Losik & associates

EAGLE LAKE
LAKE MANAGEMENT PLANNING GRANT

Prepared For:

EAGLE LAKE PROPERTY OWNERS
IMPROVEMENT ASSOCIATION, INC.

October 15, 1992

Michael J. Losik & Assoc., Inc.
Consulting Engineering, Land Surveying & Land Planning
[illegible]
414 544-2221 • FAX 544-6564

PUBLIC OPINION OF WATER USE AND QUALITY IN EAGLE LAKE (KANSASVILLE, RACINE COUNTY, WISCONSIN)

Jeffrey A. Thornton
College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481

SUMMARY

This report documents the results of a watershed-wide survey of Kansasville residents living in the Eagle Lake Watershed. The study was conducted in the fall of 1991, and revealed a high degree of environmental awareness among these residents. While passive recreational pursuits dominated the lake-related activities (viewing and walking), many respondents used the lake for swimming and boating. Most expressed concern over poor water quality and a declining fishery, even though frequent anglers were a minority of the surveyed population. This study found that most residents were concerned about nonpoint source pollution from the watershed. Further investigation of these pollution sources is recommended, to be followed, where necessary, by the development of appropriate ordinances to protect the lake.

INTRODUCTION

The Wisconsin Lake Management Planning Grant Program, launched by the Wisconsin Department of Natural Resources (WI DNR) in 1990, has resulted in a growing number of lake organizations taking an interest in beginning to manage an increasing number of the state's 15,000 plus waterbodies. An essential pre-requisite to the development of a management plan to guide these efforts is the clear definition of the existing, or potential, problem(s) facing a given lake. To this end, many communities find it convenient to begin this problem definition phase by conducting a survey of the lakeside and user community, both to gain public input into the decision-making process and to build community consensus and commitment for the lake management efforts (cf., NR119, WI Administrative Code). In the case of Eagle Lake, near Kansasville (Racine County), Wisconsin, the Eagle Lake Property Owners' Improvement Association contracted with a private consultancy, as the initial phase of their lake management planning, to conduct a

survey of their community in order to establish a basis from which to proceed with further management-related activities. In exchange for the right to make use of selected data for research purposes, the College of Natural Resources, University of Wisconsin-Stevens Point, agreed to assist this firm in the analysis of the survey results. This paper presents the results of that analysis.

SURVEY INSTRUMENT AND METHODOLOGY

The Eagle Lake Property Owners' Improvement Association, in concert with their consultant, the WI DNR and the University's College of Natural Resources, prepared a questionnaire according to the draft guidelines set out by the WI DNR for the conduct of lake user surveys under the Planning Grant Program. The survey instrument was randomly administered to approximately 450 residents of the Eagle Lake Watershed using a standard mail drop technique. This list of respondents was drawn from a subset of the sewerage records of the Town of Dover applicable to the Eagle Lake Watershed. This survey was conducted during September 1991, and resulted in a response rate of about 60% (287 responses), which is statistically significant. The data were compiled and analyzed using a Lotus 1-2-3 spreadsheet program, and examined for content and trends. The compilation of the data was carried out by a commercial agency subcontracted by the lead consultancy, and the analysis was performed by the College of Natural Resources, University of Wisconsin-Stevens Point.

RESPONDENT PROFILE

The respondents represented a relatively typical cross-section of Wisconsonites, especially those owning suburban waterfront property in the southeastern part of the state (Klessig *et al.*, 1989). Of the 84% responding to the question relating to household income, there was a slight bias toward middle and upper middle level incomes (the median being about $50,000). The majority of respondents (92%) were owners of residential property in the Eagle Lake Watershed, which was fairly evenly split between lake front (48% of respondents) and non-lake front (51%) properties. Twenty respondents also owned undeveloped property in the Watershed, and few had any intention of building on this property in the foreseeable future.

Half (50%) of the respondents had lived in the Watershed for 10 years or less, while 17% had lived there for more than 30 years. The average period of residence was 15 years, in the range from less than 1 year to a maximum of 73 years. For most respondents (60%) their residence in the Eagle Lake Watershed was considered their primary residence. Of those living elsewhere, 22% (8% of respondents) were [southeastern] Wisconsin residents while the remainder (74% of those residing elsewhere; 28% of respondents) were primarily [northern] Illinois residents. On average, these respondents spent one month in the Eagle Lake Watershed, although some (9%) spent over six months in residence (the maximum period of residence reported by those considered to maintain their primary

residence outside of the Eagle Lake Watershed was 250 days).

