SECTION 4.0:

ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

4.1 INTRODUCTION

This section presents the methodologies and assumptions used and the results of the analysis of the direct, indirect, and cumulative environmental and socioeconomic effects that would likely occur upon implementation of an SMP based on the alternatives considered; any adverse environmental effects that cannot be avoided; the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitments of resources that would be involved.

Table 4-1 summarizes the types of management elements considered in developing a new SMP. SMP elements are also discussed in Section 2.2.3. Table 4-2 briefly describes how each SMP element would be applied under each alternative considered. The shoreline classification categories used nationwide in the development of SMP elements in the Corps shoreline management are described in Section 2.2.2.

The discussions of the results of the analysis of each alternative in Sections 4.2 through 4.6 are preceded by a brief summary of how SMP elements and other parameters (such as Rezoning Evaluation Criteria [Appendix A]) combine to define that alternative.

Direct versus Indirect Effects. The terms *effect* and *impact* are synonymous as used in this EIS. Effects may be beneficial or adverse and may apply to the full range of natural, aesthetic, historic, cultural, and economic resources of Greers Ferry Lake and the surrounding area. Definitions and examples of direct and indirect impacts as used in this document are as follows:

- *Direct Impact*. A direct impact would be caused by implementing of the proposed action[1] and would occur at approximately the same time and place.

[1] Implementation of the proposed action implies implementation of any one of the SMP alternatives under consideration.

1

Table 4-1
Shoreline Management Plan Elements

Limited Development Zoning: This management element determines the amount of shoreline where docks may be permitted. Several variations or options are possible. First, the SMP could stabilize or "freeze" the amount of shoreline zoned for limited development by no longer accepting rezoning requests during periodic reviews of the SMP. Second, the SMP could provide for an increase in the extent of LDA shoreline by favorably acting on 93 rezoning requests received during the present SMP review.[1] This option could be accompanied by a determination that future rezoning requests would not be acted upon until the LDA's are fully utilized. Third, the SMP could include a determination of the physical capacity of the shoreline and use existing rezoning criteria to limit development areas. If the baseline was "recalibrated" in this manner, use of this option could possibly lead to a greater percentage of LDA's around the lake.
Vegetation Modification: The current SMP allows a vegetation modification permit to be granted to enable building owners to protect their premises from fire. The purpose is for fire protection, not landscape enhancement. Underbrush, such as broom sedge, green brier, and some saplings, may be removed. Trees and scrubs with trunk diameters equal to or exceeding 2 inches may not be removed. Flowering trees and shrubs, regardless of size, may not be removed. No plantings would be authorized, except at the specific direction of the Corps of Engineers Project Office to mitigate erosion. Under these permits, vegetation may be modified no farther than 50 feet from the foundation of habitable structures. Options under this element include increasing or decreasing the 50-foot limitation from zero to as much as 200 feet. In either event, an additional requirement could be added to the SMP that no vegetation modification occur within an established buffer along the shoreline.
Grandfathered Docks: Grandfathered docks are those that existed before the first SMP. The current SMP restricts each grandfathered dock to its original footprint, though owners may request dock expansions. An option would be to allow grandfathered docks to be reconstructed to alternative dimensions.[2] Another option would be to reallocate the locations of existing grandfathered docks outside the buffer zones or prohibited areas to limit development.
Restriction on Boats with Sleeping Quarters and/or Marine Sanitation Devices: The current SMP contains instructions on use of all boats with sleeping quarters and/or MSDs. All such boats must be moored at commercial marinas. An option would be to delete adherence to the sleeping quarters map from the SMP. The restricted area from the mouth of Peter Creek to the dam would be eliminated. Additionally, the restricted area around municipal water intakes would be changed to conform to the Arkansas State regulation.[3] The requirement that all such boats continue to be moored at commercial marinas would be retained.

[1] In connection with the SMP review, the Little Rock District accepted permit applications for limited development area-type actions. The Project Office received 123 requests by the April 1999 deadline. Of this number, 103 met 80 percent of the evaluation criteria and thus were found eligible for approval. The number of approved sites was subsequently lowered to 93 because some requests were consolidated and others were found to pertain to shoreline already zoned for limited development.

[2] A Little Rock District memorandum provides revised guidance concerning grandfathered dock alterations. The memorandum states that changes may be considered. Although the number of boats or slips may not be changed, a slip may be enlarged to a maximum width of 14 feet. No other changes to grandfathered docks, such as the addition of swimming platforms or diving boards, are eligible for approval.

[3] The current State regulation requires a 300-foot standoff on the water marked with buoys and 0.25 mile on each side of the intake on land

.

Table 4-2
Alternatives

Plan Element	Alternative Description
Limited Development Zoning	**Alternative 1: No Action Alternative** The LDA would be maintained at the current 7% of total shoreline allocation for this period. No rezoning requests from those submitted in 1999 would be approved at this time. Rezoning requests would be maintained by the project office and reconsidered at the next SMP review. Development under this alternative could eventually reach the levels described in Alternative 5.
	Alternative 2: 80% Rezoning Criteria The shoreline would be rezoned to increase the LDA from 7% to 8% LDA. Rezoning requests submitted in 1999 that met 80% of the rezoning criteria would be approved (93 requests). No rezoning requests would be accepted or approved at future SMP reviews.
	Alternative 3: No Growth The shoreline zoning would be frozen in the current configuration (7% LDA). No new land use permits (docks and paths) would be approved. No rezoning requests from those submitted in 1999 would be approved. No rezoning requests would be accepted or approved at future SMP reviews.
	Alternative 4: 90% Rezoning Criteria The shoreline would be rezoned to increase the LDA from 7% to 7.5% LDA. Rezoning requests submitted in 1999 that met 90% of the rezoning criteria would be approved (45 requests). No rezoning requests would be accepted or approved at future SMP reviews.
	Alternative 5: Maximum Modification The shoreline would be rezoned to increase the LDA from 7% to 33% LDA. Rezoning would be based on suitable topography 20%-49% slope. No rezoning requests would be accepted or approved at future SMP reviews.
	Alternative 6: Revised Preferred Alternative The shoreline would be rezoned to increase the LDA from 7% to 7.6% LDA. Of the rezoning requests submitted in 1999, 41 that met 90% of the rezoning criteria and 15 that met 80% of the rezoning criteria would be approved (56 requests total). No rezoning requests would be accepted or approved at future SMP reviews.
Vegetation Modification	**Alternative 1:** No Action Alternative Maintain 50 feet mowing from the foundation of a habitable structure. No vegetative buffer strip would be established.
	Alternative 2: 80% Rezoning Criteria Increase mowing from 50 feet to 100 feet from the foundation of a habitable structure. Establish a 50-foot vegetative buffer strip from the conservation pool.
	Alternative 3: No Growth No new permits, and expiring permits not renewed.
	Alternative 4: 90% Rezoning Criteria Increase mowing from 50 feet to 100 feet from the foundation of a habitable structure. Establish a 100-foot vegetative buffer strip from the conservation pool.
	Alternative 5: Maximum Modification Increase mowing from 50 feet to 200 feet from the foundation of a habitable structure. No vegetative buffer strip would be established.
	Alternative 6: Revised Preferred Alternative Maintain 50 feet mowing from the foundation of a habitable structure, and permit mowing up to 100 feet. Establish a 100-foot vegetative buffer strip from the conservation pool.
Restrictions on Boats with Sleeping Quarters and/or Marine Sanitation Devices	**Alternative 1: No Action Alternative** Maintain separate rules in the SMP.
	Alternative 2: 80% Rezoning Criteria Abolish separate rules in the SMP and follow State law and 36 CFR.
	Alternative 3: No Growth Maintain separate rules in the SMP.
	Alternative 4: 90% Rezoning Criteria Abolish separate rules in the SMP and follow State law and 36 CFR.
	Alternative 5: Maximum Modification Abolish separate rules in the SMP and follow State law and 36 CFR.
	Alternative 6: Revised Preferred Alternative Abolish separate rules in the SMP and follow State law and 36 CFR.

Table 4-2
Alternatives (continued)

Grandfathered Docks	**Alternative 1: No Action Alternative** Maintain current rules.
	Alternative 2: 80% Rezoning Criteria Adopt district policy that allows limited improvements to grandfathered docks.
	Alternative 3: No Growth Maintain current rules.
	Alternative 4: 90% Rezoning Criteria Adopt district policy that allows limited improvements to grandfathered docks.
	Alternative 5: Maximum Modification Rezone to LDA the shoreline where grandfathered docks exist, except in park buffers and prohibited areas.
	Alternative 6: Revised Preferred Alternative Adopt district policy that allows limited improvements to grandfathered docks.

- *Indirect Impact*. An indirect impact would be caused by implementing the proposed action and could occur to the same or another resource later in time or farther removed in distance but still be a reasonably foreseeable outcome of the action. Indirect impacts may include induced changes in the pattern of land use, population density, or growth rate, and related effects on air, water, and other natural resources and social systems.

- *Application of Direct versus Indirect Impacts.* For direct impacts to occur, a resource must be present. For example, if highly erodible soils were disturbed as a direct result of the use of heavy equipment during construction of a home, there could be a direct effect on soil due to erosion. This could further indirectly affect water quality through storm water runoff containing sediment and indirectly affect aquatic species through sedimentation downstream from the construction site.

Short-Term versus Long-Term Effects. In addition to indicating whether effects are direct or indirect, they are also expressed in terms of duration (short-term and long-term). The duration of short-term impacts are considered to be 1 year or less. For example, the construction of a building would likely expose soil in the immediate area of that construction; that exposed soil could be subject to erosion, and runoff laden with sediment could pollute nearby waters. However, this effect would be expected to be short-term because vegetation would eventually be reestablished over the disturbed area. Short-term impacts also are expected to dissipate over time and cease to contribute to cumulative impacts. Long-term impacts are described as lasting beyond 1 year and potentially continuing into perpetuity. If the long-term impacts were considered to continue into perpetuity, they also would be described as permanent. Long-term impacts could contribute to cumulative impacts. For example, an increase in the number of houses would likely result in an

increased number of vehicles. These vehicles would contribute more air pollutant emissions. The overall increase in air pollutant emissions would be expected to be long-term because the new vehicles would be expected to remain beyond 1 year.

Cumulative Effects. Evidence is increasing that the most devastating environmental effects might result not from the direct effects of a particular action but from the combination of individually minor effects of multiple actions over time. Some authorities contend that most environmental effects can be seen as cumulative because almost all systems have already been modified, even degraded, by humans. This is especially apparent for Greers Ferry Lake, a lake environment that was created 40 years ago by impounding the Little Red River.

As stated in 40 CFR 1508.7 (CEQ Regulations), cumulative effects are defined as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions." Principles of cumulative effects analysis, as described in the CEQ guide *Considering Cumulative Effects Under the National Environmental Policy Act*, are presented in Table 4-3.

Table 4-3
Principles of Cumulative Effects Analysis

- Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (Federal, nonfederal, or private) has taken the actions.
- Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
- It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
- Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
- Cumulative effects may last for many years beyond the life of the action that caused the effects.
- Each affected resource, ecosystem, and human community must be analyzed in terms of the capacity to accommodate additional effects, based on its own time and space parameters.

Intensity of Effects. The following criteria are used to describe the relative effect of direct, indirect, and cumulative impacts. Note that all of these descriptors may be used to describe adverse or beneficial impacts.

- *Negligible:* The impact is at the lowest levels of detection.
- *Minor:* The impact is slight, but detectable.
- *Moderate:* The impact is readily apparent.
- *Major:* The impact is severely adverse or exceptionally beneficial. This descriptor does not imply a significant impact unless specifically stated. Refer to the following section.

Significance. The term *significant*, as defined in 40 CFR 1508.27, part of the CEQ regulations for Implementing NEPA, requires consideration of both the context and intensity of the impact evaluated. Significance can vary in relation to the context of the proposed action, and thus the significance of an action must be evaluated in several contexts, which vary with the setting of the proposed action. For example, context may include consideration of effects on a national, regional, and/or local basis depending on the action proposed. Both short-term and long-term effects might be relevant.

In accordance with CEQ regulations and implementing guidance, impacts also are evaluated in terms of their intensity or severity. Factors contributing to the evaluation of the intensity of an impact include, but are not limited to the following:

- The balance of beneficial and adverse impacts, in the case that an activity has both.
- The degree to which the action affects public health or safety.
- Unique characteristics of the geographic area where the action is proposed, such as proximity to parklands, historic or cultural resources, wetlands, prime farmlands, wild and scenic rivers, and ecologically critical areas.
- The degree to which the effects on the quality of the human environment are likely to be controversial.
- The degree to which the effects of the action on the quality of the human environment are likely to be highly uncertain or involve unique or unknown risks.
- The degree to which the action might establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

- The degree to which the action might adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP or might cause loss or destruction of significant scientific, cultural, or historical resources.

- The degree to which the action might adversely affect an endangered or threatened species or habitat that has been determined to be critical under the Endangered Species Act of 1973.

- Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

Carrying Capacity. Carrying capacity has been defined as the population of a given species that can be supported indefinitely in a defined habitat without permanently damaging the ecosystem on which it depends (Rees, 1990). In the context of impact assessment, the scientific community has found it desirable to describe a measurable population threshold for each resource area whereby it is possible to determine how many individuals can be supported in a given area within natural resource limits and without degrading the natural, social, cultural, and economic environment for present and future generations. However, because we seem to be capable of continuously increasing the human carrying capacity of Earth by eliminating competing species, by importing locally scarce resources, and by using technology, conventional economists and planners generally reject the concept as inapplicable to people (Rees, 1996a).

This concept has received increased attention, especially in terms of sustainable development and global warming. The science on this concept principally addresses carrying capacity on a global basis (Rees, 1996b). Analysis of carrying capacity is further hampered with uncertainty in that various experts have defined human carrying capacity in terms of a per capita requirement ranging from approximately 5 to 30 acres (Redefining Progress, 2001; Wackernagel et al., 1997). The latter figure, if applied, would indicate a deficit in carrying capacity at Greers Ferry Lake. Using the current population of 40,238 (see Table 3-14), an ROI of 1,146 square miles (733,440 acres), and the per capita requirement of 30 acres per person, the ROI would have a deficit of

11.8 acres per person. To the untrained observer this would seem unreasonable for a relatively undeveloped rural area. The synergistic effects of one resource area acting on another, which are not well known or researched at this point, also make defining a specific threshold at Greers Ferry difficult without further studies. Consequently, qualitative thresholds are provided, as available, for each resource area or are otherwise described quantitatively if possible. To provide a threshold otherwise would be speculative at best.

This EIS does present the results of the carrying capacity study conducted from May through August 2001 for recreational activity on the lake. The results should be interpreted as being relevant only to Greers Ferry Lake.

This EIS also provides analysis of assimilative capacity for Greers Ferry Lake. Assimilative capacity is defined as the maximum load of any criteria pollutant that can be carried by a river, lake, or other body of water without causing violations of a water-quality standard or criterion. Refer to the sections on water quality.

Mitigation. Where adverse impacts are identified, this document describes measures that will or could be used to mitigate these effects. Mitigation may include:

- Avoiding an impact altogether by stopping or modifying an action.
- Minimizing an impact by limiting the degree or magnitude of the action and the activities associated with its implementation.
- Rectifying an impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating an impact over time by preservation and maintenance operations during the life of the action.
- Compensating for an impact by replacing or providing substitute resources or environments.

Mitigation of adverse effects associated with the implementation of an SMP is generally the responsibility of the U.S. Army Corps of Engineers. Mitigation by non-Corps entities that could avoid or reduce adverse impacts, should they be undertaken, is expressed in the conditional ("could") throughout this section.

The Corps of Engineers' *Greers Ferry Lake Rezoning* Request *Evaluation Criteria*, provided in Appendix A, describes elimination factors as well as physical and managerial criteria employed in determining whether a rezoning request could be approved or otherwise denied. The use of these elimination factors serves as mitigation in that by implementing these criteria and denying a rezoning request, adverse impacts are avoided. For example, if any significant environmental, ecological, or cultural feature are present, the rezoning request would be denied.

4.1.1 Methodology for Analyzing Alternatives

Impact assessment is typically based on an assumption that the full effect of the predicted conditions would occur immediately. Assumptions used in assessing direct, indirect, and cumulative impacts are in most cases conservative or based on a worst-case scenario. In reality the projected conditions likely would be less intense than the worst case and also would be likely to happen incrementally rather than all at once. Thus, effects identified might, in reality, be less severe than those described.

Many of the impacts described in this EIS are indirect effects that could occur as a result of the Corps actions. Although this EIS draws a direct correlation between granting rezoning requests and permits for future development beyond Corps property, this assumption might not prove valid. Impacts throughout the study area could occur regardless of the Corps actions. Initial growth in the region was induced by the formation of Greers Ferry Lake. The current growth rate for the region is higher than that of the State at more than 20 percent for 10 years or approximately 2 percent per year (see Section 3.5.2). It is apparent that some growth in the region will continue regardless of the Corps SMP-related actions. The question is whether that growth and subsequent development are induced by the Corps actions or whether the Corps is responding to growth triggered by other factors and the demands of the public. For example, under Alternative 2, based on aerial photograph interpretation, it was determined that 80 percent of the requests for rezoning were associated with adjacent property that was already developed, while 20 percent of the requests were for undeveloped adjacent property. The Greers Ferry Lake Project Office's rezoning actions have been based on rezoning requests. This is a reaction to growth rather than an inducement. Under the Maximum Modification Alternative, the Corps would rezone the maximum amount of shoreline from "protected" to "limited development," increasing the LDA from to 7 to 33 percent. Rezoning would be based on suitable topography, 20 to 49 percent slope (see Section 2.3.5). In this instance, the Corps would rezone the shoreline based on a physical criterion rather than on requests for rezoning by the public. It is not known whether

this would induce development, but it is assumed for this analysis to be an inducement. That being said, it is not expected that full buildout of the adjacent land would occur sooner than 40 to 60 years from now based on historical growth.

Table 4-4 contains an estimate of the total number of docks that could be approved under the various alternatives. The total number of potential docks was calculated for all the alternatives, with the exception of the No Growth Alternative, using certain assumptions. The minimum distance from the centerpoint of a typical dock on the shore to the centerpoint of an adjacent dock was assumed to be an average of 150 feet in fully developed areas. To account for the maximum 50 percent utilization of LDA's, a potential dock was projected every 300 feet along the shoreline, which resulted in a total of 170 potential additional docks within existing LDA's. Under the Maximum Modification Alternative, a potential dock was placed every 300 feet along reaches of shoreline having a slope between 20 and 49 percent. This resulted in a calculated potential of 1,098 additional docks. No potential docks were placed in any of the following restricted areas under any alternative: park buffers, prohibited areas, within 0.25 mile of four drinking water intake points, within 100 feet of sensitive flora species locations, and within 1,000 feet of sensitive fauna species locations. For Alternative 2, the number of potential docks includes the potential locations of the 93 rezoning request dock permits that met the 80 percent rezoning criteria; for Alternative 4, the number of potential docks includes the 45 rezoning request docks that met the 90 percent rezoning criteria. For the Revised Preferred Alternative, the number of potential docks includes 41 of the rezoning request docks that met the 90 percent rezoning criteria and 15 of the rezoning request docks that met the 80 percent rezoning criteria.

Table 4-4
Existing and Potential Number of Docks Under Each Alternative

	Alternative 1 No Action	Alternative 2 80 Percent Rezoning Criteria	Alternative 3 No Growth	Alternative 4 90 Percent Rezoning Criteria	Alternative 5 Maximum Modification	Alternative 6 Revised Preferred Alternative
Existing	295	295	295	295	295	295
Potential	170	263	0	215	1,098	226
Subtotal	465	558	295	510	1,393	521
Max Potential	928	0	0	0	0	0
Total	1,393	558	295	510	1,393	521

Several key resource areas (water quality in the watershed, socioeconomics, and aesthetic and visual resources) involved extensive analysis to determine the direct and indirect impacts and cumulative impacts resulting from implementing an SMP. A discussion of the methodologies applied is presented in Section 4.1.2.

4.1.2 Methodology and Assumptions for Analyzing Selected Resource Areas and Conditions

4.1.2.1 Greers Ferry Lake Watershed

Land use alterations were used in calculating the difference in loading from baseline conditions and from each of the possible alternatives. The land use alterations were divided among the upper watershed, the Upper Lake watershed, and the Lower Lake watershed. Loads were calculated for total phosphorus (TP), total nitrogen (TN), total suspended solids (TSS), fecal coliform bacteria (FC), and biological oxygen demand (BOD) for each lake section and the upper watershed because they are the parameters considered to be primarily affected by altered land use conditions. Using the baseline as a reference, the percent increase in loads was calculated for each constituent of concern. These loads were quantified as an annual average loading condition and represent the long-term effects of each proposed alternative.

To quantify the potential water quality impacts of the proposed alternatives, the analysis made the following general assumptions:

- A total of 90 percent of the new docks are single, one-owner docks with two slips that are associated with the addition of one new home each within the immediate watershed.

- The remaining 10 percent of the new docks are assumed to be community docks with a slip capacity of 20. These community docks are associated with one new home per available slip in the immediate watershed.

- It was determined by aerial photo interpretation that 80 percent of the 93 rezoning permits are associated with existing structures. Where existing structures were found to be associated with a rezoning permit under consideration, no land use alteration was assumed.

- Under present zoning conditions at Greers Ferry Lake, lot sizes are a mix of 0.5 to 1 acre; therefore, a representative acreage of 0.75 acre was used for land use area determinations.

- Calculation of the available area within the present LDA's shows that they could support up to 70 percent of the additional homes. The remaining homes are assumed to be within the immediate vicinity of the lake and not within the upper watershed.

Table 4-5 presents the figures used as the basis of many assumptions throughout the impact analysis. Other assumptions specific to each alternative are described here and in Appendix F.

For FC loads, the projected increase represents changes in land use as well as installation of additional septic systems in the Upper Lake and Lower Lake watersheds. These new systems are assumed to be built in the immediate vicinity of the lake and not to be connected to any present or future wastewater treatment systems. The analyses for the septic system loads use a Fecal Loading Spreadsheet created for EPA for use in evaluating land use alterations and septic loadings for the Total Maximum Daily Load (TMDL) Program.

Under the Clean Water Act, boats in freshwater lakes and rivers are prohibited from having the capability to discharge MSD waste and must have Type III MSDs. Therefore, it is not expected that the increased number of boats and boating activity would have a direct impact on FC or BOD loadings typically associated with MSD discharges. In addition, because people are not allowed to live on their boats along lake property, the potential for waste loadings from boats would be reduced.

Boat storage and operation have the potential for introducing metals and metal-containing compounds to the water. Metals and metal-containing compounds have many functions in boat operation, maintenance, and repair. Lead is used as a fuel additive and ballast and can be released through incomplete fuel combustion and boat bilge discharges (Natchez, 1991). Arsenic is used in paint pigments, pesticides, and wood preservatives. Zinc anodes are used to deter corrosion of metal hulls and engine parts. Copper and tin are used as biocides in antifoulant paints. Other metals, such as iron and chrome, are used in the construction of marinas and boats.

To quantify the effects of additional watershed and boat loadings on in-lake water quality conditions, an annual average in-lake response model was set up. The model treats the Upper Lake and Lower Lake as completely mixed systems and evaluates each of the constituents of concern conservatively. The model uses the annual average concentration for each constituent of concern from the historical data presented in Section 3.0 as the background concentration. Then

1

Table 4-5
Upper and Lower Lake Calculations

	Alternative 1: No Action	Alternative 2: 80 Percent Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative
UPPER LAKE						
Total Acre Change Calculation						
Number of existing docks	147	147	147	147	147	147
Number of potential docks	112	112	0	112	726	112
Number of rezoning request docks	0	50	0	26	0	27
Number of rezoning request docks with no structure	0	6	0	4	0	4
Total number of docks	259	309	147	285	873	286
Number of additional slips	426	615	0	524	2,758	528
Number of additional home sites	325	342	0	336	2,105	336
Acres per home	0.75	0.75	0.75	0.75	0.75	0.75
Total acres forested to residential	244	257	0	252	1,579	252
Relative Acre Change Calculation						
Acres in watershed altered	244	257	0	252	1,579	252
Marina acres altered	0	0	0	0	0	0
Septic Systems						
Additional septic systems	325	342	0	336	2,105	336
LOWER LAKE						
Total Acre Change Calculation						
Number of existing docks	148	148	148	148	148	148
Number of potential docks	58	58	0	58	372	58
Number of rezoning request docks	0	43	0	19	0	29
Number of rezoning request docks with no structure	0	13	0	5	0	7
Total number of docks	206	262	148	230	520	242
Total number of additional slips	220	384	0	293	1,414	331
Number of additional home sites	168	205	0	183	1,079	189
Acres per home	0.75	0.75	0.75	0.75	0.75	0.75
Total acres forested to residential	126	154	0	137	809	141
Relative Acre Change Calculation						
Acres in watershed altered	126	154	0	137	809	141
Marina acres altered	13	13	0	13	13	13
Septic Systems						
Additional septic systems	168	205	0	183	1,079	189
Total Number of Existing Docks	**295**	**295**	**295**	**295**	**295**	**295**
Total Number of Additional Docks	**170**	**263**	**0**	**215**	**1,098**	**226**
Total Number of Docks	**465**	**558**	**295**	**510**	**1,393**	**521**
Total Number of Additional Slips	**646**	**999**	**0**	**817**	**4,172**	**859**
Total Number of Additional Homes	**493**	**547**	**0**	**519**	**3,184**	**525**
Total Acres Forested to Residential	**370**	**411**	**0**	**389**	**2,388**	**393**
Maximum Acres Mowed	**687**	**1,323**	**0**	**1,141**	**2,824**	**1,141**
Total Acres Protected by Buffer	**0**	**1,319**	**0**	**2,469**	**0**	**2,469**

the additional loadings to the system are input and the in-lake response is calculated. The model projects the annual average in-lake concentration of the constituent of concern. The assumption of a completely mixed system is justified on the basis of wind stresses on the water surface resulting in internal mixing. In addition, when the temporal scale of the problem is sufficiently long, as from year to year, seasonal mixing processes can result in a completely mixed lake over the years (Thomann and Mueller, 1987). Additional details of the assumptions and application of the lake model are presented in Appendix F.

The assumptions made in determining potential land use alteration under each alternative are highly conservative. First of all, a significant portion of the development might occur independent of whether a dock is installed. Therefore, assuming that issuing a permit for a boat dock will induce the construction of a house, which would not otherwise be built if the permit was denied, would significantly overstate the impact of the Corps permitting action. Furthermore, some of the additional docks would not result in direct development. It is expected that some of the new docks would be used by people commuting from surrounding areas, and some might be used by existing houses on the lake. Additionally, not all community docks would be built out to their full 20-slip capacity because of design and space restrictions. Finally, not all development associated with additional boat slips would occur within the immediate watershed area of either the Upper Lake or the Lower Lake.

4.1.2.2 Socioeconomic Conditions

Impacts of the proposed alternatives were estimated using a regional economic model, which is described in Appendix C. Specifically, the model was used to project economic conditions for a baseline scenario and for each of the management alternatives. Economic projections were generated for 2000 to 2010, although implementation of the alternatives (installation of docks and construction of associated housing) was assumed to occur from 2003 to 2007. To quantify the potential economic impacts of the proposed alternatives, the analysis made the following assumptions:

- All new docks would be private (single and community) docks and, therefore, would not affect the level of recreational activity (e.g., number of visitor days) at Greers Ferry Lake.

- The docks would not generate direct economic activity except during off-site construction.

- To be conservative, it was assumed that each new private dock outside existing LDA would generate a new residence on the lake (based on the number of slips associated with each dock).

- Residents of the new housing would migrate from outside the ROI.

- The demographics of the new residents would be the same as those for the existing population.

In general, these assumptions would likely lead to upper boundary estimates of the economic impacts of the proposed alternatives because they rely on maximum construction buildout and in-migration scenarios. More likely, regulatory and other economic factors would constrain residential growth along the lake to below the levels assumed in this analysis. Furthermore, the analysis assumed a 5-year buildout period. Especially for the maximum-growth scenario, full buildout, if it actually was to occur, would likely take place over a longer period (potentially decades), and population growth along the lake would be more consistent with historical trends.

Nonetheless, given the high level of uncertainty associated with future development projections, these conservative assumptions provide "worst case" scenarios that are useful in assessing the ROI's economic capacity to assimilate potential population growth associated with dock development. Appendix C provides further discussion of the limitations of the analysis and describes the economic model used to project the impacts of the proposed alternatives.

4.1.2.3 Visual and Aesthetic Resources

Visual and aesthetic impact assessments, particularly at the landscape level, can be difficult because of their inherently subjective and somewhat intangible nature. Visual impacts are not just a function of changes to the physical components of natural and man-made landscapes but also are a function of the preferences and perceptions of people who see the changes. People with different backgrounds and experiences can be expected to react differently.

In general, the visual effects of a change in shoreline management practices are more acceptable where there is an existing disturbance to the natural landscape than in places where no change in natural scenery has occurred. Alteration of undisturbed landscapes might be considered negative even if visual quality objectives have been met because the existing visual conditions will be changed. Building additional boat docks on the shoreline of Greers Ferry Lake will change the

landscape of the lake's shoreline and the landscape and visual character of the shoreline where boat docks are introduced. Scenic integrity will be lowered, and scenic attractiveness will be reduced. The degree or significance of visual impacts reflects the degree to which these changes are deemed acceptable to residents, lake users, and visitors to the lake and its recreational facilities.

The difficulty lies in the different preferences and perceptions of the landscape viewers, as noted above. People's experiences, values, lifestyles, cultures, and subcultures influence their responses to the visual environment and to changes in that visual environment. Among the myriad factors in the perception of landscapes and landscape change are an individual's previous experience of landscapes, gender, age, education, degree of environmental awareness, and cross-cultural awareness.

The task is potentially even more complicated given the size of Greers Ferry Lake, its different morphology or shape, and the fact that although the shoreline is generally heavily vegetated, there are differences in topography, slope, aspect, vegetative type, and cover. There are also differences in the design, materials, color, and level of maintenance of both the existing docks and the houses and structures on the private land behind and above the shoreline. All these factors affect the visual absorption capacity of the lake's shoreline.

Given this degree of complexity, the approach taken in this document is to avoid the debate about landscape preferences and perception and landscape sensitivity and simply measure the change in the acreage of the lake and surrounding land from which one or more boat docks would be visible for each alternative under consideration. These viewsheds are then used as a surrogate for assessing visual impacts. Using this approach, an increase in the number of docks along the shoreline and an increase in the acreage of the lake and surrounding land from which the docks would be clearly visible would constitute a visual impact. The larger the number of docks and the greater the acreage of viewsheds, the more substantial the adverse impacts would be.

For the purpose of characterizing the landscape visibility impacts of the alternatives as minor or major, a 50 percent change in lake acreage or land acreage from which docks would be visible was chosen as a dividing line. That is, where the acreage of lake surface or surrounding land from which docks would be clearly visible would increase from the current situation by 50 percent or more under an alternative, the visual and aesthetic impacts are considered to be major. Using this magnitude of change to define a major effect on visual and aesthetic resources is reasonable given

the definitions of minor, moderate, and major provided in Section 4.1. A *minor* effect is one that is slight but detectable; a *moderate* effect is one that is readily apparent, and a *major* effect is one that is severely adverse or beneficial. It is reasonable to expect that an increase of less than 50 percent in the acreage of the lake or the surrounding land from which docks could be seen would be detectable or readily apparent (i.e., a minor or moderate effect) and that a change of more than 50 percent would be readily apparent and could be severely adverse to some people. Given the subjective nature of the perception of changes in the visual landscape, it seemed unreasonable to attempt to distinguish moderate effects from minor and major effects. Thus, a change of acreage of the lake or the surrounding land from which one or more docks would be clearly visible of 50 percent or more was considered to be a major effect and a change of less than 50 percent was considered to be minor.

This approach is consistent with the concern clearly expressed during the scoping meeting regarding preserving the natural beauty, shoreline, or pristine conditions of the lake, particularly the unspoiled, uncluttered nature of the shoreline.

Although the mass, scale, and height of most boat docks would be relatively small when viewed individually, their visibility from the surrounding area, particularly from the water, is quite marked. Assuming an effective visibility range of 1.0 mile and a hypothetical straight shoreline, an individual boat dock can be clearly visible from an area totaling 1.6 square miles (approximately 2,010 acres) on the water and up to 1.6 square miles on land, depending on the topography and vegetation surrounding the site. Collectively, new boat docks can thus have a visual impact on the landscape despite their relatively small individual size.

4.2 ALTERNATIVE 1: NO ACTION ALTERNATIVE (1994 SMP)

4.2.1 Introduction

The No Action Alternative, the consideration of which CEQ regulations prescribe, serves as a benchmark against which the other alternatives can be evaluated. Under this alternative, the Little Rock District would make no changes to the existing 1994 Greers Ferry Lake SMP. No new management elements would be adopted, and no existing management elements would be modified. Rezoning applications received during the current SMP review would not be allowed, but would be retained by the Greers Ferry Lake Project Office until the next review.

Under future reviews of the SMP, rezoning applications could be approved to the level described in Alternative 5 (Maximum Modification). Permit applications for placement of private floating facilities within present LDA's could be approved up to the established limit of 50 percent of carrying capacity. Table 4-5 shows the total number of docks that could be approved under Alternative 1. Existing and potential dock locations under the No Action Alternative are shown in Figure 2-1. Treatment of applications concerning grandfathered docks would proceed based on the 1994 SMP. The allowance for vegetation modification would permit mowing up to a maximum of 50 feet from habitable structures with no lakeside buffer, as currently allowed under the 1994 SMP (Figure 2-2). Current restrictions on the locations for boats with sleeping quarters and/or MSDs would remain in effect.

4.2.2 Greers Ferry Lake Watershed

4.2.2.1 Hydrogeology/Groundwater

No effects on groundwater are anticipated under the No Action Alternative, largely because of the generally impermeable soil of the underlying Western Interior Plains Confining System. Vegetative buffer modifications are not expected to have an impact on groundwater resources.

Under the No Action Alternative, up to 493 additional septic systems could be installed near Greers Ferry Lake as part of local development associated with the potential increase in new docks. In the event of soil saturation from septic system discharges or septic system failures, the impermeable soil would be more likely to cause pathogens to enter Greers Ferry Lake via surface water runoff than via groundwater supply. These possible surface water inputs to the lake are addressed in Section 4.2.2.2.

4.2.2.2 Water Quality

Short-term and long-term indirect minor adverse effects would be expected under the No Action Alternative. Potential alterations to the existing conditions that could affect water quality in Greers Ferry Lake include the following:

- Permitted development in existing LDA's, new shoreline activity, and potential induced development.
- Increased boating activity and potential increases in pollutant runoff from marina areas.

4.2.2.2.1 Effects of Land Use Alteration on Watershed Loading

Development to the current regulatory limit within existing LDA's would increase the total number of docks on the lake from 295 to 465. These new docks would be associated with areas adjacent to the lake shoreline that are currently undeveloped. Although installation of additional private boat docks would have no direct effect on pollutant loads to Greers Ferry Lake (except for some very short-term minor sediment runoff during their installation), indirect impacts could result if new residential housing were built in conjunction with these docks. Note, however, that new houses could be constructed even if new docks are not permitted. The potential for permitting actions to induce additional growth is not known.

Short-term indirect minor adverse effects associated with clearing for development might occur because of increased siltation and erosion from construction sites and the construction of access paths, as well as potential introduction of other pollutants. The degree and extent of these short-term effects would be a direct function of construction practices and the use of appropriate best management practices (BMPs) on the construction sites.

Long-term indirect minor adverse effects would occur because of alteration of land-use conditions in the immediate watershed of Greers Ferry Lake and the resulting increased loading of pollutants. Increased loading to the lake was estimated and compared with baseline loading conditions for TP, TN, BOD, TSS, and FC. The baseline loadings, which were presented in Section 3.2.3, reflect existing land use and established loads from the upper watershed, the immediate watershed of the Upper Lake (above the Narrows), and the immediate watershed of the Lower Lake (below the Narrows). Detailed descriptions of the methodology, assumptions, and results of the loading estimates for the baseline and alternative analyses are presented in Appendix F and summarized below for the No Action Alternative. Table 4-6 presents the land use alterations used to calculate the changes in pollutant loadings from the baseline conditions.

Table 4-6
Alteration to Watershed Conditions Under Alternative 1 (No Action Alternative)

	Upper Watershed	Upper Lake Watershed	Lower Lake Watershed	Watershed Total
Land use from forested to light residential (acres)	0	244	126	370
Land use from forested to marina property (acres)	0	0	13	13
Additional septic systems	0	325	168	493

The assumptions used to estimate potential land use changes under the No Action Alternative are highly conservative. Some of the additional docks probably would not result in direct development, and in many cases development adjacent to the shoreline would be expected to occur even where a boat dock is not installed. It is expected that some of the new docks would be used by people commuting from surrounding areas, and some might be installed by people living in houses that are already on the lake. Additionally, not all new community docks would have the maximum 20 slips because of design and space restrictions. Finally, not all development associated with additional boat docks would occur within the immediate watershed area of either the Upper Lake or the Lower Lake.

Table 4-7 presents the estimated increases in loadings for TP, TN, TSS, FC, and BOD for each of the lake sections and the upper watershed. These constituents represent those considered to be affected by altered land use conditions. The baseline loadings, presented in Section 3.2.3, are provided alongside the additional loadings.

Using the baseline as a reference, the percent increase to the loadings was estimated for each constituent of concern. For the FC loadings, the additions represent changes in land use and potential additional septic systems (325 Upper Lake, 168 Lower Lake) that could be installed in the immediate vicinity of the lake.

Table 4-7 quantifies the relative effects of the land use alterations on loadings to the lake for the constituents of concern. The table presents the loading for three of the four zones discussed in Section 3.2.3.1—the upper watershed (Zone 1), the Upper Greers Ferry Lake watershed (Zone 2), and the Lower Greers Ferry Lake watershed (Zone 3) (see Figure 3-1). As was demonstrated in Section 3.2.3, the upper watershed loadings to the lake dominate the system and provide the bulk (more than 80 percent) of the loading. The remaining loadings (approximately 20 percent) come in through the two watersheds in the immediate vicinity of the Upper and Lower Lakes. A significant amount of alteration, therefore, would have to occur in the watersheds in the immediate vicinity of the lake to have more than minor effects on the loadings to the system. For the No Action Alternative, all additional development is assumed to occur in watersheds in the immediate vicinity of the lake. No changes in loads from the baseline conditions are projected to occur in the upper watershed.

Phosphorus would be the limiting factor on algal blooms and potential eutrophication of the lake; therefore, alterations to the phosphorus loads would have the greatest effect on the system. Under

Table 4-7
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 1 (No Action Alternative)

LOWER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%
BUILT IMP	229	249		2,531	2,745		4,071	4,415		12,537	13,596		1.410E+11	1.529E+11	
BUILT PER	482	556		18,176	20,946		31,986	36,861		13,292	15,318		1.766E+11	2.035E+11	
CROPLAND	190	190		826	826		8,121	8,121		1,371	1,371		1.779E+11	1.779E+11	
FOREST	1,202	1,198		20,888	20,833		610,334	608,723		127,451	127,115		8.666E+12	8.643E+12	
PASTURE	1,314	1,314		27,706	27,706		198,816	198,816		54,124	54,124		1.579E+14	1.579E+14	
WETLAND	0	0		2	2		66	66		14	14		9.384E+08	9.384E+08	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	9.110E+11	
WATERSHED	3,417.31	3,507.03	2.63	70,129	73,057.50	4.18	853,395	857,002	0.42	208,789	211,538	1.32	1.671E+14	1.680E+14	0.55

UPPER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%
BUILT IMP	201	238		2,214	2,626		3,561	4,223		10,965	13,005		1.233E+11	1.463E+11	
BUILT PER	414	556		15,604	20,951		27,460	36,871		11,411	15,322		1.516E+11	2.036E+11	
CROPLAND	226	226		980	980		9,632	9,632		1,626	1,626		2.110E+11	2.110E+11	
FOREST	1,881	1,875		32,704	32,593		955,586	952,364		199,547	198,874		1.357E+13	1.352E+13	
PASTURE	1,807	1,807		38,102	38,102		273,424	273,424		74,435	74,435		2.172E+14	2.172E+14	
WETLAND	15	15		260	260		7,581	7,581		1,582	1,582		1.075E+11	1.075E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	1.760E+12	
WATERSHED	4,543	4,716	3.81	89,863	95,513	6.29	1,277,244	1,284,094	0.54	299,566	304,844	1.76	2.313E+14	2.331E+14	0.77%

Table 4-7
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 1 (No Action Alternative) (continued)

UPPER WATERSHED

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%
BUILT IMP	187	187		2,060	2,060		3,312	3,312		10,201	10,201		1.147E+11	1.147E+11	
BUILT PER	470	470		17,699	17,699		31,147	31,147		12,944	12,944		1.720E+11	1.720E+11	
CROPLAND	2,887	2,887		12,534	12,534		123,218	123,218		20,799	20,799		2.699E+12	2.699E+12	
FOREST	12,706	12,706		220,874	220,874		6,453,838	6,453,838		1,347,701	1,347,701		9.163E+13	9.163E+13	
PASTURE	14,991	14,991		316,133	316,133		2,268,574	2,268,574		617,586	617,586		1.802E+15	1.802E+15	
WETLAND	42	42		739	739		21,543	21,543		4,495	4,495		3.056E+11	3.056E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	0.000E+00	
WATERSHED	31,281	31,281	0	570,037	570,037	0	8,901,632	8,901,632	0	2,013,725	2,013,725	0	1.897E+15	1.897E+15	0
TRIBUTARIES	31,187	31,187	0	537,536	537,536	0	8,869,931	8,869,931	0	1,939,201	1,939,201	0	1.581E+15	1.581E+15	0

TOTAL LOADS

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%	Baseline	No Action	%
BUILT IMP	616	673		6,805	7,431		10,944	11,951		33,702	36,802		3.791E+11	4.139E+11	
BUILT PER	1,366	1,581		51,478	59,595		90,592	104,878		37,647	43,584		5.001E+11	5.790E+11	
CROPLAND	3,302	3,302		14,340	14,340		140,971	140,971		23,796	23,796		3.087E+12	3.087E+12	
FOREST	15,789	15,779		274,465	274,300		8,019,758	8,014,924		1,674,699	1,673,690		1.139E+14	1.138E+14	
PASTURE	18,111	18,111		381,941	381,941		2,740,813	2,740,813		746,145	746,145		2.177E+15	2.177E+15	
WETLAND	57	57		1,001	1,001		29,191	29,191		6,091	6,091		4.140E+11	4.140E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	2.671E+12	
TO LAKE	39,147	39,410	0.67	697,528	706,106	1.23	11,000,569	11,011,027	0.10	2,447,556	2,455,583	0.33	1.979E+15	1.982E+15	0.14

the No Action Alternative the annual average phosphorus loads would be expected to increase by less than 1 percent. This is a minor impact on the overall system conditions. Although the contributions from the Upper and Lower Lake watersheds would increase 3 to 4 percent, these changes would be tempered by the overall load from the major tributaries and the upper watershed.

