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United States
Environmental Protection
Agency

Office of Water
(4503F)

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Clean Lakes Program 1993/1994 Annual Report

Preface

The success of the Clean Lakes Program rests squarely on a commitment to partnerships. In 1993-94 EPA managers and regional coordinators, State coordinators, and local community leaders took up the challenge to build and strengthen partnership goals for the benefit of Americas lakes.

The problems facing our nations lakes are substantial. EPAs 1992 National Water Quality Inventory Report indicates that only 43 percent of assessed lake acres fully support their designated uses such as swimming, fishing, and drinking water supply. An additional 13 percent were identified as threatened and could soon become impaired if pollution controls are not taken.

EPA is working across the United States to establish watershed protection using procedures developed and used by the Clean Lakes Program. The basis of this approach is to carefully identify local problems and to frame realistic lake and watershed solutions for them.

The Watershed Protection Approach has three major elements:

1. Identifying the primary threats to human and ecosystem health within the watershed.
2. Involving the people most likely to be concerned or most able to take action to solve problems.
3. Taking corrective actions in a comprehensive, integrated manner once solutions are determined.

The Clean Lakes projects described in this report illustrate the continuing application of this approach in Americas lakes and in the watersheds tributary to them.

Robert H. Wayland III, Director
Office of Wetlands, Oceans and Watersheds

Reflections on Achievements

Many aspects of the Watershed Protection Approach were pioneered by the Clean Lakes Program. In the formative years from 1972 through 1979, the program provided assistance to the States primarily for lake quality research, development of restoration techniques, and evaluation of lake conditions.

Two key lessons were learned:

1. The long-term effectiveness of lake clean-up efforts hinge on controlling pollution within the watershed.
2. Local support and involvement are critical for success.

Responding to these lessons, EPA promulgated Clean Lakes Program regulations in 1980 (40 CFR Part 35, Subpart H) that specifically directed the incorporation of the Watershed Protection Approach within lake projects and the strengthening of local partnerships.

With the passage of the 1987 Amendments to the Clean Water Act, the program again expanded to include Statewide assessments of lake conditions and post-implementation studies that evaluate a projects effectiveness. This latter component is used to better understand cost/benefits of various restoration techniques.

Uses and enjoyment of lakes in a community are wide-ranging. They can provide:

- A source for drinking water.
- A source for hydropower, irrigation water, and other domestic, industrial, and agricultural uses.
- Natural habitat for fish, birds, and other animals.
- Important hydrologic benefits such as flood control and the maintenance of downstream flows during droughts.
- Water-based recreational opportunities such as fishing, duck-hunting, swimming, and boating.
- A stimulus for the local economy through the sale of recreational items such as boats and fishing tackle, rental lodging, and other tourist-driven businesses.
- An increased tax-base for local communities from higher assessed values of lakeside property.

Because of the importance of lakes in the fabric of communities, it is not surprising that local support of the watershed protection approach often begins with grassroots efforts to protect a favorite lake. Many States cite cases where committees and associations are formed and thousands of volunteer hours are spent mitigating such problems as aquatic weed overgrowth, algae blooms, or sediment buildup. In the process, people learn that the problems found within their lake are caused and exacerbated by conditions found in their watershed.

EPAs 1992 National Water Quality Inventory Report identifies agriculture as the most extensive source of pollution to the Nations lakes, followed by urban runoff and storm sewers, hydrologic and habitat modification, municipal point sources, and onsite wastewater disposal.

More States reported problems caused by nutrients than any other single pollutant. Forty-one States reported the impairment of more than 3 million lake acres primarily by the overgrowth of algae and aquatic plants stimulated by nutrient pollution.

For 20 years the Clean Lakes Program has been a successful example of the bottom-up approach to lake and watershed management. Since 1975 EPA has distributed more than \$145 million to State and local governments for

the improvement of lake water quality.

The Clean Lakes Program offers States four types of cooperative agreements.

1. Lake Water Quality Assessment (LWQA) grants are used to assess water quality of lakes across a State or reservation.
2. Diagnostic/Feasibility (Phase I) Studies are designed to determine the causes and extent of pollution in a specific lake, evaluate potential pollution controls, and recommend the most feasible and cost-effective restoration methods.
3. Restoration/Implementation (Phase II) Projects are designed to translate Phase I recommendations into action.
4. Post-Restoration Monitoring (Phase III) Studies are designed to advance the science of lake restoration through post-restoration monitoring and evaluation monitoring and evaluation of completed Phase II projects.

The four types of cooperative agreements complement the three major cornerstones of the watershed protection approach.

1. Identifying threats to human and ecosystem health

Lake Water Quality Assessment (LWQA)

Phase I Diagnostic/Feasibility Studies

A State or Tribe uses a LWQA grant to prepare an assessment of lake conditions, including a comprehensive list of threatened or impaired lakes. EPA can fund up to 50 percent of costs to a maximum \$50,000 per year.

A Phase I Diagnostic/Feasibility Study grant is used to focus on one or a small group of lakes to determine the causes and extent of pollution and evaluate solutions. EPA can award a State or Tribe up to 70 percent of the study costs to a maximum \$100,000.

2. Involving citizens

Lake Water Quality Assessment (LWQA)

Phase I Diagnostic/Feasibility Studies

Phase II Restoration and Protection Implementation Projects

Local commitment is essential for success. Thus many citizen/professional partnerships are typically formed to undertake LWQA and Phase I Diagnostic Study tasks such as problem identification, volunteer water quality monitoring, and benefit/cost analysis.

Translating Phase I recommendations into action, Phase II cooperative agreements fund lake restoration and protection work. Community partnerships are again critical for short- and long-term success. A Phase II project

requires a minimum non-Federal match of 50 percent of total costs.

