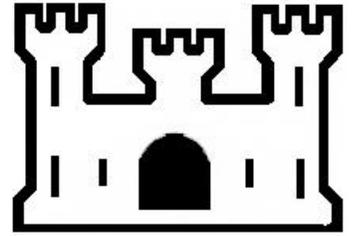


US Army Corps
Of Engineers
Southwestern Division
Reservoir Control Center

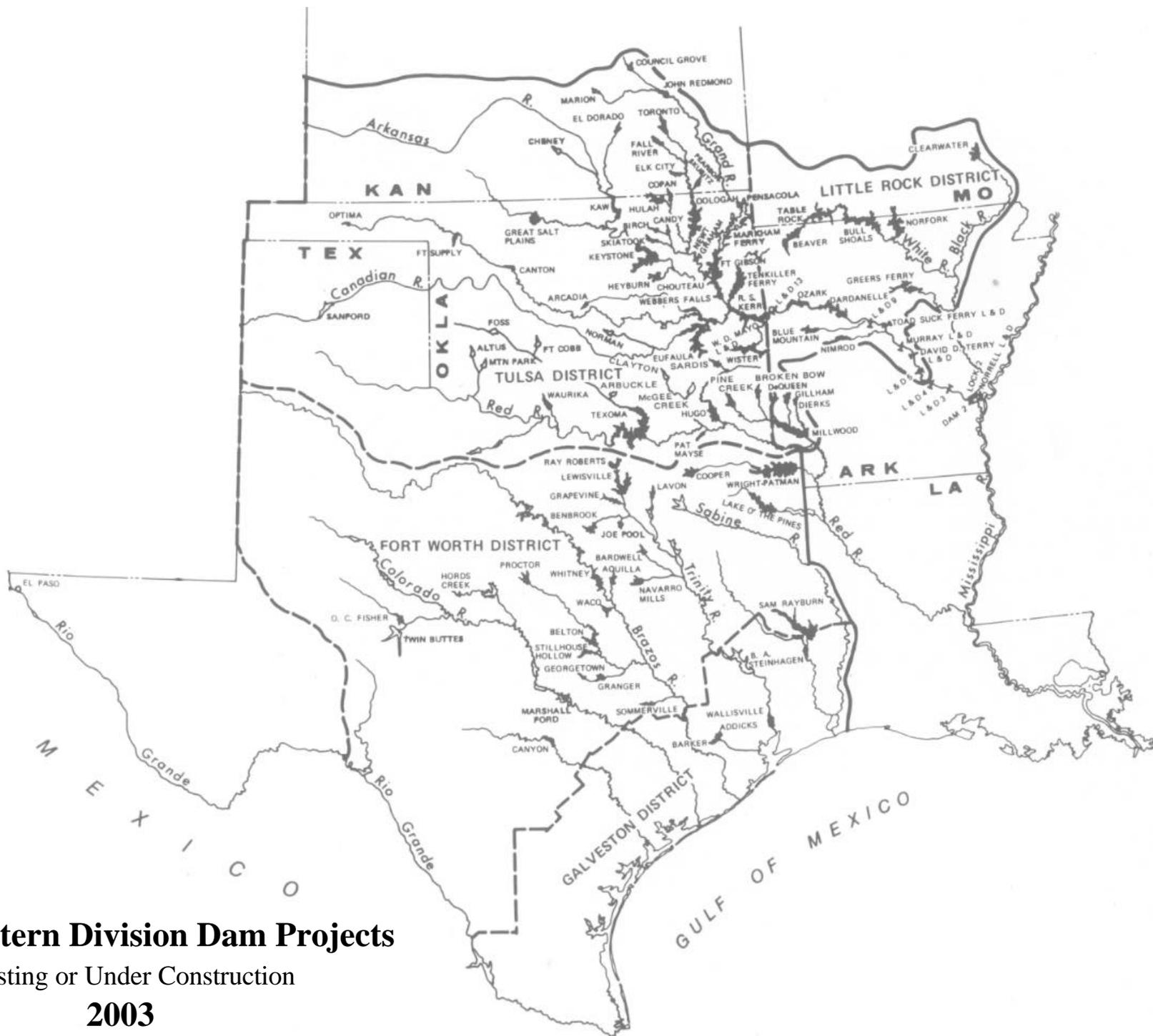


FY 2003 Annual Water Quality Report



March 2004

FOR OFFICIAL USE ONLY



Southwestern Division Dam Projects

Existing or Under Construction

2003

(With Section 7 Flood Control Projects Added)