For TSS, the increase in the overall watershed loadings would be minor, with increases of approximately 0.1 percent. The dominant contributing land uses are forest and pastures because of their extensive coverage of the upper watershed. Contributions from the immediate Upper and Lower Lake watersheds would increase under the No Action Alternative by less than 1 percent. The analyses presented here represent typical increases found under altered land use conditions. In the immediate region of the shoreline, local effects might be greater and highly dependent on the degree of exposure of erodible soil through construction of paths and walkways. The analyses indicate that these localized effects, although potentially significant in their immediate vicinity, would not have significant effects on the overall system. Under the No Action Alternative, no vegetative buffer strip would be provided between development adjacent to the shoreline and the conservation pool elevation. Buffer strips would reduce localized erosion contributions to the lake's suspended material and turbidity levels.

For BOD, the increase in the overall loadings would be less than 0.5 percent. The immediate lake watersheds would experience increases between 1 and 2 percent. The overall effects of this increased oxygen demand would be minor.

Finally, Table 4-7 identifies agricultural areas in the upper watershed as the dominant source of FC loadings to the overall system. Alterations to land uses in the immediate vicinity of the lake and additional septic systems (with an assumed failure rate of 20 percent) do not show a significant impact on the annual average loading conditions (less than 1 percent).

4.2.2.2.2 Effects of Additional Boats and Boating Activity on Water Quality in the Lake

Long-term indirect negligible adverse effects on water quality would be expected. Increased boating activity and in-lake boat storage could affect water quality through fueling operations (accidental spills), leaching of metals from paints used on boat hulls, and increased shoreline erosion from boat wakes. Under the No Action Alternative, the total number of boat docks and boating activity on the lake would increase by approximately 58 percent and 1 percent,

respectively. Effects on water quality due to the increase of boats at docks would be expected to be negligible compared to other existing sources of contaminants associated with boating activity, such as storm water runoff from parking lots in parks and emissions from boat motors. An increase in boating activity by 1 percent would not increase boat wakes by more than a negligible amount.

4.2.2.2.3 Effects of Additional Watershed Loadings on In-Lake Water Quality

Long-term indirect minor adverse effects on annual average water quality conditions in the lake would be expected because of increased watershed loads. The previous sections identified the potential for additional loadings to the lake under the No Action Alternative for TP, TN, TSS, BOD, and FC. These loadings were quantified as an annual average loading condition, and they represent the long-term effects of this alternative. To quantify the effects of these additional long-term loads on the water quality conditions in the lake, an annual average in-lake response model was developed.

Table 4-8 presents the percent concentration changes based on the additional loadings. For all the constituents, the net change in water quality concentration is very small, less than 1 percent, in all cases for both the Upper and Lower Lakes.

Table 4-8
In-Lake Water Quality Under Alternative 1 (No Action Alternative)

	Upper Lake		
Constituent	**Watershed Load Increase[1]**	**Background[2]**	**Percent Increase[2]**
Total phosphorus (lb/year, mg/L)	173	0.020	<1
Total nitrogen (lb/year, mg/L)	5,649	0.480	<1
Total suspended solids (lb/year, mg/L)[3]	6,851	0.000	N/A
BOD (lb/year, mg/L)	5,278	1.120	<1
Total coliforms (MPN/year, MPN/100 mL)	1.79E12	14.000	<1
	Lower Lake		
Constituent	**Watershed Load Increase[1]**	**Background[2]**	**Percent Increase[2]**
Total phosphorus (lb/year, mg/L)	90	0.010	<1
Total nitrogen (lb/year, mg/L)	2,929	0.430	<1
Total suspended solids (lb/year, mg/L)	3,607	1.000	N/A
BOD (lb/year, mg/L)	2,749	0.860	<1
Total coliforms (MPN/year, MPN/100 mL)	9.27E11	24.000	<1

[1] lb/year, except total coliforms, MPN/year.
[2] mg/L, except total coliforms, MPN/100 mL.
[3] Background loads unavailable.

4.2.3 Land Use, Land Cover, and Land Use Controls

4.2.3.1 Greers Ferry Lake Shoreline

No effects on land use would result from implementation of the No Action Alternative. Under this alternative, the proportion of LDA on the lake would remain at 7 percent. Note, however, that retention of the 1994 SMP could eventually result in rezoning along the shoreline to the extent described under Alternative 5, Maximum Modification. The effects of this potential change are discussed in Section 4.6.

Long-term indirect minor adverse effects on land cover would be expected. Many of the additional 170 docks that could be installed under this alternative would have access paths leading to them, resulting in minor changes to land cover on government shoreline property. Corps regulations limit the types and amount of changes that dock owners can make when installing and maintaining access paths. Similarly, vegetative clearing within the 50-foot perimeter surrounding habitable structures could result in indirect changes to land cover on government property adjacent to the 493 new homes that could be built under this alternative. Corps regulations also limit the amount and type of vegetation modification that may occur within this perimeter area (see Table 4-1).

No effects on land use controls would occur under the No Action Alternative.

4.2.3.2 Adjacent Private Land

Long-term indirect moderate adverse effects on land use on adjacent private land would be expected. Under this alternative, the proportion of LDA on the lake would remain at 7 percent, and it would be expected that all land adjacent to existing LDA's would eventually be developed in residences.

Long-term direct moderate adverse effects on land cover would be expected. Because boat dock permit grantees must have access to the lake, it is probable that most, if not all, of the 170 potential new boat docks would have a residence associated with them. Thus, residential development on private land adjacent to the LDA's along the lake's shoreline would increase, with corresponding changes in land use from undeveloped to residential and land cover from forested to residential.

Adjacent private land development would be limited by the requirement that landowners obtain approval prior to construction or placement of structures on the flowage easement land. The

flowage easement permanently grants to the Federal government the right to flood the easement land periodically when necessitated by the need to hold floodwaters in the lake. In the lower portion of the lake, flowage easement was purchased to the 491-foot contour. In the upper tributaries, the flowage easement was purchased above 491 feet to between a 492- and 498-foot elevation, MSL, to accommodate higher water conditions due to the high inflow and backup conditions that occur in these areas during very heavy rains and runoff conditions. No habitable structure or attachment to it may be constructed below the flowage easement elevation (USACE, Little Rock District, 1993).

No effects on land use controls would occur under the No Action Alternative.

4.2.3.3 Watershed Land Use

Long-term indirect minor adverse effects on land use in the watershed would be expected. To the extent that the granting of a boat dock permit encourages residential development on adjacent private land, this development could induce growth in the surrounding communities and result in land use and land cover changes in the watershed. These changes would be a reflection of the changes to socioeconomic conditions induced by the No Action Alternative. As discussed in Section 4.2.5, these socioeconomic changes would be minor.

4.2.4 Infrastructure

Long-term direct negligible beneficial and long-term indirect negligible and minor adverse effects could be expected. Implementation of Alternative 1 would increase the number of boat docks in existing LDA's by 170, representing a 58 percent increase in the number of docks along the lake's shoreline. (The assumed locations of these new docks are shown in Figure 2-1.) Such an increase in boat docks would relieve some of the current pressure on public boat launching ramps and improve traffic circulation around those facilities. Implementation of this alternative would not, however, be expected to directly affect other infrastructure elements such as utilities.

Long-term indirect negligible and minor adverse effects on other infrastructure resources would be expected from implementation of the No Action Alternative. The permitting and installation of 170 new boat docks, yielding an additional 646 slips and approximately 133 new access paths[2] to

[2] The predicted number of associated access paths is based on an estimated 78 percent of new docks having land-based permits for access paths. Currently, 230 of the existing 295 docks (or 78 percent) have access paths.

those docks, would be expected to have minor effects on landfill capacity due to the generation of minor quantities of waste from offsite dock construction. The amount of waste generated from dock construction would be expected to be negligible. Many new docks would be expected to have electrical outlets, which would create a negligible additional electrical demand.

For this analysis, it has been assumed that each additional single-owner dock would be associated with an additional home and that each additional community slip would be associated with an additional home, for a total of 493 homes. Increased residential development would create additional demands on infrastructure over time. Depending on the physical locations of new homes (their locations on the lake, and whether they would be within developed communities), it is likely that additional residential streets would have to be constructed. Some existing local roads and collectors also might require upgrading to support additional traffic. New residential development would place additional demands on potable water supplies and wastewater treatment capabilities as well. The availability of potable water is limited by surface water storage capacities and the limited groundwater supply, as described in Section 3.2.2. Demand for wastewater treatment also would be expected to increase by a minor amount. As discussed in Section 3.4.5, some areas around the lake have soils that are limiting for the proper functioning of septic tanks. The total acreage of such areas is, however, relatively small, and those soils would not be expected to create an impediment to development. Solid waste disposal would be affected by the construction of new housing and associated infrastructure, as well as by the increased population. Construction debris associated with the addition of 493 homes would yield approximately 2,159 tons of waste materials.[3] Although local landfills would have the capacity to accept the construction debris, it would decrease the overall capacity of the landfills in the long term. Additional development also would place additional demands on police, fire, and rescue services.

4.2.5 Socioeconomic Conditions

4.2.5.1 Economic Development

Short-term direct minor and short-term and long-term indirect minor beneficial economic effects would be expected. Under the No Action Alternative, up to 170 additional private docks with 646

[3] The construction debris calculation is based on an assumption that each house would be approximately 2,000 square feet in size and yield 4.38 pounds of construction waste per square feet (based on waste generation calculations published by the USEPA in 1998).

slips could be permitted. Although the development of additional private boating docks at Greers Ferry Lake would have no direct effect on the economy of the ROI (except for some very short-term construction activities), indirect economic impacts would result if new residential housing was built in conjunction with these docks. Assuming that most or all of these residences would be occupied by new migrants to the ROI, long-term economic impacts would be generated primarily through increased levels of consumer spending. Some short-term economic impacts would also be generated through construction of the new residences. It should be noted, however, that construction of new houses might occur even if areas are not rezoned and docks permitted. The potential for permitting actions to induce additional growth is not known.

Economic impacts would be minor, however, because most indicators would increase by less than 2 percent over an assumed 5-year construction period (see Appendix C). Employment and gross regional product (GRP) are projected to increase by about 1 percent and personal income by 2 percent over baseline. Total population is projected to increase by 2.7 percent more than the baseline by the end of the 5-year period. Because the new population would likely include a significant proportion of retirees, impacts on the labor market would be minimal.

As discussed earlier, these economic and demographic projections represent the maximum potential economic effects of this alternative because they are based on the assumptions that each new slip is associated with a new housing unit and that all residents are migrants to the ROI. Other factors, including the actual availability of residential lots and the more likely scenario that some new residents would move from housing already in the ROI, would diminish the magnitude of these projections.

4.2.5.2 Environmental Justice

No effects on environmental justice would be expected. As stated in Section 3.5.5, EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* was issued to identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from Federal actions. Under the No Action Alternative, the proposed changes to the SMP would not result in adverse environmental health impacts on any affected populations.

4.2.5.3 Protection of Children

No effects on protection of children would be expected. As stated in Section 3.5.6, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was issued to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. Under the No Action Alternative, the proposed changes to the SMP would not alter the *Greers Ferry Project Office Safety Plan* or any safety measures the Corps has already established at the lake to protect the safety of the visiting public.

4.2.6 Visual and Aesthetic Resources

Long-term direct minor adverse impacts on visual and aesthetic resources would result. Under the No Action Alternative, no change would be made to the current SMP. Boat dock permits would continue to be reviewed and potentially granted in the LDA's, with up to 50 percent of the shoreline in each LDA theoretically able to accommodate boat docks. For this analysis, it was assumed that vacant shoreline at least 300 feet away from an existing dock within the LDA's could eventually have a boat dock, adding up to a potential of 170 additional boat docks. When added to the 295 existing docks (247 of which are in the existing LDA's), the lake's shoreline could eventually see 465 boat docks when the LDA's are fully developed at some undetermined time in the future.

4.2.6.1 Scenic Attractiveness

Scenic attractiveness is the scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. The potential addition of 170 boat docks in the LDA's of Greers Ferry Lake would represent a potential increase of 58 percent over the number of existing boat docks. This increase in the number of boat docks would reduce the scenic attractiveness of the lake's shoreline.

At the same time, however, allowing more boat docks on the lake itself would tend to reduce the need for the expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic attractiveness of those areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Permitting mowing up to a maximum of 50 feet from habitable structures, as currently allowed, would have no new net visual and aesthetic impacts. Although modifications would detract from the natural scenic attractiveness of the shoreline by visually contrasting with the surrounding natural vegetation, the site-specific impacts would depend on the exact nature of the modifications undertaken and the degree of landscaping maintenance provided.

4.2.6.2 Scenic Integrity

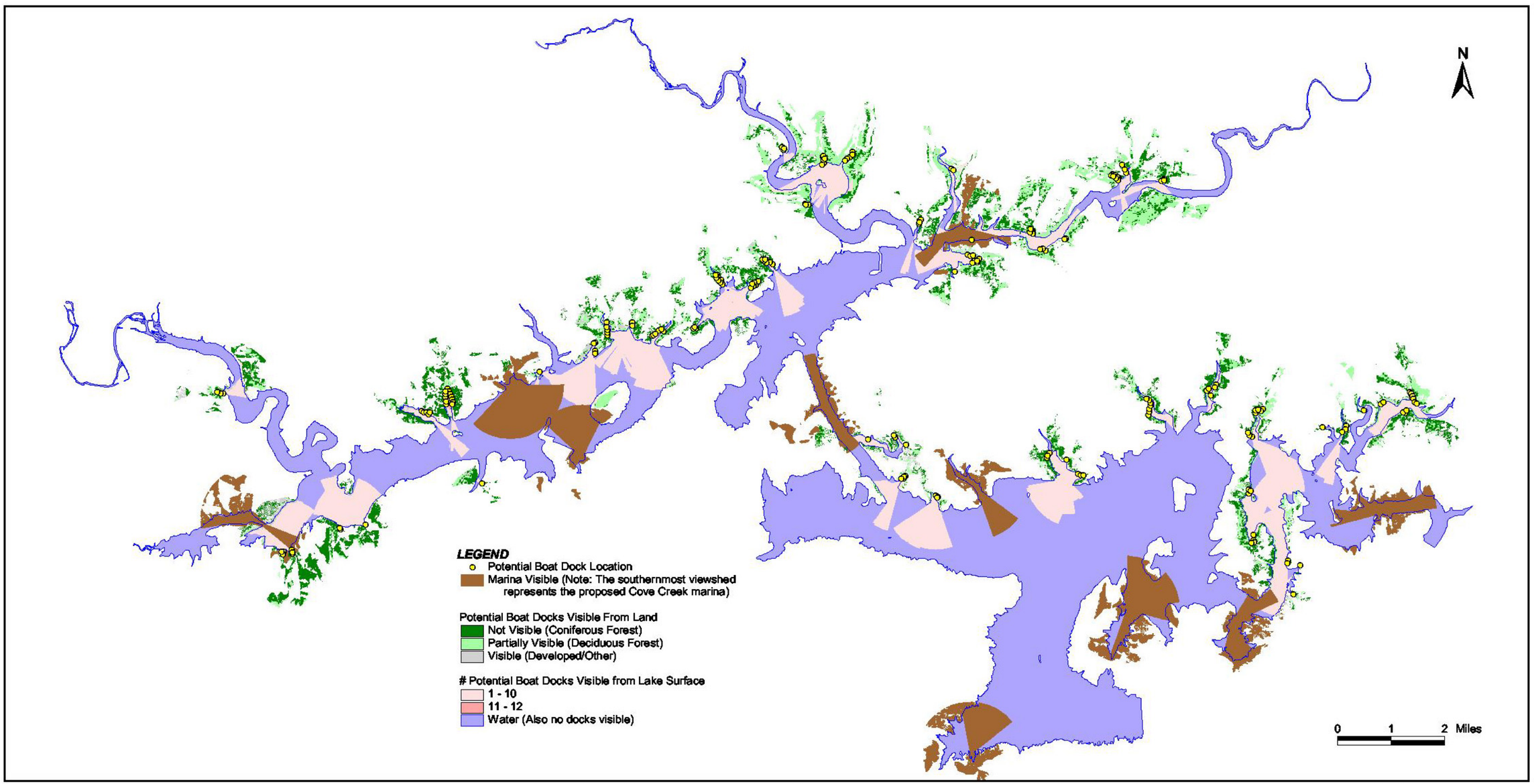
Scenic integrity is the state of naturalness or, conversely, the state of disturbance caused by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character. The potential addition of 170 boat docks in the LDA's of Greers Ferry Lake, given the current public preference for an uncluttered shoreline, would reduce the scenic integrity of the lake's shoreline because more of the shoreline would become altered from its natural state.

As with scenic attractiveness, allowing more boat docks on the lake itself would tend to reduce the need for the expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic integrity of those areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Permitting mowing up to a maximum of 50 feet from habitable structures, as currently allowed, would have no new net visual and aesthetic impacts. Although modifications would detract from the scenic integrity of the shoreline by visually contrasting with the surrounding natural vegetation, the site-specific impacts would depend on the exact nature of the modifications undertaken and the degree of landscaping maintenance provided.

4.2.6.3 Landscape Visibility

Figure 4-1 depicts areas of the lake from which the 170 new docks that potentially would be allowed in the existing LDA's under the No Action Alternative would be clearly visible. Using the 1-mile visibility range discussed in Section 3.0, one or more of the new docks would be visible from 20 percent of the lake's surface. The 170 potential new docks would be visible from some 6,400 acres of the lake, compared to the 12,000 acres where the existing boat docks are clearly visible (Table 4-9).



Potential Boat Dock Viewsheds Under Alternative 1 (No Action Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-1

THIS PAGE INTENTIONALLY LEFT BLANK.

Figure 4-2 shows the combined potential and existing boat dock viewsheds that could result from implementing the No Action Alternative. When added to the 295 existing docks, at least 1 potential or existing boat dock would be visible from 14,216 acres of water, or 45 percent of the lake's surface, with 1 to 10 docks visible from 12,871 acres of water, or 41 percent of the lake's surface (Table 4-9). Under the No Action Alternative, with new boat docks allowed on up to 50 percent of the shoreline of the lake's LDA's, maximum development of the LDA's would result in an 18 percent increase in the acreage of the lake where one or more boat docks would be clearly visible.

The largest change in boat dock viewsheds from implementing the No Action Alternative, compared to the existing situation, would be the 43 percent increase in lake acreage from which 11 to 20 boat docks would be clearly visible (from 868 acres to 1,243 acres). This increase would be particularly noticeable on the upper part of the lake, north and northeast of Sugar Loaf Mountain, in the Five Fingers area north of the Mill Creek Recreation Area, in the Middle Fork of the Little Red River, and in an arm of the Upper Lake southeast of Goodin Hollow. The channel on the eastern side of the Silver Ridge Peninsula in the lower part of the lake would also be affected, as would the upper reaches of Peter Creek (see Figure 4-2).

Table 4-9
Acreage of Lake From Which Boat Docks Are Clearly Visible:
Alternative 1 (No Action Alternative) and No Action Plus Existing Boat Docks

Number of Visible Docks	Lake Acreage		Percent of Lake's Total Surface	
	No Action	Plus Existing	No Action	Plus Existing
1-10	6,399	12,871	20	41
11-20	14	1,243	0.04	4
21-30	--	103	--	0.3
Total	6,414	14,216	20	45

Source: GIS calculations.

Figure 4-1 also shows the seen area for potential new boat docks from land surrounding the lake under the No Action Alternative. At least one dock would be potentially visible from approximately 6,445 acres of land surrounding the lake, depending on vegetative cover and season of the year. Figure 4-2 also shows the combined potential and existing boat dock viewsheds over land surrounding the lake. When added to the existing docks, at least one

potential or existing dock would be visible from 10,962 acres, an increase of 44 percent over the existing potential seen area from land over the existing situation.

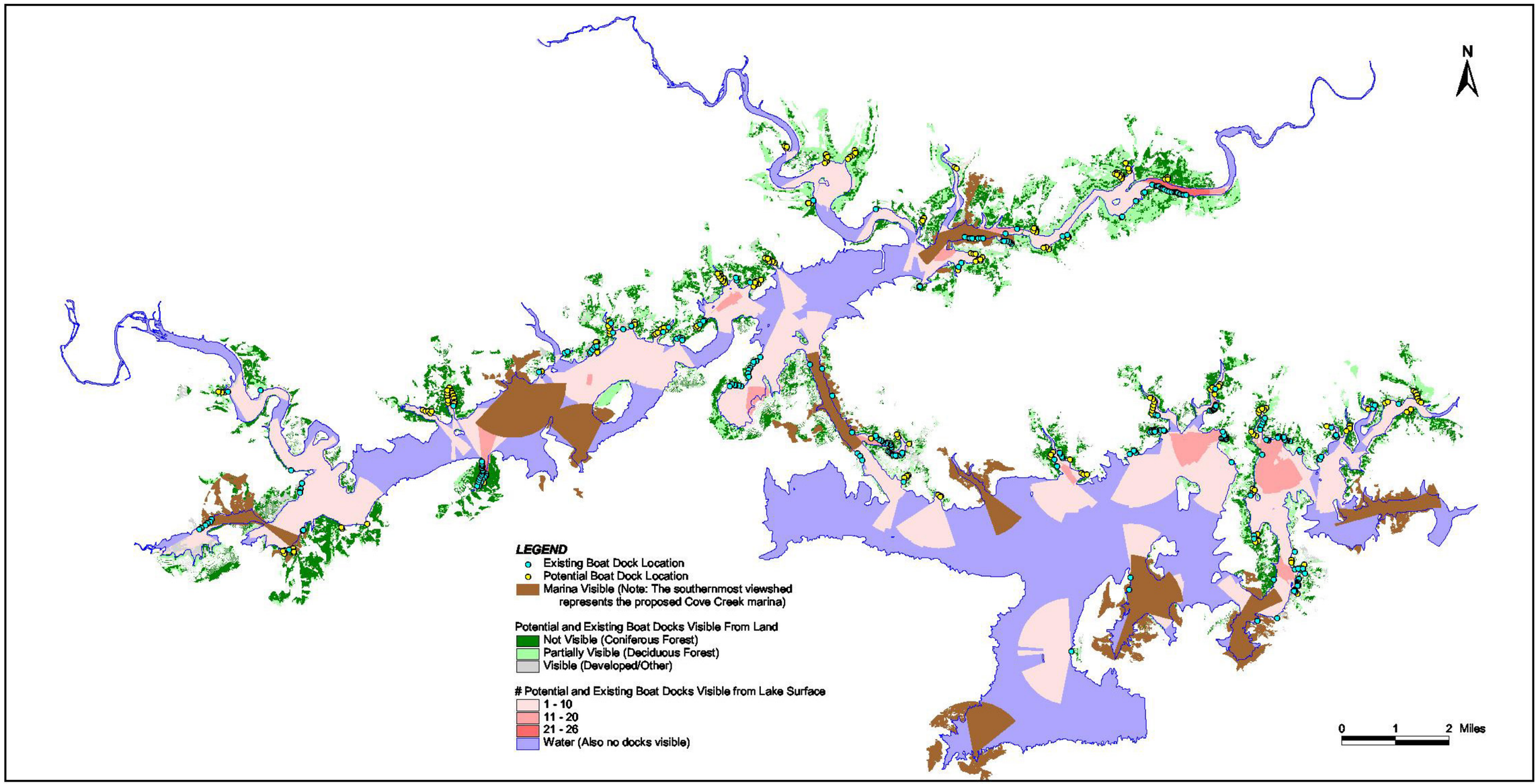
4.2.7 Recreation and Recreational Facilities

Long-term direct minor beneficial effects would be expected to result from implementation of this alternative. Under this alternative, 170 new docks would be expected to be installed in existing LDA's, and future rezoning requests to accommodate the installation of boat docks would be accepted and reviewed. This would have the effect of increasing the potential number of boaters on the lake at any one time. For every 20 additional slips (ten 2-slip private docks or one 20-slip community dock on the lake, it is estimated that there would be a one-boat increase in the total number of boats on the lake simultaneously during peak use periods. The No Action Alternative is anticipated to result in an increase of 646 boat slips. This would potentially increase the number of boats on the lake simultaneously during peak use periods by approximately 32 boats, or 2 percent. Adding more private and community docks would increase recreational opportunities on the lake.

No changes to the types of recreational activities that occur at the lake would be expected as a result of implementing this alternative. Changes to recreational facilities (campgrounds, parks, beaches, and the like) would be expected as use and popularity of the lake increase and create an additional demand for these resources. Some of this demand could be absorbed by a new 400-slip marina at the Cove Creek Park (see Cumulative Effects). It is reasonable to anticipate that some demand could be met by an increase in the availability of dry dock storage facilities in the area surrounding the lake. Access to the lake would be expected to be expanded with new launch ramps or launching lanes as necessary, reopening of the South Fork Park camping facilities, development of the Salt Creek area into a functioning park, or other changes to Corps recreational facilities. The anticipated 1 percent increase in recreational demand under the No Action Alternative would be anticipated to create a negligible need for changes to recreational facilities at the lake above baseline needs.

4.2.8 Geology and Soils

Long-term indirect minor adverse impacts on soils would be expected from maximizing development of the existing LDA's to 50 percent of their carrying capacity under the No Action Alternative. Some increase in soil disturbance would be expected in previously undisturbed areas.



Potential and Existing Boat Dock Viewsheds Under Alternative 1 (No Action Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-2

THIS PAGE INTENTIONALLY LEFT BLANK.

Short-term soil disturbance and sediment runoff would occur during residential home construction. An increase in impervious surfaces such as rooftops and roads would increase surface runoff and, thus, increase the potential for soil erosion. Increased development adjacent to Protected Areas and LDA's would increase the acreage of land with vegetation modification within 50 feet of habitable structures. The reduction in vegetative cover could increase soil erosion. It is assumed, however, that a grassy cover would remain in modified areas and bare soil would not be exposed, thus limiting the amount of soil erosion.

Short-term direct negligible adverse impacts and long-term indirect minor beneficial and adverse impacts on soils would be expected from the installation of private and community boat docks. Installation of docks could temporarily increase soil erosion when docks are anchored to the shoreline. Boat docks, however, also minimize erosion by storing watercraft at the dock, which is less disruptive to soils than boats being dragged on and off the shore. Docks also reduce shoreline erosion by attenuating waves and boat wakes. Users of boat docks may cause some soil disturbance as they walk over soils to access docks. In addition, activities on the new docks and the small increase in boating activity projected to occur under this alternative might increase wave action and hence cause some shoreline erosion.

No impacts on prime farmland soils or unique farmlands currently used for agriculture are expected under this alternative.

4.2.9 Ecological Systems

Long-term direct and indirect minor adverse effects on vegetative communities, wildlife, and sensitive species would be expected. Potential new residential development over time adjacent to LDA's and Protected Areas would be expected to have minor adverse impacts on vegetation and wildlife. According to the methodology for analyzing alternatives, under this alternative there is the potential for 493 new homes to be built in the watershed, resulting in 370 acres in the watershed converted from forested acres to residential acres (Table 4-5). Residential land use would be expected to eliminate vegetation and wildlife from formerly forested habitat. Only species tolerant of human disturbance (e.g., deer, squirrel) would be expected to remain common in disturbed areas. Future development of permanent structures and associated land clearing would also be expected to have minor adverse impacts on sensitive species.

Vegetation modification on Corps property would be expected to have minor adverse impacts on natural vegetation. The amount of Corps property that could be affected by mowing within 50 feet of habitable structures is 687 acres, or 11.2 percent of the total Corps property in LDA and Protected Shoreline Area. Of this total, 90.1 acres of LDA and 596.9 acres of Protected Shoreline Area would be affected, or 20.6 percent and 10.5 percent of the total LDA and Protected Shoreline Area, respectively. The 687 acres is the maximum that could be affected if the foundations of houses were located as close as possible to Corps property, which would be on either the Corps property line or the edge of the flowage easement. Since it is unlikely that all houses would be located as close as possible to Corps property, less than 687 acres would be expected to be affected by mowing under Alternative 1.

Soil erosion and increased runoff to the lake were cited as potential impacts of vegetation modification and access path permits. Forest vegetation in shoreline areas intercepts sediment, pesticides, nutrients, and other materials in surface runoff and reduces nutrients and other pollutants in shallow subsurface water flow. Trees and shrubs adjacent to the lake provide food and cover for wildlife, shade aquatic habitats near shore, and increase the resistance of the shoreline to erosion caused by high water or waves (USDA-NRCS, 1998). A USFWS biologist raised concerns that reduction in lakeshore underbrush would reduce habitat for insects that are food for the endangered gray bat (Rogers, 2001 in Appendix G). Minor adverse impacts on sensitive plant species would be expected as a result of vegetation modification and path permits. Seventeen State-listed rare plant species could fall into the size category of underbrush eligible to be removed under a vegetation modification permit (Table 3-34). Because some rare plants are difficult to identify, even by experts, there is a risk that these plants could be harmed unintentionally by landowners otherwise in compliance with vegetation modification or access path permits.

Insignificant effects on aquatic wildlife would be expected from installing 170 potential new boat docks under this alternative. Floating docks block light to the lake, which can result in localized environmental effects on aquatic plants and wildlife (Chmura and Ross, 1978). A small dock with only one or two slips would be expected to shade only a small portion of the lake. The location of the shaded area would move during the day as the sun changed position relative to the dock, making it unlikely that a large area would be continuously shaded. Continuous shading could reduce or eliminate aquatic plants under docks. Floating docks and breakwaters can act as fish attractors and provide substrate for other aquatic organisms (USACE, 1993). Small docks widely

spaced along the shoreline would not be expected to significantly alter fish population dynamics in the lake. Large community docks densely arranged could shade significant portions of the lake bottom and attract significant numbers of fish in the immediate area. Overall, factors such as water quality, yearly spawning success, and fish stocking by wildlife agencies would be expected to have a greater effect on fish populations in the lake than 170 potential new boat docks arranged along 276 miles of shoreline.

Except for one bald eagle nest, no sensitive habitats (as defined in Section 3.9.4) occur within the scope of the SMP, and therefore none would be affected by the No Action Alternative. No impacts would be expected from maintaining current regulations for grandfathered docks. No impacts would be expected from maintaining separate rules for restrictions on boats with sleeping quarters and/or MSDs.

4.2.10 Cultural Resources

Long-term direct and indirect minor adverse effects on cultural resources would be expected. Effects could range from negligible to moderate depending on the type and size of site affected and the extent of soil disturbance or other potential adverse effects. The direct adverse impacts would include the destruction of archeological sites that might be NRHP-eligible or the demolition or alteration of NRHP-listed or eligible historic structures, such as buildings or statues. Under this alternative, there would be no changes to the 1994 SMP. Rezoning could be considered at the next SMP review. Direct adverse effects could be expected along the shoreline, caused by erosion due to wave action from increased boating activities, soil disturbance caused by construction, and looting and treasure hunting caused by increased activity and foot traffic. Archeological sites and historic structures would be affected by associated development pressures, including new construction of residential (including vacation) and commercial structures and required infrastructure. Additional construction would disturb the soil and might affect archeological sites that could be NRHP-eligible. Pressures on existing historic structures that might be NRHP-eligible could cause demolition or alteration of such standing structures. Potential development areas have not yet been identified. The Corps has no control over development on private lands; however, National Historic Preservation Act Section 106 is invoked whenever a Federal agency issues a permit. During this Section 106 process any potential NRHP-eligible resource would be identified and the SHPO would be consulted. Apart from this process, outside Heber Springs there are no land use controls such as zoning and building permits to protect cultural resources.

4.2.11 Air Quality

Long-term indirect minor adverse effects on air quality would be expected. Under the No Action Alternative, population growth in the ROI would be expected to be less than 2 percent above baseline from 2000 to 2010, which would increase automobile traffic in the region by a proportionate amount. The significance of the additional traffic on air quality is difficult to estimate quantitatively because of the lack of air quality monitoring in the region, which would provide data on air quality during past recreational seasons. Qualitatively, it is anticipated that the additional traffic due to implementation of this alternative would have negligible effects on air quality. The region and Arkansas continue to be attainment areas for all criteria air pollutants.

The No Action Alternative would not be expected to result in appreciable increases in other activities that would result in additional air emissions, including construction and industry.

4.2.12 Hazardous and Toxic Substances

Long-term indirect minor beneficial and adverse effects would occur from implementation of the No Action Alternative. The installation of an additional 170 boat docks in existing LDA's would increase the quantities of dock materials, including metals, paint, plastics, and wood, along the shoreline. Activities on these docks would be expected to increase the quantities of potentially harmful substances—such as cleansers used for boat cleaning, boat motor oil products and solvents, and boat paints and other maintenance products—used on or near the lake. The new docks would be expected to not affect or to decrease recreational activity in parks on the lake and, therefore, to not affect or to decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect. The anticipated 1 percent increase in boating activity due to installation of the new docks would have negligible or minor effects on the quantities of oil and fuel released to the lake from boat motors. No changes are expected in the District's operational management of the docks including concessions. No impacts, therefore, are anticipated from concession activities.

4.2.13 Noise

Short-term indirect minor and long-term indirect negligible adverse effects would result under the No Action Alternative. Short-term indirect minor adverse effects due to construction noise could result if new residential housing was built in conjunction with the new docks. Noise from construction activities is limited temporally to the period and hours of construction and spatially

to the area near the construction site. Note also that construction of new houses might occur even if docks are not permitted. The potential for the granting of dock permits to induce additional growth is not known.

Under the No Action Alternative, the total number of boat slips on the lake would increase. This could have the effect of increasing the potential number of boaters on the lake at any one time. The total number of boats on the lake simultaneously during peak use periods would be expected to increase by approximately 1 percent under this alternative and result in a negligible long-term increase in boat noise.

4.2.14 Summary of Effects Under Alternative 1, the No Action Alternative

No significant beneficial or adverse effects would be expected under Alternative 1. Implementation of the No Action Alternative would have no effect on some resource areas and would have both short-term and long-term direct and indirect effects on other resource areas on Greers Ferry Lake and in the surrounding region. Where effects are anticipated, they would be either adverse and beneficial. The severity of these effects ranges from negligible to moderate. None of the expected effects would meet or exceed significance criteria as described in Section 4-1. Table 4-10 presents a summary of the environmental and socioeconomic consequences of the No Action Alternative for each resource area. No violations of Federal, State, and local laws (as summarized in Table 1-1) would be expected to occur if the No Action Alternative was implemented.

Summary of Cumulative Effects. As described in Section 3.3.3, there has been minor development in the region since the impoundment of the Little Red River. A 400-slip marina is proposed to be constructed at Cove Creek regardless of which alternative is implemented, and growth in the region is likely to occur regardless of whether the Corps implements the No Action Alternative. House construction along the lake shoreline is also not dependent on the granting of boat dock permits, and it is likely that some of this construction would occur regardless of the Corps' chosen alternative for the SMP. It is likely, therefore, that some shoreline or nearshore habitat will be lost to development, and this loss might be incrementally larger under the No Action Alternative. This development and land cover change would give the lake a somewhat more developed look, though it is likely that without significant growth in the surrounding region, the lake will retain its largely rural character.

Table 4-10
Environmental Effects Summary for Alternative 1 (No Action Alternative)

Resource Area	Direct Effects	Indirect Effects	Cumulative Effects
Greers Ferry Lake Watershed	No effects	Short-term and long-term minor adverse	Long-term minor adverse
Land Use, Land Cover, and Land Use Controls	Long-term moderate adverse	Long-term minor adverse	Long-term minor adverse
Infrastructure	Long-term negligible beneficial	Long-term negligible and minor adverse	Long-term minor adverse
Socioeconomics	Short-term minor beneficial	Short-term and long-term minor beneficial	Long-term minor beneficial
Visual and Aesthetic Resources	Long-term minor adverse	No effects	Long-term minor adverse
Recreation and Recreational Facilities	Long-term minor beneficial	No effects	Long-term minor adverse
Geology and Soils	Short-term negligible adverse	Long-term minor beneficial and adverse	Long-term minor adverse
Ecological Systems	Long-term minor adverse	Long-term minor adverse	Long-term minor adverse
Cultural Resources	Long-term minor adverse	Long-term minor adverse	Long-term minor adverse
Air Quality	No effects	Long-term minor adverse	Long-term minor adverse
Hazardous and Toxic Substances	No effects	Long-term minor beneficial and adverse	Long-term minor adverse
Noise	No effects	Short-term minor and long-term negligible adverse	Long-term negligible adverse

Growth in the region and surrounding states is likely to increase demand for use of park facilities at the lake and recreational activity on the lake, and the increase in the number of boat docks allowed under this alternative could help alleviate some of the future demand for the lake's recreational facilities while overall not leading to a noticeable increase in recreational activity on the lake.

4.2.15 Mitigation Measures for Alternative 1, No Action Alternative

The Corps of Engineers' *Greers Ferry Lake Rezoning Request Evaluation Criteria*, provided in Appendix A, describes elimination factors as well as physical and managerial criteria employed in determining whether a rezoning request could be approved. The use of these elimination

factors serves as mitigation in that implementing these criteria and denying a rezoning request avoids adverse impacts. For example, if any significant environmental, ecological, or cultural features are present, the rezoning request would be denied. The Corps of Engineers would continue to apply the Evaluation Criteria in reviewing and approving requests for rezoning and permits. The Corps would also continue to conduct annual inspections of permits to ensure compliance with permit provisions.

The Corps, in coordination with the Arkansas Department of Environmental Quality (ADEQ), should continue to monitor water quality for pollutants to assess present conditions and evaluate future changes and effects of activity on water quality.

Where soils would be disturbed by anchoring docks, installing access paths, and constructing homes, BMPs for reducing sediment runoff—such as silt fences, revegetating disturbed areas as soon as possible, and phasing construction to minimize the total area of soil disturbed at any one time—could be used by those performing the work.

Prior to any disturbance or land use change on or adjacent to the shoreline, the SHPO should be contacted concerning the presence of historic and cultural resources on the proposed site. Mitigation measures recommended by the SHPO should be used. It may be advantageous to consider executing a Programmatic Agreement (PA) among the Corps of Engineers, the Advisory Council on Historic Preservation and the Arkansas SHPO. A PA streamlines the Section 106 process by stipulating under what conditions Section 106 tasks would be completed. For example, the PA could include or exclude certain actions on the part of the Corps of Engineers, or certain types of historic resources. The PA could provide documented compliance with Section 106 of the National Historic Preservation Act, as well as the framework for site-specific coordination with the SHPO, as needed, and subject to modification or revision over time.

4.3 ALTERNATIVE 2: APPROVAL OF REZONING REQUESTS MEETING THE 80 PERCENT CRITERIA

4.3.1 Introduction

Alternative 2 is similar to the previously approved 2000 SMP, though it has been reduced in scope as a result of public input. No future rezoning requests would be accepted under this alternative. The 93 rezoning requests that met the 80 percent criteria for permit approval during the 1999 review of the 1994 SMP would be allowed. (See Appendix A for the *Greers Ferry Lake*

Rezoning Request Evaluation Criteria.) The existing docks and potential extent of rezoning are shown in Figure 2-4. Table 4-5 shows the number of docks that could be approved under this alternative. A minimum buffer from the vegetated edge of the shoreline inland for 50 feet, where mowing would be prohibited, would be established for Corps property. Permits for mowing from habitable structures could be increased from 50 to 100 feet, except where mowing would conflict with the vegetative buffer strip. Restrictions on boats with sleeping quarters and/or MSDs would be revised to conform with State law and Corps regulation. Grandfathered docks would be allowed to be improved or reconstructed to alternative dimensions, or the locations of existing grandfathered docks would be reallocated outside park buffer zones or prohibited areas.

