Ohio Environmental Protection Agency

Division of Water Quality Monitoring and Assessment

Ohio Water Quality Inventory

1988 305(b) Report
Volume III

OHIO'S LAKE RESERVOIRS PONDS

Ohio's Publicly Owned Lakes/Reservoirs/Ponds

1988 305(b) Report

Volume III

Pursuant to the Requirements of Section 305(b)
Water Quality Act Amendments 1987

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Narrative Summary

Introduction

Section 305(b) of the 1987 Water Quality Act Amendments requires each state to report on the water quality of its lakes/ponds/reservoirs that are classified under state water quality standards. In addition, Section 315 of the WQA (Clean Lakes Program) requires each state to report on the water quality of its "publicly owned" lakes. This report is submitted to fulfill these requirements, and revises the Ohio EPA 1982 305(b) "Ohio's Lakes" report (Youger, 1982). Specific details about the chemical, physical, and biological characteristics of selected publicly owned lakes are given in the 1982 report. A summary of the 1982 report is provided as Attachment F.

According to information provided by the Ohio Department of Natural Resources there are approximately 50,000 lakes in Ohio with a total surface area of about 200,000 acres (ODNR, The Story of Ohio's Lakes). About 2200 of these lakes are five (5) acres or greater with a surface area of 134,000 acres (ODNR, 1980, Inventory of Ohio's Lakes). These 2,200 lakes include both public and private lakes.

Four-hundred seventeen (417) of the 2,200 lakes over 5 acres have been identified as being "publicly owned". These 417 lakes represent 117,323 acres of the total estimated 200,000 acres of lakes in Ohio (59%). For the purposes of this report, publicly owned lakes are defined as those lakes/ponds/reservoirs, including upground reservoirs, which are five (5) acres or greater in surface area and where public access to the water is owned by a public entity (i.e., Federal, State, County, Municipal government agencies; park districts; conservation districts), or are regulated as a public water supply by the Ohio EPA. Stream impoundments not locally recognized as lakes (low head dams, locks), are classified under stream segments for the purposes of this 305(b) report. A list of the 417 publicly owned lakes is given in Attachment D of this report.

Two-hundred fifty six (61%) of Ohio's 417 publicly owned lakes are dammed impoundments, 76 (18%) are upground reservoirs, and 27 (6.5%) are natural glacial lakes, the remaining being dug-out or unknown. Public ownership includes The State of Ohio/Ohio Department of Natural Resources (122 lakes; 46,123 acres); The Army Corps of Engineers and other federal agencies (39 lakes; 46,984 acres); with the remaining distributed among numerous local government agencies and conservation districts (257 lakes; 24,216 acres).

Three lakes in Ohio are over 5,000 acres in surface area: Grand Lake St. Marys, Auglaize County (12,700 acres); Mosquito Creek Reservoir, Trumbull County (7,850 acres), and Indian Lake, Logan County (5,104 acres). An additional 27 lakes, all publicly owned, range between 1,000 and 5,000 acres.

Water Quality Assessment Process

The water quality of approximately 200 of Ohio's public lakes was summarized in the Ohio EPA 1982 305(b) report. Federal EPA guidance for the 1988 305(b) report required each state to emphasize potential attainment of designated use support, attainment of Clean Water Act goals, and the identification of publicly owned lakes that are being threatened or impaired by sources of pollution. In order to comply with these new Federal requirements, the Ohio

EPA developed a data reduction scheme that is referred to in this report as the Ohio Lake Condition Index (LCI). This index, which is discussed in detail in Attachment B of this report, was used to assess the overall health or condition of Ohio's 417 publicly owned lakes. Data obtained from the LCI were used to determine if lakes were meeting designated uses and attaining Clean Water Act goals of fishable and swimmable waters (see Attachment C). The LCI was also used to summarize the impaired and threatened conditions of Ohio's "significant" publicly owned lakes, those lakes freely open to the public for recreation.

Federal EPA guidance requires each state to distinguish between "monitored" and "evaluated" data used to assess the water quality of lakes. For the purposes of this report, "monitored" data includes all quantitative data collected by the Ohio EPA, and other sources, between 1972 and 1987. Adherence to the five year rule suggested by the US EPA was deemed to be overly restrictive for Ohio since most of the quantitative data on lakes were collected between 1973 and 1982. Lack of recent "monitored" data for Ohio's lakes is a current deficiency in the State's Water Quality Management Plan. "Evaluated" data consisted mostly of responses by individuals to the lake questionnaire distributed by the Ohio EPA, Office of Planning, as part of the State's 1987 Non-Point Assessment for Section 319 of the WQA Amendments.

Historical Lake Monitoring

Twenty-one lakes were sampled in Ohio in the early 1970's as part of the National Eutrophication Survey (see literature summary in the 1982 305(b) Lakes Report). Prior to the 1970's, lake surveys were generally restricted to university research. As part of a cooperative lake monitoring program, the Ohio EPA and the United States Geological Survey sampled 85 public lakes in Ohio between 1975 and 1980. Lakes were sampled to provide baseline data for selected chemical, physical, and biological parameters. The results of this program were published in three volumes (Tobin and Youger, 1977; Tobin and Youger 1979; Angelo and Youger, 1985). The Ohio EPA sampled an additional 26 public lakes during 1980 and 1981 as part of a Section 314 Clean Lakes Program Classification Grant. These data were presented in the 1982 305(b) Lakes report. Since 1981, a small number of lakes have been sampled and evaluated by the Ohio EPA as part of comprehensive water quality surveys for major river basins. The Army Corps of Engineers has built 28 dams in Ohio and has sampled the water quality for these lakes, in addition to conducting numerous sedimentation surveys. Additional sedimentation surveys have been conducted by the Soil Conservation Service and the Ohio Department of Natural Resources, Division of Water. The results of all sedimentation surveys in Ohio (up to 1975) have been summarized by the U.S. Department of Agriculture (USDA 1975).

Lake Pollution Control Procedures

All public and private lakes except upground reservoirs, are designated as Exceptional Warmwater Habitat for the protection of aquatic life in the Ohio EPA Water Quality Standards, Chapter 3745 of the Ohio Administrative Code. Publicly owned lakes, as defined by this 1988 305(b) report, and listed in Attachment D, are designated State Resource Waters in the Ohio EPA Water Quality Standards. The Ohio EPA "Antidegradation Policy" applies to State Resource Waters such that present ambient water quality and uses shall be maintained and protected without exception.

In addition to water quality standards, the Ohio EPA has adopted a "State Lakes Policy" to establish effluent limitations for new or expanding point source discharges to lakes and reservoirs, and to prevent degradation of these multi-use waters. A copy of the most recent revision of the Ohio EPA State Lakes Policy is provided in Attachment E of this report.

Although the State of Ohio does not have a state lake management program per se, the Ohio EPA does respond to citizen complaints to investigate possible violations of State Water Quality Standards in both public and private lakes. The Ohio DNR will respond to fish kills in public lakes and assess fines where illegal discharge is documented. Use of chemicals in public lakes to control aquatic plants requires prior approval of the Ohio EPA and the Ohio Department of Agriculture. The Ohio EPA, Office of Planning, is the lead agency contact in Ohio for the US EPA Clean Lakes Program. Since 1975 four Phase I, Section 314 Grants have been received in Ohio (Summit Lake, Meadowbrook Lake, West Fork Mill Creek Lake-Winton Woods, and Indian Lake). The Office of Planning also works closely with local Soil and Water Conservation Districts and the Soil Conservation Service to address non-point problems that may affect Ohio's lakes.

Clean Lakes Program Requirements

Section 315 of the 1987 WQA Amendments requires each state to:

(A) Provide an identification of all "publicly owned lakes", classified according to trophic condition, and if possible by water quality trend.

Ohio's 417 publicly owned lakes/ponds/reservoirs, classified according to trophic state, are presented in Attachment D of this report. Location by county is depicted in Figure 1. Based on measurements of summer chlorophyll-a, 48 of 106 assessed lakes (45%) were eutrophic; 43 (41%) were hypereutrophic; and 15 (14%) were mesotrophic. Although it is possible to "classify" or rank these lakes by water quality impairment using the Ohio LCI, it was decided that a water quality ranking would not be included in this report due to the large number of lakes that have insufficient data.

(B) Provide a list of publicly owned lakes for which uses are known to be impaired i.e., do not meet water quality standards or require implementation of control programs to maintain compliance with applicable standards.

The Ohio LCI was used to distinguish those publicly owned lakes that were meeting full use, partial use, impaired use, and full use but threatened. Justification for the use of the LCI is given in Attachments B and C. US EPA Region V guidance requests that each state identify "significant" publicly owned lakes. For the purposes of this 1988 report, "significant" publicly owned lakes are those publicly owned lakes, greater than five (5) acres, which are freely open to the public for recreation (boating, fishing, swimming). This definition excludes those privately owned lakes that are open to the public for a fee.

Figure 1. Locations of publicly owned lakes greater than 5 acres surface area by county.

Table 1. List of significant publicly owned lakes that are impaired as evaluated by the LCI.

Lake	County	LCI Impaired/Threatened Condition[a]
Acton Lake	Butler	A,NP,PPM,P,N
Alum Creek Lake	Delaware	PPM
Harrison Lake	Fulton	PPM,A, NP, N
Tycoon Lake	Gallia	PPM
W. Fk. Mill Cr.(Winton Woods)	Hamilton	V,B,N
Buckeye Lake	Licking	PPM,V,A,P,N
Essington Lake	Perry	NP,PPM,M
Lake Hope	Vinton	M,PPM,NP
Westville Lake	Columbiana	A,P
Newport Lake	Mahoning	V,B,A,PPM,N,P
Indian Lake	Logan	A,NP,N,P
Lake Van Buren[b]	Hancock	V,NP,N,P
Lake Clark[b]	Clark	NM
Baldwin Lake[b]	Cuyahoga	V

a See Attachment B for definition of symbols.
b These lakes were not impaired using the LCI, but received an impaired status by best professional judgement.

In addition to the above impaired lakes, 61 lakes were ranked by the LCI as "partial use" for EWH/PWS; 98 lakes were ranked partial use for attainment of the fishable/swimmable goals; 26 were ranked "full use-threatened" for EWH/PWS; and 46 were ranked full use threatened for attainment of the fishable/swimmable goals. LCI information for Ohio's 417 publicly owned lakes is available on computer diskette.

(C) Identify those lakes in which water quality has deteriorated as a result of high acidity that may be due to acid mine drainage.

As identified by the LCI, two lakes in Ohio, Essington Lake-Perry County, and Lake Hope-Vinton County, have impaired water quality due to acid mine drainage. Both of these lakes have been subjected to acid mitigation techniques administered by the Ohio DNR, Division of Reclamation. The Division of Reclamation is responsible for carrying out the Abandoned Mine Lands program under PL 95-87 and works in cooperation with the Soil Conservation Service in carrying out the Rural Abandoned Mine Program.

In addition to the two acid mine impaired lakes, the Ohio EPA, Division of Water Pollution Control, documented 17 additional public water supply lakes that were judged to be potentially affected by abandoned coal mine drainage (Maurer, Heitz, Myers, 1981). These water supply reservoirs include:

Lake Vesuvius	Wolf Run Lake
Tycoon Lake	Little McMahon Creek Resv.
Lake Alma	Provident Resv.
Clouse Lake	Wellsville Resv.
New Lexington (new) Resv.	Highlandtown Resv.
New Lexington (old) Resv.	Sparrow Resv.
Burr Oak Lake	Woodsfield Resv.
Hammertown Lake	Austin Lake
Hopedale Lake	Jefferson Lake
Evans Lake (Identified by ODNR)	

Although the above lakes are potentially threatened, they did not meet the LCI impaired status for acid mine drainage.

(D) Provide a general assessment of the status and trends of water quality in lakes, including the extent to which the use of lakes is impaired from point and non-point pollution, particularly with respect to toxic pollution.

The Ohio EPA Lake Condition Index (LCI) was used to summarize the status of water quality in Ohio's publicly owned lakes. Each of Ohio's 417 publicly owned lakes were evaluated for 13 parameters or matrices. The status of each lake is summarized on computer disk, and the combined summaries for the 417 publicly owned lakes are given in Table 2.

The most significant problems with Ohio's publicly owned lakes are (1) volume loss due to sedimentation (91% of 164 assessed lakes), (2) problems with aesthetics (55% of 185 assessed lakes), nuisance growths of aquatic weeds (46% of 166 assessed lakes), hypereutrophic levels of chlorophyll-a (40.5% of 106 monitored lakes), and the presence of priority pollutant metals above State Water Quality Standards (36% of 87 monitored lakes). These data are summarized in Table 2.

