CHAPTER 5 - ENVIRONMENTAL CONSEQUENCES

This chapter addresses the potential direct, indirect, and cumulative effects of adopting and implementing Alternatives A, B, C, and D. A direct impact is an effect caused by the action and occurring at the same time and place. An indirect impact is an effect caused by the action but removed in time or distance. A cumulative impact results from the incremental or collective effect of the action when combined with other past, present, and reasonably foreseeable future actions. Cumulative effects were examined within the TVA region over the next 20 years in the context of gradually increasing population and land development in that area. When determining the potential direct, indirect, and cumulative impacts to the environment, all programs and activities described under the alternatives were taken into consideration.

The remainder of this section addresses cumulative impacts of implementing the NRP programs when added to regional trends and anticipated future conditions. Consistent with the broad geographic scope of the NRP, cumulative effects were examined throughout the TVA region (Figure 1-2). Within the TVA region, in addition to TVA land, land is owned and managed by private individuals, NGOs (for example, The Nature Conservancy), and state and federal agencies. Similar to TVA, the USFS and National Park Service manage land in the region with goals for conservation, public access, and recreational opportunities. Because of the 20-year time frame and the 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.

Past and present activities in the TVA region have resulted in a region shaped, in part, by TVA's successful achievement of the purpose and goals set by Congress to improve navigation, reduce flood damage, provide for the proper use of marginal lands, support industrial development, and provide affordable power, all for the general purpose of fostering the physical, economic, and social development of the region.

Existing conditions of the TVA region are described in Section 1.3 and throughout Chapter 4. The TVA region covers a total of 76,738 square miles with 44,783 square miles extending outside the Valley watershed. TVA reservoir lands total approximately 293,000 acres (458 square miles) encompassing parts of the seven Valley states. In addition, TVA manages approximately 9,100 acres of land at its power facilities throughout the region. Historically, TVA has made approximately 485,300 acres of land available for resource conservation purposes, including recreational developments (Table 1-1). Today, TVA manages between 5 and 10 percent of the recreation facilities in the region (Section 4.1.1, Table 4-1). As described in Figure 4-7, approximately 6 percent of TVA reservoir lands are developed, 12 percent are pasture or cropland, and 81 percent are forested. These figures are in significant contrast to the approximately 11 percent developed, 24 percent pasture or cropland, and 63 percent forested on the surrounding lands within 0.25 mile of TVA lands. In comparison, SMI reported that this same area of influence was approximately 67 percent forested, and forest covered 55 percent of the area of the counties adjoining TVA reservoirs.

The NRP is designed to be implemented over 20 years. Over this period, existing conditions in the TVA region are expected to change. The following general trends are anticipated over the next two decades:

- Increasing human population
- Increasing proportion of residents in metropolitan areas
- Increasing demand for public recreation opportunities associated with population growth
- Increasing development of natural habitat in rural and suburban areas

Foreseeable future actions in the TVA region have been described in long-range and regional planning documents such as TVA's IRP (TVA 2011). Other future activities generally include:

- Continued development of shoreline properties in private ownership.
- State agency efforts to conserve natural resources and provide dispersed and developed recreation opportunities in state parks, gamelands, and state forests.
- State agency efforts to reduce regional impacts to water quality through the total maximum daily load, water quality certifications, and other programs.
- Federal agency conservation and recreation efforts with a trend toward improving biodiversity, recreation, and less timber harvest.
- Regional coalitions producing conservation plans geared toward reducing impacts to water and forest resources. An example of this type of effort is the Cumberland Habitat Conservation Plan (http://www.cumberlandhcp.org/default.html).
- Local efforts generated by various levels of governmental and nongovernmental agencies. For example, the Southeast Watershed Forum is working with local city-county leaders, resource organizations, and TWRA staff to integrate comprehensive plans with preserving priority habitat and shaping growth away from natural. Other local efforts can be found at http://wcs.conservationregistry.org/.

These past, present, and projected conditions provide the context for determining potential cumulative impacts of TVA's proposed natural resource management programs.

The management programs proposed in the NRP are designed to improve and benefit natural resources and recreation opportunities. At minimum, TVA would maintain compliance with applicable laws, regulations, guidance, and policies designed to reduce impacts to sensitive biological and cultural resources. Under the Flagship Management or Blended Management alternatives, TVA would implement additional projects designed to benefit biological and cultural resources and improve recreational opportunities. Some temporary and minor impacts of management projects could occur, as described in Section 5.1 below. However, those minor impacts are expected to be outweighed by overall benefits to natural resources (see Table 3-9).

Reservoir lands planning provides a basis for allocating lands available to various management and recreation projects. Lands planning, by itself, does not result in environmental impacts. Impacts are the result of projects or activities implemented according to the allocated land uses. The impacts of TVA projects are described in Sections 5.2 through 5.17 below. However, two aspects of the lands planning program influence the natural environment. The program: (1) establishes conservation of lands where sensitive resources exist and (2) determines the proportion of TVA lands available for various uses. In many cases, the allocation is determined by an existing use, easement, or agreement of the land, and the use allocation generally is fixed. In recent RLMPs, land use allocations changed very little. Using RLMP and RLA data and projecting maximum

changes to allocations (Table 2-9), TVA estimated that system-wide percentages of land in Zones 2, 3, 5, and 7 would change very little. The potential for change is greater in Zones 4 and 6. Therefore, on a regional basis, future reservoir land planning efforts would primarily affect the amount of land allocated to natural resource conservation (Zone 4) or developed recreation (Zone 6). Because TVA manages a finite body of land, an increase in Zone 6 allocations normally results in a decrease in Zone 4 allocations and vice versa.

Under all alternatives, TVA would continue to allocate most lands containing sensitive resources (archaeological and historic properties, wetlands, rare species, and natural areas) to the most protective zone. Other federal and state agencies in the region would, be expected to conserve sensitive resources on their lands, pursuant to federal and state regulations. Other regional efforts such as land trusts and programs operated by The Nature Conservancy and other non-governmental organizations support identification and conservation of sensitive resources on private lands in the region. These conservation efforts would combine to beneficially offset impacts to sensitive resources on private lands subject to development. Overall, the systematic protection of sensitive resources under the land planning process would contribute beneficially to regional conservation of wetlands, rare species, and cultural resources.

As described above, maximum projected changes in land uses would either emphasize developed recreation uses or natural resource conservation. Should a trend of increasing recreation uses occur, natural habitat lacking sensitive resources could be converted to developed recreation facilities. This would contribute to the regional trend of diminishing undeveloped shoreline. On a Valleywide basis, because much of the land is forest (Section 4.9), a decrease of Zone 4 lands would result in minor regional changes in undeveloped lands. Similarly, should the proportion of TVA lands allocated to conservation purposes increase, the area of undeveloped TVA lands would remain relatively stable. The proportion of the system-wide reservoir shoreline that is undeveloped, however, would continue to decrease due primarily to the development of residential shoreline. The changes on TVA lands would not result in regionally significant cumulative effects. However, on an individual reservoir, depending upon existing shoreline development, conversion of undeveloped lands to developed recreation facilities could be noticeable. Furthermore, conversion of shoreline forests and other habitats may have important local impacts to aquatic and riparian zones, which may not be abundant regionally.

TVA's proposed recreation management strategies range from slightly reduced recreation opportunities (Alternative B) to expanded programs at existing facilities and additional land allocated to recreation during lands planning (Alternatives C and D). Currently, TVA provides between 5 and 10 percent of the public recreation facilities in the region (Section 4.1). However, the reservoir- and shoreline-associated recreation opportunities on TVA lands are somewhat unique in the region. As regional population increases, the need for recreational facilities is expected to increase. TVA, together with other federal, state, and local agencies, would strive to meet that demand to avoid excessive use pressure on existing facilities.

Expansion of recreation programs and facilities would beneficially contribute to the cumulative total recreation opportunities in the TVA region. Likewise, reduction of TVA recreation programs and facilities, as proposed under Alternative B, would negatively affect the cumulative total of recreation opportunities in the TVA region. However, given that other entities provide between 90 and 95 percent of those opportunities, changes in recreation opportunities on TVA lands would not result in significant cumulative impacts.

As stated in Section 5.6, regional water quality is influenced by the aggregate actions of all landowners in the Tennessee River watershed. Because TVA lands account for a small portion of the watershed, actions on TVA land influence water quality on a local basis. TVA's proposed efforts to improve water quality under Alternatives A-D may result in important local improvements, but would not result in significant cumulative benefits. In the Tennessee River watershed, the efforts of federal and state water quality regulators, municipal/local programs, and others including TVA combine in an effort to offset threats to water quality from increased economic growth and development. TVA's contribution to beneficial cumulative impacts is greatest under Alternatives C and D, due to the increased participation in water quality outreach and programs.

5.1. Overview of Potential Environmental Impacts by Resource Management Programs

Prior to implementing activities associated with the resource management programs described in Chapter 2, TVA would conduct a site-specific environmental review for a proposed action, as appropriate. However, the typical impacts associated with these programs are described below.

5.1.1. Biological Resources Management

The biological resource management programs would mostly be implemented on the 231,000 acres of TVA lands allocated for natural resource conservation and sensitive resource management. These programs are expected to enhance the quality of targeted natural resources and to be beneficial overall. Such beneficial effects or impacts are described in the context of the program descriptions in Chapter 2. However, programs could have collateral adverse environmental impacts. The risk and severity of such collateral impacts would be mitigated by a variety of measure and activities. These include the replacement of nonnative vegetation with native plants; use of construction activity BMPs to avoid or reduce potential impacts to wetlands, aquatic life, and water quality; and the incorporation of design features to lessen the impact on visual integrity when appropriate. Site-specific review processes also would identify actions to avoid or reduce potential adverse impacts. These processes include the ESA Section 7 consultation process to address potential impacts on threatened and endangered species, the NHPA Section 106 consultation process to address potential impacts on cultural resources; and the NEPA review process itself that would identify measures to mitigate, reduce, or avoid potential impacts on wetlands, floodplains, and other important natural resources.

The remainder of this sub-section describes the typical impacts resulting from implementing specific biological resources programs and activities.

Dispersed Recreation — The types of dispersed recreation activities seen most often on TVA lands are picnicking, primitive camping, hiking, bank fishing, hunting, and kayaking/canoeing. The impacts associated with these activities include increased litter, vegetation removal, and an increase in disturbed land areas. Section 2.1.2 discusses options for TVA to increase dispersed recreation management efforts and to offset these impacts. Actions to rehabilitate the areas would result in some minor, short-term impacts such as sedimentation from soil disturbances associated with site grading and revegetation. Solid waste resulting from removal of debris and litter would be disposed of in approved landfills.

Land Stewardship Assessment Tools — The use of land stewardship assessment tools aids in the management of public lands and results in implementing actions that benefit the environment long-term. The implementing actions associated with boundary maintenance and other management activities may result in short-term minor impacts such as clearing of nonnative vegetation; increased sedimentation from improving access roads, installing shoreline stabilization, and creating wildlife habitat areas; and minor fugitive air emissions from the mechanical equipment needed to complete the project. By using the TVA Natural Heritage Database and the TVA Wetlands Database, the resulting actions can be modified to avoid or mitigate potential impacts to sensitive resources.

Public Outreach — The implementation of public outreach programs, themselves, would not directly impact the environment. However, public outreach programs would have indirect environmental effects through implementing some of the programs and activities described elsewhere in this section.

Sensitive Resources Management — The impacts associated with the management of sensitive resources are intended to be solely beneficial. By monitoring endangered and threatened species, the overall knowledge base surrounding the species is increased. This increased knowledge leads to better land management and conservation planning decisions. Projects would also be implemented to reduce invasive plant species from natural areas with sensitive plant and animal species; conversion to native plant and wildlife habitat; and enhancement of user access for education and enjoyment purposes. The potential for adverse impacts is small; these impacts could include sedimentation from grading and revegetation activities, localized reductions of nontarget species, and localized closure of areas to public access.

Terrestrial Habitat Management — The impacts from terrestrial habitat management range from increases in dispersed recreation in a defined area to changes in overall forest structure. Maintaining agricultural and open lands; improving dewatering areas; implementing wildlife habitat management and Wildlife Habitat Council (WHC) projects may result in an increase in dispersed recreation within those improved areas. Some short-term minor impacts associated with terrestrial habitat management include clearing of nonnative vegetation; increased sedimentation from improving access roads, installing shoreline stabilization, and creating wildlife habitat areas and riparian buffers; and minor fugitive air emissions from the mechanical equipment needed to complete a specific project and from prescribed burning. Dependent upon the types of forest management projects implemented, the resulting impacts may lead to changes in the overall forest structure and benefits to the type of herbaceous and woody vegetation present.

5.1.2. Cultural Resources Management

The cultural resource management programs would be implemented on all TVA lands, including power plant reservations. The typical activities associated with managing cultural resources as described in Section 2.2 include the identification of cultural resource locations, protection of eroding archaeological sites and rehabilitation/reuse or documentation of historic buildings. When protecting eroding archaeological sites, TVA may install riprap along the shoreline. The impacts associated with shoreline stabilization result in a short-term and localized increase in sedimentation and alteration of stream bank and lake-bottom aquatic habitat and visual effects. When rehabilitating historic buildings, there could be generation of solid waste with the potential for asbestos and lead paint waste streams needing special handling and disposal. Most other cultural resource management activities include site inspection, evaluation, and monitoring activities, various

consultations, and public outreach activities with little potential for direct environmental impacts.

5.1.3. Recreation Management

The recreation management programs would be implemented at those recreation facilities and stream access sites managed by TVA both on and off TVA reservoirs. The various alternatives focus on the operation and maintenance of these existing facilities and the remainder of this sub-section describes the typical impacts associated with the different program areas.

Campground Management — The types of impacts associated with campground management result from the use of and improvements to campgrounds. Increases in litter, vegetation removal, and disturbed land areas are impacts associated with the general use of a campground. Actions to rehabilitate the areas would result in minor, short-term adverse impacts such as sedimentation from soil disturbances associated with site grading and revegetation. Solid waste resulting from removal of debris and litter and from replacement of equipment and materials would be recycled or disposed of in approved landfills. Improvements to campgrounds, as proposed in the NRP, relate to upgrades consistent with ADA guidelines, incorporation of innovative designs, and installation of measures to increase reduce power and water consumption and waste generation. These upgrades and installations may require limited excavation, removal of existing vegetation, and minor fugitive air emissions from the mechanical equipment needed to complete a specific project. The installation of construction related BMPs would offset any potential short-term impacts. Overall, campground improvements, as described in the NRP, would result in long-term beneficial impacts to the environment.

Day Use Areas Management — Similar to campgrounds, the types of impacts associated with day use area management result from the use of and improvements to day use areas. Increases in litter, vegetation removal, and disturbed land areas, along with the potential increase in recreational boating traffic within a defined area are some expected impacts associated with the general use of a day use area. Actions to rehabilitate the land-based areas would result in minor, short-term adverse impacts such as sedimentation from soil disturbances associated with site grading and revegetation. Solid waste resulting from removal of debris and litter and from equipment and materials replacement would be recycled or disposed of in approved landfills. Improvements to day use areas include upgrades similar to those described above for campgrounds. The development of additional greenways and reservoir and stream access sites would result in the construction of access roads and parking areas, trails and any associated foot bridges, and boat launching ramps or other facilities. The typical impacts associated with improvements to day use areas are typical to those of a developed recreation project. In addition, there would be minor fugitive air emissions from the mechanical equipment needed to complete the project.

Public Outreach Programs — The implementation of recreation public outreach programs, themselves, would not directly impact the environment. Programs and activities promoted by such outreach efforts could have minor adverse impacts that are addressed in the context of those programs.

Recreation Assessment and Design Tools — The use of recreation assessments and design tools aids in the management of recreation areas and results in implementing actions that benefit the environment long-term.

5.1.4. Reservoir Lands Planning

The methodology which drives reservoir lands planning would not directly impact the environment. The proposed Comprehensive Valleywide Land Plan (CVLP) would establish a range in land use zone allocations (Table 2-9). This sub-section describes the typical impacts resulting from the ranges in allocations associated with the specific land use zones. The types of development that can occur on TVA lands for each land use zone is defined in Appendix F. Prior to approving any proposal to use TVA land, TVA would conduct an appropriate site-specific environmental review.

Zone 2 (Project Operations) — Between five and seven percent of TVA lands would be allocated for project operations. Currently, seven percent of TVA lands are allocated to this use across the reservoir system, the upper limit of the CVLP range. Consequently, there would be no increase in potential impacts from allocating lands to Zone 2. The largest potential change would result in a 29 percent reduction in the land available for project operations. Land removed from Zone 2 would most likely be allocated to Zone 4 - Natural Resource Conservation or Zone 6 - Developed Recreation. Allocation to Zone 4 would result in minimal environmental impact. Allocation to Zone 6 would likely result in the development of recreation facilities and the resulting impacts from site clearing and grading, establishment of lawns, and the construction of access roads, parking areas, boat launching areas, restrooms and other buildings. These impacts can include increases in runoff, altered wildlife habitats, and localized increases in vehicle and boat traffic. Typical activities associated with project operations on Zone 2 lands include lawn mowing and landscaping and building maintenance. Some TVA lands allocated for project operations also contain day use areas. The impacts associated with operation and maintenance of day use areas have been described above.

Zone 3 (Sensitive Resource Management) — The 17 percent of lands allocated to sensitive resource management could decrease to 16 percent or increase to 18 percent. This is the equivalent of about a 6 percent decrease or increase in land area in Zone 3. The typical types of projects implemented within Zone 3 lands result from biological and cultural resource management programs. The impacts associated with implementing these types of programs have been described above. Lands removed from Zone 3 would likely be allocated to Zone 4 - Natural Resource Conservation or to Zone 6 - Developed Recreation. The impacts of these allocations would be similar to those described above for allocating lands from Zone 2 to Zones 4 and 6.

Zone 4 (Natural Resource Conservation) — Sixty-one percent of TVA lands are presently allocated to natural resource conservation; this allocation could change to between 58 and 65 percent. The potential change would vary from a 5 percent reduction to a 7 percent increase. The typical types of projects implemented within Zone 4 lands are biological and cultural resource management activities. The impacts associated with implementing these have been described above. Lands removed from Zone 4 would likely be allocated to Zone 3 - Sensitive Resource Management or to Zone 6 - Developed Recreation. Allocation to Zone 3 would result in minimal environmental impact. The impacts of allocating lands from Zone 4 to Zone 6 would be similar to those described above for allocating lands from Zone 2 to Zone 6.

Zone 5 (Industrial) — Between one and two percent of TVA lands would be allocated for industrial use. Therefore, the land allocated for industrial use could be reduced by half, with a corresponding reduction in many of the impacts associated with industrial development, but a loss of the potential economic benefits associated with such use. Lands removed

from Zone 5 would likely be allocated to Zone 4 - Natural Resource Conservation or to Zone 6 - Developed Recreation. Most of the lands that would be removed from Zone 5 are likely undeveloped, and thus allocating them to Zone 4 would likely result in minimal environmental impact. The impacts of allocating them to Zone 6 would be similar to those described above for allocating lands from Zone 2 to Zone 6. Typical impacts of industrial development result from site clearing and grading, construction of access roads, parking areas, and utility connections, and construction of buildings. Depending on the type of industry, there could also be air emissions, discharges of water pollutants, and production of solid waste. Under Alternatives B, C, and D, the restriction of industrial development on Zone 5 lands to "light industrial" would be removed (see Section 2.4.1 and Appendix F). This would allow for a broader range of industrial development and potentially greater environmental impacts. Because of applicable regulatory and permitting requirements, the likelihood of these impacts being significant is low.