FY 2003

ANNUAL WATER QUALITY REPORT

RESERVOIR CONTROL CENTER

SOUTHWESTERN DIVISION

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SECTION I
INTRODUCTION

SECTION I – INTRODUCTION

PURPOSE OF REPORT. This report presents activities and accomplishments of the districts within Southwestern Division (SWD) as related to water quality management activities throughout FY03. Detailed summaries of water quality activities are also included.

This report is prepared in conformance ER 1130-2-234, Reporting of Water Quality Management Activities.

SECTION II

**WATER QUALITY ACTIVITIES
IN FORT WORTH DISTRICT**

SECTION II - WATER QUALITY ACTIVITIES IN FORT WORTH DISTRICT

1. Program Summary and Responsibilities.

During the fiscal year 2003, the Fort Worth District water-quality sampling program included 9 lakes out of 25 district lakes. One detailed water quality report for Somerville Lake was completed and forwarded to the Southwestern Division for review and approval. This report were also furnished to those water storage contractors who have a need for this information.

2. Goals..

Water quality monitoring and evaluation are essential components of the Fort Worth District's water quality program. It is designed to assess the water quality of selected Fort Worth District lakes and to accomplish the following basic objectives.

- a. Establish base-line conditions at these projects.
- b. Identify water quality problems and resolve those problems where possible.
- c. Gather monthly dissolved oxygen and temperature data to be used for thermal simulation modeling of lake projects during the design or modification stages to determine multilevel outlet sizing and location.
- d. To evaluate annual water-quality trends and to establish the magnitude of natural annual variations.

3. Organization and Staff..

Presently, the Fort Worth District's water quality staff consists of one full-time, one part-time hydraulic engineer, and one engineering technician. District personnel involved in water quality work are listed in Table 1.

**Table 1
Fort Worth District
Water Quality Staff**

Name	Org. Code	Title	Phone #.	FAX #	Gra	Exp. YRS
Shah Khan	CESWF-OD-L	Hydraulic Engineer	817-886-1541	817-886-6472	GS-12	12
Paul Lauderdale	CESWF-OD-L	Hydraulic Engineer	817-886-1547	817-886-6472	GS-11	3
Lynne Rednour	CESWF-OD-L	Hydraulic Technician	817-886-1546	817-886-6472	GS-07	4 mos.

4. Sampling Program.

In fiscal year 2003, 8 district lakes and their inflows and outflows out of 25 district lakes were sampled under the intensive water-quality sampling program. The monitored lakes were Joe Pool, Navarro Mills, Somerville (only lake samples were collected at Somerville Lake), Bardwell, Grapevine, Waco, Whitney, and Lake O' the Pines. The Fort Worth District, under its intensive sampling program, monitors the condition of lakes, upstream and downstream. Evaluation of the water quality data is based on water quality standards and criteria established by the Texas Commission on Environmental Quality (TCEQ), and the U.S. Environmental Protection Agency (USEPA), as well as other states quality standards which are designed to protect key beneficial uses. The water quality parameters that are monitored include biological, physical, chemical, temperature, and dissolved oxygen. The USGS, the Engineer Research and Development Center (ERDC), and other established labs are used to analyze these samples. The data collected are stored in the USEPA database "STORET" and in the USGS database "National Water Information System" (NWIS). The data are published yearly in the USGS Water Resources Data publications. Statistical analyses are performed on about 40 water quality parameters. Our office coordinates with the above mentioned agencies and river authorities during the interpretation phase of the collected data. We also obtain permitted wastewater loading reports in Texas rivers from TCEQ, which we use in our water quality analyses.

5. Training.

During the fiscal year 2003, the water quality team member Shah Khan attended an annual national conference of "Enhancing the States Lake Management Programs" in Chicago, Illinois on April 23-25, 2003. The team members will be scheduled for more water quality modeling and management courses as time and funds are available.

6. Research and Development Needs.

None are anticipated during the next FY.