Trends of water quality for Ohio's lakes are generally unknown due to a lack of repeated monitoring over a long time period. This lack of long-term data for Ohio's lakes is a deficiency in the Ohio EPA Water Quality Management Plan. As summarized in Table 2, 36% of 87 monitored lakes had priority metals (one or more) present in concentrations above water quality standards. The most common metal in violation was copper, most likely due to the widespread use of copper sulfate based herbicides to control aquatic weeds. Very little information is available on the presence of toxics in fish tissue from Ohio's lakes and on levels of sediment contamination. Pesticides were believed to be affecting 27 of Ohio's lakes from the responses to the Non-Point Assessment questionnaire. Lakes in southeastern Ohio tend to have lower Trophic State Index values than lakes in other sections of the state. Sedimentation is a severe problem in many of Ohio's lakes and reservoirs (see the 1982 305(b) Lakes Report).

Table 2. Summary of Lake Condition Index (LCI) matrices for Ohio's 417 publicly owned lakes. LCI matrices are defined in Appendix B.

		IBI	NM	A	NP	PPO	PPM	P	N	F	V	S	B	M
Lakes	No.	0	166	185	92	28	87	125	125	5	164	2	86	100
Assessed	Acres	0	99,895	101,971	88,153	9,471	91,226	86,399	102,029	545	99,012	180	89,995	91,179
Not	No.	417	251	232	325	389	330	292	292	412	253	415	331	317
Assessed	Acres	117,323	17,428	15,353	29,170	107,852	26,097	30,924	15,295	116,778	18,311	117,143	27,328	26,144
Full Use	No.	0	0	33	67	1	56	15	29	3	0	1	75	98
monitored	Acres	0	0	12,413	58,411	100	61,498	3,536	15,785	365	0	80	86,335	91,036
Full Use	No.		92	51	0	0	0				15			
evaluated	Acres		60,110	19,352	0	0	0				5,828			
Partial Use	No.	0	0	39	20	0	26			2	0	1	7	0
monitored	Acres	0	0	37,350	26,076	0	22,890			180	0	100	1,620	0
Partial Use	No.		74	60	3	27	0	19	34		149		2	
evaluated	Acres		39,785	27,662	3,630	9,731	0	5,901	4,509		93,184		1,752	
Impaired	No.	0	0	2	2	0	5			0	0	0	2	2
monitored	Acres	0	0	5,194	36	0	6,839			0	0	0	288	143
Eutrophic	No.							48	33					
monitored	Acres							32,681	40,289					
Hypereutrophic	No.							43	29					
monitored	Acres							44,282	41,446					

LCI matrix abbreviations: IBI = OhioEPA Index of Biotic Integrity, NM = Nuisance growths of macrophytes, A = Aesthetics, NP = Non-priority pollutants, PPO = Priority organics (toxics), PPM = Priority metals (toxics), P = Productivity (summer chlorophyll-a), N = Nutrients (spring total phosphorus), F = Fish tissue contamination, V = Volume loss due to sedimentation, B = Fecal coliform bacteria, M = Acid mine drainage.

Recommendations

The current chemical water quality of Ohio's publicly owned lakes is largely unknown. Only a few lakes have been monitored since 1981. An ongoing inland lake monitoring program should be initiated for Ohio's 417 publicly owned lakes and reservoirs. Lakes previously sampled between 1975 and 1981 should be resampled to determine trends of water quality. The collection of baseline data for unsampled lakes should be initiated.

Monitoring of a few selected lakes should be initiated to develop nutrient and sediment budgets. Emphasis should be placed on the development of regional loadings (i.e. ecoregions). Predictive models should be developed for natural lakes vs impounded reservoirs.

The Ohio EPA, in cooperation with the Ohio DNR, should investigate quantitative methods that can be used to evaluate biological community structure in lakes (i.e. Index of Biotic Integrity for fish). It is currently unknown if Ohio's lakes are attaining the "fishable" CWA goal.

As recommended in the 1982 305(b) lakes report, a review of available information on lake sedimentation should be initiated. Critical watersheds should be identified for control of soil erosion.

Attachment A

Required 305(b) Report Summary Tables
Lakes/Ponds/Reservoirs

1. EXECUTIVE SUMMARY/OVERVIEW

Each State should provide a concise executive summary/overview that is comprehensive and clear enough to stand alone. For both surface and ground-water, it should:

- describe overall State water quality (for surface water, include a summary of the degree of designated use support for the different waterbody types);
- describe the major factors affecting use support;
- discuss the general trends in water quality; and
- briefly recap the highlights of each section of the report, particularly the objectives of the State water management program and issues of special concern to the State.

2. BACKGROUND

To put the report into perspective for the reader, a brief State overview should be provided as follows:

Table 2.a. Atlas

State population	10,701,000	
State surface area	41,222	
No. of water basins (according to State subdivisions)	23	
Total no. of river miles*	43,917	
No. of border miles (subset)	451	
No. of lakes/reservoirs/ponds*	417[a]	50,000[b]
Acres of lakes/reservoirs/ponds*	117,323	200,000
Square miles of estuaries/harbors/bays		
No. of ocean coastal miles	N/A	
No. of Great Lakes shore miles*	230	
Acres of freshwater wetlands*	Unknown	
Acres of tidal wetlands*	N/A	

Names of border rivers: Ohio River

a Includes publicly owned lakes/reservoirs/ponds, greater than or equal to 5 acres, which are classified under EWH, PWS, and State Resource Water standards.

b Total number of lakes, public and private, of all sizes (ODNR, 1982).

*Classified under State water quality standards (WQS). If statewide WQS exist, the default is waters depicted on a USGS hydrologic map with scale of 1:500,000. Another rationale can be used but should be explained.

NOTE: Impoundments should be classified according to their hydrologic behavior, either as stream channel miles under rivers, or as total surface acreage under lakes/ponds, but not under both categories.

Table 2.b. Summary of classified uses

Classified Use (OEPA Terminology)	Total Size Classified for Use			
	Rivers (Miles)	Lakes (acres)	Estuaries (sq. mi.)	Other (specify)
Aq. Fish & Wildlife (EWH)		200,000[a]		
Domestic water supply (PWS)		117,323+[b]		
Recreation (Primary Contact)		200,000[c]		
Agriculture		-		
Industrial		-		
Navigation		-		
Nondegradation (State Resource Waters)		117,323+[d]		
Other (specify) (Outstanding Res. Waters)		72[e]		
Unclassified		-		

Explain what kinds of waters (if any) are unclassified and how the State determines which waters should be classified.

a Estimated acres from ODNR (1982). Section 3745-1-07 (B)1(c) of OAC--all (public and private) lakes and reservoirs, except upground storage reservoirs, are EWH.

b Section 3745-1-07(3)(a)(i) of OAC - All publicly owned lakes and reservoirs, except Piedmont Reservoir, are PWS. Acres include publicly owned lakes greater than 5 acres surface area. Not included are those private lakes used as a source of public drinking water, which are also designated PWS (3745-1-07(3)(a)(ii).

c Lakes and reservoirs are not specifically given a primary contact recreational use in OAC, but this use is assumed.

d Section 3745-1-05 (C) of OAC - Publicly owned lakes and reservoirs are State Resource Waters protected by the Ohio EPA Antidegradation Policy.

e Lake Katherine (Jackson County) and Stages' Pond (Pickaway County) are designated Outstanding Resource Waters in OAC Section 3745.

3. SURFACE WATER QUALILTY

3.a. Status

2.a.1. Methodology

States should provide information on the methods they have used to collect and analyze monitoring data for determining use support status. The classification categories and criteria for determining the status of waters are presented in Figure 1 of Appendix A. However, since the use of an alternate system to determine use support (such as a water quality index) is acceptable as long as it generally corresponds to the guidelines contained in Figure 1, the State should describe any alternate system it has used.

3.a.2. Water Quality Summary

State submissions should include summary statistics on designated use support and attainment of Clean Water Act goals. A standard reporting format is provided below.

Data should be divided by types of waterbody, as follows: Rivers (reported in miles); lakes (reported in acres); estuaries (reported in square miles); coastal waters and Great Lakes (reported in shore miles). In addition, States should report on freshwater and tidal wetlands where possible. Since States are in many cases just beginning to assess wetlands and may not have developed criteria for interpreting water quality information in relation to State Water Quality Standards, reporting on use support in wetlands is optional.

DESIGNATED USE SUPPORT

Type of Waterbody: Lakes/reservoirs/ponds (Publicly Owned, 117,323 total acres)

Degree of Use Support	Assessment Basis: Evaluated	Assessment Basis: Monitored	Total Assessed
Size fully supporting			See attached Table 3.a.2.: Use Support Summary Table. Data has been separated for attainment of CWA Goals and Use Support categories.
Size threatened[a]			
Size partially supporting			
Size not supporting			
TOTAL			

[a] Size threatened is a subset of the size fully supporting and is not included in the totals entered in the last line.

Table 3.a.2. Use Support/CWA Goals Summary Table for Ohio EPA's Publicly Owned Lakes/Ponds/Reservoirs >5 Acres Surface Area.[a]

		CWA GOALS		USE SUPPORT	
		Fish	Swim	PWS	EWH
Use Support Unknown Insufficient Data	Number	417	248	328	327
	Acres	117,323	17,064	31,016	26,552
Fully Supports Use	Number	0	7	1	15
	Acres	0	2,759	140	5,203
Supports Use But Threatened	Number	0	43	28	23
	Acres	0	19,040	19,588	25,733
Partially Supports Use	Number	0	113	52	44
	Acres	0	72,865	58,826	50,988
Does Not Support Use/ Impaired	Number	0	6	8	8
	Acres	0	5,595	7,753	8,847
Total Number of Lakes		417	417	417	417
Total Acres		117,323	117,323	117,323	117,323
Total Number of Lakes Assessed		0	169	89	90
Total Acres Assessed		0	100,259	86,307	90,771

[a] See Attachment C and Figure C-1 for an explanation of the use attainment evaluation process used for lakes.

Table 3.c.1. Relative assessment of causes.

For each of the waterbody types (e.g., rivers, lakes, etc.) provide the total size of waters affected by each category of cause. A water may be affected by several different causes and should be counted in each relevant cause category. If the magnitude of the cause is listed in the waterbody - specific information as High, the size with less than full support should be included as a major impact below; if listed as Moderate or Slight, the size should be included as a moderate/minor impact.

TOTAL SIZES OF WATERS NOT FULLY SUPPORTING USES[a]
AFFECTED BY VARIOUS CAUSE CATEGORIES

Type of waterbody: Lakes/Reservoirs/Ponds (Publicly Owned; 117,323 total acres)

CAUSE CATEGORIES	MAJOR IMPACT (Acres)	MODERATE/MINOR IMPACT (Acres)
Unknown toxicity	-	-
Pesticides	-	9636 (evaluated data)
Priority organics (other than pesticides)	-	-
Nonpriority organics	-	-
Metals (priority metals)	6839 (two or more)	22,890 (one metal)
Ammonia	-	-
Chlorine	-	-
Other inorganics (non priority)	36	29,706
Nutrients (phosphorus)	41,446 (hypereutrophic)	45,098 (eutrophic)
pH	143 (<5.0)	0
Siltation	-	93,184 (evaluated data)
Organic enrichment/DO	6,560 (low D.O.)	28,349 (BOD_5>5)
Salinity	-	-
Thermal modification	-	-
Flow alteration	-	-
Other habitat alterations	-	-
Pathogens	7,445 (Fecal Coliforms)	-
Radiation	-	-
Oil and grease	-	-

[a] Includes those lakes fully supporting uses, but threatened.

Others

Macrophytes	-	38,872 (evaluated data)
Algae (Chl-a)	44,282 (hypereutrophic)	38,582 (eutrophic)
Fish Kills	7,504	-

Table 3.c.2. Relative assessment of causes.

For each of the waterbody types (e.g., rivers, lakes, etc.) provide the total size of waters affected by each category of cause. A water may be affected by several different causes and should be counted in each relevant cause category. If the magnitude of the cause is listed in the waterbody - specific information as High, the size with less than full support should be included as a major impact below; if listed as Moderate or Slight, the size should be included as a moderate/minor impact.

TOTAL SIZES OF WATERS NOT FULLY SUPPORTING USES[a]
AFFECTED BY VARIOUS CAUSE CATEGORIES

Type of waterbody: Lakes/Reservoirs/Ponds (Publicly Owned; 117,323 total acres)

SOURCE CATEGORY	MAJOR IMPACT (Acres)	MODERATE/MINOR IMPACT (Acres)
Point Sources		
Industrial	-	-
Municipal	29,372	-
CSO	-	-
Storm sewers	7,905	-
Nonpoint Sources		
Agriculture	85,314	-
Silviculture	5,488	-
Construction (Urban)	9,923	-
Urban runoff	26,782	-
Resource extract. (mining)	13,718	-
Land disposal	3,275	-
Hydro/habitat mod.	28,160	-
Others		
Septic Tanks	31,149	-
Oil/Gas Well Sites	9,152	-
Livestock/feedlots	35,880	-
Crop Production	71,182	-
Pasture	12,852	-

NOTE: no attempt was made to distinguish major from minor impacts, all data was evaluated based on BPJ.