4.3.2 Greers Ferry Lake Watershed

4.3.2.1 Hydrogeology/Groundwater

No effects on groundwater are anticipated under the 80 Percent Rezoning Criteria Alternative because of the generally impermeable soil of the underlying Western Interior Plains Confining System. Vegetation modifications are not expected to have an impact on groundwater resources.

Under the 80 Percent Rezoning Criteria Alternative, 547 additional septic systems are projected to be installed in the Greers Ferry Lake watershed as part of local development associated with the potential increase in new docks. In the event of soil saturation from septic system discharges or mass septic system failure in the area, the impermeable nature of the soil would be more likely to cause pathogens to enter Greers Ferry Lake via surface water runoff than via groundwater supply. These possible surface water inputs to the lake are addressed in Section 4.3.2.2

4.3.2.2 Water Quality

Short- and long-term indirect minor adverse effects and long-term direct minor beneficial effects would be expected under Alternative 2. Potential alterations to existing conditions that could affect water quality in Greers Ferry Lake include the following:

- Permitted development in existing and rezoned LDA's, resulting new shoreline activity, and potential induced development.

- Increased boating activity and potential increases in pollutant runoff from potential additional marina area.

- Increased ground disturbance from expanded mowing.
- Decreased erosion from establishment of a 50-foot vegetative buffer strip.

4.3.2.2.1 Effects of Land Use Alteration on Watershed Loading

Short- and long-term indirect minor adverse effects and long-term direct minor beneficial effects would be expected. The additional docks within the present LDA's approved under the 1994 SMP would not be associated with existing houses on the lake shoreline. It is assumed, therefore, that the introduction of new docks would result in additional development along the lake shoreline and potentially within the immediate watershed of Greers Ferry Lake. Although the development of additional private boating docks would have no direct effect on pollutant loads to Greers Ferry Lake (except for some very short-term construction activities), indirect impacts would result if new residential housing was built in conjunction with these docks. It should be noted, however, that construction of new houses might occur even if areas are not rezoned and docks permitted. The potential for permitting actions to induce additional growth is not known. For all new docks an assumption is made that 90 percent would be associated with single-family dwellings while 10 percent would be community docks. Each community dock is assumed to be associated with a number of homes equal to the number of slips.

For the rezoned areas, 19 of the 93 docks currently do not have upland development; therefore, new development would be associated with only 19 of the 93 docks. This number is based on examination of present GIS coverages for the lake.

Short-term indirect minor adverse impacts associated with clearing for development might occur due to increased siltation and erosion from building sites and construction of pathways, as well as the potential introduction of other pollutants. The degree and extent of these short-term impacts would be a direct function of construction practices and the use of appropriate BMPs on the construction sites.

Long-term indirect minor adverse effects would occur because of alteration of land-use conditions in the immediate watershed of Greers Ferry Lake and the resulting increased loading of pollutants. Increased loadings to the lake were estimated and compared with baseline loading conditions for TP, TN, BOD, TSS, and FC. The baseline loadings, presented in Section 3.2.3, reflect existing land use and established loadings from the upper watershed, the immediate watershed of the Upper Lake (above the Narrows), and the immediate watershed of the Lower

Lake (below the Narrows). Detailed descriptions of the methodology, assumptions, and results of the loading estimates for the baseline and alternative analyses are presented in Appendix F and summarized here for Alternative 2. Table 4-11 presents the land use alterations used to calculate the changes in pollutant loadings from the baseline conditions.

Table 4-11
Alteration to Watershed Conditions Under Alternative 2
(80 Percent Rezoning Criteria Alternative)

	Upper Watershed	Upper Lake Watershed	Lower Lake Watershed
Land use from forested to light residential (acres)	0	257	154
Land use from forested to marina property (acres)	0	0	13
Additional septic systems	0	342	205

The assumptions used to estimate land use changes under this alternative are highly conservative. Some of the additional docks would not result in direct development. In many cases, however, shoreline development might occur even if a boat dock is not installed. It is expected that some of the new docks would be used by people commuting from surrounding areas, and some might be used by existing houses on the lake. Additionally, not all community docks would be built out to their full 20-slip capacity because of design and space restrictions. Finally, not all development associated with additional boat slips would occur within the immediate watershed area of either the Upper Lake or the Lower Lake.

Table 4-12 presents the estimated increases in loadings for TP, TN, TSS, FC, and BOD for each of the lake sections and the upper watershed. These constituents represent those considered to be affected by the altered land use conditions. The baseline loads, presented in Section 3.2.3, are provided alongside the additional loadings.

Using the baseline as a reference, the percent increase to the loadings was estimated for each constituent of concern. For the FC loadings, the additions represent changes in land use as well as the additional septic systems (342 Upper Lake, 205 Lower Lake) to be built in the immediate vicinity of the lake (Appendix F).

Table 4-12 quantifies the relative effects of the land use alterations on loadings to the lake for the constituents of concern. For the 80 Percent Rezoning Criteria Alternative, all additional

Table 4-12
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 2 (80 Percent Rezoning Criteria Alternative)

LOWER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%
BUILT IMP	229	253		2,531	2,793		4,071	4,491		12,537	13,830		1.410E+11	1.556E+11	
BUILT PER	482	572		18,176	21,566		31,986	37,953		13,292	15,772		1.766E+11	2.095E+11	
CROPLAND	190	190		826	826		8,121	8,121		1,371	1,371		1.779E+11	1.779E+11	
FOREST	1,202	1,198		20,888	20,819		610,334	608,320		127,451	127,031		8.666E+12	8.637E+12	
PASTURE	1,314	1,314		27,706	27,706		198,816	198,816		54,124	54,124		1.579E+14	1.579E+14	
WETLAND	0	0		2	2		66	66		14	14		9.384E+08	9.384E+08	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	1.140E+12	
WATERSHED	3,417	3,527	3.21	70,129	73,712	5.11	853,395	857,767	0.51	208,789	212,142	1.61	1.671E+14	1.682E+14	0.69

UPPER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%
BUILT IMP	201	240		2,214	2,648		3,561	4,259		10,965	13,115		1.233E+11	1.475E+11	
BUILT PER	414	564		15,604	21,238		27,460	37,376		11,411	15,532		1.516E+11	2.063E+11	
CROPLAND	226	226		980	980		9,632	9,632		1,626	1,626		2.110E+11	2.110E+11	
FOREST	1,881	1,875		32,704	32,589		955,586	952,231		199,547	198,846		1.357E+13	1.352E+13	
PASTURE	1,807	1,807		38,102	38,102		273,424	273,424		74,435	74,435		2.172E+14	2.172E+14	
WETLAND	15	15		260	260		7,581	7,581		1,582	1,582		1.075E+11	1.075E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	1.870E+12	
WATERSHED	4,543	4,725	4.01	89,863	95,817	6.63	1,277,244	1,284,503	0.57	299,566	305,136	1.86	2.313E+14	2.332E+14	0.82

Table 4-12
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 2 (80 Percent Rezoning Criteria Alternative) (continued)

UPPER WATERSHED

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%
BUILT IMP	187	187		2,060	2,060		3,312	3,312		10,201	10,201		1.147E+11	1.147E+11	
BUILT PER	470	470		17,699	17,699		31,147	31,147		12,944	12,944		1.720E+11	1.720E+11	
CROPLAND	2,887	2,887		12,534	12,534		123,218	123,218		20,799	20,799		2.699E+12	2.699E+12	
FOREST	12,706	12,706		220,874	220,874		6,453,838	6,453,838		1,347,701	1,347,701		9.163E+13	9.163E+13	
PASTURE	14,991	14,991		316,133	316,133		2,268,574	2,268,574		617,586	617,586		1.802E+15	1.802E+15	
WETLAND	42	42		739	739		21,543	21,543		4,495	4,495		3.056E+11	3.056E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	0.000E+00	
WATERSHED	31,281	31,281	0	570,037	570,037	0	8,901,632	8,901,632	0	2,013,725	2,013,725	0	1.897E+15	1.897E+15	0.00
TRIBUTARIES	31,187	31,187	0	537,536	537,536	0	8,869,931	8,869,931	0	1,939,201	1,939,201	0	1.581E+15	1.581E+15	0.00

TOTAL LOADS

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%	Baseline	80% Alt	%
BUILT IMP	616	679		6,805	7,501		10,944	12,062		33,702	37,146		3.791E+11	4.178E+11	
BUILT PER	1,366	1,605		51,478	60,503		90,592	106,476		37,647	44,248		5.001E+11	5.878E+11	
CROPLAND	3,302	3,302		14,340	14,340		140,971	140,971		23,796	23,796		3.087E+12	3.087E+12	
FOREST	15,789	15,778		274,465	274,281		8,019,758	8,014,389		1,674,699	1,673,578		1.139E+14	1.138E+14	
PASTURE	18,111	18,111		381,941	381,941		2,740,813	2,740,813		746,145	746,145		2.177E+15	2.177E+15	
WETLAND	57	57		1,001	1,001		29,191	29,191		6,091	6,091		4.140E+11	4.140E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	3.010E+12	
TO LAKE	39,147	39,439	0.75	697,528	707,065	1.37	11,000,569	11,012,201	0.11	2,447,556	2,456,480	0.36	1.979E+15	1.982E+15	0.15

development is assumed to occur within the immediate watersheds of the Upper and Lower Lakes; therefore, no changes in loads from the baseline conditions are seen within the upper watershed.

Phosphorus would be the limiting factor on algal blooms and potential eutrophication of the lake; therefore, alterations to the phosphorus loadings would have the greatest effect on the system. Under Alternative 2 the annual average phosphorus loads would be expected to increase by less than 1 percent. This is a minor impact on the overall system conditions. Although the contributions from the Upper and Lower Lake watersheds would increase 3 to 4 percent, these changes would be tempered by the overall loadings from the major tributaries and the upper watershed. Under Alternative 2, a 50-foot vegetative buffer strip would be provided between upland development and the conservation pool. This buffer strip provides some interception of nutrient loadings to the system.

For TSS, the increase in the overall watershed loadings would be negligible, with increases of less than 0.2 percent. The dominant contributing land uses are forest and pastures because of their extensive coverage of the upper watershed. The contributions from the immediate Upper and Lower Lake watersheds would increase under Alternative 2 by less than 1 percent. The analyses presented here represent typical increases found under altered land use conditions. In the immediate region of the shoreline, localized effects might be greater and would be highly dependent on the degree of exposure of erodible soil through construction of paths and walkways. The analyses indicate that these localized effects, although potentially significant in their immediate vicinity, would not have significant effects on the overall system. Under Alternative 2, a 50-foot vegetative buffer strip between upland development and the conservation pool would be created. The creation of a buffer strip would reduce localized erosion contributions to the lake's suspended material and turbidity levels.

For BOD, the increase in the overall loadings would be less than 0.5 percent. The immediate lake watersheds would experience increases between 1 and 2 percent. The overall effects of this increased oxygen demand would be minor.

Finally, Table 4-12 identifies agricultural areas in the upper watershed as the dominant source of FC loads to the overall system. Alterations to land uses in the immediate vicinity of the lake and

additional septic systems (with a 20 percent assumed failure rate) do not show a significant impact on the annual average loading conditions (less than 1 percent).

4.3.2.2.2 Effects of Additional Boats and Boating Activity on Water Quality in the Lake

Long-term indirect negligible adverse effects on water quality would be expected. Increased boating activity and in-lake boat storage could affect water quality through fueling operations (accidental spills), leaching of metals from paints used on boat hulls, and increased shoreline erosion from boat wakes. Under Alternative 2, the total number of boat docks and boating activity on the lake would increase by approximately 89 percent and 1.5 percent, respectively. Effects on water quality due to the increase of boats at docks would be expected to be negligible compared to other existing sources of contaminants associated with boating activity, such as storm water runoff from parking lots in parks and emissions from boat motors. An increase in boating activity by 1.5 percent would not increase boat wakes by more than a negligible amount.

4.3.2.2.3 Effects of Additional Watershed Loadings on In-Lake Water Quality

Long-term indirect minor adverse impacts on the annual average water quality conditions in the lake would be expected due to increased watershed loadings. The previous sections identified the potential for additional loadings to the lake under Alternative 2 for TP, TN, TSS, BOD, and FC. These loadings were quantified as an annual average loading condition, and they represent the long-term effects of this alternative. To quantify the effects of these additional long-term loads on the water quality conditions in the lake, an annual average in-lake response model was developed.

Table 4-13 presents the percent concentration changes based on the additional loadings. For all the constituents the net change in water quality concentration is very small, less than 1 percent, in all cases for both the Upper and Lower Lakes. Because the Lower Lake has higher volume and also fewer total increased inputs (because most watershed flow enters the Upper Lake and passes through the Narrows to the Lower Lake), the effects of the increased loadings are even less in the Lower Lake.

4.3.3 Land Use, Land Cover, and Land Use Controls

4.3.3.1 Greers Ferry Lake Shoreline

No direct effects on land use would be expected. Because the boat docks would be allowed under Alternative 2, no conflicts with existing land use plans or policies would result; thus, no direct

Table 4-13
In-Lake Water Quality Under Alternative 2 (80 Percent Rezoning Criteria)

Constituent	Upper Lake		
	Watershed Load Increase[1]	Background[2]	Percent Increase[2]
Total phosphorus (lb/year, mg/L)	182	0.020	<1
Total nitrogen (lb/year, mg/L)	5,954	0.480	<1
Total suspended solids (lb/year, mg/L)[3]	7,259	0.000	N/A
BOD (lb/year, mg/L)	5,570	1.120	<1
Total coliforms (MPN/year, MPN/100 mL)	1.901E12	14.000	<1
Constituent	**Lower Lake**		
	Watershed Load Increase[1]	Background[2]	Percent Increase[2]
Total phosphorus (lb/year, mg/L)	110	0.010	<1
Total nitrogen (lb/year, mg/L)	3,583	0.430	<1
Total suspended solids (lb/year, mg/L)	4,373	0.000	N/A
BOD (lb/year, mg/L)	3,353	0.860	<1
Total coliforms (MPN/year, MPN/100 mL)	1.159E12	24.000	<1

[1] lb/year, except total coliforms, MPN/year.
[2] mg/L, except total coliforms, MPN/100 mL.
[3] Background loads unavailable.

adverse impact on land (water) use would ensue. The potential indirect impacts of this change in land use/land cover along the shoreline also are addressed in Section 4.3.2, Greers Ferry Lake Watershed; Section 4.3.6, Visual and Aesthetic Resources; Section 4.3.9, Ecological Resources; and Section 4.3.10, Cultural Resources.

Long-term direct minor beneficial and adverse impacts on land cover would be expected. Under the 80 Percent Rezoning Criteria Alternative, the lakeshore could eventually have 558 boat docks when all of the approved boat docks are built at some uncertain time in the future. (The locations of these approved docks are shown in Figure 2-4.) This would represent an 89 percent increase in the number of boat docks on the shoreline. Many of the additional docks would have access paths leading to them, resulting in minor changes to land cover on government shoreline property. Corps regulations limit the types and amount of changes that dock owners can make when installing and maintaining access paths. Similarly, vegetative clearing within a 100-foot perimeter surrounding habitable structures could result in changes to land cover on government property adjacent to the 547 new homes that could be built under this alternative. Corps regulations limit the amount and type of vegetation modification that may occur within this perimeter area (see

Table 4-1). The establishment of a 50-foot vegetative buffer strip along the shoreline would protect and preserve vegetation.

No effects on land use controls would occur under Alternative 2.

4.3.3.2 Adjacent Private Land

No direct effects on land use would be expected. Although use of private land adjacent to the lake's shoreline would change under the 80 Percent Rezoning Criteria Alternative, no conflicts with land use plans or policies would exist; thus, no direct adverse impacts on land use would ensue.

Long-term indirect minor beneficial and adverse impacts on land cover on adjacent private land would be expected. Because boat dock permit grantees must have access to the lake, it is probable that most, if not all, of the 263 potential new boat docks would have a residence associated with them. Thus, residential development on private land adjacent to the LDA's along the lake's shoreline would increase. There would most likely be some modification to vegetation, including an increase in lawn grass cover. Establishment of a 50-foot vegetative buffer strip along the shoreline would protect vegetation. The potential indirect impacts of this change in land cover along the shoreline also are addressed in Section 4.3.2, Greers Ferry Lake Watershed; Section 4.3.6, Visual and Aesthetic Resources; Section 4.3.9, Ecological Resources; and Section 4.3.10, Cultural Resources.

No effects on land use controls would be expected. Residential development on private land adjacent to the LDA's along the lake's shoreline would increase, but such development would have to comply with county and local zoning ordinances and community subdivision regulations. In addition, adjacent private land development would be limited by the requirement that landowners obtain approval before construction or placement of structures on the flowage easement land. The flowage easement permanently grants to the Federal government the right to flood the easement land periodically when necessitated by the need to hold floodwaters in the lake. In the lower portion of the lake, flowage easement was purchased to the 491-foot contour. In the upper tributaries, the flowage easement was purchased above 491 feet to between a 492- and 498-foot elevation, MSL, to accommodate higher water conditions due to the high inflow and backup conditions that occur in these areas during very heavy rains and runoff conditions. No habitable structure or attachment to it may be constructed below the flowage easement elevation,

and no septic system may be placed below the flowage easement elevation. (USACE, Little Rock District, 1993).

4.3.3.3 Watershed Land Use

No impacts on land use in the watershed would be expected. To the extent that the availability of boat docks encourages residential development on adjacent private land, this residential development would tend to generate its own indirect and induced employment and population growth in the surrounding communities (see Section 4.3.5, Socioeconomic Conditions). Such development would change land use/land cover in the watershed. However, all such development would be subject to relevant county and community land use zoning, comprehensive plans, and subdivision regulations governing development. Therefore, it would not conflict with applicable land use plans, policies, or controls and thus no adverse impact on land use would result. The potential indirect impacts of this change in land use/land cover along the shoreline are addressed in Section 4.3.2, Greers Ferry Lake Watershed; Section 4.3.6, Visual and Aesthetic Resources; Section 4.3.9, Ecological Resources; and Section 4.3.10, Cultural Resources.

4.3.4 Infrastructure

Long-term direct negligible beneficial effects and long-term indirect minor adverse effects on infrastructure could be expected. Implementation of Alternative 2 would increase the number of boat docks in existing LDA's by 263, representing an 89 percent increase in the number of docks along the lake's shoreline. (The assumed locations of these new docks are shown in Figure 2-1.) Such an increase in boat docks would relieve some of the current pressure on public boat launching ramps and improve traffic circulation around those facilities. Implementation of this alternative would not, however, be expected to directly affect other infrastructure elements such as utilities.

Long-term indirect minor adverse effects on other infrastructure resources would also be expected from implementation of Alternative 1. The permitting and installation of 263 new boat docks, yielding an additional 999 slips and approximately 205 new access paths to those docks, would be expected to have negligible effects on landfill capacity due to the generation of minor quantities of waste from off-site dock construction. The amount of waste generated from dock construction would likely be negligible. Many new docks would be expected to have electrical outlets, which would create a negligible additional electrical demand.

The induced growth associated with the permitting of additional docks would have long-term minor adverse effects on infrastructure resources. Rezoning requests would draw additional residential development to the lake and along with it the necessary infrastructure to support that development. For this analysis, it has been assumed that each additional boat slip outside the LDA's would yield an additional home, for a total of 547 additional homes. Increases in residential development would create additional demands on infrastructure over time. Depending on the physical locations of new homes (location on the lake, and whether they are within developed communities), it is likely that additional residential streets would have to be constructed. Some existing local roads and collectors might also require upgrading to support additional traffic. New residential development would place additional demands on potable water supplies and wastewater treatment capabilities as well. The availability of potable water is limited by surface water storage capacities and the limited groundwater supply, as described in Section 3.2.2. Demand for wastewater treatment also would be expected to increase by a minor amount. Under this alternative, 548 additional septic systems could be installed in the Greers Ferry Lake watershed as part of local development associated with the potential increase in new docks. As discussed in Section 3.4.5, some areas around the lake have soils that are limiting for the proper functioning of septic tanks. The total acreage of such areas is, however, relatively small, and those soils would not be expected to create an impediment to development. In the event of soil saturation from septic system discharges or mass septic system failure in the area, the impermeable nature of the soil would be more likely to cause pathogens to enter Greers Ferry Lake via surface water runoff than via groundwater supply. These possible surface water inputs to the lake are addressed in Section 4.3.2.2. Solid waste disposal would be affected by construction of new housing and associated infrastructure, as well as by the additional waste stream from the increased population. Construction debris associated with the addition of 547 homes would yield approximately 2,400 tons of waste materials. Although local landfills would have the capacity to accept the construction debris, the debris would decrease the overall capacity of the landfills in the long term. It is likely that additional landfill cells would be required to support the region in the long term. Additional development also would place additional demands on police, fire, and rescue services.

4.3.5 Socioeconomic Conditions

4.3.5.1 Economic Development

Short-term direct minor beneficial effects and short- and long-term indirect minor beneficial effects would be expected. Under this alternative, the number of potential new docks and associated houses would be somewhat higher than that for the No Action Alternative. Specifically, in addition to dock development that would occur under the No Action Alternative, Alternative 2 would permit installation of previously approved docks that meet 80 percent of the rezoning criteria. Approximately 20 percent of the rezoning requests would likely have a new housing unit built (80 percent of these rezoning requests already are associated with a housing unit) if Alternative 2 is selected. Hence, under this alternative 547 new housing units are assumed to be constructed compared to 493 under the No Action Alternative.

The economic impacts of this alternative would be of the same magnitude as those of the No Action Alternative, although slightly higher. Most indicators would increase by less than 2 percent over an assumed 5-year construction period (see Appendix C). Employment and GRP are projected to increase by about 1 percent and personal income by 2 percent over baseline. Total population is projected to increase by 2.9 percent more than the baseline projections by the end of the 5-year period. Because the new population would likely include a major proportion of retirees, impacts on the labor market would be minimal. Further diminishing the annual economic impacts is the likelihood that buildout would take place over a time frame much longer than 5 years. Increases in population, employment, and other economic indicators would be much smaller on an annual basis compared to the 5-year scenario used in the analysis.

4.3.5.2 Environmental Justice

No effects on environmental justice would be expected. As stated in Section 3.5.5, EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* was issued to identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from Federal actions. Under the 80 Percent Rezoning Criteria Alternative, the proposed changes to the SMP would not result in adverse environmental health impacts on any affected populations.

4.3.5.3 Protection of Children

No effects on the protection of children would be expected. As stated in Section 3.5.6, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was issued to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. Under Alternative 2, the proposed changes to the SMP would not alter the Greers *Ferry Project Office Safety Plan* or any safety measures the Corps has already established at the lake to protect the safety of the visiting public.

4.3.6 Visual and Aesthetic Resources

Long-term direct major adverse impacts on visual and aesthetic resources would be expected under Alternative 2. Under this alternative, the rezoning requests that met 80 percent of the rezoning criteria would be approved in addition to the 170 potential docks projected with the maximum 50 percent development of existing LDA's, and an extension of the vegetation modification zone from 50 feet to 100 feet would be implemented. Thus, the lakeshore could eventually have 558 boat docks when all of the approved boat docks are built at some uncertain time in the future.

4.3.6.1 Scenic Attractiveness

The potential addition of 93 boat docks (over the baseline of an additional 170 docks, which are projected under the current SMP and the No Action Alternative) on the Greers Ferry Lake shoreline, representing a potential increase of 89 percent over the 295 existing boat docks, would reduce the scenic attractiveness of the lake's shoreline.

At the same time, however, allowing more boat docks on the lake itself would tend to reduce the need for expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic attractiveness of those areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Expanding the vegetation modification zone from 50 to 100 feet around residential structures along the shoreline would have some visual and aesthetic impacts. Although modifications would detract from the natural scenic attractiveness of the shoreline by visually contrasting with the surrounding natural vegetation, the degree of impact would depend on the exact nature of the

modifications undertaken and the degree of landscaping maintenance provided. As discussed in Section 4.3.6.3, under Alternative 2 the acreage of lake surface from which one to 10 docks would be visible would increase by 5,880 acres and the lake surface acreage from which 11–20 docks would be visible would increase by 1,010 acres. Assuming that each dock would be associated with a home, then the acreage of lake surface from which homes would be visible might increase similarly. Vegetation modification near homes where homes are clustered along LDA's would pose the greatest impact to scenic attractiveness.

4.3.6.2 Scenic Integrity

The potential addition of 263 boat docks on the Greers Ferry Lake shoreline would reduce the scenic integrity of the lake's shoreline because more of the shoreline would become altered from its natural state.

As with scenic attractiveness, allowing more boat docks on the lake itself would tend to reduce the need for expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic integrity of the areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Expanding the vegetation modification zone from 50 to 100 feet around residential structures along the shoreline would have some visual and aesthetic impacts. Although modifications would reduce the natural scenic integrity of the shoreline by visually contrasting with the surrounding natural vegetation, the degree of impact would depend on the degree of alteration of the natural setting and the degree of landscaping maintenance provided. The existing buffer helps screen houses and other structures and thus adds to scenic integrity. As discussed under *Scenic Attractiveness*, vegetation modification near homes where homes are clustered along LDA's would pose the greatest impact to scenic integrity.

4.3.6.3 Landscape Visibility

Figure 4-3 depicts the location of the 263 potential new docks and the areas of the lake from which they would be clearly visible. Using the 1-mile visibility range discussed in Section 3.0, 1 or more of the new docks would be visible from almost 49 percent of the lake's surface and 1 to 10 new docks would be visible from 49 percent of the lake's surface. The 263 potential new boat

docks would be clearly visible from about 15,385 acres of the lake, compared to the 12,000 acres where the existing boat docks are clearly visible (Table 4-14).

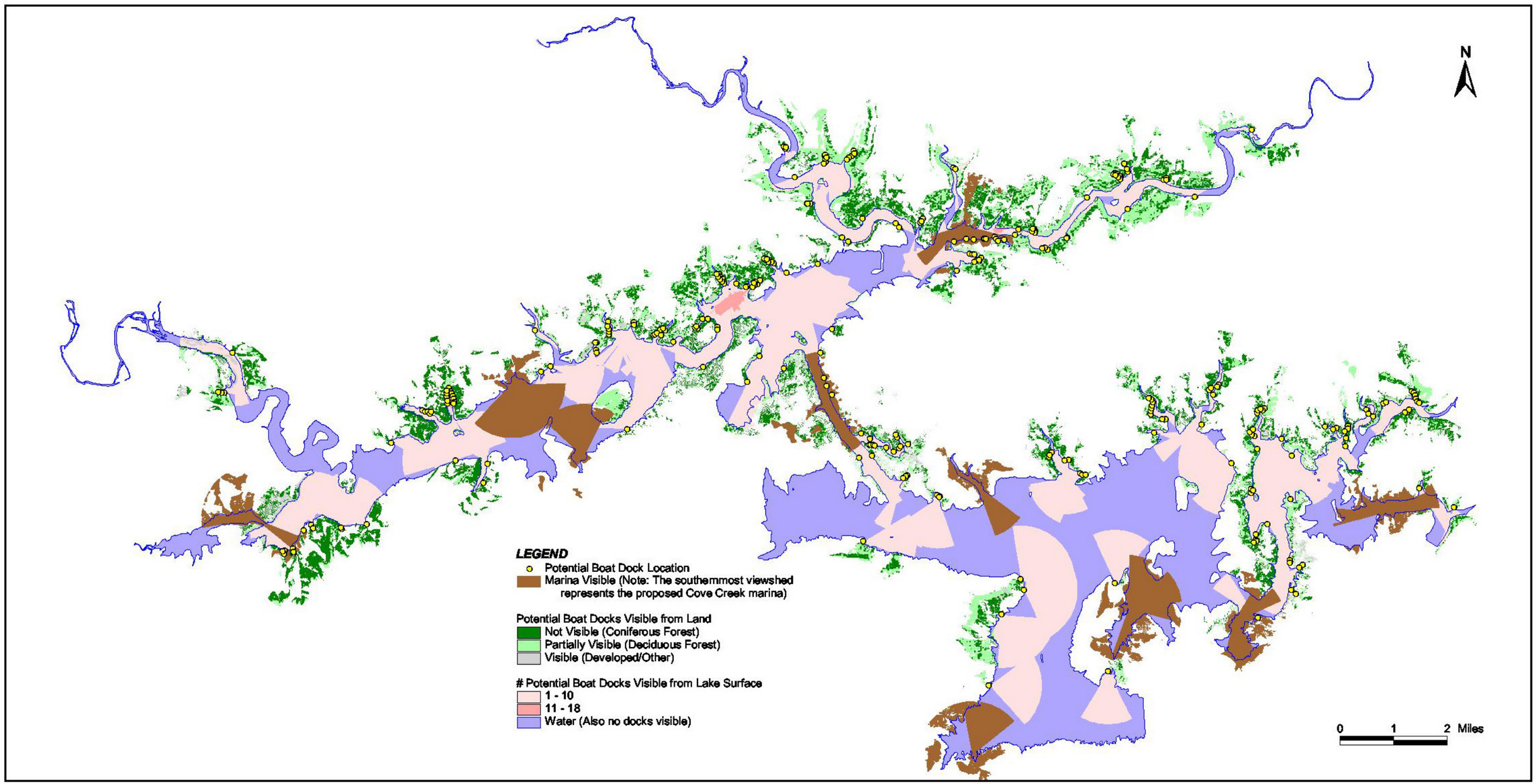
Figure 4-4 shows the combined potential and existing boat dock viewsheds that could result from implementing the 80 Percent Rezoning Criteria Alternative. When added to the existing docks, at least 1 potential or existing boat dock would be visible from 18,831 acres of water, or about 60 percent of the lake's surface, with 1 to 10 docks visible from 16,765 acres of water, or 53 percent of the lake's surface (Table 4-14). Under this alternative, with 263 potential new boat docks, there could be a 56 percent increase in the acreage of the lake where one or more boat docks would be clearly visible over the existing situation. Using the 50 percent criterion (see Section 4.1.2.3), this would represent a major change in visibility and aesthetics. There could be a 32 percent increase in the acreage of the lake where one or more boat docks would be clearly visible over the No Action Alternative.

Table 4-14
Acreage of Lake From Which Boat Docks Are Clearly Visible: Alternative 2 (80 % Rezoning Criteria Alternative) and Alternative 2 Plus Existing Boat Docks

	Lake Acreage		Percent of Lake's Total Surface	
Number of Visible Docks	80% Criteria Alternative	Plus Existing	80% Criteria Alternative	Plus Existing
1–10	15,268	16,765	49	53
11–20	117	1,878	0.4	6
21–30	--	188	--	0.6
Total	15,385	18,831	49	60

Source: GIS calculations.

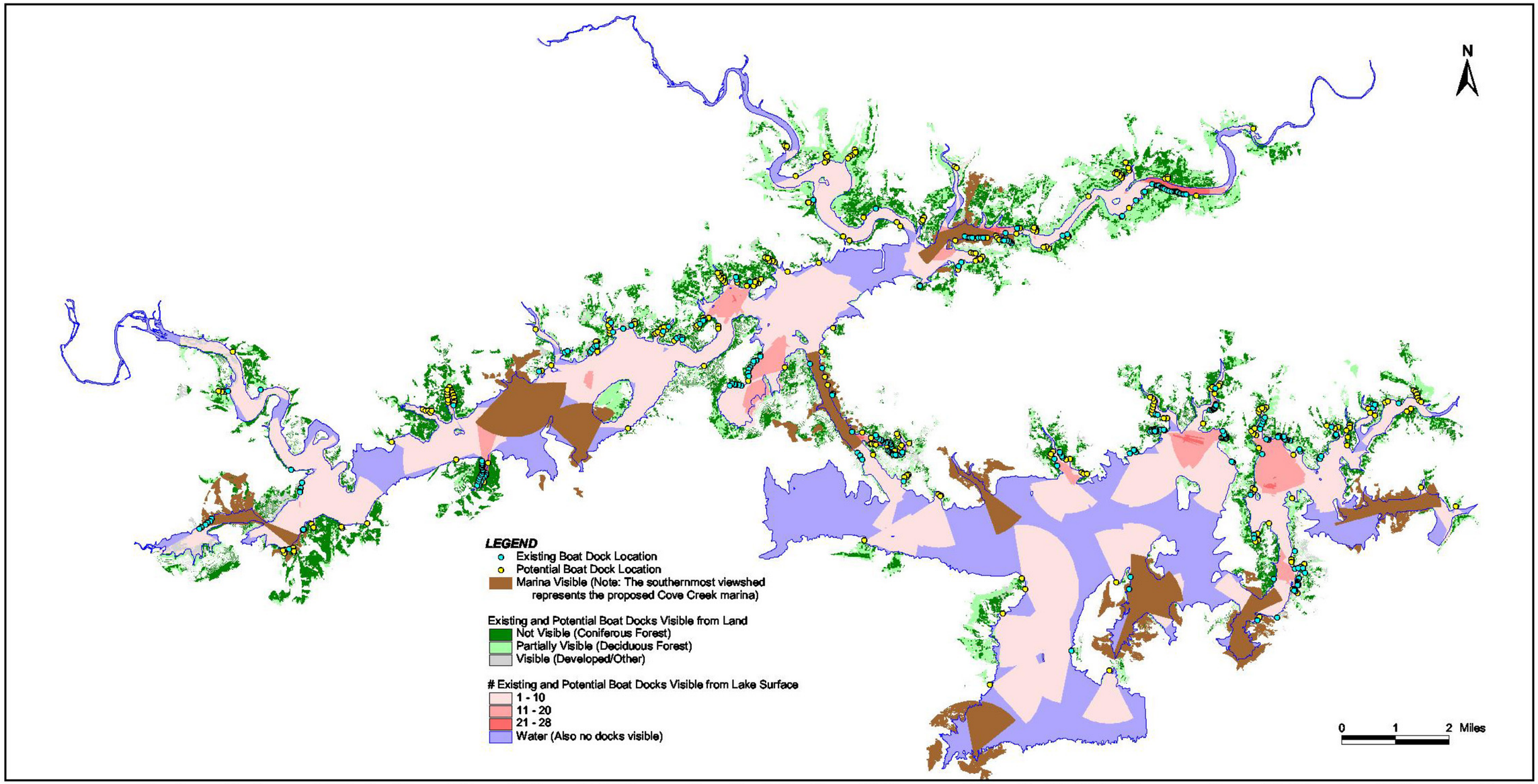
The largest changes in boat dock viewsheds from implementation of Alternative 2, compared to the No Action Alternative, would be the 51 percent increase in lake acreage from which 11 to 20 boat docks would be clearly visible (from 1,243 acres to 1,878 acres), as well as the 83 percent increase in lake acreage from which as many as 21 to 30 boat docks would be clearly visible (from 103 acres to 188 acres). These changes would be especially noticeable in the upper part of the lake, where 1 to 10 boat docks would be clearly visible for almost the entire stretch of lake, with the exception of areas south of Simpkins Cove, north of Sugar Loaf Recreation Area, and to the east and west of the Edgemont Bridge (Highway 16).



Potential Boat Dock Viewsheds Under Alternative 2 (80% Rezoning Criteria Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-3



Potential and Existing Boat Dock Viewsheds Under Alternative 2 (80% Rezoning Criteria Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-4

Another area of the lake that would noticeably be affected is in the lower part of the lake to the east and southeast of Millers Point. The visual impacts in these areas would be more pronounced because the areas have been devoid of boat docks to date and the introduction of new docks would be particularly noticeable.

The relatively small area (188 acres) with a high concentration of boat docks (21 to 30) clearly visible under Alternative 2 would be in the Devils Fork of the Little Red River area below Bear Mountain on the Upper Lake, Hurricane Bay in the Narrows, the Aaron Branch area of the Lower Lake on its northern shore just east of Silver Ridge Peninsula, and the area south of Cherokee Recreation Area on the western side of Silver Ridge Peninsula (see Figure 4-4).

Figure 4-4 also shows the seen area for potential new boat docks from land surrounding the lake under this alternative. At least one dock would be potentially visible from about 11,200 acres of land surrounding the lake, depending on vegetative cover and season of the year.

Figure 4-4 also shows the combined potential and existing boat dock viewsheds over land surrounding the lake. When added to the existing docks, at least one potential or existing dock would be visible from 13,638 acres, which would increase the land acreage from which docks could be seen over the existing situation by 79 percent. Using the 50 percent criterion (see Section 4.1.2.3), this would represent a major change in visibility and lake aesthetics from the surrounding land.

4.3.7 Recreation and Recreational Facilities

Long-term direct minor beneficial effects would be expected. The docks added because of the 93 rezoning requests and the 170 additional docks that could be permitted in the future would contribute an additional 999 slips to the lake (Table 4-5), which would be estimated to increase peak boat traffic by approximately 50 boats, or 3.5 percent. Adding more private and community docks would increase recreational opportunities on the lake.

No changes to the types of recreational activities that occur at the lake would be expected as a result of implementing this alternative. Changes to recreational facilities (campgrounds, parks, beaches, and the like) would be expected as use and popularity of the lake increase and create an additional demand for these resources. Some of this demand could be absorbed by a new marina at the Cove Creek Park. It is reasonable to anticipate that some demand could be met by an

increase in the availability of dry dock storage facilities in the area surrounding the lake. Access to the lake would be expected to be expanded with new launch ramps or launching lanes as necessary, reopening of the South Fork Park camping facilities, development of the Salt Creek area into a functioning park, or other changes to Corps recreational facilities. The anticipated 1.5 percent increase in recreational demand under the 80 Percent Rezoning Criteria Alternative would not be expected to create a major need for changes to recreational facilities at the lake above baseline needs.

4.3.8 Geology and Soils

Long-term direct and indirect minor adverse impacts on soils would be expected from maximizing development of the existing LDA's to 50 percent of their carrying capacity, as well as from a portion of the 93 floating facilities that have been applied for and are currently without an associated habitable structure. The resulting new shoreline activity would be expected to cause an increase in soil disturbance in previously undisturbed areas. Short-term soil disturbance and subsequent increased sediment runoff also would occur during residential home construction. An increase in impervious surfaces, such as rooftops and roads, would increase surface runoff and thus increase the potential for soil erosion. Long-term minor adverse impacts on soils would be expected if the Corps extended the permitted mowing distance to 100 feet from habitable structures and permitted more docks and access paths in LDA's. The acreage of modified areas would increase, resulting in some reduction of vegetative cover. However, it is assumed that a grassy cover would remain in modified areas and bare soil would not be exposed, thus limiting any major amount of soil erosion.

Long-term minor direct beneficial impacts on soils would be expected from creating a vegetative buffer strip by prohibiting vegetation modification within 50 feet of the vegetated edge of the shoreline. A 50-foot vegetative buffer strip would protect a total of 1,313.5 acres of shoreline vegetation (115.5 acres in LDA and 1,198 acres in Protected Areas). Leaving vegetation intact reduces the likelihood of soil erosion from surface water runoff and wave action in the lake, particularly in areas with soils considered highly erodible and along the lake's edge, where slopes can be noticeably steeper. In a few instances, this buffer zone would reduce the amount of allowable vegetation modification.

Short-term direct negligible adverse impacts and long-term indirect minor beneficial and adverse impacts on soils would be expected from the installation of private and community boat docks.

Installation of docks could temporarily increase soil erosion when docks are anchored to the shoreline. Boat docks, however, also minimize erosion by storing watercraft at the dock, which is less disruptive to soils than boats being dragged on and off the shore. Docks also reduce shoreline erosion by attenuating waves and boat wakes. Users of boat docks might cause some soil disturbance as they walk over soils to access docks. In addition, activities on the new docks and the small increase in boating activity projected to occur under this alternative might increase wave action and thereby cause some shoreline erosion.

No impacts on prime farmland soils or unique farmlands currently used for agriculture are expected under this alternative.

4.3.9 Ecological Systems

Long-term direct and indirect minor adverse effects on vegetative communities, wildlife, and potentially sensitive species could be expected. Rezoning protected area into LDA's would be expected to cause an increase in foot traffic, footpaths, soil disturbance, and construction of habitable structures in previously undisturbed areas. Potential new residential development over time would be expected to have indirect minor adverse impacts on vegetation and wildlife. According to the methodology for analyzing alternatives, 411 acres in the watershed could be expected to be converted from forested acres to residential acres (Table 4-5). Residential land use could be expected to eliminate most vegetation and wildlife species from formerly forested habitat. Long-term adverse impacts on sensitive species also could be expected. For example, increased human activity near bald eagle nests on the lake would be expected to have adverse impacts on bald eagle reproduction because eagles are sensitive to human activity when nesting. Only wildlife species tolerant of human disturbance could be expected to remain in residential areas.

