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OCOEE RIVER
WHITEWATER RAFTING AGREEMENT

DRAFT ENVIRONMENTAL ASSESSMENT
Polk County, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
Knoxville, Tennessee

Cooperating Agency:
U.S. Forest Service
Cherokee National Forest

November 2017

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Symbols, Acronyms, and Abbreviations

AADT	Annual Average Daily Traffic
ACS	American Community Survey
APE	Area of Potential Effects
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
ESA	Endangered Species Act
I/O	Input/Out
IBI	Index of Biotic Integrity
in/yr	Inches Per Year
LOS	Level of Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
OROA	Ocoee River Outfitters Association
ORREDF	Ocoee River Recreation and Economic Development Fund
RM	River Mile
ROD	Record of Decision
RUVD	Recreation Use Values Database
SHPO	State Historic Preservation Officer
SLDC	Southeast Local Development Corporation
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USCB	U.S. Census Bureau
USFS	U.S. Department of Agriculture Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

The Tennessee Valley Authority (TVA) is considering a new management agreement with the U.S. Department of Agriculture Forest Service (USFS), and the State of Tennessee (State) to establish partner responsibilities for recreational management along the Ocoee River in Polk County, Tennessee. The proposed agreement addresses water releases from Ocoee Dams 2 and 3 for a term of 15 years and a land action to improve recreation management. This Environmental Assessment (EA) has been prepared to evaluate environmental, economic, recreational and other impacts of the proposed agreements. The USFS is serving as a cooperating agency in this review.

1.1 Introduction and Background

The Ocoee River headwaters originate from the Toccoa River in northern Georgia. Once the Toccoa River crosses the state line from McCaysville, Georgia to Copperhill, Tennessee, the river is renamed as the Ocoee River and flows through Polk County, Tennessee. It is one of the most popular rivers in the eastern United States for whitewater rafting and kayaking (Figure 1-1). Two sections of the river, commonly known as the Upper Ocoee and the Middle Ocoee, are used for whitewater recreation (Figure 1-2). The Upper Ocoee is defined as the section from River Mile (RM) 29.2 just below Ocoee No. 3 Dam downstream to RM 24.2 at the Roger's Branch access site just above Ocoee No. 2 Dam. When generating power at the Ocoee No. 3 Powerhouse, the water in this section is diverted at No. 3 Dam into a tunnel to the Ocoee No. 3 Powerhouse located about 0.8 mile upstream of the No. 2 Dam (Figure 1-3). The Middle Ocoee is defined as the section from RM 24.1 at Ocoee No. 2 Dam downstream to the take-out at RM 19.6 below the Ocoee No. 2 Powerhouse. When generating power at the No. 2 Powerhouse, the water in this section is diverted at No. 2 Dam into an elevated flume to the No. 2 Powerhouse (Figure 1-4).

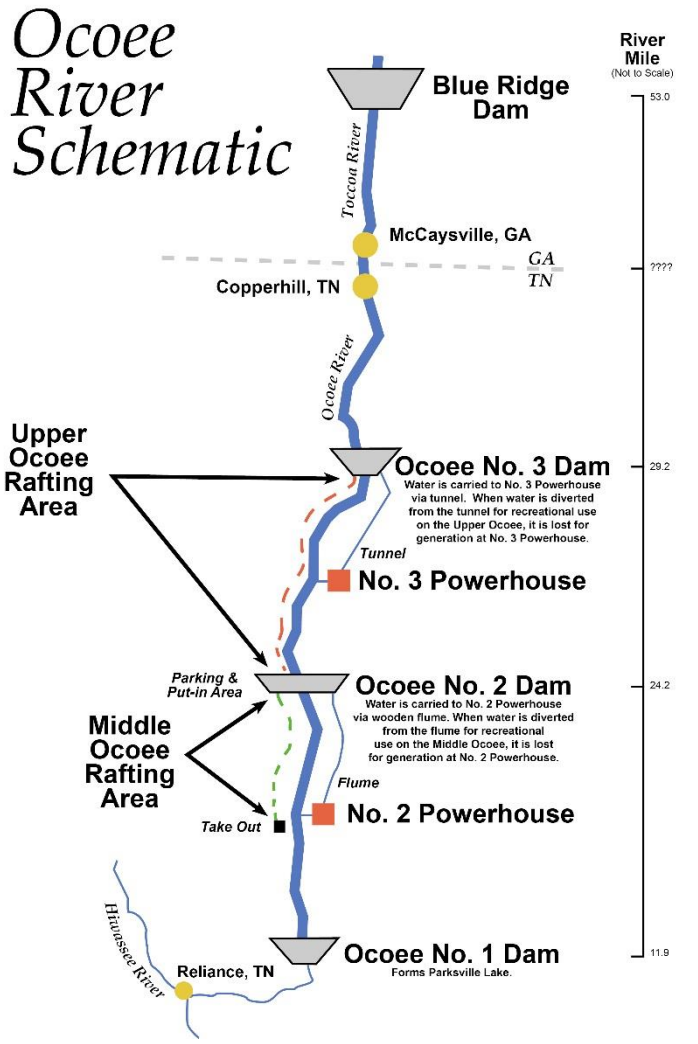

Figure 1-1. Overview of the Ocoee River (not to scale)

Whitewater recreation on both river sections is dependent on the release of water from TVA dams

into the river channel. Ordinarily, the water is diverted from the river channel to generate power, which leaves insufficient water flow in the river channel to support whitewater recreation.

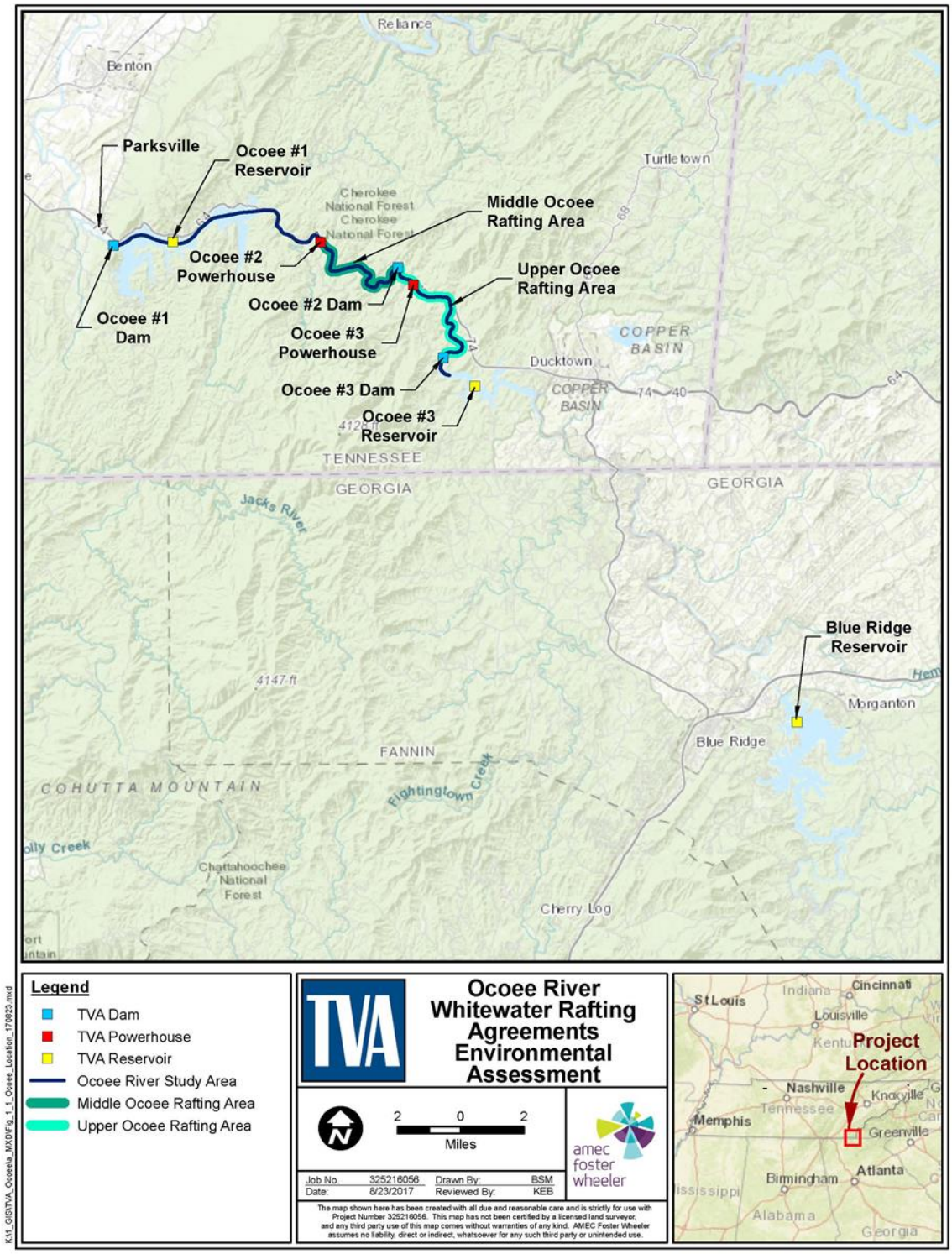

Figure 1-2. Project Location

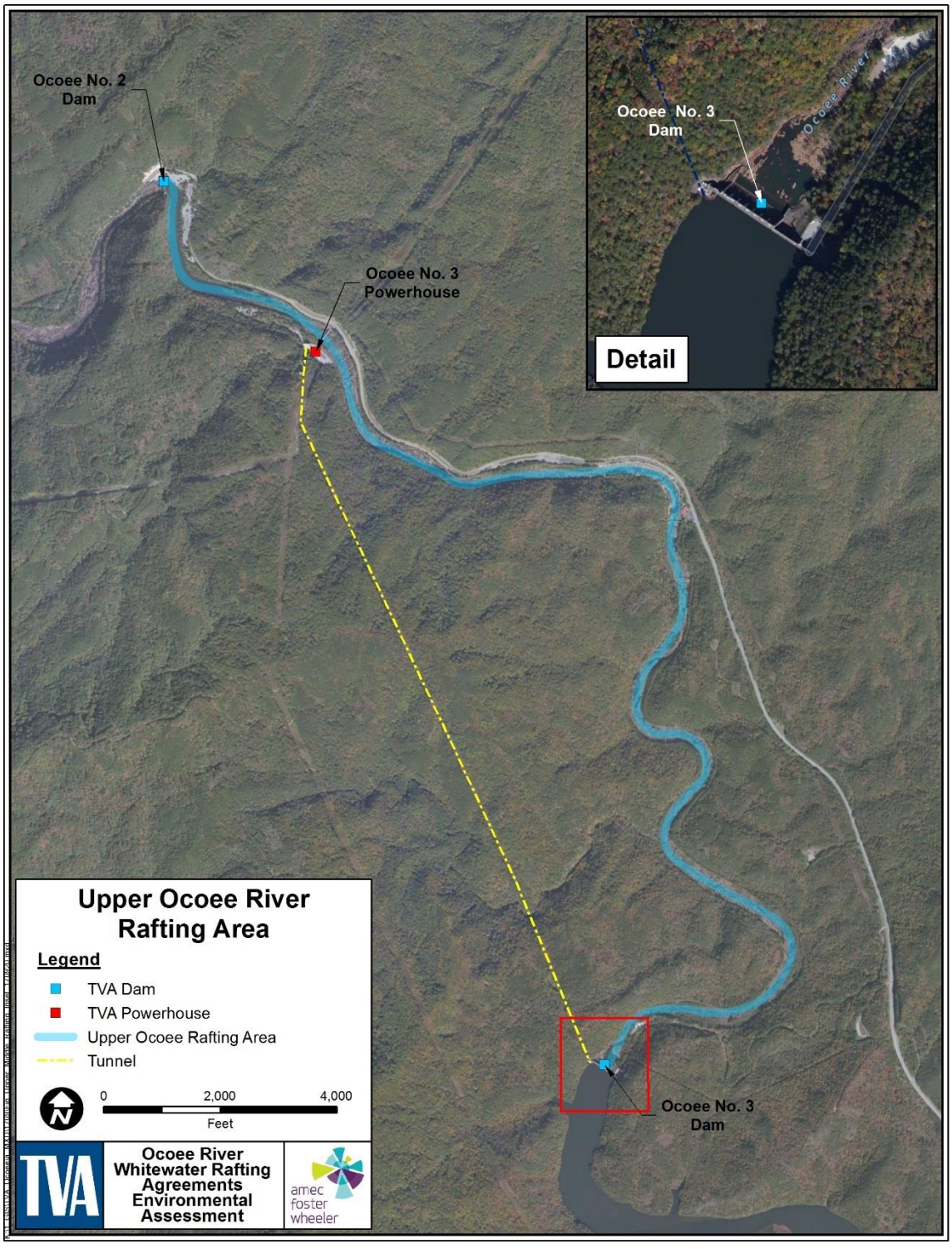

Figure 1-3. Upper Ocoee Rafting Area

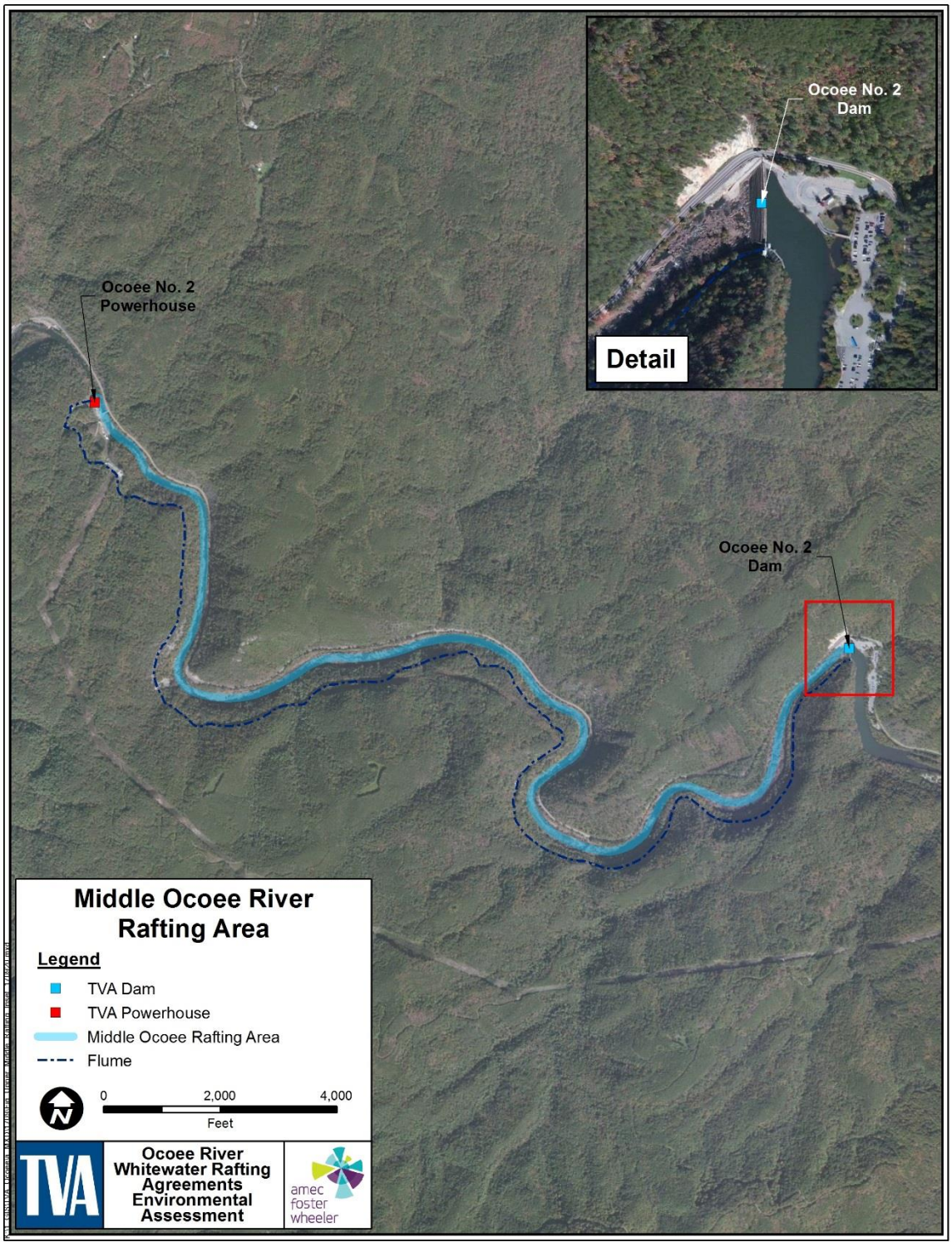

Figure 1-4. Middle Ocoee Rafting Area

Until 1976, the hydropower units at Ocoee No. 2 were regularly used to generate power. Consequently, the Middle Ocoee was rarely available for whitewater recreation, except during high flow periods in the river and during scheduled fall maintenance activities. In 1976, TVA ceased generating power at Ocoee No. 2 because of the deteriorated condition of the flume and No. 2 Dam, and whitewater recreational use of the river rapidly increased. In 1979, TVA decided to rehabilitate the Ocoee No. 2 Dam and flume to resume power production. TVA also indicated that it would provide recreational water releases, if TVA was reimbursed for the lost revenue. This led to protracted and sometimes controversial negotiations over how the river could be managed for power production and still accommodate white water recreation without burdening TVA consumers with the cost to replace the lost power generation with other energy sources.

The process established in 1983 to reimburse TVA for lost power costs from providing water releases on the Middle Ocoee ends on March 16, 2019.

In 1983, the U.S. Congress passed Public Law No. 98-151 which appropriated $7.4 million for the purpose of providing recreation on the Middle Ocoee River. This money was for reimbursement to the TVA power program for replacement power generation resulting from recreational releases of water from Ocoee No. 2 Dam. TVA placed $1 million of this appropriation in a trust fund for the State of Tennessee for compensation for their assumed responsibility for the development, operation, and maintenance of recreation facilities at Ocoee No. 2 for a 35-year period. The entire $7.4 million appropriation is being reimbursed to the U.S. Treasury through fees collected for Ocoee River recreation activities. It is anticipated that the 1984 appropriation will be paid in full by the end of 2017.

In light of the 1983 Congressional appropriation, TVA entered into a 35-year agreement with the State in March 1984 to provide scheduled recreational water releases from Ocoee No. 2 Dam for up to 116 days per year. The water release days would occur between late March and early November and include weekends and holidays. The agreement established a system under which TVA licensed commercial outfitters to provide rafting services. Outfitters submit user fees to TVA based on the number of customers served. TVA in turn submits these user fees to the US Treasury as payment toward the 1983 Congressional appropriation. Under the terms of the agreement, TVA also granted the State a 35-year recreation easement over TVA lands at the Ocoee No. 2 Dam and below the Ocoee No. 2 Powerhouse for the operation and maintenance of whitewater recreation and associated facilities on the Middle Ocoee. TVA also constructed improved access facilities at the dam and powerhouse sites.

Agreements and easements established in 1984 between TVA and the State to set the number of recreational release days on the Middle Ocoee, establish licensing of commercial rafting outfitters by TVA, and other arrangements expire on December 31, 2018.

In 1988, the State, in cooperation with the USFS and TVA, issued the Ocoee River General Management Plan (Tennessee Department of Environment and Conservation [TDEC] 1988). This plan, and its associated Memorandum of Understanding between the three agencies, describes the responsibilities of each agency in the operation and maintenance of whitewater recreation and associated facilities on the Middle Ocoee. It also incorporates rules issued by the TDEC (Chapter 0400-2-10) establishing requirements for conducting rafting services on the Ocoee River.

In 1997, the Cherokee National Forest (part of the USFS) issued a Final Environmental Impact Statement (EIS) (USFS 1997) on the development of recreational facilities in the Upper Ocoee River corridor, including the reuse of facilities developed for the whitewater competition during the 1996 Summer Olympic Games. This Final EIS addressed, among other things, commercial whitewater recreation on the Upper Ocoee River. Because this activity is dependent on TVA's releasing water from Ocoee No. 3 Dam into the river channel, TVA was a cooperating agency in the development of the Final EIS and issued a Record of Decision (ROD) on the proposed action (TVA 1997). TVA, like the USFS, decided to implement the alternative for the maximum level of land- and water-based recreation development, which approves scheduled water releases from Ocoee No. 3 Dam for up to 54 days per year for commercial and recreational use and up to 20 days per year for special events (a total of 74 days). These releases are dependent on TVA's being reimbursed for lost power generation revenues and are subject to the availability of water in Blue Ridge Reservoir upstream of Ocoee No. 3 Reservoir. The selected alternative also included expanding the facilities at Ocoee No. 2 Dam and constructing two rafting access areas on the Upper Ocoee below Ocoee No. 3 Dam. Facilities at these two access areas included separate launch areas for commercial and private boaters, a restroom and change house, and parking for large bus-type vehicles.

In 2006, TVA entered into an agreement with the Southeast Local Development Corporation (SLDC) for recreational water releases on the Upper Ocoee from Ocoee No. 3 Dam for 2006 through 2018. The agreement established a schedule for 34 release days. SLDC was also provided the option to purchase additional release days as requested by the outfitters, specifically up to 20 days for recreation and an additional 20 days for special events. Therefore, the SLDC agreement is consistent with the 1997 ROD of TVA and USFS for management of the Upper Ocoee River, which set a maximum of 74 release days. SLDC was given the option to reimburse TVA for replacement power generation through lump sum or annual payments. SLDC chose to reimburse TVA in two lump sum payments totaling $1.6 million, shortly after the agreement was signed. In 2010, SLDC assigned its rights and obligations under the 2006 agreement to the Ocoee River Outfitters Association (OROA), a state-chartered non-profit organization of outfitters operating on the Ocoee River.

1.2 Current Release Schedules and Reimbursement for Lost Power Costs

1.2.1 Middle Ocoee River

Water is released from the Ocoee No. 2 Dam in accordance the agreement established in 1984. The average flow on water release days is at least 1,200 cubic feet per second (cfs).

TVA currently licenses 25 commercial outfitters to operate on the Middle Ocoee River. The State established a capacity limit of 4,250 boaters per day on the Middle Ocoee and a methodology for allocating this capacity among the outfitters in a regulation issued by TDEC and last revised in September 2010 (TDEC Rules Chapter 0400-02-10). When this limit is reached, the number of boaters is capped on the equivalent day of the next year. The State collects an additional $0.50 per commercial rafter on the Middle Ocoee River for the reimbursement of its site maintenance expenses. Rafters floating both the Upper and Middle Ocoee sections are charged $0.50 per day by the State, rather than $0.50 for each section. There are no restrictions on the number of non-commercial, private whitewater boats using the Ocoee River.

1984 Agreement for the Middle Ocoee River Water Releases

- TVA to release water from the Ocoee No. 2 Dam for up to 116 days per year
- Releases would occur between late March and early November and include weekends and holidays
- Average release rate would be 1,200 cubic feet per second (cfs)
- TVA received $7.4 million through appropriation from U.S. Treasury.
- User fees collected by outfitters to reimburse U.S. Treasury
- Agreement expires in March 2019.

TVA received $7.4 million in 1984 to recover lost resulting from the replacement price of power resulting from water releases to the Middle Ocoee River to support whitewater recreation. The user fee collected by the outfitters to repay the congressional appropriation was initially $2 per customer and was intended to escalate over time as the industry was built. The fee was projected to increase to $5 per customer by the end of the 35-year period in 2018. However, because the commercial use far exceeded expectations, the customer fee was reduced from $2 to $1 per customer in 1999 in order to minimize the user fee while still achieving the repayment of the $7.4 million before the end of 2018. TVA now estimates that this appropriation only reimbursed TVA for replacement power generation from 1984 through 1992 or 1993. To fulfill the congressional directive, TVA has continued its obligation to release water through the full original 35-year term.

1.2.2 Upper Ocoee River

Water is released from Ocoee No. 3 Dam in accordance with the agreement established in 2006. The average flow on water release days is at least 1,600 cfs.

2006 Agreement for the Upper Ocoee River Water Releases

- TVA to release water from the Ocoee No. 3 Dam for up to 34 days per year.
- There are an additional 20 days available for purchase for rafting, and another 20 days at a lower flow rate available for purchase for special events.
- Releases would occur between early May and mid-September on weekend days.
- Average release rate would be at least 1,600 cfs for rafting and 1,400 cfs for special events.
- TVA reimbursed for replacement power generation through OROA from funds collected by outfitters.
- Agreement expires at the end of 2018.

As noted above, under the 2006 agreement additional release days could be provided, and TVA would be reimbursed for replacement power generation. However, the total number of days cannot exceed 74 days in accordance with the 1997 USFS ROD. TVA was paid a total of $1.6 million in 2006 for water releases from Ocoee No. 3 for the 2006 to 2018 seasons. As part of the 2010 contract assignment from SLDC to OROA, OROA obtained a commercial bank loan to pay the remaining contract amount. OROA charges participating outfitters a fee schedule in order to collect enough to make the monthly bank loan payment. The formula used to determine the fee is based on the number of customers served and therefore varies slightly from year to year. The fee schedule is currently an annual base amount of $1,400 and an additional $4.70 per customer, which is estimated to total approximately $5 to $6 per rafter.

The 25 commercial outfitters licensed to operate on the Middle Ocoee are also eligible to operate on the Upper Ocoee. There are no additional licensing requirements and no capacity limits for commercial operations on the Upper Ocoee. In addition to the fee schedule charged by the OROA, the State also collects $0.50 per rafter for reimbursement of its management expenses. A sizeable proportion of commercial customers raft both the Upper and Middle Ocoee sections for an all-day trip. Customers are also encouraged by outfitters to raft the upper section when the daily capacity limit on the middle section is being met. Rafters floating both the Upper and Middle Ocoee sections are charged $0.50 per day by the State, rather than $0.50 for each section.

1.3 Purpose and Need

The process established in 1983 to reimburse TVA for hydropower revenue lost from providing water releases for whitewater rafting on Middle Ocoee River ends on March 16, 2019. Existing agreements and easements established in 1984 between TVA and the State to set the number of recreational release days on the Middle Ocoee River, establish licensing of commercial rafting outfitters by TVA, and other arrangements also expire on December 31, 2018. A 2006 agreement relating to water releases on the Upper Ocoee River expires at the end of 2018 as well.

The purpose of the proposed action is to enter into new agreements to enable continued commercial rafting activities on the Ocoee River. TVA, the State and the USFS recognize the desirability of continuing commercial rafting activities on the Ocoee River beyond the expiration of the existing agreements that support these activities. TVA, in its mission of service, focuses on three key areas: energy, environment and economic development. This

management agreement would demonstrate TVA's effort to balance those three objectives in the economic benefits brought to the Ocoee River region while continuing to promote the sustainable use of the river and the surrounding environment. However, TVA must produce power in a reliable and cost effective manner which necessitates that TVA be reimbursed for the cost of replacement power when the water is used for recreational releases in the Upper and Middle Ocoee rather than for hydroelectric generation.

1.4 Decision to be Made

This EA has been prepared to inform TVA decision makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether or not to enter into new agreements to enable continued commercial rafting opportunities on the Ocoee River. TVA will use this EA to support the decision-making process and to determine whether an Environmental Impact Statement should be prepared or whether a Finding of No Significant Impact may be issued.

1.5 Related Environmental Reviews

The following environmental reviews have been prepared for actions related to operations at the Ocoee River:

Final Environmental Impact Statement – Rehabilitation of the Ocoee No. 2 Hydro Plant. Tennessee Valley Authority, Chattanooga, Tennessee (TVA 1979). The EIS evaluated the proposal to repair Ocoee No. 2 Hydroelectric project and allow recreation use of the river to be realized.

Final Environmental Impact Statement – 1996 Olympic Whitewater Slalom Venue Ocoee River, Polk County, Tennessee, Ocoee Ranger District, Cherokee National Forest (USFS 1994). The EIS evaluated four alternatives for holding the 1996 Olympic Whitewater Slalom Venue on the Upper Ocoee River. The preferred alternative was to develop the Olympic venue on the Upper Ocoee River and retain the competitive channel and facilities constructed to support the Olympic event. As a cooperating agency, TVA issued a ROD that supported the preferred alternative.

*Final Environmental Impact Statement – Upper Ocoee River Corridor Recreational Development, Polk County, Ocoee Ranger District, Cherokee National Forest (*USFS 1997*).* The EIS addressed the development of recreational facilities in the Upper Ocoee River corridor, including the reuse of facilities developed for the whitewater competition during the 1996 Summer Olympic Games. TVA, like the USFS, decided to implement the alternative for the maximum level of land- and water-based recreation development, which approves scheduled water releases from Ocoee No. 3 Dam for up to 54 days per year for commercial and recreational use and up to 20 days per year for special events (a total of 74 days). Water releases for commercial and recreational use require flows of about 1,600 cfs. Water releases for special events require flows of about 1,400 cfs. The selected alternative also included expanding the facilities at Ocoee No. 2 Dam and constructing two put-ins on the Upper Ocoee below Ocoee No. 3 Dam. Facilities at these two put-ins included separate launch areas for commercial and private boaters, a restroom and change house, and parking for large bus-type vehicles. TVA's decision stipulated that TVA would be reimbursed for the increased cost of replacement power when providing these releases.

Draft Environmental Impact Statement and Draft Section 4(f) Evaluation, Appalachian Development Highway System Corridor K (Relocated US 64) from West of the Ocoee River to State Route 68 near Ducktown, Polk County, Tennessee (Federal Highway

Administration 2003). This document, prepared by the U.S. Department of Transportation, Federal Highway Administration, evaluates the environmental impacts associated with proposed new location alternatives for US 64 between US 411 and the Ocoee No. 3 area. The proposed new location alternatives would involve construction of US 64 outside of the Ocoee Gorge corridor to the north of existing US 64. The length of the proposed new highway is 20 miles, and both new location alternatives include two Ocoee River crossings between Ocoee 3 Dam and Ocoee 3 Powerhouse.

Reservoir Operations Study Final Programmatic Environmental Impact Statement. Tennessee Valley Authority, Knoxville, Tennessee (TVA 2004). The Reservoir Operations Study evaluated policies for operating the TVA reservoir system and the associated environmental impacts of those policies. The study did not address or change the operation of Ocoee No. 2 Dam or Ocoee No. 3 Dam, citing to the two previous EISs (TVA 1979 and USFS 1997) that included decisions concerning recreation releases to the Ocoee River.

Final Environmental Impact Statement for the Revised Land and Resource Management Plan, Cherokee National Forest, Management Bulletin R8-MB 114B (USFS 2004a). The revised Land and Resource Management Plan provides program-level direction for management of the land and resources and sets management standards for the Cherokee National Forest. Monitoring is conducted every year to assess how well goals and objectives are being met, if standards are being properly implemented, and whether environmental effects are occurring as predicted. The plan was accompanied by the *Revised Land and Resource Management Plan Management Bulletin R8-MB 114B* (USFS 2004b). This document examines the environmental impacts associated implementation of the Revised Land and Resource Management Plan.

Ocoee 2 – Ocoee 3 Transmission Line Replacement Environmental Assessment. Tennessee Valley Authority, Knoxville, Tennessee (TVA 2006). The EA assesses alternatives for replacing a transmission line between the Ocoee No. 2 and Ocoee No. 3 powerhouses that is mostly located in the Ocoee gorge and crosses Middle Ocoee River several times.

Ocoee and Hiwassee Rivers Corridor Management Plan, Cherokee National Forest (USFS 2008). This plan provides an inventory of existing highway and corridor conditions near the Ocoee River, includes management strategies and guidelines for construction of features. It also addresses visitor use trends.

Mountain Reservoirs Land Management Plan, Chatuge, Hiwassee, Blue Ridge, Nottely, Ocoees 1,2, and 3, Apalachia, and Fontana Reservoirs, Georgia, North Carolina and Tennessee (TVA 2009). The plan evaluates impacts associated with implementation of a plan for managing a total of 6,220 acres of land on nine mountain reservoirs on tributaries to the Tennessee River. The document includes the land plan for the Ocoee No. 1, 2 and 3 reservoirs.

1.6 Scope of the Environmental Assessment and Summary of the Proposed Action

This EA evaluates the potential environmental, cultural, and socioeconomic impacts of implementation of management agreements with the USFS, the State, and the OROA to agreements to establish partner responsibilities for recreational management to allow the continuation of commercial whitewater rafting on the Ocoee River in Polk County,

Tennessee. Under the proposed action, TVA would provide water releases from Ocoee Dams No. 2 and No. 3 for a term of 15 years beginning in 2019. The water release agreement may be renewed after this period; *for the sake of analysis, TVA assumes one renewal over an additional 15-year period.* Water releases would be based on a schedule framework similar to the water release agreements currently in place. TVA would also grant a recreation easement to the State. Additionally, the USFS would make land available to the State to complement the recreational use on the TVA easement areas.

In addition, the State would be responsible for a commercial-use permitting program and oversight of commercial rafting activities on the Ocoee River, both administered by Tennessee State Parks. The State's responsibilities would include all general operational and maintenance activities necessary to facilitate commercial whitewater operations both within the TVA easement area and on two tracts of National Forest System lands. The State would also be responsible for emergency first response, law enforcement, traffic management, and other appropriate tasks along the Ocoee River corridor. A detailed description of the proposed action and alternatives considered are provided in Chapter 2.