[a] Includes those lakes fully supporting uses, but threatened.

3.d. Public Health/Aquatic Life Concerns

Table 3.d.1 Toxics-related concerns.

Toxic pollutants are of growing concern throughout the country; however, in many cases there is little definitive information available on their extent and impact on the aquatic environment. The information reported under 3.c.1 above provides a measure of the relative contribution to use impairment of various classes of toxic pollutants. In this section, report on the extent of toxics-caused problems.

TOTAL SIZE AFFECTED BY TOXICS

WATERBODY	SIZE MONITORED FOR TOXICS	SIZE WITH ELEVATED LEVELS OF TOXICS[a]
Inland Lakes (acres)	91,226 (priority metals)	29,729 (≥one metal above WQS)
Estuaries (miles)		
Coastal waters (miles)		
Great Lakes (miles)		
Freshwater wetlands (acres)		
Tidal wetlands (acres)		

a Elevated levels are defined as exceedances of State Water Quality Standards, 304(a) criteria, and/or FDA action levels, or levels of concern (where numeric criteria do not exist).

To the extent possible, provide information on the following public health and aquatic life impacts attributable to toxics. States are encouraged to rely on tabular formats to summarize key statistics regarding toxic impacts, but may wish to supplement tables with narrative as appropriate.

Discuss the relative levels of toxic pollutants in fish/shellfish, including a comparison with National Academy of Sciences criteria and Food and Drug Administration action levels, and the location of areas of concern.

Attachment B

The Ohio EPA Lake Condition Index (LCI)

The Ohio EPA Lake Condition Index (LCI)

Section 305(b) of the 1987 Water Quality Act Amendments requires each State to summarize the water quality of its lakes/ponds/reservoirs that are classified under State water quality standards. In addition, Section 315 of the WQA (Clean Lakes Program) requires each State to identify those publicly owned lakes that are known to be impaired, do not meet water quality standards, or are threatened, i.e., they may not maintain full use in the future due to current impacts.

In order to comply with these WQA requirements it was necessary to compile and evaluate a massive amount of "monitored" and "evaluated" data to make a reasonable assessment of lake water quality. To assist with this lake evaluation process, the Ohio EPA developed a data reduction plan called the Ohio Lake Condition Index (LCI). The Ohio LCI is comprised of 13 parameters or "matrices" that were selected to provide information about a broad spectrum of variables that are known to affect the overall state or condition of a lake.

The Ohio LCI was patterned after a water quality index developed for the nearshore areas of the Great Lakes by the University of Wisconsin (Stenhart, Schieroll, Chesters 1981); however, the final Ohio LCI bears little resemblance to the Wisconsin index. The Ohio LCI is not intended to address all of the environmental problems that may exist in lakes, but it does appear to provide sufficient power of discrimination to allow an objective assessment of attainment of designated use supports and attainment of Clean Water Act Goals (see Table 3.a.2. in Attachment A). Another advantage of the LCI is that it allows integration of hard "monitored" data with the more subjective "evaluated" data to increase the number of "assessed" lakes that are summarized in the 305(b) report. Finally, the LCI is structured in a way that a weighting system could be developed to provide a single index number for each evaluated lake. This LCI rank number could be used to compare the water quality of different lakes, and could be integrated into the State's Water Quality Management Plan to identify those lakes most seriously in need of restoration. The LCI ranks could also be used to identify high quality lakes that would benefit from watershed management plans. A ranked Ohio LCI will be included in the 1990 305(b) lakes volume.

Identification of the LCI Matrices

The first step in the development of the LCI was to identify those matrices that, taken together, would result in a holistic evaluation of potential chemical, biological, and physical lake problems. The final list of selected LCI matrices are as follows:

Evaluation of Biological Lake Condition

IBI - Ohio EPA Index of Biotic Integrity (Fish)
NM - Nuisance growths of macrophytes
B - Fecal coliform bacteria contamination
P - Primary productivity based on summer chlorophyll-a
F - Fish tissue contamination

Evaluation of Chemical Lake Condition

NP - Non priority pollutants (metals, conventional, organics)
PPO - Priority organics (toxics)
PPM - Priority metals (toxics)
N - Nutrients based on spring total phosphorus
S - Sediment contamination
M - Acid mine drainage (pH, TDS)

Evaluation of Physical Lake Condition

V - Volume loss due to sedimentation

Overall Measure of Lake Condition

A - Aesthetics, public perception of lake condition

The next step in the development of the LCI was to compile "monitored" and "evaluated" data for each lake. "Monitored" data were obtained from the Ohio EPA 1982 305(b) "Ohio's Lakes" report and from other sources that were available. "Evaluated" data were obtained from the responses to the lake questionnaire that was distributed by the Ohio EPA, Office of Planning, as part of the Non-Point Assessment (NPA) for Section 319 of the WQA.

Using the criteria discussed below, each of the 13 LCI matrices was given one of the following conditions:

ne - lake not assessed for that matric
fu(m) - full use status based on "monitored" data
fu(bpj) - full use based on "evaluated" data
t(m) - threatened/partial use based on "monitored" data
t(bpj) - threatened/partial use based on "evaluated" data
i(m) - impaired based on "monitored" data

For the N and P matrices:

t-e(m) - Eutrophic based on "monitored" data
t-h(m) - Hypereutrophic based on "monitored" data

For the purposes of the LCI, greater importance was given to a condition based on "monitored" data than was given to a condition based on "evaluated" data. If a lake was both monitored and evaluated, the monitored status was reported. As will be discussed in Attachment C of this report, greater weight was given t(m) data than to t(bpj) data in the final determination of attainment of CWA goals and designated use support.

Criteria Used to Evaluate the LCI Matrices

IBI Matrix (Index of Biotic Integrity)

This matrix is based on the fish IBI that was developed by Karr (1981) and modified by the Ohio EPA. Although the IBI was developed to assess fish communities in streams and rivers it could be adapted to inland lakes. No lakes have been assessed using the IBI, which represents a deficiency in Ohio's Water Quality Management Plan. The necessary developmental work will need to take place prior to any use of this index.

NM Matrix (Nuisance Macrophytes)

Excessive growths of aquatic weeds can affect the recreational uses of a lake. Although few macrophyte surveys have been conducted for Ohio's lakes, a t(bpj) NM condition was recorded if "weeds" were identified as being a problem in the responses to the NPA questionnarie. Where "monitored" data existed, the following criteria were applied:

Less than 25% shoreline affected---------- fu(m)
Between 25% - 50% shoreline affected-------- t(m)
Greater than 50% shoreline affected--------- i(m)

B Matrix (Fecal Coliform Contamination)

The Ohio EPA has a fecal coliform water quality standard for primary contact recreation of 1000/100 ml. A t(bpj) B condition was recorded if "pathogens" were identified as a problem in the responses to the NPA questionnaire. Where "monitored" data existed, the following criteria were applied:

Less than 200/100 ml---------- fu(m)
Between 200 - 1000/100 ml---------- t(m)
Greater than 1000/100 ml---------- i(m)

P Matrix (Primary Productivity based on Chlorophyll-a)

A t(bpj) condition was recorded if "algae" was identified as a problem in the responses to the NPA questionnaire. Whether or not algae is a problem in a lake depends on the lake uses. Higher algal levels are desirable in lakes used for fish production, but can cause problems in drinking water reservoirs. Where "monitored" data existed based on summer chlorophyll-a concentrations the following criteria from Wetzel (1983) were applied:

Chl-a 0.3 - 2.0 ug/l ----- oligotrophic ---------- fu(m)
2.0 - 6.0 ----- mesotrophic ---------- fu(m)
6.0 - 40 ----- eutrophic ---------- t-e(m)
> 40 ----- hypereutrophic -------- t-h(m)

F Matrix (Fish Tissue Contamination)

Very few of Ohio's lakes have been assessed for fish tissue contamination. No "evaluated" data were allowed to determine the use potential of this matrix. Where "monitored" data existed, and the results could be compared to fish

consumption criteria, the following classification was used:

No Fish Advisory Issued	fu(m)
Fish Advisory for Bottom Feeders	t(m)
Fish Advisory for Game Species	i(m)

NP Matrix (Non Priority Pollutants)

The US EPA has identified a list of 126 chemicals that are considered to be toxic or priority pollutants. Chemicals not on the list are considered to be non priority. Lakes are affected by a variety of non priority chemicals, however, not all can be evaluted against water quality standards. For the purpose of the LCI, the following list of chemicals were used:

non priority metals	# of WQS Violations	Condition
pH (5.0-6.5); > 9.5	0	fu(m)
TDS >1500 mg/l	1	t(m)
D.O. <6.0 mg/l (surface)	more than 1	i(m)

PPO Matrix (Priority Organics)

Very few lakes in Ohio have been assessed for priority organic chemicals. Both the US EPA and the Ohio EPA have developed criteria for many of the priority organics. A t(bpj) condition was recorded if "pesticides" was identified as a lake problem on the NPA questionnaire. Where "monitored" data existed, the following criteria were applied:

# Exceeding Criteria	
0	fu(m)
1	t(m)
more than 1	i(m)

PPM Matrix (Priority Metals)

Same criteria as in PPO, except each metal was evaluated against WQS adopted by the Ohio EPA.

N Matrix (Nutrients based on spring total phosphorus)

A t(bpj) condition was recorded if "nutrients" was identified as a problem in the responses to the NPA questionnaire. Where "monitored" data existed, the following criteria from Wetzel (1983) were applied:

T-P	3 - 9 ug/l	oligotrophic	fu(m)
	9 - 24	mesotrophic	fu(m)
	24 - 75	eutrophic	t-e(m)
	>75	hypereutrophic	t-h(m)

S Matrix (Sediment Contamination)

Very few of Ohio's lakes have been assessed for contaminated sediment. Evaluation of sediment data is difficult because no standards or criteria have been adopted by the US EPA or the Ohio EPA. No "evaluated" data were allowed to determine the use potential of this matrix. Where "monitored" data existed, the following criteria were applied:

- PCB's > 50 mg/kg ---------- i(m)
- EP Toxic Waste ---------- i(m)
- Highly Polluted based on Lake Erie Harbor Sediment ------ t(m)
- None of the above ---------- fu(m)

M Matrix (Acid Mine Drainage)

The following criteria were used to evaluate potential acid mine drainage impact on lake water quality. Where "mining" was identified as a problem on the NPA questionnaire a t(bpj) value was recorded, unless "monitored" data indicated a full use quality.

		# of WQS Violations	Condition
pH	< 5.0		
TDS	> 1500	0	fu(m)
Mn	> 4.0 mg/l	1	t(m)
Fe	> 10.0 mg/l	more than 1	i(m)
SO_4	> 960 mg/l		

These criteria were adapted from measurements conducted by the Ohio DNR, Division of Mine Reclamation and the Soil Conservation Service.

V Matrix (Volume loss due to Sedimentation)

A limited number of Ohio's lakes have been assessed for volume loss due to sedimentation. Agencies conducting surveys included the US Army Corps of Engineers, Soil Conservation Service, and the Ohio DNR Division of Water. For the purposes of this LCI evaluation, sediment data was considered "monitored" if it was post 1980. Where "sediment" was identified as a problem in the responses on the NPA questionnaire, a t(bpj) value was recorded. Where "monitored" data existed the following criteria were applied:

10% volume loss	fu(m)
10-40%	t(m)
40%	i(m)

A Matrix (Aesthetics, Public Perception of Lake Condition)

This matric was included as an overall measure of watr quality. For the most part this is a subjective matrix, however, a t(m) condition was recorded if the lake was measured to be hypereutrophic based on summer chlorophyll-a concentrations. Where "algae" was identified as a problem on the NPA questionnaire, a t(bpj) value was recorded. Where "monitored" or observed data existed, the following criteria were applied:

	Frequency	Condition
° Fish Kills	0	fu(m)
° Algae (hypereutrophic)	1	t(m)
° Oil Scums/Odors	2	i(m)

Example LCI Summary: Harrison Lake, Fulton County

Harrison Lake is a 96 acre lake located in Fulton County, Ohio. It is owned by the State of Ohio (Department of Natural Resources). Its primary use is recreation (fishing, boating) and it is also used as a public water supply. It has a watershed area of 37 square miles. Harrison Lake was "monitored" by the Ohio EPA in 1975 and 1981. The lake was drained and dredged in 1972; it was constructed in 1941. Sediment surveys conducted by the Ohio DNR, Division of Water, indicate a sediment accumulation rate of 0.2 - 0.34 acre-foot of sediment per year per square mile of drainage area. Three individuals provided "evaluated" data in response to the questionnaire distributed by the Ohio EPA, Office of Planning, as part of their 1988 Non-Point Assessment required by Section 319 of the WQA.

