# Chapter 6

## Cumulative Impacts

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## 6.1 Introduction

Cumulative impacts are defined as the effects of the proposed action when considered together with other past, present, and reasonably foreseeable future actions. Chapter 4, Description of the Affected Environment, presents information about past and present environmental conditions—including future trends, where appropriate. This chapter addresses the cumulative impacts of the reservoir operations policy alternatives and other reasonably foreseeable actions.

The ROS EIS is a programmatic evaluation of the potential consequences of changing TVA's policy for operating its integrated reservoir system. The study's broad geographic scope is the entire Tennessee River watershed and adjacent areas, including where TVA-generated electricity is consumed (TVA's Power Service Area). Consistent with the programmatic approach of this EIS and broad scale of the ROS, the cumulative impact analysis addressed cumulative impacts of the reservoir operations policy when added to future trends and future projects. Because of the time frame and geographic scope of the evaluation, predicting future resource conditions involves substantial uncertainty. Future cumulative impacts can result not only from possible actions of TVA but also from those of other agencies and the public. This increases the uncertainty. Nevertheless, existing conditions and trends provide a basis for broad assumptions for this cumulative impact analysis.

- **Future Trends.** The planning time frame of the ROS EIS is the period from 2003 to 2030. Over this three-decade period, existing conditions in many resource areas are expected to change. The amount and rate of change would vary by resource. For each resource, potential impacts were assessed for the resource conditions expected to exist over this period. The cumulative change in existing conditions between the present and 2030 was assessed as part of the resource-specific analyses in Chapter 5, Environmental Consequences of the Alternatives. This chapter summarizes the potential for cumulative impacts of each policy alternative when added to future trends, for each resource for which adverse impacts are expected to occur.

- **Future Projects.** Specific projects that would be undertaken and come into operation during the planning period were identified and evaluated. The impacts from these projects may result in regional-scale impacts when considered together with resource impacts resulting from the implementation of policy alternatives.

In addition to future trends for resources and future projects, regulatory programs—especially those that affect environmental quality—would substantially affect the occurrence of cumulative impacts. State regulatory programs, such as those implementing the Clean Air and Clean Water Acts, are designed to improve environmental conditions. While their precise effects cannot be accurately predicted, their regional or statewide application is expected to affect a positive change in the environment. Such positive environmental changes could not be fully accounted for in TVA's cumulative impact analysis. Consequently, the analysis was generally conservative; and any projected adverse cumulative impacts are likely to have been overstated.

## 6.2 Cumulative Impacts Associated with Future Trends

As appropriate in each resource area, relevant future trends were identified and evaluated along with the effects of policy alternatives, and were examined for potential cumulative impacts. The following sections provide a summary of these trends and their potential cumulative impacts. No material cumulative impacts are expected to result in the areas of Dam Safety, Invasive Plants and Animals, Aquatic Plants, Groundwater Resources, or Prime Farmland. The potential consequences of changes in the operations policy on Power and Navigation were determined to be primarily economic changes, and the modeling of economic changes integrated these cumulative effects. Changes in TVA's operations policy could affect Land Use, but these effects are also primarily economic and are captured in TVA's economic analyses. The cumulative effects of shoreline development are also presented in TVA's earlier programmatic EIS assessing shoreline development, the SMI (TVA 1998).

### 6.2.1 Air Resources/Climate

TVA evaluated potential impacts on air resources and climate based on changes in air emissions and air quality. Air quality is currently good and improving in the TVA region, as measured by EPA's national health and environmental standards for air quality, the NAAQS. Emissions of air pollutants in the region are likely to decrease in the future due to emissions reductions by TVA (see Section 4.2, Air Resources) and others. Pollution from increased motor vehicle trips and other new air pollution stationary sources (such as factories and power plants) are expected to offset some of these decreases. The overall trend, however, should be positive—with continued air quality improvements—especially as more stringent NAAQS for ozone levels and particulates are implemented by the states. On a regional basis, the Southern Appalachian Mountain Initiative has recommended an eight-state strategy designed to improve current air quality and mitigate the effects of future expected increases in cumulative air emissions from utility and other regional air emission sources. Chief among these strategies is the installation of emissions control equipment on existing and new emission sources, including energy generation facilities.

Implementation of the Tailwater Habitat Alternative or Summer Hydropower Alternative is expected to improve air quality and regional visibility because non-emitting generation either would increase or increase in summer months compared to the Base Case. These alternatives would reduce the potential for cumulative air quality effects. Reservoir Recreation Alternatives A and B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative would adversely affect air quality because emissions from fossil-fuel electric generating units are expected to increase in order to offset the small reduction in total hydropower generation. Most alternatives also would result in a seasonal shift in emissions, resulting in increased emissions in summer, when the atmosphere is more chemically active and air quality problems like ozone levels are more severe. Overall, net annual increases in emissions under Reservoir Recreation Alternatives A and B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative would be small and would not substantially increase the potential for cumulative impacts related to air quality. The Preferred Alternative is also expected to adversely affect the amount and timing of hydropower generation

but to a lesser extent than the other action alternatives, except for the Tailwater Habitat Alternative and the Summer Hydropower Alternative.

Changes in $CO_2$ emissions were also evaluated as an indicator of potential climate change effects. Under four alternatives (the Preferred Alternative, Reservoir Recreation Alternative A, the Commercial Navigation Alternative, and the Tailwater Habitat Alternative), $CO_2$ emissions would be slightly reduced. All other alternatives would cause a potential increase in $CO_2$ emissions, but at very low levels—less than 1 percent of current TVA emissions. To the extent that a relationship exists between $CO_2$ emissions and climate change, increases or decreases in greenhouse gas emissions caused by implementation of any policy alternative would be so small that they are not likely to result in noticeable or measurable cumulative impacts.