TVA prepared this EA to comply with the National Environmental Policy Act (NEPA) and regulations promulgated by the Council on Environmental Quality (CEQ) and TVA's procedures for implementing NEPA. TVA considered the possible environmental effects of the proposed action and determined that potential effects to the environmental resources listed below were relevant to the decision to be made, and assessed the potential impacts on these resources in detail in this EA.

- Recreation
- Socioeconomics
- Environmental Justice
- Traffic and Transportation
- Surface Water
- Vegetation and Wildlife
- Aquatic Ecology
- Threatened and Endangered Species
- Wetlands
- Natural Areas and Parks
- Cultural Resources

TVA also considered potential effects related to floodplains, solid and hazardous waste, public health and safety, noise, visual impacts, land use, geology, prime farmland, and air quality and climate change. As described below, these resources were considered but eliminated from detailed consideration:

- *Air Quality*. No construction activities are proposed and any changes in recreational use and shifts in hydropower generation that would occur because of the changes in water release schedules being considered would not result in any notable changes in emissions. Therefore, there would be no direct or indirect impact on regional air quality.

- *Climate Change*. No construction activities are proposed and the proposed changes in water release schedules would not have a significant change on the use of energy or fossil fuels. Therefore, no changes to climate or significant increases in greenhouse gases are anticipated.

- *Floodplains*. TVA adheres to the requirements of Executive Order (EO) 11988, Floodplain Management. The objective of EO 11988 is "…to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative". The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. The entire project area is located within the 100-year floodplain of the Ocoee River. However, there would be no activities that would result in filling or other alteration of floodplains because of the proposed changes in the water release schedules. Therefore, no impacts to floodplains would occur as a result of any alternative under consideration.

- *Solid and Hazardous Waste.* No construction activities are proposed and the proposed changes in water release schedules would not generate hazardous or solid waste. Therefore, there would be no impact associated with solid or hazardous wastes.

- *Public Health and Safety*. No construction activities are proposed, and the proposed changes in water release schedules would not impact any issues associated with public health and safety. Additionally, none of the alternatives would alter or modify outfitter health and safety practices and requirements. Therefore, no impacts to public health and safety would occur with any project alternative.

- *Noise*. The proposed changes in water release schedules under consideration would not result in additional equipment use or operational noise emissions that would appreciably alter exiting noise emissions. Therefore, no impacts from noise would occur with any project alternative.

- *Visual Impacts*. The proposed actions would not appreciably change the existing visual landscape, scenic integrity or scenic attractiveness of the project area. Views of the project area would not appreciably change under any of the water release schedules under consideration.

- *Land Use*. No development or change in current land use is proposed. Therefore, there would be no impact on land use with any project alternative.

- *Geology and groundwater*. The project area is located in a river valley and would not include any below ground disturbance that would impact geologic or groundwater resources.

- *Prime Farmland*. The project area lacks prime farmland resources. Therefore there would be no impact to prime farmland.

TVA's action would satisfy the requirements of EO 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13112 as amended by 13751 (Invasive Species) and applicable laws including the National Historic Preservation Act of 1966, Endangered Species Act of 1973 (ESA), and Clean Water Act (CWA).

1.7 Public and Agency Involvement

TVA conducted a 30-day public scoping period from June 19, 2017 through July 19, 2017, to solicit comments on the alternatives and environmental resources to be considered in the EA. The scoping period was announced by a notice on the TVA Web site. TVA received 34 comment submissions (Appendix A). Of the submissions, 31 were from individual members of the public, one was from a representative of the Lake Blue Ridge Civic Association, and one was from American Whitewater, a national non-profit organization. TVA also received a response from the Eastern Band of the Cherokee Indians noting that the project would not have any adverse impact on known Cherokee resources and from the Muscogee (Creek) Nation stating that the tribe is unaware of any Muscogee cultural or sacred sites located within the immediate project area.

Most comments supported continuing the release of water to allow whitewater rafting citing economic and recreation benefits. Many commenters requested that TVA provide additional water release days and increase flow volumes. One commenter expressed concerns regarding existing traffic volumes and the effect to public safety. The Lake Blue Ridge Civic Association opposes the recreational release arrangement citing the impact to the water level in Lake Blue Ridge. These comments were considered in the formulation of alternatives and the identification of resources evaluated in this EA. For instance, in response to comments received during the scoping period, TVA added a third alternative to this EA (Alternative C) because it would provide additional water release days and it represents the current water release framework.

TVA's public and agency involvement includes a public notice and a 30-day review of the Draft EA. The availability of the Draft EA was announced in newspapers that serve the Polk County area and the Draft EA was posted on TVA's Web site. TVA's agency involvement included notification of the availability of the Draft EA to local, state, and federal agencies and federally recognized tribes as part of the review. Chapter 6 provides a list of agencies, tribes, and organizations notified of the availability of the Draft EA.

1.8 Necessary Federal Permits or Licenses

There are no federal permits or licenses required for TVA to undertake this action.

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CHAPTER 2 – ALTERNATIVES

2.1 TVA Water Release Framework

TVA has developed a framework to develop water release schedules to meet the current agreements. The framework provides context for the alternatives presented in this chapter.

Consistent with the 1984 agreement described in Chapter 1, scheduled water releases on the Middle Ocoee occur on up to 116 days from the middle of March through the last Saturday in October. Each year, TVA develops a release schedule that provides weekend releases throughout this period and, in addition, three weekday releases each week between Memorial Day and Labor Day, and five weekday releases in late September. Minor adjustments are made annually in the dates of releases based on the dates on which the holidays and weekends occur; thus, because of how these dates fall on the calendar, the total number of water release days per year have varied slightly. The hours of releases per day also varies across the season, with more hours provided on weekends than weekdays. Between 6 and 10 hours of water releases are provided on water release days. Generally, six or seven hours of releases are provided on weekdays and during early and late season weekend days, and 8 to 10 hours of water releases are provided on weekends and holidays in the summer. The average flow during these releases would be at least 1,200 cfs. Application of this framework results in a schedule of release days and hours per year. Figure 2-1 shows the release schedule for 2017 and serves as an example of how the release days and hours on the Middle Ocoee River are designated.

Currently, TVA releases from Ocoee No. 3 Dam in accordance with the agreement with the SLDC established in 2006, providing 34 annual release days between early May and mid-September for varying hours. Water releases from the Ocoee No. 3 Dam occur from early May through mid-September for varying hours. Releases only occur on weekend days during this period, and the number of hours of release per day varies between five and eight. The average flow on water release days is at least 1,600 cfs. Figure 2-2 shows the release schedule for 2017 and serves as an example of how the release days and hours on the Upper Ocoee River are designated.

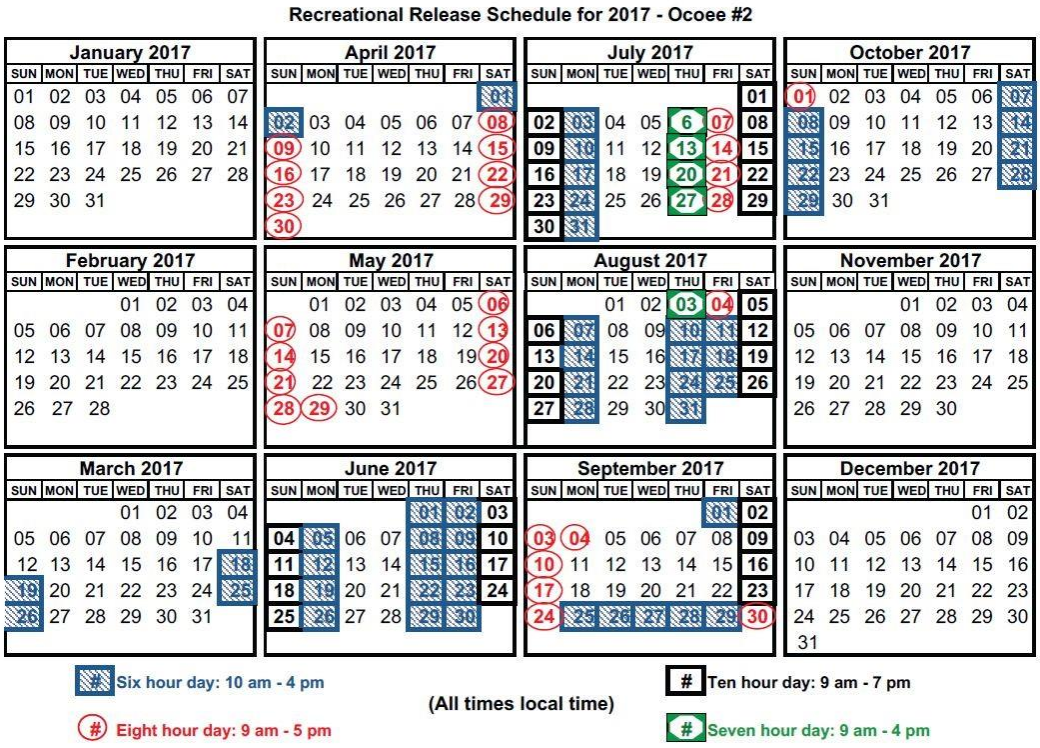

Figure 2-1. Scheduled Water Releases on the Middle Ocoee (2017)

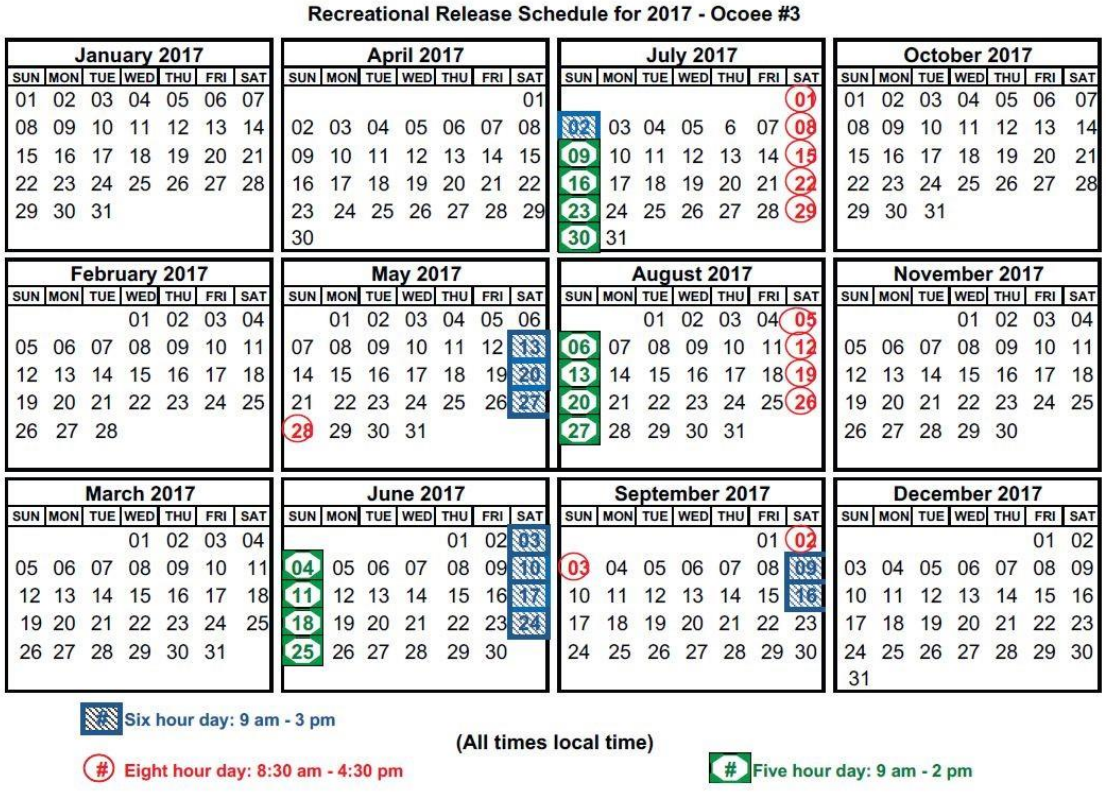

Figure 2-2. Scheduled Water Releases on the Upper Ocoee (2017)

2.2 Description of Alternatives

The scope of the potential alternatives is constrained by the need for TVA to be reimbursed for the replacement power generation that occurs when water is released into the Upper and Middle Ocoee River channels. In addition, TVA must also operate the Ocoee No. 2 flume at least two days a week during the summer to keep the wooden flume wet and minimize the leakage that would occur if the flume were to dry out. This constrains the number of days per week that TVA can release water into the Middle Ocoee instead of diverting it into the flume. Alternatives evaluated in this EA include:

- Alternative A – No Action
- Alternative B – Proposed Action
- Alternative C – Current Management Regime

2.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, the agreements and easements enabling commercial rafting on the Middle and Upper Ocoee River would expire at the end of 2018 and would not be replaced with new agreements. Thereafter, whitewater boating (rafting and kayaking) on the Middle and Upper Ocoee would only be possible during periods of naturally occurring high river flow and/or when TVA is not generating power at the Ocoee No. 2 and Ocoee No. 3 powerhouses.

2.2.2 Alternative B – Proposed Action

2.2.2.1 Water Releases

As part of the proposed agreements, TVA would provide scheduled water releases for a term of 15 years on the Middle and Upper sections of the Ocoee River, below the Ocoee No. 2 and No 3 Dams. The water releases would be provided on a schedule similar to that defined by the water release agreements currently in place. In this analysis, the water release agreement may be renewed after this period; TVA assumes one renewal over an additional 15-year period.

The proposed agreement includes the following terms:

- *Middle Ocoee River* – TVA would provide water releases from Ocoee No. 2 Dam based on the same framework for determining annual water release schedules that has been in place since 1984, with one minor difference: TVA would eliminate releases currently occurring on five weekdays in late September. Thus, over the 15-year period, TVA would provide between 106 and 112 release days annually. The number of release days would vary by year based on how weekend and holidays occur. The hours of releases per day would vary between 6 and 10 hours daily, consistent with current operations. The average rate of flow during these releases would be at least 1,200 cfs, which is also consistent with current operations.
- *Upper Ocoee River* – There would be no change from the current schedule of release to the Upper Ocoee River. TVA would continue to provide water releases from Ocoee No. 3 Dam for recreational use on 34 weekend days. The hours of release per day would vary between five and eight hours. The average rate of flow during these releases would be at least 1,600 cfs. Consistent with TVA's management decision in the 1997 ROD (described above), which set a maximum of

74 release days, an additional 20 release days for recreational use and 20 release days for special events may be requested by the outfitters or others for special events, provided reimbursement for the replacement power is given.

Water release schedules would be consistent with the framework provided in Appendix B. TVA would receive $11.78 million from the State for the cost of replacement power arising from the water releases over the 15-year term. The proposed water release agreement would not apply fees or restrict access to private boaters.

2.2.2.2 Recreation Management

Under this alternative, TVA, USFS, and the State would enter into a Memorandum of Understanding (MOU) under which the State would be responsible for the licensing (this is presently done by TVA) and continued oversight of commercial rafting activities on the Middle and Upper Ocoee. The State's responsibilities (as at present) would include emergency first response, law enforcement, traffic management, site maintenance, and enforcing commercial capacity limits. The State would be reimbursed from the Ocoee River Recreation and Economic Development Fund (ORREDF) for the estimated $450,000 annual cost of its oversight and management. The ORREDF was established by the State, will be administered by an independent board, and will be funded through annual fees paid by the outfitters. Under the agreement, the State would also continue to manage TVA and USFS tracts of lands, which would require the following USFS and TVA land actions to be implemented:

- The USFS to make Tracts FS #1 and FS #2 available to the State (approximately 3.7 acres). These tracts are used for parking (FS #1) and restroom facilities (FS #2).
- TVA would grant a 30-year easement to the State to maintain three parcels of land (approximately 27.2 acres) utilized in commercial activities. No construction or improvements on these parcels are proposed at this time. These tracts are:
    - Parcel 1, an 8.3-acre area near the Ocoee No. 2 Powerhouse used by commercial outfitters as the takeout for boaters on the Middle Ocoee;
    - Parcel 2, a 15.0-acre area at Ocoee No. 2 Dam used as the takeout for boaters on the Upper Ocoee River and as the launch area for boaters on the Middle Ocoee River; and
    - Parcel 3, the 3.87-acre area immediately downstream of Ocoee No. 3 Dam used as the launch area for boaters on the Upper Ocoee River (this tract is currently licensed by TVA to the USFS under the terms of a 30-day revocable license).

The locations of these land actions are shown on Figure 2-3.

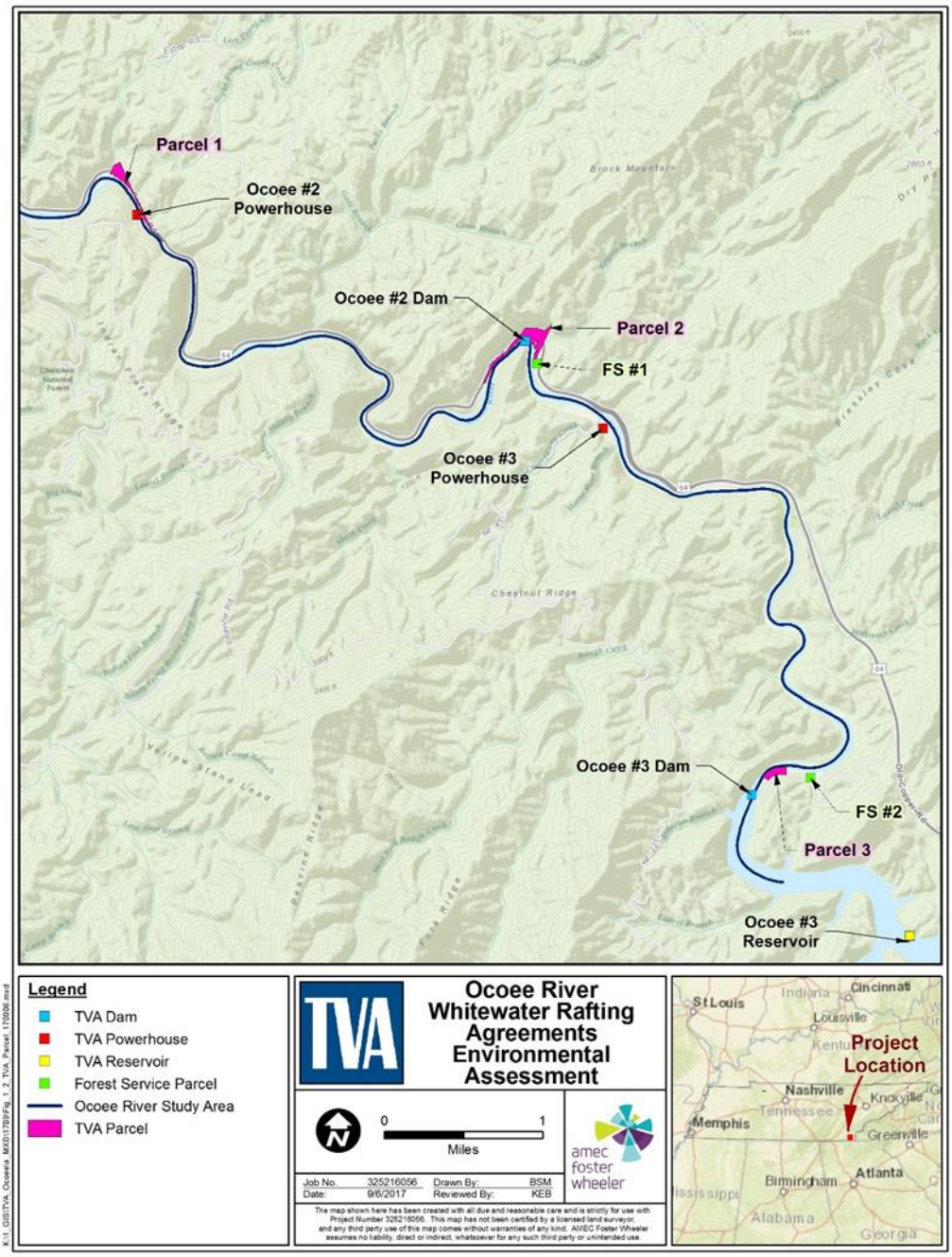

Figure 2-3. Parcels Considered for Management by the State Under the Proposed Action

2.2.3 Alternative C – Current Management Regime

This alternative is substantially similar to Alternative B, except under this alternative, TVA would continue releasing water to the Middle Ocoee River for the five weekdays in late September that are not scheduled under Alternative B. Thus, over the 15-year agreement (assumed to be renewed for an additional 15-year period), TVA would provide a total of up to 116 release days per year. This is the current management practice and the water release schedules would be consistent with the framework described in Section 2.1 above. Under this alternative, however, TVA would not receive compensation for the additional five release days in September. Water releases on the Upper Ocoee River would continue to be provided as described under Alternative B.

2.2.4 Alternatives Considered but Eliminated from Further Discussion

In response to comments received during the scoping process, TVA considered requests to increase the number of recreational release days per year and to increase the velocity of flow during water release periods. The schedules for recreational water release considered in this EA provide recreational benefit while optimizing reservoir operations and power production, and as noted above, TVA would consider additional release days at the request of the outfitters. TVA also considered requests to increase the rate of flow released. Flow rates were set based on flow testing by commercial and private users. Increasing the minimum recreation flows would increase the value of the lost power and were not considered. In addition, the actual flow rates vary depending on the amount of water that must be released to meet the recreation commitment and any additional inflow that must be released. Therefore, higher flows are provided several times throughout the season, without any additional costs. In addition, an increase in flow rate could alter the existing habitat of the river as well as impact safety of recreational users. Therefore, based on these reasons, additional alternatives to address increases in the number of release days and an increase in flow were eliminated from further consideration.

2.3 Comparison of Alternatives

The environmental impacts of each of the alternatives under consideration are summarized in Table 2-1. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2-1. Summary and Comparison of Alternatives by Resource Area

Resource Issue Area	Alternative A No Action	Alternative B Proposed Action	Alternative C Current Management Regime
Recreation and Economics	Significant impact to the local economy and recreators. Minor benefit to TVA consumers.	Minor impact to the local economy and recreators relative to baseline conditions. Minor benefit to TVA consumers.	Minor impact to the local economy and recreators relative to baseline conditions. Incrementally less than Alternative B. Minor impact to TVA consumers.
Demographics	No impact on residential population, Moderate impact on	No impact relative to existing conditions.	No impact.

Resource Issue Area	Alternative A No Action	Alternative B Proposed Action	Alternative C Current Management Regime
	local transient population.		
Environmental Justice	No impact.	No impact.	No impact.
Traffic and Transportation	No change in existing level of service, but notable improvement in seasonal recreator-based congestion.	No impact relative to existing conditions.	No impact.
Hydrology	Notable change in flow characteristics.	No impact relative to existing conditions.	No impact.
Water Quality	No impact.	No impact relative to existing conditions.	No impact.
Vegetation and Wildlife	Change in habitat could result in potentially significant impact to globally rare plant communities. Minor impact to wildlife.	No impact relative to existing conditions.	No impact.
Aquatic Ecology	Minor impact. Aquatic biota are adapted to variable flow.	No impact relative to existing conditions.	No impact.
Threatened and Endangered Species	Potential significant impact to federally listed Ruth's golden aster.	No adverse impact.	No adverse impact.
Wetlands	Change in plant composition; however, no impact to extent of wetlands.	No impact relative to existing conditions.	No impact.
Natural Areas and Parks	Minor indirect impact to parks due to decrease in visitors. Moderate indirect impact to ecologically sensitive area due to change in habitat.	No impact relative to existing conditions.	No impact.
Cultural Resources	No impact.	No impact.	No impact.
Cumulative Effects	Cumulative effect related to increased use of alternate whitewater rafting rivers in the region. Impact would be minor and not detectable on a regional level.	No impact.	No impact.

2.4 TVA's Preferred Alternative

TVA's preferred alternative is Alternative B. Under the Proposed Action TVA would enter into agreements that would allow the continued support of commercial rafting activities on the Ocoee River. Both Alternatives B and C would allow for the continued support of commercial rafting and result in minor impacts to the local economy and recreational users. However, under Alternative C, TVA consumers would bear the fractional cost associated with the replacement power generation associated for the five additional release days in September. Implementation of Alternative B would have similar impacts as Alternative C but would have the added benefit of enabling TVA to produce power in a reliable and cost effective manner.

2.5 Summary of Mitigation Measures

Mitigation measures are actions that could be taken to avoid, minimize, or reduce or compensate for adverse impacts to the environment. The EA evaluates the impacts related to the decision to enter into new agreements to enable continued commercial rafting opportunities on the Ocoee River. No activities that would have adverse impacts on the environment are proposed as part of the action evaluated in this EA; therefore, specific mitigation measures have not been identified.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Recreation and Economics

3.1.1 Affected Environment

3.1.1.1 Economic Impact of Recreation

Due to its location in the Cherokee National Forest, numerous recreational facilities are located within the vicinity of the Ocoee River. These include rafting, kayaking, camping, hunting, fishing, boating, hiking, biking and picnicking. However, the economic base of the project area is dominated by the rafting industry.

Recreational use on the Ocoee River is dominated by a developed industry of commercial rafting on both the Upper and Middle Ocoee River. As a premiere whitewater rafting location, the Ocoee River is one of the most popular rivers in the country and draws visitors from throughout the eastern U.S. Traditionally, the busiest recreational days on the Ocoee River occur on weekends during the summer months.

Two sections of the river, commonly known as the Upper Ocoee and the Middle Ocoee, are used for whitewater recreation (Figure 1-1). The Upper Ocoee is defined as the reach from RM 29.2 just below Ocoee No. 3 Dam downstream to RM 24.2 at the Roger's Branch access site just above Ocoee No. 2 Dam. When generating power at the Ocoee No. 3 Powerhouse, the water in this section is diverted at No. 3 Dam into a tunnel to the Ocoee No. 3 powerhouse located about 0.8 mile upstream of the No. 2 Dam (Figure 1-2). Most rafting trips on the Upper Ocoee River are about 5 miles long and begin at the put-in below Ocoee No. 3 Dam. A section of the Upper Ocoee River (about 1,500 feet) was modified to hold the world's first Olympic whitewater event on a natural river, the 1996 Olympic canoe and kayak slalom events. Since the Olympic competition, the Ocoee has been a premier whitewater venue for athletes from around the world who value the Class III–IV rapids in the Ocoee's Upper and Middle sections.

The Middle Ocoee is defined as the reach from RM 24.1 at Ocoee No. 2 Dam downstream to the take-out at RM 19.6 below the Ocoee No. 2 Powerhouse (Figure 1-3). When generating power at the No. 2 Powerhouse, the water in this section is diverted at No. 2 Dam into an elevated flume to the No. 2 Powerhouse. Rafting trips on the Middle Ocoee River are about 4.5-miles long and begin at the put-in below Ocoee No. 2 dam. Many rafters float both the Upper and Middle Ocoee sections in one trip.

Commercial outfitters provide rafting and other paddling services on the Upper and Middle sections of the Ocoee River. Up to 25 companies may be registered with the State to provide rafting services on the Ocoee River. Whitewater recreation on both river sections is dependent on the release of water from TVA dams into the river channel. In addition to scheduled release days, non-commercial rafters also take trips on the river when there is sufficient and plentiful rainfall.

3.1.1.2 Economic Setting

Trips to the Ocoee River benefit rafters, those who provide rafting services, and those who support the rafting industry directly or indirectly. Creating the water flow to support Ocoee River rafting trips requires restricting otherwise available power generation. This increases power generation costs. In addition, the numerous river users mean some level of facility

provision and maintenance is required. Economic effects related to the rafting industry that the analysts conducting this evaluation determined to be potentially the most important are those that would affect power generation, the southeastern rafting market, and local business and residents.

The release of water from the Ocoee dams to support recreation mean that less hydropower is generated. This leads to costs to TVA which occur as other forms of generation are used to offset unavailable lower cost hydropower. TVA uses a production cost model known as Planning and Risk, a Ventyx tool, to estimate the cost to provide replacement power. The model produces details about the projected usage of TVA's generating resources to meet forecasted demand over any desired time horizon (hourly, daily, weekly, monthly, or yearly) in the future. TVA's goal is to deploy the lowest cost resources to meet power demands before utilizing higher cost resources. The production cost model provides the marginal cost of power based on projected future supply and demand given current expectations of future system conditions. Hourly values from TVA's Planning and Risk model are used to calculate an average replacement cost of energy on a weekly basis.

The existing (baseline) economic characteristics of the southeastern rafting market and its effects on local businesses and residents were evaluated using linked simulation models. The rafting market approach begins with a travel cost based model of the demand for rafting in the southeast. The supply of Ocoee River rafting is developed based on costs and revenues of providing trips.

Inputs to the travel cost based model include changes to:

- *Cost* to outfitters to supply commercial rafting trips
- *Quality* of rafting at the Ocoee River and similar eastern U.S. rivers
- *Availability* of rafting at particular times

Outputs of the model include changes in:

- *Consumer surplus* which is an economic measure of the value that rafters derive from the rafting trips they take
- *Rafting trips* taken by type (single or multiple day)
- *Expenditures* by rafters taking single or multiple-day trips and expenditure type (e.g. restaurants, hotels)

Rafting use levels (including expenditures) under the Ocoee's existing conditions have economic impacts on local economies and employment. This evaluation uses input/out (I/O) analysis to estimate the economic impact of these use levels on local economies and employment.

The I/O models characterize changes in demand for one industry in terms of their effect on all industries within a local economic area. Inputs to the I/O model are the:

- *Direct expenditures* which represent the initial, baseline expenditures across each industry.

The outputs of this analysis are direct baseline employment, indirect and induced expenditures, employment, and tax payments in the local economy, which are defined as Polk and Bradley County, Tennessee. Although a small number of employees would pay taxes outside Polk and Bradley counties, the results of the model are not meaningfully impacted by these actions. The outputs of the analysis include:

- *Direct employment* that occur as the rafting and directly related industries experience a reduction in revenues that is equal to rafter reduction in expenditures.
- *Indirect revenues and employment* as a result of inter-industry transactions as supplying industries adjust to demands from the directly affected industries.
- *Induced revenues and employment* that reflect local spending that result from income changes in the directly and indirectly affected industry sectors.

IMPLAN is the I/O modeling package which was employed to conduct this analysis.

3.1.1.3 Economic Benefits and Impacts of Rafting

Economic impacts associated with the Ocoee River water releases are evaluated in detail in Appendix C and summarized below.

Economic implications of rafting include economic benefits and economic impacts. Economic benefits accrue to rafters as consumer surplus which is the amount rafters would be willing to pay above and beyond costs.[1] Economic benefits can't be observed directly but can be identified using travel cost modeling techniques. The economic benefits of rafting have been identified in several studies. Rosenberger (2016) compiled the Recreation Use Values Database (RUVD) for North America. The RUVD includes economic valuation studies estimating the consumer surplus (value above costs) use value of recreation activities (per person per day) in the U.S. and Canada from 1958 to 2015. Rosenberger adjusted the 3,192 estimates of diverse recreational activities in the RUVD to 2016 U.S. dollars. Rosenberger estimated a mean consumer surplus use value of $117.39 per single-day trip for non-motorized boating, including whitewater rafting.

English and Bowker (1996) estimated per trip consumer surplus for a zonal travel-cost model for outfitted rafting on the Chattooga River along Georgia's border with South Carolina. The authors collected data from a random sample of households who used commercial outfitter services on the Chattooga River. English and Bowker's estimates of consumer surplus use value per rafting trip ranged from $31.66 to $70.46 (2016 U.S. dollars).

English, Bowker, and Donovan (1996) studied per trip consumer surplus use value associated with guided whitewater rafting on the Chattooga River (Georgia and South Carolina) and the Nantahala River in rural western North Carolina. The authors estimated household recreation demand functions based on an individual travel-cost model. Their findings show average per trip consumer surplus estimates between $89 and $286 (1996 U.S. dollars). The estimates vary based on modeling assumptions regarding the opportunity cost of time and river quality.

[1] For example if a hypothetical rafter is willing to pay a total (including travel costs and fees) of $150 for a rafting trip but the actual cost of the trip is $75, the rafter received $75 in consumer surplus.

Economic impacts are different from benefits in that they measure exchange rather than value. Economic impacts from rafting occur as rafters spend money in local economies. The most recent evaluation of the local economics of Ocoee River rafting was conducted by Dr. Steve Morse. This study was requested by the OROA with support from the America Outdoors Association (Morse 2013a, 2013b). During 2012, the Ocoee River became "the most visited whitewater river" in the U.S. with 229,542 visitors (Beauchamp 2013). Morse and other researchers from the University of Tennessee studied the 2012 economic impacts of visitor spending by Ocoee River rafters. Morse's team conducted visitor spending surveys at the Ocoee River from June 8 to September 20, 2012. The researchers asked rafters how much they spent in the local area while rafting the Ocoee River. The survey data "represented the spending patterns of 3,118 rafters visiting the Ocoee River in 2012" (Morse 2013a, 2013b).

The alternatives being evaluated imply changes to Ocoee River rafting availability and costs. Existing information from economic studies including the Morse study, a recent edition of IMPLAN, and recent rafting counts were employed to develop an integrated local economic impact and supply and demand based representation of eastern U.S. rafting.

Demand for Ocoee River rafting is influenced both by the population of potential rafters and the quality, cost, and location of other premiere rafting sites.[2] The Morse study effort included a survey of Ocoee River rafters that requested information about their rafting trip. The results of the survey indicate that Ocoee River rafters come from all over the United States but are primarily from the Eastern United States. Based on this, potential Ocoee River rafters were specified as coming from the center of the 474 counties within 350 miles of the Ocoee.

