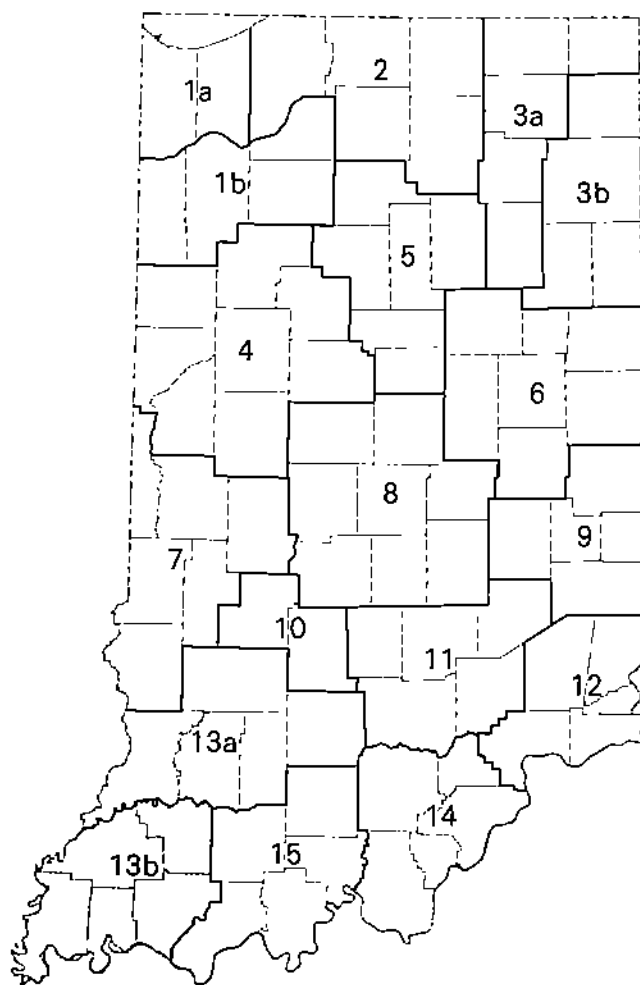
**Table 180**

The 1975 and projected populations for Region Thirteen-B.

County	1975	1980	1990	2000
Gibson	31,400	32,800	34,700	36,400
Pike	12,100	12,100	11,900	11,900
Posey	22,800	24,500	28,100	32,400
Vanderburgh	162,800	159,900	153,400	144,400
Warrick	34,000	41,000	57,000	77,900
Total	263,100	270,300	285,100	303,000

Vanderburgh County, with the city of Evansville, is by far the most populous county in the region. Other major urban areas include Mt. Vernon in Posey County, Princeton in Gibson County, and Booneville in Warrick County.

Agriculture is the dominant land use within the re-



**Figure 227**

Map of Indiana showing the location of Region Thirteen-B.

gion, comprising more than sixty-six percent of the area. Approximately twenty-one percent of the land is forested while the remaining thirteen percent represents urban and miscellaneous uses.

Nonmanufacturing businesses along with the manufacturing industry employ the greatest numbers of the region's work force. The largest employer in the nonmanufacturing sector is wholesale and retail trade followed by services and construction. The three leading industries in the manufacturing sector are transportation, furniture, and fabricated metals. Vanderburgh County and the city of Evansville constitute the leading employment center.

Average annual precipitation for the region is approximately 43.0 inches, with average monthly values ranging from a high in March of 4.5 inches and a low in October of 2.4 inches. Of the 43.0 inches of precipitation, approximately 28.0 inches are consumed through evapotranspiration while 15.0 inches appear as streamflow. Average temperatures range from 33°F. in January to 78°F. in July. The average annual temperature is 56°F. The average annual prevailing wind at the Evansville Dress Regional Airport is from the south to southwest at 8.3 miles per hour.

## THE WATER RESOURCE

### Ground Water

The availability of ground water is associated with the nature and type of aquifer materials present in a given area. In this region there is a pronounced variability in ground-water occurrence, as shown in Figure 228. The region can be divided into two broad areas based on geology and the resulting ground water occurrence. The first area is composed primarily of glacial outwash sand and gravel that is present in the Ohio River, Wabash River, and the White River valleys. These sand and gravel deposits are capable of producing over 1,000 gallons-per-minute (gpm) from large diameter wells and they comprise the major ground-water resource in the region.