### 6.2.2 Water Quality

Changes in water quality would directly affect the beneficial use of water in the Valley. Dissolved oxygen and temperature are critical to maintaining suitable habitat for aquatic organisms, including threatened and endangered species. Dissolved oxygen concentrations, the formation of toxic compounds, and the growth of algae are important to aquatic life and can affect water supply treatment costs. Water temperature is important to sport fisheries and the operation of power plants. Cumulative impacts on water quality could occur in several ways. These include the interaction of water quality changes caused by watershed development and changes in the reservoir operations policy, the potential for accumulated downstream change in water quality within the TVA system, and changes in the Valley-wide amount of reservoir or tailwater areas with anoxic conditions. Land use changes within the watershed, as well as uses of water that add nutrients and other pollutants to reservoir water, can reduce DO and increase temperature.

The interaction between future trends in water quality resulting from watershed development and changes in TVA's system-wide reservoir operations policy is difficult to predict. Future water quality throughout the Valley would depend largely on political, regulatory, and economic factors that cannot be reliably or reasonably predicted. Increased population growth would likely increase development pressure in the watershed, resulting in higher levels of nutrients and sediment loading to the TVA system. This would likely be balanced, in part, through water quality regulatory programs—including the development and implementation of targeted water quality improvement plans, such as TMDLs. These programs are expected to improve water quality in impaired segments by reducing inputs of pollutants over time.

Within reservoir systems, decreasing water quality in a downstream direction can result when releases from one dam result in worse conditions in a downstream reservoir than might otherwise occur. The following discussion focuses on the development of low concentrations of DO (anoxia) and related water quality issues, such as levels of manganese, ammonia, and nutrients, because this is the primary impact on water quality predicted by TVA's analyses.

The potential for cumulative impacts from low DO (anoxia) accumulating in a downstream direction has been considerably reduced by TVA's implementation of measures to increase

oxygen in waters below hydropower dams. Starting in the 1980s, under its Reservoir Release Improvement (RRI) Program, TVA developed methods to increase oxygen in the water below hydropower dams. These methods included auto-venting turbines, surface water pumps, oxygen injection systems, aerating weirs, and blowers. In 1991, under the Lake Improvement Plan, TVA adopted efforts to increase DO concentrations in the releases from 16 dams using these techniques (see Appendix A, Table A-05). TVA also committed to provide minimum flows from a number of dams.

Water quality improvements resulting from the RRI have resulted in increases in the number and diversity of fish and aquatic insects in the tailwaters at Apalachia, Blue Ridge, Boone, Chatuge, Cherokee, Douglas, Fontana, Fort Patrick Henry, Hiwassee, Norris, Nottely, South Holston, Tims Ford, and Watauga Reservoirs. These are tributary reservoirs. TVA is committed to not reversing any of the improvements that have been made under the RRI Program and to maintaining the DO targets and minimum flows established in the Lake Improvement Plan.

The RRI Program improvements have effectively reduced and mitigated the potential for cumulative water quality problems related to anoxia accumulating or growing in a downstream direction by improving the DO balance at points along the major tributary rivers and on the upper mainstem. Under some of the alternatives, however, the potential exists for cumulative water quality impacts along the lower mainstem reservoirs. Under all of the action alternatives, except the Commercial Navigation Alternative, there is the potential for cumulative impacts related to anoxia in the waters of the mainstem reservoirs. The Commercial Navigation Alternative would maintain sufficient flow through the reservoir system to avoid such cumulative impacts. The Summer Hydropower Alternative and Preferred Alternative would also provide sufficient flows to reduce cumulative impacts on DO, except during dry years when the potential for cumulative impacts would increase during a few weeks in late July and August compared to the Base Case.

TVA's Preferred Alternative was designed in part to address the residence time of waters in the reservoirs and thereby reduce the volume of anoxia in reservoirs compared to other alternatives that would enhance recreation. The Preferred Alternative includes somewhat higher system minimum flows through mainstem reservoirs in June, July, and August than other policy alternatives that would enhance recreation in order to reduce these potential anoxic conditions. Nevertheless, water quality modeling indicated that anoxic conditions occurring seasonally in some representative mainstem reservoirs under the Preferred Alternative would worsen in the reservoirs and in some dam releases as compared to the Base Case.

For mainstem reservoirs, modeling indicates that the predicted magnitude of changes in anoxia under the Preferred Alternative was generally smaller than almost all other action alternatives. The potential does exist, however, for increased cumulative anoxic conditions in the lower mainstem reservoirs during dry years for a limited time under the Preferred Alternative.

A final potential cumulative impact on water quality is the change in the total system-wide volume of anoxic water. Such changes could affect the diversity of aquatic habitats by

producing a directional change in the suitability of aquatic habitat within the system. Water quality modeling results for representative reservoirs indicate that all the policy alternatives, except for the Summer Hydropower Alternative and Commercial Navigation Alternative, would increase the total volume of anoxic water in the TVA system. The Preferred Alternative would reduce this potential cumulative impact compared to some of the action alternatives but would not eliminate it.

### 6.2.3 Water Supply

Although demand on water supply would increase for a variety of uses in the Valley through 2030, all of the alternatives would satisfactorily meet future water demand, and no materially adverse cumulative impacts are expected. The reservoir operations policy alternatives do differ in terms of water supply delivery costs. The Commercial Navigation Alternative and Summer Hydropower Alternative would yield adverse and substantially adverse impacts, respectively, related to water supply delivery costs. No other factors systematically affecting water supply delivery costs in the Valley were identified, and no resultant cumulative impacts on water supply delivery costs are expected under any alternative.

Some alternatives may result in increased anoxia in certain reservoirs, and water treatment costs would increase from the need to address soluble iron and manganese. The only other factor identified with a potential future impact on treatment costs was changing regulatory standards. Changing standards and their treatment cost implications could potentially interact with impacts of operational changes to produce a small cumulative impact at certain water treatment facilities under Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, the Preferred Alternative, and the Tailwater Habitat Alternative.

### 6.2.4 Aquatic Resources

Each action alternative would result in variable effects on aquatic resources throughout the reservoir system. Changes in water quality variables, including DO and temperature, would affect the quality and suitability of aquatic habitat in a different manner in each reservoir type. Reservoir sport fish would experience the most potential benefits under the Summer Hydropower Alternative, the Commercial Navigation Alternative, or the Tailwater Recreation Alternative. The Preferred Alternative is anticipated to benefit tributary reservoir and cool/cold tailwater sport fish. Small and variable changes are anticipated in mainstem reservoir biodiversity, warm and cool-to-warm tailwaters, and commercial fishing—resulting in little potential for cumulative effects.