3. Taking corrective action

Phase II Restoration and Protection Implementation Projects

Phase III Post-Restoration Monitoring Study

Phase II projects are initiated in a comprehensive, integrated manner based on the Phase I study. Funded activities include artificial aeration, phosphorus precipitation, dredging, and the installation of watershed best management practices.

Phase III grants are used to evaluate the effectiveness of restoration techniques. A study can qualify for a maximum of \$125,000 and requires a minimum non-Federal match of 30 percent.

Responding to Environmental Threats

Our nations wetlands, oceans, and lakes are linked by streams, rivers, and ground water. Their health depends on the water quality of the basin that feeds them. For this reason, the watershed protection approach encompasses not only the water resource, but all the land in the watershed.

A goal of the EPA Office of Wetlands, Oceans and Watersheds is to provide a framework for integrating local, State, and Federal programs involved with protecting water quality.

The Clean Lakes Program is an important component of the watershed protection approach. While it is specifically aimed at improving water and habitat quality in Americas lakes, it also provides benefit to the watershed as a whole.

Key Roles of Clean Lakes Representatives

Local Communities

Local support and involvement in projects is critical for success. Communities participate by:

- Nominating lake/watershed-specific projects for State consideration.
- Providing background information on the history of the lake.
- Assisting in the identification of lake problems and solutions.
- Providing matching funds.
- Undertaking volunteer water quality monitoring and participating in outreach activities.
- Forming lake associations and assisting in implementing lake protection measures.

States

With the lead role, States are responsible for:

- Managing State lake programs and overseeing lake/watershed specific projects.
- Monitoring and assessing lakes Statewide.
- Setting priorities and nominating lake/watershed specific projects for Federal funding.
- Providing matching funds.

- Providing technical support for lake management.
- Integrating lake management and protection activities with other water programs.

EPA and Other Federal Agencies

The program itself is administered by EPA. Other Federal agencies that integrate their water protection programs with projects include the Departments of Agriculture (Natural Resource Conservation Service, Forest Service), Commerce (National Oceanic and Atmospheric Administration), Defense (Army Corps of Engineers), and Interior (U.S. Fish and Wildlife Service). The role of Federal agencies include:

Developing technical and programmatic guidance.

Providing financial assistance to State and local programs.

Competitively selecting projects for funding.

Managing and supporting outreach activities.

Highlights of FY93/94 Clean Lakes Awards

Projects were initiated in 47 States, Puerto Rico, and 6 Tribal lands.

\$9 million was awarded for a total of 171 projects (\$4 million in FY93 and \$5 million in FY94).

43% was invested in Lake Water Quality Assessments

34% was invested in Phase I projects

19% was invested in Phase II projects

4% was invested in Phase III projects

Identifying Threats to Lakes

STATEWIDE LAKE ASSESSMENT, FLORIDA

Florida plans to set lake management priorities using bioassessment.

By examining the health and makeup of the biological community in over 7,000 Florida lakes, officials will gain knowledge of the in-lake impacts of pollution. This LWQA project defines ecoregions and subregions within the State and identifies high- quality reference lakes within those regions. By comparing other regional lakes with these benchmark conditions, State officials will be better able to prioritize lakes and their watersheds for remedial management programs.

LAKE CHAMPLAIN, NEW YORK AND VERMONT

States team up to control phosphorus pollution.

A 1993 international water quality agreement adopted by Vermont, New York, and Quebec established inlake phosphorus concentration criteria for Lake Champlain. Working as partners under a Phase I grant, the two States developed a phosphorus loading budget, mass balance model, and load reduction strategy. The strategy is currently incorporated into a comprehensive pollution prevention plan for the watershed.

STATEWIDE LAKE ASSESSMENT, NORTH DAKOTA

Aquatic insects and other benthic fauna provide clues to lake health.

A goal of this Clean Lakes project is to seek correlations between benthic macroinvertebrate communities and the trophic status of lakes. Investigators from North Dakota State University selected 12 lakes for this analysis. Dissolved oxygen levels, food supply, lake morphometry, and predation all play a role in determining the health and community structure of bottom-dwellers.

FISH LAKE, WISCONSIN

Wisconsin develops ecosystem model to manage Eurasian watermilfoil.

The overgrowth of Eurasian watermilfoil is a problem in Fish Lake. A Phase I Clean Lakes project focused on an innovative way to manage the growth of this nuisance species while, improving the overall ecological balance of the lake. Using the results of a model that predicts ecosystem response, a system of cutting and harvesting weeds down to 3 meters within created channels was implemented. The results improved fisheries habitat and recreational opportunities.

WISTER LAKE, OKLAHOMA

Oklahoma State University sets TMDL goals.

The Phase I effort on this lake documented productivity problems caused by nutrients and other pollutants. Modeling by the Oklahoma State University (OSU) Water Quality Research Laboratory will provide a set of total maximum daily load (TMDL) goals for the lake. Through the cooperation of the U.S. Geological Survey and OSU Dept. of Biosystems and Agricultural Engineering, recommendations on how to meet a chosen TMDL will be proposed.

STATEWIDE LAKE ASSESSMENT, KENTUCKY

Testing of fish tissue and fecal coliform proves lakes are safe.

Concern about the safety of eating game fish prompted the Division of Water and Dept. of Fish and Wildlife Resources to investigate several popular recreational lakes. As a part of an LWQA grant, State officials collected fish for tissue analysis. Fecal coliform bacteria were also analyzed to determine the safety of contact recreation use. The results indicated that the lakes were safe for fish consumption and swimming.

STATEWIDE LAKE ASSESSMENT, RHODE ISLAND

New computerized data management system will aid monitoring program.

The Dept. of Water Resources is using an LWQA grant to develop a computerized data management system to store and analyze lake water quality monitoring data. This effort will help support EPA's Waterbody System by providing summaries of raw monitoring data. This information will be used to assess the overall condition of the States lakes and plan future lake and watershed management activities.