The second area consists of rolling plains underlain by deposits of glacial till, lake clays, outwash sand and gravel, loess, and bedrock. The unconsolidated deposits located outside of the river valleys range in thickness from less than five to over 125 feet and are capable of producing from 50 to 400 gpm. Bedrock deposits consist of Pennsylvanian sandstone, shale, coal, and limestone. Because of the generally low permeabilities of these rocks the bedrock is a limited source of water, usually producing less than ten gpm. The Inglesfield sandstone, which is present in Gibson, Posey, and Vanderburg Counties, may produce from 25 to 50 gpm.

Water hardness values vary considerably from 205

parts-per-million (ppm) for Booneville to 690 ppm at Fort Branch. Soft water, below 180 ppm, occurs in parts of Warrick and Pike Counties. "Soda" water, with a pH of between eight and ten, occurs in parts of Warrick County.

Iron content levels range between 0.1 to 3.0 ppm. More than half of the municipalities provide iron removal facilities. Manganese contents reach higher levels than normal along the White River in northern Pike County and along the Ohio River and Little Pigeon Creek in Warrick County. The sand and gravel deposits contained in the Wabash River valley show both low iron and manganese levels.

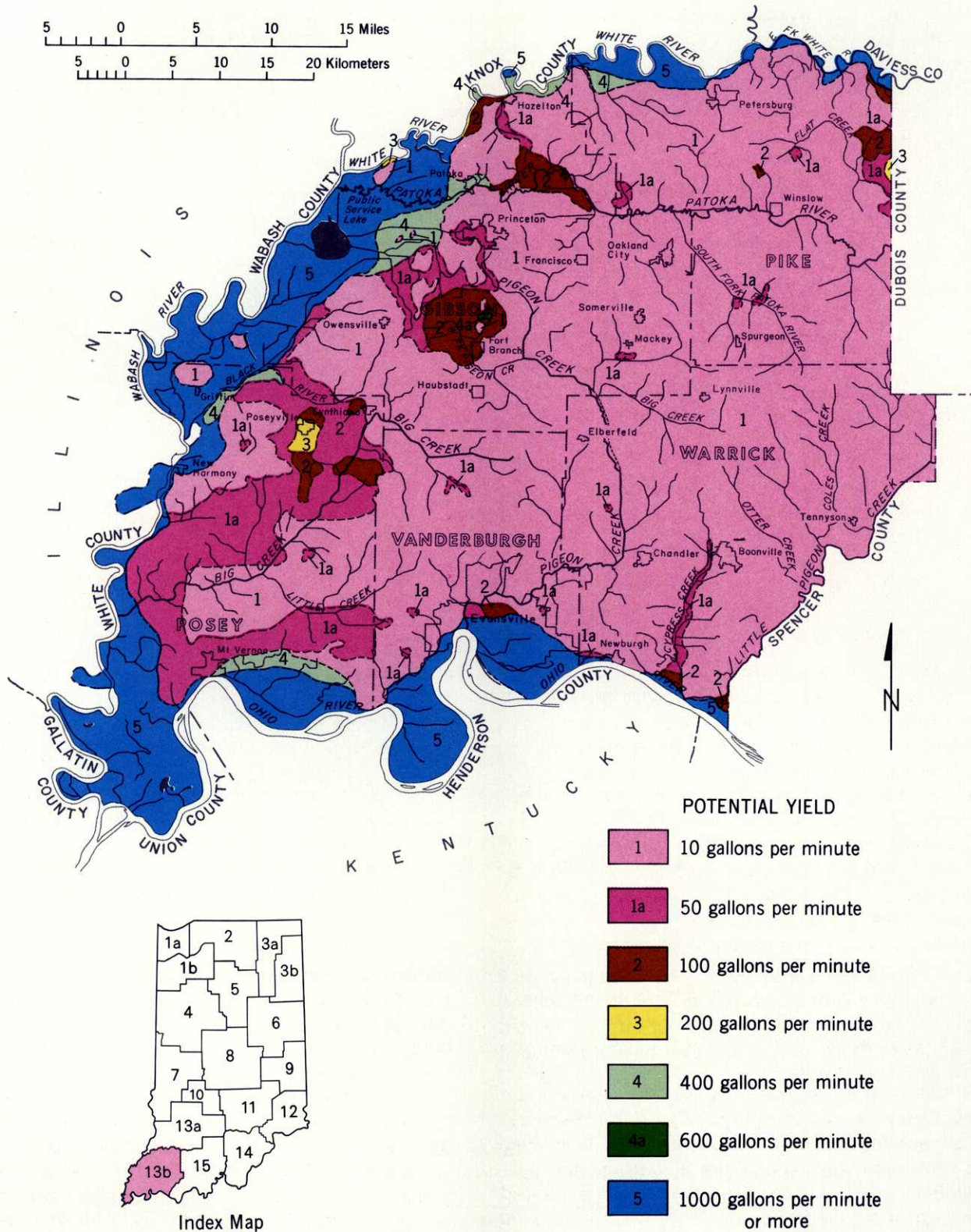
### Surface Water

**Streamflow** Region Thirteen-B is bordered on the south by the westward flowing Ohio River, on the north by the westward flowing White River, and on the west by the southward flowing Wabash River. Drainage within the region is affected primarily by the Patoka River, Pigeon Creek, Little Pigeon Creek, Big Creek, and their tributaries. Generally, streams flowing westward are part of the Wabash River basin, and the southward flowing streams enter directly into the Ohio River.

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 Thirteen-B are shown in Table 181.

