

Chapter 1

Introduction



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1.1 Introduction

The Tennessee Valley Authority (TVA) is a multipurpose federal corporation responsible for managing a range of programs in the Tennessee River Valley (the Valley) for the use, conservation, and development of the water resources related to the Tennessee River. In carrying out this mission, TVA operates a system of dams and reservoirs with associated facilities—its water control system (Figure 1.1-01). As directed by the TVA Act, TVA uses this system to manage the water resources of the Tennessee River for the purposes of navigation, flood control, power production and, consistent with those purposes, for a wide range of other public benefits.

TVA generates and distributes electric power to customers within its Power Service Area. The water control system has hydroelectric generators and provides the cooling water supply for TVA's coal-fired and nuclear power plants located adjacent to TVA reservoirs. TVA's power system and its management of water resources are central components of sustainable economic development in the Valley and TVA Power Service Area.

TVA RESERVOIR SYSTEM OPERATING OBJECTIVES

- Navigation
- Flood control
- Power production
- Water supply
- Water quality
- Recreation
- Other objectives

TVA also has custody of and manages approximately 293,000 acres of land in the Valley, most of which is along the shorelines of TVA reservoirs. TVA has established policies for the development of reservoir shorelines and adjacent TVA lands (see Section 1.8). Development and management of these lands and activities are influenced by reservoir levels and river flows.

TVA's reservoir operations policy guides the day-to-day operation of its water control system. The reservoir operations policy sets the balance of trade-offs among competing uses of the water in the system.

TVA has periodically evaluated the reservoir operations policy to respond to the values expressed by the public. The last examination of the policy culminated in the issuance of TVA's Lake Improvement Plan in December 1990 (the Tennessee River and Reservoir System Operation and Planning Review). TVA now is completing a comprehensive study of its reservoir operations policy, the Reservoir Operations Study (ROS), to determine whether changes in the policy could produce greater overall public value. With considerable involvement and advice from the public and interested federal and state agencies, TVA staff analyzed and reviewed a wide range of policy alternatives for its water control system. Staff is recommending appropriate changes in the reservoir operations policy to the TVA Board of Directors (the Board). A decision by the Board to change the reservoir operations policy would affect the operation of TVA's water control system and would modify the present balance among the various operating objectives.

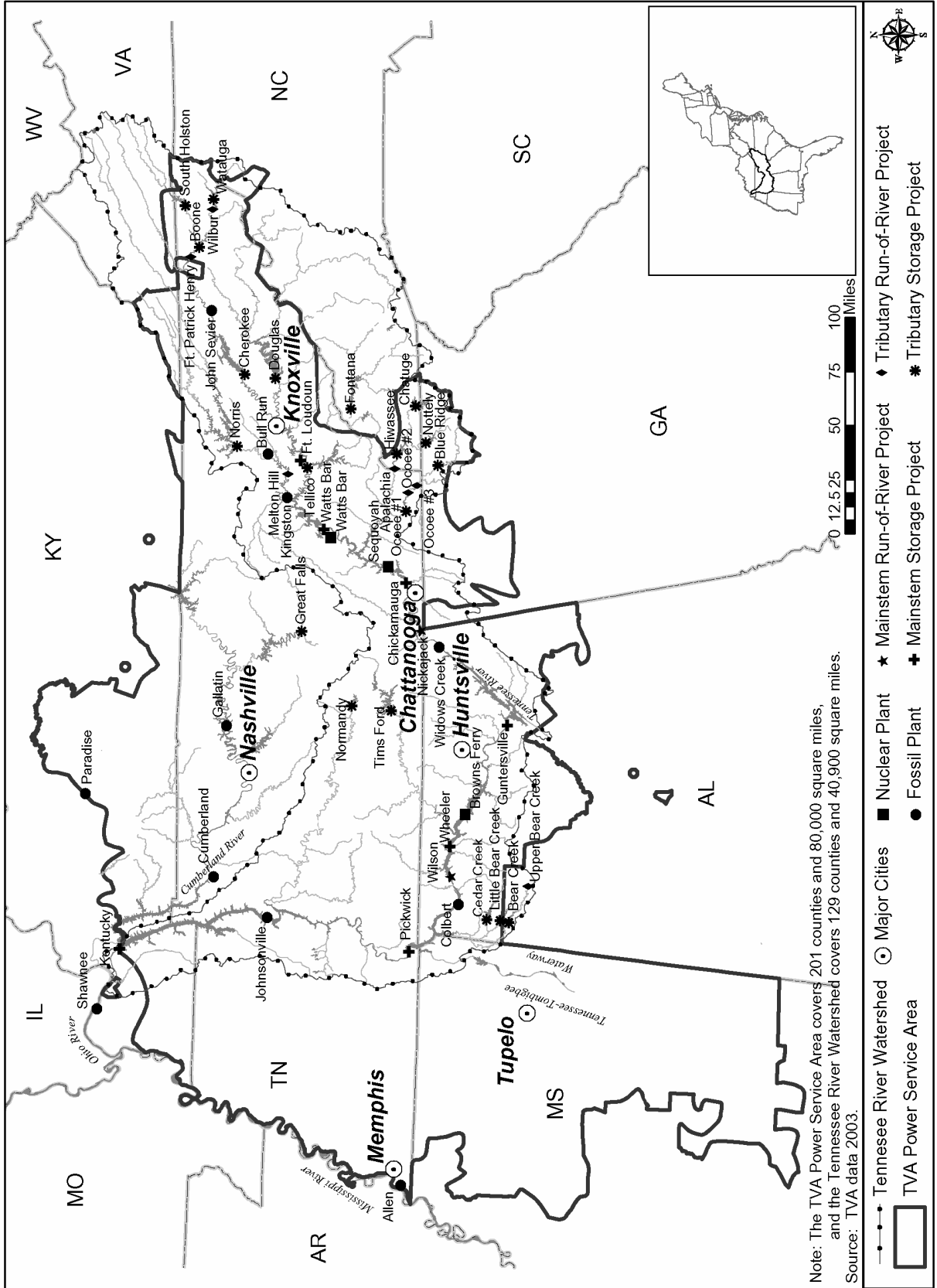


Figure 1.1-01 Tennessee River Watershed and TVA Power Service Area

TVA prepared this Final Programmatic Environmental Impact Statement (FEIS) in accordance with the Council on Environmental Quality (CEQ) regulations and TVA's own procedures for implementing the National Environmental Policy Act (NEPA). The U.S. Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service (USFWS) were cooperating agencies in the preparation of this EIS. As the lead agency in this effort, TVA was primarily responsible for ensuring opportunities for stakeholder participation, EIS content, and compliance with all aspects of NEPA and other applicable statutes and implementing regulations.

According to the CEQ, a programmatic EIS is appropriate when a decision involves a policy or program, or a series of related actions by an agency over a broad geographic area. This programmatic EIS summarizes the results of the ROS, the public involvement process, the development and evaluation of policy alternatives, and the potential impacts of those alterations on the natural and human environment. The ROS is integrated into this FEIS and is not a separate report. Distribution of the Draft EIS (DEIS) afforded the public, governmental agencies, and non-governmental organizations opportunity for review and comment prior to TVA staff making a recommendation to the Board.