LAKE HENRYETTA, OKLAHOMA

Sediment dating to be used to determine historical causes of lake pollution.

Lake Henryetta, created as a water supply reservoir, has historically experienced problems with water clarity. Sediment dating by the USDA Agriculture Research Station in Durant, used in conjunction with hydrologic modeling of present and historical land use within the watershed, should permit identification of historical causes of pollutant loadings. This Phase I project will propose recommendations to reduce loadings from present-day land uses.

LAKE BOMOSEEN, VERMONT

Vermont attempts to manage Eurasian watermilfoil growth using biological controls.

The overgrowth of an exotic aquatic plant, Eurasian watermilfoil, has caused problems in Lake Bomoseen since 1982. Recreational opportunities have been lost, and many native aquatic plant species have been displaced. This Clean Lakes Program demonstration project is investigating the use of an aquatic weevil to control the infestation of milfoil biologically. Partners in this research include the Middlebury College Biology Dept. and the U.S. Army Corps of Engineers Waterways Experiment Station.

TOWN LAKE, TEXAS

Phase I study in Austin used as a watershed-based regional planning tool.

A Phase I study on Town Lake in Austin was successfully completed in FY93 to accolades from regional planning groups. Recommendations from that study formed the foundation for a successful proposal to obtain Section 319 Clean Water Act funds. This money is being used to implement BMPs to manage urban runoff which typically contains sediments, hydrocarbons, nutrients, and other pollutants.

JUNCTION CITY & LAWRENCE, KANSAS

Study to compare pollution in urban lakes.

The Urban Lakes Assessment Project will compare and contrast water quality conditions and pollution in two urban lakes, one in Junction City and the other in Lawrence. One lake has a fully urbanized watershed, and the other is rapidly urbanizing. While urban lakes are not a large percentage of the lake acreage in Kansas, they tend to have some of the most severe water quality problems. This Phase I study will attempt to generalize urban lake water quality and identify specific problems/solutions for these two lakes.

DEAL LAKE, NEW JERSEY

Five watershed municipalities develop new pollution control ordinances .

A goal of this Phase II project is to upgrade or develop ordinances and zoning requirements dealing with soil erosion, stormwater management, and proper land use. The lake commission has developed agreements with the five watershed municipalities, and a management plan for sensitive lands is under review.

Building Partnerships

PYRAMID LAKE, NEVADA

Paiute Tribe works to keep cattle from polluting valuable fishing lake.

Improving water quality and recreation at Pyramid Lake north of Reno is a goal of a rangeland improvement plan being implemented by the Pyramid Lake Paiute Tribe. Working with members of the cattlemen's association, who use the 340,000 acres of rangeland surrounding the lake, the Tribe is developing livestock watering sites on areas where no natural water exists and is improving existing water sources. Over 2 miles of pipeline, a storage tank, and 12 miles of fencing have been completed with the help of a Phase II grant.

STEPHEN FOSTER LAKE, PENNSYLVANIA

Two-day course teaches local youth about watershed problems and solutions.

This lake, located in a newly created State park facility, was becoming prematurely eutrophic due to sediment and nutrient loading from its primarily agricultural watershed. To involve residents in the study and restoration process, the project sponsor (Bradford County Conservation District) offered a 2-day hands-on training course to volunteer students. Participants provided data for the Phase I project by walking the watershed, assessing the tributaries for erosion, and collecting and identifying macro-invertebrates.

PELICAN RIVER WATERSHED DISTRICT, MINNESOTA

Award-winning 9th grade curriculum focuses on lakes.

The Watershed District has joined other local resource management agencies in providing technical and financial assistance to Detroit Lakes Junior High for a yearlong program. Students learn about all aspects of lake ecology in science, English, social sciences, speech, math, and computer science classes. In this award-winning program, 250 students analyzed water samples, reviewed the literature, interviewed specialists, and prepared a magazine summarizing their findings.

LAKE WILLIAM C. BOWEN, SOUTH CAROLINA

Water Quality Project Committee formed to study watershed pollution.

Nonpoint source pollution from small farms, orchards, and residential developments is the suspected cause of water quality problems in Lake Bowen. The Dept. of Health & Environmental Control received a Phase I grant to investigate the situation. Several educational and technical assistance programs that promote best management practices (BMPs) for watershed landowners have been developed with the assistance of USDA Natural Resources Conservation Service, the Land Resources and Forestry Commissions, Clemson University Extension Service, the

City of Spartanburg, and others.

WEHRSPANN LAKE, NEBRASKA

Citizen action team is key to Omaha lake clean-up initiative.

A web of public-private partnerships has been formed to protect Wehr-spann Lake, a popular recreational resource located outside Omaha and owned by the U.S. Army Corps of Engineers. Water quality problems routinely occur due to agricultural chemicals and pesticides, livestock waste, septic systems, and other sources. Funded in part by Phase II and 319 grants, the Pappio-Missouri River Natural Resource District, Natural Resources Conservation Service, University of Nebraska Cooperative Extension, and other agencies, as well as a citizen action team, are implementing strategies to help restore the lake.

GRAND LAKE, OKLAHOMA

Cherokee Indians establish volunteer monitoring in watershed basin.

An active volunteer monitoring group made up primarily of Cherokee senior citizens has been collecting data since 1992. Their work has been supported by LWQA grants and coordinated by the Oklahoma Water Resources Board. Growing public awareness of their efforts fostered legislative interest, which led to congressional appropriation of a \$400,000 104(b)(3) grant in FY93 for a Grand River basin study. This major watershed project will include collaborative efforts of EPA Regions 6 and 7 and the States of Oklahoma, Kansas, Missouri, and Arkansas.