The low-flow characteristics indicate that the largest and most reliable streamflows are those in the Ohio River. Flows in the Ohio River are modified by reservoirs built by the U.S. Army Corps of Engineers upstream in the Ohio River basin, resulting in a reduction in flood flows and an increase in low flows. Likewise, the reservoirs built by the U.S. Army Corps of Engineers in the Wabash River basin modify flows in the White and Wabash Rivers.

The Patoka River near Princeton has an average flow of 620 mgd. The flow duration curve, as presented in Figure 229, indicates the stream will have a dependable flow of at least ten mgd ninety percent of the time. The flow duration curve indicates the Patoka River contains aquifers that provide minimal 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 seventeen, fourteen, and five percent for dry, average, and wet years, respectively. Conversely, from eighty-three to ninety-five percent of the flow, depending on the year, is due to direct surface runoff from runoff-producing precipitation events or from snowmelt.

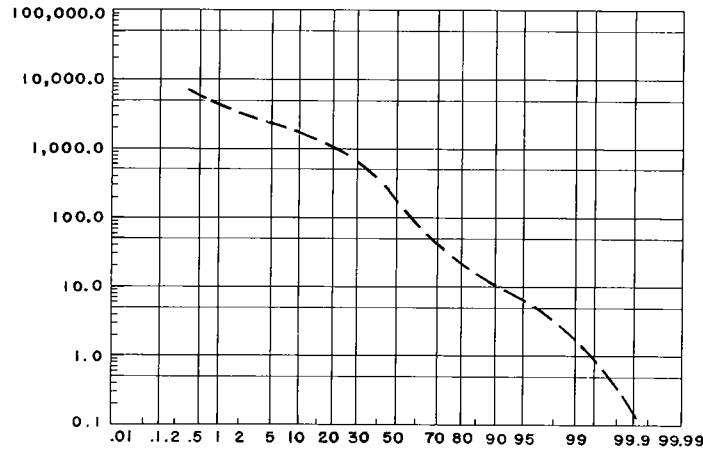


**Figure 228**  
 Map of Region Thirteen-B showing the general location and potential yield of ground water from properly constructed large diameter wells.

**Table 181**  
Flow characteristics of streams

Stream	Drainage Area (square miles)	Million-Gallons-Per-Day		
		Average Annual	Q7-10	Q1-30
Ohio River at Evansville	107,000	133,300	10,650.0	na
Patoka River near Princeton	822	620	1.1	0.1
Patoka River at Winslow	603	430	0.7	0.2
Pigeon River at Evansville	326	133	0.0	na
Wabash River at Mt. Carmel, Illinois	28,600	17,000	1,500	1,100
White River at Petersburg	11,125	7,300	490	370

na: not available.



**Figure 229**  
The flow duration curve for the Patoka River near Princeton.

**Lakes** The lakes within the region of at least 50.0 acres in size or with a storage capacity of 32.5 million gallons or more are listed in Table 182 and are located in Figure 230. These twenty-six lakes have a combined

surface area of approximately 982 acres and a gross storage capacity of approximately 13,832 million gallons.