Using the available "monitored" and "evaluated" data the following LCI summary was obtained for Harrison Lake:

IBI	NM	A	NP	PPO	PPM	P	N	F	V	S	B	M
ne	t bpj	t bpj	t m	t bpj	i m	e-t m	h-t m	ne	t bpj	ne	fu m	fu m

Attachment C

Justification for Using the Ohio Lake Condition Index (LCI) to Determine Attainment of Use Support/CWA Goals for Ohio's Lakes/Ponds/Reservoirs

Justification for using the Ohio Lake Condition Index (LCI) to determine attainment of Use Support/CWA Goals for the 1988 305(b) Report

As described in Attachment B of this report, the Ohio EPA developed the Lake Condition Index (LCI) to assist in its attempt to summarize a large amount of lake data so that each lake could be evaluated as to whether or not it was attaining designated use support and CWA Goals.

The first step in this process was to decide if sufficient "assessed" data existed (both "monitored" and "evaluated") to determine the status of each of Ohio's 417 publicly owned lakes/ponds/reservoirs. US EPA 305(b) guidance requires that only "monitored" data should be used to make decisions about attainment of designated uses (i.e., PWS, EWH), whereas both "monitored" and "evaluated" data can be used to determine attainment of CWA Goals (fishable, swimmable). In order to conform to this guidance, it was decided that the following sets of LCI matrices would be used to evaluate each lake: Fishable (IBI, F, M, S); Swimmable (B, NM, A, V); EWH (NP, PPO, PPM, M, N); and PWS (NP, PPO, PPM, M, V,P). Justification for the selection of these matrices is explained below.

It was next decided that sufficient data was available to make a decision about attainment if more than 50 percent of the appropriate LCI matrices were "assessed" in any of the four attainment categories. For example, to determine attainment of the fishable CWA goal, at least 3 of the 4 appropriate matrices would have to be "assessed". Selection of a 50 percent level is subjective, but it does assure that a majority of the information necessary to evaluate the status of a lake is available, and it allows for the fact that there is a limited amount of information available for Ohio's lakes. Justification for the selection of LCI matrices follows:

Fishable (IBI, F, M, S)

Meeting the fishable CWA goal is defined for the purposes of the 305(b) process as: providing a level of water quality consistent with the goal of protection and propagation of a balanced population of shellfish, fish, and wildlife (US EPA Regional 305(b) Guidance, June, 1987). Fish advisories, consumption bans, fish abnormalities, and measures of biological communities are examples of parameters that can be used to determine if waters are attaining the fishable goal. The four LCI matrices selected are sufficient to make a judgement as to whether or not the fishable goal is being attained.

Swimmable (B, NM, A, V)

Meeting the swimmable CWA goal is defined by US EPA guidance as: providing a level of water quality that allows for recreational activities in and on the water. Such recreational activities are not limited to swimming, but also include boating, fishing, and wading. The four LCI matrices selected are sufficient to make a judgement as to whether or not the swimmable goal is being attained.

EWH (NP, PPO, PPM, M, N)

The Ohio EPA has established Water Quality Standards for the protection of

surface waters (Chapter 3745-1 of the Ohio Administrative Code). Section 3745-1-07 (B)1(c) identifies all lakes and reservoirs (both public and private), except upground storage reservoirs, as Exceptional Warmwater Habitat (EWH) for the protection of aquatic life. Each of the five matrices selected can be evaluated against the EWH Water Quality Standards. Inclusion of the N matrix is appropriate because T-P is addressed in Section 3745 of the standards.

PWS (NP, PPO, PPM, M, V, P)

The use of a lake as a potential source of domestic drinking water is affected by a combination of chemical, physical, and biological lake attributes. Each of the attributes is addressed by the six LCI matrices that were selected to evaluate attainment of PWS use support. Both volume loss due to sedimentation (V), and primary productivity (P) are important lake condition parameters that can affect the treatability of lake water to be used as a public water supply. Chemical parameters were evaluated against EWH Water Quality Standards found in Chapter 3745-1 of the Ohio Administrative Code.

Use Support/CWA Goals Determination

The next step in the process was to examine the compiled "assessed" data for each lake to determine if the lake was meeting full use, partial use, or if the lake was impaired. These distinctions are required by US EPA 305(b) Guidance. Use attainment decisions were made separately for the fishable, swimmable, EWH, and PWS categories as explained below. An example follows, which describes how the LCI information was used to determine attainment.

Determination of EWH and PWS[a]

Fully Supports Use	If 100% of the selected "monitored" LCI matrices indicated full use status (fu-m).
Supports Use But Threatened	Same as above and if one or more LCI matrices indicated a threatened status based on "evaluated" data (t-bpj) or if a eutrophic condition (t-e) was measured for either P or N.
Partially Supports Use	If one or more of the selected LCI matrices indicated a threatened status based on "monitored" data (t-m) or if a hypereutrophic condition (t-h) was measured for either P or N.
Does Not Support Use/Impaired	If one or more LCI matrices indicated an impaired status (i-m) based on "monitored" data or if more than 50% of the LCI matrices indicated a threatened status (t-m) based on "monitored" data.

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a Only "monitored" data was used to distinguish the three main use categories, however, "evaluated" data was allowed to differentiate full use attainment from full use threatened. Full use threatened is considered to meet attainment of the designated uses.

Determination of Fishable and Swimmable[a]

Fullly Supports Use	If 100% of the selected LCI matrices indicated full use based on either "monitored" or "evaluated" data (fu-m, fu-bpj).
Supports Use But Threatened	If one, and only one, of the selected LCI matrices indicated a threatened status based on "evaluated" data (t-bpj) and the other matrices indicated full use.
Partially Supports Use	If one or more of the selected LCI matrices indicated a threatened status based on "monitored" data (t-m) or if two or more LCI matrices indicated a threatened status based on "evaluated" data (t-bpj).
Does Not Support Use/Impaired	If one or more LCI matrices indicated an impaired status based on "monitored" data (i-m) or if more than 50% of the LCI matrices indicated a threatened status based on "monitored" data.

Example Use Attainment Determination: Harrison Lake, Fulton County.

Harrison Lake is a 96 acre lake located in Fulton County, Ohio. It is owned by the State of Ohio (Department of Natural Resources). Its primary use is recreation (fishing, boating) and it is also used as a public water supply. It has a watershed area of 37 square miles. Harrison Lake was "monitored" by the Ohio EPA in 1975 and 1981. The lake was drained and dredged in 1972; it was constructed in 1941. Sediment surveys conducted by the Ohio DNR, Division of Water, indicate a sediment accumulation rate of 0.2 - 0.34 acre-foot of sediment per year per square mile of drainage area. Three individuals provided "evaluated" data in response to the questionnaire distributed by the Ohio EPA, Office of Planning, as part of their 1988 Non-Point Assessment required by Section 319 of the WQA.

Using the available "monitored" and "evaluated" data the following LCI summary was obtained for Harrison Lake as explained in Attachment B of this report:

IBI	NM	A	NP	PPO	PPM	P	N	F	V	S	B	M
ne	t bpj	t bpj	t m	t bpj	i m	e-t m	h-t m	ne	t bpj	ne	fu m	fu m

a Both "monitored" and "evaluated" data were used to distinguish the three main use categories.

Ten of the 13 LCI matrices were "assessed" using either "monitored" or "evaluated" data. No information is available for fish community structure, fish tissue, and sediment contamination. Applying the 50% rule, sufficient data was available to make a determination of use attainment for EWH, PWS, and the swimmable CWA, but not for the fishable CWA goal. Attainment of the swimmable CWA goal requires evaluation of those LCI matrices that relate to potential recreational use of Harrison Lake as follows:

LCI Matrices used to evaluate the Swimmable CWA goal	B	NM	A	V
	fu	t	t	t
	m	bpj	bpj	bpj

The above LCI information indicates that Harrison Lake is not contaminated with fecal coliform bacteria, however, best professional judgement suggests that the lake is being threatened, i.e., it is impacted, by macrophytes, aesthetics, and volume loss due to sedimentation. Next, apply the criteria presented under "Determination of Fishable and Swimmable" in Attachment C. Based on the presence of two or more t(bpj) conditions, Harrison Lake is given a Partial Use - Non Attainment status for attainment of the swimmable CWA Goal.

Continuing the above process for the EWH and PWS categories results in the following use attainment summary for Harrison Lake:

Fishable CWA Goal - Insufficient Data

Swimmable CWA Goal - Partial Use

EWH/PWS Use Support - Impaired Use

Examination of the raw "monitored" and "evaluated" data indicates that Harrison Lake has hypereutrophic levels of phosphorus; water quality standard violations for copper, mercury, and iron; is organically enriched having a BOD_5 greater than 5 mg/l; is potentially being affected by pesticides; has excessive amounts of macrophytes; and is loosing volume at a significant rate due to sedimentation. Agriculture, in particular livestock/feedlot problems and crop production, are identified as potential non-point problems in the watershed. No significant point sources were identified. Potentially threatened lake uses were identified as being fishing, boating, and water supply.

The above example shows how the LCI can be used to reduce a massive amount of monitored and visual data that is available for a lake into an objective procedure that can be used to determine potential use attainment. Figure C-1 provides a flow diagram summarizing the use attainment evaluation process for lakes.

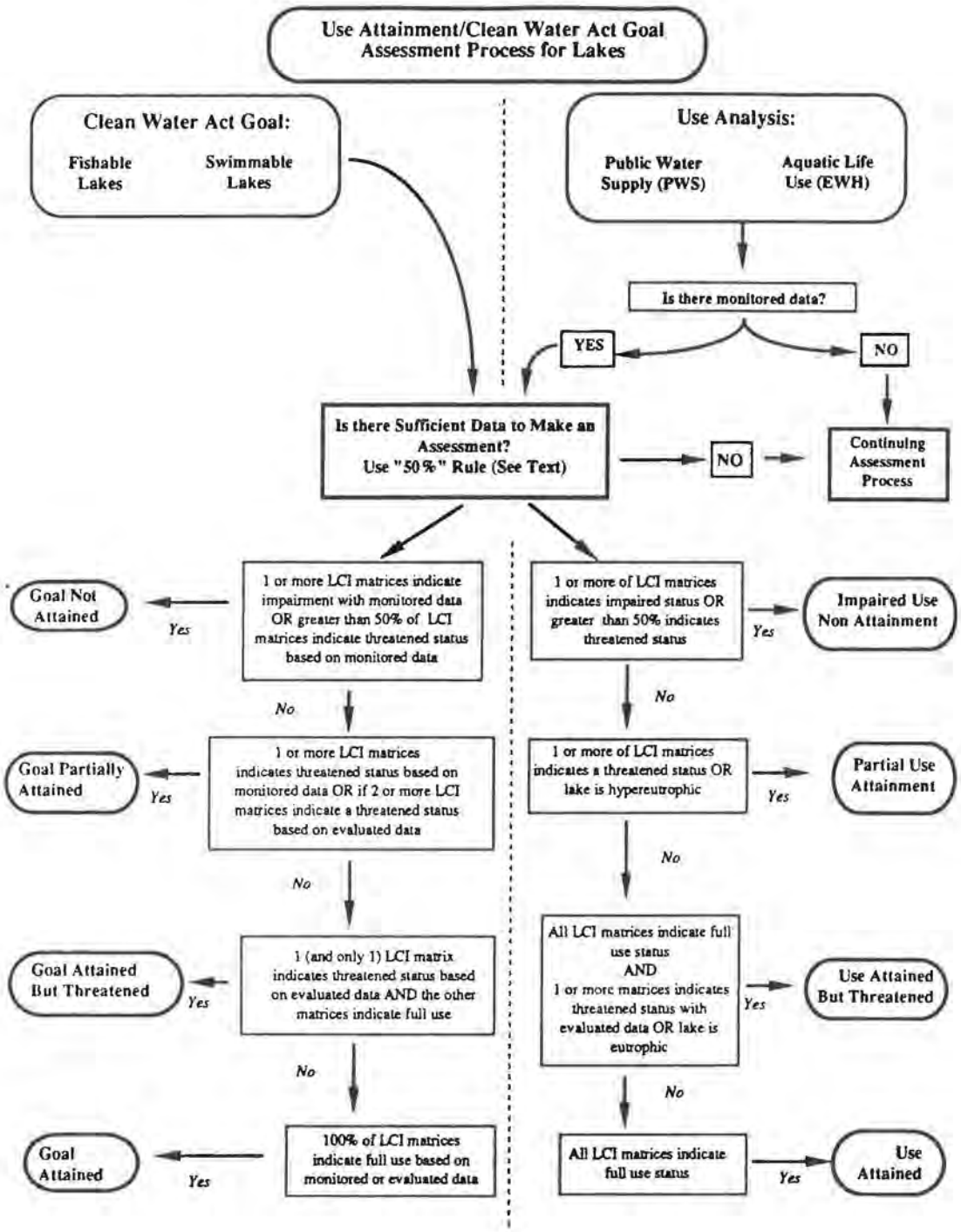

Figure C-1. Use attainment evaluation process for lakes. Only "monitored" data can be used to determine the 50% rule for PWS and EWH uses.