Long-term direct minor adverse impacts on vegetative communities and wildlife would be expected if the Corps extended the permitted fire protection vegetation modification (mowing) distance to 100 feet from habitable structures. A maximum of 1,322.7 acres of Corps property (21.6 percent of the total acreage in LDA and Protected Shoreline Area) could be affected by mowing within 100 feet of habitable structures if a 50-foot vegetative buffer strip was also established. This is the maximum acreage that could be affected if the foundations of houses were located as close as possible to Corps property, which would be on either the Corps property line or the edge of the flowage easement, and all property owners were to mow to the maximum

possible distance from their residences. The maximum possible distance would be either 100 feet or to the edge of the vegetative buffer strip, if the latter was closer than 100 feet to a residence. Since it is unlikely that all houses would be located as close as possible to Corps property and that all property owners would mow out to the maximum allowance for their property, less than 1,322.7 acres would be expected to be affected by mowing under Alternative 2.

Forest vegetation in shoreline areas intercepts sediment, pesticides, nutrients, and other materials in surface runoff and reduces nutrients and other pollutants in shallow subsurface water flow. Trees and shrubs adjacent to the lake provide food and cover for wildlife, shade aquatic habitats near shore, and increase the resistance of the shoreline to erosion caused by high water or waves (USDA-NRCS, 1998). Removal of trees and brush less than 2 inches in diameter at breast height would be expected to result in a reduction in the benefits of natural vegetation in lakeshore areas. However, it is assumed that vegetative cover in the upper tree canopy would remain intact and vegetation in mowed areas would not be reduced to bare soil. Instead, dominant plant species would shift from small trees, vines, and tall shrubs to herbaceous plants, grasses, and short shrubs as a result of clearing and mowing. However, without young trees to replace older trees as they die, forested areas would be expected to gradually turn into lawns over a span of many years.

Increasing the size of mowed areas around residences would remove shrubs and other plants that wildlife use for food and cover. Wildlife species most likely to be affected in mowed areas around habitable structures are likely to be those already present because they are tolerant of human activity. Species tolerant of human disturbance (such as white-tailed deer) that can exploit forest edge habitats would be expected to remain in the area, while some songbirds that require forest interior habitats for successful nesting would be expected to leave. Minor adverse impacts on other wildlife and some sensitive species would be expected. Sensitive mussel and fish species (speckled pocketbook mussel, yellowcheek darter) would be unlikely to be affected by lake shoreline management because those populations are primarily affected by management activities in watersheds upstream from the lake.

Minor adverse impacts on sensitive plant species would be expected as a result of vegetation modification and path permits. Seventeen State-listed rare plant species fall into the size category of underbrush eligible to be removed under a vegetation modification permit (Table 3-34). Because some rare plants are difficult to identify, even by experts, there is a risk that these plants

could be harmed unintentionally by landowners otherwise in compliance with vegetation modification or access path permits.

Long-term direct minor beneficial effects on vegetation and wildlife would be expected as a result of creating a vegetative buffer strip by prohibiting vegetation modification within 50 feet of the vegetated edge of the shoreline. A 50-foot vegetative buffer strip would protect 1,318.8 acres of Corps property, or 21.5 percent of the total Corps property in LDA and Protected Shoreline Area, from disturbance. Of this total, 115.5 acres of LDA and 1,203.3 acres of Protected Shoreline Area would be protected, or 26.4 percent and 21.2 percent of the total LDA and Protected Shoreline Area acreages, respectively.

Long-term direct minor beneficial effects on the Federally listed gray bat would be expected as a result of a 50-foot vegetative buffer strip on the shoreline. Gray bats are known to forage in forested areas immediately adjacent to lakes and rivers. According to USFWS sources, gray bats feed on insects that live in shoreline underbrush (Rogers, 2001 in Appendix G). A 50-foot vegetative buffer strip from the water's edge would preserve gray bat food sources. A 50-foot vegetative buffer strip also would be expected to maintain long-term forest cover in riparian zones where gray bats feed by protecting seedling and sapling trees needed to replace older trees as they grow old and die. Vegetation modification that extends to the conservation pool and extensive development in LDA's could deprive gray bats of both riparian forest cover and insect food sources.

Negligible effects on aquatic wildlife would be expected from 263 potential new boat docks. Floating docks block light to the lake, which can result in environmental effects on aquatic plants and wildlife (Chmura and Ross, 1978). A small dock with only one or two slips would be expected to shade only a small portion of the lake. The location of the shaded area would move during the day as the sun changes position relative to the dock, making it unlikely that a significant area would be continuously shaded. Continuous shading could reduce or eliminate aquatic plants under docks. Floating docks and breakwaters can act as fish attractors and provide substrate for other aquatic organisms (USACE, 1993). Small docks widely spaced along the shoreline would not be expected to significantly alter fish population dynamics in the lake. Large community docks densely arranged in extensive LDA's could shade large portions of the lake bottom and attract considerable numbers of fish. Overall, factors such as water quality, yearly spawning success, and fish stocking by wildlife agencies would be expected to have more of an

effect on fish populations in the lake than 263 potential new boat docks arranged along 276 miles of shoreline.

Except for one bald eagle nest, no sensitive habitats occur within the range of the directly affected area, and therefore none would be affected by Alternative 2, the 80 Percent Rezoning Criteria Alternative. No impacts would be expected from allowing limited improvements to grandfathered docks. No impacts would be expected from abolishing separate rules in the SMP for restrictions on boats with sleeping quarters and/or MSDs and instead following State law and Title 36 of the CFR.

4.3.10 Cultural Resources

Long-term direct and indirect minor adverse effects on cultural resources would be expected. Effects could range from negligible to moderate depending on the type and size of site affected and the extent of soil disturbance or other potential adverse effects. Direct adverse effects would include the destruction of archeological sites that might be NRHP-eligible or the demolition or alteration of NRHP-listed or eligible historic structures, such as buildings or statues. Under this alternative, no future rezoning would be accepted, and the 93 rezoning requests would be allowed. Direct adverse effects could be expected along the shoreline, caused by erosion due to wave action by increased boating activities, soil disturbance caused by construction, and looting and treasure hunting caused by increased activity and foot traffic. Archeological sites and historic structures would be affected by associated development pressures, including new construction of residential (including vacation) and commercial structures and required infrastructure. Additional construction would disturb the soil and might affect archeological sites that could be NRHP-eligible. Pressures on existing historic structures that might be NRHP-eligible could cause demolition or alteration of such standing structures. Potential development areas have not yet been identified. The Corps has no control over development on private lands; however, National Historic Preservation Act Section 106 is invoked whenever a Federal agency issues a permit. During this Section 106 process any potential NRHP-eligible resource would be identified and the SHPO would be consulted. Apart from this process, outside Heber Springs there are no land use controls such as zoning and building permits to protect cultural resources.

4.3.11 Air Quality

Long-term indirect negligible adverse effects on air quality would be expected. Under Alternative 2, population growth in the ROI would be expected to be 2.9 percent above baseline from 2000 to

2010, which would increase automobile traffic in the region by a proportionate amount. The significance of the additional traffic on air quality is difficult to estimate quantitatively because of the lack of air quality monitoring in the region, which would provide data on current air quality during the recreational season. Qualitatively, it is anticipated that the additional traffic due to implementation of this alternative would have negligible effects on air quality. The region and Arkansas continue to be attainment areas for all criteria air pollutants.

Alternative 2 would not be expected to result in appreciable increases in other activities that would result in additional air emissions, including construction and industry.

4.3.12 Hazardous and Toxic Substances

Short- and long-term indirect minor adverse effects and long-term indirect minor beneficial effects would be expected under the 80 Percent Rezoning Criteria Alternative. Under this alternative, the LDA's would increase by 1 percent and the number of boat docks and slips could increase by 263 and 999, respectively. The installation of additional boat docks would increase the quantities of dock materials, including metals, paint, plastics, and wood, along the shoreline. Activities on these docks would be expected to increase the quantities of potentially harmful substances—such as cleansers used for boat cleaning, boat motor oil products and solvents, and boat paints and other maintenance products—used on or near the lake. The new docks would be expected to either not affect or decrease recreational activity in parks on the lake and, therefore, to either not affect or decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect. The anticipated 1 percent increase in boating activity due to installation of the new docks would have negligible or minor effects on the quantities of oil and fuel released to the lake from boat motors. No changes are expected in the District's operational management of the docks including concessions. No impacts, therefore, are anticipated from concession activities.

4.3.13 Noise

Short-term indirect minor adverse effects and long-term indirect negligible adverse effects would be expected under the 80 Percent Rezoning Criteria Alternative. Short-term indirect minor adverse effects due to construction noise could result if new residential housing was built in conjunction with the new docks. Noise from construction activities is limited temporally to the period and hours of construction and spatially to the area near the construction site. Note also that

construction of new houses might occur even if docks are not permitted. The potential for the granting of dock permits to induce additional growth is not known.

Under Alternative 2, the total number of boat slips on the lake would increase. This could have the effect of increasing the potential number of boaters on the lake at any one time. The total number of boats on the lake simultaneously during peak use periods would be expected to increase by approximately 1.5 percent under this alternative and result in a long-term negligible increase in boat noise.

The establishment of a 50-foot vegetative buffer strip around the conservation pool would produce a perceived but not an actual reduction in noise level.

4.3.14 Summary of Effects Under Alternative 2, the 80 Percent Rezoning Criteria Alternative

No significant beneficial or adverse effects would be expected under Alternative 2. Implementation of the 80 Percent Rezoning Criteria Alternative would result in both short-term and long-term direct and indirect effects on the human and natural environment of Greers Ferry Lake and the surrounding region. These effects would be both adverse and beneficial. The degree of these impacts would range from no effect to major effects. No impacts would meet or exceed significance criteria as described in Section 4-1. Table 4-15 presents a summary of the environmental and socioeconomic consequences of Alternative 2 for each resource area. No violations of Federal, State, and local laws (as summarized in Table 1-1), would be expected to occur if Alternative 2 was implemented.

Summary of Cumulative Effects. As described in Section 3.3.3, there has been minor development since the region developed in response to the impoundment of the Little Red River. The only other major factor that could occur is the proposed construction of a 400-slip marina at Cove Creek. The addition of that marina, in conjunction with the increase in boat docks under this alternative, could help alleviate future demands on parks and recreational facilities at the lake that are anticipated due to normal growth in the area. The cumulative impacts of the proposed marina were addressed in the analysis for the resources that could most likely be incrementally affected. Those resources were water quality, visual and aesthetic resources, and recreation. It was determined that no significant impacts would occur from implementing Alternative 2.

Table 4-15
Environmental Effects Summary for Alternative 2 (80 Percent Rezoning Criteria Alternative)

Resource Area	Direct Effects	Indirect Effects	Cumulative Effects
Greers Ferry Lake Watershed	Long-term minor beneficial	Short- and long-term minor adverse	Long-term minor adverse
Land Use, Land Cover, and Land Use Controls	Long-term minor beneficial and adverse	Long-term minor beneficial and adverse	Long-term minor beneficial and adverse
Infrastructure	Long-term negligible beneficial	Long-term minor adverse	Long-term minor adverse
Socioeconomics	Short-term minor beneficial	Short- and long-term minor beneficial	Short- and long-term minor beneficial
Visual and Aesthetic Resources	Long-term major adverse	No effects	Long-term minor adverse
Recreation and Recreational Facilities	Long-term minor beneficial	No effects	No effects
Geology and Soils	Short-term negligible and long-term minor adverse and long-term minor beneficial	Long-term minor beneficial and adverse	No effects
Ecological Systems	Long-term minor beneficial and adverse	Long-term minor adverse	Long-term negligible adverse
Cultural Resources	Long-term minor adverse	Long-term minor adverse	No effects
Air Quality	No effects	Long-term negligible adverse	No effects
Hazardous and Toxic Substances	No effects	Short- and long-term minor adverse and long-term minor beneficial	Short- and long-term minor adverse
Noise	No effects	Short-term minor and long-term negligible adverse	Long-term minor adverse

Development along the shoreline (more private docks) could be a factor along with other factors (e.g., normal population growth) that cause development of adjacent land, which could result in localized reduction of wildlife habitat. With the incremental development more habitat is lost. This growth could occur regardless of whether the Corps implements this alternative. The carrying capacity for each species and the interdependencies of species are not well established; therefore, no trends for impacts caused by incremental losses of flora or fauna are predicted here. The creation of a new marina would certainly add to the incremental loss of habitat, but the loss would be minor compared to the remaining undisturbed habitat.

4.3.15 Mitigation Measures for Alternative 2, the 80 Percent Rezoning Criteria Alternative

The Corps of Engineers' *Greers Ferry Lake Rezoning Request Evaluation Criteria*, provided in Appendix A, describes elimination factors as well as physical and managerial criteria employed in determining whether a rezoning request could be approved or otherwise denied. The use of these elimination factors serves as mitigation in that implementing these criteria and denying a rezoning request avoids adverse impacts. For example, if there are any significant environmental, ecological, or cultural features present, the rezoning request would be denied. The Corps of Engineers would continue to apply the Evaluation Criteria in reviewing and approving requests for rezoning and permits. The Corps would also continue to conduct annual inspections of permits to ensure compliance with permit provisions.

The Corps, in coordination with ADEQ, should continue to monitor water quality for pollutants to assess present conditions and evaluate future changes and effects of activity on water quality.

The requirement to maintain a 50-foot vegetative buffer strip between upland development and the conservation pool would provide some interception of nutrient loadings to the lake system as well as maintain habitat. This buffer would help to prevent water quality impacts.

Where soils would be disturbed by anchoring docks, installing access paths, and constructing homes, BMPs for reducing sediment runoff—such as silt fences, revegetating disturbed areas as soon as possible, and phasing construction to minimize the total area of soil disturbed at any one time—could be used by those performing the work.

Mitigation measures for cultural resources should be discussed with the Arkansas SHPO early in the process, and with the public and interested American Indian tribes or organizations. Any mitigation measures should be proposed or considered in accordance with the provisions of 36 CFR Part 800, Protection of Historic Properties. Mitigation measures for historic structures or districts that would be altered or demolished or whose viewsheds would be adversely affected include photographic documentation, scale drawings, and archival research. Other mitigation means are also possible. Avoidance, however, is preferred. It may be advantageous to consider executing a Programmatic Agreement (PA) among the Corps of Engineers, the Advisory Council on Historic Preservation and the Arkansas SHPO. A PA streamlines the Section 106 process by stipulating under what conditions Section 106 tasks would be completed. For example, the PA could include or exclude certain actions on the part of the Corps of Engineers, or certain types of

historic resources. The PA could provide documented compliance with Section 106 of the National Historic Preservation Act, as well as the framework for site-specific coordination with the SHPO, as needed, and subject to modification or revision over time.

4.4 ALTERNATIVE 3: NO GROWTH

4.4.1 Introduction

This alternative, which is the most restrictive to lake access and recreational use but the most beneficial for natural resource protection, would seek to maintain the Corps land around the lake as it currently exists (Figure 2-5). Rezoning applications would not be accepted. No new shoreline use permits would be allowed. Expiring permits could be reissued. Permits for additional facilities or activities would not be granted. The allowance for vegetation modification permitting mowing from the foundation of habitable structures up to a maximum of 50 feet would be retained for existing permits. Restrictions on the operation of boats with sleeping quarters and/or MSDs would remain in effect.

4.4.2 Greers Ferry Lake Watershed

4.4.2.1 Hydrogeology/Groundwater

No effects on groundwater are anticipated under the No Growth Alternative. Under this alternative, no major changes would be expected in the Greers Ferry Lake area and activities would be maintained at current levels.

4.4.2.2 Water Quality

4.4.2.2.1 Effects of Land Use Alteration on Watershed Loading

No effects would be expected. Because no growth would occur in docks or land use alterations in LDA's, no adverse effects on water quality within the lake due to alteration of land use would be expected.

4.4.2.2.2 Effects of Additional Boats and Boating Activity on Water Quality in the Lake

No effects would be expected. Under the No Growth Alternative, no additional private docks would be permitted. Any increase in boats or boating activity at the lake would be due to baseline growth in the region, not implementation of this alternative.

4.4.2.2.3 Effects of Additional Watershed Loadings on In-Lake Water Quality

No effects would be expected. Under the No Growth Alternative, no adverse effects on in-lake water quality would occur because no additional pollutant loads would be created.

4.4.3 Land Use, Land Cover, and Land Use Controls

4.4.3.1 Greers Ferry Lake Shoreline

No effects on land use would be expected. Existing land use of the lake's shoreline, described in Section 3.0, would remain, with a total of 295 existing boat docks along the shoreline.

Long-term direct minor beneficial effects on land cover would be expected. The No Growth Alternative, under which no new private boat docks would be permitted on the Greers Ferry Lake shoreline and expiring vegetation modification permits would not be renewed, would have a beneficial effect on land cover on government property along the lake's shoreline.

No effects on land use controls would occur under the No Growth Alternative.

4.4.3.2 Adjacent Private Land

Long-term indirect minor beneficial effects on land use would be expected. Under this alternative, no changes in shoreline zoning would occur and no new docks would be permitted in existing LDA's. To the extent that the availability of boat docks encourages residential development on adjacent private land, the No Growth Alternative might slow residential development on adjacent private land and, thus, the pace of land use change.

Long-term indirect minor beneficial effects on land cover would be expected. To the extent that the No Growth Alternative would slow residential development on adjacent private land, it could slow the pace of land cover change equally.

No effects on land use controls would be expected. All residential development that would occur regardless of the restriction on new boat docks would be subject to the relevant county and community land use zoning, comprehensive plans, and subdivision regulations governing development. Under the No Growth Alternative, any developments would not conflict with applicable land use plans, policies, or controls, and no adverse impact on land use would result. The potential indirect impacts of this change in land use/land cover along the shoreline are also

addressed in Section 4.4.6, Visual and Aesthetic Resources; Section 4.4.9, Ecological Resources; and Section 4.4.10, Cultural Resources.

In addition, adjacent private land development would be limited by the requirement that landowners obtain approval prior to construction or placement of structures on the flowage easement land. The flowage easement permanently grants to the Federal government the right to flood the easement land periodically when necessitated by the need to hold floodwaters in the lake. In the lower portion of the lake, flowage easement was purchased to the 491-foot MSL contour. In the upper tributaries, the flowage easement was purchased above 491 feet to between a 492- and 498-foot elevation, MSL, to accommodate higher water conditions due to the high inflow and backup conditions that occur in these areas during very heavy rains and runoff conditions. No habitable structure or attachment to it may be constructed below the flowage easement elevation, and no septic system may be placed below the flowage easement elevation. (USACE, Little Rock District, 1993).

4.4.3.3 Watershed Land Use

No effects on land use in the watershed would be expected. Under the No Growth Alternative, either the expansion of existing dryland boat storage facilities in areas around the lake or the building of new dryland boat storage facilities would be expected to increase over time as boat owners seek alternative methods of boat storage. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a land use impact assessment of the dryland storage facilities cannot be made. Some changes in land use/land cover in the surrounding area would be expected. However, dryland boat storage facilities that might be developed and encouraged as an indirect consequence of implementation of the No Growth Alternative would still have to comply with the respective county and community zoning ordinances. As a result, these developments would not conflict with applicable land use plans, policies, or controls, and no adverse impact on land use would result.

4.4.4 Infrastructure

No effects on infrastructure would be expected. Implementation of the No Growth Alternative would not place additional demands on regional infrastructure resources.

4.4.5 Socioeconomic Conditions

4.4.5.1 Economic Development

No economic impacts would be expected. Under this alternative, no new private docks would be permitted. Economic growth in the ROI would remain consistent with the baseline projections (see Appendix C). It should be noted, however, that houses currently with docks would likely increase in value relative to houses without docks. However, future changes in housing values are difficult to project and would be affected by factors other than the presence or absence of a dock. Furthermore, because such changes in housing values would have little or no effect on spending patterns of the population, there would no discernable impact on the regional economy. Accordingly, the no growth alternative was assumed to have the same economic growth rate as the baseline scenario.

4.4.5.2 Environmental Justice

No effects on environmental justice would be expected. As stated in Section 3.5.5, EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* was issued to identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from Federal actions. Under the No Growth Alternative, the proposed changes to the SMP would not result in adverse environmental health impacts on any affected populations.

4.4.5.3 Protection of Children

No effects on protection of children would be expected. As stated in Section 3.5.6, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* was issued to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. Under the No Growth Alternative, the proposed changes to the SMP would not alter the *Greers Ferry Lake Project Office Safety Plan* or any safety measures the Corps has already established at the lake to protect the safety of the visiting public.

4.4.6 Visual and Aesthetic Resources

Long-term direct minor beneficial effects and long-term indirect negligible adverse effects would be expected.

4.4.6.1 Scenic Attractiveness

The No Growth Alternative, in which no new private boat docks would be permitted on the Greers Ferry Lake shoreline and existing permits would expire, would have a beneficial effect on the scenic attractiveness of the lake's shoreline. The existing scenic attractiveness of the lake's shoreline, described in Section 3.0, would remain, with a total of 295 existing boat docks along the shoreline. Expiring permits would result in regrowth of the vegetative buffer strip, enhancing scenic attractiveness along the shoreline.

Implementation of this alternative could lead to the expansion of existing dryland boat storage facilities in areas around the lake and/or the building of new dryland boat storage facilities in the immediate vicinity of the lake. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made. However, it can be assumed that the need for additional dryland boat storage could in the future lead to some loss of the surrounding area's scenic attractiveness as natural settings give way to more dry-dock boat storage buildings, though the effects would likely be negligible.

4.4.6.2 Scenic Integrity

The No Growth Alternative, under which no new private boat docks would be permitted on the Greers Ferry Lake shoreline and existing permits would expire, would have a beneficial impact on the scenic integrity of the lake's shoreline. The existing scenic integrity of the lake's shoreline, described in Section 3.0, would be enhanced by regrowth of the vegetative buffer strip.

As with scenic attractiveness, an expansion of existing or growth of new dryland boat storage facilities in areas around the lake could be expected over time, with some impacts on the scenic integrity of the sites or locations involved. However, without knowing the specifics of these reasonably anticipated changes and the sites or locations involved, a visual resource impact assessment of the dryland storage facilities cannot be made. Some reduction in the surrounding area's scenic integrity could be expected as the landscapes of the dryland boat storage areas are altered.

4.4.6.3 Landscape Visibility

No effects on landscape visibility would be expected. Figure 3-18 depicts areas of the lake from which the existing boat docks and marinas are clearly visible. It can be presumed that under the

No Growth Alternative these boat dock and marina viewsheds would remain essentially the same as the viewsheds that exist today. Using the 1-mile visibility range discussed in Section 3.0, 1 or more docks would be visible from 38 percent of the lake's surface, compared to 45 percent under the No Action Alternative, and 1 to 10 docks would be visible from 35 percent of the lake's surface, compared to 41 percent under the No Action Alternative (Table 4-16).

Figure 3-18 also shows that the potential seen area for boat docks and marinas from land surrounding the lake under the No Growth Alternative would be about 7,627 acres for at least one dock.

4.4.7 Recreation and Recreational Facilities

Short-term direct minor adverse and long-term direct minor beneficial effects would be expected. Implementation of the No Growth Alternative would not be expected to increase or decrease recreational activity at Greers Ferry Lake, but elimination of the option for adjacent landowners to have a private dock or use of a community dock could increase the demand for recreational facilities. Existing recreational facilities might be insufficient to handle the additional need in the short-term, though in the long-term park and facilities expansion to accommodate the additional demand would be expected to occur and would benefit all visitors to the lake.

Table 4-16
Acreage of Lake From Which Boat Docks Are Clearly Visible:
Alternative 3 (No Growth Alternative)

Number of Docks Visible	Lake Acreage	Percent of Lake's Total Surface
1–10	11,068	35
11–20	868	3
21–30	100	0.3
Total	12,036	38

Source: GIS calculations.

4.4.8 Geology and Soils

Long-term indirect minor beneficial effects could be expected. Under the No Growth Alternative, development activity along shoreline areas would be maintained at current levels, but the existing vegetation modification permits would expire. Over time, regrowth of the vegetative buffer strip would act as a "natural BMP" to help prevent soil erosion. Because the vegetative buffer strip is only 50 feet, its beneficial effects are limited. Any increase in boating activity, which could create

increased wave action and increased shoreline erosion, would be due to baseline growth in the region, not implementation of this alternative. No impacts on prime farmland soils or unique farmlands currently used for agriculture would be expected under this alternative.

4.4.9 Ecological Systems

Long-term direct minor beneficial effects would be expected on vegetative communities, wildlife, and sensitive species from not issuing new vegetation modification permits and not renewing expiring permits. The Federally listed gray bat is known to forage in forested areas immediately adjacent to lakes and rivers. According to USFWS sources, gray bats feed on insects that live in shoreline underbrush (Rogers, 2001). Not cutting vegetation along the shoreline would preserve gray bat food sources and maintain long-term forest cover in riparian zones where gray bats feed by protecting seedling and sapling trees needed to replace older trees as they grow old and die.

Except for one bald eagle nest, no sensitive habitats occur within the scope of the SMP, and therefore none would be affected by this alternative. No impacts on vegetative communities, wildlife, or sensitive species would be expected as a result of maintaining development activity in shoreline areas at current levels by not issuing new land use permits or approving rezoning requests. Additionally, no impacts would be expected from not approving rezoning requests at future SMP reviews, maintaining current regulations for grandfathered docks, or maintaining separate rules for restrictions on boats with sleeping quarters and/or MSDs.

4.4.10 Cultural Resources

No effects on cultural resources would be expected. Under this alternative, no new land use permits would be allowed, thereby eliminating effects such as soil disturbance from dock installation and additional pressure on standing structures.

4.4.11 Air Quality

No effects on air quality would be expected. The No Growth Alternative would not result in increases of stationary or mobile air emissions relative to baseline conditions.

4.4.12 Hazardous and Toxic Substances

No effects would be expected. Under this alternative, no direct or indirect effects on activities that might cause an increase or decrease in the quantity of hazardous and toxic substances used on or released to the lake would occur.

4.4.13 Noise

No effects would be expected. Implementation of the No Growth Alternative would not result in any direct changes to noise levels relative to baseline conditions. To the extent that the availability of boat docks encourages residential development on the adjacent private land, the No Growth Alternative might slow residential development on adjacent private land, thus slowing the increase in noise attributable to human activities. However, dryland boat storage facilities that might be developed and encouraged as an indirect consequence of implementation of the No Growth Alternative could be a source of increased boat traffic on the lake. There is also the potential for an increase in boating activity as part of baseline growth in the region. However, no change in the annoyance level or in the noise level due to boating activities under the No Growth Alternative would be expected.

4.4.14 Summary of Effects Under Alternative 3, the No Growth Alternative

No significant beneficial or adverse effects would be expected under Alternative 3. Table 4-17 presents a summary of the environmental and socioeconomic consequences of the No Growth Alternative for each resource area. No violations of Federal, State, and local laws (as summarized in Table 1-1), would be expected to occur if the No Growth Alternative was implemented. Furthermore, none of the expected effects on resources under this alternative would be significant. Each resource was considered in light of all of the significance criteria identified in Section 4.1, and all effects were determined to be minor or negligible.

Summary of Cumulative Effects. Cumulative beneficial effects on recreational facilities at the lake would be expected as a result of implementing the No Growth Alternative. Growth in the region would be expected to create demand for additional recreational facilities on the lake. Future demand for recreational facilities would be expected to increase somewhat more than under other alternatives. Any expansion of recreational facilities would benefit the public who visits the lake. The proposed 400-slip marina at Cove Creek, if constructed, would help to alleviate some of this future demand.

4.4.15 Mitigation Measures for Alternative 3, the No Growth Alternative

No direct adverse effects would be expected; therefore no mitigation measures are required.

Table 4-17
Environmental Effects Summary for Alternative 3 (No Growth Alternative)

Resource Area	Direct Effects	Indirect Effects	Cumulative Effects
Greers Ferry Lake Watershed	No effects	No effects	No effects
Land Use, Land Cover, and Land Use Controls	Long-term minor beneficial	Long-term minor beneficial	No effects
Infrastructure	No effects	No effects	Long-term minor adverse
Socioeconomics	No effects	No effects	No effects
Visual and Aesthetic Resources	Long-term minor beneficial	Long-term negligible adverse	No effects
Recreation and Recreational Facilities	Short-term minor adverse and long-term minor beneficial	No effects	Long-term minor beneficial
Geology and Soils	No effects	Long-term minor beneficial	No effects
Ecological Systems	Long-term minor beneficial	No effects	No effects
Cultural Resources	No effects	No effects	No effects
Air Quality	No effects	No effects	No effects
Hazardous and Toxic Substances	No effects	No effects	No effects
Noise	No effects	No effects	No effects

4.5 ALTERNATIVE 4: APPROVAL OF REZONING REQUESTS MEETING THE 90 PERCENT CRITERIA

4.5.1 Introduction

No future rezoning requests would be accepted under this alternative. Earlier rezoning requests would have to have met 90 percent of the rezoning criteria for permit approval (45 requests). Existing docks and the potential extent of rezoning are shown in Figure 2-6. Table 4-5 shows the number of docks that could be approved under this alternative. A minimum vegetative buffer strip from the vegetated edge of the shoreline inland for 100 feet, where mowing would be prohibited, would be established for Corps property. Authorization for mowing from habitable structures would be increased from 50 to 100 feet, except where it would conflict with the vegetative buffer strip. Restrictions on boats with sleeping quarters and/or MSDs would be revised to conform with State law and Corps regulation. Grandfathered docks would be allowed to be improved/reconstructed to alternative dimensions, or the locations of existing grandfathered docks would be reallocated outside park buffer zones or prohibited areas.

4.5.2 Greers Ferry Lake Watershed

4.5.2.1 Hydrogeology/Groundwater

No effects on groundwater are anticipated under the 90 Percent Rezoning Criteria Alternative because of the generally impermeable soil of the underlying Western Interior Plains Confining System. Vegetation modifications are not expected to affect groundwater resources.

Under the 90 Percent Rezoning Criteria Alternative, 519 additional septic systems are projected to be installed in the Greers Ferry Lake watershed as part of local development associated with the potential increase in new docks. In the event of soil saturation from septic system discharges or mass septic system failure in the area, the impermeable nature of the soil would be more likely to cause pathogens to enter Greers Ferry Lake via surface water runoff than via groundwater supply. These possible surface water inputs to the lake are addressed in Section 4.5.2.2.

4.5.2.2 Water Quality

Short- and long-term indirect minor adverse impacts would be expected under Alternative 4. Potential alterations to the existing conditions that could affect water quality within Greers Ferry Lake include the following:

- Permitted development and rezoned LDA, resulting new shoreline activity, and potential induced development.
- Increased boating activity and potential increases in pollutant runoff from marina areas.
- Increased ground disturbance from expanded vegetative mowing.
- Decreased erosion from establishment of a 100-foot vegetative buffer strip.

4.5.2.2.1 Effects of Land Use Alteration on Watershed Loading

The additional docks within the present LDA's would not be associated with existing development on the lake shoreline. Although the development of additional private boating docks would have no direct effect on pollutant loads to Greers Ferry Lake (except for some very short-term construction activities), indirect impacts would result if new residential housing was built in conjunction with these docks. It should be noted, however, that construction of new houses might occur even if areas are not rezoned and docks permitted. The potential for permitting actions to

induce additional growth is not known. For the rezoned areas, 9 of the 45 docks currently do not have upland development; therefore, new development would be associated with only 9 of the 45 docks. This number is based on examination of present GIS coverages for the lake.

Long-term indirect minor adverse impacts associated with clearing for development might occur due to increased siltation and erosion from building sites and construction of pathways, as well as the potential introduction of other pollutants. The degree and extent of these long-term impacts would be a direct function of the construction practices and the use of appropriate BMPs on the construction sites.

Additional long-term indirect minor adverse effects would occur because of alteration of land use conditions in the immediate watershed of Greers Ferry Lake and the resulting increased loading of pollutants. Increased loadings to the lake were estimated and compared with baseline loading conditions for TP, TN, BOD, TSS, and FC. The baseline loadings, presented in Section 3.2.3, reflect existing land use and established loadings from the upper watershed, the immediate watershed of the Upper Lake (above the Narrows), and the immediate watershed of the Lower Lake (below the Narrows). Detailed descriptions of the methodology, assumptions, and results of the loading estimates for the baseline and alternative analyses are presented in Appendix F and are summarized below for Alternative 4. Table 4-18 presents the land use alterations used to calculate the changes in pollutant loadings from the baseline conditions.

Table 4-18
Alteration to Watershed Conditions Under Alternative 4
(90 Percent Rezoning Criteria Alternative)

	Upper Watershed	Upper Lake Watershed	Lower Lake Watershed
Land use from forested to light residential (acres)	0	252	137
Land use from forested to marina property (acres)	0	0	13
Additional septic systems	0	336	183

The assumptions used to estimate potential land use changes under this alternative are highly conservative. Some of the additional docks would not result in direct development. In many cases, however, shoreline development might occur even if a boat dock is not installed. It is expected that some of the new docks would be used by people commuting from surrounding areas, and some might be used by existing houses on the lake. Additionally, not all community

docks would be built out to their full 20-slip capacity because of design and space restrictions. Finally, not all development associated with additional boat slips would occur within the immediate watershed area of either the Upper Lake or the Lower Lake.

Table 4-19 presents the estimated increases in loadings for TP, TN, TSS, FC, and BOD for each of the lake sections and the upper watershed. These constituents represent those considered to be affected by altered land use conditions. The baseline loads, presented in Section 3.2.3, are provided alongside the additional loadings. Using the baseline as a reference, the percent increase to the loadings was estimated for each constituent of concern. For FC loadings, the additions represent changes in land use as well as the additional septic systems (336 Upper Lake, 183 Lower Lake) to be built in the immediate vicinity of the lake (Appendix F).

Table 4-19 quantifies the relative effects of the land use alterations on loadings to the lake for the constituents of concern. For Alternative 4, all additional development is assumed to occur within the immediate watersheds of the Upper and Lower Lakes; therefore, no changes in loads from the baseline conditions are seen within the upper watershed.

Phosphorus would be the limiting factor on algal blooms and potential eutrophication of the lake; therefore, alterations to the phosphorus loadings would have the greatest effect on the system. Under Alternative 4 the annual average phosphorus loads would be expected to increase by less than 1 percent. This is a minor impact on the overall system conditions. Although contributions from the Upper and Lower Lake watersheds would increase 3 to 4 percent, these changes would be tempered by the overall loadings from the major tributaries and the upper watershed. Under Alternative 4, a 50-foot vegetative buffer strip between upland development and the conservation pool would be provided. This buffer strip might provide some interception of nutrient loadings to the system.

For TSS, the increase in the overall watershed loadings also would be minor, with increases of less than 0.2 percent. The dominant contributing land uses are forest and pastures because of their extensive coverage of the upper watershed. Contributions from the immediate Upper and Lower Lake watersheds would increase under Alternative 4 by less than 1 percent. The analyses presented here represent typical increases found under altered land use conditions. In the immediate region of the shoreline, localized effects might be greater and highly dependent on the degree of exposure of erodible soil through construction of paths and walkways. The analyses

Table 4-19
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 4 (90 Percent Rezoning Criteria Alternative)

LOWER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%
BUILT IMP	229	250		2,531	2,763		4,071	4,444		12,537	13,685		1.410E+11	1.539E+11	
BUILT PER	482	562		18,176	21,184		31,986	37,280		13,292	15,493		1.766E+11	2.058E+11	
CROPLAND	190	190		826	826		8,121	8,121		1,371	1,371		1.779E+11	1.779E+11	
FOREST	1,202	1,198		20,888	20,828		610,334	608,588		127,451	127,087		8.666E+12	8.641E+12	
PASTURE	1,314	1,314		27,706	27,706		198,816	198,816		54,124	54,124		1.579E+14	1.579E+14	
WETLAND	0	0		2	2		66	66		14	14		9.384E+08	9.384E+08	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	9.990E+11	
WATERSHED	3,417	3,515	2.85	70,129	73,309	4.54	853,395	857,316	0.46	208,789	211,773	1.43	1.671E+14	1.681E+14	0.61

UPPER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%
BUILT IMP	201	239		2,214	2,637		3,561	4,242		10,965	13,062		1.233E+11	1.469E+11	
BUILT PER	414	560		15,604	21,095		27,460	37,123		11,411	15,427		1.516E+11	2.050E+11	
CROPLAND	226	226		980	980		9,632	9,632		1,626	1,626		2.110E+11	2.110E+11	
FOREST	1,881	1,875		32,704	32,589		955,586	952,231		199,547	198,846		1.357E+13	1.352E+13	
PASTURE	1,807	1,807		38,102	38,102		273,424	273,424		74,435	74,435		2.172E+14	2.172E+14	
WETLAND	15	15		260	260		7,581	7,581		1,582	1,582		1.075E+11	1.075E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	1.810E+12	
WATERSHED	4,543	4,721	3.91	89,863	95,663	6.45	1,277,244	1,284,233	0.55	299,566	304,978	1.81	2.313E+14	2.332E+14	0.80

Table 4-19
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 4 (90 Percent Rezoning Criteria Alternative) (continued)

UPPER WATERSHED

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%
BUILT IMP	187	187		2,060	2,060		3,312	3,312		10,201	10,201		1.147E+11	1.147E+11	
BUILT PER	470	470		17,699	17,699		31,147	31,147		12,944	12,944		1.720E+11	1.720E+11	
CROPLAND	2,887	2,887		12,534	12,534		123,218	123,218		20,799	20,799		2.699E+12	2.699E+12	
FOREST	12,706	12,706		220,874	220,874		6,453,838	6,453,838		1,347,701	1,347,701		9.163E+13	9.163E+13	
PASTURE	14,991	14,991		316,133	316,133		2,268,574	2,268,574		617,586	617,586		1.802E+15	1.802E+15	
WETLAND	42	42		739	739		21,543	21,543		4,495	4495		3.056E+11	3.056E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	0.000E+00	
WATERSHED	31,281	31,281	0	570,037	570,037	0	8,901,632	8,901,632	0	2,013,725	2,013,725	0	1.897E+15	1.897E+15	0
TRIBUTARIES	31,187	31,187	0	537,536	537,536	0	8,869,931	8,869,931	0	1,939,201	1,939,201	0	1.581E+15	1.581E+15	0

TOTAL LOADS

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%	Baseline	90% Alt	%
BUILT IMP	616	676		6,805	7,460		10,944	11,998		33,702	36,947		3.791E+11	4.156E+11	
BUILT PER	1,366	1,591		51,478	59,978		90,592	105,550		37,647	43,863		5.001E+11	5.827E+11	
CROPLAND	3,302	3,302		14,340	14,340		140,971	140,971		23,796	23,796		3.087E+12	3.087E+12	
FOREST	15,789	15,779		274,465	274,290		8,019,758	8,014,657		1,674,699	1,673,634		1.139E+14	1.138E+14	
PASTURE	18,111	18,111		381,941	381,941		2,740,813	2,740,813		746,145	746,145		2.177E+15	2.177E+15	
WETLAND	57	57		1,001	1,001		29,191	29,191		6,091	6,091		4.140E+11	4.140E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	2.809E+12	
TO LAKE	39,147	39,422	0.70	697,528	706,508	1.29	11,000,569	11,011,480	0.10	2,447,556	2,455,952	0.34	1.979E+15	1.982E+15	0.14

indicate that these localized effects, although potentially significant in their immediate vicinity, would not have significant effects on the overall system. The inclusion of a vegetative buffer strip would reduce localized erosion contributions to the lake's suspended material and turbidity levels.

For BOD, the increase in the overall loadings would be less than 0.5 percent. The immediate lake watersheds would experience increases between 1 and 2 percent. The overall effects of this increased oxygen demand would be minor.

Finally, Table 4-19 identifies agricultural areas in the upper watershed as the dominant source of FC loads to the overall system. Alterations to land uses in the immediate vicinity of the lake and additional septic systems (with a 20 percent assumed failure rate) do not show a significant impact on the annual average loading conditions (less than 1 percent).

4.5.2.2.2 Effects of Additional Boats and Boating Activity on Water Quality in the Lake

Increased boating activity and in-lake boat storage could adversely affect water quality through fueling operations, leaching of metals from antifoulant paints used on boat hulls, and increased shoreline erosion. Under Alternative 4, the total number of boat slips on the lake could increase as a result of additional private and community boat docks, as well as the addition of a 400-slip marina in the Lower Lake.

Long-term indirect negligible adverse effects on water quality would be expected. Increased boating activity and in-lake boat storage could affect water quality through fueling operations (accidental spills), leaching of metals from paints used on boat hulls, and increased shoreline erosion from boat wakes. Under Alternative 4, the total number of boat docks and boating activity on the lake would increase by approximately 73 percent and 1 percent, respectively. Effects on water quality due to the increase of boats at docks would be expected to be negligible compared to other existing sources of contaminants associated with boating activity, such as storm water runoff from parking lots in parks and emissions from boat motors. An increase in boating activity by 1 percent would not increase boat wakes by more than a negligible amount.

4.5.2.2.3 Effects of Additional Watershed Loadings on In-Lake Water Quality

Long-term indirect minor adverse impacts on the annual average water quality conditions in the lake would be expected due to increased watershed loadings. The previous sections identified the

potential for additional loadings to the lake under Alternative 4 (90 Percent Rezoning Criteria Alternative) for TP, TN, TSS, BOD, and FC. These loadings were quantified as an annual average loading condition, and they represent the long-term effects of this alternative. To quantify the effects of these additional long-term loads on the water quality conditions in the lake, an annual average in-lake response model was developed.