1.2 Purpose and Need

The specific purpose of the ROS is to enable TVA to review and evaluate its reservoir operations policy to determine whether changes in the policy would produce greater public value. TVA's reservoir operations policy affects how much reservoir levels rise and fall, when changes in reservoir levels occur, and the amount of water flowing through the reservoir system at different times of the year.

Changes in TVA's reservoir operations policy would modify the present balance among the various operating objectives for the system in response to changing public values. The final result of the ROS is a set of recommendations developed by TVA staff in this FEIS and a subsequent decision by the Board, possibly establishing a new reservoir operations policy. Implementing a new reservoir operations policy would involve changing the existing reservoir system operating guidelines. The Board's decision will be documented in a Record of Decision. In addition, because TVA receives no appropriations (money) from Congress, changes to operations that require additional capital or operating expenditures would need to be funded by either TVA or others.

1.3 Scope of the ROS

TVA owns or operates 49 dams and reservoirs (called projects) within the Tennessee River and Cumberland River watersheds. The scope of the ROS included evaluating the operations of 35 of these projects—projects for which TVA schedules water releases and reservoir levels in accordance with its reservoir operations policy (Figure 1.1-01). The projects not included in the ROS are one pumped storage project and several small water retention dams that are essentially self-regulating. These projects have little impact on the operation of TVA's water control system.

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In addition, physical removal of or major structural modifications to TVA dams and power plants is not included in the scope of this EIS.

The geographic area potentially affected by changes in the reservoir operations policy includes the Tennessee River watershed and the larger TVA Power Service Area (Figure 1.1-01). This area covers almost all of Tennessee and parts of Alabama, Kentucky, Georgia, Mississippi, North Carolina, and Virginia. The Tennessee River watershed includes 129 counties and encompasses 40,900 square miles; TVA's Power Service Area comprises 201 counties and covers approximately 80,000 square miles. Analyses of some resource areas (e.g., navigation) included parts of the Ohio and Mississippi River systems that are outside the Valley. Other resource evaluations (e.g., air quality) included areas outside the TVA Power Service Area to ensure a comprehensive analysis.

KEY TERMS

The System—The TVA water control system (also referred to as the reservoir system) is a series of interconnected dams and reservoirs on the Tennessee River and its tributaries. Many of the dams include hydropower generation facilities and locks for navigation.

Operation of the System—TVA controls water storage in each reservoir and the flow of water from one reservoir to another, in response to changing rainfall and runoff.

Reservoir Operations Policy—This policy balances the benefits of operating objectives and is implemented through a set of operating guidelines for all reservoirs in the system.

Operating Objectives—These objectives include navigation, flood control, power production, recreation, water supply, water quality, and other benefits.

Operating Guidelines—Operation of the system is governed by a set of operating guidelines that include guide curves, minimum flow requirements, water release requirements, and other requirements to meet system operating objectives.

Policy Alternative—A reservoir operations policy alternative is a set of operational changes that would adjust the present balance among the various operating objectives for the system. A policy alternative may emphasize several operating objectives at the same time.

As is typical of water resource planning and management studies of this type, the ROS and this EIS used a long-range planning horizon (to the year 2030).

1.4 Decisions To Be Made

The Board will decide whether TVA's reservoir operations policy will be changed and the nature of the change, based on the recommendations of TVA staff. In addition to staff recommendations, the Board will consider this FEIS, public comments, and other factors. The Board will make a decision following the Notice of Availability of this FEIS and after public comments on the FEIS are considered. The final decision will be documented in a Record of Decision and made available to the public. Decisions made by other federal agencies would be appropriately documented by the respective agency.

1.5 History of Policy Changes

TVA has periodically made changes and adjustments to its reservoir operations policy in order to achieve greater overall value for the public. Past policy changes reflected factors such as the public's changing needs and concerns, requests from citizens and regional groups,

environmental quality issues, changes in the power industry, and TVA's own mission and planning needs. The reservoir operations policy also reflects a growing experience and understanding of the challenges and limitations imposed by annual variations in rainfall and runoff, especially during droughts and floods.

- **1970s—Improved Reservoir System Benefits.** In the early 1970s, TVA began looking for ways to improve long-term power supply, water quality in tailwaters, aquatic habitat, and recreational opportunities without sacrificing navigation, flood control, and power production. A multiple-reservoir study completed in 1971 found that TVA could meet some of these objectives by raising minimum winter water levels at nine tributary reservoirs.
- **1980s—Reservoir Resource Reevaluation Program.** TVA began its Reservoir Resource Reevaluation Program in the early 1980s, bringing together a team of TVA specialists to review its operations and evaluate suggested changes. This was the beginning of a more formal evaluation process that involved public input. Although the program did not create broad policy changes for TVA reservoir operations, it provided a forum for external groups (e.g., state organizations and reservoir user groups) to voice their concerns and to understand the impacts of requested changes on individual reservoirs, as well as the entire TVA system.
- **1980s—Reservoir Release Improvement Evaluations.** The low availability of water during the extended drought of the 1980s affected water quantity and quality in river segments below dams. In response, TVA experimented with minimum flows to improve aquatic habitat, water quality, and waste assimilation (the process by which a river accepts wastewater). TVA developed methods to provide higher minimum flows, including turbine pulsing, reregulation weirs, and continuous releases through small turbines. TVA also began the process of evaluating and implementing methods to increase dissolved oxygen (DO) concentrations in the water released from the dams.
- **1990s—Lake Improvement Plan.** By the late 1980s, there was growing recognition that benefits beyond the operating objectives of navigation, flood control, and power production had become increasingly important to residents of the Valley. In response to public input through the NEPA process, TVA completed the Tennessee River and Reservoir System Operation and Planning Review EIS, also known as the Lake Improvement Plan (TVA 1990). In 1991, the Board approved changes to the reservoir operations policy. These changes included extending summer reservoir levels on 10 tributary reservoirs to August 1 in order to increase recreational opportunities. Consistent with the Reservoir Release Improvement (RRI) evaluations, TVA also increased minimum flow requirements for many of its mainstem and tributary projects, and began a program to increase DO concentrations in the releases from 16 TVA dams.

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TVA continued to receive requests for changes to reservoir levels and other operations during implementation of the Lake Improvement Plan. As more and more users requested studies for their particular reservoir or tailwater, TVA decided that a piecemeal approach raised questions of fairness in how each reservoir would be treated. A comprehensive review was needed to examine the effects of changes in the reservoir operations policy on system performance (in terms of benefits produced) and on system-wide costs.