7. Assistance from Committees or Outside Sources.

No assistance was requested in the FY 2003.

8. Project Narratives.

At the end of February 2003, fish kill was observed at Whitney Lake and it persisted until May 2003. Total fish kill during those three months was approximately 1,200,000. Possum Kingdom Reservoir and Lake Granbury also experienced fish kill of 1,475,000 and 3,447,000, respectively. Fish kill duration was January 1, 2003 to June 2003 and January through the end of April at Possum Kingdom Reservoir and Lake Granbury, respectively. This fish kill was attributed to bio-toxic blooms of the golden alga *Prymnesium parvum*. At this time, there is nothing that can be done to help the situation according to Mrs. Joan Glass (Region 2 Pollution Biologist of the TPWD). Everything they tried in the laboratory and fish hatcheries would risk making the algal bloom worse than it is. There are some of the top toxic algae experts in the nation working on this problem, using their own funding at this time. From the data available, we found no other major water quality problems in any of the Fort Worth District projects, which are sampled intensively.

SECTION III

**WATER QUALITY ACTIVITIES
IN GALVESTON DISTRICT**

SECTION III - WATER CONTROL ACTIVITIES IN GALVESTON DISTRICT

1. Program Summary and Responsibilities.

Water Quality investigations for proposed projects are conducted in the Planning Division. Project specific, activities range from water and sediment sampling with basic insitu analysis to groundwater and soil borings collection. Associated laboratory analyses varies from basic parameters to a full range of Priority Pollutants. The Planning Division also conducts water quality activities for project maintenance. Work generally consists of water, sediment and elutriates analysis prior to dredging.

2. Goals.

Water quality research and activities are primarily focused on water quality impact analysis, maintenance of navigational waterways and flood control projects. District goals include maintaining state standards while minimizing water quality impacts, and maximizing environmentally beneficial uses of dredge material.

3. Organization and Staff.

District personnel involved in water quality work are listed in Table 2.

**Table 2
Galveston District
Water Quality Staff**

Name	Org. Code	Title	Phone #.	FAX #	Gra.	Exp. YRS
Kristy Morten	CESWG-PE-PR	Biologist	409-766-3145	3064	GS-12	25
Robert Hauch	CESWG-PE-PR	Physical Scientist	409-766-3913	3064	GS-12	22

4. Sampling Program.

Water quality activities are conducted on as –needed basis for new projects and waterway maintenance dredging. The District does not have regular water quality monitoring programs.

5. Training.

Training and workshops are attended as needed to maintain level of competency. Training needs include watershed management and other TMDL related issues.

6. Research and Development Needs.

None are anticipated in the next FY.

7. Assistance from Committees or Outside Sources.

No assistance was requested this FY.

8. Project Narratives.

The Galveston District does not own or operate standard water storage reservoirs or lakes. As such, the District does not conduct routine water quality monitoring programs. The District manages two flood control reservoirs, Addicks Reservoir and Barker Reservoir, in Houston, Texas. Designed to store floodwaters, the reservoirs are dry the majority of the year and support various recreational uses.

SECTION IV

**WATER QUALITY ACTIVITIES
IN LITTLE ROCK DISTRICT**

SECTION IV - WATER QUALITY ACTIVITIES IN LITTLE ROCK DISTRICT

1. Program Summary and Responsibilities.

The District water quality management programs are divided among the Operations Division and the Planning, Environmental, and Regulatory Division by functional missions. Responsibilities for water quality studies within the Divisions are assigned the various elements based on the nature of the study. Specific activities of the Divisions are discussed under Section 4., Sampling Program.

Goals.

- a. Manage water releases from reservoirs to best balance water quality needs with project purposes.
- b. Identify existing & potential reservoir water quality related problems & take appropriate actions consistent with our mission & authority.
- c. Provide safe drinking water for public use.
- d. Provide safe swimming areas following state health regulations.
- e. Ensure Corps' project compliance with wastewater discharge permits.
- f. Ensure water quality is addressed in the regulatory program.
- g. To support HTRW efforts.

3. Organization and Staff.

District personnel involved in water quality work are listed in Table 3. All work only part-time on water quality duties.