**Table 182**  
Lakes at least 50.0 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	Gibson Public Service Lake	na	na	9,351

Table 182 (continued)

Lake Number	Lake Name	Drainage Area (square miles)	Surface Area (acres)	Gross Storage (million gallons)
2	Lake Gibson	na	9.0	35
3	New Lake	na	60.0	391
4	Old Lake	na	12.0	52
5	Augusta Lake	na	65.2	224
6	Ends Lake	na	10.0	78
7	Forest Homes Lake	0.90	34.0	81
8	Grey Lake	na	15.1	65
9	Lake Helmerich	1.82	75.0	162
10	Prides Creek Structure No. 4	0.79	90.0	367
11	Seven Lakes	na	na	104
12	Hovey Lake	6.36	253.0	na
13	Patoka Camp Lake	na	14.6	84
14	Bell Conservation Lake	na	13.0	65
15	Edgewater Lake	na	13.0	84
16	Harold Mann Lake	na	na	368
17	Lake Talahi	0.14	27.0	97
18	Lloyd Hahn Lake	na	na	130
19	Matre Dei Provinial Lake	na	na	169
20	Schnake Lake	na	15.0	65
21	Woodland Lake	na	23.0	156
22	Hendrickson Lake	na	13.0	52
23	Refuse Reservoir	0.63	89.0	870
24	Scales Lake	na	66.0	169
25	Washing-recirculating Reservoir	na	60.0	547
26	Yellow Bank Lake	0.38	25.8	66

na: not available.

## UTILIZATION OF THE WATER RESOURCE

### Instream Uses

The supply and demand analysis for recreational uses of water by the residents of the region are pre-

sented in Table 183. 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 supply is less than one hundred the supply is less than the projected demand.

Table 183  
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	23	19.6 boats/acre/year	27,000 acres <sup>a</sup>	100+	100+	100+
Waterskiing	9	34.4 skiers/acre/year	19,700 acres <sup>b</sup>	100+	100+	100+
Canoeing	3	585 canoes/mile/year	145 miles	100+	100+	100+
Swimming	34	76,600 swimmers/acre/year	14 acres <sup>c</sup>	100	100	100
Ice-Skating	1	6,678 skaters/acre/year	0 acres	0	0	0
Fishing	37	66 persons/acre/year	39,300 acres <sup>d</sup>	100+	100+	100+

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 non-residents considered.

<sup>a</sup>Includes 17,100 acres of the Ohio River and 9,900 acres of inland waters.

<sup>b</sup>Includes 17,100 acres of the Ohio River and 2,600 acres of inland waters.

<sup>c</sup>Does not include the Ohio River.

<sup>d</sup>Includes 17,100 acres of the Ohio River and 22,200 acres of inland waters.

**Boating and Waterskiing** The recreational lakes and the acreage available in the Ohio, Wabash, and White Rivers constitutes the major boating and waterskiing resources in the region. This available supply will meet the projected demand for boating and waterskiing through the year 2000.

**Canoeing** There are approximately 145 miles of free-flowing streams with sufficient base flow to provide opportunity for canoeing. This available supply will meet the projected demand for canoeing mileage through the year 2000.

**Swimming and Ice-Skating** Estimates for 1980 indicate that the demand for swimming opportunities is approximately equal to the available supply. Projections indicate that by the year 2000 the demand may slightly exceed the supply of swimming opportunities. The lack of ice-skating opportunities does not approach supplying the current or projected demands.

**Fishing** The quality of the fisheries habitat is shown on Figure 231. The Ohio, Wabash, and White Rivers, have excellent fisheries habitat. The Ohio and Wabash Rivers offer drum, catfish, and buffalo for commercial fishing, and all three rivers contain warmwater gamefish. Water quality and channelization have adversely affected the aquatic habitat on other streams. Low flow during dry seasons limits the fishery in some of the small streams. Warmwater fish found in the streams include sunfish, catfish, and various rough and forage fish.

Sport fishing is best in the lakes. Warmwater fish, including sunfish and catfish, abound in the lakes, many of which are abandoned coal strip mine lakes. Bethel Pit, in the Patoka Fish and Wildlife Area is stocked with trout in addition to the native, warmwater fish.

Public fishing sites for streams, are located at the Harmonie State Recreation Area, Dogtown Ferry, and New Harmony for the Wabash River. Pike State Forest offers fishing access to the Patoka River. Lake fishing is available at the Patoka Fish and Wildlife Area, Hovey Lake, Scales Lake, and Prides Creek Reservoir. Bridge crossings provide another means of public access for fishing in streams. The demand for fishing waters generated by residents of the region are adequately met and may continue to be met through the year 2000.

**Riparian Habitat** The quality of the riparian or wildlife habitat associated with streams and lakes is indicated on Figure 232. Riparian habitat along the Ohio, Wabash, White, and Patoka Rivers is very good. The wooded banks and wetlands associated with these rivers provide excellent habitat for waterfowl,

shorebirds, furbearers, and most upland wildlife. Although most smaller streams have been channelized in this region, some have recovered with enough vegetation to offer fairly good habitat. Others, such as Big Creek, lack sufficient bank vegetation to provide good wildlife habitat.