In March 1997, TVA established a 4-year moratorium on making any new changes in reservoir operations. This action was taken to allow the agency time to deal with the uncertainty of deregulation of electric utilities and to develop the analytical tools and methodologies for evaluating and explaining the benefits ascribed to reservoir operations changes, particularly in the area of flood risk in the Tennessee River watershed. In July 1998, an internal TVA task force report recommended that TVA continue its moratorium and, in the next 2 to 4 years, begin a system-wide evaluation of policies that would affect reservoir levels. The task force also noted the complexities involved in carrying out such a study and identified several areas requiring further attention, including a proactive communication plan with the public and better evaluation methodologies for costs and benefits. This EIS fully addresses those recommendations.

1.6 Scoping Process

NEPA regulations require an early and open process for deciding what should be discussed in the EIS document—known as the scope of the evaluation. The scoping process involves requesting and using comments from the public and interested agencies to help identify the issues and alternatives that should be addressed in the EIS, and the temporal and geographic coverage of the study.

Consistent with NEPA requirements, the ROS process and this EIS were designed to be responsive to the values, comments, and input of the public and other governmental and non-governmental organizations. The objectives of the ROS and this EIS included, but were not limited to:

- Identifying public issues, concerns, and values regarding the reservoir system;
- Using public input to shape reservoir operations policy alternatives;
- Identifying key objectives and options for formulating and evaluating reservoir operations policy alternatives;
- Identifying the social, economic, and environmental factors to be considered in formulating policy alternatives;
- Developing and analyzing policy alternatives;
- Explaining the potential environmental and socioeconomic effects of the policy alternatives to the year 2030; and,
- Providing opportunities for the public to actively participate in this process.

In July 2002, TVA issued a report entitled Reservoir Operations Study Environmental Impact Statement Scoping Document, which is summarized in the following sections.

1.6.1 Public Involvement

At the beginning of the NEPA process, citizens were asked to help TVA define the scope of the planned evaluation. Scoping began in January 2002, when TVA mailed letters describing the ROS to more than 60,000 stakeholders across the Tennessee River Valley and Power Service Area, including representatives of agencies and Indian tribes that might be affected or interested. On February 25, 2002, TVA published a Notice of Intent in the Federal Register that described the agency's plans to prepare a programmatic EIS and invited interested parties to comment on its scope.

TVA also established two groups—an Interagency Team (IAT) and a 13-member Public Review Group (PRG)—to ensure that other agencies and members of the public were actively and continuously involved throughout the study. The IAT included representatives from 11 federal agencies and six Valley states. Members of the PRG represented reservoir user groups, white-water interests, local governments, local utilities and utility districts, industry, river advocates, fishery interest groups, academia, and other special interests. Several meetings were held with members of the joint IAT/PRG groups during the scoping process. Additional meetings with the joint IAT/PRG groups were held throughout the course of the study and preparation of this EIS.

TVA reviewed input from technical experts and management staff, and from groups such as the Regional Resource Stewardship Council and individuals of the IAT/PRG. TVA then held 21 community workshops between March 21 and April 18 that were attended by more than 1,300 people (Table 1.6-01). During each workshop, TVA staff distributed informational brochures and other materials, and answered questions about the ROS, the EIS process, and related environmental and operational issues.

TVA also sought feedback by mail, e-mail, fax, telephone, and computer polling. The agency received more than 6,000 individual comments, approximately 4,200 form letters, and petitions signed by more than 5,400 people. In addition, 3,600 residents in the Power Service Area answered a random telephone survey conducted by an independent research firm. The latter survey was designed to sample a representative cross section of the populace served by TVA.

1.6.2 Results of the Scoping Process

The scoping process identified a broad range of issues and values to be addressed and alternatives to be evaluated in the ROS. Overall, the public placed a high value on recreation, a healthy environment, production of electricity, flood control, and water supply. People were also concerned with a number of other topics. After all public feedback was evaluated, TVA identified 11 major issues for evaluation (Table 1.6-02). Other issues typically addressed in NEPA reviews were also incorporated into the analysis of each policy alternative (for example, air quality, climate, groundwater resources, and other resource topics).

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Table 1.6-01 Community Workshops Held during the Scoping Process

Date	Location	Participants Registered
Thursday, March 21, 2002	Catoosa/Walker County, Georgia	61
	Tupelo, Mississippi	13
Saturday, March 23, 2002	Murphy, North Carolina	74
	Guntersville, Alabama	45
Tuesday, April 2, 2002	Decatur, Alabama	100
	Starkville, Mississippi	7
Thursday, April 4, 2002	Paris, Tennessee	47
	Nashville, Tennessee	45
Saturday, April 6, 2002	Morristown, Tennessee	108
	Muscle Shoals, Alabama	36
Tuesday, April 9, 2002	Knoxville/Loudon County, Tennessee	28
	Chattanooga, Tennessee	96
Thursday, April 11, 2002	Blountville, Tennessee	128
	Gilbertsville, Kentucky	225
Saturday, April 13, 2002	Norris, Tennessee	28
	Savannah, Tennessee	22
Tuesday, April 16, 2002	Blairsville, Georgia	272
	Bowling Green, Kentucky	14
Thursday, April 18, 2002	Bryson City, North Carolina	57
	Memphis, Tennessee	9
	Tullahoma, Tennessee	37

Table 1.6-02 Public Feedback Provided during the Scoping Process

Major Issues	Concerns Expressed by the Public
Reservoir and downstream water quality	Dissolved oxygen concentrations, temperature, ammonia levels, wetted area (the area of river bottom covered by water), velocity, algae, and waste assimilation capacity
Environmental resources	Aquatic resources, erosion and sedimentation, visual resources, cultural resources, federally and state-listed species, wetlands, and ecologically significant areas
Reservoir pool levels	Reservoir pool elevations and the annual timing of fill and drawdown, and their effects on reservoir recreation, property values, and aesthetics
Recreation flows	TVA's ability to schedule releases for tailwater recreation, including fishing, rafting, canoeing, and kayaking
Economic development	Recreation, property values, navigation, power supply, and water supply
Water supply	Reservoir and downstream intakes and potential inter-basin transfers
Navigation	Impacts on channel depth, speed of currents, and water levels
Flood risk on regulated waterways	Available reservoir space for storing floodwaters, how fast space can be recovered after a flood, and costs related to property damage and jobs lost or disrupted
Power reliability	Availability of cooling water at coal-fired and nuclear plants, fuel delivery by barges for coal-fired plants, and restrictions on hydropower production during critical power demands
Cost of power	Hydropower production, including total megawatt hours, seasonal availability, and value during high-cost periods
Capital costs	Changes to reservoir operations, including modifications and upgrades to, as well as additions to and removal of, various structures and equipment

When asked to respond to the keypad question “Which of TVA’s public benefits should be managed as the highest priority?” workshop participants said providing recreation (34 percent), protecting the environment (21.5 percent), and providing flood control (21.5 percent) should be the top three priorities (Figure 1.6-01). The results of the same question asked in the telephone survey are illustrated in Figure 1.6-02. Unlike the results from the workshops, the telephone survey participants said protecting the environment (32 percent), producing electricity (28 percent), and water supply (17 percent) should be the top three priorities.

