Appendix F4

Response to Federal and State Agency Comments

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List of Acronyms

ADCNR	Alabama Department of Conservation and Natural Resources
ADEM	Alabama Department of Environmental Management
AWFF	Alabama Wildlife and Freshwater Fisheries Division
Cfs	cubic feet per second
Corps/USACE	U.S. Army Corps of Engineers
DEIS	Draft Environmental Impact Statement
DOI	U.S. Department of Interior
Dsf	day-second-feet
EBCI	Eastern Band of Cherokee Indians
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
REMI	Regional Economic Model, Inc.
ROS	Reservoir Operations Study
TDEC	Tennessee Department of Environment and Conservation
THPO	Tribal Historic Preservation Officer
TVA	Tennessee Valley Authority
USFWS	U.S. Fish and Wildlife Service
WCSA	Washington County Public Service Authority

F4 Response to Federal and State Agency Comments

This section of the Comment Response Appendix contains the comments that TVA received from federal and state agencies, and TVA's responses to those comments. TVA received comments from 14 state agencies, seven federal agencies, and one tribal government. The letters (or, in two instances, e-mails) that TVA received are reproduced in this section. Responses to comments follow individual correspondence and are shown with the text of the specific comment.

Nearly all resource agencies had strong reservations about any adjustments to the existing operations policy that would adversely affect water quality—most to the extent that they supported making no changes to the existing policy, the Base Case. Good water quality is an important public value. TVA carefully studied and considered water quality as it developed alternatives and created the Preferred Alternative. TVA formulated the Preferred Alternative to avoid or reduce impacts that would substantially degrade water quality and, in fact, to enhance water quality at certain locations. However, given the inherent uncertainties with any environmental analyses, TVA has identified monitoring and mitigation measures that would help offset potential adverse impacts on water quality, should they occur.

Several of the agencies acknowledged that this EIS is programmatic but nevertheless asked that TVA consider as part of the EIS or in subsequent studies various reservoir-specific issues or needs. In its responses to each agency's comments below, TVA considered it unnecessary and inappropriate to address reservoir-specific issues in a programmatic EIS. The programmatic analyses of issues that TVA has conducted would easily be overwhelmed and lost if reservoir-specific issues were also addressed. The value of a programmatic level of review is that it allows TVA, other interested agencies, and the public to be able to consider a broader perspective for the entire TVA reservoir system that is operated as an integrated whole. It would also be very difficult—perhaps impossible—to produce a study that evaluated in detail, all of the reservoir-specific issues that may be of interest to agencies or the public. Certainly, it would take much longer and would frustrate those individuals and agencies who are looking to the ROS to address their concerns about TVA's system-wide operations policy sooner rather than later. As reservoir-specific activities are proposed by TVA, either in the implementation of any ROS decision or independent of the ROS, reservoir-specific issues would be addressed and those agencies with reservoir-specific issues would be able to raise their concerns at that time, if appropriate.

Two of the agencies commented that TVA should do a better job of explaining how it ranked identified objectives and should further delineate its summary of projected impacts (i.e., explain better what is meant by "slightly adverse" or "beneficial"). The text of the EIS has been changed to do the latter. TVA's explanation of why it prefers the Preferred Alternative that is described in the FEIS indicates how TVA ranked or weighed the values and objectives that shaped the ROS process. TVA was guided by the values and objectives endorsed by the public during the ROS process, the preferences stated by commenting agencies, the economic and environmental costs of competing actions, and the priorities established for operating the TVA system in Section 9a of the TVA Act and expressed in other legislation.

F4.1 Federal Agencies

U.S. Army Corps of Engineers Comments

September 4, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, Tennessee 37902

Dear Mr. Nye:

Thank you for the opportunity to review and comment on the draft environmental impact statement for the TVA Reservoir Operations Study. This is a consolidated response of US Army Corps of Engineers comments from the Mississippi Valley Division, the Great Lakes and Ohio River Division and their respective districts.

The Corps is a cooperating agency under NEPA guidelines and has actively participated throughout the study. Our primary concerns are:

- Navigation on the Tennessee River
- Navigation, flood control, water quality and environmental conditions on the lower Tennessee, Cumberland, Ohio and Mississippi Rivers
- Lake Barkley and the Cumberland River Basin reservoir system
- Jurisdictional limits for Section 404 permitting

These concerns were voiced in our 4 March 2002 letter to Ms. Kathryn Jackson and have been communicated to TVA staff throughout the ROS process. This is a programmatic EIS document, and our comments will reflect that. **[1]**

The Corps' greatest concerns are the ultimate effects that any changes to the operating strategies of the TVA system may have on Kentucky and Barkley Lakes, the Cumberland River system and all lands and waters downstream from those projects. Our position remains as stated in the referenced letter: "that any proposed changes (at Kentucky Lake) that would involve reduction in flood storage capacity would have to be evaluated within the context of the entire lower Ohio/Mississippi River system and would possibly entail reevaluation of the Mississippi River project flood."

The scope of the EIS was limited to the Tennessee River watershed and the TVA power service area with only limited analysis of impacts outside of this region. Broader analysis of impacts to Barkley Lake and the Cumberland River system and to areas downstream from Kentucky and Barkley Lakes along the lower Tennessee, Cumberland, Ohio and Mississippi Rivers was not performed. Specific areas of concern were mentioned above. Any change to the regulation plan at Kentucky Lake would require a like action at Barkley Lake. The Corps has not performed any studies needed to support a change and has no motivation to change the Barkley regulation plan or funding for needed studies.

Because impacts outside of the TVA region were not fully addressed, we can't adequately determine the effects of the alternatives presented. However, since all alternatives demonstrated a negative impact on one or more resource area, it is safe to assume negative impacts in one or more resource areas outside of the TVA region are likely. All alternatives had an adverse impact on flood control, and the potential for those impacts to extend through the lower Ohio and Mississippi River systems can not be ignored.

Since no preferred alternative was presented, we can not at this time make a sound technical judgment. We are also unable to determine the scope of additional study that may be needed to address impacts throughout our area of responsibility. We welcome further cooperation later in the process as TVA formulates and presents a preferred alternative. **[2]**

We appreciate the opportunity to assist in this study and to review and comment on the work presented. **[3]** The attachment contains other specific comments.

Sincerely,

W. Chris Hinton-Lee, AIA
Director
Military and Technical Directorate

Enclosures

Corps of Engineers Comments
Draft Programmatic Environmental Impact Statement

Tennessee Valley Authority
Reservoir Operations Study

1. All alternatives, except the Tailwater Recreation alternative, show more adverse impacts than beneficial impacts. And the Tailwater Recreation alternative shows "adverse" impacts for Flood Control. This either makes the case to maintain the Base alternative or accept the trade-offs for the Tailwater alternative. **[4]**

2. The Tailwater Recreation alternative is the only alternative to meet the "greater overall public value" criteria established by the ROS, with total positive benefits outweighing the adverse impacts. But it ironically reduces overall recreation benefits. **[5]**

3. Several of the alternatives show increasing mainstream winter pool elevations. This is indicated as a benefit to navigation in one of the alternatives, but not in the Commercial Navigation alternative. This seems to be an inconsistent application of navigation benefits. **[6]**

4. All but one of the alternatives is adverse to Flood Control. We need to know what part of the TN River is adversely affected and can TVA contain the flood damages within the upper or middle sections of the TN River. Otherwise it will adversely impact the Kentucky/Barkley system. As our letter states, USACE cannot endorse or implement changes to the Kentucky/Barkley system without further detailed studies. **[7]**

5. The Commercial Navigation alternative includes tailwater release changes from Barkley Dam. How is TVA able to include these operational changes as part of this alternative without EIS and operational impact studies of the Kentucky/ Barkley system and the lower Ohio and Mississippi Rivers? We cannot/ should not implement any changes that will reduce the Corps flood response capabilities or add to flooding problems on the Ohio/Mississippi Rivers. **[8]**

6. As stated in the document on page 1-13, paragraph 1.7.1; Section 9a of the TVA Act authorizes the TVA board to regulate streamflow, primarily for navigation and flood control and, when consistent with these purposes, to provide and operate facilities for the generation of electric energy. Each alternative identified in the subject report, except the base plan, impacted at least one, and in some cases several, of the primary purposes of the reservoir system. It is our position that the recommended alternative should not impact any of the primary purposes of the reservoir system or affect the Barkley pool and lower Cumberland, Tennessee, Ohio and Mississippi Rivers. **[9]**

7. The report does not address flood impacts to Kentucky Reservoir for any of the alternative plans. Based on the information presented in the meeting at the Memphis District on August 6th, a detailed model of the TVA Reservoir System has been developed that includes daily flows for the period 1903 through 2001. Analyses of changes in outflow from Pickwick Reservoir in

comparison to current conditions for any proposed plan should be detailed and documented in the report. As a result of the meeting in Memphis, TVA furnished the period of record flows for Pickwick Lake to MVD. Upon review of these flows all the proposed alternatives investigated to date will have an impact on the operation of Kentucky Lake. This would then impact the operation of Barkley Lake, which is owned and operated by the Corps of Engineers. This operational impact is unacceptable since the impacts to the areas downstream of Barkley and Kentucky Lakes have not been identified nor analyzed. For those impacts to be adequately addressed, the Lower Ohio and Mississippi Rivers would have to be studied in their entirety. Furthermore, there has not been any authority or resources granted to perform such a study. It is our recommendation that any alternative that would be defined as the preferred alternative should not impact the existing flows leaving Pickwick Lake. If an alternative is so defined, we request the appropriate documentation, which demonstrates the non-impact to the flows entering or leaving Kentucky Lake. **[10]**

8. Any increases in the guide curve for Kentucky Lake during the winter or spring would have an extremely high probability of being unacceptable to residents along the lower Ohio and Mississippi River Valleys due to a loss of flood control storage. **[11]**

9. The report does not include an alternative plan to provide a significant reduction in flood risk. Such a plan would be beneficial from a NEPA perspective, and would provide information for a purpose many consider a high priority. **[12]**

10. Changes that may benefit navigation on the lower Ohio River and Mississippi River would likely create environmental concerns, as increases in low flow elevations could alter critical habitat. All of these concerns would need to be addressed in the Environmental Impact Statement. **[13]**

11. The downstream environmental impacts in the lower Cumberland, Tennessee, Ohio and Mississippi River watersheds that occur from the proposed changes in pool operation must be fully evaluated and documented, either in this EIS or in a similar subsequent document. The potential impacts from an environmental perspective include endangered species such as the least tern and pallid sturgeon, fish and wildlife impacts, changes to riparian habitats or other ecosystem effects. **[14]**

12. Since the operational parameters of Kentucky Lake essentially requires the pool elevation to be below the easement level of elev. 365.0 by 1 June, any additional flow that enters Kentucky Lake from the proposed changes during late spring or early summer floods such as occurred in 2003, would have to be passed through the system. With all of the proposed alternatives, there would likely be some adverse impacts of additional flooding on unprotected downstream croplands during these late season floods. Therefore, on behalf of our downstream flood control constituents in the Lower Mississippi Valley, we cannot support any operational change in the TVA Lakes above Kentucky Lake that would increase flood flows into Kentucky Lake, thus impacting the operation of Kentucky/Barkley Lakes, and which would subsequently impact the areas downstream of the lakes including the Lower Ohio River and the Lower Mississippi Valley. **[15]**

13. The report has done an acceptable job of identifying and determining impacts associated with the alternatives proposed in the report. However, from a MVD Operations perspective the impacts to the operation/navigation program cannot be identified from the information presented in the report. Impacts to the operation of flood control features; flow lines, navigation depths, and dredging requirements cannot be determined from this document. Without a decision document, similar to a feasibility report or detailed project report, information needed to clearly identify impacts to the operation of MVD's operation programs is clearly absent. To determine impacts to operation/navigation programs would require a clear presentation of flow changes from a seasonal basis and magnitude to determine impacts to the Mississippi River systems and associated impacts to the Corps flood control and navigation programs. **[16]**

14. The leveed floodplain along the Lower Mississippi River consists of approximately 1.7 million acres of lands, exclusive of rivers, lakes, and other water bodies. These lands function as the natural overflow system of the Mississippi River and contain a diversity of habitats. There are over one-half million acres of developed agricultural lands, which include many small communities, rural residences, and businesses, along with over 1.1 million acres of environmentally sensitive lands, which could be impacted by any change in the operational policies of the TVA system. **[17]**

RESPONSE TO COMMENTS

1. The Corps is a cooperating agency under NEPA guidelines and has actively participated throughout the study. Our primary concerns are:

- Navigation on the Tennessee River
- Navigation, flood control, water quality and environmental conditions on the lower Tennessee, Cumberland, Ohio and Mississippi Rivers
- Lake Barkley and the Cumberland River Basin reservoir system
- Jurisdictional limits for Section 404 permitting

These concerns were voiced in our 4 March 2002 letter to Ms. Kathryn Jackson and have been communicated to TVA staff throughout the ROS process.

Response to Comment 1: TVA and the Corps have a long history of cooperating, not only on the evaluation of proposed actions affecting our common interests, but also in the operation of our interconnected reservoir systems and waterbodies. TVA appreciates the Corps' willingness to participate in the ROS EIS as a cooperating agency.

2. The Corps' greatest concerns are the ultimate effects that any changes to the operating strategies of the TVA system may have on Kentucky and Barkley Lakes, the Cumberland River system and all lands and waters downstream from those projects. Our position remains as stated in the referenced letter: "that any proposed changes (at Kentucky Lake) that would involve reduction in flood storage capacity would have to be evaluated within the context of the entire lower Ohio/Mississippi River system and would possibly entail reevaluation of the Mississippi River project flood."

The scope of the EIS was limited to the Tennessee River watershed and the TVA power service area with only limited analysis of impacts outside of this region. Broader analysis of impacts to Barkley Lake and the Cumberland River system and to areas downstream from Kentucky and Barkley Lakes along the lower Tennessee, Cumberland, Ohio and Mississippi Rivers was not performed. Specific areas of concern were mentioned above. Any change to the regulation plan at Kentucky Lake would require a like action at Barkley Lake. The Corps has not performed any studies needed to support a change and has no motivation to change the Barkley regulation plan or funding for needed studies.

Because impacts outside of the TVA region were not fully addressed, we can't adequately determine the effects of the alternatives presented. However, since all alternatives demonstrated a negative impact on one or more resource area, it is safe to assume negative impacts in one or more resource areas outside of the TVA region are likely. All alternatives had an adverse impact on flood control, and the potential for those impacts to extend through the lower Ohio and Mississippi River systems can not be ignored.

Since no preferred alternative was presented, we can not at this time make a sound technical judgment. We are also unable to determine the scope of additional study that may be needed to address impacts throughout our area of responsibility. We welcome further cooperation later in the process as TVA formulates and presents a preferred alternative.

Response to Comment 2: TVA developed an alternative that would allow Kentucky Reservoir levels to be held higher longer, while still addressing the Corps' concerns about potential impacts on its operation of Lake Barkley and areas downstream along the lower Tennessee, Cumberland, Ohio, and Mississippi Rivers. TVA thinks this may be possible by increasing releases through Kentucky Dam for a brief period. While TVA is still willing to consider this change, it was not identified as part of the Preferred Alternative in the FEIS because of the Corps's concerns. In addition, TVA responded to concerns from the U.S. Fish and Wildlife Service (USFWS) and others regarding impacts on waterfowl and shorebirds. This would eliminate any risk of unacceptable impacts on operation of Lake Barkley or on the Cumberland, Ohio, or Mississippi Rivers.

3. We appreciate the opportunity to assist in this study and to review and comment on the work presented.

Response to Comment 3: We appreciate your input to the ROS and comments on the DEIS.

4. All alternatives, except the Tailwater Recreation alternative, show more adverse impacts than beneficial impacts. And the Tailwater Recreation alternative shows "adverse" impacts for Flood Control. This either makes the case to maintain the Base alternative or accept the trade-offs for the Tailwater alternative.

Response to Comment 4: TVA has identified its Preferred Alternative in the FEIS. This alternative was formulated to capture the important benefits associated with other alternatives, while reducing or avoiding potential impacts.

5. The Tailwater Recreation alternative is the only alternative to meet the "greater overall public value" criteria established by the ROS, with total positive benefits outweighing the adverse impacts. But it ironically reduces overall recreation benefits.

Response to Comment 5: We disagree with this statement. The Tailwater Recreation Alternative would produce an increase in recreation use and associated expenditures. However, increases in power costs associated with this alternative would offset these gains, resulting in a slightly adverse impact on the regional economy. When evaluated against the performance objectives that were developed from the issues identified during the scoping phase of the study, none of the action alternatives would have a beneficial impact on all of the objectives because, under certain conditions, several of the objectives can conflict with one another. For example, extending the duration of higher summer pool levels to benefit recreation and scenic integrity has the potential to adversely affect water quality and power system reliability and cost. After extensive public review of the DEIS and additional analyses, TVA developed a Preferred Alternative. This alternative combines and adjusts elements of the alternatives identified in the DEIS to preserve desirable characteristics and to avoid or reduce adverse impacts associated with those alternatives. It would establish a balance of reservoir system operating objectives that is more responsive to changing public values and consistent with the operating priorities established by the TVA Act.

6. Several of the alternatives show increasing mainstream winter pool elevations. This is indicated as a benefit to navigation in one of the alternatives, but not in the Commercial Navigation Alternative. This seems to be an inconsistent application of navigation benefits.

Response to Comment 6: The benefit to commercial navigation of increasing channel depth in winter months was calculated for the Commercial Navigation Alternative. Likewise, a reduction in benefit to navigation under the Summer Hydropower Alternative was shown for summer months. The analysis used the shipper savings or loss as an input to a regional economic input-output model (REMI).

7. All but one of the alternatives is adverse to Flood Control. We need to know what part of the TN River is adversely affected and can TVA contain the flood damages within the upper or middle sections of the TN River. Otherwise it will adversely impact the Kentucky/Barkley system. As our letter states, USACE cannot endorse or implement changes to the Kentucky/Barkley system without further detailed studies.

Response to Comment 7: The flood risk analysis demonstrated that most of the alternatives would result in a substantial increase in flood risk at a number of critical sites in the Tennessee Valley region, including both tributary and mainstem locations. See Section 5.22. For Kentucky Reservoir, TVA conducted a detailed investigation of the effect of alternative operations policies on the volume of water discharged from Pickwick Landing Dam. This investigation included identification of the 10 largest annual and seasonal volumes discharged over 1-, 3-, 7-, 10-, 15-, and 30-day durations in the 99-year simulated period of record. For each of these events, the incremental volumes discharged into Kentucky Reservoir were compared to the Base Case. The analysis showed that it is reasonable to expect that the differences in Pickwick discharge during these large storms can be temporarily stored in the Kentucky pool.

8. The Commercial Navigation alternative includes tailwater release changes from Barkley Dam. How is TVA able to include these operational changes as part of this alternative without EIS and operational impact studies of the Kentucky/ Barkley system and the lower Ohio and Mississippi Rivers? We cannot/ should not implement any changes that will reduce the Corps flood response capabilities or add to flooding problems on the Ohio/Mississippi Rivers.

Response to Comment 8: The Preferred Alternative does not include changes in Barkley operating guides or any changes in limitations to Barkley releases.

9. As stated in the document on page 1-13, paragraph 1.7.1; Section 9a of the TVA Act authorizes the TVA board to regulate streamflow, primarily for navigation and flood control and, when consistent with these purposes, to provide and operate facilities for the generation of electric energy. Each alternative identified in the subject report, except the base plan, impacted at least one, and in some cases several, of the primary purposes of the reservoir system. It is our position that the recommended alternative should not impact any of the primary purposes of the reservoir system or affect the Barkley pool and lower Cumberland, Tennessee, Ohio and Mississippi Rivers.

Response to Comment 9: Section 9a of the TVA Act sets operating priorities for the TVA reservoir system. Consistent with those priorities, the TVA Board has discretion to adjust system operations, including achieving other collateral benefits such as recreation. TVA believes that implementation of TVA's Preferred Alternative would be fully consistent with Section 9a and within the discretion of the TVA Board. The Preferred Alternative does not include changes in operation of Kentucky Reservoir. There would be minimal, if any, risk of unacceptable impacts on operation of Lake Barkley or on the Lower Cumberland, Ohio, or Mississippi Rivers.

10. The report does not address flood impacts to Kentucky Reservoir for any of the alternative plans. Based on the information presented in the meeting at the Memphis District on August 6th, a detailed model of the TVA Reservoir System has been developed that includes daily flows for the period 1903 through 2001. Analyses of changes in outflow from Pickwick Reservoir in comparison to current conditions for any proposed plan should be detailed and documented in the report. As a result of the meeting in Memphis, TVA furnished the period of record flows for Pickwick Lake to MVD. Upon review of these flows all the proposed alternatives investigated to date will have an impact on the operation of Kentucky Lake. This would then impact the operation of Barkley Lake, which is owned and operated by the Corps of Engineers. This operational impact is unacceptable since the impacts to the areas downstream of Barkley and Kentucky Lakes have not been identified nor analyzed. For those impacts to be adequately addressed, the Lower Ohio and Mississippi Rivers would have to be studied in their entirety. Furthermore, there has not been any authority or resources granted to perform such a study. It is our recommendation that any alternative that would be defined as the preferred alternative should not impact the existing flows leaving Pickwick Lake. If an alternative is so defined, we request the appropriate documentation, which demonstrates the non-impact to the flows entering or leaving Kentucky Lake.

Response to Comment 10: See Response to Comment 7.

11. Any increases in the guide curve for Kentucky Lake during the winter or spring would have an extremely high probability of being unacceptable to residents along the lower Ohio and Mississippi River Valleys due to a loss of flood control storage.

Response to Comment 11: The Preferred Alternative does not include changes to the operating guidelines for Kentucky Reservoir.

12. The report does not include an alternative plan to provide a significant reduction in flood risk. Such a plan would be beneficial from a NEPA perspective, and would provide information for a purpose many consider a high priority.

Response to Comment 12: TVA did initially consider an alternative that would substantially reduce flood risk by holding pool levels lower, but this was deemed unreasonable because it would adversely affect other system benefits and resources in a substantial way.

13. Changes that may benefit navigation on the lower Ohio River and Mississippi River would likely create environmental concerns, as increases in low flow elevations could alter critical habitat. All of these concerns would need to be addressed in the Environmental Impact Statement.

Response to Comment 13: TVA has not proposed changes to improve navigation on the Ohio or Mississippi Rivers. TVA does not believe that any of the identified alternatives would have negatively affected critical habitats. Regardless, because of the concerns of the Corps and others, TVA decided to not alter the operating guidelines for Kentucky Reservoir as an element of the Preferred Alternative identified in the FEIS.

14. The downstream environmental impacts in the lower Cumberland, Tennessee, Ohio and Mississippi River watersheds that occur from the proposed changes in pool operation must be fully evaluated and documented, either in this EIS or in a similar subsequent document. The potential impacts from an environmental perspective include endangered species such as the least tern and pallid sturgeon, fish and wildlife impacts, changes to riparian habitats or other ecosystem effects.

Response to Comment 14: See Response to Comment 7. Potential impacts on the Tennessee River system from alternative operations policies have been appropriately assessed in the ROS EIS.

15. Since the operational parameters of Kentucky Lake essentially requires the pool elevation to be below the easement level of elev. 365.0 by 1 June, any additional flow that enters Kentucky Lake from the proposed changes during late spring or early summer floods such as occurred in 2003, would have to be passed through the system. With all of the proposed alternatives, there would likely be some adverse impacts of additional flooding on unprotected downstream croplands during these late season floods. Therefore, on behalf of our downstream flood control constituents in the Lower Mississippi Valley, we cannot support any operational change in the TVA Lakes above Kentucky Lake that would increase flood flows into Kentucky Lake, thus impacting the operation of Kentucky/Barkley Lakes, and which would subsequently impact the areas downstream of the lakes including the Lower Ohio River and the Lower Mississippi Valley.

Response to Comment 15: See Response to Comment 7.

16. The report has done an acceptable job of identifying and determining impacts associated with the alternatives proposed in the report. However, from a [Mississippi Valley Division] MVD Operations perspective the impacts to the operation/navigation program cannot be identified from the information presented in the report. Impacts to the operation of flood control features; flow lines, navigation depths, and dredging requirements cannot be determined from this document. Without a decision document, similar to a feasibility report or detailed project report, information needed to clearly identify impacts to the operation of MVD's operation programs is clearly absent. To determine impacts to operation/navigation programs would require a clear presentation of flow changes from a seasonal basis and magnitude to determine impacts to the Mississippi River systems and associated impacts to the Corps flood control and navigation programs.

Response to Comment 16: See Responses to Comments 7 and 11. Any changes on the Tennessee River system that would result in changes in Pickwick discharges could be mitigated by temporarily storing water in the Kentucky and Barkley pools—the purposes for which they were designed and constructed. Under the Preferred Alternative, there are times when the releases out of Pickwick would be increased, as well as times when the releases would be decreased. TVA acknowledges the potential for an increase or decrease in risk for flooding but believes that this risk would be minimal.

17. The leveed floodplain along the Lower Mississippi River consists of approximately 1.7 million acres of lands, exclusive of rivers, lakes, and other water bodies. These lands function as the natural overflow system of the Mississippi River and contain a diversity of habitats. There are over one-half million acres of developed agricultural lands, which include many small communities, rural residences, and businesses, along with over 1.1 million acres of environmentally sensitive lands, which could be impacted by any change in the operational policies of the TVA system.

Response to Comment 17: Comment noted.

U.S. Army Corps of Engineers [Mississippi River Commission] Comments

September 3, 2003

Mr. Glenn L. McCullough, Jr., Chairman
Tennessee Valley Authority
400 West Summit Hill Drive, ET 12A,
Knoxville, Tennessee 37902

Dear Mr. McCullough:

The Mississippi River Commission is pleased with the opportunity to work with you regarding the Reservoir Operation study that is currently being conducted by your agency. However, we must advise that any proposed change in the' operation policies of your projects could impact the projects within our jurisdiction.

We are comfortable, with the knowledge that your Board is aware of the unique relationship that our respective agencies share concerning the role that TVA Reservoirs have in reducing flood crests on the lower Ohio and Mississippi Rivers. We want to stress the importance of this relationship. We are aware that others have voiced their concerns regarding the operation of your system and that many desire to see a change in policy which would accommodate a wide-ranging set of issues covering everything from cost of power, water supply, water quality, navigation, reaction, flood risk, to economic development. We are also aware of the difficulty involved in developing a policy that sets a balance of trade-offs required to maximize the beneficial, and sometimes competing uses of water in the system. **[1]**

We are concerned that any change affecting the operation of Kentucky Lake will have serious impacts on the operation of Barkley Lake by the U.S. Army Corps of Engineers (USACE). This could, in turn, violate the flood control objectives for regulation of Kentucky-Barkley Reservoirs. The major USACE objectives concerning the proposed changes include safeguarding the Mississippi River levee system reducing the frequency of use of the Birds Point-New Madrid Floodway; and reducing the frequency and magnitude of' flooding of lands along the lower Ohio and Mississippi Rivers that are not protected by levees. **[2]**

The leveed floodplain along the Lower Mississippi River consists of approximately 1.7 million acres of land, exclusive of rivers, lakes, and other water bodies. These lands function as the natural overflow system of the Mississippi River and contain a diversity of habitats. There are over one-half million acres of developed agricultural lands, which include many small communities, rural residences, and businesses, along with over 1.1 million acres of environmentally sensitive lands, which could be impacted by any change in the operational policies of the TVA system. **[3]**

In addition, we must be certain that any proposed change in the operational policies of the TVA system do not circumvent the authority of the Flood Control Act of 1944, which grants the USACE authority to direct the operation of Kentucky Reservoir during flood control operations on the lower Ohio and Mississippi Rivers. **[4]**

The technical staff of the Mississippi Valley Division and the Mississippi River Commission are reviewing the draft Environmental Impact Statement and will provide technical comments to your agency through our sister Division, the Great Lakes and Ohio River Division, before the suspense date. **[5]**

Our agencies have maintained an outstanding relationship during previous flood control activities, as well as other operations, and we will continue to work with you in the future to assure the continue success for the benefit of the nation. **[6]**

Sincerely,

Don T. Riley
Brigadier General, U.S. Army
President Designee, Mississippi
River Commission

RESPONSE TO COMMENTS

1. The Mississippi River Commission is pleased with the opportunity to work with you regarding the Reservoir Operation study that is currently being conducted by your agency. However, we must advise that any proposed change in the' operation policies of your projects could impact the projects within our jurisdiction.

We are comfortable, with the knowledge that your Board is aware of the unique relationship that our respective agencies share concerning the role that TVA Reservoirs have in reducing flood crests on the lower Ohio and Mississippi Rivers. We want to stress the importance of this relationship. We are aware that others have voiced their concerns regarding the operation of your system and that many desire to see a change in policy which would accommodate a wide-ranging set of issues covering everything from cost of power, water supply, water quality, navigation, reaction, flood risk, to economic development. We are also aware of the difficulty involved in developing a policy that sets a balance of trade-offs required to maximize the beneficial, and sometimes competing uses of water in the system.

Response to Comment 1: TVA and the Corps have a long history of cooperating, not only on the evaluation of proposed actions affecting our common interests, but also in the operation of our interconnected reservoir systems and waterbodies. TVA appreciates the USACE's willingness to participate in the ROS EIS as a cooperating agency.

2. We are concerned that any change affecting the operation of Kentucky Lake will have serious impacts on the operation of Barkley Lake by the U.S. Army Corps of Engineers (USACE). This could, in turn, violate the flood control objectives for regulation of Kentucky-Barkley Reservoirs. The major USACE objectives concerning the proposed changes include safeguarding the Mississippi River levee system reducing the frequency of use of the Birds Point-New Madrid Floodway; and reducing the frequency and magnitude of' flooding of lands along the lower Ohio and Mississippi Rivers that are not protected by levees.

Response to Comment 2: TVA developed an alternative that would allow Kentucky Reservoir levels to be held higher longer, while still addressing the Corps' concerns about potential impacts on its operation of Lake Barkley and areas downstream along the lower Tennessee, Cumberland, Ohio, and Mississippi Rivers. TVA thinks this may be possible by increasing releases through Kentucky Dam for a brief period. While TVA is still willing to consider this change, it was not identified as part of the Preferred Alternative in the FEIS because of the Corps' concerns. This also responded to concerns of the USFWS and others regarding impacts on waterfowl and shorebirds that rely on Kentucky Reservoir habitat. This would eliminate any risk of unacceptable impacts on operation of Lake Barkley or on the Cumberland, Ohio, or Mississippi Rivers.

3. The levee floodplain along the Lower Mississippi River consists of approximately 1.7 million acres of land, exclusive of rivers, lakes, and other water bodies. These lands function as the natural overflow system of the Mississippi River and contain a diversity of habitats. There are over one-half million acres of developed agricultural lands, which include many small communities, rural residences, and businesses, along with over 1.1 million acres of environmentally sensitive lands, which could be impacted by any change in the operational policies of the TVA system.

Response to Comment 3: See Response to Comment 2.

4. In addition, we must be certain that any proposed change in the operational policies of the TVA system do not circumvent the authority of the Flood Control Act of 1944, which grants the USACE authority to direct the operation of Kentucky Reservoir during flood control operations on the lower Ohio and Mississippi Rivers.

Response to Comment 4: The Preferred Alternative does not include changes to the operating guidelines for Kentucky Reservoir.

5. The technical staff of the Mississippi Valley Division and the Mississippi River Commission are reviewing the draft Environmental Impact Statement and will provide technical comments to your agency through our sister Division, the Great Lakes and Ohio River Division, before the suspense date.

Response to Comment 5: Comment noted.

6. Our agencies have maintained an outstanding relationship during previous flood control activities, as well as other operations, and we will continue to work with you in the future to assure the continue success for the benefit of the nation.

Response to Comment 6: Comment noted.

U.S. Army Corps of Engineers (Wilmington District) Comments

August 11, 2003

Regulatory Division

Action ID 200331119

David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, Tennessee 37902

Dear Mr. Nye:

Reference your request for review and comment on the Draft Programmatic Environmental Impact Statement for the Tennessee Valley Authority's (TVA) Reservoir Operations Study dated June 2003. The following comments pertain to the portion of the system within the Wilmington District's regulatory jurisdiction in North Carolina, which includes Hiwassee, Chatuge, and Fontana Reservoirs.

The various alternatives discussed in the document differ on how much reservoir levels rise and fall, when changes in the reservoir levels occur, and the amount of water flowing through the reservoir system at various times of the year. None of the alternatives discussed indicate that construction activities within waters of the United States will occur. **[1]**

Any construction, which involves the discharge of dredged and/or fill material into waters of the United States, would require Department of the Army (DA) authorization pursuant to Section 404 of the Clean Water Act prior to the initiation of the project. Additionally, Fontana Reservoir is considered navigable and is subject to regulation pursuant to Section 10 of the Rivers and Harbors Act of 1899. Section 10 jurisdiction would regulate any work in, under, or over Fontana Reservoir. **[2]**

We appreciate the opportunity to comment on the Draft Environmental Impact Statement. If you have any questions, I may be contacted at either (828) 271-7980, extension 6, or by E-mail at david.k.baker@usace.army.mil. **[3]**

Sincerely,

David K. Baker
Project Manager
Asheville Regulatory Field Office

RESPONSE TO COMMENTS

1. The various alternatives discussed in the document differ on how much reservoir levels rise and fall, when changes in the reservoir levels occur, and the amount of water flowing through the reservoir system at various times of the year. None of the alternatives discussed indicate that construction activities within waters of the United States will occur.

   Response to Comment 1: Comment noted.

2. Any construction, which involves the discharge of dredged and/or fill material into waters of the United States, would require Department of the Army (DA) authorization pursuant to Section 404 of the Clean Water Act prior to the initiation of the project. Additionally, Fontana Reservoir is considered navigable and is subject to regulation pursuant to Section 10 of the Rivers and Harbors Act of 1899. Section 10 jurisdiction would regulate any work in, under, or over Fontana Reservoir.

   Response to Comment 2: Comment noted.

3. We appreciate the opportunity to comment on the Draft Environmental Impact Statement. If you have any questions, I may be contacted at either (828) 271-7980, extension 6, or by E-mail at david.k.baker@usace.army.mil.

   Response to Comment 3: TVA and the Corps have a long history of cooperating, not only on the evaluation of proposed actions affecting our common interests, but also in the operation of our interconnected reservoir systems and waterbodies. TVA appreciates the Corps' willingness to participate in the ROS EIS as a cooperating agency.

U.S. Department of Interior (Bureau of Indian Affairs, National Park Service, and U.S. Fish and Wildlife Service) Comments

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Post Office Box 649
Albuquerque, New Mexico 87103

September 3, 2003

ER 03/579

David Nye
Reservoir Operations Study Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11A
Knoxville, Tennessee 37902

Dear Mr. Nye:

The U.S. Department of the Interior (DOI) has reviewed the Draft Programmatic Environmental Impact Statement (DEIS) on the Reservoir Operations Study (ROS), Tennessee, Alabama, Kentucky, Georgia, Mississippi, North Carolina, and Virginia, 129 Counties. The U.S. Fish and Wildlife Service (FWS) of the DOI formally cooperated with the Tennessee Valley Authority (TVA) and the U.S. Army Corps of Engineers (Corps) in the preparation of the DEIS. The Bureau of Indian Affairs and National Park Service (NPS) of the DOI, along with FWS, served on a 17-member Interagency Team that helped guide the process. Many of the concerns of the DOI have been addressed as a result of this participation. **[1]** However, we are providing the following additional general and specific comments for your consideration as you prepare the final document.

General Comments

The DEIS, with the exception of Chapter 7, is concise and well written. **[2]** However, the programmatic approach utilized by TVA does not allow reviewers and decision makers to identify and analyze specific mitigation strategies. **[3]** Although we applaud TVA's effort in undertaking such an important evaluation of its current reservoir operations, we suggest that further, sub-basin-, reservoir-, and/or ecoregion-specific evaluations be undertaken in the near future to refine the level of resolution such that operations recommendations can be appropriately developed that account for regional resource complexities and peculiarities. A programmatic EIS should identify site- or region-specific data gaps and uncertainties**. [4]** Further study and public input should be used to make local decisions. **[5]** In our opinion, the uses of the waterway that are the most frequently supported by select segments of the public will have impacts and require mitigation; Chapter 7 does not provide us the level of information we believe will be necessary to provide reasoned and informed comments on the action alternatives. **[6]**

The DOI strongly supports TVA's implicit commitment to maintaining the achievements in water quality and habitat improvements garnered to date in its implementation of the Lake Improvement Plan and Reservoir Release Improvement Plan. However, we believe these commitments should be incorporated into the Record of Decision for this process and expressly stated in the executive summary section of the final EIS and integrated within the selected preferred alternative. **[7]**

We recommend that TVA's stated purpose, to determine the changes in the reservoir operations policy, if any, that would produce "greater public value," be refined. The phrase is poorly defined and could easily be perceived as subjective (page 1-4, section 1.2) and lacking in a commitment to provide needed resources to mitigate identified needs. TVA should work with its planning partners to develop clear, dichotomous selection criteria to define and rank "public value." These selection and ranking criteria should be guided by TVA's mission, legal and regulatory constraints and opportunities, and public input received during scoping and subsequent processes. **[8]**

In large part, this concern focuses on the terms "public" and "value." The "public" that TVA is responsible to reflects a tremendous range of perspectives, opinions, and values. We recognize that "public" includes ratepayers, shoreline property owners, reservoir users, and other stakeholders and interested parties. "Public" includes individuals and organizations that have attended workshops and meetings, responded to telephone surveys, or otherwise participated in the planning process. "Public" includes the citizens of states impacted by the TVA system of impoundments, power generation and transmission facilities, and who are indirectly affected, whether they actively participate in the planning process or not. We recognize that "public" includes all Americans, from present and future generations. Finally, we recognize that "public" means government agencies with jurisdiction by law and expertise, and American Indian tribes, particularly the Cherokee, Chickasaw, Choctaw, Shawnee, and Creek tribes, which TVA must afford government-to-government rights. The TVA planning and decision-making process should not be biased by the sheer number of comments from small segments of the public, nor by the level of passion or personalities of individuals involved in the planning process. **[9]** It is incumbent on TVA to establish unambiguous, objective selection and ranking criteria, so that reviewers and decision makers can be assured of a transparent planning and decision-making process. Public value, as used in the DEIS, is unsuitable as a planning guideline or decision-making criterion. **[10]**

A refinement of the project purpose, and the development of selection criteria, should identify the methods that TVA proposes to use to resolve competing public values. The priorities generated in public workshops should contribute to the discussion of "greater public value." Those priorities (in order) are recreation, environmental protection, flood control, cheap power and clean water. The other alternatives analyzed in the DEIS do not necessarily reflect the priorities established by workshop participants for the public resources diverted by TVA. **[11]**

We recommend TVA expand the discussion to describe cost issues associated with alternatives and mitigation measures from various perspectives. The standard Federal government economic analysis may not be a useful tool for individuals who have been educated to externalize all costs except the fees they are directly responsible for paying. In our opinion, the DEIS would be a more valuable tool for such individuals if it explained the costs of each alternative and mitigation measure and how those costs would most likely be met. In our experience, some capital improvements could create new costs, which may be assumed by ratepayers and recreational or access facility users. Some alternatives and mitigation measures could reduce operational flexibility, or create episodic shortages of power, which might mean that replacement power costs would be accrued. **[12]** Reviewers and decision makers would benefit from a DEIS that is understandable to the range of perspectives and values associated with the "public." **[13]**

For example, page 4.4-2, "Regulatory Programs and TVA Management Activities" states that TVA has made the commitment to not reverse any improvements in dissolved oxygen concentrations (DO) resulting from previous improvement programs. Yet there is no discussion of the capital investments that would be required to keep the DO levels at an acceptable level. Page 1-4, section 1.2, only states that "changes to operations that require additional capital or operating expenditures would need to be funded by either TVA or others." **[14]**

At a minimum, we suggest TVA at least analyze the two alternatives most favored by the workshop participants and survey respondents, specifically, to extend the summer pool levels and protect the environment. The analysis should determine if mitigation can achieve an acceptable DO while making those goals compatible. Furthermore, the mitigation analysis should explain funding mechanisms that would allow the two goals to be simultaneously implemented. Likewise, if the goals and the DO levels are not compatible, the analysis should document the tradeoffs (gains and losses) associated with the approach selected. **[15]**

Because the potential influence of economics is likely to weigh heavily in determining a preferred alternative, the ROS should be careful to note that classical economic theory, upon which TVA's economic models are based, relies on two key assumptions that are violated within ecological systems. These are the principles of substitutability and reversibility. Given DOI's (and presumably TVA's) interests in protecting and managing resources for this and future generations, a thorough discussion of these assumptions and their relevance to the TVA ecosystem is essential.

Substitutability implies that when one resource is diminished, it can be replaced by another similar resource. In ecological systems such as rivers, this assumption potentially fails since individual species are often closely co-evolved with their environments allowing them to exist within a relatively narrow range of physical, chemical, and biological parameters. Switching to another resource is often not an option.

Similarly, reversibility in economic theory implies that economic trends caused by a particular decision can be reversed once the decision is reversed. In ecological systems, this assumption has a high likelihood of failure. For example, relatively minute changes in ecological community structure can have permanent effects that cascade the though the community and potentially the entire ecosystem. The classic example of this phenomenon is the extirpation of a keystone species. Once this critical ecological link is extirpated, the system can never recover to its pre-extirpation state. Exacerbating the situation, the loss of a keystone species can result of the loss of additional species and/or wholesale changes in ecological functions and services. **[16]**

We recommend the DEIS discussion of the underlying limnetic patterns and processes be enhanced with more obvious cross-references. The DEIS should provide reviewers and decision makers with a comprehensive discussion of biological, chemical, and physical patterns and processes, how they are influenced by specific operational regimes, and what mitigation options are available. We are particularly concerned that the discussion about dissolved oxygen concentrations and reservoir pool elevations, on page 2-25, section 2.3.6, and elsewhere, be understood by reviewers and decision makers. Section 4.4 has a good discussion of the impacts of residence time and stratification on dissolved oxygen. Section 5.4.3 and 5.7.2 have a good discussion of DO impacts due to alternatives. However, additional clarity on the meaning of the impacts and possible solutions to the impacts is needed. This specific issue is the best example of where the public needs a greater understanding of TVA's priorities, limitations, and costs. DO is often the main limiting factor when considering extending the high summer pool levels desired by the public. **[17]**

We recommend select information in the DEIS be cited as a range of values, including error terms, variance, and other sources of uncertainty. This is particularly relevant for those parameters that may significantly influence decision making, such as hydroelectric power generation capacity. Page 2-7 (Hydropower Generation Facilities), page 3-10 (Hydro Modernization Program), and other sections of text indicate that the Base Case for the alternative comparison uses upgraded electrical capacity values for the 21 turbine units that are still in the process of being upgraded to modern standards. We recognize the need to utilize some common metric as a standard for comparison but encourage TVA to inform reviewers and decision makers about the weaknesses inherent in the selected metrics. **[18]**

Actual or firm power generation values can only be obtained with in-place units. The subject 21 units are not yet modified, or "in situ." It is common for actual power values for any given generator to be below the rated power value, due to a myriad of circumstances. With a total of 109 units, the variation between actual firm and 21 in-situ power production for the 21 units could represent a significant underestimate of power generation in the DEIS. The uncertainty associated with using rated or projected power values could have a significant impact on the comparison of alternatives, especially when power production is a determining factor. Identifying the range of values, from rated through existing in situ at various efficiencies, would, in our opinion, provide a more transparent analysis than the strict use of rated power values. **[19]**

Neither section 4.18 nor 5.18 on Cultural Resources mentions whether any American Indian tribes were consulted. The subject TVA projects are located in an area where at least five federally recognized tribes have been or are located (Cherokee, Chickasaw, Choctaw, Shawnee, and Creek) and may attach aboriginal, religious, and cultural significance. Accordingly, pursuant to section 106 of the National Historic Preservation Act (NHPA), such tribes must be consulted about cultural resources affected by these projects, including consultations regarding the identification of cultural properties, the appropriate scope of the area of potential effects, and the development of any Historic Properties Management Plan. See, e.g., 36 C.F.R. 800.2(c)(2)(B)(ii). A list of potentially affected tribes is enclosed for your use as appropriate.

Regulations implementing the NHPA contemplate that Indian tribes be provided both a meaningful and early opportunity to participate in the section 106 planning process. The regulations further require that the agency make a reasonable and good faith effort to identify historic properties that may be affected by the undertaking and gather sufficient information to evaluate the eligibility of these properties for the National Register. See, e.g., 36 C.F.R. 800.4(b). Consultation with the State Historic Preservation Officer does not satisfy this requirement. **[20]**

We recommend the DEIS enhance discussions about the relationship between the need for low temperature cooling water for power plants and the impact on warm water species by releasing cold water from Fontana Dam; mitigation options should be discussed in detail. TVA acknowledges the impacts on aquatic resources by creating a dam system in section 4.7 and notes the need for cool water used for power plant cooling in section 4.23.5, but reviewers and decision makers would benefit from a more thorough discussion of underlying issues, alternatives and implications, and mitigation strategies. The cold water released from Fontana Dam is a major inhibiting factor in the existence of native fish populations in the Little Tennessee River and the reservoir system operated by the APGI Tapoco Project as well as the Tennessee River. Fontana Dam could have an inlet tower installed to select the water from anywhere in the water column and have much greater control of the temperature of the water released. However, the release of warmer water to support native fish conflicts with cooling water needs for power plants along the Tennessee River. **[21]**

Throughout the document, TVA interchangeably refers to existing conditions or the current reservoir operations as Base Case, no-policy alternative, or no-action alternative. For clarification, we recommend TVA utilize one description for this alternative. **[22]** Specific details related to operational policy changes that may be proposed at each of TVA's facilities are needed to fully assess the impacts of the individual alternatives. For all alternatives, site-specific spatial and temporal information concerning projected water elevations and releases for each reservoir and associated tailwater is also needed to fully evaluate potential impacts to existing resources. **[23]**

Based on analyses completed to date, most of the action alternatives would produce substantially higher minimum water elevations downstream from the mainstem dams. The recreation-based alternatives would also result in higher water elevations and delayed winter pool drawdowns in the tributary reservoirs. The Equalized Summer/Winter Flood Risk Alternative would produce minimum water elevations similar to the Base Case alternative. All of the other alternatives would yield higher minimum water levels. The Commercial Navigation Alternative would result in an increase in the winter flood guides of 2 feet on the mainstem reservoirs. Recent flood risk analyses have indicated that potential delayed winter pool drawdowns would result in a 33% increase in high water occurrences at 363' MSL, a 12% increase at 362' MSL, and a 17% increase at 361' MSL, in Kentucky Reservoir. A similar evaluation performed for Wheeler Reservoir indicated a 33% decrease at 559' MSL and a 17% increase at 558' MSL. As it becomes available, we would appreciate additional information regarding flood risk analyses performed in other mainstem pools utilized for navigation. **[24]**

In general terms, most alternatives would increase reservoir retention times, which would decrease dissolved oxygen (DO) and increase chlorophyll concentrations within the reservoirs. Low DO concentrations reduce the assimilative capacities in the reservoirs and result in near anoxic conditions in the hypolimnion. Other changes in water quality parameters would be expected in the reservoirs and associated tailwater releases. Since a preferred alternative is not known at this time, it is impossible to predict, with any degree of accuracy, specific expected changes in water quality within mainstem or tributary reservoirs or tailwater reaches. **[25]**

Water quality modeling to date indicates that most changes in currently observed (Base Case) DO patterns would be minor, with the exception of the Tailwater Habitat Alternative. More water volume with average DO concentrations less than 2 mg/l would be expected. This potential change would be especially problematic downstream of Wilson Dam. Modeling also indicated potential changes in DO patterns within Kentucky and Chickamauga Reservoirs. Minor temporal changes in DO patterns (more hours with DO concentrations less than 2 mg/l) would be expected with implementation of Reservoir Recreation Alternative A downstream of Guntersville Dam and Reservoir Recreation Alternative B downstream of Pickwick Dam. All of the action alternatives would produce higher average water temperatures in the Hiwassee River.

Conversely, all of the action alternatives would produce substantially lower average temperatures below TVA facilities on the Holston River. **[26]**

The DEIS does not include a thorough discussion of potential changes to flow regimes and water quality downstream of Kentucky Dam. Due to the significance of the mussel and fishery resources downstream of Kentucky Dam, we believe a detailed analysis of the potential effects of the preferred alternative is warranted in the final EIS. The DEIS also does not include a thorough discussion of potential changes to flow regimes and water quality in Lake Barkley (Cumberland River). Due to the hydrological connection to Kentucky Reservoir, we believe this evaluation is warranted in the final EIS in order to evaluate potential effects to existing operations at Cross Creeks National Wildlife Refuge (NWR). **[27]**

Given the vast degree of uncertainty associated with the influence of dam operations on river resources (e.g., native assemblages of aquatic species, economic resources), we strongly encourage TVA to establish an adaptive management process as an integral component of its operations. In a letter to TVA dated June 7, 2002, the NPS proposed the following adaptive management measures:

*Develop and apply an ongoing **adaptive management** approach to river operations that balances cultural, economic, and environmental resources uses and values.*

Rationale: Adaptive management of river operations entails making periodic incremental adjustments to operating procedures (e.g., release schedules, reservoir levels, instream flows, etc.) based on ongoing monitoring and analysis (Primack, R.B. 1998. Essentials of Conservation Biology, Second Edition. Sinauer Associates Publishers. Sunderland, MA.). The intent of adaptive management is to optimize the management capacity of TVA and all of its stakeholders. The application of adaptive management can increase the effectiveness of management decisions while thereby reducing associated long-term management costs (Johnson, B.L. 1999. The role of adaptive management as an operational approach for resource management agencies. Conservation Ecology **3**(2): 8. [online] URL: http://www.consecol.org/vol3/iss2/art8.).