Most (76%) made use of Eagle Lake for recreational purposes, and have done so in proportion to their length of residence; e.g., 37% of respondents had used the lake over a period of ten years or less, while 18% had used the lake for more than 30 years. Of the 24% of respondents who chose not to use the lake, most 58% (14% of respondents) did not use the lake because of its poor water quality or poor fishing. Virtually all respondents rated aesthetics very highly; the scenic beauty, trees, wildlife, vegetation, fisheries and recreational opportunities were all viewed as being among the most valuable assets of the Eagle Lake Watershed (in contrast, agricultural soils were valued less highly, but, by no means, were discounted completely).

LAKE USE ANALYSIS

Types and Frequencies of Use

Respondents were asked to indicate those activities which they regularly engaged in while residing at, or using, Eagle Lake. Of the fourteen activities specified (Table 1), most respondents regularly used the lake for scenic viewing (50% reporting frequent or daily use in this category), walking (26%), boating (25%) and swimming (22%); the latter obviously being seasonal activities. Use of personal water craft ("jet skis") was the activity that the least number of respondents engaged in; 75% of those responding stating that they never engage in this activity. Ice-fishing (59% of respondents never engaging in this activity), sailing (58%), snowmobiling (56%) and canoeing (56%) were also among the activities which had the fewest adherents on Eagle Lake.

Levels of Satisfaction

Generally, the respondents indicated that their assessment of the quality of the recreational experience at Eagle Lake was proportional to the degree of contact with the water (Table 1). The passive use of the waterbody for scenic viewing rated very highly with regard to suitability for that activity. Similarly, non-contact active recreational pursuits were also ranked well within acceptable limits, receiving ratings of "good" from the majority of respondents. The classification of non-contact active recreation encompasses activities such as boating where participants seldom come into direct contact with the water. Some forms of fishing can also be placed into this category, although, typically, other criteria come into play when users assess the suitability of a waterbody for angling (i.e., the types of fishes caught, degree of success per unit of angler effort, etc.; see below).

Rankings of less than acceptable were most often given to the quality of those recreational experiences requiring direct contact with the water; i.e., activities such as swimming and some forms of fishing (although the same provisos as noted above apply in this

latter category). That such an assessment is made is not altogether surprising, considering that degree of contact is directly proportional to the user's proximity to the waterbody, and parallels other studies from around the world (cf., Kooyoomijian & Clesceri, 1974; Thornton *et al.*, 1989).

TABLE 1. Uses to which Eagle Lake is put by the respondents to this survey. Uses are ranked in order of frequency of use from most popular to least popular. The degree of suitability of the lake waters for this use is also shown, again in order of frequency from most suitable to least suitable.

Respondent-Indicated Lake Use	Respondent-Assessed Lake Suitability
Scenic viewing	Excellent
Walking/Hiking	Good
Powerboating/Water-skiing	Good
Swimming	Poor
Shore/Dock-based fishing	Poor
Ice skating/Snow-skiing	Good
Boat fishing	Poor
Row/Paddle-boating	Good
Canoeing	Good
Sailing	Good
Snowmobiling	Good
Ice-fishing	Poor
Jet-skiing	Poor to Good

Fishing as a Lake Use

Although relatively few respondents regularly used the lake for fishing (only 22% reporting frequent or daily use of the lake during the open water months, and 5% during months with ice cover), the majority (between 41% and 65% for the various types of angling) did indicate some use of the lake for fishing, even if they only rarely engaged in this sport. To investigate the reason for this lack of angling, and given the frequency with which poor fishing

was cited as a reason for not using the lake (see above), respondents were asked to assess the fishery at Eagle Lake. Of the 65% of respondents who replied to this question, 72% (or 47% of respondents) rated the fishing as "poor", reenforcing the perceptions of those who stated that they did not use the lake for this reason.

The bulk of the catch consisted of Black Bullheads, Bluegills, Crappies and Carp. Although Walleyes, Largemouth Bass and Yellow Perch were caught with a moderate degree of frequency, the data supplied by the respondents suggest that these desirable sport fishing species were caught two to four times less frequently than the coarse fish species (roughly 120 respondents caught Bullheads, while only about 60 caught Bluegills; less than 40 or so caught any of the other species named). A single respondent caught a muskie in Eagle Lake! The majority of the anglers (28%) had fished Eagle Lake for five years or less, although a core group of commited fisherfolk does exist on the lake, whose members have fished Eagle Lake for as long as 71 years.

