

# **BIG CEDAR LAKE**

**WASHINGTON COUNTY, WISCONSIN**

**Department of Natural Resources  
Madison, Wisconsin**

**1972**

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(This report is No. 67 in the Department of Natural Resources series of Lake Use Reports.)

BIG CEDAR LAKE

Washington County, Wisconsin

An Inventory With Planning Recommendations

This report is a product of the lake and stream classification activity pursued in accordance with Section 23.09 (7)(m), Wisconsin Statutes, and preparation of this report was financed in part through a planning grant to the Southeastern Wisconsin Regional Planning Commission from the U. S. Department of Housing and Urban Development under the provisions of Section 701 of the Housing Act of 1954 as amended.

Lake Use Report No. M1-1

Prepared By

Wisconsin Department of Natural Resources

For The

Southeastern Wisconsin Regional Planning Commission

1972

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## INTRODUCTION

Big Cedar Lake is a large, deep, elongated drainage lake in the Towns of West Bend and Polk, Washington County, Wisconsin. It has a surface area of 932 acres and a water volume of 31,983 acre-feet, when the lake level is at 1,030.98 feet above mean sea level. The City of West Bend is three miles northeast of the lake and had a population of about 16,600 in 1970. A community of 500 homes on the adjacent lakeshore is indicative of the lake's recreational and economic value. Provisions for the protection, development and wise use of this resource are important to Big Cedar Lake's continued existence as a recreational asset.

## PHYSICAL DESCRIPTION

### Lake Basin

Big Cedar Lake is an elongate shaped lake with a deep south basin connected by a broad shallow terrace to a shallower north basin. Gilbert Lake, a shallow, 44-acre basin, adjoins Big Cedar Lake at its northern end, and its short outlet stream provides the only permanent flow of surface water to Big Cedar Lake.

Big Cedar Lake is located, geologically, in the terminal moraine left by the Green Bay lobe of the retreating Wisconsin glacier. The southern basin is deepest -- 105 feet. Other characteristics of the basin include the four islands in the upper half of the lake and a shallow 8-foot shoal immediately to the west of the deepest point in the lake. The shoreline is nearly all upland, except for the inlet to Gilbert Lake where the shoreline is soft and marshy. Maps 1 and 1A illustrate the configuration and morphology of the lake basin.

About 7 percent of the lake area is less than 3 feet deep, while 47 percent of the lake area is more than 20 feet deep. The lake's mean depth is 34 feet (volume/area). Generally, the lake bottom slopes steeply into deep water off the southern half of the eastern shore. Elsewhere in the lake, the bottom slopes gradually to 5-foot depths off shore. The shore development factor is 2.57, indicative of an elongated, rather irregular lake shape.

Basic hydrologic and morphologic data are presented in table 1.

### Shore Characteristics

Most of the lake bottom near shore is dominated by sand and gravel, interspersed occasionally with deposits of marl along the western and southern shores. The bottom of the inlet area near Gilbert Lake is covered by soft muck and detritus. Wind and wave action washes the shallower areas near shore and water less than three feet deep is free of the softer sediments. Out beyond this depth, submergent aquatic vegetation is abundant to a depth of twelve feet.

## Drainage Characteristics

Big Cedar Lake drains east, via Cedar Creek, into nearby Little Cedar Lake. The outlet flow is permanent and varies from about 8 cfs in early spring, to 1 cfs in late summer. A low-head dam (1 foot) on the outlet prevents outlet cutting and helps maintain the lake's water level. Besides

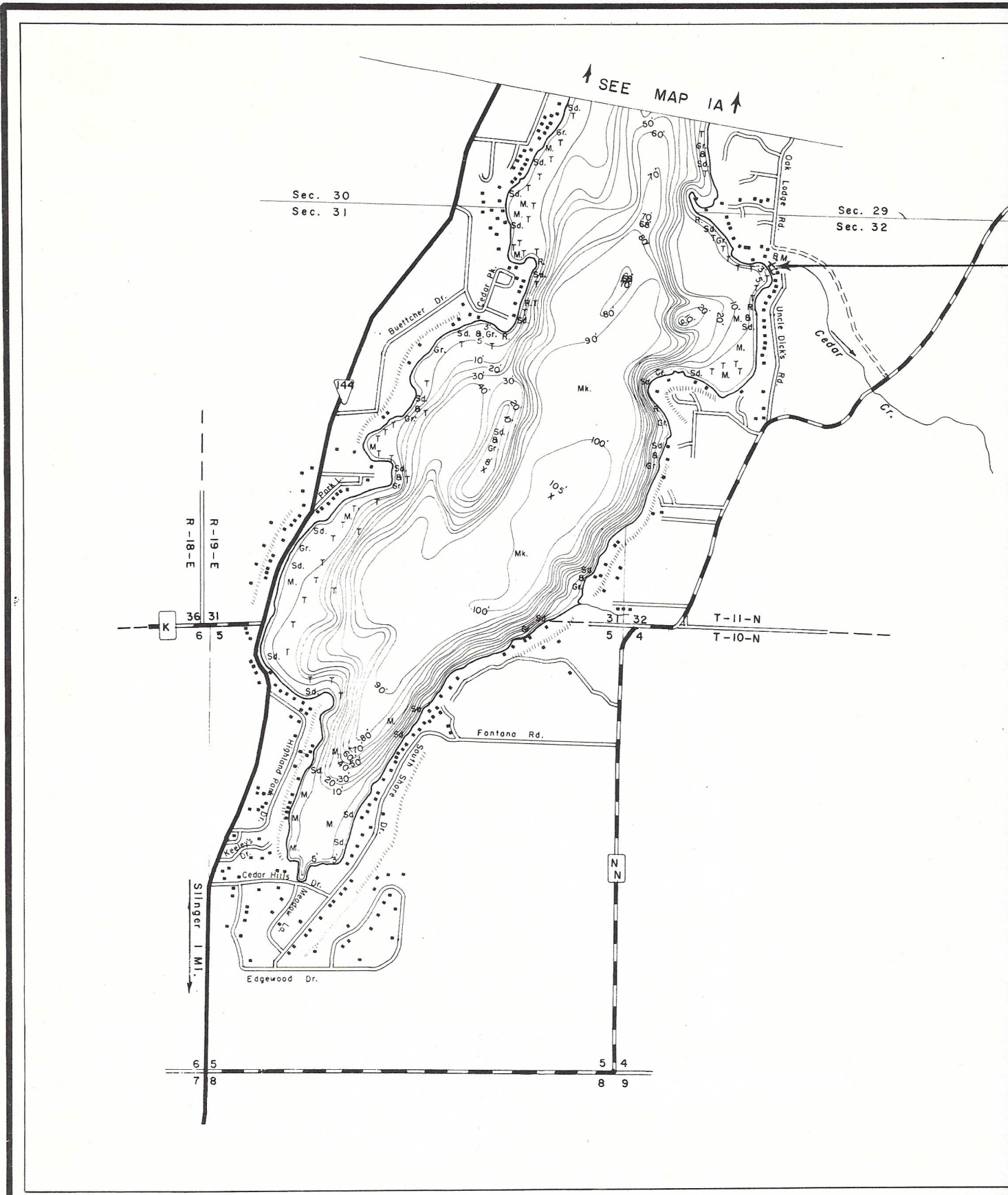
TABLE 1

### Hydrography and Morphology of Big Cedar Lake, Washington County, Wisconsin, 1970

<u>Parameter</u>	<u>Measurement</u>
<u>Size</u>	
Area	
of Lake	932 acres (1.456 sq. miles)
of Watershed and Lake	5,670 acres
Ratio	
of Area (sq. miles) to Shore Length	0.132:1
of Watershed Area to Lake Area	6.08:1
Percent of Area	
Less than 3 Feet Deep	7 percent
More than 20 Feet Deep	47 percent
Volume	31,983 acre-feet
Exchange Time	5.52 years
<u>Shape</u>	
Shore	
Length	58,080 feet (11.0 miles)
Development Factor*	2.57
Depth	
Mean	34 feet
Maximum	105 feet
Length (Maximum)	20,700 feet (3.80 miles)
Width (Maximum)	3,400 feet (0.64 miles)
<u>Frontage</u>	
Public	
Intensive Use	<0.1 percent
Wild	0 percent
Open Space	0 percent
Private	
Intensive Use	81 percent
Wild	4 percent
Open Space	15 percent

\*Shore development factor is defined as the ratio of shoreline to the circumference of a circle with the same area as the lake.

Source: Wisconsin Department of Natural Resources



MAP I

HYDR

BIG CEDAR LAKE, V

# LEGEND

## TOPOGRAPHIC SYMBOLS

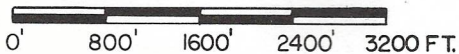
- |    |                  |  |                      |
|----|------------------|--|----------------------|
| B  | BRUSH            |  | STEEP SLOPE          |
| PW | PARTIALLY WOODED |  | INDEFINITE SHORELINE |
| W  | WOODED           |  | MARSH                |
| C  | CLEARED          |  | SPRING               |
| P  | PASTURED         |  | INTERMITTENT STREAM  |
| A  | AGRICULTURAL     |  | PERMANENT INLET      |
| BM | BENCH MARK       |  | PERMANENT OUTLET     |
| ■  | DWELLING         |  | DAM                  |
| ▣  | RESORT           |  |                      |

S.E.W.R.P.C. B.M. "X" Chiseled square on west end of dam — on east side of lake.

Sea Level Elevation 1032.08' M.S.L.  
Water Elevation 1030.98' M.S.L.

## LAKE BOTTOM SYMBOLS

- |     |             |    |                       |
|-----|-------------|----|-----------------------|
| P   | PEAT        | R  | RUBBLE                |
| Mk. | MUCK        | BR | BEDROCK               |
| C   | CLAY        | T  | SUBMERGENT VEGETATION |
| M   | MARL        | ⊥  | EMERGENT VEGETATION   |
| Sd. | SAND        | ▾  | FLOATING VEGETATION   |
| St. | SILT        | ⋅⋅ | STUMPS & SNAGS        |
| Gr. | GRAVEL      |    |                       |
| ◇   | ACCESS ONLY | ◊  | ACCESS WITH PARKING   |
|     |             | ◆  | BOAT LIVERY           |



SPECIES OF FISH			
	ABUNDANT	COMMON	RARE
MUSKIE			
N. PIKE	X		
WALLEYE			X
L. M. BASS	X		
S. M. BASS			X
PANFISH	X		
TROUT			
CISCO		X	

WATER AREA 932 ACRES  
UNDER 3 FT. DEPTH 7 %  
OVER 20 FT. DEPTH 47 %

VOLUME 31,983 ACRE FT.  
TOTAL ALK. 170 P.P.M.  
SHORELINE 11 MILES — WITHOUT ISLANDS 10.2 MILES  
MAXIMUM DEPTH 105 FT.