Suggested components of an adaptive management alternative may include:

- Establish a multi-stakeholder Adaptive River Operation Council (AROC): The AROC would consist of TVA personnel, representatives of associated agencies, technical experts from the social and natural environments, and other stakeholders such as watershed organizations, homeowner groups, and industrial interests. The goal of the AROC would be to host periodic meetings and workshops to design and evaluate monitoring and modeling efforts, detect resource trends, and suggest site-specific incremental operational changes to the TVA Board of Directors. For example, the AROC might meet annually to evaluate and assess trends of previously collected field data and new modeling results. In some cases, smaller working groups consisting of a subset of AROC members could develop recommended incremental alterations to propose to the broader council and ultimately the Board.

- Develop an Adaptive River Operation Monitoring Program. The AROMP would use ongoing TVA water quality and biological monitoring, and if needed, be broadened to incorporate system-wide resource objectives and public concerns. The AROMP might also entail computer modeling. **[28]**

Since the DEIS does not state a preferred alternative, the DOI suggests the notion of a blended alternative. A blended alternative should seek a balance in all public values (including those of future generations), but it should especially account for resource protection where the greatest amount of uncertainty and irreversible consequence reside. A blended alternative can best service the public value of this and future generations through long-term adaptive management and the ability to function on a site-specific basis. Alternatives Reservoir Recreation A and B along with Tailwater Recreation and Tailwater Habitat appear to collectively offer the greatest amount of public values as depicted by Table ES-01. An adaptive, long-term blending of these alternatives with site-specific flexibility is likely to produce a high degree of public value. **[29]**

Specific Editorial Comments

Executive Summary, pages ES-13 to ES-20, and Table ES-02, Summary of Impacts by Policy Alternative: Without specific technical analyses for a preferred alternative or proposed policy change,

these general representations should be qualified as projections that require further technical evaluation. To the average reader, a simplification of a diverse reservoir system can misrepresent realistic impacts that may occur within individual reservoirs. **[30]** The evaluation of wildlife under the terrestrial ecology category (Page ES-16) is too broad and does not recognize the potential for specific adverse effects to a variety of wildlife species. Specific groups of wildlife species (e.g., waterfowl, wading birds, reptiles, and amphibians) should be addressed separately. **[31]**

Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, pages 3-6 and 3-7: Reservoir Recreation Alternative A is grouped with the Base Case on this page, followed by the introduction of a column heading entitled "Policy Alternatives" on the next page (and all remaining pages of this table). This suggests that Reservoir Recreation Alternative A is not a policy alternative. **[32]**

Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, page 3-6, Base Case, first bullet under column entitled "Reservoir Operating Guidelines:" For clarification and consistency, we suggest changing the wording from "and restrict drawdown during June and July" to AY and continue to restrict drawdown until August 1." **[33]**

Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, page 3-6, Reservoir Recreation Alternative A, third bullet under column entitled "Reservoir Operating Guidelines:" For clarification, we suggest changing the wording from "Begin unrestricted TR drawdown on Labor Day" to "Delay unrestricted TR drawdown to Labor Day." **[34]**

Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, page 3-6, Reservoir Recreation Alternative A, fifth bullet under column entitled "Reservoir Operating Guidelines:" Insert "winter" into the phrase "Raise MR flood guides." **[35]**

Section 3.3.3, Alternatives Evaluated in Detail, Reservoir Recreation Alternative B, page 3-13, 4th full paragraph: It appears that both Reservoir Recreation Alternative B and A result in higher winter reservoir levels on tributary reservoirs, relative to the Base Case. Please clarify the discussion. **[36]**

Section 3.3, Alternatives Evaluated in Detail, pages 3-14 and throughout: Comparison statements throughout this section need to be more explicit: reduce/increase relative to Base Case, the Alternative previously discussed, or both? **[37]**

Section 3.3.8, Alternatives Evaluated in Detail, Tailwater Habitat Alternative, page 3-18, last two paragraphs: The last full paragraph on this page (beginning "Under the Tailwater Habitat Alternative") states that this alternative will result in more variable flows, whereas the following paragraph (beginning with the subheading "Achievement and Objectives") states that this alternative will increase stability in tailwater flows. These statements appear to contradict one another. **[38]**

Section 3.5.2, Reservoir Operations Policy Alternatives, Table 3.5-01: The "$" symbol should be used consistently throughout the table to denote monetary figures (it is not used in the row entitled "Lowering the cost of transporting materials on the commercial waterway," although the footnote indicates that the figures in each cell in this row are in millions of dollars). **[39]**

Section 3.5, Reservoir Operations Policy Alternatives, Aquatic Plants, Page 3-30, Table 3.5-02: We recommend that you include a footnote to this table in order to make it clear that this category includes an assessment of invasive aquatic plants. **[40]**

Section 3.5, Reservoir Operations Policy Alternatives, Terrestrial Ecology, Page 3-31, Table 3.5-02: Note that impacts to Wildlife differ from Migratory Shorebirds and Plant Communities (these latter two resource areas are affected similarly by the proposed set of alternatives). Is this because the category "Plant Communities" is actually focused upon impacts to lowland or wetland, communities? If so, this should be clarified as a footnote to the table. **[41]**

Section 3.5, Reservoir Operations Policy Alternatives, Page 3-37, 1st paragraph, 1st sentence: This section is unclear. The previous paragraph states that Reservoir Recreation Alternative B and the Tailwater Habitat Alternative would have the most adverse impact on water quality. It seems the intent of this sentence to state that these two alternatives (Reservoir Recreation Alternative A and the Tailwater Recreation Alternative) would impact water quality more on the mainstem (than the tributary) reservoirs but that these impacts would still be less than Reservoir Recreation Alternative B and/or the Tailwater Habitat Alternative. **[42]**

Section 3.5, Page 3-37, 2nd paragraph: Enhance the discussion of how the increased erosion anticipated under the Tailwater Habitat Alternative would affect aquatic organisms, including federally threatened and endangered species. **[43]**

Section 3.5, Page 3-37, 3rd paragraph, last sentence: We suggest that the discussion of Reservoir Recreation Alternative B be re-written for proper emphasis of the issue. Reservoir Recreation Alternative B would result in more adverse impacts than the other alternatives, largely due to extending the summer reservoir levels into late summer and early fall, which would inundate flats at times when these habitats are normally exposed and able to provide important habitat to migratory waterfowl and shorebirds. **[44]**

Section 4.7, Aquatic Resources, throughout: A more detailed evaluation of potential changes in available spawning and nursery habitat as a result of implementation of the various alternatives is needed. The relationship between various wetland vegetative types, their position in the landscape, and aquatic species productivity is not discussed adequately. **[45]**

Section 4.8, Wetlands, throughout: Typographical error: "THE TVA" should be changed to AThe TVA." **[46]**

Section 4.8, Wetlands, page 4.8-6, Table 4.8-02: The invested agency for the Swan Creek Dewatering Unit should be the Alabama Department of Conservation and Natural Resources. **[47]**

Section 4.8, Wetlands, page 4.8-12, 1st paragraph, last sentence: Hyperlink error: The location of the report referenced by the first hyperlink in the series (http://ncseonline.orgY.) appears to have changed; typing in this full link produces an error message that the page cannot be found. **[48]**

Section 4.8, Wetlands, page 4.8-13, 2nd paragraph, last sentence: Hyperlink error: The location of the report referenced by the first hyperlink in the series (http://hydra.gsa.govY.) also appears to have changed; typing in this link produces a "re-direct" message indicating that the information is now found within the www.gsa.gov website. **[49]**

Section 4.8, Wetlands, page 4.8-13, last paragraph, last few sentences: The statements describing the unique biological resources associated with wetland habitats directly parallel the content of Sections 4.10 (Terrestrial Ecology), Section 4.7 (Aquatic Resources), and 4.13 (Threatened and Endangered Species). The interdependency of these resources should be emphasized via a reference to these sections. In particular, globally imperiled wetland plant communities known or with potential to occur within the study area are listed in Section 4.10, Table 4.10-01 (page 4.10-3). **[50]**

Section 4.9, Aquatic Plants, page 4.9-2, Table 4.9-01: For consistency, the taxonomic authority should either be given for all or none of the species listed. **[51]**

Section 4.9, Aquatic Plants, page 4.9-3, last paragraph: We do not dispute that natural environmental variation (in weather, water flow, nutrient cycling, light availability) "tend(s) to surpass the effect of reservoir operational activities." However, as worded, this paragraph in the DEIS implies that changes in reservoir operations would be expected to produce little change in the coverage of aquatic plant species relative to these more natural (i.e., unpredictable) sources of environmental variation. However, some of the proposed alternatives may, through direct manipulation of water levels, also indirectly generate the very conditions that have been observed to affect the coverage of these species (as described in this paragraph B i.e., "higher stream flows, high turbidity, cold water temperatures"), especially in the tailwater regions. **[52]**

Section 4.10.5, Terrestrial Ecology, page 4.10-9, 1st paragraph: It is stated that "potential changes in bottomland hardwood forest, scrub-shrub wetlands, emergent wetlands, aquatic vegetation, flats, and other communities potentially affected by reservoir levels **could** affect terrestrial wildlife populations." The word "could" should be replaced with "would." When changes as significant as those addressed in this document are implemented, certain wildlife populations (e.g., shorebirds and waterfowl) will be significantly impacted. **[53]**

Section 4.10.5, Terrestrial Ecology, page 4.10-9, 4th paragraph: It is stated that "flats, isolated pools, and shallow water are created by current drawdown regimes in early August." This is correct for many reservoirs but not all. The drawdown on Kentucky and Barkley Reservoirs starts in early July. This date is significant as it provides adequate shorebird habitat during the peak migration period to provide habitat for early migrating waterfowl (e.g., blue-winged teal) and to produce the annual plants (forage) needed by wintering waterfowl. **[54]**

Section 4.10, Terrestrial Ecology, page 4.10-6, 1st paragraph, 1st sentence: "Tables 4.10-01 and 4.10-02 present the names, global ranks, and distribution of the imperiled lowland communities." In this sentence "lowland" should be changed to "wetland," since the term "lowland" (as being applied in the DEIS) encompasses more community types than would be expected in NatureServe's subset of "wetland" communities (from which this table was created). **[55]**

Section 4.10, Terrestrial Ecology, page 4.10-8, 2nd and last paragraphs: The discussion of "Future Trends" under Upland Plant Communities (last paragraph) also applies to the anticipated Future Trends for Lowland Plant Communities (2nd paragraph). **[56]**

Section 4.11, Invasive Terrestrial and Aquatic Animals and Terrestrial Plants, throughout: The information provided in the DEIS is not of sufficient detail for evaluation of the rationale for focusing upon those species of invasive terrestrial animals and plants specifically named in the discussion. The discussion in the DEIS should clarify whether or not those species mentioned are those which pose the greatest threat throughout the Tennessee Valley or are specifically those that pose the greatest risk with respect to changes in reservoir operation policies. **[57]**

Section 4.13, Threatened and Endangered Species, page 4.13-1, 3rd paragraph: The phrase "reservoir-like reservoirs" appears to contain a typographical error. **[58]**

Section 4.14, Managed Areas and Ecologically Sensitive Sites, page 4.14-9, Table 4.14-02: Swan Creek Wildlife Management Area (WMA) and Mallard-Fox Creek WMA should be identified as managed areas and/or ecologically significant sites within Wheeler Reservoir. **[59]**

Section 4.14, Managed Areas and Ecologically Sensitive Sites, page 4.14-16, 1st paragraph: The Alabama cavefish is not located on Wheeler NWR. It is endemic to Key Cave NWR. Key Cave NWR is managed by Wheeler NWR staff. The correct scientific name for the species is *Speoplatyrhinus poulsoni*. **[60]**

Section 4.14, Managed Areas and Ecologically Sensitive Sites, page 4.14-16: Significant stands of water tupelo (*Nyssa aquatica*) forested wetlands occur within Wheeler Reservoir on Wheeler NWR. The Beaverdam Creek Swamp National Natural Landmark in Limestone County, Alabama, contains approximately 530 acres of water tupelo. Approximately 20% of the area is permanently flooded and contains a mature, pure stand of water tupelo. The remainder of the area is intermittently flooded and is dominated by water tupelo and black gum (*Nyssa sylvatica*).

Pure tupelo swamps of this size and integrity are quite rare and its significance led to its designation as a National Natural Landmark. This information should also be included and referenced in Appendix D5, page D5-5. **[61]**

Section 4.17, Prime Farmland, Table 4.17-03: Footnote No. 2 should be Natural Resources Conservation Service. **[62]**

Section 5.8.5, Wetlands, page 5.8-5, 3rd paragraph: Under a discussion of Reservoir Recreation Alternative B and the Tailwater Recreation Alternative, it is stated that "the increase in winter pool elevations could interfere with wetlands with controlled water levels on Kentucky, Wheeler, and Douglas Reservoirs." This sentence stands alone without any additional qualification. We recommend that the following specific information be included in this discussion: 1) a list of managed wetlands potentially impacted (e.g., Camden and Barkley WMAs, Tennessee NWR, Wheeler NWR); 2) the potential increased impacts of flooding, such as the increased cost to upgrade and repair infrastructure and the additional threats to wildlife habitat (e.g., agricultural crop production, bottomland hardwoods, moist-soil management units); and 3) the potential impacts to public recreation activities (i.e., hunting, fishing, bird watching) that occur on these areas. **[63]**

Section 5.8.8, Wetlands, page 5.8-8, 2nd paragraph: Under a discussion of the Commercial Navigation Alternative, the potential for a loss of flats due to the rise in the minimum winter pool level of mainstem reservoirs is not included. The mudflat wetland habitat type is extremely important to waterfowl, bald and golden eagles, gulls, terns, and many other species of migratory birds. The DOI does not concur with the conclusion that there will be overall positive effects on mainstem reservoirs. **[64]**

Section 5.10.4, Terrestrial Ecology, page 5.10-3, 1st paragraph: Under a discussion of the Commercial Navigation Alternative, it is stated that "the area inundated by water would increase, potentially creating additional shallow-water foraging habitat for waterfowl and wading birds." Why would an equal amount of shallow-water habitat not be available under the Base Case Alternative? The shallow-water area should be essentially equal but at a lower elevation. The result of raising the winter pool is not a gain in shallow-water habitat. It is a loss of mudflat habitat. **[65]**

Section 5.10.6, Terrestrial Ecology, page 5.10-5, 3rd paragraph: Under a discussion of wildlife communities, it is stated that "although flats would not be available to most shorebirds migrating during late summer or early fall, extended high water levels could benefit early-migrating waterfowl such as blue-winged teal and wood ducks." We recommend that blue-winged teal (*Anas discors*) be removed from this sentence. Mudflats are a preferred habitat for blue-winged teal, where they forage on seeds of various grasses and sedges. It is unlikely that they will utilize the woody habitats that are flooded during summer pool. **[66]**

Section 5.10.8, Terrestrial Ecology, page 5.10-6, 6th paragraph: Under a discussion of the Summary of Impacts, it is stated that "except for the Summer Hydropower Alternative, changes in operations under all policy alternatives would result in limited effects on most waterfowl, semi-aquatic mammals, and non-game wildlife, as they would adapt to changing conditions." This statement is repeated in other sub-sections of the Terrestrial Ecology Section. While we agree this statement is generally true, how they adapt may not be desirable to resource managers and the public. It has been determined from data collected during waterfowl surveys conducted on Tennessee NWR over the last 7 years that over 50% of the waterfowl use on the refuge occurs on the reservoir. The resultant adaptations may include reduced localized populations of both migratory and resident wildlife. Waterfowl and other migratory birds may adapt to a significant habitat change by migrating to other areas or utilizing undesirable habitat(s). The overall loss of mudflats will result in a lower local carrying capacity for waterfowl. It is also stated that "due to the anticipated decrease in flats habitat, shorebirds would be adversely affected during fall migration periods under these alternatives." We recommend that waterfowl also be added to this sentence. **[67]**

Section 5.13, Threatened and Endangered Species, throughout: The level of discussion provided in the DEIS makes it difficult to identify and compare anticipated impacts to specific species of protected plants or animals, or populations of these species, within and among the various policy alternatives proposed. While a site-specific analysis may be beyond the scope of this broad overview of the entire set of proposed alternatives, we expect that it will be presented for the preferred alternative in the final EIS. For example, the potential for adverse affects to the green pitcher plant (*Sarracenia oreophila*) has been identified under the Summer Hydropower Alternative, but from the discussion, it is not possible to determine whether TVA anticipates similar affects to this species under the other alternatives proposed. Further, although adverse impacts to this species are identified under that alternative, the magnitude of these impacts is unclear. The discussion should address whether individual plants, an entire population, or the entire species be adversely impacted by this alternative. **[68]**

Section 5.13.2, Threatened and Endangered Species, pages 5.13-11 to 5.13-12, 5th paragraph: It is stated that "bald eagles and gray bats could be benefitted by Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Commercial Navigation Alternative, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative to the extent that each alternative would increase the size of reservoir pools and increase the numbers of food items (mostly fish and waterfowl for the eagles and adult aquatic insects for gray bats)." Eagles are commonly observed on the flats feeding on stranded fish and dead waterfowl. This suggests that the mudflats may be an important habitat component of the bald eagle (*Haliaeetus leucocephalus*) in the ROS area. We also question TVA's conclusion that raising the pool levels during the fall and winter will increase waterfowl numbers. In fact, we believe that increasing pool levels in fall and winter would likely have the opposite effect. Any increase in the production of adult aquatic insects would likely be minor. Potential adverse effects, however slight, to the gray bats' foraging habitats do not appear to have been considered. **[69]**

Section 5.13.2, Threatened and Endangered Species, page 5.13-12, 3rd paragraph: The evaluation of potential impacts to the federally endangered least tern (*Sterna antillarum*) should not be limited to nesting habitat. Least terns have been observed resting and feeding on flats on Kentucky Reservoir during fall migration. **[70]**

Section 5.22.2, Flood Control, page 5.22-1, 3rd paragraph: It is stated that "the analysis for flood risk did not consider areas downstream of Savannah, Tennessee." We recommend that other areas on Kentucky and Barkley Reservoirs be included in the flood risk analysis. Although we appreciate receiving additional limited information regarding potential flood risk on Tennessee NWR and Wheeler NWR since the publication of the DEIS, we believe additional evaluations are warranted for Cross Creeks NWR

(Barkley Reservoir) and the numerous State WMA's throughout the Tennessee Valley. Additional evaluations of Tennessee NWR and Wheeler NWR would also appear to be warranted. **[71]**

Section 6.2.7, Cumulative Impacts, page 6-5, 3rd paragraph: It is stated that "these changes may have the potential to cause some adverse impacts on federally listed threatened and endangered species; however, the level of impact would be small and not significant enough to jeopardize the continued existence of these species." Under the Base Case alternative, populations of certain federally listed species will likely continue to decline in numbers and health. There are certain species listed as endangered (e.g., turgid blossom pearlymussel) that are likely extinct; no observations have been reported since the early 1900's. We believe TVA's conclusion regarding cumulative impacts to federally endangered and threatened species is premature and without factual foundation since no preferred alternative has been selected or analyzed in detail. We recommend analysis. Appropriate conclusions and supporting analysis should be submitted in a clearly labeled biological assessment (BA) concurrent with the final EIS. **[72]**

Table D1-01: Typographical error. It is Fort Loudoun, but the location is Loudon County not Loudoun County. **[73]**

Specific Resource Category Comments

Endangered Species

We recommend that you clearly address how the alternatives consider the requirements of section 7(a)(1) and 7(a)(2) of the Endangered Species Act (ESA). These parts of section 7 of the ESA include the requirement to evaluate the potential for jeopardy, as well as the mandate that federal agencies further the conservation of federally listed species. We are generally concerned with the management of water releases from specific reservoirs, the impact of hypolimnetic discharges on federally listed mussel and fish species, and the impact of scouring on tailwater habitats. These issues are especially problematic below Kentucky, Wilson, Douglas, Cherokee, Fontana, and Tims Ford Reservoirs. While we appreciate the proposed mitigation of the current minimum flow regime in the Appalachia cut-off, we do not believe that this mitigation proposal should be limited to all alternatives except the Base Case. We would expect TVA to pursue those potential improvements regardless of a preferred alternative for the ROS. **[74]**

We anticipate a detailed BA as part of the final EIS which will evaluate the effects of the preferred alternative and the Base Case. The BA should include a complete description of the selected alternative, the effects of those actions associated with the ROS, and a determination of effect to listed species at a site-specific level. We have appreciated the ongoing dialogue with

TVA staff regarding the approach to the preparation of the BA, as well as our preferred approach in preparing the required biological opinion. **[75]**

Migratory Birds on Tennessee NWR , Cross Creeks NWR, and Wheeler NWR

Tennessee NWR and Wheeler NWR are designated Globally Important Bird Areas and could be significantly affected by several of the identified alternatives. The Tennessee NWR bird checklist shows 10 waders and bitterns and over 30 shorebirds that could be affected by a change in habitat availability (http://tennesseerefuge.fws.gov/tnbirds.pdf). Undoubtedly, other

changes will occur elsewhere in the Tennessee Valley as well, yet these effects are poorly understood. The cumulative effects of proposed changes in the pool levels of various reservoirs on bird usage, primarily roosting and foraging, are unknown and will be extremely difficult to ascertain.

During fall migration, thousands of shorebirds utilize the mudflats on Kentucky, Barkley, and Wheeler Reservoirs. The average peak fall migration of shorebirds is around mid-August. Typically, during this period of the year, shorebird habitat is extremely limited due to dry conditions and dense vegetation that has developed through the summer adjacent to the reservoirs and other impounded waters. For this reason, the fall drawdown of Kentucky and Barkley Reservoirs is extremely important. Since most shorebird species prefer habitats that are open and away from dense cover, the water level needs to be low enough to expose flats that are not covered by woody vegetation. On Kentucky and Barkley Reservoirs, the elevation of summer pool is 359' MSL and woody vegetation typically extends down to elevation 357.5' MSL. For adequate mudflat habitat to be available, the pool elevation needs to be around 356.5' MSL. Under the existing operation schedules for these reservoirs, this level is usually reached during mid to late August.

Blue-winged teal are the first migrating waterfowl to arrive. The Tennessee Valley is along one of two major migration corridors for this species. This migration route extends from Manitoba to Florida. They first arrive during early August, with the peak period of migration occurring around mid-September. Like shorebirds, blue-winged teal heavily utilize the mudflats on the reservoirs for feeding and loafing. They commonly feed on the seeds of sedges, grasses, and smartweed that were deposited on the flats in previous years, as well as on insects and mollusks that may be present. During the migration period, it is important for extensive mudflats with an abundant source of food to be present on Kentucky, Barkley, and Wheeler Reservoirs. The existing management of these reservoirs provides excellent habitat at the appropriate time of the year for blue-winged teal to utilize during migration. The drawdown also coincides with a special early duck season that provides recreational opportunities to a large number of hunters, many of which hunt on the mudflats of the reservoirs.

Traditionally, migrant Canada geese (*Branta canadensis*) from the Southern James Bay Population (SJBP) would winter in large numbers within the Tennessee Valley. The December populations of SJBP geese in Tennessee prior to 1990 averaged over 40,000. The portion of the population that migrates into the Tennessee Valley has sharply declined to a present December

average of less than 10,000 SJBP geese in Tennessee. Even though the overall population level of the SJBP has stabilized, the decline in the numbers that migrate to the Tennessee Valley continues. Migrant geese first arrive on Tennessee NWR around September 20, and generally will remain within the vicinity of the Refuge until late winter. At this time of year, typically the only habitat available are the flats associated with the reservoir. Geese browse the new growth of annual grasses and sedges that occur on these flats. The existing fall drawdown schedule for Kentucky, Barkley, and Wheeler Reservoirs provides mudflat habitat for these early migrants.

Several of the ROS alternatives would result in a significant loss of mudflat habitat on Kentucky, Barkley and Wheeler Reservoirs. Delays in the fall drawdown would eliminate or significantly reduce the quantity and quality of mudflat habitat available on these reservoirs to shorebirds and early migrating waterfowl.

Reservoir Recreation Alternative A will extend the summer elevation through August 1 with only a 1-foot drop by September 1. Specific drawdown dates are not determined for the Tailwater Habitat Alternative, but the DEIS specifically mentions that the impacts on flats under this alternative would be similar to those of the Reservoir Recreation Alternative A. These two alternatives will likely result in a complete loss of mudflat habitat during the peak shorebird fall migration. The description of these alternatives in the DEIS does not provide elevation information beyond September 1. Without a projected water elevation for mid-September when the peak blue-winged teal migration occurs and SJBP of Canada geese

first arrive, the quantity of habitat that will be available is unknown. However, we expect the quality to be degraded due to the delay in germination of annual plants on the flats.

Reservoir Recreation Alternative B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative extend the summer elevation of Kentucky and Barkley Reservoirs through September 1. We anticipate these alternatives would result in a complete loss of desirable mudflat habitat during most of the fall shorebird and blue-winged teal migration period. Habitat for SJBP geese will be extremely limited and the quality will be degraded due to the delay in germination of annual plants on the flats.

The anticipated impacts of the alternatives that delay the fall drawdown are 1) a complete loss of fall mudflat habitat for the majority of shorebirds that migrate through the area; 2) a significant-to- complete loss of fall mudflat habitat for blue-winged teal; and 3) a significant loss or degradation of fall mudflat habitat for early migrating SJBP of Canada geese. Local population declines of shorebirds, blue-winged teal, and SJBP geese that migrate into the area are expected if the fall drawdown of Kentucky, Barkley, and Wheeler Reservoirs is delayed.

Approximately 300,000 ducks and geese, 100 bald eagles, and tens-of-thousands of other wetland-dependent migratory birds typically occur on Tennessee and Cross Creeks National Wildlife Refuges during the peak wintering period. It has been determined from our data collected during waterfowl surveys over the past 7 years that 56% of the duck use and 48% of the goose use on Tennessee NWR occurs on Kentucky Reservoir as compared to the use that occurs in our intensively managed waterfowl impoundments. Under the current reservoir operation policy, the winter pool elevation of Kentucky and Barkley Reservoirs is 354' MSL. This level fluctuates throughout the winter depending upon several factors but is largely influenced by rainfall. During most of the winter, extensive mudflats with important food resources are available for migratory birds.

Large numbers of waterfowl concentrate on the flats of the refuges to rest and feed. Canada geese and wigeon (*Anas americana*) browse on the annual plants that germinate each year during the late summer and fall drawdown period. Mudflats are the preferred habitat for green-winged teal (*Anas crecca*) within this area. When large expanses of flats are present, the majority of teal on the refuges will occur within this habitat. Greenwings forage on the seeds of annual plants that have been deposited on the flats in previous years, as well as insects and mollusks.

Bald eagles are regularly observed on the flats of Tennessee NWR and Wheeler NWR scavenging the carcasses of fish and waterfowl. As the drawdown occurs, fish occasionally get trapped in shallow waters and become an easy source of food for eagles. Gulls, terns, and wading birds utilize the flats of the reservoirs in large numbers throughout the drawdown and winter pool periods. The flats are primarily used for resting areas and are typically adjacent to shallow-water feeding sites.

We anticipate the alternatives that delay the fall drawdown (Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Habitat Alternative, and the Tailwater Recreation Alternative) would significantly impact the amount and quality of forage produced by annual plants that germinate on the flats. Canada geese, wigeon, and green-winged teal are the waterfowl species that likely will be impacted the most because they are more dependant upon the vegetation grown on the flats.

The Commercial Navigation Alternative raises the minimum winter pool level 2 feet, from elevation 354' MSL to 356' MSL. This increase would permanently eliminate a large portion of the flats that occur on the refuge. The vast mudflats and shallow water areas that occur near the mouth of the Duck River on

Tennessee NWR frequently support in excess of 50,000 ducks and geese. We expect that much of this important habitat would be flooded too deep for puddle ducks if winter pool levels are raised 2 feet. Under this alternative, the overall loss of winter mudflats would have significant negative impacts on several waterfowl species, primarily geese and puddle ducks. Bald eagles, gulls, terns, and wading birds would also suffer a significant loss in habitat. **[76]**

Migratory Birds in the Remainder of the Tennessee Valley

We are concerned about the potential for impacts to migratory birds by several of the alternatives described in the DEIS. Our primary concern is that all of the identified alternatives, except the "no action" alternative, would produce adverse impacts to habitats used by migrating shorebirds, especially foraging habitat areas of wading birds. This discussion and our recommendations are based on the premise that dam removal and river restoration are outside the scope of this study. Our comments and concerns would differ if this premise is inaccurate.

If an alternative other than the Base Case (no action) is selected and implemented, pool levels would be significantly altered during the peak shorebird migration period. Depending on precipitation and other factors, pool levels would be low, but most times too high to provide the kind of habitat available for them in most normal years. Either way, changes in current TVA operations policy would greatly reduce or potentially eliminate this habitat type for migrating shorebirds, as well as for resident and migrant waders that utilize these areas for foraging and roosting/resting. This is a significant change in the current operation and represents an unquantified impact on the birds that use these resources at this time of year. Reduction in

habitat availability in the Tennessee Valley would require the birds currently utilizing this resource to locate and exploit a resource base in other areas. Little of the type and quality of this habitat exists in the region. This is especially true for the eastern part of the Tennessee Valley where limited suitable alternative habitat is available at this time of year (Chuck Nicholson, TVA, personal communication). Until baseline information is obtained, an unknown and perhaps unmitigable effect would be produced. Therefore, before any action other than the Base Case is considered for implementation, specific spatial and temporal information is needed for evaluation.

Unfortunately, we do not have comprehensive survey information for shorebirds across the TVA reservoir system. We do, however, know of several "hot-spots" such as Musick Campground on South Holston Reservoir, Rankin Bottoms on Douglas Reservoir, Savannah Bay on Chickamauga Reservoir, and Pace Point and Britton Ford areas on Kentucky Reservoir (which are within Tennessee NWR). In the past, notable numbers of shorebirds have also been reported from other sites such as the Town Creek area on Wilson Reservoir and the Swan Creek area on Wheeler Reservoir. These areas support from dozens to thousands of shorebirds during late summer-early fall during years of "normal" rainfall and reservoir operation. Typically, the lakes are being slowly drawn down during this time, providing expanses of moist mudflats coincident with the peak fall shorebird migration. Common species include killdeer (*Charadrius vociferus*), semipalmated plovers (*Charadrius semipalmatus*), greater yellowlegs (*Tringa melanoleuca*), lesser yellowlegs (*Tringa flavipes*), solitary sandpipers (*Tringa solitaria*), spotted sandpipers (*Actitis macularia*), pectoral sandpipers (*Calidris melanotos*), short-billed dowitchers (*Limnodromus griseus*), long-billed dowitchers (*Limnodromus scolopaceus*), least sandpipers (*Calidris minutilla*), Western sandpipers (*Calidris mauri*), and semipalmated sandpipers (*Calidris pusilla*). Other regularly occurring but less numerous species include black-bellied plovers (*Pluvialis squatarola*), stilt sandpipers (*Micropalama himantopus*), ruddy turnstones (*Arenaria interpres*), and other peeps. An occasional godwit and phalarope may also be encountered. Many of these areas also support large

numbers of herons and egrets during late summer. Great blue herons (*Ardea herodias*) and great egrets (*Casmerodius albus*) are most numerous, and total counts are frequently in the hundreds.

There are significant data gaps that have not been addressed in the DEIS that need attention before informed decision-making and selection of an appropriate alternative can be completed. With regard to migratory birds and resident birds that use specific habitat areas for foraging and roosting, changes in habitat availability and quality will strongly correlate with changes in bird behavior, migration, foraging, resting, and energy expense during passage through and use of these habitats in the Tennessee Valley. We recommend that TVA address the following issues and information gaps before selection of a preferred alternative:

1. All known data on species occurrence, numbers, and current usage of late-season habitats should be compiled in lieu of comprehensive surveys for shorebird and wading bird use over the entire project area. Such a comprehensive picture of late-season habitats would allow for the evaluation of the overall impact of the various alternatives relative to the availability of other potential sites which would not be affected by changes in reservoir operations policy. This synthesis of information would provide a better means to understand the impact of the various alternatives on migratory birds.

2. Assess the theoretical potential for reservoir habitat loss and shorebird use with each alternative by modeling (Geographic Information System) effects of pool levels on habitat loss during the seasons most heavily utilized by shorebirds and waders, throughout the region.

3. Assess the potential to mitigate effects of potential loss of habitat through:

    a. Creation of other suitable habitats.

    b. Purchase of other suitable habitats.

    c. Purchase and conversion of unsuitable habitat to suitable habitat (assuming the purchase isn't a high priority habitat for other valuable wildlife resources).

4. Evaluate the potential to avoid impact to certain high quality areas (e.g., Rankin Bottoms), and nominate these areas as Important Bird Areas.

5. Develop research programs to determine utilization of areas and impact of habitat loss to shorebird energetics during migration.

6. Develop a mitigation plan for loss of habitats. **[77]**

National Wildlife Refuge Infrastructure and Existing Habitat

There are over 10,000 acres of managed waters within dozens of impoundments on Tennessee NWR, Cross Creeks NWR, and Wheeler NWR. Management emphasis in these impoundments is primarily focused on waterfowl, but many other wildlife species benefit from this valuable wetland habitat. During early spring, prior to the reservoirs being raised to summer pool, the water level in most of these impoundments is lowered to produce various foods for waterfowl. A variety of habitats is provided in these impoundments, including agricultural crops, moist soil vegetation, and forested wetlands. Many of the impoundments are situated at a low elevation and do not have mechanical pumping capabilities. On these impoundments the water has to be removed when the reservoir is at winter pool. Even some of the

impoundments with pumping capabilities are managed by gravity drawdown to reduce costs associated with their management.

The Commercial Navigation Alternative would raise the winter pool level 2 feet from elevation 354' MSL to 356' MSL on Kentucky Reservoir and from 554' MSL to 556' MSL on Wheeler Reservoir. This increase would greatly reduce the acreage that can be managed on all three refuges, especially on Cross Creeks NWR. Tennessee NWR and Wheeler NWR have pumping capabilities within several impoundments, but with an increase in the reservoir winter pool elevation, pumping costs would increase substantially or managed habitat acreage would be substantially reduced.

All of the managed impoundments on these refuges are subject to flooding. Spring floods are common and occur in most years. Management strategies on the refuges have adapted to this situation, and good quality waterfowl habitat is produced in spite of spring flooding. Early summer floods (June) are less common and do have adverse impacts on the quality and quantity of waterfowl habitats, especially the agricultural crops. Late summer and fall floods are very rare, but when they occur the impacts on these habitats generally result in a total loss of food production for the year. Winter floods are uncommon and usually only occur after January. The impacts from winter flooding to waterfowl foods have been limited in the past, but an early winter flood could cause most of the habitats to be unavailable to waterfowl due to the water depth. Floods in any season would cause significant damage to refuge infrastructure (e.g., levees, water control structures, roads, etc.).

All of the alternatives addressed in the DEIS would increase the risk and potential impacts of flooding on Tennessee NWR, Cross Creeks NWR, and Wheeler NWR above that of the Base Case. Depending on the preferred alternative and precipitation patterns in the Tennessee Valley, flooding risks may also be substantially increased on Wheeler NWR. To varying degrees and during different seasons of the year, each alternative would reduce flood storage within the Tennessee Valley System. Insufficient information is provided in the DEIS to determine the significance of the increased flood risk. When a preferred alternative is selected (if other than the Base Case), a detailed analysis of the flood risk for each refuge should be conducted so that an adequate assessment of the impacts can be made.

The scrub/shrub and forested wetlands that ring Kentucky, Barkley, and Wheeler Reservoirs provide important habitats for many species of fish, mammals, amphibians, reptiles, birds, and insects. These wetlands vary from narrow bands along the shoreline to extensive forests within the creek bottoms. From May to July, several thousands of acres of buttonbush (*Cephalanthus occidentalis*) and willow (*Salix* spp.) thickets are shallowly flooded while the reservoirs are at summer pool. Outside the summer pool period, primarily during the winter and spring, these wooded wetlands periodically flood during heavy rainfall events.

When the scrub/shrub and forested wetlands are flooded, waterfowl use these habitats extensively. Wood ducks require dense cover as brood habitat. The willow-buttonbush thickets provide an excellent overhead cover and at the same time are open enough at the water surface to allow the wood duck broods to move easily and feed on the numerous invertebrates that are present. These woody wetland thickets also provide valuable spawning and nursery habitat for a variety of fish and invertebrate species. During the winter and early spring when these habitats flood, mallards (*Anas platyrhynchos*), black ducks (*Anas rubripes*), and wood ducks move into these newly flooded areas to take advantage of a wide variety of food resources.

Many other species of birds utilize this riparian zone for nesting, foraging, and migration stopover habitat. Heron rookeries occur on islands and in bald cypress (*Taxodium distichum*) sloughs in several locations on Tennessee and Wheeler NWRs. The prothonotary warbler (*Protonotaria citrea*), a Partners In Flight

(PIF) priority species within the Central Hardwoods and East Gulf Coastal Plains Bird Conservation Regions, is a relatively common breeding bird within the riparian zones of Kentucky, Barkley, and Wheeler Reservoirs. This warbler is limited to bottomland habitats and nests in cavities that are located over or very close to water.

The alternatives that delay the fall drawdown (Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Habitat Alternative, and the Tailwater Recreation Alternative) are expected to have significant negative impacts on the scrub/shrub and forested wetlands along Kentucky, Barkley, and Wheeler Reservoirs. Depending on the preferred alternative and precipitation patterns within the Tennessee Valley, these impacts may also be expected to occur on Wheeler Reservoir. Extending the duration that these habitats are inundated during the growing season would dramatically shrink the willow-buttonbush, water tupelo, and bald-cypress plant communities and alter the plant composition of the bottomland hardwoods. The loss of the woody vegetation that is currently inundated at summer pool would negatively impact aquatic organism productivity. We anticipate that the productivity of the local wood duck populations and the quantity and quality of this wintering waterfowl habitat would also be reduced. We expect that the woody plant communities in this zone would be replaced by emergent aquatic plants that would not provide suitable spawning and nursery habitat, wood duck brood cover, or foraging areas for wintering waterfowl. In many cases, these emergent aquatic plant communities may be dominated by invasive exotic species such as alligatorweed (*Achyranthes philoxeroides*) and *Phragmites*.

Shoreline erosion is a major problem along Kentucky, Barkley, and Wheeler Reservoirs. The results are a loss of riparian and upland habitats and decreased water quality. Shoreline stabilization has become a high priority for Tennessee, Cross Creeks, and Wheeler NWRs to protect upland habitats and important archeological sites and to stabilize river islands. We are currently partnering with TVA to stabilize several sites on Tennessee NWR and anticipate this project to continue indefinitely. Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Habitat Alternative, and Tailwater Recreation Alternative are listed in the DEIS as having the potential to accelerate the rate of shoreline erosion. **[78]**

Units of the National Park System

The DOI, through the NPS, is mandated by Congress to oversee issues relating to our national parks, particularly "…to conserve the scenery and the natural and historic objects and the wildlife therein, and provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of this and future generations…" (National Park Service Organic Act of 1916). Several units of the National Park System, including Great Smoky Mountain National Park (GRSM), Chickamauga-Chattanooga National Military Park, Shiloh National Military Park, Natchez Trace Parkway, and the Trail of Tears National Historic Trail are, or could be, affected by TVA's reservoir operations. For example, GRSM continues to be negatively affected by airborne emissions from TVA's fossil generation, among other regional sources. Should hydro generation be altered such that fossil generation is increased, the air quality and related ecosystem problems in GRSM could be exacerbated. Bank erosion and other impacts associated with archeology and biota within the riparian corridor that result from hydrologic alterations (e.g., ramping) are issues of concern for all park units adjacent to TVA waters. Units of the National Park System are *not* currently listed in the ROS. Potential impacts to these units should be thoroughly evaluated and included in the final EIS. **[79]**

In addition, a host of other federal laws, such as the Wild and Scenic Rivers Act, PL 90-542 and the Outdoor Recreation Act, PL 88-29, provide NPS with a mandate to look beyond the boundaries of the national parks in the interest of protecting the public's interests in river and outdoor recreation resources.

In general, NPS has an interest in protecting and promoting natural resources, recreational opportunities, aesthetics, and historical and archeological resources. More specific to TVA operations, NPS interests lie in recreational access/facilities, instream flows for recreation and aquatic habitat conservation, riparian corridor protection, and natural streambank stability. **[80]**

The NPS manages wetlands in compliance with Director's Order #77-1 which establishes standards and requirements for implementing E.O. 11990 and in compliance with Section 404 of the Clean Water Act. In following DO #77-1 the NPS is responsible for documenting any adverse impacts to wetland habitats including explanations on the final preferred alternative which will result in wetland losses or degradation. Therefore, the NPS should continue to be an integral part of the Interagency team to develop the final EIS and consideration should be given to direct, indirect and cumulative impacts to wetland habitats within and adjacent to NPS lands.

According to the ROS, approximately 183,000 acres of wetlands are within the projected groundwater influence area of the TVA reservoir system, therefore, there is the strong likelihood that wetlands associated with the operational changes of TVA reservoirs may significantly affect these aquatic habitats found on NPS lands within the Tennessee River system.

The DEIS identifies isolated wetlands as one type which is especially sensitive to groundwater alterations which could occur due to operational changes by TVA. The document also states that these wetlands have lost protection under the CWA due to the recent Supreme Court case decision (SWANCC 2000); however, the SWANCC decision was based on the definition of navigable waters and NPS defines wetlands based on the various parameters of soil, vegetation and hydrology as described in the U.S. Fish and Wildlife Services' *"Classification of Wetlands and Deepwater Habitats of the United States"* (FWS/PBS-79-31). The NPS guidance (Director's Order #77-1) which establishes requirements for the protection of wetlands, therefore, includes more wetland habitat types than those defined by the Corps including the protection of "isolated" wetland habitats. Wetland delineations on NPS lands must meet the requirements of the CWA, Section 404 and NPS wetland protection policies as required by Director's Order #77-1. The SWANCC decision eliminates many of the wetland types which will, however, continue to receive protection under the National Park Service definition of wetland habitats. Additionally, indirect adverse impacts to wetland habitat can result in increased flood risks and changes in visitor use due to alterations of water levels in upstream reservoirs which are located on adjacent rivers to park lands. **[81]**

Project Minimum Flows, Tailwater Fisheries, and Mussels

Since the minimum flow regimes provided at certain tributary reservoir tailwaters were derived using FWS techniques, we point out that the techniques were intended to provide common ground for negotiated flow regimes and are not necessarily the cutting edge of river restoration science. The methodologies have deficiencies which must be understood by users, such as the rudimentary nature of minimum flow calculations, and the vintage of some techniques and curves. We suggest that with some additional refinements, science-based minimum flows within these tailwaters could render additional benefits to the tailwater aquatic and terrestrial communities. Elsewhere within the Tennessee Valley, the FWS has initiated the development of minimum flow regimes which offer seasonally-variable flows reflective of natural run-off characteristics. We also plan to measure aquatic and riparian responses to these events. These minimum flow regimes are more refined in terms of magnitude, duration, and timing of minimum flows, as well as peak flows, so that they may offer periodic pulses for sediment transport, trigger ecological processes, and serve as behavioral cues. **[82]**

We recommend the development of a process to consider and/or reconsider in detail the minimum flow regime at specific tributary and mainstem tailwaters necessary to enhance aquatic and riparian systems, within system constraints (i.e., navigation, flood control, power generation, and recreation). This process should include the formation of an interdisciplinary team of scientists familiar with the tailwater systems and techniques for developing continuous minimum flow regimes. Key considerations should include timing of flows, magnitude, rate of change, and water quality (e.g., DO, thermal characteristics, etc.). **[83]**

We recommend the development and refinement of minimum flow regimes for the specific objective of benefiting tailwater fisheries and aquatic communities at tributary and mainstem reservoirs. There are remnants of significant natural communities which would benefit from this process in the tailwaters of Chatuge, Nottely, Cherokee, Douglas, and Blue Ridge Reservoirs. Since many of the existing minium flow regimes are measured as a daily average, rather than instantaneous flow, we believe that significant benefits would accrue from refinements that provide continuous flows for aquatic and riparian communities. Additionally, we would like to develop a beneficial minimum flow regime for the bypassed reaches of stream at Appalachia and the Ocoee Reservoirs. **[84]**

The FWS has initiated a multi-year study of the effects of stream regulation on freshwater mussels, and we welcome the opportunity to include some of the TVA tributary and mainstem project tailwaters within the experimental design. The objective of this study is to develop methodologies necessary to evaluate the impacts of flow regime changes on these mussel populations. Freshwater mussels are the most critically endangered faunal group in the United States. The construction and operation of TVA dams have and continue to adversely affect many freshwater mussel populations, and in part, these facilities have been responsible for the extinction of several species. Although water quality and temperature of the discharges have and continue to impact some mussel populations, there is a growing body of evidence that altered hydrographs are the primary cause for the decline and endangerment of many species. In order to protect and enhance the remaining populations of mussels in the Tennessee Valley, we believe there is an urgent need to provide adequate flows. The ROS provides a unique opportunity to evaluate flow regimes necessary to sustain healthy mussel populations; however, there is no empirically based method for determining a flow regime suitable for mussels. We suggest a study conducted over a 5-year period which monitors behavioral and physiological attributes might provide the best means of evaluating the effects of changes in flow regimes on mussel populations. There are also opportunities for TVA to assist in an expanded study through funding and aquatic sampling at select TVA tailwaters. **[85]**

It is unclear why hydroturbine ramping rates are not included in a comprehensive study of reservoir operations. Rapid ramping rates cause severe erosion, potentially impacting archeological and ecological resources. **[86]**

Reservoir Fisheries

The metrics utilized in the DEIS evaluation of aquatic resources focused on DO, temperature, and reservoir hydrodynamics. As concluded in the DEIS, no policy alternative represents a clear

benefit to reservoir aquatic resources. Based on water quality modeling performed to date, some degradation of the existing aquatic resources could be expected for several of the alternatives. The DEIS did not make a strong correlation between contiguous, adjacent, and peripheral wetland habitat types and sport fishery productivity. Many of these areas have the potential to change, due to increased water levels, and there could be significant effects to sport fishery spawning and nursery areas. The continued expansion of invasive aquatic emergent vegetation and non-native fish populations is also problematic for spawning and nursery wetland habitats. **[87]**

The alternatives that delay the fall drawdown (Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Habitat Alternative, and the Tailwater Recreation Alternative) are expected to have significant negative impacts on the scrub/shrub and forested wetlands along Kentucky, Barkley, and Wheeler Reservoirs.

Extending the duration that these habitats are inundated during the growing season will dramatically shrink the willow-buttonbush, water tupelo, and bald-cypress plant communities and alter the plant composition of the bottomland hardwoods. It is expected that the woody plant communities in this zone will be replaced by emergent aquatic plants. In many cases, these emergent aquatic plant communities may be dominated by invasive exotic species such as alligatorweed and *Phragmites*. We believe the final EIS should fully evaluate the potential changes in reservoir wetland habitat type associated with the preferred alternative. Those results should be considered in addition to the metrics evaluated in the DEIS and any refinement to the water quality model(s) once a preferred alternative is selected. **[88]**

Aquatic Enhancement and Mitigation Opportunities

Investigate additional fish and mussel restoration efforts at tributary and mainstem tailwaters. There are opportunities to restore native fishes and fisheries through reintroductions at several tailwaters. TVA and the FWS have been involved with several successful reintroduction efforts. We encourage the continued involvement by TVA in these efforts. **[89]**

Enhance cold/cool-water tailwaters. We recommend enhancement of aquatic conditions for native aquatic communities by provision of warmer water during summer, with less rapid daily fluctuations, and better oxygenation. Where increased water temperatures are not practical, measures could include cooperation with other agencies and organizations to enhance nearby streams that were fragmented by the construction and operation of TVA Reservoirs. These streams have experienced limited colonization and smaller population sizes of their aquatic communities. Although the Fontana and Tims Ford projects provide a significant challenge in this regard, we recognize the significant impairments their deep, cold water releases and drastic fluctuations impose on the Lower Little Tennessee River and Elk River, respectively. The dominating effects of the operation of the Fontana and Tims Ford projects have tremendous implications for our ability to recover several listed species of fish and mussels. We expect TVA to continue to cooperate in the recovery of listed species where it can and to work with us to identify measures to overcome the continued impairment of the Lower Little Tennessee River and Elk River. **[90]**

Although the scope of the DEIS does not include facilities on the Duck River, we believe significant potential for improvement exists in the Normandy tailwaters. This is due in part to the existing multi-port release mechanism and the questionable condition of the managed trout fishery below Normandy Dam. **[91]**

Provide fishways. There are opportunities to allow for upstream and downstream passage of fishes to enhance fish populations at mainstem and tributary reservoirs. The need for fishways for species such as lake sturgeon (*Acipenser fulvescens*), black buffalo (*Ictiobus niger*), smallmouth buffalo (*Ictiobus bubalus*), freshwater drum (*Aplodinotus grunniens*), sauger (*Stizostedion canadense*), walleye (*Stizostedion vitreum*), paddlefish (*Polyodon spathula*), and river redhorse (*Moxostoma carinatum*) could be estimated from cooperative review of existing and future fish sampling from seasons when species congregate at tailwaters, as well as presence/absence data from historical spawning areas. We recommend a systematic approach to providing efficient and timely fish passage at TVA facilities. **[92]**

Develop an advanced schedule for decommissioning and dam removal. We recommend that TVA begin to identify and prioritize its dams/reservoirs for eventual removal. It is never too early to project a

schedule for removal of these facilities and to plan for restoration of the natural riverine conditions of the Tennessee Valley. Parameters to consider are relative length of reaches potentially restored by dam removal(s), value of and alternate sources of energy provided by the hydroelectric generation capacity, connectivity/fragmentation of the river system, and the benefit to species and natural communities. For TVA developments with the least storage capacity, least generation capacity, and fewest reservoir-dependent neighbors, a tentative time line and plan for removal could be developed. It is important to begin limiting future dependency on these reservoirs sooner than later, reversing trends toward more dependency on their presence, while emphasizing alternate uses of a riverine ecosystem. **[93]**

Maintain Ecological Staffing. We recognize the value of TVA's professional staff in guiding and implementing the ROS. We encourage you to maintain adequate staffing and funding in these areas, with a focus on continuity, science, and professionalism. Based on the above considerations, the DOI encourages TVA to maintain its existing policy and conditions within the system by selection of the Base Case alternative presented in the DEIS. TVA has made a substantial investment in improving water quality and habitat conditions within its reservoirs and tailwaters over the years, and we believe that those improvements could be substantially compromised by a majority of the other alternatives. **[94]**

We appreciate the opportunity to comment on this DEIS. We trust that our comments will be of use as you prepare the final document and that you will continue to involve DOI bureaus in your ongoing planning activities. If you need additional information, please feel free to contact Gregory Hogue, Regional Environmental Officer in Atlanta, Georgia, at (404) 331-4524 or myself at (505) 766-3565.