Asked to indicate how they felt the lake fishery has changed over the years, most respondents (66%) stated that the numbers of Black Bullhead have clearly increased, as have the numbers of Carp (54% of respondents indicating an increase in this species). Between 37% and 43% of respondents suggested that the more desirable sport and pan fish species (e.g., Bluegills, Walleyes, bass, pike, etc.) have declined in numbers during this same period (between 28% and 35% of respondents preferentially fished for these species, while the same number, about 33%, indicated that the species caught did not really matter). Over 40% suggested that the lake be managed in such a way as to restore the more popular sport and pan fish populations.

LAKE QUALITY ANALYSIS

Water Quality Indicators

Respondents were asked to rate the existing water quality of Eagle Lake. The majority of respondents (89%) ranked the lake as having poor to fair water quality, with most (68%) tending to rank the lake's water quality as poor. Of those respondents ranking the lake as having poor water quality, most (46% of respondents) suggested that the quality has been deteriorating during their period of residence in the Watershed. A further 20% saw no change in water quality. Typically, respondents made this judgement on the basis of water clarity. Other factors, such as a "clean environment", the "quality of the fisheries", "scenic surroundings" and the "swimming potential" were also highlighted as being of significance in their assessment, but most respondents (46%) selected water clarity as their first criterion.

Confirmation of the use of these criteria by the respondents is inherent in the reasons given for their assessment of Eagle Lake as a poor quality body of water. Twenty-two percent of respondents

identified muddy, dirty and murky water as the basis of their assessment; 18%, excessive growths of algae and aquatic plants ("weeds"); and 10%, water too dirty to swim in. A further 12% cited a declining fishery, with increasing populations of rough fish and the presence of dead fish, as evidence of poor water quality. While the use of these criteria parallels those chosen by respondents to other studies (cf. Thornton & McMillan, 1989), the absence of any specific reference to litter and floating debris is a curious omission in this study (only 1% of respondents mentioned trash as an issue). This issue was not even mentioned in terms of improvements desired in the state of the lake; muck (cited by 73% of respondents), depth (67%), fishing (64%) and algae (59%) dominated these responses. What makes this unusual is the fact that, generally, lakes that are subject to heavy usage commonly suffer from very visible littering problems that are often cited along with the other visual criteria mentioned by the respondents to this survey (cf. Thornton *et al.*, 1989). The absence of such a response reflects well on the community and the self-discipline of the lake users in properly disposing of trash.

Water Quality Assessment

Asked to rate a number of typical issues statements as to their relative severity on Eagle Lake, respondents identified issues such as unwanted fish species (64% of respondents), water clarity (63%) and a muddy lake bottom (56%) as the most serious problems facing the lake. These responses related well to the water quality indicators that the respondents had identified, being primarily sensual (see above). Inclusion of the "unwanted fish species" category in this list of the three most serious problems facing Eagle Lake is remarkable for several reasons; namely, it is the only one of the three that is not directly related to a sensory perception (either visual, as in the case of water clarity, or palpable, as in the case of mud), it is related to an activity that only a minority of the respondents engaged in with any regularity, and it is, at first glance, totally unrelated to the other two issues. Inclusion of "poor fishing" (47% of respondents) and "sediment deposition in the lake" (45%) as the next most serious problems in the lake perhaps sheds further light on such a dichotomy. First, fishing is obviously being considered by the community as the prime recreational benefit to be derived from Eagle Lake. This is confirmed in terms of both the desired improvements in the state of the lake (64% of respondents requested an improved fishery) and the percieved deterioration in the fishery (47% of respondents). As such, the impact of poor fishing on lake users (and potential lake users - especially in this instance where so few respondents actually fished with any degree of frequency) would be severe. Second, the species which have replaced the more desirable sport and pan fishes in the lake, Carp and Bullhead, are probably also contributing to the increased turbidity (decreased water clarity) that an equal number of respondents noted as the second most severe problem on Eagle Lake. Similarly, the increased presence of these species in the lake reflects the excessive sedimentation (witnessed by the muddy bottom) that many respondents

noted as occurring in Eagle Lake. Both of these species are bottom-feeding fishes that prefer muddy substrates.

The emphasis placed on the muddy bottom is understandable when viewed in terms of its relationship to the poor fishery and decreased water clarity. However, few other studies have identified such a close relationship between the various aesthetic criteria and an in-lake causative factor (cf., Thornton *et al.*, 1989). This is suggestive of an effective public information program; whether this is so, or not, is difficult to determine from the responses given to this survey, especially as so few of the respondents indicated any memberships in conservation or sporting organizations (< 50% of respondents) that might account for such a high degree of environmental awareness (cf., Grieve & van Staden, 1985). But, the parallel concern expressed by many respondents over a decreasing lake depth (67% of respondents) does cast some doubt over the validity of such a conscious connection between these issues, suggesting that the selection of these issues as the major issues of concern may be coincidental. On the other hand, 67% of respondents did implicate rough fish (specifically the carp) as the most significant cause of the problems being experienced in Eagle Lake - a response that directly links these three issues of fish species, turbidity and mud.