Table 4-20 presents the percent concentration changes based on the additional loadings. For all the constituents, the net change in water quality concentration is very small, less than 1 percent, in all cases for both the Upper and Lower Lakes. Because the Lower Lake has higher volume and also fewer total increased inputs (because most watershed flow enters the Upper Lake and passes through to the Lower Lake), the effects of the increased loadings are even less in the Lower Lake.

Table 4-20
In-Lake Water Quality Under Alternative 4 (90 Percent Rezoning Criteria)

Constituent	Upper Lake		
	Watershed Load Increase[1]	Background[2]	Percent Increase[2]
Total phosphorus (lb/year, mg/L)	178	0.020	<1
Total nitrogen (lb/year, mg/L)	5,800	0.480	<1
Total suspended solids (lb/year, mg/L)[3]	6,990	0.000	N/A
BOD (lb/year, mg/L)	5,412	1.120	<1
Total coliforms (MPN/year, MPN/100 mL)	1.839E12	14.000	<1
Constituent	**Lower Lake**		
	Watershed Load Increase[1]	Background[2]	Percent Increase[2]
Total phosphorus (lb/year, mg/L)	97	0.010	<1
Total nitrogen (lb/year, mg/L)	3,181	0.430	<1
Total suspended solids (lb/year, mg/L)	3,921	0.000	N/A
BOD (lb/year, mg/L)	2,984	0.860	<1
Total coliforms (MPN/year, MPN/100 mL)	1.016E12	24.000	<1

[1] lb/year, except total coliforms, MPN/year.
[2] mg/L, except total coliforms, MPN/100 mL.
[3] Background loads unavailable.

4.5.3 Land Use, Land Cover, Land Use Controls

4.5.3.1 Greers Ferry Lake Shoreline

No direct effects on land use would be expected. Because the boat docks would be sanctioned by selection of this alternative, no conflicts with existing land use plans, policies, or controls would result; thus, no direct, adverse impacts on land (water) use would ensue. The potential indirect

impacts of this change in land use/land cover along the shoreline are addressed in Section 4.5.2, Greers Ferry Lake Watershed; Section 4.5.6, Visual and Aesthetic Resources; Section 4.5.9, Ecological Resources; and Section 4.5.10, Cultural Resources.

Long-term direct minor beneficial and adverse impacts on land cover would be expected. Under Alternative 4, the 45 preapproved docks that met the 90 percent rezoning criteria, along with the 170 potential docks as a result of maximum 50 percent development of the existing LDA's, would be allowed, totaling 215 potential new docks. Thus, the lakeshore could eventually have 510 boat docks when all the approved boat docks are built at some uncertain time in the future. (The locations of these approved docks are shown in Figure 2-6.) This would represent a 73 percent increase in the number of boat docks on the shoreline. Many of the additional docks would have access paths leading to them, resulting in minor changes to land cover on government shoreline property. Corps regulations limit the types and amount of changes that dock owners can make when installing and maintaining access paths. Similarly, vegetative clearing within a 100-foot perimeter surrounding habitable structures could result in changes to land cover on government property adjacent to the 519 new homes that could be built under this alternative. Corps regulations limit the amount and type of vegetation modification that may occur within this perimeter area (see Table 4-1). Establishment of a 100-foot vegetative buffer strip would protect and preserve vegetative cover.

No effects on land use controls would occur under Alternative 4.

4.5.3.2 Adjacent Private Land

No direct effects on land use would be expected. Because boat dock permit grantees must have access to the lake, it is probable that most, if not all, of the 215 potential new boat docks would have a residence associated with them. Thus, residential development on private land adjacent to the LDA's along the lake's shoreline would increase. However, such development would have to comply with county and local zoning ordinances and community subdivision regulations, and no conflicts with land use plans or policies would be expected to occur.

Long-term indirect minor beneficial and adverse impacts on land cover on adjacent private land would be expected. To the extent that the Corps permitting process induces growth in the surrounding area, continued permitting of boat docks in existing LDA's would encourage private development on land adjacent to LDA's. Many landowners would be expected to increase lawn

grass cover near their homes. A beneficial effect on land cover would occur where homes are located close enough to government property to prevent mowing on adjacent private land within the 100-foot vegetative buffer strip. The potential indirect impacts of this change in land cover along the shoreline also are addressed in Section 4.5.2, Greers Ferry Lake Watershed; Section 4.5.6, Visual and Aesthetic Resources; Section 4.5.9, Ecological Resources; and Section 4.5.10, Cultural Resources.

No effects on land use controls on adjacent private land would be expected. Adjacent private land development would be limited by the requirement that landowners obtain approval before construction or placement of structures on the flowage easement land. The flowage easement permanently grants to the Federal government the right to flood the easement land periodically when necessitated by the need to hold floodwaters in the lake. In the lower portion of the lake, flowage easement was purchased to the 491-foot contour. In the upper tributaries, the flowage easement was purchased above 491 feet to between a 492- and 498-foot elevation, MSL, to accommodate higher water conditions due to the high inflow and backup conditions that occur in these areas during very heavy rains and runoff conditions. No habitable structure or attachment to it may be constructed below the flowage easement elevation, and no septic system may be placed below the flowage easement elevation. (USACE, Little Rock District, 1993).

4.5.3.3 Watershed Land Use

There would be no direct or indirect adverse impacts on land use in the watershed. To the extent that the availability of boat docks encourages residential development on adjacent private land, this residential development would tend to generate its own indirect and induced employment and population growth in the surrounding communities (see Section 4.5.5, Socioeconomic Conditions). Such development would change land use/land cover in the watershed. However, all such development would be subject to relevant county and community land use zoning, comprehensive plans, and subdivision regulations governing development. Therefore, it would not conflict with applicable land use plans, policies, or controls and thus no adverse impact on land use would result. The potential indirect impacts of this change in land use/land cover along the shoreline are addressed in Section 4.5.2, Greers Ferry Lake Watershed; Section 4.5.6, Visual and Aesthetic Resources; Section 4.5.9, Ecological Resources; and Section 4.5.10, Cultural Resources.

4.5.4 Infrastructure

Long-term direct negligible beneficial effects on lake infrastructure could be expected. Implementation of Alternative 4 would increase the number of boat docks by approximately 215, representing a 73 percent increase in the number of docks along the lake's shoreline. (The assumed locations of these new docks are shown in Figure 2-1.) Such an increase in boat docks would relieve some of the current pressure on public boat launching ramps and improve traffic circulation around those facilities. Implementation of this alternative would not, however, be expected to directly affect other infrastructure elements such as utilities.

Long-term indirect negligible and minor adverse effects would also be expected from implementing Alternative 4. The permitting and installation of 215 new boat docks, yielding an additional 817 slips and approximately 168 access paths to those docks, would be expected to generation minor quantities of waste from dock construction activities. The amount of waste generated from dock construction would be negligible. Many new docks would be expected to have electrical outlets, which would create a negligible additional electrical demand.

The induced growth associated with the permitting of additional docks would have long-term minor adverse effects on infrastructure resources. Rezoning requests would draw additional residential development to the lake and along with it the necessary infrastructure to support that development. For this analysis, it has been assumed that each additional boat slip outside the LDA's would yield an additional home, for a total of 519 homes. Increases in residential development would create additional demands on infrastructure over time. Depending on the physical locations of new homes (location on the lake, and whether they are within developed communities), it is likely that additional residential streets would have to be constructed. Some existing local roads and collectors might also require upgrading to support additional traffic.

New residential development would place additional demands on potable water supplies and wastewater treatment capabilities as well. The availability of potable water is limited by surface water storage capacities and the limited groundwater supply, as described in Section 3.2.2. Demand for wastewater treatment would also be expected to increase by a minor amount. As discussed in Section 3.4.5, some areas around the lake have soils that are limiting for the proper functioning of septic tanks. The total acreage of such areas is, however, relatively small, and those soils would not be expected to create an impediment to development. Solid waste disposal would be affected by the construction of new housing and associated infrastructure, as well as by

the additional waste stream from the increased population. Construction debris associated with the addition of 519 homes would yield approximately 2,260 tons of waste materials. Although local landfills would have the capacity to accept the construction debris, it would decrease the overall capacity of the landfills in the long term. Additional development would also place additional demands on police, fire, and rescue services.

4.5.5 Socioeconomic Conditions

4.5.5.1 Economic Development

Short-term direct minor beneficial and short- and long-term indirect minor beneficial economic effects would be expected. Under this alternative, the number of potential new docks would be slightly higher than that for the No Action Alternative but somewhat lower than that for Alternative 2, the 80 Percent Rezoning Criteria Alternative. Specifically, in addition to dock development that would occur under the No Action Alternative, this alternative would permit installation of previously approved docks that meet 90 percent of the rezoning criteria. Approximately 20 percent of these previously approved docks would likely have a new housing unit built (80 percent of the approved docks are already associated with a housing unit) if this alternative is selected. Under this alternative, 519 new residences are assumed to be constructed compared to 493 residences under the No Action Alternative and 547 under Alternative 2. Therefore, economic changes to the ROI from this alternative would be greater than those from the No Action Alternative but smaller than the impacts projected from Alternative 2. Projected changes to most economic indicators from this alternative would be less than 2 percent.

4.5.5.2 Environmental Justice

No effects on environmental justice would be expected. As stated in Section 3.5.5, EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations,* was issued to identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from Federal actions. Under Alternative 4, the proposed changes to the SMP would not result in adverse environmental health impacts on any affected populations.

4.5.5.3 Protection of Children

No effects on protection of children would be expected. As stated in Section 3.5.6, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* was issued to protect

children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. Under Alternative 4, the proposed changes to the SMP would not alter the *Greers Ferry Project Office Safety Plan* or any safety measures the Corps has already established at the lake to protect the safety of the visiting public.

4.5.6 Visual and Aesthetic Resources

Long-term direct minor and major adverse effects and long-term direct minor beneficial effects on visual and aesthetic resources would be expected. The lakeshore could eventually have 510 boat docks when all the approved boat docks are built at some uncertain time in the future. Also, houseboats would be allowed on the lake.

4.5.6.1 Scenic Attractiveness

The potential addition of 215 boat docks on the Greers Ferry Lake shoreline, representing a potential increase of 73 percent over the 295 existing boat docks, would reduce the scenic attractiveness of the lake's shoreline, given the strong public preference for an uncluttered shoreline expressed during the scoping meetings.

At the same time, however, allowing more boat docks on the lake itself would tend to reduce the need for expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic attractiveness of those areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Expanding the vegetation modification zone from 50 to 100 feet around residential structures along the shoreline would also have some visual and aesthetic impacts. Although modifications would detract from the natural scenic attractiveness of the shoreline by visually contrasting with the surrounding natural vegetation, the exact nature of the modifications undertaken and the degree of landscaping maintenance provided would affect the extent of the impact. As discussed in Section 4.5.6.3, under Alternative 4 the acreage of lake surface from which one to 10 docks would be visible would increase by 3,838 acres and the acreage from which 11–20 docks would be visible would increase by 653 acres. Assuming that each dock would be associated with a home, then the acreage of lake surface from which homes would be visible might increase

similarly. Vegetation modification near homes where homes are clustered along LDA's would pose the greatest impact to scenic attractiveness.

4.5.6.2 Scenic Integrity

The potential addition of 215 boat docks on the Greers Ferry Lake shoreline, given the current public preference for an uncluttered shoreline, would reduce the scenic integrity of the lake's shoreline because more of the shoreline would become altered from its natural state.

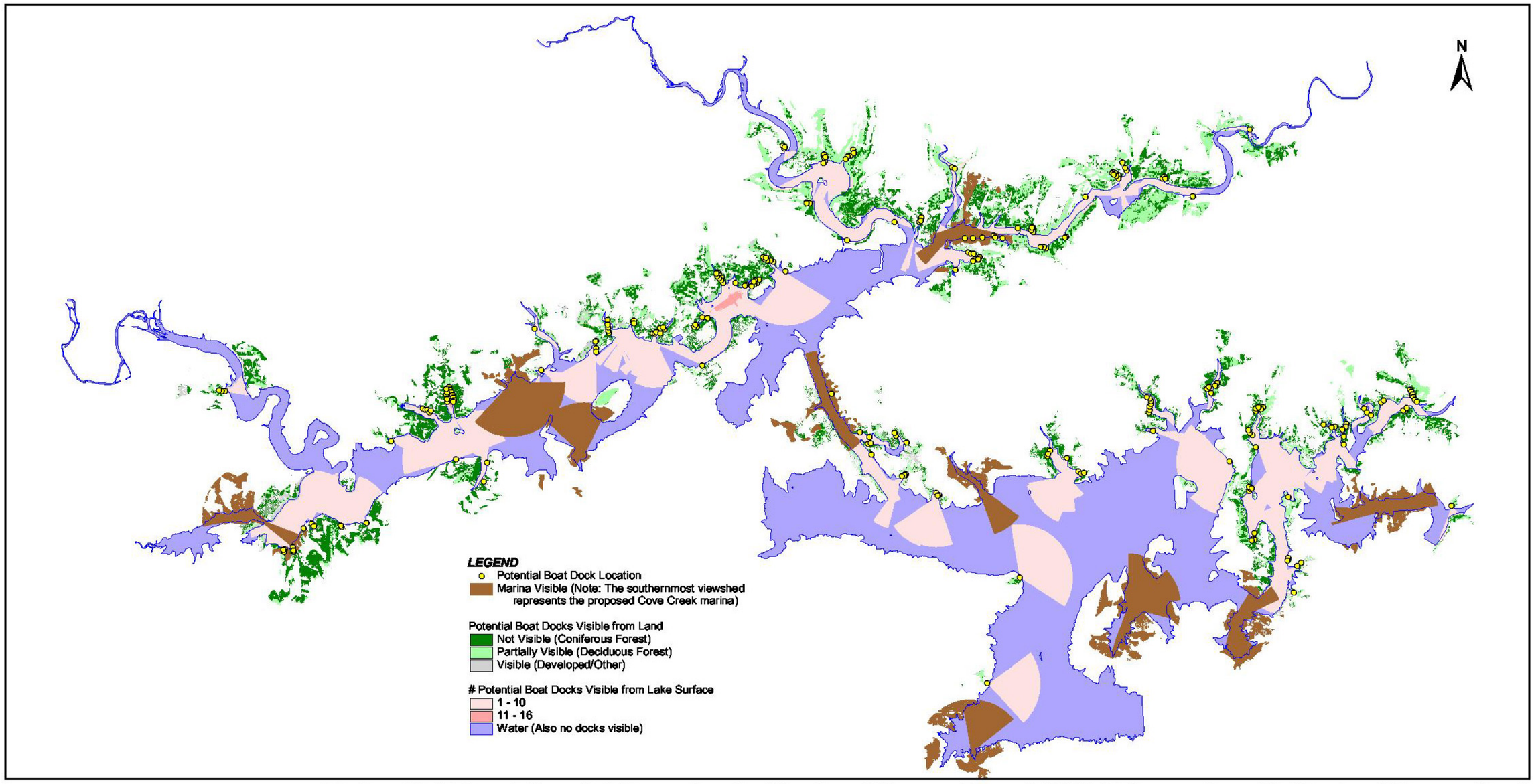
As with scenic attractiveness, allowing more boat docks on the lake itself would reduce the need for the expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic integrity of those areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Expanding the vegetation modification zone from 50 to 100 feet around residential structures along the shoreline would have some visual and aesthetic impacts. Although modifications would reduce the natural scenic integrity of the shoreline by visually contrasting with the surrounding natural vegetation, the degree of impact would depend on the degree of alteration of the natural setting and the degree of landscaping maintenance provided. As discussed above under *Scenic Attractiveness*, vegetation modification near homes where homes are clustered along LDA's would pose the greatest impact to scenic integrity.

The increase in the vegetative buffer strip along the shoreline from 50 to 100 feet would enhance the natural scenic integrity of the shoreline by hiding housing and other structures along the shore, resulting in a beneficial effect.

4.5.6.3 Landscape Visibility

Figure 4-5 depicts the location of the 215 potential new docks that would be allowed under Alternative 4 and the areas of the lake from which they would be clearly visible. Using the 1-mile visibility range discussed in Section 3.0, 1 or more of the new docks would be visible from almost 35 percent of the lake's surface and 1 to 10 new docks would be visible from 35 percent of the lake's surface. The 215 potential new boat docks would be clearly visible from about 10,875 acres of the lake, compared to the 12,000 acres from which the 295 existing boat docks are clearly visible (Table 4-21).



Potential Boat Dock Viewsheds Under Alternative 4 (90% Rezoning Criteria Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-5

THIS PAGE INTENTIONALLY LEFT BLANK.

Figure 4-6 shows the combined potential and existing boat dock viewsheds that could result from implementation of Alternative 4. When added to the existing docks, at least 1 potential or existing boat dock would be visible from 16,374 acres of water, or about 52 percent of the lake's surface, with 1 to 10 docks visible from 14,723 acres of water, or 47 percent of the lake's surface (Table 4-21). Under this alternative, with 215 potential new boat docks, there potentially would be a 36 percent increase in the acreage of the lake from which one or more boat docks would be clearly visible over the existing situation and a 15 percent increase over the No Action Alternative. Using the 50-percent criterion (see Section 4.1.2.3), this would represent a minor change in visibility from the lake surface.

Table 4-21
Acreage of Lake From Which Boat Docks Are Clearly Visible: Alternative 4 (90 Percent Rezoning Criteria Alternative), and Alternative 4 Plus Existing Boat Docks

	Lake Acreage		Percent of Lake's Total Surface	
Number of Visible Docks	**90 Percent**	**Plus Existing**	**90 Percent**	**Plus Existing**
1–10	10,811	14,723	34	47
11–20	64	1,521	0.2	5
21–30	--	130	--	0.4
Total	10,875	16,374	35	52

Source: GIS calculations.

The largest changes in boat dock viewsheds from implementation of Alternative 4, compared to the No Action Alternative, would be the 22 percent increase in lake acreage from which 11 to 20 boat docks would be clearly visible (from 1,243 acres to 1,521 acres) and the 14 percent increase in lake acreage from which 1 to 10 boat docks would be clearly visible (from 12,871 acres to 14,723 acres). These changes would be especially noticeable in the upper part of the lake, where 1 to 10 boat docks would be clearly visible for almost the entire stretch of lake, with the exception of areas south of Simpkins Cove, north of Sugar Loaf Recreation Area, and to the east and west of the Edgemont Bridge (Highway 16), as would be the case under Alternative 2. Another area of the lake that would noticeably be affected is in the lower part of the lake to the east and southeast of Millers Point. The visual impacts in these areas would be more pronounced because they have been devoid of boat docks to date and the introduction of new ones would be particularly noticeable.

The relatively small area (130 acres) with a high concentration of boat docks (21 to 30) clearly visible under Alternative 4 would be in the Devils Fork of the Little Red River area below Bear Mountain on the Upper Lake, Hurricane Bay in the Narrows, and the area south of Cherokee Recreation Area on the western side of Silver Ridge Peninsula (see Figures 3-18 and 4-6).

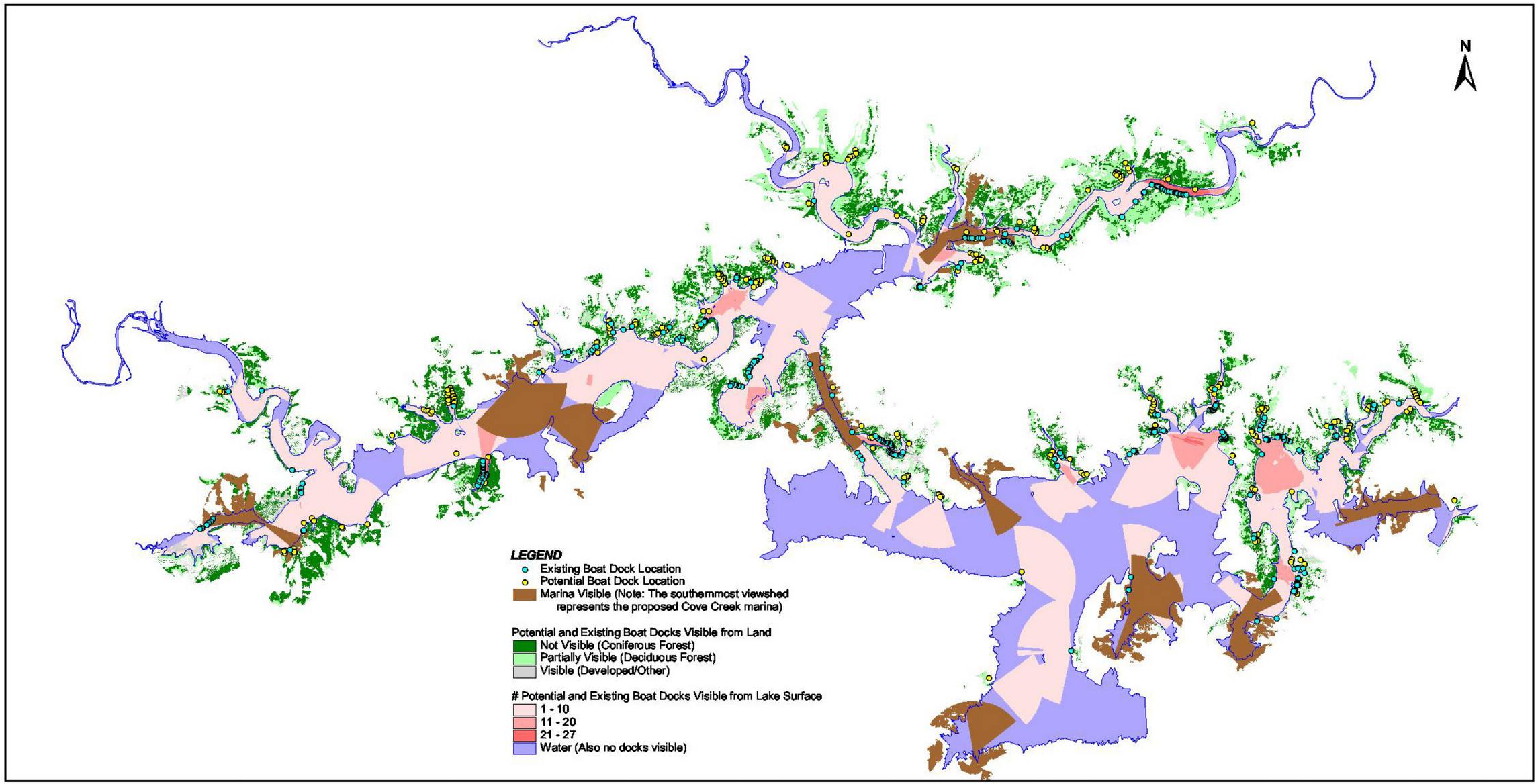
Figure 4-6 also shows the seen area for potential new boat docks from land surrounding the lake under Alternative 4. At least one dock would potentially be visible from about 8,962 acres of land surrounding the lake, depending on vegetative cover and season of the year.

The combined potential and existing boat dock viewsheds over land surrounding the lake under Alternative 4 are shown in Figure 4-6. When added to the existing docks, at least one potential or existing dock would be visible from 12,286 acres, an increase of 61 percent over the potential seen area from land over the existing situation. Using the 50-percent criterion (see Section 4.1.2.3), this would represent a major change in visibility from the surrounding land.

4.5.7 Recreation and Recreational Facilities

Long-term direct minor beneficial effects on recreation would be expected as a result of implementing this alternative. The docks added because of the 45 rezoning requests and the 170 additional docks that could be permitted in the future would contribute an additional 817 slips to the lake (Table 4-5), which would be estimated to increase peak boat traffic by approximately 41 boats, or 3 percent. Adding more private and community docks would increase recreational opportunities on the lake.

No changes to the types of recreational activities that occur at the lake would be expected as a result of implementing this alternative. Changes to recreational facilities (campgrounds, parks, beaches, and the like) would be expected as use and popularity of the lake increase and create an additional demand for these resources. Some of this demand could be absorbed by a new marina at the Cove Creek Park. It is reasonable to anticipate that some demand could be met by an increase in the availability of dry dock storage facilities in the area surrounding the lake. Access to the lake would be expected to be expanded with new launch ramps or launching lanes as necessary, reopening of the South Fork park camping facilities, development of the Salt Creek area into a functioning park, or other changes to Corps recreational facilities. The anticipated 1 percent increase in recreational demand under Alternative 4 would not be expected to create significant need for changes to recreational facilities at the lake above baseline needs.



Potential and Existing Boat Dock Viewsheds Under Alternative 4 (90% Rezoning Criteria Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-6

THIS PAGE INTENTIONALLY LEFT BLANK.

4.5.8 Geology and Soils

Long-term direct and indirect minor adverse impacts would be expected from maximizing development of the existing LDA's to 50 percent of their carrying capacity, as well as from a portion of the 45 floating facilities that have been applied for and currently have no associated habitable structure. The resulting new shoreline activity would be expected to cause an increase in soil disturbance in previously undisturbed areas. These minor adverse impacts would be the same as those expected under Alternative 2.

Long-term minor adverse impacts on soils from extending the permitted mowing distance to 100 feet from habitable structures, short-term minor adverse and long-term minor beneficial impacts from private boat dock installation, and impacts on prime farmland soils or unique farmlands currently used for agriculture would be the same as those expected under Alternative 2. Long-term indirect minor beneficial impacts on soils from creating a 100-foot vegetative buffer strip along the shoreline would be slightly greater than those expected from the 50-foot vegetative buffer strip under Alternative 2. A 100-foot vegetative buffer strip would protect a total of 2,458.8 acres of shoreline vegetation (211.7 acres in LDA and 2,247.1 acres in Protected Areas). In addition to the larger 100-foot vegetative buffer strip's further reducing the likelihood of soil erosion, there would be more instances of the vegetative buffer strip's overlapping the 100-foot mowing distance from habitable structures. In such cases the vegetative buffer strip would take precedence.

4.5.9 Ecological Systems

Long-term direct and indirect minor adverse effects on vegetative communities, wildlife, and potentially sensitive species would be expected. Direct minor beneficial effects on the Federally listed gray bat might occur as a result of a 100-foot vegetative buffer strip on the shoreline. Maintaining shoreline vegetation in a natural state would protect food and foraging cover for the gray bat. Minor adverse impacts would be expected as a result of approving rezoning requests. The higher standard would be expected to result in the approval of roughly half as many requests as would be approved using the 80 percent criteria. Rezoning protected area into LDA's would be expected to cause an increase in foot traffic, footpaths, soil disturbance, and construction of habitable structures in previously undisturbed areas. Potential new residential development over time would be expected to have minor adverse cumulative effects on vegetation and wildlife. Under this alternative, 389 acres in the watershed would be expected to be converted from

forested acres to residential acres (Table 4-5). Residential land use would be expected to eliminate most vegetation and wildlife species from formerly forested habitat. Long-term indirect minor adverse impacts on sensitive species also would be expected. For example, increased human activity near bald eagle nests on the lake would be expected to have adverse impacts on bald eagle reproduction because eagles are sensitive to human activity when nesting. Only wildlife species tolerant of human disturbance would be expected to remain in residential areas.

Long-term direct minor adverse effects would be expected to result from increasing the mowing distance from habitable structures to 100 feet. A maximum of 1,141 acres of Corps property (18.6 percent of the total acreage in LDA and Protected Shoreline Area) could be affected by mowing within 100 feet of a habitable structure if a 100-foot vegetative buffer strip was also established. This is the maximum acreage that could be affected if the foundations of houses were located as close as possible to Corps property, which would be on either the Corps property line or the edge of the flowage easement, and all property owners were to mow to the maximum possible distance from their residences. The maximum possible distance would be either 100 feet or to the edge of the vegetative buffer strip, if the latter was closer than 100 feet to a residence. Since it is unlikely that all houses would be located as close as possible to Corps property and that all property owners would mow out to the maximum allowance for their property, less than 1,141 acres would be expected to be affected by mowing under Alternative 4.

Minor adverse impacts on sensitive plant species would be expected as a result of vegetation modification and path permits. Seventeen State-listed rare plant species fall into the size category of underbrush eligible to be removed under a vegetation modification permit (Table 3-34). Because some rare plants are difficult to identify, even by experts, there is a risk that these plants could be harmed unintentionally by landowners otherwise in compliance with vegetation modification or access path permits.

Lont-term direct minor beneficial effects on vegetation and wildlife would be expected as a result of establishing a 100-foot vegetative buffer strip. A 100-foot vegetative buffer strip would protect 2,469.4 acres of Corps property, or 40.3 percent of the total Corps property in LDA and Protected Shoreline Area, from disturbance. Of this total, 211.7 acres of LDA and 2,257.7 acres of Protected Shoreline Area would be protected, or 48.3 percent and 39.7 percent of the total LDA and Protected Shoreline Area acreages, respectively.

Negligible impacts on aquatic wildlife would be expected from 215 potential new boat docks. Floating docks block light to the lake, which can result in environmental effects on aquatic plants and wildlife (Chmura and Ross, 1978). A small dock with only one or two slips would be expected to shade only a small portion of the lake. The location of the shaded area would move during the day as the sun changed position relative to the dock, making it unlikely that a significant area would be continuously shaded. Continuous shading could reduce or eliminate aquatic plants under docks. Floating docks and breakwaters can act as fish attractors and provide substrate for other aquatic organisms (USACE, 1993). Small docks widely spaced along the shoreline would not be expected to significantly alter fish population dynamics in the lake. Large community docks densely arranged in extensive LDA's could shade significant portions of the lake bottom and attract significant numbers of fish. Overall, factors such as water quality, yearly spawning success, and fish stocking by wildlife agencies would be expected to have a greater effect on fish populations in the lake than 215 boat docks arranged along 276 miles of shoreline.

Except for one bald eagle nest, no sensitive habitats occur within the scope of the SMP, and therefore none would be affected by Alternative 4. No impacts would be expected from allowing limited improvements to grandfathered docks. No impacts would be expected from abolishing separate rules in the SMP for restrictions on boats with sleeping quarters and/or MSDs and instead following State law and Title 36 of the CFR.

4.5.10 Cultural Resources

Long-term direct and indirect minor adverse effects could be expected along the shoreline, caused by erosion due to wave action by increased boating activities, soil disturbance caused by construction, and looting and treasure hunting caused by increased activity and foot traffic. Effects could range from negligible to moderate depending on the type and size of site affected and the extent of soil disturbance or other potential adverse effects. Direct adverse impacts could include destruction of archeological sites that might be NRHP-eligible or demolition or alteration of NRHP-listed or eligible historic structures, such as buildings or statues. Impacts on archeological sites and historic structures could occur as a result of associated development pressures, including new construction of residential (including vacation) and commercial structures and associated infrastructure. Additional construction would disturb the soil and could affect archeological sites that might be NRHP-eligible. Pressures on existing historic structures that might be NRHP-eligible could cause demolition or alteration of such standing structures. Potential development areas have not yet been identified. The Corps has no control over

development on private lands; however, National Historic Preservation Act Section 106 is invoked whenever a Federal agency issues a permit. During this Section 106 process any potential NRHP-eligible resource would be identified and the SHPO would be consulted. Apart from this process, except in Heber Springs there are no land use controls such as zoning and building permits to protect cultural resources.

4.5.11 Air Quality

Long-term indirect negligible adverse effects on air quality would be expected. Under Alternative 4, population growth in the ROI would be expected to be less than 2 percent above baseline from 2000 to 2010. Automobile traffic in the region would increase by a proportionate amount. The impacts of the additional traffic on air quality is difficult to estimate quantitatively because of the lack of air quality monitoring in the region. Qualitatively, it is expected that the additional traffic due to implementation of this alternative would have negligible effects on air quality. The region and Arkansas continue to be attainment areas for all criteria air pollutants.

Alternative 4 would not be expected to result in appreciable increases in other activities that would result in additional air emissions, including construction and industry.

4.5.12 Hazardous and Toxic Substances

Under Alternative 4, short- and long-term indirect minor adverse effects and long-term indirect minor beneficial effects would be expected related to the increase in the LDA's by 0.5 percent, number of boat docks by 215, and slips by 817. Adverse impacts for this alternative would be very similar to those under Alternative 2. Activities on new docks would be expected to increase the quantities of potentially harmful substances—such as cleansers used for boat cleaning, boat motor oil products and solvents, and boat paints and other maintenance products—used on or near the lake. The new docks would be expected to either not affect or decrease recreational activity in parks on the lake and, therefore, to either not affect or decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect. The anticipated 1 percent increase in boating activity due to installation of the new docks would have negligible or minor effects on the quantities of oil and fuel released to the lake from boat motors. No changes are expected in the District's operational management of the docks including concessions. No impacts, therefore, are anticipated from concession activities.

4.5.13 Noise

Short- and long-term indirect minor adverse impacts would be expected under Alternative 4. Potential alterations to the existing conditions that could affect noise levels around Greers Ferry Lake include the following:

- Permitted development and rezoned LDA and the resulting new shoreline activity.
- Potential for induced development and increased boating activity.

The additional docks in the present LDA's would not be associated with existing development on the lake shoreline. Indirect impacts would result if new residential housing was built in conjunction with these docks. For the rezoned areas, 19 of the 93 docks currently do not have upland development. Examination of existing GIS coverages for the lake revealed that new development would be associated with only 8 of the 93 docks. It is expected that people commuting from surrounding areas would use some of the new docks and existing houses on the lake might use some. Short-term indirect minor adverse effects due to construction noise could result if new residential housing were built in conjunction with the new docks. Noise from construction activities is limited temporally to the period and hours of construction and spatially to the area near the construction site. Note also that construction of new houses might occur even if docks are not permitted. The potential for the granting of dock permits to induce additional growth is not known.

The establishment of a 100-foot vegetative buffer strip around the conservation pool would produce a perceived but not an actual reduction in noise level.

In the short term, 45 new docks would be expected to contribute four additional boats to the lake during peak use periods. The 170 potential new docks in existing LDA's under this alternative would have the effect of increasing the potential number of boaters on the lake simultaneously during peak use periods by approximately 1 percent and result in a negligible long-term increase in boat noise.

4.5.14 Summary of Effects Under Alternative 4, the 90 Percent Rezoning Criteria Alternative

No significant beneficial or adverse effects would be expected under Alternative 4. Table 4-22 presents a summary of the environmental and socioeconomic consequences of Alternative 4 for

each resource area. No violations of Federal, State, and local laws (as summarized in Table 1-1), would be expected to occur if Alternative 4 was implemented.

Table 4-22
Environmental Effects Summary for Alternative 4 (90 Percent Rezoning Criteria Alternative)

Resource Area	Direct Effects	Indirect Effects	Cumulative Effects
Greers Ferry Lake Watershed	No effects	Short- and long-term minor adverse and long-term negligible adverse	Long-term minor adverse
Land Use, Land Cover, and Land Use Controls	Long-term minor beneficial and adverse	Long-term minor beneficial and adverse	Long-term minor adverse
Infrastructure	Long-term negligible beneficial	Long-term negligible and minor adverse	Long-term minor adverse
Socioeconomics	Short-term minor beneficial	Short- and long-term minor beneficial	Short- and long-term minor beneficial
Visual and Aesthetic Resources	Long-term minor and major adverse and long-term minor beneficial	No effects	Long-term minor adverse
Recreation and Recreational Facilities	Long-term minor beneficial	No effects	No effects
Geology and Soils	Long-term minor beneficial and adverse and short-term minor adverse	Long-term minor adverse	No effects
Ecological Systems	Long-term minor adverse	Long-term minor adverse	Long-term negligible adverse
Cultural Resources	Long-term minor adverse	Long-term minor adverse	No effects
Air Quality	No effects	Long-term negligible adverse	No effects
Hazardous and Toxic Substances	No effects	Short- and long-term minor adverse and long-term minor beneficial	Short- and long-term minor adverse
Noise	No effects	Short- and long-term minor adverse	Long-term minor adverse

Summary of Cumulative Effects. Cumulative impacts would be negligible to minor for all resource area under Alternative 4. For the most part, the study area is rural and characterized by slow population and economic growth. Recreational activities associated with Greers Ferry Lake

dominate the regional economy, and the current impacts on the area's resources are primarily from housing development and boating activities. The incremental increases in these activities projected under Alternative 4 are relatively minor and thus together with the ongoing activities would not have significant impacts on any resource. The construction of the 400-slip marina at Cove Creek, combined with the new docks permitted under Alternative 4, would help alleviate future demand for recreational facilities at the lake. The cumulative impacts of the proposed marina were addressed in the analysis for the resources that could most likely be incrementally affected. Those resources were water quality, visual and aesthetic resources, and recreation.

4.5.15 Mitigation Measures for Alternative 4, the 90 Percent Rezoning Criteria Alternative

The Corps of Engineers' *Greers Ferry Lake Rezoning Request Evaluation Criteria*, provided in Appendix A, describes elimination factors as well as physical and managerial criteria employed in determining whether a rezoning request could be approved or otherwise denied. The use of these elimination factors serves as mitigation in that by implementing these criteria and denying a rezoning request adverse impacts are avoided. For example, if any significant environmental, ecological, or cultural features are present, the rezoning request would be denied.

The Corps, in coordination with ADEQ, should continue to monitor water quality for pollutants to assess present conditions and evaluate future changes and effects of activity on water quality.

The requirement to maintain a 100-foot vegetative buffer strip between upland development and the conservation pool would provide some interception of nutrient loadings to the lake system as well as maintain habitat. This buffer would help to prevent water quality impacts.

Where soils would be disturbed by anchoring docks, installing access paths, and constructing homes, BMPs for reducing sediment runoff—such as silt fences, revegetating disturbed areas as soon as possible, and phasing construction to minimize the total area of soil disturbed at any one time—could be used by those performing the work.

Prior to any disturbance or land use change on or adjacent to the shoreline, the SHPO should be contacted concerning the presence of historic and cultural resources on the proposed site. Mitigation measures recommended by the SHPO should be used. It may be advantageous to consider executing a Programmatic Agreement (PA) among the Corps of Engineers, the Advisory Council on Historic Preservation and the Arkansas SHPO. A PA streamlines the Section 106 process by stipulating under what conditions Section 106 tasks would be completed. For example,

the PA could include or exclude certain actions on the part of the Corps of Engineers, or certain types of historic resources. The PA could provide documented compliance with Section 106 of the National Historic Preservation Act, as well as the framework for site-specific coordination with the SHPO, as needed, and subject to modification or revision over time.

4.6 ALTERNATIVE 5: MAXIMUM MODIFICATION

4.6.1 Introduction

Alternative 5 would allow the maximum rezoning from "protected" to "limited development." The shoreline would be rezoned to increase the LDA from 7 to 33 percent LDA. Rezoning would be based on suitable topography (20 to 49 percent slope) (Figure 2-7). Table 4-5 shows the number of docks that could be approved under this alternative. Authorization for mowing would be increased from 50 to 200 feet from habitable structures, except where it would conflict with the vegetative buffer strip. Implementation of this alternative would include mitigation measures stipulating that no additional rezoning requests would be accepted or approved at future SMP reviews or until the existing LDA's were fully utilized. Restrictions on boats with sleeping quarters and/or MSDs would be revised to conform with State law and Corps regulation. Grandfathered docks would be allowed to be improved or reconstructed to alternative dimensions, or the locations of existing grandfathered docks would be reallocated outside park buffer zones or prohibited areas.

4.6.2 Greers Ferry Lake Watershed

4.6.2.1 Hydrogeology/Groundwater

No direct effects on groundwater are anticipated under the Maximum Modification Alternative because of the generally impermeable soil of the underlying Western Interior Plains Confining System.

Under the Maximum Modification Alternative, 3,184 additional septic systems are projected to be installed in the Greers Ferry Lake watershed as part of local development associated with the potential increase in new docks. This dramatic increase in the number of septic systems in an area that is underlain with poorly permeable soils has the potential to affect water quality as a result of soil saturation from septic system discharges or mass septic system failure in the area. The impermeable nature of the soil would be more likely to cause pathogens to enter Greers Ferry

Lake via surface water runoff than via groundwater supply. The possible surface water inputs to the lake are addressed in Section 4.6.2.2.

4.6.2.2 Water Quality

Short-term direct minor adverse effects and long-term indirect major adverse effects on water quality would be expected under the Maximum Modification Alternative. Adoption of this alternative would be significant if Corps rezoning and permitting actions induce all the growth experienced around the lake. For this analysis, it was assumed that each new slip equates to the construction of a new house outside the LDA that would not have been built if the Corps had not rezoned and issued permits outside the LDA. However, the effects would decrease substantially if the Corps actions do not induce all the growth experienced around the lake, which is more likely the case. In this instance, impacts on water quality would still be significant in localized areas, but minor across the entire lake system. Potential alterations to existing conditions that could affect water quality in Greers Ferry Lake include the following:

- New shoreline activity.
- Increased boating activity and potential increases in pollutant runoff from marina areas.
- Increased ground disturbance from expanded vegetative mowing.