Since the lakes have little development, most supply good riparian habitat. Hovey Lake, in particular, attracts a great number of migratory and resident waterfowl. Other lakes, especially the strip mine lakes, provide habitat attractive to most upland game, furbearers, and birds.

Hunting in riparian areas is permitted at Hovey Lake and Patoka State Fish and Wildlife Area as well as the Pike State Forest. Limited public access for hunting is also available on county and private land with permission of the landowners.

**Hydroelectric Power** Due to the limitations of topography and streamflow characteristics there are no commercial hydroelectric installations here. However, the best opportunity for future developments are the U.S. Army Corps of Engineers' dam projects on the Ohio River at Newburgh and Uniontown.

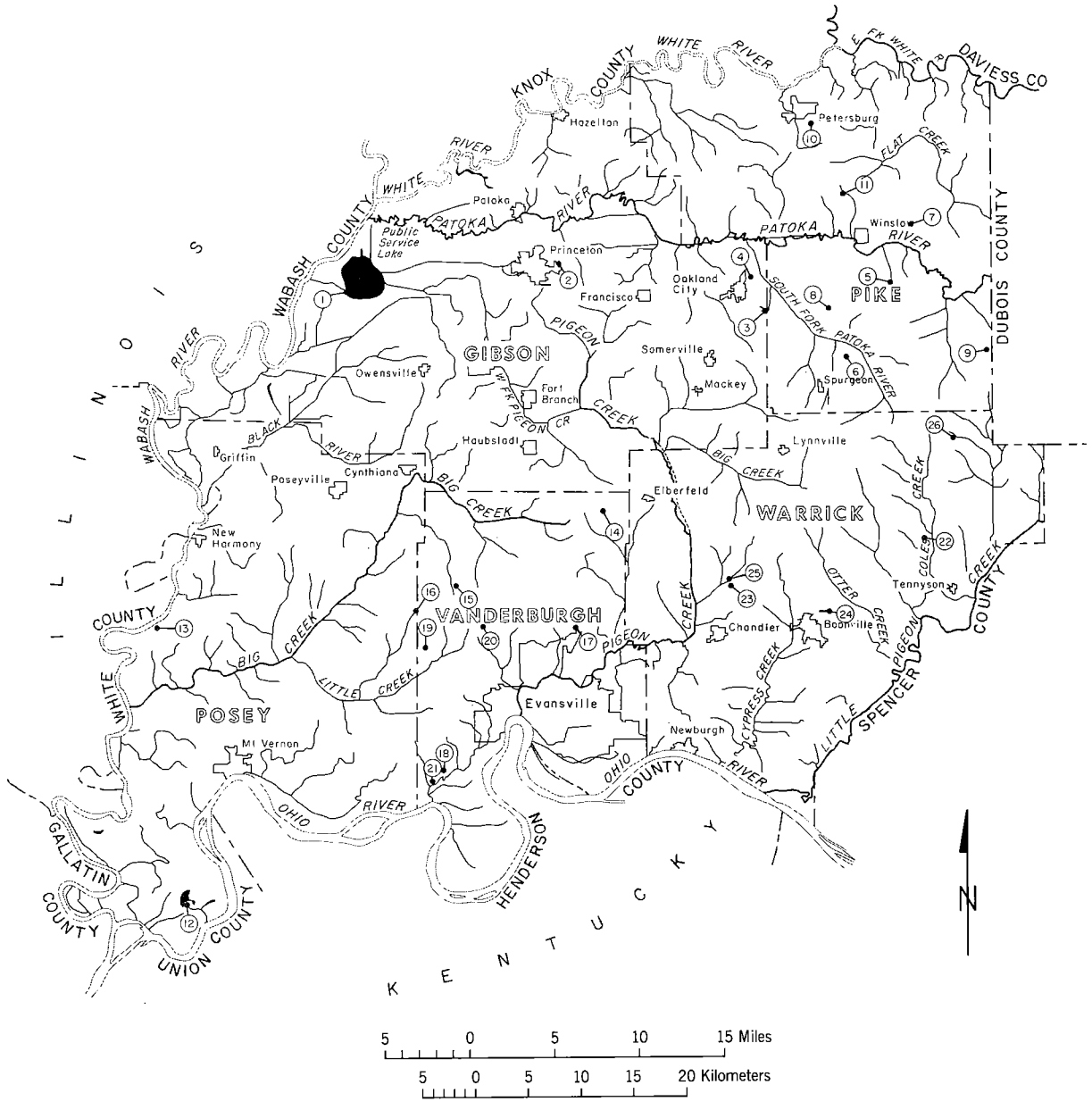
**Commercial Navigation** The region contains two lock and dam systems. Uniontown Dam is located in Posey County. Newburgh Dam is located in Warrick County. In 1974 these structures passed forty-five million tons and thirty-five million tons of cargo, respectively. The Ohio River Basin Commission projects Newburgh and Uniontown Dams, respectively, may pass ninety and one hundred and ten million tons of cargo by the year 2000.

