



*The
Regional
Analysis*

Region One-A



Lake and Porter Counties, located in the extreme northwest corner of Indiana, form Region One-A. The region contains approximately 939 square miles and is bounded by Lake Michigan to the north, the Porter-LaPorte county line to the east, the Kankakee River to the south, and the Indiana-Illinois state line to the west, as shown in Figure 51.

The population of Region One-A in 1975 was 643,084, of which eighty-five percent resided in Lake County. The official Indiana projections for 1975 to the year 2000 indicate that the region's population may increase by nineteen percent. The major population growth is expected to occur in Porter County. The projections for each county follow.

Table 29

The 1975 and projected populations for Region One-A.

County	1975	1980	1990	2000
Lake	546,757	559,100	578,800	585,700
Porter	96,327	107,800	140,700	181,300
Totals	643,084	666,900	719,500	767,000

The major population centers within the region are Hammond, Gary, and East Chicago in Lake County, and Valparaiso and Portage in Porter County. These urban centers accounted for fifty-six percent of the region's 1975 population.

One of the world's largest industrial and commercial complexes is located within the region along the shoreline of Lake Michigan. The lake provides a plentiful supply of water and invaluable transportation for this industrial complex.

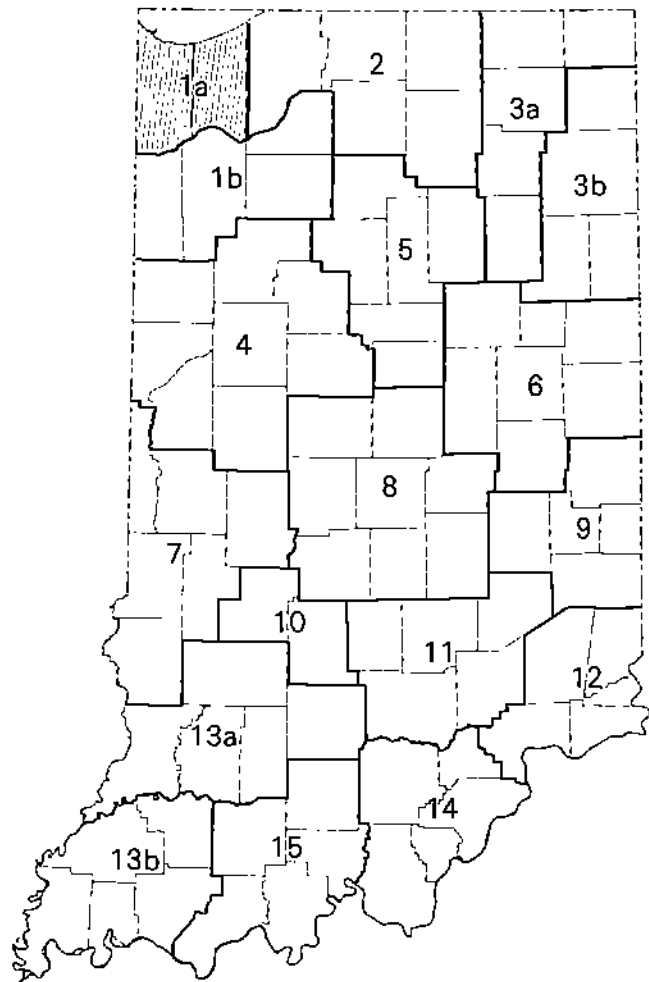


Figure 51

Map of Indiana showing the location of Region One-A.

More than seventy percent of the region's work force was employed within Lake County during 1975. Manufacturing provides approximately forty-seven percent of the total employment while wholesale and retail enterprises provide approximately twenty-two percent.

Agriculture is the dominant land use within the region with more than sixty-seven percent of the area devoted to this purpose. Approximately seven percent of land is forested while the remaining twenty-six percent is urban and miscellaneous land uses.

The region is generally characterized by flat to gently rolling topography, with the exception of the sand dunes associated with the current shoreline of Lake Michigan. The dominant land form is the Valparaiso Moraine which forms the major drainage divide within the region. Streams located north of the moraine flow toward Lake Michigan, while those located south flow into the Kankakee River.

The climate of the region is directly influenced by Lake Michigan. Such influence is most pronounced just inland from the shore of the lake and diminishes rapidly with distance. Cold air passing over the warmer lake water produces precipitation leeward of Lake Michigan in the fall and winter. In the spring, daily maximum temperatures are lower near the lake because of the cooling effect of the lake. Average minimum temperatures in the fall are higher in northwestern Indiana than those further to the south.