4.6.2.2.1 Effects of Land Use Alteration on Watershed Loading

Rezoning of the shoreline to 33 percent LDA could result in an increase in the total number of docks on the lake from 295 to 1,393. Under the 1994 SMP an additional 170 new docks could already be added so that the Maximum Modification Alternative could allow for an additional 928 docks beyond the 1994 SMP. These potential new docks would not be associated with existing development on the lake shoreline. Although development of additional private boating docks would have no direct effect on pollutant loads to Greers Ferry Lake (except for some very short-term construction activities), indirect impacts would result if new residential housing was built in conjunction with these docks. It should be noted, however, that construction of new houses might occur even if areas are not rezoned and docks permitted. The potential for permitting actions to induce additional growth is not known.

Short-term direct minor adverse effects associated with clearing for development might occur due to increased siltation and erosion from building sites and construction of pathways as well as the

potential introduction of other pollutants. The degree and extent of these short-term effects would be a direct function of construction practices and the use of appropriate BMPs on the construction sites.

Long-term indirect major adverse effects could occur because of alteration of land use conditions in the immediate watershed of Greers Ferry Lake and the resulting increased loadings of pollutants. The increased loadings were determined through comparison with baseline loading conditions for TP, TN, BOD, TSS, and FC. The baseline loadings, presented in Section 3.2.3, reflect existing land use and established loadings from the upper watershed, the immediate watershed of the Upper Lake (above the Narrows), and the immediate watershed of the Lower Lake (below the Narrows). Detailed descriptions of the methodology, assumptions, and results of the loading determination for the baseline and alternative analyses are presented in Appendix F and summarized below for the Maximum Modification Alternative. Table 4-23 presents the land use alterations used in calculating the difference in loading from the baseline conditions.

Table 4-23
Alteration to Watershed Conditions Under Alternative 5
(Maximum Modification Alternative)

	Upper Watershed	Upper Lake Watershed	Lower Lake Watershed
Land use from forested to light residential (acres)	0	1,579	809
Land use from forested to marina property (acres)	0	0	13
Additional septic systems	0	2,105	1,079

The assumptions made in determining potential land use alteration under the Maximum Modification Alternative are highly conservative. First, a significant portion of the development might occur independent of whether a dock is installed. Therefore, assuming that issuing a permit for a boat dock would induce the construction of a house, which would not otherwise be built if the permit was denied, would significantly overstate the impact of the Corps permitting action. Furthermore, some of the additional docks would not result in direct development. In many cases, shoreline development might occur even if a boat dock is not installed. It is expected that some of the new docks would be used by people commuting from surrounding areas, and some might be used by existing houses on the lake. Additionally, not all community docks would be built out to their full 20-slip capacity because of design and space restrictions. Finally, not all development

associated with additional boat slips would occur within the immediate watershed area of either the Upper Lake or the Lower Lake.

Table 4-24 presents the additional loadings for TP, TN, TSS, FC, and BOD for each of the lake sections and the upper watershed. These constituents represent those considered to be affected by altered land use conditions. The baseline loadings, presented in Section 3.2.3, are provided alongside the additional loadings.

Using the baseline as a reference, the percent increase to the loadings was calculated for each constituent of concern. For FC loads, the additions represent changes in land use, as well as the additional septic systems (2,105 Upper Lake, 1,079 Lower Lake) to be built in the immediate vicinity of the lake (Appendix F).

Table 4-24 quantifies the relative effects of land use alterations on loadings to the lake for the constituents of concern. For the Maximum Modification Alternative, all additional development is assumed to occur within the immediate watersheds of the Upper and Lower Lakes; therefore, no changes in loads from the baseline conditions are seen in the upper watershed.

Because phosphorus would be the limiting factor on algal blooms and potential eutrophication of the lake, alterations to the phosphorus loads would have the greatest effect on the system. Under Alternative 5 (Maximum Modification Alternative), the annual average phosphorus would be expected to increase by up to 5 percent (but the increase could be as low as 1 percent if Corps actions only partially induce growth). This is a significant impact on the overall system conditions. Local contributions for the immediate Upper and Lower Lake watersheds would increase 16 to 25 percent (but the increase could be as low as 3 to 5 percent if Corps actions only partially induce growth), reflecting the significant alterations in land use.

For TSS, the increase in the overall watershed loads is less than 1 percent. The dominant contributing land uses are forest and pastures because of their extensive coverage of the upper watershed. Contributions for the immediate Upper and Lower Lake watersheds would increase under Alternative 5 by up to 2 to 3 percent (assuming Corps actions induce 100 percent growth). The analyses presented here represent typical increases found under altered land use conditions. In the immediate region of the shoreline, local effects might be greater and highly dependent on the degree of exposure of erodible soil through construction of paths and walkways. The 2 to 3

Table 4-24
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 5 (Maximum Modification Alternative)

LOWER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%
BUILT IMP	229	353		2,531	3,902		4,071	6,275		12,537	19,324		1.410E+11	2.174E+11	
BUILT PER	482	954		18,176	35,939		31,986	63,247		13,292	26,283		1.766E+11	3.492E+11	
CROPLAND	190	190		826	826		8,121	8,121		1,371	1,371		1.779E+11	1.779E+11	
FOREST	1,202	1,180		20,888	20,516		610,334	599,458		127,451	125,180		8.666E+12	8.511E+12	
PASTURE	1,314	1,314		27,706	27,706		198,816	198,816		54,124	54,124		1.579E+14	1.579E+14	
WETLAND	0	0		2	2		66	66		14	14		9.384E+08	9.384E+08	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	5.850E+12	
WATERSHED	3,417	3,991	16.80	70,129	88,891	26.75	853,395	875,983	2.65	208,789	226,296	8.38	1.671E+14	1.730E+14	3.56

UPPER GREERS FERRY LAKE

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%
BUILT IMP	201	443		2,214	4,889		3,561	7,862		10,965	24,212		1.233E+11	2.723E+11	
BUILT PER	414	1,334		15,604	50,277		27,460	88,479		11,411	36,769		1.516E+11	4.885E+11	
CROPLAND	226	226		980	980		9,632	9,632		1,626	1,626		2.110E+11	2.110E+11	
FOREST	1,881	1,840		32,704	31,977		955,586	934,368		199,547	195,117		1.357E+13	1.327E+13	
PASTURE	1,807	1,807		38,102	38,102		2,734,24	273,424		74,435	74,435		2.172E+14	2.172E+14	
WETLAND	15	15		260	260		7,581	7,581		1,582	1,582		1.075E+11	1.075E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	1.140E+13	
WATERSHED	4,543	5,664	24.67	89,863	126,486	40.75	1,277,244	1,321,347	3.45	299,566	333,741	11.41	2.313E+14	2.429E+14	5.01

Table 4-24
Additional Loadings for TP, TN, TSS, BOD, and FC for Each of the Lake Sections and the Upper Watershed Under Alternative 5 (Maximum Modification Alternative) (continued)

UPPER WATERSHED

LAND USE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%
BUILT IMP	187	187		2,060	2,060		3,312	3,312		10,201	10,201		1.147E+11	1.147E+11	
BUILT PER	470	470		17,699	17,699		31,147	31,147		12,944	12,944		1.720E+11	1.720E+11	
CROPLAND	2,887	2,887		12,534	12,534		123,218	123,218		20,799	20,799		2.699E+12	2.699E+12	
FOREST	12,706	12,706		220,874	220,874		6,453,838	6,453,838		1,347,701	1,347,701		9.163E+13	9.163E+13	
PASTURE	14,991	14,991		316,133	316,133		2,268,574	2,268,574		617,586	617,586		1.802E+15	1.802E+15	
WETLAND	42	42		739	739		21,543	21,543		4,495	4,495		3.056E+11	3.056E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	0.000E+00	
WATERSHED	31,281	31,281	0	570,037	570,037	0	8,901,632	8,901,632	0	2,013,725	2,013,725	0	1.897E+15	1.897E+15	0
TRIBUTARIES	31,187	31,187	0	537,536	537,536	0	8,869,931	8,869,931	0	1,939,201	1,939,201	0	1.581E+15	1.581E+15	0

TOTAL LOADS

LAN DUSE	TP (lb/yr)			TN (lb/yr)			TSS (lb/yr)			BOD (lb/yr)			FC (MPN/yr)		
	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%	Baseline	Full	%
BUILT IMP	616	983		6,805	10,850		10,944	17,450		33,702	53,736		3.791E+11	6.044E+11	
BUILT PER	1,366	2,757		51,478	103,915		90,592	182,873		37,647	75,996		5.001E+11	1.010E+12	
CROPLAND	3,302	3,302		14,340	14,340		140,971	140,971		23,796	23,796		3.087E+12	3.087E+12	
FOREST	15,789	15,725		274,465	273,367		8,019,758	7,987,664		1,674,699	1,667,997		1.139E+14	1.134E+14	
PASTURE	18,111	18,111		381,941	381,941		2,740,813	2,740,813		746,145	746,145		2.177E+15	2.177E+15	
WETLAND	57	57		1,001	1,001		29,191	29,191		6,091	6,091		4.140E+11	4.140E+11	
SEPTIC	NA	NA		NA	NA		NA	NA		NA	NA		0.000E+00	1.725E+13	
TO LAKE	39,147	40,842	4.33	697,528	752,912	7.94	11,000,569	11,067,261	0.61	2,447,556	2,499,238	2.11	1.979E+15	1.997E+15	0.89

percent increase in total loads in the immediate watershed might be further exacerbated by the localized effects of potential additional development and nearshore activity along an additional 30 percent of the lake shoreline. Although these localized effects would still be relatively small in relation to the overall watershed load, the degree of additional shoreline affected might make these localized effects significant. Under Alternative 5, no vegetative buffer strip is provided between the shoreline development and the conservation pool elevation. Buffer strips would serve as mitigation under the Maximum Modification Alternative and provide long-term beneficial effects through reductions in the localized erosion contributions to the lake's suspended material and turbidity levels.

For BOD, the increase in the overall loads is up to 2 percent. The immediate lake watersheds would see increases of up to 8 to 12 percent (assuming Corps actions induce 100 percent of growth). The overall effects of this increased oxygen demand might be felt in the overall system.

Finally, examination of Table 4-24 identifies the dominant source of FC loads to the overall system as agricultural areas in the upper watershed. Alterations to land uses in the immediate vicinity of the lake and additional septic systems (with a 20 percent assumed failure rate) do show a significant localized effect along the lake with relative changes in loading of up to 5 percent in the immediate lake watersheds.

4.6.2.2.2 Effects of Additional Boats and Boating Activity on Water Quality in the Lake

Long-term indirect minor adverse effects on water quality would be expected. Increased boating activity and in-lake boat storage could affect water quality through fueling operations (accidental spills), leaching of metals from paints used on boat hulls, and increased shoreline erosion from boat wakes. Under Alternative 5, the total number of boat docks and boating activity on the lake would increase by approximately 372 percent and 6 percent, respectively. Effects on water quality due to the increase of boats at docks would be expected to be minor compared to other existing sources of contaminants associated with boating activity, such as storm water runoff from parking lots in parks and emissions from boat motors. An increase in peak period boating activity by 6 percent could increase boat wakes by a minor amount.

4.6.2.2.3 Effects of Additional Watershed Loadings on In-Lake Water Quality

Long-term indirect major adverse impacts would be expected for the annual average water quality conditions in the lake because of increased watershed loadings. The previous sections identified

the potential for additional loads to the lake under Alternative 5 (Maximum Modification Alternative) for TP, TN, TSS, BOD, and FC. These loads were quantified as an annual average loading condition, and they represent the long-term effects of the alternative. To quantify the effects of these additional long-term loads on the water quality conditions in the lake, an annual average in-lake response model was set up.

Table 4-25 presents the percent concentration changes based on the additional loads. Within the Upper Lake some significant changes can be seen under the revised loading conditions for nutrients. Effects of increased nutrient loadings are shown to increase the water quality concentrations on the order of 2 to 3 percent. For all other parameters, the effects are less than 1 percent. Within the Lower Lake, these concentration increases are less than 1 percent because of the higher volume of the Lower Lake and the reduced incremental load increases.

Table 4-25
In-Lake Water Quality Under Alternative 5 (Maximum Modification Alternative)

Constituent	Upper Lake		
	Watershed Load Increase[1]	Background[2]	Percent Increase[2]
Total phosphorus (lb/year, mg/L)	1,121	0.020	2
Total nitrogen (lb/year, mg/L)	36,622	0.480	3
Total suspended solids (lb/year, mg/L)[1]	44,104	0.000	N/A
BOD (lb/year, mg/L)	34,175	1.120	<1
Total coliforms (MPN/year, MPN/100 mL)	1.158E13	14.000	<1
Constituent	**Lower Lake**		
	Watershed Load Increase[1]	**Background[2]**	**Percent Increase[2]**
Total phosphorus (lb/year, mg/L)	574	0.010	1
Total nitrogen (lb/year, mg/L)	18,762	0.430	1
Total suspended solids (lb/year, mg/L)	22,588	0.000	N/A
BOD (lb/year, mg/L)	17,507	0.860	<1
Total coliforms (MPN/year, MPN/100 mL)	5.945E12	24.000	<1

[1] lb/year, except total coliforms, MPN/year.
[2] mg/L, except total coliforms, MPN/100 mL.
[3] Background loads unavailable.

4.6.3 Land Use, Land Cover, and Land Use Controls

4.6.3.1 Greers Ferry Lake Shoreline

No direct effects on land use would be expected. Because the boat docks would be sanctioned by the selection of this alternative, no conflicts with existing land use plans, policies, or controls would result and thus no direct adverse impacts on land (water) use would ensue. The potential indirect impacts of this change in land use/land cover along the shoreline also are addressed in Section 4.6.2, Greers Ferry Lake Watershed; Section 4.6.6, Visual and Aesthetic Resources; Section 4.6.9, Ecological Resources; and Section 4.6.10, Cultural Resources.

Long-term direct and indirect major adverse impacts on land cover would be expected. Under Alternative 5 an additional 1,098 boat docks would be allowed. Thus, the lakeshore could eventually have 1,393 boat docks if all the approved boat docks were built at some uncertain time in the future. The locations of these approved docks are shown in Figure 2-7. This would represent a 372 percent increase in the number of boat docks on the shoreline. Many of the additional docks would have access paths leading to them, resulting in minor changes to land cover on government shoreline property. Corps regulations limit the types and amount of changes that dock owners can make when installing and maintaining access paths. Similarly, vegetative clearing within a 200-foot perimeter surrounding habitable structures would result in changes to land cover on government property adjacent to the 3,184 new homes that could be built under this alternative. Corps regulations limit the amount and type of vegetation modification that may occur within this perimeter area (see Table 4-1).

No effects on land use controls would occur under Alternative 5.

4.6.3.2 Adjacent Private Land

No direct effects on land use would be expected. Although use of private land adjacent to the lake's shoreline would change under the Maximum Modification Alternative, no conflicts with land use plans or policies would exist and thus no direct adverse impacts on land use would ensue.

Long-term direct and indirect major adverse impacts on land cover would be expected. Because boat dock permit grantees must have access to the lake, it is probable that most, if not all, of the 1,098 potential new boat docks would have a residence associated with them, and this residential development would create some modification to vegetation, including an increase in lawn grass

cover. The potential indirect impacts of this change in land use/land cover along the shoreline also are addressed in Section 4.6.2, Greers Ferry Lake Watershed; Section 4.6.6, Visual and Aesthetic Resources; Section 4.6.9, Ecological Resources; and Section 4.6.10, Cultural Resources.

No effects on land use controls would occur under Alternative 5. All development on private property would have to comply with county and local zoning ordinances and community subdivision regulations. In addition, adjacent private land development would be limited by the requirement that landowners obtain approval before construction or placement of structures on the flowage easement land. The flowage easement permanently grants to the Federal government the right to flood the easement land periodically when necessitated by the need to hold floodwaters in the lake. In the lower portion of the lake, flowage easement was purchased to the 491-foot contour. In the upper tributaries, the flowage easement was purchased above 491 feet to between a 492- and 498-foot elevation, MSL, to accommodate higher water conditions due to the high inflow and backup conditions that occur in these areas during very heavy rains and runoff conditions. No habitable structure or attachment to it may be constructed below the flowage easement elevation, and no septic system may be placed below the flowage easement elevation. (USACE, Little Rock District, 1993).

4.6.3.3 Watershed Land Use

There would be no direct adverse effects on land use in the watershed. To the extent that the availability of boat docks encourages residential development on adjacent private land, this residential development would tend to generate its own indirect and induced employment and population growth in the surrounding communities (see Section 4.6.5, Socioeconomic Conditions). Such development would change land use/land cover in the watershed. However, all such development would be subject to relevant county and community land use zoning, comprehensive plans, and subdivision regulations governing development. It would not conflict with applicable land use plans, policies, or controls, and no direct adverse impact on land use would result. The potential indirect impacts of this change in land use/land cover are addressed in Section 4.5.2, Greers Ferry Lake Watershed; Section 4.5.6, Visual and Aesthetic Resources; Section 4.5.9, Ecological Systems; and Section 4.5.10, Cultural Resources.

4.6.4 Infrastructure

Long-term direct minor beneficial effects and short- and long-term indirect major adverse effects would be expected. Alternative 5 projects an increase in the number of boat docks by 1,098, representing a 372 percent increase in the number of docks along the lake's shoreline. (The assumed locations of these new docks are shown in Figure 2-1.) Such an increase in boat docks would relieve the current pressure on public boat launching ramps and improve traffic circulation around those facilities. Implementation of this alternative would not, however, be expected to directly affect other infrastructure elements such as utilities.

This alternative could result in the rezoning of 26.14 miles of shoreline to limited development and the permitting and installation of 1,098 potential new boat docks, yielding an additional 4,172 slips and approximately 856 access paths to those docks. In the short term, new off-site dock construction would have a minor adverse effect on local landfill capacities. Many new docks would be expected to have electrical outlets, which would create a negligible additional electrical demand.

At the current rate of new housing construction in the ROI, it could take as many as 50 years to build out to the level predicted under this scenario, and this growth would create additional demand on local infrastructure. The opening up of 26.14 miles of shoreline to development would require construction of new roads and upgrades to and expansion of existing local, connector, and arterial roads. Potable water distribution lines and electrical service to new homes would have to be installed. Wastewater service for the new homes would mostly be septic tanks because municipal wastewater systems are limited to larger towns in the area, such as Heber Springs and Greers Ferry. Some small areas around the lake have soils unsuitable for septic tanks, and this factor could prevent some of the anticipated growth. New home construction (for 3,184 homes) would generate approximately 13,946 tons of construction debris over the buildout period, decreasing local landfill capacity by approximately 366 tons per year. Existing police, fire, and rescue services would have to be expanded as new homes and entire communities were built and demand for these services increased.

4.6.5 Socioeconomic Conditions

4.6.5.1 Economic Development

Short-term direct minor beneficial effects and short- and long-term indirect major beneficial effects would be expected. Under the Maximum Modification Alternative, up to 1,098 additional private docks with 4,172 slips could be permitted. Although development of additional private boating docks at Greers Ferry Lake would have no direct effect on the ROI's economy (except for some very short-term construction activities), indirect economic impacts would result if new residential housing was built in conjunction with these docks. Assuming that most or all of these residences would be occupied by new migrants to the ROI, long-term economic impacts would be generated primarily through increased levels of consumer spending. Some short-term economic impacts also would be generated through construction of the new residences.

Economic effects of this alternative could be significant if each new dock slip resulted in an additional residence. However, the extent to which the Corps permitting actions would actually induce growth, as opposed to react to growth that would already occur independent of the Corps permitting actions, is unknown. Thus, the assumptions used in this analysis tend to significantly overstate the impact of the Corps permitting actions. To be conservative, this assumption was made to evaluate a long-term upper-bound case. Under such a scenario, the local population could increase by more than 16 percent from the baseline projection over a 5-year construction period within the ROI. Regional employment and GRP are projected to increase by about 6 percent and 5 percent, respectively, and personal income by 10 percent over the baseline projection (see Appendix C). Because the new population would likely include a significant proportion of retirees, the impacts on the labor market would be somewhat smaller.

These economic and demographic projections represent the maximum potential economic effects of this alternative because they are based on the assumptions that each new slip is associated with a new housing unit and that all residents are migrants to the ROI. Other factors, including the actual availability of residential lots and the more likely scenario that some new residents would move from housing already in the ROI, would diminish the magnitude of these projections. Furthermore, even if the Maximum Modification Alternative was selected, it would likely be implemented over a longer period than 5 years, resulting in a more gradual increase in population and smaller annual economic impacts over decades.

4.6.5.2 Environmental Justice

No effects on environmental justice would be expected. As stated in Section 3.5.5, EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, was issued to identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from Federal actions. Under the Maximum Modification Alternative, the proposed changes to the SMP would not result in adverse environmental health impacts on any populations protected under EO 12898.

4.6.5.3 Protection of Children

No effects on protection of children would be expected. As stated in Section 3.5.6, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was issued to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities, and standards. Under the Maximum Modification Alternative, the proposed changes to the SMP would not alter the *Greers Ferry Project Office Safety Plan* or any safety measures the Corps already has established at the lake to protect the safety of the visiting public.

4.6.6 Visual and Aesthetic Resources

Long-term direct significant adverse impacts would be expected under this alternative. Under the Maximum Modification Alternative, long-term direct significant and indirect major adverse effects on visual and aesthetic resources would occur. Under Alternative 5, with maximum 50 percent development of the shoreline with a 20 to 49 percent slope, an additional 1,098 boat docks would be allowed. Thus, the lakeshore could eventually have 1,393 boat docks when all of the potential boat docks are built at some uncertain time in the future.

4.6.6.1 Scenic Attractiveness

The potential addition of 1,098 boat docks on the Greers Ferry Lake shoreline, representing a potential increase of 372 percent over the 295 existing boat docks, would significantly reduce the scenic attractiveness of the lake's shoreline.

At the same time, allowing this many more boat docks on the lake itself would substantially reduce the need for the expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic attractiveness of those areas that would have accommodated dryland boat storage facilities would be partially avoided. Without

knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Expanding the vegetation modification zone from 50 to 200 feet around residential structures along the shoreline would have significant visual and aesthetic impacts. Such a large increase in allowable vegetation modification would undoubtedly expose many of the houses along the lake's shoreline, detracting from the natural scenic attractiveness of the shoreline by visually contrasting with the surrounding natural vegetation. Although the degree of impact would depend on the exact nature of the modifications undertaken and the degree of landscaping maintenance provided, the modifications would have a significant impact on scenic attractiveness. As discussed in Section 4.6.6.3, under Alternative 5 the acreage of lake surface from which one to 10 docks would be visible would increase by 5,388 acres and the acreage from which 11–20 docks would be visible would increase by 5,919 acres. Assuming that each dock would be associated with a home, then the acreage of lake surface from which homes would be visible might increase similarly. Vegetation modification near homes where homes are clustered along LDA's would pose the greatest impact to scenic attractiveness.

4.6.6.2 Scenic Integrity

The potential addition of 1,098 boat docks on the Greers Ferry Lake shoreline would significantly reduce the scenic integrity of the lake's shoreline because much more of the shoreline would become altered from its natural state.

As with scenic attractiveness, allowing more boat docks on the lake itself would reduce the need for the expansion or construction of new dryland boat storage facilities in the areas surrounding the lake. Thus, adverse impacts on the scenic integrity of the areas that would have accommodated dryland boat storage facilities would be partially avoided. Without knowing the specifics of these reasonably anticipated changes and the sites or locations that would be involved, a visual resource impact assessment of the dryland storage facilities cannot be made.

Expanding the vegetation modification zone from 50 to 200 feet around residential structures along the shoreline would have significant visual and aesthetic impacts. Such a large increase in allowable vegetation modification would undoubtedly expose many of the houses along the lake's shoreline, detracting from the scenic integrity of the shoreline by visually contrasting with the

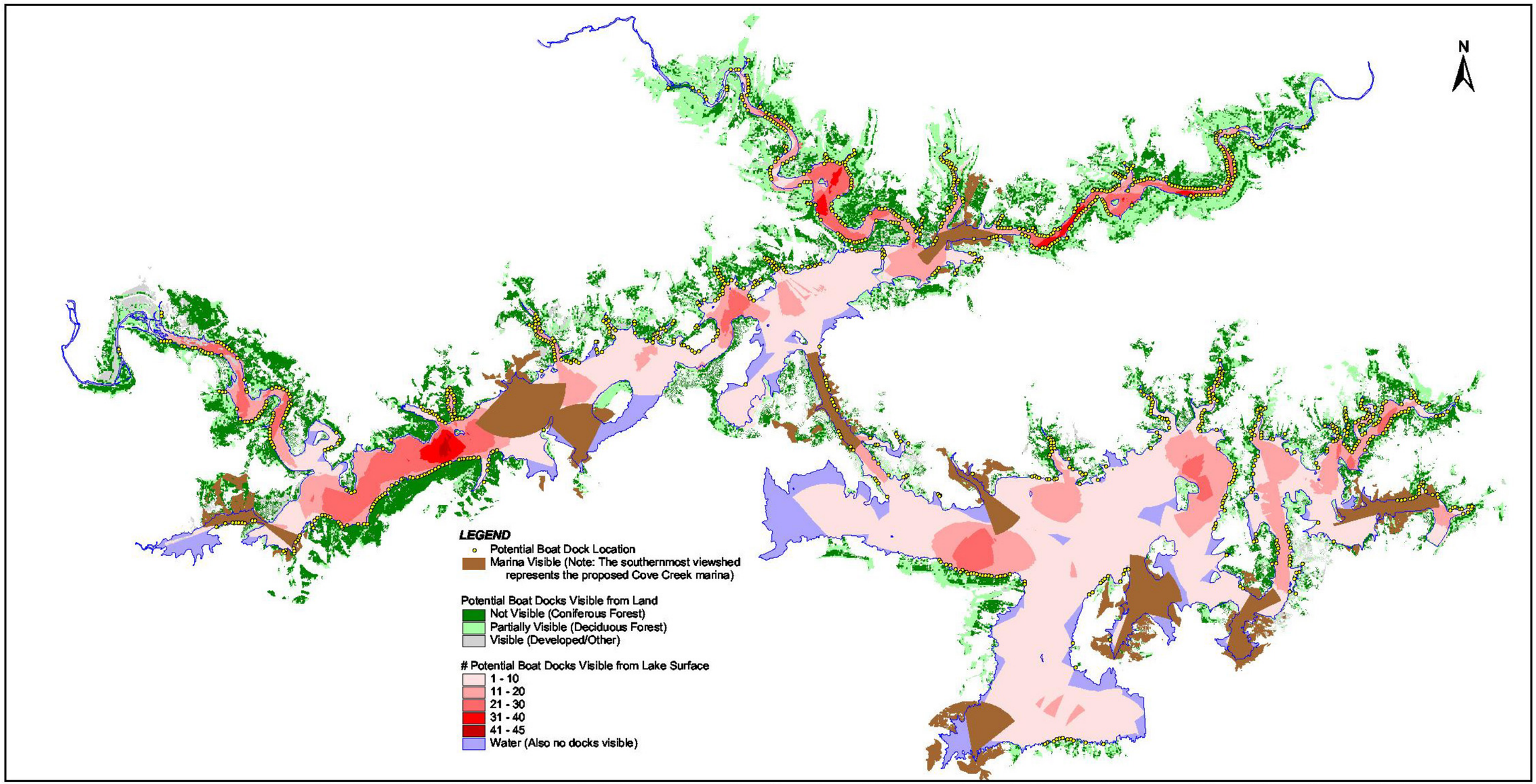
surrounding natural vegetation. Although the degree of impact would depend on the exact nature of the modifications undertaken and the degree of landscaping maintenance provided, the overall effect would have a significant impact on scenic integrity. As discussed above under *Scenic Attractiveness*, vegetation modification near homes where homes are clustered along LDA's would pose the greatest impact to scenic integrity.

4.6.6.3 Landscape Visibility

The potential 1,098 new docks allowed under the Maximum Modification Alternative would have a significant effect on landscape visibility. Figure 4-7 depicts the location of the 1,098 new docks that would be allowed under Alternative 5 and the areas of the lake from which they would be clearly visible. Using the 1-mile visibility range discussed in Section 3.0, 1 or more of the new docks would be visible from almost 86 percent of the lake's surface and 1 to 10 new docks would be visible from 55 percent of the lake's surface. The 1,098 potential new boat docks would be clearly visible from some 27,000 acres of the lake, compared to the 12,036 acres from which the existing boat docks are clearly visible (Table 4-26).

Figure 4-8 shows the combined potential and existing boat dock viewsheds that could result from implementation of Alternative 5. When added to the existing docks, at least 1 potential or existing boat dock would be visible from 27,633 acres of water, or about 88 percent of the lake's surface, with 1 to 10 docks visible from 16,273 acres of water, or 52 percent of the lake's surface (Table 4-26). Under this alternative, with 1,098 potential new boat docks, there could be a 130 percent increase over the existing situation in the acreage of the lake from which one or more boat docks would be clearly visible, and a 94 percent increase over the No Action Alternative. Such a large increase would have a significant impact on landscape visibility.

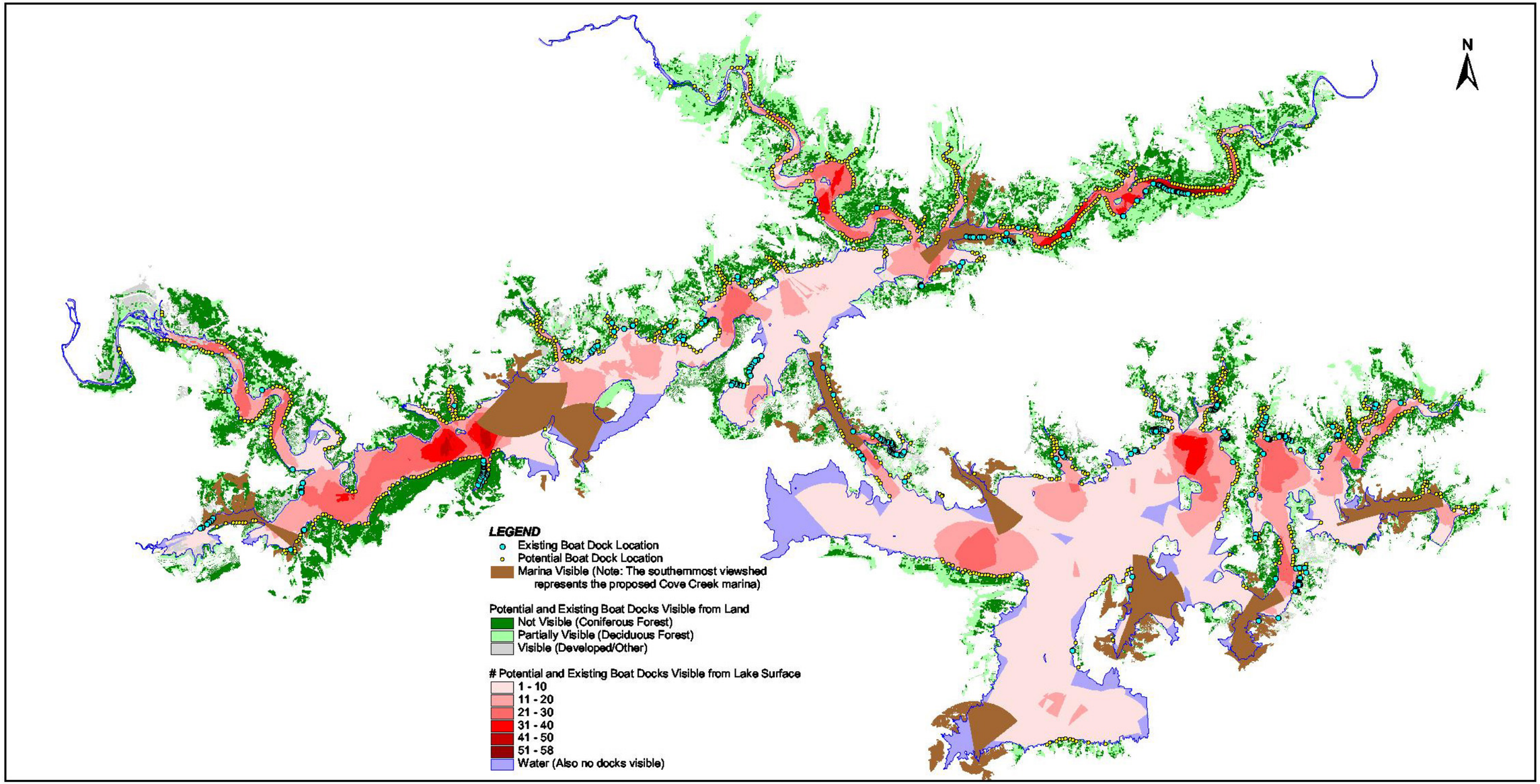
The largest changes in boat dock viewsheds from implementation of Alternative 5, compared to the No Action Alternative, would be the 3,443 percent increase in lake acreage from which 21 to 30 boat docks would be clearly visible (from 103 acres to 3,649 acres), and the 446 percent increase in lake acreage from which 11 to 20 boat docks would be clearly visible (from 1,243 acres to 6,787 acres). In addition, under Alternative 5, there would be about 925 acres where 31 to 60 boat docks would be clearly visible and almost 26 acres where more than 50 boat docks would be clearly visible (Table 4-26). Under Alternative 5, boat docks would be visible from virtually the entire lake's surface. Areas of particularly heavy concentration of boat dock



Potential Boat Dock Viewsheds Under Alternative 5 (Maximum Modification Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-7



Potential and Existing Boat Dock Viewsheds Under Alternative 5 (Maximum Modification Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-8

viewsheds include the Devils Fork and the Middle Fork of the Little Red River, the western part of the Upper Lake between the South Fork and Choctaw Recreation Areas, and the area between Cherokee Recreation Area and Scout Island on the Lower Lake. Figure 4-7 also shows the seen area for potential new boat docks from land surrounding the lake under Alternative 5. At least one dock would be potentially visible from approximately 22,495 acres of land surrounding the lake, depending on vegetative cover and season of the year.

The combined potential and existing boat dock viewsheds over land surrounding the lake under Alternative 5 are shown in Figure 4-8. When added to the existing docks, at least one potential or existing dock would be visible from 24,051 acres, an increase of 215 percent over the potential seen area from land over the existing situation. Such a large increase would have a significant adverse effect on landscape visibility.

Table 4-26
Acreage of Lake From Which Boat Docks Are Clearly Visible: Alternative 5 (Maximum Modification Alternative) and Alternative 5 Plus Existing Boat Docks

Number of Visible Docks	Lake Acreage		Percent of Lake's Total Surface	
	Maximum Modification	Plus Existing	Maximum Modification	Plus Existing
1–10	17,420	16,273	55	52
11–20	6,509	6,787	21	22
21–30	2,688	3,649	9	12
31–40	344	760	1	2
41–50	32	139	0.1	0.4
51–60	--	26	--	0.1
Total	26,993	27,633	86	88

Source: GIS calculations.

4.6.7 Recreation and Recreational Facilities

Long-term direct minor beneficial and long-term indirect minor adverse effects would be expected. Under this alternative, installation of new docks would be allowed in existing LDA's, and rezoning requests would be accepted for dock permits outside existing LDA's. These new docks could contribute slightly to the peak and nonpeak boating density on the lake.

The long-term consequences would be expected to result from an increase in peak boating density. The 4,172 potential new slips on the lake (Table 4-5) would be expected to contribute approximately 209 boats to the water surface during peak use periods, or an increase in boating

density of 14.4 percent. Adding more private and community docks would increase recreational opportunities on the lake.

No changes to the types of recreational activities that occur at the lake would be expected as a result of implementing this alternative. Changes to recreational facilities (campgrounds, parks, beaches, and the like) would be expected as growth around the lake continues and use and popularity of the lake increase and create an additional demand for these resources. A new marina at the Cove Creek Park could absorb some of this demand. Access to the lake would be expected to be expanded with new launch ramps or launching lanes as necessary, reopening of the South Fork Park camping facilities, development of the Salt Creek area into a functioning park, or other changes to Corps recreational facilities. The anticipated 6 percent increase in recreational demand under Alternative 5 would not be anticipated to create significant need for changes to recreational facilities at the lake, but some changes to accommodate increased demand would be necessary.

Boating density on the lake could increase the frequency of boater conflicts and accidents, though increased density could also reduce the accident rate because of an overall need for boaters to exercise more caution. Facilities for camping, boat launching, boat storage, recreation-related services (e.g., rescue, lake patrols, and sewage disposal) would most likely need to be increased beyond what is currently anticipated. The 928 docks beyond those that could be installed in the short term under the No Action Alternative would increase lakeshore shading where the docks are located. This could be both beneficial and detrimental to fishing. Some fish species, including largemouth bass—one of the sport fish species in Greers Ferry Lake—prefer shaded spots like those that docks provide during some seasons, and fishers in boats target such areas for catching fish. Fishing from the shoreline, however, could be hindered in areas with many docks along the shoreline.

4.6.8 Geology and Soils

Short- and long-term direct minor adverse and long-term indirect minor adverse effects on geology and soils would be expected as a result of allowing the maximum rezoning of shoreline from protected area to LDA's. Maximizing development of all areas of shoreline with slopes between 20 and 49 percent would be expected to cause an increase in soil disturbance in previously undisturbed areas. Short-term soil disturbance and subsequent increased sediment runoff would occur during residential home construction, and long-term impacts might occur as the shoreline reaches the allocated maximum of 50 percent of its carrying capacity and the

resulting new shoreline activity increases. An increase in impervious surfaces, such as rooftops and roads, would increase surface runoff, thereby increasing the potential for soil erosion.

Long-term direct minor adverse effects on soils would be expected if the Corps extended the permitted mowing distance to 200 feet from habitable structures for fire protection. The impact of mowing on soils under this alternative would be similar to impacts described under Alternative 2 because it is assumed that mowed areas, while having reduced vegetation, would retain vegetative cover. Increasing the permitted mowing distance to 200 feet, however, could potentially affect as much as four times the maximum area that would be affected by a 100-foot mowing distance.

Short-term direct minor adverse effects and long-term indirect minor adverse and direct minor beneficial effects from private boat dock installation and effects on prime farmland soils or unique farmlands currently used for agriculture would be expected. The types of effects would be the same as those discussed under Alternative 2, but they would be somewhat greater in scale.

4.6.9 Ecological Systems

Long-term direct and indirect minor adverse effects could be expected on vegetative communities, wildlife, and sensitive species as a result of rezoning as much as 33 percent of the Greers Ferry Lake shoreline to LDA's. Minor adverse impacts on ecological systems would be expected from rezoning shoreline to LDA's where grandfathered docks exist, with the exception of docks in park buffers and prohibited areas. It is assumed that an increase in the number of boat docks would, in turn, lead to increased human activity near the shore and construction of habitable structures in nearby upland areas.

Long-term direct moderate adverse impacts on vegetative communities and wildlife would be expected if the Corps extended the permitted vegetation modification (mowing) distance to 200 feet from habitable structures. The amount of Corps property that could be affected by mowing within 200 feet of habitable structures is 2,823.8 acres, or 46.1 percent of the total Corps property in LDA and Protected Shoreline Area. Of this total, 349 acres of LDA and 2,474.8 acres of Protected Shoreline Area would be affected, or 79.6 percent and 40.4 percent of the total LDA and Protected Shoreline Area, respectively. The 2,823.8 acres is the maximum that could be affected if the foundations of houses were located as close as possible to Corps property, which would be on either the Corps property line or the edge of the flowage easement. Since it is

unlikely that all houses would be located as close as possible to Corps property, less than 2,823.8 acres would be expected to be affected by mowing under Alternative 5.

Loss of lakeshore vegetation from mowing would be expected to have minor adverse impacts on gray bat foraging habitat. A USFWS biologist expressed concern that reduction in lakeshore underbrush would reduce habitat for insects that are food for the endangered gray bat (Rogers, 2001 in Appendix G). Removing underbrush could also kill young trees that are necessary to replace mature trees as they grow old and die, thereby reducing riparian forest cover for the gray bat.

Rezoning protected area into LDA's would be expected to cause an increase in foot traffic, footpaths, soil disturbance, and construction of habitable structures in previously undisturbed areas. Potential new residential development over time would be expected to have minor adverse cumulative impacts on vegetation and wildlife. According to the methodology for analyzing alternatives, 2,388 acres in the watershed would be expected to be converted from forested acres to residential acres (Table 4-5). Residential land use would be expected to eliminate most vegetation and wildlife species from formerly forested habitat. Long-term indirect minor adverse effects on sensitive species also could be expected. For example, increased human activity near bald eagle nests on the lake would be expected to have adverse impacts on bald eagle reproduction because eagles are sensitive to human activity when nesting. Only wildlife species tolerant of human disturbance would be expected to remain in residential areas. However, potential residential development under this alternative could take 40 years.