**Table 3
Little Rock District
Water Quality Staff**

Name	Org. Code	Title	Phone #.	FAX #	Gra.	Exp. YRS
Mike Black (Alt POC)	CESWL-CO-R	Hydraulic Engineer	501-324-6238	-5903	GS-12	2
Max D. Frauenthal	CESWL-PR-P	Chemical Engineer	501-324-5197	-5605	GS-12	9
Gil Wootten	CESWL-OP-OM	Section Chief	501-324-5044	-5159	GS-13	12
Joyce Perser	CESWL-PR-R	Ch. Regulatory Eval	501-324-5295	-6013	GS-12	8
Tony Hill	CESWL-PR-PE	GIS Coordinator	501-324-5834	-5605	GS-12	8
Mike Rodgers (POC)	CESWL-PR-PE	Biologist	501-324-5030	-5605	GS-11	11
Sheila Ellis	CESWL-OP-OM	Statistical Asst	501-324-5737	-5159	GS-06	8

4. Sampling Program.

The District water quality management programs are divided among the Operations Division and the Planning, Environmental, and Regulatory Division by functional missions. Extensive coordination with the appropriate federal and state agencies is completed for all activities.

a. Operations Division Responsibilities. Responsibility for water quality work within the Operations Division is assigned to the various elements based on the nature of the work.

(1) Reservoir Control Branch. Reservoir Control Branch is responsible for coordinating with the USGS and the Arkansas Soil and Water Conservation Commission to obtain water quality data in the White and North Fork river basins. This data includes dissolved oxygen profiles at our reservoirs and release monitoring. Due to the special dissolved oxygen considerations at the White River multipurpose projects, water quality data are obtained for operational purposes. Lake profiles are taken monthly during the summer and fall months at Beaver, Table Rock, Bull Shoals, Norfolk, and Greers Ferry. This is increased to biweekly as conditions worsen, during the critical dissolved oxygen period, August through the autumnal overturn in December. Data for the profiles are taken approximately 1000 feet upstream of the dam, and includes temperature, specific conductance, dissolved oxygen and pH.

(2) Maintenance Engineering Section.

(a) Bathing Beach Monitoring. Project office personnel or contractors perform the District's bathing beach-monitoring program during the swimming season to insure safe bacterial quality of reservoir waters. Samples are taken weekly for five weeks, then once a month for the remainder of the swim season. Beginning in 1997, the Arkansas Department of Health agreed to collect baseline, pre-Memorial Day and pre-July 4th samples and all necessary re-samples. We collect routine monthly samples during the months of July, August and September. The Missouri Department of Health requires samples to be taken once per week for 6 weeks beginning the week before Memorial Day, then every other week ending the week before Labor Day. The Arkansas Health Department analyzes samples free of charge. Due to budget cuts, the Missouri Department of Health does not test swim beach samples. This program is administered in accordance with SWD Regulation 1130-2-9 and applicable State Laws.

(b) Potable Water Monitoring. Potable water supplies of the District are tested for physical, chemical, and bacterial quality. Samples are collected by project office personnel and mailed to the appropriate health departments or approved laboratories, which perform the analyses for a nominal fee. When tests indicate a bacterial problem, corrective measures are immediately taken. In some cases chronic problems detected by this sampling cause wells to be replaced, reworked, or closed. Also, we are

attempting to obtain municipal water services to replace well systems where possible. This program is conducted in accordance with ER 1130-2-407 and applicable Federal and State drinking water standards for non-community water supply systems.

b. Planning, Environmental, and Regulatory Division Responsibilities.

(1) Environmental Team. The District's lake water quality program is handled through the Environmental Team of the Planning Branch. Data is collected from the 12 multipurpose reservoirs within the Little Rock District is collected through private sector contracts. No routine water quality monitoring program is conducted outside the multipurpose lakes. There are no state or Federal programs that routinely provide these data on the Corps reservoirs. Due to funding priorities, the environmental team's routine water quality monitoring program has been inactive since FY 2001. The team plans to propose reinstatement of the program in FY 2005. These data are used to identify pollution sources, determine water quality trends and changes in all areas of the reservoirs, and to properly manage each reservoir on an individual basis with regard to safety and water quality standards. This program is conducted pursuant to ER 1110-2-8154.

(2) Regulatory Branch.