OYSTER CREEK LAKES, TEXAS

Citizen monitoring of lake results in Phase I grant.

As a direct result of two years of citizen volunteer monitoring, funded with CLP LWQA grants and administered by the Texas Natural Resource Conservation Commission and the Brazos River Authority, a \$100,000 Phase I was awarded in FY94 to develop restoration alternatives.

INTERACTIVE LAKE ECOLOGY, NEW HAMPSHIRE

Interactive Lake Ecology Program educates students using videos, workbooks, and guides.

To support the Interactive Lake Ecology Program, the Dept. of Environmental Services has published student workbooks, teacher guides, and videos to supplement student and adult education. All are intended to spark interest in lake ecology and to educate the public about the importance of lake ecosystems.

ENID HIGH SCHOOL VOLUNTEER MONITORING, OKLAHOMA

Local students involved in modeling and monitoring of urban watershed.

Following a Phase I study that pointed out the pollution problems in their watershed, local students at Enid High School, with the help of the Oklahoma Water Resources Board, initiated a water quality monitoring program and expanded into bio-monitoring and flow monitoring. Their goal is to quantify impacts from a mostly urban watershed

and chart the success of restoration.

ARKANSAS WATER EDUCATION TEAM

LWQA grant helps citizens monitor their lakes.

Each month volunteers throughout the State collect water samples from one to four sites on their lakes. Additional monitoring is also performed on watershed streams. The primary objective of this project is to increase environmental awareness at the local level. Dept. of Pollution Control and Ecology personnel use these data to assess lake water quality trends.

LAKE BEMIDJI, MINNESOTA

Two videos promote watershed management.

Bemidji Watershed Management Project has produced two educational videos to promote the concept of watershed management and to provide technical information about water quality protection activities. One of the videos details the design and installation of a computerized stream monitoring network to target the installation of BMPs within the watershed. The second video gives an overview of the Watershed Management Project and shows the installation of agricultural, forestry, and urban BMPs. These videos are frequently shown to schools and civic groups.

Taking Action

NORTHEAST LAKE, OKLAHOMA

New waste controls at the Oklahoma City zoo reduce polluted runoff.

In FY93 the Oklahoma Water Resources Board completed a Phase II project that included the construction of a lift station at the City zoo to halt the seepage of animal wastes to Northeast Lake. This urban water resource also benefited from repairs to the sewage collection system in the watershed. Other activities included the removal of accumulated sediment by bulldozer and hydraulic dredge. The dredged material, in turn, was used to create more space for new zoo exhibits.

LAKE AHQUABI, IOWA

Constructed basins keep sediments and nutrients from polluting lake.

Under a Phase II grant the Iowa Department of Natural Resources completed construction of five sedimentation basins in the Lake Ahquabi watershed. Sediments and nutrients have caused eutrophication in recent years, which has ruined recreational opportunities and other uses. Three of the sedimentation basins will be partially filled with material dredged from the lake and artificial wetlands will be established to aid in the pollutant removal process.

CASCADE RESERVOIR, IDAHO

Phase II award will be used to implement BMPs.

A Phase II award will be used to better determine watershed areas that contribute phosphorus to the lake and to implement BMPs. Watershed BMPs include riparian improvements through controlled livestock access and revegetation, waste management, and sediment ponds. Effectiveness will be measured using GIS and ground-truthing. Section 319 and State funds are also helping to implement BMPs in the watershed.

SWARTSWOOD LAKE, NEW JERSEY

Five-unit aeration system breathes new life into popular trout lake.

This 510-acre glacier lake was suffering from large growths of aquatic weeds and algae and low dissolved oxygen in deeper waters. The State Dept. of Environmental Protection and a local group formed a lake restoration committee to halt deterioration and save the trout fishery. A Phase II grant helped pay for two aeration devices and three bubblers to reintroduce oxygen into the lake. Also included in the project were mechanical harvesting of weed beds and watershed strategies to reduce nutrient pollution.

BEAVER LAKE, NEW HAMPSHIRE

Watershed management plan implemented to curb algal blooms.

Algal blooms caused by excessive phosphorus loading were undermining recreational opportunities in Beaver Lake. A Phase I Diagnostic/Feasibility Study examined physical, chemical, and biological data and made a series of management recommendations to improve water quality conditions. Several of these recommendations are being implemented through a section 319 nonpoint source grant.

McDANIEL LAKE, MISSOURI

Watershed committee couples Phase I and 319 grants to assess and protect City of Springfields water supply reservoir.

McDaniel Lake is one of Springfields two water supply reservoirs. Runoff from agricultural activities, primarily beef and dairy cattle operations and septic systems located in marginal soils, are the primary sources of pollution. Administered by the Missouri Dept. of Natural Resources, the grants will be used to place BMPs in the watershed to control nutrient and sediment inputs and identify actions to restore water quality.

LAKE HOLLINGSWORTH, FLORIDA

Phase I Diagnostic/Feasibility Study recommends dredging and watershed management.

Lake Hollingsworth, located in Lakeland, is a valuable recreational resource for visitors and the local community. Sedimentation in bays ruined aquatic habitat and caused the buildup of shallows, which limited boating and fishing opportunities. A Phase I study helped define a strategy that included dredging and watershed BMPs.

LAKE AHQUABI, IOWA

Lack of oxygen chokes off fisheries until lake improvements are initiated.

The fish stock in this once-popular lake was declining. To improve habitat and fishing opportunities, the State Dept. of Natural Resources combined Phase II funding with State sport fish restoration funds and marine boat fuel-tax funds to make needed improvements in and around the lake. Included are an aeration system, fish habitat structures, shoreline riprap, and a handicapped-accessible fishing pier. Once these improvements are in place, officials anticipate a fourfold increase in use (600,000 visitor days/yr).