Average annual precipitation in the region is approximately 36.0 inches with average monthly values ranging from a high of 4.0 inches in April to a low of 1.5 inches in February. Of the 36.0 inches of average annual precipitation approximately 26.0 inches are consumed through evapotranspiration while approximately 10.0 inches appear as streamflow. The region has average temperatures ranging from 24°F. in January to 73°F. in July. The average annual temperature is 50°F. Data from the nearest recording weather station, Chicago Midway Airport, indicates the annual prevailing wind is from the west at 10.4 miles per hour.

THE WATER RESOURCE

Ground Water

The unconsolidated deposits located in Region One-A were formed by glacial action, wind, and shoreline processes associated with ancestral Lake Michigan. The thickness of these materials varies from less than 50 to over 300 feet; and the types of deposits present include lake clays, glacial till, dune sand, and outwash sand and gravel. Sand and gravel deposits serve as important aquifers in much of the area, particularly south of the Valparaiso Moraine. Fine sand

and lake clays, which predominate in areas near Lake Michigan, do not constitute a major ground-water source.

Beneath these materials are found bedrock formations of Silurian and Devonian ages. The youngest of these rocks is the black shale found beneath the unconsolidated deposits in nearly all of Porter County. In Lake County, Silurian and Devonian limestones and dolomites form the underlying bedrock and represent an important source of ground water, especially in the southern and western portions of the county.

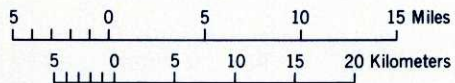
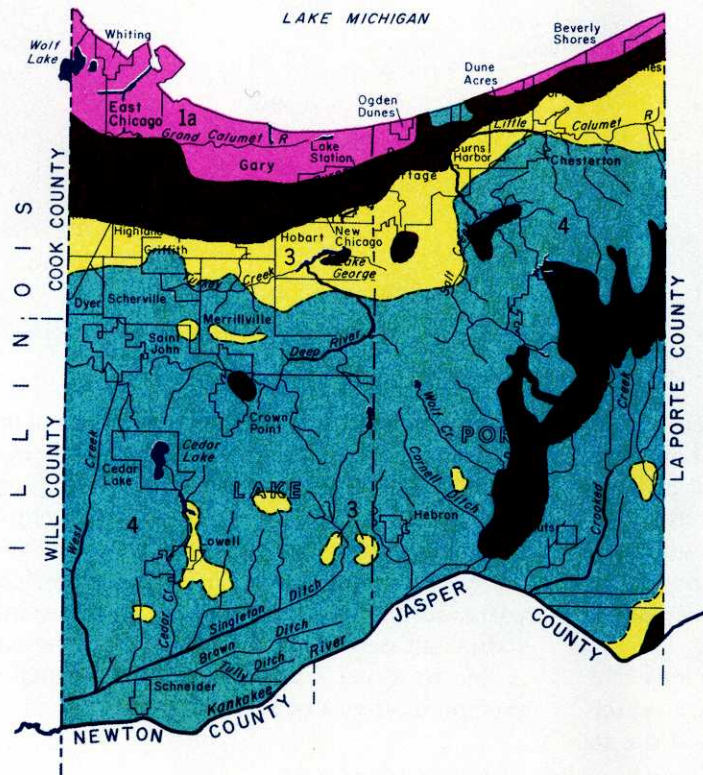
The availability of ground water is associated with the nature and type of aquifer materials present in a given area. In this region, there is a pronounced variability in ground-water occurrence from north to south, as shown in Figure 52. In areas near Lake Michigan, well yields are generally less than 100 gallons-per-minute (gpm) and may be even lower in some localities. Shallow, fine sand is the primary aquifer source in these areas and does not yield water readily. Beneath the sand are found either fine grained lake clays or glacial till deposits which do not yield water. Further south, well yields improve appreciably where outwash sand and gravel deposits occur that are capable of producing 200 to 600 gpm. These deposits are associated with the Kankakee River valley and are thickest in eastern Porter County. In addition, higher well yields are also obtainable in southwestern Lake County from the Silurian limestone-dolomite aquifer, although hydrogen sulfide may be encountered in some instances.

Ground water within the region is generally hard (300 to 500 parts-per-million), although ground water in the southern and eastern portions of the region is softer (90 to 210 parts-per-million).

Surface Water

Streamflow The majority of streams in Lake and Porter Counties have their origins within the two counties and do not have large drainage areas. These streams have their headwaters near the center of the counties on the low ridges that parallel the Lake Michigan shoreline. They either flow south into the Kankakee River or northward into the Little Calumet River and Lake Michigan. The only streams of consequence originating outside the two counties are Plum Creek which originates in Will County, Illinois, and the Little Calumet River which has its source in LaPorte County.