The impacts of recreational development of reallocated Zone 5 lands would likely be less than those resulting from industrial development.

Zone 6 (Developed Recreation) — Eight percent of TVA lands are currently allocated for developed recreation purposes. This allocation could increase to 10 percent for a 25 percent increase in Zone 6 land area. Most of this land would likely be reallocated Zone 4 - Natural Resource Conservation lands, and it would eventually be developed to accommodate the forecasted increase in demand for recreation resulting from population increases and changing leisure activities. The typical impacts associated with the development of recreation facilities result from site clearing and grading, establishment of lawns, and the construction of access roads, parking areas, boat launching areas, restrooms and other buildings. These impacts can include increases in runoff, altered wildlife habitats, and localized increases in vehicle and boat traffic. Depending on the location of the new facilities, there could be unavoidable impacts to wetlands which would be mitigated by wetland enhancement or the purchase of mitigation credits.

Zone 7 (Shoreline Access) — Approximately 5 percent of TVA lands is allocated for shoreline access purposes; this proportion is expected to remain unchanged. The direct, indirect, and cumulative impacts associated with residential shoreline development have been evaluated in the SMI EIS (TVA 1998). According to SMI, this 5 percent of TVA lands is equal to approximately 1,847 miles of shoreline. In these areas, the adjoining private property owner can access the reservoir across TVA–managed land. The future allocations for shoreline access are guided by TVA's Land Policy.

5.1.5. Water Resource Management

The water resource management programs have been limited to those programs and activities implemented by TVA to improve reservoir and watershed water quality proactively. These programs would be implemented across the entire Tennessee River watershed. The typical impacts associated with water resource management projects include short-term increases in sedimentation and very localized alterations of shoreline and stream-bottom habitats. BMPs specific to water resource management projects (Section 2.4.6) would be implemented during construction, as appropriate. The remainder of this sub-section describes the typical impacts resulting from implementation associated with the specific program categories.

Aquatic Monitoring and Management — The impacts associated with aquatic ecology management would most likely result from habitat protection and enhancement projects

along with efforts to reduce the spread of invasive species. Sedimentation from the installation of aquatic habitat enhancements such as fish attractors would be short-term and minor. These same types of impacts would also occur when installing temporary barriers to protect specific aquatic habitats. Construction related BMPs and timing of project implementation during low flow conditions would occur to further reduce potential impacts.

Partnership Programs — The implementation of partnership programs, themselves, would not directly impact the environment.

Public Outreach Programs — Projects resulting from the Clean Marina and water resource outreach campaigns directly benefit the environment. The implementation of the QGP and water efficiency program would not directly impact the environment. Clean Marina certification requires proper BMPs to address potential impacts for shoreline erosion, fuel spills, on-site septic systems and marina sewage disposal. Water resource outreach campaigns could include demonstration projects from any aspect of water resource management. The indirect beneficial impacts may include localized improvements in water quality due to the implementation of non-point pollution best practices and promotion of water conservation.

Water Resource Improvement Programs — The beneficial impacts from water resource improvement programs range from sediment reductions in tributary streams to nutrient reductions in TVA reservoirs. Some short-term minor impacts associated with water resource improvement programs include clearing of nonnative vegetation; increased sedimentation from installing shoreline stabilization and creating riparian buffers; and minor fugitive air emissions from the mechanical equipment needed to complete a specific project. Most water resource improvement programs include implementing a variety of water resource improvement tools. The additional impacts associated with these tools are discussed below.

5.1.6. Public Engagement

The proposed volunteer program and the foundation and trust fund would, respectively, increase TVA's use of volunteer labor and provide a source of funding for natural resource management projects. These programs have little potential for adverse impacts.

5.2. Recreation

5.2.1. Developed Recreation

Under all of the alternatives, TVA proposes to maintain and/or upgrade varying numbers of its existing campgrounds, day use areas, and stream access sites. TVA would assist in the development of greenways and stream access sites under Alternative C, and would develop blueway access sites under Alternatives A and C. New recreation facilities on TVA reservoirs would primarily be provided by other public and private agencies, either on land they control or on TVA lands zoned for developed recreation. TVA would be involved in the development of these facilities through the Section 26a approval process for shoreline facilities and in providing the rights for the use of any TVA land.

Alternative A — No Action Alternative

Under this alternative, TVA would continue recreation management activities at current levels. While this would provide continued "status quo" operation of TVA recreation facilities and maintain existing partnerships and outreach programs, this level would not be sufficient to keep pace with projected increases in population and recreation needs over the

next 20 years. In general, this alternative would generate a higher level of public recreation benefits and opportunities than Alternative B, a lower level than what would be achieved under Alternative C, and a slightly lower level than Alternative D.

TVA would continue to manage eight campgrounds on dam or power plant reservations and four campgrounds on TVA reservoir lands thus ensuring these areas continue to provide public recreation benefits. TVA would operate 30 day use areas on dam reservations and 33 areas located off dam reservations. Facility upgrades and modifications needed to meet accessibility standards and increase resource sustainability would be undertaken as capital funds become available, resulting in these areas being more accessible to the physically disabled and addressing some of the continued deterioration of high use sites. However, progress in meeting both sustainability objectives and accessibility standards would be slower compared to Alternatives C and D.

TVA would continue to provide limited assistance to partners and stakeholder groups in trail, greenway, and blueway development. However, TVA would not proactively participate in the development of additional blueway, trail, and greenway corridors and would contribute little to meeting the growth in future needs within the region. TVA would continue to provide for basic management of all of its 31 stream access sites plus a portion of the 50 TVA-owned sites no longer under viable third-party management agreements. However, efforts to enhance sustainability of resources at some sites would not be undertaken under this alternative and ongoing environmental degradation would not be as effectively addressed.

This alternative would maintain public outreach projects at current levels. Initiatives aimed at increasing public awareness of environmentally responsible camping and other outdoor recreation practices would not be undertaken, thus reducing TVA's capability to positively influence the level of environmental impacts associated with expected future increases in recreational development and use of TVA lands.

TVA would continue to update its reservoir recreation facility inventory data on a three-year rotation. However, inability to track changes in recreation services and facilities on a biannual or annual basis as proposed under Alternatives D and C, respectively, reduces the accuracy of the inventory data available.

Cumulative impacts would include a growing gap in water-based recreation facilities/services needs (as outlined in Section 4.1) relative to available supply, increased use pressure on existing public or commercial recreation areas, and increased use of undeveloped TVA lands leading to sanitary and safety concerns. The extent of these cumulative impacts would likely be small.

Alternative B — Custodial Management Alternative
Under this alternative, TVA would discontinue and/or scale back selected programs and focus on meeting minimum regulatory and policy requirements. This alternative would significantly reduce TVA's ability to respond proactively to existing as well as future outdoor recreation needs within the TVA region and could also result in the closure of some campgrounds, day use areas, boat launching ramps, and other facilities at a time when demand for these facilities are expected to increase. In addition, environmental conditions at unmaintained and closed facilities could increasingly deteriorate over time.

Under this alternative, three of the four campgrounds and the 33 day use areas located off dam or power plant reservations would be transitioned to other operators or would be closed. The resulting impacts would depend on the level of success achieved in transition efforts. Areas successfully transitioned to other operators would continue to provide camping, picnicking, boat launching, swimming and related facilities and services at those areas. However, changes in management policies by outside operators could have some impact on future use of these areas. For example, changes in length of stay policies could reduce campsite availability to transient campers. Operators could also charge fees for use of swimming areas, trails, boat ramps, and picnic facilities, traditionally available free of charge under TVA management. The closure of Mallard Creek, Loyston Point, or Barton Springs would significantly reduce opportunities for camping and related day use activities on Wheeler, Norris, and Normandy reservoirs. Closure of Loyston Point could also result in restricting access to the trail at Hemlock Bluff Small Wild Area. The closure of Foster Falls Recreation Area would virtually eliminate the existing access to the Foster Falls Natural Area.

Depending on the number of campgrounds and day use areas closed, negative impacts could range from small (only a few relatively remote and lightly used areas closed) to significant (large number of heavily used areas closed). Negative impacts resulting from area closings include:

- Loss of existing accommodations for camping and related activities.
- Loss of existing accommodations for water-based recreation activities including boat launching, picnicking, and swimming on TVA lands.
- Disproportional impact on lower-income users.
- Continued informal use of closed areas resulting in garbage accumulation, misuse or vandalism, and environmental degradation.

Some of the 50 stream access sites currently managed under cooperative agreements would be closed to the public if existing cooperative agreements expire or are canceled. In general, closure of any of these existing areas would adversely impact public use of the affected stream. In many cases, these sites represent the only means of safe, legal public access to these waterways, and closure would significantly restrict public use opportunities.

Under this alternative, potential impacts associated with public outreach and recreation assessments and design tools to the environment would be similar to the No Action Alternative.

This alternative would result in the closure of some recreation areas and stream access sites, and would reduce TVA's outreach programs. Therefore, it is more likely to be a growing gap between recreation needs and supply under this alternative. Cumulative impacts would likely include reduced public access to the region's reservoirs and streams, adverse impacts to local economies in part dependent on tourism and outdoor recreation, increased use of undeveloped lands and continued use of some closed areas resulting in environmental degradation and safety concerns, increased pressure on other public and/or commercial recreation operations, and some shift in recreation users to areas outside the region. The extent of these cumulative impacts would be moderate.

Alternative C — Flagship Management Alternative

Under this alternative, TVA would establish new recreation initiatives and intensify selected existing programs to keep pace with cutting edge trends in outdoor recreation resource

management and to maintain a strong TVA role in meeting regional recreation needs over the next 20 years. Implementation of this alternative would result in TVA displaying a stronger presence in recreation management compared to Alternatives A, B, and D. Overall, this alternative would result in an increase in the quality and quantity of recreation opportunities available in the TVA region. These programs would keep pace with anticipated increases in outdoor recreation needs, result in more environmentally sensitive development and management of recreation areas on TVA lands and reservoirs, and increase public awareness and adoption of more responsible and sustainable recreation use practices.

Under this alternative, TVA would accelerate upgrades at eight dam or power plant campgrounds and four campgrounds located on other reservoir properties to meet accessibility standards. These upgrades ensure the campground facilities are available and accessible to a wide range of existing and potential users including the disabled.

Under this alternative, TVA would upgrade four areas annually to meet accessibility standards. In addition, TVA would undertake additional resource conservation and sustainability measures to reduce the environmental impacts of its recreation areas. Increased partnership agreements to develop additional trails, greenways, blueways, and stream access facilities would also be undertaken. In combination, these initiatives would contribute significantly to meeting natural resource-based outdoor recreation needs within the TVA region over the next 20 years and increase recreation opportunities for a wide range of users including the disabled.

Under this alternative, TVA would increase current outreach efforts including the LNT Program and would also establish new outreach initiatives to promote sustainable, responsible recreation development and use of TVA land. Expansion of the LNT Program could result in recreation users changing their habits to reduce their impacts.

New outreach initiatives that would be implemented include annual tours, the Camp-Right Campground Program, and a Resource Ranger Program. The annual tours program would result in greater media and public awareness of TVA efforts and would increase the potential for similar technologies to be applied elsewhere in the TVA region and nation. Camp-Right would result in a reduction in the environmental footprint of developed commercial and public campgrounds. The establishment of the Resource Ranger Program could result in increased compliance with recreation regulations and/or guidelines, reduced criminal activity, and increased public security and safety at developed and undeveloped recreation areas.

Additional actions under recreation assessments and design tools would include implementation of two reservoir boating assessments annually, update of TVA's recreation inventory on an annual schedule, increased emphasis on recreation area signage and interpretation upgrades, and implementation of recreation area visitor surveys.

The completion of boating assessments would enable TVA, in partnership with state agencies and other stakeholders, to proactively develop and apply strategies and policies to address boating capacity limits and boating safety. An annual update of TVA's recreation inventory data would ensure that recreation supply data would be based on accurate, up-to-date data. Improved signage, on-site interpretation, and map products would increase public awareness of recreation opportunities on TVA projects. An enhanced visitor survey program would result in a better understanding of customer needs and

expectations and would provide a firmer foundation for identifying emerging trends and preparing development and/or management options for addressing trends and expectations.

Alternative D — Blended Management Alternative
This alternative includes elements of Alternatives A, B, and C. Overall, the implementation of this alternative would provide noticeably greater public recreation benefits than Alternative B, a somewhat greater level of benefits than Alternative A, and fewer benefits than Alternative C.

The campgrounds located on dam or power plant reservations would be upgraded to meet accessibility standards, resulting in the same benefits as those outlined under Alternative C. The potential impacts related to the remaining campgrounds would be the same as those described under Alternative B.

Annual implementation of two sustainable initiatives and two upgrades to meet accessibility standards at day use areas, while less aggressive than Alternative C, would result in improved environmental conditions at selected areas and increased water-oriented recreation opportunities for the disabled. The impacts associated with potential closure of stream access sites currently managed under cooperative agreements would be the same as Alternative B.

Compared to Alternatives A and B, this alternative would emphasize public outreach efforts by increasing annual public tours. However, this alternative would be less effective than the broader range of outreach initiatives implemented under Alternative C.

Updating recreation inventory data on a two-year cycle would result in more accurate and up-to-date information on existing reservoir recreation areas. Therefore, this information would assist in supporting the planning efforts of TVA, other agencies, and stakeholders.

Under this alternative, the cumulative impacts would be similar to Alternative A.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to developed recreation under the four alternatives are shown in Figure 5-1.

Figure 5-1. Relative Beneficial Impacts of the Alternatives on Developed Recreation

5.2.2. Dispersed Recreation

Alternative A — No Action Alternative

Under this alternative, TVA would continue its current dispersed recreation management activities. This level of management would likely not keep up with the increase in use and impacts associated with dispersed recreation activities in the Valley. TVA would continue to collect data associated with dispersed use/impacts and implement management efforts on these areas on a limited basis. This level of management would result in a direct negative impact to dispersed recreation as public use affects limited natural resources.

Data collection would be conducted on 70 dispersed recreation areas annually. While this process is robust from the dispersed recreation perspective, it fails to make vital linkages between dispersed recreation and other pressures that could potentially impact the management and user experience of an area. A holistic management approach is preferred to maximize the existing and potential benefits dispersed recreation areas are able to sustain and offer. Data collection in conjunction with the existing LCA process is a more holistic approach, which would benefit the overall management objectives for TVA land as it takes into account multiple dimensions of impacts.

TVA would implement one key opportunity associated with dispersed recreation annually. This effort is specifically designed to meet current and latent demand for dispersed recreation opportunities. This level of effort would not keep pace with the existing or future demand for dispersed recreation on TVA lands.

One heavily impacted dispersed recreation area would be mitigated annually. Based on available data, there are over 800 existing dispersed recreation areas on TVA lands. An estimated 108 areas are known to have significant impacts from use. Improving one area would result in management action on less than 1 percent of known areas. This level of effort would not be suitable for TVA to achieve management of dispersed recreation impacts in an ecofriendly manner.

TVA would continue to manage its existing 100 miles of trails. Improvements or management efforts would be restricted to known needs identified through the LCA processes with focus on current prioritization of public safety. This strategy captures some existing needs but fails to take into consideration specific strategies for trails management or development.

Potential cumulative effects to dispersed recreation may result in management objectives for dispersed recreation not being met as well as management levels below that intended by the Environmental Policy.

Alternative B — Custodial Management Alternative

Under Alternative B, TVA would engage in active management and outreach at a minimal level to comply with regulations and meet policy objectives. This alternative would be an increase in effort from Alternative A. However, it would focus only on existing impacts and issues as currently known and provide little flexibility to adapt to emerging issues during the life of the NRP.

The process of collecting data on dispersed recreation areas would be modified to align with the LCA methodology. Only areas that receive a score of “poor” for the metric of dispersed recreation under the LCA would be further evaluated with the Dispersed Recreation Analysis methodology. This would streamline the data collection process and

ensure further data are only collected on those areas needing management attention. This change would result in less robust data being collected on dispersed recreation, but the data would be more in line with the future overall stewardship objectives and needs.

TVA would implement five key opportunities associated with dispersed recreation annually. This minimal level of effort is specifically designed to meet current and latent demand for dispersed recreation opportunities. This level of effort would give TVA the ability to implement the minimal amount of projects Valleywide benefiting a moderate variety of stakeholders needs. In addition, this effort would allow TVA to have a Valleywide presence on a limited basis of key projects on an annual basis.

Implementation of a dispersed recreation educational campaign would be present under this alternative. TVA lands are often spatially noncontiguous in nature. This phenomenon presents a challenge to people seeking dispersed opportunities as no central information port exists to educate people on where TVA lands are located and what recreation opportunities they provide. In addition, TVA currently does not educate the public on preferred practices that would reduce the amount of ecological damage in established dispersed areas. The need for an educational campaign grows as more people move to the region who are unfamiliar with TVA lands or the appropriate use of these areas. The implementation of this campaign would help TVA meet its management objectives by providing users with information to be better stewards of TVA lands.

Five heavily impacted dispersed recreation areas would be improved annually. Based on past data collection, there are an estimated 108 heavily impacted dispersed recreation areas on TVA lands. Improving five areas annually would result in all known areas within the next 20 years and result in long-term benefits to the users of these sites, and to adjacent land and reservoir areas.

TVA would continue to manage its existing 100 miles of trails and would correct potential safety hazards to the public. Trails facilitate many ecofriendly dispersed recreation activities (i.e., hiking, bird watching, nature observation). The minimal management of existing dispersed recreation trails is correction of hazards to public safety. TVA would not construct new trails which would likely result in the demand for trails exceeding the supply.

Potential cumulative effects to dispersed recreation would be positive compared to Alternative A due to increased efforts of management and the implementation of an educational campaign designed to help the public assist TVA with meeting its management objectives. This alternative would allow TVA to meet the minimum objectives for managing dispersed recreation impacts and meet future needs of the recreating public.

Alternative C — Flagship Management Alternative

Under this alternative, activities currently associated with dispersed recreation management would be enhanced as described under Alternative B. In addition, many new activities designed to enhance the management of dispersed recreation would be added.

The process of collecting data on dispersed recreation areas would be modified to align with the LCA methodology. That is, only areas that receive a score of “poor” for the metric of dispersed recreation under the LCA would be further evaluated with the Dispersed Recreation Analysis methodology. This would streamline the data collection process and ensure further data are only collected on those areas that would need management attention. This change would result in less robust data being collected on dispersed

recreation, but these data would be more in line with the future overall stewardship objectives and needs.

