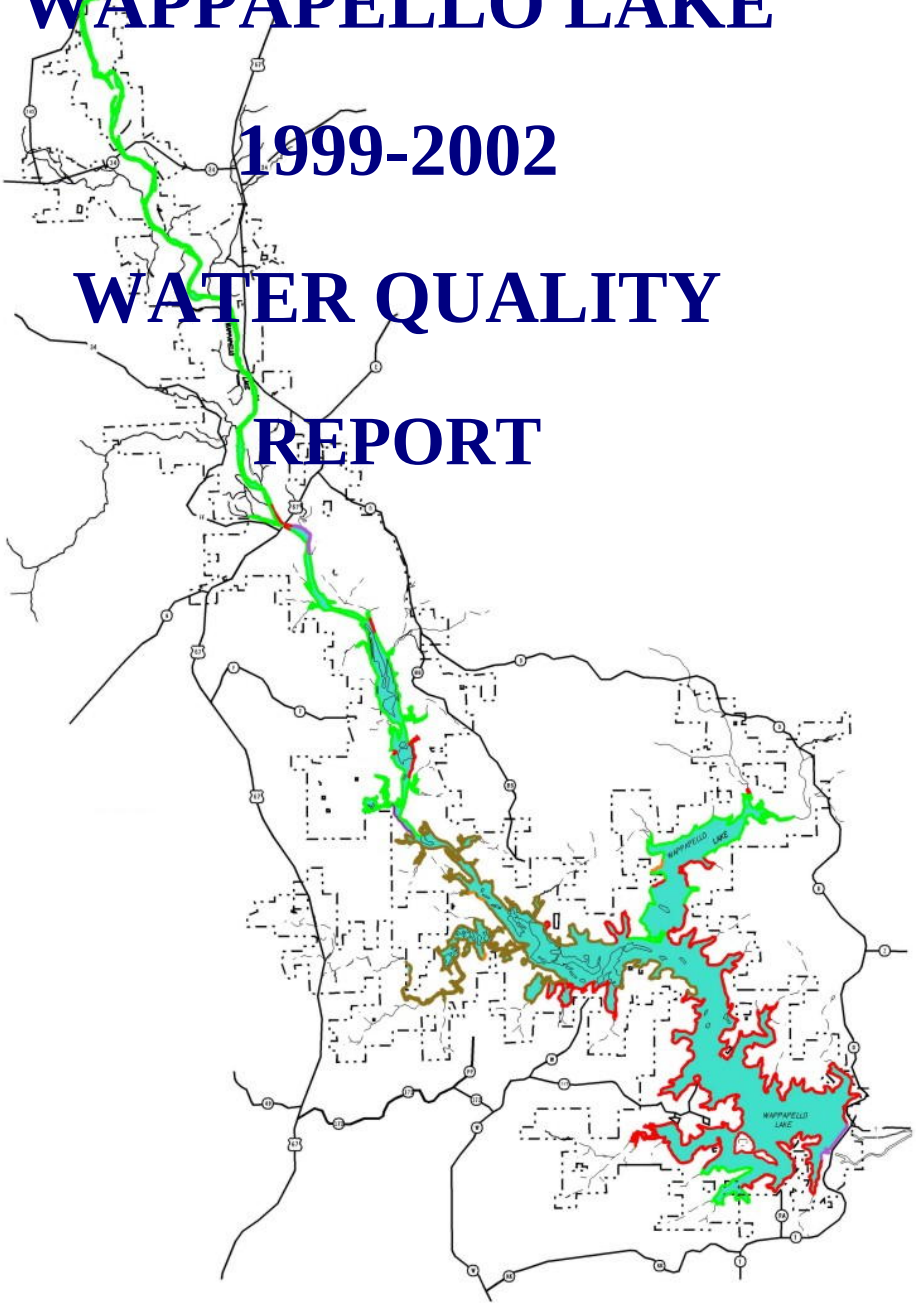
WAPPAPELLO LAKE

1999-2002

WATER QUALITY

REPORT



U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT
ENVIRONMENTAL QUALITY SECTION - Water Quality

Billy Arthur, Section Chief
Theodore Postol, Environmental Engineer
Rick Archeski, Environmental Engineer
Kevin Slattery, Hydrological Technician
Ron Frerker, Chemist

