RECOMMENDATIONS FOR APALACHICOLA-CHATTAHOOCHEE-FLINT RIVER BASIN/WATERSHED MANAGEMENT

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COMMITMENT TO COMMUNITY

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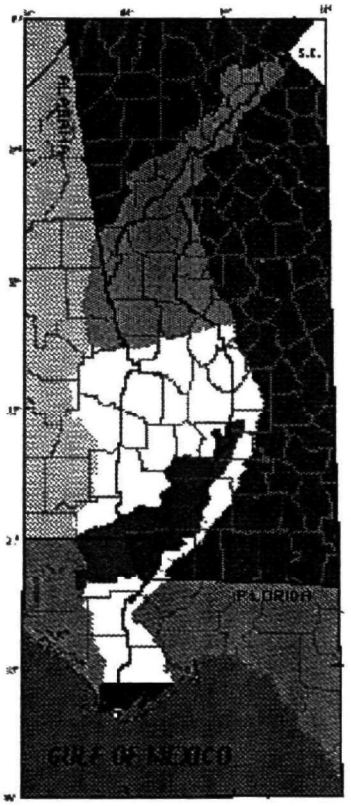

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This document was prepared by the A.L. Burruss Institute of Public Service under an EPA grant, No. X994656-94-1. Points of view expressed in this document do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency.

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INTRODUCTION

We need to look at a watershed or river basin as a functioning unit if we are to make ecological and regulatory sense of it all. The Apalachicola-Chattahoochee-Flint (ACF) River Basin is a tri-state watershed covering approximately 19,600 square miles. Two-thirds of the inhabitants of the 19,600 square mile basin, an area twice the size of Vermont, live in metro Atlanta. The challenge of maintaining and/or improving water quality in the basin is complicated by the multiple land uses and water uses as the water flows from the North Georgia mountains to the Gulf of Mexico.

Chattahoochee means "painted rock" in the Cherokee language. The river starts in the north Georgia mountains, near Coon Den Ridge in Union County. The Chattahoochee River is a much-used and abused river that goes from the mountains to the sea, passing through a major metropolitan area and several multi-use impoundments along the way. Nearly 500 miles later, the same river has a different name as it empties into one of the most productive estuaries in North America.

The Chattahoochee River is impacted by the dense human population in the Piedmont Region and by agricultural and forestry uses of the land being drained. Erosion is a major problem due to land disturbances throughout the basin. The agricultural uses include primarily poultry production in the Northern Piedmont portion, a mix of dairy and cropland in the Southern Piedmont portion and mostly cropland in the Coastal Plain portion of the river basin. The headwaters of the Flint River start on the property of the Atlanta International Airport and are highly impacted by the airport and the urban area it first flows through. There are many small NPDES sources as the Flint River flows southward to Lake Blackshear and the city of Albany. Non-point source pollution is a major problem throughout the basin; erosion is a major problem as the Flint flows through the developing urban and suburban areas; nutrient & pesticide runoff occur as the Flint River drains land used mostly for agricultural purposes as it flows throughout

the Southern Piedmont and Coastal Plains of Georgia. The Flint River and the Chattahoochee River empty into Lake Seminole which is the source of the Apalachicola River. The Apalachicola River drains rural areas of Florida and receives the Chipola River. The Chipola River starts near an urban area in southeast Alabama and flows through agricultural areas as it drains parts of Alabama and Northwest Florida. Dredging to maintain shipping channels, in the Apalachicola River, in the Chattahoochee River northward to Columbus, GA and in the Flint River to Bainbridge, GA, also impacts the quality of the river waters.

The Apalachicola River empties 16 billion gallons of water each day into Apalachicola Bay, 108 miles south of Lake Seminole. The Apalachicola Bay receives the waters of the Apalachicola River whose quality and amount reflect the uses of all three rivers and the land they drain.

Millions could not live where they do if not for the ACF River system that provides water for homes, businesses, farms and industries. All the abuses, along with the demands of the entire watershed must be considered. Tons of mud wash down the tributaries into the three rivers and wastewater and raw sewage add to this pollution mix. Illegal and legal dumps dot the landscape, many located near rivers and lakes.

The Federal Clean Water Act was passed in 1972. It called for our rivers, lakes and streams to be "fishable and swimmable" by July 1, 1983. Today, only 40% of our waterways still fail that test. The Chattahoochee River is one of those failures. In addition, Federal scientists have determined that a half-dozen smaller tributaries around Atlanta are nearly dead, unable to support most fish or aquatic life.

We must have both accountability for water-quality issues throughout the water system and clearly delineated responsibilities with quality staff and a quality approach to handling these responsibilities. Managing the rivers to ensure water quality in the rivers and in Apalachicola Bay is a complex task, requiring input from individuals from the

natural and social sciences, environmental planners and engineers, and the diverse collection of stakeholders in the entire ACF Basin. The following recommendation for River Basin Management specifically refers to the tri-state Apalachicola-Chattahoochee-Flint River Basin, but it could be easily extended to any river basin.

OVERVIEW OF INITIATIVE

In 1972, the Federal Water Pollution Control Act amendments became known as the Clean Water Act (CWA). The major features of the CWA included the NPDES permitting program, funding wastewater treatment, and funding state water quality programs. Section 303(b) required states to develop basin plans for their point source control programs. After completing these plans, most of the states had no ongoing river basin planning function. A river basin/watershed management approach at the U.S. EPA must stress these water quality programs and those involving toxics and conventional chemical pollutants, physical water quality, habitat quality, and biological diversity and health.

The U.S. EPA should form an Intra-Agency ACF River Basin Team composed of individuals with multifaceted skills and knowledge to provide a holistic approach to the ACF Basin. These individuals should also represent each U.S. EPA program that deals with water quality or watershed issues. The first tier of action will include the identification of areas of need and of perceived need as it relates to the water quality for the watershed ecosystem. The team would be responsible for integration of U.S. EPA programs to avoid duplication of effort within the agency and maximize the results per dollar spent. Once these needs are prioritized, they may be examined by a multi-agency, stakeholder based ACF River Basin Commission sponsored by the U.S. EPA. This Commission would encompass representatives of other groups involved in water-related programs within federal agencies, the individual states and regions, and

major stakeholders from business, environmental interest groups, and the concerned citizenry.

The purpose of having the U.S. EPA Intra-Agency Team working with an ACF River Basin Commission is to coordinate activities among the federal and state agencies for maximum information about the present and projected state of the ACF River Basin to minimize duplication of effort among the agencies, so that the resources available are efficiently used. Involvement of the stakeholders increases grassroots support so a call for action can arise out of the citizenry within the affected areas. Disputes that arise between the states or regions may be able to be resolved through mediation by the Commission prior to judicial actions.

The U.S. EPA's Intra-Agency ACF River Basin Team and the ACF River Basin Commission can improve communication within the U.S. EPA and between the U.S. EPA and other agencies. In addition, educational strategies can be developed with the input of stakeholders which could increase the impact of the public outreach programs.

PHASE ONE: FORMATION AND FUNCTION OF A U.S. EPA INTRA-AGENCY TEAM FOR THE ACF RIVER BASIN

The U.S. EPA's Intra-Agency ACF River Basin Team should be chaired by the Regional Administrator or his/her designee. The Team must include one member from each of the branches or sections of the U.S. EPA that deal with watersheds, water quality, clean lakes, surface waters, ground water, soils, nonpoint source pollution, point source pollution, hazardous waste, safe drinking waters, and any other watershed-related topic deemed appropriate by the EPA Regional Administrator. Each Division Director within the EPA regional office should assess her or his units and provide a list of programs to be included and agency participants to serve on the River Basin Team at EPA. Representatives from the water research laboratories should also be included. A staff liaison or coordinator should be appointed to be a link between the U.S. EPA's

Intra-Agency ACF River Basin Team and the university community that could provide specialized information and research as needed by the Team. This staff liaison/coordinator should be a person from the Watershed Section of the Wetlands, Oceans and Watershed Branch.

The responsibilities of this team would be diverse. First, they need to identify areas of duplication concerning EPA programs affecting the ACF River Basin and to make recommendations as to how to eliminate the duplicative efforts within the U.S. EPA. Once the internal duplication is eliminated, this group would prioritize the needs of the ACF River Basin and develop appropriate watershed/river basin strategies that will not duplicate, but incorporate the river basin approaches developed by the states. With these strategies in mind, the U.S. EPA's Intra-Agency ACF River Basin Team would develop a plan of action for the best utilization of available funds. This plan should include developing coordination mechanisms for interagency/interorganizational cooperation and collaboration. The River Basin Team would review and prioritize the U.S. EPA grants within the ACF River Basin given the developed strategies and plan of action for funding. It would also be the responsibility of this Team to monitor and review permits and enforcement actions throughout the ACF River Basin and to develop a GIS system for the river basin to be used for planning and enforcement.

Team actions might consider whether (EMAP) funding should be reallocated to states to conduct trend monitoring in river basins and watersheds under EPA's authority and sponsorship. Also, such programs as NPDES and TMDL should be integrated in the intra-agency work team. This team can help EPA to create a regional identity for effective basin management.

PHASE TWO: CREATION OF AN ACF RIVER BASIN COMMISSION

No single form of river basin or watershed management approach is appropriate for all river basins. Any reforms in the way we manage our multi-state river systems must be

tailored to the needs and desires of that system, its water problems, and the political, social, and legal climate of the region impacted. New innovative approaches must be built on a case-by-case basis. However, a skeletal framework should be designed to support the river basin management approach.

A common method, as in the Delaware River Basin situation, is to authorize the creation of regional commissions with the power to direct those organizations and agencies in the river basin to make the hard decisions concerning the beneficial future of the river systems.

A watershed/river basin management approach at EPA must be a strategy for more effectively protecting and restoring aquatic ecosystems and protecting human health. This strategy has as its premise that many water quality problems are best solved at the river basin/watershed level rather than at the individual waterbody or state level. The approach addresses priority issues and problems, involves stakeholders at every level, and uses the experiences and expertise of many agencies responsible for a myriad of programs and jurisdictions.

There are numerous federal agencies, state agencies, academic units, industries and businesses, and interest groups involved in issues that impact the water quality and quantity of the ACF River Basin. Many of these programs, as well as research and data collection efforts, overlap. With the massive amounts of data that are available, in order to do an effective job, the U.S. EPA (and others) needs to be aware of the research that is presently being done in the ACF River Basin as well as what has been done by other agencies and research groups. An ACF River Basin Commission, consisting of the major stakeholders and researchers and sponsored by the U.S. EPA, can lead to more efficient use of the funds available to the U.S. EPA. Direct interaction with others who are working in the ACF River Basin/Watershed can also lead to greater interagency cooperation and collaboration. Utilization of a Citizens Advisory Committee will allow input from the general public. Knowing public perception of our approaches to meet the

challenges to environmental issues can result in appropriate cost effective responses that improve the popular image of the U.S. EPA (and other federal and state agencies as well).

1. Composition of the ACF River Basin Commission:

The Commission would be chaired by the EPA Regional Administrator with staff support provided by the staff liaison/coordinator from the U.S. EPA's Intra-Agency ACF River Basin Team. The Commission would include an EPA attorney, one representative from each of the federal agencies, including the Corps of Engineers, that deal with issues impacting the River Basin, and one representative from each of the states' environmental agencies (Georgia Environmental Protection Division, Alabama Department of Environmental Management and Florida Department of Environmental Protection). To represent the different regions with their variety of interests, membership should include one representative from each of the regional development commissions, regional planning commissions/councils and water management districts in the ACF River Basin and a representative from each of the congressional offices within the River Basin. Local government representatives should be appointed to the Commission. Representatives from the various clean lakes advisory boards/committees should be involved in the River Basin Commission as well as representatives from Georgia Power and Alabama Power that operate lakes within the ACF River Basin.

Specialized advisory committees would be available to assist the River Basin Commission in its discussions. These advisory committees would be formed from a larger base of stakeholders within the Basin. These committees will be set up to advise and make recommendations to the ACF River Basin Commission.

--A Technical Advisory Committee composed of federal, state, regional and academic representatives should be formed to work with the Commission. This group would consist of individuals involved in research on any aspect of the River Basin which impacts water quality. This involves researchers from the U.S. EPA

labs and state water labs, researchers from the natural and social sciences, civil and environmental engineering, agricultural engineering, and land use planning. A subset of this large group would be assigned to projects by the ACF River Basin Commission.

--A Citizens Advisory Committee would consist of stakeholders from each state or region that represent business interests, navigation and agriculture interests, environmental organizations, lake/river advisory groups, developers, and interested citizens. This Committee would review and respond to recommendations by the River Basin Commission. They would also identify water quality issues that are of concern to the citizenry and make appropriate suggestions for the Task Force to consider.

--An Educational Advisory Committee would consist of U.S. EPA and state education and outreach personnel, members of environmental groups with an education mission, and environmental educators. This committee would provide feedback on the prioritization of educational topics and methods of outreach. One benefit is the potential of every member carrying the information back to their constituency via a variety of public information campaigns. Through grassroots publicity and education, local populations will be more likely to "own the problems." This results in the public being more interested in solving and preventing future problems and their desire to have the aid of the U.S. EPA.

2. Function of the ACF River Basin Commission:

Achieving integrated river basin management involves a holistic approach, operated as a system much like the watershed you are managing, together with coordinated actions and decisions. Regional water decisions should be made in a forum featuring a basin-wide and long-term perspective that respects the many values and uses of water.

Stakeholders must not be given only a plan/project review role, but they should play a more active role in defining problems and formulating responses. Clear lines of accountability to the stakeholders must be included in the Commission's principles.

Our past efforts in river basin and watershed management have been fraught with fragmentation. This fragmentation of responsibilities and programs with divergent viewpoints and mandates has created undesirable outcomes in the areas of legal, economic, and political dimensions and in environmental and water management decisions. There have been incompatible ideologies concerning how river systems should be managed, mostly based on jurisdictional boundaries and political geography. A major function of the ACF River Basin Commission would be to identify overlap and duplication of federal, state, regional and local programs. When such a situation exists, the Commission would coordinate the activities for a minimum of redundant research, data collection, and interpretation. This provides for efficient use of resources. Knowledge of what each research group is doing in the River Basin will increase the communication among environmental professionals. The resulting expanded view of the challenges and potential challenges facing the ACF River Basin can enhance pollution prevention initiatives throughout the watershed.

Legal issues that are raised may be mediated by the Commission long before they would impact the judicial system. Currently, the ACF River Basin lacks an appropriate, long-term forum for cooperative discussion and conflict resolution. The River Basin Commission should provide accountability by acting effectively as a forum for debate, conflict resolution, and implementation.

The ACF River Basin Commission would focus on examining interstate water quality issues, prioritizing the projects and programs, reviewing permitting and enforcement activities, evaluating proposed hazardous waste sites, recommending research needs, and providing educational support.

Comprehensive State Ground Water Protection Approach: In 1991, EPA released its new Ground Water Protection Strategy. This strategy relies on Comprehensive State Ground Water Protection Programs to protect the Nation's ground water resources. This new approach is similar to the watershed protection approach in that it represents an effort to have EPA and other Federal, State and local agencies better integrate and refocus their pollution control programs on threatened geographic areas. EPA is examining ways to better integrate the planning aspects of the CSGWPP with a more comprehensive watershed approach.

Develop tools

EPA recognizes the need to provide technical information to support watershed protection. As the examples below indicate, the Agency is working to develop tools and training for Regions, States, and other interested organizations.

Watershed Costing Study: EPA undertook a study to determine the cost implications of the watershed planning process. A survey instrument was developed and tested in North and South Carolina. There were several preliminary conclusions. First, water quality managers believe that even though little costing data is currently available making it difficult to determine actual dollar savings at this time, savings will occur and efforts to gauge the benefits of watershed protection should continue. Secondly, program benefits are already occurring and more are expected. Finally, environmental benefits will take awhile to observe but the watershed approach will improve and/or accelerate environmental benefits. Efforts continue to develop a means to collect data and measure cost impacts of the watershed planning process.

Watershed Planning Approach Document: This document, currently in draft form, describes a logical process for watershed-based water quality planning and management. The document discusses the broad issues associated with a watershed approach and presents examples of specific steps that can be undertaken to define the problem(s) that a watershed may face, establish realistic goals for the watershed, gain public support for activities, implement appropriate controls, and measure the success of these control measures. The document draws on several examples of ongoing watershed projects (e.g., Anacostia River Restoration Program, Klamath River Basin Restoration Program, and Black Earth Creek Priority Watershed) to illustrate some of the technical and programmatic issues that may arise.

Regional Implementation of National Monitoring Schemes: The Interagency Task Force on Monitoring (ITFM), which EPA chairs and the U.S. Geological Survey (USGS) serves as vice chair, was established in 1992 to develop an institutional framework for nationwide integrated monitoring. The primary objective is to provide better information on water resources and to mobilize water resource monitoring activities more efficiently. The ITFM consists of 16 members: from eight Federal agencies and eight State agencies. Four task groups address the following problems: the nationwide institutional framework, environmental indicators, data collection methods and data management and information sharing. More than 80 Federal and State staff members sit on the four task groups. The ITFM is a 3-year effort; it will disband in favor of full implementation activities in December 1995.

The ITFM recommendations will be carried out by a national entity that will set guidelines and establish comparable methods and procedures. Monitoring will be carried out on a regional basis. A pilot project in Wisconsin, which is organized into river basins, is the first test of the ITFM recommendations.

Environmental Indicators for WPA Projects: During this past year, the Office of Water Strategic Planning Steering Committee and the Environmental Indicators Workgroup developed an indicators framework, which links indicators to the strategic goals they measure. The framework consists of three programmatic areas: Human Health Protection, Ecological Protection, and Ambient Conditions/Reduction of Loadings.

The indicators framework is especially effective in evaluating watershed protection strategies because it is designed to measure the effectiveness of both program-specific activity, such as a point load reduction, and the cumulative impact of all management actions, including the improvement of ecological conditions. For instance, indicators make it possible to:

- *Evaluate both nonpoint source and point source reduction strategies and comprehensive programs to protect wetlands and sensitive ground water areas*

- *Assess ecological conditions, including those affecting fish assemblages, benthic organisms, and natural habitats found in rivers, estuaries, lakes, and wetlands.*

Among other efforts, the Environmental Indicators workgroup has produced products of use to watersheds, including a fact sheet on selection criteria for indicators and a matrix of physical, chemical, and biological indicators that would best measure the attainment of designated uses.

Geographic Targeting: Selected State Approaches: This document provides general information on geographic targeting for mid-level water quality professionals. In addition, the publication presents several approaches to geographic targeting, discussing the advantages and disadvantages of each, and provides examples of where and how these approaches are being used. The document also describes the concepts and issues involved in geographic targeting, such as ranking criteria, the incorporation of ground water concerns and riparian values, the degree of public involvement, institutional capability, and the involvement of Federal, State, and local agencies.

Geographic Information System (GIS) Demonstration Projects: EPA is conducting a pilot study to map State-defined waterbodies and individual stream segments to provide an integrated picture of watershed water quality and the attainment of State-designated uses. During the first phase, which is being conducted in South Carolina, Reach File 3 (a hydrologic mapping tool) will be used to index waterbodies and then GIS will be used to add water quality assessment information from the National Water Quality Inventory Reports (305(b) Reports) and other water quality and land use data.

The second phase of the project will add other types of spatial data, including land use/land cover information and additional water quality data, such as those found in STORET.

This project is a cooperative effort by the South Carolina Department of Health and Environmental Control, Bureau of Water Pollution Control, the South Carolina Water Resources Commission, EPA's Office of Water, and EPA's Office of Research and Development - Las Vegas Laboratory

Methods to Delineate Areas of Ground Water/Surface Water Interaction: This technical assistance document will describe various methods to delineate zones of interaction between ground water and surface water at different hydrogeological settings. It will be used by States to protect ground water connected to surface water so that human health is better protected and the environmental integrity of associated ecosystems is maintained.

Total Maximum Daily Load Case Studies: Section 303(d) of the Clean Water Act established the Total Maximum Daily Load (TMDL) process to provide for more stringent water quality-based controls when technology-based controls are inadequate to achieve State water quality standards. The objective of a TMDL is to allocate allowable loads among different pollutant sources so that the appropriate control actions can be taken, water quality standards achieved, and human health and aquatic resources protected.

As of January 1993, seven TMDL case studies have been published *(see box, next page)* and work is continuing on the development of others.

TMDL Case Study	Primary pollution problem
• Denver Metro/South Platte River, CO	Ammonia, toxics, metals (point and nonpoint sources)
• South Fork Salmon River, ID	Sediment (nonpoint source)
• West Fork Clear Creek, CO	Toxics, metals (point and nonpoint sources)
• Nomini Creek, VA	Nutrients, sediment (nonpoint source)
• Albemarle/Pamlico Estuary, NC	Nitrogen, phosphorus (point and nonpoint sources)
• Lower Minnesota River, MN	Carbonaceous biological oxygen demand, ammonia (point and nonpoint sources)
• Sycamore Creek, MI	Sediment (nonpoint source).

Compendium of Watershed-scale Models for TMDL Development: This compendium identifies and summarizes the most widely used watershed-scale models that can facilitate the TMDL process. It is intended to help water quality managers and other potential users decide which model best suits their needs and available resources. The document describes simple methods, mid-range models, and detailed models.

Measure success

As the watershed approach becomes an integral part of the water program, both programmatic and environmental successes will be measured.

Programmatic measures of success will focus on changes made within Headquarters and the Regions to incorporate watershed protection into everyday business. Potential indicators of success in this area include:

- *Shifts in reporting from a State basis to a watershed basis*
- *Implementation of various planning processes in a coordinated manner and on a watershed basis*
- *Issuance of permits on a watershed basis*
- *Application of funds to support watershed projects.*

An indicator of success in the Regions will be the degree to which they use a watershed-based approach to meet their responsibilities for implementing EPA's water programs. Beyond EPA, shifts toward a program based on a watershed protection approach at the State level will be a further indicator of programmatic success.

Environmental measures of success will focus on improvements within the watershed in water quality and habitat. Potential indicators of success in this area include the degree tc which environmental results are obtained as a consequence of watershed planning and management. Indicators of environmental results might include, for example, acres of wetlands protected/restored, reductions in pollutant levels, improved best management practices, increases in fish populations, and reductions in sedimentation. Obtaining accurate measures in this area will be aided by the products of the Interagency Task Force on Monitoring.

3. Creation of the ACF River Basin Commission

Whatever authority is created, it should not set out, initially, to achieve some lofty objectives. In fact, this is why most regional initiatives fail. Realistic goals must be set for the short-term to establish a solid and long-lasting partnership between the stakeholders involved in the process.

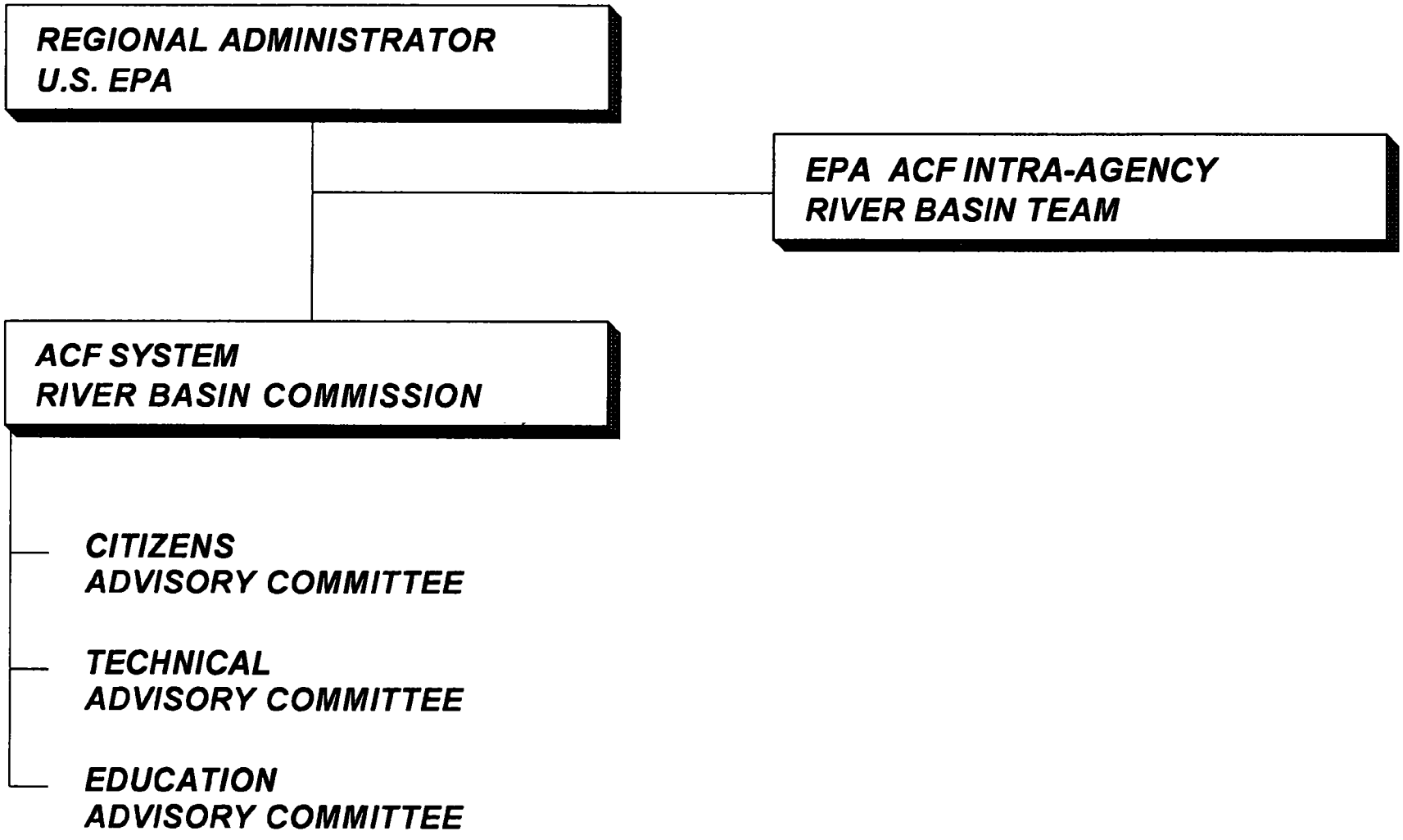
To ensure the success of the multi-agency Commission, it is suggested that the Clean Water Act be amended to include provisions for holistic approaches to river basin/watershed management. The formation of River Basin Commissions under the authority and sponsorship of the U.S. EPA, in partnership with the states, would be key to the reduction of duplicative services. A memorandum of understanding (MOU) should be used as the legal/administrative instrument that links together and commits the River Basin Commission representatives.

SUMMARY OF BENEFITS OF APPROACH

Having an EPA Intra-Agency ACF River Basin Team and an ACF River Basin Commission will prevent the duplication of policies, programs and research and data collection in the watershed. Improved cooperation among the federal, state, regional and local groups will lead to efficient and effective policy development and research. Greater interagency collaboration on watershed projects will facilitate comprehensive holistic policy and research strategies. An ACF River Basin Commission will set long-term research goals that would be resilient to short-term changes in policy. The Commission can act as a mediator for the examination and settlement of disputes at the early stages of disagreement. With public involvement comes public support for the River Basin Commission's initiatives.

Finally, there is a need for a River Basin Commission that independently addresses issues and problems not considered or resolved by the U.S. Army Corps of Engineers Comprehensive Study and that will endure after the study's completion.

ACF RIVER BASIN/WATERSHED MANAGEMENT INITIATIVE



A.L. Burruss Institute of Public Service
Kennesaw State College (1995)

II. APPENDICES

APPENDIX A

THE WATERSHED PROTECTION APPROACH ANNUAL REPORT - 1992

United States
Environmental Protection
Agency

Office of Water
(WH-556F)

EPA840-S-93-001
January 1993

EPA

The Watershed Protection Approach

Annual Report 1992

WATERSHED
PROTECTION
• An Integrated, Holistic Approach •

WATERSHED PROTECTION

• An Integrated, Holistic Approach •

A list of EPA's Regional Watershed Coordinators is found on the inside back cover.

The Watershed Protection Approach: Annual Report

Introduction

What is the watershed protection approach (WPA)?

The watershed protection approach is an integrated, holistic strategy for more effectively restoring and protecting aquatic ecosystems and protecting human health (e.g., drinking water supplies and fish consumption). This approach is a renewed effort by the U.S. Environmental Protection Agency (EPA) to focus on hydrologically defined drainage basins - watersheds - rather than on areas arbitrarily defined by political boundaries. Thus, for a given watershed, the approach encompasses not only the water resource, such as a stream, river, lake, estuary, or aquifer, but all the land from which water drains to that resource. To protect water resources, it is increasingly important to address the condition of land areas within the watershed because as water drains off the land it carries with it the effects of human activities throughout the watershed. By concentrating on natural resources and systems, it is possible to detect and take remedial action for such problems as declines in living resources and habitat loss.

The watershed protection approach has three major cornerstones:

1) *Problem Identification - Identify the primary threats to human and ecosystem health within the watershed.*[1]
2) *Stakeholder Involvement - Involve the people most likely to be concerned or most able to take action.*
3) *Integrated Actions - Take corrective actions in a comprehensive, integrated manner once solutions are determined. Evaluate success and refine actions, as necessary.*

This approach places greater emphasis on all aspects of water quality, including chemical water quality (toxics and conventional pollutants, e.g., fecal coliform and total phosphorus), physical water quality (e.g., temperature, flow, and circulation), habitat quality (e.g., channel morphology, composition, and health of biotic communities), and biodiversity (e.g., species number and range). The approach encompasses all waters - surface and ground, inland and coastal. This approach is not a new centralized program that competes with or replaces existing programs; rather it provides a framework and new focus for effective integration of ongoing programs. In taking this expanded approach, EPA must work closely with other stakeholders who have responsibilities in this area.

Why is a watershed protection approach needed?

Although significant strides have been made in reducing the impacts of discrete pollutant sources and billions of dollars have been spent to build wastewater treatment plants, the Nation's aquatic resources remain at risk. Today's challenges include resolving the significant pollution problems that come from literally millions of diffuse or nonpoint sources, maintaining safe drinking water supplies, and restoring and protecting aquatic habitats. These challenges require innovative solutions and, in a time of dwindling public resources, cooperation among many parties. The watershed protection approach provides the necessary framework for meeting these challenges. The approach emphasizes the involvement of all affected stakeholders and stresses the need for teamwork at the Federal, State, and local level to achieve the greatest improvements with the resources available. A wide variety of sectors are expressing interest in watershed protection, including all levels of government, private businesses, academics, environmental groups, and individual citizens. The watershed protection approach provides comprehensive methods for identifying, tailoring, and implementing the solutions needed to protect and restore the Nation's aquatic resources.

Who can benefit and why?

Everyone - individual citizens, the public sector, and the private sector - can benefit from a watershed protection approach. Individual citizens benefit because watershed protection improves the environment. The public sector

[1] This cornerstone has been slightly modified from that found in EPA's *The Watershed Protection Approach: An Overview* (Decembe. 1991). The name has been changed from "Risk-Based Geographi Targeting" to "Problem Identification," and the definition focuses on primary threats within a watershed rather than highest-risk watershed This modification has been made to better reflect the holistic natur of watershed protection and its applicability to all watersheds.

benefits because agencies can accomplish more through cooperation with all stakeholders than they can on their own with limited resources. Participation by local entities ensures that those who are likely to be most familiar with a watershed, its problems, and possible solutions play a major part, often a leadership role. Users of the water resources (for example, industry, agriculture, and recreation) benefit because one of the intents of the approach is to distribute the burden of water resource protection more evenly among all stakeholders.

In communities across the United States, effective watershed management can lead to more environmentally sensitive and sustainable economic growth and development. Because watershed management brings all parties to the table, the potential exists for greater consideration to be given to protecting and restoring vital natural resources during planning for new development.

What is EPA's role?

EPA's overall goal for the watershed protection approach is:

to maintain and improve the health and integrity of aquatic ecosystems using comprehensive approaches that focus resources on the major problems facing these systems within the watershed context.