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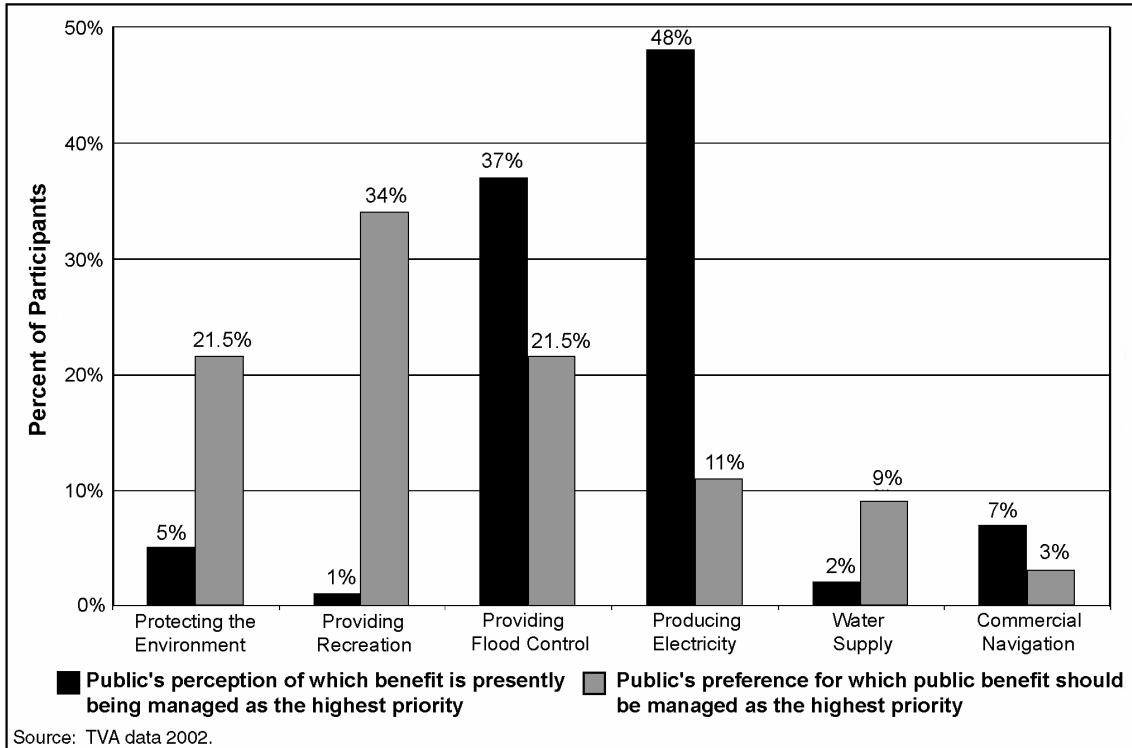


Figure 1.6-01 Community Workshop Keypad Results--Comparison of the Public's Perceptions of and Preferences for TVA Management Priorities

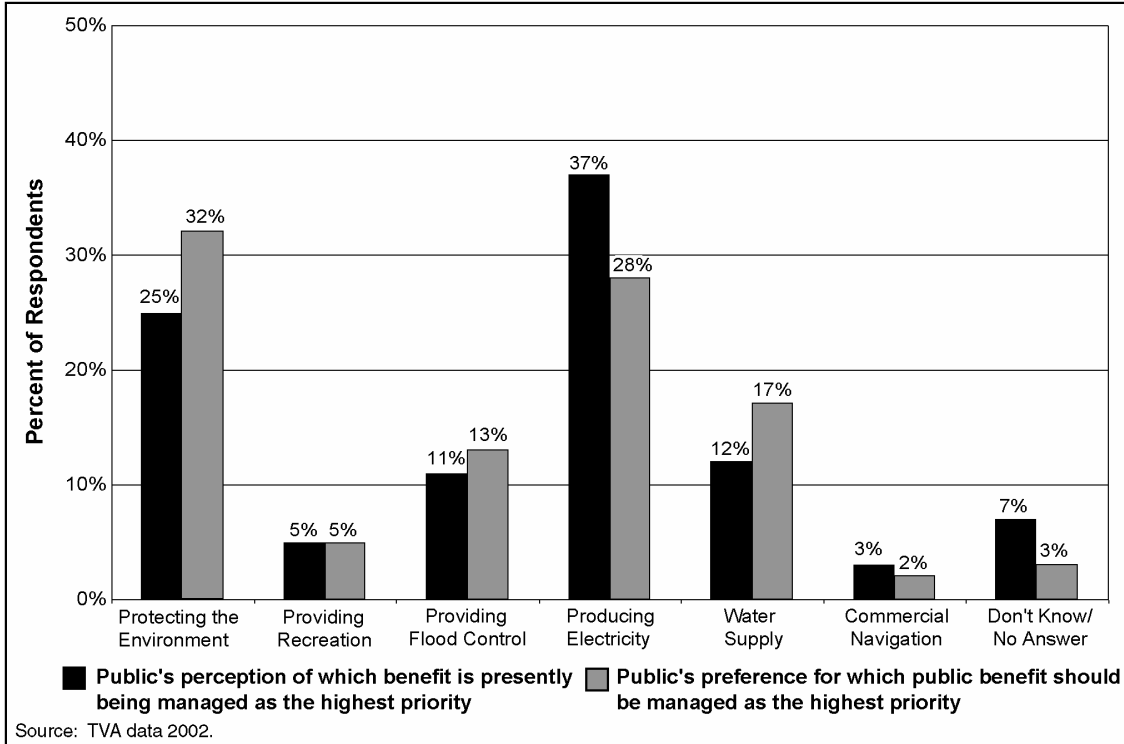


Figure 1.6-02 Telephone Survey Results--Comparison of the Public's Perceptions of and Preferences for TVA Management Priorities

Many of those commenting, including the 5,400 individuals who signed petitions, expressed the desire for TVA to increase recreational opportunities in a variety of ways, such as:

- Holding reservoir water levels stable;
- Delaying the date at which summer reservoir water levels are lowered;
- Filling reservoirs earlier to improve fish spawning and subsequent fishing opportunities; and,
- Increasing the amount of water released from some dams for wade fishing, boat fishing, and recreational boating.

Nearly 4,000 of those commenting requested that TVA change its reservoir operations policy to protect the diversity of aquatic life and, specifically, to protect endangered, threatened, and other at-risk species. Less than 1 percent of those submitting comments expressed support for TVA to continue its existing reservoir operations policy.

Objectives

To define and evaluate policy alternatives, TVA established a set of objectives that incorporates the issues that were identified by the public and interested parties during the scoping phase (Table 1.6-03). TVA also considered other objectives, such as reducing the cost of treating water for municipal and assimilation-capacity uses, maintaining existing dam safety margins, and improving air quality.