MAPPED: NOV. 1899  
REVISED: APRIL 1969  
EQUIPMENT: RECORDING SONAR  
SURFACE WATER  
ELEVATION: 1030.98' M.S.L.

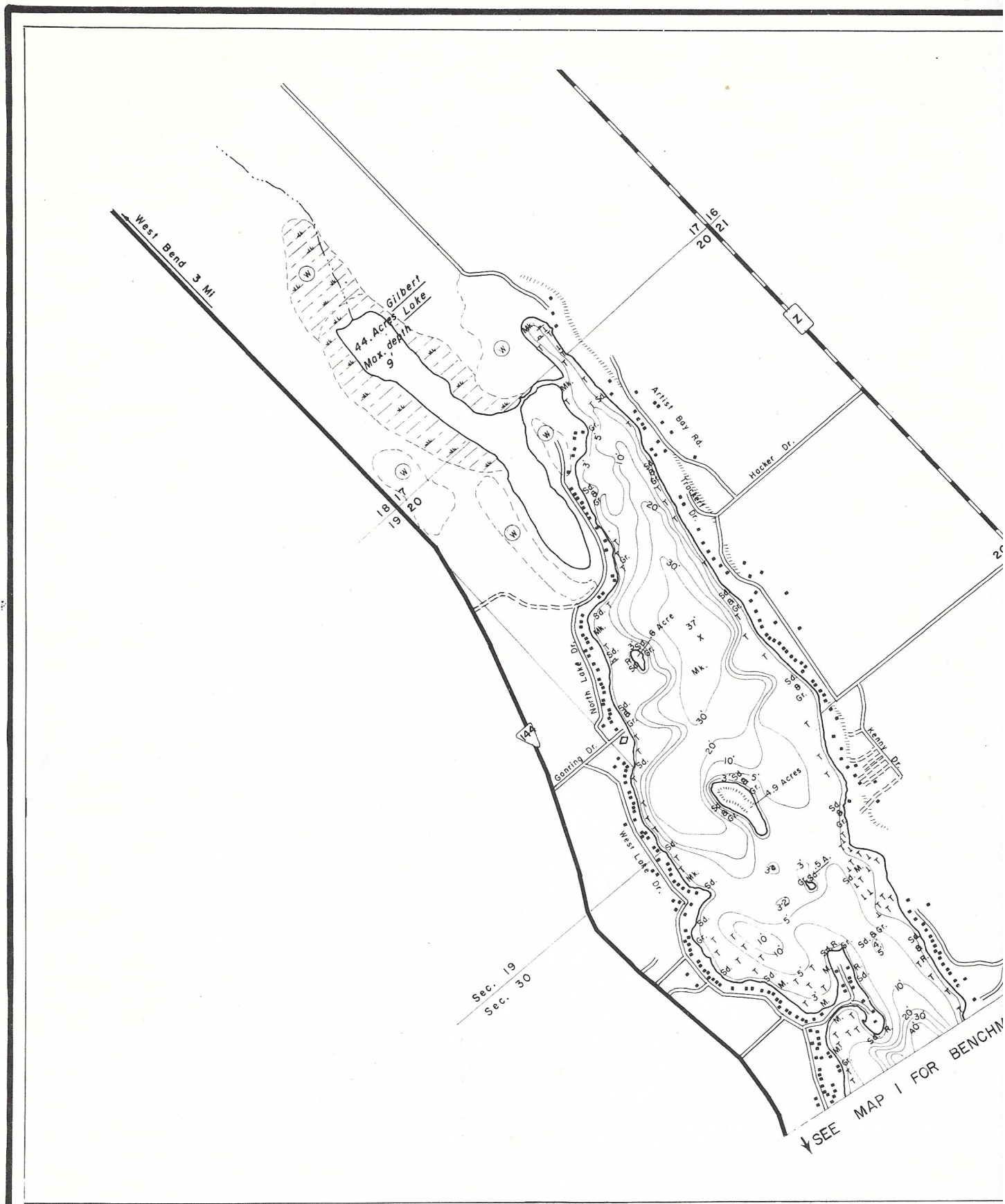
GRAPHIC MAP

INGTON COUNTY, WISCONSIN

T-10,11-N. R-19-E.

D. N. R., JULY 1970





MAP IA

HYD

BIG CEDAR LAKE,

# LEGEND

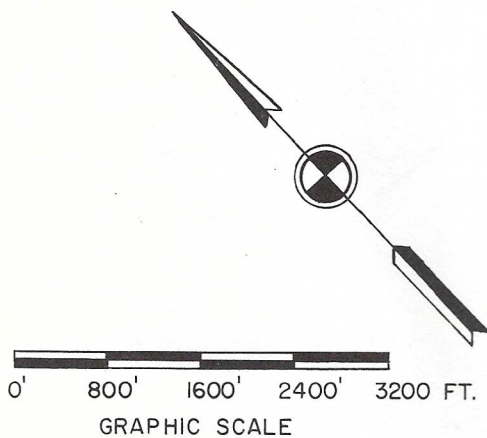
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SPECIES OF FISH			
	ABUNDANT	COMMON	RARE
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N. PIKE	X		
WALLEYE			X
L. M. BASS	X		
S. M. BASS			X
PANFISH	X		
TROUT			
CISCO		X	



WATER AREA 932 ACRES  
 UNDER 3 FT. DEPTH 7%  
 OVER 20 FT. DEPTH 47%  
 VOLUME 31,983.0 ACRE FT.  
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 SURFACE WATER  
 ELEVATION: 1030.98 M.S.L.

GRAPHIC MAP

WASHINGTON COUNTY, WISCONSIN

T.-10,11-N. R.-19-E.

D. N. R., JULY 1970

TABLE 2

Climatological Data for the Big Cedar Lake Area, Washington County, Wisconsin

Location & Parameter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
TEMP. & PRECIP. DATA													
<u>Milwaukee Station</u>													
Temp. (F)													
Mean Monthly	21.9	24.2	33.3	44.3	54.3	64.9	71.3	69.9	62.6	51.4	37.3	25.7	46.8
Precip. (inches)													
Mean Monthly	1.58	1.32	2.19	2.39	2.98	3.22	2.43	2.62	3.33	1.97	2.11	1.48	27.62
Days w/Precip.*	10	9	11	11	13	11	9	9	8	8	10	10	119
<u>Plymouth Station</u>													
Temp. (F)													
Mean Monthly	19.9	21.3	30.6	44.1	55.3	65.3	71.0	69.9	61.6	50.6	35.9	24.4	45.8
Precip. (inches)													
Mean Monthly	1.52	1.41	1.90	2.66	3.03	3.50	2.88	2.73	3.00	2.13	2.10	1.48	28.34
Days w/Precip.**	4	4	5	6	6	6	5	5	6	5	5	4	61
<u>Germantown Station</u>													
Temp. (F)													
Mean Monthly	20.1	23.1	32.7	45.8	55.2	65.3	70.2	69.9	61.5	52.1	36.2	24.6	46.4
Precip. (inches)													
Mean Monthly	1.12	0.99	1.82	2.87	2.93	3.86	3.19	2.93	2.60	1.90	2.05	1.31	27.57
Days w/Precip.**	3	3	5	7	7	7	6	5	5	4	4	4	60
<u>West Bend Station</u>													
Temp. (F)													
Mean Monthly	20.2	22.3	31.5	44.8	56.5	66.6	71.8	70.2	61.9	51.0	36.0	24.4	46.4
Precip. (inches)													
Mean Monthly	1.68	1.36	2.01	2.54	2.98	3.96	3.34	2.89	3.16	2.21	2.13	1.50	29.76
Days w/Precip.**	5	4	5	6	7	7	5	5	5	4	5	4	62
MONTHLY AVG. RUNOFF													
Milwaukee R., Milw.													
Runoff (inches)	0.40	0.54	1.34	1.55	0.85	0.44	0.40	0.29	0.59	0.60	0.59	0.52	8.11
RATIO OF RUNOFF TO PRECIP.													
Milwaukee R. Watershed													
	0.27	0.43	0.68	0.59	0.29	0.12	0.14	0.10	0.20	0.29	0.28	0.36	0.29
EVAP. FROM LAKE SURFACE													
Rockford, Ill.													
Evap. (inches)	0.31	0.57	1.75	2.90	4.03	4.37	5.09	4.05	2.95	2.15	0.89	0.34	29.40

\*Number of days with 0.01 inch or more of precipitation.

\*\*Number of days with 0.10 inch or more of precipitation.

Source: Temperature and precipitation data are taken from Wisconsin Climatological Data, 1961, U. S. Weather Bureau. Remaining data on runoff and evaporation are taken from Lake Evaporation in Illinois by W. J. Roberts and J. B. Stall, 1967, Ill. Rep. of Invest. No. 57.

the inlet flow from Gilbert Lake at 1.5 cfs, there is a small feeder stream entering the lake on the southeast shore that drains a large agricultural area.

The total drainage area of the Big Cedar Lake watershed downstream to the outlet dam is 5,670 acres. Although the area tributary to the lake is elongated in a north-south direction, drainage from the basin is towards the east. The groundwater table also slopes from west to east in the direction of the surface water flow. Since wetlands comprise only a small portion of the lakeshore, the water table near Big Cedar Lake is not as shallow as the water tables near other lakes in the Milwaukee River watershed.

### Climate and Hydrology

Climatological data for the West Bend Station approximate conditions at Big Cedar Lake. These and corroborating data from other stations in

nearby watersheds, are presented in table 2. Data from regional stations, which relate to runoff and lake surface evaporation rates are also included for reference.

About 55.0 percent of the annual precipitation falls as rain from May through September, when vegetation growth occurs. About 40.5 percent falls as snow or rain from December through May.

The Big Cedar Lake watershed receives 14,000 acre-feet of water from precipitation each year. Losses in the annual water budget for the Big Cedar Lake watershed are 2,390 acre-feet of evaporation from the surface of Big Cedar and Gilbert Lakes, 3,260 acre-feet of evaporation from the outlet, Cedar Creek and 9,600 acre-feet of evapotranspiration from the terrestrial plants and soils. An apparent deficit of 1,250 acre-feet of water occurs, representing a loss of groundwater to the outlet stream system.