To meet this end, EPA has identified the following objectives:

- *Align EPA programs to support risk-based watershed planning and management*
- *Promote the use of the approach by its partners in other Federal, State, and local agencies*
- *Address the primary threats to ground and surface waters*
- *Promote stewardship and a broad understanding of and participation in the approach by the public*
- *Effectively measure progress toward restoring, maintaining, and protecting our Nation's waterbodies and aquatic habitats.*

In pursuing its overall goal and related objectives, EPA encourages and advances watershed protection at all levels of government and is actively involved in watershed partnerships when appropriate. EPA's Office of Water develops technical tools to assist communities in adopting watershed protection approaches, promotes the watershed protection approach concept through various outreach activities, and works inside and outside of EPA to align its programs to better complement the approach.

What does the rest of this document describe?

The remainder of this publication summarizes the progress EPA has made in promoting a watershed protection approach over the last year. The next section reviews EPA's strategy for adopting this approach and the steps that have been taken in EPA Headquarters to implement the strategy. The following section summarizes watershed activities in the field, beginning with a report on how EPA Regions have supported watershed protection and concluding with brief descriptions of individual watershed projects. As an aid for new watershed activities, the appendix references pertinent EPA funding sources that could support watershed protection efforts.

EPA's Strategy

What is EPA's strategy for adopting watershed management?

EPA is pursuing a five-pronged strategy for adopting watershed management. Simply put, the components of the strategy are:

- *Try it out*
- *Develop tools*
- *Advertise it*
- *Measure success.*
- *Align programs*

An EPA Headquarters support team with representatives from the four parts of the Office of Water (Office of Ground Water and Drinking Water; Office of Science and Technology; Office of Wastewater Enforcement and Compliance; and Office of Wetlands, Oceans and Watersheds) has been convened to serve the Regions and States, as well as local and nongovernmental entities, in pursuing watershed protection approaches In addition, a subgroup has been formed to oversee each component of the strategy.

Try it out

In October 1991, all four Office Directors in the Office of Water signed a watershed protection framework document. This document lays the groundwork to implement regional watershed projects and institutional changes in EPA. The purpose of the regional watershed projects is to devise methods and tools, develop credible case studies, and lead by example. In addition, the document commits EPA to make institutional changes that will result in integrated, focused, holistic water quality programs.

Advertise it

To promote a broad understanding of the watershed protection concept, EPA is working to open, improve, and maintain communication with potential stakeholders, including other Federal agencies, State and local governments, and nongovernmental organizations. Selected efforts to advertise watershed protection are identified below.

Federal Interagency Workgroup: EPA has established an interagency workgroup that includes representatives from the Department of Agriculture, the Department of Interior, the National Oceanic and Atmospheric Administration, the Department of Transportation, the Office of Management and Budget, and the U.S. Army Corps of Engineers. This group meets on an as needed basis to share information on their agencies' watershed activities and jointly plan and carry out activities.

Watershed Events: The Office of Wetlands, Oceans and Watersheds (OWOW) publishes this quarterly newsletter to inform its readers about recent activities related to watershed protection. The newsletter circulates to nearly 1,500 readers.

The Watershed Protection Approach: An Overview: OWOW produced a document that explains the watershed protection approach and provides several examples. To date, OWOW has distributed more than 10,000 copies.

WPA Exhibit and Sessions at Conferences: Office of Water personnel at all levels have given presentations and staffed exhibits on watershed protection at conferences throughout the United States and abroad, including the following:

- *Association of Metropolitan Sewerage Agencies 1992 Summer Technical Conference*
- *Coastal Society 13th Annual International Conference*
- *Earth Summit Meeting - ECOBRASIL '92*
- *Lower Colorado River Authority Watershed Management Partners in Policy Forum*
- *Natural Areas Conference*
- *Water Environment Federation Conference*
- *Watershed Management Council Watershed Conference.*

Watershed Users Group on Nonpoint Source Bulletin Board: In October 1992, the Watershed Restoration Network became fully operational on the Nonpoint Source Electronic

Bulletin Board System (BBS). The network is one of the Special Interest Group (SIG) Forums available on the BBS. This SIG will feature watershed approaches to water quality and resource management, as well as watershed restoration.

WATERSHED '93: EPA is lead sponsor with 12 other Federal agencies, five local sponsors, and numerous nongovernmental groups for WATERSHED '93, a national conference on watershed management. This conference, to be held in March 1993, will highlight proven and emerging techniques for watershed management. WATERSHED '93 will give attendees the opportunity to exchange information on watershed approaches, clarify their roles in watershed protection, and build new alliances.

Align programs

EPA is striving to modify its programs to better incorporate watershed protection. Opportunities are being pursued to eliminate barriers and identify actions to be taken to promote and support watershed programs within EPA and State and interstate agencies. The following paragraphs identify several of these efforts.

Planning, Priority Setting, and Reporting Requirements

EPA is committed to identifying and pursuing opportunities to modify its operations to facilitate watershed activities. Some examples include:

Alignment Opportunities List: EPA's Office of Water has begun to examine ways to administratively realign programs to enhance watershed-based resource management. The Office is focusing on several areas including integration of programs, planning, priority setting, reporting requirements, and grants.

EPA/State Watershed Initiative: Many States are making their programs more compatible with watershed management. In August 1992, EPA worked with the Association of State and Interstate Water Pollution Control Administrators and several state representatives to initiate this project. The project, which is designed to examine watershed management hypotheses more carefully, has tv primary goals:

- *Identify changes needed in program policy and administration to improve the States' capacity to reorient water quality programs on a watershed basis*

- *Enhance the State/EPA partnership so that the statutory responsibilities identified in the Clean Water Act are carried out in the most comprehensive, effective manner possible.*

Wetlands and Nonpoint Source Program Implementation Grants: Watershed projects designed to directly protect or restore specific surface or ground waters are seen as essential to the success of the national nonpoint source program. Likewise, watershed projects are expected to provide a means for improving wetlands protection. Recently issued guidance from both the nonpoint source and wetlands programs promotes the use of comprehensive watershed projects. The nonpoint source guidance emphasizes that watershed projec should be given a central role in State program implementation efforts. This guidance also stipulates that funded watershed protection activities should form part of a comprehensive approach designed to control all of the major nonpoint sources affecting water quality throughout the watersheds or ground water areas being protected.

NPDES Permit Issuance: In cases where States are targeting watersheds for comprehensive protection efforts, EPA is offering flexibility in permit reissuance. This flexibility allows States and EPA Regions to align NPDES permits within targeted watersheds on a 5-year cycle.

Geographically Targeted Programs

EPA has several programs that promote a geographically targeted, comprehensive approach. EPA is working to better coordinate those programs and promote them as models of the watershed approach. These include, f example:

Near Coastal Waters (NCW) Program: Within the framework of watershed protection, the goals of the NCW Program are:

- *To direct and focus EPA's coastal activities within priority geographic areas*
- *To promote linkages among programs*
- *To encourage a comprehensive approach to problem assessment and management*
- *To maximize environmental results.*

These goals are achieved chiefly through regional NCW strategies and are carried out through activities described in annual work plans.

National Estuary Program (NEP): The NEP exemplifies watershed protection for estuarine waters and serves as an excellent model for the watershed protection approach. The NEP identifies nationally significant estuaries threatened by pollution, development, or overuse, and requires the preparation of Comprehensive Conservation and Management Plans (CCMPs) to ensure ecological integrity. The program's goals are protection and improvement of water quality and enhancement of living resources. The NEP's approach is to convene a Management Conference consisting of a variety of stakeholders to characterize the estuary, define the estuary's problems, and then develop a CCMP to be implemented by participating parties. The NEP promotes long-term involvement of all stakeholders including elected and appointed policy-making officials from all government levels; environmental managers from Federal, State, and local agencies; representatives from local scientific and academic communities; and private citizens and representatives from public and user interest groups - businesses, industries, and community and environmental organizations.

Great Water Bodies: Like the NEPs, the Great Lakes Program, the Chesapeake Bay program, and the Gulf of Mexico Program take a comprehensive, geographically targeted approach. All are promoting smaller scale watershed projects as an important part of their overall efforts to restore and protect the Nation's Great Water Bodies.

Clean Lakes Program: This program is another established model for watershed protection efforts. National guidance issued in 1987 emphasized that "Clean Lakes projects need to be developed and implemented on a watershed basis... This watershed approach should greatly facilitate the leveraging of their informational/data, technical, financial, and programmatic resources for water quality purposes.... The Clean Lakes Program is particularly conducive to a highly integrated and unified approach to water restoration and protection."

Integrated Resource Planning by Municipalities: Over the last five years, many major municipalities have developed programs for ensuring reliable and safe drinking water supplies through integrated resource planning methods. This approach requires coordination among all the entities in the watershed, leading to agreements and controls that ensure a safe water supply. Although targeted to water supply objectives, this local planning effort produces benefits that in the future could extend to greater protection of the watershed.

Surface Water Treatment Rule (SWTR): To avoid this rule's requirement to install filtration treatment of drinking water supplies, public water supplies were allowed to demonstrate that they effectively protect the watershed and meet other criteria. EPA and the States made decisions on who must filter in December 1991, and a number of municipalities (such as Seattle, Portland, New York City, and Lake Tahoe) were exempted provided that they continue to maintain effective watershed control programs. The SWTR has proven to be a major incentive for continued watershed protection in these areas.

Drinking Water Vulnerability Assessments: Starting in January 1993 public water systems are required to monitor for 65 chemical contaminants, most for the first time. By regulation, EPA has allowed reduced monitoring if the water system can demonstrate that the water source is not vulnerable to degradation by specific contaminants. This vulnerability assessment is providing a major incentive for water systems to establish wellhead protection programs and other watershed protection measures.

Activities in the Field

How are EPA's Regions adopting watershed management?

This section highlights various methods being used by Regional offices to foster watershed protection. These Regional activities are largely experimental and provide valuable lessons.

Throughout the text, several examples of watershed projects are listed in boldface type. Greater detail and additional examples of watershed projects can be found in the next section, which describes 34 individual watershed projects in which EPA is involved. In addition to these projects, many others are being organized by local communities; Federal, State, and local governments; and private citizen groups.

Regional Strategies: Several Regions have developed Regional strategies or action plans that outline their Region's approach for adopting watershed protection and define a process and criteria through which priority watersheds are identified and targeted for special attention. The foundation of Region II's strategy is to target ecosystems that continue to experience use impairments and other adverse impacts. Region IV uses eight criteria, including the following, for identifying the highest priority watersheds: the magnitude of risks to human and ecological health, the possibility of additional environmental degradation if no action is taken, and the likelihood of achieving demonstrable results. Region IX focuses its efforts on addressing cross-cutting water quality issues in priority watersheds or geographic areas, such as **California's Central Valley, San Francisco Bay,** the **Truckee River,** and **Santa Margarita Watershed.**

Regional Watershed Coordinators: One of the first steps taken by EPA to support the concept of watershed protection was to designate a Regional watershed coordinator in each Region. The coordinator is responsible for promoting watershed protection, communicating ideas, and disseminating information between EPA Headquarters (the Office of Water) and other Regional staff involved in watershed activities. Besides a Region-wide coordinator, some Regions have designated coordinators for individual watershed projects.

Involvement in Specific Watershed Activities: In most Regions, there are no clearly defined guidelines for EPA involvement in specific watershed activities. EPA can adopt either a leadership or supportive role. The decision regarding EPA involvement often depends on staffing levels, budgets, and the project's needs. Region II's approach, for example, is to assume the lead for all geographic targeting efforts in interstate and international waters and for congressionally mandated projects. The Region will also consider leading efforts where State or local commitment is not adequate to solve the problem. For other projects, the Region will look to the States to adopt a similar leadership role in State-targeted waters.

Regional Action Teams: Many Regions (Regions I, IV, VII, VIII, IX, and X) have established a Region-wide team for each project. The teams coordinate communications, provide technical review, and work with State and local stakeholders to target problem-solving on a watershed basis. Many Regional teams (such as the one for the **Casco Bay** NEP) are comprised of representatives from all water programs. Some invite representatives from programs outside the water arena, such as Superfund, pollution prevention, and emergency preparedness, to act as participants (such as **Merrimack River**) or serve as the lead (**Clear Creek**, which is being led by a Superfund staff person).

In addition to individual Regional action teams, Region IX created a Board of Directors consisting of Branch Chiefs from affected programs to oversee the numerous individual watershed action teams in the Region. Region VIII established a small workgroup, called the Watershed Eight, to assess the potential for adopting a Region-wide watershed approach.

This workgroup includes staff from many programs, such as Superfund, ground water, mining wastes, nonpoint source, and geographic information programs. Their task is to systematically evaluate the watershed approach and prepare a draft action plan outlining how the Region will more formally implement the approach. At present, the workgroup does not anticipate the need for any organizational changes other than the addition of a permanent Watershed Protection Coordinator for the Region.

Regional—State Watershed Agreements: Regions II and IX are planning to negotiate agreements with each State in their jurisdictions regarding how the Region and State will invest resources to support watershed protection. Region II is willing to reallocate resources from multiple program areas to support watershed projects with the understanding that trade-offs in base program commitments will be required. The Region recently completed this strategic planning process with the State of New York, and the process succeeded in both parties moving toward a geographically oriented, multi-programmatic approach to solving problems. In the future, the Region plans to initiate discussions with its other State and territories—New Jersey, Puerto Rico, and the U.S. Virgin Islands. Region IX also plans to work with its States, especially California and Hawaii, to explore ways of incorporating the approach into their State programs.

Interagency Partnerships: Several Regions are working on building partnerships with other Federal agencies with similar water resource programs. For example, Region VIII has supported a number of watershed projects that are also part of the USGS's National Water Quality Assessment Program (NAWQA). Although the principal focus of this USGS program is an intensive evaluation of water resource conditions and trends, the number of agencies and groups participating in the NAWQA effort provide a natural organizational nucleus for developing an integrated watershed protection approach. In the case of **Waquoit Bay**, the National Oceanic and Atmospheric Administration's National Estuarine Research Reserve in the area provides a natural setting for fostering watershed protection, because the Reserve supports conservation, research, and public outreach activities. In **Coos Bay/Coquille Bay** and the **Middle Snake River**, project personnel are working with the Department of Agriculture's Coordinated Resource Management Program, which uses a similar holistic management approach in targeted geographic areas, to integrate the concept of watershed protection into their planning efforts.

Watershed Inventory: Region VIII is one of the first EPA Regions to conduct a Regional watershed inventory. To support this effort, the Region is collecting and organizing information along watershed and ecoregion[2], rather than political, boundaries. This inventory will present information that describes (1) the physical characteristics of the watersheds; (2) human uses, past and present, of the area; (3) the principal activities affecting the quality of the watersheds' resources; (4) the current condition of the habitat and water quality; and (5) the current value and condition of the ecosystem. In addition to information about areas of high water quality and damaged water resources, the inventory will include information on areas of particular ecological importance, such as blue ribbon trout fisheries, designated and candidate wild and scenic rivers, conservation sites from the Nature Conservancy's heritage data base, and the presence of threatened and endangered species. For purposes of this inventory, the watershed boundaries are defined by the USGS hydrologic subregions. In addition, the information will be organized along EPA ecoregion boundaries. The concurrent use of ecoregions as the other primary unit of organization is intended to provide an appropriate scale for arranging the information within the watersheds and to reflect the effects of environmental characteristics, such as climate and geology, the principal factors that shape the natural character of rivers. The inventory cataloging unit is the point(s) at which a river(s) in a specific USGS sub-region intersects an ecoregion boundary.

Tracking System: To coordinate the timing of activities in different programs, Region IX is planning to develop a computer-

[2] oregions are areas gions) of relative omogeneity in cological systems t are delineated cording to the patial distributions of environmental tors, such as soil pe, vegetation, limate, geology, d physiography.

ized system to track activities that assist in watershed management. The system will track such items as the timing of monitoring, water quality standards revisions, TMDL development, and permit issuances in individual watersheds.

How is the watershed approach being implemented at the local level?

EPA's role in watershed activities ranges from modest support to very active, primary leadership. The role varies among watersheds and often among different segments of a watershed. As explained earlier, the purpose of Regional demonstration projects is to test elements of the watershed protection approach by trying them out. The following discussion highlights the success of various watershed projects in terms of:

- *Organizing*
- *Gaining stakeholder support and involvement*
- *Obtaining funding*
- *Effecting change.*

Organizing

Often, as a first step in organizing a watershed project, some type of mechanism, such as a committee or task force, helps to bring stakeholders together who live, work, plan for, and effect changes within the same watershed. Organizational arrangements range from formal to informal, large to small, depending on the political and physical nature of the watershed. In **Canaan Valley**, for example, a single entity, the Canaan Valley Task Force, develops plans and manages actions. In many watershed projects, especially those associated with the NEP, such as **New York-New Jersey Harbor**, **Santa Monica Bay**, and **Long Island Sound**, a hierarchical committee structure is used to funnel input from technical/scientific and citizen committees into a single decisionmaking body.

Watershed projects create these organizational structures at different times in their planning process. In **Merrimack River** and **Hillsdale Reservoir**, committees were established to attract funding. In **Delaware Bay** and **Lake Roosevelt**, committees were created after leading stakeholders had organized the project and secured funding. These committees serve as a mechanism for gaining technical and public input and sustaining political and public support for the project.

Gaining Stakeholder Support and Involvement

One of the primary cornerstones of the watershed protection approach is stakeholder involvement. Stakeholders include all institutions and people who affect or are affected by the watershed—such as Federal, State, and local government agencies; businesses; environmental organizations; educational institutions; civic groups; elected officials; and individual citizens.

Each project is developing its own tools for gaining stakeholder involvement. One of the greatest success stories is the **Canaan Valley Task Force**, consisting of Federal, State, and local private and public representatives. This task force was charged with resolving issues and ensuring long-term environmental protection, as well as economic growth. The National Environmental Awards Council of Renew America recognized the task force's efforts as a model watershed effort that organized community support to successfully meet current environmental challenges. As the Canaan Valley effort demonstrates, gaining multi-agency consensus on a future direction for watershed protection is important. Another example is the **Truckee River** where two States (California and Nevada), EPA, the Pyramid Lake Paiute Tribe, and local and regional government agencies developed a multi-agency plan, the Truckee River Strategy, to address watershed problems. Although the strategy is currently being implemented, it has been difficult to measure any changes due to a long term drought.

Even though a project may wish to include all stakeholders in the earliest planning stages, this decision can bring difficulties. For example, in **Malibu Creek**, the project has encountered problems in gaining consensus

among local stakeholders regarding a lead organizing entity and a facilitator. Although the project has been extremely successful in obtaining and leveraging funding, some feel that the debate over leadership may impede the success of this effort. Likewise, **Oak Creek Watershed** and **Lake Roosevelt** have found it difficult to convene all of the stakeholders and agree on project phasing.

Projects vary in terms of when they seek the input of all stakeholders. In the early stages of the **Platte River Ecosystem Management Initiative**, participants learned that seeking the input of all stakeholders without having a defined project scope or plan of action was counterproductive. Therefore, the water quality agencies decided to delay involving many other stakeholders until they had completed initial water quality assessments and had drafted preliminary goals, objectives, and operational plans to focus their own activities.

Many projects, especially those associated with the NEP, develop a public outreach strategy for the entire effort that discusses what public outreach tools will be used and how often. For example, the **Casco Bay** strategy includes such public outreach tools as a biannual public forum, a newsletter, slide show, boat tours, and fact sheets. Many projects, such as **Santa Monica, Long Island Sound,** and **Casco Bay**, integrate volunteer monitoring into their activities as another vehicle for public involvement. To organize local stakeholders, **Flint Creek** created a Citizens Committee, an Education and Outreach Committee, and a Farm Operations Committee, and **Hillsdale Reservoir** established an Information and Education Subcommittee. In one of the watersheds that has a large research component, **Waquoit Bay**, the National Estuarine Research Reserve employs a "research translator" to communicate technical information to the general public and local officials through written bulletins, user manuals, and training courses. Some projects also sponsor events for technical input and training. For example, the **Tensas Watershed** has held 3 wetland field days, targeting environmental resource workers in the basin.

A project that gains political support often succeeds in attracting funding and turning plans into actions. **Lake Champlain**, for example, had a long history of political support, dating back to the late 1940s. In 1988, the States of New York and Vermont and the Province of Quebec signed a Memorandum of Understanding regarding the management of the Lake, which subsequently led to the initiation and funding (at a level of $2 million per year) of the Lake Champlain Basin Program by Congress. Although it is often easier to gain political support for such large, multi-agency efforts, the Regions have found larger projects to be more challenging because they require greater time for communication, assessment, and the development of options.

Obtaining Funding

Unlike most new activities, the Watershed Protection Approach has been an experiment using no new funding. Therefore, the achievements listed in this report are especially noteworthy. These projects also demonstrate how Federal environmental programs and funding can be applied in a geographically targeted area to support watershed protection.

Many Regions have been successful in using existing funding sources to finance watershed projects. They have found funding from a variety of Office of Water programs (**Merrimack River, Platte River Basin, Casco Bay**) as well as from other EPA program offices (**Upper Arkansas River**). For more information on EPA funding sources that could be applied to watershed projects, see the appendix. Funding for watershed projects has also been obtained from a variety of other Federal agencies including U.S. Department of Agriculture, U.S. Geological Survey, and U.S. Army Corps of Engineers (**Malibu Creek, Rio Grande River, Hillsdale Reservoir**).

Effecting Change

Very few projects have proceeded to the point of full implementation. Yet several projects have already taken steps that led to environmental improvements. In the **Tangipahoa River Watershed**, fecal coliform levels are beginning to decline with the construction of dairy lagoons. In **Lake Roosevelt**, growing public concerns about metals being discharged from a Canadian firm, Comino Metals, led Environment Canada to conduct bioassays on the slag. Environment Canada found high levels of toxicity. Both Environment Canada and the company responded quickly to accelerate their schedule for on-land disposal of the slag. Later the Lake Roosevelt Council was asked to review the company's recent water discharge permit, and many of the Council's comments were incorporated into the final permit. This increased level of communication demonstrates how new partnerships can bring changes. In the **Long Island Sound Study**, the States of New York and Connecticut have agreed to modify NPDES permits for publicly owned treatment works on or in close proximity to the Sound to "freeze" and in some cases reduce the levels of nitrogen in plant effluent.

What has been learned?

With any new activity, it is worthwhile to periodically assess what lessons have been learned. Many Regions were successful in finding methods for supporting watershed protection efforts within their current framework of programs. Several Regions were able to shift existing staff responsibilities to create watershed coordinator positions. Most Regions found that the job of coordinating a watershed project generally requires full-time involvement and financial resources.

In terms of conducting assessments, Region VIII has learned, through its experience with the watershed inventory and work on watershed initiatives underway, that finding and bringing together information on a specific watershed is a difficult but necessary step in the process of selecting appropriate management actions. The Region has also discovered that a great deal of good information is available but that it is difficult to locate and acquire. At present, the Region has no standardized way of collecting or organizing information along watershed boundaries. Their intent is to have the inventory format provide that framework. If the inventory format is successful, a long-term goal would be to compile this information into a centralized data base or geographic information system that would provide a link between mapped information in the watershed and aquatic resource assessment and management approaches. For individual watersheds, historical and contemporary information would be organized using the watershed as the principal landscape feature and GIS as the storage and integrative management tool. The Interagency Task Force on Monitoring, discussed previously in the EPA's Strategy section, is also working on improving the availability and usefulness of watershed related data.

Some projects have encountered difficulties in linking and preventing overlaps in existing program activities. For example, the **Santa Margarita Watershed** is trying to forge a creative linkage between the permitting, TMDL, and standards activities and the advance wetlands identification process to show the importance of wetlands protection and enhancement, as well as the pollutant assimilative capacity. In the case of **Malibu Creek**, EPA, the Santa Monica Bay Restoration Project, and the Soil Conservation Service are examining the linkage of available hydrologic data and nonpoint source screening models with data from a geographic information system to develop a watershed model.

The **Platte River Ecosystem Management Initiative** learned several lessons regarding project scope. Because several agencies were involved in controversial litigation pertaining to water flow in the river, the Region and the Nebraska Department of Environmental Quality decided to concentrate on water quality issues that could be addressed using a comprehensive ecosystem approach and not to

become embroiled in the quantity controversy. When the effort was initiated, existing responsibilities prevented project staff from devoting the time required for development and coordination of a project of this magnitude. The staff also lacked the resources and skills for data management and analysis using such tools as Geographic Information Systems. These problems were addressed by reprogramming positions to support the project, providing cooperating and training across projects, learning from pilot efforts, and phasing the project. Also, the participants decided to partition the basin into smaller, more manageable segments, rather than addressing the entire river basin as a whole, to achieve real environmental results.

Watershed Projects

This section describes a selection of EPA watershed projects in alphabetical order. The map below provides approximate locations of the projects discussed. Several of the watershed projects encompass more than one EPA Region. EPA is also involved in many other watershed protection projects that are not discussed here.

* *The watershed of these projects encompasses both Regions 1 and 2.*

1. Coos Bay/Coquille River
2. Lake Roosevelt
3. Coeur d'Alene Basin
4. Middle Snake River
5. Truckee River Watershed
6. Morro Bay
7. Malibu Creek
8. Santa Margarita Watershed
9. San Luis Rey River
10. West Maui Watershed
11. Oak Creek Watershed
12. Bear River
13. Clear Creek Watershed
14. Upper Arkansas River
15. Platte River
16. Hillsdale Reservoir
17. Upper Tensas River
18. Lower Mississippi Delta
19. Tangipahoa River Watershed
20. Grand Calumet River
21. Savannah River
22. Flint Creek
23. Upper Tennessee River
24. Pequea and Mill Creeks
25. Canaan Valley
26. Pocono Watershed
27. NY-NJ Harbor
28. Lake Champlain*
29. Long Island Sound*
30. Onondaga Lake
31. Blackstone River
32. Waquoit Bay
33. Merrimack River
34. Casco Bay

Bear Creek Watershed Initiative

Stakeholders

- *Bear Lake Regional Commission*
- *Bear River Resource Conservation and Development Council*
- *Idaho Division of Environmental Quality*
  Idaho Fish and Game Department
- *Local citizen groups*
  Utah Department of Environmental Quality
- *Utah Division of Water Resources*
  Utah Division of Wildlife Resources
- *Utah Power and Light*
- *U.S. Bureau of Land Management*
- *U.S. Bureau of Reclamation*
  U.S. Environmental Protection Agency
- *U.S. Fish and Wildlife Service*
  U.S. Forest Service
  U.S. Soil Conservation Service
  Wyoming Department of Environmental Quality
- *Wyoming Game and Fish Department*

The Bear River is the longest river in the United States, whose flow does not eventually empty into an ocean. It originates in the high Uinta mountains of northeastern Utah. From there, the river follows a rather torturous path flowing first north into southwestern Wyoming, back into Utah, again into Wyoming, and then into Idaho. In Idaho the river is diverted into Bear Lake, and then the water flows or is pumped back into the natural channel north of the Lake through a series of canals. After passing Bear Lake, the river turns south and again flows into Utah where it finally empties into the Great Salt Lake approximately 500 river miles from its headwaters. The 7,600 square mile Bear River basin includes a wide range of physiographic settings, containing portions of four different ecoregions: the Wasatch and Uinta Mountains, the Wyoming Basin, the Middle Rockies, and finally the Northern Basin and Range.

Environmental Threats

The principal environmental stressors in the Bear River Basin are related to agricultural practices. A combination of favorable physiographic and climatic conditions in the basin yields productive irrigated and dry farm croplands, grazing lands, and lands suitable for feedlots and dairy operations. These operations can contribute to both excessive soil erosion, increasing sediment loadings to the river, and high nutrient loadings, principally associated with animal feeding operations and dairies. In the Wyoming portion of the basin, riparian vegetation removal, stream channelization, stream bank modification, and petroleum activities all have an impact on the water resources. Other basin land use practices which affect the river system include logging, oil and gas operations, urbanization, and recreation, especially near the popular Bear Lake area.

Actions

The first stage of the watershed effort was to target the most severe problems based on monitoring information. Using this information, the Little Bear River, one of the major tributaries in the basin was targeted for the initial implementation effort. The State of Utah, the EPA, and the Soil Conservation Service initiated a watershed Hydrological Unit project on the Little Bear, using funds from the U.S. Department of Agriculture and EPA, to restore a section of the Little Bear River. The project includes stream channel and riparian habitat restoration, land management, and animal waste treatment remediation actions. Several additional nonpoint source projects are now underway in Wyoming that are aimed at restoring tributary streams that have been impacted by channelization, stream bank modification, and riparian habitat loss. The unique feature of these projects is that some of the restoration work funded by Wyoming is in Utah, and some of the monitoring effort funded by Utah extends into Wyoming. Here the States have given priority to the watershed boundary and restoration of the resource over strict attention to State boundaries.

These "on-the-ground" demonstration projects are helping to generate enthusiasm for more cooperative efforts. Recently, an interest in increasing the use of the river as a drinking water source for the growing urban population in the lower basin and along the Wasatch Front prompted the Utah Legislature to enact the Bear River Development Act and fund a Bear River water development and management plan. The effort is to address both water development and water quality issues, with a water quality plan that includes a broad-reaching analysis of pollutant loadings to the River as well as chemical, biological, and physical habitat assessments. Building on these efforts and with the support of the three basin States and EPA, the Bear River Resource Conservation and Development Council and the Bear Lake Regional Commission are planning a Bear River Water Quality Symposium in the spring of 1993. The intent is to bring together all of the stakeholders, including governors and congressional delegations, with an interest in the river to seek their input in analyzing the problems and creating solutions.

Blackstone River Initiative

The Blackstone River flows from Worcester, Massachusetts, to the Seekonk River in Pawtucket, Rhode Island. The Blackstone extends 48 miles and drains an area of 540 square miles. The river, which is the second largest freshwater tributary to the Narragansett Bay, is an important natural, recreational, and cultural resource to both the States of Rhode Island and Massachusetts. In 1986, the United States Congress established the Blackstone River Valley National Heritage Corridor along portions of the river in both Massachusetts and Rhode Island.

Environmental Threats

The Blackstone River has had a long history of pollution problems associated with both industrial and municipal discharges. In addition, problems with water withdrawals and heavily contaminated sediments have been identified. The river is considered a significant source of pollutants to the Narragansett Bay.

Actions

Both Massachusetts and Rhode Island have adopted numeric and whole effluent water quality criteria and anti-degradation provisions in their State water quality standards. Strict water quality-based permits have been issued to major wastewater dischargers, and combined sewer overflow strategies are being implemented. The States are conducting a historic analysis of existing water quality data. They are also collecting dry and wet weather data to determine annual weather loads to Narragansett Bay as well as intermediate locations along the river and to identify water quality hot spots to target land use-based best management practices. This information and other data will be used to calibrate a dissolved oxygen model to include impacts from phosphorus and nitrogen and a trace metals model for the development of a Total Maximum Discharge Load and Waste Load Allocation.

In addition, the Massachusetts Executive Office of Environmental Affairs has initiated a technical assistance program that is providing pollution prevention assistance to industries to assist them in reducing the use of toxic materials. The assistance, given by a nonregulatory State office, consists of activities including multimedia evaluations, economic evaluations, the provision of educational materials, the presentation of seminars and workshops, and the identification of alternative chemicals and process technologies.

Stakeholders

- *Commonwealth of Massachusetts*
- *Environmental, recreation, cultural, and watershed organizations*
- *Local governments*
- *Local industries and utilities*
- *New England Interstate Water Pollution Control Commission*
- *State of Rhode Island*
- *U.S. Department of the Interior*
- *U.S. Environmental Protection Agency*
- *U.S. Geological Survey*
- *University of Rhode Island*

Canaan Valley Watershed

The 35,000-acre Canaan Valley in West Virginia, designated as a National Natural Landmark in 1975, encompasses fragile wetlands areas containing a unique and irreplaceable boreal ecosystem. The Blackwater River, originating in the valley's southern end, is an important source of drinking water and the largest stream network in the State with a self-sustaining brown trout population.