To find the substitute rafting sites needed to complete the demand model, information from American Whitewater (2017a, 2017b), Eddlemon (2014a, 2014b), print and online media articles, the USFS (2017b, 2017c, 2017d, 2017e), Web sites for Ocoee River outfitters, the National Park Service, National Geographic (2017), Riverfacts.com, Hawks Nest Hydroelectric Project (Hawks Nest Hydro, LLC 2015), and others were considered. These sources identified whitewater rafting sites in Tennessee, Alabama, Georgia, Kentucky, North Carolina, Virginia, and West Virginia. From the initial list of more than 100 alternate rafting sites, a group was selected as the most likely sites that Ocoee rafters would choose if whitewater rafting trips to the Ocoee were unavailable. These include other well-known rafting rivers such as the Gauley, Nolichucky, Chattooga, and Nantahala.

Distances and travel costs from the centers of these counties to the Ocoee River and other premiere eastern U.S. rafting destinations was calculated using truck routing software (PCMiler) and standard AAA per-mile travel costs. The quality of the Ocoee River and alternative premier rafting sites was specified using the site quality metrics of Hynes, Hanley, and Garvey (2007). Although a related econometric model was developed for whitewater opportunities in Ireland no similar studies of preferences in the U.S. are available. The relevant site quality metrics are whitewater quality, parking quality, crowding, water pollution, scenic quality and water level predictability.

The alternate whitewater rafting sites identified were studied and assigned ratings in each category identified above (whitewater quality, parking, crowding, water pollution, scenic

[2] Rafting on the Ocoee River may also compete with theme parks such as Six Flags Over Georgia. Although this is possible it was not feasible to include "unlike" competitors in this evaluation.

quality, and predictability of water level). Table 3-1 lists the sources of information used for rating each alternate whitewater site in these six categories.

Table 3-1. Sources of Information for Rating Whitewater Rafting Sites

Category	Source of Information
Whitewater quality	American Whitewater (2017a, 2017b), Eddlemon (2014a, 2014b), print and online media articles. Based on published information, the Ocoee River receives the highest rating on the scale (5) because of its whitewater class and people's enjoyment of Ocoee whitewater trips.
Parking quality	Published reports, aerial views from Google Earth.
Crowding	Published reports. A rating of "5" means that a site is not crowded with whitewater rafters.
Water quality	Published water quality reports from TDEC and other states' environmental agencies.
Scenic rating	Published reports, including Eddlemon (2014a, 2014b).
Predictability of water level	American Whitewater (2017a, 2017b), Eddlemon (2014a, 2014b), published reports (including gauge readings).

This information (population, travel costs, site characteristics) was combined in a commercial rafting site-choice demand model, used to characterize the "demand" for eastern U.S. rafting. This model provides the baseline value of rafting and the behaviors of rafters on the Ocoee River. These Ocoee River rafting trips are "supplied" by companies providing guided rafting trips on a per-person fee basis. The supply curve or "supply" for Ocoee River guided rafting trips represents the amount of trips each rafting company is willing and able to provide at a given price.

There is not a readily available source that includes the detailed cost information needed to compose the supply curve for Ocoee rafting. Evaluation of IMPLAN (an economic impact modeling platform) data indicates that approximately 91 percent of revenues in the rafting category for a particular zip code could be accounted for by Ocoee rafting companies. Costs for these companies include employee compensation (24 percent of the total revenue), facility (6 percent of the total revenue) and others (20 percent of the total revenue) with the remainder going to a large number of small categories.

Supply conditions were characterized by developing a representation of per-trip costs with total average trip costs ranging from $45 to $55. Capacity is specified to be rafting trips provided by each company as indicated by the outfitter data. Average cost is specified to be lower for larger companies. This comes from lower average facility and labor costs. Ordering these from lowest cost to highest cost results in a market marginal cost curve – the "supply" of rafting.

To complete the characterization of the baseline rafting market the representation of supply is integrated with the demand model by specifying that the average price of rafting is $50. The market model is then calibrated to replicate the 184,518 guided rafting trips to the Ocoee River. This is consistent with guided rafting trips for the most recent year with available information (2016).

Expenditure and trip data on the Ocoee River from Morse (2013) indicates that 59 percent of visits to the Ocoee River are day visits. The remaining 41 percent include overnight stays within 60 miles of the Ocoee River. Of the overnight visits, hotel stays account for 40 percent of overnight trips, rented cabins or homes for 30 percent, friends' or relatives' homes for 21 percent, and campgrounds for 9 percent. When combined, day trips account for 59 percent of total annual trips, overnight trips spent with friends and family account for 8 percent of annual trips, overnight trips spent at a hotel are 17 percent of total annual trips, overnight trips spent at a rented cabin or house are 13 percent of total annual trips, and overnight trips spent at a campground are 4 percent of total annual trips to the Ocoee River.

Table 3-2 presents the breakdown of average spending by Ocoee River whitewater rafters in 2012 (Morse 2013). Rafting trip and fees are the highest expenditure. This is because both day and overnight visitors spend money in these categories.

Table 3-2. Breakdown of Average Spending Per Person

Expenditure Category	Per Person Spending (2017 dollars)
Rafting Trip and Fees	$41.30
Lodging	$29.37
Food and Beverage	$23.33
Transportation	$16.34
Retail, souvenirs, etc.	$9.95
Total	$120.29

Source: Morse 2013b

For this analysis, these expenditure rates are further broken down by trip type and average per-day expenditures. Table 3-3 presents the expenditure breakdown by trip type. For example, day visitors spend about $90 per visitor. Because these visitors come from nearby, this $90 does not include lodging expenditures.

Overnight visitors spend between $118 and $219 per visit per person. Overnight visitors who stay with friends and family do not spend money on lodging. When these specifications are made, overnight visitors who stay with friends and family spend an average of $124.49. Overnight visitors who stay in hotels, rented cabins or houses, and at private or public campgrounds have lodging costs. Visitors who stay at hotels or motels spend about $219 per trip, followed by visitors who stay in rented cabins or homes at approximately $197, and lastly, visitors who stay in private or public campgrounds, with an average spending per trip of approximately $118.

Day visitors and overnight visitors who stay with friends and relatives spend the most on costs associated with the rafting trip, followed by food and beverage, transportation, and souvenirs/retail. Overnight visitors who stay at hotels spend the most on the rafting trip relative to the other expenditure categories. Overnight visitors who stay in rented cabins or homes spend the most on lodging. Visitors who stay in private or public campgrounds spend the most on the rafting trip.

Table 3-3. Expenditures by Sector and Trip Type (2017 Dollars)

		Overnight Visitors			
Expenditure Category	**Day Visitors**	**Relatives or Friends**	**Hotel or Motel**	**Rented Cabin or House**	**Private or Public Campground**
Rafting Trip and Fees	$47.43	$57.06	$70.67	$63.80	$44.24
Lodging	—	—	$50.35	$68.52	$12.34
Food & Beverage	$17.99	$29.07	$42.73	$31.07	$25.57
Transportation	$14.58	$27.75	$32.67	$20.63	$23.85
Retail, Souvenirs, etc.	$9.73	$10.61	$22.35	$13.06	$11.62
Average Spending Per Visitor	$89.73	$124.49	$218.77	$197.09	$117.61

Source: Morse 2013

Each expenditure category in Table 3-3 comprises a variety of sectors. Rafting trips and fees include recreation fees, parking fees, and outfitter fees (e.g., Ocoee River Outfitters). Lodging includes hotels, rental cabins and homes and private or public campgrounds. The food and beverage category includes full-service restaurants, limited-service restaurants, and all other food and drinking places (e.g., mobile food concession stands). Transportation includes expenditures at gas stations and car rentals. Souvenir/retail expenditures are spent at souvenir shops, health and personal care stores (e.g., pharmacies) and general merchandise stores (e.g., Walmart).

Per-trip expenditures by category from Table 3-3 were used to identify per-trip direct, indirect and induced economic impacts under the baseline condition. Table 3-4 presents the economic impacts associated with baseline conditions based on expenditures from the 2012 Morse study, trips and inter-market relationships in IMPLAN from 2016. Total Industrial Output refers to the dollar value of goods and services produced. Value-added impacts are employee compensation, proprietor and property type income, and tax on production and imports. Indirect Business Tax includes excise taxes, property and sales tax paid by businesses, fees, fines, licenses, and permits. Labor Income is the sum of employee compensation and proprietor income.

Table 3-4. Baseline Annual Economic Impacts from Commercial Rafters on the Ocoee (2017 Dollars)

Economic Indicator	**Direct**	**Indirect**	**Induced**	**Total**
Total Industrial Output	$18,413,162	$3,578,289	$4,056,327	$26,047,778
Total Value Added	$9,777,943	$1,762,641	$2,402,532	$13,943,116
Indirect Business Tax	$1,946,492	$148,233	$250,578	$2,345,303
Labor Income	$5,830,918	$1,163,662	$1,565,430	$8,533,010
Employment	320.4	32.0	32.5	384.9

The estimated level of direct expenditures by rafters in baseline conditions is approximately $22.67 million. Retail expenditures are specified to be gross retail sales (i.e., purchaser prices) as opposed to gross retail margin (i.e., producer prices). IMPLAN applies the appropriate margin to the gross retail sales; therefore, the output results only reflect the margined value. All non-transportation expenditures are modeled to occur in the local market which is specified to be the counties which border the Upper and Middle Ocoee (Polk and Bradley) counties. Only half of the transportation expenditures are specified for these counties to account for origin or in route gas purchases. After these adjustments are made, the estimated level of direct expenditures in baseline conditions is approximately $18.41 million. This expenditure level is responsible for about $9.78 million in value-added economic effects of which $1.95 million are indirect business taxes and $5.83 million in labor income in Polk and Bradley counties. The total federal, state, and local indirect business taxes do not include personal income tax or social security taxes.

The indirect output (i.e., amount of inter-industry transactions from supplying industries) is $3.58 million. This output is associated with 32 jobs resulting in a total of $1.16 million in labor income. The induced effects (i.e., amount of local spending that result from income in the directly and indirectly affected industry sectors) are estimated to be $4.06 million in industrial output. This output is associated with almost 33 jobs, resulting in a total of $1.57 million in labor income. In total, under the baseline conditions the expenditures by rafters of the Ocoee River results in approximately $26.05 million in industrial output, $13.94 million in value-added impacts, $2.35 million in indirect business taxes, and almost 385 jobs resulting in a total of $8.53 million in labor income.

3.1.2 Environmental Consequences

The most economically important features of the alternatives are the changes in the availability/reliability of Ocoee River flow and changes in the direct cost of Ocoee River rafting. Changes to availability and reliability of rafting occur as planned releases are eliminated under Alternative A or curtailed under Alternative B. Changes to the direct cost of Ocoee River rafting occur for both Alternatives B and C as per-rafter fees increase by approximately $5 to account for facility maintenance costs that were previously provided by the State.

These effects are evaluated by first adjusting the rafting supply and demand conditions to reflect the proposed changes in water release schedules and cost. Changes in availability and reliability are identified by developing models that are calibrated to produce the trip numbers associated with the changes. Implications for consumer surplus are developed as output from the model. Changes in cost are evaluated by changing the cost structure of rafting outfitters and observing the model-produced changes in trip numbers and consumer surplus.

Implications for expenditures are derived based on the number and type (overnight or not) of rafting trips for each alternative. Expenditures by sector for each alternative are an input to the local economic impact model. These direct expenditures are used to identify the total local economic impact (direct, indirect, induced) effect on expenditures and employment. Changes in economic benefits and economic impacts could potentially apply to commercially guided and self-guided recreational rafters. For this assessment, changes to economic impacts from self-guided rafters were not evaluated because many of these trips are expected to be local. This means that trip changes by these rafters would not lead to important changes in expenditures and therefore they would not lead to economic impacts. Changes to economic benefits are evaluated for all rafters.

3.1.2.1 Alternative A – No Action

3.1.2.1.1 Rafting-Related Economic Impacts

Under the No Action Alternative there is no agreement on water releases for recreation purposes. TVA would operate the Ocoee dams as it does its other assets – as part of an overall system to manage water for flood control, hydroelectric power generation, recreation, water supply, water quality, aquatic habitat, and other uses. Without predictable flow, all self-guided and commercially guided rafting on previous release days is expected to be unsustainable.

Based on 2016 rafter counts this would result in the loss of approximately 200,000 annual rafting trips: 181,438 commercially-guided trips and 18,598 recreational trips. The economic model used for this analysis estimates that the present value of the losses in economic benefits (consumer surplus) associated with these lost rafting trips over a 15-year time period is approximately $289 million ($19.3 million in annual losses).

This is the lost value to those 200,000 recreators who would have preferred to take rafting trips on the Ocoee River, but because the river would no longer support rafting, they either have to go to another location that is farther away, of lower quality, or both. The economic value measure reflects how much more they would prefer to take their trips to the Ocoee River than to the other distant and/or lower quality rafting sites.

Private rafting and kayaking would still exist under this alternative when conditions are favorable during periods of rain/high flow that would produce excess non-turbine flow. Private rafting and kayaking is expected to be driven by local, opportunistic recreators. This is not expected to result in a trip differential related to experience or desirability. Accordingly, there is no change to these rafters' well-being or expenditures.

In addition to losses in economic value resulting from lost trips under the No Action Alternative, there would also be economic impacts resulting from the lost trips. The analysis uses IMPLAN to assess the economic impacts resulting from the lost trips. To use the IMPLAN model, per-trip expenditures by category from Table 3-3 were used to identify per-trip indirect and induced economic impacts. Table 3-5 presents the economic impacts associated with implementation of Alternative A. Under Alternative A, all economic impacts associated with baseline conditions are lost because managed water releases for recreation purposes would be eliminated.

Table 3-5. Alternative A – Estimated Annual Economic Losses from Whitewater Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total Industrial Output	$18,413,162	$3,578,289	$4,056,327	$26,047,778
Total Value Added	$9,777,943	$1,762,641	$2,402,532	$13,943,116
Indirect Business Tax	$1,946,492	$148,233	$250,578	$2,345,303
Labor Income	$5,830,918	$1,163,662	$1,565,430	$8,533,010
Employment	320.4	32.0	32.5	384.9

3.1.2.1.2 Cost of Power

Under the No Action Alternative water previously released in support of rafting would be made available as needed by TVA to generate power at the No. 2 and No. 3 Powerhouses. As such, the higher cost of generation of replacement power under the baseline condition would not be passed on to TVA consumers under the No Action Alternative.

3.1.2.2 Alternative B – Proposed Action

3.1.2.2.1 Rafting-Related Economic Impacts

Under the proposed action, TVA would operate the dams similarly to current operations but with a slight reduction in release days. This change is expected to have a minimal impact to private rafting as the information available regarding private rafting is not quantifiable given the slight reduction in release days. Overall, fees required to be paid for commercial rafting operations would increase. There is currently a facility maintenance fee of $0.50 per rafter for all sections of the river, a U.S. Treasury repayment fee of $1 per rafter for lost power generation on the middle section, and an OROA fee for the upper section associated with lost power generation equating to approximately $5 per rafter. Under this proposal, there would be no fee associated with lost power generation and the new fee associated with maintenance is expected to be about 10 percent of current per-rafter revenue of $45 to $55 per-trip and would be used to support the State's operation, maintenance and administrative costs which are estimated to be $450,000 in 2019.

This increase in maintenance fees shifts some ongoing cost from taxpayers to some mixture of operators and customers. To evaluate the implications of the rafting cost increase, the supply demand framework described above was applied. Because the cost increase would apply evenly to all rafting companies, a per-trip price increase equivalent to the cost increase was added to the supply curve (described above). The resulting simulation indicates that adding $5 per trip to the overall costs experienced by rafters results in an annual reduction of 8,050 trips, which represents a 4.4 percent reduction in trips annually. In addition, the five days in September where rafting is eliminated accounts for approximately 400 trips, for a total impact of a loss of 8,445 trips (4.7percent of total trips).

The present value of the loss in economic benefits (consumer surplus) to recreators associated with 8,445 lost trips over a 15-year time period is approximately $12.2 million (approximately $813,000 in annual losses). These are losses to recreators who would have preferred to take rafting trips to the Ocoee River, but the increased costs of Ocoee River trips or the lack of availability during those five days causes them to either go to another location that is of lower quality or to not raft at all. The economic value measure reflects how much more they would prefer to take their trips to the Ocoee River rather than to other lower quality rafting sites or to not raft at all.

In addition to losses in economic value to recreators resulting from lost trips under Alternative B, there would also be impacts to the economy resulting from the lost trips. The analysis uses IMPLAN to assess the economic impacts resulting from the lost trips. To use the IMPLAN model, per-trip expenditures by category from Table 3-3 were used to identify per-trip indirect and induced economic impacts.

Table 3-6 presents the economic impacts associated with implementation of Alternative B.

Table 3-6. Alternative B – Estimated Annual Economic Losses from Whitewater Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total Industrial Output	$857,055	$166,554	$188,805	$1,212,414
Total Value Added	$455,122	$82,043	$111,828	$648,993
Indirect Business Tax	$90,601	$6,900	$11,663	$109,164
Labor Income	$270,148	$54,164	$72,864	$397,176
Employment	14.9	1.5	1.5	17.9

The estimated level of direct expenditures by the 8,445 rafters in Alternative B is approximately $1.06 million. After adjustments are made to retail and transportation expenditures, the estimated level of direct expenditures that will be lost under Alternative B is approximately $857,000. This expenditure level is responsible for about $455,000 in value-added impacts of which $91,000 are indirect business taxes and 15 employees making $270,000 in labor income in Polk and Bradley counties. The total federal, state, and local indirect business taxes do not include personal income tax or social security taxes.

The indirect losses (i.e., changes in inter-industry transactions as supplying industries respond to decreased demand from the directly affected industries) is $167,000 in output. This output is associated with approximately two jobs receiving a total of $54,000 in labor income. The induced losses (i.e., changes in local spending that result from income changes in the directly and indirectly affected industry sectors) are estimated to be $189,000 in industrial output. This output is associated with approximately two jobs, receiving a total of $73,000 in labor income. In total, the expenditures by rafters of the Ocoee River results in approximately $1.21 million in lost industrial output, $649,000 in lost value-added impacts, $109,000 in lost indirect business taxes, and almost 18 lost jobs receiving a total of $397,000 in labor income.

3.1.2.2.2 Cost of Power

In conjunction with Alternative B, TVA would continue to release water from Ocoee No. 3 and No. 2 dams to support commercial rafting. Consequently, TVA would reduce the amount of hydropower generation and would have to shift loads to other generation facilities at a higher production cost. However, in accordance with renewed agreements for water supply, TVA would be compensated for the differential cost of power. As such, TVA consumers would not bear the marginal cost associated with reduced hydropower generation under this alternative.

3.1.2.3 Alternative C – Current Management Regime

3.1.2.3.1 Rafting-Related Economic Impacts

Under this alternative, TVA would continue to release water from Ocoee No. 3 and No. 2 dams to support commercial rafting similar to the baseline condition. However, the existing fee of $0.50 per rafter charged to commercial rafting operations would be increased as described under Alternative B.

As described under Alternative B, this increase from existing costs would fall on some mixture of operators and customers and result in an annual reduction of 8,050 trips, which

represents a 4.4 percent reduction in trips annually. There would be no change in the current release schedule and therefore no additional loss in rafting trips.

The present value of the loss in economic benefit (consumer surplus) to recreators associated with these lost rafting trips over a 15-year time period is approximately $11.6 million (approximately $775,000 in annual losses).

Table 3-7 presents the impacts to the economy associated with Alternative C.

Table 3-7. Alternative C – Estimated Annual Economic Losses from Whitewater Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total Industrial Output	$818,944	$159,148	$180,409	$1,158,501
Total Value Added	$434,884	$78,395	$106,855	$620,134
Indirect Business Tax	$86,572	$6,593	$11,145	$104,310
Labor Income	$258,135	$51,755	$69,624	$379,514
Employment	14.2	1.4	1.4	17.0

The estimated level of direct expenditures by the 8,050 rafters in Alternative C is approximately $1.01 million. After adjustments are made to retail and transportation expenditures, the estimated level of direct expenditures that will be lost under Alternative C is approximately $819,000. This expenditure level is responsible for about $435,000 in value-added impacts of which $87,000 are indirect business taxes and 14 employees making $258,000 in labor income in Polk and Bradley counties. The total federal, state, and local indirect business taxes do not include personal income tax or social security taxes.

The indirect losses (i.e., changes in inter-industry transactions as supplying industries respond to increased demands from the directly affected industries) is $159,000 in output. This output is associated with over one job receiving a total of $52,000 in labor income. The induced losses (i.e., changes in local spending that result from income changes in the directly and indirectly affected industry sectors) are estimated to be $180,000 in industrial output. This output is associated with over one job, receiving a total of $70,000 in labor income. In total, the expenditures by rafters of the Ocoee River results in close to $1.16 million in lost industrial output, $620,000 in lost value-added impacts, $104,000 in lost indirect business taxes, and almost 17 lost jobs receiving a total of $380,000 in labor income.

3.1.2.3.2 Cost of Power

In conjunction with Alternative C, TVA would continue to release water from Ocoee No. 3 and No. 2 dams to support commercial rafting. Consequently, TVA would reduce the amount of hydropower generation and would have to shift loads to other generation facilities at a higher production cost. In accordance with renewed agreements for water supply TVA would be compensated for the differential cost of power for all recreational days extending through August. However, no compensation would be provided for the five additional release days scheduled in September. As such, TVA consumers would not bear the marginal associated with reduced hydropower generation under this alternative for most

of the recreational season, but would bear the fractional cost associated with the replacement power generation during the 5 days in September.

3.1.2.4 Summary of Environmental Consequences

Recreational rafting on the Ocoee River has an impact on the local economy, individual rafters and TVA consumers. Economic impacts from rafting occur as rafters spend money in local economies. Rafters receive benefits when the amount they are willing to pay for commercial rafting on the Ocoee River exceeds actual cost and the costs incurred by TVA to provide replacement power on recreational release days are absorbed by TVA consumers.

Total impacts to the economy (annual losses), impacts to the recreator and impacts to the TVA consumer are summarized in Table 3-8 for each of the proposed alternatives.

Table 3-8. Summary of Environmental Consequences

	Alternative A	Alternative B	Alternative C
Lost Rafting Trips	200,000	8,445	8,050
Total Annual Losses			
Total Industrial Output	$26,047,778	$1,212,414	$1,158,501
Total Value Added	$13,943,116	$648,993	$620,134
Indirect Business Tax	$2,345,303	$109,164	$104,310
Labor Income	$8,533,010	$397,176	$379,514
Employment	384.9	17.9	17.0
Impact to Recreator			
Total Loss of Economic Benefit (15 years)	$289 million	$12.2 million	$11.6 million
Annual Loss of Economic Benefit	$19.3 million	$813,000	$775,000
Impact to TVA Consumer			
Cost of Replacement Power	No cost	No cost	Cost associated with five release days in September

Under Alternative A the loss of approximately 200,000 rafting trips would result in approximately $26.05 million in lost expenditures in the local economy. This would result in a $13.94 million in lost value-added impacts, $2.35 million in lost indirect business taxes, and almost 385 lost jobs receiving a total of $8.53 million in labor income. In addition the losses in economic benefits to rafters (consumer surplus) associated with these lost rafting trips over a 15-year time period is approximately $289 million ($19.3 million in annual losses). The estimated impact to the local economy and to rafters would be significant.

However, there would be a minor beneficial impact under the No Action Alternative as the cost of generation of replacement power under the baseline condition would not be passed on to TVA consumers.

The estimated level of expenditures in the local economy that would be lost due to the loss of 8,445 rafting trips (4.7 percent of total trips) as a result of the fee increase and loss of five recreational release days in September under Alternative B is approximately $1.2 million. This expenditure level is responsible for about $650,000 in value-added impacts of which $109,000 are indirect business taxes and 18 employees making $397,000 in labor income. The impact to individual rafters over a 15-year time period is approximately $12.2 million (approximately $813,000 in annual losses). This would be a minor impact relative to the No Action Alternative, (Alternative A).

Under Alternative B, TVA would be compensated for the cost of replacement power which would have a beneficial impact on TVA consumers.

The estimated level of expenditures in the local economy that would be lost due to the loss of 8,050 rafting trips (4.4 percent of total trips) as a result of the fee increase under Alternative C is approximately $1.1 million. This expenditure level is responsible for about $620,000 in value-added impacts of which $104,000 are indirect business taxes and 17 employees making $379,000 in labor income. The impact to individual rafters over a 15-year time period is approximately $11.6 million (approximately $775,000 in annual losses). This would be a minor impact relative to the No Action Alternative, although incrementally less than Alternative B.

Under Alternative C, TVA would be compensated for the differential cost of power for all recreational days extending through October. However, no compensation would be provided for the five additional release days scheduled in September. As such, TVA consumers would bear the fractional cost associated with the replacement power generation during this period. Therefore there would be minor impact to TVA consumers relative to Alternatives A and B.

3.2 Demographics and Environmental Justice

3.2.1 Affected Environment

Demographic characteristics are assessed using 2010 Census and 2011-2015 American Community Survey (ACS) 5-year estimates provided by the U.S. Census Bureau (USCB 2017a and 2017b). Employment and housing data are provided by the 2011-2015 ACS. Data was used from a spatial extent and scale that provides the most accurate and up-to-date pictures of demographic characteristic in the vicinity of the proposed actions. Polk County and Bradley County represent the geographic scale for the analysis of demographic impacts is as this is where the Upper Ocoee and Middle Ocoee rafting areas are located and such provides an appropriate context for analysis of the local demographic conditions in the vicinity of the project area. Additionally, the State is included as an appropriate secondary geographic area of reference.

3.2.1.1 Demographics and Housing

Demographic characteristics of the study area (population, race, and age) are summarized in Table 3-9. Figure 3-1 illustrates the locations of the various geographies referenced in the analysis. There are approximately 16,687 people living within Polk County. This represents only 0.3 percent of the population of Tennessee (6,499,615 people). Polk County is rural with a population density of 38.4 people per square mile. The largest city in Polk County, Benton, has a population of 1,897 people. Ducktown and Copperhill, the largest cities near the project area, have populations of 475 and 254 people respectively. As evidenced by their population, these cities are rural in nature. Bradley County has a

population density of 310.4 people per square mile, which is much higher than that of Polk County and the State (157.6 people per square mile). Approximately 42 percent of the population of Bradley County resides in the city of Cleveland. While Bradley County has experienced a population increase (3.1 percent) since 2010, Polk County has experienced a slight population decrease (0.8 percent) (USCB 2017a and 2017b).

Table 3-9. Demographic Characteristics

	Bradley County	Polk County	State of Tennessee
Population[2]			
Population, 2015 estimate	102,062	16,687	6,499,615
Population, 2010[1]	98,963	16,825	6,346,105
Percent Change 2010-2015	3.1%	-0.8%	2.4%
Persons under 18 years, 2015	22.5%	21.1%	23.0%
Persons 65 years and over, 2015	15.4%	18.9%	14.6%
Racial Characteristics[2]			
White alone, 2015 (a)	91.7%	96.7%	77.8%
Black or African American, 2015 (a)	4.6%	0.3%	16.8%
American Indian and Alaska Native, 2015 (a)	0.1%	0.4%	0.3%
Asian, 2015 (a)	1.0%	0.1%	1.6%
Native Hawaiian and Other Pacific Islander, 2015 (a)	0.0%	0.0%	0.1%
Some Other Race, 2015 (a)	0.6%	0.7%	1.5%
Two or More Races, 2015	1.9%	1.8%	2.0%
Hispanic or Latino, 2015 (b)	5.4%	1.7%	4.9%
Income[2]			
Persons below poverty level, 2011-2015	19.6%	18.9%	17.6%
Per Capita Income, 2011-2015	$23,336	$21,404	$25,227
Housing Units[2]			
Total Housing Units	7,991	41,395	2,812,133
Occupied Housing Units	6,653	37,947	2,496,552
Vacant Housing Units	1,338	3,448	60,788

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.

Sources: [1]USCB 2017a; [2]USCB 2017b

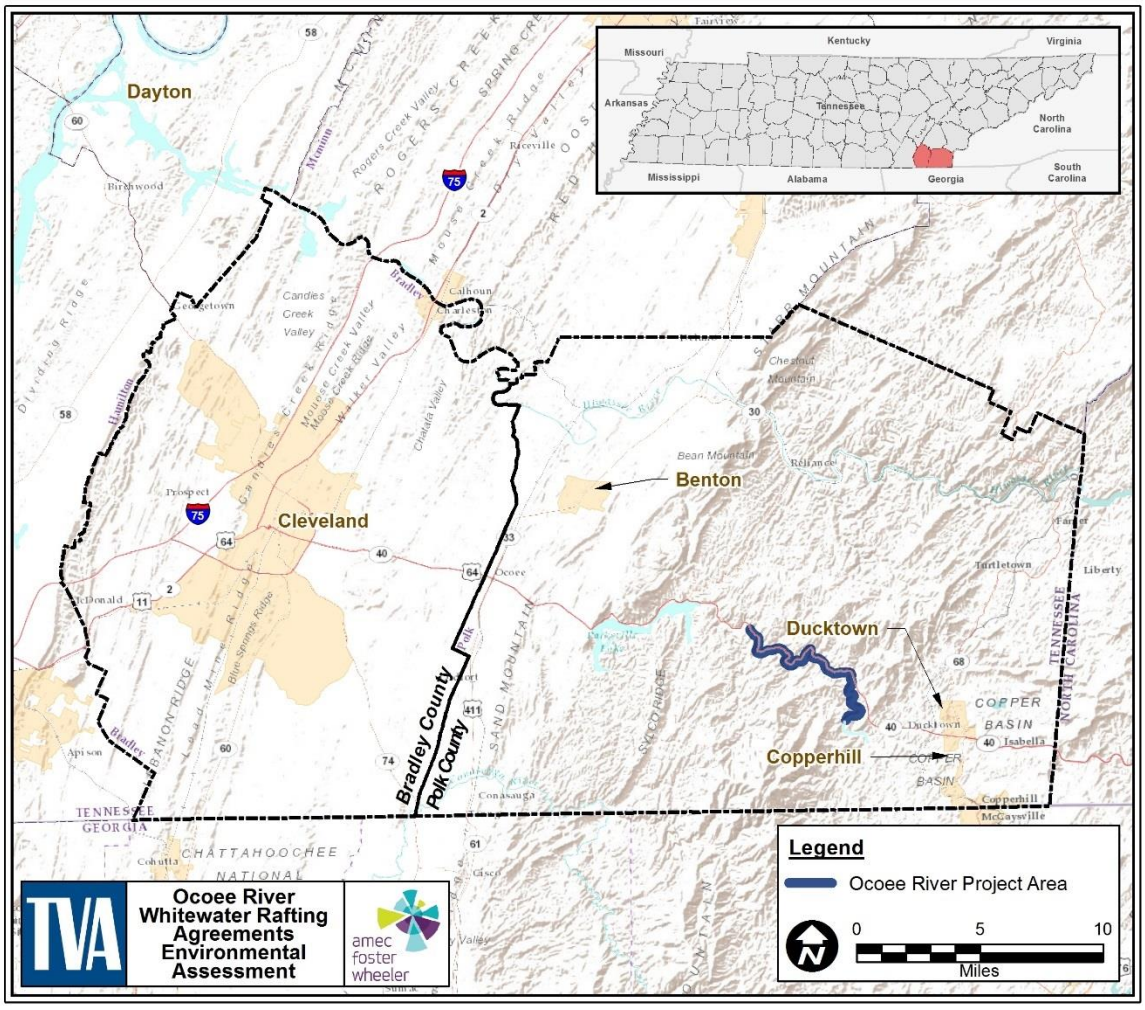

Figure 3-1. Study Area Geographies for Demographic Analysis

Numbers of persons younger than 18 within Polk County (21.1 percent) are similar to what is found in both Bradley County (22.5 percent) and throughout Tennessee (23.0 percent). More persons 65 years old and greater are found within Polk County (18.9 percent) than in Bradley County (15.4 percent) and the State (14.6 percent). Overall, Polk County contains about the same percentage of children as Bradley County and the State, but slightly more people 65 years old and greater (USCB 2017b).

As shown in Table 3-9, the populations within Polk and Bradley counties are predominantly white (96.7 percent and 91.7 percent, respectively), with all minority groups accounting for 3.3 and 8.3 percent of the population, respectively. Compared to the State of Tennessee, in which 22.2 percent of the population is a minority, these counties are less racially diverse (USCB 2017b).

The per capita income in Polk County ($21,404) is less than in both Bradley County ($23,336) and Tennessee ($25,227). Poverty rates within Polk County (18.9 percent) are similar to both Bradley County (19.6 percent) and state-wide (17.6 percent) (USCB 2017c).

Transient populations in the area increase during the summer rafting season and are generally greatest during the month of July, when in 2016, a total of 86,167 users visited the Middle section of the Ocoee River and 15,611 users visited the Upper section (Tennessee State Parks 2016a). In addition, as noted in Section 3.1, up to 25 commercial outfitters may provide guided rafting trips during the summer rafting season. Employees of outfitters and recreators living in the area utilizing the existing housing stock would increase demand on local public services, primarily police and fire protection during this time. According to the 2010 census, approximately 36 percent of vacant housing units in Polk County and 7.6 percent of the vacant housing units in Bradley County are reported to be held for seasonal, recreational, or occasional use. As is evident from these numbers, the majority of the local transient population would reside in Polk County.