KEZAR LAKE, NEW HAMPSHIRE

Phase III project monitors effects of nutrient inactivation project.

What are the impacts of using aluminum sulfate and sodium aluminate to trap the important plant nutrient phosphorus in lake sediments? Does it really provide long-lasting control of algal blooms? These and other questions are being answered through a Phase III study of Kezar Lake in North Sutton. Initiated by the Dept. of Environmental Services, researchers are examining 10 years of post-application data to determine water quality trends and the benefits/costs of this lake restoration technique, which strips phosphorus from the water column and traps it in the sediments.

LAKE OSAKIS, MINNESOTA

Watershed District plans to reduce in-lake phosphorous concentrations by 30%-40%.

Sauk River Watershed District officials have identified an important pathway of phosphorus pollution in Lake Osakis and are now working to remedy the situation. Large quantities of this nutrient have triggered excessive plant growth throughout the lake. Aided by a Phase II grant, the District is planning a combination of watershed BMPs and concentrated public education programs to reduce phosphorus discharge to the lake by 3040 percent. Lake monitoring will evaluate the progress.

LAKE ACOMITA, NEW MEXICO

Pueblo Tribe improves fisheries habitat through dredging and fish structure placement.

The Pueblo initiated this project in response to degraded water quality and poor fishing in the lake. A Phase II grant supports drainage and removal of nutrient-rich sediments and the placement of fish structures. A basinwide water quality/quantity study was also performed to identify strategies for the Tribes limited water resources.

LAKE LaPLATA, PUERTO RICO

San Juan water supply lake threatened by hyacinths and watershed pollution.

The Environmental Quality Board used Phase II funding to develop a watershed restoration plan that included water hyacinth harvesting, sewage improvements, and the use of nonpoint source BMPs. The Board also initiated the construction of a chicken manure processing plant, which began operation in 1995. Processed manure is sold to local flower growers.

National and Regional Summaries

National Projects and Events

FISH AND FISHERIES MANAGEMENT MANUAL

Technical document helps lake managers integrate a healthy fishery with lake and watershed improvement strategies.

More than 2000 copies of Fish and Fisheries Management in Lakes and Reservoirs (EPA 841R-93002) were published and distributed in May 1993. This document provides both water quality managers and fisheries managers with a better understanding of the concepts and techniques of fisheries management in the context of an integrated lake watershed management project.

ANNUAL STATE LAKES PROGRAM CONFERENCES

State and local lake officials gather in Chicago to strengthen program efforts.

EPA cosponsored the 6th and 7th annual conferences on Enhancing the States Lake Management Programs in May 1993 and 1994. An important theme was the formation of effective State and local partnerships; topics included public outreach, leadership skills, buffer zone management, and water quality monitoring.

LAKE MAINTENANCE HANDBOOK

New document provides ideas for simple, safe lake maintenance projects.

LakeSmarts, The First Lake Maintenance Handbook was published in Nov. 1993 with support from the Clean Lakes Program. This document is for lake users who wish to improve conditions in their lakes or ponds. Included are chapters on aquatic weed and algae control, fish, and sediments.

VOLUNTEERS IN THE MIDWEST COLLECT LAKE DATA

First Great American Secchi DipIn attracts more than 800 volunteers.

Citizen volunteer lake monitors throughout the Midwest joined together in July 1994 for the First Great American Secchi DipIn. The purposes were to enhance the understanding of lakes in local communities and to get citizens to help protect these resources through the collection of transparency and other data.

METHODS FOR ANALYZING WATER QUALITY TRENDS

EPA presents nonparametric statistical methods for lake water quality studies.

In December 1993 EPA published the technical guidance document Statistical Methods for the Analysis of Lake Water Quality Trends (EPA 841-R-93-003). Using the manual and the accompanying software, lake managers can employ nonparametric statistical methods to study trends in water quality.

NORTH AMERICAN LAKE MANAGEMENT SOCIETY SYMPOSIA

Lake professionals exchange latest technology at international conferences.

EPA supported the 13th and 14th Annual International Symposia of the North American Lake Management Society held in Seattle, WA, in 1993 and in Orlando, FL, in 1994. These conferences provide a forum for citizens and lake professionals at all levels to share the latest information and technology on lake management.

Region 1

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FY 1993 Awards

Maine	Statewide	LWQA	50,000
Massachusetts	Statewide	LWQA	50,000
New Hampshire	Statewide	LWQA	50,000
Rhode Island	Statewide	LWQA	50,000
Vermont	Statewide	LWQA	50,000

FY 1994 Awards

Connecticut	Statewide	LWQA	50,000
Maine	Statewide	LWQA	50,000

Massachusetts	Statewide	LWQA	50,000
New Hampshire	Statewide	LWQA	50,000
Rhode Island	Great Pond Statewide	Phase I LWQA	39,775 50,000
Vermont	Statewide	LWQA	50,000

Other Active Projects

Connecticut	Lake Waramaug	Phase III	
Maine	China Lake	Phase II	
Massachusetts	Lake Buel	Phase II	
	Lake Cochituate	Phase II	
	Eagle Lake	Phase II	
	Hills Pond	Phase II	
	Lower Mystic Lake	Phase II	
	Porter Lake	Phase II	
	Spy Pond	Phase II	
New Hampshire	Flints Pond	Phase I	
	Great Pond	Phase I	
	Pawtuckaway Lake	Phase I	
	Kezar Lake	Phase III	
Vermont	Lake Champlain	Phase I	
	Lake Bomoseen	Phase II	

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FY 1993 Awards

New Jersey	Statewide	LWQA	23,000
New York	Statewide	LWQA	50,000
	Chautauqua Lake	Phase I	50,000
	Otsego Lake	Phase I	50,000
	Collins Lake	Phase II	50,000