Table of Contents

LIST OF APPENDICES

LIST OF TABLES

LIST OF GRAPHS

WATER QUALITY MONITORING PROGRAM

Wappapello Lake, Missouri

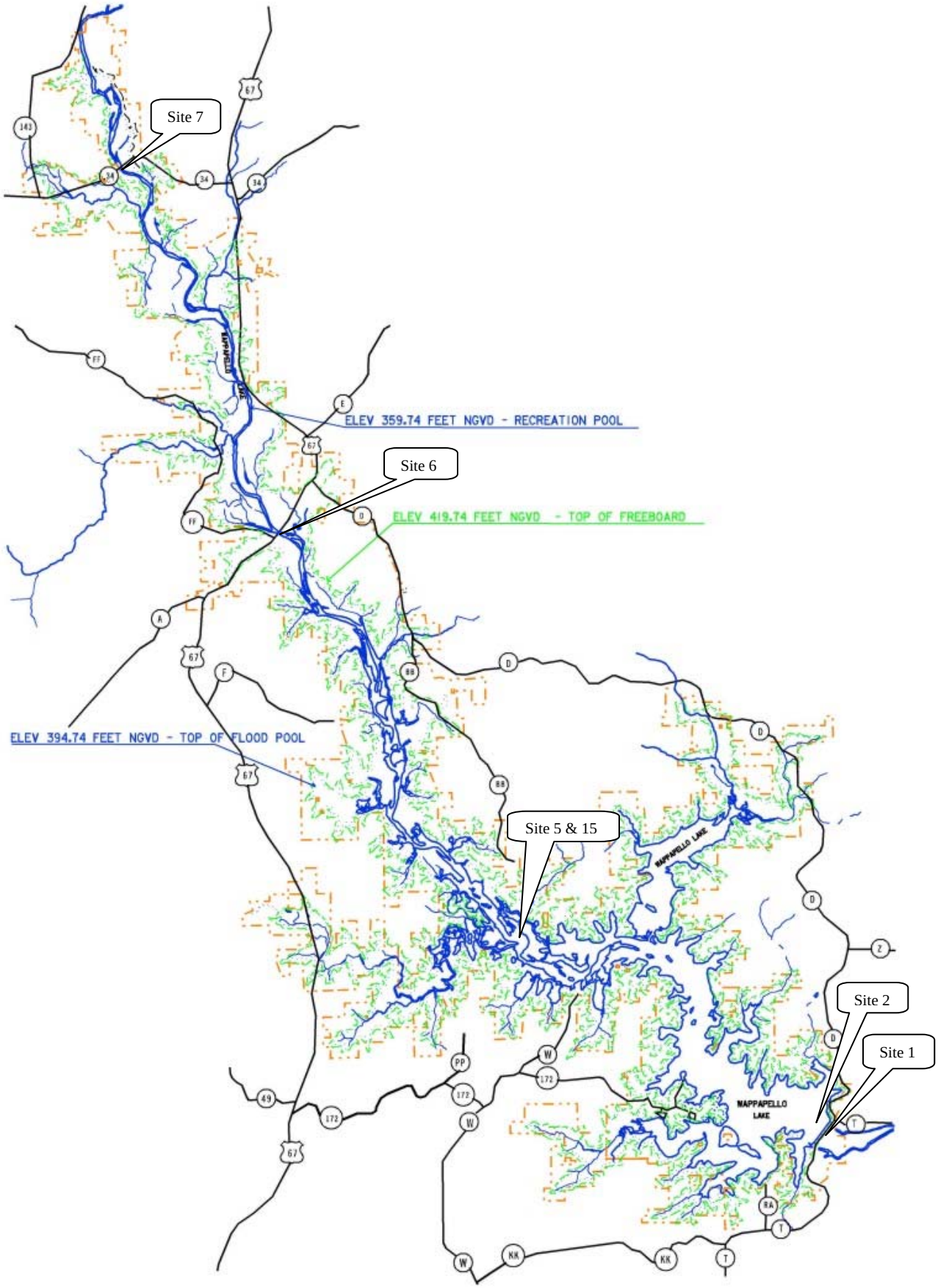
1.0 GENERAL OVERVIEW

Wappapello Lake is located in southeastern Missouri and is primarily utilized as a recreational lake. Surrounding lands are residential with little agricultural use due to the terrain.

The operating purposes for Wappapello Lake are fish/wildlife and recreation. The water quality management program for the lake includes monitoring of baseline parameters, ecological trends and investigation of problem areas to keep the lake within state and federal standards.

The water quality monitoring program was conducted during 1999-2002 at five lake sites to assure that safe conditions were maintained for human recreation, wildlife and aquatic life. One of the five sites was selected as a quality control duplicate site during each sampling event and was denoted as WAP-15. Sampling events took place four times from March to October. The location of the sampling locations are depicted on the lake area map below.

WAPPAPELLO WATER QUALITY SAMPLE SITES



2.0 WATER QUALITY ASSESSMENT CRITERIA

The water quality assessment criteria are based on the State of Missouri regulatory limits for certain contaminants and generally accepted criteria for sustaining adequate aquatic plant and animal growth.

The following parameters were analyzed in sampling at Wappapello Lake: chlorophyll, pheophytin-a, fecal coliform and fecal streptococcus bacteria, iron (Fe), manganese (Mn), nitrate-nitrogen (NO_3-N), dissolved ammonia-nitrogen (NH_3-N), alkalinity, total organic carbon (TOC), orthophosphate-phosphorus (O-PO_4), total phosphate-phosphorus (T-PO_4), total suspended solids (TSS), Total volatile suspended solids (TVSS), silica, pH, dissolved oxygen (DO), specific conductance, temperature and oxidation-reduction potential (ORP).

The Missouri Department of Natural Resources, Code of State Regulations, Division 20, Chapter 7 classifies water quality criteria based on designated usage. These standards are used to determine the water quality of the lake. Table 1 provides a listing of the regulatory limits for the parameters analyzed where a limit has been established.