Attachment D

List of Ohio Publicly Owned Lakes/Ponds/Reservoirs

Table D-1. List of Ohio's publicly owned lakes/ponds/reservoirs.

	Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses				Trophic State chlor. a	Trophic State phosphorus
5	ACTON LAKE	Butler	393327	844403	604.0	R				t-h(m)	t-h(m)
2	ADAMS LAKE	Adams	384850	833058	37.0	R				t-e(m)	t-h(m)
3	ALDER POND	Summit	410500	812731	15.0					ne	ne
1	ALDRICH POND	Sandusky	412420	831502	34.0	R				ne	ne
5	ALUM CREEK LAKE	Delaware	401103	825750	3387.0	R	WS	FC	C	ne	t-e(m)
	AMANN RESERVOIR	Morrow	404245	824921	24.0	R	WS			ne	ne
	AMICKS RESERVOIR	Morrow	404211	824922	51.0	R	WS			ne	ne
1	ARCHBOLD RESERVOIR #1	Fulton	413115	841738	20.0	R	WS			ne	t(bpj)
1	ARCHBOLD RESERVOIR #2	Fulton	413106	841738	49.0	R	WS			ne	t(bpj)
3	ASTABULA CO. METRO PARKS LAKE #1	Ashtabula	413943	803827	5.5					ne	ne
3	ASTABULA CO. METRO PARKS LAKE #2	Ashtabula	413935	803849	6.0					ne	ne
4	ATOMIC ENERGY COMM. LAKE #1	Pike	390139	825910	13.8					ne	ne
4	ATOMIC ENERGY COMM. LAKE #2	Pike	390114	825914	17.0					ne	ne
5	ATTICA RESERVOIR	Seneca	410310	825325	5.2		WS			ne	ne
4	ATWOOD RESERVOIR	Tuscarawas	403136	811803	1540.0	R		FC		t-e(m)	t-e(m)
3	BALDWIN LAKE	Cuyahoga	412147	815120	32.0	R	WS			t-e(m)	ne
3	BALDWIN RESERVOIR	Cuyahoga	412936	813635	6.0		WS			ne	ne
1	BALLVILLE DAM	Sandusky	411935	830811	89.0		WS			ne	ne
4	BARNESVILLE RESERVOIR #1	Belmont	395752	811000	35.0		WS			ne	ne
4	BARNESVILLE RESERVOIR #2	Belmont	395816	810954	11.3		WS			ne	ne
4	BARNESVILLE RESERVOIR #3	Belmont	395432	810937	98.0	R	WS			t-h(m)	t-h(m)
3-4	BEACH CITY LAKE	Tuscarawas	403806	813330	420.0	R		FC		t-e(m)	t-h(m)
1	BEAVER CREEK RESERVOIR	Seneca	411408	830113	110.0	R	WS			ne	ne
3	BEAVER LAKE	Columbiana	405313	803737	103.0		WS			ne	ne
1	BELLEVUE RESERVOIR #1,#2	Huron	411603	824935	14.2	R	WS			ne	t(bpj)
1	BELLEVUE RESERVOIR #3	Huron	411609	824926	14.0	R	WS			ne	t(bpj)
1	BELLEVUE RESERVOIR #4	Huron	411538	824922	31.0	R				ne	t(bpj)
1	BELLEVUE RESERVOIR #5	Huron	411242	824635	87.0	R	WS			ne	ne
4	BELMONT LAKE	Belmont	400201	810033	117.0	R				t-h(m)	fu(m)
5	BERLIN HEIGHTS RESERVOIR	Erie	411930	823030	5.0		WS			ne	ne
3	BERLIN RESERVOIR	Portage	410248	810010	3590.0	R	WS	FC		t-e(m)	t-e(m)
2	BETHEL RESERVOIR	Clermont	385911	840410	5.5		WS			ne	ne
4	BETHESDA RESERVOIR	Belmont	400051	810350	13.0		WS			ne	ne
	BLANCHESTER RESERVOIR #1	Clinton	391727	835846	7.1		WS			ne	ne
	BLANCHESTER RESERVOIR #2	Clinton	391727	835846	7.1		WS			ne	ne
	BLANCHESTER RESERVOIR #3	Clinton	391714	835843	11.4		WS			ne	ne
	BLANCHESTER RESERVOIR #4	Clinton	391710	835816	11.4		WS			ne	ne
	BLANCHESTER RESERVOIR #5	Clinton	391722	835836	17.9		WS			ne	ne
4	BLUE ROCK STATE PARK LAKE	Muskingum	0	0	18.0	R				ne	ne
3	BRADY LAKE	Portage	411066	811854	70.0	R				t-h(m)	t(bpj)
1	BRESLER RESERVOIR	Allen	404347	841410	582.0	R	WS			t(bpj)	ne
3	BUCKEYE LAKE	Licking	395540	822918	3136.0	R			C	t-h(m)	t-h(m)
5	BUCYRUS RESERVOIR #1	Crawford	404938	825618	36.0	R	WS			t(bpj)	ne
5	BUCYRUS RESERVOIR #2	Crawford	494912	825535	31.0	R	WS			t(bpj)	ne
5	BUCYRUS RESERVOIR #4	Crawford	405030	825612	150.0		WS			ne	ne
3	BURGESS LAKE	Mahoning	410210	803530	20.0		WS			ne	ne
4	BURR OAK LAKE (T. JENKINS RESV.)	Athens	393230	820328	664.0	R	WS	FC		ne	t-e(m)
5	C. J. BROWN LAKE	Clark	395702	834450	2120.0	R		FC		t-h(m)	t-e(m)

Uses: R-Recreation, WS-Water Supply, FC-Flood Control, C-Conservation; See Appendix B for explanation of trophic state.
03/27/89

Table D-1. List of Ohio's publicly owned lakes/ponds/reservoirs.

Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses					Trophic State chlor. a	Trophic State phosphorus
CAESAR CREEK RESERVOIR 5	Warren	0	0	2830.0	R	WS	FC			t-e(m)	t-h(m)
CALDWELL LAKE 4	Noble	394632	813139	51.0	R	WS	FC			ne	ne
CAMBRIDGE RESERVOIR 4	Guernsey	400017	813331	26.0	R	WS				ne	ne
?CAMDEN RESERVOIR	Lorain	411433	822000	9.0	R?					ne	ne
CARRIAGE HILL RESERVOIR	Montgomery	395224	840515	14.1						ne	ne
CARTER LAKE	Gallia	384917	822926	7.0	R					ne	ne
CEDARVILLE COLLEGE LAKE	Greene	394451	834848	6.0						ne	ne
CEDARVILLE RESERVOIR	Greene	394428	834854	5.0	R	WS				ne	ne
CELERYVILLE RESERVOIR	Crawford	405922	824405	75.0		WS				ne	ne
CHARLES MILL LAKE	Ashland	404427	822158	1350.0	R		FC			t-h(m)	t-h(m)
CHIPPEWA CR. WATERSHED VII C	Wayne	405305	814750	34.0			FC			ne	ne
CHIPPEWA CREEK STRUCTURE 2-A	Medina	410348	815258	12.0			FC			ne	ne
CHIPPEWA CREEK STRUCTURE 3-A	Medina	410208	815109	20.0			FC			ne	ne
CINCINNATI WATERWORKS LAKE #1	Hamilton	390406	842504	18.0	R					ne	ne
CINCINNATI WATERWORKS LAKE #2	Hamilton	390406	842518	19.0	R					ne	ne
CINNAMON LAKE	Ashland	405924	821052	131.0	R	WS				t(bpj)	ne
CITY OF ASHLAND LAKE	Ashland	405247	821733	6.0	R					ne	ne
CITY OF DAYTON LAKE #1	Montgomery	394718	840700	10.0	R?					ne	ne
CITY OF NEWTON FALLS LAKE	Trumbull	411212	805737	12.5						ne	ne
CITY OF PERRYSBURG LAKE	Wood	413324	833000	6.5						ne	ne
CITY OF WELLSTON LAKE	Jackson	390747	823103	11.0		WS				ne	t(bpj)
CLARK LAKE	Clark	395653	833938	100.0	R					fu(m)	fu(m)
CLEAR FORK RESERVOIR	Richland	404153	823623	1010.0	R	WS				ne	t-e(m)
CLENDENING LAKE	Harrison	401608	811636	1800.0	R		FC			ne	t-e(m)
CLOUSE POND	Perry	394554	821812	41.0	R			C		t-h(m)	t-e(m)
COE LAKE	Cuyahoga	412140	815106	23.0	R	WS				ne	ne
COLLEGE CORNER RESERVOIR	Preble	393423	844828	5.0						ne	ne
CORNING RESERVOIR	Perry	393510	820415	15.5	R	WS				ne	ne
COWAN LAKE	Clinton	392318	835530	688.0	R					ne	t-h(m)
CROOKSVILLE LOWER RESERVOIR	Morgan	394540	820250	7.5		WS				ne	ne
CROOKSVILLE RESERVOIR #3	Perry	394206	820430	15.0		WS				ne	ne
CROOKSVILLE UPPER RESERVOIR	Morgan	394554	820236	5.0	R					ne	ne
CRYSTAL LAKE 3	Portage	410759	811402	25.0	R					ne	ne
CUTLER LAKE 4	Muskingum	394902	815163	18.2	R	WS				t-e(m)	t(bpj)
DALE WALBURN RESERVOIR	Stark	405823	811040	670.0		WS				ne	ne
DARKE WILDLIFE AREA LAKE	Darke	0	0	21.0	R					ne	ne
DEER CREEK CAMPGROUND LAKE	Pickaway	393805	831439	8.0	R			C		ne	ne
DEER CREEK LAKE	Pickaway	393620	831442	1277.0	R		FC	C		t-e(m)	t-h(m)
DEER CREEK RESERVOIR	Stark	405807	810700	313.0	R	WS				t-h(m)	t-e(m)
DEFIANCE POWER DAM RESERVOIR	Defiance	0	0	0.0						ne	ne
DELAWARE LAKE	Delaware	402130	830408	1300.0	R		FC	C		fu(m)	t-h(m)
DELCO WATER COMPANY LAKE	Delaware	401159	830328	6.0		WS				ne	ne
DELTA POND	Fulton	413519	840205	11.0	R?					ne	ne
DELTA RESERVOIR	Fulton	413522	840044	39.0		WS				ne	t(bpj)
DELTA RESERVOIR #2	Fulton	413536	840054	50.0		WS				ne	ne
DESHLER RESERVOIR	Henry	411203	835404	23.0	R	WS				ne	ne
DILLON RESERVOIR	Muskingum	400000	820730	1325.0	R		FC			t-h(m)	t-h(m)
DOW LAKE 4	Athens	392007	820104	161.0	R					t-e(m)	fu(m)