Problems

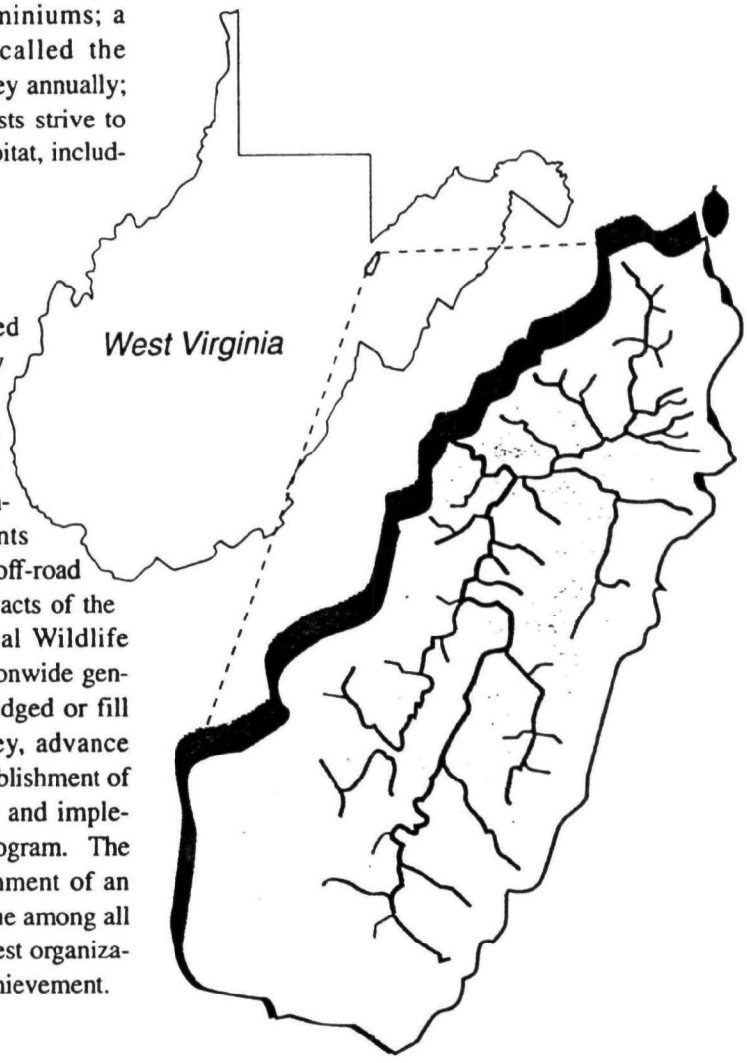
The valley and its resources attract a wide spectrum of interests. For example, a power company proposes flooding 7,000 acres of the valley; real estate developers plan to increase the number of vacation homes, golf courses, ski slopes, and condominiums; a major off-road vehicle race, called the Blackwater 100, is held in the valley annually; and natural resource conservationists strive to protect rare plants, and wildlife habitat, including wetlands.

Actions

In 1990, the partners, listed below, formed the Canaan Valley Task Force to resolve a variety of issues, ensuring long-term environmental protection while allowing reasonable, sustainable economic growth. Early accomplishments include a study of the impacts of off-road vehicles; a study of economic impacts of the proposed Canaan Valley National Wildlife Rufuge; suspension of certain nationwide general permits for discharges of dredged or fill material in wetlands in the valley, advance identification of wetlands, and establishment of a wetlands surveillance program; and implementation of a public outreach program. The residents considered the establishment of an open, effective, and regular dialogue among all levels of government, special interest organizations, and the public to be a key achievement.

Stakeholders

- *Development interest organizations*
- *Environmental organizations*
- *Landowner associations*
- *Recreational interest groups*
- *Tucker County Chamber of Commerce*
- *Tucker County Development Resources Authority*
- *Tucker County Planning Commission*
- *U.S. Army Corp of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Geological Survey*
- *U.S. Soil Conservation Service*
- *West Virginia Division of Natural Resources*



Casco Bay Initiative

Casco Bay lies within the Gulf of Maine, bounded by Cape Elizabeth on the west and Small Point on the east. Currently the most heavily developed bay in northern New England, Casco Bay attracts both business and tourism. Strategically important for commerce since colonial times because of its deep water and protection from open ocean, Casco Bay is still Maine's most important cargo port and fishing center. The bay's rich habitat provides 20 percent of all lobster caught in Maine and supports an abundance of other living resources, including endangered and threatened species. In 1988 alone, estimated tourist sales totaled $236 million.

Environmental Threats

Until the early 1980's, people believed that Casco Bay was pristine. Studies conducted in 1983, however, showed that sediments in Casco Bay were laden with various pollutants, including heavy metals, PCBs, and PAHs. Since then, contamination by pathogens and nutrients has become increasingly evident. Although Casco Bay has not experienced pollution problems to the same degree as other coastal areas of the country, without concerted attention the problems will only grow as continued development in the area adds to pollutant loads.

Actions

When the Casco Bay Initiative began in 1989, one of the State's first actions was to nominate this coastal area to the National Estuary Program, into which it was accepted in 1990. The Initiative is continuing as a separate effort in parallel with the Estuary Program, with the Initiative focusing largely on point source discharges and other areas where EPA's base programs are active.

Since 1989, the State and EPA have identified priority actions each will take under the Initiative over the next few years to address immediate problems. Many of the actions focus on increased enforcement of existing point source control programs by giving special attention to discharge permits, stepping up inspections, and taking aggressive enforcement actions. In addition, the State and municipalities have begun programs for assessing the role of combined sewer overflows (CSOs) and nonpoint sources and for implementing techniques to control the contributions from the most significant sources identified.

As a result, EPA issued permits for the 10 Casco Bay oil terminals on December 24, 1991, with more stringent discharge limits and other requirements. The communities (Portland, South Portland, and Westbrook) in Casco Bay with CSO systems have been put under CSO abatement implementation schedules by EPA and Maine's Department of Environmen-tal Protection (ME DEP). In addition, ME DEP has initiated a major program to address problems associated with groundwater contamination at Casco Bay oil terminals.

EPA continues to review discharge monitoring data from all 49 direct dischargers (9 major and 40 minor), using procedures developed for the monthly retrieval and review of effluent data to allow more rapid identification and response to violations. Enforcement actions are being taken and will continue to be initiated as necessary both by EPA and ME DEP.

Stakeholders

- *Casco Bay National Estuary Program*
- *League of Women Voters of Maine*
- *Maine's Department of Environmental Protection*
- *Town of Freeport*
- *U.S. Environmental Protection Agency*

Clear Creek Watershed Initiative

The headwaters of Clear Creek originate in the high mountains near Colorado's Continental Divide. From there, Clear Creek flows eastward through a spectacular canyon on its way to the South Platte River several thousand feet below. The 400 square mile watershed has considerable topographic relief, and Clear Creek is a swiftly flowing river. It is also a river with considerable annual flow variation. Annual runoff from snow melt occurs during the late spring and early summer, with a peak runoff flow swelling the river to 20 times its normal base flow. Clear Creek flows through portions of two ecoregions: the Southern Rockies and the Western High Plains.

Environmental Threats

The principal environmental stressors in the Clear Creek watershed are associated with past mining practices. Severe water quality problems in the upper reaches of Clear Creek are attributable to the impacts of resource extraction and processing. This region is part of Colorado's mineral belt, and contains rich deposits of ores, including gold, silver, lead, molybdenum, and zinc. The primary sources of surface water quality degradation in this area are acid mine drainage and runoff from tailings and waste-rock piles. Loadings of metals, including zinc, copper, and manganese, from active and abandoned mining sites in the basin contribute to the chronic toxicity problems limiting the river's fishery. Some tributaries to the mainstem of Clear Creek are altogether void of fish populations as a result of acid mine drainage and mining impacts on habitat. Effects are especially significant in and around the Central City mining district. Clear Creek also serves as a drinking water source for valley residents and a significant number of citizens along Colorado's Front Range. As a result, the water quality problems in the upper watershed are of considerable interest and concern to downstream water users.

Occasionally, one of the mine tunnels will produce a blow-out, releasing large quantities of water and sludge in a short period of time. A blow-out from the Argo Tunnel in 1980 focused the EPA's attention on Clear Creek, and it was a significant factor when, three years later, EPA included the Clear Creek/Central City site on the Superfund National Priorities List.

Actions

The Superfund site designations brought a significant EPA presence to the watershed, and the planned Superfund remedial actions will play an important role in the restoration of the river. In addition to Superfund, various regional water programs have been active in the basin for some time; however, there was only limited coordination of program activities. Recognizing the need for a more integrated effort on this important watershed, EPA's Regional office formed the Clear Creek Watershed Initiative Team in late 1991. The Team, which includes representatives from a broad range of EPA programs and the Colorado Health Department, has been meeting with and identifying a whole range of stakeholders throughout the valley. In particular the Team is working closely with Coors Brewing Company, AMAX Mining Company, and Solution Gold Limited, which have emerged as important and active stakeholders in the valley. The Team has established an action plan with short- and long-term goals for watershed restoration.

The Clear Creek Land Conservancy, another important and active stakeholder, in cooperation with a major land holder in the middle basin area, has begun efforts to develop a vision document for the river. Bike trails, foot paths, habitat restoration, and set-aside open space are all components of this vision. In another part of the watershed, two nonpoint

source projects are getting underway; both are being coordinated by the Colorado Division of Minerals and Geology and involve the reclamation of disturbed mining areas. Also, a number of local municipalities are funding a nutrient monitoring program in the watershed.

With funding from EPA, the Colorado Department of Health recently hired a Clear Creek watershed coordinator. The coordinator, who is also a member of the Watershed Initiative Team, will attempt to bring together all stakeholders with an interest in the river to seek their input in analyzing the problems and creating solutions. At present, the coordinator is meeting informally with stakeholders and soliciting ideas on the formation of a watershed council. The purpose of the council would be to foster cooperation, ensure coordination, and implement jointly planned and sponsored river restoration projects.

Stakeholders

- *Adams County*
- *AMAX*
- *Canyon Defense Coalition*
- *Center for Resource Management*
- *City of Brighton*
- *City of Empire*
- *City of Golden*
- *City of Thorton*
- *City of Westminster*
- *Clear Creek County*
- *Clear Creek Metal Mining Association*
- *Clear Creek Land Conservancy*
- *Colorado Department of Health*
- *Colorado Department of Natural Resources*
- *Colorado Department of Transportation*
- *Colorado Division of Minerals and Geology*
- *Colorado Division of Wildlife*
- *Colorado School of Mines*
- *Coors*
- *Denver Regional Council of Governments*
- *Jefferson County*
- *National Park Service*
- *Protect Apex Valley Environment*
- *Sierra Club*
- *Solution Gold Limited*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S. Forest Service*

Coeur D'Alene Basin Restoration Project

Stakeholders

- *Agricultural interests*
- *Benewah County*
- *Coeur d'Alene Basin Interagency Group*
- *Coeur d'Alene Tribe*
- *Idaho Department of Environmental Quality*
- *Idaho Department of Land Management*
- *Idaho Department of Water Resources*
- *Idaho Fish and Game*
- *Kootenai County*
- *Kootenai Environmental Alliance*
- *Local citizens*
- *Mining interest*
- *Panhandle Health District*
- *Shoshone County*
- *Three soil conservation districts*
- *Timber interests*
- *U.S. Bureau of Indian Affairs*
- *U.S. Bureau of Land Management*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Forest Service*
- *U.S. Geological Survey*
- *U.S. Soil Conservation Service*
- *University of Idaho*

The Coeur d'Alene Basin (3,700 square miles) includes Coeur d'Alene Lake, the Coeur d'Alene River and its North and South Forks, the St. Joe River, the St. Maries River, the Spokane River, and the Spokane-Rathdrum Prairie Aquifer, which underlies Eastern Washington and Northern Idaho. It has been estimated that one-third of the Spokane-Rathdrum Prairie Aquifer (a regional sole source aquifer to an estimated population of 400,000) is recharged by Coeur d'Alene Lake and the Spokane River, which originates from the lake.

Environmental Threats

As a result of more than 100 years of metals production, the Coeur d'Alene River and Lake system has been adversely affected by heavy metals contamination. The South Fork Coeur d'Alene River is currently listed as water quality limited as a result of metal point and nonpoint source loadings. The South Fork Coeur d'Alene River is the most contaminated stretch of river in EPA's Region X. It includes the Bunker Hill Superfund Site, as well as a Federal facility Superfund docket site. In addition to metal loadings, the lake suffers significantly from nutrient enrichment (eutrophication) that potentially threatens the quality of the drinking water from the aquifer.

Actions

Since the South Fork of the Coeur d'Alene River was identified as a water quality limited segment, the State of Idaho must develop a Total Maximum Daily Load for both the point sources and nonpoint sources in the basin. Another factor that led to action is the Bunker Hill Superfund Site that sits astride a 7-mile stretch of the South Fork Coeur d'Alene River and is one of the major contributors to the river's problems. Contamination at the Bunker Hill Site is being addressed through the Superfund remedial action process. The remedial actions implemented and resulting monitoring data will provide information that can help evaluate cleanup strategies and supplement the Total Maximum Daily Load. Further information will also be gathered because another potential National Priority List site, a Federal facility owned by the Bureau of Land Management, is located on the Lower Coeur d'Alene River downstream from Bunker Hill. Since the solution to the basin's vast environmental problems does not lie within the jurisdiction of any one agency, the Coeur d'Alene Basin Restoration Project was developed to coordinate all basin restoration activities.

To effect the long-term restoration of the basin, a reorganization of the pre-existing Basin Restoration Project has occurred. This reorganization combines the efforts of the three sovereign governments (Federal, State, and Tribal) in an attempt to cooperatively direct the activities of the Restoration Project. The reorganization of the Project currently includes a new Steering Committee whose primary roles are the oversight of the basin restoration and the development of policies regarding basin restoration activities, a Management Advisory Committee, the Coeur D'Alene Basin Interagency Group, a Citizens Advisory Committee, and a Coeur D'Alene Project Office.

The complexity of this problem has required the development of a long-term, basin-wide, multimedia strategy. The goals for the Coeur d'Alene Basin Restoration project are the following:

- *Metals containment through nutrient management (Water Quality Management Plan) to control eutrophication of Coeur d'Alene Lake*
- *Metals source reduction through the Total Maximum Daily Load process to control point and nonpoint sources of water pollution*
- *Superfund program long-term activities (remediations)*
- *Superfund program short-term actions (removals)*
- *Management of other environmental and human health problems affecting the streams, lakes, rivers, and ground water of the Coeur d'Alene Basin (Coeur d'Alene Basin Management Program).*

Coos Bay/Coquille River Basins

The Coos Bay/Coquille River Basins are adjacent to the southern part of the Oregon coast. These watersheds drain the coast mountain range, which drops from about 4,000 feet in elevation to sea level over a distance of about 45 miles. The annual average precipitation ranges from 60 to 100 inches. The upper watersheds are steep, and land use here is dominated by commercial forest activities (85 percent of the upper watersheds). The valley floodplains are flat, long, and narrow. The land use here is dominated by agriculture, predominantly dairy cattle. The relatively short rivers and streams are highly valued as salmon and trout habitat. The estuaries provide highly productive shellfish beds.

Environmental Threats

Forestry practices have filled salmonid spawning gravel areas with sediment. Cattle management practices have allowed cattle to overgraze/strip the riparian corridors, causing widespread bank erosion and severely elevated water temperatures. Increased water temperatures can significantly reduce the survival of juvenile salmon. Cattle management practices have also contributed extremely high bacteria loadings to the streams. These loadings have either resulted in or threaten closure of commercial shellfish beds.

Extensive diking and water management structures prevent young salmon from accessing wetland habitats. These fringing wetlands would normally allow juvenile salmon to avoid the high river flows during winter months. Without these off-channel habitats, juvenile salmon are prematurely flushed out of the river and stream channels, resulting in high mortalities.

Limited toxics data in the estuary indicated some potentially serious toxics problems that had not been adequately characterized or incorporated into agency work plans.

Actions

State and local interests have recognized the problems described above for some time. In many instances, individual actions had already been planned or initiated, but the level of effort and necessary teamwork was not nearly adequate to address the magnitude of the problem. EPA's Near Coastal Waters program approached the lead State agencies to attempt a more integrated watershed approach in a coastal area where it was thought a difference could be made and some new working relationships could be tested.

Stakeholders

- *County Department of Economic Development*
- *Local drainage district*
- *Oregon Department of Agriculture*
- *Oregon Department of Environmental Quality*
- *Oregon Department of Fish and Wildlife*
- *Oregon Department of Forestry*
- *Soil Conservation District*
- *U.S. Environmental Protection Agency*

Flint Creek Project

The headwaters of Flint Creek begin in the Sand Mountain Plateau and flow in a northerly direction across Morgan County, Alabama, to the confluence with the Tennessee River and Wheeler Reservoir. The lower portion of the creek is rather sluggish and meanders through tree-lined riparian areas, ranches, and other agricultural lands. The watershed encompasses approximately 300,000 acres, and the Tennessee Valley Authority owns much of the stream side land in the lower reach. Cotton production was a major crop from the turn of the century until the 1960's; this activity brought erosion and fish kills from pesticides. Now much of the area is used for pasture and hay production.

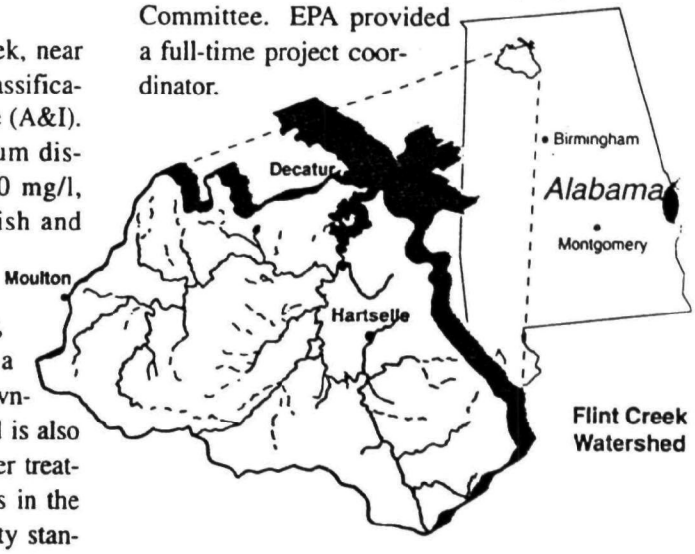
Environmental Threats

A 10-mile section of Flint Creek, near Hartselle, has an Alabama stream classification for Agricultural and Industrial Use (A&I). This classification carries a minimum dissolved oxygen concentration of 3.0 mg/l, which is not adequate to support fish and wildlife. The City of Hartselle plans to connect to the Decatur water system within the next 2 years; however, Flint Creek is certainly questionable as a safe source since it is immediately downstream of the A&I classified reach and is also downstream of the Hartselle wastewater treatment plant discharge. Bacterial levels in the em-bayment exceed State water quality standards after rainfall events. The status of the fishery in the embayment has not been determined, but dissolved oxygen levels in portions of Flint Creek are well below those needed to maintain a good fishery. These water quality problems also affect the Point Mallard recreational area located on the Flint Creek embayment, which is heavily used for onshore activities as well as water contact sports.

Actions

The major objective of the project is to improve water quality so that the stream classification can be raised. EPA was interested in working on embayment modeling and approached the Alabama Department of Environmental Management and the Tennessee Valley Authority (TVA) to seek their interest in this project. Several successful cooperative projects had been completed in this area in the past few years so there were very good working relationships with Federal, State, and local organizations. Also, the watershed was relatively small and had identifiable water quality problems that could be corrected.

An organizational meeting was held in April 1992 with many of the interested Federal and State agencies to set up a structure for the project. The group estalished a Steering Commit-tee, with representatives from several of the key agencies and organizations to provide overall guidance for the project, and four other committees to perform specific functions: the Technical Committee, Citizens Committee, Education and Outreach Committee, and Farm and Forestry Operations Committee. EPA provided a full-time project coordinator.



The approach is to identify all activities in the watershed that produce water quality problems and to implement corrective actions.

TVA is providing aerial photography with interpretation for the whole watershed. They have also developed a base map for the project. EPA and the Alabama Department of Environmental Management are monitoring water quality. The Soil Conservation Service and the Agricultural Stabilization and Conservation Service have contributed tours and reports. The U.S. Geological Survey has reactivated two stream gauging stations and is providing data. Other agencies and organizations have contributed considerable staff time.

Stakeholders

- *Alabama Cooperative Extension Service*
- *Alabama Department of Agriculture and Industries*
- *Alabama Department of Environmental Management*
- *Alabama Department of Public Health*
- *Alabama Forestry Comm.*
- *Alabama Geological Survey*
- *Alabama Soil and Water Conservation Committee*
- *Morgan County Sheriff Department (Litter Control Officer)*
- *Morgan, Lawrence, and Collman County Soil and Water Conservation District*
- *Tennessee Valley Authority*
- *Tennessee Valley Resource Conservation and Development Board*
- *U.S. Depart. of Agriculture*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Geological Survey*

Grand Calumet River/Indiana Harbor Ship Canal

In the northwest corner of Indiana, efforts are underway to reduce the enormous amounts of toxic and conventional pollutants entering southern Lake Michigan. Southern Lake Michigan serves as the primary drinking water supply for over 6 million people.

Environmental Threats

The principle source of pollutants to southern Lake Michigan is the Grand Calumet River/Indiana Harbor Ship Canal (Grand Cal). The river and canal are less than 20 miles long, yet sends over 1 billion gallons a day of treated wastewater to Lake Michigan. In addition, the small watershed of Grand Cal has a population of approximately 300,000. It contaihs over 25 percent of the total steel making capacity of the country, supports one of the largest oil refining facilities in the U.S., has an estimated 50 million gallons of petroleum distillate floating on top of the ground water, and sends an estimated 150,000 cubic yards of grossly contaminated sediments into Lake Michigan annually.

Actions

Developed in September 1990, the Northwest Indiana Action Plan currently guides EPA and the Indiana Department of Environmental Management. Its objectives are:

1) *Ensure the dredging of Federal Channel in the Indiana Harbor Canal, and where possible, other sediments in the Grand Calumet River*

2) *Achieve a high level of compliance (90 percent or greater) with all Federal environmental statutes*

3) *Assess and initiate remediation of millions of gallons of petroleum distillate currently floating on top of the ground water*

4) *Launch a broad pollution prevention initiative with local industries and municipalities as a supplement to Federal enforcement*

5) *Meet the requirements of the Great Lakes Water Quality Agreement between the United States and Canada by preparing a Remedial Action Plan for the Grand Cal, and by developing a Lakewide Management Plan for Lake Michigan*

6) *Integrate an aggressive environmental communications component into each aspect of the Plan.*

Enforcement actions to date include:

United States Steel-Gary Works, $34.2 million settlement for violations of the Clean Water Act includes $7.5 million in sediment characterization and remediation of the Grand Calumet River

City of Gary Sanitary District, multi-million dollar settlement for Clean Water and Toxic Substances Control Act violations includes $1.7 million for sediment remediation and the containment of 60,000 pounds of PCBs.

In addition, EPA and the Army Corps of Engineers developed a Memorandum of Agreement to enable them to safely dredge and dispose of 1.2 million cubic yards of contaminated sediments from the Federal navigation channel of the Indiana Harbor and Ship Canal. Pollution prevention elements are being included in all consent decrees and settlements obtained in Northwest Indiana. EPA and Indiana hosted workshops on sediments, the new Clean Air Act, and the Action Plan as well as a pollution prevention symposium for the iron and steel industry. And, they completed a nonpoint source assessment and plan for the area, including the development of a digitized land use mapping system.

Stakeholders

- *Indiana Department Environmental Management*
- *Indiana Department Natural Resources*
- *Indiana Office of the Attorney General*
- *U.S. Army Corps of Engineers*
- *U.S. Coast Guard*
- *U.S. Department of Justice*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Soil Conservation Service*

Hillsdale Reservoir Watershed Project

The Hillsdale Reservoir is located in Northern Miami County, Kansas. Land uses for this area, which comprises gently rolling hills, include pasture, row crops, woodland, and pockets of urban development (Kansas City). Land prices have increased to a point where farming is no longer profitable for new operators, and the average farm size is shrinking. The State of Kansas owns the marketing rights to water in the reservoir and wants to protect the future quality of that resource. Many local citizens wish to preserve the water quality of the reservoir for the enhancement of their community.

Environmental Threats

The primary threat to the reservoir is phosphorus loading. Studies indicate that the current loading rate will eventually push the water body into a hyper-eutrophic state. Both point sources and confined livestock operations have been identified as the chief sources of phosphorus loading.

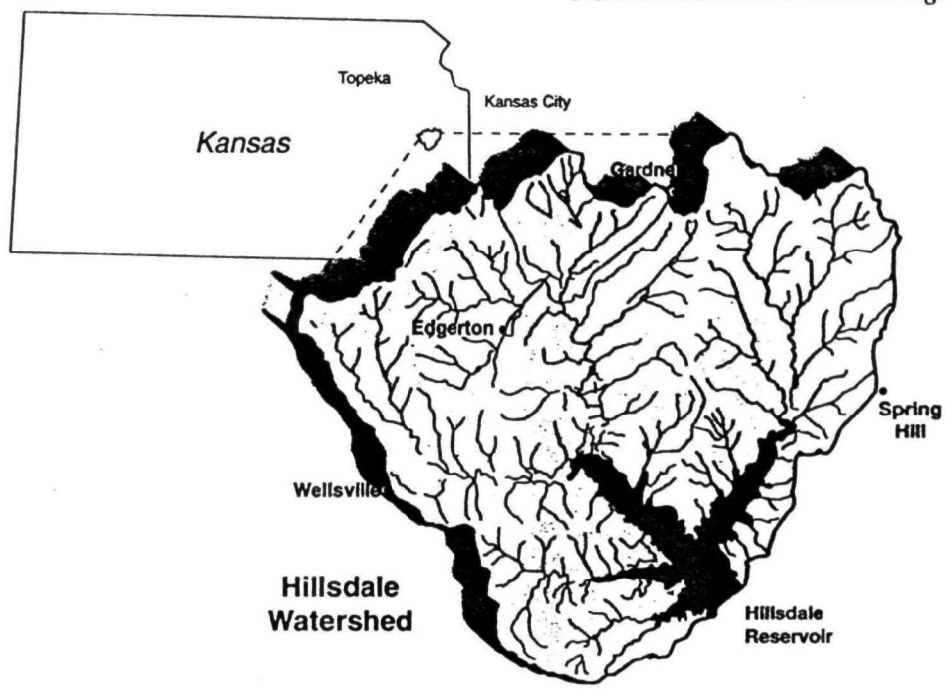
Actions

The catalyst that led to the awareness of the watershed's problems and to action being undertaken was a study initiated by the Johnson County sewer authority to assess the impact of a controversial point source.

The Hillsdale Reservoir Watershed Project began in 1992, and a strategy for improving water quality is still being developed. Activities for the immediate future include continuing to develop the necessary agreements to manage the project and continuing to develop the watershed committee and its sub-committees, to evaluate the sources of phosphorus in the watershed, to develop a successful source reduction management system, and to initiate a 5-year nonpoint source demonstration project.

Stakeholders

- *Hillsdale Reservoir Watershed Committee*
- *Johnson County*
- *Kansas Conservation Commission*
- *Kansas Department of Health and Environment*
- *Kansas Department of Wildlife and Parks*
- *Kansas Water Office*
- *Miami County*
- *Public interest groups*
- *U.S. Army Corps of Engineers*
- *U.S. Department of Agriculture*
- *U.S. Environmental Protection Agency*



Lake Champlain Basin Initiative

Lake Champlain is 120 miles long, is 12 miles at its widest point, and has a mean depth of 64 feet, although some areas exceed 400 feet. The watershed comprises 8,234 square miles that lie in Vermont, New York, and the Province of Quebec. More than 50,000 acres of wetlands adjacent to the lake and its tributaries depend on the lake's water level. Much of the landscape consists of agriculture and forested land.

Environmental Threats

Eutrophication, resulting from both point and nonpoint sources, is a threat to water quality, resulting in increased plant growth and algae blooms in many of the lake's bays. The phosphorous levels in several parts of the lake meet or exceed the highest levels found in the Great Lakes in the 1970's. Ten years of extensive monitoring associated with agricultural best management practice implementation in two watersheds has not shown a significant reduction in phosphorus loads to the lake. The presence of toxic substances is also a concern. Preliminary data finds localized presence of toxic substances, particularly in the more developed areas of Burlington and Plattsburgh, as well as a more wide presence of other pollutants. It is possible that these substances may originate from an airborne source. Nuisance aquatic flora and fauna threaten the integrity of the ecosystem.

Actions

There has been a long history of lake protection and planning efforts. The first formal interstate initiative was in 1949, and since then there have been numerous efforts to bring the States and the Province of Quebec together to focus on lake management issues The most recent was the Level B Study sponsored by the New England River Basin Commission in 1979. This was followed by the 1988 signing of a Memorandum of Understanding for Cooperative Environmental Management of Lake Champlain among New York, Vermont, and Quebec. It was renewed in 1992. This memorandum created Citizen Advisory Committees to advise each of the three governments on issues of importance to the public.

The Lake Champlain Basin Program was initiated in 1991 in response to the passage of the Lake Champlain Special Designation Act of 1990 by Congress. The program brings together 31 individuals representing a wide range of interests in both New York and Vermont to develop a Pollution Prevention, Control and Restoration Plan. Although funding is authorized for 5 years, the plan must be completed within 3 years. Funds are being used for research and characterization, demonstrations, monitoring, planning, and public education. Examples include research on toxic substances in sediment, nutrient loading from nonpoint sources with a special focus on agriculture, as well as demonstration projects to prevent the introduction of non-native species, to control water chestnuts, and to implement agricultural best management practices.

Stakeholders

- *Academics*
- *Agricultural representatives - Soil and Water Conservation Districts, Farm Bureau, farmers*
- *Business Interests*
- *Educators*
- *Lake Champlain Fish and Wildlife Management Cooperative*
- *Lake Champlain Committee*
- *Lake Champlain Maritime Museum*
- *Lake Champlain Research Consortium*
- *Local governments*
- *Local residents*
- *National Oceanic and Atmospheric Administration*
- *National Park Service*
- *New York State agencies*
- *River associations*
- *State elected officials*
- *U.S. Agricultural Stabilization and Conservation Service*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Geological Survey*
- *U.S. Soil Conservation Service*
- *Vermont and New York Citizen Advisory Committees*
- *Vermont State agencies*

Lake Roosevelt Initiative

Franklin D. Roosevelt Lake (Lake Roosevelt), the reservoir behind Grand Coulee Dam on the Columbia River in north-central Washington, is the largest reservoir in Washington. Lake Roosevelt extends over 151 miles, almost reaching the Canadian border, and has a surface area of about 80,000 acres (125 square miles). Besides the main-stem Columbia, five other rivers flow into the lake: the Sanpoil River, the Spokane River, the Colville River, the Kettle River, and the Pend Oreille River. Upstream flow on the main stem is regulated by nine major reservoirs and numerous smaller reservoirs and power plants. Outflow is through Grand Coulee Dam or is pumped from the lake into a feeder canal for irrigation storage in Banks Lake. The U.S. Bureau of Reclamation controls the lake elevation for power generation, irrigation, fisheries, flood control, and other uses.

Lake Roosevelt provides extensive recreational opportunities and associated economic benefits to residents of and visitors to the inland Northwest. It is included in the Coulee Dam National Recreation Area, administered by the National Park Service, which attracts more than 1 million visitors to its many campgrounds, picnic areas, and boat launches each year. Many more use the privately operated resort and access facilities. Lake Roosevelt also provides the Colville and Spokane Indian Tribes with significant economic opportunities. The tribes (whose reservations also border a portion of the shoreline) operate houseboat rentals, marinas, and resorts.