### Soils

The predominating soil types of the area surrounding Big Cedar Lake are the silt loam and alluvial soils. Muck soils surround the small north bay and Gilbert Lake, making the shore undesirable for residential development. Elsewhere, however, where muck soils were present, these areas have been filled with harder materials and used for home construction. Map 2 illustrates the general distribution of soil types.

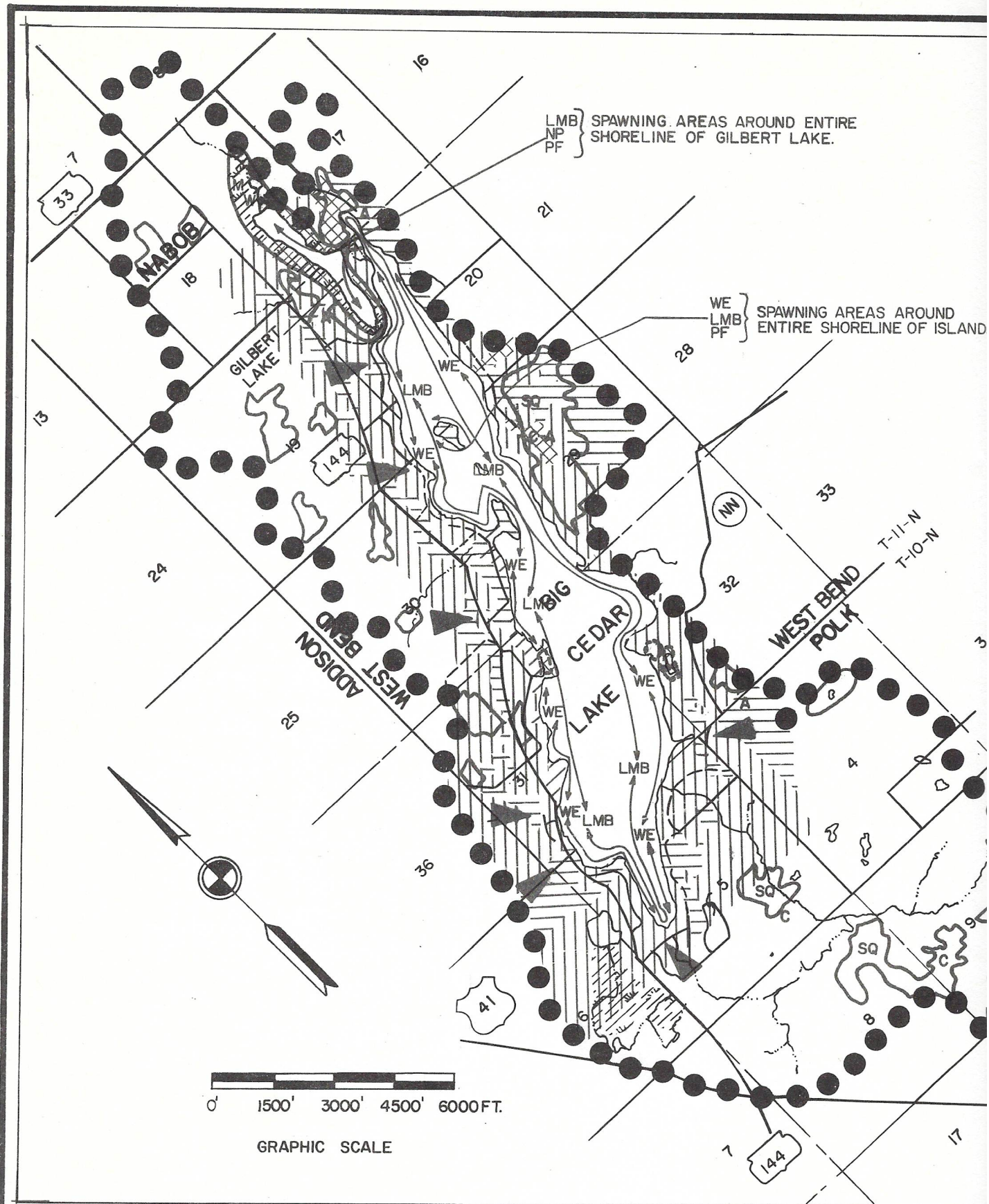
### WATER QUALITY

Selected chemical analyses for spring and mid-summer of 1968 are a basis for evaluating the present water quality of Big Cedar Lake (Table 3A). Temperature and oxygen profiles also have been utilized as additional aids to the water quality interpretation (Fig. 1).

The lake is near average in total alkalinity for lakes in the Milwaukee River watershed. It has high fertility based on spring phosphate levels and moderate fertility based on alkalinity.



Big Cedar Lake has a low pollution hazard based on mean chloride content. Chlorides have been proven reliable indicators of excessive fertility and reflect sources of nutrient enrichment even though chloride itself is not considered to be a nutrient. Those ions indicative of pollution (chloride, sulphate, sodium, potassium) are present in quantities lower than the mean concentrations of these ions for the region (Table 3B).

By mid-August of 1968, the epilimnion or upper, warm layer of Big Cedar Lake attained a thickness of 23 feet in the southern half of the main basin. Below this depth, temperature decreases rapidly with increased depth (Fig. 1). Sufficient oxygen (2.0 or more mg/l) is available during open water periods to sustain most forms of aquatic life to a depth of 27 feet. Thus the thermocline layer is only able to provide oxygen for some aquatic life, but is unable to provide enough oxygen for cold water fish to survive. Of the total volume of Big Cedar Lake, only 44 percent is adequately oxygenated in mid-summer. Sufficient dissolved oxygen is available during winter months to prevent freeze-out.





# LEGEND









## FISH AND WILDLIFE VALUES

-  PRIME IMPORTANCE
-  LESSER IMPORTANCE
- W** WATERFOWL
- M** MUSKRAT
- P** PHEASANT
- SQ** SQUIRREL
- D** DEER

## WOODLAND VALUES



-  WELL STOCKED
-  MEDIUM-POORLY STOCKED
- A** AESTHETIC
- C-A** COMMERCIAL-AESTHETIC

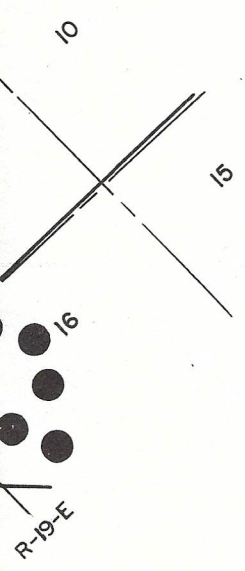
## GENERAL SOIL TYPES

-  LOAM
-  SILT LOAM
-  SANDY LOAM
-  SAND
-  MARSH
-  MUCK
-  MARL
-  ALLUVIAL SOIL

## SPAWNING AREAS

- LMB** LARGEMOUTH BASS
- NP** NORTHERN PIKE
- PF** PANFISH
- WE** WALLEYE

-  OPEN VISTAS
-  WATERSHED BOUNDARY



D VALUES AND BASIC SOIL TYPES

INGTON COUNTY, WISCONSIN

T-10, 11-N. R.-19-E.

D. N. R., JULY 1970

TABLE 3A

Selected Water Quality Parameters of Big Cedar Lake,  
Washington County, Wisconsin, 1968

Parameter*	3 ft. (4-3-68)		6 ft. (8-6-68)	15 ft. (8-6-68)	Dolomitic Mean***
	Center**	South**			
pH (units)	7.9	7.8	8.9	7.8	8.20
Tot. Alk.	183.0	183.0	154.0	158.0	179.60
Sp. Cond. (micro- mhos/cm <sup>2</sup> at 25 C)	346.0	310.0	293.0	302.0	414.90
Ca	15.0	16.2	19.0	25.0	29.20
Mg	28.6	28.6	31.7	33.2	28.00
Na	7.5	5.7	3.2	3.2	4.93
K	1.8	1.8	1.4	1.6	2.08
Fe (tot)	0.04	0.05	0.07	0.03	0.12
PO <sub>4</sub> (tot)	0.56	0.77	0.56	0.64	0.24
PO <sub>4</sub> (dis)	0.52	0.52	0.75	0.93	0.14
Cl	7.0	7.5	8.5	6.3	9.50
SO <sub>4</sub>	22.5	22.5	24.7	22.4	43.00

\*All parameters are expressed in milligrams per liter unless otherwise noted.

\*\*Represent data gathered in the center and in the southern half of the lake.

\*\*\*Represents mean water quality data for all southeastern Wisconsin lakes under which dolomite is found. (From the Chemical Composition of Wisconsin Lake Waters, 1970, Dept. of Natural Resources, Manage. Rep. No. 30).

TABLE 3B

Phosphorous and Phosphate Analyses  
for Big Cedar Lake, Washington County, Wisconsin

Parameter	Measurement
Water	0.56 mg/l PO <sub>4</sub> (tot) 0.75 mg/l PO <sub>4</sub> (dis)
Vegetation*	
<u>Potamogeton pectinatus</u>	0.49 percent P

\*Plant tissue analyses were made June, 1968 and are expressed as dry-weight percentages.