Under this alternative, TVA would develop and implement multiyear dispersed recreation plans. These plans would be a holistic view of all the dispersed recreation needs and the associated availability of opportunities on a Valleywide basis. This would allow TVA to best meet current dispersed recreation needs and plan activities well into the future as demands and activities change with time and technology. In addition, these plans would result in an interdisciplinary approach to the management of public use on TVA lands. To aid in this effort, TVA would distribute and analyze 600 dispersed recreation surveys annually to fully understand the types of uses and relative demands that are occurring on TVA lands.

TVA would implement 20 key dispersed recreation opportunities annually. This effort is specifically designed to meet current and projected future demand for dispersed recreation opportunities. This expanded level of effort would give TVA the ability to fully meet the present and future needs of a wide variety of stakeholders annually and realize maximum benefit. In addition, this effort would allow TVA to have an expanded Valleywide presence of key projects on an annual basis as compared to Alternative B.

Implementation of a dispersed recreation educational campaign would be present under this alternative. The need for an educational campaign grows as more people move to the Valley who are unfamiliar with TVA lands or the appropriate use of these areas. The implementation of this campaign would help TVA meet its management objectives by empowering users with information to be better stewards of TVA lands. The level of effort for this educational campaign would be greater than under Alternative B. In addition to basic information on TVA lands and opportunities, the results of the dispersed recreation survey data as well as the information associated with multiyear plans would be added. Future information additions would be made to this effort as more is learned about the users of TVA lands and their associated needs.

Twenty-five heavily impacted dispersed recreation areas would be improved annually. This would result in all of the estimated 108 heavily impacted areas being improved within five years. This level of effort would go above and beyond the minimum stewardship effort and would meet management objectives sooner than outlined in the other alternatives.

This alternative also includes the development and implementation of formal regulations on recreational use of TV lands. The enforcement of these regulations would be a vital component in reducing abuse by providing a meaningful deterrent to actions that degrade the integrity of TVA lands. In addition, this deterrent would aid in management efforts of bringing undeveloped lands into desirable conditions.

TVA would conduct 100 outdoor skills clinics. These clinics would be provided to members of the general public and designed to remove skills barriers from participation in outdoor recreation. These clinics would allow a greater participation in outdoor activities as well as incorporate low-impact practices specific to the activity.

TVA would continue to manage its existing 100 miles of trails. These trails would be incorporated into a holistic trails establishment and maintenance program. This program would establish annual monitoring plans to ensure maintenance needs are met in a timely fashion. It would formally inventory existing trails and monitor population/demand to ensure that existing and future trails are effectively meeting the needs of trail users. The addition

of 20 miles of new trails per year would greatly expand the TVA trails system. These additions are taking into account the most popular of trail activities including hiking, bird watching, and nature observation. This expansion from Alternatives A, B and D would allow the full utilization of all dispersed activities that are facilitated by trails maintenance and development.

The change in reservoir lands planning to the CVLP under Alternative C could result in a change in the land area allocated to Sensitive Resource Management and Natural Resource Conservation, where a large proportion of dispersed recreational activities occur. The potential reduction in lands allocated to these zones is relatively small and adverse impacts to dispersed recreation opportunities would likely be at a local rather than regional scale.

Potential cumulative impacts of Alternative C are the most positive of all the alternatives. Alternative C results in holistic management and proactive stewardship of all dispersed recreation resources. Under the Flagship Alternative, TVA would devote significant resources to the management of dispersed resources and would actively participate in activities to engage the public in outdoor recreation.

Alternative D — Blended Management Alternative

Impacts to dispersed recreation under Alternative D would be less beneficial than Alternative C and more beneficial than Alternatives A and B. Many programs outlined under Alternative C would be implemented on a more limited basis; however, some actions would be omitted. Activities outlined under Alternative C would meet current and future demand for dispersed recreation activities at a higher-than-minimal level.

The process of collecting data on dispersed recreation areas would be modified to be in alignment with the LCA methodology. The level of effort and associated impacts for this activity is similar across Alternatives B, C, and D.

TVA would implement 10 key opportunities associated with dispersed recreation annually. This effort is specifically designed to meet current and latent demand for dispersed recreation opportunities. This level of effort would give TVA the ability to annually implement enough projects Valleywide to benefit a wide variety of stakeholders needs. The impacts of this alternative are less beneficial than Alternative C and more beneficial than Alternatives A or B.

Under Alternative D, TVA would implement the same dispersed recreation educational programs and develop and implement formal regulations as under Alternative C. TVA would not conduct the user surveys included in Alternative C, which would result in less available information about dispersed recreational uses of TVA lands. TVA would develop and implement multiyear dispersed recreation plans but would have less user information available during the planning process.

Fifteen heavily impacted dispersed recreation areas would be mitigated annually. Based on past data collection, there are over 800 existing dispersed recreation areas on TVA lands. An estimated 108 areas are known to have significant impacts from use. Improving 15 areas annually would allow TVA to actively improve approximately 15 percent of its known heavily impacted areas yearly or all known areas within seven years.

The impacts to trails would be similar to those under Alternatives A and B. TVA would continue to manage its existing 100 miles of trails and correct potential public safety hazards. TVA would not construct new trails which would likely result in the demand for trails exceeding the supply.

The change in reservoir lands planning to the CVLP under Alternative D would be the same as under Alternative C. The potential reduction in lands allocated to Sensitive Resource Management and Natural Resource Conservation is relatively small and adverse impacts to dispersed recreation opportunities would likely be at a local rather than regional scale.

Potential cumulative impacts of Alternative D would be more positive than those outlined in Alternatives A and B by meeting a wide array of stakeholder needs as well as allowing for multiyear planning efforts, which approach dispersed recreation management from an interdisciplinary approach. However, the opportunity of engaging stakeholders through user surveys and skills clinics would be greater in Alternative C than Alternative D.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to dispersed recreation under the four alternatives are shown in Figure 5-2.

Figure 5-2. Relative Beneficial Impacts of the Alternatives on Dispersed Recreation

5.3. Natural Areas

Alternative A — No Action Alternative
Under the No Action Alternative, TVA natural areas preservation and management would continue to deteriorate. Currently, TVA does not actively manage all of its natural areas and most of them do not have an area-specific management plan. This alternative has the greatest potential to result in continued degradation of natural areas because of the lack of active management. Eventually, some or all of TVA's natural areas would no longer have the scenic, aesthetic, and exemplary biological values that define them. TVA natural areas designated for low-impact recreational use may no longer meet safety standards for public use, which would result in their closure.

Annual monitoring of eight TVA natural areas allows for assessments of their condition and inventories of plant and animal communities. Because only a few HPAs benefit are currently monitored, the information about the condition of the remaining TVA natural areas would remain haphazard and inconsistent; this would adversely affect their maintenance.

The process of designating new natural areas or removal of current natural areas from the program via the reservoir lands planning process would continue. Biologists survey TVA lands as part of routine land use reviews and an ongoing reservoir lands planning process. Data derived from these activities would serve as the basis for recommendations on additional natural areas. No potential impacts to existing TVA natural areas are anticipated as a result of designation and removal through the reservoir lands planning process.

However, opportunities to designate new natural areas may be limited due to the low frequency at which the RLMPs are updated.

Implementing maintenance needs on natural areas as opportunistically identified would ensure that natural areas identified through limited monitoring or during the environmental review process would be assessed. Only a small number of natural areas are assessed on a limited basis and in a random manner with this opportunistic method. Other natural areas may be directly impacted due to limited, inadequate, or nonexistent assessments.

The TVA Natural Heritage database would continue to be utilized to add new information to, update, and maintain natural areas records in support of environmental reviews and planning purposes. Data sharing through formal exchanges with other federal and state resource agencies would continue under this alternative. The management of natural areas would continue to benefit from the use of the database.

Potential cumulative effects to natural areas may result in management objectives for these natural areas not being met resulting in the loss of the values and qualities that characterize these natural areas. Specifically, these cumulative impacts would be due to the minimal assessments of natural areas, other than HPAs, and an opportunistic approach to implementing maintenance needs.

Alternative B **— Custodial Management Alternative**
Under Alternative B, the preservation and management of TVA natural areas would be adversely impacted due to lack of both active management and management plans specific to each area. Monitoring of TVA natural areas would continue under Alternative B, with one-third monitored annually. Alternative B would result in slightly less adverse effects to natural areas than Alternative A due to increased monitoring and assessment of management needs.

Under Alternative B, the duration of reservoir land planning efforts would be reduced. This would benefit natural areas because RLMPs would be completed in a shorter amount of time compared to Alternative A. Therefore, opportunities for designation of new natural areas would potentially occur more frequently.

Alternative C **— Flagship Management Alternative**
Alternative C would result in the greatest beneficial impacts to TVA natural areas. The major differences between this alternative and Alternatives A and B are the inclusion of the development and implementation of comprehensive management plans for about 33 natural areas per year and the establishment of new criteria for designating new natural areas and removing existing natural areas. Other activities currently associated with natural areas management and protection would continue as described under Alternatives A and B.

Developing and implementing area specific monitoring and management plans would result in more opportunities to identify issues and implement maintenance needs to ensure management objectives are met on a larger number of natural areas. These actions would have a positive effect on the natural areas program.

The process of designating new natural areas or removal of current natural areas from the program via the reservoir lands planning process would continue. However, the option for designating natural areas outside of the reservoir lands planning process based on the

establishment of evaluation criteria would also be available. The opportunities for designation of new natural areas would occur more frequently due to the evaluation of 5,000 acres of high-priority areas annually for potential inclusion in the program. This would have a positive impact on the natural areas program by allowing ecologically significant areas meeting the evaluation criteria to be designated as a TVA natural area within a shorter time period. Non-TVA natural areas occurring on TVA lands would be affected similar to Alternative A.

Establishment of a public outreach and volunteer program paired with the promotion of the natural areas program locally, regionally, and nationally would be beneficial to the natural areas program. There would be several opportunities to interact with and inform the public about the importance of preserving all TVA natural areas; to encourage and support research; to conduct environmental education activities; and to promote the appropriate use of TVA SWAs. The TVA natural areas program would potentially provide an effective platform to promote environmental stewardship and actively involve the public.

Promotion of the SWAs is intended to encourage interaction with and education of the public about the importance of resource conservation and preserving these areas and provide appropriate public access and recreation opportunities while minimizing potential impacts. While promotion of the SWAs may potentially increase the frequency of use by visitors and lead to increased usage of trails and campsites and even inappropriate uses by some (e.g., vandalism and all-terrain vehicle use), the benefits associated with stewardship opportunities from promotion of these SWAs (e.g., cooperative management partnerships, volunteer and educational programs) is expected to outweigh any negative impacts.

The proposed increased monitoring of natural areas would improve TVA's ability to detect and respond to management needs resulting from various factors, including the impacts of anticipated increased future demand for dispersed recreation use (both authorized and unauthorized activities).

The key to the preservation of TVA natural areas is effective management, and the components outlined in the Flagship Management Alternative would support that. Potential effects to natural areas would be beneficial and more beneficial compared to Alternatives A, B, and C.

Alternative D **— Blended Management Alternative**
Under Alternative C, the impacts to TVA natural areas would be similar to those of Alternative C. The major difference would be that under Alternative D about 15 natural area plans would annually be developed and implemented, less than the 33 under Alternative C. Under Alternative D, activities currently associated with natural areas management and protection would continue as described under Alternatives A and B, but a programmatic guideline for natural areas and the establishment of management plans, specific to each natural area similar to Alternative C would also be implemented. These measures would result in beneficial impacts to natural areas compared to Alternative A and B that do not support development of and implementation of management plans.

The process of designating new natural areas under Alternative D would be the same as under Alternative C and result in the same beneficial impacts. The establishment of a public outreach and volunteer program paired with the promotion of the natural areas program locally, regionally, and nationally would be beneficial to the natural areas program under Alternative D, similar to that of Alternative C.

Potential effects to natural areas would be more beneficial under Alternative D than Alternatives A and B due to the combined approach that would help to promote more effective management and support the goal of preserving the values and qualities that characterize these natural areas. However, the opportunity to develop and implement fewer management plans specific to each natural area would result in somewhat less beneficial impacts than under Alternative C.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to natural areas under the four alternatives are shown in Figure 5-3.

Figure 5-3. Relative Beneficial Impacts of the Alternatives on Natural Areas

5.4. Terrestrial Ecology

5.4.1. Vegetation

Alternative A **— No Action Alternative**
Under the No Action Alternative, TVA would continue implementing the current land management programs and activities. TVA would continue to address invasive plant encroachment into natural areas consistent with EO 13112 and actively participate in the Cooperative Weed Management Areas established in Mississippi, Georgia, and Tennessee. At least 38,000 acres of the 220,000 acres of Zone 3 and Zone 4 reservoir lands are likely infested with invasive plants (see Section 4.3.1). Outside of TVA natural areas, the relatively small of area on which invasive plants would be managed would likely not be sufficient to significantly reduce the infested area or reverse the spread of invasive plants, resulting in adverse impacts to both rare and more common native plant communities. Globally rare plant communities identified on reservoir lands would remain allocated in areas of sensitive resource management and natural resource conservation in RLMPs.

Cumulative impacts are expected to the terrestrial communities and biodiversity of the TVA region as a result of uncontrolled invasive plants and animals as well as deforestation. Deforestation is due to development activities and population growth causing a loss in habitat. Habitat loss, in turn, causes a reduction in biodiversity.

Alternative B **— Custodial Management Alternative**
Under the Custodial Management Alternative, TVA would continue some of the current land management strategies. Globally rare plant communities identified on reservoir lands would remain allocated in areas of sensitive resource management and natural resource conservation in RLMPs.

Where practical, TVA would continue to address invasive plant encroachments into those areas with existing environmental commitments and/or sensitive resources while following EO 13112. TVA would develop the appropriate plans to ensure consistency with EO

13112. These plans would aid in preventing the inadvertent movement of invasive plants within the aquatic and terrestrial environment that can occur during routine operations. TVA would also increase the area on which invasive plants are managed from the 600 acres/year under Alternative A to 1,000 acres/year; given the large area of TVA lands infested with invasive plants, this area may not be sufficient to prevent adverse impacts to native plant communities.

Direct, indirect, and cumulative impacts to plant communities would be similar to those described under Alternative A. The plans associated with EO 13112 compliance would have a somewhat more direct positive impact to prevent the introduction and spread of invasive plants within the TVA region.

Alternative C **— Flagship Management Alternative**
Under the Flagship Management Alternative, TVA would create and implement new reservoir lands planning strategies and a CVLP. Globally rare plant communities identified on reservoir lands would remain allocated in areas of sensitive resource management and natural resource conservation in RLMPs. Unplanned tracts would be surveyed for rare communities and listed species, and habitat protection areas containing rare communities and species would be resurveyed in order to determine their viability. In addition, TVA would work cooperatively with other federal and state agencies to develop a more comprehensive land condition assessment.

TVA would expand invasive species control measures, enhancing consistency with EO 13112. TVA would develop work plans to aid in preventing the inadvertent movement of invasive species within the aquatic and terrestrial environment that can occur during routine operations. In cooperation with the state Cooperative Weed Management Areas, TVA would develop an Early Detection and Rapid Response Management Plan to identify and ultimately control invasive species on TVA lands. Educational programs would be implemented across the Valley to make stakeholders aware of the issues surrounding invasive species and methods by which they can avoid transporting them to other areas in the TVA region. The goal of managing invasive plants on 40,000 acres/year would likely result in their control and the rehabilitation of much of the infested area.

Direct, indirect, and cumulative impacts to plant communities would be similar to those described under Alternative A. The plans associated with EO 13112 would have a direct positive impact to prevent the introduction and spread of invasive species within the TVA region.

Alternative D **— Blended Management Alternative**
Globally rare plant communities identified on TVA lands located adjacent to reservoirs would remain allocated in areas of sensitive resource management and natural resource conservation. The programs associated with globally rare plant communities and invasive plants would continue as described in Alternative B. Direct, indirect, and cumulative adverse impacts to plant communities would be comparable to those of Alternative B and less than those of Alternative C.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to vegetation under the four alternatives are shown in Figure 5-4.

Figure 5-4. Relative Beneficial Impacts of the Alternatives on Vegetation

5.4.2. Wildlife

Alternative A **— No Action Alternative**
Under the No Action Alternative, TVA would continue to manage resources using existing stewardship practices that benefit wildlife resources while providing opportunities for dispersed recreation. TVA would incorporate stewardship actions as described in unit plans at specific sites throughout the TVA region.

TVA would also address wildlife resource issues on a case-by-case basis as they arise. For instance, TVA would continue to entertain partnerships to address collective resource needs in the future. Likewise, TVA would manage nuisance wildlife in cooperation with other regulatory agencies on a project basis. Under this alternative, TVA would continue its involvement with regional conservation initiatives.

Under Alternative A, TVA's stewardship activities would lack a holistic management approach, which may result in overlooking immediate threats to wildlife, including those from encroachments or invasive species. Any potential threats would ultimately be identified during LCAs or during routine maintenance. Appropriate resource management responses to these threats would be developed at that time. Adoption of this alternative would not result in adverse direct, indirect, or cumulative impacts to wildlife or their habitats.

Alternative B — Custodial Management Alternative
Under the Custodial Management Alternative, TVA would focus on meeting regulatory and policy requirements and maintenance needs of existing assets and would address public safety issues. Stewardship activities would benefit wildlife and their habitats. Continued management of dewatering projects and habitat enhancement partnerships would benefit wildlife, especially waterfowl and nongame species found at dewatering projects and habitat enhancement sites. TVA would develop an MOU with the USFWS to define TVA's approach to implementing EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds). This would result in a programmatic approach to managing migratory bird populations on TVA lands. The increased role in forestry, although minimal under this alternative, and GHG demonstration projects would also benefit wildlife.

A reduction in nondiscretionary conservation planning would reduce TVA's involvement in regional conservation plans. Currently, this involvement benefits TVA, other agencies, and biological resources throughout the TVA region. Renewal of WHC third-party certifications would maintain the benefits to wildlife that these arrangements provide.

The closure of day use areas located off dam reservations and stream access sites not currently managed under contractual agreements could result in decreased opportunity for wildlife-associated recreation, but these closures would likely result in less disturbance to wildlife in these areas.

Under Alternative B, TVA would develop a more comprehensive strategy for nuisance animal control. This strategy would result in a more systematic application of control measures and potentially result in increased use of nonlethal measures. Adoption of the Custodial Management Alternative would result overall in fewer wildlife-oriented stewardship projects compared to the No Action Alternative. However, adoption of this alternative would not result in adverse direct, indirect, or cumulative impacts to wildlife or their habitats.

Alternative C — Flagship Management Alternative
Under Flagship Management, several high-profile projects would be selected in addition to current stewardship activities. Improved assessment tools and methodologies driving the prioritization of stewardship activities would greatly benefit wildlife resources. Increased emphasis on demonstration projects would benefit migratory birds. Improved management of dewatering projects would benefit multiple species of wildlife and would provide better recreational opportunities. Incorporating goals and objectives in the *North American Waterfowl Management Plan* (USFWS 2009a) and state wildlife action plans would also benefit migratory species on a regional scale.

An improved trails program would have minimal impact to wildlife, other than potential increased disturbance to some species located near the trails. Outdoor educational clinics would promote outdoor ethics, perhaps minimizing increased disturbance to wildlife. A holistic approach to land protection and boundary marking would better protect wildlife and other sensitive resources.