Environmental Threats

Whole fish near the Grand Coulee Dam were analyzed for zinc, copper, lead, arsenic, selenium, cadmium, and mercury as part of the National Contaminant Biomonitoring Program of the U.S. Fish and Wildlife Service. Cadmium and lead exceeded the 85th percentile for two collections during 1978-81; cadmium concentrations were the highest of 112 stations sampled nationwide. Similar studies conducted by the Washington State Department of Ecology (Ecology) in 1986 also showed concentrations of metals (zinc, copper, and lead) in fish tissues and sediments increasing as samples were taken upstream toward the U.S.-Canadian border. In that same year, Ecology also reported metals contamination of lake sediments. Sediments in the upper reaches of the lake were found to contain larger concentrations of iron, manganese, copper, zinc, and arsenic than most tributaries to the lake or to Lower Arrow Lake in Canada. Elevated concentrations of lead, cadmium, and mercury occurred in the lower reaches of the lake in association with finer-grained sediment.

Contamination is not limited to metals. In recent years, concerns have been raised about the existence of chlorinated dioxin and furan compounds that have been found in fish tissue by Ecology. In some cases, a health advisory for limiting the consumption of fish has been issued.

Contamination by metals, chlorinated organic compounds, and phosphorus is suspected to originate from point source discharges from a complex of Canadian industries situated along the Columbia River in the province of British Columbia just north of the U.S. border. Phosphorus is also discharged to the river in British Columbia by a fertilizer plant operation. Nuisance algal mats in Lake Roosevelt may be related to large phosphorus loads to the lake.

Actions

The findings of metals and dioxin contamination in sediment and fish, followed by the fish consumption advisories, led local U.S. citizens to press Congress to appropriate $500,000 to EPA to develop a water quality management plan for the lake. Along with citizens' concerns were related scientific concerns. Although studies have been conducted in the past, there has been no comprehensive or integrated assessment of the extent and significance of toxic chemical or nutrient contamination of Lake Roosevelt on which to base sound water quality management decisions.

In August 1991, the EPA office in Seattle and Ecology brought together interested groups and agencies in the Lake Roosevelt community to create the Lake Roosevelt Water Quality Council. The Council is guiding a study that is assessing the water quality of the lake and should lead to recommended strategies for improved protection. The final product will be a comprehensive water quality management plan for Lake Roosevelt.

The Council comprises a Management Committee and a Technical Advisory Committee. Since October 1992, the following organizations, as well as several private citizens, have been represented on the Lake Roosevelt Water Quality Council.

Stakeholders

- *Boise Cascade, Kettle Falls*
- *British Columbia Ministry of the Environment*
- *Citizens for a Clean Columbia*
- *Colville Confederated Tribes*
- *Douglas County Commission*
- *Environment Canada*
- *Ferry County Commission*
- *Grant County Commission*
- *Lake Roosevelt Coordinating Committee*
- *Lake Roosevelt Forum*
- *Lake Roosevelt Property Owners Association*
- *Lincoln County Commission*
- *National Park Service*
- *Okanogan County Commission*
- *Pend Oreille County Commission*
- *Spokane Tribe*
- *Stevens County Commission*
- *Stevens County Grange*
- *Tri-County Health Department*
- *Upper Columbia River Counties*
- *Upper Columbia United Tribes*
- *U.S. Bureau of Reclamation*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Geological Survey*
- *WA Association of Wheat Growers*
- *WA Department of Community Development*
- *WA Department of Ecology*
- *WA Department of Health*
- *WA Department of Wildlife*
- *WA Rural Organizing Project*
- *WA Water Research Center*

Long Island Sound Study

Long Island Sound, bordered on the north by Connecticut and on the south by Long Island, New York, lies within the most densely populated region of the United States. The Sound, 110 miles long, stretches westward from the Race to the East River. Characterized by the nearly unbroken chain of urban centers, including the country's largest city, New York City, the region's central economic and population focus lies adjacent to the Sound. More than 14.5 million people live in counties directly bordering the Sound.

The Long Island Sound watershed drains an area of more than 16,000 square miles. It encompasses virtually the entire State of Connecticut, portions of Massachusetts, New Hampshire, and Vermont, a small area in Canada at the source of the Connecticut River, portions of New York City, and Westchester, Nassau, and Suffolk Counties in New York State. With such an extensive drainage basin, management attention must begin in those areas most directly impacting water quality in the Sound. As a result, the specific area included in the Long Island Sound Study is smaller than the total drainage basin, focusing on the watershed within the States of Connecticut and New York.

Environmental Threats

Hypoxia, or low levels of dissolved oxygen in the water, is the primary concern in Long Island Sound. Nitrogen emanating from sewage treatment plants, stormwater runoff, and atmospheric deposition has been identified as the major cause of hypoxia in the Sound. Other concerns include floatable debris; toxic and pathogen contamination of sediment, shellfish, and fish; habitat loss and degradation; stormwater runoff; and atmospheric deposition.

Actions

The Long Island Sound Study (LISS) began in 1985 when Congress asked EPA, in cooperation with the States of Connecticut and New York, to sponsor a study of the estuary. LISS officially became part of the National Estuary Program in 1987 The goal of the Long Island Sound Study (LISS) is to prepare a Comprehensive Conservation and Management Plan (CCMP) for the cleanup of Long Island Sound. The plan to clean up the Sound is being developed under the auspices of the LISS Management Conference, a group representing Federal, State, local, public and private interests in the Sound. To control nutrients, the conference is completing a water quality-hydrodynamic mathematical model, modifying municipal sewage treatment plant permits to "freeze" or reduce nitrogen loadings from plant effluent, developing specific nonpoint source control actions to freeze nitrogen loadings, identifying cost-effective in-Sound nitrogen reduction actions, and developing additional actions to meet the ecological goal throughout the continued planning process. Measures to control toxic metals in the western Sound and in selected harbors will be developed as appropriate, and specific commitments to reduce or eliminate pathogens and floatables will also be developed. As part of their long-range planning efforts, the Conference will prepare a site-specific habitat management strategy, a description of critical coastal habitats for mapping on a Geographic Information System, and a report on land use and overall watershed development containing recommendations on nonpoint and habitat initiatives.

Although these plans are being developed by the LISS Management Conference, implementation will involve the targeted use of existing water quality programs, within the geographic confines of the Sound. For example, through implementation of the NPDES program, municipal permits for plants on Long Island Sound are in the process of being modified to freeze and, in some cases, reduce the nitrogen loadings to the Sound. An additional reduction may be warranted when the final nutrient model runs are completed. EPA is studying the feasibility of point/nonpoint source "bubbles" to control nitrogen discharges in the Connecticut and New York State portions of the Sound's watershed. A statewide antidegradation policy, focusing on persistent bioaccumulative chemicals of concern, will be developed and implemented in New York. EPA will work to develop and implement,

Lower Mississippi Delta Initiative

The Delta area covers 219 counties in seven states (Arizona, Illinois, Kentucky, Louisiana, Missouri, Mississippi, and Tennessee). The Mississippi River remains one of the most significant transportation arteries in the world.

Environmental Threats

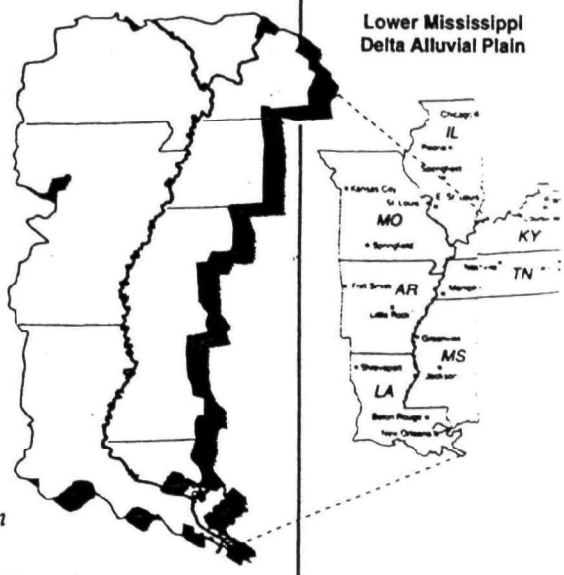
Nonpoint source pollution, wetlands loss, industrial/municipal contamination, and toxic substances are major environmental threats of concern in the Delta Region. Over the last century, the Delta has undergone extensive hydrological modifications to accommodate agricultural activities on this area's rich soil. These modifications and other human uses of the area resulted in a decrease in bottomland hardwoods (21 million acres to 4.5 million acres fragmented throughout the Delta), as well as habitat for countless species of waterfowl, neotropical birds, game and nongame animals (including the endangered Louisiana black bear). The area once served as a rich commercial/recreational fishery.

Actions

Government officials joined forces with agricultural community to conduct reforestation activities. Reforestation will replace wildlife habitat, increase forest production, and reduce nonpoint water quality problems. The project will have an important role in addressing regional economic diversity and environmental equity issues.

Stakeholders

- *Academic organizations*
- *Agricenter International*
- *Agricultural industry/organizations*
- *All interests related to water/habitat quality within Gulf of Mexico*
- *Conservation organizations*
- *Cultural heritage organizations*
- *Delta Center*
- *Farm Bureau*
- *Fish producers/fishermen*
- *Forest industry*
- *Local, State and Federal Agencies*
- *Municipalities*
- *Navigation interests*
- *Other industry*
- *Public: Farm and non-farm*
- *Recreational/tourism industry*
- *U.S. Environmental Protection Agency*



Long Island, continued — through permit modifications and enforcement actions, a comprehensive abatement program for combined sewer overflow systems in New York City. EPA and the States will develop enforceable instruments to regulate stormwater along tributaries of the Sound, and develop nonpoint source best management practices to incorporate into these stormwater controls. The beach closure/shellfish bed action plan will continue to be implemented. Finally, EPA will develop a Memorandum of Understanding with the National Oceanic and Atmospheric Administration, the State environmental agencies, and the coastal zone management agencies to effectively implement Section 6217 of the Coastal Zone Act.

Stakeholders

- *Citizen groups*
- *Connecticut Department of Environmental Protection*
- *Interstate Sanitation Commission*
- *Local governments*
- *National Oceanic and Atmospheric Administration*
- *New York State Department of Environmental Conservation*
- *New York City Department of Environmental Protection*
- *Scientific and academic community*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Geological Survey*

Malibu Creek Watershed Protection Project

The Malibu Creek Watershed spans approximately 150 square miles near Los Angeles, California. The watershed features a perennial coastal creek that flows to a valuable ocean lagoon. The watershed supports a natural steel head run and habitat for several endangered species of birds. Primary land use is currently rangeland, although the upper watershed and the area surrounding the lagoon are undergoing rapid suburban development.

Environmental Threats

The water quality and habitat within the watershed are threatened by sediments, nutrients, and toxics loadings; urban runoff both in the upper parts of the watershed and in the Malibu Lagoon coastal area; agricultural runoff from livestock facilities; and a wastewater discharge.

Actions

Efforts to protect this watershed began when the Santa Monica Bay Restoration Project, the local National Estuary Program, identified the watershed as a key contributor to pollution of the Bay from sediments. These efforts were augmented by the local Resource Conservation District, which requested and received watershed planning assistance through the U.S. Department of Agriculture's Small Watershed Program, and by the State, which targeted the lagoon for early action in developing Total Maximum Daily Loads and Waste Load Allocations, because the lagoon is not meeting State water quality standards. EPA provides a Near Coastal Waters grant for restoration activities and communication among several of the participants listed below. The Agency also provides technical support in selecting an appropriate watershed model and in developing a watershed monitoring plan. In the future, EPA will work with State and local stakeholders to identify funds for implementing controls necessary for protecting the watershed.

Stakeholders

- *California Regional Water Quality Control Board*
- *Coastal Conservancy*
- *Local dischargers and developers*
- *Local Resource Conservation District*
- *Municipal governments*
- *Santa Monica Bay Restoration Project*
- *Surfriders Foundation*
- *U.S. Department of Agriculture*
- *U.S. Environmental Protection Agency*
- *Ventura and Los Angeles Counties*

Merrimack River Initiative

The Merrimack River watershed extends from the White Mountains in northern New Hampshire through Massachusetts and into the Atlantic Ocean. Although the river is only 118 miles long, its watershed covers 5,010 square miles, of which the last 22 miles are tidal. The river provides drinking water for more than 300,000 people, water for industrial and agricultural uses, and hydropower. Many people use the river and its shores for relaxation and recreation.

Environmental Threats

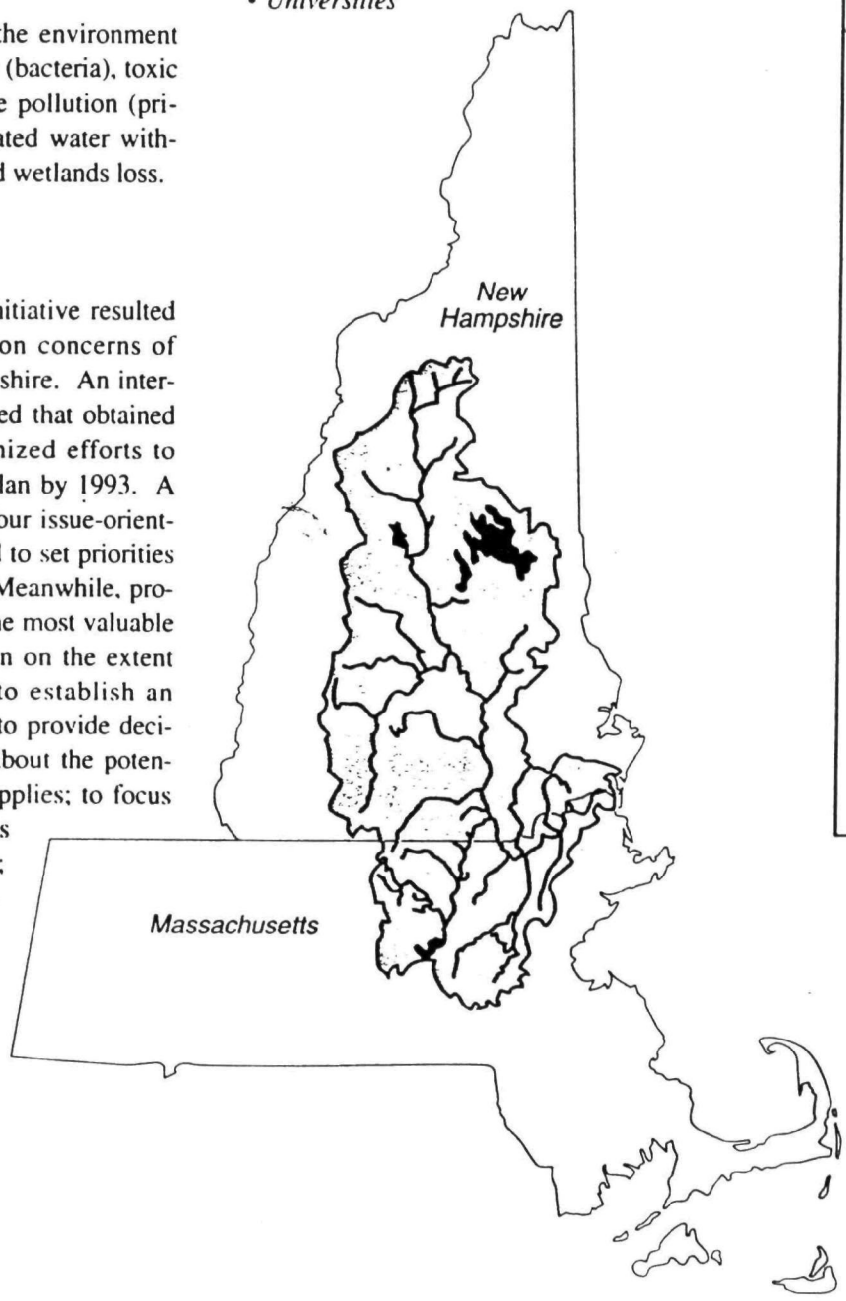
The primary threats to the environment are combined sewer overflows (bacteria), toxic contaminants, nonpoint source pollution (primarily urban runoff), unregulated water withdrawals, land development, and wetlands loss.

Actions

The Merrimack River Initiative resulted from interstate water pollution concerns of Massachusetts and New Hampshire. An interstate working group was formed that obtained funding from EPA and organized efforts to develop a draft management plan by 1993. A Management Committee and four issue-oriented subcommittees were created to set priorities and make funding decisions. Meanwhile, projects are underway to protect the most valuable areas by providing information on the extent and condition of wetlands; to establish an emergency response network; to provide decisionmakers with information about the potential contamination of water supplies; to focus regulatory activities (such as inspections and permitting); and to assist industrial pollution prevention. A Merrimack watershed management conference is planned in June of 1993.

Stakeholders

- *Agricultural, environmental, recreational, and watershed organizations*
- *Commonwealth of Massachusetts*
- *Local governments, industries, and utilities*
- *New England Interstate Water Pollution Control Commission*
- *Regional planning agencies*
- *State of New Hampshire*
- *U.S. Environmental Protection Agency*
- *U.S. Department of the Interior*
- *U.S. Department of Agriculture*
- *U.S. Fish and Wildlife Service*
- *Universities*



Middle Snake River

The Middle Snake River watershed is dominated by semiarid land on the Snake River Plain in south-central Idaho, characterized by a mosaic of irrigated croplands and open shrub/grasslands. The major feature of the watershed is the basalt canyon containing the Snake River and the extensive spring system discharging approximately 6,000 cubic feet of ground water per second to the river.

Environmental Threats

The major environmental threats to the area are water quality and aquatic ecosystem degradation due to upstream water withdrawals, return flows from approximately 930,000 acres of irrigated agriculture, runoff from dairies and feedlots, effluent from 110 fish hatcheries, hydroelectric development, discharges from sewage treatment plants, and riparian/wetland habitat degradation. The water quality parameters of concern include nutrients, dissolved oxygen, temperature, and ammonia. The biological resources of concern include five species of mollusks listed as endangered or threatened species, wintering populations of bald eagles, resident trout and sturgeon populations, populations of herons and other wading birds, wintering waterfowl, and riparian habitat. The recreational resources of concern include whitewater boating, fishing, and unique aesthetic values.

Actions

Obvious violations of water quality standards, as evidenced by excessive weed growth in the river, along with the continued threats to the river led various agencies and the public to take action. By 1988 EPA became concerned about cumulative impacts to the Middle Snake River from existing and proposed hydroelectric projects. EPA did not believe that the regulatory agencies responsible for licensing and permitting these facilities were adequately evaluating cumulative impacts. As a result, EPA initiated an ecological risk analysis of this reach of the Snake River. This analysis is utilizing both measurements and models to estimate the likelihood of deleterious changes in the river- [illegible]. The effort will form the scientific basis for assessing the ecological risk to the aquatic ecosystem from various development and management options in the Middle Snake River.

During this same time, the State of Idaho determined that a portion of the Middle Snake was not currently meeting water quality standards despite the presence of water pollution control measures. Consequently, in 1990 the State designated portions of the Middle Snake River as water quality- limited, a designation which requires the establishment of a Total Maximum Daily Load. In response to the listing of portions of the Middle Snake River as water quality-limited, the State began development of a Nutrient Management Plan (NMP). Representatives from industry, hydropower, nonpoint sources (agriculture and irrigation companies), environmental groups, and local government are participating in this effort through membership on technical and executive advisory committees. Through this work, the State will identify actions needed to restore water quality in the river. The NMP could suffice for a Total Maximum Daily Load (or pollutant management plan) if the plan clearly defines a pollutant load limit that will achieve water quality standards and specifies a clearly enforceable allocation of allowable pollutant loadings among the various dischargers. Development of the NMP will be based in large part on the ecological risk analysis currently being conducted by EPA.

Citizens and local officials also became aware of the water quality problems in the Middle Snake River during the time EPA and the State were beginning their efforts. Local officials believed that local government could have an important role in working to restore the river ecosystem and formed the Middle Snake River Study Group (MSRSG). The MSRSG is a joint effort among the Counties of Lincoln, Jerome, Twin Falls and Gooding to address water quality problems within the four-county area and ultimately enhance the water quality in the Middle Snake River. This group has completed a draft Coordinated Water Resource Management Plan for the Middle Snake River. The stakeholders in the Middle Snake River participated in the development of the plan. Many of the strategies proposed by the MSRSG rely on the findings of the EPA

Morro Bay Watershed Project

Morro Bay is located on the California coast, approximately 150 miles north of Los Angeles. The Morro Bay watershed is approximately 100 square miles and is bounded by the California Coast Range and a chain of volcanic craters that reach out to the sea called the Seven Sisters. Two streams, Los Osos Creek and Charro Creek, drain the watershed into Morro Bay. Primarily agricultural land surrounds the bay and estuary area, which provides a habitat for several endangered species. The watershed is relatively undisturbed by human activity, but the surrounding population, presently at 35,000 people, has tripled in size since 1960.

Environmental Threats

The Morro Bay watershed problem is simply sediment. At the present rate of sedimentation, sediment would fill in Morro Bay within an estimated 100 years.

Actions

To protect this endangered area, EPA supports the Morro Bay Watershed Project with both funding and technical guidance on nonpoint source monitoring and implementation of nonpoint source controls. The Central Coast Regional Water Quality Board has developed a proposal for including the project in the National Nonpoint Source Monitoring Program to measure the effectiveness of agricultural and silvicultural best management practices in terms of sedimentation.

Stakeholders

- *Cal Poly — San Luis Obispo*
- *California Regional Water Quality Control Board*
- *Local interest groups and landowners*
- *Resource Conservation District*
- *U.S. Department of Agriculture*
- *U.S. Environmental Protection Agency*

Middle Snake River continued — analyses and the State's development of the NMP. At this time, each of the four counties is seeking county adoption of the plan. It is anticipated that the MSRSG could have an important function in implementing measures at a local level to assist in restoring water quality in the river.

The integration of these three efforts (NMP, ecological risk analysis, and MSRSG plan) is providing a coordinated approach to addressing water quality problems in the Middle Snake. This coordinated approach can provide valuable assistance to other planning efforts on the Middle Snake, including the U.S. Bureau of Land Management's resource management plan, the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program, the Idaho Water Resources Board's Comprehensive State Water Plan, and the Idaho Department of Fish and Game's Fisheries Management Plan. Recovery plans by the U.S. Fish and Wildlife Service for the Federally listed threatened and endangered mollusks will utilize the information now being developed. In addition, pilot projects are being initiated in economic sustainability and point/nonpoint source trading.

Stakeholders

- *B&C Energy, Inc.*
- *City of Twin Falls*
- *Clear Springs Trout Company*
- *Cogeneration, Inc.*
- *Dairy and feedlot owners and operators*
- *Hagerman Valley Citizens Alert, Inc.*
- *Idaho Aquaculture Company*
- *Idaho Cattle Association*
- *Idaho Conservation League*
- *Idaho Dairymen's Association*
- *Idaho Department of Fish and Game*
- *Idaho Department of Parks and Recreation*
- *Idaho Division of Environmental Quality*
- *Idaho Power Company*
- *Idaho Rivers United*
- *Idaho Whitewater Association*
- *L.B. Industries*
- *Middle Snake River Study Group (elected officials and citizens from four counties)*
- *North Side Canal Company*
- *Rangen, Inc.*
- *Twin Falls Canal Company*
- *Twin Falls County Parks Department*
- *U.S. Environmental Protection Agency*

New York—New Jersey Harbor

The New York—New Jersey Harbor Complex consists of the New York Bight Apex north of the Sandy Hook—Rockaway Transect. The watershed includes tidal portions of the Hackensack, Passaic, Raritan, Navesink, Shrewsburg, Kill Van Kull, and Arthur Kill Rivers in New Jersey and the Hudson and East Rivers in New York. The estuary serves as a recreational resource available to over 16 million residents and 17.4 million visitors to the New York—New Jersey metropolitan area. The port plays a major role in the regional economy, generating several billion dollars per year and several hundred thousand jobs. Among the area's attractions are beautiful beaches, abundant wildlife (particularly in the Hackensack Meadowlands), the Manhattan skyline, Battery Park, and the Statue of Liberty. Although this urban area is densely inhabited, there are also many resident populations of birds and mammals including whales, harbor seals, osprey, bald eagles, and snowy egrets.

Environmental Threats

The major threat to the New York—New Jersey Harbor Estuary is its increasing population density. Each day, municipal sewage treatment plants in New York and New Jersey discharge more than 2.6 billion gallons of wastewater into the estuary; some of these plants do not yet provide secondary treatment. Periodic malfunctions or overloads of the sewer system result in discharges of untreated sewage, a primary source of toxic metals, organic chemicals, pathogens, nutrients, and floatable debris in the Harbor area.

Effects of pollution and contamination can be seen everywhere. New Jersey has lost 75 percent of its wetlands since 1925. Construction practices, such as deepening channels, building bulkheads against erosion, and filling water areas to expand development, have led to the filling and draining of these wetlands. Public beaches have been closed in both states because of bacterial contamination or floatable debris. New York and New Jersey have issued advisories limiting consumption of bluefish, striped bass, and American eel because concentrations of toxic chemicals in the fish are often above Food and Drug Administration limits.

Actions

This watershed effort provides a framework for coordinating activities in two ongoing related programs, the New York—New Jersey Harbor Estuary Program, formally begun in 1989, and the New York Bight Restoration Program begun in 1987. The goals of the Harbor/Bight programs are to prepare (1) a final plan for the cleanup and restoration of the New York Bight in 1993 and (2) a comprehensive management plan for New York/New Jersey Harbor by August 1994.

The plans to clean up the Harbor and Bight are being developed under the auspices of the Harbor Management Conference, a group, representing Federal, State, and local, private, and public interests in the Harbor Complex, created under the National Estuary program. To control nutrients, the Conference is considering the development of a systemwide eutrophication model encompassing the Harbor/Bight/Long Island Sound System. The Management Conference is also defining conditions that cause nuisance algal blooms and hypoxia, investigating ecosystem indicators for hypoxia, and describing the effects of low dissolved oxygen on the fish community. Ongoing characterization studies for toxics will serve to verify or refute exceedances in criteria, and identify sources causing exceedances or biological impairments. The New York City water quality model will be used to prioritize repairs to combined sewer overflow (CSO) systems in the Harbor/Bight, and the Conference will seek commitments from regulatory agencies to implement a long-term floatables plan. The Conference will also develop recommendations to improve regulatory programs for habitat protection, identify significant habitats that may warrant extra protection, determine if existing regulations protect significant habitats, and develop a system-wide program to assess habitat loss due to hypoxia. The

Oak Creek Watershed Project

Oak Creek is a perennial desert stream in the scenic Sedona, Arizona, area. Oak Creek is a tributary of the Verde River and is located southeast of the city of Flagstaff at an altitude of approximately 3000 feet. The watershed encompasses an area of 427 square miles. Oak Creek attracts many tourists, because it is noted for its scenic Red Rock geologic formations and the city of Sedona.

Environmental Threats

Bacteria levels at Slippery Rock State Park, a popular swimming hole, high nutrient levels and sedimentation from forestry and agricultural practices threaten the water quality of Oak Creek. Furthermore, the City of Sedona is expecting a population explosion from its present size of 8000 individuals to 20,000 by the year 2010.

Actions

Arizona Department of Environmental Quality initiated the Oak Creek project to provide an analytical, planning, and implementation framework to address water quality problems associated with point and nonpoint pollutant discharges.

Stakeholders

- *Arizona Department of Environmental Quality*
- *Arizona Department of Transportation*
- *Local county government*
- *Local environmental groups and landowners*
- *Northern Arizona Council of Governments*
- *U.S. Department of Agriculture*
- *U.S. Environmental Protection Agency*

NY-NJ Harbor continued — development of a comprehensive Total Maximum Daily Load based on a site-specific water quality standard for copper is a significant effort undertaken by EPA, the States, and participants of the Management Conference.

Although these plans are being developed by the Harbor Management Conference, implementation will involve the targeted use of existing water quality programs, within the geographic confines of the Harbor/Bight. For example, through implementation of the NPDES program, cost effective controls for toxic metals will be identified and permits will be modified to include water quality-based limits for toxic metals as necessary. In New York, an antidegradation policy, focused initially on persistent bioaccumulative substances found in the Great Lakes, will be developed and implemented statewide, including the Harbor/Bight waters. An analogous antidegradation plan for New Jersey's waters within the Harbor/Bight is being pursued. EPA will work to develop and implement, through permit modifications and enforcement actions, a comprehensive CSO abatement program for New York City, Yonkers, and New Jersey discharges to the Harbor. The beach closure/shellfish bed action plan will continue to be implemented by EPA. The Army Corp of Engineers and EPA will develop a dredged material management plan that includes a Mud Dump Site Management Plan and a plan for selecting new disposal sites.

Stakeholders

- *Citizen groups*
- *Interstate Sanitation Commission*
- *Local governments*
- *National Oceanic and Atmospheric Administration*
- *New Jersey Department of Environmental Protection and Energy*
- *New York State Department of Environmental Conservation*
- *New York City Department of Environmental Protection*
- *Port Authority of New York and New Jersey*
- *Scientific and academic community*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S Fish and Wildlife Service*

Onondaga Lake

Onondaga Lake is located along the northern end of the City of Syracuse in Onondaga County, New York, and is primarily surrounded by urban development. The lake is approximately one mile wide and 4.6 miles long and has a mean depth of 35 feet and a maximum depth of 63 feet. The watershed comprises 248 square miles located almost entirely within Onondaga County.

Stakeholders

- *City of Syracuse*
- *New York Department of Law*
- *New York State Department of Environmental Conservation*
- *Onondaga County*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*

Environmental Threats

Nutrient loadings, mainly from point sources, have resulted in eutrophic conditions and the violation of State water quality standards for Onondaga Lake. A ban was placed on public fishing from the lake in 1970 due to high concentrations of mercury in several species of fish. The lake was reopened to fishing in 1986 on a catch and release basis only. Petroleum products are entering the lake from contaminated ground water and contaminating lake sediment. Chlorinated hydrocarbons have also contaminated the water and sediments of Onondaga Lake through surface water runoff and ground water flow from past manufacturing practices near the lake. Mudboils, which discharge ground water that is extremely turbid, are impacting the water quality and aquatic habitats of Onondaga Creek and Onondaga Lake.

Actions

In 1989 Congress appropriated funds for EPA to convene a management conference for Onondaga Lake. Subsequently, the Great Lakes Critical Programs Act of 1990 called for the establishment of a management conference for the restoration, conservation, and management of Onondaga Lake, and called for the development of a comprehensive restoration, conservation, and management plan for Onondaga Lake that recommends priority corrective action and compliance schedules for the cleanup of the lake. The Management Conference consists of all Federal, State, local, public and private interests in the Lake. To address nutrients and toxics, the Conference is developing a eutrophication model for the Seneca River, a lake productivity model, and a hydrodynamic model for the lake outlet. The conference is also funding studies on the release of nutrients and toxic substances from lake sediments under changing dissolved oxygen levels and establishing a long-term baseline water quality program. In addition to characterizing the nonpoint source pollution problem, the Conference will draft a rural nonpoint source pollution plan, an urban/suburban nonpoint source pollution plan, and a fish and wildlife management plan. Forthcoming activities are: the evaluation, and update on a regular basis, of the contamination status of lake organisms; the development, with implementation, of a biological monitoring program; and the development of a public education plan Pilot projects to implement flow modification and sediment load reduction in the mudboil depression area will be implemented in 1992-1993 and a mudboil remediation plan will be issued in March 1994. Finally, the Conference will begin a large scale macrophyte planting project, a pilot project in wetland and nonvegetative cover restoration and enhancement, and a study of the role of vegetation in mercury cycling.

Implementation of the plan will involve the targeted use of existing regulatory programs within the geographic confines of Onondaga Lake. For example, a Remedial Investigation and Feasibility Study is being performed pursuant to a consent decree with New York State. The Study will investigate the nature and extent of contamination in the Lake. A court order directs Onondaga County to bring County sewage treatment plans and overflow discharges in compliance with legal requirements. EPA, in conjunction with the State, will work with the Onondaga County Department of Drainage and Sanitation in evaluating various engineering alternatives for upgrading and/or diverting the Syracuse Metropolitan Treatment Plant discharge, and treating and/or diverting the combined sewer overflows based on the effectiveness in cleaning Onondaga Lake and its tributaries.