3.2.1.2 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations. EO 12898 mandates some federal/executive agencies to consider EJ as part of the NEPA. EJ has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income (EPA 2016) and ensures that minority and low income populations do not bear disproportionately high and adverse human health or environmental effects from federal programs, policies, and activities.

Guidance for addressing EJ is provided by the CEQ Environmental Justice Guidance under NEPA (CEQ 1997). The CEQ defines minority as any race and ethnicity, as classified by the USCB as: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997). Low income populations are based on annual-statistical poverty thresholds also defined by the USCB.

Identification of minority populations requires analysis of individual race and ethnicity classifications as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the impacted area exceeds 50 percent of the total population.
- The ratio of minority population is meaningfully greater (i.e., greater than or equal to 20 percent) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

Low-income populations are those with incomes that are less than the poverty level, which varies by the size of family and number of related children under 18 years (CEQ 1997). The 2015 USCB Poverty Thresholds states the poverty threshold as an annual household income of $24,257 for a family of four (USCB 2017c). For an individual, an annual income of $12,082 is the poverty threshold. A low-income population exists if either of the following two conditions is met:

- The low-income population exceeds 50 percent of the total number of households.
- The ratio of low income population significantly exceeds (i.e., greater than or equal to 20 percent) the appropriate geographic area of analysis.

For this assessment, two geographic areas of analysis (i.e., county and state) were used to determine potential EJ populations. Polk and Bradley counties are defined as the potentially affected community. Demographic data for these counties was compared to state-wide data.

Total minority populations (i.e., all non-white racial groups and Hispanic or Latino, combined) comprise 27.1 percent of the population of Tennessee. Minorities make up 13.7 percent of the population of Bradley County and 5.0 percent of the population of Polk County (USCB 2017b).

The poverty rate in Tennessee is 17.6 percent. Bradley County has a poverty rate of 19.6 percent, and Polk County has a poverty rate of 18.9 percent.

The study area does not meet the specified criteria as EJ minority populations or low income populations (see Table 3-1). Therefore, no further analysis regarding Environmental Justice is required.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, water release agreements would expire at the end of 2018 and whitewater recreation on the middle and Upper Ocoee would only be possible during periods of naturally occurring high river flow and when TVA is not generating power at the Ocoee No. 2 and No. 3 powerhouses. This would result in a moderate change in the transient population as the number of recreators would decrease substantially during the current rafting period (early May through mid-September). However, the transient population influx is variable and intermittent and there would be no change to the resident population. Therefore the demand for public services would not be appreciably affected. Consequently, impacts to local demographics would be minor.

3.2.2.2 Alternative B – Proposed Action

Under this alternative, five days of water releases to the Middle Ocoee in late September would be eliminated. In addition, there would be no construction or improvements to the parcels of land affected by the proposed action. No changes to resident or transient populations or demand for public services are anticipated and this alternative is substantially similar to the current management practice. Therefore, there would be no changes to local demographics relative to the baseline condition.

3.2.2.3 Alternative C – Current Management Regime

Under Alternative C, TVA would continue the current management practice, and there would be no construction or improvements on affected parcels of land. Therefore, there would be no changes to resident or transient populations or demand for public service relative to the baseline condition.

3.3 Traffic and Transportation

3.3.1 Affected Environment

U.S. Highway 64 (US 64), also designated as State Route (SR) 40 and US 74, is the primary east west route in the region and serves through, local and recreational traffic and is the main route used to access the Upper and Middle Ocoee River (Figure 3-2). Accordingly, traffic on US 64 is composed of a mix of cars, heavy and light duty trucks, as well as buses transporting commercial rafters and kayakers, recreational vehicles, and cars

pulling recreational trailers. Within the study area, the majority of the road is two lanes with a speed limit of 45 miles per hour. From SR 30 east to the Ocoee Whitewater Center, approximately 9.5 miles, US 64 primarily has two 12-foot lanes with narrow shoulders (2 feet or less) and is striped for no passing. The exception to this is a 1.1-mile section near Forest Service Road 45 (at the Ocoee No. 3 Powerhouse) where US 64 is four lanes wide. From the Ocoee Whitewater Center east to No. 3 Dam Road, approximately 1.5 miles, the geometry of US 64 improves somewhat and has 4- to 8-foot shoulders and allows for frequent passing.

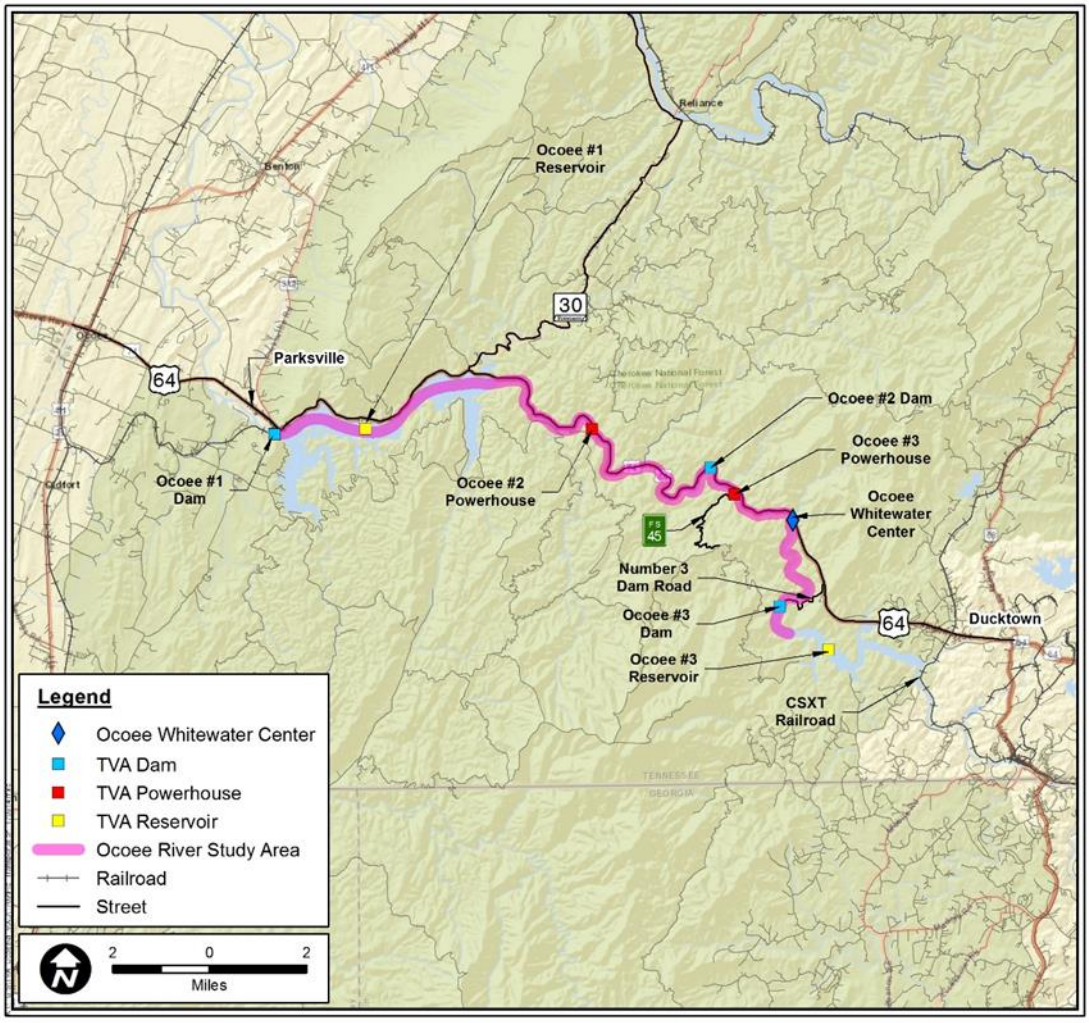

Figure 3-2. Transportation Features in the Vicinity of the Upper and Middle Ocoee River

Level of service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. LOS is described accordingly:

- LOS A: describes free flow traffic conditions;
- LOS B: free flow conditions although presence of other vehicles begins to be noticeable;
- LOS C: increases in traffic density become noticeable but remain tolerable to the motorist;
- LOS D: borders on unstable traffic flow; the ability to maneuver becomes restricted; delays are experienced;
- LOS E: traffic operations are at capacity; travel speeds are reduced, ability to maneuver is not possible; travel delays are expected; and
- LOS F designates traffic flow breakdown where the traffic demand exceeds the capacity of the roadway; traffic can be at a standstill.

The 2013 Annual Average Daily Traffic (AADT) volumes on US 64 in the vicinity of the Upper and Middle Ocoee River reported from the Tennessee Department of Transportation (TDOT) are provided in Table 3-10. LOS was determined based on annual traffic data and roadway conditions. The existing LOS on US 64 in the study area vary. Between SR 30 and the Ocoee Whitewater Center, US 64 has an LOS E. The primary reason for this relatively poor LOS is due to the geometry of the road (narrow to no shoulders, no passing, rolling terrain). East of the Ocoee Whitewater Center to No. 3 Dam Road, US 64 has an LOS C. The level of service is improved through this section because passing is allowed on this stretch of US 64, and there are wider shoulders.

Table 3-10. Average Daily Traffic Volume (2013) and LOS on Roadways in the Vicinity of the Upper and Middle Ocoee River

Roadway	Existing Annual Average Daily Vehicle Use (AADT)	Number of Lanes	Estimated LOS
US 64 just east of intersection with SR 30 to the Ocoee Whitewater Center	3,434	2	E
US 64 just east of CXST RR near Ducktown	5,383	2	C

Source: TDOT 2013.

The traffic data presented in Table 3-10 represents an annual average daily vehicle count on US 64. It should be noted that this traffic data does not reflect periodic increases in traffic, particularly during the summer months, when the area experiences a rise in recreational use on the river. Traffic is generally heaviest during the month of July, when in 2016, a total of 86,167 users visited the Middle section of the Ocoee River and 15,611 users visited the upper section (Tennessee State Parks 2016). The greatest single day usage on the Middle Ocoee was 6,638 users, and the greatest single day usage on the Upper Ocoee was 2,571 users during this period.

Assuming one person per vehicle, the daily traffic on US 64 in the vicinity of the Ocoee River would be 6,638 vehicles per day at peak times of the year when TVA releases water for recreational purposes. Realistically, there would likely be several multiple-occupant vehicles and busses would hold multiple rafters; however, as detailed traffic counts are not available, for conservative purposes, one person per vehicle is assumed. The estimated LOS on US 64 during the summer peak remained at LOS E. However, during the recreational rafting season, increased congestion and a general deterioration in level of service is expected to result from higher traffic volumes and ingress/egress associated from recreators.

Availability of parking facilities within the US 64 corridor are limited due to the mountainous terrain. Parking is available at the Middle and Upper Ocoee River access points. However, when these lots fill, recreators park on the north side of US 64 on the side of the road. This is a potentially dangerous condition, as recreational users have to cross US 64 to access the river.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action Alternative

Under Alternative A, whitewater recreation would only be available on the Middle and Upper Ocoee River during periods of naturally occurring high river flow and when TVA is not generating power at the Ocoee No. 2 and Ocoee No. 3 powerhouses. Consequently, it would be expected that recreational use on the Ocoee River would decline, which would result in a corresponding reduction in the amount of recreational-related traffic on US 64. In addition, as the number of recreational users decrease, the need to park along the roadway shoulders would be minimized. Therefore, under Alternative A, there would be a beneficial impact to transportation and pedestrian safety as a result of the decrease in recreational use of the Ocoee River.

US 64 is the primary east-west route used by both local residents and through traffic throughout the year. Since the relatively poor LOS along US 64 in the study area is attributed to both the AADT and geometry of the road (narrow to no shoulders, no passing, rolling terrain), the beneficial impacts on transportation along US 64 as a result of the reduction in recreational-related traffic would be considered minor and would not improve the LOS ranking on US 64 in the study area, but would result in a notable improvement in seasonal recreator-based congestion.

Traffic in the region could also be indirectly impacted as recreators would utilize alternate rafting rivers in the region such as the Gauly, Nolichcucky, Chatooga, and Nantahala. However, traffic would be dispersed and would only result in an incremental change to traffic and transportation conditions on the roadways which provide access to these facilities. Therefore, the indirect impact would be minor.

3.3.2.2 Alternative B – Proposed Action

As part of the proposed agreements, TVA would provide scheduled water releases on the Middle and Upper Ocoee River. The water releases would be provided based on a schedule similar to the water release agreements currently in place. However, TVA would eliminate releases to the Middle Ocoee River currently occurring on five weekdays in late September.

As stated in Section 3.3.1, the 2013 AADT volume on US 64 between SR 30 and the Ocoee Whitewater Center was 3,434 vehicles per day, which results in an LOS E. The

primary reason for this relatively poor level of service is due to the geometry of the road (narrow to no shoulders, no passing, rolling terrain). However, as noted above, during the summer peak river usage times, the traffic on US 64 can increase to as high as 6,638 vehicles per day. The LOS estimated using the traffic volumes during summer peak river usage time remained at LOS E between SR 30 and the Ocoee Whitewater Center. Additionally, under this alternative there would be no change in seasonal recreator-based congestion on US 64. Eliminating five release dates to the Middle Ocoee River in late September would have no effect on the peak summer usage time when US 64 would remain at an LOS E.

Traffic in the region could be indirectly impacted as recreators would utilize alternate rafting rivers described above when rafting is not available on the Ocoee River. However as traffic would be dispersed and would only result in an incremental change to traffic and transportation conditions during a relatively short period this impact would be negligible.

Therefore, implementation of Alternative B would result in an incremental change in traffic and transportation conditions limited to September only, but there would be no impact to LOS.

3.3.2.3 Alternative C – Current Management Regime

This alternative is substantially similar to Alternative B, except under this alternative, TVA would release water to the Middle Ocoee for five additional weekdays in late September. This alternative is the current management practice.

Under Alternative C, there would be no change to current conditions. Therefore, there would be no direct or indirect incremental effect on transportation.

3.4 Surface Water Resources

3.4.1 Hydrology

3.4.1.1 Affected Environment

A total of 1,988 acres of surface water features are identified on National Wetlands Inventory (NWI) Maps of the project area (Table 3-11).

Table 3-11. Surface Water Features

	Ocoee River	USFWS and TVA Parcels	5-mile Region
NWI Open Water Feature			
Lacustrine	1,988.0		411.9
Riverine	251.1	2.7	1,433.5
Ponded			51.2
Total	**2,239.1**	**2.7**	**2,125.1**

Source: USFWS 2017b

As described by Cowardin et al. (1979), the lacustrine system includes wetlands and deep water habitat situated in a topographic depression or dammed river channel that lacks trees, shrubs, or persistent emergent vegetation. Within the project area, this includes the Ocoee No. 1 Reservoir below the Ocoee No. 2 Powerhouse. Within the lacustrine wetlands, a majority (90 percent) are classified as limnetic, which includes all deepwater habitats

(greater than 2.5 meters deep). The other lacustrine areas are considered littoral and extend from the shoreward boundary to the limnetic limit. While there may be some emergent vegetation consisting of floating or submersed aquatic plants, it is less than 30 percent cover.

Riverine wetlands are characterized as being contained within a channel and having moving water. This includes the section of the project area between the Ocoee No. 3 Dam and the Ocoee No. 2 Powerhouse. This stretch of the river is classified as having a rocky substrate characterized by stones, boulders, and bedrock. A small amount (2.7 acres) of riverine wetlands are also mapped within the parcels that USFWS and TVA would transfer management responsibilities to the State. These parcels are currently developed and no additional development is planned at this time.

3.4.1.1.1 Reservoir Operation System

The Ocoee No. 2 and No. 3 dams are included within the overall TVA Tennessee River system operation plan. This operation plan is complex and includes 49 dams and reservoirs that provide a multipurpose system to manage water for flood control, hydroelectric power generation, navigation, recreation, water supply, water quality, aquatic habitat, and other uses. Because the system is managed to achieve multiple purposes, there are inherent competing demands and trade-offs that require balancing with respect to water flows and reservoir levels. TVA has established an overall reservoir operations plan based on many years of experience and, most recently, use of a complex computer program to assist in evaluating plans with various options that emphasize different objectives. The operating plan provides the framework for meeting defined minimum requirements (e.g., flows) related to one or more objectives while also defining ranges that allow for real-time operation-related decisions. The plan has been updated and revised periodically, including the most recent overall plan revision in 2004. The plan development and approval is documented in the Reservoir Operations Study – Final Programmatic EIS (TVA 2004).

The Ocoee River, known as the Toccoa River until it crosses the Georgia-Tennessee state line, originates in the mountains of north Georgia. TVA controls the river and maintains the Blue Ridge Reservoir upstream in Georgia as well as the Ocoee No. 2 and No. 3 dams and reservoir complexes. Downstream from the Tennessee state line, the river is impounded to form the Ocoee No. 3 Reservoir. When generating power at the Ocoee No. 3 Powerhouse, the water in the Upper Ocoee River is diverted at No. 3 Dam into a tunnel to the Ocoee No. 3 Powerhouse located about 0.8 mile upstream of the No. 2 Dam. When generating power at the No. 2 Powerhouse, the water in the Middle Ocoee River (the reach between Ocoee No. 2 Dam and Ocoee No. 3 Dam) is diverted at the No. 2 Dam into an elevated flume to the No. 2 Powerhouse. The Ocoee No. 1 Dam is located about 8 miles below the Ocoee No. 2 Powerhouse. This dam impounds the Ocoee No. 1 Reservoir (also known as Parksville Lake).

The Reservoir Operations Study was developed to address operations for 35 of the 49 dams in the TVA system. The dams not included are smaller, single-purpose dams, or structures lacking operational facilities. For the 35 structures addressed, general guidance describing, for example, seasonal reservoir target water levels with maximum and minimum levels and targeted minimum flows is provided. The Reservoir Operations Study establishes “balancing guides” for reservoir water levels that are used to meet downstream objectives (e.g., streamflow) while balancing the releases and levels in the upstream reservoirs. Flow at Chickamauga Dam is used as an index to assess the adequacy of streamflow in the TVA system (Table 3-12). If additional flow within the system is needed, releases can be made

from 10 upstream reservoirs, including Blue Ridge which releases water that flows down the Ocoee River past the Ocoee No. 2 Dam and Ocoee No. 3 Dam.

Based on operational needs, TVA will release enough water to meet the average minimum flows at Chickamauga Dam.

Water may also be released from reservoirs during summer months after significant storm events to ensure adequate flood storage capacity.

Table 3-12. Chickamauga Dam System Flow Requirements (June through Labor Day)

Flow Threshold Characteristic	Weekly Average Minimum Flow at Chickamauga Dam (cfs)	
	June 1 - July 31	**Aug. 1 - Labor Day**
If the volume of water stored in tributary reservoirs is **below** the Minimum Operations Guide	13,000 cfs	25,000 cfs
If the volume of water stored in tributary reservoirs is **above** the Minimum Operations Guide	Increases from 14,000 cfs the first week of June to 25,000 cfs the last week in July	29,000 cfs

Source: TVA 2017

There is little storage available at Ocoee No. 2 and Ocoee No. 3 headwater pools for use in regulating flow to meet timing and rate of flow needs. By the early 1990s more than 80 percent of the original reservoir storage capacity at Ocoee No. 3 had been lost to sedimentation (USFS 1997), and Ocoee No. 2 had only a small storage capacity in its original condition. These structures are operated as run-of-river structures. Blue Ridge Reservoir is the only regulating reservoir upstream of Ocoee No. 2 and Ocoee No. 3. The uncontrolled drainage area at Ocoee No. 3 is approximately 290 sq mi compared to runoff from approximately 233 sq miles that is regulated by Blue Ridge. On a long-term average basis more flow through Ocoee No. 2 and Ocoee No. 3 is uncontrolled. However, the storage in Blue Ridge with more steady release can sustain flows through Ocoee No. 2 and Ocoee No. 3 during dry weather periods when uncontrolled runoff is low.

Blue Ridge Reservoir is a 3,300-acre multipurpose reservoir that was constructed during 1925 to 1930. The reservoir provides 68,500 acre-feet of flood storage capacity. The drainage area to Blue Ridge Reservoir is approximately 233 square miles. The basic operating schedule for Blue Ridge Reservoir is presented in Figure 3-3.

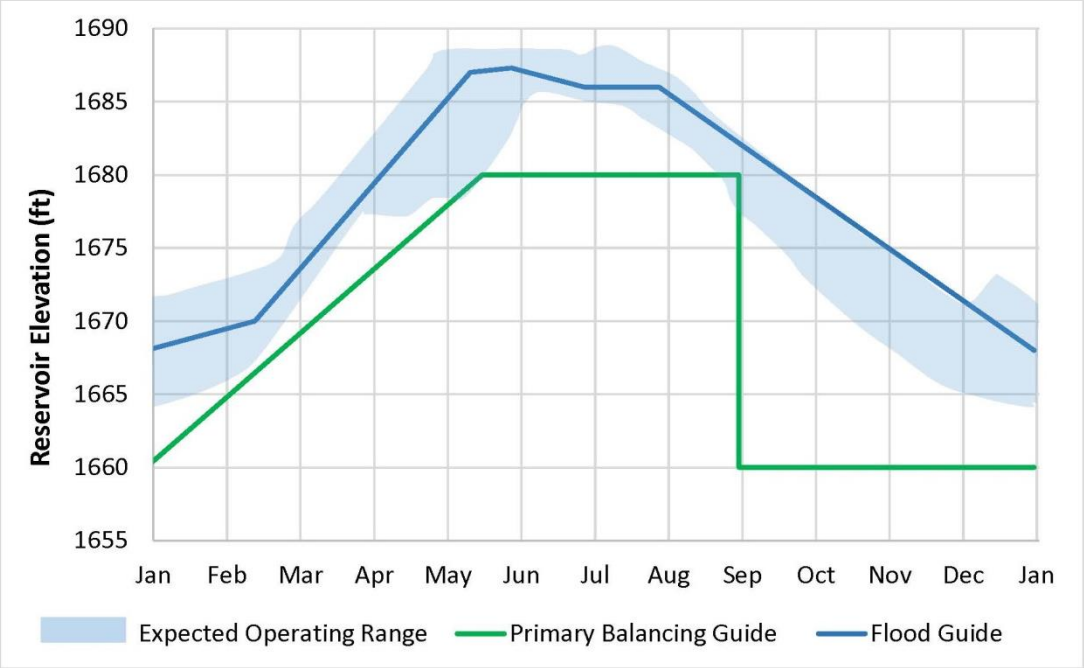

Figure 3-3. TVA Blue Ridge Reservoir Operating Schedule

Blue Ridge Reservoir releases of water occur to produce electric power at the Blue Ridge Powerhouse, but also depend on requirements of flow at Chickamauga Dam as well as storage levels in nine other reservoirs (Chatuge, Cherokee, Douglas, Fontana, Nottely, Hiwassee, Norris, South Holston, and Watauga). Releases from Blue Ridge Reservoir are also used to supplement water flow in accordance with managed water releases from Ocoee No. 3 and No. 2. There is a small storage volume at Ocoee No. 3 that allows some re-regulation of water released from Blue Ridge Reservoir. There is minimal storage at Ocoee No. 2 such that releases from Ocoee No. 3 and Ocoee No. 2 are closely scheduled. TVA uses the combination of extensive staff experience operating the system, computer simulation, and real-time information to make daily decisions regarding flows and water levels throughout the system, while maintaining flows and levels within the defined target ranges.

3.4.1.1.2 Ocoee River Flow Characteristics

3.4.1.1.2.1 General Stream Flow Characteristics

The average annual runoff at the U.S. Geological Survey (USGS) Station located downstream from the Blue Ridge Dam from 1899 through 1974 was 623 cfs (36.3 inches per year [in/yr]). The average runoff prior to completion of construction of the Blue Ridge Dam in 1930 was 715 cfs (41.7 in/yr). An evaporative loss of 34 in/yr (National Weather Service 1982) from the reservoir surface is equivalent to approximately 9,350 acre-feet/ year, or approximately 0.75 in/yr over the watershed, which contributes to a long-term lower runoff since 1930. The larger portion of the difference appears to be related to one or more of other factors such as lower precipitation and water withdrawals. The minimum mean daily stream flow prior to dam construction was 73 cfs (0.31 cfs/sq mi). Selected streamflow statistics by month and annually are presented on Figure 3-4.

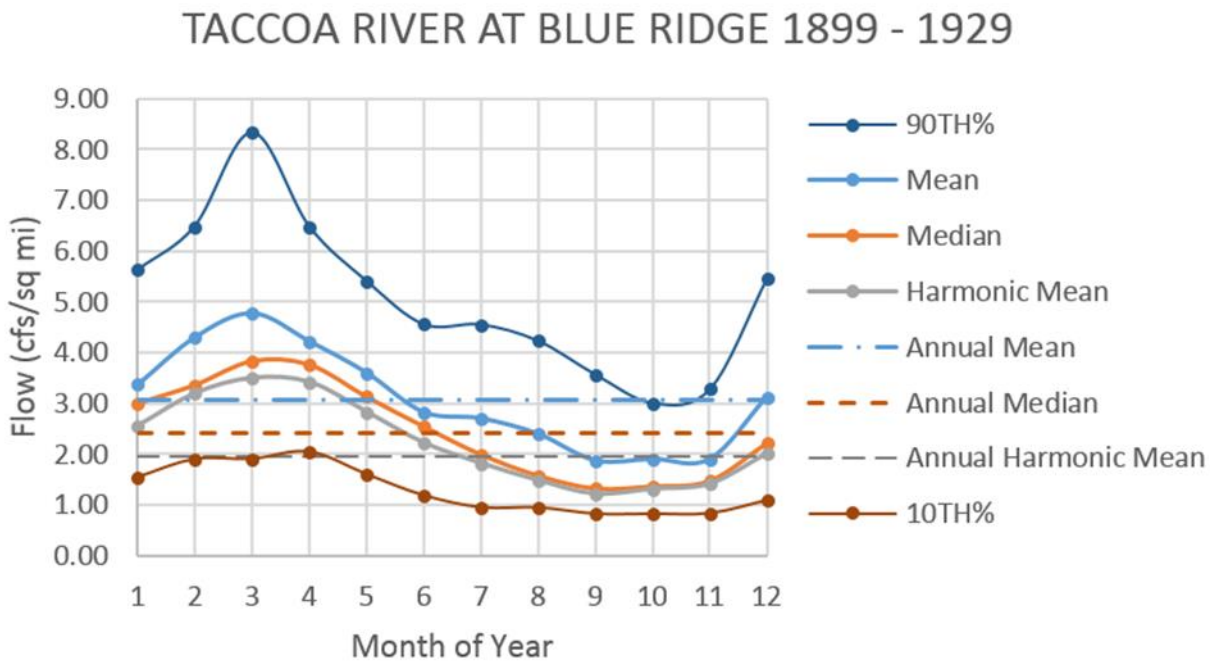

Figure 3-4. Monthly and Annual Natural Flow Statistics Toccoa River at Blue Ridge Reservoir (Downstream of Blue Ridge Dam, USGS Station 03559000)

Several long-term streamflow monitoring locations are available in the vicinity of Ocoee No. 2 and No. 3 Dams. These locations are listed in Table 3-13. The USGS data indicate a trend of decreasing streamflow per unit drainage area with increasing drainage area. The statistics from TVA flow data are relatively consistent with USGS data in the vicinity of Ocoee No. 2 and No. 3. It is expected that the large scale revegetation of exposed and unvegetated mined landscapes noted by TDEC (2014) are factors that have contributed to the observed reduced runoff rate.

The periods of record available from TVA include both a relatively extreme prolonged drought period in 2007 and 2008 and a wet, flood condition in 2013. Historically, there have been no problems during those periods in meeting the release requirements for recreational rafting and kayaking. Review of TVA flow records confirm that during the months of July and August in 2007 and 2008 selected for review, the minimum recreational flows and durations appear to have generally been met.

Table 3-13. Long-Term Streamflow Stations in Vicinity of Ocoee No. 2 and No. 3 Dams

USGS Station No.	Name	Drainage Area (sq mi)	Period of Record Available
03564500	Ocoee River at Parksville, Tennessee	595	1911 - 1994
03563000	Ocoee River at EMF, Tennessee	524	1913 - 1998
NA	TVA Ocoee River at Ocoee No. 2 Dam	512	1992 - 2017
NA	TVA Ocoee River at Ocoee No. 3 Dam	493	1984 - 2017
03561500	Ocoee River at McHarg, Tennessee	447	1917 - 1942
03559500	Ocoee River at Copperhill, Tennessee	352	1903 - 1970
NA	TVA Toccoa River near Blue Ridge, Georgia	233	1984 - 2017
03559000	Toccoa River near Blue Ridge, Georgia	233	1899 - 1974
03560000	Fightingtown Creek at McCaysville, Georgia	70.9	1943 – 1971

Sources: USGS 2017; TVA 2017

3.4.1.1.2.2 Local Stream Flow Characteristics

Local stream flow characteristics of the Upper Ocoee and Middle Ocoee are highly influenced by operation of Blue Ridge Dam and Ocoee No. 2 and No. 3 dams in conjunction with the need for hydropower and support for rafting.

The Ocoee No. 3 Dam is 110 feet high and diverts water through a tunnel to the No. 3 Powerhouse located nearly 2 miles downstream (see Figure 1-2). The reach between Ocoee No. 3 Dam and Powerhouse is referred to as the Upper Ocoee Rafting Area. The dam produces a head of approximately 300 feet and a power generation capacity of 29 megawatts for a single turbine unit. The hydropower unit at Ocoee No. 3 operates at a flow of approximately 1,000 to 1,500 cfs. As such, during the spring and summer seasons, flow within this reach of the channel immediately downstream of Ocoee No. 3 Dam is variable and fluctuates. Based on TVA flow data from 1984 to 2017, the hourly flow has ranged from zero (which has occurred 87 percent of the time during March through October) to more than 14,000 cfs (Figure 3-5).

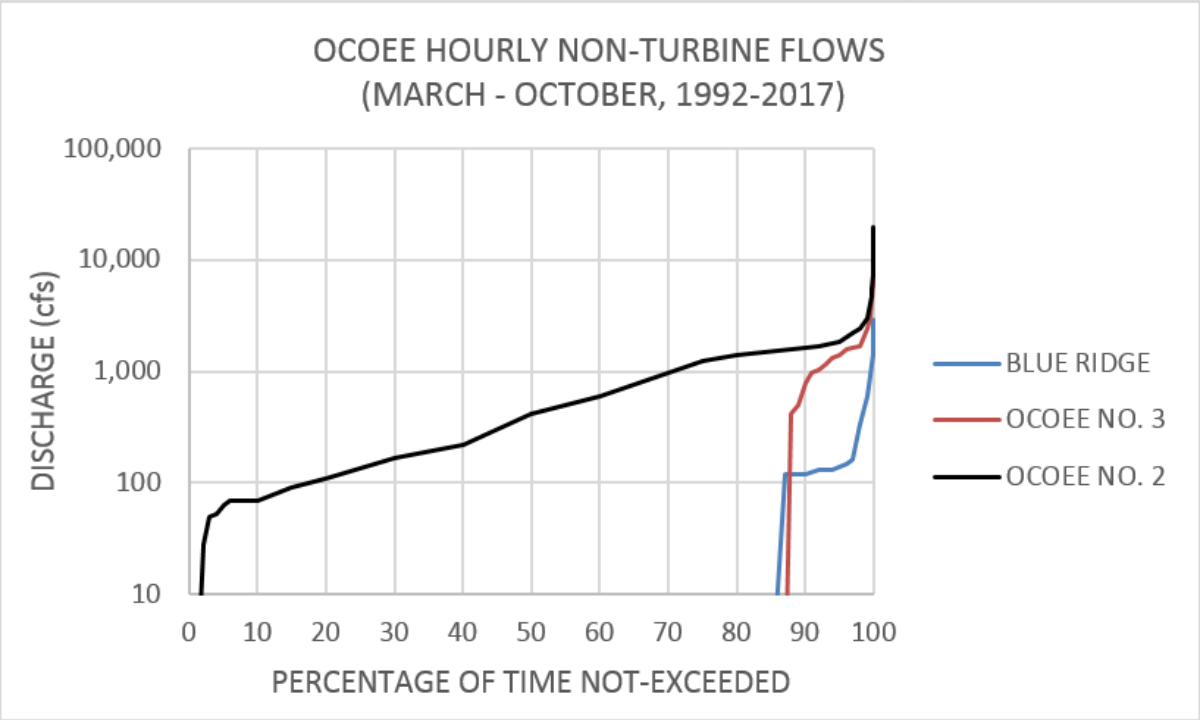

Figure 3-5. Hourly Flow Duration Graph for Non-Turbine Discharge at Blue Ridge, Ocoee No. 3, and Ocoee No. 2 Dams

Observable changes in streamflow statistics have occurred at Ocoee No. 3 over the period flow record. During the period from 2006 through 2016 with the Upper Ocoee River water release schedule in place and since the Olympics were held and the Reservoir Operations Study (TVA 2004) completed, non-turbine discharges through the Upper Ocoee River reach have been different than indicated by the statistics for the time period from 1984 through 1994. Hourly flow data for 2006 – 2016 show a distinct increase in the fraction of the time that releases at a rate of approximately 1600 cfs were made for the months of June through September compared to hourly data from the 1984 – 1994 period. Releases of approximately 1600 cfs have occurred an average of approximately 6% of the time during these months compared to slightly lower releases of approximately 1200 to 1300 cfs that were released during periods of approximately 1.0 to 2.5% of the time during the 1984 – 1994 period (see for example, Figure 3-6).