The three components of the Ohio system outside the region that affect the overall system efficiency and, therefore, the future volume of traffic on the waterway are the three locks on the dam near Gallipolis, Illinois.

The Southwind Maritime Center located near Mount Vernon in Posey County consists of a river port, a marina, and terminal facilities to accommodate water, rail, and truck transportation. Construction began in 1971 and is still under way although the port is accepting cargo. Between 1976 and 1977 the port handled approximately 156,000 tons of cargo. Projections from the Indiana Port Commission indicate an increase in cargo over the next five years ranging from four to six million tons.

## **Withdrawal Uses**

**Public Water Supplies** Gibson, Pike, Posey, Vanderburgh, and Warrick Counties are served by twenty-eight public water utilities. Twenty-one of these utilities are municipal systems, six are rural systems,



**Figure 230**  
 Map of Region Thirteen-B showing the location of lakes that are at least 50.0 acres in size  
 or with a storage capacity of 32.5 million gallons or more.



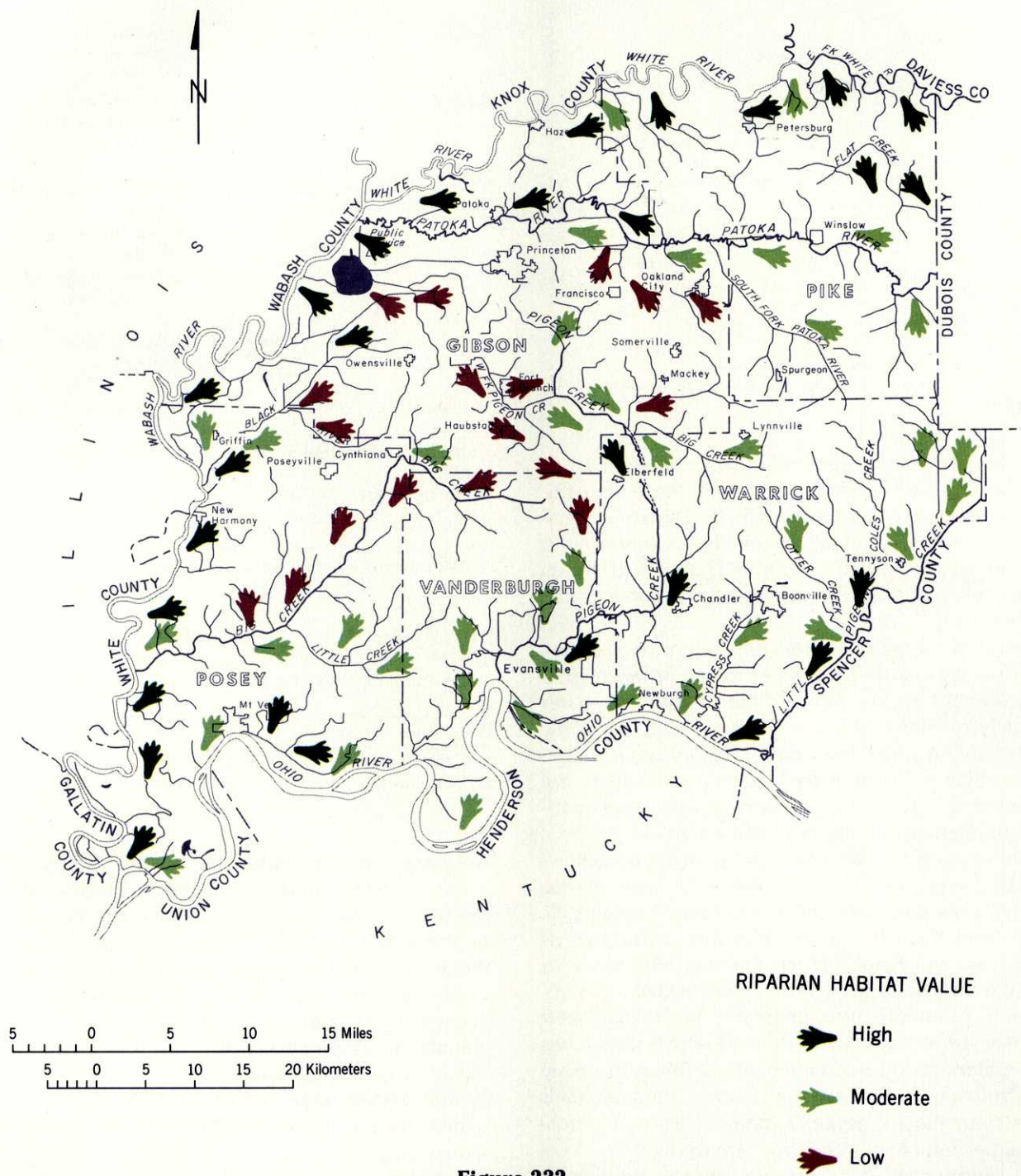


**AQUATIC HABITAT VALUE**

- █ High
- █ Moderate
- █ Low
- Negligible

**Figure 231**  
Map of Region Thirteen-B showing the quality of the fisheries habitat.





**Figure 232**  
 Map of Region Thirteen-B showing the quality of the riparian habitat.

and one is a subdivision system in Evansville. Information on the public water utilities in the region is presented in the following table.

**Table 184**

The public water supply systems as of 1975.

Counties	Number Systems	Service Population	Average Daily Withdrawals in Million-Gallons-Per-Day
Gibson	9	17,400	2.70
Pike	6	7,800	1.37
Posey	4	9,900	2.34
Vanderburgh	3	134,700	29.56
Warrick	7	14,100	2.20
Total	29*	184,000	38.07

\*Because of multi-county systems, the county totals do not add up to the regional total.

The largest, county-wide use of water is by the three systems in Vanderburgh County. These systems withdrew an average of 29.6 mgd in 1975. The six systems in Pike County account for the smallest withdrawals of water at 1.4 mgd in 1975. Figure 233 shows the water service areas and water withdrawals of public water utilities.