Pequea and Mill Creeks Watershed Project

Located in the heart of Pennsylvania Dutch county, the Pequea and Mill Creeks watershed covers 135,000 acres in southeastern Pennsylvania. Large dolomite and limestone aquifers yield a significant quantity of ground water, but are also particularly vulnerable to contamination. While ground water is the primary source of drinking and livestock water, people in the area also depend upon the creeks for drinking water, irrigation, boating, fishing, water sports, wildlife habitat, and industry.

Environmental Threats

Agriculture is the predominant land use in the watershed: 63 percent of the land is devoted to cropland and 13 percent to pasture. The watershed has 55,000 dairy cattle, 5,500,000 poultry, and 122,000 swine. According to the Pennsylvania Department of Environmental Resources, 58 5 stream miles within the watershed have been degraded by agricultural storm runoff. Cropland is eroding at an alarmingly high rate; high concentrations of nitrates, nitrate-nitrogen, and ammonia nitrogen in surface and ground water are suspected of causing high abortion rates and lowered milk production in local dairy herds; and pesticide contamination of the water has been documented. Human health, especially the health of infants under 6 months, and livestock health are at risk.

Actions

The participants identified below are aiming to significantly reduce nutrients, bacteria, and pesticide contamination to surface and ground waters and control sedimentation from runoff and erosion. Geographic Information Systems will identify those areas of high risk for contamination of drinking water, and ground water management plans will be developed.

The watershed has been designated as a high priority nonpoint source watershed in Pennsylvania and as a national U.S. Department of Agriculture (USDA) Hydrologic Unit project. The watershed initiative is receiving accelerated financial and technical assistance under the USDA Water Quality Initiative, as well as funding and support from EPA's nonpoint source management program under Clean Water Act (CWA) Section 319 and the ground water program under CWA Section 106, the Pennsylvania Department of Environmental Resources, and the U.S. Geological Survey.

Stakeholders

- *Environmental advocacy groups*
- *Lancaster County Conservation District*
- *Lancaster County Planning Commission*
- *Local consulting firms*
- *Local farmers*
- *Pennsylvania Agronomic Products Association*
- *Pennsylvania Department of Agriculture*
- *Pennsylvania Department of Environmental Resources*
- *Pennsylvania Fish Commission*
- *Pennsylvania Game Commission*
- *Pennsylvania State Cooperative Extension*
- *U.S. Agricultural Stabilization and Conservation Service*
- *U.S. Environmental Protection Agency*
- *U.S. Geological Survey*
- *U.S. Soil Conservation Service*

Platte River Ecosystem Management Initiative (PREMI)

Entering Nebraska via the South Platte from Colorado and the North Platte from Wyoming, the Platte River traverses 625 miles through Nebraska before joining the Missouri River at Nebraska's eastern border. With its major tributaries, the Elkhorn and Loup Rivers, the Platte constitutes the primary drainage system in Nebraska, and supports a unique ecosystem of national importance. It is a vital link in the Central Flyway, the major continental migration route for millions of waterfowl and shorebirds, providing habitat for over 300 species of migratory birds, including six federally endangered or threatened species. The Platte River also supports aquatic life, recreation, irrigation, hydropower generation, and ground water recharge. Its alluvial aquifer supplies drinking water to more than one-third of Nebraska's citizens.

Environmental Threats

Sediment and nutrient loading, pesticides, and hydrologic and habitat modification are the primary environmental threats to water quality and ecological integrity in the Platte River Basin in Nebraska.

Actions

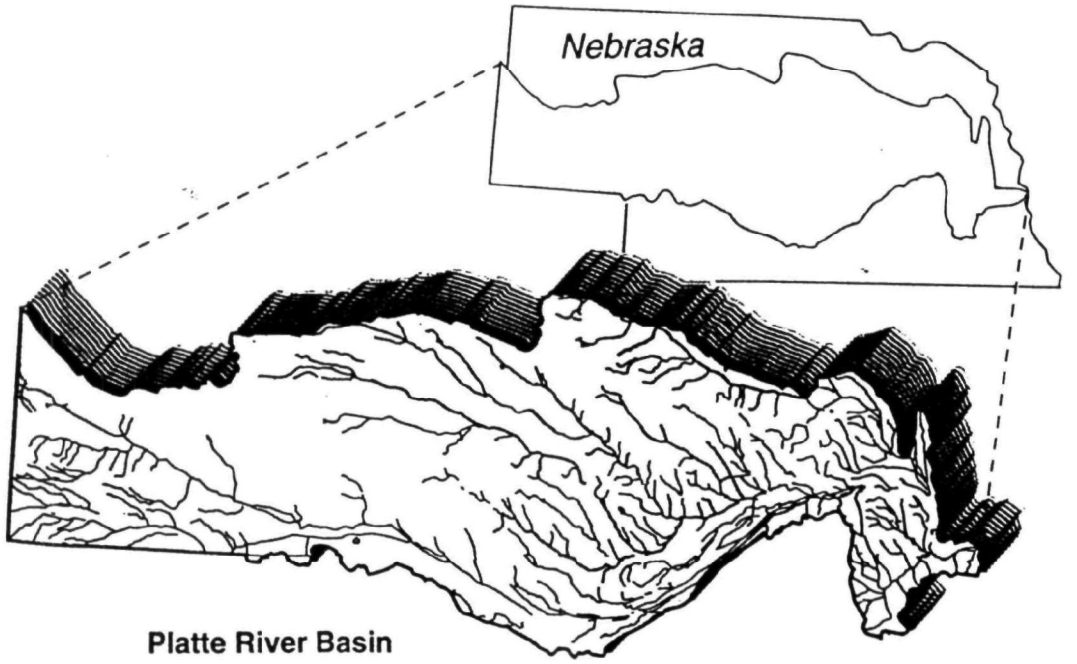
The EPA, in conjunction with the Nebraska Department of Environmental Quality (NDEQ), evaluated the analyses emerging from its Comparative Risk Project and concluded that several of the areas of concern (risk reduction from pesticides, nitrates, and toxics, and ecosystem assessment and protection) could be addressed in a comprehensive ecosystem approach to the Platte River system. The Platte River Ecosystem Management Initiative (PREMI) thus evolved from a EPA Regional enforcement pilot project in 1991 to a watershed protection approach project, involving ecosystem assessment and implementation of strategies to address identified problems, with emphasis on NPS pollution control, water quality and habitat protection/enhancement, outreach/education, and cooperative efforts

The PREMI project has two stages. The first focuses ongoing activities basinwide. The second involves longer term actions, such as developing more detailed water quality assessments, identifying problems, and developing and implementing strategies to address identified problems. This stage is most logically accomplished in phases, the first of which features the Lower Platte River Basin. Succeeding phases will address the Elkhorn Basin, the Middle, North, and South Platte Basins, and the Loup Basin. The assessments will feed into NDEQ's newly adopted basinwide water quality planning approach and will be used for targeting of future actions.

Initially EPA, NDEQ, and the U.S. Geological Survey (USGS) have been the primary participants in the PREMI as it has concentrated on coordinating water quality/ environmental assessment activities to define the problems. As the project evolves, other stakeholders will participate in developing goals and approaches for addressing watershed problem defining specific actions to be taken, and determining how they will be coordinated and evaluated.

Accomplishments to date include:

- *Focusing EPA's ongoing program activities, including assessments, inspections, enforcement, and implementation activities of all program areas, on the Platte River Basin*
- *Preparation of a bibliography of existing research studies and investigations in cooperation with USGS*
- *Coordination of water quality monitoring efforts with USGS's National Water Quality Assessment (NAWQA) program, NDEQ monitoring programs, and the Tri-State Nonpoint Source Assessment project*
- *Funding for investigations and implementation activities in the Lower Platte River Basin, including:*
  - *$50,000 for assessment of critical areas in priority watersheds*
  - *$94,500 for riparian environmental indicators investigation*



Platte River Basin

  - *$506,000 for Section 319 Nonpoint Source Management Program surface and groundwater protection projects*
  - *$360,000 for Section 314 Clean Lakes Program Lake Water Quality Assessment, Phase I diagnostic/ feasibility study, and Phase II implementation awards.*
- *Compilation and assessment of water quality data for the Lower Platte River Basin for entry into a Geographic Information System.*
- *Support for coordinator positions within EPA and NDEQ.*

The PREMI is also included in a larger ecosystem management project - the Great Plains Initiative sponsored by the Western Governor's Association, the U.S. Department of Interior, EPA, and others.

Stakeholders

- *Environmental, agricultural and recreational organizations*
- *Federal agricultural and natural resource agencies*
- *Industries and utilities*
- *Local agricultural and natural resource agencies*
- *Nebraska Department of Environmental Quality*
- *Regional and local governments*
- *State agricultural and natural resource agencies*
- *University of Nebraska-Lincoln*
- *U.S. Environmental Protection Agency*
- *U.S. Geological Survey*

Pocono Partnership for Better Environmental Plannin

This watershed project encompasses two smaller watersheds, the Tobyhanna and the McMichael's watersheds in Pike and Monroe Counties, respectively, of Pennsylvania, an area covering approximately 250 square miles. Natural features include the glaciated Pocono plateau, as well as the other glaciated (and unglaciated) portions of the Pocono region. The watershed includes mixed hardwood forests, peat bogs, other freshwater wetlands, lakes, free-flowing streams, and unique plant communities, such as shrub-oak and pitch-pine barrens.

Environmental Threats

The major threat facing the watershed is rapid and uncontrolled urban development and the various threats associated with such factors as wastewater treatment, sewage treatment, highway construction, nonpoint source pollution, and habitat degradation and fragmentation.

Actions

The Nature Conservancy has identified portions of the unglaciated plateau area as harboring the largest number of globally rare or endangered species and, thus, has identified this area in its bioreserve program and a shrub-oak/pitch-pine forest found in the watershed as its highest priority in Pennsylvania. This recognition led stakeholders to establish an executive committee to initiate plans to protect the watershed. To date, a project proposal has been developed. To gain support of the townships and municipalities associated with the watershed, the committee is publicizing its efforts and is creating a study group, which will open the process to more people. Major components of the planning process include creating a vision statement, setting goals, conducting resource inventory and risk assessment, analyzing alternatives, and implementing recommendations.

Other activities directed to the watershed include gap analysis (in cooperation with the New York Cooperative Research Unit at Cornell) and a biodiversity project with EPA's research laboratory in Corvallis, Oregon.

Stakeholders

- *County conservation districts*
- *Economic Development Council of NE PA*
- *Pocono Chamber of Commerce (Pocono Plan)*
- *Pocono NE*
- *Resource Conservation and Development Board*
- *Three county planning commissions*
- *U.S. Environmental Protection Agency*

San Luis Rey River Watershed Protection Project

The San Luis Rey, located in Southern California, is a coastal river that supports valuable wetlands resources.

Environmental Threats

The river and its wetlands face degradation from sand and gravel mining and from the recent development of orchards, ranches, golf courses, and resorts.

Actions

To support protection of the San Luis Rey wetlands and watershed, EPA assists in coordination of planning, enforcement, and restoration activities within the watershed. EPA provides funding for watershed resources management planning and implementation efforts and will pursue additional funding for implementation activities. EPA will also continue to develop additional wetlands protection activities and will participate in Section 404, Clean Water Act enforcement activities.

Stakeholders

- *Coastal Conservancy*
- *Local landowners, sand and gravel mining operations, and environmental organizations*
- *Rincon Band of Mission Indians*
- *San Diego County*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*

Santa Margarita Watershed Protection Project

The Santa Margarita Watershed, in San Diego and Riverside counties, comprises an area of about 740 square miles and is one of the larger river basins in the southern California coastal plain. A perennial river and lagoon are dominant features in this coastal watershed, which supports unique aquatic habitat, wildlife habitat, and recreational resources. The vernal pools and riparian communities provide high quality habitat for a diversity of plant and wildlife species, including 70 special status species. The total bird densities and diversities observed in this watershed are among the highest reported for southern California in similar habitats. The River provides a breeding habitat for one of the two premier populations of the least Bell's vireo bird remaining in California. The coastal wetlands support around 200 bird species, including several Federal and State endangered/threatened species.

Environmental Threats

The primary environmental problems threatening this watershed include rapid urban development in the upper watershed, increased point source and nonpoint source runoff from urban areas, and wetlands destruction. Much of the upper watershed is privately owned and is subject to intense development pressure. The area within commuting distance of Riverside and San Diego is projected to undergo a threefold increase in population in the next twenty years. According to the U.S. Army Corps of Engineers, 38 dredge and fill permits have been issued since 1987, affecting 179 acres of waters of the United States. Thus far, the permit review process has been unable to address the cumulative impacts of these activities; however, it is being raised as an issue of concern as part of a proposed project by the Riverside County Flood Control District to channel the lower 11 miles of Murrieta Creek, a major tributary of the Santa Margarita River.

Many measures of surface water quality, such as dissolved oxygen, nutrients, total dissolved solids and minerals (boron, manganese, and iron), exceed or appear likely to exceed recommended concentrations in the River. The State lists the Santa Margarita Estuary as an impaired water body due to nutrient loadings. Likely pollutant sources include agricultural operations, septic systems, and wastewater treatment facilities. Ground water quality is also a concern in the upper part of the watershed and on Camp Pendleton. Murrieta Water District relies exclusively on ground water for its water supply. Camp Pendleton also depends on the River for its drinking water, although the Camp has a Federal Superfund site within the floodplain of the River. Definitive information about potential contamination from this site will not be available until the Remedial Investigation reports are completed.

Actions

To protect the watershed from environmental threats, EPA will augment Riverside and San Diego Counties' efforts to develop a comprehensive watershed management plan. Specifically, EPA will evaluate the assimilative capacity of the watershed's wetlands and help implement necessary actions to protect these wetlands. To support this effort, EPA will utilize two ongoing activities, the water permitting program and the wetlands advance identification process. As part of the watershed protection approach, EPA will evaluate the relationship between surface water quality and the quality of ground water used down stream as a source of drinking water. EPA will provide funding for nonpoint source control and watershed planning efforts and will give oversight to local watershed planning efforts to ensure that documented water quality problems will be addressed.

Stakeholders

- *California Department of Fish and Game*
- *California Regional Water Quality Control Board*
- *Camp Pendleton Marine Base*
- *County and municipal governments*
- *Local conservation and environmental groups and local residents*
- *National Park Service*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*

Savannah River

The Savannah River is one of the major river systems of the southeastern United States, encompassing a total area greater than 10,000 square miles and including portions of North Carolina, South Carolina, and Georgia. The Savannah River is formed at Hartwell Reservoir by the confluence of the Seneca and Tugaloo Rivers and flows southeast to the Atlantic Ocean at the port city of Savannah, Georgia. For this watershed project, the study area is defined as that portion of the watershed from the Strom Thurmond Dam to the Atlantic Ocean. This area lies within the boundaries of Georgia and South Carolina only and includes 150 miles of river and 30 miles of estuary.

Basin ecosystem types include forests, agricultural systems, bottomland hardwoods, tidal freshwater and marine marshes, free-flowing streams, and the near-coastal waters of the Carolinian province. Although the study area is predominantly rural, the watershed includes the expanding urban centers of Augusta and Savannah, Georgia, a Department of Energy nuclear production facility, the Savannah National Wildlife Refuge, and the Strom Thurmond Dam, a hydroelectric power plant facility.

Environmental Threats

Many water quality-related studies of the Savannah River have been conducted, beginning in the 1950's when Strom Thurmond Dam was built (then known as Clark's Hill Dam). In recent years, Georgia and South Carolina water quality agencies and EPA have invested considerable resources into monitoring, modeling, and evaluating the watershed problems. Other State and Federal agencies have contributed through direct participation in and technical transfers to these activities.

A review of these studies and discussions with key personnel in several agencies yielded the following preliminary list of environmental issues in the Savannah River watershed:

- *Dam water release impacts — e.g., fish kills, cold water releases, water containing low dissolved oxygen*
- *Dredging modifications/physical changes in the estuary — e.g., Tide Gate opening, New Cut closure, harbor deepening, agitation dredging*
- *Fishery impacts due to poor water quality — e.g., striped bass, endangered short-nose sturgeon*
- *Low dissolved oxygen in river and estuary*
- *Habitat alteration/destruction*
- *nonpoint source (NPS) impacts from forestry, agriculture, and urban development activities in the Augusta and Savannah areas*
- *Point source discharge impacts.*

Actions

EPA established the Savannah River watershed project because of the importance of the watershed as a natural resource, the many known environmental impacts on the watershed, the susceptibility of the watershed to additional degradation, the opportunity for a high degree of involvement and coordination with many Federal, State, and local agencies, and the likelihood of success because of a high level of interest in protecting this river system. Other factors include the economic importance of the resource to the southeastern United

States and high-visibility issues associated with endangered species, coastal water quality standards, and interstate water allocations.

EPA initiated the Savannah River Watershed Project by convening a meeting between the primary water quality agencies, the Georgia Environmental Protection Division (EPD) and the South Carolina Department of Health and Environmental Control (DHEC). The purpose of this meeting was to introduce the project to the States, receive agreements of support, gain consensus on the first steps of the project, and receive any other comments/issues from these agencies. An organizational structure of the project was developed with EPA, EPD, and DHEC as the lead organizations.

EPA is preparing an initial document outlining the concepts of this project, including a description of the watershed, preliminary identification of watershed issues, a watershed management strategy outline, discussion of ngoing watershed activities, a plan for organizational management of the project, a schedule, and a list of contacts. The EPA is also developing a monitoring plan for the basin and a GIS data management system. Options for obtaining a land use/land cover classification system for the project are being pursued. An EPA Advisory Committee, representing all Water Management Division programs and other regional programs, has been established to provide input into the project. Facilities in the Savannah watershed have been identified for inclusion on the EPA's multimedia inspection list.

EPA, in conjunction with EPD and DHEC, will develop a Watershed Management Strategy to identify and prioritize watershed impairments and to specify appropriate solution and control plans. This strategy will be based on existing data and known or potential environmental impacts to the watershed.

Monitoring of the watershed will be conducted as part of the Environmental Monitoring and Assessment Program to further investigate and characterize watershed impairments. Other ongoing monitoring programs will continue to collect and analyze data for the project. Ongoing efforts to model water quality impacts to the Savannah River and estuary are underway with EPD, DHEC, and other Federal, State and local groups. These cooperative efforts are aimed at ensuring that designated uses of the river are attained and natural resources are protected.

Sources of funding for project activities will be identified and obtained as the strategy is developed and implemented.

Stakeholders

- *Georgia Conservancy*
- *Georgia Department of Natural Resources*
- *Georgia Environmental Protection Division*
- *Georgia Ports Authority*
- *Local government, consultants, and industry*
- *National Oceanic and Atmospheric Administration*
- *South Carolina Department of Health and Environmental Control*
- *South Carolina Department of Wildlife and Marine Resources*
- *U.S. Army Corps of Engineers*
- *U.S. Environmental Protection Agency*
- *U.S. Geological Survey*

Tangipahoa River Watershed Project

The Tangipahoa River flows southeastward from the Mississippi-Louisiana state line through the Mississippi Valley Loess and Southeastern Plains, and the Mississippi Alluvial Plain into Lake Pontchartrain. Initially the river is an upland stream, flowing through rolling hills and having a sand and gravel substrate. The characteristics of the river change to those of a lowland stream as the river widens and flows through cypress/tupelo swamp before entering Lake Pontchartrain.

Environmental Threats

This watershed and others that comprise the Lake Pontchartrain basin are threatened by extensive pesticide application, physical degradation of water and wetlands, degradation of terrestrial habitats, hazardous and toxic air pollution, and nonpoint source discharges. Specific threats to the Tangipahoa River stem from both industrial point and nonpoint sources, resource extraction and exploration, surface mining, and land development Water quality problems include metals, ammonia, organics, pathogens, and suspended solids. All of these problems can be seen as outgrowths of the larger, more generalized problems facing the Lake Pontchartrain basin.

Actions

EPA characterized land use in the watershed to develop an impact assessment for targeting activity in the area. This characterization revealed heavy agricultural use. Initial investigations by the State in response to concerns over high pathogen counts resulted in enforcement actions for multiple wastewater facilities. The EPA has shifted its focus to address permitting of minor point source discharges that predominate in the watershed.

Nonpoint sources have also been identified as major contributors to the Lake's water quality problems. In the State's efforts to control runoff from the 273 dairies in the watershed, it has sought the involvement of Citizens for a Clean Tangipahoa, a group that has been instrumental in educating and involving farmers about the problems of agricultural run-off. This partnership lead to the installment of waste treatment systems on many of the watershed's dairy farms. The Soil Conservation Service and Cooperative Extension Service provided design specifications, technical oversight for installation, and financial assistance for the construction of these systems. EPA provided funding through the Louisiana Department of Environmental Quality to monitor the effectiveness of this effort. The Citizens for a Cleaner Tangipahoa continue to sponsor nonpoint source education programs. Meanwhile, the Louisiana Department of Environmental Quality is also working with the Louisiana State Department of Health and Hospitals to address septic tank and non-sewered community problems in the Tangipahoa watershed, and the State of Mississippi has begun to monitor the portion of the Tangipaho within its borders for bacteria levels in an effo to document and control sources that may originate in its State.

Efforts to improve the Tangipahoa River will also be assisted by another local organization, the Lake Pontchartrain Basin Foundation that received Congressional funding to develop a comprehensive management plan for the Lake's basin, which includes the Tangipahoa watershed.

Stakeholders

- *Citizens for a Clean Tangipahoa*
- *Lake Pontchartrain Basin Foundation*
- *Louisiana Department of Environmental Quality*
- *Louisiana Department of Health and Hospitals*
- *Louisiana Cooperative Extension Service*
- *State of Mississippi*
- *U.S. Environmental Protection Agency*
- *U.S. Geological Survey*
- *U.S. Soil Conservation Service*

Truckee River Watershed Protection Project

The Truckee River travels through a desert ecosystem while transporting water from Lake Tahoe, California, into the saline Pyramid Lake in Nevada. The Truckee River headwaters arise in the Sierra Nevada mountains of eastern California and western Nevada at the outlet of oligotrophic Lake Tahoe, and the River drains approximately 3,060 square miles in its 140 mile course. The upstream area is mostly mountainous alpine forest, the middle area is dominated by meadows and significant geothermal springs, and the lower watershed is predominantly desert.

The flow of the Truckee River is highly regulated with most of the river water fully allocated via water rights. Lake Tahoe and Boca, Prosser, Martis, and Stampede Reservoirs supply water to those with water rights. Stampede Reservoir is also used by the U.S. Fish and Wildlife Service to induce spawning of the endangered fish, cui-ui, and to provide drought relief. Below the cities of Reno and Sparks, Nevada, approximately one-third of the river flow is diverted via dam to Lahontan Valley to irrigate alfalfa and pastures. The watershed also supports the resort communities surrounding Lake Tahoe, the greater metropolitan area of Reno and Sparks, and the Pyramid Lake Paiute Indian Reservation. Key land uses include residential, commercial, industrial, agricultural, mining, skiing, fishing, and hunting.

Environmental Threats

The Truckee River suffers from water quality degradation caused by nutrients and sediment loadings and the diversion of water from the river to irrigation projects. Poor water quality, including elevated temperatures, deteriorates the aquatic habitat, including the threatened and endangered fish species habitat.

Actions

The Pyramid Lake Paiute Tribe has taken numerous legal actions over the last 100 years to obtain legal compensation for the adverse impacts resulting from the diversion to Lahontan Valley. Lake elevations have dropped 80 feet, thereby restricting fish access for spawning. The Tribe also pressed for efforts to reduce pollutant loadings, to ameliorate elevated water temperatures, and to restore the water course. EPA initiated the Truckee River Strategy to end litigation, and Senator Reid of Nevada facilitated a negotiated settlement accord through public law. EPA coordinates different program activities and agencies to focus restoration efforts on the Truckee River Strategy, a holistic watershed restoration program. In particular, EPA provides grant assistance to Native American tribes to assess problems, to develop a water quality model, and to implement both nonpoint and point source controls. EPA also oversees and approves the development of State water quality standards, Total Maximum Daily Loads, and stormwater and treatment works permits.

Stakeholders

- *California's environmental agencies*
- *Citizens and environmental groups*
- *Nevada's environmental agencies*
- *Pyramid Lake Paiute Tribe*
- *Reno and Sparks municipal governments*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *Washoe County, Nevada*

Upper Arkansas River Watershed Initiative

At more than 13,000 feet above sea level, the Arkansas River originates in the Pike-San Isabel National Forest near Colorado's Continental Divide. Formed by snow melt, the Upper Arkansas flows south through magnificent mountain scenery before turning east to follow a steep gorge on its way to the high plains of eastern Colorado. The Upper Arkansas Watershed Initiative defines the Upper Arkansas watershed as the basin from the headwaters to Pueblo Dam at the edge of the high plains. The Upper Arkansas River flows through portions of two ecoregions: the Southern Rockies and Southwestern Tablelands, with the majority of the upper watershed in the mountainous Southern Rockies ecoregion. This region is characterized by steep slopes that are prone to erosion, especially during the runoff season. The vegetation communities shift from tundra to coniferous forests dominated by Englemann spruce and sub-alpine fir, grading into Douglas fir, Lodgepole pine, and finally open stands of Ponderosa pine at lower to middle elevations.

Environmental Threats

In the Upper Arkansas River watershed, the principal human-related stressors are associated with past mining practices, erosion of rangeland, loss of riparian and wetland areas, and hydrologic modification. Drainage and runoff from abandoned hard rock mines and mine tailings contribute significant loads of heavy metals and contaminated sediments to the river's mainstem and a number of tributaries in the upper basin. Agricultural practices have increased erosion on large areas of upland rangeland, and the cumulative effect on water resources has been aggravated through loss of riparian and wetland areas along many tributaries and portions of the mainstem. Consequently, stream bank erosion contributes large amounts of sediment to the river system, eliminating aquatic and wildlife habitat and altering channel stability. The river also serves as a transport system for large water diversions from the west side of the Continental Divide. The overall consequences of this hydrological modification to aquatic life and channel stability are unknown; however, there are channel effects in the headwater tributary streams.

Actions

Many State and Federal agencies are involved in a wide range of activities in the basin. In 1989 a technical workshop brought all people conducting research in the Upper Arkansas basin together to inform each other of their work, discuss specific questions, and develop recommendations for further research in the basin. The overarching finding from this forum was that coordination among agencies had to be improved. At the same time, researchers from the EPA developed a proposed management plan for research that would lead to a comprehensive understanding and remediation of water quality impacts from human disturbances, principally hard rock mining. The ongoing work, the workshop, and t management plan helped generate enthusiasm for more cooperative efforts and culminated in a Memorandum of Understanding among the Colorado Departments of Health and Natural Resources; the U.S. Bureau of Reclamation, and EPA, which, among other things, set a self-reproducing brown trout fishery as their biological remediation goal for the river.

Recognizing the need for better and more effective coordination of its responsibilities, EPA formed a Regional Upper Arkansas Watershed Initiative Team in 1992. The Team, which includes representatives from a broad range of EPA programs, established as its mission, the goal of "integrating the Region's water resources assessment and management programs and expertise to guide the development and implementation of a watershed protection strategy for the Upper Arkansas Basin," and the Team set out specific objectives for achieving that goal

There are a number of current and future remediation activities already underway or planned, such as nonpoint source projects at an abandoned mining site along Chalk Creek and on rangeland along Badger Creek. These projects have already provided noteworthy lessons. For example, the Chalk Creek participants discovered the importance of and methods for fully characterizing the hydrogeology of mining sites before beginning remediation - techniques and lessons that are being transferred to other similar sites. Several recently constructed metal treatment facilities will control two major point source discharges to the river, with an expected significant reduction in metals load to the mainstem of the river.

Local citizen participation is also underway in the watershed. A local Resource Conservation and Development Council, with EPA funding support, recently hired a local teacher to serve as the on-site watershed coordinator for the Initiative. The on-site coordinator will foster cooperation among various stakeholders, solicit ideas for the strategy, and develop a public outreach program for the Initiative. A volunteer monitoring program, with strong participation by local high schools, is active in the basin. This program was developed by the Colorado Division of Wildlife, and based on its success in the Arkansas basin, the program is being implemented statewide.

Stakeholders

- *ASARCO*
- *Cities of Leadville, Buena Vista, Salida, and Canon City*
- *Colorado Association of Conservation Districts*
- *Colorado Division of Minerals and Geology*
- *Colorado Division of Parks and Outdoor Recreation*
- *Colorado Division of Wildlife*
- *Colorado Riparian Association*
- *Colorado State Engineer's Office*
- *Colorado State Soil Conservation Board*
- *Friends of the Arkansas*
- *Irrigation companies*
- *Lake County Conservation District*
- *Sangre de Cristo Resource Conservation and Development Council, Inc.*
- *Southeast Colorado Water Conservancy District*
- *The Nature Conservancy*
- *Upper Arkansas River Recreation Task Force*
- *U.S. Bureau of Land Management*
- *U.S. Bureau of Mines*
- *U.S. Bureau of Reclamation*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *U.S. Forest Service*
- *U.S. Geological Survey*
- *U.S. Soil Conservation Service*

Upper Tennessee River Basin

The Upper Tennessee River Basin, which contains the Clinch, Powell, and Holston Rivers, is located in Virginia and supports more than twenty Federally endangered and over 130 globally rare species, including mussels, fish, mammals, plants, and other invertebrates. In addition, there are more than 50 species endemic to the area. The Nature Conservancy recognized this area as an international riverine conservation initiative through its Last Great Places program.

The watershed, characterized by karst topography, contains a vast network of caves and sunholes that directly link ground and surface waters. The local economy of this rural and forested area is poor, based on a single industry, coal mining.

Environmental Threats

A complex array of threats could significantly impact water quality, including point source pollution, catastrophic spills, nonpoint source pollution from agriculture and urban development, and coal mining. The quantities and sources of threats are poorly understood and the specific environmental effects, particularly on aquatic organisms, remain mostly undocumented.

Actions

The Nature Conservancy launched its Clinch Valley Bioreserve in 1969 to address the protection of the rare species. Interest in the watershed increased as life history studies of mussels by the U.S. Fish and Wildlife Service documented their decline.

Declines in the health and numbers of mussels prompted initiation of creative answers based on the interconnected nature of the water dependent resources. This effort was further supported by the Virginia Division of Soil and Water, which described many of the hydrologic units in the watershed as high priorities for nonpoint source pollution potential. Watershed-wide quantification of sources of threats led to the adoption of riparian and karst conservation programs as well as the development of new partnerships.

The U.S. Fish and Wildlife Service, EPA, the Nature Conservancy, and the Virginia Division of Soil and Water are now working together to reduce nonpoint sources of pollution to the rivers. The Virginia Water Control Board placed a ban on halogen-based sewage treatment systems in endangered species waters, which includes most of the watershed, and has adopted stricter standards for parameters such as copper in the Clinch River. The Nature Conservancy has completed a 5-year strategic plan for the watershed and is committed to ecosystem protection in the area.

All partners will continue to implement nonpoint source pollution prevention techniques. EPA will act as facilitator for the partnership infrastructure by bringing its water programs to bear in one geographic area. The watershed protection effort, and other related projects—Ecological Risk Assessment and Mid-Atlantic Highland projects—will solidify partnerships throughout the watershed.

Stakeholders

- *Local governments*
- *State Water Control Board*
- *The Nature Conservancy*
- *U.S. Environmental Protection Agency*
- *U.S. Fish and Wildlife Service*
- *Virginia Division of Soil and Water Conservation*
- *Virginia Tech*

Upper Tensas River Watershed Project

As part of the Mississippi River Alluvial Plain, the Upper Tensas River watershed was once dominated by bottomland hardwoods. Today as much as 85 percent of the landscape has been converted to other uses, primarily agriculture, and consists mainly of ridges and swales. Wetlands generally occur as backwater depressional areas, old scour channels, and old river cutoffs.