Implementation of Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Equalized Summer/Winter Flood Risk Alternative, or the Commercial Navigation Alternative would result in minor effects on aquatic resources and thus would have little potential for additional cumulative impact. TVA has instituted programs to improve biodiversity through selected improvements in water quality.

The primary potential cumulative impact on aquatic resources would result from alternatives that would increase water retention times in reservoirs. Increased residence time lowers water quality in summer and fall, and reduces spring flows in the mainstem reservoirs. Commercial fisheries in reservoirs would experience adverse effects under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Habitat Alternative due to increased amounts of water with low DO concentrations. Generally, impacts on commercial fisheries would be concentrated on mussels, as commercial fish species are mobile and can escape decreasing water quality conditions as long as other suitable habitat is available. The long-term effect of these changes is anticipated to be variable, as water temperatures in some dam releases would limit the effectiveness of TVA programs intended to improve biodiversity.

The Preferred Alternative would reduce the potential for cumulative effects on commercial fish. Under this alternative, flows through the mainstem reservoirs would be maintained at levels slightly lower than under the Base Case during summer and early fall. Under the Preferred Alternative, no change is projected for commercial mussels. Commercial fish species in some areas would slightly benefit; in other areas, reservoir habitat conditions (DO concentrations) would decline slightly.

### 6.2.5 Wetlands

Wetlands are extensive in the TVA reservoir system and are experiencing a minor but continuous decline that is expected to continue under the existing reservoir operations policy. This decline is cumulative because wetland succession, a slowly evolving process, is not maintaining present wetland diversity and function. Through the SMI and its permitting authority under the TVA Act, TVA manages impacts on development of shoreline water-use facilities, and federal regulation (the Clean Water Act) requires mitigation for disturbance of jurisdictional wetlands. To some extent, both of these programs would reduce the potential for long-term cumulative impacts resulting from interactions between changes in the TVA reservoir system operations policy and other impacts on wetlands resulting from construction and development in the Valley.

The Summer Hydropower Alternative and the Equalized Summer/Winter Flood Risk Alternative would result in an overall decrease in availability of water to wetlands during the growing season, isolating these wetlands from their most prevalent source of water. This would result in negative impacts on both wetland extent and type, including substantial adverse effects on scrub/shrub and forested wetlands around tributary reservoirs. Because of the geographic extent and importance of some wetland resources, this could constitute an adverse cumulative impact on scrub/shrub and forested wetlands; but these changes may be partially offset by cumulative increases in the coverage of other wetland types.

Implementation of Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, the Tailwater Habitat Alternative, or the Preferred Alternative would increase the availability of water to wetlands but could result in overall negative effects on wetlands. These alternatives would likely increase the formation of new wetlands but potentially

would result in conversion and replacement of existing wetland types (e.g., scrub/shrub to emergent wetlands and forested wetlands to scrub/shrub), and would result in other adverse effects on existing wetland functions. Some wetland habitats would be converted in a way that would make recovery a long process or unlikely (e.g., loss of forested wetlands and loss of buttonbush swamps). Because of the geographic extent and importance of these wetland resources, this could constitute a substantial adverse cumulative impact. Under the Preferred Alternative, potential impacts on wetlands have been substantially reduced compared to the other action alternatives; but there could still be an adverse cumulative impact on wetland resources in the Tennessee Valley region. To the extent practicable, potential impacts on wetlands may be mitigated using the approaches described in Chapter 7, thereby reducing their potential for long-term cumulative impacts. The effectiveness of the mitigation measures may be limited, however, and long-term cumulative impacts could continue.

### 6.2.6 Terrestrial Ecology

TVA evaluated lowland and upland plant and wildlife communities in areas along TVA reservoirs and tailwaters. The analysis found that these communities have adapted to the current operations of the water control system. Long-term changes in these communities are expected as a result of natural succession and changes in wetlands (see wetland discussion above), and from other construction and development activities as well as recreational pressures. These impacts would be slow and may be offsetting; therefore, broad cumulative effects may not occur. Cumulative effects are possible, at least in the short term, on shorebirds and migratory waterfowl and the plant communities of flats habitats—in addition to the potential loss of control of gravity-maintained dewatering units on wildlife refuges on affected reservoirs. Impacts would be of greatest concern if they occurred during critical migratory periods. Cumulative effects may result from adverse impacts on managed areas and wetland habitats—both important habitats for these bird populations. The Preferred Alternative and the Commercial Navigation Alternative are expected to result in a lower level of impacts on plant and animal populations than the other action alternatives; however, impacts under both these alternatives would be greater than those observed under the Base Case. Due to the instability of reservoir levels and the projected negative changes in wetland communities, the Summer Hydropower Alternative would result in the most extensive adverse cumulative impacts on the terrestrial ecology of the region.

### 6.2.7 Vector Control

The annual cycle of reservoir mosquito populations is a long-term, persistent issue throughout the Valley. The mosquito is a pest species with disease-transmission potential, and management to minimize mosquito populations is ongoing in the region. Management programs and natural variation in the availability of breeding habitat are expected to control mosquito populations at existing levels, and cumulative impacts are unlikely. Implementation of any action alternative, except the Summer Hydropower Alternative or the Commercial Navigation Alternative, is expected to increase the availability of mosquito breeding habitat—allowing some potential increase in mosquito populations. These increases would be small and are not expected to be cumulative. (See Chapter 7 for potential mitigation actions.)

### 6.2.8 Threatened and Endangered Species

A number of federal- and state-listed threatened and endangered species inhabit areas in and adjacent to the reservoirs and stream reaches of the water control system. Most of these species are found in aquatic habitats, including warm tributary tailwaters, flowing mainstem reaches, some pooled reservoirs, and some cool-to-warm tributary tailwaters. As indicated by their classification as threatened and endangered, many of these species are in a state of long-term decline and require protection. Plans to protect their habitat and assist in their recovery have been implemented for some species and are being developed for others. Cumulative impacts on such species are usually related to further degradation of habitat from development and disturbance.