The adoption of the Flagship Management Alternative would result in improved communication between TVA and conservation partners. Programs under this alternative would facilitate further collaboration with the public and would result in benefits to natural resources on TVA lands and the region. Cumulative impacts would also be beneficial at a regional scale.

Alternative D **— Blended Management Alternative**
The Blended Management Alternative meets TVA's regulatory and policy objectives while allowing flexibility to implement additional programs. This alternative includes actions described in Alternative B, including management of dewatering units, an increased role in forestry, and habitat enhancement partnerships in addition to other activities that benefit wildlife. TVA's increased surveillance of its natural areas would also benefit the resources that these areas protect.

This alternative includes an increased focus on wildlife habitat enhancement partnerships, regional landscape conservation initiatives, and invasive plant-control activities, and WHC certification would also benefit these resources. These cooperative partnerships would benefit wildlife on and adjacent to TVA lands and provide opportunities for TVA to collaborate with other agencies to address regional conservation issues in an efficient manner.

TVA's increase in dispersed recreation activities, developed recreation improvements, and increased shoreline stabilization could result in localized adverse impacts to wildlife from alterations of wildlife habitat and increased levels of human disturbance. These potential impacts are considered minor as any impacts could be greatly reduced by proposed public outreach initiatives and through mitigation measures incorporated during development of specific projects.

The Blended Management Alternative would provide a more holistic and collaborative approach to managing wildlife resources on TVA properties, and provide flexibility regarding the implementation of management options as resource needs are identified. Benefits of this alternative would range between those described in Custodial and Flagship Management alternatives. Adoption of the Blended Management Alternative would not result in significant adverse direct, indirect, or cumulative impacts to wildlife or their habitats.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to wildlife under the four alternatives are shown in Figure 5-5.

Figure 5-5. Relative Beneficial Impacts of the Alternatives on Wildlife

5.5. Wetlands

This section analyzes impacts to wetlands that are associated with the four alternatives, including direct, indirect, and cumulative impacts.

Direct impacts result from disturbances that occur within the wetland. Common direct impacts to wetlands include filling, grading, removal of vegetation, building construction, and changes in water levels and drainage patterns. Most disturbances that result in direct impacts to wetlands are controlled by federal and state wetland regulatory programs.

Indirect impacts result from disturbances that occur in areas outside of the wetland, such as uplands, other wetlands, or waterways. Common indirect impacts include influx of surface water and sediments, fragmentation of a wetland from a contiguous wetland complex, loss of recharge area, or changes in local drainage patterns. Most indirect impacts are beyond the authority of federal and state wetland regulatory programs.

Cumulative impacts reflect a net loss of wetland area and functions as the result of the incremental direct and indirect impacts of human activities.

Alternative A **— No Action Alternative**
Under the No Action Alternative, TVA would continue to implement the existing stewardship programs and tools for wetland identification and protection. Under this alternative, wetlands are typically identified using the TVA wetlands database. The wetlands database also uses SMI data, and for project-specific analysis, field surveys are used to identify and map wetlands. No process exists for adding wetlands identified in the field for current projects to the existing wetlands database.

This alternative would continue to apply the existing methodology when planning lands along TVA reservoirs. TVA lands that include wetlands are typically designated as either sensitive resource management or natural resource management. In cases where high-

quality or unique wetland habitats are identified on TVA lands, these parcels may be designated as natural areas and managed appropriately.

Under the No Action Alternative, there would be no significant direct wetland impacts. TVA would continue to comply with CWA, applicable state wetland protection regulations, and EO 11990 (Protection of Wetlands) through its environmental review process. Where direct wetland impacts are unavoidable, impacts would be assessed and mitigated via existing regulatory mechanisms.

Indirect wetland impacts associated with the No Action Alternative are due to activities or disturbances that occur outside the wetland. Regionally, indirect and cumulative adverse effects on wetlands would be related to the indirect effect of increased demand for shoreline access and regional growth.

The current management issues identified in Section 4.4 would continue; some site-specific impacts to wetlands would be addressed when identified during land condition assessments (e.g., ATV access to wetlands blocked if identified as high priority), but in general, there would be negligible gains in wetland condition associated with this alternative.

Alternative B **— Custodial Management Alternative**
Under this alternative, wetland impacts would be similar to the No Action Alternative.

Alternative C **— Flagship Management Alternative**
Under this alternative, TVA would explore, pilot/test, and implement new strategies for enhancing wetland stewardship. This would include development and implementation of a wetland management policy that includes a proactive program for wetland identification, management, and protection on TVA lands.

TVA would conduct additional activities in support of database development, maintenance, and use. Activities would consist of an information-gathering effort on TVA lands for assessment of wetland resources. TVA would modify its existing wetland impact analysis tool, used in siting TVA projects, to support planning on TVA lands. This process utilizes soils data, NWI mapping data, and aerial photography. Wetlands indentified during these surveys would be incorporated into the database. This would also include the identification and mapping of globally rare wetland communities as indicated by NatureServe. These communities would also be added to the TVA Natural Heritage database.

Field surveys, mapping, and assessment of wetland resources would allow the identification of opportunities to improve these resources, where appropriate. Improvement activities would include invasive species removal, restoration of hydrologic functions, and restoration of native wetland species. These activities would address some of the specific management issues and problems identified in Section 4.4.

This alternative would include a change to the CVLP methodology for planning TVA reservoir lands. The CVLP identifies target ranges for allocations to each land use zone for the Valley as a whole (Table 2-9); this could result in an increase in lands allocated to developed recreation, and a decrease in lands allocated to conservation (Zones 3 and 4). Despite this change, the CVLP would continue to allocate TVA lands including wetlands to either sensitive resource management or natural resource management. In cases where high-quality or unique wetland habitats are identified on TVA lands, these parcels may be designated as natural areas and managed appropriately.

Under this alternative, TVA would expand its role in large-scale wetland conservation efforts across the region via partnerships with other federal and state agencies, academics, and NGOs. Planning efforts would address individual species associated with wetlands and communities of species or could operate on a larger scale (e.g., regional or ecoregional planning and landscape conservation cooperatives).

Implementation of this alternative would result in a positive effect on wetlands on TVA lands, and no direct or indirect adverse wetland impacts would result from this alternative. TVA would continue to comply with CWA and EO 11990 (Protection of Wetlands) through its environmental review process. Where wetland impacts are unavoidable due to operational-associated projects, impacts would be assessed and mitigated via existing regulatory mechanisms.

Cumulative actions would have a long-term, moderate, beneficial cumulative effect on wetlands within the Valley due to wetland identification, protection, and restoration efforts. These benefits would provide moderate increases in wetland function (wildlife habitat, increased ability to trap sediment and pollutants, invasive species removal, and increased species diversity) as the result of wetland restoration, rehabilitation, and ecosystem management efforts. Regionally, cumulative adverse effects on wetlands would be related to the indirect effect of increased demand for shoreline access and regional growth.

Alternative D **— Blended Management Alternative**
Under this alternative, TVA mixes portions of the programs and activities as described under Alternatives B and C. The direct, indirect, and cumulative impacts on wetlands would be similar to those described under the Flagship Management Alternative. As strategic partnerships and resources become available, TVA would enhance management of both the in-house wetland database and wetlands on its lands.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to wetlands under the four alternatives are shown in Figure 5-6.

Figure 5-6. Relative Beneficial Impacts of the Alternatives on Wetlands

5.6. Water Quality

Alternative A — No Action Alternative
Improving water quality is the primary focus of the current and proposed Water Resources Management programs. Many of the current and proposed Biological, Cultural, and Recreation programs (including dispersed recreation management) would also likely result in net improvements to water quality. The practices and levels of active management are generally adequate to comply with regulations and to control pollutants in runoff from TVA land. Shoreline erosion contributes some sediment and associated pollutants in many areas and is an ongoing slight adverse impact. Small amounts of sediment and slight adverse impacts may be generated by heavily used informal recreation areas and trails.

Access controls, land protection, and road and parking area maintenance generally control runoff and erosion from these facilities. Inadequate maintenance or access controls may occasionally allow accelerated erosion, generate pollutant loading, and cause slight adverse impacts to water quality. Shoreline erosion generates much larger amounts of sediment, but this is still a slight impact compared to other background sources.

TVA land under contractual agreements for agriculture, especially areas that allow grazing or row crops, can generate pollutants such as sediment, nutrients, bacteria, and pesticides. These areas total about 10,000 acres. For several years, TVA has been working with the licensees to reduce in impacts of the agricultural operations; these efforts would continue and the continued grassland and agricultural land management activities are not likely to result n significant environmental impacts.

Management of sensitive biological resources and terrestrial habitat generally improves vegetative cover of soil and thereby provides slightly beneficial water quality impacts in the long term. During the process of improving habitat, bare soil and herbicide use may generate pollutants, but any impacts would be minor and short term.

Dewatering areas support agriculture during the summer and are flooded during the winter to provide winter habitat for large populations of waterfowl. Water discharged from dewatering areas can contain nutrients and sediment. These pollutants come from the seasonally flooded agricultural areas within the dewatering areas, waste from waterfowl, and other pollutants from the watersheds upstream of the dewatering areas. The quantity of pollution discharged is usually small, resulting in slight adverse water quality impacts. However, adverse impacts are associated with the West Sandy dewatering area, where Tennessee lists the downstream West Sandy embayment as not supporting designated uses due to nutrients and low DO.

Erosion of shoreline archaeological sites, as well as the illegal exploration and excavation of artifacts on TVA land can generate sediment and associated pollutants. Shoreline erosion generates much larger amounts of sediment and sometimes impacts cultural resources. These sources create a slight impact compared to other background sources. Active protection of archaeological sites and enforcement of laws that protect cultural resources decrease these impacts.

The scope of current Recreation Management actions is on the maintenance and upgrading of developed recreation facilities; therefore, these activities are less likely to have any measurable effect on water quality than the biological and cultural resources management activities. Water quality is not a primary focus of the recreation programs but the practices are generally adequate to comply with regulations and control potential runoff pollutants from TVA lands developed for recreation, although some pollutants reach adjacent water bodies in storm water runoff. However, good design, construction, and maintenance practices would make any impacts very slight. Waste treatment facilities would continue to be operated in compliance with local and state regulations.

If policies are followed consistently, reservoir lands planning would have no impact on water quality.

Water Resource Management programs are intended to improve water quality throughout the Tennessee River watershed and create public support for water quality and water resources improvement.

The Stream and Tailwater Monitoring Program assesses water quality and ecological condition of streams throughout the Valley. The information generated by this program is used to target and track TWI projects and is used by other water quality agencies in the Valley to support their assessment and water quality improvement efforts. The quality and accessibility of data influences the accuracy of needs assessment and thereby the effectiveness of management actions. Vital Signs and Fixed Station monitoring provides data for running the reservoir system, evaluating environmental impacts of any change to system operations, and for water quality improvement and protection activities.

Partnerships and relationships with state and federal agencies and non-governmental organizations that are concerned with water quality are important in water quality improvement and protection activities. TVA would continue to maintain these relationships.

The TVCMI Program provides education material to the public and certifies those marinas that take efforts to improve and protect water quality. The WEP promotes water provides educational workshops with the goal of reducing water use. The QGP targets segments of the public to make them more aware of water resource issues and the value of clean water while encouraging them to act to protect and improve water quality.

The TWI Program has measurable beneficial impacts to water quality. During construction, there can be minor and temporary slight adverse impacts, but these would be minimized by appropriate BMPs. The TWI produces long-term decreases in pollutant quantities and measurable improvement of water quality in targeted water bodies and makes the public more aware of water resource issues and the value of clean water while enabling them to act to protect and improve water quality.

In summary, TVA lands are mostly a narrow band around reservoirs. Because these lands account for only a small portion of the watershed of a given reservoir or perennial stream and none of the uses of TVA lands generate substantial amounts of pollutants, activities on these lands are unlikely to have any measurable effect on water quality other than locally. TVA's management practices create opportunities for leadership by example, and management practices used by TVA can influence attitudes and expectations among visitors.

Management practices are generally adequate to comply with regulations and to control pollutants in runoff from TVA lands. However, some pollutants do reach water bodies from sources such as runoff from developed areas, eroding reservoir shoreline, land leased for agricultural uses, and dewatering areas. Overall impacts are slightly adverse compared to pristine conditions.

Water Resource Management programs have a direct connection to water quality and a greater geographic scope than programs that are focused on management of TVA land, and therefore, potentially have a much greater impact. The TWI program is intended to reduce pollutant loadings to water bodies and target these reductions in a manner that creates improvements measureable by biological monitoring and/or state use-support status. Stream and Tailwater Monitoring directly supports this effort. The QGP and TVCMI programs have slight beneficial impacts, and enhance the TWI program. Overall, the benefits of the Water Resource Management programs outweigh the slightly adverse impacts of the land management programs and this alternative is beneficial.

Alternative B — Custodial Management Alternative
Under this alternative, there would be many changes to biological, cultural, and recreation management programs, but only a few of these would affect water quality. The removal of the restriction to “light industry” on Zone 5 — Industrial lands and the subsequent potential development of heavy industry could also affect water quality due to increased requirements for process water and increased discharges. TVA would review the potential impacts of proposed industrial developments on its lands and the facilities would be subject to NPDES discharge limits and other regulations and permitting requirements. These reviews and requirements would reduce the potential for significant impacts to water quality.

Increased management of sensitive biological resources and terrestrial habitat generally improves vegetative cover and thereby provides slightly beneficial water quality impacts in the long term. During the process of improving habitat, bare soil and herbicide use may generate pollutants, but any negative impacts would be minor and short term. An increase in the number of heavily-impacted dispersed recreation sites repaired would also create a slight water quality benefit.

The small increase in shoreline stabilization of archaeological sites would create a slight water quality benefit. Although there is some potential for slight water quality impacts during construction, these impacts would be brief and would be minimized by appropriate management practices. TVA would close day use areas located off dam reservations. This would most likely have no impact on water quality, but aggressive conservation management by a new manager or reversion to forest if the facilities were closed may have a slight beneficial impact; poor management by a new manager or continued heavy recreation use after closing would have a slight adverse impact.

Water Resource Management programs have a direct connection to water quality and changes to these programs can therefore be expected to affect water quality. There would be several changes under this alternative.

Creation of the new Aquatic Ecology Management outreach and implementation program would target a watershed that is already in good shape for protection and enhancement. This would create a net water quality benefit, but the amount of water quality benefit would be difficult to predict because goals and activities would be specific to a particular project.

Stream assessments would be continued at the same rate, which would maintain the availability of current stream-condition data for decision-making. An aquatic monitoring program to evaluate climate change would be initiated under this alternative. This program would not provide direct water quality benefits but would provide information for any future mitigation activities.

Strategic Partnership planning would be continued, as would the TVCMP. The WEP and the QGP would be discontinued, but the Water Resource Outreach Campaign Program would be initiated. The WRICP would operate at a smaller scale than WEP and QGP combined, but would have more flexibility in terms of the water resource issues chosen for outreach activities.

The TWI Program would be eliminated. This program is intended to create significant measureable water quality improvement within the watershed-level project areas. Any water quality improvements generated by this program would also be eliminated.

The Nutrient Source Watershed Identification and Improvement Program would be initiated. This program would reduce the pollutant loading to water bodies by a greater amount than the TWI Program it would replace. If effectively targeted, this program could create more water quality benefit than TWI at its current scale of operation.

The net direct impact of Alternative B would be slightly beneficial for the biological, cultural and recreation programs. The changes to the water resource programs would also likely create a positive impact, but the lack of water quality condition goals in addition to the currently undefined goals for some new programs makes it difficult to compare this alternative directly with the No Action alternative.

There are numerous federal, state, local, and NGO efforts to improve water quality throughout the Valley. TVA's activities are consistent with these efforts, but cumulative impacts of TVA actions on water quality are limited to the potential that TVA activities would encourage others to participate in similar projects. TVA water resource management programs seek to partner directly with some existing efforts, generate new initiatives, provide resource condition data, and encourage those efforts in which TVA cannot directly participate; these programs would result in positive cumulative impacts. The cumulative impacts are implicit in the water resource management activities and would be approximately proportional to TVA's activity level. The creation of the Aquatic Ecology Management, Climate Change Sentinel Monitoring, Nutrient Source Watershed Identification and Improvement Program, and Water Resource Improvement Campaign program, and the continuation of Strategic Partnership Planning and TVCMP would compensate for the elimination of the WEP, QGP and TWI programs. The cumulative impact of this alternative would be diffuse and difficult to quantify, but would result in greater water resource improvements than under the No Action Alternative, assuming greater total resource investment from TVA.

Alternative C — Flagship Management Alternative

Under this alternative, there would be additional changes to biological, cultural, and recreation management programs that would affect water quality. Probably the largest change would be the conversion of all current agricultural lease land to grassland or other appropriate wildlife habitat. After very slight potential negative water quality impacts during establishment of the new cover, this would be a slight long-term benefit to water quality. As with Alternative B, the proposed change to the reservoir lands planning Zone 5 definition could increase the potential for water quality impacts.

Refurbishment of dewatering areas would likely cause some short-term generation of pollutants, especially sediment, during construction, which would be minimized by use of appropriate construction management practices. This would not change the long-term negative water quality impacts of operating these areas.

Compared to the other alternatives, there would be a largest increase in acreage of terrestrial habitat improved. This generally improves vegetative cover of soil and thereby provides slightly beneficial water quality impacts in the long term. During the process of improving habitat, bare soil and herbicide use may generate pollutants, but any negative impacts would be minor and short term. An increase in the number of heavily-impacted dispersed recreation sites repaired would also create a slight water quality benefit.

A goal of 20 miles of trails would be constructed per year under this alternative; no trail construction is proposed for the other three alternatives. The construction and use of

unsurfaced trails have the potential to create slight water quality impacts from erosion. However, good design, construction, and maintenance practices would make these impacts very slight. There would also be a large increase in the number of heavily impacted dispersed recreation areas repaired. This would generate a slight water quality benefit.

This alternative would result in the greatest increase in shoreline stabilization for both archaeological site protection and erosion control. Although the benefits would be fairly localized and small on a regional basis, they would be greater than those of the other alternatives. Although there is some potential for slight water quality impacts during construction, these impacts would be brief and would be minimized by appropriate management practices.

Water Resource Management programs have a direct connection to water quality and changes to these programs can therefore be expected to affect water quality. There would be several changes under this alternative.

The new Aquatic Ecology Management outreach and implementation program would be larger than in Alternative B, expanding to three watersheds. This would create a net water quality benefit, but the amount of water quality benefit would be difficult to predict because goals and activities would be specific to a particular project.

Stream assessments would be expanded, which would improve the availability of current stream-condition data for decision-making. An aquatic monitoring program to evaluate climate change would be initiated under this alternative, and would have an expanded scope compared to Alternative B. This program would not provide direct water quality benefits but would provide important information for any future mitigation activities.

A new Case Study/Research Initiative Program would be initiated. This program would likely contribute information that could lead to additional water quality benefits; whether it directly results in water quality improvement would depend on the particular studies and initiatives.