An increase in the mowing distance from 50 to 200 feet could, in rare instances, affect 16 times as much area as a 50-foot mowing distance. According to the methodology for analyzing alternatives, there is a potential for 1,098 new boat docks to be built under Alternative 5, the Maximum Modification Alternative (Table 4-5). Assuming each boat dock were associated with one new home eligible for a vegetation modification permit, and each home were permitted to modify vegetation into Corps property in the shape of a half-circle with a radius of 150 feet, the maximum acres potentially modified by 1,098 new boat dock-related homes would be 889.4 acres. A distance of 150 feet rather than 200 feet is used for this calculation because the model assumes that under maximum allowed use of LDA's, docks would be 300 feet apart. Therefore, each new dock-associated home could in theory mow only 150 feet in most directions before overlapping with another dock-associated home's vegetation modification permit. The acreage

modified would be expected to equal less than that amount for reasons stated in Section 4.2.9. Also, in many cases there might be less than 200 feet between a house adjacent to Corps property and the conservation pool. Minor adverse impacts on sensitive plant species would be expected as a result of vegetation modification and path permits. Seventeen State-listed rare plant species fall into the size category of underbrush eligible to be removed under a vegetation modification permit (Table 3-34). Because some rare plants are difficult to identify, even by experts, there is a risk that landowners otherwise in compliance with vegetation modification or access path permits could harm these plants unintentionally.

Minor effects on aquatic wildlife would be expected from building 1,098 potential new boat docks. Floating docks block light to the lake, which can result in environmental effects on aquatic plants and wildlife (Chmura and Ross, 1978). A small dock with only one or two slips would be expected to shade only a small portion of the lake. The location of the shaded area would move during the day as the sun changed position relative to the dock, making it unlikely that a significant area would be continuously shaded. Continuous shading could reduce or eliminate aquatic plants under docks. Floating docks and breakwaters can act as fish attractors and provide substrate for other aquatic organisms (USACE, 1993). Small docks widely spaced along the shoreline would not be expected to significantly alter fish population dynamics in the lake. Large community docks densely arranged in extensive LDA's could shade significant portions of the lake bottom and attract significant numbers of fish. Overall, factors such as water quality, yearly spawning success, and fish stocking by wildlife agencies would be expected to have a greater effect on fish populations in the lake than 1,098 potential new boat docks.

Except for one bald eagle nest, no sensitive habitats occur within the scope of the SMP, and therefore none would be affected by Alternative 5. No impacts would be expected from abolishing separate rules in the SMP for restrictions on boats with sleeping quarters and/or MSDs and instead following State law and Title 36 of the CFR.

4.6.10 Cultural Resources

Long-term direct and indirect minor adverse effects on cultural resources could be expected along the shoreline, caused by erosion due to wave action created by increased boating activities; soil disturbance caused by construction; and looting and treasure hunting caused by increased activity and foot traffic. Effects could range from negligible to moderate, depending on the type and size of site affected and the extent of soil disturbance or other potential adverse effects. Direct adverse

effects could include the destruction of archeological sites that might be NRHP-eligible or the demolition or alteration of NRHP-listed or eligible historic structures, such as buildings or statues. Under this alternative, the maximum rezoning, from protected to limited development, would be allowed. No rezoning requests would be considered at future SMP reviews. Archeological sites and historic structures would be affected by associated development pressures, including construction of new residential (including vacation) and commercial structures and required infrastructure. Additional construction would disturb the soil and might affect archeological sites that could be NRHP-eligible. Pressures on existing historic structures that might be NRHP-eligible could cause demolition or alteration of such standing structures. Potential development areas have not yet been identified. The Corps has no control over development on private lands; however, National Historic Preservation Act Section 106 is invoked whenever a Federal agency issues a permit. During this Section 106 process any potential NRHP-eligible resource would be identified and the SHPO would be consulted. Apart from this process, except for Heber Springs there are no land use controls such as zoning and building permits to protect cultural resources.

4.6.11 Air Quality

Long-term indirect minor adverse effects on air quality could be expected. Under Alternative 5, population growth in the ROI could be expected to be 16 percent above baseline from 2000 to 2010, which would increase automobile traffic in the region by a proportionate amount. The significance of the additional traffic on air quality is difficult to estimate quantitatively because of the lack of air quality monitoring in the region, which would provide data on current air quality during the recreational season. Qualitatively, it is anticipated that the additional traffic due to implementation of this alternative would not have a significant effect on air quality. The region and Arkansas continue to be attainment areas for all criteria air pollutants.

Alternative 5 could not be expected to result in significant increases in industrial activities that would result in additional air emissions, and increases in construction activity would not contribute significantly to air pollution due to the temporary nature of such activity.

4.6.12 Hazardous and Toxic Substances

Short- and long-term indirect moderate adverse effects and long-term indirect minor beneficial effects would be expected from this alternative, in which the amount of shoreline zoned as LDA would increase by 26 percent and the number of boat docks and slips would increase by 1,098

and 4,172, respectively. The installation of new boat docks would increase by approximately three times the quantities of dock materials, including metals, paint, plastics, and wood, along the shoreline. Activities on these docks would lead to increases in the quantities of potentially harmful substances—such as cleansers used for boat cleaning, boat motor oil products and solvents, and boat paints and other maintenance products—used on or near the lake. The new docks would be expected to either not affect or decrease recreational activity in parks on the lake and, therefore, to either not affect or decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect. The anticipated 6 percent increase in boating activity due to installation of the new docks would have minor effects on the quantities of oil and fuel released to the lake from boat motors. No changes are expected in the District's operational management of the docks including concessions. No impacts, therefore, are anticipated from concession activities.

4.6.13 Noise

Short- and long-term indirect minor adverse effects are expected under the Maximum Modification Alternative. An increase in the annoyance level and an increase in noise would be likely to occur due to the 6 percent increase in boating activity associated with the Maximum Modification Alternative, although quantifying the increase would require developing a noise model for the area.

Because boat dock permit grantees must have access to the lake, it is probable that most of the 1,098 potential new boat docks would have a residence associated with them. Thus, residential development on the private land adjacent to the LDA's along the lake's shoreline could increase, accompanied by a possible increase in noise due to the general increase in human activities. Short-term indirect minor adverse effects would result from construction noise, including house construction, road construction, and other associated construction. Noise from construction activities is limited temporally to the period and hours of construction and spatially to the area near the construction site. Note also that construction of new houses might occur even if docks are not permitted. The potential for the granting of dock permits to induce additional growth is not known.

4.6.14 Summary of Effects Under Alternative 5, the Maximum Modification Alternative

Some significant adverse effects would be expected under Alternative 5. Table 4-27 presents a summary of the environmental and socioeconomic consequences of the Maximum Modification

Alternative for each resource area. Each resource was considered in light of all of the significance criteria identified in Section 4.1. Long-term direct significant adverse impacts on visual and aesthetic resources would be expected under this alternative. Greers Ferry Lake is considered a unique geographic area. The public has stated its desire to preserve the natural beauty, shoreline, and pristine conditions of the lake. A change of this magnitude would irretrievably change that character. The considerable amount of change to what is considered a unique geographic area would likely be highly controversial. Several of the expected effects on resources under this alternative would be significant, including direct and indirect adverse effects on water quality and visual and aesthetic resources, and indirect effects on socioeconomic resources. However, implementation of the mitigation measures described in Section 4.6.15 would likely reduce the severity of these significant effects.

Table 4-27
Environmental Effects Summary for Alternative 5 (Maximum Modification Alternative)

Resource Area	Direct Effects	Indirect Effects	Cumulative Effects
Greers Ferry Lake Watershed	Short-term minor adverse	Long-term minor and major adverse	Long-term significant adverse
Land Use, Land Cover, and Land Use Controls	Long-term major adverse	Long-term major adverse	Long-term major adverse
Infrastructure	Long-term minor beneficial	Short- and long-term major adverse	Long-term major adverse
Socioeconomics	Short-term minor beneficial	Short- and long-term major beneficial	Long-term major beneficial
Visual and Aesthetic Resources	Long-term significant adverse	Long-term major adverse	Long-term significant adverse
Recreation and Recreational Facilities	Long-term minor beneficial	Long-term minor adverse	Long-term minor adverse
Geology and Soils	Short- and long-term minor adverse and long-term minor beneficial	Long-term minor adverse	Long-term minor adverse
Ecological Systems	Long-term minor and moderate adverse	Long-term minor adverse	Long-term minor adverse
Cultural Resources	Long-term minor adverse	Long-term minor adverse	Long-term negligible to moderate adverse
Air Quality	No effects	Long-term minor adverse	Long-term minor adverse
Hazardous and Toxic Substances	No effects	Short- and long-term moderate adverse and long-term minor beneficial	Long-term minor adverse
Noise	No effects	Short- and long-term minor adverse	Long-term minor adverse

Although no violations of Federal, State, and local laws (as summarized in Table 1-1) would be expected to occur if the Maximum Modification Alternative was implemented, unmitigated development and encroachment could result in violation of the laws protecting water quality, threatened and endangered species, and historic and archeological resources. However, implementation of the mitigation measures described in Section 4.6.15 would reduce the probability of such violations.

Summary of Cumulative Effects. An increase in the number of boat docks from 295 to 1,393 (372 percent) under the Maximum Modification Alternative could significantly increase development in the vicinity of the Greers Ferry Lake and could increase boater activities on the lake during peak use periods by 6 percent. New development in the watershed such as the proposed 400-slip marina at Cove Creek would further increase boater activity on the lake. The marina and the boat docks permitted under this alternative could help alleviate the need for future development of recreational facilities at the lake by reducing demand for new facilities. The cumulative effects of the Maximum Modification Alternative are described here; however, these effects are likely to be less significant if the mitigation measures listed in Section 4.6.15 are implemented.

Adverse cumulative effects on lake water quality could occur from increased loading of pollutants as a result of resort area, housing, and new infrastructure construction in the watershed. Changes to infrastructure might need to be considered in future county planning, including a need to expand roads to handle more traffic year-round, increases in electrical and water supply capacities, and expanded communication systems. The increase in recreational activity on the lake could require an increase in the availability of sewage disposal facilities for boaters and increased enforcement of no discharge regulations. Future development of marinas and other public facilities on the lake, as well as housing subdivisions and business growth off the lake, would be expected to have a major beneficial cumulative effect on the local economy.

A significant increase in impervious surfaces, such as rooftops and roads, along with wave action created from increased boater usage of the lake, would increase surface runoff and thus increase the potential for soil erosion. Although prime farmland soils or unique farmlands currently used for agriculture would not be directly affected, the potential exists for increasing development to consume these soils. Such an increase in development also could convert forested areas containing wildlife habitat to residential areas. Development also could negatively affect known

or potential archeological sites through encroachment or increased soil erosion. An increase in boater activities on the lake could result in increased noise levels and an increased potential for hazardous material spills and contamination. No other actions under the Maximum Modification Alternative that would have the potential for additive, cumulative effects on the socioeconomic and natural resources of Greers Ferry Lake have been identified.

4.6.15 Mitigation Measures for Alternative 5, the Maximum Modification Alternative

The following measures are proposed to help mitigate the impacts of potentially increasing the number of boat docks by 372 percent under the Maximum Modification Alternative. This alternative would allow rezoning of areas of shoreline with slopes between 20 and 49 percent to LDA's. The Corps of Engineers' *Greers Ferry Lake Rezoning Request Evaluation Criteria*, provided in Appendix A, describes elimination factors as well as physical and managerial criteria employed in determining whether a rezoning request could be approved or otherwise denied. The use of these elimination factors serves as mitigation in that by implementing these criteria and denying a rezoning request, adverse impacts are avoided. For example, if there are any significant environmental, ecological, or cultural features present, the rezoning request would be denied.

A compilation of suggested mitigation measures for individual resource areas follow. The introduction of pollutants and sediment to surface water bodies from surface water runoff can be reduced if BMPs are used during construction, agricultural operations, industrial operations, and daily household operations in the Greers Ferry Lake watershed. Proper operation and maintenance of septic systems in the watershed is critical, as is proper operation and maintenance of boats and PWCs. Planting a grassy cover would help minimize soil erosion and nonpoint source pollution associated with surface water runoff following vegetation removal if the vegetation modification (mowing) distance from habitable structures is increased. Maintaining an intact vegetative buffer strip within 50 feet of the vegetated edge of the shoreline would also reduce the likelihood of soil erosion and nonpoint source pollution. Visual and aesthetic impacts could be mitigated by the use of earth-tone or green-colored materials, particularly for the roofs and any siding, depending on the color of the background vegetation.

Mitigation measures for archeological sites include data recovery excavations at archeological sites that would be destroyed due to construction or soil disturbance. It may be advantageous to consider executing a Programmatic Agreement (PA) among the Corps of Engineers, the Advisory Council on Historic Preservation and the Arkansas SHPO. A PA streamlines the Section 106

process by stipulating under which conditions Section 106 tasks would be completed. For example, the PA could include or exclude certain actions on the part of the Corps of Engineers, or certain types of historic resources. The PA could provide documented compliance with Section 106 of the National Historic Preservation Act, as well as the framework for site-specific coordination with the SHPO, as needed, and subject to modification or revision over time.

Boater conflicts and accident rates could be reduced by increasing the message of boater safety and tolerance for multiple uses during patrols on the lake and encounters between law enforcement officials and lake visitors and area residents. Were conflicts between adjacent homeowners and boaters (for instance, concerning fishing near private docks or jet ski use in coves) to become too common, some form of use regulation might become desirable. The use of a lake surface can be regulated by zoning different parts of the lake for different activities or by allowing conflicting activities on a lake at different times.

4.7 ALTERNATIVE 6: REVISED PREFERRED ALTERNATIVE

4.7.1 Introduction

Under the Revised Preferred Alternative, the Corps of Engineers would approve 56 rezoning requests, including 41 of the rezoning requests that met the 90 percent criteria. Four of the 45 requests that originally met the 90 percent criteria would not be approved as a result of the following additional elimination criteria:

- Boat dock rezoning requests in the Narrows would be denied. This elimination criterion would deny two rezoning requests.

- No rezoning requests along very high scenic integrity protected areas would be approved (see Figure 2-9). This elimination criterion would deny two more rezoning requests.

Additionally, the Corps of Engineers would conditionally approve rezoning requests issued during the time the 2000 SMP was approved. Sixteen permits for rezoning requests scored fewer than 90 points and were issued during that time, though one of these sites would be eliminated because of the new elimination criterion of safety in the Narrows, resulting in 15 additional docks.

The limits of the conditional approval would restrict any future expansion of the boat docks once permitted. The permits would be approved only for construction of a boat dock meeting the

specifications of size and slip number as indicated in the original rezoning request. Table 4-28 provides a detailed breakdown of the rezoning request that would be approved. No additional rezoning requests would be accepted, evaluated, or approved at future SMP reviews.

Table 4-28
Detailed Breakdown of Rezoning Requests That Would Be Approved Under the Revised Preferred Alternative

Approved Request	Score (%)	# of Slips per Request	Total Number of Slips
4	>90	20	80
2	>90	8	16
1	>90	7	7
6	>90	6	36
9	>90	4	36
2	>80	4 (Conditional)	8
1	>80	3 (Conditional)	3
19	>90	2	38
12	>80	2 (Conditional)	24
Total 56 Sites			**248 Slips**

A vegetative buffer strip from the vegetated edge of the shoreline inland for 100 feet would be established for Corps property. Authorization for mowing would remain at 50 feet from habitable structures, though a landowner could be granted a permit for up to an additional 50 feet of mowing if the mowing would not conflict with the vegetative buffer strip.

Restrictions on boats with sleeping quarters and/or MSDs would be revised to conform with State law and Corps regulation. Grandfathered docks would be allowed to be improved/reconstructed to alternative dimensions, or the locations of existing grandfathered docks would be reallocated outside park buffer zones or prohibited areas.

The following discussions of the effects of implementing the Revised Preferred Alternative on the resource areas are presented in terms of the effects of Alternatives 1through 5, which were discussed previously. The effects of implementing the four key elements of the Revised Preferred Alternative have each been analyzed under one or more of the other analyses of alternatives. For example, the effects of maintaining a 50-foot vegetative clearing (mowing) distance from habitable structures was analyzed as part of Alternative 1, the No Action Alternative, and the effects of establishing a 100-foot vegetative buffer strip was analyzed as part of Alternative 4, the

90 Percent Rezoning Criteria Alternative. The effects of the Revised Preferred Alternative, then, are characterized in terms of their similarity to the effects attributed to Alternatives 1 through 4.

For most resource areas, the magnitude of effects of the Revised Preferred Alternative would lie between that of Alternative 2 and that of Alternative 4, and the characterizations of the magnitude of effects for those two alternatives are, in most cases, very similar. For example, effects on water quality of both Alternative 2 and Alternative 4 are characterized as "short-term and long-term minor indirect adverse effects." Because effects on water quality are primarily due to permitted development and boating activity, and the magnitude of these activities under the Revised Preferred Alternative would lie between that of Alternative 2 and that of Alternative 4, the characterizations of those effects would not change; that is, the effects would still be "short-term and long-term minor indirect adverse effects."

This approach to analyzing the effects of the Revised Preferred Alternative was believed to most clearly present the magnitude of the anticipated effects. Because the Revised Preferred Alternative primarily represents a combination of elements chosen from the other alternatives, with some minor differences, and it is based on public review of those alternatives and their effects, discussing the impacts of the Revised Preferred Alternative in terms of the effects of the other alternatives seemed to be the clearest and most succinct approach.

The effects of the Revised Preferred Alternative on only one resource area, Visual and Aesthetic Resources, would be perceptibly different from those discussed under the other alternatives. This is because the exact locations of the boat docks that would be permitted under the Revised Preferred Alternative would be different from those under the other alternatives. Considering that those docks could be located near other docks or in areas of the lake currently without docks, it was impossible to estimate the effect of the Revised Preferred Alternative on the quantity of lake and land acres from which those docks would be visible without a precise analysis. Also, because of the subjective nature of impacts to aesthetic resources and the decision to distinguish between minor and major impacts at a 50 percent change in visibility, it was desirable to know precisely the magnitude of landscape visibility changes under the Revised Preferred Alternative. The magnitude of changes in visibility under the Revised Preferred Alternative, therefore, is analyzed in Section 4.7.6.

4.7.2 Greers Ferry Lake Watershed

4.7.2.1 Hydrogeology/Groundwater

No effects on groundwater would be expected under the Revised Preferred Alternative. As with the other alternatives, the impermeable soils of the area make impacts on Greers Ferry Lake caused by groundwater runoff unlikely.

4.7.2.2 Water Quality

Short- and long-term minor indirect adverse impacts would be expected under the Revised Preferred Alternative. Effects on water quality are attributed primarily to new homes and septic systems near the lake and development in the watershed. The magnitude of the effects of this alternative on water quality would be expected to lie between that of Alternative 4, the 90 Percent Rezoning Criteria Alternative, and that of Alternative 2, the 80 Percent Rezoning Criteria Alternative, both of which are anticipated to cause minor adverse effects on water quality.

Under the Revised Preferred Alternative, 525 additional homes and septic systems are projected to be constructed and installed, respectively, in the Greers Ferry Lake watershed as part of local development associated with the potential increase in new docks. This number compares to 519 new homes under Alternative 4 and 547 new homes under Alternative 2. The quantity of shoreline zoned as LDA would increase from 7 percent to 7.6 percent, resulting in an increase in the number of boats stored on the lake and a slight increase in shoreline and boating activity. In addition, there would be some increase in ground disturbance from expanded vegetation mowing.

4.7.3 Land Use, Land Cover, Land Use Controls

No effects on land use would be expected; long-term minor direct beneficial and adverse impacts on land cover on the Greers Ferry Lake shoreline would be expected; long-term minor indirect beneficial and adverse impacts on land cover on adjacent private land would be expected; and no effects on land use controls would be expected.

As with the other alternatives, no conflicts with existing land use plans, policies, or controls would result; thus, no direct, adverse impacts on land use would ensue. The potential indirect impacts of this change in land cover along the shoreline also are addressed in Section 4.7.2, Greers Ferry Lake Watershed; Section 4.7.6, Visual and Aesthetic Resources; Section 4.7.9, Ecological Resources; and Section 4.7.10, Cultural Resources.

4.7.4 Infrastructure

Long-term negligible direct beneficial effects and long-term negligible and minor indirect adverse effects would be expected. Effects on infrastructure are attributed primarily to new home development and new docks. Implementation of the Revised Preferred Alternative would increase the number of boat docks by 226, compared with an increase of 215 under Alternative 4 and 263 under Alternative 2. As mentioned in Section 4.7.2, the number of new homes in the watershed would also be less than that expected under Alternative 2 and more than that anticipated under Alternative 4. The magnitude of the effects of this alternative on infrastructure, therefore, would be expected to lie between that of Alternative 4, the 90 Percent Rezoning Criteria Alternative, and that of Alternative 2, the 80 Percent Rezoning Criteria Alternative. Alternatives 2 and 4 are each characterized as causing negligible beneficial effects and minor adverse effects on infrastructure.

4.7.5 Socioeconomic Conditions

Short-term minor direct beneficial and short-term and long-term minor indirect beneficial socioeconomic effects would be expected. Effects on socioeconomic conditions are attributed primarily to induced development and new construction, including new homes and new docks. As discussed in Section 4.7.4, under the Revised Preferred Alternative the number of potential new homes and new docks would be slightly higher than that under Alternative 4 but lower than that under Alternative 2, and each of those alternatives is characterized as causing minor direct and indirect beneficial effects on socioeconomics.

No effects on environmental justice or protection of children would be expected.

4.7.6 Visual and Aesthetic Resources

Long-term minor direct beneficial and adverse effects and long-term major direct adverse effects on visual and aesthetic resources would be expected. Effects on visual and aesthetic resources are attributed primarily to new docks and vegetative cover. The number of new docks under the Revised Preferred Alternative would be 226, which is more than that under Alternative 4 and less than that under Alternative 2. Scenic integrity and scenic attractiveness would be affected under the Revised Preferred Alternative similarly to how they would be affected under Alternative 4.

Maintaining the mowing distance from a habitable structure at 50 feet would represent no change from the current situation. Allowing some adjacent landowners to mow up to 100 feet from their residences would adversely affect aesthetics around the lake, and it would be expected that this

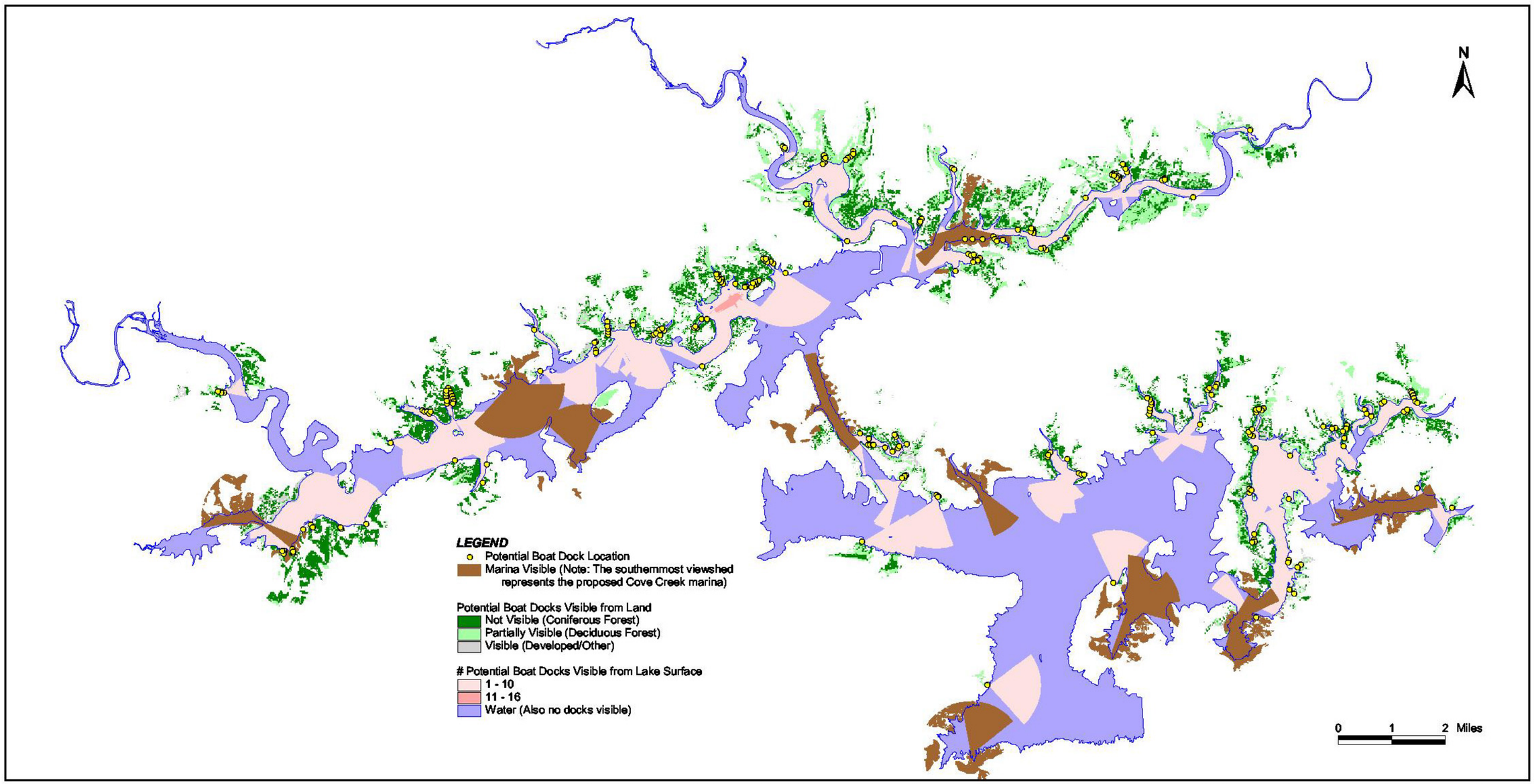
change would cause a minor adverse effect because modifications to the natural vegetation would reduce scenic integrity and attractiveness. The degree of impact would depend on the number of landowners to whom permits were granted for an additional 50 feet of mowing and the types of alterations to the natural vegetation made. Designating three areas of the lake shoreline as very high scenic integrity protected area would protect a total of 54.7 highly visible miles of shoreline from dock development and, along with establishing a 100-foot vegetative buffer strip around the lake, a beneficial effect on lake aesthetics would be created.

Landscape visibility would be affected based on the precise locations of the docks that potentially would be permitted under this alternative. The locations of the 56 new docks that would be permitted under the Revised Preferred Alternative as a result of rezoning requests along with the 170 potential new docks in existing LDA's are shown on Figure 4-9.

Using the 1-mile visibility range discussed in Section 3.0, 1 or more of the new docks would be visible from 10,588 acres, or 34 percent of the lake's surface, compared to the 12,036 acres from which the 295 existing boat docks are clearly visible (Table 3-24). One to ten new docks would be visible from 10,524 acres, or 34 percent of the lake's surface.

Figure 4-10 shows the combined potential and existing boat dock viewsheds that could result from implementation of Alternative 6. When added to the existing docks, at least 1 potential or existing boat dock would be visible from 16,312 acres of water, or about 52 percent of the lake's surface, with 1 to 10 docks visible from 14,629 acres of water, or 47 percent of the lake's surface (Table 4-29). Under this alternative, with 226 potential new boat docks, there potentially would be a 36 percent increase in the acreage of the lake from which one or more boat docks would be clearly visible over the existing situation and a 15 percent increase over the No Action Alternative. Using the 50 percent criterion (see Section 4.1.2.3), this would represent a minor change in visibility from the lake surface.

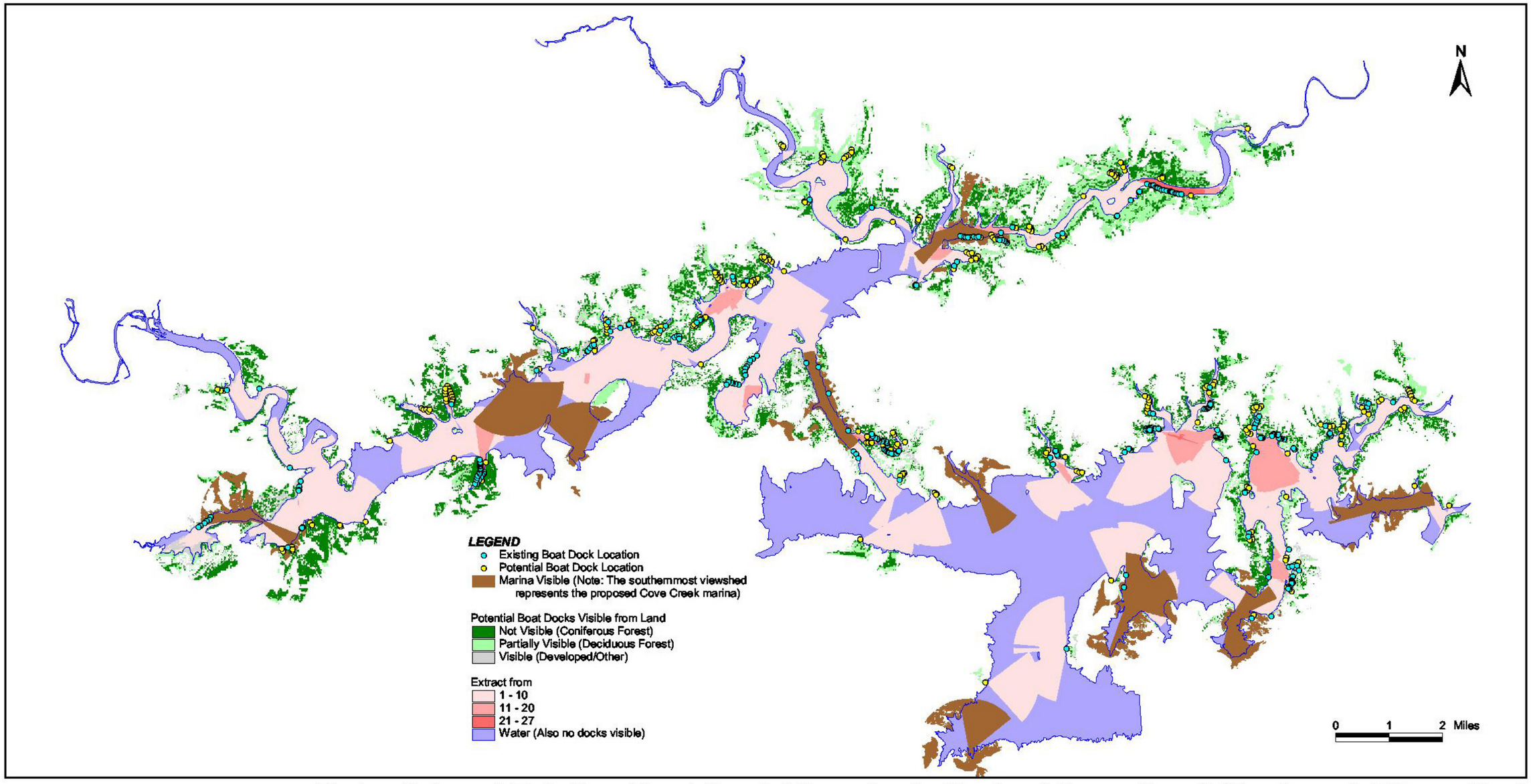
The discussion of changes in boat dock viewsheds for Alternative 4 is accurate for Alternative 6. Notable changes, as compared to Alternative 1 (No Action Alternative), would be a 25 percent increase in the lake acreage from which 11 to 20 boat docks would be clearly visible (from 1,243 acres to 1,557 acres) and a 14 percent increase in the lake acreage from which 1 to 10 boat docks would be clearly visible (from 12,871 acres to 14,629 acres), with these changes being especially noticeable in the upper part of the lake.



Potential Boat Dock Viewsheds Under Alternative 6 (Preferred Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-9



Potential and Existing Boat Dock Viewsheds Under Alternative 6 (Preferred Alternative)

Sources: GIS calcuations; USACE, Little Rock District, 2001.

Figure 4-10

Table 4-29
Acreage of Lake From Which Boat Docks Are Clearly Visible: Alternative 6 (Revised Preferred Alternative), and Alternative 6 Plus Existing Boat Docks

Number of Visible Docks	Lake Acreage		Percent of Lake's Total Surface	
	Preferred	Plus Existing	Preferred	Plus Existing
1–10	10,524	14,629	34	47
11–20	64	1,557	0.2	5
21–30	--	126	--	0.4
Total	10,588	16,312	34	52

Source: GIS calculations.

Figure 4-10 also shows the seen area for potential new boat docks from land surrounding the lake under Alternative 6. At least one dock would potentially be visible from about 9,335 acres of land surrounding the lake, depending on vegetative cover and season of the year.

The combined potential and existing boat dock viewsheds over land surrounding the lake under Alternative 6 are shown in Figure 4-10. When added to the existing docks, at least one potential or existing dock would be visible from 12,530 acres, an increase of 64 percent over the potential seen area from land over the existing situation. Using the 50 percent criterion (see Section 4.1.2.3), this would represent a major change in visibility from the surrounding land.

4.7.7 Recreation and Recreational Facilities

Long-term minor direct beneficial effects on recreation would be expected as a result of implementing the Revised Preferred Alternative. Effects on recreation and recreational activities are attributed primarily to new docks and recreational facilities. Under the Revised Preferred Alternative, 859 additional slips would potentially be placed on the lake (Table 4-5), which is less than the 999 new slips under Alternative 2 and more than the 817 new slips under Alternative 4. The 859 new slips would be estimated to contribute an additional 43 boats to the lake during peak use periods, a 3 percent increase. A 3 percent increase was also estimated under Alternative 4. Both Alternative 2 and Alternative 4 are characterized as causing minor beneficial effects on recreation and recreational resources.

4.7.8 Geology and Soils

Short-term and long-term minor direct adverse, long-term minor direct beneficial, and long-term minor indirect adverse and beneficial effects would be expected. Effects on geology and soils are attributed primarily to vegetation clearing and maintenance or establishment of natural vegetation. Adverse effects would be expected to result from issuing permits to some landowners for clearing vegetation up to 100 feet from a habitable structure, similar to but less than the effects discussed in the analysis for Alternative 2, the 80 Percent Rezoning Criteria Alternative. The effects of vegetation clearing on geology and soils under Alternative 2 are also characterized as minor and adverse. Beneficial effects would be expected to result from maintenance of a 100-foot vegetative buffer strip, similar to the effects of the vegetative buffer strip as discussed under Alternative 4, the 90 Percent Rezoning Criteria Alternative. The beneficial effects of the Revised Preferred Alternative attributable to the vegetative buffer strip, therefore, would be similar to those discussed for Alternative 4. The effects of the 100-foot vegetative buffer strip on geology and soils under Alternative 4 are also characterized as minor beneficial effects.

4.7.9 Ecological Systems

Long-term minor direct and indirect adverse and long-term minor direct beneficial effects would be expected. Effects on ecological systems are attributed primarily to vegetation clearing and maintenance or establishment of natural vegetation. Minor adverse effects on vegetative communities, wildlife, and potentially sensitive species would be expected from increased vegetation clearing up to 100 feet from a habitable structure. A maximum of 1,141 acres of Corps property (18.6 percent of the total acreage in LDA and Protected Shoreline Area) could be affected by mowing within 100 feet of habitable structures if a 100-foot vegetative buffer strip was also established. This is the maximum acreage that could be affected if the foundations of houses were located as close as possible to Corps property, which would be on either the Corps property line or the edge of the flowage easement, and all property owners were to mow to the maximum possible distance from their residences. The maximum possible distance would be either 100 feet or to the edge of the vegetative buffer strip, if the latter was closer than 100 feet to a residence. Since it is unlikely that all houses would be located as close as possible to Corps property and that all property owners would apply for a permit to mow out to 100 feet from their residences, less than 1,141 acres would be expected to be affected by mowing under Alternative 6.

Minor beneficial effects on shoreline vegetation and the Federally listed gray bat would be expected to result from the maintenance of a 100-foot vegetative buffer strip. A 100-foot vegetative buffer strip would protect 2,469.4 acres of Corps property, or 40.3 percent of the total Corps property in LDA and Protected Shoreline Area, from disturbance. Of this total, 211.7 acres of LDA and 2,257.7 acres of Protected Shoreline Area would be protected, or 48.3 percent and 39.7 percent of the total LDA and Protected Shoreline Area acreages, respectively. The effects of the Revised Preferred Alternative would be less than those attributed to Alternative 4, under which a 100-foot vegetative buffer strip would also be established but vegetation clearing around habitable structures is increased to 100 feet for all landowners. Alternative 4 is also characterized as causing minor adverse and beneficial effects on ecological systems.

4.7.10 Cultural Resources

Long-term negligible to minor direct and indirect adverse effects could be expected. As with the other alternatives, effects could range from negligible to minor depending on the type and size of site affected and the extent of soil disturbance or other potential adverse effects. Effects on cultural resources are attributed primarily to soil disturbance and the level of human activity. The level of these activities would be expected to be more than that attributed to Alternative 4 and less than that attributed to Alternative 2. Both of those alternatives were characterized as potentially causing minor adverse impacts on cultural resources.

4.7.11 Air Quality

Long-term negligible indirect adverse effects on air quality would be expected. Effects on air quality are attributed primarily to automobile traffic, which is related to the amount of growth in a region. The level of growth expected under the Revised Preferred Alternative is more than that anticipated under Alternative 4 and less than that anticipated under Alternative 2. Both of those alternatives were characterized as causing negligible adverse impacts on air quality.

4.7.12 Hazardous and Toxic Substances

Short-term and long-term minor indirect adverse effects and long-term minor indirect beneficial effects would be expected. Effects on hazardous and toxic substances are attributed primarily to the increase in boat docks and boating activity. The number of boat dock permits anticipated to be issued under the Revised Preferred Alternative would be less than the number issued under Alternative 2 and more than the number issued under Alternative 4. The level of new boating

activity under the Revised Preferred Alternative also would fall somewhere between the levels anticipated under Alternatives 2 and 4. Both Alternative 2 and Alternative 4 are characterized as causing minor adverse and beneficial effects on hazardous and toxic substances.

4.7.13 Noise

Short-term and long-term minor indirect adverse impacts would be expected. Effects on noise are attributed primarily to boating activity and residential development. The amount of boating activity and residential development anticipated to occur under the Revised Preferred Alternative would be less than that anticipated under Alternative 2 and more than that anticipated under Alternative 4. Both Alternative 2 and Alternative 4 are characterized as causing minor adverse effects on the noise environment.

4.7.14 Summary of Effects Under the Revised Preferred Alternative

No significant beneficial or adverse effects would be expected under Alternative 6. Table 4-30 presents a summary of the environmental and socioeconomic consequences of the Revised Preferred Alternative for each resource area. No violations of Federal, State, or local laws (as summarized in Table 1-1) would be expected to occur if the Revised Preferred Alternative was implemented.

Summary of Cumulative Effects. Cumulative impacts would be negligible to minor for all resource areas under the Revised Preferred Alternative. The discussion of cumulative effects for either Alternative 2 (Section 4.3.14) or Alternative 4 (Section 4.5.14) is valid for the Revised Preferred Alternative.

4.7.15 Mitigation Measures for the Revised Preferred Alternative

The mitigation measures described for Alternative 2 or Alternative 4 are valid for the Revised Preferred Alternative. Mitigation measures employed under the Revised Preferred Alternative would include water quality monitoring, recommendation that landowners use BMPs during any soil disturbance, consultation with the SHPO before any soil disturbance, and use of materials for boat docks that have earth-tone colors or colors that blend in with the natural surroundings. Establishment of a 100-foot vegetative buffer strip; use of the Corps of Engineers' *Greers Ferry Lake Rezoning Request Evaluation Criteria*, provided in Appendix A; denying permits for vegetation clearing beyond a 50-foot distance from a habitable structure, unless necessary based

Table 4-30
Environmental Effects Summary for Alternative 6 (Revised Preferred Alternative)

Resource Area	Direct Effects	Indirect Effects	Cumulative Effects
Greers Ferry Lake Watershed	No effects	Short- and long-term minor adverse	Long-term minor adverse
Land Use, Land Cover, and Land Use Controls	Long-term minor beneficial and adverse	Long-term minor beneficial and adverse	Long-term minor adverse
Infrastructure	Long-term negligible beneficial	Long-term minor adverse	Long-term minor adverse
Socioeconomics	Short-term minor beneficial	Short- and long-term minor beneficial	Short- and long-term minor beneficial
Visual and Aesthetic Resources	Long-term minor beneficial and adverse and major adverse	No effects	Long-term minor adverse
Recreation and Recreational Facilities	Long-term minor beneficial	No effects	No effects
Geology and Soils	Short-term and long-term minor adverse and long-term minor beneficial	Long-term minor adverse and beneficial	No effects
Ecological Systems	Long-term minor beneficial and adverse	Long-term minor adverse	Long-term negligible beneficial
Cultural Resources	Long-term negligible to moderate adverse	Long-term negligible to moderate adverse	No effects
Air Quality	No effects	Long-term negligible adverse	No effects
Hazardous and Toxic Substances	No effects	Short- and long-term minor adverse and long-term minor beneficial	Short- and long-term minor adverse
Noise	No effects	Short- and long-term minor adverse	Long-term minor adverse

on site-specific circumstances; permitting boat docks (beyond those that would be permitted per rezoning requests as described under the Revised Preferred Alternative) only in established LDA's; and establishing very high scenic integrity protected areas around open water areas of the lake also serve as mitigation measures under the Revised Preferred Alternative for controlling impacts on Greers Ferry Lake and its environment.