Several of the public water utilities not only supply their own systems, but sell water to one or more other utilities in the region. Most of the utilities use water originally obtained within a county of use, but some utilities obtain water from out-of-county utilities. The relationships between system sellers and buyers are presented in Table 185. There is at least one multi-county system, extending into two counties.

Eight systems in the region, including some sellers and purchasers, utilize surface water to some extent. Evansville obtains most, and Mount Vernon obtains all, water from the Ohio River. Winslow withdraws its water from the Patoka River, Lynville withdraws its supply from a strip mine lake, while Oakland City relies on water supply impoundments. The Stendal Water Company buys water from Holland which also relies on a water supply impoundment. German Township and Cynthiana in Vanderburgh County purchase their water from the Evansville system. Newburgh purchases a portion of its water from Evansville.

The twenty-eight utilities in the region withdrew an average of 38.1 mgd in 1975. Approximately twenty percent was withdrawn from surface water sources while eighty percent was withdrawn from groundwater sources.

Projections of public water utilities indicate that withdrawals may increase to approximately 48.1 mgd by the year 2000, as shown in Table 186.

**Table 185**

Public water system sellers and purchasers.

Sellers	Purchasers
Boonville Water Works	Tennyson Water Utility Gentryville Water Utility <sup>b</sup>
Chandler Water	Elberfield Water Indiana Cities Water Corp., Newburgh
Evansville Water Department	German Township Water District Indiana Cities Water Corp., Newburgh Cynthiana Water Works, via German Twp.
Fort Branch Municipal Water Utility	Haubstadt Municipal Water Utility
Holland Water Works <sup>a</sup>	Stendal Water Corporation
Petersburg Municipal Water Utility	Pike-Gibson, Inc.
Princeton Water Works	Patoka Corporation

<sup>a</sup>This seller is located outside of the region.

<sup>b</sup>This purchaser is located outside the region.

**Table 186**

The 1977 and projected water withdrawal and consumption rates for public water supplies, in million-gallons-per-day.