FY 1994 Awards

New Jersey	Statewide	LWQA	30,000
	Shadow Lake	Phase I	54,000
New York	Statewide	LWQA	50,000
	Upper Saranac Lake	Phase I	100,000
Puerto Rico	Territory-wide	LWQA	50,000

Other Active Projects

New Jersey	Lake Musconetcong	Phase I
	Strawbridge Lake	Phase I
	Alcyon Lake	Phase II
	Cranberry Lake	Phase II
	Deal Lake	Phase II
	Greenwood Lake	Phase II
	Lake Hopatcong	Phase II
	Manahawkin Lake	Phase II
	Sylvan Lake	Phase II
New York	Lake Champlain	Conference
	Lake Onondaga	Conference
	Lake Champlain	Phase I
	Chautauqua Lake	Phase I
	Ostego Lake	Phase I
	Collins Lake	Phase II
	Lake George	Phase II
	Greenwood Lake	Phase II
Puerto Rico	Cidra Lake	Phase I
	Lake La Plata	Phase II

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FY 1993 Awards

Delaware	Statewide	LWQA	50,000
Maryland	Statewide	LWQA	16,885
	Allen Pond	Phase II	23,524
Pennsylvania	Statewide	LWQA	50,000
	Conneaut Lake	Phase I	22,820
	Stephen Foster Lake	Phase I	34,020
Virginia	Mills/Coles Run Lake	Phase I	36,751
West Virginia	Statewide	LWQA	30,000

FY 1994 Awards

Delaware	Statewide	LWQA	50,000
Maryland	Statewide	LWQA	26,873
	Urieville Lake	Phase I	41,188
Pennsylvania	Statewide	LWQA	50,000
	Green Lake Reservoir	Phase I	65,000
	Pinchot Lake	Phase I	53,300

Virginia	Statewide	LWQA	25,000
West Virginia	Statewide	LWQA	20,000
	Hurricane Lake	Phase II	45,414

Other Active Projects

Delaware	Lums Pond	Phase II	
Maryland	Centennial Lake	Phase I	
	Lake Roland	Phase II	
West Virginia	Mountwood Park Lake	Phase II	

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FY 1993 Awards

Alabama	Statewide	LWQA	50,000
	Neely Henry Lake	Phase I	22,000

Florida	Statewide	LWQA	50,000
Georgia	Statewide	LWQA	50,000
Kentucky	Statewide	LWQA	50,000
Mississippi	Statewide	LWQA	50,000
North Carolina	Statewide	LWQA	50,000
South Carolina	Statewide	LWQA	50,000
	Lake Wateree	Phase I	30,000
Tennessee	Statewide	LWQA	50,000
Cherokee Tribe	Cherokee Pond	Phase II	3,000
Poarch Tribe	Poarch Pond	Phase I	3,000
FY 1994 Awards			
Alabama	Statewide	LWQA	50,000
	Lake Neely Henry	Phase I	8,000
	Smith Lake	Phase I	93,000
Florida	Statewide	LWQA	50,000

Georgia	Statewide	LWQA	50,000
	Lake Blackshear	Phase I	20,000
	Carters Lake	Phase I	92,000
Kentucky	Statewide	LWQA	50,000
Mississippi	Statewide	LWQA	50,000
North Carolina	Statewide	LWQA	50,000
South Carolina	Statewide	LWQA	50,000
	Lake Bowen	Phase II	8,000
Cherokee Tribe	Cherokee Pond	Phase II	3,000

Other Active Projects

Alabama	Lake Walter F. George	Phase I	
	Lake Weiss		Phase I
	Lake West Point	Phase I	
Georgia	Lake Allatoona	Phase I	
	Lake Lanier		Phase I

Lake Walter F. George Phase I

Lake West Point Phase I

Mississippi Lake Washington Phase II

North Carolina Big Lake/Lake Long Phase II

South Carolina Lake Brown Phase II

Broadway Lake Phase III

Tennessee Lake Normandy Phase I

Cherokee Tribe Fishing Lakes Phase II

Poarch Tribe Poarch Lake Phase I

Region 5

Regional Clean Lake Coordinator

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U.S. EPA Region V

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Fax (312) 886-7804

FY 1993 Awards

Illinois	Lake George	Phase I	48,900
	McCullom Lake	Phase II	182,655
	Paris Twin Lakes	Phase II	22,345
Indiana	Statewide	LWQA	50,000
	Versailles Lake	Phase I	50,000
Michigan	Statewide	LWQA	50,000
	Sisters Lakes	Phase I	23,517
	Hamlin Lake	Phase II	40,050
Minnesota	Statewide	LWQA	50,000
	Long/Spring Lake	Phase I	36,833

	Bemidji/Irving Lakes	Phase II	16,500
	Sallie-Detroit Lakes	Phase II	35,200
Ohio	Statewide	LWQA	50,000
Wisconsin	Statewide	LWQA	50,000
	Bass Lake	Phase II	35,000
FY 1994 Awards			
Illinois	Statewide	LWQA	50,000
	McCullom Lake	Phase II	9,800
	Paris Twin Lakes	Phase II	148,305
Indiana	Statewide	LWQA	50,000
Michigan	Statewide	LWQA	50,000
	Elk Lake	Phase I	20,000
	Hamlin Lake	Phase II	100,400
Minnesota	Statewide	LWQA	50,000
	Bemidji/Irving Lakes	Phase II	84,471

	Sallie-Detroit Lakes	Phase II	78,983
	Sauk/Oaskis Lakes	Phase II	79,491
Ohio	Statewide	LWQA	50,000
Wisconsin	Statewide	LWQA	50,000
	Lake Mendota	Phase I	50,000
	Devils Lake	Phase III	125,000
	Mole Lake Tribe	LWQA	50,000
Other Active Projects			
Illinois	Canton Lake	Phase I	
	Stephen Forbes Lake	Phase I	
	Sand Lake	Phase I	
	Third Lake	Phase I	
	Wolf Lake	Phase I	
	Lake Pittsfield	Phase II	
	Sherman Park Lagoon	Phase II	