Because construction of new facilities and additional land disturbance are not proposed under any policy alternative, direct or incremental cumulative impacts on terrestrial habitat would not occur. Changes to reservoir operations under policy alternatives may alter reservoir levels, water flows, and some water quality parameters—especially temperature and DO. These changes have the potential to result in adverse impacts on federal-listed threatened and endangered species; however, the level of impact would be small and not enough to jeopardize the continued existence of these species. Potential cumulative impacts on federal-listed species should be reduced because the Endangered Species Act requires that federal agencies not take actions that would jeopardize the continued existence of listed species and prohibits the "taking" of listed species by individuals.

### 6.2.9 Managed Areas and Ecologically Significant Sites

Managed areas and ecologically significant sites are designated to protect and manage sensitive resources that are typically linked with wetlands, bottomland hardwood forests, and other important habitats. As protected areas, they are managed to preserve the resource value for which they were designated. TVA's evaluation of these areas did not identify long-term trends in their condition. Implementation of either the Summer Hydropower Alternative or the Equalized Summer/Winter Flood Risk Alternative would likely cause some adverse impacts on a number of areas. Implementation of any of the other policy alternatives, including the Preferred Alternative, would result in slightly adverse to slightly beneficial impacts on managed areas. Because of the minimal nature of these changes and because these areas are affirmatively protected, future cumulative impacts are unlikely.

### 6.2.10 Shoreline Erosion

TVA's evaluation found that natural erosion processes (rain, wind, runoff, and streamflow), recreational boating, fluctuating reservoir levels, and shoreline land development would continue the present trend of erosion of reservoir and tailwater shorelines. TVA management programs may reduce these rates in some areas, while increased recreational activities and land development may increase erosion in other areas. The contribution of land development to overall cumulative impacts would be limited, as the SMI is designed to limit the maximum extent of residential shoreline development to 38 percent or less. The continuing effects of shoreline

erosion may include further loss of shoreline habitat, changes to water quality, and impacts on cultural resources and visual integrity. Together, these impacts could be considered cumulative.

Implementation of Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, or the Tailwater Habitat Alternative has the potential to substantially increase reservoir shoreline erosion system wide, with more extensive impacts on the tributaries than on the mainstem reservoirs. These alternatives would result in potential adverse impacts that, together with erosion of backlands and land development, may result in some cumulative erosion impacts. Shoreline erosion resulting from changes in the operations policy is expected to be a minor contribution to total land erosion. These potential impacts may be mitigated using the approaches described in Chapter 7, thereby avoiding or reducing their potential for long-term cumulative effects.

In contrast, the Summer Hydropower Alternative and Equalized Summer/Winter Flood Risk Alternative would substantially decrease shoreline erosion, resulting in cumulative beneficial effects on shoreline erosion. The Commercial Navigation Alternative is expected to have little impact on shoreline erosion. The Preferred Alternative would result in minor increases in erosion, contributing in a small way to adverse cumulative impacts.

### 6.2.11 Cultural Resources

The integrity of cultural resources (archaeological sites and historic structures) is affected by a number of factors directly and indirectly related to the reservoir operations policy, resulting in the potential for cumulative effects. These factors include soil erosion by rainfall, streamflow, and wave action from wind and recreational boat traffic; exposure by elevation fluctuations; development of the shoreline and back-lying lands; changes to the viewshed; and looting/vandalism or disturbance from recreational activities. TVA's evaluation of cultural resources found that ongoing shoreline land development and shoreline erosion are expected to continue long-term potentially cumulative adverse impacts on the integrity of cultural resources on shoreline and near-shore reservoir bottom areas. These impacts are anticipated to occur regardless of the reservoir operations policy alternative selected.

Implementation of Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, the Tailwater Habitat Alternative, or the Preferred Alternative would cause additional adverse impacts—which would increase the potential for cumulative impacts compared to the Base Case. Among the preceding alternatives, the potential for cumulative impacts would be least under the Preferred Alternative. Potential adverse impacts would be reduced using the approaches described in Chapter 7, thereby reducing their potential for long-term cumulative effects.

Because they would reduce shoreline erosion, the Commercial Navigation Alternative, Summer Hydropower Alternative, and Equalized Summer/Winter Flood Risk Alternative would result in neutral to beneficial impacts on cultural resource sites and would reduce the potential for long-term adverse cumulative effects.

### 6.2.12 Flood Control

Requirements for storage of flood waters in TVA reservoirs to minimize flood damage during flood events were determined from evaluation of potential floodflows, based on a 99-year historical record and additional consideration of very large storm events. Except for the Base Case, detailed analyses indicated that all of the action alternatives evaluated in the DEIS would result in unacceptable increases in the risk of flooding at one or more critical locations in the Valley. A central component in formulating the Preferred Alternative was risk of flood damages. By modifying individual project flood guides and/or regulating zones, the overall potential for increased flood damage was reduced immediately downstream from each project as well as downstream at damage centers.

Extensive land development has the potential to change the volume and rate of runoff from rainfall in the Tennessee River basin. Localized areas of rapid development could result in changes to local runoff characteristics. The changes in basin-wide land use anticipated through 2030, however, are not expected to result in watershed runoff characteristics that would change the outcome of future flood events. Therefore, no cumulative impacts related to flood risk are expected under the Preferred Alternative.

### 6.2.13 Visual Resources

Cumulative impacts on visual resources of the TVA reservoir system could result from interaction among shoreline erosion, shoreline development, and the effects of a reservoir operations policy that may interact to degrade scenic integrity. Continued development along TVA reservoirs and tailwaters would generally affect scenic quality regardless of the policy alternative implemented. Development standards and controls may reduce such impacts, but continued development of shorelines would result in visual resource impacts that are considered unavoidable and cumulative. Scenic quality is also affected by shoreline erosion and the exposure of reservoir bottoms during periods of lower reservoir pool levels, but this is already occurring under the existing operations policy.