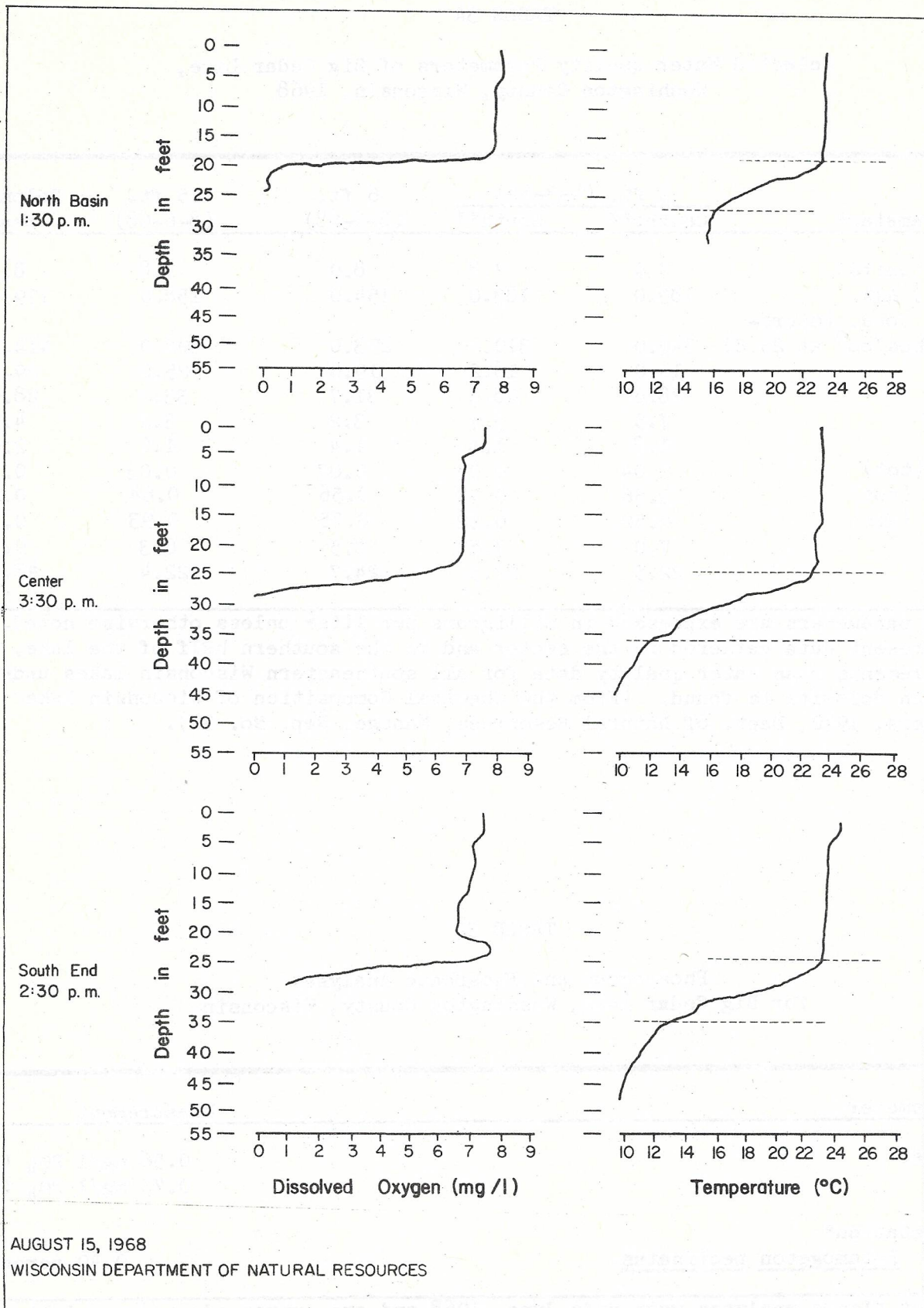


Figure 1. Temperature and oxygen profiles.



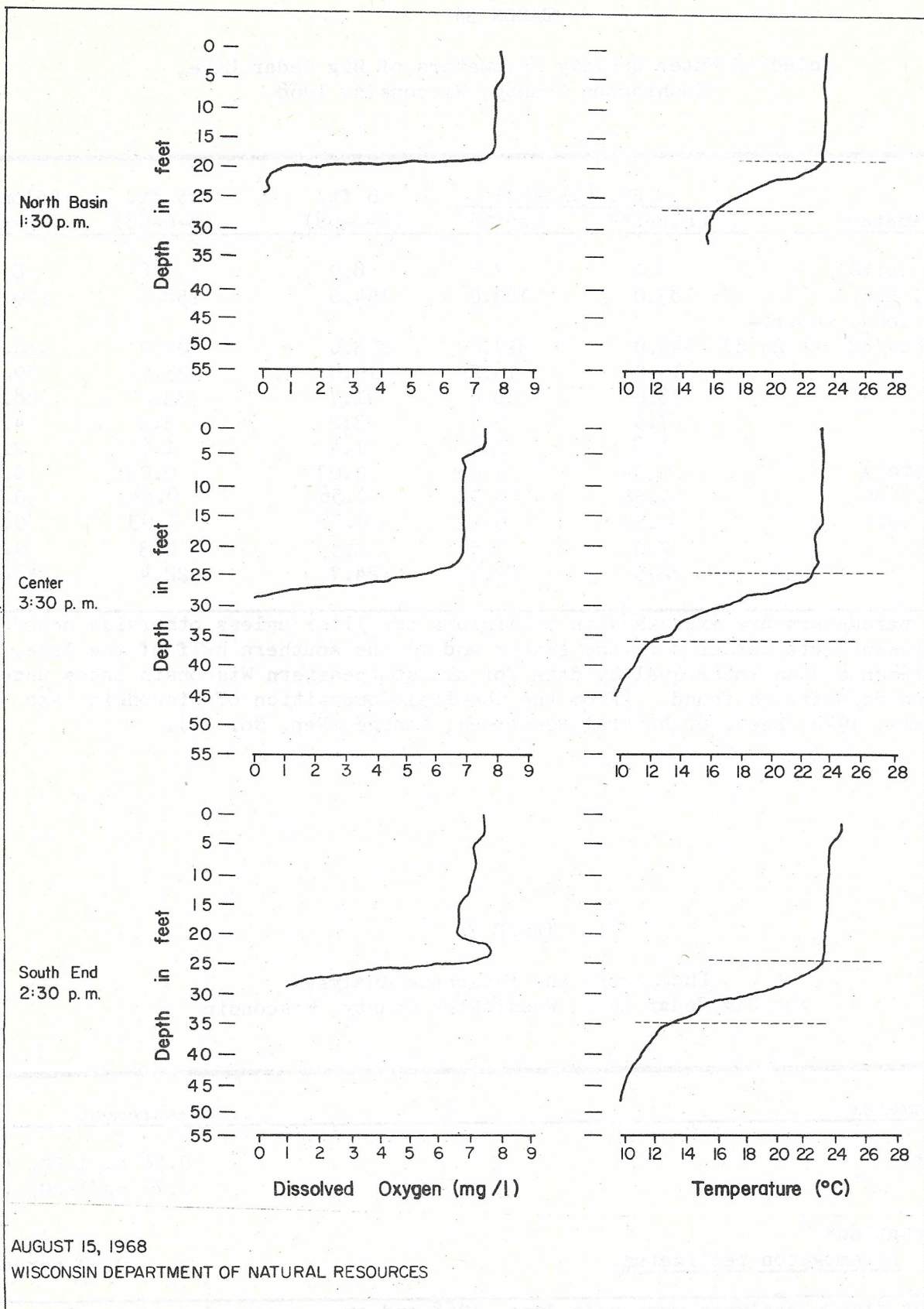


Figure 1. Temperature and oxygen profiles.

The lake's secchi disk transparency was 6 feet on May 20, 1968, but increased to 11 feet on August 22, 1968. Algal growth near the lake surface is apparently increasing thereby reducing photosynthetic activity and oxygen production in deeper waters. As a result of this oxygen depletion, summer kills of fish are becoming more and more frequent. Ciscos -- a cold water species which requires well oxygenated waters -- were once common in the lake but have been dwindling in recent years due to these low mid-summer oxygen levels.

## RESOURCES

### Aquatic Plants

Aerial surveys and intensive water reconnaissance revealed the extent of growth of rooted aquatic vegetation. The general distribution of emergent, submergent and floating leaved vegetation is illustrated on Map 1. Dominant species and their growth in the basin are presented in table 4.

Most of the vegetation is concentrated in the shallower northern half of Big Cedar Lake. The submergent aquatics occur at all depths except toward the center of the lake in water deeper than 12.5 feet. Potamogeton pectinatus is everywhere. It occurs in dense continuous stands. Nearer shore is Chara sp. in moderate to heavy abundance. It also can be found at a depth of 12 feet. Potamogeton pectinatus and Chara make up almost 50 percent of the total aquatic vegetation in the lake. Another 15 percent is made up of Potamogeton richardsonii and Myriophyllum exalbescens which are scattered between the P. pectinatus and Chara sp. The eastern shore is almost devoid of aquatics, although sparse growths of Chara sp. can be found between the rocks. A protected bay north of Echo Point is the only area along the east shore south of Linden Point that has a moderate to heavy concentration of submergents. Here again P. pectinatus and Chara sp. are the dominant plants.

In Gilbert Lake submergents grow along the shore and intermixed between the waterlilies. A large concentration of Ceratophyllum demersum occurs at the mouth of a small stream on the north end of the lake. Potamogeton amplifolius and P. pectinatus are scattered along the shores of the northern part of the lake and are concentrated on the west shore just before the large bed of waterlilies begin. The east shore is covered by tamarack and dogwood; however, in the water are large heavy stands of Scirpus validus, another Scirpus sp. and Typha sp. The northern third of the lake contains the only areas of open water. The rest of the lake is completely choked with Nymphaea tuberosa and scattered beds of Nuphar sp.

Floating and emergent aquatics are sparse on Big Cedar Lake. Ninety-nine percent are concentrated on the northernmost tip as well as around and in Gilbert Lake. Species of the genera, Scirpus and Typha, are the most common. Sparganium eurycarpum occurs on the southern end of Big Cedar Lake just west of Lake View Point. An occasional arrowhead, Sagittaria latifolia, can be found along the shoreline. Nymphaea tuberosa and Nuphar sp. are rare in Big Cedar Lake. Those that are present are in the northernmost area where the bottom is a highly organic muck. About 90 percent of all the waterlilies are in Gilbert Lake.

TABLE 4

Dominant Species of Aquatic Vegetation in Big Cedar Lake  
Washington County, Wisconsin, 1968\*

Scientific Name**	Common Name**	Growth Character	Extent in Basin
<u>Ceratophyllum demersum</u>	Coontail	Submergent	Common near Gilbert Lake inlet
<u>Chara</u> sp.	Muskgrass	Submergent	Very abundant to 12-foot depths
<u>Myriophyllum exalbescens</u>	Northern watermilfoil	Submergent	Scattered in moderate abundance
<u>Nuphar</u> sp.	Yellow waterlily	Floating-- leaves	Rare in Big Cedar Lake; abundant in Gilbert Lake
<u>Nymphaea tuberosa</u>	White waterlily	Floating-- leaves	Rare in Big Cedar Lake; abundant in Gilbert Lake
<u>Potamogeton amplifolius</u>	Bigleaf pondweed	Submergent & floating	Dominant along northern end of Gilbert Lake
<u>P. pectinatus</u>	Sago pondweed	Submergent	Found throughout Big Cedar Lake in dense stands and along northern shores of Gilbert Lake
<u>P. richardsonii</u>	Redhead-grass	Submergent	Scattered in moderate abundance
<u>Sagittaria latifolia</u>	Broadleaf arrowhead	Emergent	Found occasionally along the shoreline
<u>Scirpus</u> sp.	Bulrush	Emergent	Concentrated around northern end of Big Cedar Lake and off eastern shore of Gilbert Lake
<u>Scirpus validus</u>	Softstem bulrush	Emergent	Found along eastern shore of Big Cedar Lake
<u>Sparganium eurycarpum</u>	Burreed	Emergent	Common in southern end of Big Cedar Lake
<u>Typha</u> sp.	Cattail	Emergent	Found in northern end of Big Cedar Lake and along eastern shore of Gilbert Lake

\*Results of an intensive survey conducted August 12-13, 1968.