The Calumet River system has a long history of modifications, flow reversals and diversions into and out of the river. The river is known as the Grand Calumet or the Little Calumet. The Little Calumet River in Indiana is divided into the east and west arms. About seven miles of the west arm has been replaced



- POTENTIAL YIELD**
- 1a 50 gallons per minute
 - 100 gallons per minute
 - 3 200 gallons per minute
 - 4 400 gallons per minute
 - 600 gallons per minute



Index Map

Figure 52
Map of Region One-A showing the general location and potential yield of ground water from properly constructed large diameter wells.

by Burns Ditch. Burns Waterway furnishes the outlet into Lake Michigan for the east arm of the Little Calumet River, Deep River, and all of the west arm of the Little Calumet River east of Griffith. From Griffith westwardly, the Little Calumet flows into Illinois and eventually into the Illinois River. The Grand Calumet

River discharges its limited flows into Lake Michigan by way of the Indiana Harbor Canal.

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 within Region One-A are presented below.

Table 30
Flow characteristics of streams.

Stream	Drainage Area (square miles)	Million-Gallons-Per-Day		
		Average Annual	Q7-10	Q1-30
Deep River below Lake George in Hobart	124	60	3.3	2.5
East Arm Little Calumet River at Porter	66	46	13.0	11.0
Kankakee River at Dunns Bridge	1,352	825	210.0	180.0
Kankakee River at Shelby	1,779	1,010	270.0	220.0
West Arm Little Calumet River at Munster (Flows into Illinois)	90	43	2.1	1.3

The low-flow characteristics indicate that the largest and most reliable streamflow is that of the Kankakee River. The Kankakee has a sustained flow of at least 220 million-gallons-per-day (mgd), and its average annual flow exceeds 1,000 mgd. The flow duration curve for the Kankakee River at Shelby, as shown by Figure 53, indicates the stream will have a dependable flow of at least 400 mgd ninety percent of the time.

The slope of the flow duration curve indicates that the Kankakee 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 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.

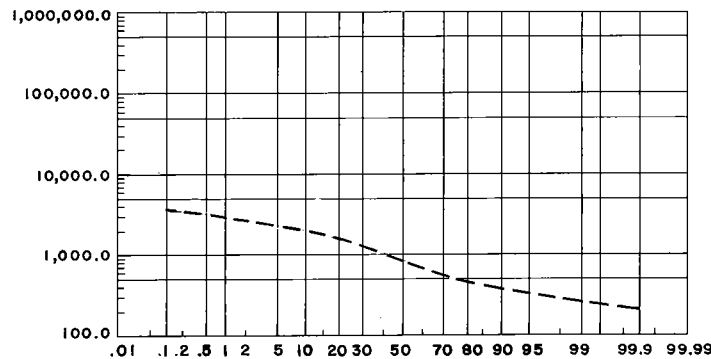


Figure 53
The flow duration curve for the Kankakee River at Shelby.

Lakes Lake Michigan is the dominant water feature within the region, and is the major source of industrial and public water supplies. Approximately 154,000 acres of Lake Michigan are included within Indiana.

The remaining fourteen 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 31 and are located on Figure 54. These lakes have a combined surface area of approximately 2,770 acres with a gross storage capacity of approximately 4,900 million gallons.