4.8 CUMULATIVE EFFECTS

4.8.1 Introduction

There is a growing recognition that the combined, incremental effects of various human activities on a resource—cumulative effects—can pose a threat to the resource. Although each effect might be insignificant by itself, adverse effects from multiple sources occurring at different times can build up and result in serious degradation of a resource.

CEQ's regulations for implementing the procedural provisions of NEPA define cumulative effects as the "effects on the environment, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions." Cumulative effects on a given resource, ecosystem, or human community are rarely aligned with political or administrative boundaries.

This EIS considered actions from the past 10 years and known future actions that could occur within the next 5 years. Population trends were predicted using the REMI model. Water quality trends and changes to visual and aesthetic resources were modeled based on predicted development that could occur under the various alternatives. Recreation trends were based on predictions of the number of docks that would be allowed under each of the alternatives and data from a separate recreational carrying capacity study. The only important future action known to be planned and included in the analysis was the new marina under consideration for Cove Creek in the south lake area.

It is worthwhile to note that about 40 years ago the Greers Ferry Lake project was a riverine environment. Damming of the river created a lentic environment. This change significantly transformed both the environment and the economics of the region. As a result, people were drawn to this area principally for recreation. Existing communities around the lake grew, and new communities, such as Fairfield Bay, were developed. It could be argued that the Corps action directly stimulated this growth. However, the environment and the region adapted to the change, and growth over the past 10 years has been limited.

In managing Greers Ferry Lake, the Corps has taken actions to address the needs of the public as well as the need to maintain the lake's resources in a sound environmental manner. Consequently,

the Corps actions in managing the lake are primarily viewed as a reaction to growth rather than as an inducement to growth.

The following subsections address cumulative effects specific to the affected resources.

4.8.2 Greers Ferry Lake Watershed

No cumulative effects on groundwater resources would be expected. No effects to groundwater resources are anticipated to occur from implementation of the alternatives.

Minor adverse cumulative effects on water quality could result from an increase in development in areas adjacent to the lake within the project area. Additional construction related to resort areas, housing, and new infrastructure in the Greers Ferry Lake watershed would contribute additional pollutant loadings to the lake. In addition, the planned construction of a 400-slip boat marina in Cove Creek could cause minor adverse cumulative effects on water quality. These effects were discussed previously under each alternative.

4.8.3 Land Use, Land Cover, and Land Use Controls

No other actions that would have the potential for additive, cumulative impacts on land use along the shoreline of Greers Ferry Lake, on adjacent private lands, or in the lake's watershed have been identified.

4.8.4 Infrastructure

Infrastructure changes that would be anticipated under the six alternatives include more private and community docks, more access paths, new and upgraded roads, increased dry stack storage locations for boats, increases in launching facilities for boats (whether in the form of marina slips or boat launching ramps or lanes), an increased capacity of lake recreational facilities to accommodate overnight visitors, new water and electrical lines, and more septic tanks. In addition to these infrastructure changes, the planned construction of a 400-slip boat marina in Cove Creek would create additional demand on existing infrastructure resources.

Alternatives 1 through 4 and 6 are very similar in that the total number of new homes in any of these alternatives does not appreciably exceed the 493 anticipated under the No Action Alternative. Given that the No Action Alternative implies growth without changes to the current situation, it is likely that the planning done by officials in both Van Buren County and Cleburne

County has anticipated this level of future growth around the lake. Only Alternative 5 presents a different situation. Implementation of Alternative 5, combined with other growth that would be expected to occur in the region, could have cumulative effects on infrastructure that might need to be considered in future county planning. Those effects might include a need to expand roads to handle more traffic year-round in Greers Ferry, Heber Springs, and other surrounding towns; increases in electrical and water supply capacities; and expanded communication systems (including wired and cellular telephone and Internet access). If recreational activity at the lake increased under Alternative 5, it might be desirable to increase the availability of sewage disposal facilities for boaters and expand enforcement of no discharge regulations.

4.8.5 Socioeconomic Conditions

Future development of marinas and other public facilities would be expected to have a minor beneficial effect on the local economy. If marinas and parking facilities were expanded, more people would be expected to visit the lake. These visitors would spend money on food, lodging, gas, recreation, and other services in the ROI, creating minor beneficial cumulative effects.

4.8.6 Visual and Aesthetic Resources

Construction and operation of the Cove Creek marina would have a minor adverse cumulative effect on the scenic attractiveness and scenic integrity of the lake's shoreline over and above the introduction of new private boat docks. No other specific actions that would have the potential for additive, cumulative impacts on the visual and aesthetic resources of Greers Ferry Lake have been identified. Normal growth and development in the area surrounding the lake, apart from that associated with dock permitting, would be expected to occur and add to any adverse visual and aesthetic impacts on the lake from development associated with the proposed action.

4.8.7 Recreation and Recreational Facilities

Minor beneficial cumulative effects on recreation and recreational activities would be expected under all of the alternatives due to the effects of any alternative occurring in the context of normal growth in recreation and demand for recreational facilities at Greers Ferry Lake. The local economy would be expected to respond to this increased demand by providing additional services and facilities, resulting in a beneficial effect. Recreational activity in the area is likely to continue to increase in the future regardless of which alternative is implemented, and the character of recreation at the lake (the variety of activities in which lake users participate and when they

participate in these activities) would not be likely to be affected by implementing one of the alternatives. The low density of recreational activity at Greers Ferry Lake, compared to Corps lakes such as Lake Sydney Lanier outside Atlanta, Georgia, is not likely to change appreciably because of the lack of a major metropolitan area near the lake. Moreover, the density of recreational activity at the lake would not be expected to change significantly without significant changes in the populations of nearby metropolitan areas such as Memphis, Tennessee, and Little Rock, Arkansas, and without a concurrent increase in recreational facilities that would be needed to accommodate a significantly larger user population. Such changes, if they were to occur, would likely happen over a time span of 50 years or longer.

4.8.8 Geology and Soils

Long-term minor adverse cumulative effects could result from implementation of alternatives that allow for more development along the shoreline. Development behind Corps property along Greers Ferry Lake is likely to continue to increase; therefore, soil disturbance and subsequent increased sediment runoff would occur during construction of new structures. An increase in impervious surfaces, such as rooftops and roads, would increase surface runoff and, consequently, the potential for soil erosion. Minor impacts from construction of the proposed Cove Creek marina would occur through soil erosion. Fluctuating water levels from lake level management and increased boating activity on the lake, although not necessarily a result of the alternatives listed herein, would be likely to contribute to soil erosion through wave action and increased surface runoff.

Although none of the alternatives under the proposed action would affect prime farmland soils or unique farmlands currently used for agriculture and the regulations of the Farmland Protection Policy Act would not apply to the proposed action, the potential exists for increasing development in the Greers Ferry Lake region to consume prime farmland soils or unique farmlands.

No other actions that would have the potential for additive, cumulative impacts on the geology and soil resources of Greers Ferry Lake have been identified.

4.8.9 Ecological Systems

Minor adverse cumulative effects would be expected. Alternatives that allow for more development along the shoreline (more private docks) could lead to increased development of

adjacent land, which would result in a localized reduction of wildlife habitat. The lake watershed occupies 1,146 square miles (733,437 acres). Under Alternatives 1, 2, 4, and 6, growth induced by development in LDA's would be expected to convert less than 0.06 percent of the watershed from forested area to residential use. Alternative 5 would be expected to induce development at a projected maximum of 0.33 percent of the watershed over 40 years. Compared to the size of the lake watershed, the quantity of acreage potentially affected by vegetation modification and path permits is miniscule. Under Alternatives 2 and 4, a maximum of approximately 94 acres of Corps property would be expected to be mowed if every new dock permittee obtained a vegetation modification permit.

Lakes and lake tributaries have recreational and aesthetic benefits that attract potential home builders; more than 200 subdivisions adjoin the Greers Ferry Lake project property. Development that occurs in close proximity to the lake or lake tributaries would be expected to have greater adverse impacts on lake ecological systems than development spread evenly throughout the watershed. However, only about 30 percent of the lots in the 200 subdivisions have been developed. Unless the rate of development increases exponentially in the near future, there will be time to plan for the long-term protection of wildlife, vegetation, and sensitive species with appropriate conservation easements and nature preserves.

Any new boat dock would be expected to attract some fish species and shade a small portion of the lake bottom. At present, 295 boat docks have been permitted on 276 miles of shoreline around a lake with 31,500 surface acres at its conservation pool. Under the Maximum Modification Alternative, there is a potential for 1,098 new boat docks to be built over the next 40 years. Under current regulations, docks must be 100 feet apart. This distance would be expected to result in lake bottom shading of small, isolated locations. Even under such an extreme scenario, the effect of boat docks on aquatic plants and wildlife would be expected to be localized in LDA's with the highest density of 20-slip community boat docks. Changes to regulations involving grandfathered docks and boats with sleeping quarters and/or MSDs could be expected to affect water quality (discussed earlier), which could indirectly affect aquatic wildlife habitat both near docks and in the entire lake.

4.8.10 Cultural Resources

Minor adverse cumulative effects could result from an increase in development in areas adjacent to the lake within the project area. Adverse impacts could include the destruction of archeological

sites that might be NRHP-eligible or the demolition or alteration of NRHP-listed or eligible historic structures, such as buildings or statues. Additional construction related to resort areas, housing, and new infrastructure would disturb the soil and might affect archeological sites that could be NRHP-eligible. Erosion exposing sites could be caused by an increase in boating activities, and looting and treasure hunting could increase as population and foot traffic expand. Pressures on existing historic structures that might be NRHP-eligible could cause their demolition or alteration. Potential development areas have not yet been identified. The Corps has no control over development on private lands; however, National Historic Preservation Act Section 106 is invoked whenever a Federal agency issues a permit. During this Section 106 process, any potential NRHP-eligible resource would be identified and the SHPO would be consulted. Apart from this process, except for Heber Springs there are no land use controls, such as zoning and building permits, to protect cultural resources.

4.8.11 Air Quality

Long-term minor adverse cumulative effects on air quality would be expected. Normal growth in the region surrounding Greers Ferry Lake would lead to increases in automobile and boat traffic, which would lead to some increases in pollutants emitted from vehicles. These changes would not be expected to be significant because the region and Arkansas are attainment areas for all criteria air pollutants and this status would not change due to anticipated growth in the region surrounding the lake. Changes resulting from implementing any of the alternatives would not be expected to lead to other activities, such as new industry, that would affect air quality.

4.8.12 Hazardous and Toxic Substances

Long-term minor adverse cumulative effects could result from an increased number of boats using Greers Ferry Lake related to the use and potential spills of oil, fuel, and solvents from boat fueling operations and maintenance activities. Short-term minor adverse effects related to the installation of new docks from the use and spill of fuel, oil and grease, and solvents would be expected. The potential use of antifouling paint on boat hulls could have minor adverse effects due to metals leaching into the surrounding water. However, the type of paint used on the hulls of boats at Greers Ferry Lake is not regulated and the use of antifouling paints is left to the discretion of the boat owners. Because of the expense of antifouling paints, many boat owners will likely choose other types of paints. The addition of a potential 1,098 docks and 4,172 slips under Alternative 5 would have the greatest adverse impact. No anticipated changes are expected

in the District's operational management of the docks including concessions. No additional impacts are anticipated from concession activities.

4.8.13 Noise

Minor adverse cumulative effects could result from an increase in development in areas adjacent to the lake within the project area and from an increase in boater activities. These impacts were discussed previously under each alternative.

4.9 MITIGATION SUMMARY

4.9.1 Introduction

Recommended mitigation measures for each resource area are provided in the following subsections.

4.9.2 Greers Ferry Lake Watershed

No mitigation would be required for groundwater resources.

The introduction of pollutants and sediment to surface water bodies from surface water runoff can be reduced if BMPs are used during construction, agricultural operations, industrial operations, and daily household operations in the Greers Ferry Lake watershed. Single-house lots can be subject to a NPDES storm water general permit if they are part of a larger "common plan of development or sale" that cumulatively would disturb 5 or more acres (1 or more acres after March 10, 2003), such as might occur in a custom home subdivision where single lots are sold to individuals (or builders). If the roads in the subdivision disturb a total of 3 acres and the portion of 24 lots that would be disturbed is ¼ acre each (6 acres total), then the "common plan" would disturb a total of 9 acres and would be subject to NPDES permitting for any construction activity in that subdivision. Proper operation and maintenance of septic systems in the watershed is critical, as is proper operation and maintenance of boats and PWCs. Planting a grassy cover would help minimize soil erosion and nonpoint source pollution associated with surface water runoff following vegetation removal if the vegetation modification (mowing) distance from habitable structures is increased. Maintaining an intact vegetative buffer strip along the shoreline would also reduce the likelihood of soil erosion and nonpoint source pollution.

4.9.3 Land Use, Land Cover, and Land Use Controls

No adverse impacts on land use have been identified; therefore, mitigation measures would not be necessary.

4.9.4 Infrastructure

No mitigation would be required.

4.9.5 Socioeconomic Conditions

No mitigation would be required.

4.9.6 Visual and Aesthetic Resources

Visual and aesthetic impacts could be mitigated by the use of earth-tone or green-colored materials for boat docks, particularly for the roofs and any siding, depending on the color of the background vegetation. This would tend to make the boat docks less intrusive by helping them blend in with the natural background soils and vegetation along the shoreline.

4.9.7 Recreation and Recreational Facilities

Boater conflicts and accident rates could be reduced by increasing the message of boater safety and tolerance for multiple uses during patrols on the lake and encounters between law enforcement officials and lake visitors and area residents. If conflicts between adjacent homeowners and boaters (for instance, concerning fishing near private docks or jet ski use in coves), particularly under Alternative 5, were to become too common, some form of use regulation might be desirable. The use of a lake surface can be regulated by zoning different parts of the lake for different activities or by allowing conflicting activities on a lake at different times.

4.9.8 Geology and Soils

Mowing and clearing around habitable structures and along paths would be expected to result in a loss of natural vegetation. Loss of natural vegetation can lead to soil erosion. To identify and avoid potential damage to the environment, Corps of Engineers lake managers conduct annual inspections to ensure compliance with boat dock, vegetation modification, and path permits. Corps staff observing direct adverse environmental impacts on soils have the authority to modify or revoke permits. Corps staff have sufficient leeway to include conditional terms in permits to address potential problems on a case-by-case basis. Soil disturbance could be reduced if BMPs

such as silt fences and sediment retention ponds were used during construction of new structures and facilities. Maintaining an intact vegetative buffer strip within 50 to 100 feet of the vegetated edge of the shoreline would also reduce the likelihood of soil erosion.

4.9.9 Ecological Systems

Mowing and clearing around habitable structures and along paths would be expected to result in a loss of natural vegetation. Loss of natural vegetation has the potential to cause direct and indirect impacts on wildlife and sensitive species. For example, the gray bat is known to forage in forested habitats adjacent to water bodies. Long-term removal of shoreline vegetation could deprive the gray bat of foraging cover and insect prey. Homeowners might inadvertently harm State-listed plants while carrying out permitted vegetation modification. To identify and avoid potential damage to the environment, Corps of Engineers lake managers conduct annual inspections to ensure compliance with boat dock, vegetation modification, and path permits. Corps staff that observe direct adverse environmental impacts on wildlife or vegetation have the authority to modify or revoke permits. Corps staff have sufficient leeway to include conditional terms in permits to address potential problems on a case-by-case basis.

Because the gray bat is the only Federally listed species known from the Greers Ferry Lake vicinity that has not been scientifically documented in the project area, planning-level surveys for this species are recommended. At this time, management concerns for the gray bat are based on professional opinion, not scientific evidence. Corps managers need more information about this species if they are to implement appropriate and effective habitat protection measures in the project area. However, not locating a species during a survey does not necessarily prove its absence. Special attention during annual permit inspections to identify State-listed plant species where they occur near homes and development also would help to maintain viable populations of these plants, educate homeowners, and avoid adverse impacts.

4.9.10 Cultural Resources

Mitigation measures for archeological sites include data recovery excavations at archeological sites that would be destroyed because of construction or soil disturbance. In addition, ongoing impacts of the reservoir and SMP implementation could include erosion along the shoreline due to wave action from increased boating activities, soil disturbance caused by construction, and looting and treasure hunting caused by increased activity and foot traffic. Mitigation measures for historic structures or districts that would be altered or demolished or whose viewsheds would be

adversely affected include photographic documentation, scale drawings, and archival research. Other mitigation means are also possible. Avoidance, however, is preferred. Mitigation measures should be discussed with the Arkansas SHPO early in the process, and with the public and interested American Indian tribes or organizations. Any mitigation measures should be proposed or considered in accordance with the provisions of 36 CFR Part 800, Protection of Historic Properties.

It may be advantageous to consider executing a Programmatic Agreement (PA) among the Corps of Engineers, the Advisory Council on Historic Preservation and the Arkansas SHPO. A PA streamlines the Section 106 process by stipulating under what conditions Section 106 tasks would be completed. For example, the PA could include or exclude certain actions on the part of the Corps of Engineers, or certain types of historic resources. The PA could provide documented compliance with Section 106 of the National Historic Preservation Act, as well as the framework for site-specific coordination with the SHPO, as needed, and subject to modification or revision over time.

4.9.11 Air Quality

No mitigation would be required.

4.9.12 Hazardous and Toxic Substances

Adverse impacts from potential spills of oil, fuel, and solvents from construction could be mitigated by ensuring that boat owners who use the lake are provided information on proper procedures for using and handling these materials and what procedures they should follow in case of a spill.

4.9.13 Noise

There is a potential to mitigate the increase in noise levels resulting from increased human activity through county and municipal land use regulations, construction codes, and zoning restrictions. In the past the Corps recommended implementing a noise (loud boat) ordinance to a local county quorum court (USACE, Little Rock District, 1987) without success. Potential mitigation activities directly under control of the Corps could include establishing a limit for allowable boat motor horsepower or limiting or restricting motorboat use to specified areas of the lake.

4.10 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

All the SMP alternatives evaluated in the EIS would result in some unavoidable adverse environmental effects, as detailed in the previous sections. Many of these effects would be reduced through mitigation; however, certain impacts would be unavoidable. The principal unavoidable adverse effects on the environment are summarized below:

- ***Visual and Aesthetic Resources.*** With the exception of the No Growth Alternative, some loss of scenic attractiveness and loss of scenic integrity would be associated with implementing any of the SMP alternatives. However, implementing Alternative 5 (Maximum Modification Alternative) would have significantly greater visual and aesthetic impacts than implementing the other SMP alternatives. For example, expanding the vegetation modification zone from 50 to 200 feet around residential structures along the shoreline would have long-term, direct, significant adverse visual and aesthetic impacts. Furthermore, the potential addition of more than 1,000 boat docks represents a 268 percent increase, which would significantly reduce the scenic attractiveness and scenic integrity of the lake's shoreline.

- ***Recreation.*** Increases in boat docks and rezoning associated with many of the SMP alternatives might directly and indirectly increase the number of watercraft on the lake, thereby increasing the potential for accidents and boater conflicts and affecting the recreational experience of those using the lake.

- ***Water Quality.*** SMP management measures (e.g., rezoning, policies on grandfathered docks, and houseboat rules) would have a direct negligible effect on water quality. However, rezoning and/or additional permits might result in induced growth, which could have a significant impact on water quality, particularly for nutrient parameters. Increased pollutant loadings associated with increased growth can be expected under all the SMP alternatives, particularly Alternative 5 (Maximum Modification Alternative). The additional loadings to the lake modeled for Alternative 5 would likely worsen lake water quality noticeably. With increased growth and development in the Greers Ferry Lake watershed, loadings for certain parameters might increase (thereby increasing the potential for water quality standard exceedances). Implementing construction BMPs would minimize some of the impacts of new development. Proper operation and maintenance of septic systems and MSDs also would aid in minimizing impacts.

Implementing such BMPs throughout the entire watershed might reduce loadings below current baseline conditions even in the event of further development.

- ***Terrestrial Habitat/Wildlife.*** Induced growth, particularly for Alternative 5 (Maximum Modification Alternative), might result in additional loss of terrestrial habitat within the watershed of the lake. This loss of habitat would in turn result in adverse effects on wildlife and sensitive species. Furthermore, expansion of the vegetation modification zone and rezoning would result in habitat loss and enhanced light penetration, which would have a minor impact on the vegetative community structure of the shoreline.

4.11 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of a proposed action (e.g., extinction of a threatened or endangered species).

No irreversible and only minor irretrievable commitments of resources would be expected from implementation of the SMP alternatives evaluated in this EIS. Land and natural resources (flora, fauna, water) within the area addressed by the SMP alternatives would be managed with sound stewardship with minimal damage, and with a long-term goal of sustainability and the avoidance of irreversibility. Furthermore, direct actions governed by the SMP alternatives, such as rezoning and permitting actions, represent small changes to the natural environment that can be reversed over the long term. With respect to the indirect effects and secondary actions that might result from the Corps permitting decisions (increased shoreline growth and enhanced regional growth), long-term irretrievable commitments of resources might occur, including loss of terrestrial habitat and minor reductions in the aesthetic quality of the area. Such impacts would be most evident for Alternative 5 (Maximum Modification Alternative), which would increase the private use and modification of shoreline in the long term, while reducing the public aesthetic benefit of a pristine lake environment. Once areas are rezoned for private use, it is unlikely that such areas would revert back to a pristine, undeveloped shoreline that would be more appealing for public uses in the future. Therefore, the baseline aesthetic quality of the lake would likely be irretrievable once areas are rezoned under Alternative 5.

4.12 SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Significant conflicts between short-term use and long-term sustainability of the lake environment are not foreseen under SMP alternatives, with the exception of Alternative 5. Under this alternative, rezoning actions might result in enhanced development activities in the watershed that in turn could result in significant increases in nutrient loadings for parameters that have exceeded water quality parameters in the past. Therefore, long-term significant impacts on water quality might result in a system that appears to be beyond its carrying capacity for nutrient loadings. Short-term disturbances in the watershed during construction activities could also result in long-term accumulation of sediments, which might adversely affect benthic aquatic life. These increases in nutrient loadings could result in long-term adverse effects on the aquatic ecological productivity of the lake.

In the long term, vegetation management and clearing along the shoreline, as well as in the watershed, also might result in minor adverse effects on biological productivity for terrestrial systems for each SMP alternative. Clearing vegetation cover would reduce foraging and breeding habitat for wildlife and sensitive species in the area. For example, the gray bat, which is a Federally listed endangered species, could potentially use areas along the lake for foraging. This species prefers vegetation cover for foraging to reduce the potential for predation.

For visual and aesthetic resources, conflicts between short-term use of the environment and long-term sustainability are not likely, with the exception of Alternative 5. Because boat docks could, at least in theory, be removed, the SMP alternatives do not foreclose future options for use of the lake's shoreline. However, it would be unlikely that shoreline areas would revert back to their predevelopment condition once they were rezoned as LDA and development had occurred.

4.13 SUMMARY OF THE ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

Tables 4-31 and 4-32 present a summary of the environmental and socioeconomic consequences of the alternatives analyzed in this EIS for each resource area. As described in Table 4-31 and Section 4.8, Cumulative Effects, all of the alternatives analyzed in this EIS would result in some adverse effect on the environment. (See also Section 4.9 for a discussion of mitigation.) In designating Alternative 6 as the preferred configuration of key SMP elements for incorporation into and implementation through a revised SMP, the Little Rock District is guided by Corps

regulations and policy governing SMPs, the District's objectives for the Greers Ferry Lake SMP, public input to the SMP and EIS development processes, and court-ordered mandates. The District views the Revised Preferred Alternative (Alternative 6) as the alternative that conforms with existing laws and regulations and best balances public use of lake shoreline for recreational opportunity, public safety, and environmental protection.

It should be noted when reviewing the results presented in these tables that several assumptions used to analyze these impacts are in most cases highly conservative and might represent a worst-case scenario. For example, for Alternative 5 (Maximum Modification Alternative), it was conservatively assumed that Corps rezoning and permitting actions induce all the growth realized outside the LDA's along the shoreline and that in the absence of such actions, development would not occur in these areas. Furthermore, given the historical rate of growth in the region, it might take decades before the extent of residential development reaches the levels assumed for the alternatives analyzed in the EIS. Therefore, the results presented in the tables should not be construed as the impacts that might occur in the next 5 years; rather, these effects might take decades to occur.

Table 4-31
Comparison of Alternatives

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Greers Ferry Lake Watershed	Short- and long-term indirect minor adverse effects. Minor increase in loadings for certain parameters with periodic violation of water quality standards. Less than 1% increase in total phosphorus (TP) and total suspended solids (TSS) for the entire system. Negligible change in fecal coliform (FC) loads. Localized impacts on areas with high-density marina operations. No effects to groundwater.	Short- and long-term indirect minor adverse impacts. Less than 1% increase in TP, TSS, and FC for the entire system. Localized impacts on areas dependent on the degree of exposure of erodible soil through construction of paths and walkways. No effects to groundwater.	No effects. Any changes in water quality would be due to baseline growth in the region, not implementation of the No Growth Alternative. No effects to groundwater.	Short- and long-term indirect minor adverse effects. Less than 1% increase in TP and TSS for the entire system. Negligible change in FC loads. Localized impacts on areas with high-density marina operations. No effects to groundwater.	Short-term direct minor adverse and long-term indirect major adverse effects. Major effects assuming Corps actions induce 100% growth. TP could increase up to 16% to 25%, TSS could increase up to 2% to 3%, BOD could increase up to 8% to 12%, and FC could increase up to 5%, assuming Corps actions induce 100% growth. Minor effects for the lake if Corps actions only partly induce growth (e.g., 20%). No effects to groundwater.	Short- and long-term indirect minor adverse effects. Impacts would be more than those under Alternative 4, but less than those under Alternative 2	Adverse cumulative effects on water quality could result from an increase in development in areas adjacent to the lake within the project area. Additional construction related to resort areas, housing, and new infrastructure in the Greers Ferry Lake watershed would contribute additional pollutant loadings to the lake. In addition, the proposed construction of a 400-slip boat marina in Cove Creek would cause cumulative impacts on water quality. No effects to groundwater.
Land Use and Land Cover	Long-term direct and indirect moderate adverse effects. New homes, new access paths, and clearing around additional homes would affect land use and vegetative cover.	Long-term direct and indirect minor beneficial and adverse effects. New homes, new access paths, and clearing around additional homes would affect land use and vegetative cover. A 50-foot vegetative buffer strip would protect vegetation.	Long-term direct and indirect minor beneficial effects. Reduced clearing around homes would improve vegetative cover.	Long-term direct and indirect minor beneficial and adverse effects. New homes, new access paths, and clearing around additional homes would affect land use and vegetative cover. A 100-foot vegetative buffer strip would protect vegetation.	Long-term direct and indirect major adverse effects. Many new homes, new access paths, and clearing around additional homes to 200 feet would change land use and vegetative cover.	Long-term direct and indirect minor beneficial and adverse effects. Impacts would be more than those under Alternative 4, but less than those under Alternative 2.	Long-term adverse effects. Continued development around the lake would add to any effects of implementation of one of the alternatives.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Infra-structure	Long-term direct negligible beneficial effects and long-term indirect negligible and minor adverse effects. Additional boat docks would relieve some pressure on existing boat launch facilities and ease traffic circulation around them. However, building new docks would result in negligible amounts of construction wastes in landfills and additional energy usage. Induced development will generate minor increased demand for roads, potable water supply, wastewater treatment, solid waste disposal, landfill space, and fire and rescue services.	Long-term direct negligible beneficial effects and long-term indirect negligible and minor adverse effects. Additional boat docks would relieve some pressure on existing boat launch facilities and ease traffic circulation around them. However, building new docks would result in negligible amounts of construction wastes in landfills and additional energy usage. Induced development will generate minor increased demand for roads, potable water supply, wastewater treatment, solid waste disposal, landfill space, and fire and rescue services.	No effects. Implementation of the No Growth Alternative would not place additional demands on regional infrastructure resources.	Long-term direct negligible beneficial effects and long-term indirect negligible and minor adverse effects. Additional boat docks would relieve some pressure on existing boat launch facilities and ease traffic circulation around them. However, building new docks would result in negligible amounts of construction wastes in landfills and additional energy usage. Induced development will generate minor increased demand for roads, potable water supply, wastewater treatment, solid waste disposal, landfill space, and fire and rescue services.	Long-term direct minor beneficial and short- and long-term indirect major adverse effects. Additional boat docks would relieve some pressure on existing boat launch facilities and ease traffic circulation around them. However, building new docks would result in minor amounts of construction wastes in landfills and additional energy usage. Induced development would have major adverse effects by generate increased demand for roads, potable water supply, wastewater treatment, solid waste disposal, landfill space, and fire and rescue services. Expected growth under this alternative could take as many as 50 years to build out to expected levels.	Long-term direct negligible beneficial effects and long-term indirect negligible and minor adverse effects. Impacts would be more than those under Alternative 4, but less than those under Alternative 2.	Alternative 5 would likely create cumulative effects on infrastructure that might need to be considered in future county planning. Those effects might include a need to expand roads to handle more traffic year-round in Greers Ferry, Heber Springs, and other surrounding towns; increases in electrical and water supply capacities; and expanded communication systems (including wired and cellular telephone and Internet access). If recreational activity at the lake increased under Alternative 5, it might be desirable to increase the availability of sewage disposal facilities for boaters and expand enforcement of no discharge regulations.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Socio-economics	Short-term direct minor and short-term and long-term indirect minor effects. Employment and gross regional product (GRP) to increase by 1% and personal income by 2%. Population increases by 2.7% more than baseline by end of 5-year period. No effects to environmental justice or protection of children.	Short-term direct minor beneficial and short- and long-term indirect minor beneficial effects. Employment and GRP to increase by 1% and personal income by 2%. Population increase by 2.9% more than the baseline by the end of the 5-year period. No effects to environmental justice or protection of children.	No effects. Economic growth in the region of influence (ROI) would remain consistent with the baseline projections. No effects to environmental justice or protection of children.	Short-term direct minor beneficial and short- and long-term indirect minor beneficial effects. Projected changes to most indicators would be less than 2%. No effects on environmental justice or protection of children.	Short-term direct minor beneficial effects and short- and long-term indirect major beneficial effects. Major long-term indirect effects if Corps actions induce 100% of lakeshore growth. Local population could increase by more than 16 % from the baseline projection. Employment and GRP are projected to increase by about 6 % and 5%, respectively. Personal income increase by 10% over the baseline projection. Effects may not occur for several decades. No effects to environmental justice or protection of children.	Short-term direct minor beneficial effects and short- and long-term indirect minor beneficial effects. Impacts would be more than those under Alternative 4, but less than those under Alternative 2.	Future development of marinas and other public facilities would be expected to have a minor beneficial effect on the local economy. If marinas and parking facilities were expanded, more people would visit the lake. These visitors would spend money on food, lodging, gas, recreation, and other services in the ROI.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Visual and Aesthetic Resources	Long-term direct minor adverse impacts. *Scenic attractiveness* affected with 58% potential increase in docks. Addition of 170 boat docks[1] would reduce *scenic integrity*. *Landscape visibility* affected by 18% increase in lake acreage where 1 or more boat docks would be clearly visible. No new net visual and aesthetic impacts from vegetation modification, grandfathered docks, or boats with sleeping quarters and/or marine sanitation devices (MSDs).	Long-term direct minor adverse impacts. *Scenic attractiveness* affected with 89% potential increase in docks. Addition of 263 boat docks would reduce *scenic integrity*. *Landscape visibility* affected by 49% increase in lake acreage where 1 or more boat docks would be clearly visible. 50-foot vegetation modification zone would have adverse visual and aesthetic impacts. No new net visual and aesthetic impacts from grandfathered docks, or boats with sleeping quarters and/or MSDs.	Long-term direct minor beneficial and indirect negligible adverse effects. Not adding new private boat docks and eliminating mowing would have a beneficial effect on the scenic attractiveness of the lake's shoreline. The need for additional dryland boat storage could lead to some loss of the surrounding area's scenic attractiveness as natural settings give way to more dry-dock boat storage buildings.	Long-term direct minor adverse and beneficial effects. *Scenic attractiveness* affected with 73% potential increase in docks. Addition of 215 boat docks would reduce *scenic integrity*. *Landscape visibility* affected by 35% increase in lake acreage where 1 or more boat docks would be clearly visible. 100-foot vegetative buffer strip would enhance the natural scenic integrity of the shoreline by hiding housing and other structures along the shore.	Long-term direct significant and indirect major adverse effects. *Scenic attractiveness* significantly affected with 372% potential increase in docks. Addition of 1,098 boat docks would significantly reduce *scenic integrity*. *Landscape visibility* affected by 55% increase in lake acreage where 1 or more boat docks would be clearly visible. The 200-foot vegetation modification zone would detract from the natural scenic attractiveness of the shoreline by visually contrasting with the surrounding natural vegetation.	Long-term direct minor beneficial and adverse effects and major direct adverse effects. Effects on boat dock visibility would be more than Alternative 4, but less than those under Alternative 2, and effects on vegetative clearing would be slightly more than those under Alternative 1.	Construction and operation of the proposed Cove Creek marina would have a minor effect on the scenic attractiveness and scenic integrity of the lake's shoreline over and above the introduction of new private boat docks. Significant cumulative impacts under Alternative 5.
Recreation and Recreational Facilities	Long-term direct minor beneficial effects due to the potential increase to on-lake boating recreational opportunities.	Long-term direct minor beneficial effects due to the potential increase to on-lake boating recreation opportunities.	Short-term direct minor adverse effects and long-term direct minor beneficial effects. No change in recreational activities, but increased demand for recreational facilities.	Long-term direct minor beneficial effects due to the potential increase in on-lake boating recreational opportunities.	Long-term direct minor beneficial and indirect adverse effects. Additional 209 boats on the water surface during peak use periods in boating density (14.4%). Some increase in recreational opportunities.	Long-term direct minor beneficial effects. Effects would be more than those under Alternative 4, but less than those under Alternative 2.	Long-term minor adverse effects due to the upper level of boating due to new marina in addition to more boat docks.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Geology and Soils	Short- and long-term direct minor adverse and long-term direct minor beneficial effects.	Long-term direct and indirect minor adverse effects with vegetation modification (mowing) increase to 100 feet from homes. Long-term minor beneficial effects from 50-foot vegetative buffer strip from conservation pool.	Long-term indirect minor beneficial effects. Existing vegetative modification permits would expire and, over time, the regrowth of the vegetative buffer would naturally help prevent soil erosion.	Long-term direct and indirect minor adverse effects with vegetation modification (mowing) increase to 100 feet from homes. Long-term minor beneficial effects from 100-foot vegetative buffer strip from conservation pool.	Short- and long-term direct minor adverse and long-term indirect minor adverse effects. Maximizing development of all areas of shoreline with slopes between 20% and 49% would cause increase in soil disturbance and soil erosion. Increase in impervious surfaces, such as rooftops and roads, would increase surface runoff, thereby also increasing potential for soil erosion. Long-term minor adverse effects with vegetation modification (mowing) increase to 200 feet from homes.	Short- and long-term direct minor adverse effects and long-term direct minor beneficial effects. Effects would be less than those under Alternative 4.	Development behind Corps property along the lake is likely to continue to increase; therefore, soil disturbance and subsequent increased sediment runoff would occur during construction of new structures. Increase in impervious surfaces, such as rooftops and roads, would increase surface runoff and, consequently, the potential for soil erosion. Minor impacts from construction of proposed Cove Creek marina would occur through soil erosion. Fluctuating water levels from lake level management and increased boating activity on the lake would be likely to contribute to soil erosion through wave action and increased surface runoff.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Ecological Systems	Long-term direct and indirect minor adverse effects. LDA development would affect vegetation, wildlife, and sensitive species. No effect from mowing 50 feet from homes.	Long-term direct and indirect minor adverse and long-term minor direct beneficial affects. LDA development would affect vegetation, wildlife, and sensitive species. Adverse effect on vegetation from mowing 100 feet from homes. 50-foot vegetative buffer strip from the shoreline would preserve habitat.	Long-term direct minor beneficial effects. Not issuing new vegetation modification permits and not renewing expiring permits would preserve habitat.	Long-term direct and indirect minor adverse and long-term minor direct beneficial effects. LDA development would affect vegetation, wildlife, and sensitive species. Adverse effect on vegetation from mowing 100 feet from homes. 50-foot vegetative buffer strip from the shoreline would preserve habitat.	Long-term direct and indirect minor to moderate adverse effects. LDA development would affect vegetation, wildlife, and sensitive species. Adverse effect on vegetation from mowing 200 feet from homes. Loss of lakeshore vegetation would reduce quality of habitat.	Long-term direct and indirect minor adverse effects and long-term minor direct beneficial effects. Effects would be less than Alternative 4.	Alternatives that allow for more development along the shoreline (more private docks) could lead to increased development of adjacent land, which would result in a localized reduction of habitat.
Cultural Resources	Long-term direct and indirect minor adverse effects. Construction could demolish potential NRHP-eligible archeological sites.	Long-term direct and indirect negligible to moderate adverse effects. Construction could demolish potential NRHP-eligible archeological sites.	No effects. Any effects on cultural resources would be due to baseline growth in the region, not implementation of this alternative.	Long-term direct and indirect negligible to moderate adverse effects. Construction could demolish potential NRHP-eligible archeological sites.	Long-term direct and indirect negligible to moderate adverse effects. Construction could demolish potential NRHP-eligible archeological sites.	Long-term direct and indirect minor adverse effects. Effects would be more than those under Alternative 4, but less than those under Alternative 2.	Additional construction related to resort areas, housing, and new infrastructure would disturb the soil and might affect archeological sites that could be NRHP-eligible. Development pressure could also affect historic structures.
Air Quality	No effects. Air emissions would not increase due to construction or automobile traffic.	Long-term indirect negligible adverse effects due to increased automobile traffic.	No effects. No increase of stationary or mobile air emissions relative to baseline.	Long-term indirect negligible adverse effects due to increased automobile traffic.	Long-term indirect minor adverse effects because of increased automobile traffic due to additional recreational traffic and increase in popula-tion in the ROI.	Long-term indirect negligible adverse effects. Effects would be more than those under Alternative 4, but less than those under Alternative 2.	No effects.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Hazardous and Toxic Substances	Long-term indirect minor beneficial and adverse effects. New docks would either not affect or decrease recreational activity in parks on the lake and, therefore, either not affect or decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect. Activities on docks would be expected to increase quantities of potentially harmful substances used on or near the lake.	Short- and long-term indirect minor adverse effects and long-term indirect minor beneficial effects. Due to 1% increase in boating activity, expect increase in quantities of potentially harmful substances used on or near the lake. New docks would either not affect or decrease recreational activity in parks on the lake and, therefore, either not affect or decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect.	No effects.	Short- and long-term indirect minor adverse effects and long-term indirect minor beneficial effects very similar to those described under Alternative 2 would be expected.	Short- and long-term indirect moderate adverse and long-term indirect minor beneficial effects. New boat docks would increase by about 3 times the quantities of dock materials along the shoreline, which would increase quantities of potentially harmful substances used on or near the lake. Six percent increase in boating activity would have minor effects on quantities of oil and fuel from boat motors released to the lake. New docks would either not affect or decrease recreational activity in parks on the lake and, therefore, either not affect or decrease the quantities of pollutants spilled onto parking lots at these facilities, potentially resulting in a beneficial effect.	Short- and long-term indirect minor adverse effects and long-term indirect minor beneficial effects. Effects would be more than those under Alternative 4, but less than those under Alternative 2.	Long-term indirect minor adverse cumulative effects could result from increased number of boats using lake related to the use and potential spills of oil, fuel, and solvents from boat fueling operations and maintenance activities. Short-term minor adverse effects related to installation of new docks from use and spillage of fuel, oil and grease, and solvents. Potential use of antifouling paint on boat hulls could have minor adverse effects due to metals leaching into the water.

Table 4-31
Comparison of Alternatives (continued)

Resource Area	Alternative 1: No Action Alternative	Alternative 2: 80% Rezoning Criteria	Alternative 3: No Growth	Alternative 4: 90% Rezoning Criteria	Alternative 5: Maximum Modification	Alternative 6: Revised Preferred Alternative	Cumulative Effects
Noise	No effects. Noise would not be expected to increase due to increased boating activities.	Short- and long-term direct and indirect minor adverse effects. Increases in noise and annoyance levels would be likely due to increased boat traffic and induced residential growth.	No effects. No direct change to noise levels relative to baseline conditions.	Short- and long-term indirect minor adverse impacts. Increases in noise and annoyance levels would be likely due to increased boat traffic and induced residential growth.	Short- and long-term direct and indirect minor adverse effects. Increases in noise and annoyance levels would be likely due to increased boat traffic and induced residential growth.	Short- and long-term indirect minor adverse effects. Effects would be more than those under Alternative 4, but less than those under Alternative 2.	Adverse cumulative effects could result from an increase in development in areas adjacent to the lake within the project area and from an increase in boater activities.

[1] Although a potential increase of 170 boat docks is indicated here, possible rezoning approvals under future 5-year reviews could lead to more rezoning actions and additional docks.

THIS PAGE INTENTIONALLY LEFT BLANK.

Table 4-32
Impact Summary and Comparison