The interplay among these variables produces little potential for cumulative impacts on visual resources under any alternative because the directions of the impacts do not correspond. For example, the Tailwater Habitat Alternative—the alternative with the highest potential for increasing shoreline erosion and related impacts on visual integrity—also would result in a substantially beneficial effect on scenic integrity due to longer duration at higher pool levels and less fluctuation in pool levels. Except for the Summer Hydropower Alternative and the Equalized Summer/Winter Risk Alternative, all of the action alternatives, including the Preferred Alternative, were found to benefit scenic quality by reducing the size of the shoreline ring effect and amount of exposed reservoir bottoms.

The Summer Hydropower Alternative has the greatest potential to cause cumulative adverse effects on visual resources because it would generally result in the greatest exposure of reservoir bottoms, flats, and the shoreline ring throughout the reservoir system.

### 6.2.14 Recreation

Recreation and use of recreation resources are generally expected to increase in the future, in relation to regional population growth. All action alternatives except the Summer Hydropower Alternative and the Equalized Summer/Winter Flood Risk Alternative would result in increased recreational use, primarily as a result of higher reservoir levels or more predictable tailwater releases. Increases in recreation use under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, or the Tailwater Habitat Alternative would be greater than under the Summer Hydropower Alternative or Preferred Alternative. The Preferred Alternative is expected to enhance recreation uses but to a lesser extent than the other alternatives that would enhance recreation use. The Summer Hydropower Alternative and the Equalized Summer/Winter Flood Risk Alternative are expected to reduce recreation use due to reduced summer and fall reservoir levels and tailwater flows, and could contribute to adverse cumulative effects on recreation uses.

## 6.3 Cumulative Impacts Associated with Future Projects

The preceding future trends discussion addresses the cumulative impacts that could result from implementing various operations policy alternatives and activities generally occurring throughout the TVA region. At the regional level, specific projects or actions could contribute to cumulative effects.

### 6.3.1 Identification of Future Projects

A three-step process was used to identify future projects to be included in the cumulative impact analysis. This process included:

- **Identification of Reasonably Foreseeable Projects (Actions).** Candidate projects were identified by reviewing published notices related to the preparation of environmental documents. The USEPA clearinghouse for NEPA compliance and state agency administrative dockets for the period from 1995 to 2002 were searched for: Notices of Intent to Prepare an Environmental Review, Notices of Availability of Draft and Final Environmental Documents, Findings of No Significant Impact, and Notices of No Practical Alternative to Impacting Wetlands or Floodplains. These lists were searched to identify reasonably foreseeable projects with potential cumulative effects in the Tennessee River watershed. This search identified 161 listings, which were reviewed and evaluated for their relevance. From this review, 31 candidate projects were selected based on their location, size, and status.

- **Review of Candidate Cumulative Projects.** Abstracts for candidate projects were reviewed and evaluated to determine whether a project met criteria for potential regional cumulative impact. Projects were considered that had been approved and not yet implemented or constructed, and projects for which a notice to proceed with environmental review had been issued. Projects in construction or that had completed construction but not yet begun operation were also considered. Projects

being discussed but for which no action had yet been taken were considered speculative and were not included.

- **Selection of Projects for Cumulative Analysis.** Based on the scope, status, and potential cumulative effect of those projects reviewed, TVA selected the following projects for evaluation of potential cumulative effects:

  - TVA land management plans
  - Other land development programs
  - U. S. Forest Service land and resource management plans
  - TVA hydro modernization projects
  - Hydroelectric projects licensed by the Federal Energy Regulatory Commission (FERC)

The specific projects identified for cumulative impact analysis are listed in Table 6.3-01. This table also summarizes the types of impacts that may be associated with each project.

### 6.3.2 Cumulative Impacts Associated with TVA Land Management Plans

TVA has developed and implemented reservoir land management plans (LMPs) for the areas surrounding a number of its reservoirs. To the extent these plans have been adopted and implemented by TVA, they were considered part of the existing environment and were included in the Base Case.

As part of the review of future projects, plans for 13 TVA reservoirs were identified (see Table 6.3-01). These plans include management of areas ranging from 66,651 acres at Kentucky Reservoir and 40,236 acres at Guntersville Reservoir to 880 acres on Boone Reservoir and 2,578 acres on Melton Hill Reservoir. Generally, these are multi-use plans designating areas for resource conservation and management, and for residential and commercial/industrial access and development. In all of the LMPs, except those for Kentucky and Wheeler Reservoirs, approximately 75 percent of the TVA land evaluated by the reservoir land planning process has been allocated for resource management and conservation. Allocations for specific uses have not yet been made in the Kentucky and Wheeler Reservoir plans. To the extent that the development occurs along reservoir shorelines, it was included in the SMI assessment of maximum buildout (see Section 4.15, Land Use). In addition, adopted SMI policies, including amendments to TVA's Section 26a permitting regulations, would substantially reduce the potential for cumulative impacts. Although implementation of the LMPs would result in some loss of habitat, these plans also would provide a cumulative increase in the availability of regional recreational facilities and enhanced protection of natural resources, including sensitive resources.

**Table 6.3-01 Summary of Projects Included in the Cumulative Analysis**

| No. | Project | Description of Location | Resources Affected |
|---|---|---|---|
| 1 | Guntersville Reservoir Land Management Plan | Land Management Plan for 40,236 acres on Guntersville Reservoir. The plan includes 5,079 acres for project operations, 32,584 acres for resource management and conservation, 327 acres for industrial access or commercial use, 1,704 acres for recreational uses (such as campgrounds and parks), and 543 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 2 | Tellico Reservoir Land Management Plan | Land Management Plan for 12,643 acres of TVA land on Tellico Reservoir. The plan designates 635 acres for project operations, 9,320 acres for resource management and conservation, 332 acres for industrial access or commercial use, 1,804 acres for recreational uses (campgrounds, parks, and public access areas), and 552 acres for residential lake access. Also includes designation of greenway and river corridor areas for resource protection. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 3 | Tims Ford Reservoir Land Management Plan | Land Management Plan for 6,453 acres of state and federal lands on Tims Ford Reservoir. The plan designates 386 acres for project operations, 4,573 acres for resource management and conservation, 67 acres for industrial/commercial development, 573 acres for recreational uses (campgrounds, parks, and public access areas), and 864 acres for residential access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |

**Table 6.3-01 Summary of Projects Included in the Cumulative Analysis (continued)**

| No. | Project | Description of Location | Resources Affected |
|---|---|---|---|
| 4 | Boone Reservoir Land Management Plan | Land Management Plan for 880 acres of TVA land on Boone Reservoir. The plan designates 209 acres for project operations, 594 acres for resource management and conservation, 76 acres for recreational uses (campgrounds, parks, and public access areas), and 1 acre for residential access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 5 | Melton Hill Reservoir Land Management Plan | Land Management Plan for 2,578 acres of TVA land on Melton Hill Reservoir. The plan designates 294 acres for project operations, 1,890 acres for resource management and conservation, 22 acres for industrial/commercial development, 221 acres for recreational uses (campgrounds, parks, and public access areas), and 151 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 6 | Bear Creek Reservoirs Land Management Plan (Upper Bear Creek, Bear, Little Bear Creek, and Cedar Creek Reservoirs) | Land Management Plan for 9,178 acres of TVA land on the four Bear Creek Reservoirs. The plan designates 851 acres for project operations, 7,456 acres for resource management and conservation, 14 acres for industrial/commercial development, 616 acres for recreational uses (campgrounds, parks, and public access areas), and 241 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |

**Table 6.3-01 Summary of Projects Included in the Cumulative Analysis (continued)**

| No. | Project | Description of Location | Resources Affected |
|---|---|---|---|
| 7 | Norris Reservoir Land Management Plan | Land Management Plan for 27,927 acres of TVA land on Norris Reservoir. The plan designates 934 acres for project operations, 23,776 acres for resource management and conservation, 1,744 acres for recreational uses (campgrounds, parks, and public access areas), and 1,473 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 8 | Cherokee Reservoir Land Management Plan | Land Management Plan for 8,026 acres of TVA land on Cherokee Reservoir. The plan designates 542 acres for project operations, 6,615 acres for resource management and conservation, 601 acres for recreational uses (campgrounds, parks, and public access areas), and 268 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 9 | Pickwick Reservoir Land Management Plan | Land Management Plan for 19,238 acres of TVA land on Pickwick Reservoir. The plan designates 2,861 acres for project operations, 13,431 acres for resource management and conservation, 534 acres for industrial/commercial development, 1,327 acres for recreational uses (campgrounds, parks, and public access areas), and 1,085 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |

**Table 6.3-01 Summary of Projects Included in the Cumulative Analysis (continued)**

| No. | Project | Description of Location | Resources Affected |
|---|---|---|---|
| 10 | Chickamauga Reservoir Land Management Plan | Land Management Plan for 12,862 acres of TVA land on Chickamauga Reservoir. The plan designates 337 acres for project operations, 8,653 acres for resource management and conservation, 46 acres for industrial/commercial development, 899 acres for recreational uses (campgrounds, parks, and public access areas), and 2,927 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 11 | Watts Bar Reservoir Land Management Plan | Land Management Plan for 11,121 acres of TVA land on Watts Bar Reservoir. The plan designates 586 acres for project operations, 7,394 acres for resource management and conservation, 142 acres for industrial/commercial development, 644 acres for recreational uses (campgrounds, parks, and public access areas), and 2,355 acres for residential lake access. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |
| 12 | Kentucky Reservoir Land Management Plan | The Kentucky Reservoir Land Management Plan designated 66,651 acres for multiple uses. This reservoir has not been allocated into specific zones. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion |
| 13 | Wheeler Reservoir Land Management Plan | Wheeler Reservoir Land Management Plan designated 28,004 acres for multiple uses. This reservoir has not been allocated into specific zones. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion |
| 14 | Use of Columbia Dam Project Lands | On the Duck River, upstream of the former Columbia Dam site, approximately 13,000 acres of TVA land was transferred to the State of Tennessee for management. Up to 2,000 acres are available for residential development; 3,800 acres for a possible water supply reservoir; remaining acreage was set aside for resource protection, wildlife management, and recreation. | Ecological Resources—direct impacts on resources from development of 2,000 acres but protection of natural resources on remaining 7,200 acres and possibly 3,800 more acres if water supply reservoir not developed<br>Visual Resources – protection of visual resources |

**Table 6.3-01 Summary of Projects Included in the Cumulative Analysis (continued)**

| No. | Project | Description of Location | Resources Affected |
|---|---|---|---|
| 15 | U.S. Forest Service Land and Resource Management Plans | Land and resource management plans are being revised or proposed for the six national forests that are in proximity to the Tennessee Valley. Draft plans for Cherokee and Chattahoochee-Oconee National Forests and all national forests in Alabama, including Bankhead, indicate that a greater emphasis will be placed on forest restoration, recreation, and wildlife while allowable timber harvest acreage will be decreased. The proposed forest plan for Daniel Boone reflects similar goals of improved habitat biodiversity, riparian areas, fire management, and old-growth forest stands while reducing timber harvest volumes. Revision of land management plans for Land between the Lakes and Nantahala/Pisgah are still in the planning stages. | Ecological Resources – protection of natural resources and restoration of habitat biodiversity<br>Aquatic Resources – increased protection of watersheds, reduced sediment loads, and increased abundance of local aquatic species<br>Recreation – increased backcountry recreation, trails and dispersed recreation areas<br>Visual Resources – protection of scenic areas, corridors, and sensitive viewsheds |
| 16 | TVA Hydro Modernization Projects | Hydro modernization efforts were initiated in 1992 to upgrade hydropower units in the TVA power system (see Section 3.3.1). Modification projects would address several types of upgrades, including increased efficiency and electrical output, and modifications to improve DO concentrations. | Power – increased generation capacity in the region<br>Water Quality – management of low DO levels in hydro unit discharge<br>Ecological Resources – benefits to downstream habitat from changes in water quality |
| 17 | Hydroelectric Projects Licensed by the Federal Energy Regulatory Commission | Hydroelectric projects are now in the relicensing process in the upper Tuckaseegee, Nantahala, and Little Tennessee Rivers. Duke Power's Nantahala Area Projects include the Bryson Project (FERC No. 2601), Dillsboro Project (FERC No. 2602), Franklin Project (FERC No. 2603), Mission Project (FERC No. 2619), East Fork Project (FERC No. 2698), West Fork Project (FERC No. 2686), and Nantahala Project (FERC No. 2692). Tapoco's Tapoco Project (FERC No. 2169) is a four-development hydroelectric project located on the Little Tennessee and Cheoah Rivers in eastern Tennessee and western North Carolina that includes Santeetlah, Cheoah, Calderwood, and Chilhowee. | Land development acreage is limited by SMI policy, with reduced potential for increased erosion<br>Ecological Resources – protection of species/habitat in areas designated for resource management<br>Recreation – increased recreation access and facilities<br>Visual Resources – protection of visual resources |