\*\*Nomenclature taken from Underwater and Floating-leaved Plants of the United States and Canada, 1967, Bur. Sport Fish. & Wildl., Resour. Publ. 44, 124 p. and Common Marsh Plants of the United States and Canada, 1970, Bur. Sport Fish. & Wildl., Resour. Publ. 93, 99 p.

Source: Wisconsin Department of Natural Resources

Big Cedar Lake has a tremendous weed problem. Between 1950 and 1961, applications of sodium arsenite were applied to control rooted aquatics and copper sulfate was used to control algae. In recent years, weeds have been cut with a mechanical harvester. Although weed harvesting does little to reduce the rate of eutrophication in lakes, it does serve to reduce one of the nuisances accompanying this eutrophication.

### Fish Resources

The primary game fish species in Big Cedar Lake are northern pike and largemouth bass. Principal panfish species present include bluegills, pumpkin-seeds, black crappies and yellow perch. In addition to these species, there are smallmouth bass, walleyes, cisco, rock bass, green sunfish, yellow bullheads, white suckers and lake chub suckers. Carp are also present but are not a management problem.

The panfish are small and abundant, while the northern pike and largemouth bass offer good fishing, are abundant and are in good condition. The walleyes tend to be large but are only taken occasionally. Summerkills of cisco occur nearly every year at about the same time and are caused by oxygen depletion in the deep colder waters of the lake.

Large numbers of northern pike migrate to Gilbert Lake during the spring of the year to spawn. In 1968 and 1969, the combined northern pike spawning population in Gilbert and Big Cedar Lakes consisted of about 2,500-3,000 fish, with about one-half spawning in Gilbert Lake. Because of the long-recognized value of this lake as a spawning and nursery area, Gilbert Lake and its outlet to Big Cedar Lake have been designated as a fish refuge (Wisconsin Administrative Codes, NR Chapter 26.01).

### Pleasure Boating

Water deep enough to support motor driven boats without hazard (5 feet) encompasses 670 acres, or 72 percent, of the lake area. The long, narrow shape of the lake is well suited to and heavily used by boaters. Use of the lake by speed boaters has created a conflict with daytime fishermen, but water skiing hours are limited to 10:00 a.m. to 7:00 p.m. on weekdays and from 10:00 a.m. to 6:00 p.m. on weekends and holidays. Although submerged vegetation is abundant, it does not interfere greatly with boating. Big Cedar Lake is the largest lake in the Milwaukee River watershed, yet it has only limited public boat access and limited parking space.

### Game Resources

Wildlife areas have been identified on Map 2. Wetland areas within the watershed total about 360 acres. When flooded, these wetlands, such as the one surrounding Gilbert Lake, are primarily of value for fish spawning and rearing habitat. These wetlands are also used to some extent by furbearers and waterfowl. Migratory birds nesting here include mallards, blue-winged teal, wood ducks and Florida gallinules. Diving ducks are also common sights during spring and fall migrations. Development of the shoreline for homesites and increased spring and summer boating have reduced use of the lake for nesting in recent years.

## Aesthetic Features

The waters of Big Cedar Lake remain relatively clear throughout most of the year, despite the lake's fertility and heavy use. The lake has appealed to people desiring to build both permanent residences and summer cottages near large bodies of water. Consequently, most of the shore is occupied. The shoreline is predominantly wooded and, as such, helps screen and beautify the otherwise heavily used lakeshore. Nearby Gilbert Lake is undeveloped and is the only remaining wild area in the Big Cedar Lake basin. Open vistas overlooking Big Cedar Lake are common and are located on Map 2.

## LAKE USE

### Fishing

Fishing pressure is below average for lakes in this region. Adequate boat launching facilities are not available for public use. Both fish harvest and angler success rates are below the regional averages. This may be partly explained by the facts that panfish are small and that pressure from other boaters may be limiting fishing use of the lake. During the summer of 1968, pleasure craft and water skiing boats outnumbered fishing boats two to one. On summer weekends, there may be as many as 85 boats of all types in use at one time.

Annually, the lake receives about 106 man hours of fishing pressure per acre of water. This figure is considerably below the average (174 hours per acre) for major lakes in the watershed. Most pressure is during the summer months (70 hours) rather than during the winter ice fishing season (36 hours).

Fishermen harvest an estimated 98 fish per acre annually -- 70 per acre in summer and 28 per acre in winter. The mean annual harvest for the major lakes in the Milwaukee River watershed is 115 fish per acre -- 88 per acre in summer and 27 per acre in winter. Of the fish caught annually per acre of water in Big Cedar Lake, 74 are panfish and 24 are game fish. The average catch for major lakes in the watershed is 89 panfish per acre and 26 game fish per acre. The rate of catch per hour at Big Cedar Lake was 0.41 fish in 1968, while the average catch per hour for all major lakes in the watershed was 0.58 fish per hour during the same year.

### Hunting, Trapping, Wildlife Observation

These uses have not been quantitatively assessed; however, some waterfowl hunting takes place, mostly by frontage owners. Fur trapping is a minor use of the lake. Gilbert Lake has an undeveloped shoreline and lends itself readily as a wildlife and outdoor study area.

### Swimming

In general, the lake is suitable for swimming. Its water is clear, although choked with aquatic vegetation. Both chemical and mechanical means have been used as means of vegetation removal and control.

There are no public beaches to attract swimmers to Big Cedar Lake. Swimming opportunity is restricted to private residential beaches.

### Cottages and Homesites

Eighty-one percent of the shoreline of Big Cedar Lake is utilized by homesites, cottages and resorts. Four percent has remained as low, marshy shoreland, and the remaining 15 percent is upland, private shore. Of the eleven miles of frontage on the lake, only the narrow, town road is public land. Since relatively little remains of the lakeshore for further development, secondary development and construction is taking place beyond present developed sites on the lakeshore.

### Boating

Aerial observations indicate that on weekdays, 27 boats may be counted at one time, while on weekends an average of 47 boats are in use at one time. These data are biased by instantaneous daytime count, but are still within reliability limits. Use level has been observed to be as high as 85 boats in use at one time. During the summer of 1968, pleasure and water skiing boats outnumbered fishing boats by two to one. Boat density in 1968 was observed to reach one boat per 11 acres of water. This is near the maximum boat density of the Milwaukee River watershed, where maximum use was one boat per 9 acres of water. Normal boat use on Big Cedar Lake was also near the average use for the watershed lakes.

The total annual boat use was 62,500 hours, or 62 hours per acre of water in 1968. The average boating pressure for all of the watershed lakes was 67 hours per acre; however, because of the large size of Big Cedar Lake it provided nearly 30 percent of the boating pressure in the watershed, even with its limited accessibility. Separated into use categories, Big Cedar Lake provided 21,300 hours of fishing, 33,700 hours of pleasure boating, and 7,000 hours of water skiing.

## RECREATIONAL RATING

A desirable planning element is a rating of the lake's value in terms of primary use categories. The recreational base of Big Cedar Lake has been assessed numerically in table 5. The lake is rated highly for swimming and is moderate for boating, fish production and scenic qualities. With 52 out of a possible 72 points, Big Cedar Lake can be described briefly as being above average in recreational values. Economically, it ranks as one of the leading recreational lakes in the Milwaukee River watershed.

## EXISTING LAND USE

Land use acreages for the watershed are summarized by quarter section in table 6. The total watershed area of Big Cedar Lake encompasses 6,255.91 acres. Most of the watershed is used for agriculture (53.93 percent), and is left as open lands (34.24 percent). Urban lands comprise 11.83 percent

TABLE 5

## Recreational Rating of Big Cedar Lake, Washington County, Wisconsin, 1969

Quality Category	Number of Points for Each Rating*		
	Six	Four	Two
Fish	<u>High production</u> <u>No problems</u>	<u>X Medium production</u> <u>X Some problems</u> such as infrequent winterkill, small rough fish problems, etc.	<u>Low production</u> <u>Serious problems</u> such as frequent winterkill, carp activities, excessive fertility, etc.
Swimming	<u>X Sand or gravel</u> ( >75% ) <u>X Clean water</u>  <u>No algae or weed problems</u>	<u>Sand or gravel</u> ( 25-50% ) <u>Moderately clean water</u> <u>X Moderate algae or weed problems</u>	<u>Sand or gravel</u> ( <25% ) <u>Turbid or darkly stained water</u> <u>Frequent algae or weed problems</u>
Boating	<u>Adequate depths</u> ( 75% of basin >5' deep ) <u>Adequate size</u> for extended boating ( >1,000 acres ) <u>Good water quality</u>	<u>X Adequate depths</u> ( 50-75% of basin >5' deep ) <u>X Adequate size</u> for some boating ( 200-1,000 acres )  <u>X Adequate water quality</u> with some inhibiting factors such as a few weedy bays, algae blooms, etc.	<u>Adequate depths</u> ( 50% of basin >5' deep ) <u>Inadequate size</u> for boating ( <200 acres )  <u>Poor water quality</u> with overwhelming inhibiting factors such as extensive weed beds
Aesthetics	<u>Extensive wild shore</u> ( >25% ) <u>Varied landscape</u>  <u>Few nuisances</u> such as excessive algae, carp, dumps, etc.	<u>X Some wild shore</u> ( <25% ) <u>X Moderately varied landscape</u> <u>X Moderate nuisances</u>	<u>No wild shore</u>  <u>Unvaried landscape</u>  <u>Many nuisances</u>

\*All ratings are 6, 4 and 2 points each except for those in the fish category which are 9, 6 and 3 points each.

Source: Wisconsin Department of Natural Resources

of the watershed. Residential space amounts to 6.69 percent, while lands used for transportation and communication use comprise 4.17 percent of the watershed area. The remaining urban area is used for commercial purposes, gravel mining, institutional and recreational lands.

Existing land use in the Big Cedar Lake watershed is illustrated in Map 3, as interpreted from 1967 SEWRPC land use inventory.