Sincerely,

Stephen R. Spencer
Acting Regional Environmental Officer

Enclosure

Federally-recognized tribes potentially affected by TVA operations in Tennessee, Alabama, Kentucky, Georgia, Mississippi, North Carolina and Virginia.

Cherokee Nation
PO Box 948
Chadwick Smith, Principal Chief
Tahlequah, OK 74465

United Keetoowah Band of Cherokee Indians
PO Box 746
Dallas Proctor, Chief
Tahlequah, OK 74465

Eastern Band of Cherokee Indians
Qualla Boundary
PO Box 455
Leon Jones, Principal Chief
Cherokee, NC 28719

Chickasaw Nation
PO Box 1548
Bill Anoatubby, Governor
Ada, OK 74821

Muscogee (Creek) Nation
PO Box 580
R. Perry Beaver, Principal Chief
Okmulgee, OK 74447

Poarch Creek Indians
5811 Jack Springs Road
Eddie L. Tullis, Chairman
Atmore, AL 36502

Eastern Shawnee Tribe of Oklahoma
PO Box 350
Charles D. Enyart, Chief
Seneca, MO 64865

Shawnee Tribe
PO Box 189
Ron Sparkman, Chairman
Miami, OK 74355

Absentee-Shawnee Tribe of Indians of Oklahoma
2025 S. Gordon Cooper Drive
James “Lee” Edwards, Jr., Governor
Shawnee, OK 74801

For additional information, contact Kurt Chandler, Bureau of Indian Affairs, Eastern States Regional Office, Nashville, Tennessee, (615) 467-1677

RESPONSE TO COMMENTS

1. The Bureau of Indian Affairs and National Park Service (NPS) of the DOI, along with FWS, served on a 17-member Interagency Team that helped guide the process. Many of the concerns of the DOI have been addressed as a result of this participation.

Response to Comment 1: One of TVA's objectives in establishing the referenced Interagency Team was to provide interested federal and state agencies with an opportunity to participate in guiding and influence the ROS, and its associated analyses. TVA appreciates the acknowledgement that the DOI found its involvement on the team useful.

2. However, we are providing the following additional general and specific comments for your consideration as you prepare the final document. …The DEIS, with the exception of Chapter 7, is concise and well written.

Response to Comment 2: Comment noted. A concise, well-written document was one of TVA's goals for the ROS EIS.

3. However, the programmatic approach utilized by TVA does not allow reviewers and decision makers to identify and analyze specific mitigation strategies.

Response to Comment 3: Because the ROS EIS is a programmatic review of alternative operations policies for TVA's entire integrated reservoir system, mitigation measures are appropriately scaled to a reservoir-system level. Further delineation of feasible system-wide mitigation measures is now possible with the identification of TVA's Preferred Alternative, and this has been done in the FEIS.

4. Although we applaud TVA's effort in undertaking such an important evaluation of its current reservoir operations, we suggest that further, sub-basin-, reservoir-, and/or ecoregion-specific evaluations be undertaken in the near future to refine the level of resolution such that operations recommendations can be appropriately developed that account for regional resource complexities and peculiarities. A programmatic EIS should identify site- or region-specific data gaps and uncertainties**.**

Response to Comment 4: As suggested, more reservoir- or site-specific analyses would be undertaken in the future, as appropriate. This would be done if any ROS decision results in discrete proposed actions at the reservoir- or site-specific level, or when actions independent of the ROS are proposed. Such future proposals would either tier from or reference the ROS EIS.

5. Further study and public input should be used to make local decisions.

Response to Comment 5: See Response to Comment 4. The ROS EIS provides TVA a sound basis for making reservoir-system level decisions, including implementation of any operations policy changes approved by the TVA Board across the affected reservoirs. If discrete actions are proposed on specific reservoirs in the future, TVA would conduct additional analyses and seek public input, as appropriate.

6. In our opinion, the uses of the waterway that are the most frequently supported by select segments of the public will have impacts and require mitigation; Chapter 7 does not provide us the level of information we believe will be necessary to provide reasoned and informed comments on the action alternatives.

Response to Comment 6: See Response to Comment 3. TVA agrees that many of the operational changes preferred by those commenting on the DEIS would result in adverse environmental impacts and should be mitigated. As suggested later by DOI, TVA

developed the Preferred Alternative to reduce or avoid the adverse impacts associated with the alternatives presented in the DEIS. Additional information about mitigation has been provided in Chapter 7...

7. The DOI strongly supports TVA's implicit commitment to maintaining the achievements in water quality and habitat improvements garnered to date in its implementation of the Lake Improvement Plan and Reservoir Release Improvement Plan. However, we believe these commitments should be incorporated into the Record of Decision for this process and expressly stated in the executive summary section of the final EIS and integrated within the selected preferred alternative.

Response to Comment 7: TVA is committed to maintaining water quality and other improvements that resulted from its 1990 Lake Improvement Plan. TVA committed to those actions in the Record of Decision that finalized the process for that EIS. The Preferred Alternative identified in the FEIS reflects TVA's ongoing commitment.

8. We recommend that TVA's stated purpose, to determine the changes in the reservoir operations policy, if any, that would produce "greater public value," be refined. The phrase is poorly defined and could easily be perceived as subjective (page 1-4, section 1.2) and lacking in a commitment to provide needed resources to mitigate identified needs. TVA should work with its planning partners to develop clear, dichotomous selection criteria to define and rank "public value." These selection and ranking criteria should be guided by TVA's mission, legal and regulatory constraints and opportunities, and public input received during scoping and subsequent processes.

Response to Comment 8: From the beginning of the ROS and the scoping of the EIS, TVA identified greater public value as its objective for proposing changes to its reservoir system operations policy. TVA agrees that "public value" is inherently subjective because it encompasses a wide range of perspectives and opinions held by the diverse group of stakeholders that benefit from the operation of the reservoir system. This is why TVA has aggressively sought input on values from the broadest possible range of the public and interested federal and state agencies. As discussed in Appendix F1 under "Introduction to the Comment Response Appendix," TVA used a variety of techniques to achieve this. TVA expressly sought and received numerous comments about values, frequently with expressed or implicit statements of preference among identified values. These statements help describe the meaning of public value in ways that will contribute directly to decision making. TVA's efforts to objectively weigh and rank identified values is expressed by the formulation of its Preferred Alternative presented in the FEIS. As with most matters concerning public policy, the final decision to be made is subjective, and decision makers must take staff recommendations, public input, and other factors into consideration in their efforts to serve the public interest in the best way possible.

9. In large part, this concern focuses on the terms "public" and "value." The "public" that TVA is responsible to reflects a tremendous range of perspectives, opinions, and values. We recognize that "public" includes ratepayers, shoreline property owners, reservoir users, and other stakeholders and interested parties. "Public" includes individuals and organizations that have attended workshops and meetings, responded to telephone surveys, or otherwise participated in the planning process. "Public" includes the citizens of states impacted by the TVA system of impoundments, power generation and transmission facilities, and who are indirectly affected, whether they actively participate in the planning process or not. We recognize that "public" includes all Americans, from present and future generations. Finally, we recognize that "public" means government agencies with jurisdiction by law and

expertise, and American Indian tribes, particularly the Cherokee, Chickasaw, Choctaw, Shawnee, and Creek tribes, which TVA must afford government-to-government rights. The TVA planning and decision-making process should not be biased by the sheer number of comments from small segments of the public, nor by the level of passion or personalities of individuals involved in the planning process.

Response to Comment 9: See Response to Comment 8 and "Introduction to the Comment Response Appendix" in Appendix F1. TVA agrees that the public has many perspectives and interests. It includes those who chose to participate in the ROS EIS process and those who did not; private citizens, and public agencies. TVA used a qualitative approach that was guided more by the merits of the comments made than the numbers of comments.

10. It is incumbent on TVA to establish unambiguous, objective selection and ranking criteria, so that reviewers and decision makers can be assured of a transparent planning and decision-making process. Public value, as used in the DEIS, is unsuitable as a planning guideline or decision-making criterion.

Response to Comment 10: See Response to Comment 8. We disagree that public value is an inappropriate planning criteria. Public value is discernible and has been repeatedly articulated by those commenting during the scoping and DEIS processes. In comments from its representatives on the Interagency Team and its comments here, DOI has itself expressed its views about values. Objective criteria were established and used in the ROS process. The results of these efforts are reflected in TVA's Preferred Alternative. For example, because all of the action alternatives evaluated in DEIS would result in unacceptable increases in flood risk, combined elements of TVA's Preferred Alternative were incrementally adjusted to meet the flood risk evaluation criterion described in Section 5.22.

11. A refinement of the project purpose, and the development of selection criteria, should identify the methods that TVA proposes to use to resolve competing public values. The priorities generated in public workshops should contribute to the discussion of "greater public value." Those priorities (in order) are recreation, environmental protection, flood control, cheap power and clean water. The other alternatives analyzed in the DEIS do not necessarily reflect the priorities established by workshop participants for the public resources diverted by TVA.

Response to Comment 11: The statements of, and preferences among, values that were made during scoping and the DEIS review process were part of TVA's discussion of public values with interested members of the public and other agencies. The values identified by DOI in this comment were among the values identified during the EIS process. The values and associated objectives were used to formulate the alternatives presented and analyzed in the DEIS. TVA's preferred alternative expresses how TVA weighed the identified public values.

12. We recommend TVA expand the discussion to describe cost issues associated with alternatives and mitigation measures from various perspectives. The standard Federal government economic analysis may not be a useful tool for individuals who have been educated to externalize all costs except the fees they are directly responsible for paying. In our opinion, the DEIS would be a more valuable tool for such individuals if it explained the costs of each alternative and mitigation measure and how those costs would most likely be met. In our experience, some capital improvements could create new costs, which may be assumed by ratepayers and recreational or access facility users. Some alternatives and

mitigation measures could reduce operational flexibility, or create episodic shortages of power, which might mean that replacement power costs would be accrued.

Response to Comment 12: The cost impact of alternative operations policies on TVA's power system was identified in the DEIS. This information has been expanded in the FEIS and now includes mitigation cost estimates as requested.

13. Reviewers and decision makers would benefit from a DEIS that is understandable to the range of perspectives and values associated with the "public."

Response to Comment 13: TVA agrees that both the public and decision makers benefit from an understandable discussion of values. Although we believe that the ROS Scoping Document and the DEIS explain how the major public issues reflecting underlying values were used to develop a set of performance objectives to evaluate the policy alternatives, we further clarified the discussion in the FEIS. For example, Table 1.6-03 was added to better define the performance objectives.

14. For example, page 4.4-2, "Regulatory Programs and TVA Management Activities" states that TVA has made the commitment to not reverse any improvements in dissolved oxygen (DO) concentrations resulting from previous improvement programs. Yet there is no discussion of the capital investments that would be required to keep the DO levels at an acceptable level. Page 1-4, section 1.2, only states that "changes to operations that require additional capital or operating expenditures would need to be funded by either TVA or others."

Response to Comment 14: See Response to Comment 12 and Table 5.23-03.

15. At a minimum, we suggest TVA at least analyze the two alternatives most favored by the workshop participants and survey respondents, specifically, to extend the summer pool levels and protect the environment. The analysis should determine if mitigation can achieve an acceptable DO while making those goals compatible. Furthermore, the mitigation analysis should explain funding mechanisms that would allow the two goals to be simultaneously implemented. Likewise, if the goals and the DO levels are not compatible, the analysis should document the tradeoffs (gains and losses) associated with the approach selected.

Response to Comment 15: The alternatives presented in the DEIS did analyze the impacts of extending summer pool levels on water quality, other environmental factors, the regional economy, and system operating objectives. TVA designed the alternatives that were evaluated in detail in the DEIS to reflect the broad range of issues and recommendations that were identified during scoping. This enabled a determination of the full range of associated potential impacts. Results of the analyses were then used to determine which elements of the alternatives would and would not meet evaluation criteria that were established for the primary system operating objectives, such as reducing the risk of floods. TVA developed its Preferred Alternative in order to maintain flood risk at acceptable levels, while preserving desirable characteristics that were associated with the other alternatives. Generally, descriptions of the mitigation measures that TVA would implement and how the costs of these measures would be funded are included in the Record of Decision.

16. Because the potential influence of economics is likely to weigh heavily in determining a preferred alternative, the ROS should be careful to note that classical economic theory, upon which TVA's economic models are based, relies on two key assumptions that are violated within ecological systems. These are the principles of substitutability and

reversibility. Given DOI's (and presumably TVA's) interests in protecting and managing resources for this and future generations, a thorough discussion of these assumptions and their relevance to the TVA ecosystem is essential.

Substitutability implies that when one resource is diminished, it can be replaced by another similar resource. In ecological systems such as rivers, this assumption potentially fails since individual species are often closely co-evolved with their environments allowing them to exist within a relatively narrow range of physical, chemical, and biological parameters. Switching to another resource is often not an option.

Similarly, reversibility in economic theory implies that economic trends caused by a particular decision can be reversed once the decision is reversed. In ecological systems, this assumption has a high likelihood of failure. For example, relatively minute changes in ecological community structure can have permanent effects that cascade the though the community and potentially the entire ecosystem. The classic example of this phenomenon is the extirpation of a keystone species. Once this critical ecological link is extirpated, the system can never recover to its pre-extirpation state. Exacerbating the situation, the loss of a keystone species can result of the loss of additional species and/or wholesale changes in ecological functions and services.

Response to Comment 16: TVA has taken steps to ensure that these two assumptions are not applied in the context of ecological systems. An inherent risk of assigning monetary values to the identified environmental impacts is that some readers might assume that TVA was suggesting that it could buy substitutes for affected ecosystems or pay to reverse such impacts. .Rather than assigning monetary values, TVA preferred to state environmental costs in their natural metrics, such as increases or decreases in DO, and did so in the ROS analyses.

17. We recommend the DEIS discussion of the underlying limnetic patterns and processes be enhanced with more obvious cross-references. The DEIS should provide reviewers and decision makers with a comprehensive discussion of biological, chemical, and physical patterns and processes, how they are influenced by specific operational regimes, and what mitigation options are available. We are particularly concerned that the discussion about dissolved oxygen concentrations and reservoir pool elevations, on page 2-25, section 2.3.6, and elsewhere, be understood by reviewers and decision makers. Section 4.4 has a good discussion of the impacts of residence time and stratification on dissolved oxygen. Section 5.4.3 and 5.7.2 have a good discussion of DO impacts due to alternatives. However, additional clarity on the meaning of the impacts and possible solutions to the impacts is needed. This specific issue is the best example of where the public needs a greater understanding of TVA's priorities, limitations, and costs. DO is often the main limiting factor when considering extending the high summer pool levels desired by the public.

Response to Comment 17: Additional information about mitigation measures has been added to Chapter 7 in the FEIS. See Response to Comment 3. TVA agrees that DO is often a limiting factor when considering higher lake levels. Reducing potential water quality impacts was one of the primary drivers in the formulation of TVA's Preferred Alternative. Additional cross-references have been included in the FEIS.

18. We recommend select information in the DEIS be cited as a range of values, including error terms, variance, and other sources of uncertainty. This is particularly relevant for those parameters that may significantly influence decision making, such as hydroelectric power generation capacity. Page 2-7 (Hydropower Generation Facilities), page 3-10 (Hydro Modernization Program), and other sections of text indicate that the Base Case for the

alternative comparison uses upgraded electrical capacity values for the 21 turbine units that are still in the process of being upgraded to modern standards. We recognize the need to utilize some common metric as a standard for comparison but encourage TVA to inform reviewers and decision makers about the weaknesses inherent in the selected metrics.

Response to Comment 18: TVA readily acknowledges that uncertainties are associated with all of the ROS analyses—particularly the computer-program-driven analyses, which provide the backbone for most of the ROS analyses. The appendices to the EIS (both Draft and Final) describe the models and identify their more important limitations. For example, TVA noted that the Weekly Scheduling Model, which provides the analytical foundation for most of the ROS analyses, produces only average weekly discharges. As explained in the model description appendix, this limitation for ROS water quality modeling required TVA to estimate hourly discharges with a different computer program. These limitations were described textually and were not always mathematically characterized. For most readers, textual explanations are more informative than mathematical characterizations. However, detailed box plots showing the variability of results were included in Appendix C.8. Appendix C also identified assumptions and limitations of other important analyses. To further aid the reader in understanding uncertainties, additional graphical depictions of probability ranges associated with resulting reservoir elevations have been included in Appendix C in the FEIS.

19. Actual or firm power generation values can only be obtained with in-place units. The subject 21 units are not yet modified, or "in situ." It is common for actual power values for any given generator to be below the rated power value, due to a myriad of circumstances. With a total of 109 units, the variation between actual firm and 21 in-situ power production for the 21 units could represent a significant underestimate of power generation in the DEIS. The uncertainty associated with using rated or projected power values could have a significant impact on the comparison of alternatives, especially when power production is a determining factor. Identifying the range of values, from rated through existing in situ at various efficiencies, would, in our opinion, provide a more transparent analysis than the strict use of rated power values.

Response to Comment 19: Although some uncertainty accompanies projecting unit generation levels, the experience of being well into the modernization of its hydroelectric units increases TVA's confidence in its projections. To the extent that the projections may be in error, the error would have been applied across all alternatives and would therefore not affect their relative comparisons.

20. Neither section 4.18 nor 5.18 on Cultural Resources mentions whether any American Indian tribes were consulted. The subject TVA projects are located in an area where at least five federally recognized tribes have been or are located (Cherokee, Chickasaw, Choctaw, Shawnee, and Creek) and may attach aboriginal, religious, and cultural significance. Accordingly, pursuant to section 106 of the National Historic Preservation Act (NHPA), such tribes must be consulted about cultural resources affected by these projects, including consultations regarding the identification of cultural properties, the appropriate scope of the area of potential effects, and the development of any Historic Properties Management Plan. See, e.g., 36 C.F.R. 800.2(c)(2)(B)(ii). A list of potentially affected tribes is enclosed for your use as appropriate.

Regulations implementing the NHPA contemplate that Indian tribes be provided both a meaningful and early opportunity to participate in the section 106 planning process. The regulations further require that the agency make a reasonable and good faith effort to

identify historic properties that may be affected by the undertaking and gather sufficient information to evaluate the eligibility of these properties for the National Register. See, e.g., 36 C.F.R. 800.4(b). Consultation with the State Historic Preservation Officer does not satisfy this requirement.

Response to Comment 20: TVA has invited 17 federally recognized Indian tribes to be consulting parties in the process that addresses effects on historic properties, consistent with Section 106 of the National Historic Preservation Act. TVA is executing an agreement with the seven Tennessee Valley region State Historic Preservation Officers and other consulting parties, outlining the actions TVA would take to avoid or mitigate adverse effects on historic properties associated with the Preferred Alternative.

21. We recommend the DEIS enhance discussions about the relationship between the need for low temperature cooling water for power plants and the impact on warm water species by releasing cold water from Fontana Dam; mitigation options should be discussed in detail. TVA acknowledges the impacts on aquatic resources by creating a dam system in section 4.7 and notes the need for cool water used for power plant cooling in section 4.23.5, but reviewers and decision makers would benefit from a more thorough discussion of underlying issues, alternatives and implications, and mitigation strategies. The cold water released from Fontana Dam is a major inhibiting factor in the existence of native fish populations in the Little Tennessee River and the reservoir system operated by the APGI Tapoco Project as well as the Tennessee River. Fontana Dam could have an inlet tower installed to select the water from anywhere in the water column and have much greater control of the temperature of the water released. However, the release of warmer water to support native fish conflicts with cooling water needs for power plants along the Tennessee River.

Response to Comment 22: Changes have been made in the FEIS to address this issue (see Sections 4.7 and 5.7).

22. Throughout the document, TVA interchangeably refers to existing conditions or the current reservoir operations as Base Case, no-policy alternative, or no-action alternative. For clarification, we recommend TVA utilize one description for this alternative.

Response to Comment 22: Changes have been made to improve the use of consistent terminology throughout the FEIS.

23. Specific details related to operational policy changes that may be proposed at each of TVA's facilities are needed to fully assess the impacts of the individual alternatives. For all alternatives, site-specific spatial and temporal information concerning projected water elevations and releases for each reservoir and associated tailwater is also needed to fully evaluate potential impacts to existing resources.

Response to Comment 23: The ROS analyses do contain detailed information about the potential effect of the alternatives on reservoir-specific parameters, such as elevations and flows. TVA makes additional technical information available on request. Most readers would have little use for such details and are more interested in a broader perspective on issues that interest them specifically. The ROS EIS contains the latter. However, the appendices provide additional details, including box plots and tables that show estimated elevations on a weekly basis across reservoirs by each alternative (see Appendix C). Additional details also have been provided in the FEIS for TVA's Preferred Alternative.

24. Based on analyses completed to date, most of the action alternatives would produce substantially higher minimum water elevations downstream from the mainstem dams. The

recreation-based alternatives would also result in higher water elevations and delayed winter pool drawdowns in the tributary reservoirs. The Equalized Summer/Winter Flood Risk Alternative would produce minimum water elevations similar to the Base Case alternative. All of the other alternatives would yield higher minimum water levels. The Commercial Navigation Alternative would result in an increase in the winter flood guides of 2 feet on the mainstem reservoirs. Recent flood risk analyses have indicated that potential delayed winter pool drawdowns would result in a 33% increase in high water occurrences at 363' MSL, a 12% increase at 362' MSL, and a 17% increase at 361' MSL, in Kentucky Reservoir. A similar evaluation performed for Wheeler Reservoir indicated a 33% decrease at 559' MSL and a 17% increase at 558' MSL. As it becomes available, we would appreciate additional information regarding flood risk analyses performed in other mainstem pools utilized for navigation.

Response to Comment 24: Additional information about flood risk has been provided in the FEIS. Substantial additional data exist that support the summary data provided in the EIS. TVA makes this information available on request.

25. In general terms, most alternatives would increase reservoir retention times, which would decrease dissolved oxygen (DO) and increase chlorophyll concentrations within the reservoirs. Low DO concentrations reduce the assimilative capacities in the reservoirs and result in near anoxic conditions in the hypolimnion. Other changes in water quality parameters would be expected in the reservoirs and associated tailwater releases. Since a preferred alternative is not known at this time, it is impossible to predict, with any degree of accuracy, specific expected changes in water quality within mainstem or tributary reservoirs or tailwater reaches.

Response to Comment 25: As noted by DOI in Comment 26, TVA modeled potential water quality changes associated with each of the alternatives and summarized the results in the EIS. This was also done in the FEIS for TVA's Preferred Alternative. TVA believes that these results are reasonably accurate. To the extent that the projections may be in error, the error would have been applied across all alternatives and therefore would not affect their relative comparisons.

26. Water quality modeling to date indicates that most changes in currently observed (Base Case) DO patterns would be minor, with the exception of the Tailwater Habitat Alternative. More water volume with average DO concentrations less than 2 mg/l would be expected. This potential change would be especially problematic downstream of Wilson Dam. Modeling also indicated potential changes in DO patterns within Kentucky and Chickamauga Reservoirs. Minor temporal changes in DO patterns (more hours with DO concentrations less than 2 mg/l) would be expected with implementation of Reservoir Recreation Alternative A downstream of Guntersville Dam and Reservoir Recreation Alternative B downstream of Pickwick Dam. All of the action alternatives would produce higher average water temperatures in the Hiwassee River. Conversely, all of the action alternatives would produce substantially lower average temperatures below TVA facilities on the Holston River.

Response to Comment 26: This summary identifies some of the general effects of the alternatives on various water quality characteristics. The intent of examining a fairly wide range of alternatives in the DEIS was to be able to identify when and where different possible operations policies would adversely affect water quality and other characteristics of the river system. These results identified components and limits that contributed to the formulation of the Preferred Alternative.

27. The DEIS does not include a thorough discussion of potential changes to flow regimes and water quality downstream of Kentucky Dam. Due to the significance of the mussel and fishery resources downstream of Kentucky Dam, we believe a detailed analysis of the potential effects of the preferred alternative is warranted in the final EIS. The DEIS also does not include a thorough discussion of potential changes to flow regimes and water quality in Lake Barkley (Cumberland River). Due to the hydrological connection to Kentucky Reservoir, we believe this evaluation is warranted in the final EIS in order to evaluate potential effects to existing operations at Cross Creeks National Wildlife Refuge (NWR).

Response to Comment 27: Under the Preferred Alternative, TVA did not anticipate substantial changes in average flow conditions below Kentucky Reservoir. Consequently, mussel resources were expected to respond as they would under the Base Case. TVA's Preferred Alternative does not include changes in Barkley operating guides; therefore, no need for changes in the management of the Cross Creeks National Wildlife Refuge is anticipated.

28. Given the vast degree of uncertainty associated with the influence of dam operations on river resources (e.g., native assemblages of aquatic species, economic resources), we strongly encourage TVA to establish an adaptive management process as an integral component of its operations. In a letter to TVA dated June 7, 2002, the NPS proposed the following adaptive management measures:

*Develop and apply an ongoing **adaptive management** approach to river operations that balances cultural, economic, and environmental resources uses and values.*

Rationale: Adaptive management of river operations entails making periodic incremental adjustments to operating procedures (e.g., release schedules, reservoir levels, and instream flows) based on ongoing monitoring and analysis (Primack 1998). The intent of adaptive management is to optimize the management capacity of TVA and all of its stakeholders. The application of adaptive management can increase the effectiveness of management decisions while thereby reducing associated long-term management costs (Johnson, B. L. 1999. The role of adaptive management as an operational approach for resource management agencies. Conservation Ecology **3**(2): 8. [online] URL: http://www.consecol.org/vol3/iss2/art8.).

Suggested components of an adaptive management alternative may include:

Establish a multi-stakeholder Adaptive River Operation Council (AROC): The AROC would consist of TVA personnel, representatives of associated agencies, technical experts from the social and natural environments, and other stakeholders such as watershed organizations, homeowner groups, and industrial interests. The goal of the AROC would be to host periodic meetings and workshops to design and evaluate monitoring and modeling efforts, detect resource trends, and suggest site-specific incremental operational changes to the TVA Board of Directors. For example, the AROC might meet annually to evaluate and assess trends of previously collected field data and new modeling results. In some cases, smaller working groups consisting of a subset of AROC members could develop recommended incremental alterations to propose to the broader council and ultimately the Board.

Develop an Adaptive River Operation Monitoring Program. The AROMP would use ongoing TVA water quality and biological monitoring, and if needed, be broadened to incorporate system-wide resource objectives and public concerns. The AROMP might also entail computer modeling.

Response to Comment 28: As discussed in Chapter 3, TVA believes that it already uses an adaptive management approach because of the inherent flexibility of its operating guidelines, the routine extensive monitoring of reservoir system parameters, and its ability to react to monitoring results by appropriately adjusting operations within the guidelines. TVA expects to continue this approach regardless of any decisions that are made as a result of the ROS. TVA always welcomes suggestions for improving operations and freely shares the monitoring data that are collected.

29. Since the DEIS does not state a preferred alternative, the DOI suggests the notion of a blended alternative. A blended alternative should seek a balance in all public values (including those of future generations), but it should especially account for resource protection where the greatest amount of uncertainty and irreversible consequence reside. A blended alternative can best service the public value of this and future generations through long-term adaptive management and the ability to function on a site-specific basis. Alternatives Reservoir Recreation A and B along with Tailwater Recreation and Tailwater Habitat appear to collectively offer the greatest amount of public values as depicted by Table ES-01. An adaptive, long-term blending of these alternatives with site-specific flexibility is likely to produce a high degree of public value.

Response to Comment 29: As suggested, TVA has developed a Preferred Alternative that combines desirable features of the alternatives identified in the DEIS. It is agreed that implementing this Preferred Alternative—with sufficient site-specific flexibility (adaptability)—is likely to improve the public value of TVA's reservoir system without resulting in unacceptable environmental impacts.

30. Executive Summary, pages ES-13 to ES-20, and Table ES-02, Summary of Impacts by Policy Alternative: Without specific technical analyses for a preferred alternative or proposed policy change, these general representations should be qualified as projections that require further technical evaluation. To the average reader, a simplification of a diverse reservoir system can misrepresent realistic impacts that may occur within individual reservoirs.

Response to Comment 30: The FEIS contains TVA's Preferred Alternative and associated analyses of that alternative. TVA has continued to use general representations of impacts because it is believed that this best allows most readers to easily compare and understand the implications of the alternatives. Specific technical analyses provide further details for these general representations; some of the details of these analyses are provided in the appendices. See Responses to Comments 18 and 23.

31. The evaluation of wildlife under the terrestrial ecology category (Page ES-16) is too broad and does not recognize the potential for specific adverse effects to a variety of wildlife species. Specific groups of wildlife species (e.g., waterfowl, wading birds, reptiles, and amphibians) should be addressed separately.

Response to Comment 31: Initially, it was planned that the Executive Summary would summarize impacts for a broad variety of wildlife; however, because there was a greater potential for impacts on shorebirds than other species, they were highlighted in the Executive Summary. As noted in the EIS, the alternatives would result in both beneficial and adverse impacts on wildlife. These impacts are addressed in Section 5.10.

32. Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, pages 3-6 and 3-7: Reservoir Recreation Alternative A is grouped with the Base Case on this page, followed by the introduction of a column heading entitled "Policy Alternatives" on the next page (and all

remaining pages of this table). This suggests that Reservoir Recreation Alternative A is not a policy alternative.

Response to Comment 32: This has been changed in the FEIS.

33. Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, page 3-6, Base Case, first bullet under column entitled "Reservoir Operating Guidelines:" For clarification and consistency, we suggest changing the wording from "and restrict drawdown during June and July" to "and continue to restrict drawdown until August 1."

Response to Comment 33: This has been changed in the FEIS.

34. Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, page 3-6, Reservoir Recreation Alternative A, third bullet under column entitled "Reservoir Operating Guidelines:" For clarification, we suggest changing the wording from "Begin unrestricted TR drawdown on Labor Day" to "Delay unrestricted TR drawdown to Labor Day."

Response to Comment 34: Additional information has been included in the FEIS to better explain this concept.

35. Section 3.3, Alternatives Evaluated in Detail, Table 3.3-01, page 3-6, Reservoir Recreation Alternative A, fifth bullet under column entitled "Reservoir Operating Guidelines:" Insert "winter" into the phrase "Raise MR flood guides."

Response to Comment 35: This change has been made in the FEIS.

36. Section 3.3.3, Alternatives Evaluated in Detail, Reservoir Recreation Alternative B, page 3-13, 4th full paragraph: It appears that both Reservoir Recreation Alternative B and A result in higher winter reservoir levels on tributary reservoirs, relative to the Base Case. Please clarify the discussion.

Response to Comment 36: Additional information has been included in the FEIS to better explain this concept.

37. Section 3.3, Alternatives Evaluated in Detail, pages 3-14 and throughout: Comparison statements throughout this section need to be more explicit: reduce/increase relative to Base Case, the Alternative previously discussed, or both?

Response to Comment 37: Additional information has been included in the FEIS to better explain this concept.

38. Section 3.3.8, Alternatives Evaluated in Detail, Tailwater Habitat Alternative, page 3-18, last two paragraphs: The last full paragraph on this page (beginning "Under the Tailwater Habitat Alternative") states that this alternative will result in more variable flows, whereas the following paragraph (beginning with the subheading "Achievement and Objectives") states that this alternative will increase stability in tailwater flows. These statements appear to contradict one another.

Response to Comment 38: Additional information has been included in the FEIS to better explain this concept.

39. Section 3.5.2, Reservoir Operations Policy Alternatives, Table 3.5-01: The "$" symbol should be used consistently throughout the table to denote monetary figures (it is not used in the row entitled "Lowering the cost of transporting materials on the commercial waterway," although the footnote indicates that the figures in each cell in this row are in millions of dollars).

Response to Comment 39: This has been changed in the FEIS.

40. Section 3.5, Reservoir Operations Policy Alternatives, Aquatic Plants, Page 3-30, Table 3.5-02: We recommend that you include a footnote to this table in order to make it clear that this category includes an assessment of invasive aquatic plants.

Response to Comment 40: The footnote has been added in the FEIS.

41. Section 3.5, Reservoir Operations Policy Alternatives, Terrestrial Ecology, Page 3-31, Table 3.5-02: Note that impacts to Wildlife differ from Migratory Shorebirds and Plant Communities (these latter two resource areas are affected similarly by the proposed set of alternatives). Is this because the category "Plant Communities" is actually focused upon impacts to lowland or wetland, communities? If so, this should be clarified as a footnote to the table.

Response to Comment 41: The focus was on both upland and lowland plant communities. Because the policy alternatives involve the timing and duration of fluctuating water levels, effects on lowland plant communities are more widespread and of greater magnitude than those on upland plant communities.

42. Section 3.5, Reservoir Operations Policy Alternatives, Page 3-37, 1st paragraph, 1st sentence: This section is unclear. The previous paragraph states that Reservoir Recreation Alternative B and the Tailwater Habitat Alternative would have the most adverse impact on water quality. It seems the intent of this sentence to state that these two alternatives (Reservoir Recreation Alternative A and the Tailwater Recreation Alternative) would impact water quality more on the mainstem (than the tributary) reservoirs but that these impacts would still be less than Reservoir Recreation Alternative B and/or the Tailwater Habitat Alternative.

Response to Comment 42: The commenter's interpretation of the content of these sentences is correct. To eliminate possible confusion, the sentences have been reworded in the FEIS**.**

43. Section 3.5, Page 3-37, 2nd paragraph: Enhance the discussion of how the increased erosion anticipated under the Tailwater Habitat Alternative would affect aquatic organisms, including federally threatened and endangered species.

Response to Comment 43: In the FEIS, this paragraph has been expanded to include additional information from revisions made in Section 5.16 (Shoreline Erosion), Section 5.7 (Aquatic Resources), and Section 5.13 (Threatened and Endangered Species).

44 Section 3.5, Page 3-37, 3rd paragraph, last sentence: We suggest that the discussion of Reservoir Recreation Alternative B be re-written for proper emphasis of the issue. Reservoir Recreation Alternative B would result in more adverse impacts than the other alternatives, largely due to extending the summer reservoir levels into late summer and early fall, which would inundate flats at times when these habitats are normally exposed and able to provide important habitat to migratory waterfowl and shorebirds.

Response to Comment 44: The public and other agencies commenting on the identified alternatives appear to understand the elements of the identified alternatives. Nevertheless, TVA further clarified descriptions throughout the FEIS.

45. Section 4.7, Aquatic Resources, throughout: A more detailed evaluation of potential changes in available spawning and nursery habitat as a result of implementation of the various alternatives is needed. The relationship between various wetland vegetative types, their position in the landscape, and aquatic species productivity is not discussed adequately.

Response to Comment 45: Additional discussion of fish spawning requirements has been added to the FEIS.

46. Section 4.8, Wetlands, throughout: Typographical error: "THE TVA" should be changed to "The TVA."

Response to Comment 46: This typographical error has been corrected in the FEIS.

47. Section 4.8, Wetlands, page 4.8-6, Table 4.8-02: The invested agency for the Swan Creek Dewatering Unit should be the Alabama Department of Conservation and Natural Resources.

Response to Comment 47: Table 4.8-02 in the FEIS has been changed to reflect that the Alabama Department of Conservation and Natural Resources is the correct invested agency at the Swan Creek Dewatering Unit.

48. Section 4.8, Wetlands, page 4.8-12, 1st paragraph, last sentence: Hyperlink error: The location of the report referenced by the first hyperlink in the series (http://ncseonline.orgY.) appears to have changed; typing in this full link produces an error message that the page cannot be found.

Response to Comment 48: Text has been changed in Section 4.8 to indicate the authors of the referenced document and the date the document was published. The full citation of the report with an updated hyperlink has been added to Chapter 10.

49. Section 4.8, Wetlands, page 4.8-13, 2nd paragraph, last sentence: Hyperlink error: The location of the report referenced by the first hyperlink in the series (http://hydra.gsa.gov.) also appears to have changed; typing in this link produces a "re-direct" message indicating that the information is now found within the www.gsa.gov website.

Response to Comment 49: See Response to Comment 48.

50. Section 4.8, Wetlands, page 4.8-13, last paragraph, last few sentences: The statements describing the unique biological resources associated with wetland habitats directly parallel the content of Sections 4.10 (Terrestrial Ecology), Section 4.7 (Aquatic Resources), and 4.13 (Threatened and Endangered Species). The interdependency of these resources should be emphasized via a reference to these sections. In particular, globally imperiled wetland plant communities known or with potential to occur within the study area are listed in Section 4.10, Table 4.10-01 (page 4.10-3).

Response to Comment 50: Appropriate references have been inserted into Section 4.8. Text has been added to reference additional related discussions in Section 4.7 (Aquatic Resources), Section 4.10 (Terrestrial Resources), Section 4.13, (Threatened and Endangered Species), and Section 4.14 (Managed Areas and Ecologically Significant Sites).

51. Section 4.9, Aquatic Plants, page 4.9-2, Table 4.9-01: For consistency, the taxonomic authority should either be given for all or none of the species listed.

Response to Comment 51: Taxonomic authority is no longer included for the species listed.

52. Section 4.9, Aquatic Plants, page 4.9-3, last paragraph: We do not dispute that natural environmental variation (in weather, water flow, nutrient cycling, light availability) "tend(s) to surpass the effect of reservoir operational activities." However, as worded, this paragraph in the DEIS implies that changes in reservoir operations would be expected to produce little change in the coverage of aquatic plant species relative to these more natural (i.e.,

unpredictable) sources of environmental variation. However, some of the proposed alternatives may, through direct manipulation of water levels, also indirectly generate the very conditions that have been observed to affect the coverage of these species (as described in this paragraph B i.e., "higher stream flows, high turbidity, cold water temperatures"), especially in the tailwater regions.

Response to Comment 52: The analysis of impacts on aquatic plants focused on changes in elevation and duration of inundation. Although changes in flow, turbidity, and temperature can affect coverage of aquatic plants, the changes in these parameters that would occur as a result of the alternatives are expected to be on a smaller scale than changes caused by natural hydrologic and climatic events. Aquatic plants are absent or minimal for several miles downstream of most TVA mainstem dams due to a lack of habitat (e.g., embayments and inlets) and the high flows associated with spill events and hydropower generation.

53 Section 4.10.5, Terrestrial Ecology, page 4.10-9, 1st paragraph: It is stated that "potential changes in bottomland hardwood forest, scrub-shrub wetlands, emergent wetlands, aquatic vegetation, flats, and other communities potentially affected by reservoir levels could affect terrestrial wildlife populations." The word "could" should be replaced with "would." When changes as significant as those addressed in this document are implemented, certain wildlife populations (e.g., shorebirds and waterfowl) will be significantly impacted.

Response to Comment 53: Changes were made in the FEIS.

54. Section 4.10.5, Terrestrial Ecology, page 4.10-9, 4th paragraph: It is stated that "flats, isolated pools, and shallow water are created by current drawdown regimes in early August." This is correct for many reservoirs but not all. The drawdown on Kentucky and Barkley Reservoirs starts in early July. This date is significant as it provides adequate shorebird habitat during the peak migration period to provide habitat for early migrating waterfowl (e.g., blue-winged teal) and to produce the annual plants (forage) needed by wintering waterfowl.

Response to Comment 54: Changes were made in the FEIS.

55. Section 4.10, Terrestrial Ecology, page 4.10-6, 1st paragraph, 1st sentence: "Tables 4.10-01 and 4.10-02 present the names, global ranks, and distribution of the imperiled lowland communities…" In this sentence "lowland" should be changed to "wetland," since the term "lowland" (as being applied in the DEIS) encompasses more community types than would be expected in NatureServe's subset of "wetland" communities (from which this table was created).

Response to Comment 55: Comment noted. Changes were not made because lowland, in this context, included more than wetlands.

56. Section 4.10, Terrestrial Ecology, page 4.10-8, 2nd and last paragraphs: The discussion of "Future Trends" under Upland Plant Communities (last paragraph) also applies to the anticipated Future Trends for Lowland Plant Communities (2nd paragraph).

Response to Comment 56: Future trends for these two plant communities are similar. Declines are partly attributed to the direct impacts of various land uses, such as timber harvesting, agriculture, and urban and rural development, and partly to associated impacts from increases in invasive exotic species. Trends for lowland communities are addressed in Section 4.8, Wetlands.

57. Section 4.11, Invasive Terrestrial and Aquatic Animals and Terrestrial Plants, throughout: The information provided in the DEIS is not of sufficient detail for evaluation of the rationale for focusing upon those species of invasive terrestrial animals and plants specifically named in the discussion. The discussion in the DEIS should clarify whether or not those species mentioned are those which pose the greatest threat throughout the Tennessee Valley or are specifically those that pose the greatest risk with respect to changes in reservoir operation policies.

Response to Comment 57: The rationale for choosing to focus on the species addressed was mistakenly presented in Section 5.11 in the DEIS. The appropriate changes were made in the FEIS.

58. Section 4.13, Threatened and Endangered Species, page 4.13-1, 3rd paragraph: The phrase "reservoir-like reservoirs" appears to contain a typographical error.

Response to Comment 58: The error has been corrected in the FEIS.

59. Section 4.14, Managed Areas and Ecologically Sensitive Sites, page 4.14-9, Table 4.14-02: Swan Creek Wildlife Management Area (WMA) and Mallard-Fox Creek WMA should be identified as managed areas and/or ecologically significant sites within Wheeler Reservoir.

Response to Comment 59: Table 4.14-02 in the DEIS was originally intended to list a sample of the various managed areas and ecologically significant sites in the ROS study area. To avoid confusion, the table has been deleted from the FEIS.

60. Section 4.14, Managed Areas and Ecologically Sensitive Sites, page 4.14-16, 1st paragraph: The Alabama cavefish is not located on Wheeler NWR. It is endemic to Key Cave NWR. Key Cave NWR is managed by Wheeler NWR staff. The correct scientific name for the species is *Speoplatyrhinus poulsoni*.

Response to Comment 60: Corrections were made to Section 4.14 in the FEIS.

61. Section 4.14, Managed Areas and Ecologically Sensitive Sites, page 4.14-16: Significant stands of water tupelo (Nyssa aquatica) forested wetlands occur within Wheeler Reservoir on Wheeler NWR. The Beaverdam Creek Swamp National Natural Landmark in Limestone County, Alabama, contains approximately 530 acres of water tupelo. Approximately 20% of the area is permanently flooded and contains a mature, pure stand of water tupelo. The remainder of the area is intermittently flooded and is dominated by water tupelo and black gum (Nyssa sylvatica). Pure tupelo swamps of this size and integrity are quite rare and its significance led to its designation as a National Natural Landmark. This information should also be included and referenced in Appendix D5, page D5-5.

Response to Comment 61: Potential impacts on this community type are discussed in Section 5.10.

62. Section 4.17, Prime Farmland, Table 4.17-03: Footnote No. 2 should be Natural Resources Conservation Service.

Response to Comment 62: This footnote was corrected in the FEIS.

63. Section 5.8.5, Wetlands, page 5.8-5, 3rd paragraph: Under a discussion of Reservoir Recreation Alternative B and the Tailwater Recreation Alternative, it is stated that "the increase in winter pool elevations could interfere with wetlands with controlled water levels on Kentucky, Wheeler, and Douglas Reservoirs." This sentence stands alone without any additional qualification. We recommend that the following specific information be included in this discussion: 1) a list of managed wetlands potentially impacted (e.g., Camden and

Barkley WMAs, Tennessee NWR, Wheeler NWR); 2) the potential increased impacts of flooding, such as the increased cost to upgrade and repair infrastructure and the additional threats to wildlife habitat (e.g., agricultural crop production, bottomland hardwoods, moist-soil management units); and 3) the potential impacts to public recreation activities (i.e., hunting, fishing, bird watching) that occur on these areas.

Response to Comment 63: Section 4.8.2 contains a concise discussion that lists reservoirs with wetlands with controlled water levels, a discussion of issues related to management of these areas, and some of the implications that increased winter pool levels might have on infrastructure and management. Table 4.8-02 contains a list of each managed wetland by reservoir. Section 5.8 contains a description of potential adverse impacts on reservoirs with managed wetlands. Section 5.10 (Terrestrial Ecology) and Section 5.14 (Managed Areas and Ecologically Significant Sites) contain additional discussion of potential impacts on wetlands with artificially controlled water levels.

64. Section 5.8.8, Wetlands, page 5.8-8, 2nd paragraph: Under a discussion of the Commercial Navigation Alternative, the potential for a loss of flats due to the rise in the minimum winter pool level of mainstem reservoirs is not included. The mudflat wetland habitat type is extremely important to waterfowl, bald and golden eagles, gulls, terns, and many other species of migratory birds. The DOI does not concur with the conclusion that there will be overall positive effects on mainstem reservoirs.

Response to Comment 64: As stated in Section 5.8, the Commercial Navigation Alternative does not differ substantially from the Base Case. The Commercial Navigation Alternative would not affect summer pool duration of mainstem reservoirs; therefore, it would not affect the exposure of flats for migrating birds during late summer and fall. The Commercial Navigation Alternative would increase summer pool duration on five tributary reservoirs (Hiwassee, Nottely, Fontana, Douglas, and Watauga). These increases would delay exposure of flats in late summer between 1 and 4 weeks. Douglas Lake has the largest amount of flats of the five affected reservoirs. Summer drawdown would be delayed up to 3 weeks under the Commercial Navigation Alternative.

As described in Section 5.8, the Commercial Navigation Alternative could increase winter pool levels from 1.5 to 1.7 feet over the Base Case on seven mainstem reservoirs. The increase in winter pool levels on affected mainstem reservoirs would primarily reduce exposure of flats during winter months. The positive effects of the Commercial Navigation Alternative on other wetlands habitat on mainstem reservoirs would help to offset the adverse effects of this alternative on flats.

65. Section 5.10.4, Terrestrial Ecology, page 5.10-3, 1st paragraph: Under a discussion of the Commercial Navigation Alternative, it is stated that "the area inundated by water would increase, potentially creating additional shallow-water foraging habitat for waterfowl and wading birds." Why would an equal amount of shallow-water habitat not be available under the Base Case Alternative? The shallow-water area should be essentially equal but at a lower elevation. The result of raising the winter pool is not a gain in shallow-water habitat. It is a loss of mudflat habitat.

Response to Comment 65: This alternative would result in more shallow-water surface area during winter than under the Base Case. The paragraph originally stated that there would be an overall reduction of flats under this alternative. TVA adjusted the text in the FEIS to better present the information.

66. Section 5.10.6, Terrestrial Ecology, page 5.10-5, 3rd paragraph: Under a discussion of wildlife communities, it is stated that "although flats would not be available to most

shorebirds migrating during late summer or early fall, extended high water levels could benefit early-migrating waterfowl such as blue-winged teal and wood ducks." We recommend that blue-winged teal (*Anas discors*) be removed from this sentence. Mudflats are a preferred habitat for blue-winged teal, where they forage on seeds of various grasses and sedges. It is unlikely that they will utilize the woody habitats that are flooded during summer pool.

Response to Comment 66: Appropriate changes were made to the FEIS.

67. Section 5.10.8, Terrestrial Ecology, page 5.10-6, 6^{tth} paragraph: Under a discussion of the Summary of Impacts, it is stated that "except for the Summer Hydropower Alternative, changes in operations under all policy alternatives would result in limited effects on most waterfowl, semi-aquatic mammals, and non-game wildlife, as they would adapt to changing conditions." This statement is repeated in other sub-sections of the Terrestrial Ecology Section. While we agree this statement is generally true, how they adapt may not be desirable to resource managers and the public. It has been determined from data collected during waterfowl surveys conducted on Tennessee NWR over the last 7 years that over 50% of the waterfowl use on the refuge occurs on the reservoir. The resultant adaptations may include reduced localized populations of both migratory and resident wildlife. Waterfowl and other migratory birds may adapt to a significant habitat change by migrating to other areas or utilizing undesirable habitat(s). The overall loss of mudflats will result in a lower local carrying capacity for waterfowl. It is also stated that "due to the anticipated decrease in flats habitat, shorebirds would be adversely affected during fall migration periods under these alternatives." We recommend that waterfowl also be added to this sentence.

Response to Comment 67: Appropriate changes were made to the FEIS.

68. Section 5.13, Threatened and Endangered Species, throughout: The level of discussion provided in the DEIS makes it difficult to identify and compare anticipated impacts to specific species of protected plants or animals, or populations of these species, within and among the various policy alternatives proposed. While a site-specific analysis may be beyond the scope of this broad overview of the entire set of proposed alternatives, we expect that it will be presented for the preferred alternative in the final EIS. For example, the potential for adverse affects to the green pitcher plant (*Sarracenia oreophila*) has been identified under the Summer Hydropower Alternative, but from the discussion, it is not possible to determine whether TVA anticipates similar affects to this species under the other alternatives proposed. Further, although adverse impacts to this species are identified under that alternative, the magnitude of these impacts is unclear. The discussion should address whether individual plants, an entire population, or the entire species be adversely impacted by this alternative.