Notes: FERC = Federal Energy Regulatory Commission. SMI = Shoreline Management Initiative. DO = Dissolved oxygen.

Because none of the action alternatives proposes development or preservation of any land areas, direct cumulative impacts of policy alternatives in concert with implementation of TVA LMPs is not expected to occur. To the extent that both implementation of policy alternatives and any of the LMPs would indirectly affect an environmental resource, cumulative effects may occur. The loss of terrestrial and shoreline habitat from development under an LMP and increased impacts on wildlife resources from implementation of a policy alternative may result in a small cumulative effect on wildlife species. Many of these potential cumulative impacts are likely to be reduced by the resource protection benefits of TVA's reservoir LMPs.

### 6.3.3 Cumulative Impacts Associated with Other Land Development Programs

Continuing development and urbanization throughout the Valley would occur over the planning period. Where and when these activities would occur cannot be predicted, but they are certain to occur in light of population growth trends in the Southeast. In aggregate, this development may result in regional cumulative impacts, such as reduction in habitat, changes in surface water runoff, increased water use, and increased wastewater for disposal. None of the policy alternatives proposes the development of any new facilities; therefore, no direct impacts associated with development and urbanization would occur that could be considered cumulative. In addition, new development that may be expected to occur adjacent to TVA reservoirs has been included as part of the Base Case and was considered in the impact analyses for relevant resources.

The review of future projects identified one large land development program that is located upstream of TVA 's former Columbia Dam site. This 12,800-acre site was transferred to the State of Tennessee for management. Under the State's plan, approximately 2,000 acres are planned for residential development. The remaining area would be primarily set aside for wildlife management. While implementation of this development plan would remove as much as 2,000 acres of natural habitat, it would preserve other natural areas that are very important habitats for a number of sensitive resources, including species listed as threatened or endangered. No materially adverse cumulative impacts are expected to occur from implementation of any policy alternative in concert with this land development program.

### 6.3.4 Cumulative Impacts Associated with U.S. Forest Service Land Management Plans

Because national forest lands comprise large blocks of undeveloped acreage proximate to the Tennessee Valley region, management plans for nearby forests were reviewed for potential cumulative impacts. These federally managed lands include Cherokee National Forest in Tennessee, Nantahala/Pisgah National Forests in North Carolina, Chattahoochee-Oconee National Forests in Georgia, Bankhead National Forest in Alabama, Daniel Boone National Forest in Kentucky, and Land between the Lakes National Recreation Area in Tennessee and Kentucky.

The National Forest Management Act (NFMA) requires national forests to be managed under forest or land management plans that must be periodically revised. Three of the above national forests (Cherokee; Chattahoochee-Oconee; and all national forests in Alabama, including

Bankhead) are currently undergoing land management plan revisions. This is part of a collaborative effort among five forests to develop a more consistent management approach to improving forest health, productivity, and public enjoyment of national forests in the Southern Appalachians. This new approach to developing forest plans will use the findings of the Southern Appalachian Assessment (USDA Forest Service 1996) to identify common issues and management prescriptions across all Southern Appalachian forests. These common goals will be incorporated into each proposed management plan, along with any unique issues specific to individual forests. Drafts of management plans and DEIS documents for these three forests were released in March 2003; maintaining and restoring healthy forests was identified as the most significant goal of the revised plans (USDA Forest Service 2003a). Although these management documents are still being developed, they include such changes as more focus on ecological habitat protection and restoration, protection of old-growth forests, watershed health, and wilderness benefits while decreasing annual timber harvests. The proposed changes represent a shift from balanced-age timber management to an emphasis on the health of existing forest stands and restoration of forest ecosystems (USDA Forest Service 2003b, 2003c, 2003d).

The Daniel Boone DEIS and Proposed Revised Land and Resource Management Plan that was released in April 2003 reflects a similar shift in goals and management direction, including new prescriptions for habitat biodiversity and riparian areas, reduction in timber harvest volume, better understanding of fire habitat needs, and increased progression to old-growth stands (USDA Forest Service 2003e). New land and resource management plans are proposed to be released in 2004 for Land between the Lakes and in 2008/2009 for Nantahala/Pisgah National Forests. Current trends indicate a positive impact on regional land and water resources from U.S. Forest Service management activities, and no substantial adverse cumulative impacts relating to TVA's proposed action are anticipated.

### 6.3.5 Cumulative Impacts Associated with Hydro Modernization Projects

TVA is in the process of modernizing its hydropower facilities throughout the water control system. The potential impacts of these activities were addressed in TVA's Energy Vision 2020 EIS (1995). HMOD projects that were designed and funded, implemented, or completed on or before October 2001 are considered in this EIS as part of the Base Case (see Appendix A, Table A-09). The projects considered but not designed or implemented as of October 2001 are considered in the cumulative impacts analysis. These projects are listed in Table 6.3-02. The purpose of the HMOD projects is to increase the effective output and operational flexibility of these units; nevertheless, in most circumstances, an increase in discharge flow rate would occur during operations (as noted in Table 6.3-02).