(a) Dredged Material Analysis. Periodically, a bottom sediment survey is performed at twelve locations along the Arkansas River Navigation System, and less frequently at other locations on other District rivers and reservoirs. Sediment and water column samples are collected, and sent for laboratory analyses. The purpose of this program is to detect potential effects of dredging operations on water quality, and to have these data available for the required 404(b)(1) evaluations of future Corps and private dredging. These operations include both commercial dredging under Corps permits and channel maintenance dredging performed under Corps of Engineers contract. The results are also used to update the water quality database on the Arkansas River.

(b) Special Activities. Regulatory Branch periodically conducts cooperative water quality studies with other agencies in monitoring activities authorized under Corps Section 10 and 404 permits. Regulatory Branch personnel are also involved on a daily basis with personnel from the Arkansas Department of Environmental Quality in the evaluation of Department of the Army permit applications and resolving the water quality matters arising therein.

(c) Data Management. Electronic copies of the reservoir water quality data are stored and can be retrieved at <http://waterdata.usgs.gov/nwis/qw>. The water quality data collected in conjunction with the low dissolved oxygen problem at

the White River projects are stored in DSS files on SWL's WCDS computer. Results of potable water, bathing beaches, NPDES, and other monitoring are kept in computer storage, log books, or files as appropriate. Special data collection results are contained in the reports dealing with the specific subject for which the data were collected.

5. Training.

Training needs include basic training in water quality modeling and watershed management for improving water quality. Training will be scheduled if appropriate courses and funds are available.

6. Research and Development Needs.

Research needs include improved water quality models and watershed management techniques.

7. Assistance from Committees or Outside Sources.

No assistance was requested in the last FY.

8. Project Narratives. We have ongoing special studies and operations related to water quality at several of our 12 multipurpose reservoirs in the District.

- a. White River Lakes.** Lake profiles, containing dissolved oxygen (DO), specific conductance, pH and water temperature data, are taken typically once in early spring and monthly from August through December at Beaver, Table Rock, Bull Shoals, Norfolk and Greers Ferry. As conditions worsen the frequency increases to biweekly and sometimes weekly until the lake overturns. Profile data are used by Reservoir Control Branch personnel to monitor DO conditions in the lakes. To monitor downstream conditions, continuously recording dissolved oxygen and water temperature monitors, connected to satellite Data Collection Platforms, are in place. As conditions worsen hydropower generation rates are recommended to maintain DO levels at 4 mg/l or greater in the releases. Data collection is done by the USGS under a contract between SWL and the Arkansas Soil and Water Conservation Commission. Another purpose of this monitoring is to evaluate mechanisms, which can provide an appropriate DO and water temperature regime in releases from the lakes to meet Missouri and Arkansas State standards of 6 mg/l DO and a maximum temperature of 75 degrees Fahrenheit.

In addition to recommending hydropower generation rates as mentioned above, powerhouse modifications have been made including improved vent pipes and the addition of hub deflectors at Bull Shoals and Norfolk to increase airflow to the turbines. At Table Rock a liquid oxygen injection system is also being used. To date, all powerhouse modifications still fall short of meeting the 6 mg/l state

standards. A more permanent solution to the low dissolved oxygen in hydropower releases is needed.

In an effort to find this permanent solution personnel from the Tennessee Valley Authority (TVA), which has considerable experience with improving DO in hydropower releases at their projects, were invited to visit the projects and to help SWL determine the most reasonable aeration alternatives. A preliminary study by the TVA has lead to several proposals for permanent solutions to reach 6 mg/l DO. These include the use of reaeration weirs, autoventing turbines and oxygen injection, alone or in various combinations.