Preliminary Alternatives

On the basis of the objectives identified during scoping, 65 possible changes to the reservoir operations policy were identified and proposed. TVA technical experts worked with individuals in the IAT/PRG to refine this list into a set of operations options—specific changes to reservoir operations that could be considered in formulating alternative reservoir operations policies (Table 1.6-04). Various combinations of these options were then evaluated to develop specific policy alternatives. Chapter 3 further describes the process TVA used to develop, screen, and select a range of policy alternatives for detailed evaluation.

OBJECTIVES IDENTIFIED DURING SCOPING FOR THE ROS EIS

- Supplying low-cost, reliable electricity
- Increasing revenue from recreation
- Reducing flood risk and flood-related damages
- Lowering the cost of transporting materials on the commercial waterway
- Providing enough water for municipal, agricultural, and industrial purposes
- Improving recreation on reservoirs and tailwaters
- Improving water quality in reservoirs and tailwaters
- Improving aquatic habitat in reservoirs and tailwaters
- Minimizing erosion of reservoir shoreline and tailwater riverbanks
- Increasing protection for threatened and endangered species
- Protecting and improving wetlands and other ecologically significant areas
- Protecting and improving the scenic beauty of the reservoirs

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Table 1.6-03 Description of Objectives Identified during the Scoping Process

Objective	Summary Definition ¹
Supplying low-cost, reliable electricity	<p>Supplying low cost, reliable electricity from the TVA system involves efficiently managing the water within the TVA reservoir system to release water as necessary to assure adequate cooling water for TVA’s coal-fired and nuclear power plants that provide the majority of TVA’s generation. This water management lessens the need to reduce generation at these plants during the summer and fall to maintain water quality. Reservoir releases for cooling water and other purposes are dispatched through hydropower units when it is most valuable, reducing reliance on higher cost fuels during high demand periods.</p> <p>Also, although hydropower provides only 10 to 15 percent of TVA’s annual energy generation, the operational flexibility afforded by the hydropower units to adjust the system generation to changes in demand is critical to maintaining the stability of the power system at a low cost.</p> <p>Reservoir operations that enhance the ability to meet these factors result in lower cost of electricity and increased system reliability.</p>
Increasing revenue from recreation and tourism	<p>Reservoir levels and river flows affect the level of use and desirability for recreational uses. Managing the reservoir system for longer periods at levels more suitable and desirable for recreation—especially during high-use periods—can increase recreational use and the expenditures of users, increasing recreation and tourism revenues within the Valley economy.</p>
Reducing flood risk and flood-related damages	<p>Flood risk and flood-related damages within the Valley are closely related to the amount of flood storage space available within the TVA reservoir system—which is controlled by reservoir levels—especially during winter. The timing and rate of filling the mainstem reservoirs in spring can also be of particular importance. Reservoir operations that increase the available flood storage throughout the year and maintain more flood storage space through spring decrease flood risk and flood-related damage.</p>
Lowering the cost of transporting materials on the commercial waterway	<p>Reservoir levels and flows within the commercial waterway of the TVA system influence the depths and velocities in the navigation channel, which influence the navigability, size of barges that can used, barge travel times, and a number of factors that influence shipper costs. Reservoir operations that improve the suitability of the commercial waterway result in reduced shipper costs.</p>
Providing enough water for municipal, agricultural, and industrial purposes	<p>The TVA reservoir system provides the source of water for a variety of municipal, agricultural, and industrial uses. Reservoir levels and flows are important components affecting the availability of sufficient water supplies. Water levels in reservoirs and flow rates can affect conditions at the intake structures, the cost of pumping water, and other factors that affect the use of water. Reservoir operations that ensure adequate flow and reduce pumping costs result in a greater reliable supply of water.</p>
Improving recreation on reservoirs and tailwaters	<p>Reservoir levels and river flows affect the level of use, desirability, and quality of experience for recreational uses. Managing the reservoir system to provide longer periods at reservoir levels more suitable and desirable for recreation, especially during high-use periods, and providing flows to support greater and more desirable conditions for water-based recreation improve the quality and diversity of recreation opportunities.</p>

Table 1.6-03 Description of Objectives Identified during the Scoping Process (continued)

Objective	Summary Definition ¹
Improving water quality in reservoirs and tailwaters	Water quality throughout the TVA system is strongly affected by reservoir system operations. Indicators of water quality include temperature, dissolved oxygen levels, and the occurrence of water quality constituents. Changes in system operation affect flows in tailwaters and the length of time that water stays in the reservoirs, affecting the probability and occurrence of unsuitable water quality conditions and overall system water quality. Management of the reservoir levels and dam releases can either improve or degrade these conditions.
Improving aquatic habitat in reservoirs and tailwaters	A variety of factors, including water quality, temperature, reservoir levels, flows, and hydraulic-habitat conditions in tailwaters, determine the quantity, quality, and diversity of aquatic habitat within the TVA reservoir system. Other important factors include the timing of changes in reservoir levels, flows during critical spawning or migration periods, severity of low oxygen conditions, and the abundance of aquatic plants. Reservoir operations that improve water quality, improve tailwater flow-habitat conditions (e.g., increased minimum flows, reduced daily flow fluctuation), or lead to improved spawning and rearing conditions result in improved aquatic habitat and an enhancement of aquatic resources.
Minimizing erosion of reservoir shoreline and tailwater riverbanks	The length of time that reservoir or tailwater shorelines are exposed to wave action or sustained high flow affect the rate of shoreline erosion. A number of resource areas are affected by shoreline erosion, including visual and cultural resources, wetlands and shoreline habitats, and water quality. Reservoir operations that reduce shoreline erosion positively affect shoreline conditions and a number of other related resource areas.
Increasing protection for threatened and endangered species	Most threatened and endangered species in the TVA system occur in aquatic habitats along the stream sections least modified by construction of the TVA reservoir system. Reservoir operations that improve water quality conditions result in greater protection for these species.
Protecting and improving wetlands and other ecologically significant areas	Wetlands and other ecologically significant areas along the TVA reservoir system are dependent on how often and for how long they are inundated or saturated. Over time, changes in the timing and duration of surface water and soil saturation can affect the location, types, and functions of wetlands. In addition, a number of important or ecologically significant areas depend on certain reservoir levels (e.g., reservoir levels at waterfowl management areas) to maintain their operational integrity.
Protecting and improving the scenic beauty of the reservoirs	The scenic beauty of the TVA reservoirs can be affected by reservoir levels, especially during the fall foliage viewing period. Lower reservoir levels expose reservoir bottoms and a “shoreline ring.” In general, reservoir operations that maintain higher levels and reduce the exposure and visibility of the shoreline serve to protect and improve the scenic beauty.

¹ See Chapter 2 for more detailed descriptions of the relationships between reservoir operations and operating objectives.