Public Water Supply	1977	1980	1990	2000
Withdrawal	38.1	38.7	43.3	48.1
Consumption	4.2	4.3	4.8	5.3

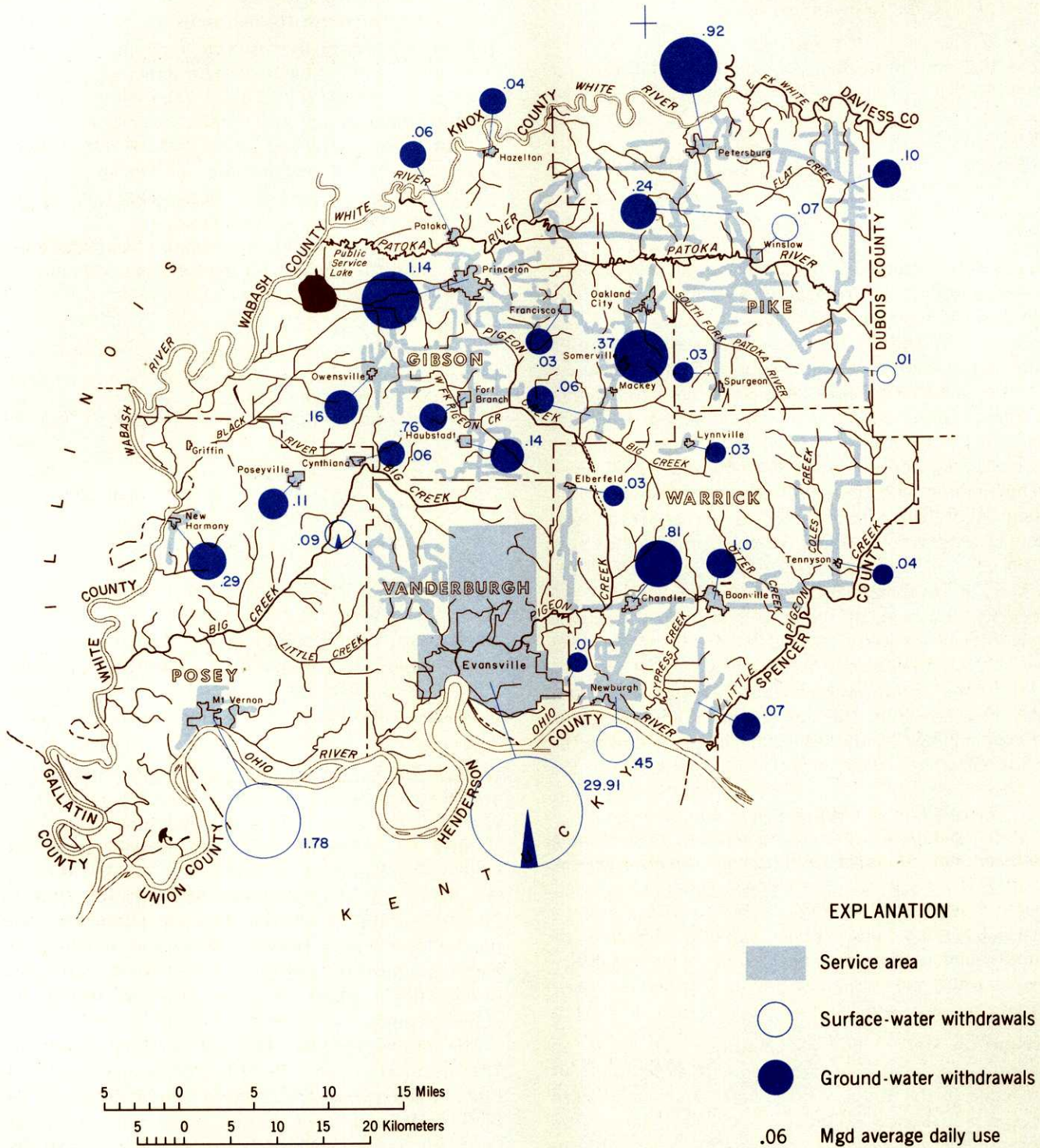
**Industrial Water** Industrial establishments had an estimated water intake averaging 27.3 mgd in 1977. Of the total industrial intake, 12.0 mgd was self-supplied by the industries while 15.3 mgd was purchased from the region's public water utilities. The self-supplied water is withdrawn from both surface-water and ground-water sources and is consumed during the manufacturing process at the rate of 1.4 mgd.

The largest water-using industry group is primary metals. Other large industrial water users include manufacturers of rubber and plastics and the electrical industries.

Although industrial output is expected to increase, total industrial water intake is expected to decrease initially due to plant efficiency and then rise slowly as output increases.

Water supplied by public utilities to industries is expected to decrease to 14.1 mgd by the year 2000, while the self-supplied water withdrawals may increase to 14.6 mgd by the year 2000. The 1977 and projected





**Figure 233**  
Map of Region Thirteen-B showing the service areas of the public water utilities and average daily use in million-gallons-per-day.