Pine Lake
Waushara County, Wisconsin

Aquatic Plant Survey Results

2001

Prepared by:

Mary Gansberg
Water Resources Biologist

Wisconsin Department of Natural Resources

Table of Contents

1.0 Introduction

A study of the aquatic macrophytes (plants) in Pine Lake was conducted during June 2001 by Water Resources Management staff at the Wisconsin Department of Natural Resources. Laura Felda from University of Wisconsin-Extension Lakes Partnership and Jack and Judy Kusch from the Pine Lake Property Owners Association assisted in the field survey work. This is the first vegetation survey of Pine Lake conducted by the Department of Natural Resources. A sensitive area designation was also conducted but is reported under separate cover (Gansberg, 2003).

Pine Lake is located in the Township of Springwater, Waushara County (T20N, R11E, Sec 2 and 3). Pine Lake is a 143-acre hard water seepage lake with no inlet or outlet. The lake is divided by a sand spit; the west lobe of the lake has a maximum depth of 16 feet and the east lobe has a maximum depth of 48 feet.

This report presents the methods, results and discussion, and conclusions of the aquatic plant survey.

2.0 Methods

2.1 Sampling methods

An aquatic vegetation survey was conducted during June 25-26, 2001. Sampling methods were based on a modified rake-sampling method developed by Jessen and Lound (1962). Twenty-one transects were equally spaced around Pine Lake's shoreline labeled A through U (**Figure 1**). Species occurrence were collected at each of the four different depth ranges of 0-1.5 feet, 1.5–5 feet, 5–10 feet, and 10–20 feet going from shore out toward the deep spot in each lake basin. Four rake samples were taken at each depth range using a tethered long-handled garden rake for a total of 336 rake samples. Transect tracking was facilitated with a hand-held GPS unit (GPS coordinates are given in

Appendix 1). Data are recorded separately for each transect. All samples collected were identified to genus and to species whenever possible

2.2 Data analysis methods

The collected transect data was used to estimate percent frequency, percent relative frequency, and average density for each species observed. The percent frequency is defined as the frequency of this species at all sampling points. The percent relative frequency is the frequency of this species relative to all other plants present. It gives an indication of the importance of that species in the plant community. In other words, if plants are found, which are the most important. The average density is the average density of this species in the area sampled.

A floristic quality assessment (FQA) was also applied to the aquatic vegetation species list using the methodology of Nichols (1999). FQA is a rapid assessment metric used to assist in evaluating the floristic and natural significance of a given area. Examination of the floristic quality index within the context of statewide and regional trends was used to provide an overall evaluation of the floristic quality of Pine Lake. A coefficient of conservatism (C) value was assigned to each species present. Conservatism is the estimated probability that a plant is likely to occur in a landscape that is believed to be relatively unaltered from presettlement conditions. As disturbance occurs less conservative species become more predominant. The C value ranges from 0-10 with 10 being assigned to species most sensitive to disturbance.

And lastly, an overview of the ecological value of the plant species found in Pine Lake was also compiled.

3.0 Results and Discussion

3.1 Survey Results

A total of thirteen species of aquatic plants were observed in Pine Lake including eleven submergent, one emergent, and one floating-leaf species (**Table 1**). Chara sp was the most frequently occurring species in Pine Lake (63.1 percent of sample points). Whitestem pondweed (Potamogeton praelongus) was the next most frequently occurring species at 22.9 percent of sample points. The exotic invasive Eurasian watermilfoil species was found at 2.7 percent of the sampling points. No plants were found at 24.1 percent of the sample points.

Excluding the exotic species, the number of aquatic species (12) found in Pine Lake is below the state and regional median of 13 and 14 respectively (Nichols, 1999) (**Table 2**). The FQA completed for the Pine Lake aquatic vegetation indicates a mean native species coefficient of Conservatism (C) of 6.1 (**Tables 1 & 2**). Nichols (1999) found that the median C for lakes in the North Central Hardwoods and Southeastern Till Plains lakes and flowages (NCSE) region, in which Pine Lake is located, was 5.6. Pine Lake therefore, appears to have relatively high mean coefficient of conservatism. The FQA of the plant community in Pine Lake was 21.1, which is above the 20.8 average for lakes in the NCSE region. This suggests that the plant community has been subject to less disturbance than the average lake in the region; however, more disturbed than the average lake in all of Wisconsin.