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Table 1.6-04 Operating Options Developed during the Scoping Process

Options for Mainstem Reservoirs	Raise or lower winter and/or summer pool elevations
	Fill reservoirs to summer levels earlier
	Delay summer drawdown until later in the year
Options for Tributary Reservoirs	Raise or lower maximum and/or minimum summer pool elevations
	Raise winter pool elevations
	Fill reservoirs to summer levels earlier
	Delay unrestricted drawdown until later in the year
	Replace unrestricted drawdown with a restricted (stepped) drawdown
	Provide tailwater flows to support fishing and boating
	Modify the rate of flood-storage recovery by slowing drawdown
Options for All Reservoirs	Increase minimum flows to improve water quality and biodiversity

1.7 DEIS Public Review Process

The DEIS on TVA's ROS was distributed in July 2003. Approximately 1,530 copies of the DEIS were sent to affected tribal governments, agencies, organizations, and members of the public. The Notice of Availability of the DEIS was published in the Federal Register on July 3, 2003. The comment period closed on September 4, 2003, but TVA continued to accept comments through mid-October from tribes and persons informing the agency that their comments would be late.

Comments were provided by members of the public, organizations, and interested agencies at 12 interactive workshops held around the Tennessee Valley region after the DEIS was released. Approximately 1,700 individuals registered at the workshops (Table 1.7-01). During these workshops, comments could be made in writing using comment cards, given to court reporters, or entered on computer terminals through an interactive software program that was specially designed to assist the public in providing comments. TVA also posted a copy of the DEIS on its official agency internet web site, and comments could be made through this web site. In addition, TVA accepted comments through surface or electronic mail, by phone, and by facsimile.

While the ROS proceeded, TVA continued to meet with its cooperating agencies and with members of the IAT/PRG to receive their input on the DEIS. TVA conducted special briefings with resource agency staffs, including the U.S. Environmental Protection Agency (USEPA), to apprise them of ROS analyses and progress. These briefings provided interested agencies multiple opportunities to help direct and influence the scope and substance of the study, the EIS process, and associated analyses. TVA also held briefings with about 200 community leaders and representatives of interest groups to share information and to receive their input on the DEIS (see Appendix F, Table F1-02).

Including form letters and petitions, TVA received a total of 2,320 sets of comments on the DEIS (Appendix F, Table F1-03). These sets of comments included input from almost 7,000 individuals, 7 federal agencies, 14 state agencies, one tribal government, 8 county and local government agencies, and 42 other organizations. TVA has carefully reviewed and responded to all of the comments on the DEIS (see Appendix F).

Table 1.7-01 DEIS Community Workshops

Date	Location	Attendance
July 21, 2003	Murfreesboro, TN	30
July 22, 2003	Knoxville, TN	58
July 24, 2003	Bristol, TN	299
July 28, 2003	Morristown, TN	479
July 29, 2003	Murphy, NC	53
July 31, 2003	Blairsville, GA	407
August 5, 2003	Chattanooga, TN	53
August 7, 2003	Decatur, AL	106
August 12, 2003	Gilbertsville, KY	105
August 14, 2003	Pickwick, TN	70
August 19, 2003	Muscle Shoals, TN	54
August 21, 2003	Columbus, MS	10
Total workshop attendance		1,724

1.8 Statutory Overview

A number of federal statutes and executive orders are relevant to the formulation and evaluation of reservoir operations policy alternatives. Compliance with applicable regulations may affect the environmental consequences of an alternative or measures needed during its implementation.

Chapter 4, Description of Affected Environment, describes the regulatory setting for each resource; Chapter 5, Environmental Consequences of the Alternatives, discusses applicable laws and their relevance to this analysis. Specific analyses and EIS sections or content that are required by these statutes are included in this EIS (for example, a prime farmland report and analysis of threatened and endangered species).

The key authorities that relate to this EIS are summarized in the following sections.

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1.8.1 Tennessee Valley Authority Act

The TVA Act charges TVA to promote the social and economic welfare of the citizens of the region through wise use and conservation of the area's natural resources (*United States ex rel. TVA v. Welch*, 327 U.S. 546 [1946]). Two sections of the TVA Act are especially important to TVA's management of the Tennessee River system. Section 9a authorizes the Board to regulate the river system—primarily for the purposes of navigation and flood control and, when consistent with these purposes, to provide and operate facilities for the generation of electric energy. Section 26a requires TVA approval before any obstruction affecting navigation, flood control, or public lands can be constructed, operated, or maintained along or in the Tennessee River system. Under the authority of the TVA Act, TVA manages the Tennessee River system to advance the economic and social well being of the citizens of the Tennessee Valley region.

1.8.2 National Environmental Policy Act

NEPA established a process by which federal agencies must study the effects of their actions. Whenever a federal agency proposes an action, grants a permit, or agrees to fund or authorize an action that could affect the natural or human environment, the agency must consider the potential adverse and beneficial effects of the action. NEPA requires that an EIS be prepared for major federal actions. This process must include public involvement and analysis of a reasonable range of alternatives. TVA prepared this FEIS to comply with the requirements of NEPA.

1.8.3 Protection of Water Quality

The Clean Water Act (CWA) was passed in 1972 to protect the Nation's water quality. The CWA is the primary law for regulating discharges of pollutants into the waters of the United States by enforcing water quality standards that are defined in Section 301 of the Act. Two categories of pollutants enter streams, rivers, and lakes or reservoirs: nonpoint sources (runoff from the landscape) and point sources (direct discharge via a pipe or ditch into the water). Section 402, the National Pollutant Discharge Elimination System (NPDES) Program, regulates point source discharges; states have been mandated to grant and enforce permits under this program. When stream segments are listed under Section 303(d) as impaired by a pollutant(s), a total maximum daily load (TMDL) must be developed for pollutant(s) for the listed stream segment. This TMDL determines the load of the pollutant(s) that a waterbody can receive without compromising its biological and chemical integrity. Both nonpoint and point sources are targeted for reductions under a TMDL. Many streams in the Tennessee River watershed are listed on the Section 303(d) lists for parameters such as flow alterations; low DO; sediment accumulation; contamination with polychlorinated biphenyls (PCBs), other organic compounds or metals, and pathogens (bacteria or microorganisms); high fecal coliform; and poor biological health. TMDLs for these listed waters are in various stages of development.

Certain actions that affect waters of the United States are coordinated with the applicable state to receive approval under Section 401, water quality certification. This certification is received by showing that the project or discharge will not adversely affect the water quality of the

receiving stream, as defined by its designated uses. The designated use is determined by the primary uses of the water, such as recreation, water supply, and aquatic life.

1.8.4 Protection of Wetlands and Floodplains

Disturbance of many wetlands or any other waters of the United States by the discharge of any dredge or fill material requires a permit from the USACE under Section 404 of the CWA. Under Executive Order 11990—Protection of Wetlands, federal agencies are required to avoid construction in wetlands to the extent practicable and to mitigate potential impacts as appropriate. State programs for protection of wetlands also exist. For example, the Tennessee Aquatic Resource Alteration Permit Program controls alteration of streams and wetlands for actions within the state of Tennessee.

Under Executive Order 11988—Floodplain Management, federal agency actions must, to the extent practicable, avoid siting in floodplain zones in order to reduce the risk of flood loss; minimize impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values of floodplains. The Federal Emergency Management Agency (FEMA) has identified where floodplains occur, and many local governments have adopted regulations to control the development of these defined floodplains.