Response to Comment 68: A site-specific analysis for each of the 526 federal- and state-listed endangered, threatened, or otherwise protected species is outside the scope of this programmatic EIS. However, TVA has conducted species-specific analyses with regard to the Preferred Alternative for 59 federal-listed or identified candidate species. The results of those analyses are summarized in Section 5.13 in the FEIS. If a decision is made to change reservoir operations, it is anticipated that monitoring and adaptive response will be an important component of the implementation plan.

69. Section 5.13.2, Threatened and Endangered Species, pages 5.13-11 to 5.13-12, 5th paragraph: It is stated that "bald eagles and gray bats could be benefited by Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Commercial Navigation Alternative, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative to the

extent that each alternative would increase the size of reservoir pools and increase the numbers of food items (mostly fish and waterfowl for the eagles and adult aquatic insects for gray bats)." Eagles are commonly observed on the flats feeding on stranded fish and dead waterfowl. This suggests that the mudflats may be an important habitat component of the bald eagle (*Haliaeetus leucocephalus*) in the ROS area. We also question TVA's conclusion that raising the pool levels during the fall and winter will increase waterfowl numbers. In fact, we believe that increasing pool levels in fall and winter would likely have the opposite effect. Any increase in the production of adult aquatic insects would likely be minor. Potential adverse effects, however slight, to the gray bats' foraging habitats do not appear to have been considered.

Response to Comment 69: The effects of the alternatives on flats and other shoreline habitats were an important component of the terrestrial ecology evaluation. The EIS section has been revised to better address the subject. In addition, TVA prepared a Biological Assessment and has received a Biological Opinion (Appendix G) from the USFWS that specifically addresses the potential for impacts on federal-protected species such as the bald eagle and gray bat. Sections 4.13 and 5.13 were modified in the FEIS in order to be consistent with relevant parts of the Biological Assessment, Biological Opinion, and Terrestrial Ecology sections.

70. Section 5.13.2, Threatened and Endangered Species, page 5.13-12, 3rd paragraph: The evaluation of potential impacts to the federally endangered least tern (*Sterna antillarum*) should not be limited to nesting habitat. Least terns have been observed resting and feeding on flats on Kentucky Reservoir during fall migration.

Response to Comment 70: See Response to Comment 69. Potential impacts on the least tern have been addressed in TVA's Biological Assessment and the USFWS Biological Opinion. Sections 4.13 and 5.13 were appropriately modified in the FEIS to summarize these analyses.

71. Section 5.22.2, Flood Control, page 5.22-1, 3rd paragraph: It is stated that "the analysis for flood risk did not consider areas downstream of Savannah, Tennessee." We recommend that other areas on Kentucky and Barkley Reservoirs be included in the flood risk analysis. Although we appreciate receiving additional limited information regarding potential flood risk on Tennessee NWR and Wheeler NWR since the publication of the DEIS, we believe additional evaluations are warranted for Cross Creeks NWR (Barkley Reservoir) and the numerous State WMA's throughout the Tennessee Valley. Additional evaluations of Tennessee NWR and Wheeler NWR would also appear to be warranted.

Response to Comment 71: While the area downstream of Savannah was not included in the flood risk simulation model, TVA did evaluate the likely impact of changes in Pickwick discharges on Kentucky and Barkley pool levels. The analysis demonstrated that it is reasonable to expect that changes in Pickwick discharges associated with the implementation of any of the alternatives considered could be accommodated in Kentucky and Barkley Reservoirs. Temporary, minor increases in pool levels would result under TVA's Preferred Alternative. For the 10 largest historical events that have occurred during the March through May season, the average total increase in Pickwick discharge volumes over a 30-day period for the Preferred Alternative was about 156,000 day-second-feet (dsf). For June and July, the average increase is about 11,800 dsf. These volumes can easily be stored as required in Kentucky and Barkley Reservoirs without aggravating downstream flooding conditions.

72. Section 6.2.7, Cumulative Impacts, page 6-5, 3rd paragraph: It is stated that "these changes may have the potential to cause some adverse impacts on federally listed threatened and endangered species; however, the level of impact would be small and not significant enough to jeopardize the continued existence of these species." Under the Base Case alternative, populations of certain federally listed species will likely continue to decline in numbers and health. There are certain species listed as endangered (e.g., turgid blossom pearly mussel) that are likely extinct; no observations have been reported since the early 1900's. We believe TVA's conclusion regarding cumulative impacts to federally endangered and threatened species is premature and without factual foundation since no preferred alternative has been selected or analyzed in detail. We recommend analysis. Appropriate conclusions and supporting analysis should be submitted in a clearly labeled biological assessment (BA) concurrent with the final EIS.

Response to Comment 72: The FEIS contains analyses of TVA's Preferred Alternative, including potential impacts on listed species. These analyses include TVA's Biological Assessment that was submitted to USFWS for review. The USFWS review of that Biological Assessment is contained in their Biological Opinion (Appendix G) for the ROS. Section 6.2.8, which addresses cumulative impacts for threatened and endangered species, has been revised as appropriate to incorporate input provided by USFWS in the Biological Opinion, as well as other relevant information developed as a result of public and agency comments on the DEIS.

73. Table D1-01: Typographical error. It is Fort Loudoun, but the location is Loudon County not Loudoun County.

Response to Comment 73: This has been corrected in the FEIS.

74. We recommend that you clearly address how the alternatives consider the requirements of section 7(a)(1) and 7(a)(2) of the Endangered Species Act (ESA). These parts of section 7 of the ESA include the requirement to evaluate the potential for jeopardy, as well as the mandate that federal agencies further the conservation of federally listed species. We are generally concerned with the management of water releases from specific reservoirs, the impact of hypolimnetic discharges on federally listed mussel and fish species, and the impact of scouring on tailwater habitats. These issues are especially problematic below Kentucky, Wilson, Douglas, Cherokee, Fontana, and Tims Ford Reservoirs. While we appreciate the proposed mitigation of the current minimum flow regime in the Apalachia cut-off, we do not believe that this mitigation proposal should be limited to all alternatives except the Base Case. We would expect TVA to pursue those potential improvements regardless of a preferred alternative for the ROS.

Response to Comment 74: TVA prepared and submitted a Biological Assessment to USFWS that contains analyses of potential impacts of TVA's Preferred Alternative on listed species. The USFWS Biological Opinion on this project is provided as Appendix G to this EIS. As indicated in the Biological Assessment and the Biological Opinion, the minimum flow augmentation at Apalachia Dam is included in the Preferred Alternative.

75. We anticipate a detailed BA as part of the final EIS which will evaluate the effects of the preferred alternative and the Base Case. The BA should include a complete description of the selected alternative, the effects of those actions associated with the ROS, and a determination of effect to listed species at a site-specific level. We have appreciated the ongoing dialogue with TVA staff regarding the approach to the preparation of the BA, as well as our preferred approach in preparing the required biological opinion.

Response to Comment 75: See Responses to Comments 71, 72, and 74. TVA appreciates the willingness of USFWS biologists to facilitate this large consultation effort.

76. Migratory Birds on Tennessee NWR , Cross Creeks NWR, and Wheeler NWR

Tennessee NWR and Wheeler NWR are designated Globally Important Bird Areas and could be significantly affected by several of the identified alternatives. The Tennessee NWR bird checklist shows 10 waders and bitterns and over 30 shorebirds that could be affected by a change in habitat availability (http://tennesseerefuge.fws.gov/tnbirds.pdf). Undoubtedly, other changes will occur elsewhere in the Tennessee Valley as well, yet these effects are poorly understood. The cumulative effects of proposed changes in the pool levels of various reservoirs on bird usage, primarily roosting and foraging, are unknown and will be extremely difficult to ascertain.

During fall migration, thousands of shorebirds utilize the mudflats on Kentucky, Barkley, and Wheeler Reservoirs. The average peak fall migration of shorebirds is around mid-August. Typically, during this period of the year, shorebird habitat is extremely limited due to dry conditions and dense vegetation that has developed through the summer adjacent to the reservoirs and other impounded waters. For this reason, the fall drawdown of Kentucky and Barkley Reservoirs is extremely important. Since most shorebird species prefer habitats that are open and away from dense cover, the water level needs to be low enough to expose flats that are not covered by woody vegetation. On Kentucky and Barkley Reservoirs, the elevation of summer pool is 359' MSL and woody vegetation typically extends down to elevation 357.5' MSL. For adequate mudflat habitat to be available, the pool elevation needs to be around 356.5' MSL. Under the existing operation schedules for these reservoirs, this level is usually reached during mid to late August.

Blue-winged teal are the first migrating waterfowl to arrive. The Tennessee Valley is along one of two major migration corridors for this species. This migration route extends from Manitoba to Florida. They first arrive during early August, with the peak period of migration occurring around mid-September. Like shorebirds, blue-winged teal heavily utilize the mudflats on the reservoirs for feeding and loafing. They commonly feed on the seeds of sedges, grasses, and smartweed that were deposited on the flats in previous years, as well as on insects and mollusks that may be present. During the migration period, it is important for extensive mudflats with an abundant source of food to be present on Kentucky, Barkley, and Wheeler Reservoirs. The existing management of these reservoirs provides excellent habitat at the appropriate time of the year for blue-winged teal to utilize during migration. The drawdown also coincides with a special early duck season that provides recreational opportunities to a large number of hunters, many of which hunt on the mudflats of the reservoirs.

Traditionally, migrant Canada geese (*Branta canadensis*) from the Southern James Bay Population (SJBP) would winter in large numbers within the Tennessee Valley. The December populations of SJBP geese in Tennessee prior to 1990 averaged over 40,000. The portion of the population that migrates into the Tennessee Valley has sharply declined to a present December average of less than 10,000 SJBP geese in Tennessee. Even though the overall population level of the SJBP has stabilized, the decline in the numbers that migrate to the Tennessee Valley continues. Migrant geese first arrive on Tennessee NWR around September 20, and generally will remain within the vicinity of the Refuge until late winter. At this time of year, typically the only habitat available are the flats associated with the reservoir. Geese browse the new growth of annual grasses and sedges that occur

on these flats. The existing fall drawdown schedule for Kentucky, Barkley, and Wheeler Reservoirs provides mudflat habitat for these early migrants.

Several of the ROS alternatives would result in a significant loss of mudflat habitat on Kentucky, Barkley and Wheeler Reservoirs. Delays in the fall drawdown would eliminate or significantly reduce the quantity and quality of mudflat habitat available on these reservoirs to shorebirds and early migrating waterfowl.

Reservoir Recreation Alternative A will extend the summer elevation through August 1 with only a 1-foot drop by September 1. Specific drawdown dates are not determined for the Tailwater Habitat Alternative, but the DEIS specifically mentions that the impacts on flats under this alternative would be similar to those of the Reservoir Recreation Alternative A. These two alternatives will likely result in a complete loss of mudflat habitat during the peak shorebird fall migration. The description of these alternatives in the DEIS does not provide elevation information beyond September 1. Without a projected water elevation for mid-September when the peak blue-winged teal migration occurs and SJBP of Canada geese first arrive, the quantity of habitat that will be available is unknown. However, we expect the quality to be degraded due to the delay in germination of annual plants on the flats.

Reservoir Recreation Alternative B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative extend the summer elevation of Kentucky and Barkley Reservoirs through September 1. We anticipate these alternatives would result in a complete loss of desirable mudflat habitat during most of the fall shorebird and blue-winged teal migration period. Habitat for SJBP geese will be extremely limited and the quality will be degraded due to the delay in germination of annual plants on the flats.

The anticipated impacts of the alternatives that delay the fall drawdown are 1) a complete loss of fall mudflat habitat for the majority of shorebirds that migrate through the area; 2) a significant-to- complete loss of fall mudflat habitat for blue-winged teal; and 3) a significant loss or degradation of fall mudflat habitat for early migrating SJBP of Canada geese. Local population declines of shorebirds, blue-winged teal, and SJBP geese that migrate into the area are expected if the fall drawdown of Kentucky, Barkley, and Wheeler Reservoirs is delayed.

Approximately 300,000 ducks and geese, 100 bald eagles, and tens-of-thousands of other wetland-dependent migratory birds typically occur on Tennessee and Cross Creeks National Wildlife Refuges during the peak wintering period. It has been determined from our data collected during waterfowl surveys over the past 7 years that 56% of the duck use and 48% of the goose use on Tennessee NWR occurs on Kentucky Reservoir as compared to the use that occurs in our intensively managed waterfowl impoundments. Under the current reservoir operation policy, the winter pool elevation of Kentucky and Barkley Reservoirs is 354' MSL. This level fluctuates throughout the winter depending upon several factors but is largely influenced by rainfall. During most of the winter, extensive mudflats with important food resources are available for migratory birds.

Large numbers of waterfowl concentrate on the flats of the refuges to rest and feed. Canada geese and wigeon (*Anas americana*) browse on the annual plants that germinate each year during the late summer and fall drawdown period. Mudflats are the preferred habitat for green-winged teal (*Anas crecca*) within this area. When large expanses of flats are present, the majority of teal on the refuges will occur within this habitat. Greenwings forage on the seeds of annual plants that have been deposited on the flats in previous years, as well as insects and mollusks.

Bald eagles are regularly observed on the flats of Tennessee NWR and Wheeler NWR scavenging the carcasses of fish and waterfowl. As the drawdown occurs, fish occasionally get trapped in shallow waters and become an easy source of food for eagles. Gulls, terns, and wading birds utilize the flats of the reservoirs in large numbers throughout the drawdown and winter pool periods. The flats are primarily used for resting areas and are typically adjacent to shallow-water feeding sites.

We anticipate the alternatives that delay the fall drawdown (Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Habitat Alternative, and the Tailwater Recreation Alternative) would significantly impact the amount and quality of forage produced by annual plants that germinate on the flats. Canada geese, wigeon, and green-winged teal are the waterfowl species that likely will be impacted the most because they are more dependant upon the vegetation grown on the flats.

The Commercial Navigation Alternative raises the minimum winter pool level 2 feet, from elevation 354' MSL to 356' MSL. This increase would permanently eliminate a large portion of the flats that occur on the refuge. The vast mudflats and shallow water areas that occur near the mouth of the Duck River on Tennessee NWR frequently support in excess of 50,000 ducks and geese. We expect that much of this important habitat would be flooded too deep for puddle ducks if winter pool levels are raised 2 feet. Under this alternative, the overall loss of winter mudflats would have significant negative impacts on several waterfowl species, primarily geese and puddle ducks. Bald eagles, gulls, terns, and wading birds would also suffer a significant loss in habitat.

Response to Comment 76: TVA appreciates this background information and the comments regarding migratory birds. The discussion of migratory birds has been expanded in the FEIS.

77. Migratory Birds in the Remainder of the Tennessee Valley

We are concerned about the potential for impacts to migratory birds by several of the alternatives described in the DEIS. Our primary concern is that all of the identified alternatives, except the “no action” alternative, would produce adverse impacts to habitats used by migrating shorebirds, especially foraging habitat areas of wading birds. This discussion and our recommendations are based on the premise that dam removal and river restoration are outside the scope of this study. Our comments and concerns would differ if this premise is inaccurate.

If an alternative other than the Base Case (no action) is selected and implemented, pool levels would be significantly altered during the peak shorebird migration period. Depending on precipitation and other factors, pool levels would be low, but most times too high to provide the kind of habitat available for them in most normal years. Either way, changes in current TVA operations policy would greatly reduce or potentially eliminate this habitat type for migrating shorebirds, as well as for resident and migrant waders that utilize these areas for foraging and roosting/resting. This is a significant change in the current operation and represents an unquantified impact on the birds that use these resources at this time of year. Reduction in habitat availability in the Tennessee Valley would require the birds currently utilizing this resource to locate and exploit a resource base in other areas. Little of the type and quality of this habitat exists in the region. This is especially true for the eastern part of the Tennessee Valley where limited suitable alternative habitat is available at this time of year (Chuck Nicholson, TVA, personal communication). Until baseline information is obtained, an unknown and perhaps unmitigable effect would be produced. Therefore,

before any action other than the Base Case is considered for implementation, specific spatial and temporal information is needed for evaluation.

Unfortunately, we do not have comprehensive survey information for shorebirds across the TVA reservoir system. We do, however, know of several "hot-spots" such as Musick Campground on South Holston Reservoir, Rankin Bottoms on Douglas Reservoir, Savannah Bay on Chickamauga Reservoir, and Pace Point and Britton Ford areas on Kentucky Reservoir (which are within Tennessee NWR). In the past, notable numbers of shorebirds have also been reported from other sites such as the Town Creek area on Wilson Reservoir and the Swan Creek area on Wheeler Reservoir. These areas support from dozens to thousands of shorebirds during late summer-early fall during years of "normal" rainfall and reservoir operation. Typically, the lakes are being slowly drawn down during this time, providing expanses of moist mudflats coincident with the peak fall shorebird migration. Common species include killdeer (*Charadrius vociferus*), semipalmated plovers (*Charadrius semipalmatus*), greater yellowlegs (*Tringa melanoleuca*), lesser yellowlegs (*Tringa flavipes*), solitary sandpipers (*Tringa solitaria*), spotted sandpipers (*Actitis macularia*), pectoral sandpipers (*Calidris melanotos*), short-billed dowitchers (*Limnodromus griseus*), long-billed dowitchers (*Limnodromus scolopaceus*), least sandpipers (*Calidris minutilla*), Western sandpipers (*Calidris mauri*), and semipalmated sandpipers (*Calidris pusilla*). Other regularly occurring but less numerous species include black-bellied plovers (*Pluvialis squatarola*), stilt sandpipers (*Micropalama himantopus*), ruddy turnstones (*Arenaria interpres*), and other peeps. An occasional godwit and phalarope may also be encountered. Many of these areas also support large numbers of herons and egrets during late summer. Great blue herons (*Ardea herodias*) and great egrets (*Casmerodius albus*) are most numerous, and total counts are frequently in the hundreds.

There are significant data gaps that have not been addressed in the DEIS that need attention before informed decision-making and selection of an appropriate alternative can be completed. With regard to migratory birds and resident birds that use specific habitat areas for foraging and roosting, changes in habitat availability and quality will strongly correlate with changes in bird behavior, migration, foraging, resting, and energy expense during passage through and use of these habitats in the Tennessee Valley. We recommend that TVA address the following issues and information gaps before selection of a preferred alternative:

1. All known data on species occurrence, numbers, and current usage of late-season habitats should be compiled in lieu of comprehensive surveys for shorebird and wading bird use over the entire project area. Such a comprehensive picture of late-season habitats would allow for the evaluation of the overall impact of the various alternatives relative to the availability of other potential sites which would not be affected by changes in reservoir operations policy. This synthesis of information would provide a better means to understand the impact of the various alternatives on migratory birds.
2. Assess the theoretical potential for reservoir habitat loss and shorebird use with each alternative by modeling (Geographic Information System) effects of pool levels on habitat loss during the seasons most heavily utilized by shorebirds and waders, throughout the region.
3. Assess the potential to mitigate effects of potential loss of habitat through:
    a. Creation of other suitable habitats.
    b. Purchase of other suitable habitats.

c. Purchase and conversion of unsuitable habitat to suitable habitat (assuming the purchase isn't a high priority habitat for other valuable wildlife resources).

4. Evaluate the potential to avoid impact to certain high quality areas (e.g., Rankin Bottoms), and nominate these areas as Important Bird Areas.

5. Develop research programs to determine utilization of areas and impact of habitat loss to shorebird energetics during migration.

6. Develop a mitigation plan for loss of habitats.

Response to Comment 77: In part to address these concerns, TVA formulated its Preferred Alternative to largely leave unchanged operations on Kentucky and Barkley Reservoirs. Consequently, under the preferred alternative, there would be no noticeable effects on wildlife resources at these reservoirs or on Kentucky Reservoir's important flats. With regard to other specific sites throughout the Tennessee Valley region, the Preferred Alternative would not affect shorebird and wading bird resources on Chickamauga Reservoir and would have only limited impacts on shorebird and wading bird populations on Douglas Reservoir. The extension of summer pool levels on most mainstem reservoirs, however, would delay development of flats on Wheeler and Pickwick Reservoirs. Although existing operations limit the use of flats on these reservoirs until the latter half of the migratory season, an extended summer pool would aggravate this situation. TVA is considering several options to address these impacts (see Chapter 7).

78. National Wildlife Refuge Infrastructure and Existing Habitat

There are over 10,000 acres of managed waters within dozens of impoundments on Tennessee NWR, Cross Creeks NWR, and Wheeler NWR. Management emphasis in these impoundments is primarily focused on waterfowl, but many other wildlife species benefit from this valuable wetland habitat. During early spring, prior to the reservoirs being raised to summer pool, the water level in most of these impoundments is lowered to produce various foods for waterfowl.

A variety of habitats is provided in these impoundments, including agricultural crops, moist soil vegetation, and forested wetlands. Many of the impoundments are situated at a low elevation and do not have mechanical pumping capabilities. On these impoundments the water has to be removed when the reservoir is at winter pool. Even some of the impoundments with pumping capabilities are managed by gravity drawdown to reduce costs associated with their management.

The Commercial Navigation Alternative would raise the winter pool level 2 feet from elevation 354' MSL to 356' MSL on Kentucky Reservoir and from 554' MSL to 556' MSL on Wheeler Reservoir. This increase would greatly reduce the acreage that can be managed on all three refuges, especially on Cross Creeks NWR. Tennessee NWR and Wheeler NWR have pumping capabilities within several impoundments, but with an increase in the reservoir winter pool elevation, pumping costs would increase substantially or managed habitat acreage would be substantially reduced.

All of the managed impoundments on these refuges are subject to flooding. Spring floods are common and occur in most years. Management strategies on the refuges have adapted to this situation, and good quality waterfowl habitat is produced in spite of spring flooding. Early summer floods (June) are less common and do have adverse impacts on the quality and quantity of waterfowl habitats, especially the agricultural crops. Late summer and fall floods are very rare, but when they occur the impacts on these habitats generally result in a total loss of food production for the year. Winter floods are uncommon

and usually only occur after January. The impacts from winter flooding to waterfowl foods have been limited in the past, but an early winter flood could cause most of the habitats to be unavailable to waterfowl due to the water depth. Floods in any season would cause significant damage to refuge infrastructure (e.g., levees, water control structures, roads, etc.).

All of the alternatives addressed in the DEIS would increase the risk and potential impacts of flooding on Tennessee NWR, Cross Creeks NWR, and Wheeler NWR above that of the Base Case. Depending on the preferred alternative and precipitation patterns in the Tennessee Valley, flooding risks may also be substantially increased on Wheeler NWR. To varying degrees and during different seasons of the year, each alternative would reduce flood storage within the Tennessee Valley System. Insufficient information is provided in the DEIS to determine the significance of the increased flood risk. When a preferred alternative is selected (if other than the Base Case), a detailed analysis of the flood risk for each refuge should be conducted so that an adequate assessment of the impacts can be made.

The scrub/shrub and forested wetlands that ring Kentucky, Barkley, and Wheeler Reservoirs provide important habitats for many species of fish, mammals, amphibians, reptiles, birds, and insects. These wetlands vary from narrow bands along the shoreline to extensive forests within the creek bottoms. From May to July, several thousands of acres of buttonbush (*Cephalanthus occidentalis*) and willow (*Salix* spp.) thickets are shallowly flooded while the reservoirs are at summer pool. Outside the summer pool period, primarily during the winter and spring, these wooded wetlands periodically flood during heavy rainfall events.

When the scrub/shrub and forested wetlands are flooded, waterfowl use these habitats extensively. Wood ducks require dense cover as brood habitat. The willow-buttonbush thickets provide an excellent overhead cover and at the same time are open enough at the water surface to allow the wood duck broods to move easily and feed on the numerous invertebrates that are present. These woody wetland thickets also provide valuable spawning and nursery habitat for a variety of fish and invertebrate species. During the winter and early spring when these habitats flood, mallards (*Anas platyrhynchos*), black ducks (*Anas rubripes*), and wood ducks move into these newly flooded areas to take advantage of a wide variety of food resources.

Many other species of birds utilize this riparian zone for nesting, foraging, and migration stopover habitat. Heron rookeries occur on islands and in bald cypress (*Taxodium distichum*) sloughs in several locations on Tennessee and Wheeler NWRs. The prothonotary warbler (*Protonotaria citrea*), a Partners In Flight (PIF) priority species within the Central Hardwoods and East Gulf Coastal Plains Bird Conservation Regions, is a relatively common breeding bird within the riparian zones of Kentucky, Barkley, and Wheeler Reservoirs. This warbler is limited to bottomland habitats and nests in cavities that are located over or very close to water.

The alternatives that delay the fall drawdown (Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Habitat Alternative, and the Tailwater Recreation Alternative) are expected to have significant negative impacts on the scrub/shrub and forested wetlands along Kentucky, Barkley, and Wheeler Reservoirs. Depending on the preferred alternative and precipitation patterns within the Tennessee Valley, these impacts may also be expected to occur on Wheeler Reservoir. Extending the duration that these habitats are inundated during the

growing season would dramatically shrink the willow-buttonbush, water tupelo, and bald-cypress plant communities and alter the plant composition of the bottomland hardwoods. The loss of the woody vegetation that is currently inundated at summer pool would negatively impact aquatic organism productivity. We anticipate that the productivity of the local wood duck populations and the quantity and quality of this wintering waterfowl habitat would also be reduced. We expect that the woody plant communities in this zone would be replaced by emergent aquatic plants that would not provide suitable spawning and nursery habitat, wood duck brood cover, or foraging areas for wintering waterfowl. In many cases, these emergent aquatic plant communities may be dominated by invasive exotic species such as alligatorweed (*Achyranthes philoxeroides*) and *Phragmites*.

Shoreline erosion is a major problem along Kentucky, Barkley, and Wheeler Reservoirs. The results are a loss of riparian and upland habitats and decreased water quality. Shoreline stabilization has become a high priority for Tennessee, Cross Creeks, and Wheeler NWRs to protect upland habitats and important archeological sites and to stabilize river islands. We are currently partnering with TVA to stabilize several sites on Tennessee NWR and anticipate this project to continue indefinitely. Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Habitat Alternative, and Tailwater Recreation Alternative are listed in the DEIS as having the potential to accelerate the rate of shoreline erosion.

Response to Comment 78: Specific managed areas that could be affected are addressed in Section 4.14 and the possible effects on various features of such areas are analyzed in greater detail in discipline-specific sections—including Section 4.8 (Wetlands), Section 4.10 (Terrestrial Ecology), and Section 4.13 (Threatened and Endangered Species). Additional information about potential flooding in national wildlife refuges has been added to the FEIS.

79. The DOI, through the NPS, is mandated by Congress to oversee issues relating to our national parks, particularly "…to conserve the scenery and the natural and historic objects and the wildlife therein, and provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of this and future generations…" (National Park Service Organic Act of 1916). Several units of the National Park System, including Great Smoky Mountain National Park (GRSM), Chickamauga-Chattanooga National Military Park, Shiloh National Military Park, Natchez Trace Parkway, and the Trail of Tears National Historic Trail are, or could be, affected by TVA's reservoir operations. For example, GRSM continues to be negatively affected by airborne emissions from TVA's fossil generation, among other regional sources. Should hydro generation be altered such that fossil generation is increased, the air quality and related ecosystem problems in GRSM could be exacerbated. Bank erosion and other impacts associated with archeology and biota within the riparian corridor that result from hydrologic alterations (e.g., ramping) are issues of concern for all park units adjacent to TVA waters. Units of the National Park System are *not* currently listed in the ROS. Potential impacts to these units should be thoroughly evaluated and included in the final EIS.

Response to Comment 79: While some alternatives would result in slightly more fossil generation and others less, TVA does not believe that these slight potential emission changes would result in a substantial change in air quality (see Section 5.2). TVA's ongoing emissions control programs for nitrogen oxides and sulfur dioxide would continue to reduce TVA's impact on regional air quality.

Ramping rates would not increase under any of the alternatives. However, selection of any of the action alternatives would likely result in a minor increase in erosion rates in some

areas. Based on an analysis of representative areas, TVA believes that similar effects, described in Section 5.16, would be experienced by units of the national park system.

80. In addition, a host of other federal laws, such as the Wild and Scenic Rivers Act, PL 90-542 and the Outdoor Recreation Act, PL 88-29, provide NPS with a mandate to look beyond the boundaries of the national parks in the interest of protecting the public's interests in river and outdoor recreation resources. In general, NPS has an interest in protecting and promoting natural resources, recreational opportunities, aesthetics, and historical and archeological resources. More specific to TVA operations, NPS interests lie in recreational access/facilities, instream flows for recreation and aquatic habitat conservation, riparian corridor protection, and natural streambank stability.

Response to Comment 80: Comment noted.

81. The NPS manages wetlands in compliance with Director's Order #77-1 which establishes standards and requirements for implementing E.O. 11990 and in compliance with Section 404 of the Clean Water Act. In following DO #77-1 the NPS is responsible for documenting any adverse impacts to wetland habitats including explanations on the final preferred alternative which will result in wetland losses or degradation. Therefore, the NPS should continue to be an integral part of the Interagency team to develop the final EIS and consideration should be given to direct, indirect and cumulative impacts to wetland habitats within and adjacent to NPS lands.

According to the ROS, approximately 183,000 acres of wetlands are within the projected groundwater influence area of the TVA reservoir system, therefore, there is the strong likelihood that wetlands associated with the operational changes of TVA reservoirs may significantly affect these aquatic habitats found on NPS lands within the Tennessee River system.

The DEIS identifies isolated wetlands as one type which is especially sensitive to groundwater alterations which could occur due to operational changes by TVA. The document also states that these wetlands have lost protection under the CWA due to the recent Supreme Court case decision (SWANCC 2000); however, the SWANCC decision was based on the definition of navigable waters and NPS defines wetlands based on the various parameters of soil, vegetation and hydrology as described in the U.S. Fish and Wildlife Services' *"Classification of Wetlands and Deepwater Habitats of the United States"* (FWS/OBS-79-31). The NPS guidance (Director's Order #77-1) which establishes requirements for the protection of wetlands, therefore, includes more wetland habitat types than those defined by the Corps including the protection of "isolated" wetland habitats. Wetland delineations on NPS lands must meet the requirements of the CWA, Section 404 and NPS wetland protection policies as required by Director's Order #77-1. The SWANCC decision eliminates many of the wetland types which will, however, continue to receive protection under the National Park Service definition of wetland habitats. Additionally, indirect adverse impacts to wetland habitat can result in increased flood risks and changes in visitor use due to alterations of water levels in upstream reservoirs which are located on adjacent rivers to park lands.

Response to Comment 81: National Wetland Inventory maps, which were developed by the USFWS using the Cowardin system (FWS/OBS-79-31), are the source of the wetland acreage data used in the EIS. The reference to the SWANCC decision was intended to identify the resulting loss of federal regulatory protection for certain types of wetlands and the associated increased risk of impacts.

For additional information on managed areas and ecologically significant sites and recreation, please see Sections 5.14 and 5.24.

82. Since the minimum flow regimes provided at certain tributary reservoir tailwaters were derived using FWS techniques, we point out that the techniques were intended to provide common ground for negotiated flow regimes and are not necessarily the cutting edge of river restoration science. The methodologies have deficiencies which must be understood by users, such as the rudimentary nature of minimum flow calculations, and the vintage of some techniques and curves. We suggest that with some additional refinements, science-based minimum flows within these tailwaters could render additional benefits to the tailwater aquatic and terrestrial communities. Elsewhere within the Tennessee Valley, the FWS has initiated the development of minimum flow regimes which offer seasonally-variable flows reflective of natural run-off characteristics. We also plan to measure aquatic and riparian responses to these events. These minimum flow regimes are more refined in terms of magnitude, duration, and timing of minimum flows, as well as peak flows, so that they may offer periodic pulses for sediment transport, trigger ecological processes, and serve as behavioral cues.

Response to Comment 82: In the late 1980s and early 1990s, TVA performed a variety of studies and consulted with several agencies—including USFWS and user groups—during the process of determining appropriate minimum flows downstream from the tributary dams. A concise description of the steps involved in this process was presented in an engineering technical article:

"We selected target minimum flows in a trade-off evaluation that considers four factors: (1) visual observation of flow tests, which shows what actually happens to the river at particular flow rates; (2) computer-modeled incremental physical changes with increased flow; (3) professional judgment of the benefits to aquatic life; and (4) assessment of impacts to recreation, upstream reservoir pools, and annual power production. The resulting minimum flow we chose ranged from 50% to 150% of the unregulated seven-day, 10-year low flow."

TVA worked closely with state water quality and resource management agencies throughout this process. The goal was to select minimum flow levels that would maximize benefits and minimize adverse effects for a wide variety of biological, recreational, water quality, and power production interests.

83. We recommend the development of a process to consider and/or reconsider in detail the minimum flow regime at specific tributary and mainstem tailwaters necessary to enhance aquatic and riparian systems, within system constraints (i.e., navigation, flood control, power generation, and recreation). This process should include the formation of an interdisciplinary team of scientists familiar with the tailwater systems and techniques for developing continuous minimum flow regimes. Key considerations should include timing of flows, magnitude, rate of change, and water quality (e.g., DO, thermal characteristics, etc.).

Response to Comment 83: The ROS is a programmatic review of the operations policy and is not intended to examine specific operations at specific facilities. TVA is committed to improving the quality of tailwaters, however, and is open to partnerships and recommendations that advance that goal. TVA would certainly want to participate on any inter-disciplinary team that undertakes a site-specific study of minimum flow needs.

84. We recommend the development and refinement of minimum flow regimes for the specific objective of benefiting tailwater fisheries and aquatic communities at tributary and mainstem

reservoirs. There are remnants of significant natural communities which would benefit from this process in the tailwaters of Chatuge, Nottely, Cherokee, Douglas, and Blue Ridge Reservoirs. Since many of the existing minimum flow regimes are measured as a daily average, rather than instantaneous flow, we believe that significant benefits would accrue from refinements that provide continuous flows for aquatic and riparian communities. Additionally, we would like to develop a beneficial minimum flow regime for the bypassed reaches of stream at Appalachia and the Ocoee Reservoirs.

Response to Comment 84: See Responses to Comments 82 and 83. A minimum flow of 25 cubic feet per second (cfs) below Apalachia Dam was identified as an element of all of the ROS policy alternatives, including TVA's preferred alternative. However, providing continuous flows may not appropriately mimic natural flows. Before deciding to do this, further site-specific evaluations would be needed, as suggested by DOI in preceding comments.

TVA uses modeling to continue to evaluate minimum flow regimes for the benefit of tailwater fisheries and aquatic communities. Tailwater minimum flows are maintained at most TVA projects by routine pulsing. At some point downstream from dams, pulsed flows attenuate into a continuous minimum flow; however, the point of minimum flow attenuation varies by project. For projects with weir dams (like Chatuge), minimum flow is instantaneous at the weir dam; for larger, shallower tailwaters, the attenuation point may be further downstream. In the pulse-affected reaches of Chatuge and Cherokee tailwaters, cold summer-water temperatures are probably the limiting factor for aquatic communities. At Douglas Dam, pulsing proved to be more biologically beneficial for providing a greater minimum flow than releasing a continuous but smaller minimum flow.

85. The FWS has initiated a multi-year study of the effects of stream regulation on freshwater mussels, and we welcome the opportunity to include some of the TVA tributary and mainstem project tailwaters within the experimental design. The objective of this study is to develop methodologies necessary to evaluate the impacts of flow regime changes on these mussel populations. Freshwater mussels are the most critically endangered faunal group in the United States. The construction and operation of TVA dams have and continue to adversely affect many freshwater mussel populations, and in part, these facilities have been responsible for the extinction of several species. Although water quality and temperature of the discharges have and continue to impact some mussel populations, there is a growing body of evidence that altered hydrographs are the primary cause for the decline and endangerment of many species. In order to protect and enhance the remaining populations of mussels in the Tennessee Valley, we believe there is an urgent need to provide adequate flows. The ROS provides a unique opportunity to evaluate flow regimes necessary to sustain healthy mussel populations; however, there is no empirically based method for determining a flow regime suitable for mussels. We suggest a study conducted over a 5-year period which monitors behavioral and physiological attributes might provide the best means of evaluating the effects of changes in flow regimes on mussel populations. There are also opportunities for TVA to assist in an expanded study through funding and aquatic sampling at select TVA tailwaters.

Response to Comment 85: TVA has funded and provided sampling data for previous tailwater mussel studies, and would certainly be interested in cooperating in future studies.

86. It is unclear why hydroturbine ramping rates are not included in a comprehensive study of reservoir operations. Rapid ramping rates cause severe erosion, potentially impacting archeological and ecological resources.

Response to Comment 86: Changing ramping rates were included as an element of the Tailwater Habitat Alternative. Under the Preferred Alternative, ramping rates were not changed from the Base Case.

87. The metrics utilized in the DEIS evaluation of aquatic resources focused on DO, temperature, and reservoir hydrodynamics. As concluded in the DEIS, no policy alternative represents a clear benefit to reservoir aquatic resources. Based on water quality modeling performed to date, some degradation of the existing aquatic resources could be expected for several of the alternatives. The DEIS did not make a strong correlation between contiguous, adjacent, and peripheral wetland habitat types and sport fishery productivity. Many of these areas have the potential to change, due to increased water levels, and there could be significant effects to sport fishery spawning and nursery areas. The continued expansion of invasive aquatic emergent vegetation and non-native fish populations is also problematic for spawning and nursery wetland habitats.

Response to Comment 87: See Section 4.7.2. The control of invasive species is increasingly challenging to all agencies managing natural resources in this area (see Section 5.11).

88. The alternatives that delay the fall drawdown (Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Equalized Summer/Winter Flood Risk Alternative, Tailwater Habitat Alternative, and the Tailwater Recreation Alternative) are expected to have significant negative impacts on the scrub/shrub and forested wetlands along Kentucky, Barkley, and Wheeler Reservoirs.

Extending the duration that these habitats are inundated during the growing season will dramatically shrink the willow-buttonbush, water tupelo, and bald-cypress plant communities and alter the plant composition of the bottomland hardwoods. It is expected that the woody plant communities in this zone will be replaced by emergent aquatic plants. In many cases, these emergent aquatic plant communities may be dominated by invasive exotic species such as alligatorweed and *Phragmites*. We believe the final EIS should fully evaluate the potential changes in reservoir wetland habitat type associated with the preferred alternative. Those results should be considered in addition to the metrics evaluated in the DEIS and any refinement to the water quality model(s) once a preferred alternative is selected.

Response to Comment 88: Delayed drawdown alternatives are expected to result in impacts on some forested and scrub/shrub wetlands (see Section 5.8).

89. Investigate additional fish and mussel restoration efforts at tributary and mainstem tailwaters. There are opportunities to restore native fishes and fisheries through reintroductions at several tailwaters. TVA and the FWS have been involved with several successful reintroduction efforts. We encourage the continued involvement by TVA in these efforts.

Response to Comment 89: Comment noted.

90. Enhance cold/cool-water tailwaters. We recommend enhancement of aquatic conditions for native aquatic communities by provision of warmer water during summer, with less rapid daily fluctuations, and better oxygenation. Where increased water temperatures are not practical, measures could include cooperation with other agencies and organizations to enhance nearby streams that were fragmented by the construction and operation of TVA

Reservoirs. These streams have experienced limited colonization and smaller population sizes of their aquatic communities. Although the Fontana and Tims Ford projects provide a significant challenge in this regard, we recognize the significant impairments their deep, cold water releases and drastic fluctuations impose on the Lower Little Tennessee River and Elk River, respectively. The dominating effects of the operation of the Fontana and Tims Ford projects have tremendous implications for our ability to recover several listed species of fish and mussels. We expect TVA to continue to cooperate in the recovery of listed species where it can and to work with us to identify measures to overcome the continued impairment of the Lower Little Tennessee River and Elk River.

Response to Comment 90: This programmatic EIS does not address site-specific water temperature issues. Recovery of listed species is addressed in Sections 4.13 and 5.13.

91. Although the scope of the DEIS does not include facilities on the Duck River, we believe significant potential for improvement exists in the Normandy tailwaters. This is due in part to the existing multi-port release mechanism and the questionable condition of the managed trout fishery below Normandy Dam.

Response to Comment 91: Comment noted.

92. Provide fishways. There are opportunities to allow for upstream and downstream passage of fishes to enhance fish populations at mainstem and tributary reservoirs. The need for fishways for species such as lake sturgeon (*Acipenser fulvescens*), black buffalo (*Ictiobus niger*), smallmouth buffalo (*Ictiobus bubalus*), freshwater drum (*Aplodinotus grunniens*), sauger (*Stizostedion canadense*), walleye (*Stizostedion vitreum*), paddlefish (*Polyodon spathula*), and river redhorse (*Moxostoma carinatum*) could be estimated from cooperative review of existing and future fish sampling from seasons when species congregate at tailwaters, as well as presence/absence data from historical spawning areas. We recommend a systematic approach to providing efficient and timely fish passage at TVA facilities.

Response to Comment 92: The ROS is a programmatic study looking at policy changes on a system-wide basis. This suggestion could require structural modifications that are not being proposed by TVA. The fish species listed do not benefit from traditional fish ladder technology because they do not jump barriers. Moving these species around a dam would require a system without any form of barrier to navigate, which is not currently economically feasible. TVA does monitor technological advances in fish passage and would be willing to revisit this issue if a suitable technology was developed.

93. Develop an advanced schedule for decommissioning and dam removal. We recommend that TVA begin to identify and prioritize its dams/reservoirs for eventual removal. It is never too early to project a schedule for removal of these facilities and to plan for restoration of the natural riverine conditions of the Tennessee Valley. Parameters to consider are relative length of reaches potentially restored by dam removal(s), value of and alternate sources of energy provided by the hydroelectric generation capacity, connectivity/fragmentation of the river system, and the benefit to species and natural communities. For TVA developments with the least storage capacity, least generation capacity, and fewest reservoir-dependent neighbors, a tentative time line and plan for removal could be developed. It is important to begin limiting future dependency on these reservoirs sooner than later, reversing trends toward more dependency on their presence, while emphasizing alternate uses of a riverine ecosystem.

Response to Comment 93: As discussed in Chapter 3, removal or modification of TVA's dams is considered beyond the scope of the ROS and this EIS, whose purpose is to

consider operational changes that would increase the public value of TVA's reservoir system. Removing dams, draining reservoirs, and disaggregating the reservoir system would be inconsistent with this purpose and would not increase the overall value of the system.

94. Maintain Ecological Staffing. We recognize the value of TVA's professional staff in guiding and implementing the ROS. We encourage you to maintain adequate staffing and funding in these areas, with a focus on continuity, science, and professionalism.

Response to Comment 94: Comment noted.

95. Based on the above considerations, the DOI encourages TVA to maintain its existing policy and conditions within the system by selection of the Base Case alternative presented in the DEIS. TVA has made a substantial investment in improving water quality and habitat conditions within its reservoirs and tailwaters over the years, and we believe that those improvements could be substantially compromised by a majority of the other alternatives.

Response to Comment 95: TVA's Preferred Alternative was formulated to address these and other issues.

U.S. Environmental Protection Agency Comments

August 20, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, TN 37902

SUBJ: EPA Comments on the TVA DPEIS for the "Tennessee Valley Authority Reservoir Operations Study"; Greater Tennessee Valley (AL, GA, KY, MS, NC, TN & VA); CEQ No. 030303

Dear Mr. Nye:

The U.S. Environmental Protection Agency (EPA) has reviewed the referenced Tennessee Valley Authority's (TVA) Draft Programmatic Environmental Impact Statement (DPEIS) in accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. The purpose of the subject document is to determine if any policy changes in TVA's reservoir operations are appropriate for greater public value. Operating objectives considered were navigation, flood control, power generation, water supply, water quality, recreation and other benefits. We appreciate TVA's presentations to EPA regarding this study, introducing it to us in March 2002, presenting water quality modeling conclusions to us and other agencies in April 2003, and presenting the DPEIS to us in July 2003. **[1]**

Seven river operations policy alternatives were considered by TVA in the DPEIS. The performances of the six action alternatives were designed to enhance certain operational aspects for public benefit and were compared against the *Base Case* (existing operating procedures) alternative. These six action policy alternatives were the Reservoir Recreation A Alternative (*Reservoir Rec A*) which would enhance flatwater (reservoir) recreation by maintaining summer pool levels longer; the Reservoir Recreation B Alternative (*Reservoir Rec B*) which would emphasize recreational benefits more than Reservoir Rec A, the Summer Hydropower Alternative (*Summer Hydro*) which would allow unrestricted drawdowns earlier to concentrate hydropower electric generation in the summer to help accommodate peak power demands; the Equalized Summer/Winter Flood Risk Alternative (*Equalized Flood Risk*) which would equalize the flood risk throughout the year, decreasing risk slightly in summer but increasing it slightly in winter; the Commercial Navigation Alternative (*Commercial Navigation*) which would enhance navigation by elevating water levels to allow greater vessel drafts for heavier cargo; the Tailwater Recreation Alternative (*Tailwater Rec*) which would increase whitewater recreational opportunities below the dam by releasing greater and more predictable volumes downstream; and the Tailwater Habitat Alternative (*Tailwater Habitat*) which would release additional flows at variable rates to simulate more natural, riverine conditions and enhance downstream aquatic habitats. TVA did not identify a preferred alternative in the DPEIS.

EPA has concentrated its review of the DPEIS on water quality and related areas such as wetlands, water supply and hydropower generation, as opposed to recreational, navigational and

economic aspects. In addition to the enclosed *Detailed Comments,* we offer the following summary comments for TVA's consideration in the development of the Final PEIS (FPEIS) together with its cooperators, the U.S. Army Corps of Engineers (COE) and the U.S. Fish and Wildlife Service (FWS): **[2]**

o ENVIRONMENTAL IMPACTS

We offer the following summary comments on water quality, wetlands, water supply and hydropower. Our comments are made from a water quality perspective relative to the policy alternatives presented. Additional water quality aspects (assimilative capacity, anoxia, chlorophyll *a*, and soil erosion) are considered in the enclosed *Detailed Comments*. **[3]**

➢ Water Quality - Overall (Table ES-01), water quality would not be benefited by the performance of most of the policy action alternatives compared to the Base Case. Most policy alternatives would increase reservoir residence (retention) times (pg. 5.4-16). Those alternatives that propose holding water longer than the Base Case (e.g., Reservoir Rec A&B) would store water longer under lake conditions during hot summer days. This would result in longer periods of lake stratification, low DO levels, higher chlorophyll *a* levels (if sufficient nutrients are present), and possibly nuisance or invasive species such as Eurasian milfoil. Reservoir water temperatures may also be warmer on average, which would reduce the DO saturation capability of the impounded waters. Low DO waters have also been associated (pg. 5.4-20) with the mobilization of anoxic products (such as iron, manganese, sulfides and ammonia) from sediments. Once normal drawdowns are allowed for the Reservoir Rec A&B Alternatives, these reservoir releases characterized by low DOs and anoxic products would occur a greater number of days per year than currently and would inundate and adversely affect downstream aquatic habitats. By comparison, those alternatives that increase the release of downstream waters (e.g., Tailwater Rec and Tailwater Habitat) could also have negative water quality effects. That is, the increased flows could result in downstream erosion as well as the release of greater volumes of low DO waters. The performance of most other alternatives also did not favor water quality or would produce no change, although aspects of the Summer Hydro and Commercial Navigation Alternatives would be beneficial. **[4]**

➢ Wetlands - Based on Table ES-01, the performance of the majority of the policy alternatives would have an overall adverse effect on wetlands, or specifically on wetland type. Wetland losses would tend to occur due to their exposure (lower reservoir pool levels or reduced releases downstream) or inundation (greater pool levels or greater releases). With the implementation of a new policy alternative, it may be assumed that over time a system equilibrium would eventually be reached under the new water regime (if shallow flooded areas were to generate new wetlands to help offset wetlands losses elsewhere). However, since many shorelands are no longer natural due to shoreline development (retainer walls), wetland gains may not equal losses. In addition, the value (function, type and location) of the wetlands lost or gained may be different. For example, the loss of reservoir forested wetlands due to their dessication in low pool reservoirs would be considered a greater loss than the downstream gain of herbaceous wetlands due to greater releases. We note that only the Commercial Navigation Alternative showed no change relative to wetlands, although the Reservoir Rec A&B Alternatives and the Tailwater Rec and Habitat Alternatives would benefit wetland function and location (but not type). **[5]**

➢ Water Supply - Although water supply delivery would generally be benefited (no cost) by the alternatives (except for an adverse effect by the Summer Hydro Alternative due to intake modification costs), a general decrease in system water quality would have an adverse effect on water supply quality and treatment costs. Based on Table ES-02, only the Summer Hydro and the Commercial Navigation Alternatives would show no change in water supply quality. **[6]**

➢ Hydropower - Although not without downstream aquatic impacts, EPA recognizes that hydropower is a renewable form of energy useful for generating peaking and baseload power. Due to operational changes from the Base Case involving pool levels and downstream releases, some of the policy action alternatives would increase hydropower use (i.e., decrease electricity generation by non-hydropower means) and thereby decrease annual air emissions from TVA's electric generation (e.g., NOx, SOx, PM and mercury emissions). This would be particularly true for the Tailwater Habitat Alternative (Table 5.2-01). Compared to the Base Case, the Summer Hydro Alternative would annually decrease hydropower use, although it would increase its use during summer peaking and periods of ozone formation. **[7]**

o CONCLUSIONS & RECOMMENDATIONS

The concept of considering a change from the Base Case in the operation of TVA's reservoir system for public benefit is a sound one. Operational objectives considered included recreation, flood risk, summer hydropower, navigation and tailwater habitat. Upon EIS analysis, however, it appears that such enhancements would have environmental tradeoffs (slightly to substantially adverse impacts, with the exception of the Commercial Navigation Alternative). From a water quality perspective, the presented policy alternatives generally do not favor water quality overall or necessarily related areas such as wetlands. The DPEIS in fact has grouped the alternatives into three categories and concluded (pg. 3-36) that they would either produce water quality impacts, substantial environmental impacts or be somewhat neutral. Accordingly, EPA suggests that one of the following approaches be considered in the FPEIS: **[8]**

➢ Base Case - Given the overall impacts of the policy action alternatives compared to the Base Case, continuation of the Base Case should be considered. However, environmental and engineering improvements should be continued to further refine TVA's existing operational policy where appropriate. These actions should include elevating reservoir DO levels, increasing downstream releases, water quality monitoring, shoreline management, adaptive management and other upgrades such as the ongoing refurbishing and upgrading of TVA's hydropower turbines (pg. 2-7) to produce more power more efficiently with apparently minimal additional impacts. Similar to the Base Case, the Commercial Navigation Alternative could also be selected since it would not change (have adverse or beneficial environmental impacts) from the Base Case. **[9]**

➢ Tailwater Habitat Alternative - Although not without impacts, this alternative has some environmental merit. Under this scenario, more water would be released in variable volumes to downstream environments such that the current impounded system would return to a more riverine condition. Hydropower ramping rates would apparently also be changed to modify pulsing flows during periods of generation such as peaking. This change in water volume and in the timing and duration of flows would benefit downstream wetlands (function and location) and aquatic flora and fauna in general, and increase the wetted areas for fish spawning. More riverine conditions would also likely limit the conditions conducive to the eutrophication of chlorophyll *a* and nuisance species in the sense that waters would be more lotic than in the Base Case, as long as water was seasonally available. Since the DPEIS (pg. 3-21) reports that structural changes such as presumed dam removals are not options, the Tailwater Habitat Alternative could be used to nevertheless approach more riverine conditions. From a practical perspective, this alternative would also increase hydropower (reducing air emissions) and whitewater recreation, which are both economically beneficial to TVA. We also assume that basic TVA requirements for flood control and navigation would be satisfied with this alternative. **[10]**

However, as is generally the case for the policy alternatives, the Tailwater Habitat Alternative is predicted to have an overall adverse effect on water quality. Table ES-02 indicates an adverse effect on anoxic conditions (despite having a beneficial effect on assimilative capacity). The FPEIS should therefore offer

methods to potentially mitigate these anoxic conditions. For example, additional bottom aeration devices may be needed in the forebays of selected dams or all dams, including aeration devices at Melton, Hill, Guntersville, Pickwick and Kentucky reservoirs which currently do not have any augmentation. Other forms of aeration (damsite aspiration, tailrace aeration, etc.) may also be tried in order to increase the DO levels in downstream releases and inhibit the mobilization of anoxic products. **[11]** Similar to water quality, the Tailwater Habitat Alternative would also generally have an overall adverse effect on wetlands – specifically on wetland type, since wetland function and location would be benefitted. The FPEIS should offer possible actions to mitigate impacts on wetland type, which may be difficult if the loss (exposure) of forested wetlands results from the implementation of the alternative. Mitigation for shoreline soil erosion downstream should also be explored in the FPEIS since this alternative was predicted to have an adverse effect on reservoir and tailwater shorelines. Mitigation might include rip-rap retainer walls in scour areas or in-stream structures that reduce erosion and dissipate wave energy. **[12]**

➢ Hybrid Alternative - Potential refinements of one or more DPEIS-presented policy alternatives to form a hybrid alternative may also be possible. Such hybrids should be designed to reduce identified environmental impacts but still have more of a public enhancement benefit than the Base Case. For example, if enhancement of reservoir recreation is targeted by TVA, the water quality lake effects of increased residence times (low DO, anoxia, anoxic products, warmer temperature, higher chlorophyll, invasive/nuisance species, etc.) should be minimized, mitigated or balanced against recreational benefits that are somewhat reduced. For example, if Reservoir Rec A or B is selected in the FPEIS, the document should discuss and recommend mitigative methods to help offset the water quality effects of longer lake storage and/or perhaps not hold reservoir water at a higher pool as long to lessen water quality impacts of the alternative. **[13]**

o SUMMARY

The enhancement of public benefits relative to the Base Case proposed by the policy alternatives would involve varying environmental tradeoffs. Accordingly, if a policy alternative is selected by TVA, the FPEIS should document how these tradeoffs will be addressed through modifying the alternative and/or mitigating the environmental impacts. In addition to consideration of the Base Case (with further refinements), we recommend consideration of the Tailwater Habitat Alternative (with mitigation) or a hybrid alternative that minimizes impacts but still provides more enhancement than the Base Case. **[14]**

o EPA DEIS RATING

EPA rates this DEIS as "EC-2" (Environmental Concerns, additional information requested). We primarily base this rating on the potential for water quality impacts of the proposed policy alternatives, and our information requests regarding the further refinement and/or mitigation of the Base Case, Tailwater Habitat Alternative, or a hybrid alternative.