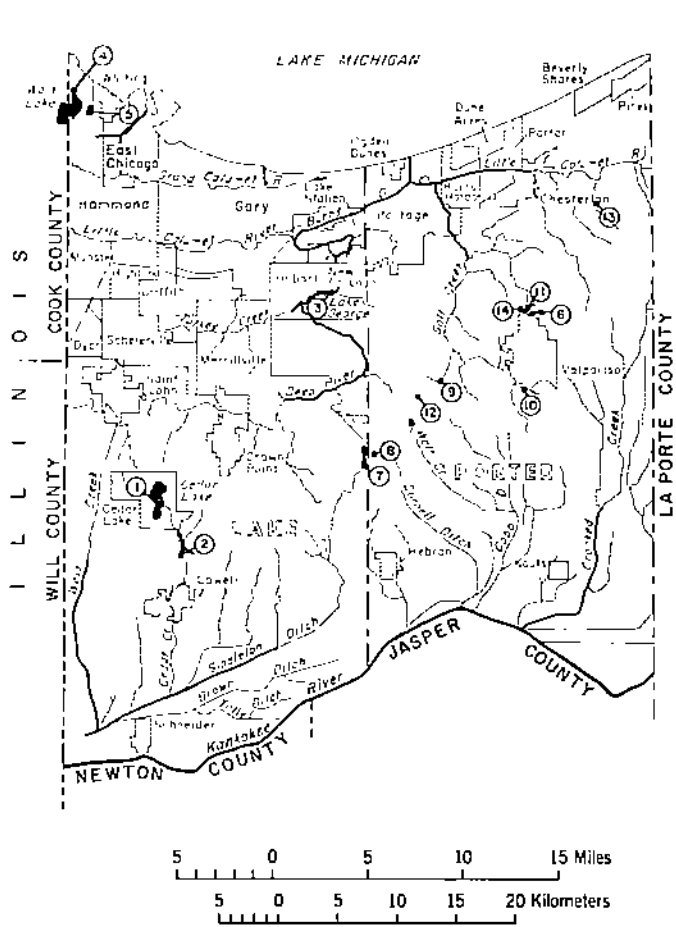


Figure 54

Map of Region One-A 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. Lake numbers correspond to the lake numbers in Table 31.

Table 31
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	Cedar Lake	8.14	781.0	2,199
2	Dalecarlia Lake	20.10	193.0	na
3	Lake George at Hobart	124.00	282.0	879
4	Wolf Lake	5.72	999.0	na
5	Lake George at Hammond	na	78.0	na
6	Flint Lake	2.62	86.0	na
7	Lake of the Four Seasons Nos. A and B	na	na	133
8	Lake of the Four Seasons No. C	na	na	553
9	Lake Louise	2.56	228.0	645
10	Lake of the Woods	na	24.5	65
11	Long Lake	1.31	65.0	169
12	Norman Olson Lake	0.23	14.0	38
13	Rice Lake	na	38.3	58
14	Spectacle Lake	0.53	62.0	175

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-A is presented in Table 32. The existing supply for recreational activity is expressed as a percentage of the projected demand. Therefore, when this percentage exceeds one hundred the supply exceeds the demand. Conversely, when the existing supply as a percentage of demand is less than one hundred percent, the supply is less than the projected demand.

Boating and Waterskiing Both Lake and Porter Counties have rivers available for boating and waterskiing. Deep River in Lake County is used for waterskiing. Waterskiing on the Kankakee River is dangerous due to occasional debris in the water. Boating is allowed on other streams, including the Little Calumet River. Lake Michigan is used extensively for boating and some waterskiing. Dangerous conditions can come up quickly on this lake; therefore, boating on Lake Michigan is limited to craft larger than sixteen feet during favorable conditions. Cedar and Wolf Lakes also provide waterskiing in Lake County. Porter County has only Lake Michigan suitable for waterskiing, although boating is allowed on most other lakes.

Table 32
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	157,000 acres ^a	100+	100+	100+
Waterskiing	7	34.4 skiers/acre/year	19,200 acres ^b	100+	100+	100+
Canoeing	10	585 canoes/mile/year	97 miles	100+	100+	93+
Swimming	57	76,600 swimmers/acre/year	105 acres ^c	100+	100+	100+
Ice-Skating	12	6,678 skaters/acre/year	45 acres	100+	100+	100+
Fishing	43	66 persons/acre/year	161,400 acres ^d	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 nonresidents considered.

^aIncludes 154,000 acres of Lake Michigan and 3,000 acres of inland waters.

^bIncludes 18,400 acres of Lake Michigan (thirty square miles excluding the two hundred feet from the shoreline) and 800 acres of inland waters.

^cDoes not include Lake Michigan.

^dIncludes 154,000 acres of Lake Michigan and 7,400 acres of inland waters.

Cedar Lake, Flint Lake, Wolf Lake, and Lake Michigan have some form of public access. Access to the Kankakee River is available at the LaSalle Fish and Wildlife Area in Lake County. Access to other rivers is limited by the lack of boat ramps and parking facilities. Due to the recreational potential of Lake Michigan, no shortage of boating and waterskiing areas is projected to occur in Region One-A. However, access to Lake Michigan is limited by a shortage of boat storage and launching opportunities.

Canoeing Canoeing opportunities in the region are numerous. Eleven miles along Deep River in Lake County is canoeable. A ten mile trip is available on the East Branch of the Little Calumet River. The Kankakee River along the southern border of the region is an excellent canoeing stream.

The region does not have a current need for additional canoeing stream mileage. However, the demand is expected to increase by the year 2000 when a shortage of canoeing opportunities may occur.

Swimming and Ice-Skating Swimming is available in Lake Michigan at municipal beaches, the Indiana Dunes State Park, and the Indiana Dunes National Lakeshore. In addition swimming is available on inland lakes and numerous public pools. Ice-skating is available on the smaller lakes within the region, but is not available on Lake Michigan due to safety considerations. The demand and supply analysis indicates that the supply of swimming and ice-skating areas will exceed the demand generated by residents of Region One-A through the year 2000.