Strategic Partnership planning would be expanded compared to Alternatives A and B. The TVCMP would also be expanded, with new education efforts and a net increase in the number of certified marinas. The WEP and the QGP would be discontinued, but the Water Resource Outreach Campaign Program would be initiated and expanded relative to Alternative B. Under this alternative, the WRICP would operate at a scale comparable to WEP and QGP combined, and would have more flexibility in terms of the water resource issues chosen for outreach activities.

A new grant program would be initiated to support water quality projects managed by other entities; this program is proposed only for this alternative. Impacts would depend on selection criteria and the effectiveness of the organizations receiving the grants. The benefits of this program would be spread across the Valley, so it is unlikely to produce significant water quality improvement at any location. The program would likely generate slight beneficial impacts, depending on the particular project.

The TWI Program would be eliminated. This program is intended to create significant measurable water quality improvement within the watershed-level project areas. It would be replaced by the new Nutrient Source Watershed Identification and Improvement Program. Under Alternative C, this new program would be expanded to three reservoirs

and include sufficient resources to address point sources of pollution, compared to one reservoir and non-point source only for Alternative B. This program would reduce the pollutant loading to each water body by a greater amount than the TWI Program. If effectively targeted, this program could create more water quality benefit than the current TWI Program.

The Northern Gulf of Mexico / Mississippi River Basin Nutrient Load Reductions program would be initiated under this alternative. This program would study sources and transport of nutrients within the Valley that have the potential to impact the Gulf of Mexico and explore strategies for reducing the export of these nutrients from the Valley. Because of the scale of the Gulf hypoxia issue, this program is unlikely to have a measurable impact on water quality, but it would contribute to the knowledge base that is necessary to make progress on the issue.

The changes to the water resources programs under this alternative likely would create a positive impact compared to either preceding alternative, but the lack of water quality condition goals in addition to loading goals for the new programs makes it difficult to compare this alternative directly with the No Action alternative.

There are numerous federal, state, local, and NGO efforts to improve water quality throughout the Valley. TVA's activities are consistent with these efforts, but cumulative impacts of TVCA's actions on water quality are limited to the potential that TVA activities would encourage others to participate in similar projects. TVA water resource management programs seek to partner directly with some existing efforts, generate new initiatives, provide resource condition data, and encourage those efforts in which TVA cannot directly participate; these programs, along with planning, assessment, and outreach programs in the biological, cultural, and recreation management programs, would result in positive cumulative impacts. The cumulative impacts are implicit in the water resource management activities and would be approximately proportional to TVA's activity level. The creation of the Aquatic Ecology Management, Climate Change Sentinel Monitoring, Case Study/Research Initiative Program, Water Resource Grant Program, Nutrient Source Watershed Identification and Improvement Program, and Water Resource Improvement Campaign program, and the expansion of Strategic Partnership Planning and TVCMP would compensate for the elimination of the WEP, QGP and TWI programs. The cumulative impact of this alternative would be greater water resource improvements than under both Alternatives A and B.

Alternative D — Blended Management Alternative

Most of the new programs and activities in Alternative C that would affect water quality are also present in Alternative D, although many of them would be implemented at a smaller scale. As with Alternative B, the proposed change to the reservoir lands planning Zone 5 definition could increase the potential for water quality impacts.

As under Alternatives A and B and unlike Alternative C, TVA would continue to lease land for agricultural uses, so this minor source of pollutants would continue. As in Alternative C, refurbishment of dewatering areas would likely cause some short-term generation of pollutants, especially sediment, during construction, which would be minimized by use of appropriate construction management practices. This would not change the long-term negative water quality impacts of operating these areas.

The acreage of terrestrial habitat improved under this alternative would be greater than in Alternative A, the same as in Alternative B, and much less than in Alternative C. This generally improves vegetative cover of soil and thereby provides slightly beneficial water quality impacts over the long term. During the process of improving habitat, bare soil and herbicide use may generate pollutants, but any negative impacts would be minor and short term. There would be an increase in the number of heavily impacted dispersed recreation areas repaired over Alternatives A and B, but a reduction compared to Alternative C. Water quality benefit would be proportional to the number of sites repaired.

Shoreline stabilization activity for archaeological site protection and erosion control would be greater than in Alternatives A and B and less than in Alternative C, and water quality benefits would be proportional to the amount of shoreline stabilized. Although there is some potential for slight water quality impacts during construction, these impacts would be brief and would be minimized by appropriate management practices.

Water resource management programs have a direct connection to water quality and any changes to these programs can therefore be expected to have greater water quality impacts than the other programs evaluated. There would be several changes under this alternative.

The new Aquatic Ecology Management outreach and implementation program would be larger than in Alternative B, expanding to three watersheds, as in Alternative C. This would create a net water quality benefit, but the amount of water quality benefit would be difficult to predict because goals and activities would be specific to a particular project.

Stream assessments would be expanded over Alternatives A and B, though not as much as in Alternative C. This would improve the availability of current stream-condition data for decision-making compared to Alternatives A and B, but reduce the availability compared to Alternative C.

An aquatic monitoring program to evaluate climate change would be initiated under this alternative, and would have a larger scope compared to Alternative B but smaller compared to Alternative C. This program would not provide direct water quality benefits but would provide information for any future mitigation activities.

As in Alternative C, Strategic Partnership planning would be expanded compared to Alternatives A and B. The TVCMP would also be expanded, with new education efforts and a net increase in the number of certified marinas. The WEP and the QGP would be discontinued, but the Water Resource Outreach Campaign Program would be initiated and expanded over Alternative B. Under this alternative, the WRICP would operate at a scale smaller than Alternative C and somewhat smaller than the current scope of WEP and QGP combined, and would have more flexibility in terms of the water resource issues chosen for outreach activities.

The TWI Program would be eliminated. This program is intended to create significant measurable water quality improvement within the watershed-level project areas. It would be replaced by the Nutrient Source Watershed Identification and Improvement Program which would be implemented at a scale greater than Alternative B but less than Alternative C. The program under this alternative would address two reservoirs with sufficient resources to address point sources of pollution. If effectively targeted, this program could create more water quality benefit than TWI.

The Northern Gulf of Mexico / Mississippi River Basin Nutrient Load Reductions program would be initiated under this alternative and Alternative C, but would be scaled back compared to Alternative C . This program would study sources and transport of nutrient sources within the Valley that have the potential to impact the Gulf of Mexico. In this alternative, activities would limited to studying, monitoring, and planning, with no on-the-ground component. This program would have no direct water quality impact, but it would contribute to the knowledge base that is necessary to make progress on the issue.

The net direct impact of Alternative D to water resources likely would create a positive impact compared to Alternatives A, more positive impact than Alternative B but less than Alternative C. The lack of water quality condition goals in addition to sediment and nutrient loading goals for the new programs makes it difficult to compare this alternative directly with the No Action alternative.

There are numerous federal, state, local, and NGO efforts to improve water quality throughout the Valley. TVA's activities are consistent with these efforts, but cumulative impacts of TVA's actions on water quality are limited to the potential that TVA activities would encourage others to participate in similar projects. TVA water resource management programs seek to partner directly with some existing efforts, generate new initiatives, provide resource condition data, and encourage those efforts in which TVA cannot directly participate; these programs, along with planning, assessment, and outreach programs in the biological, cultural, and recreation management programs, would result in positive cumulative impacts. The cumulative impacts are implicit in the water resource management activities and would be approximately proportional to TVA's activity level. The creation of the Aquatic Ecology Management, Climate Change Sentinel Monitoring, Nutrient Source Watershed Identification and Improvement Program, and Water Resource Improvement Campaign, and the expansion of Strategic Partnership Planning and TVCMP would compensate for the elimination of the WEP, QGP and TWI programs. The cumulative impact of this alternative would be greater water resource improvements than under Alternatives A and B, but since these programs would be at a smaller scale than Alternative C, the benefits would be less than under Alternative C.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to water quality under the four alternatives are shown in Figure 5-7.

Figure 5-7. Relative Beneficial Impacts of the Alternatives on Water Quality

5.7. Aquatic Ecology

This section analyzes impacts to aquatic life that are associated with the four alternatives, including direct, indirect, and cumulative impacts.

Direct impacts result from disturbances that occur within aquatic environments. Common direct impacts to aquatic habitats include dredging, placement of fill in streams or other

water features (including placement of riprap and other stabilization structures) and changes in water levels and drainage patterns. They may also include the introduction of pollutants (other than sediment) into streams. Most disturbances that result in direct impacts to aquatic life are controlled by federal and state regulatory programs including approvals under Section 26 of the TVA Act.

Indirect impacts result from disturbances that occur in areas outside of the water body in upland areas. Common indirect impacts include influx of surface water and sediments, loss of wetland function in areas along the water body, loss of recharge area, or changes in local drainage patterns. Most disturbances that result in indirect impacts to aquatic life are controlled by federal and state regulatory programs often including approvals under Section 26a of the TVA Act.

Cumulative impacts are those impacts resulting from combined direct and indirect impacts to the stream, water quality, or instream habitats over time.

Alternative A — No Action Alternative
Under the No Action Alternative, TVA would continue to implement the existing stewardship programs and tools. Because the majority of the actions discussed as part of biological, cultural, and recreation management programs, as well as reservoir lands planning occur on TVA lands and not in aquatic environments, these activities rarely result in direct impacts to aquatic resources. Some of the activities associated with these programs would reduce sediment runoff, which would benefit aquatic resources.

Water resource management programs are designed to improve riparian areas, water quality and instream habitat throughout the Valley. Because of the large geographic scope of water resource management programs, these programs have a much higher potential to affect aquatic resources. Activities performed as a part of water resource improvement programs occur within or immediately adjacent to streams, wetlands, ponds, and other aquatic environments. Disturbance associated with water resource improvement programs may have a minor short-term, direct adverse effect on instream water quality and habitats. Project planning and appropriate implementation of BMPs would be utilized to minimize these effects.

The goal of these programs is to benefit aquatic and riparian conditions in the watersheds where they are applied. There is potential for some activities (particularly bank stabilization activities associated with both cultural and water resource management) to directly affect aquatic habitats and communities. These activities would be carefully planned and implemented to minimize adverse impacts and would result in long-term beneficial, although fairly localized, impacts.

This alternative would continue to apply the existing methodology when planning lands along TVA reservoirs. Lands that include important aquatic resources (primarily caves and springs) are typically designated as either sensitive resource management or natural resource conservation. In cases where high-quality or unique habitats are identified on TVA land, the specific tract of land may be designated as a natural area and managed appropriately.

Under the No Action Alternative, it is not anticipated that there would be large, unavoidable impacts to aquatic resources. Long-term effects on aquatic resources from TVA's resource

management activities are expected to be beneficial to aquatic habitat conditions and aquatic communities.

Alternative B — Custodial Management Alternative
Under this alternative, aquatic impacts would be essentially similar to the No Action Alternative. Scaling back some activities under Alternative B would result in fewer recreation development, biological and cultural resources management, or water resource improvement programs. The reduction of some beneficial programs (particularly water resource improvement programs) may reduce some of the short-term impacts of implementing these programs. However, there would be fewer beneficial projects for natural resources realized under this option, and some adverse cumulative impacts to water quality and aquatic communities could result. Implementation of the Aquatic Ecology Management program in one healthy, high biological diversity watershed in the Tennessee River system would result in direct benefits to aquatic resources located within this watershed.

No significant adverse direct, indirect, or cumulative impacts to aquatic communities are expected to occur from implementation of Alternative B. However, many of the beneficial effects on water quality and aquatic communities that would result from Alternatives C and D would not be realized by Alternative B.

Alternative C — Flagship Management Alternative
Under this alternative, TVA would explore, pilot/test, and implement new strategies for enhancing environmentally sustainable recreation, resource stewardship, water resource improvements, and reservoir lands planning. The potential impacts associated with reservoir lands planning and the associated ranges in land use zone allocations would be the same as those described under Alternative A. Direct, positive, beneficial changes in aquatic ecology due to the implementation of water resource improvement programs would be realized across the Valley. An inventory of resources on TVA lands would help inform TVA (and partners) of opportunities to protect or enhance aquatic resources found on or adjacent to those lands. Field surveys, mapping, and assessment of resources would allow identification of opportunities to improve these resources where appropriate. Implementation of the Aquatic Ecology Management program in three healthy, high biological diversity watersheds in the Tennessee River system would result in direct benefits to aquatic resources located within this watershed.

Under this alternative, TVA would expand its role in large-scale conservation efforts across the region via partnerships with other federal and state agencies, academics, and NGOs. Planning efforts would address individual species that are state- or federally listed and communities of rare and common species or would operate on a larger scale (e.g., regional or ecoregional planning; landscape conservation cooperatives). These conservation efforts should have measurable benefits to aquatic resources across the region.

Implementation of water resource improvement programs under the Flagship Management Alternative would likely provide direct, beneficial effects on aquatic life within the Valley. These benefits would result from direct improvements in water quality and aquatic habitat conditions in watersheds targeted under water resource improvement programs.

Under Alternative C, indirect, beneficial impacts to water quality and aquatic habitats are likely to be realized as upland conditions improve (i.e., better practices would be

implemented during upland development, resulting in the increased ability of riparian areas to trap sediment and pollutants).

Implementation of the proposed Alternative C is expected to result in a long-term positive effect on aquatic life in the TVA region. No long-term direct or indirect adverse impacts to aquatic habitats or communities are expected to result from this alternative.

Alternative D — Blended Management Alternative
Implementation of the proposed Blended Management Alternative is expected to result in a positive effect on aquatic life in the TVA region. No long-term direct or indirect adverse impacts to aquatic habitats or communities are expected to result from this option. Several of the programs associated with water quality improvements would be implemented at a higher level of effort than identified Alternatives A and B. Additional water quality and wildlife habitat improvements would be realized under this alternative when compared to Alternatives A and B. Implementation of the Aquatic Ecology Management program in three healthy, high biological diversity watersheds in the Tennessee River system would result in direct benefits to aquatic resources located within this watershed. These improvements would have a net long-term benefit to aquatic communities in the TVA region.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to aquatic ecology under the four alternatives are shown in Figure 5-8.

Figure 5-8. Relative Beneficial Impacts of the Alternatives on Aquatic Ecology

5.8. Endangered and Threatened Species

The ESA requires TVA to ensure that its actions do not jeopardize the continued existance of any species listed as threatened or endangered or adversely modify critical habitat. It applies to all actions authorized, funded, or carried out by TVA. If an action has the potential to affect listed species or their habitats, TVA must consult with the USFWS. USFWS has regulations that establish this consultation process and TVA has established a process for consultation with USFWS; see Appendix I for a summary of this process. The ESA also requires federal agencies, including TVA, to carry out programs for the conservation of endangered and threatened species. Under all alternatives, TVA will continue to comply with these ESA requirements. TVA will also continue its current monitoring of populations of endangered and threatened species and its cave protection activities on TVA lands, and continue to maintain its Natural Heritage database and honor agreements to share this data with other state and federal resource agencies. TVA will also continue to comply with the CWA, state regulations, EO 13112 (Invasive Species), and other applicable federal and state regulations through its environmental review process.

5.8.1. Aquatic Animals

Alternative A — No Action Alternative
Under the No Action Alternative, TVA would continue the current stewardship activities designed to protect and enhance populations of protected, listed, or rare species and their habitats while providing recreational opportunities. As described in Section 4.7.1, no listed aquatic species are known to occur on lands that would be directly managed by TVA as part of the NRP. However, federally and state-listed species do occur throughout the TVA region. TVA's natural resource management programs currently incorporate a variety of stewardship programs benefiting rare species and meeting regulatory responsibilities for protecting listed species and their habitats on the lands and waters within the TVA region.

While short-term direct and indirect impacts may occur as a result of the implementation of specific projects under this alternative, any direct, indirect, or cumulative impacts to aquatic resources (including listed species) would be assessed, avoided, and/or minimized via existing regulatory mechanisms (particularly ESA and NEPA). It is anticipated that only beneficial long-term changes to aquatic resources including listed aquatic species from TVA's resource management activities would occur.

Adoption of this alternative would not result in direct, indirect, or cumulative adverse impacts to federally or state-listed aquatic species or their habitats.

Alternative B — Custodial Management Alternative
Stewardship activities described under the Custodial Management Alternative would benefit listed species and their habitats. Impacts to listed species differ little from those described in the No Action Alternative. Implementation of the Aquatic Ecology Management program in one healthy, high biological diversity watershed in the Tennessee River system would result in direct benefits to aquatic resources (including endangered and threatened species) within this watershed. Because one of the criteria for choosing the targeted watershed is the presence of federally listed species, adoption of Alternative B is likely to have more direct benefit to endangered and threatened aquatic animals than the No Action Alternative.

The transfer of day use areas located off dam reservations and stream access sites not currently managed under contractual agreements could potentially result in impacts to listed species near these resources if operation of these sites is transferred to external operators. TVA would inform future operators of potential conflicts with listed species and provide information on how to avoid impacts to these resources. Any potential direct, indirect, or cumulative impacts to aquatic resources would be assessed during planning of NRP implementation projects. As part of the planning process, these impacts would be avoided, and/or minimized via existing regulatory mechanisms (particularly NEPA and ESA). Adoption of the Custodial Management Alternative would have similar levels of regulatory compliance as the No Action Alternative. Adoption of this alternative would have no direct, indirect, or cumulative adverse impacts to federally or state-listed aquatic species or their habitats.

Alternative C — Flagship Management Alternative
Implementation of the proposed Flagship Management Alternative is expected to result in net positive improvements to water quality and aquatic life in the TVA region (including listed aquatic species). No long-term direct or indirect adverse impacts to aquatic habitats or communities are expected to result from this alternative. Implementation of endangered and threatened species monitoring and management activities and water quality

improvement programs at the highest proposed level of effort is expected to result in measurable improvements to water quality and aquatic habitats in the TVA region.

Implementation of the Aquatic Ecology Management program in three healthy, high biological diversity watersheds in the Tennessee River system would result in direct benefits to aquatic resources (including endangered and threatened species) within these systems. Because one of the criteria for choosing targeted watersheds is the presence of federally listed species, adoption of Alternative C is likely to directly benefit endangered and threatened aquatic animals. Because up to three watersheds would be addressed by this program, the benefits to endangered and threatened aquatic species would be greater than either the No Action Alternative, or Alternative B.

Due to the number of additional programs addressing endangered species management, conservation planning, and water quality and the level of effort proposed under the Flagship program alternatives, Alternative C would result in the most benefit to endangered and threatened aquatic animals.

Alternative D — Blended Management Alternative
Implementation of the Blended Management Alternative is expected to result in a positive effect listed aquatic species) in the TVA region. No long-term direct or indirect adverse impacts to aquatic habitats or communities are expected to result from this alternative.

Implementation of the Aquatic Ecology Management program in three healthy, high biological diversity watersheds in the Tennessee River system would result in direct benefits to endangered and threatened aquatic species within these systems. Because one of the criteria for choosing targeted watersheds is the presence of federally listed species, adoption of Alternative D is likely to directly benefit endangered and threatened aquatic animals. Several of the programs associated with endangered and threatened species monitoring, and water quality improvements would be implemented at a higher level of effort than identified in the No Action Alternative, or Alternative B. Adoption of Alternative D would result in fewer benefits to endangered and threatened aquatic species than Alternative C.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to listed aquatic species under the four alternatives are shown in Figure 5-9.