Overall, these findings indicate that Pine Lake's floristic quality is similar or slightly above that of other lakes found in the region, but slightly less than on a statewide basis.

Table 2. Floristic Quality Assessment

	Number of species	Average conservatism	Floristic quality
Wisconsin Lakes	13	6	22.2
NCSE region	14	5.6	20.8
Pine Lake	12	6.1	21.1

3.2 Ecological values

In general, aquatic plants in Pine Lake are about average in diversity and are not abundant. Many of the species found provide important spawning, nursery and foraging habitat for fish. Likewise, many of the species found provide critical food and shelter for a variety of wildlife. The aquatic plants help maintain the lake water quality. Aquatic plants capture sediments and nutrients that enter the system. The ability of rooted plants to utilize available phosphorus greatly limits the potential for algae blooms. Aquatic plants also stabilize bottom sediments preventing resuspension from wave action. Plants species vary in their ability to provide these characteristics; thus, maintaining a high aquatic plant diversity is critical to protecting the lake's water quality. The description and ecological value of aquatic plants found in Pine Lake is given in **Table 3**.

As indicated in **Table 1,** Chara was the most prevalent species in Pine Lake. This species forms dense green blankets along the lakebed that stabilize sediment and contribute to good water quality. These plant beds provide important cover and feeding areas for juvenile fish. Chara is a favorite waterfowl food. A report in the DNR files dated December 27, 1983, says a heavy growth of Chara was observed in 1983 and this is fairly normal in hard water lakes such as Pine Lake (Reif, 1983).

The second most abundant plant found was whitestem pondweed (Potamogeton praelongus). This species is considered a northern pondweed that is sensitive to water quality changes. Some researchers have given it a "turbidity tolerance rating" of zero (Davis and Brinson, 1980). Because it will disappear from disturbed systems, it can be

considered an indicator species. It serves as a "canary in a cage" for degrading water quality.

Of significance is the fact that no plants were found at 24.1percent of all sampling points. In general, a more abundant and diverse aquatic plant community in the 0-5 foot depth zone would greatly benefit fish and other aquatic life for the lake as a whole and also help protect these near shore areas from wave action and sediment resuspension. These near shore areas provide critical food and cover for young fish and other critters.

There is a definite lack of floating-leaf type plants in Pine Lake. Only one patch of white water lily (Nymphaea odorata) was found in the east bay of the lake. This small patch did not happen to fall within our random sampling sites, but is worth mentioning. Special care should be taken to preserve these unique and beautiful plants. White water lily provide seeds for waterfowl. Rhizomes are eaten by deer, muskrats, beaver, and porcupine. The leaves offer shade and shelter for fish.

There is also a definite lack of emergent plants in Pine Lake which is unfortunate because this type of macrophyte community provides excellent aquatic habitat and is the preferred spawning substrate for northern pike (Esox Lucius) (Becker, 1983). The lack of this community type is likely related to shoreline development and use. These plants need relatively undisturbed sites to do well.

3.3 Exotic species

One exotic species was found during this survey. Although Eurasian water milfoil only represented 2 percent of the plant species found in the lake, control of this exotic species should be a primary lake management concern. Eurasian water milfoil has the ability to out-compete native plants and reduce species diversity. This invasive plant can form dense stands that are a nuisance to humans and provide low-value habitat for fish and wildlife.

4.0 Conclusions

The aquatic plant community of Pine Lake is near average quality; furthermore, it has been subject to less disturbance than the average lake in the region. Chara sp was by far the dominant species within the Pine Lake plant community followed by Whitestem pondweed. Of significance is the general lack of near-shore submergent and emergent aquatic plants. Lakeshore property owners should be aware that near-shore aquatic plants are often critical habitat for fish and wildlife and play an important role in stabilizing banks and preventing erosion. Therefore human disturbances of these habitats should be minimized as much as possible. Eurasian water milfoil is present in the lake; nonetheless, management efforts should continue to try to control this exotic species as much as possible to preserve the overall integrity of the aquatic plant community of Pine Lake.