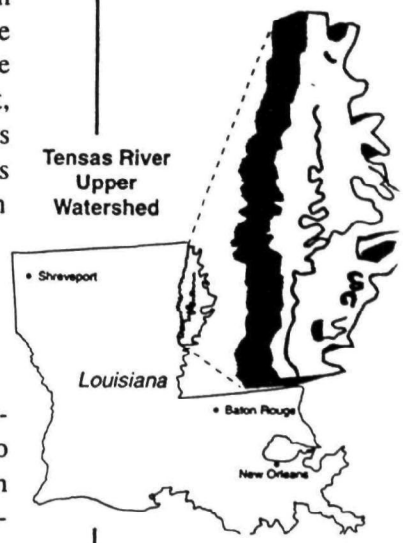
Environmental Threats

According to 1987 land use statistics, bottomland hardwood forest in the Tensas Basin has decreased from about 2.5 million acres to 387,790 acres, an 85 percent decline. This has resulted in forest fragmentation, isolating small patches of non-contiguous forest. Further, agricultural fields in the basin typically extend to the stream edge. In 1987, only 14.7 percent of all streams in the Tensas Basin remained bordered by bottomland hardwood forest.

As a result of land use conversion, water quality in the basin is poor. Total phosphorus levels exceed the EPA-recommended maximum concentration in 96 percent of the samples taken. Total suspended solids (TSS) loads in the basin were also measurably high, particularly during storm events. The high TSS values are a consequence of forest clearing and the highly erodible soils that are found in the Tensas Basin. Additionally, the Louisiana black bear, a federally listed threatened species, lives in the basin.

Actions

Recent wetland regulatory events and the growing awareness of the environmental problems threatening the river led the public, especially the agricultural community, to become involved in actions to protect the Upper Tensas River watershed. At the same time, Federal and State agencies recognized the need for collaborative action given their shrinking budgets. The Northeast Delta Resource Conservation and Development (RC&D) Board formed a 14-member Environmental Committee representing a broad range of special interests within the Tensas Basin. This committee will inform the RC&D Council on environmental issues and concerns throughout the local parishes. The EPA, Soil Conservation Service, the Nature Conservancy, RC&D, and local Soil and Water Conservation District provided funding for an onsite project coordinator. The coordinator will serve as a direct link between the RC&D and the various agencies and groups that make up the Technical Steering Committee, which consists of representatives from all of the active agencies. This organizational structure is designed to reduce duplication of effort, increase public understanding of various Federal and State laws pertaining to wetlands and water quality, improve communication between partners and land users, target funding for coordinated restoration and protection projects, and serve as a model for other States along the Mississippi Valley.



The Louisiana Department of Environmental Quality currently has a State grant to document the Tensas Watershed Protection Approach. As part of this grant, special projects, such as public outreach and GIS information gathering, support the overall effort. Also, the USDA is developing a river basin study targeting wetlands and water quality. The USDA will work with EPA's research laboratory in Corvallis to apply the "synoptic approach" to wetlands risk assessment in the basin.

Stakeholders

- *Farm Bureau*
- *LA Association of Conservation Districts*
- *LA Cooperative Extension Service*
- *LA Department of Agriculture and Forestry*
- *LA Department of Environmental Quality*
- *LA Department of Wildlife and Fisheries*
- *Louisiana State University*
- *National Assoc. of Conservation District*
- *Northeast Delta Resource Conservation and Development Board*
- *The Nature Conservancy*
- *U.S. Agricultural Stabilization and Conservation Service*
- *U.S. Environmental Protection Agency*
- *U.S. Soil Conservation Service*
- *U.S. Forest Service*

Waquoit Bay Land-Margin Ecosystems Project

Waquoit Bay is a shallow coastal bay on the southern shore of Cape Cod, Massachusetts. The bay and its watershed encompass an area of approximately 20 square miles. The site is ideal for examining land use impacts on an estuary since the subwatersheds draining into the bay exhibit different degrees of urbanization and forestation and since many characteristics of the bay have been documented by previous research because of the bay's proximity to research institutions at Woods Hole. In addition, as a designated National Oceanic and Atmospheric Administration National Estuarine Research Reserve, Waquoit Bay provides a setting that fosters conservation, research, and public outreach activities.

Environmental Threats

There is good historical evidence that the bay's waters are steadily becoming enriched with nitrogen and that water quality, eel grass beds, and the existing shellfishery are declining as indicated by an accompanying increase in fish kills and mats of macroalgae.

Actions

As a result of these disturbing trends, the EPA and the National Science Foundation began the Waquoit Bay Land-Margin Ecosystems Research Project. The primary goal of the project is to determine the relationship between land use and water quality. Land uses and nutrient loadings are being characterized; physical, chemical, and biological processes occurring in the bay and surrounding subwatersheds are being determined; and a geographical information system (GIS) and a variety of models are being developed to understand the links between land use and impacts observed in Waquoit Bay.

Research results to date are being fe into an easy-to-use management model that calculates steady state nitrogen loading rates for various scenarios. The initial version of this management model was tested in fall 1992 by a variety of potential users, including the town planners from the towns in which Waquoit Bay is located, planners from other Cape Cod towns, and planners from the Cape Cod Commission, the regional planning authority with regulatory powers. This and other extensive reviews will ensure that the model be more than locally applicable since nitrogen loading is a pervasive problem along much of the East Coast.

Stakeholders

- *Association for the Preservation of Cape Cod*
- *Cape Cod Commission*
- *Citizens for the Protection of Waquoit Bay*
- *Massachusetts Department of Environmental Protection*
- *Massachusetts Executive Office of Environmental Affairs*
- *National Oceanic and Atmospheric Administration*
- *National Science Foundation*
- *Towns of Falmouth and Mashpee*
- *U.S. Environmental Protection Agency*
- *U.S. Geological Survey*
- *Universities*
  - *Boston University*
  - *Hampshire College*
  - *Smith College*
  - *University of Southern California*
  - *Woods Hole Oceanographic Institute*
- *Waquoit Bay National Estuarine Research Reserve*

West Maui Watershed Protection Project

Maui is a Hawaiian island formed by volcanic activity in the Pacific Ocean that is a popular tourist attraction. The West Maui Watershed is actually a series of small watersheds along a 16-mile stretch of coast between Olowalu and Kapalua. The topography is very steep; for example, 5 miles from shore, there is one peak that is 5,788 feet high. Along this stretch of coast, the West Maui mountains are deeply incised by over 24 streams. To the south, the streams are perennial. To the north, the drier side of the island, the streams become annual. Rainfall in the mountains can be more than 400 inches annually. A freshwater lens resting on top of a salt water aquifer underlies the watershed. The freshwater aquifer occasionally extends seaward of the shoreline and causes fresh water seeps.

Rainforest covers the upper reaches of these watersheds. At the base of these mountains, residents cultivate sugar cane and pineapple on the steeply sloping plains. Over me urban development consisting of resorts, condominiums, and golf courses has been replacing agricultural land along the coast.

Environmental Threats

In 1988 the west coast of Maui began to suffer massive macroalgal (seaweed) blooms that have killed reefs through smothering and threatened Maui's tourist industry, because the decomposing algae along the beach raised public health concerns. In the nutrient-poor waters of Hawaii, nutrient inputs from agriculture, golf courses, and sewage injection wells appear to be the likely cause of the algal blooms.

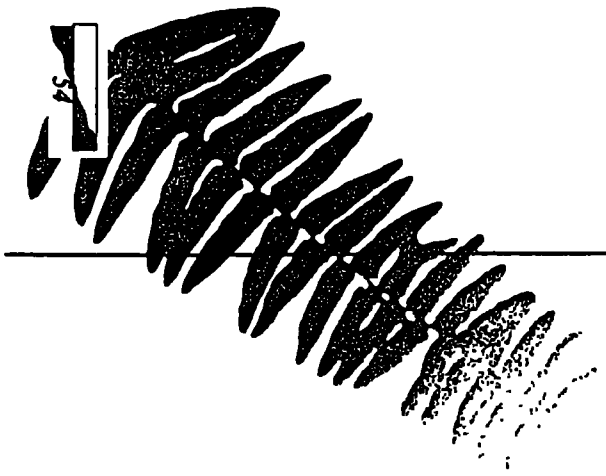
Actions

The algal problem was first brought to EPA's attention by four Congressional inquiries in the fall of 1991. EPA responded by forming an EPA Maui Algae Team to coordinate with the State of Hawaii's Department of Health. This partnership drafted a strategy to mitigate the algal problem. The strategy is basically a comprehensive watershed management plan focusing on nutrient source controls within the watershed. EPA is also working with the Hawaii Department of Health, the County of Maui, and the National Oceanic and Atmospheric Administration on studies regarding the linkage between sewage injection wells and the ocean and source controls.

Through this effort, the Mayor of Maui publicly committed to increased water reclamation and canceled plans for new sewage injection wells.

Stakeholders

- *Hawaii Department of Health*
- *Local sugar and tourist industries*
- *Maui County*
- *National Oceanic and Atmospheric Administration*
- *U.S. Environmental Protection Agency*



Watershed Protection Approach Funding Matrix

The watershed protection approach funding matrix is intended to assist project managers by providing a broad perspective on EPA's Office of Water funds which potentially could be applied to watershed activities. It also delineates the specific applications of those funds. It is important to note that this information may become outdated as the result of changes in budget levels and/or priorities.

This matrix was developed by EPA's Office of Wetlands, Oceans and Watersheds (OWOW), but relies heavily on a table developed by EPA Region I that describes funding resources for state water programs. OWOW would like to thank Region I's Bill Nuzzo as well as the people in Headquarters and the Regions who have reviewed the various drafts of this document.

* *Catalog of Federal Domestic Assistance Number.*

Funding Source*	Funding Purpose/ Eligible Recipients	Allocation Method/ Conditions/ Limitations	Eligible Activities *(Examples)*	Funding Available *($ Million)*
Clean Water Act (CWA)				
Section 106 Water Pollution Control [66.419]	To administer programs for the prevention, reduction, and elimination of water pollution *State and interstate agencies, Indian tribes.*	State targets determined by national formula. Level of Effort (LOE) required	Prevention and abatement of surface and ground water pollution (permitting, pollution control studies, water quality planning, sampling and monitoring, enforcement, assistance to localities, training, and public information).	FY-93 81.7 FY-92 81.7 FY-91 81.7
Section 604(b) Title VI set-aside Water Quality Management Planning [66.454]	To carry out water quality management planning *State agencies (Planning activities shall involve local, regional, and interstate entities.)*	1% of Title VI funds appropriated; $100,000 minimum per state. 40% pass-through to Regional Public Comprehensive Planning Organizations (RPCPOs)/ Interstate Organizations (IOs)	Funds can be used to determine the nature, extent, and causes of water quality problems. Funds can be used in identifying cost effective and locally acceptable facility and nonpoint measures to meet and maintain water quality standards and develop an implementation plan to obtain state and local financial and regulatory commitments to implement such measures	FY-93 20.1 FY-92 19.5 FY-91 20.5
Section 603(d) Revolving Fund Title VI set-aside [66.458]	Water Pollution Control Revolving Fund *State agencies*	Up to 4% of capitalization grant amount may be used for administering the SRF. Part of capitalization grant -- not a separate grant Title VI allocated by national formula.	Administering the SRF program; financial assistance to any municipality, intermunicipal, interstate, or state agency for construction of publicly owned treatment works.	FY-93 80.5 FY-92 77.9 FY-91 81.9
Section 319(h) Nonpoint Source Implementation [66.458]	Implementation of nonpoint source management program *State designated lead NPS agencies. (In developing and implementing a management program, a state shall, to the maximum extent practicable, involve local public and private agencies.)*	Regional targets based on formula including State targets and competitive pool. Approved NPS assessment and management program required. Maintenance of Effort (MOE) and 40% match required. Administrative costs are limited to 10% of the amount of the grant. States may use funds from grants made pursuant to this Section for financial assistance to persons only to the extent that such assistance is related to the cost of demonstration projects	Section 319(h) awards fund implementation of approved NPS Management Programs, and can be targeted at particular watersheds. Activities can include post-implementation monitoring A portion of 319(h) grants may be used for ground water assessment as part of an approved comprehensive NPS pollution control program.	FY-93 50.0 FY-92 52.5 FY-91 51.0

Funding Source	Funding Purpose/ Eligible Recipients	Allocation Method/ Conditions/ Limitations	Eligible Activities *(Examples)*	Funding Available *($ Million)*
Section 320(g) National Estuary Program [66 456]	Development of comprehensive conservation and management plans for specific estuaries. *State, interstate, and regional water pollution control agencies, state coastal zone management agencies, interstate agencies, other public or non-profit private organizations, individuals*	Funds allocated by formula. Limited to specific estuaries. Grants Shall not exceed 75% of the costs of research, survey, studies, and work necessary for the development of CCMPs. The non-Federal share of such costs must be provided from non-Federal sources.	Planning activities in designated estuaries; implementation precluded by Section 320.	FY-93 15 2 FY-92 15 2 FY-91 15 2
Near Coastal Waters [66 464]	Improving the environmental conditions of near coastal waters *State water pollution control agencies, interstate agencies, other public or non-profit agencies, institutions, organizations, and individuals.*	Assistance awards (i e grants and cooperative agreements) using NCW funds require a minimum of 5% non-Federal match. Grants awarded under Section 104(b)(3)	Implement watershed approach for coastal areas NCW funds can be used to develop and implement regional strategies that target geographic areas. Activities include identification of problems, identification of appropriate participants, and strategy implementation	FY-93 [1] FY-92 3.4 FY-91 4 1
State Wetlands Program [66 461]	Grant funds can be used to either (1) develop new wetlands programs or (2) refine existing wetland protection programs *State agencies administering or developing wetland protection programs. State agencies with wetlands-related programs, and Federally-recognized Indian Tribes.*	States will be expected to provide at least a 25% match for the Federal funds awarded through this program. Grants awarded under Section 104(b)(3)	State Wetland Conservation Plans, State Section 404 Assumption Assistance, Watershed Protection Approach Demonstration Projects, incorporating wetlands into Section 401 Programs, streamlining state regulatory programs (Projects must clearly demonstrate a direct link to increasing a state's ability to protect its wetland resources)	FY-93 10 0 FY-92 8 5 FY-91 5 0
Assessment and Watershed Protection Support	*Assessment and watershed protection support activities can include all levels of government and private organizations.*	Funds availability determined annually. Grants in this program are made under the authority of CWA Section 104(b)(3). Resources may also be used for IAGs and contract support	FY 1992 guidance highlights watershed planning priorities, including 303(d), general support for watershed approach projects, and Region-wide geographic targeting FY 1992 guidance emphasizes support for monitoring program priorities, including 305(b) process environmental indicators	FY-93 [2] FY-92 0 6
Water Quality Cooperative Agreements Section 104(b)(3) [66.463]	Unique investigations, special one-time studies, pilots and demonstrations to implement NPDES-related activities. *State water pollution control agencies, interstate agencies, other public or non-profit agencies, institutions, organizations and individuals.*	Regional targets based on formula. No state funding targets. Regional selection of projects No match required 1- to 2-year demonstration-type projects Not for continuing program operation	Support implementation of NPDES program combined sewer overflow/stormwater discharge control programs (develop stormwater permit program, develop and implement BMPs for stormwater, demonstration of innovative CSO controls, development of permit conditions for CSO systems).	FY-93 16 5 FY-92 16 5 FY-91 16 5

[1] *Total Regional allocation of FY93 Near Coastal Waters funds has not yet been determined, pending final operating plan.*
[2] *Total Regional allocation of FY93 Assessment & Watershed Protection funds has not yet been determined, pending final operating plan.*

Funding Source	Funding Purpose/ Eligible Recipients	Allocation Method/ Conditions/ Limitations	Eligible Activities *(Examples)*	Funding Available *($ Million)*
Regional Initiatives	*No limitations on potential participants.*	A relatively new process allowing Regions to develop individual initiatives within the framework of the annual budget process.	All phases of a watershed protection project can be supported.	FY-93 4.0
Wetlands Protection Program	*Wetlands protection activities can involve other Federal agencies, state agencies, and local groups, including agricultural groups.*	Grants in this program can be made under the authority of CWA Section 104(b)(3). Resources may also be used for IAGs and contract support.	Funds can be used to provide technical assistance on effective river corridor/watershed management planning. Wetlands protection funds can be used for activities involving targeted watersheds such as advance identification, targeted Section 404 enforcement actions and education/outreach programs. Funds can be used for Section 404 compliance monitoring programs for specific priority watersheds	FY-93 [3] FY-92 4.2
Section 314(b) Clean Lakes [66.435]	To prepare identification and classification surveys of all publicly-owned lakes, to establish methods & procedures to control sources of pollution and restore the quality of such lakes *Grants are provided to states. (Historically, participants in Clean Lakes projects have represented various levels of both public and private sectors)*	30% match for Phase I --diagnostic/feasibility (Not to exceed $100,000.) 50% match for Phase II -- restoration, assessment (Priority consideration given to projects that show a commitment to program integration.) 30% match for Phase III -- post-restoration monitoring (Not to exceed $125,000)	Lake Water Quality Assessment (LWQA) -- funds are to compile a comprehensive, statewide assessment of lake water quality, to enhance overall state lake management programs and to increase public awareness and commitment to preserving lakes. Diagnostic/Feasibility Study -- funds are provided to perform a comprehensive study of a particular lake and its watershed. Funds can be used to evaluate possible solutions and recommend restoration and protection methods. (Phase I) Restoration/Protection Implementation Project -- funds are provided to implement recommended in-lake techniques and watershed management practices. (Phase II) Post-Restoration Monitoring -- funds are provided to determine effectiveness of various restoration techniques (Phase III)	FY-93 4 0 FY-92 7 0 FY-91 7 0
Congressional Appropriation Add-Ons	*No limitations on potential participants* *Participants are often determined by appropriation language.*	Appropriations language may or may not impose specific restrictions on how resources may be spent (e g through grants, contracts, etc)	No limitations on potential activities. Activities are generally determined by appropriations language	FY-93 46 9 [4]
Section 104(g) Operator Training	To provide an adequate supply of trained personnel to operate and maintain existing and future treatment works. *State and interstate agencies, municipalities, and educational institutions*	State allocation by performance. Congressional add-on to budget 25% match required	Training projects, technical assistance for publicly owned treatment works operators	FY-93 0 8 FY-92 2.0 FY-91 1 8

[3] *Total Regional allocation of FY93 Wetlands Protection funds has not yet been determined, pending final operating plan.*
[4] *OW AC&C Add-ons (Does not include Congressional add-ons for Clean Lakes and NPS Grants)*

Funding Source	Funding Purpose/ Eligible Recipients	Allocation Method/ Conditions/ Limitations	Eligible Activities *(Examples)*	Funding Available *($ Million)*
Section 104(g) Small Community Outreach	Incentive grants to develop or expand small community outreach programs. *State agencies, nonprofit agencies, universities, water research institutes, Indian tribes.*	Regional allocation. Competition within Region. 50% match of the requested Federal amount.	Intended to encourage the establishment or enhancement of state small community outreach programs.	FY-93 0.2 FY-92 0.0 FY-91 0.15
Safe Drinking Water Act				
Section 1443(a)(1) Public Water System Supervision [66.432]	To carry out public water system supervision programs. *State agencies, Indian tribes.*	State targets determined by national formula. States must have primacy. 25% match required.	Public water system supervision; state drinking water programs (program costs, technical assistance, lab capability, enforcement, data management).	FY-93 58.9 FY-92 50.0 FY-91 47.8
Section 1443(b) Underground Injection Control [66.433]	To carry out underground injection control program. *State agencies, Indian tribes.*	State targets determined by national formula. States must have primacy. 25% match required.	Underground injection control programs (program costs, inventories, data management, technical assistance).	FY-93 10.5 FY-92 10.5 FY-91 10.5
Section 1442(b) Wellhead Protection (WHP)	Demonstration projects aimed at assisting municipalities to design and implement a wellhead protection program. *Municipalities, as defined under the SDWA, meaning cities, towns, or other public bodies created by or pursuant to state law, or Indian tribes.*	Regional allocation. Competitive process within Region. 5% match required.	Delineation of WHP areas; identifying sources of contamination; public education; development of ordinances for WHP; WHP contamination source surveys; GIS mapping of WHP areas	FY-93 0.0 FY-92 1.5 FY-91 1.5

For more information on EPA's involvement in watershed activities in your area, contact the appropriate Regional contact listed below.

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Boston, MA 02203

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Janice Rollwagen (National Estuary Programs) (212) 264-5170
U.S. EPA, Region 2
26 Federal Plaza
New York, NY 10278

Region 3
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Rich Pepino (215) 597-1181
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Atlanta, GA 30365

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Cat Kuhlman (415) 744-2001
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John Armstrong (206) 553-1368
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For general information on EPA's watershed protection approach, contact:

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Office of Wetlands, Oceans, and Watersheds
U.S. Environmental Protection Agency
401 M Street, SW
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(202) 260-9108

APPENDIX B

COMPREHENSIVE STUDY
ACT and AFC RIVER BASINS
VOLUME I
PLAN OF STUDY
MAIN REPORT

COMPREHENSIVE STUDY

ALABAMA-COOSA-TALLAPOOSA AND APALACHICOLA-CHATTAHOOCHEE-FLINT RIVER BASINS

VOLUME I
PLAN OF STUDY
MAIN REPORT

Prepared By:

THE
COMPREHENSIVE STUDY
TECHNICAL COORDINATION GROUP

JANUARY 1992
REPRINT FEBRUARY 1994

COMPREHENSIVE WATER RESOURCES STUDY

ALABAMA-COOSA-TALLAPOOSA / APALACHICOLA-CHATTAHOOCHEE-FLINT RIVER BASINS

December 18, 1991

TO ALL INTERESTED PARTIES:

The States of Alabama, Florida, Georgia and the U. S. Army Corps of Engineers, hereby adopt the attached Plan of Study as the general guide for the Comprehensive Study of the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River Basins. The attached Plan of Study represents a consensus of the partners. It incorporates, or addresses in Appendix A, verbal and written comments received during July and August, 1991.

The Plan of Study will serve as the basis for preparing detailed scopes of work for the Comprehensive Study. The states and the Corps, as partners, hereby reaffirm their commitment to the study process.

We appreciate your interest in the water resources within the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River Basins and look forward to continued public involvement as work commences on the detailed scoping and specific studies for the Comprehensive Study.

Alabama

Guy Hunt, Governor

Florida

Lawton Chiles, Governor

Georgia

Zell Miller, Governor

U. S. Corps of Engineers
Army Engineers, Mobile

Michael Thuss, District Engineer

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JANUARY 1992

PLAN OF STUDY

COMPREHENSIVE STUDY

ALABAMA-COOSA-TALLAPOOSA AND APALACHICOLA-CHATTAHOOCHEE-FLINT RIVER BASINS

Prepared By:

ALABAMA, FLORIDA, GEORGIA
and the
U.S. ARMY CORPS OF ENGINEERS

EXECUTIVE SUMMARY
PLAN OF STUDY
FOR THE
COMPREHENSIVE STUDY

I. PURPOSE OF THE PLAN OF STUDY

A. Background.

Recent proposals to develop water resource projects and to revise operating practices in the Apalachicola-Chattahoochee-Flint (ACF) and the Alabama-Coosa-Tallapoosa (ACT) River Basins have created controversy between water user groups, the states and various federal agencies. To address these issues, Congress has funded a Comprehensive Study to develop the needed basin and water resource data and recommend an interstate mechanism for resolving issues.

B. Comprehensive Study.

The purpose of the Comprehensive Study is to determine the capabilities of the water resources, to describe the water resource demands of the basins, and to evaluate alternatives which utilize the water resources to benefit all user groups within the basins.

II. STUDY AREA DEFINITION

The area for the Comprehensive Study is defined as the combined basins of the Alabama-Coosa-Tallapoosa River systems and the Apalachicola-Chattahoochee-Flint River systems. The area covers approximately 42,400 square miles and includes portions of the States of Alabama, Georgia, Florida, and Tennessee.

III. STUDY MANAGEMENT, COORDINATION AND PUBLIC INVOLVEMENT

A. Study Management.

The multi-level study management organization includes work groups composed of representatives of Alabama, Florida, Georgia and the Corps. The principal parties are equal partners in the study and are responsible for the overall management of the study process.

B. Coordination Structure.

The formal coordination structure proposed for the Comprehensive Study process is shown in Figure 4 of this Plan of Study. Descriptions of each group in the coordination structure follow.

1. Executive Coordination Committee. The Executive Coordination Committee (ECC) will be composed of four members: the Mobile District Engineer and one designee of each of the Governors of Alabama, Florida and Georgia. The purpose of the ECC is to define the water resources issues to be reviewed in the study and to manage the overall study effort within each basin.

2. Technical Coordination Group. The Technical Coordination Group (TCG) will be composed of four members. Each member of the Executive Coordination Committee will designate one representative to serve on the TCG. The purpose of the TCG is to provide interstate and intrastate coordination for the study process, recommend the technical content and direction of the study, and oversee the work that is performed.

3. Legal Support Group. The Legal Support Group (LSG) will be composed of four representatives. The purpose of the LSG is to provide legal expertise in support of the study effort.

4. Technical Review Panels. Each Technical Review Panels (TRP) will be jointly selected, as needed, by the Technical Coordination Group and will be subject to approval by the Executive Coordination Committee. The purpose of the TRP will be to provide peer review of technical analyses and products produced by the study.

5. Technical Support Groups. Each state or federal Technical Support Group (TSG) will consist of agencies and organizations, public or private, designated by the respective members of the Executive Coordination Committee. The purpose of the TSG shall be to provide technical support during the study process.

6. Interest Groups. Interest groups are shown in the management structure to indicate that representatives of local governments, private industry, special interest groups and citizens shall have access to the study process. Participation of interest groups is intended to provide groups and individuals with diverse water resources concerns an opportunity to participate in the development and conduct of the study.

C. Public Involvement.

The public involvement program for the Comprehensive Study will include coordination with the interest groups and the general public within the basins. Public involvement efforts will involve a wide range of agencies, interest groups, organizations and the general public.

IV. STUDY ELEMENTS

A. Introduction.

The study elements are grouped into three major categories reflecting the areas of emphasis. The categories are: Water Demand, Water Resources Availability and Comprehensive Management Strategy.

B. Water Demand.

This section of the Plan of Study presents study elements for the water demand portion of the Comprehensive Study. The purpose of the water demand section is to identify, describe and quantify all water demands within the basins. Water demands shall include both consumptive and non-consumptive uses of groundwater and surface water, including reservoirs. The water demand elements described in this section are as follows.

- Agriculture Demand: Describe and quantify the existing and projected agricultural demand on the water resources within the ACT and ACF River Basins.

- Apalachicola River and Bay: Improve knowledge of the bay and riverine system in order to describe: (1) the freshwater and nutrient requirements of Apalachicola River and Bay necessary to maintain historic productivity and diversity in the system; and (2) the linkage and correlation between the riverine conditions and estuarine productivity.

- Environment: Determine significant, water related environmental needs of the basins and describe environmental effects caused by changes in the existing water management system.

- Hydropower Demand: Describe and quantify the existing capacity and operational procedures for hydroelectric power facilities within the ACT and ACF Basins.

- Industrial Demand: Describe and quantify the existing industrial water demand within the ACT and ACF Basins and project industrial water needs through the planning period.

- Municipal Water Demand: Describe and quantify the existing municipal water demand within the basins and project municipal water demand through the planning period. Municipal demand includes all uses with the exception of industrial, agricultural and instream uses.

- Navigation Demand: Describe and quantify the existing and projected demand for navigation use and determine the effects of varying flow conditions on commercial navigation in the basins.

- Recreation Demand: Describe and quantify the existing and projected recreational demand on the water resources within the basins.

- Waste Assimilation Demand: Describe and quantify the existing and projected waste assimilation demand on water resources within the ACT and ACF Basins.

C. Water Resources Availability.

Water resources availability will examine the factors that influence the availability of water resources in the basins through a review and analysis of climatology, physiography, geology and existing groundwater and surface water resources, including reservoirs, and the interaction between groundwater and surface water resources. The following study elements are included in this section.

- Groundwater Supply: Determine the existing and potential future availability and quality of groundwater resources within the basins.

- Surface Water Supply: Determine the existing and potential future availability and quality of surface water resources within the basins.

D. Comprehensive Management Strategy.

The purpose of the Comprehensive Management Strategy is to provide information with which to make informed decisions regarding the water resources within the basins. The Comprehensive Management Strategy study element includes two major components:

- Basinwide Management Program: Develop a range of water management strategies to guide future water management decisions in the basins.

- Institutional Framework and Coordination Mechanism: Analyze the existing institutional framework and recommend a coordination mechanism for the future management of water resources in the basins.

PLAN OF STUDY
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I. PURPOSE OF THE PLAN OF STUDY

A. Background

Recent proposals to develop water resource projects and to revise operating practices in the Apalachicola-Chattahoochee-Flint (ACF) and the Alabama-Coosa-Tallapoosa (ACT) River Basins have created controversy between water user groups, the states and various federal agencies. Public responses to various reallocation proposals by the Corps of Engineers were concerned with projected impacts to reservoir levels and downstream flows, interbasin transfers, cumulative impacts from water withdrawals, water quality, and concerns over the adequacy of environmental protection. These concerns center on relationships among various uses and a multitude of users. They are indicative of existing water resource problems which are anticipated to become more intense in the future. As a result, widespread concern has been expressed regarding the need to properly manage the water resources so that regional economies may continue to be supported within the bounds of the environmental conditions that exist within the river systems.

To address these issues, Congress has funded a Comprehensive Study to develop the needed basin and water resource data and recommend an interstate mechanism for resolving issues. Such a mechanism would allow the water resources to be managed from a basin- wide context.

A draft Plan of Study was prepared and furnished to the public for review in July 1991. A series of 11 public meetings was held in Alabama, Florida and Georgia from the end of July 1991 through the end of August 1991. The purposes of these meetings were to inform the public about the Comprehensive Study, to solicit comments on the draft Plan of Study and to identify water resource issues and concerns to be addressed by the study. Comments received at the public meetings and written comments pertaining to the Comprehensive Study are summarized in Appendix A to this Plan of Study. These comments will be utilized in developing detailed scopes of work for the analyses to be conducted in the Comprehensive Study.

B. Comprehensive Study

The purpose of the Comprehensive Study is to determine the capabilities of the water resources, to describe the water resource demands of the basins, and to evaluate alternatives which utilize the water resources to benefit all user groups within the basins. The Comprehensive Study will focus on providing a good technical understanding of the water resources in the basins and defining alternatives. Needs and potential solutions will be identified through the year 2050. Initial study efforts will concentrate on the basins individually so that separable concerns can be more effectively addressed. Subsequent

efforts will consider interrelationships between the two basins so that cumulative impacts and region-wide problems, needs, and opportunities can be thoroughly addressed.

The overall completion schedule for the Comprehensive Study has been estimated to take three to five years, but is contingent on the availability of Federal and State funding. The total study effort is estimated to cost between $3.0 and $5.0 million. The states and the Corps have agreed that this program is important to the region and that all reasonable efforts will be made to expedite the completion of the Comprehensive Study.

C. Plan of Study

This Plan of Study has been prepared for the Comprehensive Study of the Alabama-Coosa-Tallapoosa (ACT) and the Apalachicola-Chattahoochee-Flint (ACF) River Basins. The purpose of the Plan of Study is to describe the methods by which the technical analyses, other study products, and the coordination of the study will be accomplished. This Plan of Study presents:

- The geographic coverage of the study, which may be divided into subareas at a later date, if appropriate;
- A description of the study management structure;
- One goal and four objectives for the Comprehensive Study;
- A general description of the tasks to be performed;
- A general description of the results to be attained by each study element;
- An indication of study task sequencing to indicate which tasks need to be accomplished to make information available for other required studies.

Following approval of this conceptual Plan of Study a detailed work plan will be developed. The detailed work plan will include:

- Specific scopes of work for the study elements which will be based on the tasks identified in this Plan of Study.
- A realistic schedule for conducting the Comprehensive Study.
- A preliminary estimate of study costs.

II. STUDY AREA DEFINITION

A. General

The area for the Comprehensive Study is defined as the combined basins of the Alabama-Coosa-Tallapoosa River systems and the Apalachicola-Chattahoochee-Flint River systems. The area covers approximately 42,400 square miles and includes portions of the States of Alabama, Georgia, Florida, and Tennessee, as shown in Figure 1.