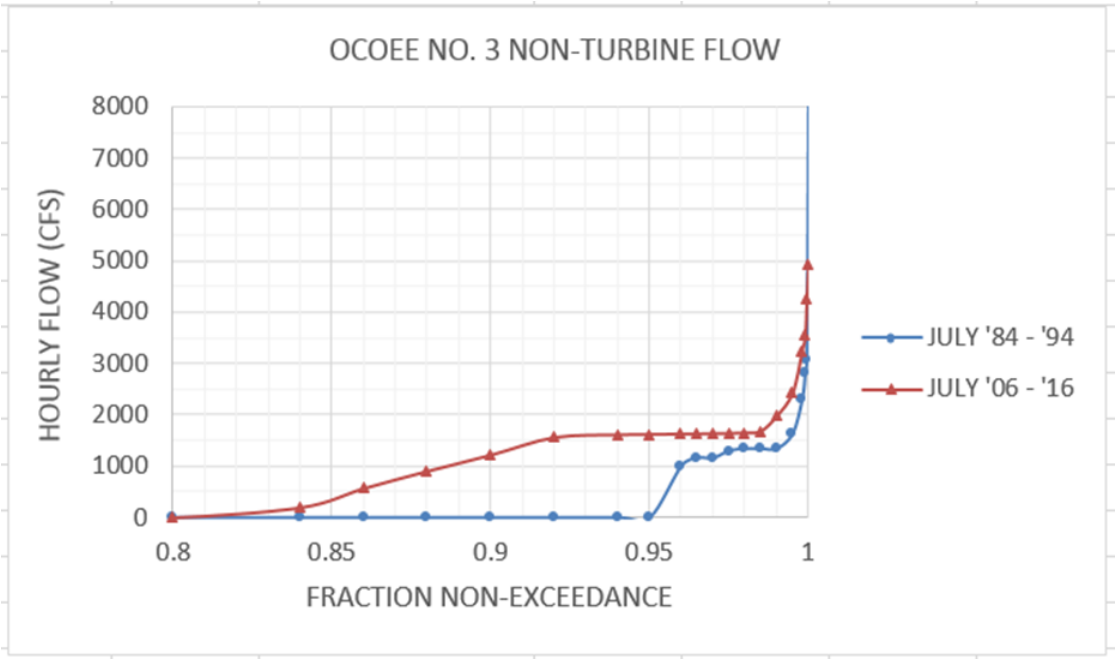

Figure 3-6. Comparison of Hourly Non-Turbine Flow Duration at Ocoee No. 3 for Period 2006 – 2016 with Period 1984 – 1994

Typical hourly flows at Blue Ridge Dam, Ocoee No. 3 and No. 2 are illustrated in Figures 3-7A, 3-7B, and 3-7C, respectively. These hydrographs illustrate flows and water levels on a randomly selected weekend (Saturday and Sunday, August 18 and 19, 2007) during a typical low-normal flow period characterized by scheduled recreational releases. "Non-turbine" flows are flows through the river channel, including recreational releases. As is evident in Figure 3-7A and Figure 3-7B, hydropower generation at Ocoee No. 2 and 3 Dam is truncated by the managed release of water to support rafting within this reach of the river. During periods of higher, normal flows, releases would be higher (up to capacity for hydropower generation) and/or for longer durations as appropriate based on the operations plan for the system . Additionally, as indicated in Figure 3-5, approximately 88 percent of the time during March through October over the past 30 years has been characterized as having no flow through the Ocoee No. 3 tailwater reach.

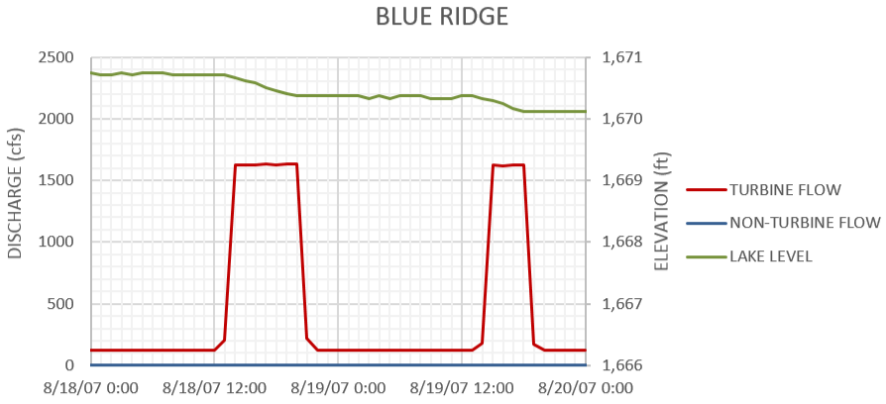

Figure 3-7A

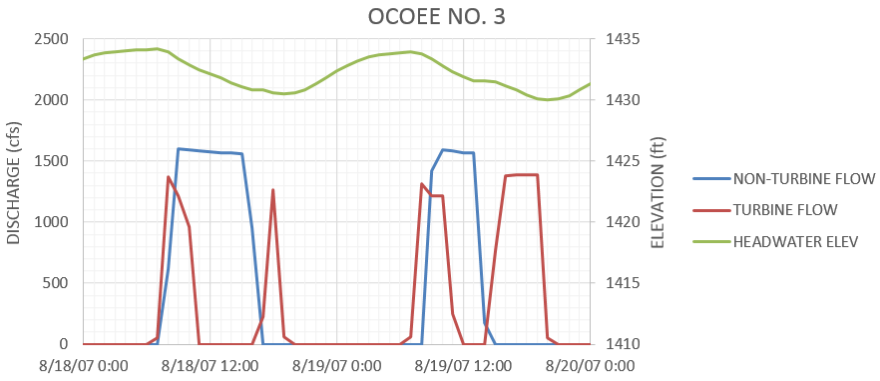

Figure 3-7B

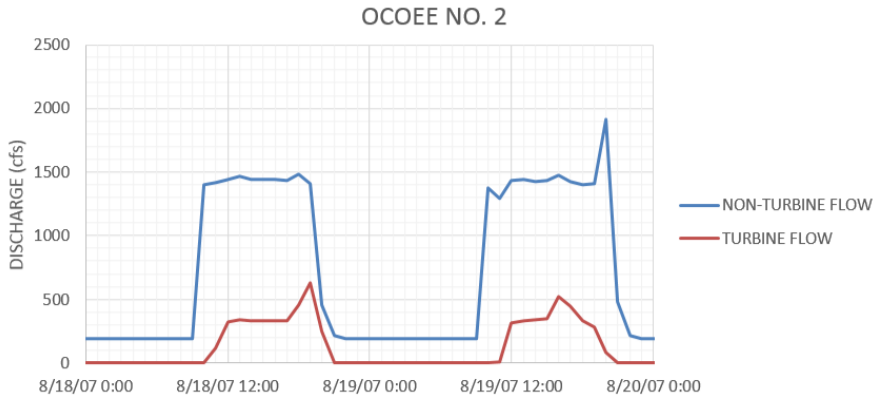

Figure 3-7C

Figure 3-7. Flow Hydrographs at Blue Ridge, Ocoee No. 3 and Ocoee No. 2 August 18-19, 2007

The Ocoee No. 2 Dam is 30 feet high and allows diversion of water via a flume to the Ocoee No. 2 Powerhouse approximately 5 miles downstream (see Figure 1-3). The reach between Ocoee No. 2 Dam and powerhouse is referred to as the Middle Ocoee Rafting Area. The dam creates a useable head of approximately 250 feet for two turbines with a 23 megawatt capacity generating plant. The hydropower units operate at a flow of approximately 800 to 1,100 cfs with both units operating. As such, during the spring and summer seasons, flow within the 4.5-mile reach of the channel immediately downstream of Ocoee No. 2 Dam is variable and fluctuates. Based on TVA flow data from 1992 to 2017, the hourly flow has ranged from zero (which has occurred 1 percent of the time during March through October) to more than 19,000 cfs (Figure 3-5). The median flow is 420 cfs and the flow defined to support rafting (1,200 cfs) has been exceeded approximately 25 percent of the time.

The recreational release schedules for Ocoee No. 2 and No. 3, combined with target recreational release flow rates of 1,200 cfs and 1,600 cfs (respectively), represent approximately 43,430 cfs-days and 14,400 cfs-days, respectively, of flow volume. These flow volumes would generate approximately 15.4 and 6.1 gigawatt-hours, respectively, of electrical power annually if entirely diverted to power generation.

During the months from March through October, over the period from 2006 through 2017 approximately 84 percent of the total river flow at Ocoee No. 3 Dam was diverted for power generation leaving 16 percent of the flow in the channel. At the Ocoee No. 2 Dam, the March through October volume diverted from the Middle Ocoee channel for power generation during the period from 1992 through 2017 was 43 percent of the total annual flow volume.

Drawdown of Blue Ridge Reservoir storage augments natural runoff during low flow periods in accordance with the operating schedule (Figure 3-7A). The importance of Blue Ridge storage and releases for flood storage recovery and power generation, as well as for rafting, can be assessed by evaluating Upper Ocoee River natural flow without Blue Ridge. Based on approximately 29 years of daily streamflow from Fightingtown Creek from 1943 through 1971, scaled upward to a drainage area of 550 sq mi by the ratio of drainage areas, the mean daily flow at Ocoee No. 2 and Ocoee No. 3 would be sufficient to meet the flow needs for rafting with high reliability during March through July; during August flow augmentation to provide 1600 cfs is needed approximately 15% of the days and during September and October the estimated natural flows would be sufficient for 1600 cfs on approximately 55% of the days. During dry weather, low flow days Blue Ridge releases augment flows through Ocoee No. 3 to sustain power generation and 1600 cfs for 8-hour release periods for rafting. On average approximately half of the flow volume through the Middle and Upper Ocoee River passes through Blue Ridge Reservoir. The release from Blue Ridge Reservoir is primarily dictated by the demand for flow to generate power, for flood storage recovery, and to meet minimum flow requirements for water quality, amongst other downstream needs. The flow to support power generation and rafting are similar in rate and timing based on the need for peaking power during the daytime hours, the flow required for the installed turbines, and the schedules established for rafting. This is illustrated by the hourly hydrographs for the Blue Ridge, Ocoee No. 3 and Ocoee No. 2 locations for a randomly selected weekend low flow period of August 18 and 19, 2007 (see Figure 3-7).

3.4.1.2 Environmental Consequences

3.4.1.2.1 Alternative A – No Action Alternative

Under this alternative agreements and easements enabling commercial rafting on the Ocoee River would expire and would not be replaced with new agreements. From a total system perspective (i.e., extending from upstream of Ocoee Dam No. 3 to the river below Ocoee No. 2 Powerhouse) flow characteristics within the Ocoee River would be altered but not dramatically.

However, within the reaches immediately below Ocoee No. 3 and No. 2 dams, the scheduled and managed releases that are characteristic of the baseline condition would be replaced with an operating plan that is driven by need for hydropower generation and precipitation-based runoff (i.e., excess non-turbine flow). Consequently, flow characteristics of the approximately 5-mile reach of the Upper Ocoee and 4.5-mile reach of the Middle Ocoee would be dramatically altered during the rafting season. When power is needed from these hydropower units, water would be diverted at both Ocoee No. 2 and No. 3 dams

except for the volume associated with high flows exceeding the maximum turbine flow. Flow within the channel below these dams would, therefore, be reduced to only that volume associated with excess non-turbine flow (i.e., that which is released to the river immediately below the dam). Approximately half of the Upper and Middle Ocoee River flow is released from Blue Ridge Reservoir; if the recreational releases were entirely transferred to power generation, the storage and water level in Blue Ridge Reservoir would be unaffected.

During the last 25 to 30 years, high volume flows exceeding maximum power generation flow or recreational release rates, requiring discharge in the channel, occurred up to approximately 8 percent of the time during March through October. The actual distribution of flows for power generation versus excess non-turbine flow would be determined with consideration of the multiple objectives of the system, including aquatic habitat and water quality benefits of maintaining non-turbine flows (or discharging an equivalent volume at a more steady rate of flow) as well as the potential to generate additional electrical power.

Therefore, under the No Action Alternative the flow characteristics of the river within the Upper and Middle Ocoee River would be markedly altered during the recreational season as water associated with hydropower generation would bypass these areas. Consequently, annual flow volumes within these reaches would be reduced by approximately 14,400 cfs-days (28,600 acre-ft) and 43,350 cfs-days (86,000 acre-ft) for the Upper and Middle Ocoee (respectively) under conditions in which the hydropower units are operating. These reductions are approximately 34 percent (Upper Ocoee) and 25 percent (Middle Ocoee) of the channel flow volumes during March through October over the past 30 years.

3.4.1.2.2 Alternative B – Proposed Action

Under Alternative B, the annual required recreational release volume would be decreased only during the month of September at Ocoee No. 2 Dam relative to the existing condition. Overall, this alternative would represent an approximate 3.5 percent reduction in the annual recreational release volume at Ocoee No. 2 Dam. Assuming that releases at Blue Ridge and at Ocoee No. 3 Dam are not influenced by demand for recreational release at Ocoee No. 2 Dam , there would be no appreciable change at Ocoee No. 3 Dam compared to the existing condition.

3.4.1.2.3 Alternative C – Current Management Regime

For Alternative C, the annual required recreational release volume would be unchanged from the existing condition. There would be no change at either Ocoee No. 2 Dam or Ocoee No. 3 Dam compared to the existing condition.

3.4.2 Water Quality

3.4.2.1 Affected Environment

Under the CWA, the Middle and Upper Ocoee River has designated uses of Industrial Water Supply, Fish and Aquatic Life, Livestock Watering and Wildlife, Recreation, and Irrigation. Additionally, from the Ocoee No. 3 Powerhouse near mile 25.1 to Rock Creek near mile 26.5, the river is designated as a Trout Stream (TDEC 2013). TDEC's proposed 2016 final 303(d) list (TDEC 2017) identifies four water body segments that constitute the Ocoee River reach within the study area that have been identified as "Category 5" water bodies, indicating that one or more uses are impaired. Causes of impairment identified are copper, iron, and zinc concentrations and siltation associated with historic mining activities in the watershed. The water bodies are also identified as being impaired by "flow alteration", Category 4c, which involves no pollutant. The Ocoee River from Ocoee No. 2 Dam to the

Ocoee No. 3 Dam (which constitutes the Upper Ocoee River) is also identified as impacted by flow alteration.

Approximately half of the drainage to Ocoee No. 2 and No. 3 dams passes through Blue Ridge Reservoir. The Blue Ridge Reservoir has been identified by TVA for their Reservoir Health Rating system as having relatively good water quality and it is identified as supporting its intended uses by the Environmental Protection Division of the Georgia Department of Natural Resources (2017). There are some concerns regarding Blue Ridge Reservoir sediments and habitat, which are rated as "fair" by the TVA reservoir health rating system, but those concerns are not significant issues related to the quality of water discharged from the reservoir. The concerns are identified as low levels of arsenic and polychlorinated biphenyl in sediment.

Much of the watershed upstream of Ocoee No. 3 and Ocoee No. 2 that had been mined and contributed to the reduced water quality of the Ocoee River has now been reforested. Revegetation of these landscapes along with extensive restoration activities has resulted in substantially improved water quality (TDEC 2014).

Natural free-flowing segments of the Ocoee River (such as those within the Upper and Middle Ocoee) have a rock streambed and are not characterized by extensive areas of sedimentation. Additionally, pooled areas where sediment accumulation is expected to occur, are limited within the Upper and Middle reaches of the river to areas immediately upstream of the Ocoee No. 3 Dam. There is no record that indicates there is a significant volume of sediment accumulated upstream of the Ocoee No. 2 Dam.

On-going releases for rafting are not identified as contributing to any impairment of the river.

3.4.2.2 Environmental Consequences

3.4.2.2.1 Alternative A – No Action Alternative

Implementation of Alternative A would potentially lead to reduced non-turbine flows as a result of ending recreational releases, with the recreational release volume re-directed to power generation. TVA would consider aquatic habitat and water quality in adjusting to the absence of those recreational release requirements. However, reduced non-turbine releases would result in fewer days of flow and/or less flow volume through the Ocoee No. 2 and Ocoee No. 3 reaches bypassed by the diversions for power generation as described in Section 3.4.1.2.1. The Ocoee No. 3 tailwater currently has an 80 percent reduction in streamflow volume over the long-term compared to total river flow volume, and a further reduction might be expected to produce impacts to aquatic habitat. The impacts would likely be dependent upon how the non-turbine flows were released. A more steady release of a flow volume over a longer period of time compared to the higher, but shorter duration, recreational release might produce some habitat benefit. A similar effect may be expected within the Ocoee No. 2 tailwater, although currently nearly half of the total flow within the tailwater occurs as non-turbine flow through the channel. The rates of flow associated with diversion for power generation versus recreational releases are mostly too low to be of significance relative to sediment scouring and suspension of potentially contaminated sediment. Periodic high flows in the range of six times or more larger than the power generation or recreational release rates occur in the Middle and Upper Ocoee River.

Differences in thermal effects to flow passing through the flume (turbine flow) as compared to that passing through the exposed rock channel (non-turbine flow) may result in some

temperature differences in the river water entering the Ocoee No.1/Parksville reservoir and downstream areas under this alternative. Generally, non-turbine flow of the Middle Ocoee that are carried over the Ocoee No. 2 spillway fall into a shallow, rocky riverbed that allows the sun to heat the water up before it enters Ocoee No. 1/Parksville reservoir. Releases that travel down the flume instead of the river bed enter the river at the Ocoee No. 2 powerhouse are generally cooler because the flume protects the water inside it from the sun. However, because water temperature within the Ocoee are more prominently influenced by numerous other factors, including weather, precipitation, time of year and time of day, this change is expected to be minor and of little consequence to water quality.

In summary, water quality is not expected to be significantly impacted by the No Action Alternative because there are no other activities proposed that may result in the impairment of water quality (i.e., ground disturbance, water or wastewater use and release, etc.). However, aquatic habitat has the potential to be reduced to a minor extent under this alternative. This effect would be particularly evident within the Ocoee No. 3 tailwater where non-turbine flows would be more limited.

3.4.2.2.2 Alternative B – Proposed Action
Under this alternative, only minor changes in water releases would occur in September. Differences in thermal effects to water passing through the flume as compared to the exposed rock channel may produce minor differences in the temperature of the river water entering the Ocoee No. 1/Parksville reservoir and river downstream as described above. However, because these changes are limited to only five days of managed releases, and because there are no other activities proposed that may result in the impairment of water quality (i.e., ground disturbance, water or wastewater use and release, etc.) no impacts to water quality from this alternative are expected relative to the baseline condition.

3.4.2.2.3 Alternative C – Current Management Regime
Under this alternative, there would be no change to the current release schedule. The minor difference in water temperature associated with the water passing through the flume as compared to the exposed rock channel would be essentially the same as Alternative B. There would be no other activities proposed that may result in the impairment of water quality (i.e., ground disturbance, water or wastewater use and release, etc.), therefore, no impacts to water quality from this alternative are expected.

3.5 Vegetation and Wildlife

3.5.1 Affected Environment

3.5.1.1 Vegetation
The Ocoee River project area is located within the Southern Metasedimentary Mountains, a sub-ecoregion of the Blue Ridge Mountains (66) Level IV ecoregion, which on the whole, is dominated by deciduous, evergreen, and mixed evergreen-deciduous forest (Griffith et al. 1998). This region is characterized by steep, dissected, biologically-diverse mountains. The Appalachian oak forests and at higher elevations, the northern hardwood forests include a variety of oaks and pines, as well as silverbell, hemlock, yellow poplar, basswood, buckeye, yellow birch, and beech. Areas that have been disturbed over the years include the spruce-fir forests, found generally above 5,500 feet, and the Copper Basin, located in the southeast corner of Tennessee. The spruce-fir forests have been reduced over the past 35 years from an invasive insect species and the Copper Basin was the site of copper mining and smelting for approximately 137 years that terminated activity in 1987 (Griffith et al. 1998).

The vegetation within a 5-mile radius surrounding the project area was evaluated using land use/land cover information obtained from the National Land Cover Database (Homer et al. 2015). Land cover in the 5-mile vicinity is primarily deciduous forest (63,205 acres), evergreen forest (19,819 acres), mixed forest (8,298 acres), hay/pasture (4,727 acres), and open water.

In-channel habitats on the Ocoee River are dominated by herbaceous species, because periodic releases from Ocoee Dams No. 2 and No.3 preclude trees from establishing downstream. These herbaceous habitats are inherently restricted, because they are only found in association with larger river systems with appropriate bedrock geology. Two globally rare herbaceous plant habitats, the Hiwassee/Ocoee River Boulder Riverscour Wet Meadow and the Hiwassee/Ocoee Bedrock Riverscour Wet Meadow, occur on the small section of the Ocoee River included within the scope of the proposed whitewater rafting agreement (NatureServe 2017). These habitats contain a unique assemblage of plants, including the federally listed plant species, Ruth's golden aster (*Pityopsis ruthii*), and are only found along the Hiwassee and Ocoee rivers in Polk County, Tennessee (TVA 2017). Drier sections of the in-channel habitat support species such as narrowleaf silkgrass, poison ivy, rice button aster, smallhead blazing star, splitbeard bluestem, slenderleaf false foxglove, tall coreopsis, and stunted Virginia pine. Wetter herbaceous habitats include species like chairmaker's bulrush, nodding lady's tresses, southern lobelia, swamp sunflower, as well as shrubs like hazel alder.

TVA parcels and USFS tracts FS #1 and FS #2 proposed to be managed by the State have been developed and are currently used for commercial and personal recreation. Naturalized vegetation does occur along the periphery of these sites, but substantial portions of each parcel are built up and contain facilities like parking lots, boat launches and restrooms. The fragmented riparian vegetation contains tree species like red maple, river birch, and sycamore. No rare plant communities occur on these TVA and USFS tracts.

Invasive plant species always pose a threat to native vegetation when there is disturbance surrounding an area. EO 13112 as amended by EO 13751 (Invasive Species) defines an invasive species as any species that is not native to that ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plant species are common in previously disturbed areas, such as areas near dams, roads, and reservoirs. These species have the potential to affect the native plant communities adversely because of their ability to spread rapidly and displace native vegetation. Common species that threaten the integrity of native ecosystems in the Cherokee National Forest include tree of heaven, small carpetgrass, autumn olive, sericea lespedeza, kudzu, Chinese privet, Japanese honeysuckle, multiflora rose, and Nepal grass. However, in general, invasive plant species are not well established within in-channel habitats on the Middle and Upper Ocoee River.

3.5.1.2 Wildlife

As described in Section 3.5.1.1 (Vegetation), the immediate project area consists mostly of open water habitat especially in the Ocoee No. 1 Reservoir (Parksville Lake) with naturalized vegetation and fragmented riparian forests occurring in the TVA parcels and USFS tracts. These habitats would likely support wildlife species that prefer open water habitat and can readily adapt to disturbed or altered habitats. In the area surrounding the Ocoee River, the southern Cherokee National Forest dominates the land cover and there are smaller areas of hay/pasture and some developed land to the east and west. Since the

forest consists of large areas of contiguous and undisturbed habitat, the habitat supports many wildlife species commonly found throughout mixed forested landscapes.

Open water habitats in the Ocoee No.1 Reservoir would support wildlife communities characterized by waterfowl (ducks, geese), wading birds, shorebirds, raptors (hawks, bald eagle), various mammal species (beaver, otter), and herpetofauna (snakes, frogs, toads, turtles, and salamanders). These species would be more common around the Ocoee No. 1 Reservoir where there is a large open water habitat in comparison to the stretch of the Ocoee River used for whitewater rafting since the open water habitat is smaller and there is not a consistent water flow.

Naturalized vegetation and fragmented riparian forests found within the USFS tracts FS #1 and FS #2 may provide a limited amount of nesting habitat for migratory bird species as well as common mammal, amphibian, and reptile species. The majority of the USFS tracts are paved or otherwise developed. Therefore, most of the wildlife habitat for these species is limited to the edges of the tracts. The TVA parcels discussed in the proposed easement to the State are much less developed and are mostly comprised of natural vegetation also found in the adjacent surrounding area.

In the surrounding area, the mixed deciduous and evergreen forests provide contiguous forested habitat for many wildlife species commonly found throughout the Cherokee National Forest. These habitats would support wildlife communities characterized by songbirds (warblers, wren), cavity nesters (woodpeckers, owls), game birds (wild turkey, grouse), raptors (hawks), mammal species (racoon, squirrel, white-tailed deer, fox, coyote, black bear), and herpetofauna (snakes, frogs, toads, turtles, and salamanders).

Several migratory bird species of concern are listed in the region surrounding the Ocoee River project area. These include the black-billed cuckoo, bobolink, Canada warbler, cerulean warbler, eastern whip-poor-will, Kentucky warbler, prairie warbler, red crossbill, red-headed woodpecker, rusty blackbird, wood thrush, and yellow-bellied sapsucker (U.S. Fish and Wildlife Service [USFWS] 2017). The moist habitats present around the Ocoee #1 Reservoir and Ocoee River would likely provide suitable habitat for the rusty blackbird and red-headed woodpecker, and the mixed forested habitat in the surrounding area would likely provide suitable habitat for all the bird species of concern except the rusty blackbird and bobolink.

No wading bird colonies or other aggregations of migratory birds have been documented within 3 miles of the project area. In addition, no caves have been documented within the Ocoee River project area and none are known to occur within 3 miles of the project area.

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action Alternative

3.5.2.1.1 Vegetation

Under the No Action Alternative, higher volume water releases into the Middle and Upper Ocoee would only occur when TVA is not generating power or during periods of naturally occurring high river flow. Therefore, there would be a substantial decrease in the frequency of large flow water releases under this alternative. With the decrease in frequency of water releases, there is potential for woody vegetation to encroach on herbaceous habitats that currently dominant the in-channel habitat of the Ocoee River, including the rare plant communities. Encroachment of woody vegetation into formerly open habitats has been

documented at many locations, including downstream of the Apalachia Dam on the Hiwassee River (Moore et al. 2016). Sections of the Hiwassee River downstream of Apalachia Dam now experience only minimal base flows (25 cfs) because water is carried to the powerhouse via penstock for electricity production, thereby by-passing the Hiwassee River between RM 54 and RM 66. In this cut-off reach, aerial photos taken around the time of dam closure show that riparian area of the Hiwassee River was much more open than today. Presumably, this shift resulted in a substantial reduction of the globally rare Hiwassee/Ocoee River Boulder Riverscour Wet Meadow and the Hiwassee/Ocoee Bedrock Riverscour Wet Meadow habitats. Implementation of the No Action Alternative would likely have a similar effect on the herbaceous vegetation currently found in the Middle and Upper Ocoee. Given the rarity of the habitats found along the Middle and Upper Ocoee, implementation of the No Action Alternative would produce negative impacts to the rare plant communities present there and those impacts may be significant.

The No Action Alternative would not affect plant communities on the TVA parcels and USFS tracts that would be made available to the State. In addition, those small, fragmented habitats are currently developed for recreation and possess little if any conservation value

3.5.2.1.2 Wildlife

With Alternative A, there is potential for minor shifts in wildlife use and species composition in accordance with the anticipated changes in the associated plant communities from herbaceous dominated habitat to more woody plant dominated habitats. However, most of the common wildlife present in this area utilize a variety of habitat types and would likely continue to utilize the area as it transitions from herbaceous to woody habitats. Species that prefer herbaceous habitats may relocate to utilize other habitats in the surrounding area. Therefore, the impact would be minor.

3.5.2.2 Alternative B – Proposed Action

3.5.2.2.1 Vegetation

Under Alternative B, the elimination of water releases from Ocoee No. 2 dam during five weekdays in late September would have no discernible effect on surrounding vegetation communities in the project area since this alternative only differs slightly from current water release operations agreements. The globally rare Hiwassee/Ocoee River Boulder Riverscour Wet Meadow and the Hiwassee/Ocoee Bedrock Riverscour Wet Meadow communities would not be appreciably impacted by the minor change in water releases. In addition, there would be no construction or improvements to the TVA parcels and USFS tracts affected by the proposed change in management, and therefore, there would be no impacts to the surrounding vegetation communities.

3.5.2.2.2 Wildlife

There would be no effect on wildlife communities associated with Alternative B since this alternative only differs slightly from current water release operations and no construction or improvements would occur on the TVA parcels and USFS tracts.

3.5.2.3 Alternative C – Current Management Regime

3.5.2.3.1 Vegetation

Unlike Alternative B, Alternative C would continue the current schedule of water releases to support recreational rafting, including five weekdays in late September, and therefore, would have no effect on vegetation or globally rare plant communities. In addition, as with Alternative B, there would be no construction or improvements to the TVA parcels and

USFS tracts affected by the proposed change in management, and therefore, there would be no impacts to the surrounding vegetation communities.

3.5.2.3.2 Wildlife

There would be no effect on wildlife communities associated with Alternative C since this alternative does not differ from current water release operations and no construction or improvements would occur on the TVA parcels and USFS tracts.

3.6 Aquatic Ecology

3.6.1 Affected Environment

The primary aquatic resource within the project area includes the Ocoee River, more specifically the sections referred to as the Upper and Middle Ocoee and its tributaries. Power generation, rainfall events, and flood control releases from the upstream Blue Ridge Reservoir are factors that affect flow and the availability of aquatic habitat on the Upper and Middle Ocoee, along with scheduled releases in these sections of the river. As described in Subsection 3.4.1, an overall reservoir operations plan is used to manage water levels within various reservoirs in the Tennessee River system. Flow at Chickamauga Dam is used as an index to assess the adequacy of streamflow in the Tennessee River system, and releases from upstream reservoirs, including the Blue Ridge Reservoir are used to augment water levels as needed (TVA 2004). Aquatic habitats above Ocoee No. 3 Dam and Ocoee No. 2 Dam are deeper, pooled areas; whereas aquatic habitats within the reaches immediately downstream of each dam are typically more shallow riverine habitats with varying degrees of riffles, rapids and exposed rock.

During the rafting season, managed releases from Ocoee No. 3 and No. 2 dams result in short-duration, high-flow “pulses” of flow within the reaches immediately downstream of each dam. Such flows result in intermittently flooded areas (particularly in the areas between each dam and powerhouse) and provide for a localized expansion of aquatic habitat availability as high flows inundate low-flow border areas of the channel. Water duration within these areas is, however, temporary as pulses of water released for rafting typically recede in a matter of hours.

TVA has monitored fish and benthic macroinvertebrate communities at several locations within the Ocoee River over many years. As part of the monitoring for fish and benthic macroinvertebrates, a calculated Index of Biotic Integrity (IBI) is used as an assessment of environmental quality at each stream site through application of ecologically based metrics of fish and benthic invertebrate community data from the site. Two monitoring sites that are within the Middle and Upper Ocoee River are at RM 19.6 and 27.1, respectively. Invertebrates and fish were collected at these sites to establish IBI scores.

Based on TVA collection records, fish sampling conducted at RM 19.6 for the Middle Ocoee River from 1995 to 2016 resulted in the collection of 7,615 fish represented by 37 species. Species representing 3 percent or more of the total catch included redbreasted sunfish (18 percent), mottled sculpin (15 percent), yellow perch (13 percent), brook silverside (12 percent), warpaint shiner (10 percent), bluegill (7 percent), banded sculpin (6 percent), redline darter (6 percent), spotted bass (4 percent), and central stoneroller (3 percent). Fish IBI scores maintained a range of “fair” to “fair/good” rating with a steady improvement since 1995.

Fish sampling conducted at RM 27.1 for the Upper Ocoee River from 2009 to 2016 resulted in the collection of 8,128 fish represented by 21 species. Species representing 3 percent or more of the total catch included central stoneroller (66 percent), warpaint shiner (17 percent), redbreasted sunfish (6 percent), and northern hogsucker (5 percent). Fish IBI scores maintained a range of "poor" to "poor/fair" rating with a slight improvement since 2009. Additionally, a short reach of the Upper Ocoee River from the Ocoee No. 3 Powerhouse near RM 25.1 to Rock Creek near RM 26.5 is designated as a Trout Stream (TDEC 2013). From the 8,128 fish collected near RM 27.1 for the Upper Ocoee River from 2009 to 2016, rainbow trout represented only 0.02 percent of the total catch.

Species composition for the benthic macroinvertebrate sampling was similar for the Middle and Upper Ocoee sites. Numerically dominant taxa groups included Coleoptera (beetles), Ephemeroptera (mayflies), Diptera (true flies), Oligochaeta (worms), and Trichoptera (caddisflies). Benthic IBI scores for the Middle Ocoee River (RM 19.6) from 2002 to 2014 have remained in the "fair" range. The only exception was in 2002 when the benthic community received a "poor" rating. Benthic IBI scores for the Upper Ocoee River (RM 27.1) from 2009-2013 have been in the "poor" or "poor/fair" range except for 2013, when the benthic community received a "fair" rating.