1.8.5 Flood Control Act of 1944

The Flood Control Act of 1944 generally exempts TVA from USACE regulations governing the operation of federal dams, except when there is danger of flooding on the lower Ohio and Mississippi Rivers. In such a situation, USACE can direct TVA how to release water from the Tennessee River system into the Ohio River system.

1.8.6 Protection of Air Quality

Under the Clean Air Act (CAA), proposed new air pollutant sources must be permitted and must demonstrate that they will not violate the National Ambient Air Quality Standards (NAAQS). State Implementation Plans (SIPs) are developed by each state; these plans outline how the state will protect air quality. SIPs are based on the NAAQS, which are set by the USEPA for pollutants such as sulfur and nitrogen-based air emissions, with margins of safety to protect human health and welfare. Sources of air emissions are controlled based on the size of the emission, its location, and the type of pollutant. For new sources, best available control technology must be used to control emissions, and offsets (reducing emissions from existing sources) are required in some areas.

1.8.7 Protection of Threatened and Endangered Species

Under the Endangered Species Act (ESA), federal agencies must ensure that their actions will not jeopardize the existence of species federally listed as threatened or endangered, or affect the critical habitat of those species. Under provisions of Section 7(a)(2) of the ESA, a federal agency that permits, licenses, funds, or otherwise authorizes activities must consult with the

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USFWS as appropriate, to ensure that its actions will not jeopardize the continued existence of any listed species. In addition, Section 9 makes it unlawful to take or harm any listed species. The states within the Tennessee Valley also have programs that protect state-listed threatened and endangered species.

1.8.8 Protection of Cultural Resources

The National Historic Preservation Act (NHPA) and Archaeological Resource Protection Act were enacted to protect cultural and archaeological resources. Before disturbing any cultural or archaeological resources with historical significance, the State Historic Preservation Office must be consulted. In some circumstances, the Federal Advisory Council on Historic Preservation must also be consulted. The Valley states have additional requirements for protection of excavation of the remains of Native Americans on lands under state or local control. Some of these lands border TVA managed reservoirs, and TVA actively works with the states to protect these resources.

1.8.9 Protection of Farmland

Under the Farmland Protection and Policy Act (FPPA), federal agencies are required to identify and consider the potential adverse effects of a proposed action on prime farmland. The FPPA ensures, to the maximum extent practicable, that federal programs are administered in a manner that is compatible with state and local government and private programs to protect farmland. In addition, the State of Tennessee has enacted the Agricultural District and Farmland Preservation Act, which provides limited protection of farmlands that have been specially designated under the Act.

1.8.10 Environmental Justice

Executive Order 12898—Environmental Justice requires some federal agencies to identify and address the adverse human health or environmental effects of federal programs, policies, and activities that may be disproportionately greater for minority and low-income populations. Federal agencies must ensure that federal programs or activities do not directly or indirectly result in disparate impacts on minorities or low-income populations. Federal agencies must provide opportunities for input into the NEPA process by affected communities and must evaluate the potentially significant and adverse environmental effects of proposed actions on minority and low-income communities during preparation of environmental documents. TVA is not subject to this executive order but evaluates environmental justice impacts as a matter of policy.

1.8.11 Homeland Security Act

The primary mission of the Homeland Security Act is to prevent terrorist attacks in the United States, reduce the vulnerability of the United States to terrorism, and minimize damage and assist with recovery if attacks do occur. All federal, state, and local agencies, including TVA,

must follow this Act by ensuring that any public service is protected, emergency plans are developed, and communities are protected from potential terrorist attacks.

1.8.12 Other Regulations and Executive Orders

Other statutes and executive orders may be relevant, depending on the type of specific projects or operating changes that occur as a consequence of this EIS, including:

- Executive Order 13112—Invasive Species;
- Section 10 of the River and Harbors Act;
- Migratory Bird Treaty Act;
- Executive Order 13186—Responsibilities of Federal Agencies to Protect Migratory Birds;
- The Safe Drinking Water Act and Tennessee drinking water regulations;
- The Toxic Substances Control Act;
- The Federal Insecticide, Fungicide, and Rodenticide Act;
- The Resource Conservation and Recovery Act and other solid waste disposal regulations; and,
- The Comprehensive Environmental Response, Compensation, and Liability Act.

1.9 Relationship with Other NEPA Reviews

This EIS builds on other EISs and NEPA reviews. The following completed environmental reviews are relevant to this EIS because they may affect or be affected by related TVA policies, or were included in and used as a basis for the analyses presented herein:

- **Tennessee River and Reservoir System Operation and Planning Review Final Environmental Impact Statement.** Published in December 1990, this EIS was the basis for TVA's present reservoir operations policy. The Lake Improvement Plan is the starting point for the evaluation of the reservoir operations policy, and this ROS EIS relies on relevant information from that document.
- **Shoreline Management Initiative Final Environmental Impact Statement.** In November 1998, TVA issued a final EIS on its policy regulating permitting activities and allowable residential uses for TVA-owned lands and easement properties along 11,000 miles of shoreland in the Tennessee River system. Many of these shorelands are included in the scope of the ROS EIS. The SMI established a management and environmental planning and review process, including individual reservoir Land Management Plans (LMPs) and procedures for implementing the Section 26a permitting program that affect and are affected by the reservoir operations policy. The SMI is the source of some of the basic land use and shoreline development projections used in this ROS EIS, and some of the management

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measures resulting from the SMI are relevant to the conclusions about environmental consequences.

- **Energy Vision 2020 Final Environmental Impact Statement.** In December 1995, TVA completed an Integrated Resource Plan identifying and selecting a long-range strategy that would enable TVA to meet the additional electricity needs of its customers from 1996 to 2020. TVA prepared an EIS on the portfolio of energy resource options (including hydropower) that best met TVA's evaluation criteria regarding costs, rates, environmental impacts, debt, and economic development. The plan was designed to aid TVA and its customers in addressing the uncertainty that the electric utility industry would face in a deregulated environment. The power analyses presented in this document are consistent with the analysis in the Energy Vision 2020 EIS.
- **Final Supplemental Environmental Impact Statement for Browns Ferry Nuclear Plant Operating License Renewal, Athens, Alabama.** In March 2002, TVA prepared a Final Supplemental EIS for renewing the operating licenses and extending operation of all three units at its Browns Ferry Nuclear Plant located in Limestone County, Alabama. The Final Supplemental EIS tiered from the 1972 Final EIS and included refurbishment and restart of Unit 1, with extended operation of all three units as its preferred alternative, which was subsequently adopted by TVA. These actions are considered in this ROS EIS as part of the Base Case and all of the policy alternatives.
- **Environmental Assessments for Hydro Modernization Projects.** Various Environmental Assessments (EAs) have been prepared during the implementation of individual elements of TVA's Hydro Modernization (HMOD) projects. EAs have been completed for modernization and rehabilitation of the following TVA hydropower plants: Douglas (March 1995), Cherokee (July 1995), Raccoon Mountain (July 1999), Fort Loudoun (February 2000), Hiwassee (February 2001), Chatuge (April 2001), Watts Bar (December 2001), Apalachia (February 2002), and Boone (October 2002). HMOD projects that were designed and funded, implemented, or completed on or before October 2001 are considered in this ROS EIS as part of the Base Case (see Appendix A, Table A-09); the projects yet to be designed or implemented as of October 2001 are considered in the cumulative impacts analysis.
- **Environmental Assessments and Environmental Impact Statements for Land Management Plans.** Environmental Assessments and EISs were completed for LMPs at the following TVA reservoirs: Melton Hill, Boone, Tellico, Tims Ford, Guntersville, Cherokee, Bear Creek, Norris, and Pickwick. These LMPs were developed in a manner consistent with the implementation of TVA's land management policy as established in the SMI.
- **Final Chickamauga Dam Navigation Lock Project Environmental Impact Statement.** In May 1996, this EIS evaluated the proposed construction of a new 110– by 600–foot navigation lock at Chickamauga Dam. The Final EIS addressed the economic, social, and environmental impacts of various alternative plans and the proposed plan. The USACE prepared a final supplement to the EIS in February 2002. In fiscal