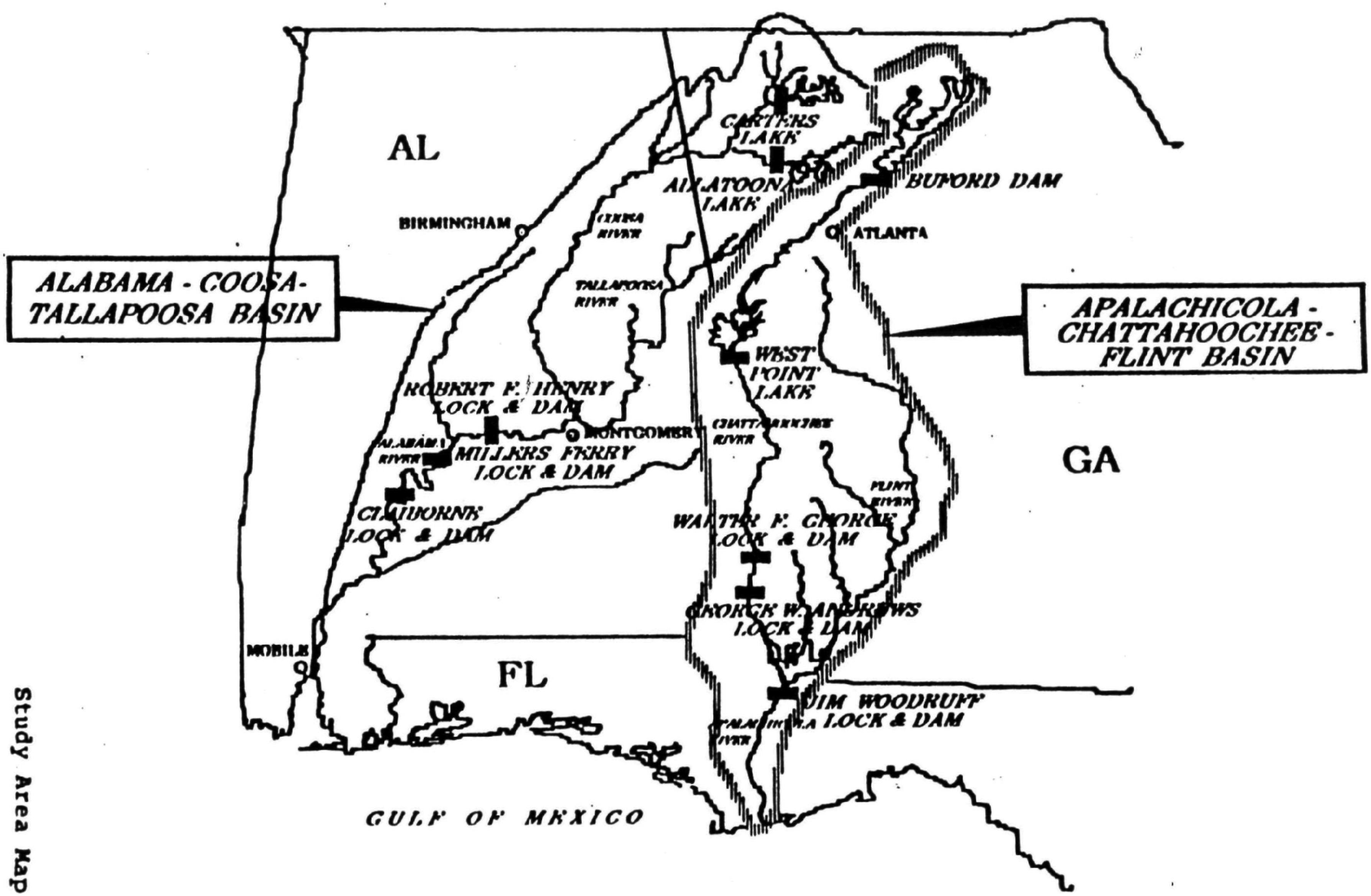
B. Alabama-Coosa-Tallapoosa River Basin

The Alabama-Coosa-Tallapoosa River Basin extends about 320 miles from northwest Georgia and a very small portion of southeast Tennessee diagonally across Alabama to near the southwest corner of Alabama. The total area of the drainage basin is 22,800 square miles. The main rivers of the Alabama-Coosa-Tallapoosa Basin are the Coosa, Tallapoosa, and Alabama. Figure 2 contains the major features within the basin.

The Coosa River, formed by the Oostanaula and Etowah Rivers which drain northwestern Georgia, begins at Rome, Georgia. From Rome, the Coosa River flows west into Alabama, and then swings southward to Wetumpka, where it joins the Tallapoosa to form the Alabama River. The length of the main stem of the Coosa River is 286 miles. The Coosa River Basin is highly developed with both Federal and private dams operated by the Corps of Engineers and Alabama Power Company. The Coosa River is fed by a number of smaller rivers in Georgia, two of which are the sites of large Corps reservoirs (Carters and Allatoona lakes).

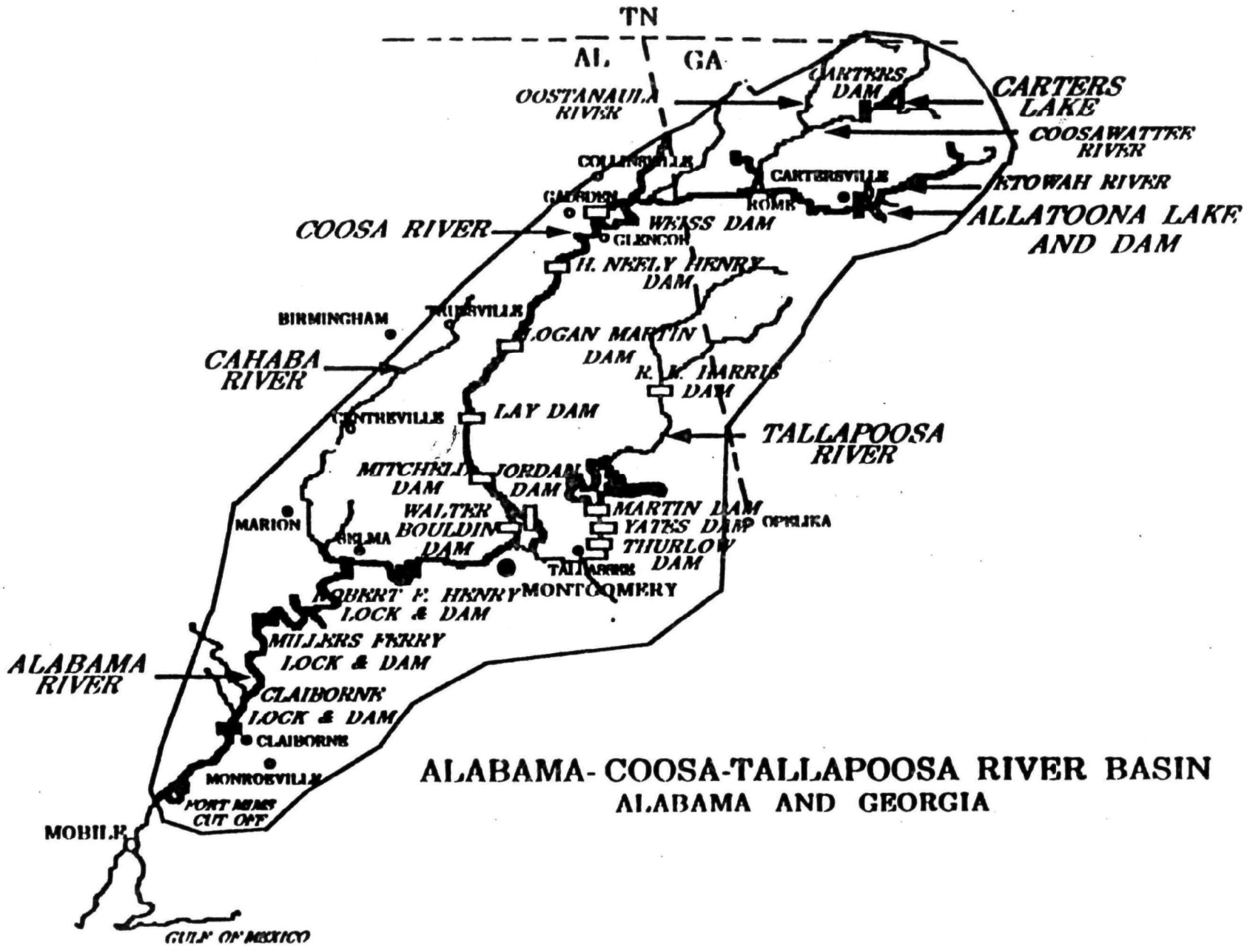
The Tallapoosa River begins in Georgia about 40 miles west of Atlanta and flows southwesterly through hilly terrain for about 45 miles before entering Alabama. After leaving Georgia, it continues to flow southwesterly for about 150 miles, then westerly for about 40 miles to its junction with the Coosa River. The length of the main stem of the Tallapoosa River is 235 miles. Four Alabama Power Company dams form lakes for about 33 miles above Tallassee.

The Alabama River meanders southwest from its source at the confluence of the Coosa and Tallapoosa rivers near Wetumpka for about 15 miles to Montgomery, then in a generally westward direction for about 85 miles to Selma, Alabama then southwest for about 215 miles to its junction with the Tombigbee River to form the Mobile River near Calvert, Alabama about 45 river miles above Mobile, Alabama and Mobile Bay. The length of the main stem of the Alabama River is about 315 miles. Three Corps dams on the river create a series of lakes extending from near Claiborne,



Study Area Map

Figure 1



ALABAMA- COOSA-TALLAPOOSA RIVER BASIN
ALABAMA AND GEORGIA

Figure 2

about 82 miles above the mouth, to the vicinity of Wetumpka on the Coosa River.

C. Apalachicola-Chattahoochee-Flint River Basin

The Apalachicola-Chattahoochee-Flint River System drains an area of 19,600 square miles, of which 8,770 square miles lie along the Chattahoochee arm and 8,460 square miles along the Flint River arm, with the remaining 2,370 square miles along the Apalachicola River below the confluence of the Chattahoochee and Flint rivers. Figure 3 contains the major features within the basin.

The Chattahoochee River flows southwesterly from the Blue Ridge Mountains in northeast Georgia for 120 miles, then southerly for 200 miles, forming the boundary between Georgia and Alabama and between Georgia and a small portion of Florida. At the transition zone between the coastal plains and the upland plateau of the central part of Georgia, the Chattahoochee falls about 375 feet. The length of the main stem of the Chattahoochee River is 320 miles.

The drainage area of the Flint River is in west central and southwest Georgia, encompassing all or portions of 42 counties. The river originates south of Atlanta in Fulton and Clayton counties in the Piedmont province. It flows southerly in a wide eastward arc, crosses the fall line into the upper Coastal Plain, and terminates in Lake Seminole at the juncture of the Chattahoochee and Apalachicola rivers. Two existing reservoirs along the Flint River have very little storage capacity and are operated generally as run-of-the-river reservoirs. The length of the main stem of the Flint River is 349 miles.

The main stem of the Apalachicola River is 108 miles. It flows southerly across northwest Florida from the vicinity of the Georgia line to the Gulf. It is formed by the junction of the Chattahoochee and Flint rivers in the southwest corner of Georgia, and its terminus is in Apalachicola Bay in the northwest portion of Florida. For the purpose of the Comprehensive Study, the Apalachicola-Chattahoochee- Flint River Basin will consist of the watershed described above and will also include Apalachicola Bay, East Bay, St. Vincent Sound and St. George Sound, Tates Hell Swamp and Lake Wimico.

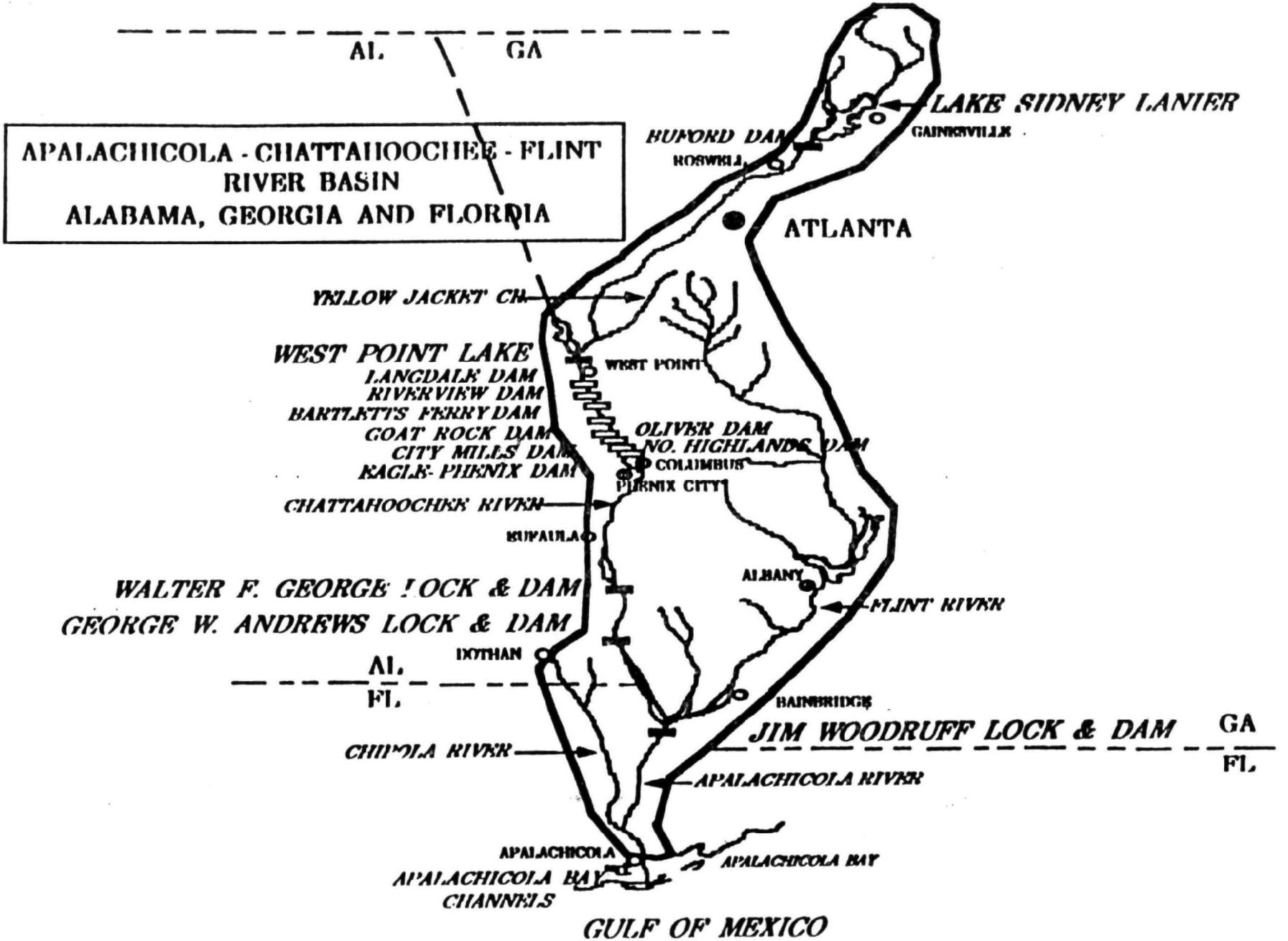

APALACHICOLA - CHATTAHOOCHEE - FLINT
RIVER BASIN
ALABAMA, GEORGIA AND FLORIDA
AL.
GA
LAKE SIDNEY LANIER
BUFORD DAM
GAINESVILLE
ROSWELL
ATLANTA
YELLOW JACKET CR.
WEST POINT LAKE
LANGDALE DAM
RIVERVIEW DAM
BARTLETT'S FERRY DAM
GOAT ROCK DAM
CITY MILLS DAM
EAGLE-PHENIX DAM
WEST POINT
OLIVER DAM
NO. HIGHLANDS DAM
COLUMBUS
PHENIX CITY
CHATTAHOOCHEE RIVER
EUFAULA
WALTER F. GEORGE LOCK & DAM
GEORGE W. ANDREWS LOCK & DAM
ALBANY
FLINT RIVER
DOTHAN
AL.
FL.
BAINBRIDGE
JIM WOODRUFF LOCK & DAM
GA
FL.
CHIPOLA RIVER
APALACHICOLA RIVER
APALACHICOLA
APALACHICOLA BAY
APALACHICOLA BAY CHANNELS
GULF OF MEXICO

Figure 3

III. STUDY MANAGEMENT, COORDINATION AND PUBLIC INVOLVEMENT

A. Study Management

This section of the Plan of Study presents information related to managing the study and public involvement. The formal study management structure includes work groups composed of representatives of Alabama, Florida, Georgia and the Corps. These four entities are referred to as the "principal parties" in the following sections. The principal parties shall be equal partners in the study and shall be responsible for the overall management of the study process including, but not limited to, establishing policies, reviewing and overseeing technical and legal analyses, developing budgets and financial plans, reviewing and approving contracts and agreements, and developing recommendations for the implementation of the study's findings.

Following the completion of this Plan of Study, the principal parties shall develop detailed scopes of work for the elements of the Comprehensive Study. For each element in which one or more of the states desire to participate fully in the development, implementation, and management, the Corps and such state or states shall enter into an appropriate cost sharing arrangement. The Corps shall maintain its authority under federal law with respect to any element of the Comprehensive Study to be funded wholly with federal funds.

The public involvement process is to provide a means for two way communication between the public and the principal parties. First, the process will enable citizens and interest groups to make their views known about the issues to be studied. Second, the process will inform the public about the progress and results of the study components.

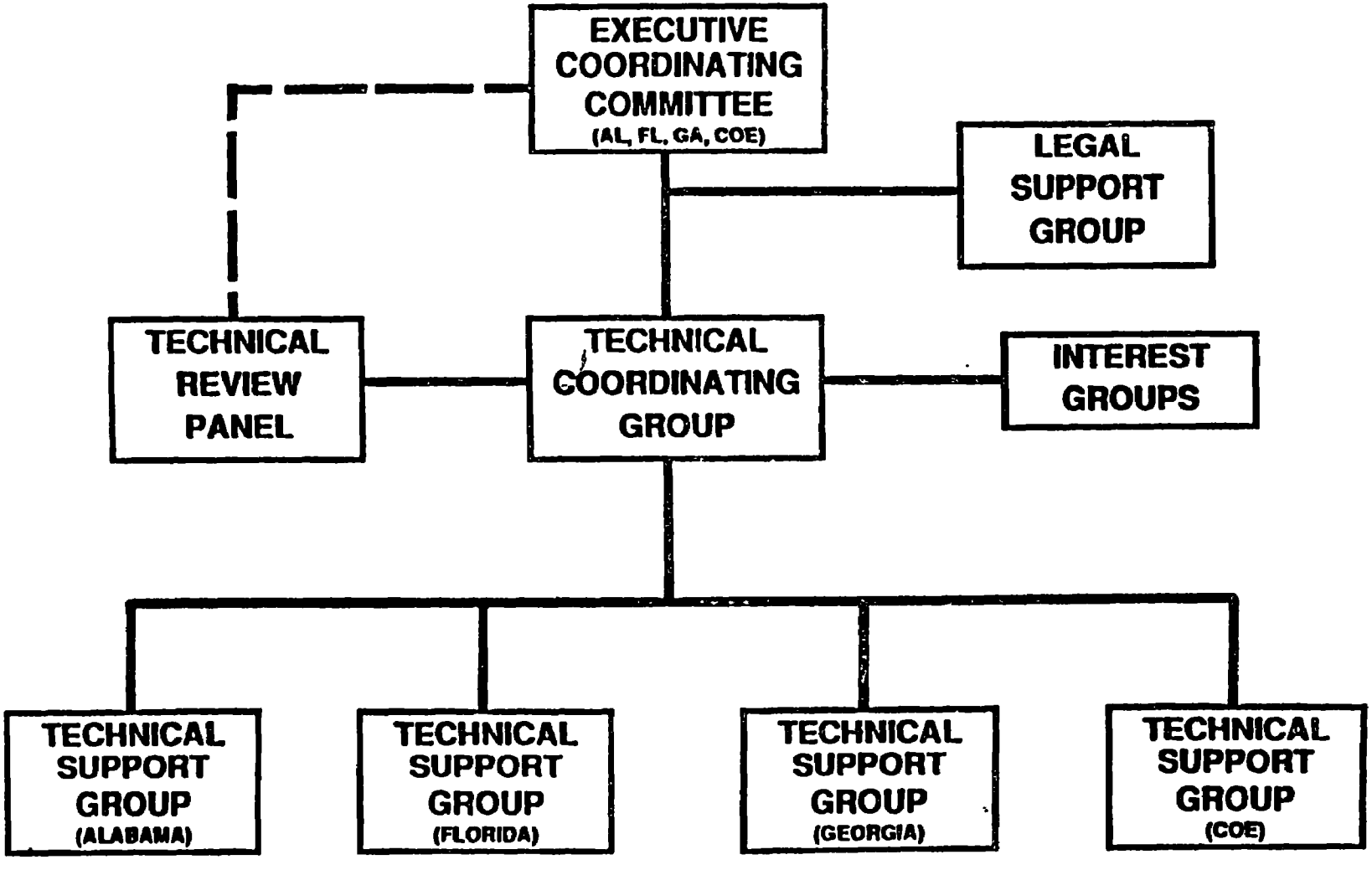
B. Coordination Structure

The coordination structure for the Comprehensive Study has been built on the "Interstate Coordinating Committee", a formal coordination mechanism which has been in place within the ACF Basin for several years, and the cooperative procedures which currently exist between the principal parties. The formal coordination structure proposed for the Comprehensive Study process is shown in Figure 4. Descriptions of each group in the coordination structure follow.

1. Executive Coordination Committee.

Composition: The Executive Coordination Committee (ECC) will be composed of four members: the Mobile District Engineer and one designee of each of the Governors of Alabama, Florida and

STUDY MANAGEMENT ORGANIZATION



and Responsibilities: The purpose of the ECC is to ter resources issues to be reviewed in the study and overall study effort within each basin. In rving as a member, the Mobile District Engineer aintain records of the ECC.

The ECC will have the responsibilities to:

- Establish or approve all policy matters related to the study;
- Provide direct oversight and management of the study process including technical scopes of work prepared by the Technical Coordination Group and task assignments to the Legal Support Group and other committees;
- Approve the appointments of Technical Review Panels;
- Receive reports, on a quarterly basis, from the Corps of Engineers and the Technical Coordination Group indicating all previous quarter expenses to be charged against the budget for the study and all projected expenses to be charged against the budget for the study during the next quarter;
- Adopt annual and total study budgets prepared by the Technical Coordination Group;
- Approve all contracts or other agreements for the performance of work under the study;
- Adopt a "Conflict Resolution Plan" for resolving issues related to the Comprehensive Study and provide issue resolution for matters not otherwise resolved;
- Report annually to Congress and the Governors;
- Approve and coordinate the design and implementation of the study coordinating mechanism; and
- Negotiate agreements between or among the states and the Corps.

Function: The ECC will meet on a quarterly basis. Special meetings may be called upon request of one of the principal parties by notification to all other parties and shall be scheduled within two (2) weeks of the notification. Other committees shall report to the ECC at regular meetings of the ECC.

2. Technical Coordination Group.

Composition: The Technical Coordination Group (TCG) will be composed of four members. Each member of the Executive Coordination Committee will designate one representative to serve on the TCG. Each representative on the TCG will be allowed to bring other persons to meetings to serve in an advisory capacity.

Purpose and Responsibilities: The purpose of the TCG is to provide interstate and intrastate coordination for the study process, recommend the technical content and direction of the study, and oversee the work that is performed.

The TCG shall have the responsibilities to:

- Report quarterly to the Executive Coordination Committee on the progress of each task assigned to, or to be performed by, the TCG;
- Provide technical direction for the Comprehensive Study by:
  - Identifying water resource issues to be studied and establishing the priority, budget and schedule for each study element;
  - Determining the types of analyses to be performed, the methodologies to be employed, and the geographic areas to be analyzed;
  - Developing and implementing technical scopes of work for the study elements;
  - Developing, for Executive Coordination Committee approval, annual and total study budgets;
  - Recommending, for Executive Coordination Committee approval, the entities to perform, and the compensation for, any work to be done; and
  - Reviewing, coordinating and synthesizing technical products;
- Coordinate the Comprehensive Study process by:
  - Coordinating with the respective Technical Support Groups;
  - Working with the Legal Support Group on legal issues related to the study;

- Recommending for approval by the Executive Coordination Committee, when necessary, the formation, membership and budget of Technical Review Panels;

- Identifying and appointing special task groups to perform specific tasks in support of the study; and

- Receiving reports from Technical Review Panels and special task groups;

- Prepare a "Conflict Resolution Plan" to resolve issues related to the Comprehensive Study and submit it to the Executive Coordination Committee for adoption;

- Resolve technical issues, and when not resolvable by the TCG, refer such issues to the Executive Coordination Committee; and

- Design and implement a public involvement program.

Function: The TCG will meet at frequent intervals during the preparation of the Comprehensive Study. It is anticipated that monthly meetings will be necessary to maintain interstate coordination.

3. Legal Support Group.

Composition: The Legal Support Group (LSG) will be composed of four representatives. One member of the LSG will be appointed by each of the members of the Executive Coordination Committee. Each representative on the LSG is allowed to bring other persons to meetings to serve in an advisory capacity.

Purpose and Responsibilities: The purpose of the LSG is to provide legal expertise in support of the study effort. At the request or direction of the Executive Coordination Committee or the Technical Coordination Group, members of the LSG, consistent with the representation of their respective principals, shall cooperate for the purpose of identifying and developing positions, strategies and agreements which will facilitate progress of the study.

The LSG will have the responsibilities to:

- Recommend necessary studies to the Technical Coordination Group;

- Review information and recommendations produced by the study from a legal standpoint; and

- Develop agreements between the states and, where appropriate, the Corps.

Function: The LSG will work and meet as authorized by, or at the request of, the Executive Coordination Committee. The LSG may meet as an independent group or with other groups formed as part of the study management structure. Expenses incurred by the LSG shall be paid by the respective principal parties as a part of their study support. No expenses of the LSG shall be charged to the study project unless authorized by the Executive Coordination Committee. Participation in the LSG shall not waive or eliminate the attorney-client privilege or the attorney work product doctrine applicable to a principal party and the members of the LSG appointed by such party.

4. Technical Review Panels.

Composition: Technical Review Panels (TRPs) will be jointly selected, as needed, by representatives of the Technical Coordination Group and will be subject to approval by the Executive Coordination Committee. The TRPs shall consist of an odd number of impartial individuals with nationally or regionally recognized expertise and experience in legal and/or technical fields relating to comprehensive water resources planning and management. The Technical Coordination Group, in making recommendations to the Executive Coordination Committee, shall assure that appropriate areas of expertise are represented on the individual TRPs.

Purpose and Responsibilities: The purpose of the TRPs will be to provide peer review of technical analyses and products produced by the study. Each TRP will have the general responsibility to advise and assist the Executive Coordination Committee or Technical Coordination Group regarding any issue(s) referred to such panel.

Function: The TRPs will review technical products and legal analyses to resolve technical or legal issues and meet with the Executive Coordination Committee or other committees as appropriate. The expenses of each TRP shall be paid from the funds appropriated for the study.

5. Technical Support Groups.

Composition: Each state or federal Technical Support Group (TSG) will consist of agencies and organizations, public or private, designated by the respective members of the Technical Coordination Group.

Purpose and Responsibilities: The purpose of the TSGs shall be to support the respective principal party during the study process. The TSGs will actively participate in the study effort and have the responsibilities to:

- Recommend necessary studies to the Technical Coordination Group;
- Provide input into the technical scopes of work;
- Furnish technical data;
- Perform technical analyses;
- Recommend potential solutions to issues addressed in the study; and
- Review technical data and analyses produced for the study.

Function: The TSGs shall meet at the request of the respective representatives of either the Executive Coordination Committee or Technical Coordination Group. No expenses shall be charged to the federal portion of the study project unless authorized by the Executive Coordination Committee. The TSGs may communicate through their respective representatives and at public meetings or workshops conducted during the study.

6. Interest Groups.

Composition: Interest groups are shown in the management structure to indicate that representatives of local governments, private industry, special interest groups and citizens shall have access to the study process.

Purpose and Responsibility: Participation of interest groups is intended to provide groups and individuals with diverse water resources concerns an opportunity to participate in the development and conduct of the study.

Function: Interest groups will have the opportunity to communicate through the respective Technical Support Groups, representatives on the Technical Coordination Group and the Executive Coordination Committee, and through public meetings and workshops conducted during the study process.

C. Public Involvement.

The public involvement program for the Comprehensive Study will include coordination with the interest groups and the general public within the basins. Public involvement efforts will involve a wide range of agencies, interest groups, organizations and the general public. The objectives of the public involvement program are to:

- Involve interested persons within each state and basin in the development of the Plan of Study and the comprehensive basin planning process;
- Obtain views and concerns from interest groups and the general public by holding public meetings and workshops to receive comments and identify issues during the study;
- Provide reports and solicit comments from interested persons regarding the results of technical investigations and other aspects of the study.
- Prepare and distribute news releases and secure media coverage during the study.

IV. GOAL AND OBJECTIVES

A. Introduction

This section of the Plan of Study presents the goal of the Comprehensive Study and four objectives related to the major areas of emphasis within the study. Qualifying statements follow each objective to clarify the meaning and assist in interpretation. Later, each objective is further refined by the specific study element objectives.

B. Study Goal

The goal of the Comprehensive Study is to:

Develop relevant technical information, strategies and plans and recommend a formal coordination mechanism for the long term, basinwide management and use of the water resources to meet the environmental, public health, and economic needs of the basins.

C. Study Objectives

1. Water Demand Objective.

Conduct a comprehensive assessment of the demands for water resources in both basins.

- "Comprehensive assessment" shall include historic, present and reasonably foreseeable future demands. Historic shall mean the period of record. Future demands shall be projected, when appropriate, for the years 1995, 2000, 2010, 2020 and 2050.

- "Demands" shall include, but not necessarily be limited to, both instream and out-of-stream uses such as: agriculture; environmental quality (including water quality, riverine, estuarine and terrestrial wildlife and habitat, wetlands and special natural resources such as the freshwater needs of Apalachicola Bay); industrial; navigation; power generation; recreation; waste assimilation; and municipal water supply.

- "Water resources" shall mean both surface water, including reservoirs, and ground water.

2. Water Resources Availability Objective.

Conduct a comprehensive assessment of the historic and present availability of water resources in both basins.

- "Comprehensive assessment" shall include the influence of the climate and pertinent physiographic factors such as topography and geology.

- "Availability of water resources" shall mean both surface water, including reservoirs, and ground water.

3. Comprehensive Management Strategy Objective.

Develop implementable strategies for the planning period for the basins to guide water management decisions for a full range of hydrologic conditions.

- "Implementable strategies" shall consider: (a) methods to influence water availability; (b) interbasin transfers, (c) water conservation measures, and (d) other water management practices.

- "Planning period" shall mean from now through the year 2050 and shall be projected, when appropriate, for the years 1995, 2000, 2010, 2020 and 2050.

- "Water management decisions" are to consider the impacts of existing water resource commitments, the institutional framework, and a cumulative assessment of actions within the basins, and be aware of the local, regional and national perspectives.

- "Full range of hydrologic conditions" shall include the continuum from floods to droughts.

4. Coordination Mechanism Objective.

Recommend a permanent coordination mechanism for the implementation of comprehensive management strategies.

V. STUDY ELEMENTS

A. Introduction

This section of the Plan of Study presents the study elements that are contemplated for inclusion in the Comprehensive Study. The study elements are grouped into three major categories reflecting the areas of emphasis and relating to the study objectives. The sections presented are:

- Water Demand

- Water Resources Availability

- Comprehensive Management Strategy

B. Databases and Models

Various resources, such as databases, models and existing reports, are available for use in developing the Comprehensive Study. Some of these resources are to be located by specific inventory tasks included in this Plan of Study. One of the responsibilities of the study managers will be the review of the available resources to determine their suitability for inclusion in the study process.