Fishing The quality of the fisheries habitat is indicated on Figure 55. Many of the lower reaches of the streams in southern Lake and Porter Counties have been straightened and dredged to provide agricultural drainage. The Kankakee River serves as the main outlet of this southern drainage, and although it has been extensively channelized, provides good aquatic habitat. It flows steadily with sufficient depth to provide food and cover for warmwater fishes such as bluegill, crappie, largemouth and smallmouth bass, other sunfishes, catfish, and suckers. Northern pike and walleye are also present, using tributaries and flooded woods and backwaters for spawning in the spring. Crooked Creek contains suitable aquatic habitat and water quality to support a "put-and-take" trout fishery. With these exceptions, most southern streams offer limited aquatic habitat due to their channelized bed, lack of aquatic plants, and overall lack of diversity.

In general, streams have been channelized less in the northern portion of the region, but aquatic habitat

suitable for game fish is limited in some streams by poor water quality. The West Arms of the Little Calumet and the Grand Calumet Rivers offer poor aquatic habitat due to heavy input from industrial and domestic pollution sources. They may support only rough fish populations including carp and white suckers. In contrast, Salt Creek and the East Arm of the Little Calumet River are used by Lake Michigan trout and salmon for spawning. Salt Creek also provides habitat for a put-and-take trout fishery.

The region has fewer lakes than the other parts of northern Indiana, and intense shoreline development is characteristic of most of its lakes. Moderately good aquatic habitat can be found in most lakes in the region as is indicated by the presence of thriving game fish populations. Lake Michigan provides an abundance of fishing water and is especially noted for coho and chinook salmon; steelhead, lake, and brown trout; and yellow perch. Fancher Lake is stocked with trout, besides supporting a warmwater fishery. Wolf Lake is noted for largemouth bass, bluegill, and northern pike fishing. Another example of good aquatic habitat is Flint Lake, evidenced by its bluegill, black crappie, and largemouth bass fishing. In comparison, Cedar Lake provides spawning areas in the wetlands along its south end, but desirable game fish populations are limited by poor water quality.

Fishing access to streams and lakes can usually be found at bridges or city and county parks. Almost two-thirds of the lakes have public access for fishing. A state-owned public fishing site is located on Cedar Lake. Lake Michigan offers beach and pier fishing at municipal parks, the Indiana Dunes State Park, the Indiana Dunes National Lakeshore, and fishing from boats.

Lake Michigan and an additional 3,000 acres of inland waters insure that the demand for fishing through the year 2000 will be met. Use of Lake Michigan is limited, however, by the frequent occurrence of rough water and by inadequate public access.

Riparian Habitat The quality of the wildlife habitat associated with surface streams is indicated in Figure 56. The streams and lakes of the region differ greatly in the quality of habitat associated with their banks. The Kankakee River offers some of the most valuable riparian and wetland habitats, attracting furbearers, waterfowl, and other mammals such as deer and squirrels. The most outstanding wetlands of the region are the backwaters and wooded swamps along the lower portion of the Kankakee River. The LaSalle Fish and Wildlife Area located adjacent to the Kankakee River increases the wildlife production with the intensive management practiced on the property. Salt Creek and Crooked Creek also offer good wildlife habitat. Their