There are also several small tributaries within both the Middle and Upper Ocoee drainage areas. These tributaries are smaller in nature and primarily only provide flow to the Ocoee River during and preceding rainfall events. Tributaries of the Ocoee River within the Upper Ocoee reach include:

- Rough Creek
- Williams Creek
- Laurel Creek
- Rock Creek
- Horse Bone Branch
- Little Gassaway Creek
- Gassaway Creek
- Rodgers Branch

Tributaries of the Ocoee River within the Middle Ocoee reach include:

- Short Creek
- Goforth Creek
- Tolliver Shanty Branch
- Left Prong Caney Creek

Due to the proximity and connection of the Ocoee River tributaries within the Middle Ocoee and Upper Ocoee, benthic macroinvertebrate species composition and abundances are expected to be similar to that described above for the Ocoee River. Fish species composition is also expected to be similar to that described above for the Ocoee River and is expected to favor the smaller fishes found in the Ocoee River, such as juvenile sunfishes, shiners, minnows, and silversides since these tributaries are much smaller in size relative to the Ocoee River. Invertebrate community within the tributaries is expected to be similar to that described for the Ocoee River, dominated by beetles, mayflies, true flies, worms, and caddisflies

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would only release water from the Ocoee No. 3 and No. 2 dams into the river channel when not generating power at the Ocoee No. 3 and Ocoee No. 2 powerhouses and during periods of naturally occurring high river flow (those due to moderate/heavy rainfall). From a total system perspective (i.e., extending from upstream of Ocoee No. 3 Dam to the reach below Ocoee No. 2 powerhouse) flow characteristics within the Ocoee River would be altered due to less frequent water releases. However, within the reaches immediately below Ocoee No. 3 and No. 2 dams the scheduled and managed releases that are characteristic of the baseline condition would be replaced with a discharge regime that is driven by need for hydropower generation and precipitation-based runoff (i.e., excess non-turbine flow). Consequently, flow characteristics of the 5-mile reach of the Upper Ocoee River and the 4.5-mile reach of the Middle Ocoee River would be altered during the rafting season. When power is needed from these hydropower units, water would be diverted at both Ocoee No. 3 and No. 2 dams except for the excess flows exceeding the maximum turbine flow. Flow within the channel below these dams would therefore, be reduced to only that volume associated with excess non-turbine flow (i.e., that which is released to the river immediately below the dam).

The elimination of managed releases during the rafting season under this alternative is expected to reduce the cross-sectional area within the channel below each dam that is wetted under high flows and available intermittently to aquatic organisms. Because high flows would be less frequent under this alternative, some species that are less tolerant of the frequent high flows associated with managed releases may be expected to become somewhat more common in the reach below each dam. Benthic fish species such as those described in Section 3.6.1 (sculpins, darters, stonerollers, northern hogsucker) are naturally more tolerant of higher flows and may be expected to be relatively unaffected by this alternative. However, in spite of the elimination of scheduled recreational releases, the river and its flow characteristics remain a managed system that is influenced by hydropower generation. The associated aquatic biota within the reaches below each dam would still be subject to some variability associated with seasonal variations in non-turbine flow. Therefore, while some compositional changes in the reach below each dam may occur, they are expected to be minor. Additionally, species that are more typical of reduced flow environments of the pool areas upstream of each dam (sunfish, yellow perch, shiners, brook silverside) are expected to continue to be characteristic of the pool areas upstream of each dam. Therefore, because the aquatic biota within the project area (Upper and Middle Ocoee River) are already adapted to highly variable river flows below each dam and not subject to notable shifts in community composition, impacts to aquatic resources under Alternative A are expected to be minor. In addition, as noted in Section 3.4.2.2.1, differences in discharge at the spillway and turbine combined with differences in thermal effects to water passing through the flume as compared to the exposed rock channel may produce some minor temperature differences in the river water. However, because the resident aquatic biota are characteristic of a fishery that is naturally tolerant of such minor temperature ranges, any temperature variation caused by the above factors is not expected to have a notable effect on the composition or character of aquatic biota in the reservoir or the river below Ocoee No. 1.

3.6.2.2 Alternative B – Proposed Action

Under Alternative B, the schedule for water releases would change very slightly from the existing condition. The annual required recreational release volume would be decreased

only during the month of September relative to the existing condition. As with the No Action Alternative, the aquatic biota within the project area (Middle Ocoee and Upper Ocoee River) are already adapted to highly variable river flows. Existing species composition and abundances are not expected to undergo discernable change under this proposed action since the releases will be relatively consistent with the existing condition. Therefore, no impacts on aquatic resources are expected under Alternative B.

3.6.2.3 Alternative C – Current Management Regime

Under Alternative C, TVA would continue with the current release schedule. Therefore, there would be no change from the existing conditions and no impacts to aquatic resources due to this alternative.

3.7 Threatened and Endangered Species

3.7.1 Affected Environment

The ESA, 16 United States Code §§ 1531-1543, was passed to conserve the ecosystems upon which endangered and threatened species depend, and to conserve and recover those species. An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. Likewise, a threatened species is likely to become endangered within the foreseeable future throughout all or a significant part of its range. Critical habitats, essential to the conservation of listed species, also can be designated under the ESA. The ESA establishes programs to conserve and recover endangered and threatened species and makes their conservation a priority for federal agencies. Under Section 7 of the ESA, federal agencies are required to consider the potential effects of their proposed action on endangered and threatened species and critical habitats. If the proposed action has the potential to affect these resources, the federal agency is required to consult with the USFWS.

The State of Tennessee provides protection for species considered threatened, endangered or deemed in need of management within the state other than those already federally listed under the ESA. Plant species are protected in Tennessee through the Rare Plant Protection and Conservation Act of 1985. The listing of species is managed by TDEC. Additionally, TVA also maintains databases of aquatic and terrestrial animal species that are considered threatened, endangered, special concern, or are otherwise tracked in Tennessee and other states within its power service area because these species are rare and/or vulnerable within the state.

3.7.1.1 Terrestrial Wildlife

A review of the terrestrial animal species in the TVA Regional Heritage database in September 2017 resulted in records for nine state-listed species (common shrew, hellbender, northern pine snake, seepage salamander, smoky shrew, southeastern shrew, southern Appalachian woodrat, Swainson's warbler, woodland jumping mouse), one federally protected species (bald eagle), and two federally listed species (gray bat and northern long-eared bat) within three miles of the project footprint. No additional federally listed species have been recorded in Polk County, Tennessee. The USFWS has determined that the federally listed Indiana bat has the potential to occur in the project area, thus this species also will be evaluated (Table 3-14).

Table 3-14. Federally Listed Terrestrial Animal Species Reported From Polk County, Tennessee and Other Species of Conservation Concern Documented Within Three Miles of Ocoee River Whitewater Rafting Agreement Action Area[1]

		Status[2]	
Common Name	**Scientific Name**	**Federal**	**State (Rank)**
Amphibians			
Hellbender[4]	*Cryptobranchus alleganiensis*	PS	D(S3)
Seepage salamander	*Desmognathus aeneus*	--	D(S1)
Birds			
Bald eagle	*Haliaeetus leucocephalus*	DM	D(S3)
Swainson's warbler	*Limnothlypis swainsonii*	--	D(S3)
Mammals			
Common shrew	*Sorex cinereus*	--	D(S4)
Gray bat	*Myotis grisescens*	LE	E(S2)
Indiana bat	*Myotis sodalis*	LE	E(S1)
Northern long-eared bat	*Myotis septentrionalis*	LT	(S1S2)
Smoky shrew	*Sorex fumeus*	--	D(S4)
Southeastern shrew	*Sorex longirostris*	--	D(S4)
Southern Appalachian woodrat	*Neotoma floridana haematoreia*	--	D(S4)
Woodland jumping mouse	*Napaeozapus insignis*	--	D(S4)
Reptiles			
Northern pine snake	*Pituophis melanoleucus*	--	T(S3)

[1] Source: TVA 2017; USFWS 2017a
[2] Status Codes: D = Deemed in Need of Management; DM = Delisted, still being monitored; E = Endangered; LE = Endangered; LT = Listed Threatened; PS = Partial Status; T = Listed Threatened.
[3] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Rare; S4 = Apparently Secure.
[4] A subspecies of hellbenders found in the Ozarks of Missouri and Arkansas is federally listed. Species of hellbenders found in Polk County, Tennessee are not federally listed.

Hellbenders are found in cool, fast-flowing, streams and rivers with large shelter rocks. Eggs are laid in depressions created beneath large rocks or submerged logs (Niemiller and Reynolds 2011; Petranka 1998). The nearest known hellbender record occurs approximately 0.9 miles from the project footprint. Suitable habitat for hellbender does occur in the Middle and Upper Ocoee River .

Seepage salamanders inhabit seepages or forested habitats adjacent to small streams. They are found in moist, thick leaf litter where they hunt for invertebrates or beneath logs, rocks, and mats of moss (Niemiller and Reynolds 2011; Petranka 1998). The closest known record of seepage salamanders to the Middle and Upper Ocoee River is approximately 155 feet away. Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts included within the project area.

Swainson's warblers utilize forests with a thick understory typically comprised of rhododendron, but are also known from areas of dense saplings, both coniferous and deciduous. They migrate to Tennessee in mid- to late April and are thought to depart in mid-September (Nicholson 1997). Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts included within the project area.

Common shrews are found in a variety of habits with substantial vegetation, but appear to prefer lowland, moist areas near streams or in floodplains with thick leaf litter. They create systems of tunnels underground in logs and stumps with chambers for food storage,

resting, and nesting (Schwartz and Schwartz 2001; NatureServe 2017). The closest record of this species is approximately 1.5 miles from the Ocoee River on a forested ridge between two creeks. Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts included within the project area.

Smoky shrews are found in a variety of forested habitats though they are most abundant in damp, coniferous and deciduous forested habitat with suitable soil for borrowing, fallen trees, and standing hollow trees. They nest beneath stumps, rotted logs, and rocks (NatureServe 2017). The nearest known smoky shrew record is approximately 1.0 mile from Ocoee Lake along an unnamed tributary. Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts included within the project area.

Southeastern shrews are primarily found in wooded areas with dense groundcover (including briars and vines), or in swampy, marshy, boggy areas. It builds nests in depressions in decaying logs and lines them with leaf litter (Schwartz and Schwartz 2001; NatureServe 2017). The closest record of this species is approximately 1.5 miles from the Ocoee River on a forested ridge between two creeks. Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts included within the project area.

Southern Appalachian woodrats are found in dry, mesic, and mixed deciduous forests, ravines, swamps, and bottomlands. They also utilize rock outcrops, cliffs, and talus slopes. Nests are built in rocky crevices, in abandoned buildings, in or under hollow trees, in brush piles (Bunch et. al. 2005; NatureServe 2017). The closest record of southern Appalachian woodrat is approximately 2.2 miles away. Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts within the project area.

Woodland jumping mice occupy cool, moist, hardwood and coniferous forests, with dense vegetation. They live in underground borrows and forage on subterranean fungus (Whittaker 1996). The closest record of woodland jumping mouse is approximately 1.0 mile away. Suitable habitat for this species likely occurs in forested sections of the TVA parcels and USFS tracts within the project area.

Northern pine snakes are generally found in areas of sandy, well-drained soils where they can borrow easily to hunt for prey. In mountainous areas like the project area, they are likely found in dry, rocky areas (Dorcas and Gibbons 2005). The closest record of northern pine snake is approximately 2.1 miles away. Suitable habitat for this species may occur in forested sections of the TVA parcels and USFS tracts within the project area.

Bald eagles are protected under the Bald and Golden Eagle Protection Act (USFWS 2013). This species is associated with large, mature trees capable of supporting its massive nests. These are usually found near larger waterways where eagles forage (Turcotte and Watts 1999). The closest recorded bald eagle nest is approximately 141 feet from Ocoee Reservoir #1. This nest was last reported active in 2007. Suitable foraging habitat for this species occurs across the Ocoee River.

Gray bats roost in caves year-round and migrate between summer and winter roosts during spring and fall (Brady et al. 1982, Tuttle 1976). Although they prefer caves, gray bats have been documented roosting in large numbers in buildings (Gunier and Elder 1971) and under bridges (Barbour and Davis 1969; Lamb and Wyckoff 2010). Bats disperse over bodies of water at dusk where they forage for insects emerging from the surface of the

water (Harvey 1992). The closest gray bat record is known from a mist netting survey effort over Sylco Creek, approximately 0.3 mile from the Middle and Upper Ocoee River. There are no known caves or occupied buildings or bridges within the project area or within three miles of the project area. Foraging habitat for gray bat occurs over the Ocoee River and Ocoee Lake.

Indiana bats hibernate in caves in winter and use areas around them in fall and spring (for swarming and staging), prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead and living trees in mature forests with an open understory, often near sources of water. Indiana bats are known to change roost trees frequently throughout the season, yet still maintain site fidelity, returning to the same summer roosting areas in subsequent years. This species forages over forest canopies, along forest edges and tree lines, and occasionally over bodies of water (Pruitt and TeWinkel 2007, Kurta et al. 2002, USFWS 2017c). Although less common, Indiana bats have also been documented roosting in buildings (Butchkoski and Hassinger 2002) and bridges (Barbour and Davis 1969). The nearest known records of Indiana bat are roosts in Cherokee National Forest, approximately 18.6 miles away. There are no known caves or occupied buildings or bridges within the project area or within three miles of the action area. Foraging habitat for Indiana bat occurs over the Ocoee River and Ocoee Lake as well as the surrounding forests. Suitable foraging and potential summer roosting habitat occurs in forested sections of the TVA parcels and USFS tracts included within the project area.

The northern long-eared bat predominantly overwinters in large hibernacula such as caves, abandoned mines, and cave-like structures. During the fall and spring they utilize entrances of caves and the surrounding forested areas for swarming and staging. In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees. Roost selection by northern long-eared bat is similar to that of Indiana bat, however northern long-eared bats are thought to be more opportunistic in roost site selection. This species also roosts in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014). Twenty-two records of northern long-eared bat are known within three miles of the Middle and Upper Ocoee River. The closest record is approximately 0.3 mile away over Sylco Creek. There are no known caves or occupied buildings or bridges within the project area or within 3 miles of the action area. Foraging habitat for northern long-eared bat occurs over the Ocoee River and Ocoee Lake as well as the surrounding forests. Suitable foraging and potential summer roosting habitat occurs in forested sections of the TVA parcels and USFS tracts within the project area.

3.7.1.2 Aquatic Animals

One federally listed as endangered mussel (tan riffleshell), two fishes deemed in need of management by Tennessee (tangerine darter and Tennessee dace), and one state tracked snail (knotty elimia) have been collected within a 10-mile radius of the project area (TVA 2017) (Table 3-15). However, only the Tennessee dace has been recorded within the project area of the Ocoee River and connected tributaries between Ocoee No. 3 and Ocoee No. 1 Dam. Therefore, the tangerine darter, tan riffleshell, and knotty elimia (with records of the prior two species having not been found within 10 miles in over 25 years) are considered to not occur within the project area. These species will not be addressed further.

The Tennessee dace has a state status of S3 that indicates this species is vulnerable to becoming imperiled within the state. This small (2-inch long) fish is highly localized to

headwater streams in upper Tennessee River drainage within the Ridge and Valley physiographic province of Tennessee/Virginia (NatureServe 2017). It lives about three years and is reproductive at age one or two in early- to mid-May. It is usually found in gravel, sand, silt-covered streams that are cool and near springs. This species is an herbivore that presumably eats algae, diatoms, and detritus (NatureServe 2017).

Table 3-15. Records of Federal and State-Listed Aquatic Animal Species Within 10 Miles of the Proposed Project[1]

Common Name	Scientific Name	Element Rank[2]	Federal Status[3]	State Status[3]	State Rank[4]	Record in Project Reach
Fishes						
Tangerine Darter	*Percina aurantiaca*	H		D	S3	No
Tennessee Dace	*Chrosomus tennesseensis*	E		D	S3	Yes
Mussels						
Tan Riffleshell	*Epioblasma f. walkeri*	H	END	END	S1	No
Snails						
Knotty Elimia	*Elimia interrupta*	E		TRKD	S1	No

[1] Source: TVA 2017

[2] Heritage Element (=population) Occurrence Rank; E = extant record ≤25 years old; H = historical record >25 years old; X = considered extirpated; ? = uncertain status

[3] Status Codes: CAND = Candidate for federal listing; D = Deemed In Need of Management; END = endangered; EXTI = Extirpated from state or region; PROP = Proposed; PROT = Protected; PSM = Protected Status for Mussels (equivalent to TRKD); SP = State Protected; THR = Threatened; TRKD = Tracked by state natural heritage program (no legal status)

[4] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; SX = Extirpated from the state; ? = uncertain status

3.7.1.3 Plants

As discussed in Section 3.5.1 above, two globally rare herbaceous plant habitats, the Hiwassee/Ocoee River Boulder Riverscour Wet Meadow and the Hiwassee/Ocoee Bedrock Riverscour Wet Meadow, occur on the small section of the Ocoee River included within the scope of the proposed whitewater rafting agreement (NatureServe 2017). These habitats contain a unique assemblage of plants, including the federally listed plant species Ruth's golden aster (*Pityopsis ruthii*), and are only found along the Hiwassee and Ocoee rivers in Polk County, Tennessee.

Six state-listed plant species have also been previously reported from within 500 feet of the Middle and Upper Ocoee River (TVA 2017). One additional federally listed plant, white fringeless orchid, has been documented from Polk County, Tennessee. To facilitate analysis, these species have been organized based on their proximity to the river channel (Table 3-16). Plant species that primarily occur in locations that could be affected by recreational releases are considered as occurring in the river channel.

Table 3-16. Federally Listed Plant Species Previously Documented in Polk County, Tennessee and All Plants of Conservation Concern Known from Within 500 Feet of the Ocoee River Within the Project Area[1]

Common Name	Scientific Name	Federal Status[2]	State Status[2]	State Rank[3]	Occurs In Channel?
Wine Vine	*Clematis vinacea*		E	S1	N
Mountain Bush-honeysuckle	*Diervilla sessilifolia* var. *rivularis*		T	S2	N
Southern Lobelia	*Lobelia amoena*		T	S1S2	Y
Fraser's Loosestrife	*Lysimachia fraseri*		E	S2	N
White Fringeless Orchid[4]	*Platanthera integrilabia*	T	E	S2S3	N
Ruth's Golden Aster	*Pityopsis ruthii*	E	E	S1	Y
Nevius' Stonecrop	*Sedum nevii*		E	S1	N
Horsesugar	*Symplocos tinctoria*		S	S2	N

[1] Source: TVA 2017.
[2] Status Codes: E = Listed Endangered; S = Special Concern; T = Listed Threatened.
[3] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
[4] Species documented from Polk County, Tennessee but not from within the Ocoee River gorge.

Wine vine (*Clematis vinacea*) – The majority of occurrences for this newly described, globally rare plant are known from the Ocoee River gorge, though the species has also been documented from a handful of sites along the Hiwassee River in Tennessee and at one location in Murray County, Georgia (Floden 2013). In the Ocoee River valley, wine vine is found in woodlands and other dry habitats and is locally abundant along US 64.

Mountain bush-honeysuckle (*Diervilla sessilifolia* var. *rivularis*) – This species is a Southern Appalachian endemic that is rare across its limited range. Mountain bush-honeysuckle has been observed at several river-bank locations along Upper and Middle Ocoee, but the largest populations of the species occur on rock outcrops and bluffs above the high water line.

Southern lobelia (*Lobelia amoena*) – This lobelia has been observed at multiple locations within floodplain forest adjacent to the Ocoee River and in wet, open areas in the channel that can be inundated during higher flows.

Fraser's Loosestrife (*Lysimachia fraseri*) – This globally rare species is found at multiple locations throughout the Ocoee River valley, but is most common in mesic, open conditions found along portions of US 64. This species may occur adjacent to the river channel, but it is not common there.

White fringeless orchid (*Platanthera integrilabia*) – This species is not known to occur in the Ocoee River valley. The nearest and only location for the species in Polk County is approximately 10 miles southwest of the Middle and Upper Ocoee River.

Ruth's golden aster (*Pityopsis ruthii*) – This globally rare, federally endangered plant grows only in crevices of boulders situated in or adjacent to small sections of Ocoee and

Hiwassee Rivers. Approximately 10 percent of the global population of the species occurs in the Middle Ocoee River, often at the regular high water line experienced during recreational releases. Some portion of these plants are periodically inundated during periods of high flows, which are caused both by weather events and human-made causes like maintenance of dam infrastructure.

Ruth's golden aster populations appear to have increased since the early 1980s when the first survey work for the species was conducted. These positive changes appear correlated with the initiation of recreational releases. Early estimates put the population of Ruth's golden aster on the Ocoee River at less than 500 individual plants (White 1977, Wofford and Smith 1980) while the first comprehensive survey in 1985 located 593 individuals (Haggard and Halback 1985). Since beginning a total census of Ruth's golden aster on both the Hiwassee and Ocoee rivers in 2011, the average number of plants on the Ocoee River has been 1,201 (range = 1,053 to1,299).

Nevius' Stonecrop (*Sedum nevii*) – This globally rare species occurs only in Alabama, Georgia, Tennessee (historically in West Virginia). In the Ocoee River valley, Nevius' stonecrop occurs most often on rock outcrops well above elevation of even the highest flows experienced in the river channel.

Horsesugar (*Symplocos tinctoria*) – This shrub or small tree occurs primarily in floodplain forests along the Middle and Upper Ocoee segments of the river. Recreational flows would not inundate the species or its habitat.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action Alternative

3.7.2.1.1 Terrestrial Wildlife

Under Alternative A (No Action Alternative), commercial rafting agreements and easements on the Ocoee River would expire in late 2018. Whitewater boating on the Middle and Upper Ocoee would occur when TVA is not generating power or when water levels were sufficient for boating.

Although no records of hellbender have been reported from the Middle and Upper Ocoee River, potential habitat for hellbender does occur in these sections when water is being released (i.e. when TVA is not generating power). When water is not being released, water levels in the upper section (below Ocoee Dam 3) may be too low to support hellbender movement through this section. Water levels in the sections below Ocoee Dam 2 would still be sufficient to provide movement through the River. The current water release schedule already restricts water flow in these sections for almost 70 percent of the year. Additional reductions in this schedule are not expected to impact any hellbenders that may reach these sections of the Ocoee River from adjacent tributaries. TVA parcels associated with the proposal have the potential to provide habitat for all other threatened or endangered terrestrial animals listed in Table 3-14 in Section 3.7.1.1. However, actions proposed under this alternative are not expected to alter natural habitat beyond current maintenance actions in these terrestrial areas. Therefore, no impacts to habitat would occur and no other threatened or endangered terrestrial animal species are expected to be impacted by the proposed actions.

3.7.2.1.2 Aquatic Animals

The No Action Alternative would result in operations that differ from the existing regime by primarily reducing non-turbine flows with much of the volume re-directed to power generation. This would result in fewer days of flow and/or less flow volume through the Ocoee No. 2 and No. 3 reaches bypassed by the diversions directly to the respective powerhouses. This would result in a reduction in aquatic habitat in each tailwater, particularly downstream of Ocoee No. 3 where non-turbine flows would be more limited. Use of the affected reaches by the Tennessee dace (state tracked) is presumably very limited due to a lack of preferred habitat that includes smaller streams, as well as the extreme variation in existing conditions. Therefore, a change in flow patterns that would reduce tailwater habitat is not expected to significantly alter populations of the Tennessee dace. No federally listed species occur in the affected project area and thus none would be affected.

3.7.2.1.3 Plants

Implementation of the No Action Alternative would result in substantial decreases in the frequency of larger flows comparable to current recreational releases from Ocoee No. 2 and No. 3 dams. Over time this would likely result in a substantial shift in the herbaceous, in-channel habitats currently found along the Middle and Upper Ocoee River.

This shift from a herbaceous community could adversely impact southern lobelia and would likely have an adverse effect on the federally listed Ruth's golden aster, both of which occur primarily in or adjacent to the river channel. Adverse impacts to southern lobelia would likely be less than those experienced by Ruth's golden aster because that species has the ability to persist and reproduce in shady, forested environments. Ruth's golden aster can persist for some time in shady environments, but will not successfully reproduce under those conditions (Moore et al. 2016). Ruth's golden aster is exceedingly rare; the global range is boulders and rock outcrops along small sections of the Ocoee and Hiwassee rivers in Polk County, Tennessee. Substantial changes to in-channel vegetation along the Middle Ocoee River, which is where the species occurs on that river, could endanger approximately 10 percent of the total population of the species. This could result in significant impacts to the plant.

Multiple very rare plant species occur in the Ocoee River gorge, but not primarily within the river channel. Though some isolated individuals occurring near the channel could be indirectly affected by changes to riparian vegetation, nearly all individuals of these state-listed plants occur outside of the riparian zone and would not be impacted by implementation of the No Action Alternative. Federally listed species do not occur on the TVA and USFS tracts that would be made available to the state of Tennessee; state-listed plants are not known to occur on those parcels, but may be present in small numbers. However, given that those parcels are currently used for recreation and no future development is proposed outside of disturbed areas, any impacts to state-listed plants present on those tracts would be minor and insignificant.

Implementation of the No Action Alternative would have no effect on the federally listed white fringeless orchid (because the species does not occur in the Ocoee River gorge) and potential significant impacts on Ruth's golden aster. Impacts to southern lobelia would be small and all other state-listed plants known from the Middle and Upper Ocoee River would not be appreciably impacted by the alternative.

3.7.2.2 Alternative B – Proposed Action

3.7.2.2.1 Terrestrial Wildlife

Under Action Alternative B, TVA would agree to provide a water release schedule similar to the one in place for a term of 15 years (assumed to be renewed for an additional 15-year period) on the Middle and Upper sections of the Ocoee. The State of Tennessee would continue to be responsible for site maintenance (including mowing) on their lands. No construction of new facilities or improvements to existing facilities are proposed on USFS Tracts FS #1 and FS #2 and TVA parcels proposed to be managed by the State at this time.

Forested parcels and sections of the Ocoee River have the potential to provide habitat for all of the terrestrial animal species listed in Section 3.7.1. However, actions proposed under this alternative are not expected to alter natural habitat beyond current maintenance actions. Deed restrictions would ensure that any future major vegetation removal (e.g. clearing of trees greater than 3 inches in diameter at breast height), construction, or improvements (including demolition of buildings) would be reviewed by TVA for environmental impacts prior to these actions taking place. Any potential future impacts to federally listed species under Section 7 of the Endangered Species Act would be consulted upon with the USFWS as appropriate. No other threatened or endangered terrestrial animal species are expected to be impacted by the proposed actions. No direct, indirect, or cumulative impacts to terrestrial threatened or endangered terrestrial species are expected to occur as a result of proposed actions under Alternative B.

3.7.2.2.2 Aquatic Animals

The minor changes to the existing flow regime would only reduce recreational flows in the Ocoee No. 2 and 3 tailwaters by a small number of days per year. This change would not significantly alter aquatic habitat in the reach. This insignificant change to aquatic habitat, in combination with a lack of preferred habitat for the state-tracked Tennessee Dace would result in no significant impacts to this species. No federally listed species occur in the affected project area and thus none would be affected.

3.7.2.2.3 Plants

Implementation of the Proposed Action and the associated five-day reduction in flows would not likely result in discernable changes to vegetation along the Middle and Upper Ocoee River. The frequency, duration, and magnitude of recreational flows under this alternative would be comparable to those currently occurring along those sections of the river and would be sufficient to maintain plant habitats found there. In fact, the substantial increase in Ruth's golden aster populations found along the Middle Ocoee River has taken place during recreational flows that are essentially identical to those proposed in Alternative B. Neither rare plants occurring in the channel or outside of the riparian area on the TVA or USFS tracts proposed for transfer would be appreciably affected by the minor change in operations. Therefore, implementation of this alternative is unlikely to result in adverse impacts to threatened and endangered plant species.

TVA has consulted with the USFWS under Section 7 of the ESA on the potential to affect Ruth's golden aster. In a letter dated November 1, 2017, the USFWS concurred with TVA's determination that the proposed action would not likely adversely affect Ruth's golden aster (Appendix D) and would have no effect on white fringeless orchid because it does not occur in the Ocoee River gorge.

In the letter, the USFWS also concurred that there would be no effect to the snail darter, gray bat, Indiana bat, or northern long-eared bat.

3.7.2.3 Alternative C – Current Management Regime

Alternative C would continue the current schedule of water releases to support recreational rafting. Therefore, there would be no change to the current conditions and no impact to threatened and endangered species.

No effects to the aquatic habitat (other than those caused by natural environmental conditions) would be expected to occur. Additionally, the affected reaches are not preferred habitat for the Tennessee dace. Therefore, the project would not affect the state-tracked Tennessee dace. No federally listed aquatic animal species occur in the affected project area and thus none would be affected. No other threatened or endangered terrestrial animal species are expected to be impacted by the proposed actions.

3.8 Wetlands

3.8.1 Affected Environment

The U.S. Army Corps of Engineers regulates the discharge of dredged or fill material into waters of the United States, including wetlands, under CWA Section 404 Permit [33 United States Code § 1344]. Additionally, EO 11990 – Protection of Wetlands requires federal agencies to avoid possible long-term and short-term impacts to wetlands, and minimize their impact in order to preserve and enhance their natural and beneficial values.

As defined in Section 404 of the CWA, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Types of wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands and wetland fringe areas can also be found along the edges of many watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits including flood storage, erosion control, water quality improvement, wildlife habitat, and recreation opportunities (33 Code of Federal Regulations [CFR] 328.39(b)).

The Ocoee River project area is in the Southern Metasedimentary Mountains Level IV Ecoregion (66g), a subdivision of the Blue Ridge Mountains Level III Ecoregion (66) (Griffith et al. 1998). Within the Southern Metasedimentary Mountains, the steep, dissected, mountains support Appalachian oak forests at lower elevations, and northern hardwood forests at higher elevations.

Wetlands within the Middle and Upper Ocoee River project area identified on the National Wetlands Inventory maps included lacustrine (i.e., related to a lake) and riverine (i.e., related to a river) (Table 3-17). Since lacustrine and riverine wetlands are considered to be deepwater habitats that lack vegetation, they are discussed in surface water (Section 3.4).

Table 3-17. Wetlands and Other Waters of the U.S. Within the Ocoee River Project Area and Vicinity

Wetland Type	Ocoee River	USFWS and TVA Parcels	5-mile Region
Emergent			24.2
Forested			90.4
Scrub-Shrub			113.9
Open Water			1,896.6
Total			**2,125.1**

Source: USFWS 2017b

The majority of the National Wetlands Inventory wetlands within the 5-mile radius of the project area are open water (89 percent), as well as smaller amounts of palustrine emergent, forested, and scrub-shrub wetlands (see Table 3-17). Areas of emergent/scrub-shrub wetlands are located upstream of Ocoee Dam No. 3 and along some of the smaller tributary channels. Isolated wetlands such as bogs, seeps, and fens are relatively rare considering the high relief of the region. Forested wetlands occur on lower-lying, undisturbed areas and along tributary streams.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would only release water from the TVA dams into the river channel when TVA is not generating power at the Ocoee No. 2 and Ocoee No. 3 powerhouses and at other times during periods of naturally occurring high river flow. There would be a substantial decrease in the frequency of large flow water releases under this alternative. With the decrease in frequency of water releases, there is potential for woody vegetation to encroach on any herbaceous vegetation that is currently located along the margins of the deepwater habitats of the Ocoee River. However, this potential change in vegetation composition would not affect the current wetland classifications, and no discernable change is anticipated under this alternative. Therefore, there would be no impacts to wetland resources under the No Action Alternative.

3.8.2.2 Alternative B – Proposed Action

Under Alternative B, the schedule for water releases would change slightly from the existing condition. As with Alternative A, the wetland resources within the project area are considered to be deepwater habitats and would not be impacted with the proposed water release schedule. The only wetland resources located within the parcels affected by the proposed action are already classified as riverine. No changes to the classification of those resources are anticipated as a result of the proposed action. Therefore, as with Alternative A, there are no impacts to wetland resources under Alternative B.

3.8.2.3 Alternative C – Current Management Regime

Under Alternative C, TVA would continue with the current release schedule. Therefore, there would be no change from the existing conditions and no impacts to wetland resources.

3.9 Natural Areas, Parks, and Recreation

3.9.1 Affected Environment

Natural areas include managed areas, ecologically significant sites, and Nationwide Rivers Inventory streams. Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, National Park Service, USFS, state or county) to protect and maintain certain ecological and/or recreational features. Ecologically significant sites are tracts of privately owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant, but not specifically managed by TVA's Natural Areas Program. The National Rivers Inventory is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more outstandingly remarkable natural or cultural values judged to be of more than local or regional significance.

This section addresses natural areas and parks that are on, immediately adjacent to (within 0.5 mile), or within the region of the project area (5-mile radius). As noted in Table 3-18, several natural areas and parks are located within 5 miles of the Middle and Upper Ocoee River.