The ranking of poor water clarity as a co-equal issue of concern with the presence of coarse fishes is not unexpected. The use of water clarity as a water quality indicator is well established both in terms of its importance to public perceptions (Thornton *et al.*, 1989; Thornton & McMillan, 1989) and to the aquatic environment (e.g., OECD, 1982; Shaw *et al.*, 1989). What is noteworthy in this particular situation is the fact that the turbidity is inorganic (i.e., it is silt turbidity rather than algal, or organic, turbidity). In fact, even though over 50% of respondents suggested that Eagle Lake had an excessive amount of algal and aquatic plant growth and that a reduction in the algal population of Eagle Lake was desirable in terms of improving the quality of the lake, relatively few (32%) cited algae as a serious problem (even fewer respondents (22%) suggested that aquatic plants were a serious problem). This is in contrast to many other studies in North America where the percentages have been typically reversed (Thornton *et al.*, 1989).

The selection of issues such as litter, crowding, and noise as relatively minor issues by upwards of 30% of the respondents is also in contrast to many other studies in which these use-related issues have been highlighted as matters of public concern. While a moderate amount of concern was expressed over boating behavior (i.e., excessive speeds and traffic) by 20% to 30% of respondents, these issues received less comment than has been generated on many other Wisconsin lakes (cf., Korth & Klessig, 1990). Few respondents (< 20%) felt that use-related issues played a major part in the decline of Eagle Lake.

Water Quality Management

Although algal and aquatic plant-related problems were not identified to the extent anticipated, respondents were, nevertheless, asked to evaluate various types of lake management strategies for controlling excessive plant and algal growth. Of the preferred methods, upstream soil conservation measures (both in terms of soil erosion controls and in terms of integrated nutrient and pest management practices) and in-lake dredging were selected by over 45% of respondents. The selection of these practices clearly creates the link between watershed-based caustive factors and in-lake response; i.e., watershed-based practices have most likely generated the excessive quantities of sediment and nutrients that have led to the deterioration in fishing and water quality in the lake (although further study should be undertaken to quantify and confirm this perceived linkage). It also further supports the comments made above concerning the degree of understanding of the ecological processes exhibited by the respondents.

In terms of aquatic plant control, mechanical means were strongly preferred while chemical controls were even more strongly rejected (30% of respondents supported mechanical controls while 43% rejected chemical treatments). Few respondents (< 15%) saw any noticeable changes in the lake following the application of copper sulfate or the eradication of rough fish that was undertaken in 1975. In contrast, many respondents (> 60%) felt that sewering the community resulted in a positive effect on the lake.

Additional land use controls received moderate levels of support. Controls on development received slightly more support than did restrictions on fertilizer use, with a third or less of respondents expressing a strong preference for this type of intervention. Given the strong feeling regarding adoption of improved soil erosion, and nutrient and pest management practices in the watershed, some consideration might be given to quantifying the relative magnitudes of the urban/peri-urban and rural nonpoint pollutant sources and implementing uniform standards for erosion control and chemical use within the watershed, perhaps as a second stage study in the Wisconsin Lake Management Planning Grant Program. This would be consistent with the generally positive feeling toward the point source pollution controls that have already been implemented.

PUBLIC PERCEPTIONS, FUNDING AND ORGANIZATIONAL ACTIVITY

In the penultimate section of the survey, respondents were asked to rank a number of commonly heard statements regarding their lake. These statements covered most of the areas previously discussed and provided a better measure of some of the use-related issues that had been previously under-played. While confirming that most respondents had a poor view of the water quality of Eagle Lake (86% suggesting that a visitor would find the lake dirty), this section also highlighted the moderate degree of concern expressed previously over motorized boat traffic on the lake.