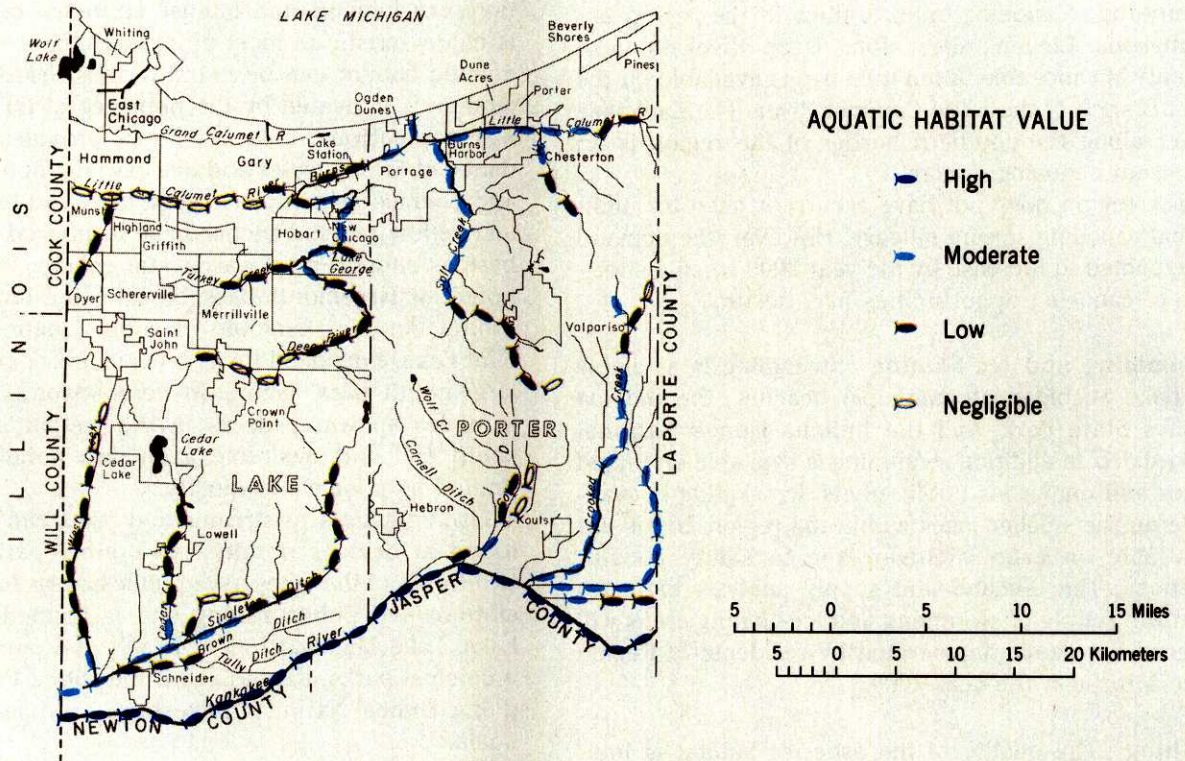


Figure 55
Map of Region One-A showing the quality of fisheries habitat.