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Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses				Trophic State chlor. a	Trophic State phosphorus
EAST BRANCH RESERVOIR	Geauga	413013	810538	416.0	R	WS			t-e(m)	t-e(m)
EAST FORK LAKE	Clermont	390123	840859	2160.0	R	WS	FC		t-h(m)	t-h(m)
EAST PALESTINE RESERVOIR	Columbiana	405014	803338	5.0	R	WS			ne	ne
EAST RESERVOIR	Summit	410004	813153	201.0	R				t-h(m)	t-e(m)
EASTWOOD LAKE	Montgomery	394700	840820	170.0	R				ne	ne
ECHO LAKE	Miami	400922	841537	14.5		WS			ne	ne
EDEN PARK POND	Hamilton	390643	842939	6.0	R				ne	ne
ERNST LAKE	Miami	400954	841438	10.0		WS			ne	ne
ESSINGTON LAKE	Perry	394528	821232	16.0	R			C	fu(m)	ne
EVANS LAKE	Mahoning	405852	803706	566.0	R	WS			ne	ne
EVERGREEN LAKE	Lucas	413147	835004	8.5	R?				ne	ne
FAIRMOUNT RESERVOIR	Cuyahoga	412942	813630	8.0		WS			ne	ne
FALLSVILLE WILDLIFE AREA LAKE	Highland	0	0	11.0	R				ne	ne
FERGUSON RESERVOIR	Allen	404355	840243	305.0	R	WS			t(bpj)	t(bpj)
FINDLAY RESERVOIR #1	Hancock	410030	833356	186.0	R	WS			ne	t(bpj)
FINDLAY RESERVOIR #2	Hancock	410036	833418	650.0	R	WS			ne	t(bpj)
FINDLEY LAKE	Lorain	410815	821230	83.0	R				t-h(m)	t-e(m)
FIRESTONE RESERVOIR	Summit	410039	813052	83.0	R	WS			t-h(m)	ne
FORKED RUN LAKE	Meigs	390530	814604	104.0	R				ne	fu(m)
FORTY ACRE POND	Auglaize	403458	842324	70.0	R				t-h(m)	ne
FOX LAKE STRUCTURE #6	Athens	391800	821132	47.0	R		FC		t-e(m)	fu(m)
FRANZ POND	Miami	400859	841538	6.0		WS			ne	ne
FRIENDSHIP PARK LAKE	Jefferson	401702	804555	85.0	R				ne	ne
FULTON POND	Fulton	413548	835534	15.0	R			C	t(bpj)	t(bpj)
GEORGETOWN VILLAGE RESERVOIR	Brown	385147	835518	11.8		WS			ne	ne
GIRARD LAKE	Trumbull	411230	804232	185.0	R	WS			ne	ne
GRAFTON WATER SUPPLY LAKE	Lorain	411026	820637	10.0		WS			ne	ne
GRAND LAKE ST. MARYS	Auglaize	403117	842518	12700.0	R				t-h(m)	t-h(m)
GRAND RIVER WILDLIFE AREA LAKE	Trumbull	412323	805433	11.2	R				ne	ne
GRANT LAKE	Brown	385513	835544	181.0	R				t-h(m)	ne
GREENE COUNTY PARKS LAKE	Greene	393736	840501	5.0					ne	ne
GREENFIELD LAKE	Fairfield	394615	823757	13.5	R		FC	C	ne	ne
GREENWICH RESERVOIR	Huron	410135	823057	6.5		WS			ne	ne
GUILFORD LAKE	Columbiana	404742	805220	396.0	R				t-h(m)	t-e(m)
HAMMERTOWN LAKE (JACKSON CITY RESV.)	Jackson	390323	824105	186.0	R	WS			fu(m)	fu(m)
HARGUS LAKE	Pickaway	393736	825315	130.0	R			C	fu(m)	t-e(m)
HARRISON LAKE	Fulton	413822	842140	96.0	R				t-e(m)	t-h(m)
HEBRON FISH HATCHERY LAKE	Licking	395607	823054	75.0				C	ne	ne
HELENA LAKE	Sandusky	412220	831900	15.0	R				ne	ne
HICKORY LAKE	Portage	410912	810644	6.0	R				ne	ne
HIGHLANDTOWN LAKE	Columbiana	403816	804455	170.0	R				t-h(m)	fu(m)
HIGHLANDTOWN WILDLIFE AREA POND	Columbiana	403928	804600	7.0	R			C	ne	ne
HILLSBORO RESERVOIR	Highland	391446	833600	22.0	R	WS			t(bpj)	t(bpj)
HINCKLEY LAKE	Medina	411335	814313	88.0	R				t-e(m)	t(bpj)
HOCKING HILLS RESERVOIR	Hocking	392527	823220	21.0		WS			ne	ne
HOOVER RESERVOIR	Franklin	400558	825253	3000.0	R	WS			t-e(m)	t-h(m)
HOSTERMAN LAKE	Clark	395444	835416	9.2	R				t-h(m)	ne
HOWER RESERVOIR	Summit	405955	813303	0.0	R				ne	ne

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Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses				Trophic State chlor. a	Trophic State phosphorus
HRCD STRUCTURE 1	Fairfield	394258	824215	5.0			FC		ne	ne
HRCD STRUCTURE 2	Fairfield	394219	824057	8.9			FC		ne	ne
HRCD STRUCTURE 5	Fairfield	394727	823806	7.1			FC		ne	ne
HRCD STRUCTURE 8	Fairfield	394353	824215	7.5			FC		ne	ne
HRCD STRUCTURE R-21	Fairfield	394335	824200	5.3			FC?	C	ne	ne
HUDSON SPRINGS LAKE	Summit	411500	812400	45.0	R				ne	ne
INDEPENDENCE DAM RESERVOIR	Defiance	0	0	605.0	R				ne	ne
INDIAN CR. WILDLIFE AREA PONDS	Brown	391003	835338	56.0	R				ne	ne
INDIAN LAKE	Logan	402803	835232	5104.0	R				t-h(m)	t-h(m)
J. GRIGGS RESERVOIR	Franklin	400056	830538	385.0	R	WS			t-h(m)	t-e(m)
JACKSON LAKE	Jackson	385330	823609	243.0	R				t-e(m)	fu(m)
JEFFERSON LAKE	Jefferson	402738	804740	25.0	R				t-e(m)	fu(m)
JISCO LAKE	Jackson	0	0	0.0					ne	ne
KENT BOARD OF TRUSTEES LAKE	Portage	411236	812150	10.0				C?	ne	ne
KILLDEER RESERVOIR	Wyandot	404155	832246	253.0	R				fu(m)	fu(m)
KILLDEER WILDLIFE POND #1	Wyandot	404256	831841	9.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #2	Wyandot	404254	832025	45.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #3	Wyandot	404247	831359	9.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #4	Wyandot	404233	831423	8.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #5	Wyandot	404104	831754	18.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #6	Wyandot	404250	831626	15.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #7	Wyandot	404209	831718	225.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #8	Wyandot	404235	831640	373.0	R			C?	ne	ne
KILLDEER WILDLIFE POND #9	Wyandot	404233	831640	225.0	R			C?	ne	ne
KIPTON RESERVOIR	Lorain	411515	821822	20.0	R	WS			ne	ne
KISER LAKE	Champaign	401150	835855	380.0	R				t-h(m)	t-e(m)
KNOX LAKE	Knox	402947	823136	474.0	R			C	t-e(m)	t-e(m)
LAKE ALMA	Vinton	390840	823105	63.0	R	WS			t-e(m)	fu(m)
LAKE ANNA	Summit	410050	813636	12.0					ne	ne
LAKE AQUILLA	Geauga	413246	811012	27.0	R				t-e(m)	ne
LAKE CALDWELL	Ross	391339	825705	9.6	R				t-h(m)	ne
LAKE COHASSET	Mahoning	410455	804051	27.0	R				ne	ne
LAKE DAUGHTERY	Hancock	410840	832542	12.0	R	WS			ne	ne
LAKE GEORGE	Portage	411126	811931	12.0	R				ne	ne
LAKE GLACIER	Mahoning	410552	804029	43.0	R				ne	ne
LAKE HAMILTON	Mahoning	410210	803530	104.0	R	WS			ne	ne
LAKE HODGSON	Portage	410818	811726	190.0	R	WS			fu(m)	ne
LAKE HOPE	Vinton	391912	822123	127.0	R				t-e(m)	fu(m)
LAKE ISABELLA	Hamilton	391437	841818	23.0	R				fu(m)	ne
LAKE ISSAC	Cuyahoga	0	0	0.0	R				ne	ne
LAKE KATHARINE	Jackson	390505	824022	42.0	R				ne	ne
LAKE LA SU AN	Williams	0	0	134.0	R				ne	ne
LAKE LAMBERJACK	Hancock	410923	832555	45.0	R	WS			ne	t(bpj)
LAKE LAVERE	Williams	414122	844215	11.1	R				ne	ne
LAKE LOGAN (HOCKING LAKE)	Hocking	393203	822703	354.0	R				t(bpj)	t-e(m)
LAKE LORAMIE	Shelby	402127	842132	785.0	R				t-h(m)	t-h(m)
LAKE LORETTA	Fairfield	394048	823442	5.0					ne	ne
LAKE LaCOMTE (FOSTORIA RES. #5)	Hancock	410657	832650	128.0	R	WS			ne	t(bpj)

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Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses				Trophic State chlor. a	Trophic State phosphorus
LAKE MEDINA	Medina	410821	814920	109.0	R	WS			ne	ne
LAKE MILTON	Mahoning	410738	805840	1685.0	R	WS	FC		t-e(m)	fu(m)
LAKE MOSIER	Hancock	410820	832540	88.0	R	WS			ne	t(bpj)
LAKE MOTRAM	Hancock	410928	832552	18.0	R	WS			ne	ne
LAKE NESMITH	Summit	410126	813305	80.0	R	WS			t-h(m)	t-e(m)
LAKE PARK	Mahoning	405443	810352	20.0	R				t-e(m)	ne
LAKE PIPPEN	Portage	411026	811842	143.0	R	WS			ne	ne
LAKE ROCKWELL	Portage	411058	811952	539.0		WS			t-h(m)	t-h(m)
LAKE ROMONA	Fairfield	393658	823806	5.0					ne	ne
LAKE RUPERT	Vinton	391035	823115	325.0	R	WS			t-e(m)	fu(m)
LAKE SNOWDEN (Structure #2)	Athens	391500	821117	131.0	R	WS			t-e(m)	fu(m)
LAKE STEWART	Ross	391303	825742	7.5	R				t-h(m)	ne
LAKE SUE	Williams	414119	844149	10.5	R				ne	ne
LAKE VESUVIUS	Lawrence	383623	823750	105.0	R				ne	fu(m)
LAKE WHITE RESERVOIR	Pike	390605	830050	337.0	R				t-e(m)	fu(m)
LAMPSON RESV. (JEFFERSON RESV.)	Ashtabula	414508	804750	20.0	R	WS			ne	ne
LEESVILLE LAKE	Carroll	402807	811141	1000.0	R		FC	C	ne	t-e(m)
LEIPSIC RESERVOIR	Putnam	410623	835544	27.0	R				ne	ne
LIBERTY LAKE	Trumbull	411100	804230	99.0	R	WS			ne	ne
LIMA RESERVOIR	Allen	404512	840252	84.0	R	WS			ne	ne
LIME KILN LAKE	Tuscarawas	403650	812457	29.0	R				ne	ne
LONDON FISH HATCHERY LAKE	Madison	395358	833031	7.0				C	ne	ne
LONG LAKE	Summit	410054	813236	180.0	R	WS			t-h(m)	t-e(m)
LOST CREEK RESERVOIR	Allen	404413	840400	121.0	R	WS			ne	ne
LOWER SHAKER LAKE	Cuyahoga	412924	813454	16.7	R				t-e(m)	ne
LaDUE RESERVOIR	Geauga	412425	811112	1500.0	R	WS			t(bpj)	t(bpj)
LaGRANGE WATER WORKS LAKE	Lorain	411546	820904	6.0		WS			ne	ne
M. OLANDER PARK LAKE	Lucas	414126	834232	20.0	R				ne	ne
MADISON LAKE	Madison	395158	832235	106.0	R			C	t-e(m)	t-h(m)
MAPLE GROVE LAKE	Morrow	403257	824844	5.0	R	WS			ne	ne
MARGARET CR. CONS. DIST. #1	Athens	391510	821000	0.0			FC		ne	ne
MARGARET CR. CONS. DIST. #4	Athens	391510	820728	28.0			FC		ne	ne
MARGARET CR. CONS. DIST. #5	Athens	391540	820705	8.3			FC		ne	ne
MAYSVILLE REG. WATER DIST. LAKE	Muskingum	395148	820648	45.0	R	WS			ne	ne
MEADOW BROOK LAKE	Summit	411110	812918	24.0	R				t-h(m)	t-h(m)
MEANDER CREEK RESERVOIR	Trumbull	410912	804845	2010.0	R	WS		C	t-e(m)	fu(m)
METAMORA RESERVOIR	Fulton	414242	835620	7.0	R?	WS			ne	ne
METZGER RESERVOIR	Allen	404418	840250	157.0	R	WS			t(bpj)	t(bpj)
MIAMI CONS. DIST. LAKE	Greene	394806	840526	43.0	R				ne	ne
MIAMI WHITEWATER LAKE	Hamilton	391535	844445	85.0	R				t-e(m)	t(bpj)
MICHAEL J. KIRWIN RESERVOIR	Portage	410924	810448	2650.0	R	WS	FC		t-e(m)	fu(m)
MILLER ANTRIM QUARRY	Franklin	400438	830202	37.0	R				t-h(m)	ne
MILLER LAKE	Summit	405845	813127	28.0	R				ne	ne
MOGADORE RESERVOIR	Portage	410328	812250	900.0	R	WS			t(bpj)	t-e(m)
MOHAWK LAKE	Coshocton	402105	820521	0.0			FC		ne	ne
MOHICANVILLE RESERVOIR	Ashland	404328	820906	0.0			FC		ne	ne
MONROE LAKE	Monroe	394905	810817	39.0	R				t-e(m)	fu(m)
MOSQUITO CREEK RESERVOIR	Trumbull	411806	804568	7850.0	R	WS	FC		t-h(m)	t-e(m)