Skokie Lagoons Phase II

Frank Holten State

Park Lakes Phase III

Lake Le-Aqua-Na Phase III

Indiana Lake George Phase I

Lake Monroe Phase I

Wolf Lake Phase I

Michigan Elk River Chain of Lakes Phase I

East and West Glen Lakes Phase I

Fremont Lake Phase I

Higgins Lake Phase I

Mona Lake Phase I

Marble-Coldwater

Chain of Lakes Phase II

Lake Mitchell Phase II

	Morrison Lake	Phase II
	Lake Lansing	Phase III
Minnesota	Alimagnet Lake	Phase I
	Boy River Chain of Lakes	Phase I
	Bemidji/Irving Lakes	Phase I
	Big Kandiyohi Lake	Phase I
	Diamond Lake	Phase I
	East Side Lake	Phase I
	Florence Lake	Phase I
	French Lake	Phase I
	Green Lake	Phase I
	Grove Lake	Phase I
	Koronis-Rice Lakes	Phase I
	Long Lake/	
	Minnehaha Watershed	Phase I
	Long Year Lake	Phase I

	Lake Ripley	Phase I
	Sallie/Detroit Lakes	Phase I
Minnesota	Sauk Lake	Phase I
	Sauk River Chain of Lakes	Phase I
	Tanners Lake	Phase I
	Upper and Lower	
	Prior Lakes	Phase I
	Big Stone Lake	Phase II
	Clearwater Chain of Lakes	Phase II
	Crystal Lake	Phase II
	Golden Lake	Phase II
	Medicine Lake	Phase II
	Moore Lake	Phase II
	Lake Riley	Phase II
	Lake McCarrons	Phase III

Ohio	Dillon Reservoir	Phase I
	Indian Lake	Phase II
	Sippo Lake	Phase II
	Twin Lakes	Phase III
Wisconsin	Bass Lake	Phase I
	Fish Lake	Phase I
	Pickereel/Crane Lakes	Phase I
	Lake Wissota	Phase I
	Lake Comus	Phase II
	Delavan Lake	Phase II
	Lake Henry	Phase II
	Milwaukee Urban Lakes	Phase II
	Lake Noquebay	Phase II
	Upper Willow Reservoir	Phase II
	Wind Lake	Phase II
	8 Lakes	Phase III

White Earth

Chippewa Tribe

LWQA

Red Lake

Chippewa Tribe

LWQA

Mille Lacs

LWQA

Chippewa Tribe

Phase I

Menominee Tribe

Phase I

Lac du Flambeau Tribe

LWQA

Region 6

Regional Clean Lake Coordinator

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FY 1993 Awards

New Mexico	Statewide	LWQA	50,000
Oklahoma	Statewide	LWQA	50,000
	Lake Henryetta	Phase I	100,000
	Taylor Lake	Phase I	62,000
Texas	Statewide	LWQA	50,000
	Lake Pat Cleburne	Phase I	100,000

FY 1994 Awards

Arkansas	Statewide	LWQA	30,000
Oklahoma	Statewide	LWQA	50,000
	Arcadia Lake	Phase I	148,000
Texas	Statewide	LWQA	50,000

Oyster Creek Lake Phase I 100,000

White Rock Lake Phase I 100,000

Other Active Projects

Oklahoma

Carmen Lake Phase I

Lake Claremore Phase I

Lake Eucha Phase I

Lake Eufaula Phase I

Hunter Lake Phase I

Newkirk Lake Phase I

Lake Perry Phase I

Skipout Lake Phase I

Tenkiller Ferry Lake Phase I

Lake Wister Phase I

Texas Lake Worth Phase II

Acoma Pueblo Lake Acomita Phase II

Region 7

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FY 1993 Awards

Iowa	Lake Ahquabi	Phase II	34,274
	Little Wall Lake	Phase II	25,000
	Upper/Lower Pine Lakes	Phase II	67,000
Kansas	Ramrock/Marys Lakes	Phase I	44,986

Missouri	McDaniel Lake	Phase I	45,000
Nebraska	Statewide	LWQA	
50,000	Big Indian Reservoir	Phase I	35,700
	Maskenthine Lake/		
	Willow Creek	Phase II	25,000
	Wehrspann Lake	Phase II	27,040
FY 1994 Awards			
Iowa	Lake Ahquabi	Phase II	211,000
Missouri	Statewide	LWQA	26,873
	Cameron City Lakes	Phase I	65,000
Nebraska	Statewide	LWQA	50,000
	Valentine Mill Pond	Phase I	70,000
Other Active Projects			
Iowa	Five Island Lake	Phase II	
Kansas	Ford County Lakes	Phase II	
Nebraska	Buckley Reservoir	Phase I	

Chalkrock/Buckskin Hills Phase I

Nemaha Lakes Phase I

Lower Elkhorn Lakes Phase II

Region 8

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FY 1993 Awards

Colorado	Statewide	LWQA	50,000
Montana	Statewide	LWQA	50,000
	Swan Lake	Phase I	10,000
North Dakota	Statewide	LWQA	50,000
South Dakota	Statewide	LWQA	50,000
Utah	Statewide	LWQA	50,000
	Mantua Reservoir	Phase I	88,000

FY 1994 Awards

Colorado	Statewide	LWQA	52,500
Montana	Statewide	LWQA	52,500
	Swan Lake	Phase I	20,000
North Dakota	Statewide	LWQA	90,000
South Dakota	Statewide	LWQA	52,500
	Elm Lake	Phase I	100,000
	Lakes Madison/Brant	Phase I	100,000