Seventy-seven percent of respondents felt that the lake had sufficient public access in terms of the existing public beaches, marinas, parks and boat ramps; few people felt that the watershed was "too developed" (at least, few people felt the area was so developed that it was time to move on elsewhere). Most (73%) would support a speed limit of motorized craft using the lake, and many (66%) would support launching fees based on boat or motor size (although there was mixed opposition to the suggestion that boat use be restricted to certain times of day). [**Note:** Boating times are currently restricted to between sunrise and sunset by state regulation; additional restrictions may be applied, such as the existing limitation of boating hours on Eagle Lake to between 10h00 (10 am) and 20h00 (8 pm) - of the 33% of respondents favoring stricter standards, most suggested limiting early morning boating activities.] Seventy-six percent of respondents favored the use of user fees to fund lake management activities. [**Note:** Such fees are currently viewed as being contrary to the provisions of Article IX, Section 1, of the State Constitution; further, the WI DNR has held that fees for the use of boat ramps, etc., should be in concert with the fee structure in Wisconsin's state parks.]

Most respondents (> 65%) felt that the quality of Eagle Lake directly affected their property values. Yet despite this concern and their obvious knowledge of the causal linkages between the watershed and lake, respondents exhibited mixed feelings regarding their knowledge of local land use and zoning regulations. Forty-one percent claimed familiarity with the regulations and an equal number disclaimed such knowledge. While this is not surprising, given the complexity of these regulations and the lack of exposure that most citizens have to these regulations, it is noteworthy in view of the fact that this is one of the principle legal means of giving effect to their desires with regard to the lake environment. Thus, the scepticism displayed toward the effectiveness of such legal remedies, in the responses given by many (about 65%) of those expressing familiarity with the land use planning concept, is truly cause for concern. In this vein, a number of respondents expressed a desire for better communications between the authorities (at various levels of government) and the residents.

With regard to the financial responsibility for the lake and its environs, most respondents (> 50%) felt that all concerned should bear a fair share of the cost; i.e., federal, state and local governments, users, residents and owners, and polluters. There was an undercurrent of support for the suggestion that polluters bear the entire cost of managing the lake (i.e., an acceptance of the "polluter pays" principle, by 31% of respondents) and a lack of support for the suggestion that property owners and residents pay (i.e., a rejection of the "beneficiary pays" principle, by about 25% of respondents). Such a stance is consistent with constitutional principle of common ownership.

Opinion was divided on the question of Association-sponsored events at Eagle Lake. Forty-five percent of respondents felt that the Association should sponsor some types of activities. Fishing

contests, sailing regattas, and, to a lesser extent, water-skiing exhibitions were the most popular choices of those wishing to see a more active Association; however, as these were also the prompts given for this question, care should be exercised in interpretting this as unbiased community agreement in favor of these activities. Other events, such as shoreline clean-ups, "block" or skating parties, and Fourth of July fireworks may have proven equally popular had they been used as prompts. In other words, the Association should conduct a further public participation exercise(s) before beginning to promote such activities, especially as 31% of the respondents felt that the Association should not be involved in any of these actvities.

CONCLUSIONS

The Eagle Lake Watershed community is comprised of a fairly typical group of middle to upper-middle income property owners, most of whom have relatively recently moved into the area (within the last decade) and many of whom live in the Kansasville area. Most have made use of Eagle Lake for recreational purposes. Scenic viewing, walking, boating and swimming make up the principle activities which respondents have engaged in. There was a general level of dissatisfaction with the lake during this survey, which revolved around the perceived deterioration in water quality and fishery quality. Decreased water clarity and increasing populations of coarse fish were the main complaints. Most respondents felt that this worsening situation was related to agricultural nonpoint source pollution (contributing both sediment and chemicals to the lake). Few felt that this situation could be controlled using existing legislation. Surface use conflicts were a relatively minor issue in this watershed.

There was a high degree of environmental awareness demonstrated by the respondents to this survey. Many made the connection between the watershed and the lake. Unfortunately, this awareness was coupled to a healthy level of scepticism regarding current land use and zoning regulations, the legal mechanism that is most likely to be the vehicle for controlling the environmental deterioration. While most respondents recognized their public (financial) responsibility in terms of any lake management efforts, there was a recognition of the roles of government and the polluters in this process, and a reluctance to commit to any large-scale events on the lake.

Several conclusions and avenues for further investigation were identified during this study; namely, the community's desire that the lake be managed as a sport/pan fishery, that (nonpoint source) controls be established to restrict the input of sediment and nutrients (and other chemical substances) to the lake, and that some form of boating ordinance restricting speeds and early morning boat traffic be adopted. Of these, the need for an assessment of the silt, nutrient and substance loads to the lake would appear to be the most pressing, as this will form the basis for any future management interventions aimed at re-establishing the sport/pan

fishery. Ordinance development could also then proceed once there was confirmation of the relative importance of the various silt, nutrient and substance sources, and the impact of boating. (Obviously, development of a boating ordinance restricting boating during the early morning could proceed independently from the foregoing study, as this is a social, rather than environmental, issue.)