Figure 5-9. Relative Beneficial Impacts of the Alternatives on Listed Aquatic Species

5.8.2. Terrestrial Animals and Plants

Alternative A — No Action Alternative
Under the No Action Alternative, TVA would continue current stewardship activities designed to protect and enhance populations of endangered and threatened terrestrial

animals and plants and their habitats while providing recreational opportunities. TVA currently implements a variety of stewardship programs benefiting these species and meeting regulatory responsibilities for protecting them and their habitats. These programs mostly focus on federally listed species. Adoption of this alternative would not result in direct, indirect, or cumulative adverse impacts to federally listed species or their habitats. Adverse impacts to some state-listed species, particularly plants, could occur due to the likely continued spread of invasive species on TVA and adjacent lands. Reservoir lands planning would continue as it is currently implemented and most tracts containing listed terrestrial animals and plants, particularly federally listed species, would continue to be allocated to Sensitive Resource Management.

Alternative B — Custodial Management Alternative
Stewardship activities described under the Custodial Management Alternative would benefit listed species and their habitats. Impacts to federally listed species would differ little from those described in the No Action Alternative, and TVA would continue to allocate most tracts of TVA reservoir lands containing listed terrestrial animals and plants to Sensitive Resource Management. The increase in the area of invasive plant management efforts from 600 acres under Alternative A to 1,000 acres annually would be beneficial to listed plants and animals.

The transfer to other operators of day use areas located off dam reservations and stream access sites not currently managed under contractual agreements would potentially result in impacts to listed species near these areas. TVA would inform future operators of potential conflicts with listed species and provide information on how to avoid impacts to these resources.

Adoption of this alternative would have no direct or indirect adverse impacts to listed terrestrial animals and plants or their habitats. Adverse cumulative impacts could occur, particularly to state-listed species which receive a lower level of legal protection, from the continued development of other lands in the TVA region.

Alternative C — Flagship Management Alternative
Adoption of the Flagship Management Alternative would result in the highest level of beneficial impacts to endangered and threatened terrestrial animals and plants and their habitats. TVA would greatly increase its lands and natural area assessment and management activities, and increase its annual invasive plant management from 1,000 acres under Alternatives B and D to 40,000 acres. These activities would have a large direct beneficial effect on listed species and allow TVA to more rapidly identify and respond to threats to them, such as could result from encroachments, new invasive species introductions, and changes resulting from climate change. The change in reservoir lands planning methodology could result in a small decrease or increase in the area allocated to Sensitive Resource Management. Allocation of lands to this zone that contain sensitive resources, including endangered and threatened species, would continue to be a high priority during reservoir lands planning and any change in the area allocated would not likely result in a reduced level of protection for sensitive resources. Under Alternative C, TVA would increase its monitoring and management of listed species on TVA lands as well as its involvement in landscape-level conservation planning efforts over those of the other alternatives; these efforts would benefit many listed animals and plants.

Adoption of this alternative would have no direct or indirect adverse impacts to listed terrestrial animals and plants or their habitats. Adverse cumulative impacts could occur,

particularly to state-listed species which receive a lower level of legal protection, from the continued development of other lands in the TVA region.

Alternative D — Blended Management Alternative
Adoption of the Blended Management Alternative would result in a level of beneficial impacts somewhat greater than those resulting from Alternatives A and B, but noticeably less than those of Alternative C. The reservoir lands planning approach would be the same as Alternative C, with the same potential impacts to the amount of land allocated to Sensitive Resource Management. TVA's natural area management efforts, which would benefit several listed species, would increase over those of Alternatives A and B. Invasive plant control efforts would be similar to those under Alternative B.

Adoption of this alternative would have no direct or indirect adverse impacts to listed terrestrial animals and plants or their habitats. Adverse cumulative impacts could occur, particularly to state-listed species which receive a lower level of legal protection, from the continued development of other lands in the TVA region.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to listed terrestrial species under the four alternatives are shown in Figure 5-10.

Figure 5-10. Relative Beneficial Impacts of the Alternatives on Listed Terrestrial Species

5.9. Cultural Resources

The alternatives under consideration propose several programs designed to protect, preserve, enhance, and minimize adverse effects to historic properties located on TVA land. The level at which these programs would be implemented varies among the different alternatives. It is important to note that under each alternative except the No Action Alternative, planning for the management of cultural resources would be integrated with planning for other natural resource programs so that a balance may be achieved among potentially competing goals.

Consultation under Section 106 of the NHPA with the Advisory Council on Historic Preservation, the seven Valley SHPOs, 18 federally recognized Indian tribes, and other consulting parties on the effects that the NRP actions may have on historic properties is and would be ongoing. A programmatic agreement (PA) is being developed that addresses potential adverse effects and stipulates a process for phased compliance under Section 106 of the NHPA to identify and evaluate historic properties that may be impacted as a result of the alternatives proposed in this undertaking. In addition, the PA stipulates that TVA will prepare a Cultural Resource Management Plan within 3 years of the approval of the NRP in order to set specific long term cultural resource management goals for each of programs that are implemented under the NRP. This PA will be executed prior to the TVA Board's decision on the NRP.

Alternative A — No Action Alternative
Under the No Action Alternative**,** TVA would continue to manage its historic properties as it currently functions. Management is conducted pursuant to the relative laws and regulations discussed in Chapter 2. Resource management is conducted to meet the basic requirements of these laws and regulations with most stewardship conducted around responsibilities and mitigation related to NHPA Section 106 compliance for TVA-related projects. A notable exception is the employment of dedicated ARPA investigators to provide greater protection of archaeological resources from looting and vandalism as discussed below.

With the current state of deteriorating cultural resources under TVA management, this alternative would have the greatest overall negative impact on historic properties with the exception of the ARPA Program. TVA would continue to meet the minimum requirements of the relevant laws and regulations and would take measures to ensure compliance with those requirements not currently being met.

As part of TVA's ARPA Program, two police investigators are dedicated to ARPA violation enforcement. While not a requirement under ARPA or its associated regulations, TVA took this proactive approach to the extensive looting and vandalism problem. By having these investigators on staff, TVA has been able to better protect numerous sites and deter vandals and looters. TVA manages approximately 11,500 recorded archaeological sites, and many sites are vulnerable to both looting and erosion due to their location along TVA's reservoirs. As a result, many archaeological sites on TVA lands have been extensively damaged. The ARPA investigators have been invaluable in deterring looting and vandalism of historic properties on TVA reservoirs and their work has resulted in several convictions. Continuation of this program would be very beneficial to archaeological sites on TVA lands.

The looting problem must be combated with public outreach and education as well as with violation enforcement. While the investigators have succeeded in bringing forth numerous successful convictions, TVA has followed stakeholders' suggestions to improve its public outreach efforts to complement the enforcement of the law. TVA is currently posting ARPA signs at launching ramps and other access areas to inform the public of the need for protecting these resources. In addition, TVA participates in one or two public outreach events per year on a "by invitation" basis. Continuation of this format would not likely result in a significant increase in public appreciation and knowledge of the need for archaeological site protection.

TVA's current Preservation Program (pursuant to Section 110 of the NHPA) includes the survey and identification of archaeological sites on about 2,000-3,000 acres of TVA lands annually. This focus has been limited to archaeological sites and does not include historic structures located on or within the viewshed of TVA lands. Evaluation of historic properties has been conducted through NHPA Section 106 for TVA-related undertakings and therefore have not been proactively focused on the most significant resources. Nominations to the NRHP have been limited to efforts by universities and community groups. At the current survey rate, it would take TVA over 60 years to complete its inventory of archaeological resources. However, this effort would be greater than the proposed inventory effort in the custodial alternative, which would increase this time to nearly 200 years. With a lack of historic structures data or inventory management, TVA buildings and structures eligible for listing in the NRHP would likely continue to deteriorate.

Records of historic properties managed by TVA are maintained through various data sources and TVAs lacks a centralized database. This lack of consolidated data creates a challenge in developing a comprehensive NHPA Section 110 plan to complete the identification, evaluation, and nomination of historic properties owned by TVA. Continuation of the current form of data management would result in errors in the management of historic properties and may lead to inadvertent adverse effects to historic properties. Consolidated data on the resources under TVA management would continue to be a “best guess” making long-term management goals difficult and far less efficient than with a comprehensive database.

TVA currently conducts its monitoring and archaeological site protection, typically through shoreline stabilization and other means such as gating caves, under Section 106 mitigation agreements on TVA-related projects rather than through needs systematic assessments. Under the current archaeological site protection program, TVA has stabilized an average of 0.2 miles of shoreline per year, less than 0.01 percent of the estimated amount of critically eroding archaeological shoreline. Many sites in need of stabilization have not been protected. Where stabilization does occur, TVA takes the appropriate steps to ensure that the process of protection does not further impact the resource. Stabilization measures include the placement of rock riprap built out to an appropriate angle rather than shaping the bank. This requires additional costs, but ensures that no additional damage is done to the already deteriorated resource.

TVA has recently begun evaluating historic buildings associated with the Muscle Shoals Reservation for potential adaptive reuse. This type of study is consistent with EO 13287 (Preserve America). As an asset manager of historic properties owned by the federal government, TVA is responsible for recognizing and managing historic properties in its ownership as assets that can support the Agency mission while contributing to the vitality and economic well-being of the public. However, other buildings that are potentially eligible for the NRHP and not needed for the Agency’s mission have been neglected resulting in an adverse effect.

Pursuant to the stipulations of EO 13287, TVA submitted the required initial report on its NHPA Section 110 Program in 2004. Progress reports on its NHPA Section 110 improvements were not submitted in 2005 and 2008. TVA would meet the EO’s requirement in the future regardless of which NRP alternative is chosen.

TVA would continue to review all projects and activities with a potential to affect historic properties. This review would be conducted pursuant to Section 106 of the NHPA and other relevant laws and regulations as well as through the stipulations defined in the PA being developed for this undertaking. Activities defined in the Action Alternatives include a process for greater integration with the management of other resources and their associated activities. Selection of Alternative A would mean this integrative approach would not likely occur.

Alternative B — Custodial Management Alternative

Under the Custodial Management Alternative, TVA would establish programs to heighten adherence to the basic stewardship requirements of all historic preservation laws, regulations, and EOs. Existing programs that would be improved include the NHPA Section 106 compliance and the Preservation Program. Additional programs would be established to ensure that each requirement is met. Proposed programs include public outreach, archaeological site monitoring and protection, and the Preserve America Program.

Overall, the adverse effects under Alternative B would be fewer than under Alternative A as more programs would be implemented to benefit the resources. With the exception of the reduced acreage surveyed annually for archaeological sites, the Preservation Program would improve under this alternative. With additional programs for the identification of historic structures and buildings as well as a plan for the evaluation and nomination of historic properties to the NRHP, TVA would be in line with all of the goals and responsibilities of Section 110 of the NHPA. With the development of a comprehensive database, TVA would improve its overall management of historic properties through improved efficiency and knowledge base.

The two TVA Police staff positions dedicated to ARPA enforcement would continue with approximately 1,000 security checks per year. While this effort continues to be minimal (11% of the overall sites recorded on the land), it is beneficial to maintain the dedicated investigators to build relationships with the U.S. Attorneys and other federal agencies with the same responsibilities. Funding would be included for archaeological support to assist in these cases, as well.

Although TVA nominally has a program to promote archaeological site protection (Thousand Eyes), this program has been limited in its efforts and has mainly functioned by invitation or has been opportunistically approached through appropriate NHPA Section 106 undertakings where archaeological resources are at risk of damage from looting.

By establishing a formal program with an annual budget, TVA would proactively plan activities each year to meet the needs of the resource. Public outreach would be focused in areas of greatest need, and programs would include public presentations, academic speakers, school programs, grants, and partnerships with universities and other interested groups to promote archaeological site protection awareness. In addition, TVA would partner in report publications and add interpretive signs at local historic sites through cooperative efforts with community groups.

Site looting is a significant problem on TVA lands, and this alternative would ensure that TVA is taking appropriate steps to share archaeological information with the public to build a greater appreciation for the need to protect these sensitive resources. In order to make a difference in public outreach, TVA would be proactive in these efforts and reach out to those communities with the greatest need. Public education offers the greatest long-term effects to the resources by providing the public with a greater understanding of the need for protection in order to reduce the on-going looting problem. This alternative would support these efforts.

Under Alternative B, TVA would enhance its Preservation Program by including additional activities. Those activities that would be included under this alternative are:

- Identification of Archaeological Sites – Under this alternative, there would be a reduction in the focus for the identification of archaeological sites. This reduced focus would delay TVA from systematically completing surveys regarding NHPA Section 110 inventory. This delay would push the completion of this inventory out to over 200 years vs. the 60 year plan currently being conducted. However, as the focus for archaeological identification is decreased, increased opportunities are available for other activities within the Preservation Program.
- Identification and Management of Historic Buildings and Structures – TVA would develop a plan for the identification, evaluation, and nomination of historic buildings

and structures on TVA lands to the NRHP. Under this alternative, historic structures on TVA lands would be enhanced through preservation and protection, reversing the deterioration rate of these resources. This alternative would be responsive to the public's expressed concern for TVA's cultural and historic resources. It would directly address preferences for more protection, maintenance, and greater access of these resources for public use and enjoyment.

- Evaluate and Nominate Sites to the NRHP – Pursuant to Section 110 of the NHPA, federal agencies are responsible for the identification, evaluation, and nomination to the NRHP. TVA identifies additional historic properties each year; however, evaluation and nomination of significant sites have not occurred. TVA proposes to develop goals for the evaluation and nomination of significant historic properties under its management which would reduce the risk of adverse effects to these properties as well as improve stakeholder relations with those groups concerned with the preservation of historic properties.
- Develop an Implementation Procedure – In order to improve the Preservation Program and facilitate a more efficient process for compliance with preservation laws, TVA would develop procedures for compliance processes required under these laws. By having a defined set of procedures, TVA would improve consistency in its management and compliance procedures.
- Comprehensive Database – Pursuant to Section 112 of the NHPA, federal agencies shall ensure that records and other data are permanently maintained in appropriate databases. TVA maintains numerous data sources relating to historic properties under its management. However, because no comprehensive database has ever been developed, these sources are fragmentary. As a result, TVA does not have consolidated data on the locations of its previous surveys, site location information, and other important data for the resources under its management. Development of a database would improve efficiency and the overall management of TVA's historic properties. A consolidated database would also provide long-term savings of time and money.

The inclusion of these activities in the Preservation Program would be beneficial in the long term as they would improve TVA's information base of historic properties. By doing so, it would improve the incorporation of cultural resources management in early project planning and reduce potential future mitigation costs.

Under this alternative, TVA would establish a database to monitor and manage ongoing mitigation measures to ensure compliance with NHPA Section 106 agreements and NEPA documents. This database would be very beneficial with the number of compliance agreement documents that are executed by TVA each year. By establishing a database system that would track these commitments and stipulations, TVA would ensure adherence to these agreements.

TVA would establish a program for archaeological site monitoring and protection. TVA would focus efforts on those areas with the greatest need (i.e., areas where our most significant archaeological sites are located and where threat of damage to these resources is the greatest). As a part of the cultural resource management plan specified in the PA being developed for the NRP, TVA would develop long term monitoring goals for approximately 150 shoreline miles per year and protect a specific number of sites from erosion and looting. The plan would help prioritize the resources in need of protection and

would be a great benefit to the resource. While limited in effort, it would demonstrate TVA's good faith effort to protect archaeological resources.

Under this alternative, TVA would complete an assessment of its NHPA Section 110 needs and prepare a report every three years on its improvement progress. This assessment is beneficial to the Agency because it meets the requirements under EO 13287 and allows the Agency to set long-term goals on its NHPA Section 110 responsibilities.

Many new natural resource programs proposed for Alternative B have a potential to adversely affect historic properties. Specifically, any activity which causes ground disturbance or alters the viewshed or other ambiance of a historic property has the potential to have an adverse effect. Those activities will be described in Appendix B of the PA being developed for the NRP. TVA would continue to review all projects and activities with a potential to affect historic properties. This review would be conducted pursuant to Section 106 of the NHPA and other relevant laws and regulations as well as through the stipulations defined in the PA for this undertaking.

Numerous programs are proposed that would encourage proactive management of TVA lands. Included in these activities is a more integrated approach to resource management where cultural resources would be considered in initial NRP project planning. Integration of these programs would be beneficial for cultural resources as well.

Alternative C — Flagship Management Alternative
Under the Flagship Management Alternative, TVA would initiate numerous programs that would focus on an increased effort toward stewardship of its resources. Of the different alternatives, this option would have the most beneficial effect to cultural resources. Some of the enhanced programs would include ARPA, public outreach, NHPA Section 106 compliance, historic preservation, archaeological site monitoring and protection, corporate history, tribal consultation, and Preserve America.

Overall, Alternative C would be the most beneficial for cultural resources managed by TVA. Cultural resources would be managed proactively to reduce adverse effects and promote the protection and preservation of resources in a manner that benefits the public. This option would result in the greatest improvement in the current state of cultural resources on TVA land.

Under Alternative C, TVA would expand its ARPA Program to include more resources for greater coverage across the Valley. Given TVA's high density of archaeological sites that are vulnerable to looting, ARPA enforcement is key to reducing this significant adverse effect to archaeological resources. This would be a great benefit to the archaeological resources and would improve our relationships with stakeholders, such as federally recognized Indian tribes, SHPOs, and other preservation groups that have an identified interest in these resources. This program would have a long-term beneficial effect on archaeological resources, as it would help reduce looting on TVA lands.

TVA would initiate a very progressive public outreach program that would include outreach events, and numerous partnerships, interactive Web sites, assistance in programs for school systems in the Valley, and the establishment of a formal site monitoring program. Coupled with an aggressive ARPA investigation program, the outreach program would ensure that TVA is reaching the largest audience possible on the need for archaeological site protection. The need for such outreach is great in the Valley, and expansion of this

program would be highly beneficial. Of all the management activities conducted by the Agency for archaeological resources, public outreach has the greatest long-term effects to making sure these resources are protected for future generations.

In addition, TVA would establish an environmental education program to include all biological and cultural resources managed by the Agency. This would allow for an integrated approach to sharing resources with the public while promoting the protection of those sensitive resources that are being affected on TVA lands. The outreach program would be expanded beyond archaeological resources and include public awareness of all historic properties (such as historic structures) and the need to protect and preserve them. This integrated approach would be highly beneficial to the historic properties under TVA's management.

In combination with the Preserve America Program, TVA would identify properties that are important to its heritage and provide public access to these areas. This would include providing information kiosks, self- or TVA-guided tours, or other methods to provide relevant information of the historic property. If the public were able to participate more in the protection and preservation of these resources, there would be a greater appreciation of the resources as well as the heritage associated with them.

TVA's NHPA Section 106 compliance would be detailed through the development of emergency procedures. Federal agencies are encouraged to develop procedures for taking historic properties into account during operations that respond to a disaster or emergency declared by the President, a tribal government, or the governor of a state or during situations that respond to other immediate threats to life or property. In addition, the program would benefit from the development and execution of PAs for compliance on requests for routine or repetitive actions. These agreements would streamline small projects that have no effects to historic properties and potentially reduce the number of recurring reviews conducted by TVA.