Thank you for the opportunity to provide comments on the DPEIS. Should you have questions regarding our comments, the staff contact for this project is Chris Hoberg who can be reached directly at 404/562-9619.

Sincerely,

Heinz J. Mueller, Chief
Office of Environmental Assessment
Environmental Accountability Division

Enclosure - *Detailed Comments*

DETAILED COMMENTS

EPA offers the following detailed comments on water quality, wetlands, hydropower, document quality and other aspects.

o ENVIRONMENTAL IMPACTS

➢ **Water Quality** - Overall, water quality would not be benefited by the performance of most of the policy action alternatives compared to the Base Case. The following water quality aspects were reviewed:

***** Water Quality Effects - Table ES-01 summarizes the overall performance of the policy alternatives by public objective. For the water quality objective (*improving water quality in reservoirs and tailwaters*), all action alternatives were rated as having the potential for adverse water quality impacts when compared to the Base Case. Using the impact descriptors in this table, the action alternatives might be ranked (overall impacts – worst to best) as follows: Tailwater Habitat (*adverse*), Reservoir Rec B (*slightly to substantially adverse*), Reservoir Rec A (*slightly adverse to adverse*), Summer Hydro (*adverse to beneficial*), Tailwater Rec (*no change to substantially adverse*), Equalized Flood Risk (*no change to adverse*), and Commercial Navigation Alternative (*no change* to *slightly beneficial*).

***** Assimilative Capacity & Anoxia - The potential for the assimilative capacity and anoxic conditions was summarized in Tables ES-01 for storage, transitional and mainstem reservoirs. In general, changing the Base Case would generate greater potential for anoxia, although not for every action alternative. In this table, most action alternatives were rated as *adverse*, *substantially adverse*, *slightly adverse*, *variable*, or *no change to slightly adverse*. Only the Commercial Navigation, Equalized Flood Risk and Summer Hydro Alternatives were predicted to show a more positive *no change*, *no change to slightly beneficial*, *variable*, *slightly beneficial*, or *substantially beneficial* condition for the three types of reservoirs.

Regarding the assimilative capacity of the three types of reservoir in the TVA system, a change from the Base Case would result in either a benefit, adverse impact or no change (Table ES-02). Specifically, impact descriptors for effects on storage tributaries were *beneficial*, *slightly beneficial*, *variable* or show *no change*; for effects on transitional tributaries were *slightly adverse*, *no change to slightly adverse*, or show *no change*; and for effects on mainstem reservoirs showed *no change*. Benefited storage reservoirs were associated with the implementation of the Reservoir Rec A, Reservoir Rec B, Tailwater Rec and Tailwater Habitat Alternatives.

***** Chlorophyll *a* - Chlorophyll or algal levels in aquatic environments serve as a surrogate or indicator of water quality pollution due to reservoir nutrient levels. Alternatives extending lake residence times can elevate chlorophyll *a* concentrations while those enhancing flows can reduce concentrations. Since most alternatives would increase retention times (pg. 5.4-16), chlorophyll *a* levels would tend to increase with a change from the Base Case. The DPEIS suggests these increases would be generally small "...with a maximum increase less than 10 percent." The FPEIS should discuss the ecological

significance of such increases with emphasis on any reservoirs with elevated existing levels. In any event, it can be assumed that any increase in chlorophyll *a* concentrations would not indicate water quality maintenance or improvement.

***** Soil Erosion - Since soil erosion also affects water quality through turbidity and downstream siltation, it was also considered in our review. Based on Table ES-01, the overall performance of the action alternatives were related to the soil erosion objective (*minimizing erosion of reservoir shoreline and tailwater banks*). This table predicts that the Reservoir Rec A, Reservoir Rec B, Tailwater Rec and Tailwater Habitat Alternatives would show an erosion potential (*slightly adverse* or *slightly adverse to adverse*) while the Summer Hydro and Equalized Flood Risk Alternatives were to show no change or some benefit (*no change* or *no change to slightly beneficial*). Table ES-02 dissects these data into reservoir versus tailwater shoreline effects. The Summer Hydropower and Equalized Flood Risk Alternatives were predicted to benefit (reduce) shoreline erosion for reservoirs (*slightly beneficial*) and produce *no change* in the erosion of tailwater shorelines.

***** Wetlands - Wetlands also affect water quality by providing a water treatment function. Wetland impacts are further discussed below.

***** Water Quality Modeling - EPA appreciated being invited to the TVA water quality presentation made to several agencies in Knoxville on April 15, 2003, regarding TVA's modeling conclusions on the study (*Preliminary Water Quality Results for Reservoir Operations Study*). Although an extensive amount of water quality work was performed, the DPEIS only summarizes it in general terms without presenting details. The FPEIS should provide sufficient water quality modeling detail to distinguish differences among policy alternatives. **[15]**

- **Wetlands** - For the public objective involving wetland protection (*protecting and improving wetlands and other ecologically sensitive areas*), Table ES-01 indicates that the potential for adverse impacts exists through implementation of most of the action alternatives, with only the Commercial Navigation Alternative showing *no change* relative to wetlands. Based on Table ES-01, the policy alternatives might be ranked (overall impacts – worst to best) as follows: Summer Hydro (*substantially adverse*), Equalized Flood Risk (*adverse to substantially adverse*), Reservoir Rec B (*adverse to slightly beneficial*), Reservoir Rec A/Tailwater Rec/Tailwater Habitat (*slightly adverse to slightly beneficial*) and Commercial Navigation Alternative (*no change*).

Table ES-02 more specifically considers impacts to the location, type and function of wetlands. In such an analysis, the two recreational enhancement alternatives (Reservoir Rec A&B) and the two Tailwater alternatives (Tailwater Rec and Tailwater Habitat) would benefit (*slightly beneficial* or *slightly beneficial to beneficial*) wetland location and function. Wetland type, however, would not be benefited by these four alternatives (*adverse (variable)* or *slightly adverse (variable)*) which would make the overall wetland impact adverse as presented in Table ES-01 and discussed above. The Commercial Navigation Alternative is the only alternative that would not impact wetland type since it is predicted to show *no change*. **[16]**

- **Hydropower -** The Summer Hydro Alternative maximizes summer hydropower generation for peaking purposes. On an annual basis, however, it would result in a reduction of hydropower and a

consequential increase in air emissions from fossil fuel power plants. Although the emissions would increase, it should be noted that emissions (including ozone precursors such as NOx) should be less than the Base Case during the summer. This is significant since conditions are ripe for ozone formation during the summer. Although the DPEIS discusses this benefit (pg. 6-3), ozone is not specifically mentioned. The FPEIS should discuss the value of less summertime air emissions relative to ozone formation in the Tennessee Valley. **[17]**

o OTHER COMMENTS

➢ **Ramping Rates** - Page 3-20 states that "[c]hanging ramping rates was included as an element of the Tailwater Habitat Alternative" and page 3-8 states that there would be "no turbine peaking allowed." The FPEIS should further discuss how this would affect downstream aquatics versus hydropower generation during peaking. **[18]**

➢ **Structural Changes** - Page 3-21 indicates that structural changes, such as the presumed removal or modification of dams and levees, was not carried forward in the DPEIS as a component to any of the policy alternatives. However, all such structures have a finite project life. Are any TVA owned or operated dams nearing the end of their project life? Would TVA refurbish or remove such facilities? The FPEIS should discuss the TVA policy and any candidate sites. **[19]**

➢ **Document Quality** - Although the DPEIS was well organized, the nature of the subject matter is complex since enhancement of one benefit for a given alternative often resulted in a tradeoff of other benefits. In order to facilitate public readability and review of the FPEIS, we recommend the following modifications: **[20]**

***** Designed Enhancements - Page 1-9 and 1-10 indicate that based on the scoping process, the top three public priorities were recreational benefits, environmental protection and flood control, while the public priorities at the workshops were environmental protection, power production and water supply. Given that environmental protection was the first or second priority for the public, it is somewhat surprising that essentially only one alternative (Tailwater Habitat) was analyzed that would enhance the environment (by comparison, three alternatives would enhance recreation). **[21]**

***** Study Objectives - The study objectives provided by the public during the scoping process are listed on page 1-12. Although most are self explanatory, the FPEIS would be improved if some definitions were provided. For example, the objective for *improving aquatic habitat in reservoirs and tailwaters* might suggest increasing submerged aquatic vegetation in both the downstream tailwater area and in the littoral zone of the reservoir. However, an adverse impact to this objective might not only imply a *reduction* in submerged aquatic vegetation but also an *increase* in invasive species such as Eurasian milfoil or a pollution indicator species such as chlorophyll *a*. Where appropriate, the FPEIS should clarify the objectives through textual discussion or tabular footnotes to better describe the objectives being considered. **[22]**

***** Impact Descriptors - Tables ES-01 and ES-02 present impact descriptors for various identified public study objectives or impact categories by alternative. In general, Table ES-02 is more specific than Table ES-01 since it dissects data (e.g., wetland impacts are divided into wetland location type and

function), so that the impact descriptors in Table ES-01 seem to be a composite of various components in Table ES-02 (we note that this resulted in some wide-ranging conclusions such as a *slightly adverse to slightly beneficial* effect that appear confusing). However, in the case of the public study objective for water quality (*improving water quality in reservoirs and tailwaters*), the impact descriptors for the various water quality aspects considered in Table ES-02 (assimilative capacity and anoxia in tributary and mainstem reservoirs) do not relate to those descriptors used in Table ES-01 (i.e., are not a composite of the descriptors used in Table ES-01). The FPEIS should discuss this and the basis for the descriptors used in Table ES-01 for water quality.

We also note from Table ES-02 that even though the Tailwater Habitat Alternative (for storage tributaries) was predicted to be *beneficial* for assimilative capacity, its performance was considered *adverse* for anoxia. The FPEIS should discuss why this was predicted. Can the same system be beneficial for one and adverse for the other? **[23]**

***** Significance - In addition to clarifying impact descriptors, the basis of these conclusions should be further discussed. Although Tables ES-01 and ES-02 are intended to be summary tables, the text (Chapter 5) should further explain how these conclusions were reached and summarized in the tables. For example, page 5.4-13 states that "...mainstem reservoirs would experience an increase in volumes of water with low DO concentrations under Reservoir Rec Alternative B relative to the Base Case..." We suggest that such conclusory statements be substantiated, such as "...mainstem reservoirs would experience an increase in volumes of water with low DO concentrations under Reservoir Rec B Alternative relative to the Base Case since reservoir residence times would be longer." Without such discussion, some of the conclusions in tables are not always intuitive and may even seem counterintuitive. **[24]**

***** Typographical - We note that Table 5.2-01 may contain an error. The first column of this table presents an increase (+) of 298,810 MW hours of non-hydro generation for the Tailwater Habitat Alternative. However, given that the emissions are predicted to be decreased (-) for this alternative, the 298,810 MW hour figure should presumably also be negative to indicate a decrease in MW hours of non-hydro generation and to account for the decreased emissions. This should be modified or discussed in the FPEIS. EPA has assumed this value to be a negative 298,810 (-298,810) in our hydropower review. **[25]**

RESPONSE TO COMMENTS

1. We appreciate TVA's presentations to EPA regarding this study, introducing it to us in March 2002, presenting water quality modeling conclusions to us and other agencies in April 2003, and presenting the DPEIS to us in July 2003.

Response to Comment 1: Comment noted.

2. Seven river operations policy alternatives were considered by TVA in the DPEIS. The performances of the six action alternatives were designed to enhance certain operational aspects for public benefit and were compared against the Base Case (existing operating procedures) alternative. These six action policy alternatives were the Reservoir Recreation A Alternative (Reservoir Rec A) which would enhance flatwater (reservoir) recreation by maintaining summer pool levels longer; the Reservoir Recreation B Alternative (Reservoir Rec B) which would emphasize recreational benefits more than Reservoir Rec A, the Summer Hydropower Alternative (Summer Hydro) which would allow unrestricted drawdowns earlier to concentrate hydropower electric generation in the summer to help accommodate peak power demands; the Equalized Summer/Winter Flood Risk Alternative (Equalized Flood Risk) which would equalize the flood risk throughout the year, decreasing risk slightly in summer but increasing it slightly in winter; the Commercial Navigation Alternative (Commercial Navigation) which would enhance navigation by elevating water levels to allow greater vessel drafts for heavier cargo; the Tailwater Recreation Alternative (Tailwater Rec) which would increase whitewater recreational opportunities below the dam by releasing greater and more predictable volumes downstream; and the Tailwater Habitat Alternative (Tailwater Habitat) which would release additional flows at variable rates to simulate more natural, riverine conditions and enhance downstream aquatic habitats. TVA did not identify a preferred alternative in the DPEIS.

EPA has concentrated its review of the DPEIS on water quality and related areas such as wetlands, water supply and hydropower generation, as opposed to recreational, navigational and economic aspects. In addition to the enclosed Detailed Comments, we offer the following summary comments for TVA's consideration in the development of the Final PEIS (FPEIS) together with its cooperators, the U.S. Army Corps of Engineers (COE) and the U.S. Fish and Wildlife Service (FWS):

Response to Comment 2: Comment noted.

3. We offer the following summary comments on water quality, wetlands, water supply and hydropower. Our comments are made from a water quality perspective relative to the policy alternatives presented. Additional water quality aspects (assimilative capacity, anoxia, chlorophyll a, and soil erosion) are considered in the enclosed Detailed Comments.

Response to Comment 3: Comment noted.

4. ➢ Water Quality - Overall (Table ES-01), water quality would not be benefited by the performance of most of the policy action alternatives compared to the Base Case. Most policy alternatives would increase reservoir residence (retention) times (pg. 5.4-16). Those alternatives that propose holding water longer than the Base Case (e.g., Reservoir Rec A&B) would store water longer under lake conditions during hot summer days. This would result in longer periods of lake stratification, low DO levels, higher chlorophyll a levels (if sufficient nutrients are present), and possibly nuisance or invasive species such as Eurasian milfoil. Reservoir water temperatures may also be warmer on average, which would reduce

the DO saturation capability of the impounded waters. Low DO waters have also been associated (pg. 5.4-20) with the mobilization of anoxic products (such as iron, manganese, sulfides and ammonia) from sediments. Once normal drawdowns are allowed for the Reservoir Rec A&B Alternatives, these reservoir releases characterized by low DOs and anoxic products would occur a greater number of days per year than currently and would inundate and adversely affect downstream aquatic habitats. By comparison, those alternatives that increase the release of downstream waters (e.g., Tailwater Rec and Tailwater Habitat) could also have negative water quality effects. That is, the increased flows could result in downstream erosion as well as the release of greater volumes of low DO waters. The performance of most other alternatives also did not favor water quality or would produce no change, although aspects of the Summer Hydro and Commercial Navigation Alternatives would be beneficial.

Response to Comment 4: TVA considered the potential impacts on water quality while formulating its Preferred Alternative to reduce the risk of adverse impacts associated with the alternatives identified in the DEIS.

5. ➢ Wetlands - Based on Table ES-01, the performance of the majority of the policy alternatives would have an overall adverse effect on wetlands, or specifically on wetland type. Wetland losses would tend to occur due to their exposure (lower reservoir pool levels or reduced releases downstream) or inundation (greater pool levels or greater releases). With the implementation of a new policy alternative, it may be assumed that over time a system equilibrium would eventually be reached under the new water regime (if shallow flooded areas were to generate new wetlands to help offset wetlands losses elsewhere). However, since many shorelands are no longer natural due to shoreline development (retainer walls), wetland gains may not equal losses. In addition, the value (function, type and location) of the wetlands lost or gained may be different. For example, the loss of reservoir forested wetlands due to their desiccation in low pool reservoirs would be considered a greater loss than the downstream gain of herbaceous wetlands due to greater releases. We note that only the Commercial Navigation Alternative showed no change relative to wetlands, although the Reservoir Rec A&B Alternatives and the Tailwater Rec and Habitat Alternatives would benefit wetland function and location (but not type).

Response to Comment 5: TVA's Preferred Alternative would reduce the potential impacts on wetlands relative to the impacts associated with the action alternatives described in the DEIS. See Section 3.3.9.

6. ➢ Water Supply - Although water supply delivery would generally be benefited (no cost) by the alternatives (except for an adverse effect by the Summer Hydro Alternative due to intake modification costs), a general decrease in system water quality would have an adverse effect on water supply quality and treatment costs. Based on Table ES-02, only the Summer Hydro and the Commercial Navigation Alternatives would show no change in water supply quality.

Response to Comment 6: See Response to Comment 4.

7. ➢ Hydropower - Although not without downstream aquatic impacts, EPA recognizes that hydropower is a renewable form of energy useful for generating peaking and baseload power. Due to operational changes from the Base Case involving pool levels and downstream releases, some of the policy action alternatives would increase hydropower use (i.e., decrease electricity generation by non-hydropower means) and thereby decrease annual air emissions from TVA's electric generation (e.g., NOx, SOx, PM and mercury

emissions). This would be particularly true for the Tailwater Habitat Alternative (Table 5.2-01). Compared to the Base Case, the Summer Hydro Alternative would annually decrease hydropower use, although it would increase its use during summer peaking and periods of ozone formation.

Response to Comment 7: TVA formulated its Preferred Alternative to reduce the potential impact on hydropower generation values, relative to the action alternatives in the DEIS. See Section 3.3.9.

8. The concept of considering a change from the Base Case in the operation of TVA's reservoir system for public benefit is a sound one. Operational objectives considered included recreation, flood risk, summer hydropower, navigation and tailwater habitat. Upon EIS analysis, however, it appears that such enhancements would have environmental tradeoffs (slightly to substantially adverse impacts, with the exception of the Commercial Navigation Alternative). From a water quality perspective, the presented policy alternatives generally do not favor water quality overall or necessarily related areas such as wetlands. The DPEIS in fact has grouped the alternatives into three categories and concluded (pg. 3-36) that they would either produce water quality impacts, substantial environmental impacts or be somewhat neutral. Accordingly, EPA suggests that one of the following approaches be considered in the FPEIS:

Response to Comment 8: Comment noted.

9. ➢ Base Case - Given the overall impacts of the policy action alternatives compared to the Base Case, continuation of the Base Case should be considered. However, environmental and engineering improvements should be continued to further refine TVA's existing operational policy where appropriate. These actions should include elevating reservoir DO levels, increasing downstream releases, water quality monitoring, shoreline management, adaptive management and other upgrades such as the ongoing refurbishing and upgrading of TVA's hydropower turbines (pg. 2-7) to produce more power more efficiently with apparently minimal additional impacts. Similar to the Base Case, the Commercial Navigation Alternative could also be selected since it would not change (have adverse or beneficial environmental impacts) from the Base Case.

Response to Comment 9: TVA developed the Preferred Alternative in response to these and other issues, and also investigated the kind of adjustments described in the comment that could be made to the Base Case. Unfortunately, TVA was unable to effectively address the general public desire for enhanced recreational opportunities with this approach. TVA believes that the Preferred Alternative identified in the FEIS does appropriately address the concerns expressed in the comment.

10. ➢ Tailwater Habitat Alternative - Although not without impacts, this alternative has some environmental merit. Under this scenario, more water would be released in variable volumes to downstream environments such that the current impounded system would return to a more riverine condition. Hydropower ramping rates would apparently also be changed to modify pulsing flows during periods of generation such as peaking. This change in water volume and in the timing and duration of flows would benefit downstream wetlands (function and location) and aquatic flora and fauna in general, and increase the wetted areas for fish spawning. More riverine conditions would also likely limit the conditions conducive to the eutrophication of chlorophyll a and nuisance species in the sense that waters would be more lotic than in the Base Case, as long as water was seasonally available. Since the DPEIS (pg. 3-21) reports that structural changes such as presumed dam removals are not

options, the Tailwater Habitat Alternative could be used to nevertheless approach more riverine conditions. From a practical perspective, this alternative would also increase hydropower (reducing air emissions) and whitewater recreation, which are both economically beneficial to TVA. We also assume that basic TVA requirements for flood control and navigation would be satisfied with this alternative.

Response to Comment 10: See Response to Comment 9.

11. However, as is generally the case for the policy alternatives, the Tailwater Habitat Alternative is predicted to have an overall adverse effect on water quality. Table ES-02 indicates an adverse effect on anoxic conditions (despite having a beneficial effect on assimilative capacity). The FPEIS should therefore offer methods to potentially mitigate these anoxic conditions. For example, additional bottom aeration devices may be needed in the forebays of selected dams or all dams, including aeration devices at Melton, Hill, Guntersville, Pickwick and Kentucky reservoirs which currently do not have any augmentation. Other forms of aeration (damsite aspiration, tailrace aeration, etc.) may also be tried in order to increase the DO levels in downstream releases and inhibit the mobilization of anoxic products.

Response to Comment 11: The particular situation mentioned—adverse effect on anoxic conditions despite a beneficial effect on assimilative capacity under the Tailwater Habitat Alternative (Table ES-02)—would occur only on storage tributary reservoirs. The two representative reservoirs for this category included in the EIS are Douglas and South Holston Reservoirs—both of which already have aeration equipment and target DO concentrations. TVA has committed to maintaining these targets, regardless of which operations alternative is eventually selected.

12. Similar to water quality, the Tailwater Habitat Alternative would also generally have an overall adverse effect on wetlands – specifically on wetland type, since wetland function and location would be benefited. The FPEIS should offer possible actions to mitigate impacts on wetland type, which may be difficult if the loss (exposure) of forested wetlands results from the implementation of the alternative. Mitigation for shoreline soil erosion downstream should also be explored in the FPEIS since this alternative was predicted to have an adverse effect on reservoir and tailwater shorelines. Mitigation might include rip-rap retainer walls in scour areas or in-stream structures that reduce erosion and dissipate wave energy.

Response to Comment 12: TVA's Preferred Alternative was designed, in part, to reduce impacts on wetlands relative to the impacts associated with the action alternatives in the DEIS. An ongoing TVA program assesses, prioritizes, and repairs eroding TVA-owned shoreline. In addition, TVA Watershed Teams work with local communities and property owners to address problem areas on tailwater banks. Watershed Teams provide technical support and assist with obtaining funding.

In addition to traditional riprap, TVA supports the use of bioengineering and natural channel design techniques in order to enhance habitat and aesthetics, while stabilizing the shoreline and channels. These efforts will be ongoing and may be expanded if the chosen alternative is shown to increase erosion rates.

13. ➢ Hybrid Alternative - Potential refinements of one or more DPEIS-presented policy alternatives to form a hybrid alternative may also be possible. Such hybrids should be designed to reduce identified environmental impacts but still have more of a public enhancement benefit than the Base Case. For example, if enhancement of reservoir

recreation is targeted by TVA, the water quality lake effects of increased residence times (low DO, anoxia, anoxic products, warmer temperature, higher chlorophyll, invasive/nuisance species, etc.) should be minimized, mitigated or balanced against recreational benefits that are somewhat reduced. For example, if Reservoir Rec A or B is selected in the FPEIS, the document should discuss and recommend mitigative methods to help offset the water quality effects of longer lake storage and/or perhaps not hold reservoir water at a higher pool as long to lessen water quality impacts of the alternative.

Response to Comment 13: The alternative identified in the FEIS as TVA's Preferred Alternative is a hybrid or blended alternative. It was formulated to accomplish what is suggested by this comment.

14. The enhancement of public benefits relative to the Base Case proposed by the policy alternatives would involve varying environmental tradeoffs. Accordingly, if a policy alternative is selected by TVA, the FPEIS should document how these tradeoffs will be addressed through modifying the alternative and/or mitigating the environmental impacts. In addition to consideration of the Base Case (with further refinements), we recommend consideration of the Tailwater Habitat Alternative (with mitigation) or a hybrid alternative that minimizes impacts but still provides more enhancement than the Base Case.

Response to Comment 14: As suggested, TVA created a hybrid or blended alternative and identified it as TVA's Preferred Alternative. Chapter 3 discusses what the Preferred Alternative would accomplish and how it addresses the comments received on the DEIS.

15. ➢ Water Quality - Overall, water quality would not be benefited by the performance of most of the policy action alternatives compared to the Base Case. The following water quality aspects were reviewed:

* Water Quality Effects - Table ES-01 summarizes the overall performance of the policy alternatives by public objective. For the water quality objective (improving water quality in reservoirs and tailwaters), all action alternatives were rated as having the potential for adverse water quality impacts when compared to the Base Case. Using the impact descriptors in this table, the action alternatives might be ranked (overall impacts – worst to best) as follows: Tailwater Habitat (adverse), Reservoir Rec B (slightly to substantially adverse), Reservoir Rec A (slightly adverse to adverse), Summer Hydro (adverse to beneficial), Tailwater Rec (no change to substantially adverse), Equalized Flood Risk (no change to adverse), and Commercial Navigation Alternative (no change to slightly beneficial).

* Assimilative Capacity & Anoxia - The potential for the assimilative capacity and anoxic conditions was summarized in Tables ES-01 for storage, transitional and mainstem reservoirs. In general, changing the Base Case would generate greater potential for anoxia, although not for every action alternative. In this table, most action alternatives were rated as adverse, substantially adverse, slightly adverse, variable, or no change to slightly adverse. Only the Commercial Navigation, Equalized Flood Risk and Summer Hydro Alternatives were predicted to show a more positive no change, no change to slightly beneficial, variable, slightly beneficial, or substantially beneficial condition for the three types of reservoirs.

Regarding the assimilative capacity of the three types of reservoir in the TVA system, a change from the Base Case would result in either a benefit, adverse impact or no change (Table ES-02). Specifically, impact descriptors for effects on storage tributaries were beneficial, slightly beneficial, variable or show no change; for effects on transitional tributaries were slightly adverse, no change to slightly adverse, or show no change; and for

effects on mainstem reservoirs showed no change. Benefited storage reservoirs were associated with the implementation of the Reservoir Rec A, Reservoir Rec B, Tailwater Rec and Tailwater Habitat Alternatives.

Chlorophyll a - Chlorophyll or algal levels in aquatic environments serve as a surrogate or indicator of water quality pollution due to reservoir nutrient levels. Alternatives extending lake residence times can elevate chlorophyll a concentrations while those enhancing flows can reduce concentrations. Since most alternatives would increase retention times (pg. 5.4-16), chlorophyll a levels would tend to increase with a change from the Base Case. The DPEIS suggests these increases would be generally small "...with a maximum increase less than 10 percent." The FPEIS should discuss the ecological significance of such increases with emphasis on any reservoirs with elevated existing levels. In any event, it can be assumed that any increase in chlorophyll a concentrations would not indicate water quality maintenance or improvement.

* Soil Erosion - Since soil erosion also affects water quality through turbidity and downstream siltation, it was also considered in our review. Based on Table ES-01, the overall performance of the action alternatives were related to the soil erosion objective (minimizing erosion of reservoir shoreline and tailwater banks). This table predicts that the Reservoir Rec A, Reservoir Rec B, Tailwater Rec and Tailwater Habitat Alternatives would show an erosion potential (slightly adverse or slightly adverse to adverse) while the Summer Hydro and Equalized Flood Risk Alternatives were to show no change or some benefit (no change or no change to slightly beneficial). Table ES-02 dissects these data into reservoir versus tailwater shoreline effects. The Summer Hydropower and Equalized Flood Risk Alternatives were predicted to benefit (reduce) shoreline erosion for reservoirs (slightly beneficial) and produce no change in the erosion of tailwater shorelines.

* Wetlands - Wetlands also affect water quality by providing a water treatment function. Wetland impacts are further discussed below.

* Water Quality Modeling - EPA appreciated being invited to the TVA water quality presentation made to several agencies in Knoxville on April 15, 2003, regarding TVA's modeling conclusions on the study (Preliminary Water Quality Results for Reservoir Operations Study). Although an extensive amount of water quality work was performed, the DPEIS only summarizes it in general terms without presenting details. The FPEIS should provide sufficient water quality modeling detail to distinguish differences among policy alternatives.

Response to Comment 15: As the U.S. Environmental Protection Agency (USEPA) notes, an extensive amount of water quality modeling was conducted. From the analyses, TVA concluded that increases in chlorophyll-a—even on reservoirs where levels are already elevated—would not result in substantially adverse impacts. Much of the water quality modeling information was contained in the Water Quality Technical Report prepared to support the EIS, but was not included as a core component because of size limitations. It is always difficult to judge how much technical detail to provide in a document that is supposed to be understandable and usable by the average, non-technical reader. TVA thinks that the balance struck in the EIS is appropriate. If a reviewer would like more detail, the Water Quality Technical Report is available on request.

16. ➢ Wetlands - For the public objective involving wetland protection (protecting and improving wetlands and other ecologically sensitive areas), Table ES-01 indicates that the potential for adverse impacts exists through implementation of most of the action alternatives, with only the Commercial Navigation Alternative showing no change relative to

wetlands. Based on Table ES-01, the policy alternatives might be ranked (overall impacts – worst to best) as follows: Summer Hydro (substantially adverse), Equalized Flood Risk (adverse to substantially adverse), Reservoir Rec B (adverse to slightly beneficial), Reservoir Rec A/Tailwater Rec/Tailwater Habitat (slightly adverse to slightly beneficial) and Commercial Navigation Alternative (no change).

Table ES-02 more specifically considers impacts to the location, type and function of wetlands. In such an analysis, the two recreational enhancement alternatives (Reservoir Rec A&B) and the two Tailwater alternatives (Tailwater Rec and Tailwater Habitat) would benefit (slightly beneficial or slightly beneficial to beneficial) wetland location and function. Wetland type, however, would not be benefited by these four alternatives (adverse (variable) or slightly adverse (variable)) which would make the overall wetland impact adverse as presented in Table ES-01 and discussed above. The Commercial Navigation Alternative is the only alternative that would not impact wetland type since it is predicted to show no change.

Response to Comment 16: See Response to Comment 5.

17. ➢ Hydropower - The Summer Hydro Alternative maximizes summer hydropower generation for peaking purposes. On an annual basis, however, it would result in a reduction of hydropower and a consequential increase in air emissions from fossil fuel power plants. Although the emissions would increase, it should be noted that emissions (including ozone precursors such as NOx) should be less than the Base Case during the summer. This is significant since conditions are ripe for ozone formation during the summer. Although the DPEIS discusses this benefit (pg. 6-3), ozone is not specifically mentioned. The FPEIS should discuss the value of less summertime air emissions relative to ozone formation in the Tennessee Valley.

Response to Comment 17: While some alternatives would result in slightly more fossil generation and others less, TVA does not believe that these slight potential emission changes would result in a substantial change in air quality (see Section 5.2). TVA's ongoing emissions control programs for nitrogen oxides and sulfur dioxide would continue to reduce TVA's impact on regional air quality.

18. ➢ Ramping Rates - Page 3-20 states that "[c]hanging ramping rates was included as an element of the Tailwater Habitat Alternative" and page 3-8 states that there would be "no turbine peaking allowed." The FPEIS should further discuss how this would affect downstream aquatics versus hydropower generation during peaking.

Response to Comment 18: Ramping rates would not be increased under any of the alternatives, which would provide more stable flows that would contribute to a more diverse aquatic community. The issue is addressed in Section 5.7.2.

19. ➢ Structural Changes - Page 3-21 indicates that structural changes, such as the presumed removal or modification of dams and levees, were not carried forward in the DPEIS as a component to any of the policy alternatives. However, all such structures have a finite project life. Are any TVA owned or operated dams nearing the end of their project life? Would TVA refurbish or remove such facilities? The FPEIS should discuss the TVA policy and any candidate sites.

Response to Comment 19: As discussed in Chapter 3, removal or modification of TVA's dams is considered beyond the scope of ROS and this EIS, whose purpose is to consider

operational changes that would increase the public value of TVA's reservoir system. Removing dams, draining reservoirs, and disaggregating the reservoir system would be inconsistent with this purpose and would not increase the overall value of the system. TVA has an ongoing effort to modernize its hydropower generation facilities.

20. ➢ Document Quality - Although the DPEIS was well organized, the nature of the subject matter is complex since enhancement of one benefit for a given alternative often resulted in a tradeoff of other benefits. In order to facilitate public readability and review of the FPEIS, we recommend the following modifications:

Response to Comment 20: Comment noted.

21. * Designed Enhancements - Page 1-9 and 1-10 indicate that based on the scoping process, the top three public priorities were recreational benefits, environmental protection and flood control, while the public priorities at the workshops were environmental protection, power production and water supply. Given that environmental protection was the first or second priority for the public, it is somewhat surprising that essentially only one alternative (Tailwater Habitat) was analyzed that would enhance the environment (by comparison, three alternatives would enhance recreation).

Response to Comment 21: The Tailwater Habitat Alternative was structured to enhance certain environmental features, but all of the alternatives were formulated with environmental protection in mind. As discussed in Chapter 3 of the EIS, one of the first things TVA did in formulating alternatives was to eliminate possible alternatives that would result in substantially adverse environmental impacts. The TVA reservoir system is so large and has such a wide range of different habitats and resource conditions that it is difficult to make any changes to operations that would not result in some adverse impacts somewhere. While formulating the Preferred Alternative, TVA made every effort to reduce adverse impacts to the greatest extent possible, while still achieving or enhancing those aspects of the reservoir system most valued by the public.

22. * Study Objectives - The study objectives provided by the public during the scoping process are listed on page 1-12. Although most are self explanatory, the FPEIS would be improved if some definitions were provided. For example, the objective for improving aquatic habitat in reservoirs and tailwaters might suggest increasing submerged aquatic vegetation in both the downstream tailwater area and in the littoral zone of the reservoir. However, an adverse impact to this objective might not only imply a reduction in submerged aquatic vegetation but also an increase in invasive species such as Eurasian milfoil or a pollution indicator species such as chlorophyll a. Where appropriate, the FPEIS should clarify the objectives through textual discussion or tabular footnotes to better describe the objectives being considered.

Response to Comment 22: As suggested, TVA modified discussions in the FEIS to better define the identified objectives.

23. * Impact Descriptors - Tables ES-01 and ES-02 present impact descriptors for various identified public study objectives or impact categories by alternative. In general, Table ES-02 is more specific than Table ES-01 since it dissects data (e.g., wetland impacts are divided into wetland location type and function), so that the impact descriptors in Table ES-01 seem to be a composite of various components in Table ES-02 (we note that this resulted in some wide-ranging conclusions such as a slightly adverse to slightly beneficial effect that appear confusing). However, in the case of the public study objective for water quality (improving water quality in reservoirs and tailwaters), the impact descriptors for the

various water quality aspects considered in Table ES-02 (assimilative capacity and anoxia in tributary and mainstem reservoirs) do not relate to those descriptors used in Table ES-01 (i.e., are not a composite of the descriptors used in Table ES-01). The FPEIS should discuss this and the basis for the descriptors used in Table ES-01 for water quality.

We also note from Table ES-02 that even though the Tailwater Habitat Alternative (for storage tributaries) was predicted to be beneficial for assimilative capacity, its performance was considered adverse for anoxia. The FPEIS should discuss why this was predicted. Can the same system be beneficial for one and adverse for the other?

Response to Comment 23: The FEIS addresses this issue. Tables ES-01 and ES-02 have been extensively revised.

24. * Significance - In addition to clarifying impact descriptors, the basis of these conclusions should be further discussed. Although Tables ES-01 and ES-02 are intended to be summary tables, the text (Chapter 5) should further explain how these conclusions were reached and summarized in the tables. For example, page 5.4-13 states that "...mainstem reservoirs would experience an increase in volumes of water with low DO concentrations under Reservoir Rec Alternative B relative to the Base Case..." We suggest that such conclusory statements be substantiated, such as "...mainstem reservoirs would experience an increase in volumes of water with low DO concentrations under Reservoir Rec B Alternative relative to the Base Case since reservoir residence times would be longer." Without such discussion, some of the conclusions in tables are not always intuitive and may even seem counterintuitive.

Response to Comment 24: A balance must be struck between concisely summarizing results of analyses and including too much information. TVA believes that the conclusions presented in the EIS are supported and explained by information in the document, either in the text itself or in the appendices. Nevertheless, we have reviewed the document and, as suggested, have provided further explanation of conclusions where appropriate.

The water quality components of Tables ES-01 and ES-02 are summaries of information in Table 5.4-02. Table D1-02 provides the actual model-generated data on which the summaries in Table 5.4-02 were based. The text in Section 5.4 under "Model Results" explains how data in Table D1-02 were evaluated and transformed into the information in Table 5.4-02. A more detailed discussion of results is provided in the Water Quality Technical Report, which was prepared to support the EIS and is available on request.

25. * Typographical - We note that Table 5.2-01 may contain an error. The first column of this table presents an increase (+) of 298,810 MW hours of non-hydro generation for the Tailwater Habitat Alternative. However, given that the emissions are predicted to be decreased (-) for this alternative, the 298,810 MW hour figure should presumably also be negative to indicate a decrease in MW hours of non-hydro generation and to account for the decreased emissions. This should be modified or discussed in the FPEIS. EPA has assumed this value to be a negative 298,810 (-298,810) in our hydropower review.

Response to Comment 25: The number is correct as reported, and the reason for the drop in emissions is discussed in Section 5.2.10.

U.S. Geological Survey

United States Geological Survey
3039 Amwiler Road, Suite 130
Atlanta, Georgia 30360

Memo

To: David Nye
ROS Project Manager, Tennessee Valley Authority
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From: Edward M Martin
United States Geological Survey, District Chief
3039 Amwiler Road, Suite 130
Atlanta, Georgia 30360

Date: 10/19/2003

Re: **Review of Draft Programmatic Environmental Impact Statement: Tennessee Valley Authority Reservoir Operations Study June 2003**

Thank you for the opportunity to review the subject draft Environmental Impact Statement. This office has limited its review of this broad-based study to those report components focused on the hydrology and hydraulics of the watersheds and streams in Georgia in the affected basins. **[1]** The discussions of water-quality effects in Georgia were also reviewed. The largely qualitative discussions are technically sound and well written. Because they are largely qualitative, we have limited ability to evaluate or comment upon them in any detail. **[2]** Under the Peak Flows and Frequency section (4.22.3), it does not seem reasonable to conclude that "Because the flow frequency analyses were not performed using a methodology consistent with those performed for this EIS as described above, a comparison of the estimated frequencies from this analysis with the flow frequencies used for the Flood Insurance Studies is not meaningful." The FEMA FIS studies typically require a FEMA approved method, and are a valuable base of comparison. It is good engineering practice to compare the results of frequency estimates from different methods; especially when one method is regarded as standard practice (such as the FEMA FIS methods) and the other is less well known. The single paragraph in the appendix on Flood Flow Modeling is somewhat brief. **[3]**

Again, thank you for the opportunity to review the subject report.

RESPONSE TO COMMENTS

1. Thank you for the opportunity to review the subject draft Environmental Impact Statement. This office has limited its review of this broad-based study to those report components focused on the hydrology and hydraulics of the watersheds and streams in Georgia in the affected basins.

Response to Comment 1: We appreciate your review and comments on the DEIS.

2. The discussions of water-quality effects in Georgia were also reviewed. The largely qualitative discussions are technically sound and well written. Because they are largely qualitative, we have limited ability to evaluate or comment upon them in any detail.

Response to Comment 2: As stated in Chapter 1, the analysis presented in the EIS was conducted at a programmatic level. With respect to water quality effects, a more detailed information is contained in the Water Quality Technical Report, which is available on request.

3. Under the Peak Flows and Frequency section (4.22.3), it does not seem reasonable to conclude that "Because the flow frequency analyses were not performed using a methodology consistent with those performed for this EIS as described above, a comparison of the estimated frequencies from this analysis with the flow frequencies used for the Flood Insurance Studies is not meaningful." The FEMA FIS studies typically require a FEMA approved method, and are a valuable base of comparison. It is good engineering practice to compare the results of frequency estimates from different methods; especially when one method is regarded as standard practice (such as the FEMA FIS methods) and the other is less well known. The single paragraph in the appendix on Flood Flow Modeling is somewhat brief.

Response to Comment 3: TVA made changes in Section 4.22.3 in the FEIS to address this issue. Previously published Federal Emergency Management Agency flood insurance studies include regulated flow-frequency curves that were developed using the best information available at the time. At many locations, this meant having 20 to 40 years of observed annual peak flow data, collected over a period during which floodplain development led to fairly large modifications to upstream reservoir operations policy. In TVA's judgment, comparing these data was not meaningful.

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Raleigh. NC 27609

Mary K. Combs, State Conservationist
Phone: (919) 873-2101
Fax No.: (919) 873-2156
Email: mary.combs@nc.usda.gov

July 11, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit hill Dr, WT11A
Knoxville, IN 37902

Dear Mr. Nye:

Thank you for the opportunity to provide comments on Draft Programmatic Environmental Impact Statement as part of TVA Reservoir Operations Study, which covers almost all of the state of Tennessee and parts of Alabama, Kentucky, Georgia, Mississippi, North Carolina and Virginia.

The Natural Resources Conservation Service in the state of North Carolina does not have any comments at this time. **[1]**

If you need additional information, please feel free to contact Mike Hinton at (919) 873-2134,

Sincerely,

Mary K. Combs
State Conservationist

RESPONSE TO COMMENTS

1. The Natural Resources Conservation Service in the state of North Carolina does not have any comments at this time.

Response to Comment 1: Comment noted.

F4.2 State Agencies

Alabama Department of Environmental Management Water Division

August 29, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, TN 37902

Dear Mr. Nye:

The Alabama Department of Environmental Management (ADEM) has reviewed the draft programmatic Environmental Impact Statement prepared as a part of the Tennessee Valley Authority's (TVA) Reservoir Operations Study. We appreciate the opportunity to provide the following comments regarding impacts that the various alternatives may have on water quality in the Tennessee River in Alabama.

The study considers seven alternatives to the current operating plan and provides a clear discussion of how changes in reservoir operations could impact various objectives, including hydropower, navigation, recreation, habitat, and flood risk. As a part of the study, TVA considered how the proposed changes could affect, among other things, water quality and water supply. Since ADEM has regulatory authority regarding these uses, any changes that would have a negative impact on either use is a concern to the Department. **[1]**

Specifically, alternatives which would result in decreased flows and/or increased retention times in the mainstem reservoirs will likely contribute to eutrophication in these systems. The Department recently (2002) established chlorophyll-*a* criteria for all of the Tennessee River mainstem reservoirs in Alabama. These criteria were established using historic chlorophyll-*a* levels associated with the current operating plan, and an increase in chlorophyll-*a* levels could result in non-attainment of these criteria. In addition, increased reservoir retention times and subsequent elevated chlorophyll-*a* levels may increase water supply treatment costs necessary to meet drinking water standards.

An additional concern related to increased retention time in the reservoirs is the increase in the volume of the anoxic zone and the likely decrease in tailwater dissolved oxygen concentrations downstream of each reservoir. Alabama's water quality standards require a minimum dissolved oxygen concentration of 4.0 mg/l downstream of existing hydroelectric generating turbines. **[2]**

In light of these concerns, ADEM recommends that TVA not make changes to its current operating plan which may result in unfavorable impacts to water quality. The current plan (basecase alternative), in place since 1990, has provided water quality conditions which support the many varied uses throughout the Tennessee River in Alabama. **[3]**

Page 2

David Nye

August 29, 2003

Again, we appreciate the opportunity to provide comments as a part of TVA's thorough review of its Reservoir Operations Plan. If you have questions about any of the comments or need additional information, please call Lynn Sisk at (334) 271-7826. **[4]**

Sincerely,

James E. McIndoe, Chief
Water Division

RESPONSE TO COMMENTS

1. The study considers seven alternatives to the current operating plan and provides a clear discussion of how changes in reservoir operations could impact various objectives, including hydropower, navigation, recreation, habitat, and flood risk. As a part of the study, TVA considered how the proposed changes could affect, among other things, water quality and water supply. Since ADEM has regulatory authority regarding these uses, any changes that would have a negative impact on either use is a concern to the Department.

Response to Comment 1: Comment noted.

2. Specifically, alternatives which would result in decreased flows and/or increased retention times in the mainstem reservoirs will likely contribute to eutrophication in these systems. The Department recently (2002) established chlorophyll-a criteria for all of the Tennessee River mainstem reservoirs in Alabama. These criteria were established using historic chlorophyll-a levels associated with the current operating plan, and an increase in chlorophyll-a levels could result in non-attainment of these criteria. In addition, increased reservoir retention times and subsequent elevated chlorophyll-a levels may increase water supply treatment costs necessary to meet drinking water standards.

An additional concern related to increased retention time in the reservoirs is the increase in the volume of the anoxic zone and the likely decrease in tailwater DO concentrations downstream of each reservoir. Alabama's water quality standards require a minimum DO concentration of 4.0 mg/l downstream of existing hydroelectric generating turbines.

Response to Comment 2: TVA shares your concern about increased eutrophication and anoxia in TVA reservoirs, which arise primarily from nutrient over-enrichment. Alabama Department of Environmental Management (ADEM) recognizes this and has been modifying its existing embayment-watershed approach to monitoring and pollution abatement in the Tennessee Valley region. TVA also recognizes the relationship between algal productivity and reservoir residence time. Reservoir flows should not be viewed as the sole control mechanism for algal productivity. However, TVA concentrated on reservoir flows in its Preferred Alternative rather than reservoir elevations, as it does under its existing operations policy. Minimum system flows in summer that are included in the Preferred Alternative would help alleviate some of the concerns over low flows that would result from several of the action alternatives in the DEIS.

3. In light of these concerns, ADEM recommends that TVA not make changes to its current operating plan which may result in unfavorable impacts to water quality. The current plan (basecase alternative), in place since 1990, has provided water quality conditions which support the many varied uses throughout the Tennessee River in Alabama.

Response to Comment 3: TVA formulated the Preferred Alternative to address these and other concerns, and to enhance other system benefits.