Table 3-18. Natural Areas and Parks Within 5 Miles of the Middle and Upper Ocoee River

Park Name	Managing Agency
Big Frog Extension Wilderness Study Area	USDA Forest Service
Big Frog Wilderness Area	USDA Forest Service
Chattahoochee-Oconee National Forests	USDA Forest Service
Cherokee National Forest/South Cherokee National Forest	USDA Forest Service
Cherokee National Game Refuge	USDA Forest Service
Cherokee South State Wildlife Management Area	Tennessee Wildlife Resources Agency (TWRA)
Cohutta State Wildlife Management Area	Georgia Department of Natural Resources, Wildlife Resources Division
Cohutta Wilderness	USDA Forest Service
Ducktown School Conservancy	TDEC
Enota Certified Organic Farm and Garden	Private Ownership
Fourth Fractional Township Wildlife Management Area	TWRA
Goforth Creek Gorge Protection Planning Site	TDEC
Hiwassee/Ocoee Scenic River State Park	Tennessee State Parks
Little Frog Mountain Wilderness	USDA Forest Service
Merrie J Farm (Darden) – Conservation Easement Land Trust of Tennessee	Private Ownership
Ocoee No. 1 Dam Reservation	TVA
Ocoee No. 1 Reservoir Reservation	TVA
Ocoee No. 2 Dam Reservation	TVA
Ocoee No. 2 Reservoir Reservation	TVA
Ocoee No. 3 Reservoir Reservation	TVA
Ocoee River	National Park Service
Ocoee River Gorge - Unique Geological Feature	N/A
Ocoee River/Ruth's Golden Aster Protection Planning Site	TDEC
Ocoee State Bear Reserve	TWRA

Park Name	Managing Agency
Ocoee Whitewater Center	USDA Forest Service
Rock Creek Gorge Scenic Area	USDA Forest Service
Sugarloaf Mountain Park	TVA/Tennessee State Parks
Walkertown Branch Bog	TDEC
William Davenport Designated State Natural Area	TWRA

Source: TVA 2017, Tennessee State Parks 2017b, USFS 2017f

Five natural or managed areas are located adjacent to the study area, and the project area boundaries are located within ten natural or managed areas. These areas are described below.

Goforth Creek Gorge Protection Planning Site is a TDEC conservation site located adjacent to the Middle Ocoee River, north of US 64. This is an ecologically significant area that supports fishing, hiking, kayaking, and nature viewing.

The Hiwassee/Ocoee Scenic River State Park encompasses various whitewater sites along the Hiwassee and Ocoee Rivers. While whitewater boating is the major feature of this park, there are also opportunities for hiking, picnicking, camping, and fishing (Tennessee State Parks 2016b).

The Little Frog Mountain Wilderness Area is located adjacent to the Upper Ocoee River, northeast of US 64 and covers approximately 4,690 acres (University of Montana 2017). This area is used for recreation including hunting, fishing, hiking, bird watching, and photography.

Portions of the Ocoee No. 2 Dam Reservation, Ocoee No. 2 Reservoir Reservation, and Ocoee No. 3 Reservoir Reservation, areas managed by TVA, are located within and adjacent to the Middle and Upper Ocoee River project area. The Ocoee River from the Parksville Reservoir to Ocoee No. 3 Dam is listed on the Nationwide Rivers Inventory by the National Park Service. This encompasses both the Middle and Upper sections of the Ocoee River. The Ocoee River Gorge was carved out of the Appalachian Mountains by the Ocoee River and is considered a unique geological feature.

The Ocoee Whitewater Center is an approximately four-acre recreation area located along the Upper Ocoee River, constructed for the 1996 Olympic Canoe and Kayak Slalom competitions. This area offers a visitor center, whitewater rafting, picnicking, hiking, and biking (USFS 2017f).

A TDEC protection planning site for the federally endangered Ruth's Golden Aster is located along an approximately 1-mile stretch of the Ocoee River, south of Ocoee No. 2 Powerhouse. This is an ecologically sensitive area, as it supports one of only two known populations of this species (NatureServe 2017)(see Subsection 3.5.1).

The Upper and Middle sections of the Ocoee River are located within the South Cherokee National Forest. The Tennessee Wildlife Resources Agency (TWRA) cooperatively manages the Cherokee National Forest as a Wildlife Management Area. The Cherokee National Forest covers approximately 650,000 acres and is divided into northern and southern sections (USFS 2017a). The South Cherokee National Forest and Wildlife Management Area cover approximately 290,000 acres (TVA 2017). This area is used

primarily for recreation, including hunting, fishing, camping, hiking, picnicking, nature viewing, and water activities. The Ocoee State Bear Reserve and Cherokee National Game Refuge, are closed to bear and game hunting, respectively. These lands are located south adjacent to the Ocoee River within the Cherokee Wildlife Management Area/South Cherokee National Forest.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, the existing water release agreements would not be renewed and would expire at the end of 2018. Whitewater rafting and kayaking on the Middle and Upper Ocoee would only be possible during periods of naturally occurring high river flow and when TVA is not generating power at the Ocoee No. 2 and No. 3 powerhouses. Elimination of scheduled water releases from the Ocoee No. 2 and No. 3 dams would not directly impact natural areas or parks. However, without predicable flow, guided rafting trips on the Middle and Upper Ocoee River would unsustainable, and the Hiwassee/Ocoee Scenic River State Park and Ocoee Whitewater Center would see a decline in visitors. Private rafting would be available during periods of high flow and additional recreational opportunities, such as hiking, picnicking, camping, biking, and fishing are available at these areas; therefore, indirect impacts to the Hiwassee/Ocoee Scenic River State Park and Ocoee Whitewater Center would be minor. In addition, the Ruth's golden aster benefits from recreational water releases to the Middle Ocoee. As noted in Section 3.7.2, elimination of scheduled water releases to the Middle Ocoee may eventually result in a shift in the herbaceous, in-channel habitats currently found along the Middle Ocoee River. Changes to the in-channel vegetation along this reach of the river could endanger this population of the Ruth's golden aster. Therefore, implementation of this alternative would have a moderate indirect impact to the Ruth's Golden Aster Protection Planning Site. No other natural areas or parks are anticipated to be impacted by this alternative.

3.9.2.2 Alternative B – Proposed Action

Under this alternative, five water release days on the Middle Ocoee in late September would be eliminated. There would be no construction or improvements to the parcels of land affected by the proposed action, and this alternative is substantially similar to the current management practice. Therefore, there would be no impacts to natural areas or parks.

3.9.2.3 Alternative C – Current Management Regime

This alternative is the current management practice, and there would be no construction or improvements to the affected parcels of land. Therefore, no impacts to natural areas or parks would result from implementation of this alternative.

3.10 Cultural Resources

3.10.1 Affected Environment

Cultural resources include prehistoric and historic archaeological sites, districts, buildings, structures, and objects, as well as locations of important historic events that lack material evidence of those events. Cultural resources that are listed, or considered eligible for listing, on the National Register of Historic Places (NRHP) are called historic properties. To be considered an historic property, a cultural resource must possess both integrity and significance. A historic property's integrity is based on its location, design, setting, materials, workmanship, feeling, and association. The significance is established when

historic properties meet at least one of the following criteria: (a) are associated with important historical events or are associated with the lives of significant historic persons; (b) embody distinctive characteristics of a type, period, or method of construction; (c) represent the work of a master, or have high artistic value; or (d) have yielded or may yield information important in history or prehistory (36 CFR Part 60.4).

Section 106 of the NHPA requires federal agencies to consider the effects of their proposed undertakings on historic properties and provide the Advisory Council on Historic Preservation an opportunity to comment on those effects. TVA determined that the Proposed Action Alternative is an "undertaking" as defined by the regulations under NHPA. Once an action is determined to be an undertaking, the regulations require agencies to consider whether the proposed activity has the potential to impact historic properties. If the undertaking is such an activity, then the agency must follow the following steps: (1) involve the appropriate consulting parties; (2) define the area of potential effects (APE); (3) identify historic properties in the APE; (4) evaluate possible effects of the undertaking on historic properties in the APE; and (5) resolve adverse effects (36 CFR § 800.4 through 800.13). An APE is defined as the "geographic area or areas within which the undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR § 800.16.).

Concerning cultural resources, the APE is taken as the affected environment for purposes of this EA. TVA defined the APE to be the following: the Middle and Upper Ocoee River shoreline cutbanks potentially affected by changing water releases; USFS Tracts FS #1 and FS #2 (approximately 3.7 acres); TVA Parcel 1 (8.3 acres), TVA Parcel 2 (15.0 acres), and TVA Parcel 3 (3.87 acres). This APE includes a 1/2-mile radius surrounding the land tracts to account for visual effects to historic structures. Prehistoric and historic archaeological sites may exist in the APE, including along the river shoreline. A review of the Tennessee Historical Commission Viewer and TVA's Integrated Cultural Database indicates that the NRHP listed Ocoee No. 2 Hydroelectric Project and Ocoee No. 3 Hydroelectric Project (including the dams, flume, powerhouse, surge tanks, etc.) lie in view of the APE.

Section 106 of the NHPA requires federal agencies to consult with the respective State Historic Preservation Officer (SHPO) and Indian tribes when proposed federal actions could affect historic and cultural resources, including archaeological resources, which are also protected under the Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act, in addition to the NHPA.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action Alternative

As Alternative A would not authorize any changes to land use or increase water releases, this alternative would not increase erosion along the Middle and Upper Ocoee River shoreline cutbanks and would therefore would have no effect to historic properties .

3.10.2.2 Alternative B – Proposed Action

Under Alternative B, the 15-year recreation management agreement (assumed to be renewed for an additional 15-year period) stipulates that ground disturbing activities in support of occupation and maintenance would be coordinated with TVA prior to their implementation. As these projects materialize, TVA will consider effects to historic properties pursuant to Section 106 of the NHPA. Also under this alternative TVA water releases would remain the same with the exception of eliminating 5 weekdays in late September on the Middle Ocoee River. TVA expects the erosive effects of water releases

to unrecorded archaeological sites would not increase under this alternative and therefore the recreation agreement and the water releases would have no effect to historic properties. Further, any improvements resulting from the recreation agreement would be reviewed for effects to historic properties prior to their implementation.

TVA is consulting with the Tennessee SHPO about TVA's findings. Pursuant to 36 CFR Part 800.3(f)(2), TVA is also consulting with the following federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, Muscogee (Creek) Nation of Oklahoma, Alabama-Coushatta Tribe of Texas, Kialegee Tribal Town, Thlopthlocco Tribal Town, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and the Shawnee Tribe.

3.10.2.3 Alternative C – Current Management Regime

Alternative C is similar to Alternative B, except that water releases would occur during five additional days in September. Ground disturbing activities in support of occupation and maintenance of TVA parcels under easement to the State would be coordinated with TVA prior to their implementation. As these projects materialize, TVA will consider effects to historic properties pursuant to Section 106 of the NHPA. Also under this alternative, TVA water releases would remain the same and therefore would have no effect to historic properties. TVA expects the erosive effects of water releases to unrecorded archaeological sites would be indiscernible under this alternative given it is a minor increase in release days from Alternative B. Therefore the proposed water releases would have no effect to historic properties. Further, any improvements resulting from the recreation agreement would be reviewed for effects to historic properties prior to their implementation.

3.11 Cumulative Effects

This section supplements preceding analyses and includes the potential for cumulative adverse impacts to the region's environment that could result from the implementation of the proposed management agreements and scheduled water releases. A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of a project when added to other past, present and reasonably foreseeable future actions (40 CFR 1508.7). Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions that include the following prior actions which are either explicitly or implicitly considered cumulative impacts:

- Repair and maintenance of the flume at the No. 2 Dam
- Development of the Olympic Whitewater Slalom Venue on the Upper Ocoee River
- Development of the Ocoee Whitewater Center and Ocoee Recreational Corridor
- Transmission line replacement between the Ocoee No.2 and the Ocoee No. 3 Powerhouses

Because these actions are considered part of the baseline, they are not addressed separately in the cumulative effects analysis.

The Corridor K project was first introduced as one of 31 regional projects included in the Appalachian Regional Development Act of 1965. The project was introduced to link the

metropolitan areas of Chattanooga, Tennessee and Asheville, North Carolina. TDOT has been working in conjunction with TVA, U.S. Army Corps of Engineers, USFS and other entities since the late 1980s to assess the potential effects of the Corridor K project in Tennessee. A Draft EIS for a proposed project between the Ocoee River Bridge, and Ducktown was completed and approved by the Federal Highway Administration in 2003 with public meetings held in January 2004. The Draft EIS was later rescinded by TDOT in 2008. TDOT determined that a fresh look at Corridor K was warranted and initiated a Transportation Planning Report in 2010 (TDOT 2010). A subsequent Draft EIS was initiated, and was scheduled to be available in late 2015. This document has not been published. Currently, as this project is still in the early development phase, no work has been undertaken and no funding or permits have been issued. Therefore, this project is not considered to be reasonably foreseeable. Ongoing activities including various forms of recreation (rafting, kayaking, camping, hunting, fishing, boating, hiking, biking and picnicking), road maintenance, vegetation management, and wildlife habitat improvements would continue in the region. However, there are no other reasonably foreseeable future actions within the region that could contribute to cumulative effects.

The potential for cumulative effects associated with the alternatives considered in this EA is a function of several factors that include the magnitude of the impact and the sensitivity of the resource affected in addition to the quality and condition of the baseline. The water release and management agreements considered in this EA would only affect the flow regime of the Ocoee River and would not result in any ground disturbance or construction activities. Therefore, there would be no cumulative impacts to air quality, climate change, floodplains, solid and hazardous waste, noise, visual resources or public health and safety associated with any construction or ground disturbing activity. Accordingly, the potential for cumulative effects are largely driven by the flow regime change within the middle and lower sections of the river and the change in recreation use and the associated economic impacts.

Under the No Action Alternative, scheduled water releases would be eliminated and whitewater rafting would only be possible during periods of high non-turbine flow. Recreational users that would normally use the Middle and Upper sections of the Ocoee River would likely utilize alternate whitewater rafting rivers such as the Gauly, Nolichcucky, Chatooga, and Nantahala. As a result, increased traffic and economic input would be shifted to other locations. Given that there are no foreseeable future actions that would impact the availability of these sites, the cumulative impact would be minor and not detectable on a regional level.

Under Alternative B, recreational use of the Ocoee River would be reduced by five weekdays in September and recreators would have to travel to the alternate sites in the region described above during this period. Due to the relatively low numbers of users who have historically used the Ocoee River on these days, and the potential distribution of this use across multiple sites, this is not expected to result in adverse cumulative effects.

Alternative C represents the current condition. Because there would be no change to current water releases or management agreements under this alternative, there would be no adverse cumulative effects.

3.12 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or best management practices have

been applied. Mitigation measures and best management practices are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with the proposed changed in water release schedules have the potential to cause unavoidable adverse effects to natural and human l resources.

Changes in the flow regime associated with the No Action Alternative have the potential to have a negative impact to the rare plant communities present along the Middle and Upper Ocoee River and impact economic resources. Given the rarity of the habitats found in this area and the magnitude of economic impact, these impacts may be significant.

Alternatives B and C would entail a minor change in water release schedules and the current condition. Implementation of either of these alternatives would result in unavoidable minor economic adverse effects.

3.13 Relationship of Short-Term Uses to Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EA focuses on the analysis of environmental impacts associated with the implementation of water release and recreation management agreements to continue commercial whitewater rafting on the Ocoee River. For the purposes of this section, the proposed 15-year management agreement (assumed to be renewable for one 15-year period) is considered a short-term use of the environment, and the long term is initiated upon expiration of whitewater rafting management agreements. This section includes an evaluation of the extent that short-term uses preclude any options for future long-term use of the Middle and Upper Ocoee River.

The No Action Alternative would impact commercial recreational use during the short-term. As identified in this EA, it is anticipated that recreational users may identify alternative locations for commercial rafting. However, implementation of this alternative would not change the productivity of natural resources or preclude any options for future long-term use of the river.

Implementation of Alternatives B and C would change the management of flow released to the Upper and Middle Ocoee River and would not change the productivity of natural resources. In addition, because no construction or improvements are proposed to the parcels of land affected by the proposed actions, no loss of productivity of natural resources is anticipated. The short-term use of the Middle and Upper Ocoee River for commercial whitewater rafting would not preclude any options for future long-term use of the river.

3.14 Irreversible and Irretrievable Commitments of Resources

An irreversible or irretrievable commitment of resources refers to impacts on or losses to resources that cannot be recovered or reversed. Irreversible is a term that describes the loss of future options. It applies primarily to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity, that are renewable only over long periods of time. A commitment of a resource would be considered irretrievable when the project would directly eliminate the resource, its productivity, or its utility for the life of the project and possibly beyond. No construction or improvements are proposed on the parcels of land affected by the proposed alternatives. Therefore, a decision on the proposed alternatives in this EA would not result in irreversible and irretrievable commitments.

CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Matthew Higdon (TVA)**
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4.2 Other Contributors

4.2.1 Tennessee Valley Authority

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Name	**Edward W. Wells III**
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Name	**W. Doug White**
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Name	**A. Chevales Williams**
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Name:	**Matt Basler**
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Name:	**Karen Boulware**
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Experience:	25 years of professional experience.

Name:	**Joel Budnik**
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Name:	**Linda Hart**
Education:	B.S., Business/Biology
Project Role	Technical Editing
Experience:	30 years of experience in production of NEPA documents including technical editing, formatting, and assembling.

Name	**Wayne Ingram P.E.**
Education	B.S., Civil Engineering and B.S., Physics
Project Role	Surface Water
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Name	**Emily Kinzinger**
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Project Role	Demographics and Environmental Justice, Natural Areas
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Name:	**Stephanie Miller**
Education:	M.S., Biology and B.S., Marine Biology
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Name:	**Keara Pringle**
Education:	M.S., Environmental Science and B.S., Biology
Project Role:	Vegetation and Wildlife
Experience:	1 year experience in NEPA

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CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

Department of Agriculture, Forest Service, Cherokee National Forest
Department of Agriculture, Natural Resources Conservation Service, Tennessee State Conservationist
Department of Army, Corps of Engineers, Nashville District
Department of the Interior, National Park Service

5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Alabama-Quassarte Tribal Town of the Creek Nation of Oklahoma
Alabama-Coushatta Tribe of Texas
Cherokee Nation of Oklahoma
Chickasaw Nation
Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Jena Band of Choctaw Indians
Kialegee Tribal Town
Mississippi Band of Choctaw Indians
Muscogee Creek Nation
Poarch Band of Creek Indians
Seminole Nation of Oklahoma
Shawnee Tribe
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies/Officials

Representative Dan Howell, Tennessee House of Representatives
Senator Mike Bell, Tennessee Senate
Tennessee Department of Economic and Community Development
Tennessee Department of Environment and Conservation
Tennessee Historical Commission
Tennessee Wildlife Resources Agency

5.4 Local Agencies/Officials

Bradley County Commission, Tennessee
Cherokee County Commission, North Carolina
City Manager, Ducktown, Tennessee
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County Manager, Cherokee County, North Carolina
County Mayor, Bradley County, Tennessee
County Mayor, Monroe County, Tennessee
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5.5 Individuals and Organizations

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Ocoee Outdoors
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Appendix A – Public Scoping Comments

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#	Date	Commenter	Location	Comment
1	6/19/2017	C. Walbridge	Bruceton Mills, WV	As a whitewater paddler and long time sales rep to the rafting industry I strongly support the plan for continued water releases on the Upper and Middle Ocoee River. They're good for the sport and the region's economy.
2	6/19/2017	C. Harjes	-	Thank you for continuing recreational releases on the Ocoee, and please consider more high water releases. The Ocoee is a staple of Southeastern whitewater, both commercially and purely recreationally. Maintaining the current release schedule would continue this. However there is substantial room for improvement if possible, primarily in water levels- the Ocoee is rocky and marginal at 1200 CFS, great at 1500, and rowdy and awesome at 1800 and higher. Mixing in a few of these healthier releases, possibly even conditional on normal or better inflow, would greatly improve the quality and variety of challenges and fun to be had on this wonderful river. Thank you for your consideration.
3	6/20/2017	K. Blanchard	Memphis, TN	Ocoee Dam # 2 and #3- continue current release dates or increase the dates: Please continue the opportunity for recreational activities on the Ocoee river and possibly expand the release days. We have taken commercial trips on the river and hope to continue to do so. My family lived in Memphis and we spent the weekends playing on the river. We either camped or stayed in hotels. We also ate out at the local places near there. We had a great time and encouraged our Memphis friends to visit.
4	6/19/2017	R. Steeves	-	I'm a private boater who spends many weekends running the Ocoee, driving there from Durham, NC, and have over 400 descents of the Middle Ocoee. Every year I attend the Ocoee Drawdown season that is planned for elimination. That's a 9-day window I would not be in the area. If the schedule no longer needs to be the end of September, that week would be of even more benefit if scheduled during the summer months where students are out of school and the weather is warmer. Moving it to the summer could provide a substantial economic benefit. With the new more focused flow levels, there would be benefit to periods of time with a slightly more increased flow to provide a different experience. I would gladly pay an annual fee (much like the Nantahala) to support those services. Thank you for your consideration.
5	6/22/2017	Anonymous	-	It's a shame this "pork barrel" / behind closed doors / deal was passed. Now the taxpayers have to foot the bill, instead of the rafters/outfitters paying their bill.
6	6/23/2017	J. Dugger	-	Subject: Proposed Future Ocoee Recreation Management Thanks for the opportunity to express my suggestions for the management of the middle Ocoee. Many of us travel a long distance to raft and kayak the Ocoee. Usually, when there is a holiday during the week, it allows us to take 4 days of vacation from work to get two weekends plus of paddling. 1. Memorial Day, 4th of July, and Labor Day, I would like to suggest that the river run that entire week. That would allow participants from further distances making the Ocoee a desirable destination for a full week of vacation. Memorial Day and Labor Day always fall on Monday. Since the 4th of July holiday can vary, we get either Friday or Monday off if it falls on a weekend. That day we get off would determine which week the river could run. 2. I've noticed that the number of people rafting has remained about the same the last few years. This might suggest that this activity has become a "mature" market. To energize more excitement and use, higher water levels could entice previous paddlers to return for that excitement. I would suggest early June and Aug for these levels, as well as a couple of days the week of the 4th of July.

#	Date	Commenter	Location	Comment
				3. I don't believe the early release's in March and early April are needed anymore with the availability of other rivers running with those dam's now releasing during this period. Those days could be substituted for the additional days around holidays. 4. Already this year, the take out parking lot for private paddlers has been full, forcing some people to park across the highway. This is a dangerous situation with the speed limit being 45 mph, and blind curves on either side, and people trying to cross the road with boats. 5. Recently I drove to Knoxville following TN Hwy 411. This 4 lane, divided highway, for the most part is 45 mph with only a few stretches 55 mph. Yet, the two lane, winding road along the middle Ocoee is posted 45 mph, but many cars and trucks exceed that speed. The road has sharp, blind turns, with lots of bus traffic. This is extremely fast for 18 wheeler's also. I think the state highway dept should conduct a study to reduce the maximum speed to 35 mph and should instruct the state police to vigorously enforce the limit. I have never seen a driver ticketed on this section of the highway. 6. The shoulder on the road has deteriorated over the years and will need significant work to be widened to a safe distance. On the other side of the road, there are "unguarded" culverts as well as a deep ditch in places. The ditch caused a van, which dropped its right wheel into it, when the driver over corrected by pulling the steering wheel to the left, caused the van to cross the highway and plunge into the upper part of the lake about 15 years ago killing three children. (but it could have hit a bus carrying rafters) The road has only gotten worse since with little maintenance, except the maintenance done after the rock slide a couple of years ago. 7. Since all of the bus drivers have a CDL license, they are the only personnel subject to drug testing. The raft guides are part time employees during the summer, yet they are responsible for the safety of their passengers. With that kind of responsibility, they should be subject to drug testing for public safety. I think the majority of them are very responsible and concerned for their customers, but it only takes one incident to harm the integrity of the management system. Finally, I would like to invite the decision holders to spend a day at the Ocoee during its busy time in June or July on a Saturday. Rafting, hiking down to some of the rapids, talking with customers and private boaters at the takeouts and walking along the road at overlooks. Over the years, it seems that the decision makers sit behind a desk, read our comments, discard the ones they don't understand, misunderstand, or personally disagree with and make decisions that effect us, and not them. There is no substitute for experience, and hands on information FYI, I first paddled the Ocoee in late March 1986. I am just a recreational paddler. Now, semi-retired, I spend my entire summer at the Ocoee. Should you have any questions or require additional information, please bring them to my attention via e mail or cell. Thanks for your attention to this very important challenge to improve the facilities and management of the Ocoee.
7	6/29/2017	J. Cheveallier	-	I'll keep my comments short. I am in favor of renewing the release schedule on the Ocoee River. It's been made clear how much the local economy has grown to depend on revenue generated by the thousands of people who come to this area each year. If the river no longer provided the recreational opportunities it currently does it would prove disastrous. For my personal reasons. I'd like to see the river flows continue because I love kayaking it every year. Thank you for your consideration.

#	Date	Commenter	Location	Comment
8	7/3/2017	R. Griest	Atlanta, GA	I write to strongly encourage the TVA to consider the recreational value of the Ocoee River in the upcoming agreements. From the first time I rafted the Ocoee as a young boy at summer camp, it has been a special place for me. Now a professional in Atlanta in my 30s, the Ocoee is a place where I clear my mind, enjoy good company, and take in the outdoors as a whitewater kayaker. I cannot emphasize enough what a great recreational asset it is for the entire southeast. Please continue to provide consistent recreational releases so that generations to come may also enjoy this great resource. One specific issue the TVA should consider is the offering of increased volume releases. These releases would allow paddlers to experience a slightly more intense Ocoee, and would create some fun and excitement for commercial rafters and private paddlers alike. Thank you for your consideration and continued support of the paddling community.
9	7/3/2017	T. Bryant	-	Would not the boating public would be better served by adding hours to the summer release schedule? Why would we not have releases on Tuesday and Wednesdays when the weather is best? This would allow more users to take advantage of the available releases. This could be accomplished by deleting March and early April releases. Add those days or hours to weekdays during the summer months. Paddlers have a number of river options during the spring for boating. You see very few rafters or any other boaters in April and March. I'm sure it would help generate more income for the rafting companies, restaurants, hotels and other small business owners. ….. Why would we not have releases on Tuesday and Wednesdays when the weather is best? This would allow more users to take advantage of the available releases. Can we delete some of the March and early April releases and add those days or hours to weekdays during the summer. You see very few rafters or any other boaters in April and March. I'm sure it would help generate more income and create jobs for all the small business owners.
10	7/6/2017	T. Pinckney	-	I read the recent proposal for Ocoee river TVA releases starting in 2019. While I'm glad that there will be continued releases on the middle Ocoee at the same schedule as we currently have, I'm dismayed to see that the upper Ocoee will have a reduction in number of releases. I have fond memories of boating on the Ocoee with my dad. It's a beautiful river and also a great economic asset to the state of TN to have boaters visit from out-of-state like my dad and I. I understand that it's a complicated set of priorities to manage power generation and recreational access. However I feel like many times too much weight is given to power generation and not enough to recreation. As the TVA is a governmental organization it's also a bit odd that the water releases require payment to the TVA for lost power revenue. The TVA's charter also includes economic development and white water boating certainly qualifies as such. Thank you.
11	7/7/2017	T. Pinckney Jr.	-	My son … wrote you expressing his hopes that the TVA will maintain and possibly increase releases on both the Upper and Middle sections of the Ocoee. As to economic impact, our visits would usually consist of 9 motel nights plus breakfasts and dinners as well as incidentals. Thus if you multiply our one family's expenditures by all the people on the river, the impact is substantial. Plus you have the most fun, easily accessed, white water rivers anywhere in the country. It is a real treasure for the nation!!! Sincerely.

#	Date	Commenter	Location	Comment
12	7/7/2017	J. Hubbard	-	I am a private boater that kayaks on the Upper and Middle Ocoee River many times each year. I live in the Chattanooga area. I am pleased that TVA, the State of Tennessee, and the Ocoee River Rafting Industry came to a mutually beneficial agreement that insures recreational releases on the Upper and Middle Ocoee for the next 15 years. This is an economic benefit to the area and a recreational benefit to the many paying rafting customers and private boaters that come to the Ocoee River for it world class whitewater experience. Thank you to all, including TVA, who made this agreement possible.
13	7/10/2017	J. Ryan	-	As an avid whitewater kayaker, kayaking instructor, swiftwater rescue instructor, and conservationist, I consider the new Ocoee river agreements to be fair and beneficial to the river community and I hope to TVA, as well. Thank you for the opportunity to comment.
14	7/11/2017	R & D Teal	-	I am glad there is an extended agreement in place. A few comments and questions: - Why doesn't TVA count at least some of the lost power generation revenue as a "cost" to TVA's Economic Development (ED) mission? TVA spends millions to generate economic development. These releases generate $44M in economic development. Seems to me the Economic Development budget should contribute some to offset lost generation revenue. It could be based on what TVA typically spends per Million Dollars of Economic Development generated. - Where are the easements on TVA and USFS land? - What aren't private boaters charged in a manner similar to the daily/yearly permits needed to paddle the Nantahala River? That system seems to work very well. - Disappointed to lose what has become known as "Secret Week" in September. I understand TVA's need no long exists. It would be good to move those 5 days to other days or the Upper.
15	7/12/2017	J. Pack, Lake Blue Ridge Civic Association	-	This letter is in response to the TVA's Request for Comments Regarding the Proposed Ocoee River Whitewater Rafting Agreements. The Lake Blue Ridge Civic Association (LBRCA) wishes to go on record as not just providing comments on the proposed agreement, but being in disagreement with the entire recreational release arrangement in principal. Our logic, which mirrors your request to evaluate environmental, economic, recreational, and other impacts, is provided in the bullet points below: - All of the water for the recreational releases comes from Lake Blue Ridge, which has a small volume inventory of water. The quick drain and refill activities associated with the recreational releases erode the shoreline and harm the fishing nests. - The contract negotiations between the TVA and the rafting organization have not included any input from the Lake Blue Ridge area, where all the water comes from. We're pretty sure the TVA appreciates a voice in decisions that affect its future, and so does the Lake Blue Ridge Civic Association and Fannin County. Reopen this discussion and give us a voice. - The TVA does not prioritize recreation as a driver in managing lake levels, but somehow will allow recreation to become important if the user offers funds in exchange for more water. Is this offer available to Lake Blue Ridge residents, in which we can keep more water if we pay for it? - While the TVA claims it would be releasing water anyway, the arrangement of huge releases within short time periods (six, seven, eight, and even ten hours at a time) causes the lake level to change rapidly. Docks and boats, particularly for non-residents, are placed in jeopardy throughout the release days, and often can't be managed without damage.

#	Date	Commenter	Location	Comment
				- TVA commits to releasing this volume of water with no regard to wet or dry periods or rainfall. In dry times, this practice empties Lake Blue Ridge even faster, further penalizing area residents and lake users, and in wet times would seem to add to flood risks further downstream. - TVA already makes revenue from Fannin County in several ways. TVA has a monopoly on electric sales, and also draws revenue from the dam generators, when they work. This practice of huge water releases to Tennessee benefits that state, which incidentally houses the headquarters of TVA, while penalizing Georgia lake and area property owners who already pay a premium in property taxes to be near the water. - TVA has continually denied the LBRCA's request to change the local Operating Guide to allow for a longer lake season into the fall, despite the potential benefits to the local economy, citing their interest in avoiding the expense and effort to repeat the 2004 EIS. However, the practice of releasing huge amounts of water would seem to be in violation of TVA's own rules for strict adherence to the Operating Guide. Will the 2004 EIS be repeated as a step toward the decision to go with the proposed contract? If not, why not? In summary, the State of Georgia, Fannin County, and Lake Blue Ridge area residents have suffered enough from the practice of recreational releases. Please end this practice when the current contract expires. Let the whitewater rafting companies live with the same conditions as Lake Blue Ridge residents-they can raft when it rains a lot, and they can do without when its dry. This is the same logic as the TVA applies to Lake Blue Ridge regarding our water levels. Please do not hesitate to contact me if you have questions about this letter. Sincerely, Jon Pack President, Lake Blue Ridge Civic Association
16	7/16/2017	L. Case	Columbia, SC	The five weekdays in late September are the best 5 days to paddle the Ocoee. It's a tradition. Honor history. Keep the Fab Five.
17	7/16/2017	T. Gonzalez	Asheville, NC	Please keep the 5 day window of generating in September in place. This helps the local economy greatly due to its original nenes use by private boaters who come from neighboring states as well as Tennessee and pour much needed funds into the lead cal economy.
18	7/16/2017	J. Staley	-	• Ocoee River releases are extremely valuable to the paddling community, the general public and the regional economy. TVA should fully consider these benefits. • The TVA should consider an alternative under which they continue to provide the current schedule for the next 15-20 years, and provide any releases not paid for by the proposed payment agreements free of charge as a public benefit. • The TVA should consider modest increases in flow volumes (total of 1200-1500cfs) during some releases to provide higher quality and more diverse recreation experiences. • TVA should consider takeout improvements for private paddlers on the Middle Ocoee. Like other paddlers, I plan my vacations around these releases. Especially the 5day release in September. Thank you for your time

#	Date	Commenter	Location	Comment
19	7/16/2017	G. Grant	-	I am grateful that an agreement has been reached with TVA, the state of Tennessee, and other interested parties concerning the continued releases for whitewater on the Ocoee River. I am a long-term resident of Chattanooga, TN and have been paddling the Ocoee River since 1977. The Ocoee is a very important local resource to me and indeed, one of the reasons that I stayed in the SE TN area for so many years. However, I am strongly opposed to the loss of the weekdays in the Fall (usually the last week of September). While I understand that the week was originally scheduled due to required maintenance that is no longer needed, nevertheless, this week should be included and remain in the annual release schedule. I would like to understand the reason for the removal of this week of releases since it is a very popular time to paddle the Ocoee with a number of boaters. I have spoken with many private boaters from the Southeastern US who regularly schedule a week of vacation around this week of releases. These people come from San Antonio, New Orleans, and Fayetteville, Arkansas. They will schedule a week or more of fall vacation around this release. Its discontinuation will mean loss revenues for tourism business in Polk County, TN as well as the surrounding area. Hotels, cabins, and other lodgings, restaurants, and gas stations will all feel the effect economically if this week is continued. Many boaters come to SE TN for this week of releases. The weather is typically warm, but not hot, dry, and fall is just beginning in the mountains. There has been a noted increase also in commercial rafting during the week of fall releases. If TVA is concerned about a maximum number of release dates, I would suggest dropping the two sets of weekend releases in March, which are far less popular than the week of releases. The weather is not as good then, and the boat traffic on the Ocoee is reduced. In summary, I am opposed to the loss of the Fall weekday releases in the schedule for 2019 and beyond. Economically, it does not make sense for the area. If you wish to contact me for additional comments, my email address is ….. Thanks for your consideration. Sincerely.
20	7/16/2017	Shayna	-	Hello, Please consider keeping the late September release dates as many boaters plan vacations around those days. September is usually a slower month as most tourists are gone and the leaves haven't changed yet. That week provides a nice boost in restaurant and lodging sales. Please consider releasing a bit more water too. The Ocoee runs at a boney water level and since Americans aren't getting any smaller, a bit more water would be helpful and enjoyable for all. Thank you.