Alternative C includes a number of activities that would further expand TVA's Preservation Program. Additional resources would be available to increase the amount of surveys conducted each year to identify historic properties on TVA lands, as well as to evaluate and nominate sites to the NRHP and seek partners to identify traditional cultural places. By having a better knowledge base of the historic properties located on its lands, TVA would be able to more effectively manage these resources for the benefit of both the resource and the public.

A plan would be developed to identify historic cemeteries on TVA lands, as well as to provide a Web-based interactive cemetery database. These tools would be very beneficial because TVA receives numerous requests each year for this information.

The long-term effects of this program would be the increased efficiency and knowledge base of the resources under TVA's management. TVA would complete its Section 110 obligations under NHPA more quickly and be able to have more historic property information to incorporate into early project planning. This could reduce future compliance costs associated with NHPA Section 106 and result in fewer adverse effects on historic properties.

Under this alternative, TVA would expand its program to monitor and protect sensitive archaeological sites. With a larger program in place to assess these sites and identify

those that are in critical need for protection, fewer sites would be adversely affected each year due to erosion and looting. This would be highly beneficial to the archaeological resources under TVA's management. Since this activity has the greatest immediate effect on archaeological sites being adversely affected, the long-term effects of this program would be highly beneficial. Archaeological sites are being threatened on a daily basis from erosion and looting; the greater effort to save these resources each year would ensure that a greater number of them would be preserved for future generations.

TVA would establish a TVA History and Archaeology Museum showcasing TVA's significance on a regional, national, and international level. This museum would provide a location for improved curation and interpretation of TVA's historic collection. The creation of a museum would also be an excellent opportunity to develop partnerships with retirees, local communities, universities, federally recognized tribes, and with other stakeholders.

Consultation with federally recognized Indian tribes would be improved by having workshops more frequently with tribal representatives to talk about ways to improve management of those resources considered of religious or cultural importance. More frequent workshops would improve TVA's consultative relationship with Indian tribes and consequently would improve the Section 106 compliance process.

In addition to improving the Agency's NHPA Section 110 Program, TVA would seek partners to promote heritage tourism with communities and local governments. By seeking partners for heritage tourism, TVA would be supporting its mission to promote economic development by using historic properties in ways that benefit both the resource and the public. In general, this would assure that such properties are attended rather than neglected and would enhance the public's appreciation of such resources.

TVA proposes to develop a program to support publications pertaining to cultural resources in the Valley. Specifically, these publications would address both academic and nonacademic audiences and include topics on historic properties in the Valley. These publications would support TVA's public outreach programs in promoting the need for protection of sensitive resources. TVA participated in the publication of scientific reports many decades ago. These publications continue to be valued by the professional archaeological community today. Preservation laws were passed because Congress recognized these resources as being important to the American people. As such, TVA would share the importance of these resources with the public.

TVA would also participate in partnerships for the training of future archaeologists by providing locations or funding for archaeological field schools. These would be conducted when beneficial to TVA and would help enhance relationships with regional professional archaeologists and expand TVA's knowledge base of its own resources. Whereas field schools in the past have primarily focused on data recovery, new technology has made nondestructive data gathering possible through techniques such as geophysical testing (i.e., ground-penetrating radar, proton magnetometers). Data recovery field schools may be considered when sites are being adversely affected and other methods of protection or mitigation are not feasible. These partnership efforts would improve relationships with academic archaeologists and federally recognized tribes as well as with the public.

Under this alternative, other biological resource, recreation, and water resource management activities would be enhanced above other alternatives, and reservoir lands planning would create a CVLP. However, these activities have a potential to adversely

affect historic properties as described under Alternative B. TVA would continue to review all projects and activities with a potential to affect historic properties. This review would be conducted pursuant to Section 106 of the NHPA and other relevant laws and regulations as well as through the stipulations defined in the being developed for this undertaking.

Alternative C includes a number of integrated land management activities that would be highly beneficial to biological and cultural resources on TVA land. In particular, a larger human presence on TVA lands would support improved land conditions. Annual monitoring would allow TVA to develop long-term goals and identify problems before they arise rather than later.

Alternative D — Blended Management Alternative
Under this alternative, TVA would establish programs to meet the basic stewardship requirements of all historic preservation laws, regulations, and EOs. All cultural resource programs established in the custodial option would be included in this alternative. In addition, those programs that are considered essential stewardship functions for cultural resource management would be enhanced. Each of these programs is intended to avoid or reduce adverse effects on historic properties, whether by Agency action, neglect, or natural forces.

Overall, Alternative D would result in fewer adverse effects than Alternatives A and B and would provide greater benefit to those resources that are at greatest risk. This alternative would include the ARPA investigation program outlined in the Alternatives A and B. ARPA investigations curb adverse effects to archaeological sites resulting from illegal acts on TVA lands. Programs that would be enhanced under this alternative are the Archaeological Site Monitoring and Protection Program, Preservation Program, Corporate History Program, and the Archaeological Outreach Program. Other programs would be considered if resources become available.

As in Alternative B, TVA would have a formal Archaeological Outreach Program focusing on those geographic areas with the greatest need. More outreach activities including public presentations, school programs, and grants are beneficial to historic resources by raising the public's awareness of their importance.

Because of the significant looting problem on TVA lands, implementing this alternative would be more beneficial than Alternatives A and B. More events and partnerships enhance the public's appreciation for the need to protect these sensitive resources more rapidly.

Under this alternative, TVA would enhance its Preservation Program from the activities outlined in Alternative B. Those activities that would be enhanced in this alternative beyond the custodial level include the following:

- Identification of Archaeological Sites – The more rapidly TVA lands are inventoried for archaeological resources, the lower the risk of adverse effect. Under this alternative, the inventory would be completed three times.
- Evaluate and Nominate Sites to the NRHP –TVA would evaluate and nominate up to twice as many sites under this alternative as under the Custodial Management Alternative. TVA would evaluate and nominate twice as many sites under this alternative. The greater the effort to evaluate the significance of resources, the

greater the benefit is to those significant resources because protection and preservation efforts can be more focused on those significant resources.

In regards to NHPA Section 106 Compliance, the effects of this alternative would be the same as Alternative B.

The activities under the archaeological site monitoring and protection program provide the most immediate benefit toward the goal of preserving these significant resources. This alternative would include an enhanced archaeological site monitoring and protection program. In addition, the number of archaeological sites monitored and protected each year would double. By focusing efforts on those locations and resources with the greatest need, the benefits to those resources would be accomplished most efficiently.

With the establishment of a formal Corporate History Program, TVA would be able to actively promote awareness of its unique history through development of a Web site and public outreach programs on TVA history. Providing such information to the public raises the appreciation of TVA's role in the historical development of the Valley and of those historic resources associated with that development.

These efforts to promote TVA's history could provide an educational opportunity for the public and lead to a better understanding of TVA's past accomplishments and its future role in the history of the region and the nation. The oral history program would ensure that information is collected and retained that could otherwise be lost as older generations pass.

In regards to the preserve America program, the effects of this alternative would be the same as Alternative B. In regards to the ARPA Enforcement Program, the effects of this alternative would be the same as Alternative A.

Under this alternative, other biological resource, recreation, and water resource management activities would be enhanced above Alternative B, and reservoir lands planning would create a CVLP. However, these activities have a potential to adversely affect historic properties as described under Alternative B. TVA would continue to review all projects and activities with a potential to affect historic properties. This review would be conducted pursuant to Section 106 of the NHPA and other relevant laws and regulations as well as through the stipulations defined in the PA being developed for this undertaking.

As with Alternative B, this alternative proposes a more integrated approach to resource management. By interdisciplinary planning of resource management, it is anticipated that adverse effects on all types of resources would be minimized.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to cultural resources under the four alternatives are shown in Figure 5-11.

Figure 5-11. Relative Beneficial Impacts of the Alternatives on Cultural Resources

5.10. Land Use

Alternative A — No Action Alternative
Under the No Action Alternative activities currently associated with the management of TVA lands would not change. TVA would continue to plan its reservoir properties on an individual basis, and both the land use plans and subsequent implementing actions that result in changes in the use of particular tracts of land would be reviewed in accordance with TVA guidelines and policies and for compatibility with surrounding land uses. The most likely changes in the use of TVA lands would result from industrial development of Zone 5 lands and recreational development of Zone 6 lands. While the area allocated to Zone 5 is unlikely to increase, the future demand for developed recreation could result in an increase in the area allocated to Zone 6. These developments could result in adverse impacts to land use.

Alternative B — Custodial Management Alternative
The impacts to land use resulting from Alternative B would be somewhat greater than those of Alternative A. The differences result from the broadened definition of land use Zone 5 - Industrial that removes the light manufacturing restriction (see Section 3.2.2.4). While the impacts to land use resulting from the development of land allocated to Zone 5 - Industrial Development could increase, the total land area allocated to Zone 5 is unlikely to increase. The increased historic preservation efforts could also result in small beneficial impacts on land use.

Alternatives C — Flagship Management Alternative and D - Blended Management Alternative
These alternatives would have similar impacts to land use, although the impacts of Alternative D would likely be slightly greater than those of Alternative C. Under both alternatives, the same change in the land use Zone 5 definition described above for Alternative B would occur, resulting in the potential for industrial developments with greater land use impacts. The land area allocated to Zone 5 would not increase and could decrease, resulting in reduced land use impacts from industrial development. The land area allocated to Zone 6 - Developed Recreation would likely increase resulting in a reduction of land allocated to Zone 4 - Natural Resource Conservation with adverse impacts to the vegetation, wildlife, and the dispersed recreation use of these lands. Conversion of undeveloped area to developed recreation could adversely affect nearby land uses; these effects would be localized and TVA would assess them during the lands planning process and review of individual recreation developments. Many of the other programs and activities proposed under Alternatives C and D would reduce the impacts from current land uses.

Under all of the alternatives, residential and commercial development of privately owned lands adjacent to the TVA reservoirs would continue, as would the development of the TVA-managed residential access shorelands. As described in the SMI EIS (TVA 1996), this could result in adverse cumulative impacts to land use at some reservoirs.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to land use under the four alternatives are shown in Figure 5-12.

Figure 5-12. Relative Beneficial Impacts of the Alternatives on Land Use

5.11. Prime Farmland

Effects to prime and unique farmlands can occur when actual or designated land uses are changed to other uses or designations, such as industrial or recreational development, which preclude the property from being used for agricultural purposes. Generally, prime farmland on properties located in zones for sensitive resource management and natural resource conservation is not subject to adverse impacts because those properties would be retained in a relatively "natural" state and not be converted to other land uses, preserving any prime farmland. However, prime farmland on tracts allocated to other zoning designations is subject to potential adverse effects because land in these zones would be devoted to nonagricultural uses, such as industrial development, developed recreation, and water access. The largest change in zoning designation would likely be from Zone 4 - Natural Resource Management, which is generally compatible with prime farmland protection, to Zone 6 - Developed Recreation. Depending on the characteristics of the individual tracts being rezoned, the eventual recreational development could adversely affect prime farmland.

Under all of the alternatives, proposed actions that could affect prime farmland would be reviewed according to FPPA procedures, including the completion of Form AD 1006, *Farmland Conversion Impact Rating*. This impact rating is based on soil characteristics as well as site assessment criteria, such as agriculture and urban infrastructure, support services, farm size, compatibility factors, on-farm investments, and potential farm production loss to the local community and county. Site assessment scores tend to be higher for the more rural locations. For sites receiving scores greater than 160 points (out of a possible 260), TVA would consider alternative locations or other modifications to the proposed action in order to reduce or avoid impacts to prime farmland.

Alternative A — No Action Alternative

Under Alternative A, minor adverse impacts are expected as lands are converted to uses incompatible with agriculture. Positive impacts to prime and unique farmlands under this alternative are related primarily to the biological and cultural resources management programs. Shoreline stabilization activities not only protect archaeological and historic sites but indirectly may include prime farmland in some areas. More importantly, TVA manages approximately 5,600 acres of agricultural/open lands through the existing licensing program. These revocable licenses, which allow for the production of hay/forage or row crops, directly enhance soil quality and contribute to the success of local farm services. Included in these 5,600 acres are prime farmlands within TVA's dewatering projects on Kentucky and Wheeler reservoirs. These dewatered lands are some of the most productive agricultural lands in their respective regions.

Alternative B — Custodial Management Alternative

Under Alternative B, TVA would continue all current activities in order to meet the minimum requirements of the laws, regulations, and EOs related to the management and protection

of resources. Although the definition of reservoir land planning Zone 5 (Industrial) would be broadened, this is unlikely to increase potential impacts to prime farmland because the land area allocated to Zone 5 is unlikely to increase. Positive impacts to prime and unique farmlands under this alternative are related primarily to enhanced dewatering activities, continued forest management, invasive plant control, and increased public awareness of the importance of environmental stewardship.

Alternative C — Flagship Management Alternative
Under Alternative C, overall adverse impacts to prime farmland are expected to be minimal. TVA would not only continue all current activities in order to meet the minimum requirements of the laws, regulations, and EOs related to the management and protection of resources but would implement new strategies for enhancing stewardship programs. With an additional focus on enhancing recreational facilities, some minor adverse impacts are expected as lands are converted to uses incompatible with agriculture. As with Alternative B, the change in the definition of reservoir land planning Zone 5 (Industrial) is unlikely to increase potential impacts to prime farmland because the land area allocated to Zone 5 is unlikely to increase. The likely increase in Zone 6 - Developed Recreation land could affect prime farmland.

Positive impacts to prime and unique farmlands under this alternative would be related to both existing and new programs and activities:

- The continuation of TVA's agricultural/open lands licensing program would protect and enhance prime farmland, as well as supply support to existing local agricultural services.
- Since prime farmland can be forested, the proposed focus on forest management under this alternative can be beneficial to soil resources through protection and vegetation management (i.e., invasive plants).
- The terrestrial carbon sequestration initiative would promote long-term commitment to soil improvement and prime farmland preservation. Since lands would be prioritized according to their sequestration potential, prime farmland would receive added attention and protection.
- Indirect support to prime farmland may be provided by an increased focus on stewardship assets through the use of the land stewardship assessment tool and habitat enhancement partnerships.
- Under the EE Program, TVA would communicate to various audiences the successful techniques and methodologies for sound natural resource management. Protection of soil resources (whether on public or private land) has been a focus of TVA since its establishment.

Cumulative impacts under this alternative would likely be long term and beneficial.

Alternative D — Blended Management Alternative
Under Alternative D, TVA would continue to meet the minimum requirements of laws, regulations, and EOs relating to the management and protection of prime farmland resources. TVA's agricultural/open lands licensing program not only protects and enhances prime farmland, but it supports local and regional agricultural services. TVA's licensed property may also serve as corridors to adjacent farmland (under private ownership), and any discontinuances may result in fragmentation of existing farm units.

Positive impacts to prime and unique farmlands under this alternative would be related to existing programs and new directives:

- Indirect support to prime farmland may be provided by an increased focus on stewardship assets through the use of the land stewardship assessment tool and enhancement partnerships.
- Under the EE Program, TVA would communicate to various audiences the successful techniques and methodologies for sound natural resource management. Protection of soil resources (whether on public or private lands) has been a focus of TVA since its establishment.
- Since prime farmland can include forests, the proposed focus on forest management under this alternative can be beneficial to soil resources through protection and vegetation management.

Under this alternative, cumulative impacts would be similar to those described under Alternative C.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to prime farmlands under the four alternatives are shown in Figure 5-13.

Figure 5-13. Relative Beneficial Impacts of the Alternatives on Prime Farmlands

5.12. Visual Resources

Although the NRP alternatives do not include programs specifically designed to improve the scenic quality of TVA lands and adjacent areas, the implementation of many programs would affect scenic quality. Under all alternatives, TVA would manage its lands under one or more of the following objectives to address the public's concerns for scenic quality. These objectives are keyed to the values set forth for scenic value class and sensitivity levels (see Section 4.11). Except for preservation, each describes a different degree of acceptable alteration of the landscape based upon the importance of aesthetics. The degree of alteration is measured in terms of visual contrast with the surrounding natural landscape.

- Preservation – This objective allows low visual-impact activities. Low-impact recreational activities are generally prohibited. This objective applies to areas that have not been disturbed by human alteration.
- Retention – Under this objective, activities may only repeat form, line, color, and texture. This would include some low-impact forest activities such as select tree removal or reforestation.
- Partial Retention – Management activities under this objective would be visually subordinate to the characteristic landscape. Activities must repeat form, line, color, and texture, but changes of size, amount, intensity, and other factors would remain subordinate.

- Modification – Under this objective, proposed activities may visually dominate the original landscape character. Activities that would alter the landscape would borrow from naturally established form, line, color, or texture at a scale that would complement the surrounding area.
- Maximum Modification – Management activities of vegetative and landform alterations may dominate the landscape under this objective. However, when viewed from background distances, the visual characteristics would be similar to those that are naturally occurring in the area. When viewed in the middleground and foreground distances, they may not appear to borrow completely from existing form, line, color, or texture. Alterations may also be out of scale or not consistent with natural occurrences.

Two additional short-term management goals may be required. The first is used to upgrade landscapes containing visual impacts that do not meet the quality objectives set for a given area. The second is for landscapes that are more natural appearing. These are:

- Rehabilitation – A short-term management objective used to restore landscapes that have undesirable characteristics. This may include a number of measures: alterations to terrain, vegetation, or removal or concealment of structures.
- Enhancement – A management alternative used to achieve visual variety where little now exists. This option could be achieved through addition, subtraction, or alteration to vegetation or other physical features such as variety, form, color, texture, or patterns.

Under all alternatives, TVA would continue to evaluate visual resources on a case-by-case basis and during the development of reservoir land management plans. The protection of lands with outstanding visual quality would continue to be a criterion for allocating them to Zone 3 - Sensitive Resource Conservation. The gradual change in the appearance of reservoir shorelines due to residential and commercial development of private lands and residential development of TVA-managed residential access shoreland would also continue under all alternatives.

Alternative A — No Action Alternative
Under this alternative, TVA would continue to evaluate visual resources on a case-by-case basis and during the development of reservoir land management plans. This would include TVA lands possibly being subjected to various forms of development. A slow, but noticeable, decline in scenic resources, aesthetic quality, and visual landscape character would be expected as development demands continue to increase.

This and the other alternatives would likely result in the continued preservation of specific scenic areas through the reservoir lands planning process. A gradual loss of natural undisturbed areas would continue on some other lands. The cumulative effects of this alternative could reduce the scenic attractiveness of TVA lands over time, resulting in a negative impact on the visual landscape character and aesthetic sense of place.

Alternative B — Custodial Management Alternative
As with Alternative A, TVA would continue to evaluate visual resources on a case-by-case basis and during the development of reservoir land management plans. This would include TVA lands possibly being subjected to various forms of development. A slow, but noticeable, decline in scenic resources, aesthetic quality, and visual landscape character would be expected as development demands continue to increase.