5.0 References

Becker, G.C. 1983. *Fishes of Wisconsin.* University of Wisconsin Press. Madison.

Borman, Susan, Robert Korth, and Jo Temte. 1997. *Through the Looking Glass – A Field Guide to Aquatic Plants.* Wisconsin Lakes Partnership, University of Wisconsin, Stevens Point.

Fasset, Norman C. 1940. *A Manual of Aquatic Plants.* University of Wisconsin Press, Madison.

Nichols, Stanley A., and James G. Vennie. 1991. *Attributes of Wisconsin Lake Plants.* Wisconsin Geological and Natural History Survey.

Nichols, Stanley A. 1999. *Floristic Quality Assessment of Wisconsin Lake Plant communities with Example Applications.* Journal of Lake and Reservoir Management. 15(2):133-141.

Jessen, Robert and Richard Lound. 1962. *An Evaluation of a Survey Technique for Submerged Aquatic Plants.* Minnesota Department of Conservation. Game Investigational Report No. 6.

Reif, Michael. 1983. Wisconsin Department of Natural Resource Water Resource Management files.

Davis, Graham J. and Mark M. Brinson. 1980. *Responses of Submerged Vascular Plant Communities to Environmental Change.* FWS/OBS-79/33. U.S Fish and Wildlife Service, Washington, D.C.

Gansberg, Mary K. 2003. Pine Lake Sensitive Area Survey Report. Wisconsin Department of Natural Resources.

6.0 Appendix

Appendix 1. GPS coordinates for aquatic plant survey transects from the 0 to 1.5-foot depth range.

Site	Latitude	Longitude
A	44° 13.944	89° 10.253
B	44° 13.998	89° 10.140
C	44° 14.006	89° 10.026
D	44° 13.940	89° 01.898
E	44° 13.835	89° 09.811
F	44° 13.940	89° 01.869
G	44° 14.035	89° 09.871
H	44° 14.099	89° 09.749
I	44° 14.138	89° 09.698
J	44° 14.217	89° 09.535
K	44° 14.157	89° 09.401
L	44° 13.998	89° 09.302
M	44° 13.944	89° 09.326
N	44° 13.916	89° 09.447
O	44° 13.869	89° 09.561
P	44° 13.795	89° 09.632
Q	44° 13.769	89° 09.775
R	44° 13.778	89° 09.885
S	44° 13.814	89° 10.017
T	44° 13.838	89° 10.191
U	44° 13.873	89° 10.244

Table 1. Results of aquatic plant survey conducted on Pine Lake during June 2001.

Species common name	scientific name	Percent Frequency[1]	Percent Relative Frequency[2]	Average Density[3]	Coefficient of Conservatism[4]
Bushy Pondweed	*Najas flexilis*	9.2	6.7	0.37	6
Variable Pondweed	*Potamogeton gramineus*	3.3	2.4	0.13	7
Elodea	*Elodea canadensis*	6.8	5.0	0.27	3
White Stem Pondweed	*Potamogeton praelongus*	22.9	16.7	0.92	8
Musk Grass	*Chara spp.*	63.1	46.1	2.52	7
Water Celery	*Valisneria americana*	6.3	4.6	0.25	6
Eurasian Water milfoil	*Myriophyllum spicatum*	2.7	2.0	0.12	Exotic
Flatstem Pondweed	*Potamogeton zosteriformis*	4.2	3.0	0.17	6
Northern Water milfoil	*Myriophyllum sibericum*	8.9	6.5	0.36	7
Illinois Pondweed	*Potamogeton illinoensis*	6.5	4.8	0.26	6
Floating Leaf Pondweed	*Potamogeton natans*	0.3	0.2	0.01	5
Sago Pondweed	*Potamogeton pectinatus*	1.2	0.9	0.05	3
Three-way Sedge	*Dulichium arundinaceum*	1.5	1.1	0.06	9
No Plants Found		24.1			
Average value					6.1

1 = frequency of this species at all sampling points
2 = frequency of this species relative to all other plants present
3 = average density of this species in the area sampled
4= coefficient of conservatism (C). The probability that a plant is likely to occur in a landscape that is relatively unaltered from presettlement conditions. The C values range from 0-10 with 10 being species most sensitive to disturbance

Table 3. Description and ecological value of aquatic plants found in Pine Lake, June 2001.