TABLE 6

Existing Land Use in the Big Cedar Lake Watershed,  
Washington County, Wisconsin, 1967

Land Use		Area (in Acres)	Total Acreage	Percent of Watershed
Major	Detailed			
Residential		418.26	418.26	6.69
Commercial		3.48	3.48	0.06
Industrial	Major	0.00	22.25	0.36
	Mining	18.57		
	Other	3.68		
Transportation and Communication		260.99	260.99	4.17
Government and Institutional		30.74	30.74	0.49
Recreational	Public	0.00	4.29	0.07
	Private	0.00		
	Other	4.29		
Openland	Wetland	1,339.18	2,141.82	34.24
	Unused land	19.90		
	Woodland	782.74		
Agricultural	Crops	3,366.57	3,374.08	53.93
	Other	7.51		
TOTAL*		6,255.91	6,255.91	100.00

\*Summarized to the nearest whole U. S. Public Land Survey quarter section.

Source: SEWRPC Existing Land Use Inventory, 1967



## EXISTING PROTECTIVE MEASURES

### Sewage Disposal

Public sewerage does not exist in the watershed at the present time. A new sanitary code has been adopted by Washington County and accepted by the Department of Natural Resources. New subdivision ordinances are being formulated at this time by the county. If the remaining silt loam and muck soils of the lakeshore are developed on Big Cedar and Gilbert Lakes, the resulting poor drainage and absorption characteristics will probably present problems to private disposal systems. Elsewhere on the developed lakeshore, small lot sizes are an important drawback to adequate disposal. It is already likely that eutrophication has been accelerated by nutrient enrichment in Big Cedar Lake.

### Shoreland Zoning

Zoning ordinances of the Town of West Bend, Washington County, have applied to most of this lake basin since 1964. The Town of Polk, on the southern tip of the lake, has had no zoning ordinances. Zoning of Big Cedar Lake shoreland in the Town of West Bend has been entirely residential (A-1). Map 3A indicates present zoning restrictions and table 7 is an evaluation of the degree of protection afforded by this zoning. Improved shoreland zoning must be established shortly to comply with minimum state requirements for establishing more adequate shore protection.

### Water Zoning

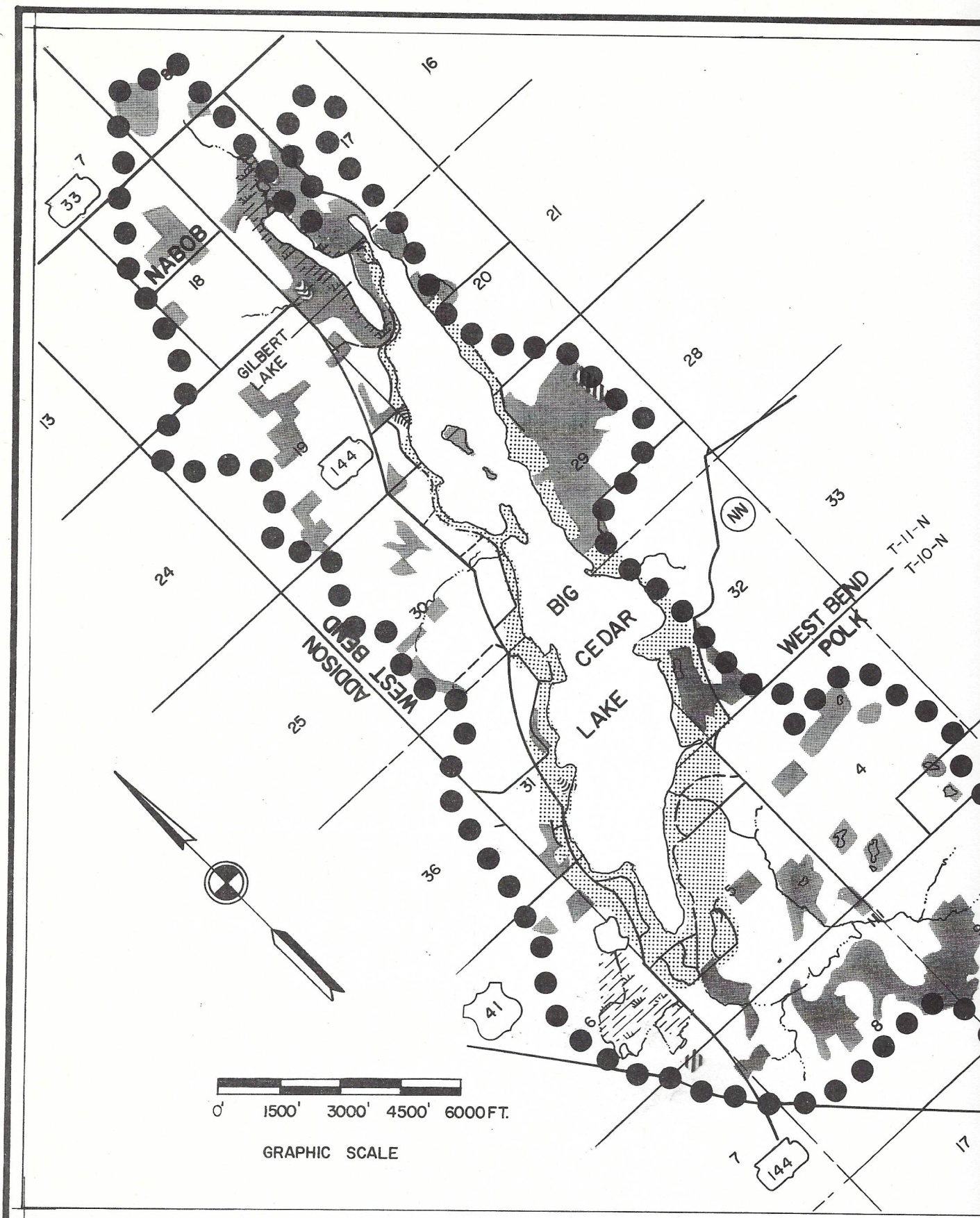
Boat control ordinances of the Towns of West Bend and Polk, Washington County, apply to this lake. Specific restrictions are as follows: From Monday through Friday, motor boat speed is restricted to 25 mph from sunrise to sunset and to 10 mph from sunset to sunrise. On Saturday, Sunday and legal holidays, speed is restricted to 25 mph from sunrise to 6:00 p.m. and to 10 mph from 6:00 p.m. to sunrise. Boating speed is further restricted to 4 mph near beaches, moored craft, etc. Water skiing hours are limited to 10:00 a.m. to 7:00 p.m. on weekdays and from 10:00 a.m. to 6:00 p.m. on weekends and legal holidays. In addition, no skin diving or water skiing is permitted in any marked fish spawning areas, no water skiing or aqua planing is permitted in any marked weed bed areas, and all swimming beaches must be marked.

The ordinances have been evaluated in table 8. The lake encompasses 932 acres, of which 670 acres are suitable for boating. Even so, there is still some conflict between fast boaters and fishermen. Imposition of speed limits and hours for water skiing have served to somewhat reduce this hostility.

## RECREATION AND RESOURCE-RELATED PROBLEMS

### Water Quality

A significant increase takes place from spring to summer in total phosphates within the lake. The source of this increase can partly be