- b. White River Minimum Flows.** The White River Basin in Arkansas and Missouri contains five Corps multiple-purpose lakes: Beaver, Table Rock, Bull Shoals, Norfolk, and Greers Ferry. Section 374 of WRDA '99 and Section 304 of WRDA'00 modifies the authorization of these projects to include specific amounts of project storage to provide minimum flows to sustain natural reproduction in the trout fishery. Prior to this authorization, water management decisions affecting lake levels and downstream flows were based primarily on flood control and hydropower needs. WRDA 99 & 00 directs the Corps to reallocate the following amounts of storage: Beaver Lake, 1.5 feet; Table Rock Lake, 2 feet; Bull Shoals Lake, 5 feet; Norfolk Lake, 3.5 feet; and Greers Ferry Lake, 3 feet. The stored water will be used to sustain a minimum release during periods when hydropower is not being generated. These minimum flows are intended to sustain the trout fishery. These changes cannot be carried out until this study determines that this work is technically sound, environmentally acceptable, and economically justified. The study is ongoing with a draft report and draft EIS scheduled for release in September 2004.
- c. Release Modifications at the Tri-Lakes.** Low-flow structures at Gillham, De Queen, and Dierks reservoirs release surface water, when the reservoirs are stratified, to help maintain warm water fisheries downstream. To reduce sudden temperature changes on the fishery, small changes in release rates are made when mixing warm water from the low-flow structures and cold water from the conduit. This procedure, which requires a large number of gate changes, occurs during the transition from low flow to flood releases and vice versa.
- d. Rockaway Beach Aquatic Ecosystem Restoration, Lake Taneycomo.** The project area is on Lake Taneycomo within the city limits of Rockaway Beach, Missouri 7 miles northeast of Branson, Missouri in Taney County. The proposed modifications include excavation and rehabilitation of the existing causeway and area between the shoreline and the city fishing island with replacement of the causeway's drainage structures to restore stream flow and the placement of aerators in the water to increase the dissolved oxygen levels. This plan will increase fishery habitat and improve water quality by increasing dissolved oxygen levels, improving water clarity

and reducing the accumulation of sediment and algae growth in the area surrounding Rockaway Beach.

- e. **White River Fishery Partnership.** SWL cooperates with the states of Arkansas and Missouri in increasing the quality of the aquatic habitat for fish species and the associated increase in recreational fishing opportunities on Beaver, Table Rock, Bull Shoals, Norfolk, and Greers Ferry reservoirs. The Arkansas Game and Fish Commission, Missouri Department of Conservation, Missouri Department of Natural Resources, US Fish and Wildlife Service, Southwest Power Association (SWPA), Little Rock District USACE, White River Project offices, and Bass Pro Shops have been participants since the inception. Representatives from other agencies/organizations have been present intermittently. The USACE requested the addition of the Nature Conservancy in 2002. Ongoing coordination involves potential ecosystem restoration opportunities, reservoir operation, community docks, and public relations.

SECTION V

**WATER QUALITY ACTIVITIES
IN TULSA DISTRICT**

SECTION V - WATER QUALITY ACTIVITIES IN TULSA DISTRICT

1. Program Summary and Responsibilities.

Historically, water quality studies performed by District personnel fall under three categories: baseline, monitoring, and special studies. Baseline studies are designed to collect a large amount of data over a short period of time, usually April through October, what is generally considered the growing season. Monitoring programs are long-term, measure fewer parameters than baseline studies, and are tailored to the data needs of each lake. Special studies are those generally funded by special Congressional appropriation or by other agencies. In FY 03, personnel in the Environmental Analysis and Compliance Branch (EACB) were responsible for the overall water quality program in the District. They developed sampling plans, wrote scopes of work, collected water samples and field data, performed sample analyses, and managed data. In addition, they were responsible for data analysis and report writing. Other responsibilities included ordering materials and supplies, maintaining water quality instruments, and providing water quality information to interested parties.

2. Goals.

The goals of the program are to (1) complete one baseline study at each lake that characterizes existing water quality and provides a data set for comparison with future studies, (2) develop monitoring programs to track changing water conditions and guide future lake management decisions, (3) conduct special studies to the satisfaction of project proponents, and (4) coordinate annual programs with interested State agencies and local organizations.

3. Organization and Staff.

In FY 03, 3.5 FTEs (1.5 FTP) in Planning, Environmental, and Regulatory Division were devoted to the water quality program. These FTEs are located in the Environmental Analysis & Compliance Branch. FTP District personnel involved in water quality work are listed in Table 4. One long-time water quality FTE (Dr. John Carroll) retired in April, 2003.