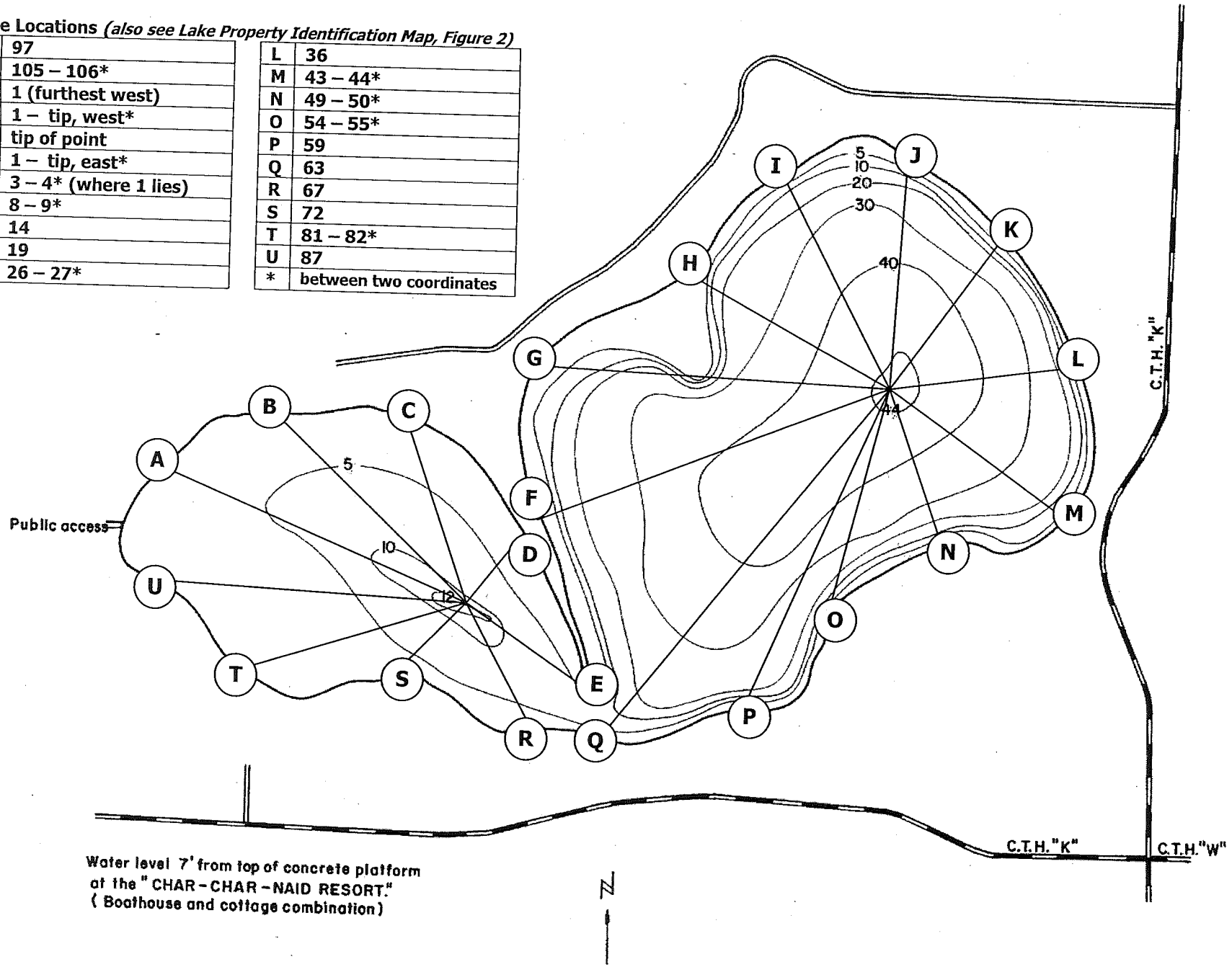
Species	Description	Ecological Value
Bushy Pondweed *(Najas flexilis)*	Submersed plant with a finely branched stem growing up to 1 meter; leaves are narrow, pointed, and grow in pairs	Very important food for many species of waterfowl and marsh birds; provides a good source of shelter and food for fish
Elodea *(Elodea canadensis)*	Made up of slender stems with small, lance shaped leaves that attach directly to the stem; leaves are in whorls of 2 or 3 and are more crowded toward the stem tip	Provide cover for fish and is home for many insects that fish feed upon
Variable Pondweed - *(Potamogeton gramineus)*	Stems emerge from spreading rhizomes and often sprawl on the sediment and branch repeatedly; leaves lack stalks and have 3-7 veins	Provides food for ducks, geese, muskrats, beaver and deer; provides habitat for invertebrates for foraging fish
Eurasian Water milfoil *(Myriophyllum spicatum)*	Produces long spaghetti-like stems; leaves are feather-like with 14-20 leaflet pairs, resemble bones on a fish spine, and are in whorls of 4-5; flower spike sticks out of the water with whorls of flowers	An invasive exotic species that grows in dense stands and has the ability to out-compete more desirable native plant species
Flat-stem Pondweed (*Potamogeton zosterformis)*	Emerges from a rhizome and has strongly flattened stems; leaves are stiff with a prominent midvein and many fine parallel veins	Provides cover for fish and is home for many insects which are fed upon by fish
Floating-Leaf Pondweed *(Potamogeton natans)*	Stems emerge from red-spotted rhizomes; floating leaves are heart shaped at base and rest flat on the water's surface	Provides food for ducks, geese, muskrats, beaver, and deer; offers shade and cover for fish
Illinois Pondweed *(Potamogeton illinoensis)*	Stout stems emerge from a thick rhizome; leaves are lance-shaped to oval and often have a sharp needle-like tip	Excellent cover for fish and invertebrates; source of food for waterfowl, muskrats, beaver, and deer