year 2003, Congress authorized construction of a 110– by 600–foot replacement lock.

- **Final and Supplemental Environmental Impact Statements, Lower Cumberland and Tennessee Rivers Kentucky Lock Addition Project.** These Final EISs evaluated the potential impact of constructing a 110– by 1,200–foot navigation lock at the Kentucky Dam.

1.10 EIS Overview

Volume I of this FEIS consists of 10 chapters (Figure 1.10-01) as outlined below. Volume II includes eight appendices, with more detail on technical analyses and supporting data.

- **Chapter 1**—describes the purpose and need for the ROS EIS, scope of the ROS, decision to be made, history of policy changes, reservoir operations policy scoping process, public review and agency consultation requirements, relationship to other NEPA reviews, and EIS overview.
- **Chapter 2**—provides a background and water control system overview, a description of how the water control system is operated to achieve public benefits, and the existing water control system operations.
- **Chapter 3**—includes a description of the process of developing, evaluating, and winnowing the list of reservoir operations policy alternatives; a summary of analyses of policy alternatives; and a summary of the environmental consequences of the policy alternatives considered. It also identifies TVA’s Preferred Alternative.
- **Chapter 4**—discusses the affected environment of the reservoir system.
- **Chapter 5**—identifies the environmental consequences of each policy alternative.
- **Chapter 6**—addresses the cumulative impacts of alternatives identified in this EIS, in consideration of other major actions in the region of influence.
- **Chapter 7**—describes a range of potential mitigation measures to offset potential adverse impacts of the Preferred Alternative.
- **Chapters 8–10**—contain a list of preparers, an FEIS distribution list, and supporting information (including an index, a glossary, and the literature cited).
- **Appendix A**—contains tables describing the characteristics of the water control system and its individual projects.
- **Appendix B**—contains detailed descriptions of the Base Case, the preliminary operations policy alternatives, and the Preferred Alternative.
- **Appendix C**—contains information on models used to analyze the alternatives: reservoir level, water availability, and hydropower modeling; energy cost modeling; water quality modeling; flood flow modeling; the hedonic valuation model; and the economic model. Appendix C also contains elevation and flow results from the

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Weekly Scheduling Model for key reservoirs and probability plots of the Preferred Alternative.

- **Appendix D**—contains additional information on water quality, groundwater resources, aquatic resources, wetlands, terrestrial ecology, threatened and endangered species, cultural resources, recreation, inter-basin transfers, and social and economic resources.
- **Appendix E**—contains the Prime Farmland Technical Report.
- **Appendix F**—contains the responses to comments on the DEIS.
- **Appendix G**—contains the results of consultations required under Section 7 of the ESA.
- **Appendix H**—contains the results of consultations required under Section 106 of the NHPA.

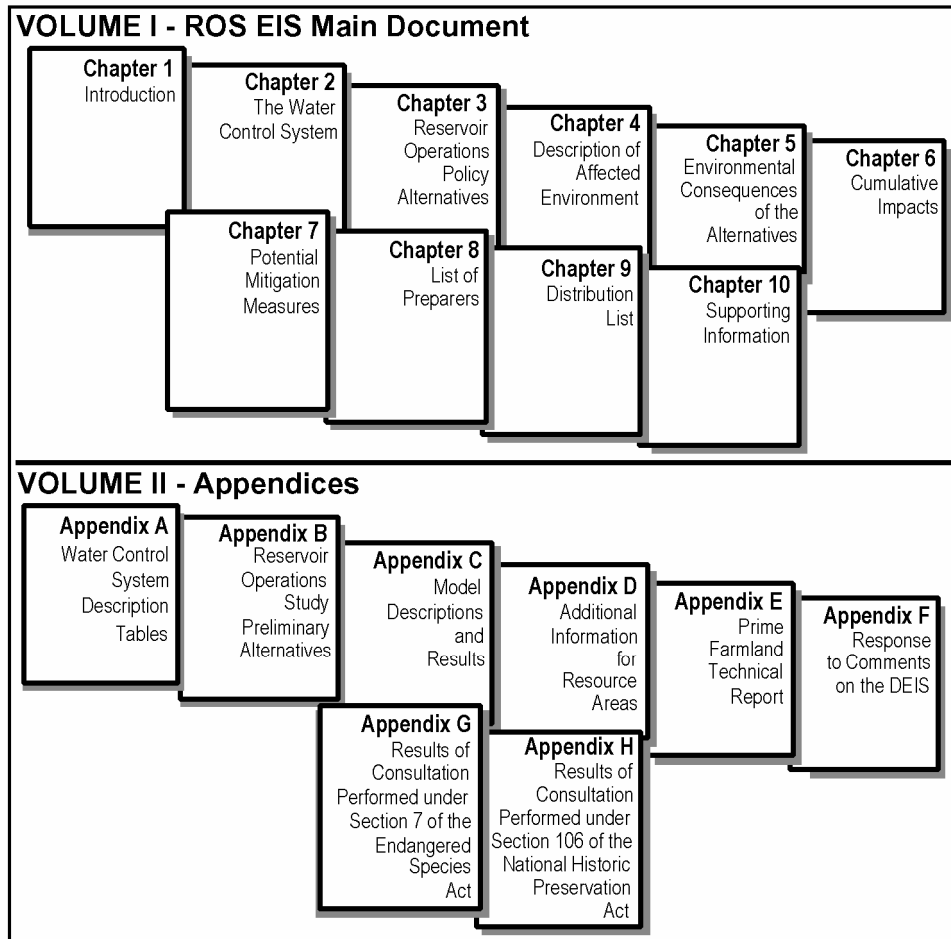


Figure 1.10-01 Contents of the ROS EIS