MAP 3


EXISTI


BIG CEDAR LAKE,


## LEGEND


- 


 LOW DENSITY RESIDENTIAL  
 (0.5-7.2 PERSONS PER RESIDENTIAL ACRE)
- 


 MEDIUM DENSITY RESIDENTIAL  
 (7.3-22.8 PERSONS PER RESIDENTIAL ACRE)
- 


 HIGH DENSITY RESIDENTIAL  
 (22.9-59.2 PERSONS PER RESIDENTIAL ACRE)
- 


 RETAIL AND SERVICES
- 


 WHOLESALE AND STORAGE
- 


 TRANSPORTATION, COMMUNICATION & UTILITY
- 


 MANUFACTURING & QUARRYING
- 


 GOVERNMENTAL & INSTITUTIONAL
- 

 WOODLAND
- 

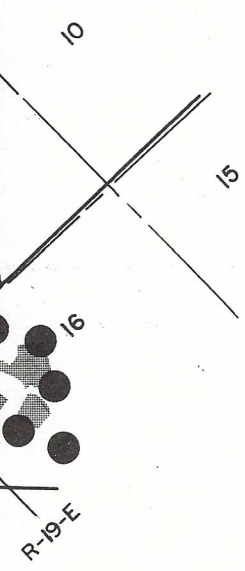
 WETLAND
- 

 PARK & RECREATIONAL
- 

 WATER
- 

 AGRICULTURE AND AGRICULTURE-RELATED
- 

 WATERSHED BOUNDARY

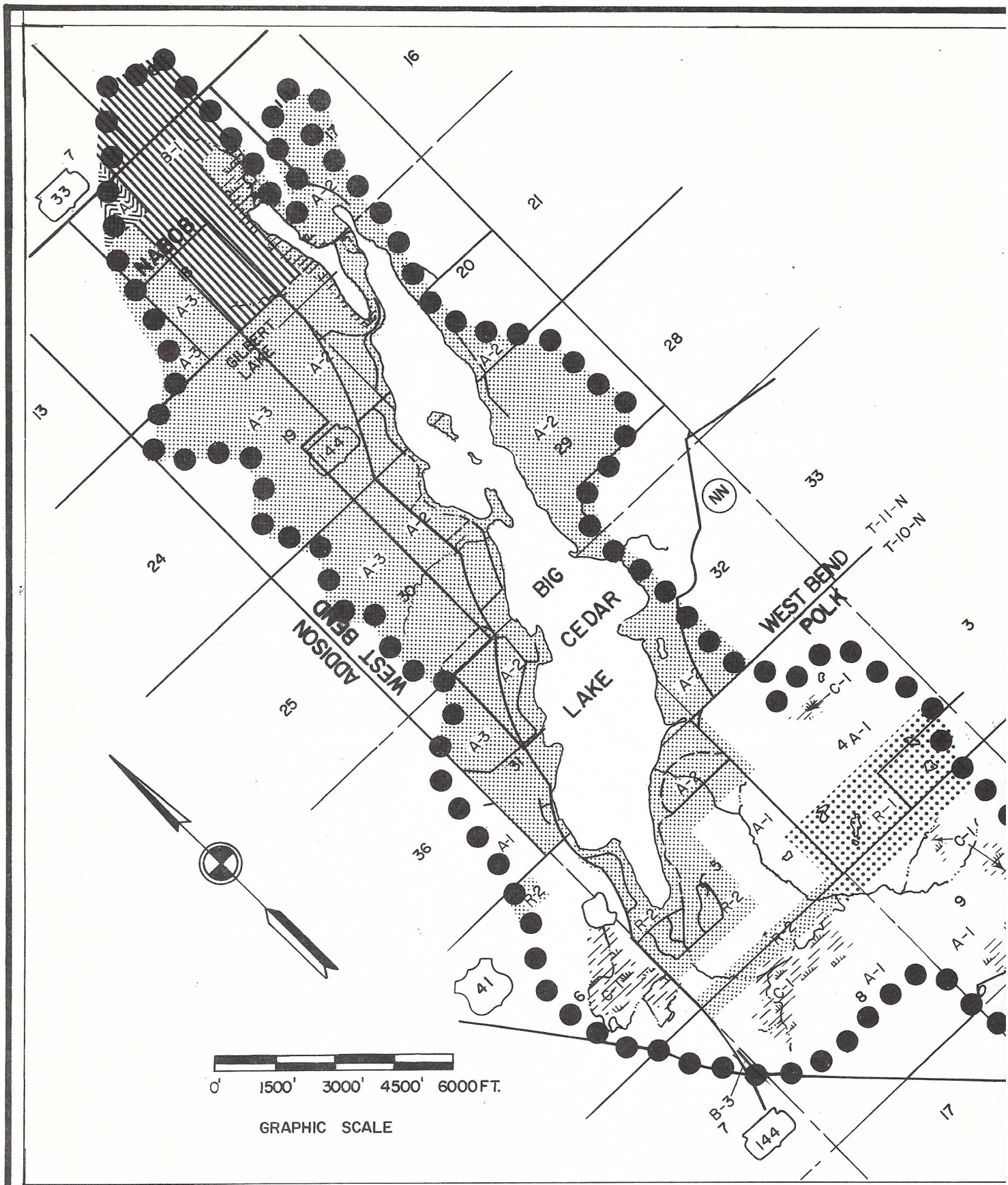


LAND USE , 1967

NGTON COUNTY, WISCONSIN

T-10, 11-N. R-19-E.

D. N. R., JULY 1970



MAP 3A

PRESENT

BIG CEDAR LAKE, WA

# LEGEND

## Local Zoning Classification

R-1 RESIDENTIAL

R-1  
R-2  
R-3 } RESIDENTIAL

B-1  
B-3 } COMMERCIAL

A INDUSTRY

C-1 CONSERVANCY

A-1 AGRICULTURE

## Regional Land Use Classification



LOW DENSITY RESIDENTIAL  
(0.5-7.2 PERSONS PER RESIDENTIAL ACRE)



MEDIUM DENSITY RESIDENTIAL  
(7.3-22.8 PERSONS PER RESIDENTIAL ACRE)



HIGH DENSITY RESIDENTIAL  
(22.9-59.2 PERSONS PER RESIDENTIAL ACRE)



RETAIL AND SERVICES



WHOLESALE AND STORAGE



TRANSPORTATION, COMMUNICATION & UTILITY



MANUFACTURING & QUARRYING



GOVERNMENTAL & INSTITUTIONAL



WOODLAND



WETLAND



PARK & RECREATIONAL



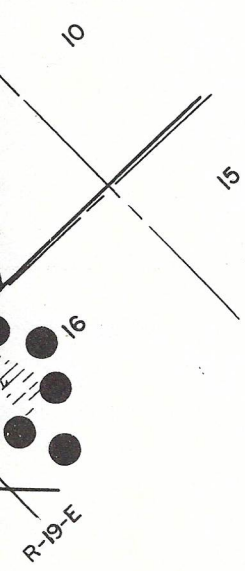
WATER



AGRICULTURE AND AGRICULTURE-RELATED



WATERSHED BOUNDARY



ZONING, 1967

NGTON COUNTY, WISCONSIN

T-10, 11-N. R-19-E.

D. N. R., JULY 1970

# LEGEND

## Local Zoning Classification

R-1 RESIDENTIAL

R-1  
R-2  
R-3 } RESIDENTIAL

B-1  
B-3 } COMMERCIAL

A INDUSTRY

C-1 CONSERVANCY

A-1 AGRICULTURE

## Regional Land Use Classification



LOW DENSITY RESIDENTIAL  
(0.5-7.2 PERSONS PER RESIDENTIAL ACRE)



MEDIUM DENSITY RESIDENTIAL  
(7.3-22.8 PERSONS PER RESIDENTIAL ACRE)



HIGH DENSITY RESIDENTIAL  
(22.9-59.2 PERSONS PER RESIDENTIAL ACRE)



RETAIL AND SERVICES



WHOLESALE AND STORAGE



TRANSPORTATION, COMMUNICATION & UTILITY



MANUFACTURING & QUARRYING



GOVERNMENTAL & INSTITUTIONAL



WOODLAND



WETLAND



PARK & RECREATIONAL



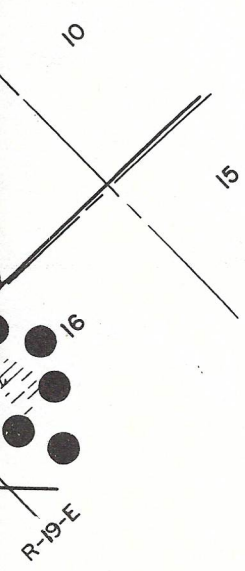
WATER



AGRICULTURE AND AGRICULTURE-RELATED



WATERSHED BOUNDARY



ZONING, 1967

NGTON COUNTY, WISCONSIN

T-10, 11-N. R-19-E.

D. N. R., JULY 1970

TABLE 7

Degree of Protection Afforded by Land Use Controls  
to Big Cedar Lake, Washington County, Wisconsin, 1970

Criterion	Suggested Limitations	Degree of Protection	
		Adequate	Inadequate
Dwelling setback	Dwellings should be >75' from the ordinary high water mark and >2' above water level.		X
Sewage disposal facilities	Lot size should be adequate to permit proper location of onsite waste disposal systems.	X	
Boathouses	Boathouses shall not be located toward the water from the ordinary high water mark and shall not be used as dwellings.		X
Refuse disposal	Public or private refuse disposal areas should not be contiguous with the water or adjoining wetlands.	X	
Lot width	Minimum width shall be >100' and should be set to enhance shoreline values.	X	
Bank shore cover	Removal of cover is not permitted in a strip 35' deep parallel to the water except for one allowable opening of 30' in each 100'.		X
Grazing of shores	Fencing is suggested and indiscriminate grazing should be discouraged since it destroys spring areas and aids bank erosion.	X	
Conservancy district	Adjoining wetlands should be protected by a conservancy zoning program.		X
Commercial facilities	Adequate space should be required to buffer facilities from private development and to be serviceable.	X	
Slope protection	Construction on slopes of >20 percent should be closely regulated.		X
Billboards	Billboard placement and size should be restricted to protect scenic shores.	X	

Source: Wisconsin Department of Natural Resources

TABLE 8

Degree of Protection Afforded by Boat Control Ordinances to  
Big Cedar Lake, Washington County, Wisconsin, 1970

Criterion	Suggested Limitations	Degree of Protection	
		Adequate	Inadequate
Motors	Lakes <50 acres should be limited to boats without motors.	X	
Shore zone	Speed should be restricted to <5 mph within 200' of shore.	X	
Cabin craft mooring	Boats on which persons are living, sleeping or camping should be prohibited from mooring, drifting or overnight anchoring.		X
Mooring at landings	Mooring should be prohibited at public landings for >24 hours except in designated areas.		X
Speed limits	On 50- to 200-acre lakes, speed should be limited to 5 mph or less.	X	
Passing	Within 200' of another object, speed should be limited to 5 mph or less.	X	
Shore preservation	Twenty-five percent of shore should remain in wild state.		X
Weed preservation	Vital aquatic vegetation beds should be located and marked off limits to boating	X	

Source: Wisconsin Department of Natural Resources

attributed to the small inflowing stream from the southeastern part of the watershed which drains an agricultural area. However, the flow of this stream diminishes considerably in late summer. Thus, nutrient enrichment appears to also come from the heavy residential development surrounding the lake. The abundance of rooted aquatic vegetation has served to reduce nutrient levels in the aquatic environment, and therefore, reduce the potential growth of algae in Big Cedar Lake. In the future, however, algal production may reach unacceptable proportions, if phosphate levels are not reduced.



## Fishery

A good population of northern pike and largemouth bass exists in Big Cedar Lake. The panfish, on the other hand, are small and abundant. The presence of a large number of panfish is related to the heavy aquatic vegetation growth which reduces the susceptibility of panfish to predation by the larger game fish.

Carp are present but do not appear to present a management problem. Summerkills of cisco occur nearly every year at about the same time and are due to oxygen depletion in the deep colder waters of the lake.

## Wildlife Habitat

Not much habitat exists in the watershed to sustain a varied wildlife resource. The undeveloped shores of Gilbert Lake offer about the only environment suitable for furbearers and waterfowl. This area is also a prime spawning ground of northern pike in Big Cedar Lake and should be preserved as wildlife and fish habitat. It is also about the only undisturbed area left in the watershed for nature study.

## Public Use Opportunity

The general public lacks suitable access to Big Cedar Lake for fishing, swimming and boating. On a lake of this size, the opportunity to utilize the lake's resources should be made more readily available.

## RECOMMENDED RESOURCE PROTECTION AND ENHANCEMENT MEASURES

The following specific recommendations have been formulated for the protection, development and enhancement of the Big Cedar Lake recreational resource base:

1. Shoreland zoning should recognize the marshy character of the remaining undeveloped areas of private wetland shore and should be protected from further alteration by zoning as conservancy districts. This zoning should apply to Gilbert Lake, as well as Big Cedar Lake.
2. In order to further protect these wetland areas, principally along Gilbert Lake and the northern bay of Big Cedar Lake, a long-range goal of establishing a publicly owned wildlife area should be considered, in view of this area's importance as a spawning site and a waterfowl and furbearer producing area.
3. The origin of inflowing nutrients should be delineated more precisely and measures should be taken to reduce the trend toward eutrophication that is occurring in Big Cedar Lake.

4. The establishment of a sanitary sewer system to serve the developed area around the lake should be encouraged in order to decrease eutrophication and possible pollution sources. The collected sewage should be transported via a truck sewer to the City of West Bend sewage system for treatment at the city's sewage treatment plant.