Musk Grass *(Chara spp.)*	A complex algae that resembles a higher plant; its is identified by its pungent, musk-like odor and whorls of toothed branched leaves	Is a favorite waterfowl food and provides a food source and cover for fish; helps stabilize bottom sediments and contributes to better water quality
Three-way Sedge *(Dulichium arundinaceum)*	The stiff round and hollow stems emerge from a spreading rhizome; the leaves are short and stiff and stand out from the plant	The shallow, spreading rhizomes create interlocking stands that are effective in buffering wave action and stabilizing sediments
Northern Water milfoil *(Myriophyllum sibericum)*	Light colored stems with leaves divided like a feather with a short stalk and about 5-12 leaflet pairs; flower spike emerges above water level and is made up of whorls of red tinted flowers	Offers excellent foraging habitat for fish; food for waterfowl and provides a home for invertebrates
Sago Pondweed *(Potamogeton pectinatus)*	Stems emerge from slender rhizomes with many starchy tubers; leaves are thin and resemble a pine needle; flowers emerge in small whorls that are slightly spaced apart on the stalk	One of the most important foods for migrating waterfowl; important habitat for young fish
Water Celery *(Valisneria americana)*	Made up of long ribbon-like leaves that emerge from a cluster; leaves tend to be mostly submersed with only leave tips trailing at water surface; the white female flower bobs at the surface on a spiral-coiled stalk	A premiere source of food for waterfowl and good habitat for fish
White-Stem Pondweed *(Potamogeton praelongus)*	Long zigzag stems up to 2-3 meters; leaves clasp the stem and are oval shaped with a cupped, boat shaped tip.	Good food producer for waterfowl and furbearers; good habitat for fish