ACKNOWLEDGEMENTS

The author wishes to acknowledge Messrs Michael J. Losik & Associates, Aron & Associates, EWI Engineering Associates and Eagle Lake Property Owners' Improvement Association, Inc. for their part in the compilation, conduct and analysis of this survey. The authorship of this report was supported in part by a University of Wisconsin-Stevens Point Personnel Development Committee Mini-Grant and the University of Wisconsin Extension (Environmental Resources Unit: Lakes Program).

REFERENCES

Grieve, K.W. & F.J. van Staden (1985). Environmental concern in South Africa: An attitudinal study. *South African Journal of Psychology*, 15(4):135-136.

Klessig, L., B. Sharp & R. Wedepohl (1989). Using a special purpose unit of government to manage lakes. *Lake & Reservoir Management*, 5(1):37-44.

Kooyoomijian, K.H. & N.L. Clesceri (1974). Perceptions of water quality by select respondent groups in inland-water-based recreational environments. *Water Resources Bulletin*, 10:728-744.

Korth, R.M. & L.L. Klessig (1990). Overcoming the tragedy of the commons: Alternatiuve lake management institutions at the community level. *Lake & Reservoir Management*, 6(2): 219-225.

OECD (Organisation for Economic Cooperation and Development) (1982). *Eutrophication of Waters: Monitoring, assessment and control*. OECD, Paris.

Shaw, B., C. Mechenich & L. Klessig (1989). *Interpretting lake water quality data: A citizen's guide*. University of Wisconsin Press, Stevens Point.

Thornton, J.A. & P.H. McMillan (1989). Reconciling public opinion and water quality crieria in South Africa. *Water SA*, 15(4):221-226.

Thornton, J.A., P.H. McMillan & P. Romanovsky (1989). Perceptions of water pollution in South Africa: Case studies from two water bodies (Hartbeespoort Dam and Zandvlei). *South African Journal of Psychology*, 19(4):199-204.

FIELD DATA ACQUISITION

The following data sheets combine the results of sampling sessions collected in April, June, July and August of 1991, and February, April, June, July and August of 1992. During each sampling session, three representative samples of the lake's water column were collected from the deepest location in the lake (upper, middle and lower). During the April sampling, no samples were collected from the middle. Samples were stored in ice-filled coolers in transit to the laboratory. Parameters included: chlorophyll a, total phosphorus, total kjeldahl nitrogen, ammonia nitrogen, and suspended solids. Each representative sample was delivered to a DNR approved laboratory and analyzed. Profiles of dissolved oxygen, pH, water clarity, specific conductance, and temperature were collected and recorded at the sampling locations.

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	April 25, 1991	Weather:	High thin clouds, wind 10-15 mph, temp. approx. 50^0 F
Ice Thaw:	March 20, 1991	Observers:	Eric Parker/EWI Rob McLennan/DNR Sharon Gayan/DNR
Secchi Depth:	2.5 feet	Time:	9:45 a.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (^{0}C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	11.0	10.6	485	8.2	19
1	11.1	10.6	x	x	x
2	11.5	10.6	x	x	x
3	11.4	10.6	x	x	x
4	10.8	10.6	x	x	x
5	11.0	10.5	485	x	x
6	11.1	10.5	x	x	x
7	11.0	10.5	486	x	x
8	10.0	10.0	x	x	x
9	11.0	10.2	491	8.3	x
10					
11					
12					
13					
14					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.054	1.2	0.028	13.0
Metalimnion (skip in April)	x	x	x	x
Hypolimnion	0.064	1.1	0.028	15.0

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 250 ml

NOTES:

The sampling location was determined by the use of a depth finder. Although a 13' depth was observed on the way to the ultimate location, it was determined the lack of stratification, typical of April lake conditions, as well as the shallowness of Eagle Lake rendered the exact location of the sampling irrelevant. More effort will be exercised in future sampling sessions to locate the exact location of the deepest point in Eagle Lake. Field Report sheet was completed.