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MOUNT ORAB RESERVOIR #2	Brown	390203	885530	5.6		WS			ne	ne
MT. GILEAD LAKE (LOWER)	Morrow	403257	824902	11.0	R	WS			fu(m)	ne
MT. GILEAD LAKE (UPPER)	Morrow	403257	824340	7.0	R				t-e(m)	ne
MUD LAKE	Summit	405750	813142	85.0	R				ne	ne
MUDPORT BASIN	Coshocton	401714	815224	9.0	R				ne	ne
MUNROE BASIN	Muskingum	400912	815718	17.0	R				ne	ne
MUZZY LAKE	Portage	410651	811504	82.0		WS			ne	ne
MWCD STRUCTURE 7-C	Medina	410328	814743	23.0			FC		ne	ne
McCOMB RESERVOIR #1	Hancock	410625	834700	6.0	R	WS			ne	ne
McCOMB RESERVOIR #2	Hancock	410500	840235	20.0	R	WS			ne	ne
McKELVEY LAKE	Mahoning	410617	803541	133.0	R	WS			ne	ne
NETTLE LAKE	Williams	414037	844341	94.0	R				t-e(m)	t-e(m)
NEW CONCORD RESERVOIR	Muskingum	400026	814514	9.6	R	WS			ne	ne
NEW LEXINGTON RESERVOIR #1 New	Perry	0	821411	44.0		WS	FC		ne	ne
NEW LEXINGTON RESERVOIR #2 Old	Perry	394400	821255	27.0	R	WS			fu(m)	fu(m)
NEW LONDON RESERVOIR	Huron	410358	822530	221.0	R	WS			ne	ne
NEW WILMINGTON RESERVOIR	Clinton	392432	834830	54.0		WS			ne	ne
NEWPORT LAKE	Mahoning	410352	804043	105.0	R				t-h(m)	t-h(m)
NIMISILA RESERVOIR	Summit	405528	813056	825.0	R	WS			t-h(m)	t-e(m)
NORTH BALTIMORE RESERVOIR	Wood	411005	834010	29.0	R	WS			ne	t(bpj)
NORTH BRANCH KOKOSING RIVER LAKE	Knox	403023	823431	154.0	R		FC	C	t-h(m)	t-e(m)
NORTH KINGSVILLE RESERVOIR	Ashtabula	415511	804131	7.3					ne	ne
NORTH RESERVOIR	Summit	410006	813234	160.0	R				ne	ne
NORWALK LOWER RESERVOIR	Huron	411418	823524	31.0	R	WS			ne	t(bpj)
NORWALK MEMORIAL RESERVOIR	Huron	411404	823526	97.0	R	WS			ne	t(bpj)
NORWALK UPPER RESERVOIR	Huron	411402	823458	50.0	R	WS			ne	t(bpj)
O'SHAUGHNESSY RESERVOIR	Delaware	400912	830733	920.0	R	WS			fu(m)	t-h(m)
OAK THORPE RESERVOIR	Fairfield	394833	822655	43.0	R		FC	C	ne	ne
OBERLIN OLD UPGROUND RESERVOIR	Lorain	411700	821400	10.0		WS			ne	ne
OBERLIN RESERVOIR	Lorain	411630	821042	56.0	R	WS			t(bpj)	t(bpj)
OHIO POWER REC. LAKES	Morgan	0	0	2000.0	R				ne	ne
OLD REID PARK LAKE	Clark	395643	834530	15.0	R				fu(m)	ne
OPOSSUM CREEK LAKE #1	Montgomery	394227	841550	5.0	R				ne	ne
OPOSSUM CREEK LAKE #2	Montgomery	0	0	18.0	R				ne	ne
OSU GOLF COURSE LAKE	Franklin	400205	830326	8.6					ne	ne
OTTAWA NATIONAL WILDLIFE REFUGE LAKE	Ottawa	413626	831139	8.0				C	ne	ne
OTTAWA RESERVOIR	Putnam	410040	840114	20.0		WS			ne	ne
OXBOW LAKE	Defiance	412038	842630	40.0	R				ne	ne
PAINT CREEK LAKE	Highland	391503	832115	1190.0	R	WS	FC		t(bpj)	t-h(m)
PARK LAKE	Summit	410748	812531	13.0	R				ne	ne
PAULDING PONDS	Paulding	410733	843531	6.0	R				ne	ne
PAULDING RESERVOIR	Paulding	410712	843516	67.0	R	WS			ne	t(bpj)
PERRY RECLAMATION POND	Perry	394616	821221	6.0	R				ne	ne
PETROS LAKE	Stark	0	0	12.0	R				ne	ne
PIEDMONT LAKE	Harrison	401125	811248	2310.0	R		FC		t-e(m)	fu(m)
PIKE LAKE RESERVOIR	Pike	390934	831308	13.0	R				ne	ne
PINE CREEK STRUCTURE #8	Lawrence	383626	824245	8.8			FC		ne	ne
PINE LAKE	Mahoning	405540	803835	474.0	R	WS			ne	ne

Uses: R-Recreation, WS-Water Supply, FC-Flood Control, C-Conservation; See Appendix B for explanation of trophic state.
03/27/89

Table D-1. List of Ohio's publicly owned lakes/ponds/reservoirs.

Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses				Trophic State chlor. a	Trophic State phosphorus
PINE LAKE	Ross	392303	824457	14.0	R				ne	fu(m)
PLEASANT HILL LAKE	Ashland	403722	821930	850.0	R		FC		t-e(m)	fu(m)
POND LICK LAKE	Scioto	384149	831014	5.4	R				ne	ne
PORTAGE CO. COMM. LAKE	Portage	411511	811607	5.0					ne	ne
POWERS RESERVOIR	Crawford	404305	824812	29.0	R	WS			ne	ne
PUNDERSON LAKE	Geauga	412651	811227	101.0	R				t-e(m)	t-e(m)
PYMATUNING RESERVOIR	Ashtabula	413101	803005	3580.0	R	WS	FC		t-e(m)	t-e(m)
RACCOON CREEK RESERVOIR	Sandusky	411715	825835	34.0	R	WS			ne	ne
RAVENNA ORD. PLANT LAKE	Portage	411200	810249	7.0					ne	ne
RCCD STRUCTURE 1-B	Perry	394448	821356	44.0	R		FC		ne	ne
RCCD STRUCTURE 3-A	Perry	394506	821901	13.0	R		FC	C	ne	ne
RCCD STRUCTURE 3-B	Perry	394511	822000	13.0	R		FC	C	ne	ne
RCCD STRUCTURE 4-C	Perry	394216	822038	49.0	R		FC		ne	ne
RCCD STRUCTURE 5-A	Fairfield	394409	822226	20.0			FC		ne	ne
RCCD STRUCTURE 5-B	Fairfield	394416	822330	12.1			FC		ne	ne
RCCD STRUCTURE 5-C	Fairfield	394423	822436	13.0			FC		ne	ne
RCCD STRUCTURE 6-A	Fairfield	394725	822500	302.0	R		FC		ne	ne
RCCD STRUCTURE 7-A	Fairfield	394407	823108	22.0	R		FC		ne	ne
RCCD STRUCTURE 7-C	Fairfield	0	0	43.0			FC		ne	ne
RCCD STRUCTURE 7-D	Fairfield	394202	823028	15.0	R		FC		ne	ne
RCCD STRUCTURE 7-E	Fairfield	394113	822851	9.9			FC		ne	ne
RESTHAVEN WILDLIFE AREA PONDS	Erie	412339	824951	200.0	R			C	ne	ne
REX LAKE	Summit	405823	813256	48.0	R				ne	ne
RICHWOOD PARK LAKE	Union	402544	831756	16.0					ne	ne
RILEY RESERVOIR	Crawford	404938	825600	28.0	R	WS			t(bpj)	ne
RIO GRANDE RESERVOIR	Gallia	385301	822320	7.2		WS			ne	ne
ROAMING ROCK LAKE	Ashtabula	413918	805025	464.0	R	WS			t(bpj)	t(bpj)
ROCK MILL LAKE IX	Fairfield	394420	824156	19.8	R		FC	C	ne	ne
ROCKY FORK LAKE	Highland	0	0	2080.0	R				t-h(m)	t-e(m)
ROOSEVELT LAKE	Scioto	384333	831032	16.0	R				t-h(m)	ne
ROSS LAKE	Ross	392005	825420	140.0	R				fu(m)	fu(m)
RUSH CREEK LAKE	Perry	394715	822230	300.0	R		FC		ne	ne
RUSH RUN LAKE	Preble	393542	843646	54.0	R				t(bpj)	ne
RUSSELLVILLE RESERVOIR	Brown	385314	835131	11.0		WS			ne	ne
SALEM RESERVOIR	Columbiana	404847	805010	97.0	R	WS			ne	ne
SALT FORK RESERVOIR	Guernsey	400617	813326	2952.0	R	WS			ne	fu(m)
SAULIS BERRY PARK LAKE	Hardin	403704	833813	50.0	R				ne	ne
SCHOONOVER LAKE	Allen	404450	840550	22.0	R	WS			ne	ne
SCHROCK LAKE	Franklin	400640	825735	12.0	R			C	ne	ne
SEBALD POND #1	Butler	393123	842718	5.5	R				ne	ne
SEBALD POND #2	Butler	393140	842721	5.4	R				ne	ne
SENECAVILLE LAKE	Guernsey	0	0	3550.0	R		FC		ne	t-e(m)
SENECAVILLE NATIONAL FISH HATCHERY	Guernsey	395528	812618	20.0					ne	ne
SHADOW LAKE	Warren	385230	842230	6.0		WS			ne	ne
SHARON WOODS LAKE	Hamilton	391657	842323	38.0	R				t-h(m)	t-h(m)
SHELBY RESERVOIR #1	Richland	405208	823935	29.0	R	WS			ne	ne
SHELBY RESERVOIR #2	Richland	405208	823920	12.0	R	WS			ne	ne
SHREVE LAKE	Wayne	404103	820237	58.0	R				ne	ne

Uses: R-Recreation, WS-Water Supply, FC-Flood Control, C-Conservation; See Appendix B for explanation of trophic state.
03/27/89

Table D-1. List of Ohio's publicly owned lakes/ponds/reservoirs.

Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses				Trophic State chlor. a	Trophic State phosphorus
SIPPO LAKE	Stark	404752	812729	88.0	R				t-e(m)	ne
SMITH PARK LAKE	Butler	393129	842348	7.0	R				ne	ne
SNIDER DITCH LAKE	Trumbull	0	0	245.0					ne	ne
SNYDER PARK LAKE	Clark	395554	835020	5.9	R				t-e(m)	ne
SOMERSET RESERVOIR	Perry	394700	821730	7.5		WS		C	ne	ne
SOUTH WEBSTER RESERVOIR	Scioto	384922	824428	5.5		WS			ne	ne
SPARROW RESERVOIR	Harrison	401623	805830	17.2		WS			ne	ne
SPENCER LAKE	Medina	410625	820450	51.0	R				t-h(m)	ne
SPENCER RESERVOIR	Medina	410527	820731	8.5		WS			ne	ne
SPRING VALLEY LAKE	Warren	393350	840114	58.0	R				ne	ne
SPRINGFIELD LAKE	Summit	418444	812554	200.0	R				t-h(m)	ne
ST. CLAIR REC. AREA LAKE	Butler	392638	843127	10.0	R				ne	ne
ST. CLAIRSVILLE RESERVOIR #1	Belmont	400355	805518	10.0		WS			ne	ne
ST. CLAIRSVILLE RESERVOIR #2	Belmont	400517	805500	6.0		WS			ne	ne
ST. JOSEPH'S LAKE	Perry	394615	821730	60.0	R		FC		ne	ne
ST. MARTIN RESERVOIR	Brown	391236	835324	6.0		WS			ne	ne
STAGE'S POND	Pickaway	0	0	30.0				C	ne	ne
STATE OF OHIO LAKE	Seneca	410002	832411	5.0					ne	ne
STATE OF OHIO LAKE (NO NAME)	Trumbull	412339	805457	5.5	R				ne	ne
STATE OF OHIO LAKE (NO NAME)	Trumbull	412526	804827	21.0				C	ne	ne
STATE OF OHIO LAKE (NO NAME)	Trumbull	0	0	35.0					ne	ne
STONELICK RESERVOIR	Clermont	391257	840501	160.0	R				t-e(m)	t-h(m)
SUMMIT LAKE	Summit	410254	813238	100.0	R	WS			t-e(m)	t-e(m)
SUNBURY RESERVOIR #1	Delaware	401455	825120	6.9		WS			ne	ne
SUNBURY RESERVOIR #2	Delaware	401454	825111	18.8		WS			ne	ne
SUNNY LAKE (HARMONS POND)	Portage	411753	811855	63.0	R				t-h(m)	t(bpj)
SWANTON RESERVOIR	Lucas	413408	835226	25.0		WS			ne	t(bpj)
SWIFT RUN LAKE	Miami	401035	841548	40.0	R	WS			ne	ne
TAPPEN LAKE	Harrison	402133	811334	2350.0	R		FC		t-e(m)	t-e(m)
TAWAWA LAKE	Shelby	401713	840829	8.0	R				ne	ne
THOREAU POND (BLENDON WOODS)	Franklin	400431	825214	10.7				C	ne	ne
TINKERS CREEK STATE PARK LAKE	Portage	411700	812323	5.0				C?	ne	ne
TOUSSAINT CR. WILDLIFE AREA LAKE	Ottawa	413434	830932	5.0	R			C	ne	ne
TURKEY CREEK LAKE	Scioto	384400	831122	51.0	R				t-h(m)	ne
TURKEY FOOT LAKE	Summit	405809	813238	318.0	R				t-e(m)	t-h(m)
TWIN LAKES RESERVOIR	Allen	404428	840500	26.0	R	WS			ne	ne
TYCOON LAKE	Gallia	385518	822112	204.0	R				t-e(m)	fu(m)
UPPER SANDUSKY RESERVOIR	Wyandot	404913	831619	36.0	R	WS			ne	ne
UPPER SHAKER LAKE	Cuyahoga	412859	813338	11.4	R?				ne	ne
USA DEPT. LABOR LAKE	Medina	411507	814124	7.0					ne	ne
VA. KENDALL PARK LAKE	Summit	411302	813142	14.0	R				ne	ne
VAN BUREN LAKE	Hancock	410802	833840	53.0	R				t-e(m)	t-h(m)
VAN WERT RESERVOIR #1	Van Wert	405014	843430	60.0	R	WS			ne	ne
VAN WERT RESERVOIR #2	Van Wert	405030	843424	60.0	R	WS			ne	ne
VETO LAKE	Washington	392042	813848	160.0	R				t-e(m)	t-e(m)
VILLAGE OF BARNESVILLE LAKE	Belmont	395955	811055	7.7	R				ne	ne
VILLAGE OF BLANCHESTER LAKE	Clinton	391714	835843	10.0		WS			ne	ne
VILLAGE OF CONTINENTAL LAKE	Putnam	410526	841555	5.0					ne	ne

Uses: R-Recreation, WS-Water Supply, FC-Flood Control, C-Conservation; See Appendix B for explanation of trophic state.
03/27/89

Table D-1. List of Ohio's publicly owned lakes/ponds/reservoirs.