Figure 1
PINE LAKE, Waushara County
Aquatic Plant Survey Sites

Site Locations *(also see Lake Property Identification Map, Figure 2)*

A	97
B	105 – 106*
C	1 (furthest west)
D	1 – tip, west*
E	tip of point
F	1 – tip, east*
G	3 – 4* (where 1 lies)
H	8 – 9*
I	14
J	19
K	26 – 27*

L	36
M	43 – 44*
N	49 – 50*
O	54 – 55*
P	59
Q	63
R	67
S	72
T	81 – 82*
U	87
*	between two coordinates



Water level 7' from top of concrete platform at the "CHAR-CHAR-NAID RESORT." (Boathouse and cottage combination)

Figure 2.

PINE LAKE PROPERTY IDENTIFICATION MAP

COUNTY HIGHWAY

PAVED ROAD

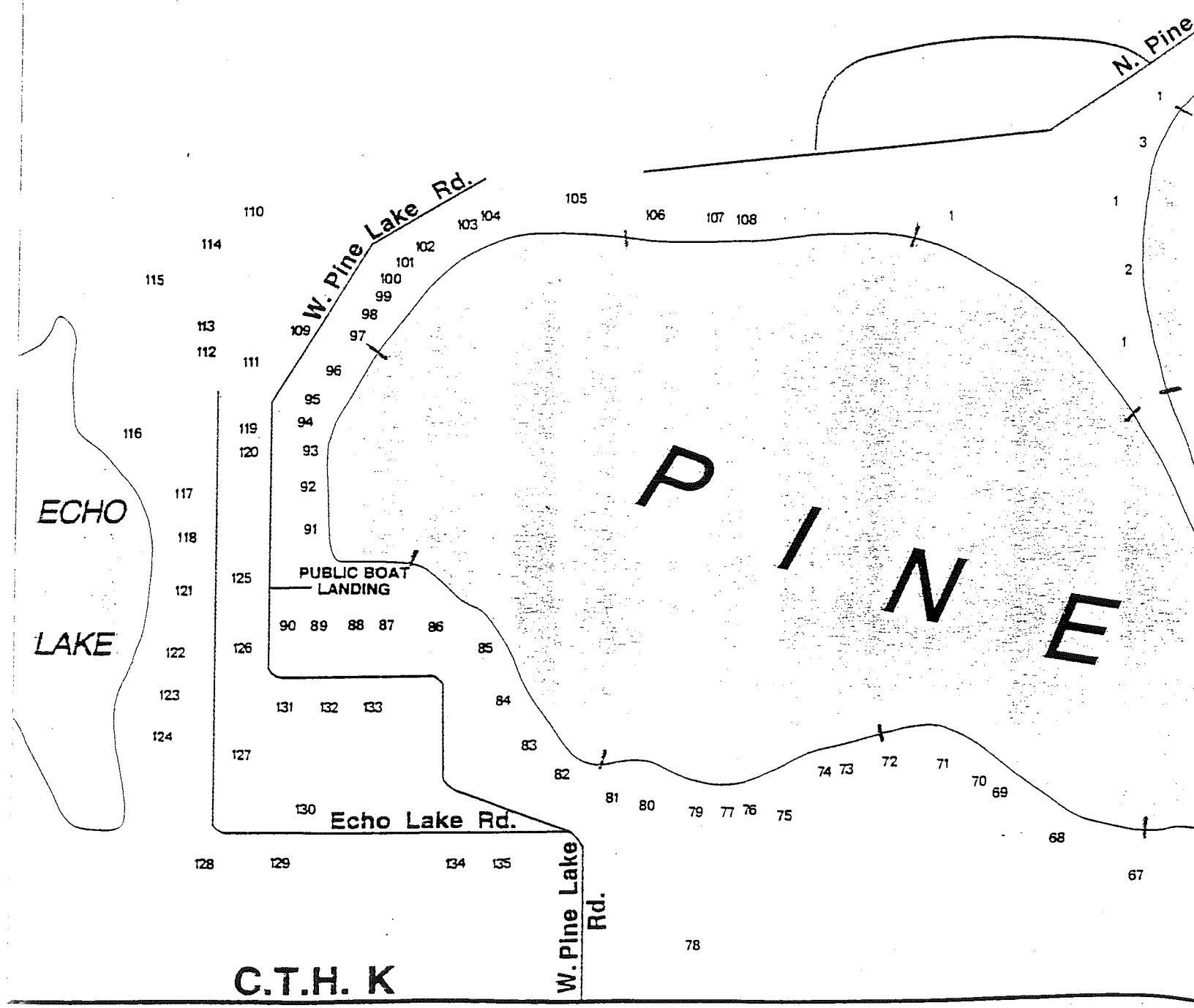
DIRT ROAD

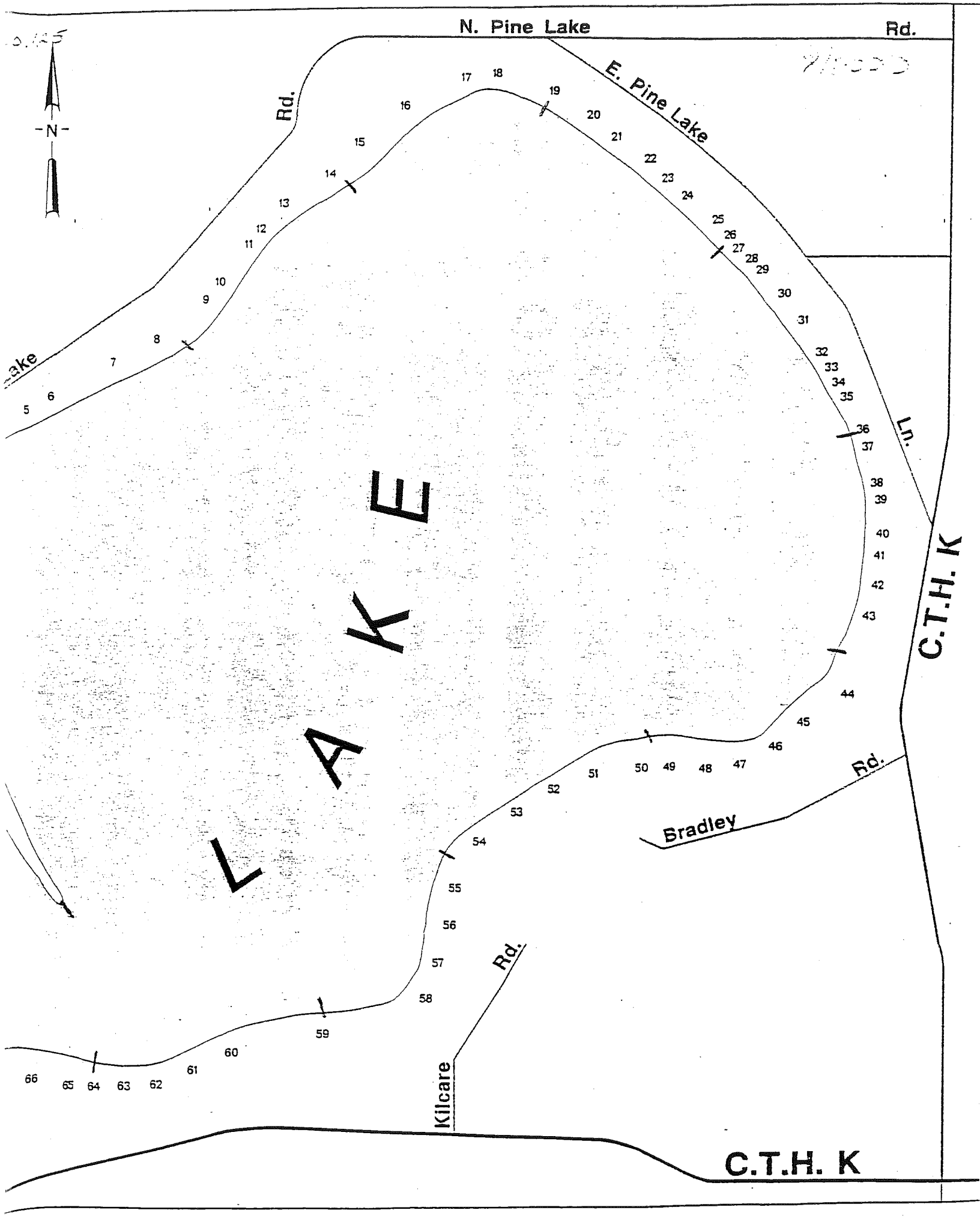
37 PROPERTY IDENTIFICATION NUMBER

0 0.0625 1/8 MILES

PINE LAKE

Springwater Township
Waushara County, WI
Acres: 143
Area: 6,229,080 sq. ft.
Maximum Depth: 48 ft.
Average Depth: 18 ft.




N. Pine Lake Rd.
E. Pine Lake
Rd.
Ln.
C.T.H. K
LAKE
Bradley Rd.
Kilcare Rd.
C.T.H. K
-N-