Parameter	Value	TSI
Chlorophyll a	19 ug/l	56
Total Phosporus	54 ug/l	64
Secchi Depth	0.76 m	64

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	June 13, 1991	Weather:	Sunny southeast wind 5-10 mph, temp. approx 82° F
Ice Thaw:	March 20, 1991	Observers:	Eric Parker/EWI John Zinnen/ELPOIAI Don Hermes/ELPOIAI
Secchi Depth:	1.77 feet	Time:	10:30 a.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	7.2	24.5	525	8.3	27
1	7.2	24.5	525	x	x
2	6.9	24.6	525	x	x
3	6.8	24.5	525	x	x
4	6.3	24.0	525	x	x
5	5.4	24.0	525	8.3	x
6	5.6	24.0	527	x	x
7	5.5	24.0	527	x	x
8	5.1	24.0	527	x	x
9	5.5	23.9	528	x	x
10	3.5	23.8	528	8.3	x
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.047	1.2	0.047	19.0
Metalimnion (skip in April)	0.050	1.2	0.137	21.0
Hypolimnion	0.086	1.6	0.134	118.0

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 200 ml

NOTES:

Deepest location found was 10 feet. Located directly in line with long stairway on peninsula of southeast portion of lake.

Parameter	Value	TSI
Chlorophyll a	27 ug/l	58
Total Phosporus	47 ug/l	62
Secchi Depth	0.54 m	69

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	July 19, 1991	Weather:	Sunny southwest wind 8 mph, temp. approx 82° F
Ice Thaw:	March 20, 1991	Observers:	Tom Chapman/EWI John Zinnen/ELPOIAI Don Hermes/ELPOIAI Bob Wakeman/WDNR
Secchi Depth:	2.25 feet on 7-18-91	Time:	9:00 a.m.
Water Level:	6 inches below		
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	7.2	25	590	8.7	25
1	7.3	25	x	x	x
2	7.3	25	x	x	x
3	7.2	25	x	x	x
4	7.2	25	x	x	x
5	6.8	25	595	8.6	x
6	6.8	25	x	x	x
7	6.8	25	x	x	x
8	6.6	25	x	x	x
9	6.4	25	590	8.6	x
10					
11					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.080	1.3	0.014	31.0
Metalimnion (skip in April)	0.077	1.2	0.011	32.0
Hypolimnion	0.080	1.2	0.018	41.0

Secchi depth (feet)	Chlorophyll a filtration volume
< 1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered : 250 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	25 ug/l	62
Total Phosporus	80 ug/l	67
Secchi Depth	0.69 m	65

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	August 21, 1991	Weather:	Sunny, wind 10-15 mph, temp. approx 82° F
Ice Thaw:	March 20, 1991	Observers:	Tom Chapman/EWI John Zinnen/ELPOIAI Don Hermes/ELPOIAI Rob McLennan/WDNR
Secchi Depth:	1.75 feet	Time:	5:00 p.m.
Water Level:	12 inches below		
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	x	x	x	x	x
1	10.3	23	480	9.0	44
2	10.3	23	x	x	x
3	10.4	23	x	x	x
4	10.4	23	490	x	x
5	10.4	23	x	x	x
6	10.4	23	x	x	x
7	10.4	23	x	x	x
8	10.1	23	495	9.0	x
9					
10					
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.088	1.5	ND	22.0
Metalimnion (skip in April)	0.090	1.3	0.007	22.0
Hypolimnion	0.079	1.4	0.005	22.0

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 200 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	44 ug/l	62
Total Phosporus	88 ug/l	71
Secchi Depth	0.53 m	69

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	February 19, 1992	Weather:	Cloudy, wind 10 mph, Temp. approx. 35° F
Ice Thaw:	Ice Depth = 8" on 2/19/92	Observers:	Tom Chapman/MJL & Associates John Zinnen/ELPOIAI
Secchi Depth:	7.0 feet	Time:	11:00 a.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	x	x	x	x	x
1	15.0+	1.5	68	7.9	2
2	15.0+	2.0	x	x	x
3	15.0+	3.0	x	x	x
4	15.0+	3.5	295	x	x
5	15.0+	3.5	x	x	x
6	15.0+	3.5	x	x	x
7	15.0+	3.5	x	x	x
8	15.0+	4.0	325	7.6	x
9					
10					
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.008	0.6	0.258	< 2
Metalimnion (skip in April)	0.029	1.2	0.049	< 2
Hypolimnion	0.030	1.3	0.124	< 2

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 300 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	2 ug/l	37
Total Phosphorus	8 ug/l	34
Secchi Depth	2.1 m	49