4. Again, we appreciate the opportunity to provide comments as a part of TVA's thorough review of its Reservoir Operations Plan. If you have questions about any of the comments or need additional information, please call Lynn Sisk at (334) 271-7826.

Response to Comment 4: We appreciate ADEM's review of the DEIS.

Alabama Department of Economic and Community Affairs Office of Water Resources

September 2, 2003

Mr. David Nye
TVA ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, TN 37902

RE: TVA ROS Programmatic EIS Comments

Dear Mr. Nye:

The ADECA Office of Water Resources (OWR) has reviewed the draft programmatic Environmental Impact Statement (EIS) prepared as part of TV A's Reservoir Operations Study (ROS). It certainly represents a significant amount of work on the part of the TVA staff and we applaud your efforts to solicit public input and involvement.

We also appreciate your efforts to provide Alabama agencies with a special briefing on August 13, 2003. As a result, staff members from ADEM, ADCNR, and OWR were able to develop a better understanding of the ROS, the technical analysis and tools used in the ROS, and the development of alternatives under evaluation. **[1]**

The focus of our comments on the ROS concerns the use and management of these water resources. As we discussed while you were here, a key aspect of the successful implementation of any operational changes to the system will be heavily depended upon how water is used and managed in the TVA region. **[2]**

As a result, we strongly recommend the creation of a committee of state representatives to provide advice and recommendations to TVA on the use and management of these water resources. The convergence of overlapping authorities and responsibilities as well as the wide ranging differences in state laws and regulations require that the states work together with TVA to preserve and share the water resources of the region. Foremost in the effort should be a commitment to address drought planning and management and to understand how the states and TV A will work together in the event of a significant drought. We, along with many other states in the region, are actively working on drought planning and water conservation measures. It will only improve our results if we can work with surrounding states on these issues. **[3]**

Other issues such as the assessment of groundwater withdrawals, interbasin transfers, shared opportunities for public education and outreach, and the need for more comprehensive gauging and monitoring would also be appropriate issues for discussion. **[4]**

We appreciate the opportunity to participate in this ROS process and look forward to helping in any way we can as this process moves forward. **[5]**

Please let us know if we can provide any assistance.

Sincerely,

Onis "Trey" Glenn III, Division Director
Office of Water Resources

cc: Mr. Lynn Sisk, ADEM
Mr. Stan Cook, ADCNR

RESPONSE TO COMMENTS

1. The ADECA Office of Water Resources (OWR) has reviewed the draft programmatic Environmental Impact Statement (EIS) prepared as part of TVA's Reservoir Operations Study (ROS). It certainly represents a significant amount of work on the part of the TVA staff and we applaud your efforts to solicit public input and involvement.

We also appreciate your efforts to provide Alabama agencies with a special briefing on August 13, 2003. As a result, staff members from ADEM, ADCNR, and OWR were able to develop a better understanding of the ROS, the technical analysis and tools used in the ROS, and the development of alternatives under evaluation.

Response to Comment 1: Thank you for your comment.

2. The focus of our comments on the ROS concerns the use and management of these water resources. As we discussed while you were here, a key aspect of the successful implementation of any operational changes to the system will be heavily depended upon how water is used and managed in the TVA region. As a result, we strongly recommend the creation of a committee of state representatives to provide advice and recommendations to TVA on the use and management of these water resources. The convergence of overlapping authorities and responsibilities as well as the wide ranging differences in state laws and regulations require that the states work together with TVA to preserve and share the water resources of the region

Response to Comment 2: At the recommendation of TVA's chartered federal advisory committee, the Regional Resource Stewardship Council, TVA is considering formation of such a committee.

3. Foremost in the effort should be a commitment to address drought planning and management and to understand how the states and TVA will work together in the event of a significant drought. We, along with many other states in the region, are actively working on drought planning and water conservation measures. It will only improve our results if we can work with surrounding states on these issues.

Response to Comment 3: As stated in Section 3.4.1 and Chapter 7, TVA is considering development of a formal drought management plan that would include other agencies. TVA fully agrees that drought management requires regional planning and is willing to participate in the commenter’s state efforts for that.

4. Other issues such as the assessment of groundwater withdrawals, interbasin transfers, shared opportunities for public education and outreach, and the need for more comprehensive gauging and monitoring would also be appropriate issues for discussion.

Response to Comment 4: Comment noted.

5. We appreciate the opportunity to participate in this ROS process and look forward to helping in any way we can as this process moves forward

Response to Comment 5: We appreciate your review of the DEIS.

Alabama Department of Conservation and Natural Resources Wildlife and Freshwater Fisheries Division

August 27, 2003

Mr. David Ney
ROS Project Manager
TVA, WT 11A
400 West Summit Hill Drive
Knoxville, TN 37902

Re: TVA Reservoir Operations Study: Draft Environmental Impact Statement Comments

Dear Mr. Ney:

The Alabama Wildlife and Freshwater Fisheries Division (AWFF) has reviewed the Draft Environmental Impact Statement (DEIS) of the TVA Reservoir Operations Study. We support DEIS alternatives which provide the least impact on the aquatic resources of the Tennessee River Watershed in Alabama and significantly improve recreational opportunities available to the public. We submit the following comments concerning our review of the DEIS:

1. Research on Alabama reservoirs has revealed the relationship between reservoir hydrology and variability of year-class strength of fishes. AWFF supports the concept of water level manipulation to enhance crappie and bass sport fisheries and to benefit the overall fish community. A rising or higher than average lake level in the winter months (January-March) before the spawning period may increase crappie year-class strength. Stable or long retention times during the post-winter period will enhance both crappie and largemouth bass recruitment success (stable water levels in April are particularly important for bass recruitment). Operation of the Tennessee River reservoirs to maintain higher winter lake levels should be fully evaluated to determine impacts on fish population dynamics. Priority should be given to storage reservoirs where the lake level may be easier to manipulate; for example, Wheeler and Pickwick Reservoirs in Alabama. **[1]**

2. AWFF supports mitigation measures that will enhance boating access facilities and increase areas for angler bank access. Boating facility enhancements could include adding floating courtesy boat docks at many of the access areas that now have only fixed docks or none. Adding lighting at many of the facilities would enhance security and increase the opportunities for night angling. Some access areas need the addition of restrooms and increased parking spaces. AWFF would consider partnering with TVA to investigate and upgrade facilities in those areas where feasible. **[2]**

3. We recommend that a minimum continuous flow from Wilson Dam be considered. One of the most important freshwater mussel beds in the world, with regard to federally endangered species, as well as commercial harvest, lies in the tailwaters of Wilson Dam. A cumulative total of 40 species has been reported from that reach of river since 1990, including five federally endangered species and two species recently elevated to candidates for protection. Wilson tailwaters appear to be home to the only remaining population of White Wartybacks (*Plethobasus cicatricosus*). The riverine habitat and frequent releases from Wilson Dam during hydropower generation provide excellent habitat for these large-river species. However, the discharge of sewage from the Florence wastewater treatment facility has the potential to cause problems. Discharge from the plant is continuous (according to the

Alabama Department of Environmental Management), but release of water from Wilson Dam is negligible when power is not being generated or water spilled through floodgates. Our malacologist has observed that on most days, current is not perceptible until late morning, at least during summer and fall months. Thus, treated sewage accumulates in the vicinity of the treatment plant diffuser for at least several hours on most days. Continual release, in quantities adequate to flush the treated sewage, would probably be of great benefit to this globally important mussel community. **[3]**

4. We recommend that consideration be given to how the reservoir water levels are manipulated in the four reservoirs of the Bear Creek system, particularly in the fall to early winter period. Bear Creek is home to a diverse assemblage of freshwater mussels. However, poor water release practices from the four Bear Creek system dams have caused a drastic reduction in the fauna. A total of 25 species remains in the Bear Creek system, including two federally endangered species. However, most species are limited to a reach of stream less than two miles long, located just upstream of the portion of creek impounded as part of Pickwick Reservoir. In discussions with TVA personnel, our malacologist has found that water is held as long as possible in the fall to satisfy landowners. Then water is quickly released in order to increase holding capacity for winter rains. This quick release of water causes incredible amounts of bank and stream bed erosion, which has resulted in elimination of mussels, and probably some fish, from most of the system. With much of the historic fauna maintaining a foothold in the lower reaches (tenuous though it may be), alteration of flow regime and mitigation of affected habitat would almost certainly allow repopulation of the system. What should be questioned is the need to have these reservoirs empty by mid-December. Is their capacity (compared to that of Pickwick Reservoir) enough to make a significant difference in the ability of TVA to control floods? **[4]**

5. Other important issues which need to be addressed in TVA's reservoir operation plan include:

   (a) Water temperature fluctuations and dissolved oxygen levels below generating plants. **[5]**
   (b) Lack of fish passage facilities for riverine species. **[6]**
   (c) Entrainment and impingement of fishes in generating facilities. **[7]**
   (d) Loss of increasing amounts of littoral zone habitat due to bulkheads. **[8]**
   (e) Greenway development along riparian habitat and the setting aside of undeveloped properties for future wild, scenic, and natural use. **[9]**
   (f) The minimization of risks from aquatic nuisance species. **[10]**
   (g) The discharge of heated effluents which exceed Alabama's water quality standard for thermal discharges at fossil fuel or nuclear plants. **[11]**

These are the primary concerns of AWFF regarding the TVA Reservoir Operations Study and the policy alternatives that have been presented. AWFF urges TVA to consider alternatives which have the least impact on the aquatic resources of the Tennessee Valley system and which significantly increase recreational opportunities. Thank you for the opportunity to provide comments. **[12]** Please contact us if you have questions.

Sincerely,

M. N. Pugh
Director

RESPONSE TO COMMENTS

1. Research on Alabama reservoirs has revealed the relationship between reservoir hydrology and variability of year-class strength of fishes. AWFF supports the concept of water level manipulation to enhance crappie and bass sport fisheries and to benefit the overall fish community. A rising or higher than average lake level in the winter months (January-March) before the spawning period may increase crappie year-class strength. Stable or long retention times during the post-winter period will enhance both crappie and largemouth bass recruitment success (stable water levels in April are particularly important for bass recruitment). Operation of the Tennessee River reservoirs to maintain higher winter lake levels should be fully evaluated to determine impacts on fish population dynamics. Priority should be given to storage reservoirs where the lake level may be easier to manipulate; for example, Wheeler and Pickwick Reservoirs in Alabama.

Response to Comment 1: As discussed in Section 4.7.2, TVA attempts to stabilize tributary reservoir water levels as the water temperature at a depth of 5 feet reaches 65 ºF, by minimizing for a 2-week period water level fluctuations (maintaining level within 1 foot per week, either higher or lower). Beginning as early as spring 2004, TVA proposes to adjust this program so that it stabilizes levels at 60 ºF in order to better help crappie, smallmouth bass, and early largemouth and spotted bass spawning. Minimizing water level fluctuations is only one part of the fish spawning issue. Other environmental characteristics are also important in determining larvae and juvenile fish production. For example, the amount of food and cover available for much of the initial growing season are critical to determining the number of catchable fish. Higher winter levels would positively affect aquatic species (see Section 5.7.2). Daily fluctuations on Wheeler Reservoir are not conducive to stabilization during spring spawning. TVA has discussed this issue with the Alabama Department of Conservation and Natural Resources (ADCNR) in the past.

2. AWFF supports mitigation measures that will enhance boating access facilities and increase areas for angler bank access. Boating facility enhancements could include adding floating courtesy boat docks at many of the access areas that now have only fixed docks or none. Adding lighting at many of the facilities would enhance security and increase the opportunities for night angling. Some access areas need the addition of restrooms and increased parking spaces. AWFF would consider partnering with TVA to investigate and upgrade facilities in those areas where feasible.

Response to Comment 2: TVA would welcome partnering with the Alabama Wildlife and Freshwater Fisheries Division (AWFF) to investigate and, subject to the availability of resources, upgrade recreational access facilities.

3. We recommend that a minimum continuous flow from Wilson Dam be considered. One of the most important freshwater mussel beds in the world, with regard to federally endangered species, as well as commercial harvest, lies in the tailwaters of Wilson Dam. A cumulative total of 40 species has been reported from that reach of river since 1990, including five federally endangered species and two species recently elevated to candidates for protection. Wilson tailwaters appear to be home to the only remaining population of White Wartybacks (Plethobasus cicatricosus).

The riverine habitat and frequent releases from Wilson Dam during hydropower generation provide excellent habitat for these large-river species. However, the discharge of sewage from the Florence wastewater treatment facility has the potential to cause problems. Discharge from the plant is continuous (according to the Alabama Department of Environmental Management), but release of water from Wilson Dam is negligible when power is not being generated or water spilled through floodgates. Our malacologist has observed that on most days, current is not perceptible until late morning, at least during summer and fall months. Thus, treated sewage accumulates in the vicinity of the treatment plant diffuser for at least several hours on most days. Continual release, in quantities adequate to flush the treated sewage, would probably be of great benefit to this globally important mussel community.

Response to Comment 3: It is our understanding that the sewage treatment plant is in compliance with its permit. TVA realizes that the permit is based on minimum flows from Wilson Dam that would not be decreased under the Preferred Alternative. Under the Preferred Alternative, TVA would begin operating its reservoir system with the goal of achieving certain flows from its dams rather than certain elevations on its reservoirs. This approach should be more environmentally advantageous from a water quality standpoint and would address the concern identified in this comment.

4. We recommend that consideration be given to how the reservoir water levels are manipulated in the four reservoirs of the Bear Creek system, particularly in the fall to early winter period. Bear Creek is home to a diverse assemblage of freshwater mussels. However, poor water release practices from the four Bear Creek system dams have caused a drastic reduction in the fauna. A total of 25 species remains in the Bear Creek system, including two federally endangered species. However, most species are limited to a reach of stream less than two miles long, located just upstream of the portion of creek impounded as part of Pickwick Reservoir. In discussions with TVA personnel, our malacologist has found that water is held as long as possible in the fall to satisfy landowners. Then water is quickly released in order to increase holding capacity for winter rains. This quick release of water causes incredible amounts of bank and stream bed erosion, which has resulted in elimination of mussels, and probably some fish, from most of the system. With much of the historic fauna maintaining a foothold in the lower reaches (tenuous though it may be), alteration of flow regime and mitigation of affected habitat would almost certainly allow repopulation of the system. What should be questioned is the need to have these reservoirs empty by mid-December. Is their capacity (compared to that of Pickwick Reservoir) enough to make a significant difference in the ability of TVA to control floods?

Response to Comment 4: As discussed in Section 3.4.1, none of the alternatives evaluated for the ROS would affect operation of the Bear Creek Projects. Changes at the Bear Creek Projects could be analyzed on a case-by-case basis, as the opportunity for habitat improvement is identified.

5. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(a) Water temperature fluctuations and dissolved oxygen levels below generating plants.

Response to Comment 5: Water temperature fluctuations and DO concentrations below hydropower generating facilities were evaluated in the ROS. TVA evaluated each alternative by comparing temperature and oxygen concentrations predicted by water quality models. Numerous metrics were calculated for this comparison, such as the water temperature variation at critical locations during spawning periods and the total number of hours that DO concentrations met a target at a critical location. These metrics were used to evaluate impacts on aquatic resources and on threatened and endangered species.

6. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(b) Lack of fish passage facilities for riverine species.

Response to Comment 6: The ROS is a programmatic study looking at policy changes on a system-wide basis. This suggestion could require structural modifications that are not being proposed by TVA. However, the fish species listed do not benefit from traditional fish ladder technology because they do not jump barriers. Moving these species around a dam would require a system without any form of barrier to navigate, which is not currently economically feasible. TVA does monitor technological advances in fish passage and would be willing to revisit this issue if a suitable technology was developed.

7. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(c) Entrainment and impingement of fishes in generating facilities.

Response to Comment 7: These activities are normally conducted under Section 316(b) evaluations for TVA facilities. TVA has installed screens on its plant intakes and taken other measures to reduce entrainment and impingement impacts. Previous analyses indicate that such measures are effective, and that entrainment and impingement of fish would be reduced to acceptable levels.

8. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(d) Loss of increasing amounts of littoral zone habitat due to bulkheads.

Response to Comment 8: This issue was addressed as part of TVA's Shoreline Management Initiative EIS in 1998, and TVA adopted a policy to manage shoreline development.

9. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(e) Greenway development along riparian habitat and the setting aside of undeveloped properties for future wild, scenic, and natural use.

Response to Comment 9: The focus of the ROS EIS is the operations policy of the TVA reservoir system, not land use. TVA does address land use in its comprehensive reservoir land use plans and associated NEPA reviews. For example, TVA examined residential access and shoreline uses in its reservoir land management plans for Pickwick, Guntersville, and Bear Creek Reservoirs.

10. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(f) The minimization of risks from aquatic nuisance species.

Response to Comment 10: Impacts related to invasive aquatic species are addressed for each policy alternative in Sections 5.9 and 5.11. Minimization of the risks from such species is a high priority for TVA.

11. Other important issues which need to be addressed in TVA's reservoir operation plan include:

(g) The discharge of heated effluents which exceed Alabama's water quality standard for thermal discharges at fossil fuel or nuclear plants.

Response to Comment 11: Thermal plant discharges are regulated under Section 316(a) of the Clean Water Act. National Pollutant Discharge Elimination System permits have been issued for TVA facilities. TVA would comply with these permits, regardless of which alternative is chosen. Some alternatives would require more generation reduction and cooling tower use than others. This potential effect was evaluated in Section 5.23.2, Step 3.

12. AWFF urges TVA to consider alternatives which have the least impact on the aquatic resources of the Tennessee Valley system and which significantly increase recreational opportunities.

Response to Comment 12: TVA's Preferred Alternative was formulated to enhance recreational opportunities, while reducing potential environmental impacts associated with the alternatives identified in the DEIS that would enhance recreation.

Georgia State Clearinghouse (Georgia Department of Natural Resources Historic Preservation Division, Soil & Water Conservation, EPD/Floodplain Management)

EPD/Floodplain Management

TO: Barbara Jackson
Georgia State Clearinghouse
270 Washington Street, SW, Eighth Floor
Atlanta, Georgia 30334

FROM: MR. COLLIS BROWN
EPD/FLOOD PLAIN MANAGEMENT

SUBJECT: Executive Order 12372 Review

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) – Tennessee Valley Authority

STATE ID: GA030703003

DATE: *7—09-2003*

[✓] This notice is considered to be consistent with those state or regional goals, policies, plans, fiscal resources, criteria for developments of regional impact, environmental impacts, federal executive orders, acts and/or rules and regulations with which this organization is concerned.

See attached comments.

This notice is not consistent with:

[ ] The goals, plans, policies, or fiscal resources with which this organization is concerned. (Line through inappropriate word or words and prepare a statement that explains the rationale for the inconsistency. Additional pages may be used for outlining the inconsistencies).

[ ] The criteria for developments of regional impact, federal executive orders, acts and/or rules and regulations administered by your agency. Negative environmental impacts or provision for protection of the environment should be pointed out. (Additional pages may be used for outlining the inconsistencies).

[ ] This notice does not impact upon the activities of the organization.

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) - Tennessee Valley Authority

STATE IDENTIFICATION: GA030703003

For floodplain management purposes, any alternative that increases peak discharge and results in adverse damages including slight or substantially adverse damages. appears to be a deviation from Executive Order 11988. Sound floodplain management does not support the alternative reservoir operation policies called Reservoir Recreation A, Reservoir Recreation B, Summer Hydropower. Equalized Summer/Winter Flood Risk, Commercial] Navigation, Tai]water Recreation. and Tai1water Habitat. **[1]**

Additionally, the proposed project referenced above may alter federally designated Special Flood Hazard Areas (SFHA) and federally designated floodways. It is necessary to notify adjacent communities and the Georgia Department of Natural Resources prior to any alteration or relocation of a watercourse and submit evidence of such notification to the Federal Emergency Management Agency (FEMA), Region IV Office in Atlanta, Georgia. For any altered or relocated watercourse, submit engineering data/analysis within six (6) months to the FEMA, Region IV Office, in Atlanta, Georgia to ensure accuracy of community flood maps through the **Letter or Map Revision** process. Assure flood carrying capacity of any altered or relocated watercourse is maintained. You may obtain federal application forms for map revisions by contacting the Georgia Floodplain Management Office at (404) 656-6382.

Pursuant to Executive Order 11988, (Floodplain Management), direct or indirect federal support of floodplain development should be avoided unless there are no practicable alternatives. If there are no practicable alternatives and development in the floodplain is to be undertaken, the federal agency should document the reasons supporting this finding through the notification procedures outlined in the Executive Order. **[2]**

RESPONSE TO COMMENTS

1. For floodplain management purposes, any alternative that increases peak discharge and results in adverse damages including slight or substantially adverse damages, appears to be a deviation from Executive Order 11988. Sound floodplain management does not support the alternative reservoir operation policies called Reservoir Recreation A, Reservoir Recreation B, Summer Hydropower, Equalized Summer/Winter Flood Risk, Commercial Navigation, Tailwater Recreation, and Tailwater Habitat.

Response to Comment 1: Eliminating unacceptable flood risk effects associated with the alternatives identified in the DEIS was one of the primary drivers in the formulation of TVA's Preferred Alternative.

2. Additionally, the proposed project referenced above may alter federally designated Special Flood Hazard Areas (SFHA) and federally designated floodways. It is necessary to notify adjacent communities and the Georgia Department of Natural Resources prior to any alteration or relocation of a watercourse and submit evidence of such notification to the Federal Emergency Management Agency (FEMA), Region IV Office in Atlanta, Georgia. For any altered or relocated watercourse, submit engineering data/analysis within six (6) months to the FEMA, Region IV Office, in Atlanta, Georgia to ensure accuracy of community flood maps through the Letter of Map Revision process. Assure food carrying capacity of any altered or relocated watercourse is maintained. You may obtain federal application forms for map revisions by contacting the Georgia Floodplain Management Office at (404) 656-6382.

Pursuant to Executive Order 11988, (Floodplain Management), direct or indirect federal support of floodplain development should be avoided unless there are no practicable alternatives. If there are no practicable alternatives and development in the floodplain is to be undertaken, the federal agency should document the reasons supporting this finding through the notification procedures outlined in the Executive Order.

Response to Comment 2: See Response to Comment 1. TVA does not propose to alter or relocate any water courses.

Office of Planning and Budget

SONNY PERDUE
GOVERNOR

TIMOTHY A. CONNELL
DIRECTOR

GEORGIA STATE CLEARINGHOUSE MEMORANDUM
EXECUTIVE ORDER 12372 REVIEW PROCESS

TO: David Nye
Tennessee Valley Authority
400 W. Summit Hill Dr., WT11A
Knoxville, TN 37902-

FROM: Barbara Jackson
Georgia State Clearinghouse

DATE: 8/29/2003

SUBJECT: Executive Order 12372 Review

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) – Tennessee Valley Authority

STATE ID: GA030703003

CFDA NO:

THE APPLICANT IS ADVISED TO NOTE ADDITIONAL COMMENTS FROM DNR'S HISTORIC PRESERVATION DIVISION.

THE APPLICANT IS ADVISED TO NOTE ADDITIONAL COMMENTS FROM THE SOIL & WATER CONSERVATION COMMISSION.

THE APPLICANT IS ADVISED TO NOTE ADDITIONAL COMMENTS FROM DNR'S EPD/FLOOD PLAIN MANAGEMENT.

THESE REVIEWERS WERE ALSO INCLUDED: DEPARTMENT OF NATURAL RESOURCES' DRINKING WATER PROTECTION, SAFE DAMS PROGRAM, AND WILDLIFE RESOURCES DIVISION. HOWEVER, THEY DID NOT COMMENT WITHIN THE REVIEW PERIOD. SHOULD THEY HAVE COMMENTS, THEY WILL CONTACT YOU DIRECTLY.

/BJ

ENC.: HPD, JULY 25, 2003
GA GEOLOGIC SURVEY, JULY 8, 2003
SWCC, JULY 22, 2003
DNR WATER PROTEC BRANCH, JULY 16, 2003
DNR WATER RESOURCES, JULY 28, 2003
EPD/FLOOD PLAIN MGT, JULY 14, 2003

GEORGIA STATE CLEARINGHOUSE MEMORANDUM
EXECUTIVE ORDER 12372 REVIEW PROCESS

TO: Barbara Jackson
Georgia State Clearinghouse
270 Washington Street, SW, Eighth Floor
Atlanta, Georgia 30334

FROM: MR. BILL MCLEMORE
GEORGIA GEOLOGIC SURVEY

SUBJECT: Executive Order 12372 Review

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) – Tennessee Valley Authority

STATE ID: GA030703003

DATE: 7/7/03

[✓] This notice is considered to be consistent with those state or regional goals, policies, plans, fiscal resources, criteria for developments of regional impact, environmental impacts, federal executive orders, acts and/or rules and regulations with which this organization is concerned.

See attached comments.

This notice is not consistent with:

[ ] The goals, plans, policies, or fiscal resources with which this organization is concerned. (Line through inappropriate word or words and prepare a statement that explains the rationale for the inconsistency. Additional pages may be used for outlining the inconsistencies).

[ ] The criteria for developments of regional impact, federal executive orders, acts and/or rules and regulations administered by your agency. Negative environmental impacts or provision for protection of the environment should be pointed out. (Additional pages may be used for outlining the inconsistencies).

[ ] This notice does not impact upon the activities of the organization.

GEORGIA STATE CLEARINGHOUSE MEMORANDUM
EXECUTIVE ORDER 12372 REVIEW PROCESS

TO: Barbara Jackson
Georgia State Clearinghouse
270 Washington Street, SW, Eighth Floor
Atlanta, Georgia 30334

FROM: MR. WILLIAM D. BENNETT, ACTING EXECUTIVE DIRECTOR
SOIL & WATER CONSERVATION COMMISSION

SUBJECT: Executive Order 12372 Review

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) – Tennessee Valley Authority

STATE ID: GA030703003

DATE: 7/21/03

[✓] This notice is considered to be consistent with those state or regional goals, policies, plans, fiscal resources, criteria for developments of regional impact, environmental impacts, federal executive orders, acts and/or rules and regulations with which this organization is concerned.

See attached comments.

This notice is not consistent with:

[ ] The goals, plans, policies, or fiscal resources with which this organization is concerned. (Line through inappropriate word or words and prepare a statement that explains the rationale for the inconsistency. Additional pages may be used for outlining the inconsistencies).

[ ] The criteria for developments of regional impact, federal executive orders, acts and/or rules and regulations administered by your agency. Negative environmental impacts or provision for protection of the environment should be pointed out. (Additional pages may be used for outlining the inconsistencies).

[ ] This notice does not impact upon the activities of the organization.

GEORGIA STATE CLEARINGHOUSE MEMORANDUM
EXECUTIVE ORDER 12372 REVIEW PROCESS

TO: Barbara Jackson
Georgia State Clearinghouse
270 Washington Street, SW, Eighth Floor
Atlanta, Georgia 30334

FROM: MR. ALAN W. HALLUM, CHIEF
DNR WATER PROTECTION BRANCH

SUBJECT: Executive Order 12372 Review

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) – Tennessee Valley Authority

STATE ID: GA030703003

DATE: 7-10-03

[ ] This notice is considered to be consistent with those state or regional goals, policies, plans, fiscal resources, criteria for developments of regional impact, environmental impacts, federal executive orders, acts and/or rules and regulations with which this organization is concerned.

See attached comments.

This notice is not consistent with:

[ ] The goals, plans, policies, or fiscal resources with which this organization is concerned. (Line through inappropriate word or words and prepare a statement that explains the rationale for the inconsistency. Additional pages may be used for outlining the inconsistencies).

[ ] The criteria for developments of regional impact, federal executive orders, acts and/or rules and regulations administered by your agency. Negative environmental impacts or provision for protection of the environment should be pointed out. (Additional pages may be used for outlining the inconsistencies).

[✓] This notice does not impact upon the activities of the organization.

GEORGIA STATE CLEARINGHOUSE MEMORANDUM
EXECUTIVE ORDER 12372 REVIEW PROCESS

TO: Barbara Jackson
Georgia State Clearinghouse
270 Washington Street, SW, Eighth Floor
Atlanta, Georgia 30334

FROM: MR. NOLTON JOHNSON
DNR WATER RESOURCES

SUBJECT: Executive Order 12372 Review

PROJECT: Draft Programmatic EIS: Reservoir Operations Study (ROS) – Tennessee Valley Authority

STATE ID: GA030703003

DATE: 7/24/03

[✓] This notice is considered to be consistent with those state or regional goals, policies, plans, fiscal resources, criteria for developments of regional impact, environmental impacts, federal executive orders, acts and/or rules and regulations with which this organization is concerned.

See attached comments.

This notice is not consistent with:

[ ] The goals, plans, policies, or fiscal resources with which this organization is concerned. (Line through inappropriate word or words and prepare a statement that explains the rationale for the inconsistency. Additional pages may be used for outlining the inconsistencies).

[ ] The criteria for developments of regional impact, federal executive orders, acts and/or rules and regulations administered by your agency. Negative environmental impacts or provision for protection of the environment should be pointed out. (Additional pages may be used for outlining the inconsistencies).

[ ] This notice does not impact upon the activities of the organization.

July 23, 2003

Mr. David Nye
ROS Project Manager
TVA c/o WT 11A
400 West Summit Drive
Knoxville, TN 37902

RE: TVA Reservoir Operations Study (ROS): Draft Programmatic EIS
Fannin County, et al., Georgia
GA-030703-003

Dear Mr. Nye:

The Historic Preservation Division (HPD) has received the Draft Environmental Impact Statement (EIS) for the Tennessee Valley Authority Reservoir Operations Study. Our comments are offered the assist the Tennessee Valley Authority (TVA) and its applicants in complying with the provisions of Section 106 of the National Historic Preservation Act.

According to the Draft EIS, the effects to cultural resources of the proposed alternatives range from "adverse" to "slightly beneficial," with "adverse" and "slightly adverse" listed for half of the alternatives. HPD would, of course, prefer that the TVA choose an alternative with no adverse effects to historic resources, but, as the draft EIS points out, no decision has been made concerning preferred alternatives. We look forward to receiving a copy of the revised EIS after you have selected a preferred alternative. At that point, we will be able to offer our comments on the proposed undertaking. **[1]**

We look forward to working with you on this project. Please refer to the project number referenced above in any future correspondence. **[2]** If we may be of any further assistance, please do not hesitate to contact me at (404) 651-6777 or Serena Bellew, Environmental Review Coordinator at (404) 651-6624.

Sincerely,

Denise P. Messick

Environmental Review Historian

Enclosure: "Documentation Required for Review of Projects Under Section 106 of the NHPA of 1966"

CC: Barbara Jackson, Georgia State Clearinghouse
Kevin McAuliff, North Georgia ROC
Dan Latham, Jr., Coosa Valley RDC
Bryan Flower, Georgia Mountains ROC

DOCUMENTATION REQUIRED FOR REVIEW OF PROJECTS UNDER
SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966

At a minimum, the Historic Preservation Division (HPD) requires the following information in order to conduct a review of any proposed undertaking in accordance with Section 106 of the National Historic Preservation Act:

1. A letter describing the proposed undertaking, the federal agency involved (i.e. HUD funding, FDIC insurance, etc.) and language requesting HPD's review of the undertaking in accordance with the appropriate legis1ation.

2. A USGS topographic map indicating the location and area of potential effect (APE) of the proposed undertaking. Please indicate the "footprint' of the proposed project (i.e. the ground disturbing area). The name of that specific topographic map and its scale should also be included.

3. Original 35mm or high quality digital color photographs of all buildings that appear to be fifty years old or older, which are located on, immediately adjacent to and/or within view of the project area, as well as photographs of the surrounding area to document the "setting" of the proposed undertaking. All photographs must be keyed to a site map indicating their location and direction of view.

    - For projects involving the rehabilitation, alteration, or demolition of buildings, please provide interior and exterior photographs whenever possible (including all facades and significant details). Photographs must be keyed to a floor plan indicating the location and direction of view of each photograph.

4. For projects involving alteration or rehabilitation, include a detailed work write-up, existing floor plans and proposed floor plans.

5. For projects involving the demolition of buildings that appear to be fifty years old or older, include alternatives to demolition that were considered and a discussion of why such alternatives were determined not to be feasible.

6. For projects involving archaeological resources, include any cultural resource surveys or reports conducted on the site.

All submittals should be addressed to W. Ray Luce, Division Director, at the above address. Please note that there is a thirty (30) day review and comment period for project submittals.

Prepared by: Historic Preservation Division,
Georgia Department of Natural Resources
SGB/April, 2002

RESPONSE TO COMMENTS

1. According to the Draft EIS, the effects to cultural resources of the proposed alternatives range from "adverse" to "slightly beneficial," with "adverse" and "slightly adverse" listed for half of the alternatives. HPD would, of course, prefer that the TVA choose an alternative with no adverse effects to historic resources, but, as the draft EIS points out, no decision has been made concerning preferred alternatives. We look forward to receiving a copy of the revised EIS after you have selected a preferred alternative. At that point, we will be able to offer our comments on the proposed undertaking.

Response to Comment 1: TVA is executing an agreement with the seven Tennessee Valley region State Historic Preservation Officers, including Georgia and other consulting parties. The agreement outlines the actions that TVA will take to address potential adverse effects on historic properties associated with the Preferred Alternative.

2. We look forward to working with you on this project. Please refer to the project number referenced above in any future correspondence.

Response to Comment 2: Thank you for your comment.

Georgia Department of Natural Resources Wildlife Resources Division

August 25, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Drive, WT11A
Knoxville, TN 37902

Dear Mr. Nye:

Thank you for the opportunity to comment on the draft programmatic environmental impact statement (EIS) for your agency's Reservoir Operations Study (ROS). Fish and wildlife resources in north Georgia have benefited from prior TVA initiatives, such as the Reservoir Release Improvement Program, to improve habitat conditions, and we believe that additional improvements can be achieved as a result of this study. We have also appreciated the opportunity to provide input into the ROS process via Regional Fisheries Supervisor Jeff Duniak's participation on your Public Review Group. We commend your agency on an open and objective process that, most importantly, has maintained its efficiency and is on schedule to meet an ambitious two-year deadline for study completion. The inclusion of north Georgia destinations in your public meeting tour was also appreciated. **[1]**

There are three TVA tributary reservoir projects (Blue Ridge, Chatuge, Nottely) and two associated tailwaters (Blue Ridge, Nottely) located in north Georgia. My agency is keenly interested in the aquatic and terrestrial communities and the associated public uses that are supported by these three TVA projects. **[2]** Staffs from our Fisheries Management. Game Management, and Nongame Wildlife/Natural Heritage sections have reviewed your document. The following comments are provided to help your agency strengthen your final EIS and to decide which operational changes may provide the greatest benefit to the natural resources and citizens of the Tennessee Valley, including north Georgia.

We certainly understand the programmatic nature of the ROS and the intense balancing act among competing water uses in the Tennessee Valley. In simple terms, we have two primary interests in the three Georgia TVA projects as they relate to this study. The first is a desire to maintain and hopefully enhance the aquatic habitat conditions for fish species of concern in the Blue Ridge tailwater. The second is a goal to maintain higher water levels in these tributary reservoirs, which currently suffer from extreme water level fluctuations, to benefit resident fish communities and their associated recreational uses. Any operational changes that can improve these two conditions over those currently existing under the Base Case Alternative would be highly desirable. To that end, we support, in declining order of preference, the Tailwater Habitat, Reservoir Recreation A, and Reservoir Recreation B operating alternatives. Conversely, we do not support the Summer Hydropower and Equalized Flood Risk alternatives due to predicted adverse impacts to our stated interests. **[3]**

Although our three reservoirs comprise a very small segment of TVA's overall system, they are very representative of your basinwide issue of the management of tributary reservoirs. There seems to be some opportunity to closely examine your needs for flood storage and possibly increase tributary reservoir water levels where appropriate. **[4]** We commend you on the proposal in the draft EIS to extend

the duration of spring water level stabilization, when climatic conditions permit, to enhance fish spawning and recruitment. That is a significant step toward the improvement of our reservoir fish communities. **[5]** Attached are more specific comments on your draft EIS that should help your staff to finalize that document. A boldfaced page marker indicates significant issues.

The Georgia Wildlife Resources Division has enjoyed our longstanding partnership with TVA in the management of fish and Wildlife resources at the Blue Ridge, Chatuge, and Nottely projects. We look forward to continuing this relationship and taking it to a new level as a result of the Reservoir Operations Study. **[6]** If you have any questions regarding these comments, feel free to contact Regional Fisheries Supervisor Jeff Durniak at 770-535-5498.

Sincerely,

David Waller

DW/jd

Attachment

cc: Section Chiefs

Georgia Wildlife Resources Division (GAWRD)
Specific Comments on TVA Reservoir Operations Study-
Proposed draft Programmatic Environmental Impact Statement
August 2003

* Page 2-25; Section 2.3.6: The last sentence in the second paragraph should read: "This lower level of DO stresses aquatic life in tailwaters and *coolwater species in reservoirs*, and limits the water's capacity for assimilating waste." **[7]**

* **Page 3-9; Table 3.3-01:** Water level stabilization during fish spawning is mentioned several times (Table 3.3-01 and Page 3.20) and is being considered under all alternatives. The temperature criterion for initiation of the stabilization period (60°F) and the duration (4-6 weeks) should be explicitly stated together in the text. **[8]**

* Page 3-20; Fish Spawning: Need to insert in the text the new temperature criterion of 60°F. Both the water temperature (60°F) when stabilization will begin and the duration of the period should appear together in the "Fish Spawning" text. **[9]**

* Page 4.7-21; Table 4.7-08: Omit the SFI score for striped bass in Lake Chatuge because they have not been stocked in Lake Chatuge. **[10]**

* Page 4.7-23; 1st paragraph, lines 7-8: Need to include "stocking success" as a major factor influencing striped bass populations. **[11]**

* Page 4.7-23; Line 13: states, "present walleye populations in tributary reservoirs have been maintained by stocking." The Blue Ridge walleye population is self-sustaining and is not maintained by stocking. It was last stocked by GAWRD in 1961. **[12]**

* Page 4.7-24; Future Trends, Line 6: Replace "while recruitment of young fish is expected to be poor in dry years" with "while lower recruitment rates of a number of littoral spawners are expected in dry years." **[13]**

* **Page 4.7-24; Future Trends,** Lines 9-12: The text, "However, dry years would decrease reservoir conditions for cool-water species due to increased stratification causing summer/fall water quality problems" is not true, based on our data. The DEIS used 1990, 1993, and 1994 to represent normal, dry, and wet climatic years, respectively in modeling the effects of TVA alternatives on water quality (DO and temperature). Our September oxygen profiles documented higher DO levels (2-6 ppm) in 1993 (dry year) compared to anoxic to low concentrations (0-0.5 ppm) in 1994 (wet year) at Lake Nottely. The case is similar in Lake Lanier, where we have documented generally higher DO levels and lower water temperatures in coolwater habitat during summers of dry years in the Lanier watershed. **[14]**

* Page 4.8-3; Table 4.8-01: Total acreage (4,551) for wetland types appears to be in error. Total lake acreage is 4,180 at normal full pool. **[15]**

* Page 4.11-3; Section 4.11.4: The blueback herring, an invasive aquatic species illegally introduced to the TVA system during the early 1990s, should be included in this section. Negative impacts of

bluebacks on largemouth bass populations have been documented in these two TVA Tributary impoundments (*Lake Nottely Annual Report 2002 GAWRD, unpublished*). **[16]**

* Page 4.24-4 Section 4.24.3: Hunting should be listed as a non-water activity (waterfowl hunting would be water-based) on this page. Hunting is included on the list of activities on Page 4.24-7. **[17]**

*** Page 5.4.3:** Douglas and South Holston reservoirs were selected as the "representatives" for modeling the different alternatives in tributary reservoirs. Model results were occasionally contrasting and varied in magnitude between the two impoundments. There was insufficient information (i.e. fisheries, existing water quality) describing both "representative" reservoirs so it was difficult to determine which impoundment would best represent the impact potential for reservoirs not specifically modeled. The same argument could be made for the "representative" tailwaters modeled and extrapolating their applicability to the Blue Ridge tailwater. **[18]**

* Page 5.4-5; Line 14: Error in Table 4.4-02. Should read Table 5.4-02. **[19]**

* Page 5.4-5; Lines 16-21: We do not agree with the statement that impacts related to DO and high water temperatures would be less during cool, wet years and greater during hot, dry years. See previous comments for Page 4.7-24. **[20]**

* Page 5.4-13; Section 5.4.5 (3rd paragraph): The word "cold" should replace the word "cool" on line 23, using your defined coldwater temperature criteria (≤10°C) in Tables 5.4-02 and 5.4-01. **[21]**

* Page 5.7-3; Table 5.7-01: Word error for Condition Indicator under Tributary Type for "mean volume of suitable cool-water habitat (temperature <20°C and DO >5 mg/L)". It should read "mean volume of suitable cold-water habitat…" **[22]**

*** Page 5.7-18; Table 5.7-07:** The DEIS does not effectively address the effects of the alternatives on coolwater and coldwater habitats in reservoirs. For example, there is no analysis on volume of critical and preferable coolwater habitat for representative reservoirs and the effects on coolwater species. Table 5.7-07 does not give enough detail for our interpretation of effects. **[23]**

* Pages 5.7-22 and 5.7-23; Sport Fisheries-Reservoirs: We suggest adding the word "may" before "adversely influencing cool-water species…" (Line 15, Page 5.7-22) and insert in parenthesis "(DO levels)" between "coolwater habitat" and "would be more important…" (Line 25, Page 5.7-23). Increasing the volume of low DO water in the thermocline/hypolimnion layers would not necessarily be more stressful for coolwater species. **[24]**

* Pages 5.7-22–5.7-28; Sport Fisheries-Reservoirs: Even though this is a programmatic EIS, localized reservoir effects (water quality problems) by reservoir alternatives should be mentioned and considered in the overall metrics rating. For example, four localized September fish kills of coolwater species (trophy striped bass and walleye) have occurred on Lake Nottely between 1980 and 1996. These apparently resulted from low dissolved oxygen conditions deep (22-28 m) in the reservoir in the vicinity of the dam. Temperature/oxygen data collected by GAWRD fishery biologists before and following the 1996 kill document a rapid loss of a deep-water layer with sufficient oxygen to support fish. The kill probably resulted from oxygen depletion in the deep layer and fish stress when the fish were forced to undergo a rapid pressure change as they tried to get to the epilimnion. The available evidence suggests that this kill and previous kills of this nature at Lake Nottely may be related to power generation and water withdrawals in late summer. The DEIS did not address this problem. **[25]**

Pages 5.11-2—5.11-4; Invasive Plants and Animals: Include blueback herring as invasive aquatic pests where appropriate. **[26]** End

RESPONSE TO COMMENTS

1. Fish and wildlife resources in north Georgia have benefited from prior TVA initiatives, such as the Reservoir Release Improvement Program, to improve habitat conditions, and we believe that additional improvements can be achieved as a result of this study. We have also appreciated the opportunity to provide input into the ROS process via Regional Fisheries Supervisor Jeff Durniak's participation on your Public Review Group. We commend your agency on all open and objective process that, most importantly, has maintained its efficiency and is on schedule to meet an ambitious two-year deadline for study completion. The inclusion of north Georgia destinations in your public meeting tour was also appreciated.

Response to Comment 1: Thank you for your comment regarding TVA undertaking the ROS. TVA appreciates Georgia Wildlife Resources Division's input—especially the contributions the Regional Fisheries Supervisor, Jeff Durniak, has made as a member of the Public Review Group.

2. There are three TVA tributary reservoir projects (Blue Ridge, Chatuge, Nottely) and two associated tailwaters (Blue Ridge, Nottely) located in north Georgia. My agency is keenly interested in the aquatic and terrestrial communities and the associated public uses that are supported by these three TVA projects.

Response to Comment 2: Comment noted.

3. In simple terms, we have two primary interests in the three Georgia TVA projects as they relate to this study. The first is a desire to maintain and hopefully enhance the aquatic habitat conditions for fish species of concern in the Blue Ridge tailwater. The second is a goal to maintain higher water levels in these tributary reservoirs, which currently suffer from extreme water level fluctuations, to benefit resident fish communities and their associated recreational uses.

Any operational changes that can improve these two conditions over those currently existing under the Base Case Alternative would be highly desirable. To that end, we support, in declining order of preference, the Tailwater Habitat, Reservoir Recreation A, and Reservoir Recreation B operating alternatives. Conversely we do not support the Summer Hydropower and Equalized flood risk alternatives due to predicted adverse impacts to our stated interests.

Response to Comment 3: TVA's Preferred Alternative was formulated to enhance recreational opportunities, while reducing potential environmental impacts associated with the alternatives identified in the DEIS that would enhance recreation.

4. Although our three reservoirs comprise a very small segment of TVA's overall system, they are very representative of your basinwide issue of the management of tributary reservoirs. There seems to be some opportunity to closely examine your needs for flood storage and possibly increase tributary reservoir water levels where appropriate.

Response to Comment 4: TVA's Preferred Alternative does this.

5. We commend you on the proposal in the draft EIS to extend the duration of spring water level stabilization, when climatic conditions permit, to enhance fish spawning and recruitment. That is a significant step toward the improvement of our reservoir fish communities.

Response to Comment 5: Unfortunately, TVA's analysis of flood risks indicates that risks would become unacceptable if the length of the stabilization was longer than 2 weeks.

6. The Georgia Wildlife Resources Division has enjoyed our longstanding partnership with TVA in the management of fish and wildlife resources at the Blue Ridge, Chatuge, and Nottely projects. We look forward to continuing this relationship and taking it to a new level as a result of the Reservoir Operations Study.

Response to Comment 6: Comment noted.

7. * Page 2-25; Section 2.3.6: The last sentence in the second paragraph should read: "This lower level of DO stresses aquatic life in tailwaters and coolwater species in reservoirs, and limits the water's capacity for assimilating waste."

Response to Comment 7: This change has been made in the FEIS.

8. *** Page 3-9; Table 3.3-01:** Water level stabilization during fish spawning is mentioned several times (Table 3.3-01 and Page 3.20) and is being considered under all alternatives. The temperature criterion for initiation of the stabilization period (60°F) and the duration (4-6 weeks) should be explicitly stated together in the text.

Response to Comment 8: The water temperature used as the trigger point for the 2-week fish spawning stabilization in individual tributary reservoirs will be reduced to 60 ºF beginning in spring 2004. See Response to Comment 5.

9. * Page 3-20; Fish Spawning: Need to insert in the text the new temperature criterion of 60°F. Both the water temperature (60°F) when stabilization will begin and the duration of the period should appear together in the "Fish Spawning" text.

Response to Comment 9: The suggested changes were made in the FEIS.

10. * Page 4.7-21; Table 4.7-08: Omit the SFI score for striped bass in Lake Chatuge because they have not been stocked in Lake Chatuge.

Response to Comment 10: The table was adjusted in the FEIS.

11. * Page 4.7-23; 1st paragraph, lines 7-8: Need to include "stocking success" as a major factor influencing striped bass populations.

Response to Comment 11: The text was changed in the FEIS.

12. * Page 4.7-23; Line 13: states, "present walleye populations in tributary reservoirs have been maintained by stocking." The Blue Ridge walleye population is self-sustaining and is not maintained by stocking. It was last stocked by GAWRD in 1961.

Response to Comment 12: Additional text was added in the FEIS to clarify that walleye populations are naturally sustained in many tributary reservoirs.

13. * Page 4.7-24; Future Trends, Line 6: Replace "while recruitment of young fish is expected to be poor in dry years" with "while lower recruitment rates of a number of littoral spawners are expected in dry years."

Response to Comment 13: The text was changed in the FEIS.

14. *** Page 4.7-24; Future Trends**, Lines 9-12: The text, “However, dry years would decrease reservoir conditions for cool-water species due to increased stratification causing summer/fall water quality problems" is not true, based on our data. The DEIS used 1990, 1993, and 1994 to represent normal, dry, and wet climatic years, respectively in modeling the effects of TVA alternatives on water quality (DO and temperature). Our September oxygen profiles documented higher DO levels (2-6 ppm) in 1993 (dry year) compared to anoxic to low concentrations (0-0.5 ppm) in 1994 (wet year) at Lake Nottely. The case is similar in Lake Lanier, where we have documented generally higher DO levels and lower water temperatures in coolwater habitat during summers of dry years in the Lanier watershed.

Response to Comment 14: The statement was intended to be applied to mainstem reservoirs and some, but not all, tributary reservoirs. The statement has been rewritten in the FEIS.

15. * Page 4.8-3; Table 4.8-01: Total acreage (4,551) for wetland types appears to be in error. Total lake acreage is 4,180 at normal full pool.

Response to Comment 15: All wetland acreage was derived from National Wetland Inventory (NWI) data that was prepared by USFWS. NWI maps are based on aerial photographs taken in the mid-1980s. The numbers that were used included data not only for the reservoir but also for any NWI wetlands within the shoreline fringe and isolated wetlands within the groundwater influence zone. On Nottely Reservoir, this zone was estimated to extend 1,250 feet beyond the maximum pool elevation.

16. * Page 4.11-3; Section 4.11.4: The blueback herring, an invasive aquatic species illegally introduced to the TVA system during the early 1990s, should be included in this section. Negative impacts of bluebacks on largemouth bass populations have been documented in these two TVA Tributary impoundments (Lake Nottely Annual Re port 2002 GAWRD, unpublished).

Response to Comment 16: TVA agrees that, if not already an actual problem, blueback herring is a potential problem for sport fish, and added the species to the FEIS as an invasive species in some of the Hiwassee River reservoirs in North Carolina, Georgia, and Tennessee. TVA believes that expansion of blueback herring, as well as alewives, in TVA reservoirs would be limited by low DO concentrations and warm temperatures.

17. * Page 4.24-4 Section 4.24.3: Hunting should be listed as a non-water activity (waterfowl hunting would be water-based) on this page. Hunting is included on the list of activities on Page 4.24-7.

Response to Comment 17: The change was made in the FEIS.