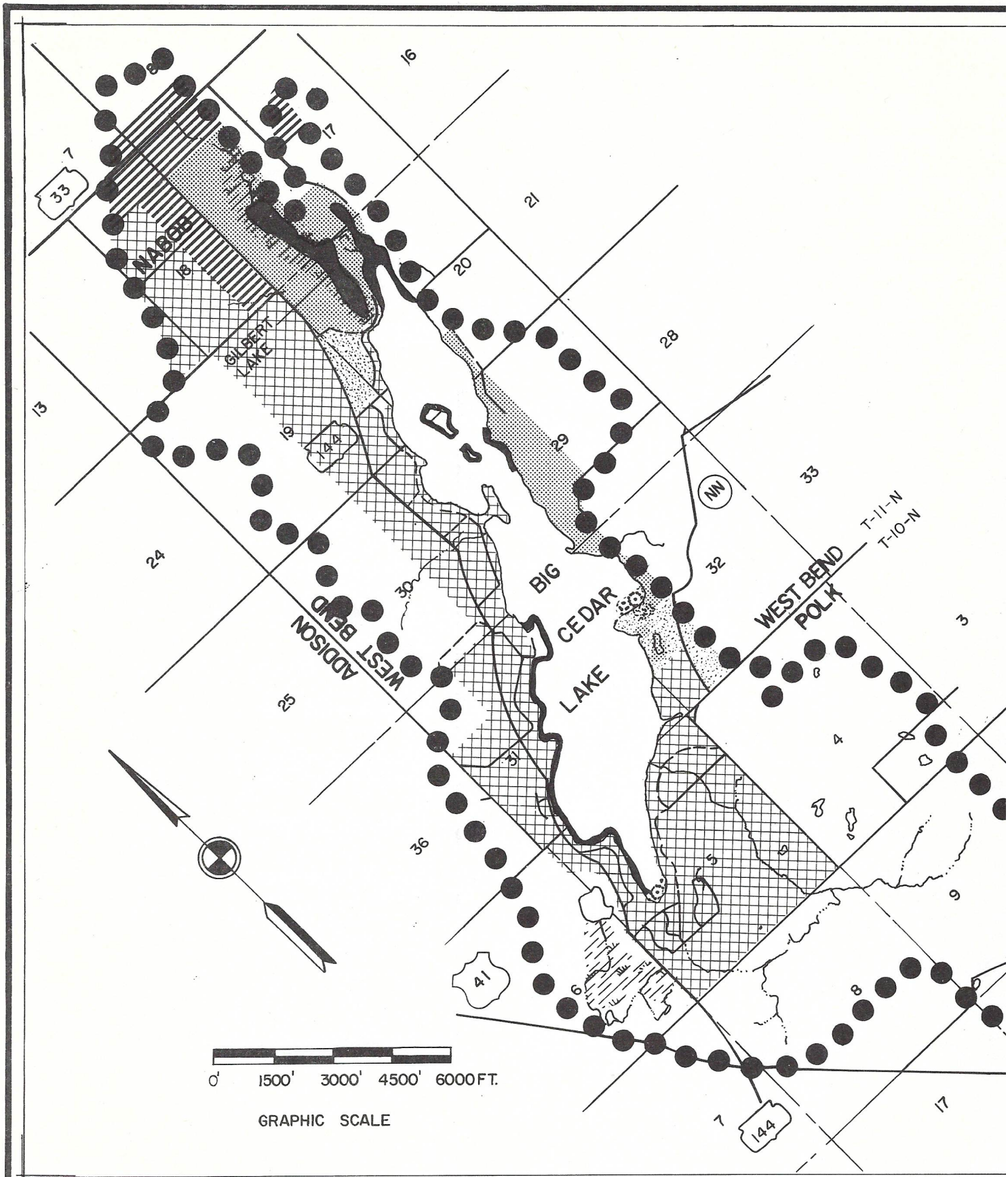
5. To further decrease eutrophication, a program of weed harvesting and algal control as well as a program of soil conservation practices (such as bench terracing) should be established on the agricultural lands in the watershed.

6. The development of a community park is desirable.

7. Adequate public access for fishing boats is needed and recommended.

8. A public beach is lacking on this lake. Efforts should be made to establish one at a suitable site.

9. Although a master plan of development is not within the scope of this lake use report, recreational use plans have been formulated and are recommended herein. Intermediate resource conservation objectives are illustrated in Map 4, while ultimate objectives are shown in Map 5.



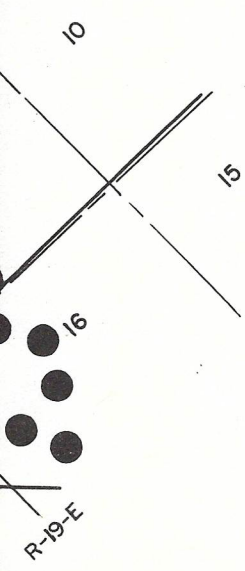
MAP 4

INTERMEDIATE F

BIG CEDAR LAKE, WAS

# LEGEND

-  CONSERVANCY DISTRICT
-  INTENSIVELY DEVELOPED PARK LAND (BEACH & FACILITIES)
-  EXTENSIVE PARK LANDS
-  COMMERCIAL FACILITIES
-  RESIDENTIAL
-  BEACH IMPROVEMENTS
-  PUBLIC WILDLIFE AREA
-  AGRICULTURE AND AGRICULTURE-RELATED
-  WATERSHED BOUNDARY
-  WEED PRESERVATION AREAS

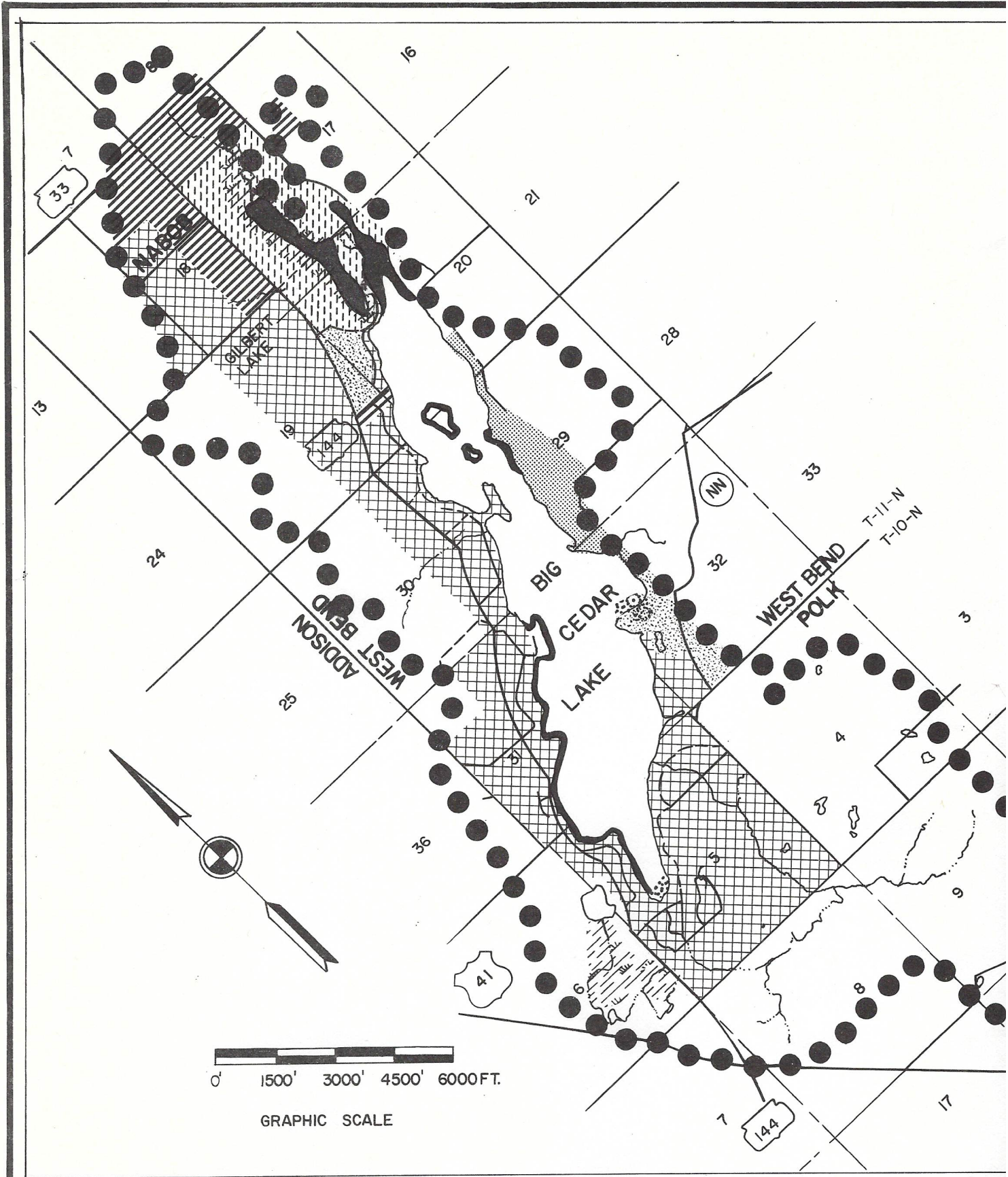


CREATIONAL USE PLAN

NGTON COUNTY, WISCONSIN

T-10, 11-N. R-19-E.

D. N. R., JULY 1970

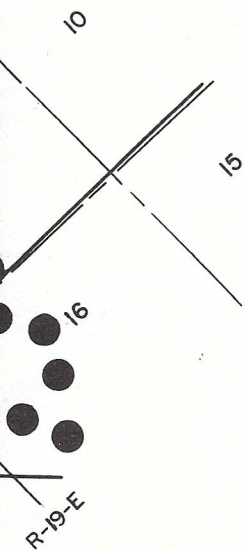


MAP 5

ULTIMATE REC  
 BIG CEDAR LAKE, WA

## LEGEND

-  CONSERVANCY DISTRICT
-  INTENSIVELY DEVELOPED  
PARK LAND (BEACH &  
FACILITIES)
-  EXTENSIVE PARK LANDS
-  COMMERCIAL FACILITIES
-  RESIDENTIAL
-  BEACH IMPROVEMENTS
-  PUBLIC WILDLIFE AREA
-  AGRICULTURE AND  
AGRICULTURE-RELATED
-  WATERSHED BOUNDARY
-  WEED PRESERVATION  
AREAS



EATIONAL USE PLAN

NGTON COUNTY, WISCONSIN

T-10, 11-N. R.-19-E.

D. N. R., JULY 1970