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	April 15, 1992	Weather:	Cloudy, wind 15 mph, Temp. approx. 40° F
Ice Thaw:	March 6, 1992	Observers:	TomChapman/MJL&Assoc. John Zinnen/ELPOIAI Don Hermes/ELPOIAI
Secchi Depth:	10.5 feet	Time:	11:00 a.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	x	x	x	x	x
1	13.5	8	340	8.9	1
2	13.5	8	x	x	x
3	13.3	8	x	x	x
4	13.3	8	x	x	x
5	13.3	8	x	x	x
6	13.3	8	x	x	x
7	13.2	8	x	x	x
8	12.8	8	330	8.8	x
9					
10					
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.024	1.0	0.024	3
Metalimnion (skip in April)	- -	- -	- -	- -
Hypolimnion	0.026	1.1	0.023	4

Secchi depth (feet)	Chlorophyll a filtration volume
< 1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 300 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	1 ug/l	31
Total Phosphorus	24 ug/l	50
Secchi Depth	3.2 m	43

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	June 24, 1992	Weather:	Cloudy, wind 6 mph, Temp. approx. 65° F
Ice Thaw:	March 6, 1992	Observers:	TomChapman/MJL&Assoc. John Zinnen/ELPOIAI Don Hermes/ELPOIAI
Secchi Depth:	9.0 feet	Time:	11:00 a.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	x	x	x	x	x
1	8.1	19	360	8.0	1
2	8.0	19	x	x	x
3	7.9	19	x	x	x
4	7.8	19	x	x	x
5	7.8	19	365	8.2	x
6	7.8	19	x	x	x
7	7.8	19	x	x	x
8	7.8	19	365	8.2	x
9					
10					
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.017	1.0	0.135	2
Metalimnion (skip in April)	0.024	1.0	0.137	2
Hypolimnion	0.016	1.1	0.162	2

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 300 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	1 ug/l	31
Total Phosphorus	17 ug/l	45
Secchi Depth	2.7 m	45

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	July 22, 1992	Weather:	Cloudy, wind 13 mph, Temp. approx. 65° F
Ice Thaw:	March 6, 1992	Observers:	TomChapman/MJL&Assoc. John Zinnen/ELPOIAI Don Hermes/ELPOIAI
Secchi Depth:	9.0 feet	Time:	10:00 a.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	x	x	x	x	x
1	7.6	23	365	9.1	2.2
2	7.6	23	x	x	x
3	7.5	23	x	x	x
4	7.5	23	365	9.1	x
5	7.5	23	x	x	x
6	7.5	23	x	x	x
7	7.5	23	x	x	x
8	7.5	23	365	9.1	x
9					
10					
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.032	1.3	0.315	3
Metalimnion (skip in April)	0.039	1.4	0.325	5
Hypolimnion	0.037	1.6	0.314	6

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 300 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	2.2 ug/l	38
Total Phosphorus	32 ug/l	54
Secchi Depth	2.7 m	45

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50

WATER QUALITY TESTING DATA
EAGLE LAKE
RACINE COUNTY, WISCONSIN
STORET #523131

Date:	August 19, 1992	Weather:	Partly cloudy, wind 7 mph, Temp. approx. 72° F
Ice Thaw:	March 6, 1992	Observers:	TomChapman/MJL&Assoc. John Zinnen/ELPOIAI Don Hermes/ELPOIAI
Secchi Depth:	8.5 feet	Time:	1:00 p.m.
Water Level:			
Sample Location:	Deepest spot of lake		

Depth (feet)	Dis Oxygen (mg/l)	Temperature (°C)	Spec. Cond. (umhos/cm)	pH (pH units)	Chlorophyll a (ug/l)
0	x	x	x	x	x
1	12.0	22	365	9.4	2.1
2	12.0	22	x	x	x
3	12.0	22	x	x	x
4	11.8	22	370	9.5	x
5	11.4	22	x	x	x
6	10.8	21	x	x	x
7	10.4	20	x	x	x
8	10.2	20	375	9.4	x
9					
10					
11					
12					

	Total Phosphorus (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Ammonia Nitrogen (mg/l)	Suspended Solids (mg/l)
Epilimnion	0.014	1.0	0.030	< 2
Metalimnion (skip in April)	0.014	0.9	0.020	< 2
Hypolimnion	0.021	1.0	0.044	2

Secchi depth (feet)	Chlorophyll a filtration volume
<1.0	50 ml
1.00 - 1.50	100 ml
1.50 - 2.25	200 ml
2.25 - 3.25	300 ml

Volume filtered 300 ml

NOTES:

Parameter	Value	TSI
Chlorophyll a	2.1 ug/l	38
Total Phosphorus	14 ug/l	42
Secchi Depth	2.6 m	46

Oligotrophic $\leq$ 39
Mesotrophic 40-49
Eutrophic $\geq$ 50