18. *** Page 5.4.3:** Douglas and South Holston reservoirs were selected as the "representatives" for modeling the different alternatives in tributary reservoirs. Model results were occasionally contrasting and varied in magnitude between the two impoundments. There was insufficient

information (i.e. fisheries, existing water quality) describing both "representative" reservoirs so it was difficult to determine which impoundment would best represent the impact potential for reservoirs not specifically modeled. The same argument could be made for the "representative" tailwaters modeled and extrapolating their applicability to the Blue Ridge tailwater.

Response to Comment 18: Representative storage tributary reservoirs responded differently for certain water quality metrics. However, detailed information was provided in Appendix D of the FEIS under "Base Case" in order to allow reviewers to become familiar with the water quality characteristics of all representative reservoirs.

An additional representative storage tributary reservoir (Hiwassee Reservoir) was included in the FEIS. This reservoir was added in response to a comment that the initial evaluation did not include a reservoir representative of the upper-elevation, oligotrophic reservoirs in the Blue Ridge ecoregion.

19. * Page 5.4-5; Line 14: Error in Table 4.4-02. Should read Table 5.4-02.

Response to Comment 19: This was corrected in the FEIS.

20. * Page 5.4-5; Lines 16-21: We do not agree with the statement that impacts related to DO and high water temperatures would be less during cool, wet years and greater during hot, dry years. See previous comments for Page 4.7-24.

Response to Comment 20: The statement was intended to be applied to mainstem reservoirs and some, but not all tributary reservoirs. The statement was rewritten in the FEIS.

21. * Page 5.4-13; Section 5.4.5 (3rd paragraph): The word "cold" should replace the word "cool" on line 23, using your defined coldwater temperature criteria (≤10°C) in Tables 5.4-02 and 5.4-01.

Response to Comment 21: This was revised in the FEIS.

22. * Page 5.7-3; Table 5.7-01: Word error for Condition Indicator under Tributary Type for "mean volume of suitable cool-water habitat (temperature <20°C and DO >5 mg/L)". It should read "mean volume of suitable cold-water habitat…"

Response to Comment 22: This change was made in the FEIS.

23. * **Page 5.7-18; Table 5.7-07:** The DEIS does not effectively address the effects of the alternatives on coolwater and coldwater habitats in reservoirs. For example, there is no analysis on volume of critical and preferable coolwater habitat for representative reservoirs and the effects on coolwater species. Table 5.7-07 does not give enough detail for our interpretation of effects.

Response to Comment 23: Section 5.7.2 describes the methods used to assess the impacts of the alternatives. The FEIS has been revised to include additional information on this subject. The volume of preferred or critical cool-water fish habitat is not expected to change under the Preferred Alternative.

24. * Pages 5.7-22 and 5.7-23; Sport Fisheries-Reservoirs: We suggest adding the word "may" before "adversely influencing cool-water species…" (Line 15, Page 5.7-22) and insert in parenthesis "(DO levels)" between "coolwater habitat" and "would be more important…"

(Line 25, Page 5.7-23). Increasing the volume of low DO water in the thermocline/hypolimnion layers would not necessarily be more stressful for coolwater species.

Response to Comment 24: The changes were made in the FEIS.

25. * Pages 5.7-22–5.7-28; Sport Fisheries-Reservoirs: Even though this is a programmatic EIS, localized reservoir effects (water quality problems) by reservoir alternatives should be mentioned and considered in the overall metrics rating. For example, four localized September fish kills of coolwater species (trophy striped bass and walleye) have occurred on Lake Nottely between 1980 and 1996. These apparently resulted from low dissolved oxygen conditions deep (22-28 m) in the reservoir in the vicinity of the dam. Temperature/oxygen data collected by GAWRD fishery biologists before and following the 1996 kill document a rapid loss of a deep-water layer with sufficient oxygen to support fish. The kill probably resulted from oxygen depletion in the deep layer and fish stress when the fish were forced to undergo a rapid pressure change as they tried to get to the epilimnion. The available evidence suggests that this kill and previous kills of this nature at Lake Nottely may be related to power generation and water withdrawals in late summer. The DEIS did not address this problem.

Response to Comment 25: This issue was considered in the analysis of the volume of water with low DO concentrations.

26.. * Pages 5.11-2—5.11-4; Invasive Plants and Animals: Include blueback herring as invasive aquatic pests where appropriate.

Response to Comment 26: See Response to Comment 16.

Kentucky Department of Fish and Wildlife Resources

September 23, 2004

Mr. David Nye, ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WTIIA
Knoxville, TN 37902

Dear Mr. Nye:

The Kentucky Department of Fish and Wildlife Resources (KDFWR) has reviewed the Draft Programmatic Environmental Impact Statement (EIS) for the Reservoir Operations Study. KDFWR staff has also participated in the meetings that have been held by the Tennessee Valley Authority (TVA) on this study. Accordingly, we offer the following comments and recommendations. **[1]**

The purpose of the study was to identify and evaluate the environmental and socioeconomic impacts of TVA's existing reservoir operations policy and develop options that might produce greater public value. As a result of this study, 8 options were identified (including the Base Case) for further evaluation and study. All of these options, excluding the Base Case, looked at changes in the timing of filling and emptying the reservoirs in the TVA system and how those changes might impact the environment and socioeconomics around each reservoir.

After reviewing the document, KDFWR recommends the Base Case option should become the Preferred Alternative for the Final EIS. We believe the other options could have impacts on fish spawning activity, reduce water quality, result in lost shoreline and shoreline habitat, and negatively impact adjacent wetlands. By delaying reservoir filling later, this could result in crappie and bass spawns being very low which would impact sport-fishing opportunities. By keeping water levels higher through the summer, there could be a loss of shoreline through increased erosion and a loss of habitat since mudflats won't have time to become vegetated. **[2]**

Additionally, since Kentucky Lake is connected to Lake Barkley by a canal, any change in the operation of Kentucky Lake will have a similar change on Lake Barkley. Therefore, any EIS should not only consider impacts to Kentucky Lake but should evaluate impacts on Lake Barkley. **[3]**

If you or any of your staff should have any questions regarding our comments, please contact Mr. Wayne L. Davis, Environmental Section Chief, at 502/564-7109, ext. 365.

We appreciate the opportunity to comment.

Sincerely,

C. Tom Bennett
Commissioner

cc: Benjamin T. Kinman, Director, Division of Fisheries
Edwin F. Crowell, Asst. Director, Division of Fisheries
Paul W. Rister, Western Fishery District Biologist
Pat Brandon, Purchase Wildlife Region Supervisor
Boyce Wells, KY Dept. for Environmental Protection
Lee Andrews, USFWS, Frankfort, KY
Environmental Section Files

RESPONSE TO COMMENTS

1. The Kentucky Department of Fish and Wildlife Resources (KDFWR) has reviewed the Draft Programmatic Environmental Impact Statement (EIS) for the Reservoir Operations Study. KDFWR staff has also participated in the meetings that have been held by the Tennessee Valley Authority (TVA) on this study. Accordingly, we offer the following comments and recommendations.

Response to Comment 1: Thank you for your comments and continued participation in the ROS as a member of the Interagency Team.

2. After reviewing the document, KDFWR recommends the Base Case option should become the Preferred Alternative for the Final EIS. We believe the other options could have impacts on fish spawning activity, reduce water quality, result in lost shoreline and shoreline habitat, and negatively impact adjacent wetlands. By delaying reservoir filling later, this could result in crappie and bass spawns being very low which would impact sport-fishing opportunities. By keeping water levels higher through the summer, there could be a loss of shoreline through increased erosion and a loss of habitat since mudflats won't have time to become vegetated.

Response to Comment 2: Thank you for supporting the Base Case Alternative. Many of the concerns addressed in your comments were considered during the development of TVA's Preferred Alternative that is now identified in the FEIS.

3. Additionally, since Kentucky Lake is connected to Lake Barkley by a canal, any change in the operation of Kentucky Lake will have a similar change on Lake Barkley. Therefore, any EIS should not only consider impacts to Kentucky Lake but should evaluate impacts on Lake Barkley.

Response to Comment 3: Under the Preferred Alternative, Kentucky and Barkley Reservoirs would be operated similar to the Base Case.

North Carolina Wildlife Resources Commission

September 3, 2003

Mr. David T. Nye
Project Manager
Reservoir Operations Study
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, TN 37902

Subject: Draft Programmatic Environmental Impact Statement, Reservoir Operations Study

Dear Mr. Nye:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the Draft Programmatic Environmental Impact Statement (DPEIS). The DPEIS has been prepared by Tennessee Valley Authority (TVA) staff and consultants to report on the outcome of a basin-wide Reservoir Operations Study (ROS). Our comments are provided in accordance with provisions of the National Environmental Policy Act (42 U.S.C. 4332 (2) (C)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We commend TVA for initiating a study of this magnitude to re-evaluate the potential of the greater Tennessee Valley's hydropower projects to serve multiple resource interests. We are optimistic that the ROS development process will identify important issues regarding the reservoirs, tailraces and other resources associated with these projects, and lead to better management of these resources. **[1]** Pursuant to that goal, the following comments are offered:

In our scoping comments on the ROS (C. Goudreau, April 26, 2002), NCWRC staff outlined specific concerns regarding current TVA operating policies, including: conservation and management of shoreline habitat; magnitude of winter drawdown on large reservoirs; duration/timing of reservoir elevation changes; reservoir habitat development opportunities and a variety of reservoir-specific issues. A copy of our scoping letter is attached for your reference. In reviewing the DPEIS, we found no record of agency scoping comments, nor any specific responses to the concerns expressed in our letter or by any other resource agency. We recommend that the final Environmental Impact Statement (EIS) document include a section devoted to TVA responses to resource agency comments, providing detailed information on how each comment was incorporated into the ROS or why it was not incorporated.

Because the DPEIS has not addressed many of the concerns detailed in our scoping letter of April 26, 2002, and because neither our recommended operational alternatives nor any alternatives that would target benefits to natural resources associated with reservoirs have been developed in the document, we cannot support any of the alternatives presented. While strengths and weaknesses of several alternatives are discussed herein, we caution the document preparers that such discussions should not be used to categorize the NCWRC as favoring those alternatives in any simplification or summarization of public or agency comment. Our specific concerns are discussed below. **[2]**

In general, the scope of the ROS document is too geographically broad or operationally narrow to address many long-standing project-specific issues. In our scoping comments, we listed a variety of such issues,

including: houseboat permitting on Fontana and other reservoirs; the shortage of low-water access on Chatuge Reservoir; the five-year "maintenance" drawdown of Fontana Reservoir; opportunities for creating small subimpoundments to improve fish habitat and recreational access, particularly at Siles Branch on Fontana Reservoir; improved boating access on Appalachia reservoir; impact of peaking flows from Nottely Reservoir on the Nottely River, and from Chatuge Reservoir on the Hiwassee River; and improved flows in the bypass reach below Appalachia Dam. As part of the agency response section recommended above, TVA should identify those agency comments and requests that are outside the intended scope of the ROS, and propose alternative processes by which those concerns might be addressed. In some cases, particularly regarding reservoir levels and tailrace flows, opportunity still exists to address these issues through a more detailed alternatives analysis within the ROS development process. Where applicable, we recommend that discussion of operational alternatives include references to specific agency concerns expressed during the scoping process. For example, would an operational shift toward more stable lake levels eliminate the current five-year drawdown practice on Fontana, or would alternatives intended to improve tailrace conditions affect the frequency or amplitude of peaking flows in the Nottely River? While we recognize that it would be impractical to consider all possible scenarios for all projects in the TVA system, the final EIS should address those reservoirs or river reaches identified by resource agencies as areas of particular concern. **[3]**

The broad scope of the ROS document also confounds any meaningful interpretation of the alternatives summaries presented in public hearings, handouts and newsletters by TVA. Concepts such as recreation and water quality are too diverse and variable across the project area to be depicted as having unilaterally good or bad responses to any of the operational alternatives. Such simplistic depiction of study results precludes any opportunity to address these issues by project, region or type of water body (reservoir versus tailrace), and may mislead the public into choosing an operational alternative that is not the most beneficial to their local resources and associated economies. **[4]**

The analysis of operational alternatives in the ROS is based mainly on basin-wide predictive models. Based on our review of the DPEIS document and materials presented at the public meetings, the sources of data used for model input appear in some cases to be vague, arbitrary, inappropriate or incomplete. Where applicable, we have outlined our concerns about questionable model input in our comments on specific alternatives and document sections below. We encourage TVA to carefully review input data for all models used for alternatives analysis, and expand or balance these data sets as needed. This will ensure that the potential of available water resources, not the limits of predictive models, determines the amount of public benefit that is derived from the costly and difficult ROS development process.

In addition to concerns regarding input data, the calibration of the models appears to be biased. Benefits of operational changes are presented in document and handout graphics on the same four-point scale as adverse results, but benefits are rarely measured above one-half of the available scale, while adverse results employ the entire scale. While this is intended to show the relative importance, from TVA's perspective, of the beneficial and adverse effects of each alternative, the resulting graphs are of little use in comparing benefits of similar alternatives to a particular resource category. For example, the estimated benefit to recreation is shown as "slightly beneficial" for all three alternatives for which recreational benefits are projected. Because most of the benefit scale is unused, it is difficult or impossible to compare relative degrees of benefit among alternatives. Also, the unused portion of the benefit scale presumably represents outcomes that are impossible under any operational scenario. Because arbitrary values or composite index scores are used for all scaling of impacts, it would be more useful and informative to rate the maximum possible benefits at the top of the four-point scale, just as maximum adverse impacts are calibrated. This would allow a more insightful review of alternatives by members of the public who are unlikely to read the text of the document. **[5]**

The DPEIS describes a process by which TVA staff condensed 65 preliminary alternatives into a refined list of 25, of which eight were developed in the document. While details on the 25 refined alternatives are provided in Appendix B, information on the initial screening is limited to a single page of text in Chapter 3 of the DPEIS, describing a process of consolidating and scoring preliminary alternatives by TVA staff to eliminate those that directly conflicted with operational capabilities. Although an overview of the public input process is provided in Section 1.6, operating options considered are described only in general terms. The final EIS document should describe the initial screening process in detail, including information on scoring criteria used to screen alternatives and a complete list of alternatives with justification for their selection or elimination. Without this information, it is impossible to determine whether our recommended alternative involving filling of reservoirs by April 1, which did not appear in the DPEIS, was eliminated in the preliminary screening, inappropriately consolidated with other operating options or omitted entirely from the alternatives review process. **[6]**

Although two alternatives involving longer retention of summer reservoir levels are presented in the DPEIS, neither alternative considers reaching summer lake levels earlier in the season. In our scoping comments, we specifically requested consideration of operational alternatives that produce higher and more stable reservoir water levels during the period from April through June, with a target date of April 1 for full pool. We reiterate that such an alternative should be considered, and request that it be included in the final EIS. While we recognize that flood control potential of reservoirs would be compromised during this period, water quality impacts attributed to the two existing full pool alternatives should be alleviated, because water level management during the late summer would be similar to existing conditions. By achieving full pool in April, the fisheries resources of tributary reservoirs would be enhanced though improved fish spawning success and reservoir primary productivity, with resulting benefits to recreation and associated local economies. **[7]**

We also requested that extent of winter drawdown be reduced in at least one alternative, particularly on Fontana and Hiwassee reservoirs, where significant portions of the reservoirs are completely dewatered annually. While the "Equalized Winter/Summer Flood Risk" alternative would partially achieve this objective, the alternative as considered in the DPEIS produces significant impacts to other resource categories, largely due to its basin-wide scope. We recommend that a similar alternative be evaluated that equalizes winter and summer water levels in the tributary reservoirs only, similar to the full pool models used in the recreational alternatives. It is likely that substantial improvements in winter and early spring water levels of tributary reservoirs could be compensated by slight modifications in water levels of larger downstream impoundments. This is particularly true of Fontana Reservoir, where extensive dewatering continues in spite of the more recent development of Tellico Reservoir downstream. **[8]**

Comparisons of reservoir elevations projected under the different operational alternatives are presented in the document using numeric data and box plots that show predicted elevations at one point during each season. Of greater concern to us is the rate and timing of reservoir filling during the critical spawning period from April through June. At the public meeting, TVA computer specialists were able to model continuous curves depicting daily water levels for specific reservoirs. For all alternatives developed in the final EIS, such curves should be included in the document for representative reservoirs, showing mean, minimum and maximum predicted water levels projected by each operational model. **[9]**

The following comments apply to specific document sections, primarily those in Chapters 4 through 7 that relate to natural resources and associated recreation and economics:

Section 4.7.8: In the discussion of existing sport fisheries, the document should clarify that in contrast to striped bass and striped bass hybrid fisheries, walleye populations in many tributary reservoirs have become naturalized and are now sustained by natural reproduction, not by stocking. We would also

contend that in reservoir environments, the stability of water levels may be more important than the amount of annual rainfall for many centrarchid species. While these two phenomena may be difficult to distinguish under current operational conditions in tributary reservoirs, future conditions will likely depend on the operational regime selected through the ROS process. **[10]**

Section 5.4: Water quality modeling is based on levels of dissolved oxygen, temperature and algal activity in two "representative" tributary storage reservoirs. While the development of this water quality model is useful for predicting overall conditions in the entire volume of water in a reservoir, it is a poor predictor of water quality aspects that directly affect fish populations, especially when used to evaluate different levels of reservoir filling. While we concede that a reservoir at full pond may potentially have a higher volume of anoxic water at certain times of the year, it also has a substantially greater amount of oxygenated littoral habitat, due to the inundation of coves. It is also unfortunate that the only full pool alternatives developed in the document involve late summer filling, when anoxic conditions would be most widespread. The extrapolation of water quality parameters from lower-elevation Tennessee reservoirs to North Carolina's mountain reservoirs is probably tenuous as well. Algal activity in Fontana or Hiwassee would likely be low compared to other tributary storage reservoirs, and in any case would represent much-needed primary productivity rather than any kind of harmful eutrophication. Because water quality is one of the resource categories presented to the public in the alternatives analysis process, it is unfortunate that the indices used for model input have so little relevance to quality of sport fisheries in mountain reservoirs. **[11]**

Section 5.7: Again as in section 5.4, availability of habitat, including modeled oxygen levels, is related to total reservoir volume, limiting the model's ability to predict fishery resource benefits of higher lake levels, which inundate greater amounts of littoral habitat but also increase the relative volume of anoxic water in the reservoir. Biodiversity is also applied to both tailrace and reservoir habitats as an indicator of quality. As with dissolved oxygen, this is more relevant to tailrace habitats than reservoir systems. Species diversity in reservoirs is determined as much by species introductions as by habitat quality; in oligotrophic systems like our mountain reservoirs, the addition of species over time has not necessarily benefited the quality of fishery resources. White bass and other temperate basses overlap and compete with walleye for prey resources, spotted bass compete for reproductive habitat and readily hybridize with other black basses, and river herring adversely impact walleye recruitment. While Fontana Reservoir may have a less diverse fish community than downstream reservoirs, we view the absence of alewife and yellow bass as a benefit, rather than an impairment, to fishery resources. The difficulties of incorporating biodiversity indices into reservoir quality assessment are acknowledged in the text, but it is not clear how much these indices affected relative scoring of operational alternatives. As indicated in our opening comments, we requested that TVA develop a full summer pool alternative incorporating stable water levels from April through June. While the document text discusses the adverse impacts of rapid spring water level changes on fish spawning, and describes existing TVA measures to briefly limit fluctuations during times of critical bass spawning temperatures, no operational alternative is proposed in the document that would both inundate cove areas and stabilize water levels in the April-June period. None of the alternatives presented in the DPEIS has a substantial projected benefit to sport fisheries. At least one such alternative should be developed and evaluated in the final EIS. **[12]**

Section 5.8: The wetlands section of the document deals primarily with wetland losses associated with various alternatives. It is likely that wetland areas will be created or enhanced under some alternatives, particularly those associated with water margins. The wetlands analysis used in the document is admitted by the preparers to be limited in predicting changes in wetland extents; as a result, any alternatives analysis based on wetlands impacts is likely to be tenuous at best. The information in this section would be clarified by including tables similar to the table in Section 4.8, comparing projected wetlands for each alternative. In the wetlands section as in other places in the DPEIS document, sweeping predictions about

impacts of alternatives on large geographic scales, such as "tributary reservoirs" or "mainstem tailwaters", seem not to be supported by data, and reflect the difficulty of modeling localized natural resource impacts on such scales. The associated appendix (D4b) provides details on wetlands analysis, but does not explain the theoretical basis or literature sources for reservoir-specific coefficients used to predict wetland impacts. Differences in impacts of alternatives listed in the appended analyses do not appear to be reflected in the document, where alternatives with dissimilar coefficient scores have similar statements evaluating wetland impacts. **[13]**

Section 5.11: Blueback herring is an invasive non-native aquatic species that potentially affects sport fisheries. While some species or life stages of species of game fish appear to benefit from blueback herring as a forage resource, other species or life stages may be adversely affected. Blueback herring should be included in the list and discussion of invasive animals. **[14]**

Section 5.13: The document attempts to predict threatened and endangered species impacts at the scope of the ROS. However, project-specific evaluations would be required for any change in operations that would adversely impact threatened or endangered species or their habitats. Because these species are typically limited in range or habitat requirements, it is likely that under any alternative chosen, projects with significant threatened and endangered species concerns would have to be treated differently than other projects of that type. Therefore, threatened and endangered species impacts may not be the best tool for evaluating alternatives on a basin-wide scale. We appreciate that flow improvements in the Appalachia bypass reach, mentioned in our scoping letter as a concern, are discussed in the DPEIS document and will be implemented under all operational alternatives. **[15]**

Section 5.24: Models used to predict recreational use of reservoirs under different operational alternatives assume reservoir level to be the only variable that would change. However, access area use information used for model input (Section 4.24) does not appear to distinguish between angling and non-angling boating use. Because quality of recreational fisheries may be affected by operational alternatives, the recreational model should include a modifier to reflect improved or impaired recreational boat fishing. Breakdowns of recreational users in the model should include separate seasonal estimates of angling and non-angling boaters based on or extrapolated from creel survey information on reservoirs in the region. Our recent surveys from reservoirs in the upper Little Tennessee Basin indicate that 70 to 95 percent of annual boating use and nearly all cool-season boating is associated with recreational fishing. Failure to incorporate impacts of alternatives on fishery resource quality therefore limits the utility of the existing recreational model on mountain reservoirs, and it should be revised accordingly. **[16]**

Section 5.25: Based on discussions between our staff and TVA representatives at the recent informational meeting, economic models include only recreation-associated jobs that occurred entirely within the Tennessee Valley, omitting those jobs associated with outfitters or fishing/hunting guide services based in adjacent areas. It is likely that the economic benefits of alternatives enhancing reservoir or tailrace recreation are therefore underestimated, particularly when compared to economic benefits of navigation, which are presumably confined to the mainstem region. All known economic impacts of each alternative should be included in comparative analysis for the final EIS. **[17]**

Chapter 6: Discussion of cumulative impacts of the ROS alternatives is brief, typically in the form of a summary paragraph for each of the affected resources. No comprehensive, multi-resource assessment of cumulative impacts is attempted. As the list of alternatives should be narrowed in the final document, the EIS should include a more detailed projection of overall cumulative impacts associated with the recommended operational changes. The DPEIS does not provide enough information on the methods used to evaluate cumulative impacts to allow us to comment on their validity; these should also be described in detail in the EIS. **[18]**

Chapter 7: As with the cumulative impacts chapter, the discussion of mitigation is generic in nature and does not outline specific areas where mitigation opportunities might be reduced or enhanced under different operational alternatives. Again we refer to our scoping comments, and suggest that our project-specific issues, and those of other resource agencies, form the basis of a list of mitigation opportunities for any resource impacts associated with the operational alternative recommended in the final EIS. **[19]**

As always, our field staff will be available to clarify any of the comments provided, or to cooperate as needed with development of the final EIS document. If you have questions regarding the information in this letter, please contact me at (919) 733-3633. **[20]**

Sincerely,

Fred A. Harris, Chief
Division of Inland Fisheries

Attachment

RESPONSE TO COMMENTS

1. We commend TVA for initiating a study of this magnitude to re-evaluate the potential of the greater Tennessee Valley's hydropower projects to serve multiple resource interests. We are optimistic that the ROS development process will identify important issues regarding the reservoirs, tailraces and other resources associated with these projects, and lead to better management of these resources.

Response to Comment 1: Comment noted.

2. In our scoping comments on the ROS (C. Goudreau, April 26, 2002), NCWRC staff outlined specific concerns regarding current TVA operating policies, including: conservation and management of shoreline habitat; magnitude of winter drawdown on large reservoirs; duration/timing of reservoir elevation changes; reservoir habitat development opportunities and a variety of reservoir-specific issues. A copy of our scoping letter is attached for your reference. In reviewing the DPEIS, we found no record of agency scoping comments, nor any specific responses to the concerns expressed in our letter or by any other resource agency. We recommend that the final Environmental Impact Statement (EIS) document include a section devoted to TVA responses to resource agency comments, providing detailed information on how each comment was incorporated into the ROS or why it was not incorporated.

Because the DPEIS has not addressed many of the concerns detailed in our scoping letter of April 26, 2002, and because neither our recommended operational alternatives nor any alternatives that would target benefits to natural resources associated with reservoirs have been developed in the document, we cannot support any of the alternatives presented. While strengths and weaknesses of several alternatives are discussed herein, we caution the document preparers that such discussions should not be used to categorize the NCWRC as favoring those alternatives in any simplification or summarization of public or agency comment. Our specific concerns are discussed below.

Response to Comment 2: As suggested, TVA is responding separately to federal and state agencies that submitted comments on the DEIS. TVA issued a 15-page document that summarized its evaluation of all of the comments received during the scoping period. This document also described how TVA intended to use those comments to establish the contents of the FEIS and better define the analyses that would be conducted to support this effort. The Scoping Document was widely distributed and made available on TVA's public web site. The reservoir system issues identified in this comment and in the earlier referenced scoping comments have been analyzed in this EIS to the extent that they relate to a system-wide operations policy. Although potential impacts on shoreline resources were analyzed as part of the ROS, possible changes to TVA's shoreline management policies and practices were not included. Those policies and practices were the subject of TVA's 1998 Shoreline Management Initiative EIS.

The focus of this programmatic EIS was to conduct detailed analysis on system-wide issues, not the kind of reservoir-specific issues that are the dominant focus of this and other comments from the North Carolina Wildlife Resources Commission. However, reservoir-specific recommendations that were received from scoping through the DEIS were considered in constructing all of the policy alternatives evaluated in this EIS, including the Preferred Alternative. Due to the infinite number of policy alternatives that could be developed from combinations of these recommendations, not all of the suggestions could

be specifically included in the detailed analysis, but the nature of the suggestions was addressed within the context of broader programmatic issues. For example, under TVA's Preferred Alternative, winter flood guides would be raised on Boone, Chatuge, Cherokee, Douglas, Norris, Nottely, South Holston, and Watauga Reservoirs. Also, the duration of the restricted summer drawdown would be extended on Blue Ridge, Chatuge, Cherokee, Douglas, Great Falls, Norris, Nottely, South Holston, Watauga, and Wheeler Reservoirs under the Preferred Alternative. During the implementation of any ROS decision, or in the context of other actions that may be proposed on reservoirs of specific interest to the Commission, reservoir-specific issues and concerns would be addressed, as appropriate. TVA encourages the Commission to raise any such concerns in that context.

3. In general, the scope of the ROS document is too geographically broad or operationally narrow to address many long-standing project-specific issues. In our scoping comments, we listed a variety of such issues, including: houseboat permitting on Fontana and other reservoirs; the shortage of low-water access on Chatuge Reservoir; the five-year "maintenance" drawdown of Fontana Reservoir; opportunities for creating small subimpoundments to improve fish habitat and recreational access, particularly at Siles Branch on Fontana Reservoir; improved boating access on Appalachia reservoir; impact of peaking flows from Nottely Reservoir on the Nottely River, and from Chatuge Reservoir on the Hiwassee River; and improved flows in the bypass reach below Appalachia Dam. As part of the agency response section recommended above, TVA should identify those agency comments and requests that are outside the intended scope of the ROS, and propose alternative processes by which those concerns might be addressed. In some cases, particularly regarding reservoir levels and tailrace flows, opportunity still exists to address these issues through a more detailed alternatives analysis within the ROS development process. Where applicable, we recommend that discussion of operational alternatives include references to specific agency concerns expressed during the scoping process. For example, would an operational shift toward more stable lake levels eliminate the current five-year drawdown practice on Fontana, or would alternatives intended to improve tailrace conditions affect the frequency or amplitude of peaking flows in the Nottely River? While we recognize that it would be impractical to consider all possible scenarios for all projects in the TVA system, the final EIS should address those reservoirs or river reaches identified by resource agencies as areas of particular concern.

Response to Comment 3: See Response to Comment 2. TVA agrees that the ROS EIS is too broad to appropriately address the kind of reservoir-specific concerns identified in this comment. As a programmatic level of review, the ROS EIS is purposefully structured for a broader level of analyses. However, the impact analyses, as well as Appendix C, do provide a great deal of information about individual reservoirs and tailwaters. TVA explained in some detail how alternative operations policies could affect the operation of specific reservoirs, including the reservoirs identified in this comment. Under the Preferred Alternative, a number of reservoirs would be maintained at higher levels for longer durations, including Fontana, Chatuge, Nottely, and Hiwassee. However, deep drawdowns on the reservoirs would still be periodically required for mandated dam safety inspections and maintenance.

4. The broad scope of the ROS document also confounds any meaningful interpretation of the alternatives summaries presented in public hearings, handouts and newsletters by TVA. Concepts such as recreation and water quality are too diverse and variable across the project area to be depicted as having unilaterally good or bad responses to any of the

operational alternatives. Such simplistic depiction of study results precludes any opportunity to address these issues by project, region or type of water body (reservoir versus tailrace), and may mislead the public into choosing an operational alternative that is not the most beneficial to their local resources and associated economies.

Response to Comment 4: By their nature, programmatic reviews have broad scopes and purposefully analyze issues and alternatives in broad ways. Indeed, if we allowed this programmatic review to be dominated by reservoir-specific concerns, decision makers' and the public's ability to understand the system-wide ramifications of proposed actions could easily be impaired. We do agree that generalizing the results of impact analyses could obscure unique effects on specific reservoirs. Based on our knowledge of TVA's reservoirs, the kinds of analyses and analytical methods used for the ROS, and TVA's extensive monitoring of various reservoir parameters, we do not think this has occurred to any material extent. We have provided detailed information about the potential ramifications of alternative operations policies on each of the reservoirs studied for the ROS. Additional details have now been provided about TVA's Preferred Alternative. We hope and anticipate that this will enable the public (and commenting agencies with reservoir-specific interests) to discern how their interests could be affected.

5. The analysis of operational alternatives in the ROS is based mainly on basin-wide predictive models. Based on our review of the DPEIS document and materials presented at the public meetings, the sources of data used for model input appear in some cases to be vague, arbitrary, inappropriate or incomplete. Where applicable, we have outlined our concerns about questionable model input in our comments on specific alternatives and document sections below. We encourage TVA to carefully review input data for all models used for alternatives analysis, and expand or balance these data sets as needed. This will ensure that the potential of available water resources, not the limits of predictive models, determines the amount of public benefit that is derived from the costly and difficult ROS development process.

In addition to concerns regarding input data, the calibration of the models appears to be biased. Benefits of operational changes are presented in document and handout graphics on the same four-point scale as adverse results, but benefits are rarely measured above one-half of the available scale, while adverse results employ the entire scale. While this is intended to show the relative importance, from TVA's perspective, of the beneficial and adverse effects of each alternative, the resulting graphs are of little use in comparing benefits of similar alternatives to a particular resource category. For example, the estimated benefit to recreation is shown as "slightly beneficial" for all three alternatives for which recreational benefits are projected. Because most of the benefit scale is unused, it is difficult or impossible to compare relative degrees of benefit among alternatives. Also, the unused portion of the benefit scale presumably represents outcomes that are impossible under any operational scenario. Because arbitrary values or composite index scores are used for all scaling of impacts, it would be more useful and informative to rate the maximum possible benefits at the top of the four-point scale, just as maximum adverse impacts are calibrated. This would allow a more insightful review of alternatives by members of the public who are unlikely to read the text of the document.

Response to Comment 5: As the comment suggested, TVA has carefully reviewed its modeling efforts associated with the ROS and has determined they were comprehensive, driven by valid data, tested extensively, and adequate to demonstrate real changes between the Base Case and any simulated alternative operations policy. Additional

information regarding the models is provided in Appendix C, and detailed results are contained in technical reports and other information that is part of the ROS administrative record. Some of the details about the models are as follows:

The flood risk analysis was driven primarily by continuous simulations of the Tennessee River basin over the 99-year period between 1903 and 2001. The watershed was conceptually subdivided into 55 sub-basins, and a continuous hydrologic inflow time series was developed for each sub-basin. This effort was supported by comprehensive hydrologic data records, including U.S. Geological Survey (USGS) stream gage records and TVA reservoir operations data. Where necessary, gaps in the hydrologic data record were filled using standard hydrologic techniques in such a way that mass balance was preserved throughout the basin, and—to the extent practical for a study of this nature—that the dynamic response of each sub-basin was quantified for a wide range of spatially and temporally varying flood events.

The reservoir simulation model used in the flood risk analysis was RiverWare. This software has been routinely used by TVA for several years. The model captures all of the physical processes that are important to effective flood analysis. Operational rules were developed to reflect existing and alternative operations policies, and significant effort was made to test them.

Given the scope of the project, it was not possible to perform typical model calibration. The model was never intended to reproduce every water release decision made over a period during which the extent of flood-regulating capability, operations policy and staffing levels, forecasting technology, and basin development were continuously evolving. The intent of the simulation effort was to be able to demonstrate any real, defensible changes between existing and proposed operations policies.

Model verification was performed by comparing simulated elevation and discharge hydrographs at key points throughout the system with observed data for 1991 to 2001. This period encompasses the time frame that most closely reflects TVA's existing operations policy (that is, the time since the implementation of the policy modifications associated with the Lake Improvement Plan in 1991).

Water quality model input varied between bodies of water. Any available data from the extensive TVA monitoring program and USGS gages were used. Geometry was obtained from the most recent sediment surveys. Meteorology was obtained from the nearest National Weather Service airport stations. Where available, inflow water quality was obtained from monitoring data on tributary streams. Where inflow water quality data were not available, values were used that represented similar streams.

Each waterbody (reservoir or tailwater) was calibrated individually by comparing at least 1 year of water temperature and DO data with model results. The calibration year was chosen for each waterbody based on the year for which the most data were available. The models were then linked together to create the system-wide model. After linkage, the system-wide model was calibrated by comparing model results with 8 years of measured data for water temperatures and DO concentrations. In most cases, computed water temperature matched measured data within 1 ºF, and DO concentrations matched measured data within 1 milligram per liter.

Using water quality model results, numerous metrics were computed for Water Quality, Aquatic Resources, Water Supply, Threatened and Endangered Species, and other resource areas. These metrics included, for example, the seasonal volume of suitable habitat, the volume of water with suitable assimilative capacity, and the hours per year that a DO target was met at a critical location.

These numerous metrics were then summarized by the resource specialists to form the four-point scale mentioned in the comment. The alternatives were judged based on the weight of evidence in the various metrics.

Additional information has been added to the FEIS to better define the four-point performance scale that was used to document the impacts of each alternative.

6. The DPEIS describes a process by which TVA staff condensed 65 preliminary alternatives into a refined list of 25, of which eight were developed in the document. While details on the 25 refined alternatives are provided in Appendix B, information on the initial screening is limited to a single page of text in Chapter 3 of the DPEIS, describing a process of consolidating and scoring preliminary alternatives by TVA staff to eliminate those that directly conflicted with operational capabilities. Although an overview of the public input process is provided in Section 1.6, operating options considered are described only in general terms. The final EIS document should describe the initial screening process in detail, including information on scoring criteria used to screen alternatives and a complete list of alternatives with justification for their selection or elimination. Without this information, it is impossible to determine whether our recommended alternative involving filling of reservoirs by April 1, which did not appear in the DPEIS, was eliminated in the preliminary screening, inappropriately consolidated with other operating options or omitted entirely from the alternatives review process.

Response to Comment 6: Additional information about the alternative screening process has been provided in Section 3.2 of the FEIS. Results of the flood risk analysis showed that changing reservoir operations to achieve full pool on April 1 would result in unacceptable increases in flood risk.

7. Although two alternatives involving longer retention of summer reservoir levels are presented in the DPEIS, neither alternative considers reaching summer lake levels earlier in the season. In our scoping comments, we specifically requested consideration of operational alternatives that produce higher and more stable reservoir water levels during the period from April through June, with a target date of April 1 for full pool. We reiterate that such an alternative should be considered, and request that it be included in the final EIS. While we recognize that flood control potential of reservoirs would be compromised during this period, water quality impacts attributed to the two existing full pool alternatives should be alleviated, because water level management during the late summer would be similar to existing conditions. By achieving full pool in April, the fisheries resources of tributary reservoirs would be enhanced though improved fish spawning success and reservoir primary productivity, with resulting benefits to recreation and associated local economies.

Response to Comment 7: See Response to Comment 6.

8. We also requested that extent of winter drawdown be reduced in at least one alternative, particularly on Fontana and Hiwassee reservoirs, where significant portions of the reservoirs are completely dewatered annually. While the “Equalized Winter/Summer Flood

Risk" alternative would partially achieve this objective, the alternative as considered in the DPEIS produces significant impacts to other resource categories, largely due to its basin-wide scope. We recommend that a similar alternative be evaluated that equalizes winter and summer water levels in the tributary reservoirs only, similar to the full pool models used in the recreational alternatives. It is likely that substantial improvements in winter and early spring water levels of tributary reservoirs could be compensated by slight modifications in water levels of larger downstream impoundments. This is particularly true of Fontana Reservoir, where extensive dewatering continues in spite of the more recent development of Tellico Reservoir downstream.

Response to Comment 8: TVA's Preferred Alternative was formulated partially in response to this comment. One of its features is reduced winter drawdowns at several reservoirs, including Chatuge, Fontana, Nottely, and Hiwassee.

9. Comparisons of reservoir elevations projected under the different operational alternatives are presented in the document using numeric data and box plots that show predicted elevations at one point during each season. Of greater concern to us is the rate and timing of reservoir filling during the critical spawning period from April through June. At the public meeting, TVA computer specialists were able to model continuous curves depicting daily water levels for specific reservoirs. For all alternatives developed in the final EIS, such curves should be included in the document for representative reservoirs, showing mean, minimum and maximum predicted water levels projected by each operational model.

Response to Comment 9: Appropriate plots for the Base Case and Preferred Alternative are provided in the FEIS (see Appendix C).

10. Section 4.7.8: In the discussion of existing sport fisheries, the document should clarify that in contrast to striped bass and striped bass hybrid fisheries, walleye populations in many tributary reservoirs have become naturalized and are now sustained by natural reproduction, not by stocking. We would also contend that in reservoir environments, the stability of water levels may be more important than the amount of annual rainfall for many centrarchid species. While these two phenomena may be difficult to distinguish under current operational conditions in tributary reservoirs, future conditions will likely depend on the operational regime selected through the ROS process.

Response to Comment 10: The FEIS was changed to clarify that walleye populations are naturally sustained in many tributary reservoirs. Stable water for centrarchid species are considered, along with other concerns, in Section 4.7.2 of the FEIS.

11. Section 5.4: Water quality modeling is based on levels of dissolved oxygen, temperature and algal activity in two "representative" tributary storage reservoirs. While the development of this water quality model is useful for predicting overall conditions in the entire volume of water in a reservoir, it is a poor predictor of water quality aspects that directly affect fish populations, especially when used to evaluate different levels of reservoir filling. While we concede that a reservoir at full pond may potentially have a higher volume of anoxic water at certain times of the year, it also has a substantially greater amount of oxygenated littoral habitat, due to the inundation of coves. It is also unfortunate that the only full pool alternatives developed in the document involve late summer filling, when anoxic conditions would be most widespread. The extrapolation of water quality parameters from lower-elevation Tennessee reservoirs to North Carolina's mountain reservoirs is probably tenuous as well. Algal activity in Fontana or Hiwassee would likely be low compared to other tributary storage reservoirs, and in any case would represent much-

needed primary productivity rather than any kind of harmful eutrophication. Because water quality is one of the resource categories presented to the public in the alternatives analysis process, it is unfortunate that the indices used for model input have so little relevance to quality of sport fisheries in mountain reservoirs.

Response to Comment 11: Indices that were used focused on the availability of suitable cool-water species habitat. This habitat was considered the most vulnerable habitat in reservoirs, even in oligotrophic mountain reservoirs. To respond to this comment, Hiwassee Reservoir was added to the representative reservoirs used for analysis in the FEIS.

12. Section 5.7: Again as in section 5.4, availability of habitat, including modeled oxygen levels, is related to total reservoir volume, limiting the model's ability to predict fishery resource benefits of higher lake levels, which inundate greater amounts of littoral habitat but also increase the relative volume of anoxic water in the reservoir. Biodiversity is also applied to both tailrace and reservoir habitats as an indicator of quality. As with dissolved oxygen, this is more relevant to tailrace habitats than reservoir systems. Species diversity in reservoirs is determined as much by species introductions as by habitat quality; in oligotrophic systems like our mountain reservoirs, the addition of species over time has not necessarily benefited the quality of fishery resources. White bass and other temperate basses overlap and compete with walleye for prey resources, spotted bass compete for reproductive habitat and readily hybridize with other black basses, and river herring adversely impact walleye recruitment. While Fontana Reservoir may have a less diverse fish community than downstream reservoirs, we view the absence of alewife and yellow bass as a benefit, rather than an impairment, to fishery resources. The difficulties of incorporating biodiversity indices into reservoir quality assessment are acknowledged in the text, but it is not clear how much these indices affected relative scoring of operational alternatives. As indicated in our opening comments, we requested that TVA develop a full summer pool alternative incorporating stable water levels from April through June. While the document text discusses the adverse impacts of rapid spring water level changes on fish spawning, and describes existing TVA measures to briefly limit fluctuations during times of critical bass spawning temperatures, no operational alternative is proposed in the document that would both inundate cove areas and stabilize water levels in the April-June period. None of the alternatives presented in the DPEIS has a substantial projected benefit to sport fisheries. At least one such alternative should be developed and evaluated in the final EIS.

Response to Comment 12: While it is true that reservoirs and some tailwaters are heavily managed for sport fisheries and that management actions can affect biodiversity, biodiversity is still an important measure of environmental quality. Non-native species stocked are not counted in biodiversity metrics for reservoirs. TVA's assessment of preliminary alternatives did include earlier and more stable fills of the reservoir system. Unfortunately, the increase in flood risks made an alternative with early fill or extended stabilization periods beyond the current 2-week period unreasonable at most tributary reservoirs.

As discussed in Section 4.7.2, TVA attempts to stabilize tributary reservoir water levels as the water temperature at a depth of 5 feet reaches 65 ºF, by minimizing for a 2-week period water level fluctuations (maintaining level within 1 foot per week, either higher or lower). Beginning as early as spring 2004, TVA proposes to adjust this program so that it stabilizes levels at 60 ºF in order to better help crappie, smallmouth bass, and early largemouth and

spotted bass spawning. Minimizing water level fluctuations is only one part of the fish spawning issue. Other environmental characteristics are important in determining larvae and juvenile fish production. For example, the amount of food and cover available for much of the initial growing season are critical to determining the number of catchable fish. Different aspects of the alternatives benefit different sport fisheries.

13. Section 5.8: The wetlands section of the document deals primarily with wetland losses associated with various alternatives. It is likely that wetland areas will be created or enhanced under some alternatives, particularly those associated with water margins. The wetlands analysis used in the document is admitted by the preparers to be limited in predicting changes in wetland extents; as a result, any alternatives analysis based on wetlands impacts is likely to be tenuous at best. The information in this section would be clarified by including tables similar to the table in Section 4.8, comparing projected wetlands for each alternative. In the wetlands section as in other places in the DPEIS document, sweeping predictions about impacts of alternatives on large geographic scales, such as “tributary reservoirs” or “mainstem tailwaters”, seem not to be supported by data, and reflect the difficulty of modeling localized natural resource impacts on such scales. The associated appendix (D4b) provides details on wetlands analysis, but does not explain the theoretical basis or literature sources for reservoir-specific coefficients used to predict wetland impacts. Differences in impacts of alternatives listed in the appended analyses do not appear to be reflected in the document, where alternatives with dissimilar coefficient scores have similar statements evaluating wetland impacts.

Response to Comment 13: As stated in Section 5.8, five policy alternatives would increase the duration of summer pool (Reservoir Recreation Alternatives A and B, the Tailwater Recreation Alternative, the Tailwater Habitat Alternative, and the Preferred Alternative). These five alternatives could result in some conversion of wetland habitat on affected reservoirs. Forested and scrub/shrub wetlands could be affected most by lengthened summer pools. Therefore, the primary effect of these five alternatives could be loss of forested wetlands and specific types of scrub/shrub wetlands (i.e., buttonbush swamps).

The metrics chosen to evaluate changes in wetland habitat were the best available, considering the programmatic nature of the analysis. The rationale for their selection is described in Sections 5.8.1 and 5.8.2, and in Appendix D4b.2. Coefficient scores vary widely because the proposed changes in summer and winter pool conditions associated with each alternative would affect each reservoir differently, particularly tributary reservoirs.

14. Section 5.11: Blueback herring is an invasive non-native aquatic species that potentially affects sport fisheries. While some species or life stages of species of game fish appear to benefit from blueback herring as a forage resource, other species or life stages may be adversely affected. Blueback herring should be included in the list and discussion of invasive animals.

Response to Comment 14: Discussions of blueback herring were added to Sections 4.11 and 5.11 of the FEIS.

15. Section 5.13: The document attempts to predict threatened and endangered species impacts at the scope of the ROS. However, project-specific evaluations would be required for any change in operations that would adversely impact threatened or endangered species or their habitats. Because these species are typically limited in range or habitat requirements, it is likely that under any alternative chosen, projects with significant

threatened and endangered species concerns would have to be treated differently than other projects of that type. Therefore, threatened and endangered species impacts may not be the best tool for evaluating alternatives on a basin-wide scale. We appreciate that flow improvements in the Appalachia bypass reach, mentioned in our scoping letter as a concern, are discussed in the DPEIS document and will be implemented under all operational alternatives.

Response to Comment 15: Threatened and endangered species have been addressed in the Biological Assessment. The Biological Opinion is included in Appendix G of the FEIS.

16. Section 5.24: Models used to predict recreational use of reservoirs under different operational alternatives assume reservoir level to be the only variable that would change. However, access area use information used for model input (Section 4.24) does not appear to distinguish between angling and non-angling boating use. Because quality of recreational fisheries may be affected by operational alternatives, the recreational model should include a modifier to reflect improved or impaired recreational boat fishing. Breakdowns of recreational users in the model should include separate seasonal estimates of angling and non-angling boaters based on or extrapolated from creel survey information on reservoirs in the region. Our recent surveys from reservoirs in the upper Little Tennessee Basin indicate that 70 to 95 percent of annual boating use and nearly all cool-season boating is associated with recreational fishing. Failure to incorporate impacts of alternatives on fishery resource quality therefore limits the utility of the existing recreational model on mountain reservoirs, and it should be revised accordingly.

Response to Comment 16: Two separate response models were developed: a "Trip Response Model" and a "Property Owners Model." The Trip Response Model was based on survey data collected at access points (public and commercial) on TVA lakes and tailwaters. The Property Owners Model was based on survey data collected from shoreline homeowners. The models were used to predict recreational use of reservoirs under different operations alternatives. For public and commercial access site users, the trip response model included variables to indicate primary activity (e.g., pleasure boating or fishing). The model used to predict recreational use by shoreline property owners was developed differently to address residency and does not include activity as a variable.

Trip Response Model: The recreational use estimates provided in Section 4.24 for public access sites were developed through on-site monitoring efforts at various TVA access points. On-site monitoring efforts did not distinguish between angling and non-angling boaters (boaters were counted as they exited the water but were not approached to determine the primary purpose of the activity). Recreationists were, however, surveyed as they exited each access point; the survey asked individuals to indicate the primary purpose of their trip. The Trip Response Model that was used to predict recreational use of reservoirs was developed with survey data, which is presented in Section 5.24.

For the Trip Response Model, a two-stage modeling approach was used. During the first stage, site and region characteristics were used to model the probability that any given lake would be visited on any one occasion. Site characteristics included distance from the respondent's home, the number of boat ramps and campgrounds at any given site, and measures of pool elevation on particular dates. Regional characteristics included measures of precipitation and temperature, and the percentage of the region covered by water. The information from this model was accumulated into an index of the "utility" associated with reservoir and tailwater recreation. The index was then used during the

second stage of the model, which related the utility index and individual characteristics to describe the total number of trips taken to all lakes and tailwaters during the 3-month period of interest.

The second-stage model included two binary variables, one for boating (BOATER) and one for angling (ANGLER), whose values were based on the respondent's self-reported primary activity. The data were structured in the following way:

	BOATER	ANGLER
Pleasure boater:	1	0
Fish from boat:	1	1
Fish from shore:	0	1

The statistical model estimated parameters α, β, γ, and η for the following specification,

$TRIPS = \exp(\alpha + \beta\ OTHER\ VARIABLES + \gamma\ BOATER + \eta\ ANGLER)$

Trips will differ between the three kinds of users, depending on the values for BOATER and ANGLER (reservoir-level information is contained in other variables).

The variable for boating was statistically significant; the variable for angling was not. Following standard econometric practice, however, all variables included in the statistical model were used to estimate the change in total trips. Thus, changes in total trips for each management scenario do differentiate between pleasure boaters, anglers who fish from boats, and anglers who fish from shore.

The potential differences between anglers and boaters suggested by the reviewer are incorporated into the Trip Response Model for public and commercial reservoir and tailwater access sites.