The direct impact of modernized units would be increased flows. This may cause changes in river hydrology at run-of-river projects during operation of upstream hydropower units. These projects would include the reaches below Wheeler, Ocoee #3, Watauga, Blue Ridge, and Wilbur Reservoirs. The increased flows are not expected to be outside the range of flows that would otherwise occur at these projects; therefore, the direct impacts related to flows would not

cumulatively be greater than impacts already assessed in each relevant resource area under the Base Case.

**Table 6.3-02 Hydro Modernization Projects Considered in Cumulative Impact Analysis**

| Power Plant | Status in October 2001 | Receiving Water | Planned Changes | Flow Increase |
|---|---|---|---|---|
| Cherokee (Units 1–4) | Phase 1 | Mainstem storage | High efficiency, low flow | Yes |
| Wheeler (Units 1–8) | Phase 1 | Mainstem run-of-river | High efficiency, low flow | Not expected |
| Wilson (Units 19–21) | Phase 1 | Mainstem storage | Increased efficiency/capacity | Expected |
| Fort Loudoun (Units 1–2) | Not started | Mainstem storage | Increased efficiency/capacity | Mix |
| Wilson (Units 1–4) | Not started | Mainstem storage | High efficiency | Yes |
| Wilson (Units 5–8) | Not started | Mainstem storage | High efficiency | Yes |
| Ocoee #3 (Unit 1) | Not started | Tributary run-of-river | Increased efficiency/capacity | Yes |
| Nickajack (Units 3–4) | Not started | Mainstem storage | Increased efficiency/capacity | Yes |
| South Holston (Unit 1) | Not started | Tributary storage | Increased efficiency/capacity | No |
| Melton Hill (Units 1–2) | Not started | Mainstem storage | Increased efficiency/capacity | No |
| Watauga (Units 1–2) | Not started | Tributary run-of-river | Increased efficiency/capacity | Yes |
| Blue Ridge (Unit 1) | Not started | Tributary run-of-river | Increased efficiency/capacity | Yes |
| Wilbur (Units 1–4) | Not started | Tributary run-of-river | Increased efficiency/capacity | Insignificant |

Increased flows for modernized hydropower units discharging to mainstem and tributary storage reservoirs could affect water quality (principally by changes in temperature in the receiving waters). The incremental increase in discharge volume from modernized units would be small when compared to overall discharge volume and would be within the normal range of variation for release volumes, such that water quality is unlikely to be changed and no cumulative impact is likely to result.

Increased power generation capacity would allow production of additional electrical energy with the same amount of water. The TVA reservoir system currently has approximately 3,842 MW of hydropower capacity (not including Raccoon Mountain). Although this capacity would be increased through modernization efforts; actual hydrologic conditions and operations of the water control system in any given year would determine the cumulative increase in electrical production. Because TVA hydropower units are often operated during periods of peak demand, increased electrical output from hydropower production could reduce the requirements for

energy from fossil-fired peaking units on the TVA power system. The cumulative effects of this offset could be to displace some peak fossil production. Displacing peak fossil production with incremental hydropower production could reduce air emissions from power production. The incremental offset of fossil generation is likely to be small, however, and would occur only if no long-term increase in overall peak energy growth occurs. It is unlikely that a cumulative reduction in air emissions from incremental hydropower production as a result of modernization would occur.

### 6.3.6 Cumulative Impacts Associated with Hydroelectric Projects Licensed by the FERC

A number of hydroelectric projects in the Tennessee Valley are operating under licenses authorized by the FERC. Some of these projects are now in the process of being relicensed, a multi-year process that includes engineering and operations review of the project; consultation with relevant federal and state natural resources agencies, Indian tribes, and state water quality agencies; resource studies; and environmental and economic analyses. The process culminates with the submittal of a license application to the FERC, development of a NEPA compliance document (EA or EIS), and a decision by the Commission as to the term and operating conditions of the license. The relicensing process typically results in the issuance of a new license for operation of the project for the next 30 to 50 years under new operating conditions and with new operations and other measures for the protection, mitigation, and enhancement of environmental resources.

Several hydroelectric projects are now in the relicensing process in the upper Tuckaseegee and Nantahala Rivers, two major tributaries of Fontana Reservoir, and in the Little Tennessee River downstream of Fontana Reservoir.

- **Nantahala Area Projects.** Duke Power is relicensing its Nantahala Area projects, including 10 hydroelectric stations and 12 reservoirs on the Hiwassee, Nantahala, Oconaluftee, and Tuckasegee Rivers in western North Carolina. These include the Bryson Project (FERC No. 2601), Dillsboro Project (FERC No. 2602), Franklin Project (FERC No. 2603), Mission Project (FERC No. 2619), East Fork Project (FERC No. 2698), West Fork Project (FERC No. 2686), and Nantahala Project (FERC No. 2692).

- **Tapoco Project.** Tapoco, a division of the Alcoa Power Generating Inc (APGI), is relicensing its Tapoco Project (FERC No. 2169), a four-development hydroelectric project located below Fontana Reservoir on the Little Tennessee and Cheoah Rivers in eastern Tennessee and western North Carolina. The four developments that comprise the project are Santeetlah, Cheoah, Calderwood, and Chilhowee.

These hydroelectric projects are well along in the licensing process, and the licensing process for these projects has included the development of draft settlement agreements with the resource agencies and other participants. These settlement agreements are not yet finalized, and the FERC must make its own independent analysis and issue the licenses. Based on the draft settlement agreements to date and the history of recent relicensing process at other

hydroelectric projects, the new licenses for the Nantahala Area and Tapoco Projects would likely contain protection, mitigation, and enhancement measures. These would include such measures as improvement and enhancement of recreational access and opportunity, new minimum flows that would improve aquatic habitat and benefit fish and wildlife, protection of historical and cultural resources, and other environmental enhancements. Consequently, the relicensing of these projects would contribute in a positive way to beneficial cumulative impacts.

Duke Power and Tapoco projects are both located in the headwaters of the TVA region, and their total water storage volume is very small relative to the TVA reservoir system. Due to their size and location, there is limited potential for adverse cumulative effects on TVA's operations or flood risk.