Compared to Alternative A, Alternative B includes more programs that would result in localized improvements in the scenic quality of TVA lands. These include increased wildlife habitat enhancement partnerships, prioritized boundary maintenance, increased land condition assessment and maintenance activities, and increased efforts to repair heavily impacted dispersed recreation sites. The localized improvements in scenic quality, however, would likely not offset the continued decline in visual quality resulting from residential and commercial development and cumulative adverse impacts to visual resources would likely continue.

Alternative C — Flagship Management Alternative
The cumulative adverse impacts to visual resources resulting from residential and commercial development would likely continue. This alternative, however, would result in the implementation of the most programs and activities that would result in localized improvements in the scenic quality of TVA lands. These would include the implementation of the programs listed above for Alternative B at greatly increased levels, as well as increased upgrades to recreation facilities and increased shoreline stabilization. The various increased monitoring and assessment efforts would also allow TVA to respond more quickly to issues that degrade visual resources. As a result of these programs, Alternative C would result in the greatest beneficial impacts to visual resources.

Alternative D — Blended Management Alternative
Alternative D includes most of the programs included in Alternative C that would result in localized improvement in the scenic quality of TVA lands, but at lower levels of implementation. The beneficial impacts of this Alternative D would be greater that those of Alternatives A and B, but less than those of Alternative C. The cumulative adverse impacts to visual resources resulting from residential and commercial development would likely continue.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to visual resources under the four alternatives are shown in Figure 5-14.

Figure 5-14. Relative Beneficial Impacts of the Alternatives on Visual Resources

5.13. Floodplains

Under any of the alternatives, TVA would apply criteria contained in EO 11988 (Floodplain Management) during its review of all projects. EO 11988 directs federal agencies to use their authority to avoid (to the extent possible).

- Long-term and short-term adverse impacts associated with the occupancy and modification of floodplains.
- Direct and/or indirect support of floodplain development wherever there is a practicable alternative.

For activities involving TVA lands, a floodplain review is conducted to ensure that the proposed activity is consistent with EO 11988 and TVA's flood damage reduction objectives. Regardless of the alternative implemented, compliance with EO 11988 should limit increases in flood damage associated with new development and ensure that the reservoir system can be operated for flood-control benefits. Under EO 11988, actions with no practicable alternative can proceed provided adverse impacts are minimized. Adverse impacts to facilities would be minimized by designing and constructing these facilities to withstand flooding with minimum damage and by using the least amount of fill possible to complete the project. However, some types of shoreland development would negatively impact natural and beneficial floodplain values (i.e., water quality, wildlife and plant resources, cultural resources). The amount of shoreland made available for development would directly relate to the amount of potential impacts to natural and beneficial floodplain values. TVA would continue to require BMPs and other measures such as those described in the SMI EIS (1996) to minimize these impacts.

Without the implementation of appropriate BMPs, some shoreline/shoreland development could also result in increased sedimentation in the reservoirs, resulting in a loss of reservoir flood control and/or power storage capacity. One source of sediment would be from erosion occurring during construction. In many instances, however, sedimentation would be deposited in the reservoir below the lower limits of flood control and power storage. Therefore, the potential loss of flood control and power storage should be negligible under any of the alternatives.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to floodplains under the four alternatives are shown in Figure 5-15.

Figure 5-15. Relative Beneficial Impacts of the Alternatives on Floodplains

5.14. Socioeconomics and Environmental Justice

5.14.1. Socioeconomics

Alternative A — No Action Alternative
Under the No Action Alternative, current programs would continue to be implemented, and therefore, there would be no new impacts. However, there likely would be missed opportunities to improve quality and availability of recreation opportunities, to improve the stewardship of natural and water resources, and to increase overall benefits of the reservoir lands. Access to, and quality of, recreational experiences would suffer due to failure to keep pace with increases in population and recreational needs and expectations. This could result in slower growth in recreation expenditures, employment, and tax revenues that would otherwise occur. The overall adverse socioeconomic impacts on a regional basis, however, would be very small.

Alternative B — Custodial Management Alternative
Under this alternative, legal and policy requirements would be met. However, some existing programs would be discontinued, and there would be no additional projects to elevate TVA's stewardship programs. Reservoir lands planning would continue similar to current practice. The change in the Zone 5 land use definition could change the socioeconomic effects of the resulting industrial developments. Whether this would result in increased or decreased employment, personal income, and tax revenues is difficult to predict without knowing more details about the particular industries. Under this alternative, many recreation areas would be managed by third parties or closed. Third party management could result in user fees and thus increased costs to recreation users. Closure of areas would reduce recreation opportunities and cause recreation users to travel farther to alternative areas. Generally, this alternative is likely to have small localized negative socioeconomic impacts. Lost opportunities and, therefore, cumulative impacts likely would be similar to those of the No Action Alternative, although somewhat greater.

Alternative C — Flagship Management Alternative
This alternative includes positive changes to a variety of programs, including cultural resources, historic preservation, trails and dispersed recreation, land and natural heritage stewardship, wetlands, wildlife, and water resources. These programs would result in the greatest increase in the quality of visitors' experience on TVA lands and result in positive socioeconomic impacts. New lands planning strategies and ranges in land use zone allocations would be implemented, which could lead to significant changes that generate greater total benefits from TVA lands. While the potential increase in land zoned for developed recreation would directly result in socioeconomic effects, the resulting development of this land would result in local increases in employment, expenditures, and tax revenues. The change in the Zone 5 land use definition could change the socioeconomic effects of the resulting industrial developments. Whether this would result in increased or decreased employment, personal income, and tax revenues is difficult to predict without knowing more details about the particular industries.

Lost opportunities likely would be somewhat fewer than those of the No Action and Custodial Management alternatives since some programs would undergo positive changes. On the other hand, the increased pressure on available resources as population grows, could result in some cumulative impacts. However, adverse cumulative impacts would be least under this alternative.

Alternative D — Blended Management Alternative
At a minimum, this alternative would maintain the programs of the Custodial Management Alternative and would increase the emphasis on some programs. Therefore, some of the impacts would be similar to those of that alternative but likely would be somewhat better overall. Therefore, the socioeconomic impacts would be positive and similar to or slightly better than those of the Custodial Management Alternative but smaller than those of the Flagship Management Alternative. Over the longer term, if other programs are implemented, positive impacts would be greater but likely would still be smaller than those of the Flagship Management Alternative. The change in the Zone 5 land use definition could change the socioeconomic effects of the resulting industrial developments. Whether this would result in increased or decreased employment, personal income, and tax revenues is difficult to predict without knowing more details about the particular industries.

Relative Beneficial Impacts of the Alternatives
Overall, the Flagship Management Alternative would have the greatest positive impacts on the social and economic environment of the TVA region. Positive impacts would be next greatest under Alternative D. The Custodial Management Alternative would likely have the smallest positive impacts, at least somewhat smaller than those of the No Action Alternative.

The relative beneficial impacts to socioeconomics under the four alternatives are shown in Figure 5-16.

Figure 5-16. Relative Beneficial Impacts of the Alternatives on Socioeconomics

5.14.2. Environmental Justice

Alternative A — No Action Alternative
As discussed above in 5.13.1, access to and quality of recreational experiences on TVA sites would suffer over time. These negative impacts are likely to be greater for low-income populations because their ability to access and utilize alternatives would be less than for other users (see Section 5.1). Cumulative impacts could result if opportunities to better serve the public overall are lost. Alternative recreational opportunities likely would be located at greater distances and be more expensive. Although detailed information on users of TVA recreation areas is limited, any such negative cumulative impacts would be proportionately somewhat greater on low-income populations.

Alternative B — Custodial Management Alternative
The potential loss of accommodations for water-based recreation and loss of public access to streams with significant recreation use potential would result in disproportionate negative impacts to low-income populations due to the increased cost to access alternatives, either through imposition of fees or increased travel. This alternative likely would result in disproportionate negative impacts to low-income populations. Lost opportunities, and therefore, cumulative impacts likely would be similar to those of Alternative A, although somewhat greater.

Alternative C — Flagship Management Alternative
The changes in reservoir lands planning under both this alternative and Alternative D would likely have little to no disproportionate impact to disadvantaged populations. TVA would continue to operate and upgrade most campgrounds and day use areas. Overall, the impact on disadvantaged populations would be positive. Cumulative impacts would be least under this alternative. Such cumulative impacts would be disproportionate impacts to lower-income and other disadvantaged populations but less likely than under the other alternatives.

Alternative D — Blended Management Alternative
Under Alternative D, the programs and actions of TVA would be at least as beneficial to disadvantaged populations as those of Alternative B but fewer than under Alternative C.

Therefore, the positive impacts to environmental justice would be fewer than under Alternative C. Cumulative impacts would be similar to those of Alternative C and may be somewhat less beneficial. However, they likely would be fewer than under Alternatives A and B.

Relative Beneficial Impacts of the Alternatives
The beneficial relative impacts to socioeconomics under the four alternatives are shown in Figure 5-17.

Figure 5-17. Relative Beneficial Impacts of the Alternatives on Environmental Justice

5.15. Navigation

Protection of the waterway is provided for under Section 26a of the TVA Act. TVA conducts Section 26a reviews to ensure that construction of water use facilities does not encroach upon the commercial navigation channel or marked recreational channels. Consequently, there would be no direct impact on commercial navigation under any of the proposed alternatives.

For reservoir lands planning, revisions in land use zone definitions and ranges in land use zone allocations have the potential to affect navigation interests. It is essential that navigation assets, uses, and interests on the Tennessee River and its tributaries are considered and protected during the land planning process. Historically, TVA has taken steps to ensure that impacts to navigation uses are minimized to the extent possible. Under any of the proposed alternatives, the reservoir lands planning process would remain a systematic method of identifying and evaluating the most suitable use of lands along TVA reservoirs. In addition, any specific proposal on TVA land would be subject to a site-specific environmental review. Therefore, with future input from a navigation perspective, impacts to commercial navigation would be minimal under any alternative.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to navigation under the four alternatives are shown in Figure 5-18.

Figure 5-18. Relative Beneficial Impacts of the Alternatives on Navigation

5.16. Air Quality

Under all alternatives, adverse impacts to air quality would be small. Direct sources of emissions of air pollutants during the implementation of the alternatives are primarily from vehicles used in accessing TVA lands and from construction, farming, and forest management equipment. These emissions would have negligible effects on air quality. The proposed prescribed burns would also result in emissions of air pollutants. TVA would comply with local air quality regulations when planning any prescribed burns. The proposed change under Alternatives B, C, and D in the Zone 5 land use definition would allow a greater variety of industrial development on TVA land and the potential for increased industrial emissions of air pollutants. Any such industries would have to comply with applicable emissions requirements and are unlikely to result in significant adverse impacts to air quality.

Relative Beneficial Impacts of the Alternatives

The relative beneficial impacts to air quality under the four alternatives are shown in Figure 5-19.

Figure 5-19. Relative Beneficial Impacts of the Alternatives on Air Quality

5.17. Climate

In order to understand future climate scenarios in the TVA region better, TVA contracted with the Electric Power Research Institute (EPRI) to prepare a report on the impacts of global climate change on various resources throughout the Valley, including water resources, agriculture, forestlands, ecological resources, air quality, and recreation, which could be reasonably anticipated to occur over the 21st century (EPRI and TVA 2009). The report summarizes temperature and precipitation forecasts for the TVA region based on General Circulation Model results presented in the 2007 IPCC report (Christensen et al. 2007). These forecasts are based on the A1B scenario; GHG projections associated with this scenario are in the middle of the range of the scenarios analyzed by the IPCC. The potential effects and causes of climate change continue to be the subject of scientific debase and discussion.

The TVA region spans two model regions, the Central and Eastern North America region. Temperature forecasts for the TVA region are similar for the two model regions and predict an increase in annual mean temperatures in the TVA region of about 0.8°C (1.4°F) from 1990 to 2020 and up to 4.0°C (7.2°F) by 2100. Precipitation forecasts for the two model

regions are more variable. In the central region, winter precipitation is forecast to increase by 2.6 percent from 1990 to 2020 and by 3.6 percent by 2100. Central region summer precipitation is forecast to decrease by 6.1 percent from 1990 to 2020 and by 3 percent by 2100. In the eastern region, winter precipitation is forecast to increase by 11.3 percent from 1990 to 2020 and by 13 percent by 2100. No change in eastern region summer precipitation is forecast from 1990 to 2020 or by 2100. It is important to note that these forecasts are based on coarse-scale model results; more localized downscaled analyses are required to refine the forecasts (USCCSP 2008).

TVA received and reviewed comments on the 2009 EPRI report from Christy (2009). Christy presented two arguments regarding these estimates. First, based on historical climate records, a change of +0.8°C in 30 years is within the natural climate variations of the region. Second, the +4°C estimate is an “up to” result that is the least likely to occur.

The direct emissions of greenhouse gases from implementation of the various alternatives are likely to be less than the 25,000 metric tons of CO2-equivalent GHGs on an annual basis that CEQ (2010) proposes as an indicator of the need for a more detailed assessment. This guidance does not apply to federal land and resource management actions which are the primary actions considered in the NRP. The operation of fossil-fueled machinery to implement many of the actions would result in GHG emissions, as would prescribed burns and some forest management activities. Over the long term, some forest management activities, as well as efforts to improve the management of agricultural lands, could result in a net increase in the sequestration of GHGs. The overall increases in GHG emissions and any resulting impacts on climate change resulting from any of the alternatives are expected to be negligible.

Climate change effects forecasted for the TVA region would be relatively modest over the next decade and increase in magnitude by mid-century (EPRI and TVA 2009). Potential effects on water resources include increased water temperatures, increased stratification of reservoirs, reduced dissolved oxygen levels, and increased water demand for crop irrigation. Potential effects on agriculture include increased plant evapotranspiration, altered pest and pathogen regimes, and changes in the types of crops grown. Potential effects on forest resources include increased tree growth, altered disturbance regimes, changes in forest community composition with declines in species currently at the southern limit of their ranges, and expansion of the oak-hickory and oak-pine forest types. Potential effects on fish and wildlife include range retractions and expansions, altered community composition, loss of cool to cold aquatic habitats and associated species such as brook trout, and increased threats to many endangered and threatened species. Potential effects on recreation include lengthening the summer recreation season, reduced cold water fishing (i.e., trout) and increased warm water fishing. These potential effects are described in more detail in Appendix M.

Under Alternatives B, C, and D, TVA would increase its natural resource monitoring and assessment activities. These increases include a new Climate Change Sentinel Monitoring program that would target streams in the TVA area’s major ecoregions. This program would be most fully implemented under Alternatives C and D. Under Alternatives C and D, TVA would also increase its ongoing stream and tailwater monitoring, and endangered and threatened species monitoring. The land condition assessment monitoring would increase under Alternatives B, C, and D, with the greatest increase under Alternative C. Under these three alternatives, TVA would also increase its forest monitoring efforts. These increased

monitoring efforts would allow TVA to better detect and respond to impacts to natural resources resulting from climate change, if appropriate.

The management activities that TVA proposes under the various alternatives are designed to be flexible and driven, in part, by the results of the monitoring and assessment activities. These should give TVA the ability to adapt them to changing conditions resulting from climate change, population changes, and other factors. TVA also proposes to regularly review and, as necessary, revise the NRP. This will also help it adapt to changing conditions.

Relative Beneficial Impacts of the Alternatives
The relative beneficial impacts to climate under the four alternatives are shown in Figure 5-20.

Figure 5-20. Relative Beneficial Impacts of the Alternatives on Climate

5.18. Unavoidable Adverse Effects

Continuing regional development trends, such as residential development on non-TVA lands, would likely continue to result in degradation of aquatic and terrestrial habitat regardless of the alternative selected. Because the NRP has been designed to improve the management of natural resources located on TVA lands, few, if any, unavoidable potential environmental effects would result under any of the four alternatives. Furthermore, implementation of any of the four alternatives is not expected to result in significant adverse cumulative effects to any resources.

5.19. Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires consideration of the “relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR §1502.16). For the NRP, short-term uses generally are those that occur within the project’s span of 20 years, and long-term refers to later decades. Productivity is the capability of the land to provide market and amenity outputs and values for future generations. The capability of the land to maintain productivity is one factor that influences the quality of life for future generations.

Generally, the NRP would result in very few actions that adversely affect long-term productivity. As described in this document, TVA manages public lands for multiple uses, including recreation, natural resources, and protection of sensitive resources, for the goal of protecting these values for the public.

5.20. Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources generally occur through the use of nonrenewable resources that have few or no alternative uses at the termination of the proposed action. Irretrievable commitments of resources result in the lost production or elimination of renewable resources such as timber, agricultural land, or wildlife habitat.

The construction of recreational facilities/structures, project operations, and industrial uses on TVA lands allocated during the reservoir lands planning processes would involve irreversible commitment of fuel, energy, and building material resources. Use of these resources would occur under all four alternatives, but have the greatest potential under Alternatives C and D. Under these alternatives, the ranges in land use zone allocations provided for in the CVLP facilitate the potential construction mentioned above by allocating more TVA lands to Developed Recreation than Alternatives A and B.

As shoreline is converted to residential, commercial, industrial, and some types of recreational use, the land is essentially permanently changed and is no longer available for agriculture, forestry, wildlife habitat, natural areas, or certain dispersed recreational activities for the foreseeable future. This is an irretrievable commitment of land that would occur under all alternatives. Over the long term, this type of irretrievable commitment would be greatest under Alternatives C and D due to the target ranges provided for in the CVLP described above. .

5.21. Energy Resources and Conservation Potential

Developing and implementing the NRP does not involve substantive use of energy resources, but there could be a small use of energy resources. Energy is used to fuel machines needed to maintain wildlife habitat areas, fields around recreation facilities, installation of shoreline stabilization, management of invasive plants and other activities described in Chapter 2.

Energy is consumed by campers, boaters, and other recreation users. TVA is encouraging campers who utilize developed recreation areas to reduce energy consumption and to conserve water resources. Under certain NRP programs, TVA would encourage energy conservation measures to be utilized at recreation areas that may be developed in the future. These practices could potentially reduce energy usage under all alternatives.

Finally, because each alternative contains TVA lands allocated for Industrial use, potential energy use associated with industrial activities would occur under each alternative. TVA actively promotes public education and outreach to encourage energy efficiency and green-energy offerings and promotes the integration of energy efficiency and water conservation into community planning and building construction. TVA would work with potential users of TVA lands to achieve energy savings and to implement conservation practices.

5.22. Summary of TVA Commitments and Proposed Mitigation Measures

Mitigation measures are actions that could be taken to avoid, minimize, rectify, offset, reduce, or compensate for adverse impacts to the environment. The following mitigation measure would be entered into TVA's electronic database and tracking system used to record NEPA reviews. This database tracks commitments and mitigation measures identified in EAs and EISs.

Under any of the alternatives, TVA would comply with all applicable federal, state, and local regulations. Likewise, prior to approving any proposal to use TVA land, TVA would conduct an appropriate environmental review to determine the potential site-specific environmental effects of the proposed use. In addition to the use of construction-related BMPs, the following nonroutine measure would reduce the potential for adverse environmental effects.

- TVA is consulting with the Valley SHPOs and federally recognized Indian tribes on a PA for the identification, evaluation, and treatment of all cultural resources adversely affected by future proposed uses of TVA lands subject to the NRP. All activities would be conducted in accordance with the stipulations defined in this PA.