**Table 4
Tulsa District
Environmental Analysis & Compliance Branch
Organization & Staff**

Name	Org. Code	Title	Phone #	FAX #	Gra.	Exp. YRS
John Carroll (retired 4/03)	CESWT-PE-E	Limnologist	918-669-7659	-7546	GS-12	30
Steve Nolen	CESWT-PE-E	Limnologist	918-669-4359	-7546	GS-12	18
Tony Clyde	CESWT-PE-E	Limnologist	918-669-7556	-7546	GS-11	4
David Gade	CESWT-PE-E	Limnologist	918-669-7579	-7546	GS-11	4

4. Sampling Programs.

Sampling programs are developed specifically for each lake being studied. For baseline studies, fixed sites are located in key areas (e.g., dam site, mid-lake, upper lake, coves with pollution source, and if possible, the stilling basin). A minimum of three sites per lake is established. Vertical profiles of dissolved oxygen, water temperature, pH, and conductivity are measured at each site on each sampling trip. Secchi disk transparency and turbidity are also measured each time. In addition, water samples are collected at the surface and about one meter above the bottom for analysis of several parameters, including nutrients (phosphorus and nitrogen series), total metals, and other inorganic parameters (alkalinity, hardness, chloride, sulfate). Chlorophyll a is also measured at each site except the stilling basin.

For monitoring programs, a somewhat different approach is taken. Monitoring studies are long term in nature (3+ years), but fewer key parameters are measured. Sampling sites can be fixed or random, depending on the nature of the study. The main purposes of monitoring are to track changing water conditions for key parameters and to guide future lake management decisions.

Special studies are designed and conducted according to goals specific for the project.

5. Training

No personnel attended formal training courses during this period.

6. Research and Development Needs.

None are anticipated in the next FY.

7. Assistance from Committees or Outside Sources.

Dr. Jim Schooley, Professor of Biology, Northeastern State University, Tahlequah, assisted EACB personnel under an IPA agreement. He assisted in evaluating water quality data and preparing water quality reports, in addition to advising on special projects.

Dr. Myron Cherry, Professor of Chemistry, Northeastern State University, Tahlequah, assisted EACB personnel under an IPA agreement. He used his experience and training in chemistry and instrumentation to provide guidance in sample preparation and analysis using the fluorometer for chlorophyll detection on site. He also reviewed and refined chemical analyses for nutrients and other lake parameters.

Dr. Robert Lynch, Associate Professor of Health Sciences, University of Oklahoma, Norman, assisted EACB personnel under an IPA agreement. He identified phytoplankton collected in water quality studies from several District lakes

8. Project Narratives.

(1) Baseline Studies.

Field work and laboratory analyses were completed for baseline studies at Skiatook and Ft. Gibson Lakes, Oklahoma. Data have been put on spreadsheets and will be entered into the EPA STORET national water quality data system. Water quality reports on each of these lakes should be completed by Fall of 2004. In addition, all water quality data are being input to DASLER, a water quality database developed for the Corps of Engineers.

An ecosystem restoration feasibility study aimed at evaluating water quality and habitat concerns in Oologah Lake, Oklahoma, and the Verdigris River watershed was continued. This study is a continuation of previous efforts and is being administered by the Tulsa District with the City of Tulsa the cost sharing sponsor. The study will evaluate alternatives for ecosystem restoration using a watershed approach.

(2) Water Quality Reports.

Baseline water quality reports were completed for Arcadia and Eufaula Lakes in Oklahoma. These reports describe existing water quality and discuss potential problems.

(3) Monitoring Programs.

(a) Broken Bow Lake, OK.

The monitoring program was continued at Broken Bow Lake. The purpose of this program is to identify water quality trends in the lake, with the emphasis on the potential for increased eutrophication rates because of watershed activities. The data will be evaluated to determine what future actions might be needed to maintain the high quality of the lake water.

(b) Lake Texoma, OK & TX.

Continuing studies are being conducted at Lake Texoma in support of the EPA-sponsored system assimilative capacity study. The Tulsa District is working with EPA, other Federal and State agencies, and local universities on a basin-wide study of contaminant sources and potential effects of these contaminants on the system assimilative capacity of the lake. This portion of the project is funded by the USEPA.

(c) Tenkiller Lake, OK.

The third year of a water quality monitoring program was completed by District personnel. The purpose of this program is to develop data to look at trends relating to eutrophication rates and water clarity, and potential effects on water users and recreation.