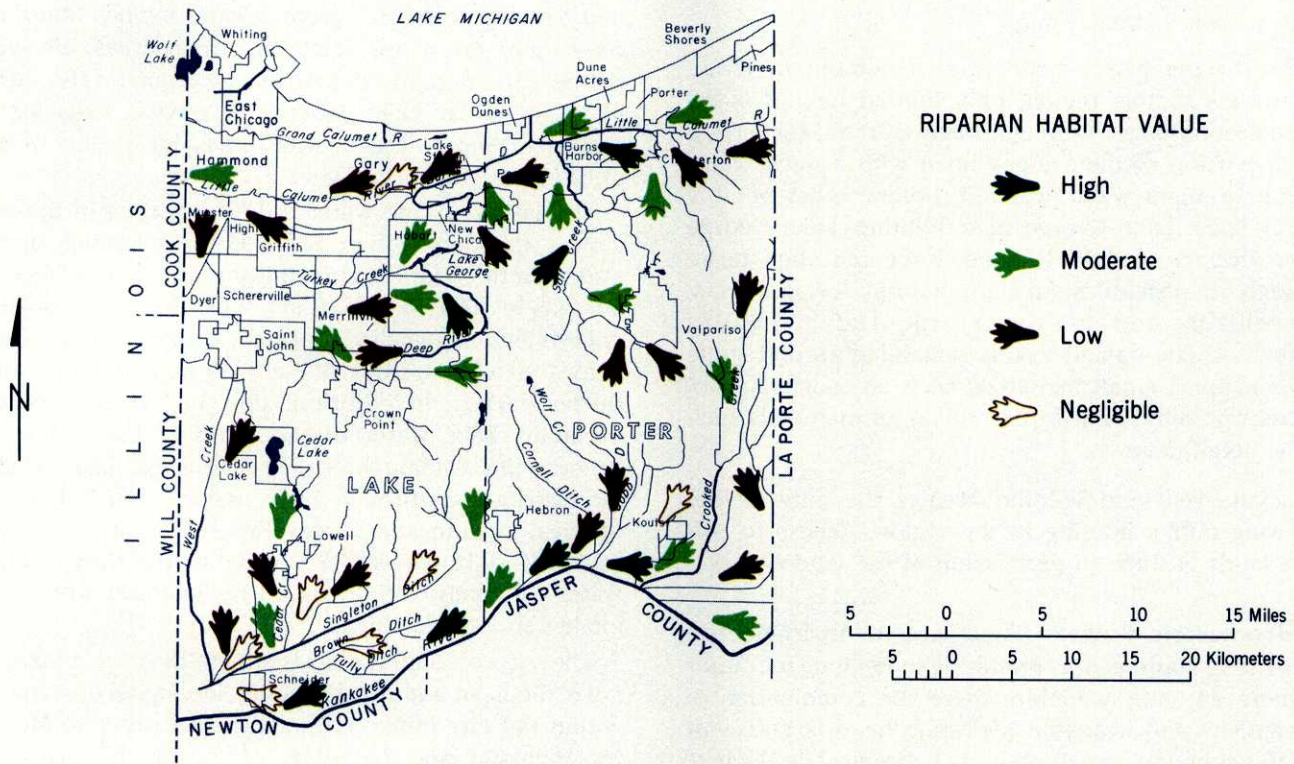


Figure 56
Map of Region One-A showing the quality of riparian habitat.

banks have a sufficient amount and diversity of vegetation to provide food and cover for many species of animals. Some of the straightened streams, such as parts of the Singleton Ditch and West Creek in Lake County, offer very poor riparian habitat. If their banks are grass covered, however, they will attract game birds such as pheasants and bobwhite quail. Other animals use them as nesting areas or travel lanes. The streams in northern urban areas provide small mammal and game bird habitat in the city and county parks. Large stretches of these streams, however, offer little wildlife habitat value.

Due to the heavy residential development along lakeshores in this region, only limited habitat is offered around lakes. Although many of the lakes have a small portion of their edges lined with a deep water marsh or open water wetland, others, most notably Cedar Lake, Lake George near Whiting, Lake George near Hobart, and Wolf Lake, have marshes large enough to provide significant habitat for muskrats, shorebirds, and various residential migratory waterfowl. The upland woods remaining around some lakes support small mammals such as squirrels, raccoons, opossums, songbirds, and larger mammals such as whitetail deer.

LaSalle Fish and Wildlife Area is the only facility allowing public hunting in the region. Access to private lands is through permission of the landowners.

Hydroelectric Power There are no hydroelectric generating stations now operating in Region One-A nor is there any site available where the combination of streamflow and available hydraulic head is sufficient for the economic production of hydroelectric power.

Commercial Navigation Lake Michigan is part of the Great Lakes—St. Lawrence navigation system, one of the most important inland waterway systems in the world. There are four commercial harbors in the region which provide access to this waterway. These are: Indiana Harbor, Gary Harbor, Buffington Harbor, and the Port of Indiana.

Traffic through these harbors consists of both inter-lake and overseas cargo. Harbor commerce consists of iron ore, petroleum, steel, grain, and general cargo.

Indiana Harbor was completed by the Corps of Engineers in the 1930s. Periodic dredging is necessary to maintain project depths. Gary and Buffington Harbors are private and are privately owned and maintained. The Port of Indiana (Burns Waterway Harbor) is owned and operated by the Indiana Port Commission, a state agency established for the purpose of developing and operating such facilities.