Lake Name	County	Latitude	Longitude	Surface Area (acres)	Lake Uses					Trophic State chlor. a	Trophic State phosphorus
VILLAGE OF GRAFTON LAKE	Lorain	411600	820250	7.0		WS				ne	ne
VILLAGE OF TIPP CITY LAKE #1	Miami	395709	841004	7.0	R					ne	ne
VILLAGE OF TIPP CITY LAKE #2	Miami	395725	840900	14.0	R					ne	ne
WABASH CONS. DIST. RESV. #1	Darke	401857	843805	57.0	R		FC			ne	ne
WALLACE LAKE	Cuyahoga	412152	815130	15.8	R	WS				fu(m)	ne
WASHINGTON C.H. RESERVOIR	Fayette	393229	832722	37.0	R	WS				ne	ne
WAUSEON RESERVOIR #1	Fulton	413042	840900	49.0	R	WS				t(bpj)	t(bpj)
WAUSEON RESERVOIR #2	Fulton	413042	840900	17.0	R	WS				ne	ne
WAYNE NATIONAL FOREST LAKE	Gallia	384917	822926	7.0	R					ne	ne
WAYNOKA RESERVOIR	Brown	385614	834802	11.8		WS				ne	ne
WAYNOKA RETENTION DAM	Brown	385628	834820	11.6		WS				ne	ne
WELLINGTON RESERVOIR (LOWER)	Lorain	410910	821344	160.0		WS				ne	ne
WELLINGTON RESERVOIR (UPPER)	Lorain	410834	821401	21.0	R?	WS				t(bpj)	t(bpj)
WELLSVILLE RESERVOIR	Columbiana	403716	804135	25.0	R	WS				ne	ne
WEST RESERVOIR	Summit	405849	813207	104.0	R					ne	ne
WESTERVILLE RESERVOIR	Delaware	400931	825625	53.0		WS				ne	ne
WESTVILLE LAKE	Columbiana	405328	810020	90.0	R	WS	FC			t-h(m)	ne
WHITE SULPHUR LAKE	Delaware	401607	830935	39.0	R	WS				ne	ne
WILLARD CITY RESERVOIR	Huron	410326	823955	200.0	R	WS				t-e(m)	fu(m)
WILLARD MARSH AREA	Huron	410136	824508	6.3	R				C	t(bpj)	t(bpj)
WILLS CREEK RESERVOIR	Coshocton	400926	815102	900.0	R		FC			ne	t-h(m)
WILLSHIRE QUARRY LAKE	Van Wert	404459	844717	7.0		WS				ne	ne
WILMINGTON RESERVOIR	Clinton	392433	834900	16.0		WS				ne	t(bpj)
WINCHESTER LAKE	Adams	385648	834003	10.0	R					ne	ne
WINTON WOODS LAKE (W.FK.MILL CK.)	Hamilton	391529	842942	183.0	R		FC			t-e(m)	t-h(m)
WOLF CREEK RESERVOIR	Summit	410329	813704	196.0		WS				ne	ne
WOLF RUN RESERVOIR	Noble	394726	813254	209.0	R	WS	FC			fu(m)	fu(m)
WOODLAND HILLS PARK LAKE	Cuyahoga	412810	813624	5.0	R					ne	ne
WOODSFIELD RESERVOIR	Monroe	394726	810655	7.0	R	WS				ne	ne
YOUCTANGEE PARK LAKE	Ross	392009	825907	6.0	R					ne	ne
ZANESVILLE STATE NURSERY LAKE	Muskingum	400147	815807	10.0					C	ne	ne
ZEPPERNICK LAKE	Columbiana	404719	805842	41.0	R					ne	ne
ZOAR LAKE WILDLIFE AREA	Tuscarawas	0	0	28.0	R					ne	ne

Uses: R-Recreation, WS-Water Supply, FC-Flood Control, C-Conservation; See Appendix B for explanation of trophic state.
03/27/89

Attachment E
Ohio EPA State Lakes Policy

September 28, 1988
Revision

Policy No.: 1.05
Drafted: N/A
Approved: February 19, 1986
Revised: September 28, 1988

State Lakes Policy

Purpose: The purpose of the State Lakes Policy is to: (1) establish effluent limitations for new or expanding point source discharges to lakes or reservoirs that are included in the definition of "Surface Waters of the State" in Ohio's Water Quality Standards (O.A.C. 3745-1-02), and (2) prevent degradation of these multi-use waters.

When to Apply: The State Lakes Policy applies to point source discharges to all publicly owned lakes and reservoirs and tributary streams within three miles of lakes or reservoirs and establishes effluent limitations for new, existing, or expanded wastewater treatment facilities. This policy is not applicable to upground storage reservoirs, point source dischargers into Lake Erie or privately owned lakes.

Discharges into streams tributary to lakes and reservoirs shall have limitations as stringent as if the discharge were occurring directly into the lake or reservoir except where a stream assimilation study has been done. For lakes whose depth is varied seasonally, such as for flood control purposes, the lake boundary shall be taken at the water surface of the summer low water level.

This policy is to be applied to three different categories of discharge.

Category 1. All <u>new</u> point sources discharging directly into a lake, reservoir, or into streams tributary (within three stream miles) to the lake or reservoir will be assigned the following effluent limitations:

<u>Total discharge volume of facility greater than or equal to 0.1 MGD</u>

$CBOD_5$		8.0 mg/l
NH_3-N	Summer -	1.5 mg/l or present ambient standard for toxicity whichever is more stringent.
	Winter -	Present ambient standard for toxicity.
T-Phosphorus		1.0 mg/l
Dissolved Oxygen		6.0 mg/l
TRC	(Summer only)	11.0 ug/l
Fecal Coliform	(Summer only)	bathing waters 200/100 ml other areas 1000/100 ml

Policy No.: 1.05

Total discharge volume of facility less than 0.1 MGD

$CBOD_5$		8 mg/l
NH_3-N	(Summer)	1.5 mg/l or present ambient standard for toxicity whichever is less stringent.
	(Winter)	Present ambient standard for toxicity.
T-Phosphorus		0.83 lbs/day
Dissolved Oxygen		6.0 mg/l
TRC	(Summer only)	11.0 ug/l
Fecal Coliform	(Summer only)	bathing waters 200/100 ml other areas 1000/100 ml

Category 2. All existing point source discharges directly into a lake, reservoir, or into streams tributary (within three stream miles) to the lake or reservoir will be assigned the following effluent limitations:

TSS		12.0 mg/l
$CBOD_5$		10.0 mg/l
NH_3-N	(Summer)	2.0 mg/l or present ambient toxicity whichever is less stringent; if discharge is into a tributary stream, a wasteload allocation may be considered.
	(Winter)	Monitor Note: If design flow is less than 0.01 MGD, neither monitoring nor a NH_3N limitation is required.
T-Phosphorus		If less than 0.2 MGD design flow, no limit or monitoring required. If greater than or equal to 0.2 MGD design flow, use 8.34 lbs/day or 1 mg/l whichever is less stringent.
Dissolved Oxygen		6.0 mg/l
TRC	(Summer only)	0.5 mg/l
Fecal Coliform	(Summer only)	bathing waters 200/100 ml other areas 1000/100 ml

Category 3. All point sources discharges from expanded facilities discharging directly into a lake, reservoir, or stream tributary (within three stream miles) to the lake or reservoir will be assigned limitations using the following formula in combination with limitations listed in applicable parts of Category 1. The formula develops limitations for Category 3 dischargers by prorating the existing and additional design flows and existing and more stringent effluent limitations. The existing permit limits or the existing effluent quality 95 percent confidence interval, whichever is most stringent, along with the limitations shown in Category 1 which are applicable to the additional flow, should be used when developing limitations for Category 3 discharges.

$$L_N = \frac{(PF_o \times L_o) + (PF_1 \times L_1)}{PF_o + PF_1}$$

L_N = new permit limit

L_o = the limits from Category 2 or existing permit limit/existing effluent quality 95 percent confidence interval when these are more stringent than Category 2 limits.

L_1 = limits for expanded capacity as taken from this policy

PF_o = design flow of existing portion of the WWTP

PF_1 = design flow of expanded portion of the WWTP

All other possible alternatives should be considered prior to approving a new direct discharge to a lake or reservoir. On-lot wastewater disposal may be feasible where suitable subsoils exist. In some cases, it may be possible to direct the discharge to a stream not tributary to the lake or reservoir. If a direct discharge to a lake or reservoir is the only viable alternative, the Ohio EPA will require public ownership of the treatment facility.

NOTE:

The feasibility of a controlled discharge lagoon discharge to a lake, reservoir, or stream tributary (within three stream miles) to the lake or reservoir that is included in the criteria described above will be assessed on a case-by-case basis. If approved, effluent limitations will be set based upon the Ohio EPA Lagoons Policy. Additional effluent limitations (i.e., phosphorus) may be required as necessary to assure continued high water quality.

Attachment F

1982 305(b) Report, "Ohio's Lakes"

SUMMARY

Attachment F

1982 305(b) Report, "Ohio's Lakes"

SUMMARY

One hundred-nineteen, or 54% of the lakes listed in Ohio EPA's public lake inventory have been classified according to trophic state using Carlson's (1977) lake classification scheme; 73 percent of the lakes were classified as eutrophic, 16 percent were classified as mesotrophic and 11 percent were classified hypereutrophic.

Lakes in southeastern Ohio tended to have lower Trophic State Index values than lakes in other sections of the state. This is believed to be due to the underlying nutrient poor sandstone bedrock and the low population density of the area.

Nitrogen and phosphorus concentrations were generally high in Ohio lakes. The total nitrogen concentration at the two foot depth ranged from 0.8 mg/l in Hammertown Lake (summer) to 7.5 mg/l in Madison Lake (spring). Total phosphorus concentration at the two foot depth ranged from below detection limits (<2.0 ug/l) in Lake Hope (spring), Hammertown Lake (spring), and Dow Lake (summer) to 0.16 mg/l in West Fork Mill Creek Lake (summer).

As indicated by nitrogen-phosphorus (N-P) ratios, the majority of the lakes for which data is available were phosphorus limited or potentially phosphorus limited. The N-P ratios ranged from 5.1 to 1 in Sharon Lake to 400 to 1 in Dow Lake.

Sedimentation was a severe problem in many Ohio lakes. Van Buren Lake and Newport Lake have silted in to such an extent that recreational use of these lakes has been impaired.

Lake depth has a major influence on water quality in Ohio lakes during the summer months. Lakes of 15 feet or greater depth usually develop distinct thermal gradients which restrict vertical water circulation and result in the degradation of water quality in the hypolimnion. Stable thermal gradients did not develop in wind-exposed shallow lakes (depths less than 15 feet). These lakes (e.g., Buckeye, Charles Mill, Tycoon, Madison and Clark Lakes) remained generally mixed and did not exhibit degraded water quality in their near bottom waters.

Fecal coliform counts were generally within Ohio Water Quality Standards (Ohio WQS). Counts in excess of Ohio WQS (fecal coliform and fecal streptococcus) were recorded after storm runoff events. The highest counts were recorded in the West Fork of Mill Creek Lake.

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