TABLE 1

State of Missouri
Water Quality Standards

PARAMETER	LIMIT
Nitrate-Nitrogen (NO_3-N)	10 mg/l
Iron (Fe)	0.30 mg/l
Manganese (Mn)	0.05 mg/l
Fecal Coliform	< 200 colonies/100 ml
pH	Range: 6.5 to 9.0
DO	> 5.0 mg/l

Monitoring of the alkalinity provides the measurement of the buffering capacity of lake water as well as the effect on the toxicity of certain pollutants in the water (i.e., algae blooms and decay). Ammonia nitrogen is monitored so that the effects on fish spawning, hatching, growth rate and pathologic changes in gills, liver and kidney tissue can be related to the detected levels of ammonia nitrogen. Nitrate-nitrogen degrades to nitrite or produces ammonia which has a detrimental effect on aquatic life and therefore is monitored to assure levels are below the regulatory "safe" limit. The metals manganese and iron are nutrients for both plant and animals. Phosphate is analyzed as phosphorus and is monitored due to the potential for uptake by nuisance algae. Levels of phosphate can indicate the potential for rapid growth of algae (algae bloom) which can cause serious oxygen depletion during the algae decay process. Serious oxygen depletion has a major effect on aquatic life. Photosynthetic activity can be hindered by the levels of total suspended solids. Total suspended solids concentrations which cause the photosynthetic

activity to be reduced by more than 10% from the seasonably established norm, would have a detrimental effect on aquatic life. Silica, chlorophyll and pheophytin-a are monitored to provide indicators of algae growth and therefore potential oxygen depletion activity. Total volatile solids indicate the presence of organics in suspension and therefore additional demand levels of oxygen. Fecal coliform bacteria is monitored for the protection of human health as it relates to full body contact of lake waters. pH and dissolved oxygen are monitored for the protection of aquatic life.

3.0 SPECIAL STUDIES

	MCL	FENS-1	FENS-2	FENS-3	UNITS
PARAMETERS:					
Iron	0.3	**1210**	**452**	**3.1**	MG/L
Manganese	0.0500	**13.7**	**4.2**	**0.057**	MG/L
Alkalinity	20	**69.4**	**77.3**	**108**	MG/L
Fecal Sreptococcus	500	**18700**	**TNTC**	**7500**	COL/100 ML
Nitrate Nitrogen	10	0.013	0.073	0.076	MG/L
Ammonia- Nitrogen	15	ND	ND	0.086	MG/L
Phosphorus-ortho	0.05	**0.096**	ND	ND	MG/L
Phosphorus-total	0.05	**0.068**	**0.063**		MG/L
Silica	0.5	**11.5**	**10.5**	**8.6**	MG/L
Total Suspended Solids	100	**10900**	**16400**	**7400**	MG/L
Volatile Suspended Solids	100	**3290**	**5180**	**2150**	MG/L
Total Organic Carbon	1	**59.8**	**20**		MG/L
Pheophytin-a	5	**129**	**249**		MG/CU.M.
Chlorophyll	5	5	**82.2**		MG/CU.M.
Fecal Coliform	200	**TNTC**	**14000**	**TNTC**	COL/100 ML

Highlighted are elevated levels, all of which exceed the MCL's established by state and federal regulations. The higher levels of solids indicate samples that were collected in areas with little water therefore, the samples contained an increased amount of sediment. These conditions resulted in Higher levels of total organic carbon. Fecal Streptococcus, a bacteria generally associated with animal waste, was above the standards. The high levels are probably due to animal droppings and runoff from nearby pastures. Phosphorus is also higher than water quality standards. The source of this contamination should be identified by determining the drainage area and land usage.

4.0 WATER QUALITY MONITORING RESULTS

The laboratory analytical results for water samples are summarized in Table C-1, Appendix C. Analytical results of detected levels are plotted in graphical form on Graphs C-1a through C-1h, Appendix C.

Field collected analytical results are summarized in Table D-1 through D-4, Appendix D. A graphical presentation of field results are presented in Graphs D-1a through D-4, Appendix D.

5.0 SUMMARY OF MONITORING RESULTS

Bacteria levels were elevated in the early spring and could be attributed to surface water runoff carrying additional wildlife wastes into the lake during a time of seasonably increasing temperatures. Bacteria levels decreased to acceptable limits within the summer months.

The metals manganese and iron were seen at slightly elevated levels within the lake waters but no evidence exists that demonstrate the levels are detrimental to the overall lake system at this time.

The monitoring program for Wappapello Lake during FY98 revealed a good water quality when compared to limits established by the MDNR for general use, secondary contact and indigenous aquatic life. The St. Louis District personnel will continue working with lake personnel, area communities and agencies in implementation of educational and implementation planning to bring about the use of better management techniques which will improve the lake water quality.

6.0 FUTURE STUDIES

Wappapello Lake is primarily utilized as a recreational use lake. Surrounding lands are relatively light residential with little agricultural use due to terrain. Water quality monitoring was continued in FY98 on a reduced level as needed. Water quality monitoring demonstrated a stable baseline condition. Future monitoring is planned to assure baseline conditions are maintained.