Property Owners Model: Primary recreation activity was not included as an explanatory variable in the Property Owners Model. Property owners typically access water from their properties and use the water for multiple activities. As a result, we could not relate a single primary purpose to the volume of activity. Estimated changes in use for property owners under various operations alternatives were based on the total change in recreation use, in trips by activity.

Summary: A distinction was made between angling and non-angling boating use for people accessing reservoirs and tailwaters at public and commercial access sites. This distinction was not made for shoreline property owners. Attention to anglers and their individual characteristics and needs are appropriately accounted for in the models. See Section 5.7 for a discussion of impacts on recreation fishery resources.

17. Section 5.25: Based on discussions between our staff and TVA representatives at the recent informational meeting, economic models include only recreation-associated jobs that occurred entirely within the Tennessee Valley, omitting those jobs associated with outfitters or fishing/hunting guide services based in adjacent areas. It is likely that the economic benefits of alternatives enhancing reservoir or tailrace recreation are therefore underestimated, particularly when compared to economic benefits of navigation, which are presumably confined to the mainstem region. All known economic impacts of each alternative should be included in comparative analysis for the final EIS.

Response to Comment 17: The regional economic model that was used, REMI, was custom-designed for the Tennessee Valley region, including the TVA Power Service Area and the watershed counties in North Carolina and Virginia. The model contains Bureau of Economic Analysis data for those counties, including jobs, demographics, and industries.

The economic analysis for recreation was based on surveys of recreationists and shoreline property owners that focused on net effects of changes in alternative reservoir operations policies. The surveys from customers outside the region were included in the economic analysis because they represented a net gain to the Tennessee Valley region.

TVA's random surveys of reservoir users should have captured some number of these out-of-region outfitters and guides, particularly since these surveys were conducted throughout the primary recreation season. Therefore, while it is possible that some of these outfitters and guides were left out using this analytical approach, the effect of this omission on the conclusions reached is likely to be minor.

18. Chapter 6: Discussion of cumulative impacts of the ROS alternatives is brief, typically in the form of a summary paragraph for each of the affected resources. No comprehensive, multi-resource assessment of cumulative impacts is attempted. As the list of alternatives should be narrowed in the final document, the EIS should include a more detailed projection of overall cumulative impacts associated with the recommended operational changes. The DPEIS does not provide enough information on the methods used to evaluate cumulative impacts to allow us to comment on their validity; these should also be described in detail in the EIS.

Response to Comment 18: The discussion of cumulative impacts was expanded in the FEIS.

19. Chapter 7: As with the cumulative impacts chapter, the discussion of mitigation is generic in nature and does not outline specific areas where mitigation opportunities might be reduced or enhanced under different operational alternatives. Again we refer to our scoping comments, and suggest that our project-specific issues, and those of other resource agencies, form the basis of a list of mitigation opportunities for any resource impacts associated with the operational alternative recommended in the final EIS.

Response to Comment 19: The discussion of possible mitigation measures in Chapter 7 was expanded in the FEIS, in light of the identification of a Preferred Alternative by TVA. Because this is a programmatic level of review, the identified mitigation measures are generally programmatic in nature.

20. As always, our field staff will be available to clarify any of the comments provided, or to cooperate as needed with development of the final EIS document. If you have questions regarding the information in this letter, please contact me at (919) 733-3633.

Response to Comment 20: Comment noted.

Tennessee Department of Environment and Conservation (TDEC) Division of Water Pollution Control

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Dear Mr. Nye:

This will transmit the comments of the Tennessee Department of Environment and Conservation on the Draft Programmatic Environmental Impact Statement for the TVA Reservoir Operations Study. TDEC very much appreciates TVA's commitment to a full and thorough review of all aspects of reservoir operations and to implementation of the alternative that will yield the greatest overall public benefit to citizens in the TVA area. We recognize that this has been a tremendous effort, and we believe that both the process and the product will be of lasting value in guiding TVA's resource management decisions for years to come. **[1]**

We agree with TVA that the preferred alternative should be that which yields the greatest overall public benefit while carefully valuing the importance of environmental quality. Among the options evaluated, we believe the base case best serves that objective. The commercial navigation alternative is close to the base case in most regards and also has merit. By comparison, the other alternatives present less overall benefit and involve unwarranted compromise in environmental objectives. **[2]**

We agree that where the study does identify minor or site-specific operational changes that will benefit some users without offsetting harm to others, those changes should be adopted. For example, TVA proposes under all alternatives to hold reservoir levels steady for a longer period to improve fish spawning. We certainly support that. **[3]**

Wherever possible, water quality standards should be attained and impairments resolved. We agree that ongoing programs and planned efforts to improve tailwater quality and control shoreline erosion should go forward. And we agree that TVA should work with appropriate agencies to develop a formal drought plan. **[4]**

Thank you for your work on this study and your consideration of these comments. **[5]**

Paul E. Davis, P.E. Director
Division of Water Pollution Control
Tennessee Department of Environment and Conservation

Paul Davis
Paul.Estill.Davis@state.tn.us
615/532-0632

RESPONSE TO COMMENTS

1. TDEC very much appreciates TVA's commitment to a full and thorough review of all aspects of reservoir operations and to implementation of the alternative that will yield the greatest overall public benefit to citizens in the TVA area. We recognize that this has been a tremendous effort, and we believe that both the process and the product will be of lasting value in guiding TVA's resource management decisions for years to come.

Response to Comment 1: We appreciate the Tennessee Department of Environment and Conservation's (TDEC's) participation on the Interagency Team that provided oversight for this effort.

2. We agree with TVA that the preferred alternative should be that which yields the greatest overall public benefit while carefully valuing the importance of environmental quality. Among the options evaluated, we believe the base case best serves that objective. The commercial navigation alternative is close to the base case in most regards and also has merit. By comparison, the other alternatives present less overall benefit and involve unwarranted compromise in environmental objectives.

Response to Comment 2: After extensive public review of the DEIS and additional analyses, TVA has formulated the Preferred Alternative, which would enhance recreation opportunities while lessening impacts on the environment and other operating objectives. The Preferred Alternative combines and adjusts desirable features of the alternatives identified in the DEIS to create a more feasible, publicly responsive alternative.

3. We agree that where the study does identify minor or site-specific operational changes that will benefit some users without offsetting harm to others, those changes should be adopted. For example, TVA proposes under all alternatives to hold reservoir levels steady for a longer period to improve fish spawning. We certainly support that.

Response to Comment 3: Unfortunately, TVA's analysis of flood risks indicates that risks become unacceptable if the length of the stabilization is longer than 2 weeks.

4. Wherever possible, water quality standards should be attained and impairments resolved. We agree that ongoing programs and planned efforts to improve tailwater quality and control shoreline erosion should go forward. And we agree that TVA should work with appropriate agencies to develop a formal drought plan.

Response to Comment 4: TVA plans to meet DO concentration and minimum flow targets established in the 1990 Lake Improvement Plan. Furthermore, TVA is available to work with the Tennessee Valley region states to develop a formal drought plan.

5. Thank you for your work on this study and your consideration of these comments.

Response to Comment 5: We appreciate TDEC's continued involvement in the study as part of the Interagency Team.

Tennessee Historical Commission

July 8, 2003

Mr. David Nye
Tennessee Valley Authority
400 West Summit Hill Drive/WT11A
Knoxville, Tennessee, 37902

RE: TVA, RESERVOIR OPERATIONS STUDY, UNINCORPOREATED, MULTI COUNTY

Dear Mr. Nye:

In response to your request, received on Thursday, July 3, 2003, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process. **[1]**

Considering available information, we find that the project as currently proposed MAY ADVERSELY AFFECT PROPERTIES THAT ARE ELIGIBLE FOR LISTIGN IN THE NATIONAL REGISTER OF HISTORIC PLACES. You should now begin immediate consultation with our office. **[2]** Please direct question and comments to Joe Garrison (615) 532-1550-103. We appreciate your cooperation.

Sincerely,

Herbert L. Harper
Executive Directory and
Deputy State Historic
Preservation Officer

HLH/jyg

RESPONSE TO COMMENTS

1. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process.

Response to Comment 1: Comment noted.

2. Project as currently proposed MAY ADVERSELY AFFECT PROPERTIES THAT ARE ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES. You should now begin immediate consultation with our office.

Response to Comment 2: TVA is executing an agreement with the seven Tennessee Valley region State Historic Preservation Officers, including Tennessee and other consulting parties, which outlines the actions TVA would take to avoid or mitigate adverse effects on historic properties associated with TVA's Preferred Alternative.

Tennessee Wildlife Resources Agency

September 2, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, TN 37902

Re: Reservoir Operations Draft EIS

Dear Mr. Nye:

The Tennessee Wildlife Resources Agency (TWRA) appreciates the opportunity to provide comments and recommendations on the Draft Reservoir Operations Study (ROS). Please find attached the Agency's recommendations for inclusion in a final EIS. We appreciate TVA's effort to consider the impact of changes in the reservoir operations on reservoir users and TVA ratepayers. Likewise, we appreciate TVA's effort to assess impacts on natural resources including wildlife, fish and aquatic life, and habitat. **[1]** In general, we find the least damaging alternative to be the "base case" and elements of the "navigation" operation. We are concerned that the recreation options will result in unacceptable adverse impact to wildlife resources, water quality, and habitat. **[2]**

We look forward to continued discussions with TVA technical staff regarding preparation of the final EIS and identification of preferred alternatives. If you have any questions or need additional information related to the attached TWRA comments and recommendations, please contact David McKinney, Division of Environmental Services, at (615) 781-6643. **[3]**

Sincerely

Gary T. Myers

Executive Director

DM:bg
attachment

Recreational Benefit Projects:

We find the economic analysis upon which the recreational option benefit projections are based to be suspect. Tennessee has approximately 270,000 registered boats; this number of watercraft does not include canoes, kayaks, or various inflatables. Unregistered boats and boats registered in other states routinely utilize Tennessee reservoirs. Assuming full, year-round occupancy of all available commercial boat slips, fewer than thirteen percent of Tennessee's registered watercraft are associated contractually with commercial marinas. The economic data utilized here are unverified. The in-state economic value of boat sales, fuel purchases, boat maintenance, lodging, fishing gear, and travel cost associated with public access boating should be fully and fairly assessed. The majority of boat owners, including those who trailer their boats in pursuit of seasonal sport fishing opportunity, have been given limited consideration. TVA's assumption that the majority of all economic benefit from boating is from or through commercial operations should be verified by an independent economic analysis conducted by an unbiased expert, such as the University of Tennessee. An independent economic evaluation would give TVA a much-needed credible basis for decision-making. **[4]**

Adverse Impacts:

Consideration of the adverse impacts of higher, longer duration reservoir levels on near shore and riparian habitat is inadequate. The adverse impacts on habitat and water quality from higher, longer duration reservoir levels adopted in the 1990's should be addressed as separate components of the current base case. Vegetation required for successful spawning and recruitment of sport fish and as essential riparian habitat has retreated to incrementally higher elevation contours and is unavailable as aquatic habitat for spawning, nursery areas, or as suitable habitat for riparian species such as migratory shore birds. Higher, longer duration reservoir levels above the base case will cause incrementally greater destruction of shoreline habitat. The Draft EIS appears to significantly underestimate the adverse impact of higher, longer summer pool levels, especially on main-stem reservoirs. TWRA is engaged in an innovative agency-citizen project to restore near-shore and shoreline habitat on Kentucky Lake. It is likely this effort will be negated if TVA initiates higher, longer duration summer pools. **[5]**

TVA should, as part of the Draft EIS, contract with independent habitat analysis expertise, such as the Oak Ridge National Laboratory (ORNL), to develop a comprehensive habitat behavior model relative to reservoir pool elevation and duration. This model should include analysis of the natural resource and economic impact of lost near-shore and shoreline habitat on fish and aquatic life, migratory shorebirds, and waterfowl. This analysis should also consider the impact of extended higher pool levels on shoreline erosion. Exposed mud-flats are essential habitat for wildlife resources. **[6]**

Stable Spring Spawning Levels:

Fish and aquatic life resources in Tennessee would benefit from stable reservoir surface elevations for spring spawning. Given the variability of spring reservoir inflow and power demands, TVA's commitment to providing stable spring spawning conditions is no stronger than the base case. TWRA request that TVA prepare an option which provides that each tributary and each main-stem reservoir be provided a minimum of one year of stable spring conditions in each four-year cycle. Such a rotation in non-average spring inflow years would greatly assist to prevent the loss of or greatly diminished sport fish opportunity on a given reservoir. **[7]**

Tailwater Restoration:

TVA's agreement with the State of Tennessee as found in the Phased Approach to Tailwater Restoration, later advanced and expanded in the TVA Reservoir Improvement Program, has resulted in TVA becoming the global leader in tailwater management and restoration. TVA's decision to maintain and improve this program is the most significant commitment and outcome of the ROS review. In general terms, TWRA is opposed to options, or elements of options, the consequences of which are not supportive of or in harmony with tailwater restoration and improvement. If anything, we believe that public support, interest, and enthusiasm for successful restoration projects such as Watauga, South Holton, Douglas, and Cherokee tail waters is under appreciated in the Draft EIS from both a natural resource and economic impact perspective. We recommend to you the recent report by Tennessee Tech University (TTU) entitled "Net Value of Trout Fishing Opportunities in Tennessee Tailwaters", by Williams and Bettoli. **[8]**

Navigation Option:

Fewer than 8% of TVA reservoir users are lakefront property owners. As Tennessee's population grows, this percentage will rapidly diminish at the same time demand for reservoir use increases. Of the options considered, the navigation option provides economic, public safety, and societal benefits for all TVA ratepayers and reservoir users. Although the navigation option appears to have little adverse impact on natural resources, TWRA would prefer to see an independent evaluation of the impact of this option on near-shore and shoreline habitat on both tributary and main-stem reservoirs. If TVA's no adverse impact projections are verified, TWRA would be supportive of adoption of the navigation option. **[9]**

Kentucky Lake:

Kentucky Lake is considered by many to be the crown jewel of the TVA reservoir system. The tremendous biological diversity and productivity found in Kentucky Lake is due largely to continuing riverine characteristics. Kentucky Lake's diverse freshwater mussel fauna includes both federally protected species and commercially harvested mussels that are the foundation of the global cultured pearl industry. Commercial harvest of fish, including paddlefish and their roe, is economically significant. Important sport fish include crappie, sauger, black bass, and catfish.

In the latter half of the 1980's, Kentucky Lake experienced significant problems, including diseased and blemished fish and a sustained die-off of freshwater mussels. These problems were related to drought-induced reductions in flow, elevated water temperatures, lower dissolved oxygen levels, and reduced assimilative capacity. These problems were related to a shift from riverine conditions to typical reservoir conditions. To address this issue, TVA made a commitment in the early 1990's to maintain a 12,000 cubic feet per second (CFS) flow through Kentucky Lake to maintain both water quality and riverine character. **[10]**

Keeping Kentucky Lake at full summer pool into late summer and/or early fall, particularly in years of low to normal inflow, will result in a return of the unacceptable occurrences of the mid to late 1980's. The best scenario for maintaining the biological health of this highly important resource is begin draw down from summer pool earlier than the existing base case and operate Pickwick and Kentucky dams in tandem to maximize Kentucky Lake's riverine character. **[11]**

Should TVA propose an ill-advised extension of summer pool conditions beyond the base case, TWRA will request the U.S. Fish and Wildlife Service (USFWS) to require formal consultation regarding the potential impact on special status species, the preparation of low to normal inflow contingency plan, an extensive biological monitoring program for fish, benthic organisms and freshwater mussels, and extensive mitigation for lost shorebird habitat in the form of artificially flooded shorebird habitat. **[12]**

RESPONSE TO COMMENTS

1. We appreciate TVA's effort to consider the impact of changes in the reservoir operations on reservoir users and TVA ratepayers. Likewise, we appreciate TVA's effort to assess impacts on natural resources including wildlife, fish and aquatic life, and habitat.

Response to Comment 1: Comment noted.

2. In general, we find the least damaging alternative to be the "base case" and elements of the "navigation" operation. We are concerned that the recreation options will result in unacceptable adverse impact to wildlife resources, water quality, and habitat.

Response to Comment 2: Comment noted.

3. We look forward to continued discussions with TVA technical staff regarding preparation of the final EIS and identification of preferred alternatives.

Response to Comment 3: Comment noted.

4. Recreational Benefit Projects: We find the economic analysis upon which the recreational option benefit projections are based to be suspect. Tennessee has approximately 270,000 registered boats; this number of watercraft does not include canoes, kayaks, or various inflatables. Unregistered boats and boats registered in other states routinely utilize Tennessee reservoirs. Assuming full, year-round occupancy of all available commercial boat slips, fewer than thirteen percent of Tennessee's registered watercraft are associated contractually with commercial marinas. The economic data utilized here are unverified. The in-state economic value of boat sales, fuel purchases, boat maintenance, lodging, fishing gear, and travel cost associated with public access boating should be fully and fairly assessed. The majority of boat owners, including those who trailer their boats in pursuit of seasonal sport fishing opportunity, have been given limited consideration. TVA's assumption that the majority of all economic benefit from boating is from or through commercial operations should be verified by an independent economic analysis conducted by an unbiased expert, such as the University of Tennessee. An independent economic evaluation would give TVA a much-needed credible basis for decision-making.

Response to Comment 4: Recreational economic benefits were estimated based on survey data of customers at facilities located on reservoirs (recreationists at locations where water-based recreation is the primary activity), marina operator customers, and reservoir property owners. The study measured changes in recreation value to the Tennessee Valley region that corresponded to changes in reservoir operations; this change would occur primarily through water-based recreation.

The numbers shown for commercial use facilities included boats on trailers that were launching from those facilities, in addition to watercraft moored at the facility.

The EIS recreation analysis and results are consistent with a 2003 recreation study in six counties of East Tennessee conducted by the University of Tennessee's Center for Business and Economic Research, which is available at their web site at

http://bus.utk.edu/cber/lakeres.htm. TVA retained nationally recognized recreation experts to lead the analysis of recreation effects.

5. Adverse Impacts: Consideration of the adverse impacts of higher, longer duration reservoir levels on near shore and riparian habitat is inadequate. The adverse impacts on habitat and water quality from higher, longer duration reservoir levels adopted in the 1990's should be addressed as separate components of the current base case. Vegetation required for successful spawning and recruitment of sport fish and as essential riparian habitat has retreated to incrementally higher elevation contours and is unavailable as aquatic habitat for spawning, nursery areas, or as suitable habitat for riparian species such as migratory shore birds. Higher, longer duration reservoir levels above the base case will cause incrementally greater destruction of shoreline habitat. The Draft EIS appears to significantly underestimate the adverse impact of higher, longer summer pool levels, especially on main-stem reservoirs. TWRA is engaged in an innovative agency-citizen project to restore near-shore and shoreline habitat on Kentucky Lake. .It is likely this effort will be negated if TVA initiates higher, longer duration summer pools.

Response to Comment 5: TVA recognizes that higher water levels for longer durations are likely to increase shoreline erosion. Aquatic vegetation along the shoreline is an important factor in the survival of many species and requires a period of regrowth each year to continue its benefits. TVA's Preferred Alternative does not include any operating guide changes for Kentucky Reservoir.

6. TVA should, as part of the Draft EIS, contract with independent habitat analysis expertise, such as the Oak Ridge National Laboratory (ORNL), to develop a comprehensive habitat behavior model relative to reservoir pool elevation and duration. This model should include analysis of the natural resource and economic impact of lost near-shore and shoreline habitat on fish and aquatic life, migratory shorebirds, and waterfowl. This analysis should also consider the impact of extended higher pool levels on shoreline erosion. Exposed mud-flats are essential habitat for wildlife resources.

Response to Comment 6: The effects of the alternatives on flats and other shoreline habitats are an important component of the terrestrial ecology evaluation. The FEIS has been modified to better address these habitats. In addition to the USFWS, a number of other federal and state agencies have worked closely with TVA during the preparation of the ROS and its EIS. These agencies have provided an appropriate level of independent oversight of this effort.

7. Stable Spring Spawning Levels: Fish and aquatic life resources in Tennessee would benefit from stable reservoir surface elevations for spring spawning. Given the variability of spring reservoir inflow and power demands, TVA's commitment to providing stable spring spawning conditions is no stronger than the base case. TWRA request that TVA prepare an option which provides that each tributary and each main-stem reservoir be provided a minimum of one year of stable spring conditions in each four-year cycle. Such a rotation in non-average spring inflow years would greatly assist to prevent the loss of or greatly diminished sport fish opportunity on a given reservoir.

Response to Comment 7: TVA would attempt to stabilize tributary reservoir levels for 2 weeks after the water temperature at 5 feet has reached 60 ºF. Unfortunately,

TVA's analysis of flood risks indicates that risks become unacceptable, if the length of the stabilization is longer than 2 weeks—even on a rotational basis.

8. Tailwater Restoration: TVA's agreement with the State of Tennessee as found in the Phased Approach to Tailwater Restoration, later advanced and expanded in the TVA Reservoir Improvement Program, has resulted in TVA becoming the global leader in tailwater management and restoration. TVA's decision to maintain and improve this program is the most significant commitment and outcome of the ROS review. In general terms, TWRA is opposed to options, or elements of options, the consequences of which are not supportive of or in harmony with tailwater restoration and improvement. If anything, we believe that public support, interest, and enthusiasm for successful restoration projects such as Watauga, South Holton, Douglas, and Cherokee tail waters is under appreciated in the Draft EIS from both a natural resource and economic impact perspective. We recommend to you the recent report by Tennessee Tech University (TTU) entitled "Net Value of Trout Fishing Opportunities in Tennessee Tailwaters" by Williams and Bettoli.

Response to Comment 8: TVA plans to meet DO concentrations and minimum flow targets established in the 1990 Lake Improvement Plan. In addition, TVA proposes to commit to minimum flows in the Apalachia Dam Bypass reach (as described in Chapter 3 and Appendix B of the EIS) in order to help restore that tailwater. The independent contractor considered the Williams and Bettoli data in the analysis.

9. Navigation Option: Fewer than 8% of TVA reservoir users are lakefront property owners. As Tennessee's population grows, this percentage will rapidly diminish at the same time demand for reservoir use increases. Of the options considered, the navigation option provides economic, public safety and societal benefits for all TVA ratepayers and reservoir users. Although the navigation option appears to have little adverse impact on natural resources, TWRA would prefer to see an independent evaluation of the impact of this option on near-shore and shoreline habitat on both tributary and mainstem reservoirs. If TVA's no adverse impact projections are verified, TWRA would be supportive of adoption of the navigation option.

Response to Comment 9: TVA retained a number of outside experts in various disciplines to assist in ROS analyses. TVA also worked closely with individuals representing various public stakeholders and federal and state agencies during the preparation of the ROS EIS. These activities ensured an appropriate level of independent oversight of the ROS EIS. TVA's Preferred Alternative now has been identified in the FEIS.

10. Kentucky Lake: Kentucky Lake is considered by many to be the crown jewel of the TVA reservoir system. The tremendous biological diversity and productivity found in Kentucky Lake is due largely to continuing riverine characteristics. Kentucky Lake's diverse freshwater mussel fauna includes both federally protected species and commercially harvested mussels that are the foundation of the global cultured pearl industry. Commercial harvest of fish, including paddlefish and their roe, is economically significant. Important sport fish include crappie, sauger, black bass, and catfish.

In the latter half of the 1980's, Kentucky Lake experienced significant problems, including diseased and blemished fish and a sustained die-off of freshwater

mussels. These problems were related to drought-induced reductions in flow, elevated water temperatures, lower dissolved oxygen levels, and reduced assimilative capacity. These problems were related to a shift from riverine conditions to typical reservoir conditions. To address this issue, TVA made a commitment in the early 1990's to maintain a 12,000 cubic feet per second (CFS) flow through Kentucky Lake to maintain both water quality and riverine character.

Response to Comment 10: TVA plans to meet DO concentrations and minimum flow targets established in the 1990 Lake Improvement Plan.

11. Keeping Kentucky Lake at full summer pool into late summer and/or early fall, particularly in years of low to normal inflow, wil1 result in a return of the unacceptable occurrences of the mid to late 1980's. The best scenario for maintaining the biological health of this highly important resource is begin draw down from summer pool earlier than the existing base case and operate Pickwick and Kentucky dams in tandem to maximize Kentucky Lake's riverine character.

Response to Comment 11: As discussed in TVA's responses to the comments from the Corps and others, TVA is not proposing to alter the operating guide curve for Kentucky Reservoir as an element of its Preferred Alternative.

12. Should TVA propose an ill-advised extension of summer pool conditions beyond the base case, TWRA will request the U.S. Fish and Wildlife Service (USFWS) to require formal consultation regarding the potential impact on special status species, the preparation of low to normal inflow contingency plan, an extensive biological monitoring program for fish, benthic organisms and freshwater mussels, and extensive mitigation for lost shorebird habitat in the form of artificially flooded shorebird habitat.

Response to Comment 12: TVA has consulted with USFWS on the potential impacts of the Preferred Alternative on threatened and endangered species. The results of this consultation are incorporated into Section 5.13 and Appendix G of the FEIS. Projected loss of important shoreline habitat, such as flats, has been substantially reduced by the decision to not include operating guide curve changes on Kentucky Reservoir as part of the Preferred Alternative.

Commonwealth of Virginia Department of Environmental Quality, Department of Conservation and Recreation, and Department of Transportation

September 2, 2003

Mr. David Nye
Reservoir Operations Study Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT11A
Knoxville, Tennessee 37902

RE: Draft Programmatic Environmental Impact Statement, Reservoir Operations Study
DEQ-03-130F

Dear Mr. Nye:

The Commonwealth of Virginia has completed its review of the above document (hereinafter Draft PEIS). The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents and responding to appropriate federal officials on behalf of the Commonwealth. The following agencies took part in this review:

Department of Environmental Quality (hereinafter "DEQ")
Department of Conservation and Recreation
Department of Transportation.

In addition, the Department of Game and Inland Fisheries and the Department of Historic Resources were invited to comment.

Project Description

TVA is evaluating its reservoir operations in order to determine whether they can be improved throughout the Tennessee Valley (Draft PEIS, page ES-3). The watershed includes portions of western Virginia (Draft PEIS, page 1-2, Figure 1.1-01). The document examines the "Base Case" (present operational scheme) and seven alternative schemes, focused on hydropower, recreation, flood control, habitat, and navigation (Draft PEIS, page ES-5; see pages 3-10 through 3-19). TVA has not indicated a preferred alternative; it will make a selection following the receipt of additional public input and articulate that selection in the Final PEIS (Draft PEIS, page ES-24).

Environmental Impacts and Mitigation

1. General Comment. Environmental issues addressed in this document include aquatic habitat, water quality, water quantity, erosion control, protection of threatened or endangered species, wetlands, and other ecologically sensitive areas. The information appears accurate and addresses the complex nature of accommodating the many concerns associated with dam operations. **[1]**

2. Natural Heritage Resources. The Department of Conservation and Recreation (DCR) has searched its Biotics Data System for occurrences of natural heritage resources in the areas covered by the Study. "Natural heritage resources" are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations. According to DCR, natural heritage resources are documented in the Study area, but the scope of the schemes under study and the distance to the resources indicate to DCR that the schemes are unlikely to give rise to adverse effects upon the resources.

Under a Memorandum of Agreement between DCR and the Department of Agriculture and Consumer Services (VDACS), DCR has the authority to report for VDACS on state-listed endangered and threatened plant and insect species. According to DCR, the activities undertaken pursuant to the Study would not affect any such species. **[2]**

3. Exotic Species Concern. The Draft PEIS indicates that the commercial navigation alternative would increase shipper savings (by way of raised winter reservoir elevations in the mainstem reservoirs, see page ES-22 and also page 5.11-3, section 5.11.6). The Department of Conservation and Recreation is concerned that increased commercial navigation in the Tennessee River system may facilitate exotic species transmission, especially with larger vessels retaining foreign ballast water. Such species may adversely affect natural heritage resources. The Draft PEIS mentions that colonization of shoreline habitats by red fire ants might result from raised reservoir levels under this alternative; but it states that increased winter reservoir elevations could reduce the spread of some invasive terrestrial plant species (page 5.11-3, section 5.11.6). The Department of Conservation and Recreation recommends that TVA investigate ways to avoid the transmission of invasive species. **[3]**

4. Water Resources and Wetlands. According to DEQ's Water Division, only one of the reservoirs in the TVA system is in Virginia. The northern portion of South Holston Lake is just north of the Tennessee-Virginia border in Washington County, Virginia; the dam which is responsible for the reservoir is in Tennessee.

Fringe wetlands around the South Holston Lake and along other bodies of surface water will be affected by water level adjustments in that lake under any of the alternatives. Some fringe wetlands will re-colonize an area from which they have been removed through either flooding from raised water levels or drying out from lowered water levels. **[4]**

According to DEQ's Water Division, the Washington County Public Service Authority (WCSA) plans to install a water supply intake in the upper reaches of South Holston Lake. Under the current operational scheme, unrestricted drawdown of the lake beginning in August lowers the lake level at the same time that this new intake would be most in demand. The alternative for WCSA would be to take water from the Middle Fork of the Holston River during this low-flow season; that course of action would be harmful to minimum in-stream flow objectives. DEQ's

Water Division recommends that TVA select the preferred alternative with this WCSA project in mind. **[5]**

Of the alternatives presented, it appears that "Reservoir Recreation A" and "Commercial Navigation" alternatives will result in the least impacts to water resources. The Commonwealth would support either of these as the preferred alternative. We would not recommend selection of any of the following alternatives because they would give rise to adverse effects to wetlands and water quality: **[6]**

"Reservoir Recreation B"
"Summer Hydropower"
"Equalized Summer/Winter Flood Risk"
"Tailwater Recreation" or
"Tailwater Habitat."

5. Natural Areas. The Department of Conservation and Recreation indicates that there are no State Natural Area Preserves in the Study area. **[7]**

6. Transportation Impacts. The operational schemes are unlikely to have long-term, negative impacts on traffic, according to the Virginia Department of Transportation (VDOT). Any operational work with the potential to affect roads or other transportation facilities should be coordinated with VDOT's Bristol District Office (Ken Brittle, telephone (276) 669-9903, extension 203). **[8]**

Thank you for the opportunity to review this document. We look forward to reviewing the Final Programmatic EIS for the Reservoir Operations Study. **[9]**

Sincerely,

Ellie L. Irons
Program Manager
Office of Environmental Impact Review

Enclosures

cc: Brian D. Moyer, DGIF
Derral Jones, DCR
Ellen Gilinsky, DEQ-Water
Allen J. Newman, DEQ-SWRO
David V. Grimes, VDOT
Ethel R. Eaton, DHR

RESPONSE TO COMMENTS

1. *General Comment.* Environmental issues addressed in this document include aquatic habitat, water quality, water quantity, erosion control, protection of threatened or endangered species, wetlands, and other ecologically sensitive areas. The information appears accurate and addresses the complex nature of accommodating the many concerns associated with dam operations.

Response to Comment 1: Comment noted.

2. *Natural Heritage Resources.* The Department of Conservation and Recreation (DCR) has searched its Biotics Data System for occurrences of natural heritage resources in the areas covered by the Study. "Natural heritage resources" are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations. According to DCR, natural heritage resources are documented in the Study area, but the scope of the schemes under study and the distance to the resources indicate to DCR that the schemes are unlikely to give rise to adverse effects upon the resources.

Under a Memorandum of Agreement between DCR and the Department of Agriculture and Consumer Services (VDACS), DCR has the authority to report for VDACS on state-listed endangered and threatened plant and insect species. According to DCR, the activities undertaken pursuant to the Study would not affect any such species.

Response to Comment 2: As indicated in Section 4.13 and in Appendix D6a, Heritage Database records available to TVA indicated that five federal- and/or state-listed species have been encountered within 1-mile buffers around the TVA reservoirs and regulated stream reaches in Virginia. This relatively large initial search area was used to identify reported occurrences of any listed species that might be affected by changes in the reservoir operations policy. Potential impacts of the alternatives on these species, which are listed in Appendix D, Table D6a-01, are addressed in Section 5.13.

3. *Exotic Species Concern.* The Draft PEIS indicates that the commercial navigation alternative would increase shipper savings (by way of raised winter reservoir elevations in the mainstem reservoirs, see page ES-22 and also page 5.11-3, section 5.11.6). The Department of Conservation and Recreation is concerned that increased commercial navigation in the Tennessee River system may facilitate exotic species transmission, especially with larger vessels retaining foreign ballast water. Such species may adversely affect natural heritage resources. The Draft PEIS mentions that colonization of shoreline habitats by red fire ants might result from raised reservoir levels under this alternative; but it states that increased winter reservoir elevations could reduce the spread of some invasive terrestrial plant species (page 5.11-3, section 5.11.6). The Department of Conservation and Recreation recommends that TVA investigate ways to avoid the transmission of invasive species.

Response to Comment 3: Larger vessels with the capability of holding ballast water do not typically navigate the Tennessee River system, where barge traffic is the primary means of transport. TVA is working with several groups—locally and regionally—to address these invasive species issues.

4. *Water Resources and Wetlands.* According to DEQ's Water Division, only one of the reservoirs in the TVA system is in Virginia. The northern portion of South Holston Lake is

just north of the Tennessee-Virginia border in Washington County, Virginia; the dam which is responsible for the reservoir is in Tennessee.

Fringe wetlands around the South Holston Lake and along other bodies of surface water will be affected by water level adjustments in that lake under any of the alternatives. Some fringe wetlands will re-colonize an area from which they have been removed through either flooding from raised water levels or drying out from lowered water levels.

Response to Comment 4: Comment noted.

5. According to DEQ's Water Division, the Washington County Public Service Authority (WCSA) plans to install a water supply intake in the upper reaches of South Holston Lake. Under the current operational scheme, unrestricted drawdown of the lake beginning in August lowers the lake level at the same time that this new intake would be most in demand. The alternative for WCSA would be to take water from the Middle Fork of the Holston River during this low-flow season; that course of action would be harmful to minimum in-stream flow objectives. DEQ's Water Division recommends that TVA select the preferred alternative with this WCSA project in mind.

Response to Comment 5: This is a reservoir-specific issue that should be addressed in a context other than this programmatic EIS, which considers system-wide operations policy changes. However, TVA understands that the proposed intake for WCSA has generated debate, and TVA is committed to working with other state and federal agencies to arrive at the best solution. Maintaining higher levels at South Holston Reservoir may appear to be an option but, under dry hydrologic conditions, that might not be possible because there might not be enough water to accomplish that objective. Other alternatives should be explored. For example, because the low flow in the South Fork Holston River appears to be similar to the low flow in the Middle Fork, splitting the withdrawal between the two rivers would lessen the impact on the Middle Fork. An additional alternative would be to move the WCSA intake further down into the South Holston Reservoir, so that it would not be influenced by normal reservoir drawdown.

6. Of the alternatives presented, it appears that "Reservoir Recreation A" and "Commercial Navigation" alternatives will result in the least impacts to water resources. The Commonwealth would support either of these as the preferred alternative. We would not recommend selection of any of the following alternatives because they would give rise to adverse effects to wetlands and water quality:

"Reservoir Recreation B"
"Summer Hydropower"
"Equalized Summer/Winter Flood Risk"
"Tailwater Recreation" or
"Tailwater Habitat."

Response to Comment 6: TVA formulated its Preferred Alternative with the intent of capturing the beneficial elements of the identified alternatives, while lessening adverse impacts—particularly those related to flood control and water quality.

7. *Natural Areas.* The Department of Conservation and Recreation indicates that there are no State Natural Area Preserves in the Study area.

Response to Comment 7: Comment noted.

8. *Transportation Impacts*. The operational schemes are unlikely to have long-term, negative impacts on traffic, according to the Virginia Department of Transportation (VDOT). Any

operational work with the potential to affect roads or other transportation facilities should be coordinated with VDOT's Bristol District Office (Ken Brittle, telephone (276) 669-9903, extension 203).

Response to Comment 8: Comment noted.

9. Thank you for the opportunity to review this document. We look forward to reviewing the Final Programmatic EIS for the Reservoir Operations Study.

Response to Comment 9: We appreciate Virginia's continued involvement in the ROS as a member of the Interagency Team.

Tribal Comments (Eastern Band of Cherokee Indians)

September 24th 2003

Mr. David Nye
ROS Project Manager Tennessee Valley Authority
WT 11A
400 West Summit Drive
Knoxville
TN 37902

Re: ROS Comments

Dear Mr. Nye,

I attended the Murphy, NC Workshop and have subsequently obtained hardcopy study documents from your staff. The Tribal Environmental Office is most certainly interested in providing you with our comments on the study, however due to my commitments to the Duke Power FERC re-licensing negotiations I have been unable to formulate our comments in time for your deadline.

I hereby request a sixty day extension past the deadline for our written response. I also understand a similar request has been made by the Tribal Cultural Resources Office to the TVA Cultural Resources Office. **[1]** The Tribal Environmental and Cultural Resources Offices will work together to produce comments on the study that will endeavor to take a holistic approach towards protection of natural and cultural resources.

Sincerely,

Michael Bolt

Eastern Band of Cherokee Indians
TRIBAL UTILITIES
MIKE BOLT
WATER QUALITY STANDARDS
P. O. BOX 547, OLD #4 RD. 828-497-6824
CHEROKEE, N. C. 28719 FAX: 828-497-5419
michbolt@nc-cherokee.com

Cc. Cannen Mclntyre,
TEO Lora K.O. Taylor, THPO
Michelle Hamilton, THPO

RESPONSE TO COMMENT

1. The Tribal Environmental Office is most certainly interested in providing you with our comments on the study, however due to my commitments to the Duke Power FERC re-licensing negotiations I have been unable to formulate our comments in time for your deadline.

I hereby request a sixty day extension past the deadline for our written response. I also understand a similar request has been made by the Tribal Cultural Resources Office to the TVA Cultural Resources Office.

Response to Comment 1: TVA continued to accept comments (through mid-October) from tribes and persons who informed the agency that their comments would be late.

Tribes of the Eastern Oklahoma Region

AUG 29, 2003

Mr. David Nye
ROS Project Manager
Tennessee Valley Authority, WT 11A
400 West Summit Drive
Knoxville, Tennessee 37902

Dear Mr Nye:

On July 14, 2003, the Eastern Oklahoma Regional Office (EORO), Bureau of Indian Affairs (BIA), received a copy of an Environmental Impact Statement (EIS) from the Tennessee Valley Authority, Knoxville, Tennessee, regarding changes in the operating policies for the Tennessee Valley (TV) reservoir. The EIS identified seven alternative operating policies and a "no-action" alternative.

The TV reservoir may be within the aboriginal lands of the following Tribes of the Eastern Oklahoma Region: Muscogce (Creek) Nation, Cherokee Nation of Oklahoma, United Keetoowah Band of Cherokees of Oklahoma, Kialegee Tribal Town, Thlopthlocco Tribal Town and the Alabama-Quassarte Tribal Town. The policy changes may impact cultural and/or religious properties that are significant to these tribes. Your letter will be forwarded to the BIA Agencies/Field Stations, Eastern Oklahoma Region, for distribution to these tribes for review and comments. For your information, a list is enclosed of the formal contact person and the mailing address for each Tribe referenced above. **[1]**

If additional information is needed, please contact Mr. Jimmy Gibson, Acting Branch Chief, Branch of Natural Resources, Eastern Oklahoma Regional Office, at (918) 781-4642.

Respectively,

J. Mannis

Regional Director
U.S. Bureau of Indian Affairs
Eastern Oklahoma Regional Office

Eastern Oklahoma Region Tribes

Honorable Chadwick Smith
Principal Chief, Cherokee Nation
P.O. Box 948
Tahlequah, Oklahoma 74465

Honorable Dallas Proctor
Chief, United Keetoowah Band of Cherokees
P.O. Box 746
Tahlequah, Oklahoma 74465

Honorable Tarpie Yargee
Chief, Alabama-Quassarte Tribal Town
P.O. Box 187
Wetumka, Oklahoma 74883

Honorable Lowell Wesley
Town King, Kialegee Tribal Town
P.O. Box 332
Wetumka, Oklahoma 74883

Honorable R. Perry Beaver
Principal Chief, Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Honorable Bryan McGrett
Town King, Thlopthlocco Tribal Town
P.O. Box 188
Okemah, Oklahoma 74859

RESPONSE TO COMMENT

1. The TVA reservoir may be within the aboriginal lands of the following Tribes of the Eastern Oklahoma Region: Muscogce (Creek) Nation, Cherokee Nation of Oklahoma, United Keetoowah Band of Cherokees of Oklahoma, Kialegee Tribal Town, Thlopthlocco Tribal Town and the Alabama-Quassarte Tribal Town. The policy changes may impact cultural and/or religious properties that are significant to these tribes. Your letter will be forwarded to the BIA Agencies/Field Stations, Eastern Oklahoma Region, for distribution to these tribes for review and comments. For your information, a list is enclosed of the formal contact person and the mailing address for each Tribe referenced above.

Response to Comment 1: TVA invited 17 federally recognized Indian tribes to be consulting parties in the process that addressed effects on historic properties, consistent with Section 106 of the National Historic Preservation Act.

From: Lee Clauss [mailto:leerainsclauss@yahoo.com]
Sent: Saturday, August 09, 2003 2:56 PM

THPO's comments/concerns:

Reservoir Operations Study: The EBCI THPO is very interested in this study and has previously requested consulting party status. Just recently, we were provided with the NEPA documents related to this study. We understand that comments are due in early September, but do to the staffing changes, it is highly improbable that such a review will be completed by that date. Furthermore, it is our understanding that the current submission is incomplete, as it lacks the archaeological study. If that study can be provided prior to our commenting, that would make the process much more efficient. Also, because of the EBCI's great interest in the reservoirs included in this study, especially Fontana Reservoir, I think it would be beneficial to TVA to arrange a meeting with the EBCI about the ROS. This meeting should include, at the very least, a representative from Cultural Resources (Russ), Environmental (Carmen McIntyre or Tommy Cabe), and Wastewater (Mike Bolt). Perhaps someone from Fish and Wildlife could also attend. Anyway, I would discuss this suggestion with Russell and have him provide you with the appropriate contact information for the other tribal employees. **[1]**

RESPONSE TO COMMENT

1. Reservoir Operations Study: The EBCI THPO is very interested in this study and has previously requested consulting party status. Just recently, we were provided with the NEPA documents related to this study. We understand that comments are due in early September, but do to the staffing changes, it is highly improbable that such a review will be completed by that date. Furthermore, it is our understanding that the current submission is incomplete, as it lacks the archaeological study. If that study can be provided prior to our commenting, that would make the process much more efficient. Also, because of the EBCI's great interest in the reservoirs included in this study, especially Fontana Reservoir, I think it would be beneficial to TVA to arrange a meeting with the EBCI about the ROS. This meeting should include, at the very least, a representative from Cultural Resources (Russ), Environmental (Carmen McIntyre or Tommy Cabe), and Wastewater (Mike Bolt). Perhaps someone from Fish and Wildlife could also attend. Anyway, I would discuss this suggestion with Russell and have him provide you with the appropriate contact information for the other tribal employees.

Response to Comment 1: TVA Cultural Resources staff met with the Deputy Tribal Historic Preservation Officer of the Eastern Band of Cherokee Indians (EBCI) to discuss EBCI's concerns regarding impacts on historic properties from reservoir operations. Consistent with the National Historic Preservation Act, TVA is executing a programmatic memorandum with the State Historic Preservation Offices of the seven Tennessee Valley region states and other consulting parties.

The Eastern Band of Cherokee Indians
Tribal Historic Preservation Office
P.O. Box 455, Cherokee, NC 28719
(828) 488-5637 / Fax (828) 488- 5648

October 15, 2003

Danny Olinger
Archaeologist
TVA Cultural Resources
P.O. Box 1589
Norris, TN 37828-1589

RE: DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT: TENNESSEE VALLEY AUTHORITY RESERVOIR OPERATIONS STUDY, VOLUMES I AND II.

Dear Mr. Olinger,

The Eastern Band of Cherokee Indians THPO is in receipt of the above-referenced document and has reviewed the reservoir operations alternatives for their impacts to cultural resources. Obviously, we are in favor of those alternatives which lessen adverse impacts to archaeological resources and historic properties. After reviewing all considered alternatives, we would like to offer the following comments regarding each policy alternative and the Base Case.

Base Case: Current operating policy. Levels of erosion, exposure, development, and visual impact remain the same, and both direct and indirect effects to cultural remain unchanged. Under this option the largest number of known NRHP-eligible sites are exposed during drawdown between summer and winter pools, and the drive and pace of development along the shorelines remains the same because water elevations and drawdown schedules see no change.

Reservoir Recreation A: Summer levels extended through August 1 and Labor Day for 16 specific tributary and mainstem reservoirs, while winter levels on 15 tributary and mainstem reservoirs would be increased. Under this option, the potential for both direct and indirect adverse effects to historic properties and archaeological resources is increased due to increased erosion levels, increased boating and recreational use, and encouragement and acceleration in pace of shoreline development. ***Although fewer archaeological sites would be exposed during drawdown between summer and winter***

***pools, the Eastern Band of Cherokee Indians does not support this alternative because of its accumulated and overall negative impact to cultural resources*.**

Reservoir Recreation B: Summer levels extended through Labor Day for 17 specific tributary and mainstem reservoirs, while winter levels on 15 tributary and mainstem reservoirs would be increased. Under this option, the potential for both direct and indirect adverse effects to historic properties and archaeological resources is increased due to increased erosion levels, increased boating and recreational use, and encouragement and acceleration in pace of shoreline development. ***Although fewer archaeological sites would be exposed during drawdown between summer and winter pools, the Eastern Band of Cherokee Indians does not support this alternative because of its accumulated and overall negative impact to cultural resources.***

Summer Hydropower: On June 1, reservoir releases unrestricted during summer and into fall for hydropower production. Winter levels increased on 10 tributary reservoirs. Under this option, the potential for beneficial impacts to cultural resources is increased. Erosion is decreased due to shorter periods of full summer pool levels, fewer archaeological sites are exposed during drawdowns, and the pace and acceleration of shoreline development may slow due to changes in scenic integrity. ***The Eastern Band of Cherokee Indians supports this option as the first preferred alternative.***

Equalized Summer/Winter Flood Risk: Pool levels lower during the summer and higher during the winter. Under this option, the potential for beneficial impacts to cultural resources is slightly increased. Erosion is decreased due to shorter periods of full summer pool levels (but increased levels during the winter may increase erosion during that period) , fewer archaeological sites are exposed during drawdowns, and shoreline development may slow due to changes in scenic integrity. ***The Eastern Band of Cherokee Indians supports this option as the second preferred alternative.***

Commercial Navigation: Increases navigation channel depth by 2 feet and creates a 13 foot channel for heavier barges. Under this option, the potential for both direct and indirect adverse effects to historic properties and archaeological resources is increased due to continued levels of erosion, increased boating and use, and continuance of acceleration and pace of shoreline development. Like the Base Case, the largest number of known NRHP-eligible sites are exposed during drawdown between summer and winter pools under this alternative. ***The Eastern Band of Cherokee Indians does not support this alternative because of its accumulated and overall negative impact to cultural resources.***

Tailwater Recreation: Similar to Recreation Alternative B, with adjusted tailwater recreational flows.

Under this option, the potential for both direct and indirect adverse effects to historic properties and archaeological resources is increased due to increased erosion levels, increased boating and recreational use, and encouragement and acceleration in pace of shoreline development. ***Although fewer archaeological sites would be exposed during drawdown between summer and winter pools, the Eastern Band of Cherokee Indians does not support this alternative because of its accumulated and overall negative impact to cultural resources.***

Tailwater Habitat: Seventy-five percent of inflows retained to maintain reservoir elevations, while the remaining portion released through the system as continuous flows with no turbine peaking. Under this

option, the potential for both direct and indirect adverse effects to historic properties and archaeological resources is increased due to increased erosion levels, increased boating and recreational use, and encouragement and acceleration in pace of shoreline development. ***Although fewer archaeological sites would be exposed during drawdown between summer and winter pools, the Eastern Band of Cherokee Indians does not support this alternative because of its accumulated and overall negative impact to cultural resources.***

The Eastern Band of Cherokee Indians THPO has reviewed the alternatives offered and has concluded that while the majority of alternatives will impact cultural resources in a significant and negative manner, the **Summer Hydropower** and **Equalized Summer/Winter Flood Risk** alternatives results in a beneficial-to-slightly beneficial impact to cultural resources, and these are the options that we support. In addition, the Tribal Environmental Office has reviewed the ROS and concurs with our position as well. **[1]**

We thank you for the opportunity to review and comment on this document, and we look forward to working with you on this project. **[2]** If we can be of further service, or if you have any comments or questions, please direct them to me at (828) 479-1589.

Sincerely,

Michelle Hamilton
Tribal Historic Preservation Specialist
Eastern Band of Cherokee Indians

RESPONSE TO COMMENT

1. The Eastern Band of Cherokee Indians THPO has reviewed the alternatives offered and has concluded that while the majority of alternatives will impact cultural resources in a significant and negative manner, the **Summer Hydropower** and **Equalized Summer/Winter Flood Risk** alternatives results in a beneficial-to-slightly beneficial impact to cultural resources, and these are the options that we support. In addition, the Tribal Environmental Office has reviewed the ROS and concurs with our position as well.

Response to Comment 1: TVA is executing a programmatic memorandum with the State Historic Preservation Offices of the seven Tennessee Valley region states and other consulting parties, which will guide how TVA further assesses and mitigates potential impacts on cultural resources.

2. We thank you for the opportunity to review and comment on this document, and we look forward to working with you on this project.

Response to Comment 2: Comment noted.

F4.3 References

Primack, R. B. 1998. Essentials of Conservation Biology. Second Edition. Sinauer Associates Publishers. Sunderland, MA.

Tennessee Valley Authority. 1998. Shoreline Management Initiative: An Assessment of Residential Shoreline Development Impacts in the Tennessee Valley. Norris, TN.

_____. 1990. Lake Improvement Plan, Tennessee River and Reservoir System Operating and Planning Overview. Final Environmental Impact Statement. (TVA/RDG/EQS-91/1.)

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