Utah	Statewide	LWQA	52,500
	Pelican Reservoir	Phase I	100,000
Other Active Projects			
South Dakota	Burke Lake	Phase II	
	McCook Lake	Phase II	
	Punished Woman Lake	Phase II	
	Wall Lake	Phase II	
Utah	East Canyon Reservoir	Phase I	
	Hyrum Reservoir	Phase I	
	Navajo Lake	Phase I	
	Otter Creek Reservoir	Phase I	

Utah Lake

Phase I

Wind River Reservation

LWQA

Southern UTE Reservation

LWQA

Region 9

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FY 1993 Awards

Arizona	Statewide	LWQA	50,000
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California	Statewide	LWQA	39,106
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	Gull and Silver Lakes	Phase I	62,500
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Nevada	Pyramid Lake		
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	Watershed #1	Phase II	68,500
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	Watershed #2	Phase II	69,894
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FY 1994 Awards

Arizona	Statewide	LWQA	50,000
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California	Salton Sea	Phase I	95,000
	Big Bear Lake	Phase II	90,000
Nevada	Pyramid Lake	Phase II	49,000
	Lake Tahoe	Phase II	80,000
Other Active Projects			
Arizona	Rainbow Lake	Phase I	
California	Eagle Lake	Phase I	
	Lake Elsinore	Phase I	
	Keswick Reservoir	Phase I	
	Lake Nacimiento	Phase I	
Nevada	Walker Lake	Phase I	

Region 10

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FY 1993 Awards

Idaho	Statewide	LWQA	28,170
	Henrys Lake	Phase I	10,850
	Priest Lake	Phase I	51,747
	Williams Lake	Phase I	22,133
	Clark Fork/Pend Orielle	Phase II	25,000
Oregon	Statewide	LWQA	25,000
	Lake Lytle	Phase I	59,650
	Smith/Bybee Lakes	Phase I	21,000
Washington	Lake Roosevelt	Phase I	36,300
	Coeur d'Alene Tribe	LWQA	40,150
	Nez Perce Tribe Mud Springs/		

Talmak Reservoirs	Phase I	30,000
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FY 1994 Awards

Alaska	Statewide	LWQA	30,000
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Idaho	Payette Lake	Phase I	61,852
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	Priest Lake	Phase I	48,148
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	Cascade Reservoir	Phase II	35,000
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Oregon	Statewide	LWQA	50,000
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	Clatsop County Lakes	Phase I	10,000
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	Smith/Bybee Lakes	Phase I	25,000
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Washington	Statewide	LWQA	70,000
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	Lake Sawyer	Phase I	50,000
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Yakima Tribe		LWQA	70,000
Other Active Projects			
Idaho	Cocollala Lake	Phase I	
	Crystal Springs	Phase I	
	Henrys Lake	Phase I	
	Lake Pend Oreille	Phase I	
	Williams Lake	Phase I	
	Cascade Reservoir	Phase II	
	Winchester Lake	Phase II	
Oregon	Lake Lytle	Phase I	
Washington	Giffen Lake	Phase I	

Lake Roosevelt Phase I

Lake Fenwick Phase II

Coeur d'Alene Tribe LWQA

Phase I

Klamath Tribe LWQA

Nez Perce Tribe Mud Springs Reservoir Phase I

Talmaks Reservoir Phase I

Office of Wetlands, Oceans and Watersheds Publications

If you are interested in receiving additional Office of Wetlands, Oceans and Watersheds publications, write or fax your request to:

NCEPI
11029 Kenwood Road, Building 5
Cincinnati, OH 45242
Fax (513) 489-8695

Request Office of Wetlands, Oceans and Watersheds 1995 Publication List (EPA 840-B-95-001) for a complete list of available titles. Presented below are selected publications that focus on lake management.

The Lake and Reservoir Restoration Guidance Manual (Second Edition)

EPA440-4-90-006

8/90

Written for informed citizens who are interested in protecting, restoring, and managing lakes. Focuses on four areas: identifying lake problems, evaluating management practices for addressing problems or for protecting water quality, developing a site-specific management plan, and implementing and evaluating lake management plans. Includes a hypothetical case study, point source techniques, best management practices, and State and Provincial lake management programs. (326 pgs.)

Volunteer Lake Monitoring: A Methods Manual

EPA440-4-91-002

12/91

Provides step-by-step methods for monitoring key lake water quality problems using citizen volunteers. Includes information on quality assurance/quality control (QA/QC) of data, data analysis and preservation, and equipment. (121 pgs.)

Fish and Fisheries Management in Lakes and Reservoirs: Technical Supplement to the Lake and Reservoir Restoration Guidance Manual

EPA A841-R-93-002

5/93

Focuses on the management of fisheries and lake water quality. An important objective of this manual is to encourage the development of an integrated lake management program that assesses fish, other biota, the physical and chemical characteristics of the lake habitat, and the associated watershed as an interdependent unit. (321 pgs.)

Monitoring Lake and Reservoir Restoration: Technical Supplement to the Lake and Reservoir Restoration Guidance Manual

EPA440-4-90-007

8/90

Explains how to design and implement a lake monitoring program during and following a lake restoration project. Describes monitoring methods for both the waterbed and the watershed. Provides recommendations for consistent monitoring methods and quality assurance procedures to assist lake managers and researchers. Includes a U.S. Geological Survey map illustrating the average annual runoff in the United States. (130 pgs.)

Statistical Methods for the Analysis of Lake Water Quality Trends

EPA841-R-93-003

12/93

This manual and the accompanying software in the SAS system presents nonparametric statistical methods for trend assessment in water quality, with an emphasis on lakes. The purpose of the manual and software is to furnish lake program managers with guidance on the application and interpretation of methods for the detection of trends in lake water quality. (107 pgs.)