Withdrawal Uses

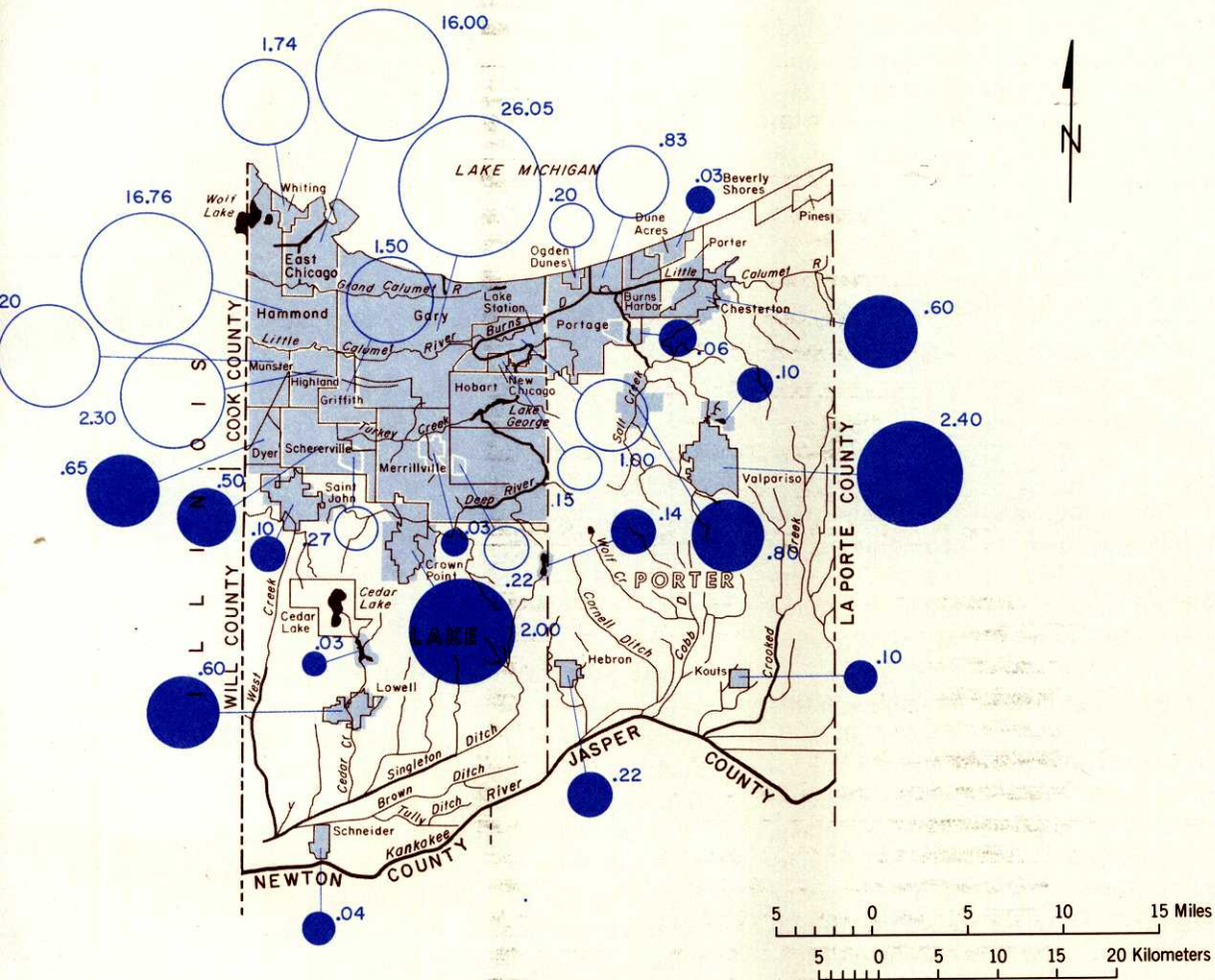
Public Water Supply Lake and Porter Counties are served by twenty-nine public water utilities. Eighty-nine percent of the population was served by a public utility in 1975. The utility systems in Lake County consist of several large utilities located along Lake Michigan, all withdrawing water from the lake. These utilities either serve or sell water to a "row" of towns just south of the lakefront communities. Further south, a third and sometimes a fourth "row" of communities had developed its own ground-water supply. South of Gary there are a few scattered urban areas, all with public water supplies dependent on ground water. Residents of Cedar Lake depend on private wells for a source of water. The service areas for public water utilities are shown in Figure 57.

The largest single water utility operating in the region is the Gary-Hobart Water Company which operates in both counties. This utility served about 248,600 persons in 1975. In 1977, it supplied an average of 29.1 million-gallons-per-day. Its direct distribution area includes all of the cities of Gary, Hobart, Portage, and Burns Harbor. In addition, the Gary-Hobart Water Company sells water to the cities of Lake Station, Schererville, Ogden Dunes, New Chicago, and Griffith for distribution through their lines. Two subdivision utilities, Lincoln and Turkey Creek, are also supplied by the Gary-Hobart Water Company. The Gary-Hobart Water Company withdraws all of its water from two intakes in Lake Michigan.

The city of Hammond also maintains an intake in Lake Michigan and in addition to serving all customers within the city limits, Hammond sells water to Munster, Highland, and the village of Lansing, Illinois.

Other large utilities in 1975 included the Hammond system which served 105,900 persons and withdrew 16.8 mgd, and the East Chicago system which served 44,200 and withdrew 16.0 mgd. Valparaiso, Highland, Munster, and Crown Point all pumped over 2.0 mgd in 1975. The towns of Whiting, Griffith, and Lake Station each withdrew between 1.0 and 2.0 mgd in 1975. Many of these systems, particularly those directly on the lake, serve industries that consume large amounts of water. The remaining systems to the south of the lakeshore primarily serve residential customers, withdrawing 0.6 mgd or less.

In 1975 these twenty-nine utilities withdrew an average of 77.3 mgd. Lake County accounted for 72.0 mgd while Porter County accounted for the remaining 5.3 mgd. About 67.0 mgd of the total public water supply is withdrawn from Lake Michigan, while 2.0 mgd is withdrawn from other surface water sources, principally Flint Lake. The remaining 8.4 mgd is withdrawn from ground-water sources.



EXPLANATION

- Service area
- Surface-water withdrawals
- Ground-water withdrawals
- .06 Mgd average daily use

Figure 57

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