The databases which are available for use in the study process are maintained by several different agencies and vary in content and format. The data from existing sources may be incomplete, in terms of the purposes for which it will be used in

the study, and occasionally may be conflicting. In addition, much of the data to be gathered during the study process will overlap many tasks and study elements.

To minimize data related problems a "Comprehensive Study database" will be established to provide a uniform source of data for all study participants. Inventories which independently produce data will be coordinated with the database requirements. Although a single repository may be established, the databases will be accessible to all parties and may potentially be copied. To establish the Comprehensive Study database, the Technical Coordination Group will select or direct the development of the database system to be used, determine the data to be entered, and oversee the maintenance of the database during the course of the study.

There are numerous models available which will be considered for use in the study process. One task in the Plan of Study specifically addresses inventorying the methods of analyses that are available. Ideally, a single model would incorporate all the variables and show how decisions with respect to one point in the study area would effect the total system and describe the impacts to the socio-economic system. It is highly probable that such a state-of-the-art model may not exist and will not be available during the initial study period.

To address this situation a series of models may be used. The models may be linked so that the output from one becomes input for another. Or, the models may be integrated by actually combining two or more models. Decision matrices will be used to supplement quantitative models where appropriate.

C. Study Element Format

Each study element is described using a uniform format which is described below.

Study Objective

Each study element has a study objective that directly relates to a major area of emphasis objective and highlights why the specific study element is being included in the Comprehensive Study.

Rationale

This portion of the study element provides a limited amount of background information as justification for the study element.

Task Description

The task descriptions reflect the types of work that are anticipated in order to complete the study element. Each task item, or bullet entry, is envisioned as representing at least one major component of the overall study element. These conceptual task statements will be detailed when the full scope of work is developed for the study element.

For purposes of the task description the phrase "state, river basin, stream segment, and county" is intended as a generic term to describe both data collection areas and geographic areas for analysis. The word "state" shall generally be interpreted as that portion of each state lying within the designated study area. The term "stream segment" shall be subject to definition by the Technical Coordination Group. The term "county" is generally included because some types of data are normally available at the county level.

The task descriptions indicate the general time frame in which certain elements should be accomplished. The early, middle and late designations included in parentheses at the end of each task description is intended as representation of sequencing. For example, certain inventory tasks may need to be accomplished early in the study process to make information available to facilitate other studies.

Actual work performance schedules will be developed as detailed scopes of work are developed for each study element. Along with the detailed scope of work a detailed budget for the study element will be developed, including total costs and sources of funding.

End Results

The end results statement briefly describes the product that is expected to be produced for each study element.

D. Water Demand

This section of the Plan of Study presents study elements for the water demand portion of the Comprehensive Study. The purpose of the water demand section is to identify, describe and quantify all water demands within the basins. Water demands shall include both consumptive and nonconsumptive uses of groundwater and surface water, including reservoirs.

To do this, the study must singularly and simultaneously consider all the water demands under a range of conditions, such as flood, normal, and drought, seasonal variability, and appropriate time scales. The water demand elements described in

this section are as follows.

- Agriculture Demand
- Apalachicola River and Bay
- Environmental Demand
- Hydropower Demand
- Industrial Demand
- Municipal Water Demand
- Navigation Demand
- Recreation Demand
- Waste Assimilation Demand

1. Agriculture Demand.

Study Element Objective

Describe and quantify the existing and projected agricultural demand on the water resources within the ACT and ACF River Basins.

Rationale

Agricultural demand for water is a recognized use of the water resources of the ACT and ACF Basins. Several thousand farmers currently use groundwater and surface water resources for irrigation, aquaculture and stock watering. A considerable amount of additional land that is suitable for irrigation and aquaculture is located in these basins and has yet to be developed.

Task Description

1 • Determine existing agricultural water use (livestock watering, aquaculture, and crop irrigation) by both groundwater and surface water sources by state, river basin, stream segment, and county. Existing irrigation usage includes number of systems in use, techniques used, amount of withdrawal capacity, weather patterns, number of days irrigation systems are operated, crop types and number of acres irrigated. (Early)

2 • Describe agricultural production rates, both existing and projected, within the basins. (Early)

3 • Project unconstrained agricultural water demands by crop types and other agricultural uses by state, basin, stream, segment, and county, using appropriate projections and land suitability analysis. (Middle)

4 • Recompute agricultural water demands assuming conservation practices within the agricultural sector, including costs and mandatory controls, by state, basin, stream segment, and county. (Middle)

5 • Consider alternate sources for agricultural water, including but not limited to, farm ponds and treated industrial and municipal discharges. (Middle)

6 • Consider alternative crops that could be grown to reduce the demand for irrigation water. (Middle)

End Results

This study objective will result in a report or analysis that summarizes the existing and projected agricultural water needs.

2. Apalachicola River and Bay.

Study Element Objective

Improve knowledge of the bay and riverine system in order to describe: (1) the freshwater and nutrient requirements of Apalachicola River and Bay necessary to maintain historic productivity and diversity in the system; and (2) the linkage and correlation between the riverine conditions and estuarine productivity.

Rationale

The Apalachicola Estuary serves as an important commercial fishery for oysters, shrimp and blue crab and as a breeding and nursery ground for a large variety of commercial and recreational fin fish species. Research in other estuaries has shown that productivity is directly linked to the delivery of freshwater and nutrients. The ACF river system acts as the conduit for this transport. The potential effects of water management practices throughout the ACF are therefore important components in the health of the river and bay system. Though there is a known link between flow and productivity, this relationship is not well understood.

Task Descriptions

7 • Examine ecological and natural resource inventory research dealing within the Apalachicola River and Bay, including mapping of historic natural resources. (Early)

8 • Examine research from the Apalachicola River and Bay system and from other estuaries on freshwater and nutrient relationships. (Early)

9 • Develop a three-dimensional hydrodynamic model for the Apalachicola Estuary and lower River (tidal influence) including an appropriate data acquisition program. (Middle)

10 • Develop ecological and/or water quality models, as required, and associated data acquisition programs that directly link results from three-dimensional hydrodynamic model to examine the time and space relationships between salinity distribution and estaurine productivity. (Late)

11 • Examine localized effects on productivity in the Bay (i.e., Sikes Cut and local land use issues). (Middle)

12 • Determine the physiological and ecological requirements for maintaining and enhancing the productivity of the various fisheries, including oysters, shrimp, fin fishes, plankton and other biological communities in Apalachicola River and Bay, to include seasonal flows and a range of salinity regimes and nutrient transport. Develop an understanding of the relationships between oysters, oyster predators and salinity regimes within the Bay System. (Late)

13 • Determine the effects of varying flow regimes on the water quality and nutrient transport within and from the wetlands (both freshwater and saltwater) of the Apalachicola, Chattahoochee and Flint Rivers. (Middle)

14 • Analyze potential changes to the periodicity of riverine floodplain inundations due to flow alterations and structural modifications. (Middle)

15 • Determine instream flow needs for the fisheries in the river system including impacts of flow alterations to cold water refuges used by anadromous fishes. (Middle)

16 • Determine nutrient loading and limitations, including potential of soils, as a basis for understanding nutrient releases and estimates of loadings to adjacent water bodies. (Middle)

17 • Examine the link between productivity and fishery data including commercial and recreational landings. (Early)

18 • Examine ecosystem processes relative to freshwater inflows. (Late)

End Results

This study element will examine the ecological relationships that exist in Apalachicola River and Bay. Documents will be prepared which describe the physical attributes of the estuary, the relationships between the physical processes and biological productivity, and the importance of the hydrologic regime to the ecological stability of the system.

3. Environmental Demand.

Study Element Objective

Determine significant, water related environmental needs of the basins and describe environmental effects which could be caused by changes in the existing water management system.

Rationale

There are environmental conditions which could be improved or harmed through changes in operating procedures (water control features) or basin management efforts in each basin. Therefore, the potential environmental effects of water management practices in the ACT and the ACF River Basins are important to the users of the water resources.

Many of the reservoirs, rivers and streams within the basins serve as important sport fisheries and some as commercial fisheries. The rivers of both basins have a diverse fishery and serve as nursery habitat for many species of shell and fin fish. Wetlands and floodplains, archaeological, cultural, and historical features and resources throughout the basins should be protected. Additionally, the basins contain several plant and animal species which are federally listed as threatened or endangered, are proposed for listing, or are candidates for listing. Because of this, future changes in flow allocations or additions of water control structures must take into account these species and their essential habitats.

Task Descriptions

19 • Evaluate water quality data and describe existing water quality for both surface water and groundwater sources for each segment of each basin. (Early)

20 • Identify historic and present major water quality and sediment quality problems in the basins and the identifiable instream and out-of-stream sources of problems. (Early)

21 • Determine existing water quality classifications throughout the basins (i.e., fishing, swimming, shellfish propagation, etc.). (Early)

22 • Identify significant archaeological, cultural or historical features which could be affected by changes in operation of existing water resources projects or development of new ones. (Middle)

- Identify and characterize aquatic and wildlife habitat needs throughout the basins and locate designated areas of critical habitats. (Middle)

- Identify species that are endangered, threatened, formally proposed candidates for listing, or similarly protected; and identify habitats and status of these species. (Early)

- Identify historic and present riverine and estaurine wetlands. (Middle)

- Determine the effects of the existing and proposed water management practices on aquatic and wildlife resources and habitat. (Late)

- Determine flow regime requirements for maintaining and enhancing aquatic and wildlife resources and habitat, including threatened, endangered, or otherwise protected species. (Early)

- Analyze potential changes to the periodicity of riverine floodplain inundations due to flow alterations. (Middle)

- Determine instream flow needs for the fisheries in the river system including impacts of flow alterations to cold water refuges used by anadromous fishes. (Middle)

- Develop a method to describe changes to reservoir, stream, wetland, and estuary aquatic and wildlife resources from baseline conditions and existing flow regimes. (Early)

- Identify appropriate nutrient and sediment transport monitoring programs. (Middle)

End Results

This study element will result in a series of documents that describe the relationships of riverine, estuarine, and water related terrestrial wildlife and habitat to water and sediment quality and the alterations of flow regimes. The element should also develop a method to quantitatively assess the natural resource flow requirements.

4. Hydropower Demand.

Study Element Objective

Describe and quantify the existing capacity and operational procedures for hydroelectric power facilities within the ACT and ACF Basins.

Rationale

Hydropower generation is an important use of the water resources of the ACT and ACF Basins. Both the quantity of water released through the generating turbines and the timing of releases to coincide with peak electricity demand periods are important to realizing maximum economic benefits from hydroelectric power generation. It is also important to maximize the value of power generated, and to minimize the cost to purchase power during shortages subject to constraints caused by other operational objectives.

Hydropower generated by the federal facilities is marketed by the Southeastern Power Administration (SEPA) and is a component of a power grid which includes federal projects in other basins. Operational changes implemented at federal projects which impact private generation facilities, or recommended changes at federally licensed facilities, may also influence the power grid and are subject to approval by the Federal Energy Regulatory Commission (FERC).

Task Description

32 • Identify the existing hydropower facilities and describe the existing hydroelectric generating capacity, based on operating procedures at each dam within the ACT and ACF basins. Determine the turbine installation dates at all facilities. (Early)

33 • Describe the existing hydroelectric generating contracts with SEPA and other entities, and their operating procedures, at each dam within the ACT and ACF basins. (Early)

34 • Project the potential improvement of instream water quality due to replacing existing turbines with auto-venting turbines in accordance with the expected replacement schedule, bubble mixing, tailwater reaeriation devices, direct oxygen injection, and other methods. This evaluation shall consider the status of technology, research needs, and reasonable retrofitting

costs. Nominal efficiency losses (e.g. 3 to 5%) should be expressed as a cost for environmental improvement. (Middle)

35 • Obtain the turbine replacement schedules, based on the life expectancy of existing equipment, and identify 'windows of opportunity' for installing turbines, or other methods of aeration, which are more efficient or will improve water quality. (Early)

36 • Develop or utilize an existing computer model capable of determining dependable system capacity for power generation. (Early)

37 • Determine the cost and impact of offsetting lost dependable capacity at public and private facilities due to modified operating practices; determine the national and regional economic development impacts. This analysis will include consideration of the effects of changes made within the study area on other facilities and projects and systems in other basins. (Middle)

38 • Develop a pricing framework where federally licensed projects can recover on investments for lost capacity and energy due to physical or operational changes in the basins. (Middle)

39 • Examine water management practices which integrate system hydropower resources and multiple site requirements placed on individual dams. (Middle)

40 • Identify additional hydropower capability in the basins at either existing sites or at potential new sites. (Early)

41 • Evaluate the change in dependable capacity (MW) and associated energy (MWh) that results from modifying present operating practices. (Middle)

42 • Evaluate the headwater benefit requirements and impacts, as described in Section 10 of the Federal Power Act, of any structural or operational changes made in the basins. (Middle)

43 • Evaluate the impact of not fully using hydropower capability by determining the increased costs to customers and the impact on air quality. (Middle)

44 • Evaluate operational changes in the overall SEPA system which, by improving its operation, could have the effect of off-setting lost capacity in the two basins without significant adverse impacts to other operating objectives. (Middle)

45 • Assess the effects of energy conservation (including pricing, mandatory controls and load management), develop conservation scenarios and recompute energy needs for the planning period. Evaluate economic benefits of phased operational modifications to SEPA system projects as they relate to water supply and dependable capacity. (Middle)

End Results

This study element will result in a document that summarizes the dependable capacity and secondary energy available within the basins, identifies alternatives, and determines costs and impacts associated with hydropower as one of several operating objectives.

5. Industrial Demand.

Study Element Objective

Describe and quantify the existing industrial water demand within the ACT and ACF Basins and project industrial water needs through the planning period.

Rationale

Industrial water demand includes not only process water for industrial processes, such as textiles, chemicals, pulp and paper, but also cooling water and steam for fossil fuel and nuclear power plants. These industrial demands are recognized uses of water resources within the basins.

Task Description

46 • Determine existing industrial water demand and locate withdrawals for both groundwater and surface water resources by state, basin, stream segment, and county. (Early)

47 • Determine the foreseeable future water consumption of industries (e.g. by Standard Industrial Classifications) and identify low water demand industries. (Early)

48 • Develop unconstrained industrial water demand requirements, by state, basin, stream segment, county, and metropolitan area, if appropriate, using state projections, industry expectations, OBERS economic growth projections, and other appropriate methods. (Middle)

49 • Recompute industrial water demand requirements considering water conservation practices - including pricing, recirculation, and mandatory controls - and develop conservation scenarios by state, basin, stream segment, county, and metropolitan area. (Middle)

50 • Consider the development of alternative water sources. (Middle)

51 • Determine which industrial sectors could potentially use off-stream storage for industrial water supply. (Middle)

End Results

This study element will result in a document that summarizes the industrial water demand needs and alternatives of the ACT and ACF basins through the year 2050.

6. Municipal Water Demand.

Study Element Objective

Describe and quantify the existing municipal water demand within the basins and project municipal water demand through the planning period. Municipal demand includes all uses with the exception of industrial, agricultural and instream uses. Municipal water uses and demands shall be identified for residential and commercial sectors.

Rationale

Municipal demand for water supply is a recognized use of the water resources of the ACT and ACF basins.

Task Description

52 • Determine existing municipal water demand and locate withdrawal facilities for both groundwater and surface water resources by state, basin, stream segment, and county. Include at least annual average, peak day usage and seasonal variations as appropriate. (Early)

53 • Collect and project population using OBERS, BEA, Census Bureau and other methods for each state, county, basin, and stream segment through the year 2050. (Early)

54 • Develop unconstrained municipal water demand, by state, basin, stream segment, and county. The unconstrained municipal water demand requirements will be needed for at least annual average and peak day demands. (Early)

55 • Recompute municipal water demands considering water conservation practices, including cost, pricing and mandatory controls, and develop conservation scenarios. (Middle)

56 • Consider the development of alternative water sources or the use of treated discharges or 'gray water'. (Middle)

End Results

This study element will result in a report that summarizes the projected municipal water demands, through the planning period and assesses the impacts of varying withdrawal rates on the water resources within the ACT and ACF Basins.

7. Navigation Demand.

Study Element Objective

Describe and quantify the existing demand for navigation use and determine the effects of varying flow conditions on commercial navigation in the basins.

Rationale

Water-based transportation is a viable alternative for shipping heavy and/or bulk products such as fuels, ores, grain, wood products, chemicals and special products. Federal statutes authorized the construction and maintenance of navigation projects in both basins.

Task Description

57 • Identify and describe the existing navigation features and major facilities. (Early)

58 • Describe the existing status of navigation, including historic channel availability and usage (trips, tonnage and commodities) in each basin. (Early)

59 • Analyze existing and projected commodity flows, seasonality of activities, rates and origins/destinations in the ACT and ACF basins. (Middle)

60 • Analyze and project changes in the cost of shipment in response to various flow conditions, and considering alternative means of transportation (rail and truck); including the consideration of the cost of light loading during low water periods, cost of delays, including the non-availability of channel due to low flow conditions; and cost of inventory controls. The analysis should include the costs incurred for dredging and maintenance of the channel and supporting facilities. (Middle)

61 • Evaluate the volume of navigation traffic, historic and current, and tonnage supportable under reservoir operations as delineated in the Congressional legislation and currently supported navigation under existing operations. (Middle)

62 • Evaluate alternatives for supplying navigation channel availability including: operational changes of the existing system; additional locks and dams; and increased maintenance dredging. (Middle)

63 • Conduct the scheduled update of the "Navigation Maintenance Plan" for the ACF, using other funding sources. (Middle)

64 • Evaluate environmental impacts relative of changes in the system or system operation designed to improve navigation. (Middle)

65 • Investigate national and regional economic development impacts associated with any changes in existing operational procedures affecting the duration and depth of channel availability. (Middle)

End Results

This study element will result in documents pertaining to the water resource requirements and opportunities of the navigation industry with emphasis on the actual costs and benefits relative to operation and maintenance of the industry and facilities under the various flow regimes.

8. Recreation Demand.

Study Element Objective

Describe and quantify the existing recreational demand on the water resources within the basins. The focus of recreation studies in the two basins will be to determine current and future recreation demand and use of reservoir, river and stream resources and the extent to which recreation use and the value of recreation is affected for each incremental unit of water allocated to competing existing and future uses.

Rationale

The recreational demand for water resources is a recognized use of the water resources of the ACT and ACF Basins. Large public and private investments have been made for recreational uses at many reservoirs and at other locations. Fishing, boating, water sports and other recreational uses are pervasive throughout the basins.

Task Description

66 • Identify existing major public and private water-based outdoor recreation facilities and describe the capacity and actual use of facilities in each basin. (Early)

67 • Describe the existing water-based outdoor recreation demand (visitation) in each basin. (Early)

68 • Develop recreation demand functions which describe the level and value of recreation for varying reservoir levels, river flow regimes, and water quality. (Middle)

69 • Project the impact of shoreline management and aquatic plant management on recreational uses. (Middle)

70 • Consider alternatives, such as the installation of floating docks, at recreation facilities to maintain recreation access during low flow periods. (Middle)

71 • Measure the national and regional economic development benefits of recreation within the basins. (Middle)

End Results

This study element will result in a document that summarizes the water-based recreation demands and values within the ACT and ACF basins, and how those demands and values change with varying reservoir levels, river flow regimes, and water quality.

9. Waste Assimilation Demand.

Study Element Objective

Describe and quantify the existing and projected waste assimilation demand on water resources by stream segment within the ACT and ACF Basins.

Rationale

Waste assimilation demand for water resources is a recognized use of the water resources of the ACT and ACF basins, and is strongly related to environmental quality and influences the type of industrial development that may occur in the basins.

Task Description

72 • Identify the major point source and storm water discharges, and describe the characteristics of their wastewaters. Major dischargers will be defined by EPA protocols. (Early)

73 • Identify major areas of non-point loadings and their characteristics using readily available information. (Early)

74 • Quantify projected wastewater loadings (lbs. per day) in terms of oxygen demand. (Middle)

75 • Determine the waste assimilation demands of the basins and the impacts to the capacity caused by any recommended changes. (Middle)

76 • Determine assimilative capacity (Total Maximum Daily Loads), for organics and toxics, by river segments to accept existing and future wasteloads and non-point loadings. (Middle)

77 • Determine and evaluate alternatives to direct discharge, such as land application, holding ponds, wetland treatment, requiring discharges to be upstream of intakes, and reuse. (Middle)

78 • Describe the effects of various withdrawal and wastewater treatment conditions on downstream water quality in each segment of each river basin. (Middle)

79 • Quantify critical and target flow conditions for each stream segment to meet existing and projected NPDES permits needs. (Middle)

End Results

This study element will result in a document that summarizes the projected waste assimilation demands on the water resources within the ACF and ACT basins for the planning period.

E. Water Resources Availability.

Water resources availability is the second area of emphasis for the Comprehensive Study. It examines the factors that influence the availability of water resources in the basins through a review and analysis of climatology, physiography, geology and existing ground and surface water resources, including reservoirs, and the interaction between ground and surface water resources. The following study elements are included in this section.

- Groundwater Supply
- Surface Water Supply

1. Groundwater Supply.

Study Element Objective

Determine the existing and potential future availability and quality of groundwater resources within the basins.

Rationale

A groundwater resource database is needed as a basis for measuring the effects of alternative uses, development and management of groundwater resources within the basins.

Task Descriptions

80 • Describe the topographic, physiographic, water quality, costs and climatologic factors influencing the availability of groundwater resources, including floods, droughts and normal conditions. (Early)

81 • Quantify recharge to groundwater aquifers from surface water. (Early)

82 • Quantify the availability of dependable groundwater resources within the basins and establish a groundwater availability budget. (Early)

83 • Determine potentially available groundwater resources under varying climatological conditions. (Early)

84 • Determine opportunities for recharge and regeneration of stressed aquifers. (Middle)

85 • Describe the effects of varying levels of groundwater withdrawals on water levels and quality in aquifers and in hydraulically connected water bodies. (Middle)

86 • Evaluate and improve, as required, the existing groundwater monitoring network. (Middle)

End Results

The results of this analysis will be a database containing an inventory of groundwater resources within the basins and a description of the effects of varying levels of groundwater withdrawals.

2. Surface Water Supply.

Study Element Objective

Determine the existing and potential future availability and quality of surface water resources within the basins.

Rationale

A surface water resource database is needed as a basis for measuring the effects of alternative uses, development and management of surface water resources within the basins.

Task Description

87 • Describe the topographic, physiographic, and climatologic factors influencing the availability of surface water resources, including floods, droughts and normal conditions. (Early)

88 • Describe the reservoir system and its historic operations and evaluate the reservoirs for both project life and capacity. (Early)

89 • Determine the quantity, quality and timing of return flows in the basins. (Early)

90 • Quantify recharge to surface water from groundwater aquifers. (Early)

91 • Describe historic flooding and the projects and programs in place to address flooding within each basin. (Early)

92 • Describe historic drought conditions. (Early)

93 • Determine potentially available surface water resources under varying climatological conditions. (Early)

94 • Evaluate and improve, as required, the existing stream flow monitoring network. (Middle)

95 • Quantify availability of surface water resources within the basins and establish a water availability budget. (Early)

End Results

The results of this analysis will be a database containing an inventory of existing and potential future surface water supplies within the basins and the results of the effects of varying amounts of surface water withdrawal.

F. Comprehensive Management Strategy.

This section of the Plan of Study presents study elements for the Comprehensive Management Strategy portion of the Comprehensive Study. The purpose of the Comprehensive Management Strategy section is to provide the public and decision makers with information to make informed decisions regarding the water resources within the basins. To do this, the study must simultaneously consider the availability of water resources, competing water demands, extremes of natural conditions that will be encountered, the limitations imposed by law and regulations, and the impacts of various operational conditions on all uses.

Assuming that management information is being generated to make mutually agreeable decisions it is necessary to consider the organizational arrangements for coordination and implementation. For purposes of this study the organizational arrangement is referred to as a "Coordination Mechanism". The exact form and functions of the Coordination Mechanism must also be determined as a part of the study process.

The Comprehensive Management Strategy study element includes two major components:

- Basinwide Management Program
- Institutional Framework and Coordination Mechanism

1. Basinwide Management Program.

Study Element Objectives

Prepare a "Basinwide Management Program" that develops a range of water management strategies to guide future water management decisions in the basins. The basinwide management program should:

- Address the water resource problems identified throughout the planning period for a full range of hydrologic conditions.
- Formulate alternative solutions, for existing and projected problems and predict the outcomes of implementing various combinations of alternatives.
- Measure levels of attainment relative to problem resolution and meeting specified objectives.
- Analyze the cumulative impacts of a reasonable number of the management strategies.
- Describe mutually agreed upon basinwide management strategies that can be used in a coordinated manner to address the water demands within the basins.

Rationale

Existing demands on the water resources are caused by competition for use, preemption of water quantity and quality, and degradation of water quality making it less suitable for certain uses. All of these pressures exist to some degree in the basins and are expected to increase in the future. The basinwide management program should strive to accommodate all the beneficial uses which are anticipated throughout the basins.

Each study element in the water demand and availability sections will identify alternatives which address a particular water using sector. The purpose of the data collection and singular analyses is to provide an objective database to assess the impacts of projects or changes in water management practices within the basins. However, many of the changes have the potential to cause related water resource issues which transcend political and jurisdictional boundaries. A basinwide management program is needed to provide a common framework for proposing changes, assessing cumulative impacts and defining strategies which resolve water resource conflicts and issues.

Task Descriptions

96 • Compare the water demand and water resource availability alternatives developed in the individual study elements and prepare a water budget to determine the problems that must be addressed in the basins throughout the planning period. (Middle)

97 • Inventory and evaluate other cumulative impact analyses performed for other basins and determine the appropriate methods of analysis to be used. (Early)

98 • Project the probabilities of extreme climatic conditions occurring and determine the management strategies to effectively respond to the emergency conditions imposed by droughts and floods. (Middle)

99 • Examine technologies and evaluate projects or modifications to operating procedures that would increase water storage in the basins. Examples include the construction of new community and regional reservoirs, the use of flood storage capacity in existing reservoirs, increasing rates of return, reverse pumping aquifers, raising reservoir levels, seasonal rule curve modification, real time management, storage exchange and other alternatives. (Middle)

100 • Formulate alternative structural and non-structural plans to achieve each study element objective to varying degrees. (Late)

101 • Conduct a "Water Resource Impact Analysis" to analyze basin water management practices and projects to integrate system resources and multiple on site (river and stream) requirements. (Late)

102 • Conduct a "Multiple Objective Analysis" to compare the degree to which each alternative plan satisfies the various study element objectives. (Late)

103 • Conduct a "Multiple Goal Attainment Analysis" to determine if the Comprehensive Study goal and objectives were met. (Late)

104 • Conduct a "System Analysis" to evaluate the basinwide impacts of individual actions and consider those individual actions relative to all other water demands within the basins. (Late)

105 • Evaluate the positive and negative environmental impacts of alternatives, throughout the basins, and incorporate the environmental water needs to protect natural resources and prevent adverse impacts to sensitive areas. (Late)

106 • Evaluate impact(s) to national and regional economic development benefits as a result of changes in water availability or distribution between the various uses within the basins. (Late)

107 • Prepare a Plan of Study for future work beyond the scope of the Comprehensive Study. (Late)

End Results

The end product will be a recommended "Basinwide Management Program". The program will include strategies that generally describe approaches for the development and use of the water resources within the basins. It is anticipated that a formal document will be produced as a result of this effort.

The scope and content of this document will be defined more precisely when the results of the various analyses become available. However, three types of information should be incorporated in the report. First, the document should serve as a decision document for making mutually agreeable water resources management and development decisions in the basins. Second, the analyses conducted should provide input for appropriate National Environmental Policy (NEPA) documentation associated with water resources management and development decisions in the basins. Last, but an equally important part of the report, will be the documentation of the various alternatives that have been tested and the findings of the analyses so a permanent record is created to prevent future duplications.

2. Institutional Framework and Coordination Mechanism.

Study Element Objective

Analyze the existing institutional framework and potential coordination mechanisms to develop a basis for possible revisions to the framework and recommend a coordination mechanism(s) for the future management of water resources in the basins.

- "Existing institutional framework" shall include, but not be limited to, statutory, regulatory, and water resource management guidelines that effect water management in the basins.
- "Potential coordination mechanisms" shall include a broad spectrum of effective federal-state and interstate relationships for managing water resources.

Rationale

Federal and common law, regulations, licensing requirements and management guidelines impact both the water quantity and quality available in the basins. In addition, a vast body of state legislation and regulations impose water quality standards on the basins. The entire institutional framework of federal and state law, regulation, and operating procedures impacts flow regimes, reservoir levels, and ultimately, the general use of water in the basins. It is essential that a complete understanding of this institutional framework be developed.

Water resource management decisions within the basins might be improved through a mutually agreeable, coordinated management approach. Recent droughts and projected water demands have focused attention on the competitive issues to be addressed in water management. Recent responses to proposals for water development projects and modifications to management procedures have clearly indicated that water resource issues transcend political boundaries.

Task Descriptions

108 • Inventory, compare and contrast federal and state laws, regulations, operational guidelines, and management plans related to water resource development and management in the basins and determine the limiting factors of each. (Early)

109 • Inventory authorized, but undeveloped, projects in each basin. (Early)

110 • Inventory coordination procedures which currently exist among Alabama, Florida, Georgia, the Corps of Engineers and other federal and state agencies. (Early)

111 • Inventory methods of federal-state and interstate relations used in other areas to manage water resources, address conflicts and resolve disputes. The primary source for this information is expected to be existing coordination methods used by states in other parts of the country. This shall include, but not necessarily be limited to: interstate planning and management commissions; interstate and federal-state compacts; informal agreements; congressional allocations; and litigation. (Early)

112 • Project water management and coordination needs within the basins. (Middle)

113 • Establish the objectives to be achieved by the coordination mechanism(s) for the basins. (Middle)

114 • Compare existing management procedures and identify and recommend needed coordination mechanism(s). (Middle)

115 • Evaluate the capabilities of the identified management and coordination alternatives for managing and coordinating water supplies and demands within the basins. (Middle)

116 • Evaluate the need to change certain elements of the institutional framework to address water management procedures within the basins. (Middle)

117 • Evaluate the identified methods of federal, state and interstate relations by listing the advantages and disadvantages of each method. (Middle)

118 • Present the analyses of management and coordination needs and methods as the range of alternatives to be considered for use in the basins. (Late)

119 • Evaluate and blend the management and coordination alternatives presented to devise a mechanism to fit the management and coordination needs of each basin. The Technical Coordination Group and the Legal Support Group shall review the preliminary material and prepare a recommendation to be forwarded to the Executive Coordination Committee. (Late)

120 • Approve a mutually agreeable coordination mechanism to be recommended to the individual states and Corps for implementation. Following approval by the Executive Coordination Committee a detailed recommendation regarding the institutional framework and coordination mechanism(s) shall be prepared. (Late)

121 • Recommend changes to the institutional framework and details for the mutually agreed upon coordination mechanism(s). A description of the procedures to be used, tasks to be undertaken, and other required material or legislation needed to implement this course of action, shall be prepared. (Late)

End Results

- A formal document for the three states and the Corps of Engineers shall be developed which describes the relevant factors related to changes needed in the institutional framework and a description of the recommended, permanent coordination mechanism(s). The establishment of a permanent coordination mechanism(s) is to be a primary result. Other tangible working documents which are expected include the inventory and analyses of coordination methods and any required agreements, legislation or other material to support implementation of the coordination mechanism(s).

A.L. BURRUSS
1927 - 1986

A.L. (Al) Burruss served his community through elected public office and business, religious and personal commitments. During his 22-year career in public service in Georgia, he gave special attention to the communities of northwest Georgia.

A.L. Burruss' career in the state legislature was devoted to providing a better standard of living for all Georgia citizens. His dedication to the state of Georgia and its citizens is now carried on through the A.L. Burruss Institute of Public Service at Kennesaw State College.