#	Date	Commenter	Location	Comment
21	7/17/2017	K. Yount	-	Thank you for working with the state and commercial and private whitewater interests . I would like to propose some additional considerations that would make for a better experience on the Ocoee. Increase the flow on the Middle Ocoee on days when the Upper Ocoee is releasing as well. Since the upper Ocoee releases at 1400 cfs, the middle Ocoee flow should be increased from 1200 to 1400 on those days as well. Build more restrooms at both the Ocoee 2 put in and at the private boater take out. Consider adding and servicing portable toilets while these are being built. Allow for more companies to apply for and receive commercial use permits. The current system of a cap on the number of permits given out bars entry to new entrepreneurs entering the market. Under the guise of protecting the resource from overcrowding, the cap on permits really protects those who got to the party early enough from having to compete against a new generation of entrepreneurs. Anyone who is able to secure liability insurance and that wishes to operate a commercial operation should be allowed to apply for an receive a permit. The amount of people who wish to raft the Ocoee is going to always be high and it shouldn't matter whether there are 24 or 100 companies competing for their share of that number. Thank you for providing power and water releases; and for hearing comments.
22	7/17/2017	C. McCarter	-	I am writing in response to the proposed release calendar for 2019 on the Ocoee river. Ocoee River releases are extremely valuable to the paddling community and local economy. The TVA should consider an alternative under which they continue to provide release on the current schedule, including the release for five weekdays in late September. This week-long release has become a sacred time for me and my family. We have planned vacations around this release and I urge you to consider agreeing to continue with the current schedule. Thank you for your consideration.
23	7/17/2017	D. Watford	-	• Ocoee River releases are extremely valuable to the paddling community, the general public and the regional economy. TVA should fully consider these benefits. • The TVA should consider an alternative under which they continue to provide the current schedule for the next 15-20 years, and provide any releases not paid for by the proposed payment agreements free of charge as a public benefit. • The TVA should consider modest increases in flow volumes (total of 1200-1500cfs) during some releases to provide higher quality and more diverse recreation experiences. • TVA should consider takeout improvements for private paddlers on the Middle Ocoee.
24	7/17/2017	J. Hussey	Fayetteville, AR	I have been an Ocoee paddler since 1987. I have driven to Tennessee from Arkansas almost every year since then sometimes twice and three times a year. I now spend at least one month of the summer in the Ocoee area, starting in 2012, renting a vacation home. I appreciate what is made available to me as a private boater by having scheduled releases that I can count on. I hope the proposed plan will be amended to include the full week of releases in the fall. I enjoy coming then as much as the summer releases. Thank you.

#	Date	Commenter	Location	Comment
25	7/16/2017	J. Jones	Kansas City, MO	Subject: Ocoee Secret Week I'm writing to reiterate my support for the following points list below. I currently live in Kansas City Missouri, and spend about 25 days each year paddling the upper and middle ocoee. I am alarmed to learn that secret week may no longer happen in the future, as that is one of the times that I paddle the ocoee river outside of my summer break. I hope you will consider the following points as you look to make future decisions. • Ocoee River releases are extremely valuable to the paddling community, the general public and the regional economy. TVA should fully consider these benefits. • The TVA should consider an alternative under which they continue to provide the current schedule for the next 15-20 years, and provide any releases not paid for by the proposed payment agreements free of charge as a public benefit. • The TVA should consider modest increases in flow volumes (total of 1200-1500cfs) during some releases to provide higher quality and more diverse recreation experiences. • TVA should consider takeout improvements for private paddlers on the Middle Ocoee.
26	7/16/2017	F. Mueller	-	Hi! Please do not eliminate the 5 weekdays from the middle Ocoee release schedule. We plan our vacation around that on a yearly basis, it is the highlight of the year!
27	7/16/2017	A. Buckner	Franklin, NC	I agree with and echo AW' s position on the Ocoee. • Ocoee River releases are extremely valuable to the paddling community, the general public and the regional economy. TVA should fully consider these benefits. • The TVA should consider an alternative under which they continue to provide the current schedule for the next 15-20 years, and provide any releases not paid for by the proposed payment agreements free of charge as a public benefit. • The TVA should consider modest increases in flow volumes (total of 1200-1500cfs) during some releases to provide higher quality and more diverse recreation experiences. • TVA should consider takeout improvements for private paddlers on the Middle Ocoee.
28	7/17/2017	B. Brewer	Fayetteville, AR	Please reconsider removing the fall draw down week from the Ocoee release schedule. I have been coming out every year since 1995, usually with a group of friends. Last year ten of us drove across Tennessee and paddled that week. It is a great time of year to be on the Ocoee and it will be sad to go elsewhere starting in 2019.
29	7/18/2017	D. Richardson	-	I am writing to encourage TVA to keep the weekday releases for the Ocoee No. 2 dam/ Middle Ocoee the last week of September. For most of the past 30 years, I have participated in paddling the Ocoee during this week and have been joined by friends from Texas, Arkansas, Virginia, Maryland, and other areas who come to this area of Tennessee specially for this week of recreational releases. These September weekday releases offer several advantages to BOTH the local economy and to those in the paddling community, e.g. • By continuing weekday releases, local restaurants, hotels/ lodging facilities, grocery stores, gas stations, etc. get a boost during a slow time of year. • Tourists and paddlers get to see this area at a less crowded time of year and are more likely to come back to this area. ALSO: any mechanical system, including the powerhouses on the Ocoee River, requires periodic maintenance. It makes sense to do this during times of the year when power demands for cooling and heating are lower, i.e. around the time of the annual fall weekday releases. Respectfully submitted.

#	Date	Commenter	Location	Comment
30	7/18/2017	M. Hollingsworth	-	I have recently started whitewater kayaking, I am a member of a local club, and through this it has brought my "pocketbook" to local businesses. Not only does recreational kayaking, SUP, and rafting bring revenue to the area, but it also promotes use of state parks, camping, hiking, and other activities. Promoting healthier lifestyles and opens people's eyes too nature conservation. In a world where phones, tablets, and TV remove people from the beauty that surrounds them, the Ocoee and what it represents, for private boaters and raft companies alike, is immeasurable. I would respectfully object to the elimination of the 5 business day release in September, as this is still at the height of the season and urge you to reconsider this dismissal and instead ask that you retain the agreement previously agreed upon, and maybe even extend it? Sincerely.
31	7/16/2017	R. Huff	-	I would very much like to keep in the release schedule the annual 5 consecutive days in late September or early October.
32	7/19/2017	H. Austin, Eastern Band of the Cherokee Indians	-	This proposed agreement does not seem as though it will have any adverse impacts on Cherokee resources or human remains. However, if there are known burials located in the banks or put-in/take-out locations along the Ocoee River that could be negatively impacted by maintenance or increased traffic, we would like to see measures taken to ensure that those sites will have additional protection. If possible, I would like to request that some shovel testing be conducted in conjunction with the Environmental Assessment to determine the presence or lack of historic properties and/or graves. Sincerely, Holly Austin Tribal Historic Preservation Office Eastern Band of the Cherokee Indians
33	7/19/2017	K. Colburn, American Whitewater	Washington, DC	Dear Mr. Smith, Attached are American Whitewater's comments on the Ocoee River Whitewater Rafting Agreements scoping notice. Thank you for considering these comments. Kevin Colburn National Stewardship Director American Whitewater **LETTER ----SEE SEPARATE PDF**
34	7/20/2017	M. Przybysz	Chattanooga TN	Thanks in advance for reading my comments. First, I'd like to say if it weren't for Ocoee releases, I wouldn't be living in Chattanooga and currently using TVA power or spending my money in Tennessee. I relocated to Polk County in 2000, by 2001 I was living there year round and did so until 2007. During that time, I registered my vehicle in Polk County, shopped for groceries and ate at restaurants. The TVA releases enabled me to both work and live there. Since 2007, I have lived in Chattanooga, I still travel to the river regularly where I purchase gas and food in Bradley/Polk County areas on my to and from the river. I have enjoyed the releases on the Ocoee since 2000, I appreciate TVA and the rafting outfitters working together to continue the releases. The river releases provide many benefits to Polk County and the surrounding communities, and I believe TVA should consider

#	Date	Commenter	Location	Comment
				these factors when weighing the decisions to change the flows. I like the idea of the extra 30 acres for the state to manage the take-out for the river. I'd love for TVA to consider more flow than promised through the rafting agreement. And finally, I respectfully request TVA to continue releasing for one week in the fall as that's one of the best and most peaceful times to be on the river. The weather is generally amazing and it provides an amazing opportunity to see the region and use the river. Thanks for your time.
35	8/21/2017	C. Lowe-Zepeda, Muscogee (Creek) Nation	Okmulgee, OK	Thank you for the correspondence regarding the recreational management along the Ocoee River. The project area located in Polk County, Tennessee is within our historic area of interest. The Muscogee (Creek) Nation is unaware of any Muscogee cultural or sacred sites located within the immediate project area. We concur that there should be no effects to any known historic/cultural properties and that work should proceed as planned. However, as the project is located in a area that is of general historic interest to the Tribe, we request that work be stopped and our office contacted immediately if any Native American cultural materials are encountered. This stipulation should be placed on the construction plans to insure contractors are aware of it. Please feel free to contact me with an further questions or concerns.

Kevin Colburn
National Stewardship Director
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www.americanwhitewater.org

July 19, 2017

Tennessee Valley Authority
c/o Russell D. Smith
400 W. Summit Hill Drive, WT-11D
Knoxville, Tennessee 37902
Submitted electronically to: PLIC@tva.gov

Dear Mr. Smith,

American Whitewater is a national non-profit organization with a mission to conserve and restore our nation's whitewater resources and to enhance opportunities to enjoy them safely. Our members are primarily non-commercial kayakers, rafters, and canoeists, and significant portion of our membership lives in the region served by the TVA. Many of our members regularly visit the Ocoee River to enjoy its treasured rapids. The historic flow releases on the middle and upper Ocoee have had profound benefits to the regional economy and the quality of life of our members. Our interest is in no net loss of releases, and we are supportive of continuing the current or an enhanced flow regime into the future and offer the following scoping comments to that end.

We support full consideration of the proposal described by TVA in the scoping notice, with minor caveats.

The TVA proposes to continue the historic flow regime on both the upper and middle Ocoee River for the next 15 years, except that a block of weekday releases in the fall will be eliminated. At this time we support this proposal and its full consideration, with the caveat described below concerning continuation of the fall block of weekday releases without charge.

One very important element of the scoping notice, which we request be carried forward in the NEPA analysis is the statement that: "The proposed water release agreement would not apply fees or restrict access to private boaters." Our support of the proposed future management is contingent upon this statement remaining in the plan.

We request that the TVA fully consider the benefits of Ocoee River releases on the local and regional economy.

The releases on the Ocoee River area create major economic benefits for the region and the rural area nearest to the river. A recent study found 622 jobs and an economic impact of $43.83 million associated with whitewater rafting throughout the 2012 paddling season.[1]

A Forest Service and TVA analysis of the Upper Ocoee found significant economic benefits of releases on that reach in a 1997 Environmental Impact Statement titled Upper Ocoee River Corridor Land and Water-Based Recreational Development.[2]

American Whitewater created an online survey regarding paddling the Ocoee River in 2016 that received 762 responses, 673 of which were private boaters. Key results are summarized below and additional data is available upon request.

- 70% of respondents stay overnight in the area, 60% of respondents typically camp.
- 88% of respondents sometimes go out to eat when visiting the Ocoee, and over half go out to eat in the area more than 10 times annually.
- 38% of respondents spend $21-40/day, and 44% spend more than $40/day.
- The average daily expenditure reported from private paddler respondents was greater than or equal to $49.72 per person (n=667). When multiplied by the 15,712 private user days on the Upper and Middle Ocoee in 2015, this results in local annual private boater direct expenditures of $781,195. The full economic impact of private boating is significantly higher than this figure based on the standard economic practice of factoring in multipliers to direct expenditure data.
- 78% of respondents said they would surf at a whitewater park if one were available. Respondents would go out to eat, shop, bike, hike and camp more if better options existed.

The economic benefits of the Ocoee dam releases are vital to the regional economy and far outweigh the foregone power generation revenues associated with the program. TVA's analysis of the release program must fully account for these benefits at the local and regional scale.

We request that the TVA provide historical releases not paid for by the proposed payment agreements free of charge as a public benefit.

The scoping notice outlines a plan that includes a schedule framework and proposed schedules for 2019, and a proposal to eliminate a block of fall weekday releases. It is unclear whether and how this schedule could be changed in the future based on any number of factors. To ensure a sound NEPA process that analyzes the actual flow regime to

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[1] See http://www.americaoutdoors.org/america_outdoors/pdf/Ocoee2pp.pdf

[2] See https://www.gpo.gov/fdsys/pkg/FR-1997-02-21/pdf/97-4323.pdf, and https://www.gpo.gov/fdsys/pkg/FR-1997-04-18/pdf/97-10008.pdf

be provided, and to provide the paddling community with certainty in the flows that will be provided, we request that the TVA explicitly state that there will be no net loss in releases for the forthcoming 15 years.

We also request that TVA explicitly commit to provide any historic release days not covered or funded through the payment system as a public benefit free of charge. This includes the fall block of weekday releases that TVA has proposed to eliminate, and any releases that may be unfunded in the future via unforeseen circumstances.

We request that the TVA consider modest increases in flow volumes (total of 1200-1500cfs) during some releases to provide higher quality recreation experiences.

One of the primary findings of our private boater survey was an interest in slightly higher Middle Ocoee releases, in the range of 1200 to 1500cfs. We ask that TVA consider the costs and benefits of such releases in the analysis. We propose that these slightly higher releases could enhance the recreation experiences of commercial customers as well as private paddlers, leading to increased visitation. It may be that these higher flows could be utilized during shoulder season or other times of lower visitation to attract more visitors to the area, or they could be employed during seasons of greater water availability.

We request that the TVA consider the benefits of the Ocoee release program on rare plant species compared with the release program in the Hiwassee River below Apalachia Dam.

Ruth's golden aster, Pityopsis ruthii, is a federally endangered endemic plant that's sole habitats are the bypassed river reaches of the Ocoee and Hiwassee rivers. Annual monitoring from 1987 through 2014 revealed that Ocoee populations have consistently grown to more than double their original size over that timeframe. Monitoring since 1987 of three Hiwassee River sites has shown consistent declines in populations of Ruth's golden aster, with current populations roughly half of their 1987 levels.[3]

The distinct flow regimes of these two rivers are often cited as the primary driver of the plant's divergent population trends. The middle Ocoee's roughly 116 annual pulse flow releases, mostly during the growing season, appear to benefit Ruth's golden aster. There are no analogous pulse flows on the Hiwassee River below Apalachia Dam, where flows are typically flat-lined at a very low level for the entire year. The result has been significant woody vegetation encroachment in the Hiwassee River channel, and indeed the river channel is essentially forested in some sections.[4]

The current and historical flow regime on the Ocoee is working for Ruth's golden aster. Significant reductions in releases would make the Ocoee flow regime more similar to the

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[3] Moore, Philip A., et al. Current knowledge, threats, and future efforts to sustain populations of Pityopsis ruthii (Asteraceae), an endangered southern Appalachian species. Journal of the Torrey Botanical Society 143(2): 117–134, 2016.
[4] *Id*, pg. 123

Hiwassee flow regime, and could reverse the positive population trends of the Ocoee population of the plant. We request that TVA acknowledge the relationship between the flow regimes of these reaches and Ruth's golden aster populations. The data on this rare plant suggest that continuing a release schedule similar to the current schedule on the Ocoee River would likely continue to benefit Ruth's golden aster.

At the same time, to quote the US Fish and Wildlife Service, the data "suggest that providing periodic intermediate-to-high flows could be an important component of management to improve growth rates in the Hiwassee population and reduce the extinction risk it faces," and that "Improved flows will be an important component in any long-term solution for controlling vegetation succession and maintaining suitable habitat conditions for *P. ruthii* in the Hiwassee drainage."[5] We request that the TVA analysis contain a comparative analysis of Ruth's golden aster population trends between the two rivers, and that that analysis trigger an immediate and separate assessment of the need for ecological pulse flows on the Hiwassee River downstream of Apalachia Dam.

We request that the TVA consider access improvements for private paddlers.

Our survey produced many calls for improved take out facilities on the Middle Ocoee. We request that TVA consider the costs and benefits of investing in improved and expanded take-out options for private boaters on the Middle Ocoee.

Our survey also produced many comments requesting that the Upper Ocoee put in remain open for longer hours for post-trip vehicle recovery. The locking of the gate is a limiting factor to use, and one easily resolved. We request that TVA consider investing in solutions to this problem, such as automatic gates or expanded staffing and parking hours.

Thank you for considering these comments.

Sincerely,

Kevin Colburn
National Stewardship Director
American Whitewater
PO Box 1540
Cullowhee, NC 28723
828-712-4825
kevin@americanwhitewater.org

[5] U.S. Fish and Wildlife Service, Southeast Region, Tennessee Ecological Services Field Office. Ruth's Golden Aster: 5-Year Review: Summary and Evaluation. https://www.fws.gov/southeast//pdf/five-year-reviews/ruths-golden-aster.pdf

Appendix B – Proposed Water Release Framework

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Ocoee River Release Scheduling Framework

Releases from Ocoee No. 2 Dam for the Middle Ocoee (Scheduling Framework)	
March	• The last two Saturdays in March will be 6 hour release days. • The following Sundays will each be 6 hours release days. In some years (2029 and 2035) the following Sunday is April 1.
April and May	• With the exception of when April 1 is a Sunday, all Saturdays and Sundays in April and May, through Memorial Day are 8 hour release days. • Memorial Day is an 8-hour release day. • Starting the Thursday after Memorial Day, weekday releases are 6 hour days.
June	• Releases are made every day of the week, except Tuesdays and Wednesdays*. • All Saturdays and Sundays between Memorial Day and Labor Day weekend, excluding Labor Day, are 10 hours release days. • Weekday releases are 6 hour days.
July	• Releases are made every day of the week, except Tuesdays and Wednesdays*. • All Saturdays and Sundays between Memorial Day and Labor Day weekend, excluding Labor Day, are 10 hours release days. • Mondays in July and August are 6 hour release days. • Beginning July 1, the first 6 Thursdays are 7 hour release days, and the following Fridays are 8 hour release days.
August	• Releases are made every day of the week, except Tuesdays and Wednesdays*. • All Saturdays and Sundays between Memorial Day and Labor Day weekend, excluding Labor Day, are 10 hours release days. • Mondays in July and August are 6 hour release days. • Beginning July 1, the first 6 Thursdays are 7 hour release days, and the following Fridays are 8 hour release days. The remaining Thursdays and Fridays in August through Labor Day are 6 hour release days.
September	• Releases are made every day of the week, except Tuesdays and Wednesdays*, through Labor Day. • All Saturdays and Sundays between Memorial Day and Labor Day weekend, excluding Labor Day, are 10 hours release days. • Labor Day is an eight hour release day. • After Labor Day, there are 3 Saturdays with 10 hour release days, and the Sundays of those same weekends are 8 hour release days. • Thursdays and Fridays before Labor Day are 6 hour release days. • The season ends with 5 weekends of 6 hour releases on both Saturday and Sunday. These 5 weekends will sometimes start the last weekend in September, depending on the number of Saturdays in September, and continue through the month of October
October	• The season ends with 5 weekends of 6 hour releases on both Saturday and Sunday. These 5 weekends will sometimes start the last weekend in September, depending on the number of Saturdays in September, and continue through the month of October. • Rafting concludes on the last Saturday of October.
November	• November 1 will be a 6 hour release day when it is a Sunday

* These 2 consecutive days of no recreation releases ensures that the wooden flume is wetted adequately each week to minimize leakage.

Releases from Ocoee No. 3 Dam for the Upper Ocoee

Below Ocoee #3, TVA currently provides 34 days of releases on most weekends through mid-May to mid-September. Under the Proposed Action, the same releases would occur through the 15-year term of the proposed agreement. From June until August, there are and would continue to be 12 Sundays with 5 hours of releases. Additionally, the Sunday before Memorial Day and the Sunday before Labor Day are and would continue to be eight hour release days. From May through September, there are and would be 10 Saturdays with eight-hour releases, typically in July and August, and 10 Saturdays with six hours of releases, typically distributed within May, June and September.

Appendix C – Evaluation of Economic Effects from Alternative Ocoee River Release Schedules

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Technical Appendix
Evaluation of Economic Effects from Alternative Ocoee River Release Schedules

Prepared for:

Tennessee Valley Authority

Prepared by:

Veritas Economic Consulting

November 2017

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1. Overview

The Ocoee River is one of the most popular rivers in the eastern United States for whitewater boating and rafting. Two sections of the river, commonly known as the Upper Ocoee and the Middle Ocoee, are used for whitewater recreation. Commercial outfitters provide rafting and other paddling services on the Upper and Middle sections of the Ocoee River. Up to 25 companies may be registered with the State to provide rafting services on the Ocoee River. Whitewater recreation on both river sections is dependent on the release of water from TVA dams into the river channel.

As part of NEPA activities TVA evaluated the economic implications of three different Ocoee River Dams release alternatives. These include Alternative A the “No Action” alternative in which flow reverts to only being used to produce electricity, Alternative B the “Proposed Action” where in channel flow typically used for hydroelectric generation is diverted for recreational water release days with a slight reduction in available release days (5 September weekdays less than current conditions) and rafting costs increase by approximately $5 per and Alternative C “Current” which is identical to Alternative B with additional water release days. The selected alternative will be included in an agreement that covers a 15 year period that is extendable to a total of 30 years. This evaluation considers the first 15 years however annual results are applicable for the 30 year period as well.

Trips to the Ocoee River may provide economic benefits rafters, those who provide rafting services and those who support the rafting industry directly or indirectly. The release of water from the Ocoee dams to support recreation means that less hydropower is generated. This leads to costs to TVA which occur as other forms of generation are used to offset unavailable lower cost hydropower. Also, the numerous river users mean some level of facility provision and maintenance is required. This is currently provided by the State, but would under some alternatives be borne by Ocoee River rafters and outfitters. Economic effects related to the rafting industry that the analysts conducting this evaluation determined to be potentially the most important are those that would affect power generation, the southeastern rafting market, and local business and residents.

The cost to provide replacement power was estimated by TVA using a production cost model known as Planning and Risk, a Ventyx tool. The model produces details about the projected usage of TVA’s generating resources to meet forecasted demand over any desired time horizon (hourly, daily, weekly, monthly, or yearly) in the future. The production cost model provides the marginal cost of power based on projected future supply and demand given current expectations

of future system conditions. Inputs to this model are alternative release schedules. Outputs are the average replacement cost of energy on a weekly basis.

Economic implications for the southeastern rafting market and local economies proximate to the Ocoee River were evaluated using linked simulation models. The rafting market approach begins with a travel cost based model of the demand for rafting in the southeast. The supply of Ocoee River rafting is developed based on costs and revenues of providing trips.

Inputs to the travel cost based model include changes to:

- *Cost* to outfitters to supply commercial rafting trips
- *Quality* of rafting at the Ocoee River and similar eastern U.S. rivers
- *Availability* of rafting at particular times.

Outputs of the model include changes in:

- *Consumer surplus,* which is an economic measure of the value that rafters derive from the rafting trips they take
- *Rafting trips* taken by type (single or multiple day)
- *Expenditures* by rafters taking single or multiple-day trips and expenditure type (e.g. restaurants, hotels).

Rafting use levels (including expenditures) under the Ocoee's existing conditions have economic impacts on local economies and employment. This evaluation uses input/output (I/O) analysis to estimate the economic impact of these use levels on local economies and employment.

The I/O models characterize changes in demand for one industry in terms of their effect on all industries within a local economic area. Inputs to the I/O model are the:

- *Direct expenditures,* which represent the initial, baseline expenditures across each industry.

The outputs of this analysis are direct baseline employment, indirect and induced expenditures, employment, and tax payments in the local economy, which are defined as Polk and Bradley County, Tennessee. These include:

- *Direct employment* that occur as the rafting and directly related industries experience a reduction in revenues that is equal to rafter reduction in expenditures
- *Indirect revenues and employment* as a result of inter-industry transactions as supplying industries adjust to demands from the directly affected industries

- *Induced revenues and employment* that reflect local spending that result from income changes in the directly and indirectly affected industry sectors.

Economic implications of rafting include economic benefits and economic impacts. Economic benefits accrue to rafters as consumer surplus, which is the amount rafters would be willing to pay above and beyond costs.[1] Economic benefits can't be observed directly but can be identified using travel cost modeling techniques. The economic benefits of rafting have been identified in several studies. Rosenberger (2016) compiled the Recreation Use Values Database (RUVD) for North America. The RUVD includes economic valuation studies estimating the consumer surplus (value above costs) use value of recreation activities (per person per day) in the U.S. and Canada from 1958 to 2015. Rosenberger adjusted the 3,192 estimates of diverse recreational activities in the RUVD to 2016 U.S. dollars. Rosenberger estimated a mean consumer surplus use value of $117.39 per single-day trip for non-motorized boating, including whitewater rafting.

English and Bowker (1996) estimated per trip consumer surplus for a zonal travel-cost model for outfitted rafting on the Chattooga River along Georgia's border with South Carolina. The authors collected data from a random sample of households who used commercial outfitter services on the Chattooga River. English and Bowker's estimates of consumer surplus use value per rafting trip ranged from $31.66 to $70.46 (2016 U.S. dollars).

English, Bowker, and Donovan (1996) studied per trip consumer surplus use value associated with guided whitewater rafting on the Chattooga River (Georgia and South Carolina) and the Nantahala River in rural western North Carolina. The authors estimated household recreation demand functions based on an individual travel-cost model. Their findings show average per trip consumer surplus estimates between $89 and $286 (1996 U.S. dollars). The estimates vary based on modeling assumptions regarding the opportunity cost of time and river quality.

Economic impacts are different from benefits in that they measure exchange rather than value. Economic impacts from rafting occur as rafters spend money in local economies. The most recent evaluation of the local economics of Ocoee River rafting was conducted by Dr. Steve Morse. This study was requested by the Ocoee River Outfitters Association with support from the America Outdoors Association (Morse 2013a, 2013b). Morse and other researchers from the University of Tennessee studied the 2012 economic impacts of visitor spending by Ocoee River rafters. Morse's team conducted visitor spending surveys at the Ocoee River from June 8 to

[1] For example, if a hypothetical rafter is willing to pay a total (including travel costs and fees) of $150 for a rafting trip but the actual cost of the trip is $75, the rafter received $75 in consumer surplus.

September 20, 2012. The researchers asked rafters how much they spent in the local area while rafting the Ocoee River. The survey data “represented the spending patterns of 3,118 rafters visiting the Ocoee River in 2012” (Morse 2013a, 2013b).

2. Methods

The alternatives being evaluated imply changes to Ocoee River rafting availability and costs. Existing information from economic studies including the Morse study, a recent edition of IMPLAN, and recent rafting counts were employed to develop an integrated local economic impact and supply and demand based representation of eastern U.S. rafting.

2.1 Model of Demand for Eastern Rafting

Demand for Ocoee River rafting is influenced by the population of potential rafters and the quality, cost, and location of other premiere rafting sites.[2] The Morse study effort included a survey of Ocoee River rafters that requested information about their rafting trip. As depicted in Figure 1, survey results indicate that Ocoee River rafters come from all over the United States but are primarily from the Eastern United States.

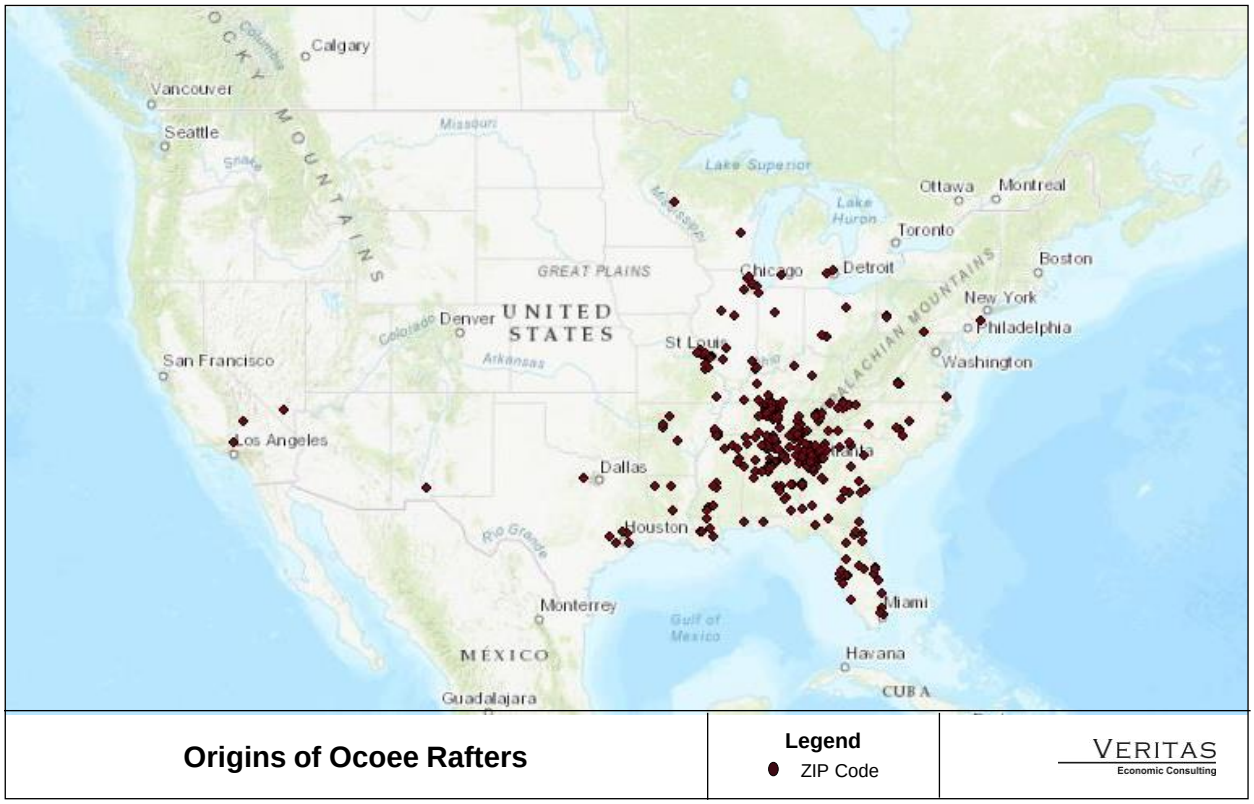

Figure 1: Origins of Ocoee River Rafters

Based on the widespread geography of rafter origins in the Morse study, potential Ocoee River rafters were specified as coming from the center of the 474 counties within 350 miles of the

[2] Rafting on the Ocoee River may also compete with theme parks, such as Six Flags Over Georgia. Although this is possible, it was not feasible to include "unlike" competitors in this evaluation.

Ocoee. To find the substitute rafting sites needed to develop the demand model, information from American Whitewater (2017a, 2017b), Eddlemon (2014a, 2014b), print and online media articles, the USFS (2017c, 2017d, 2017e, 2017f), web sites for Ocoee River outfitters, the National Park Service, National Geographic (2017), Riverfacts.com, Hawks Nest Hydroelectric Project (Hawks Nest Hydro, LLC 2015), and others were considered. These sources identified whitewater rafting sites in Tennessee, Alabama, Georgia, Kentucky, North Carolina, Virginia, and West Virginia. From the initial list of more than 100 alternate rafting sites, a group was selected as the most likely sites that Ocoee rafters would choose if whitewater rafting trips to the Ocoee were unavailable. These include other well-known rafting rivers such as the Gauley, Nolichucky, Chattooga, and Nantahala. Figure 2 depicts origin counties and alternative rafting sites specified in economic modeling.

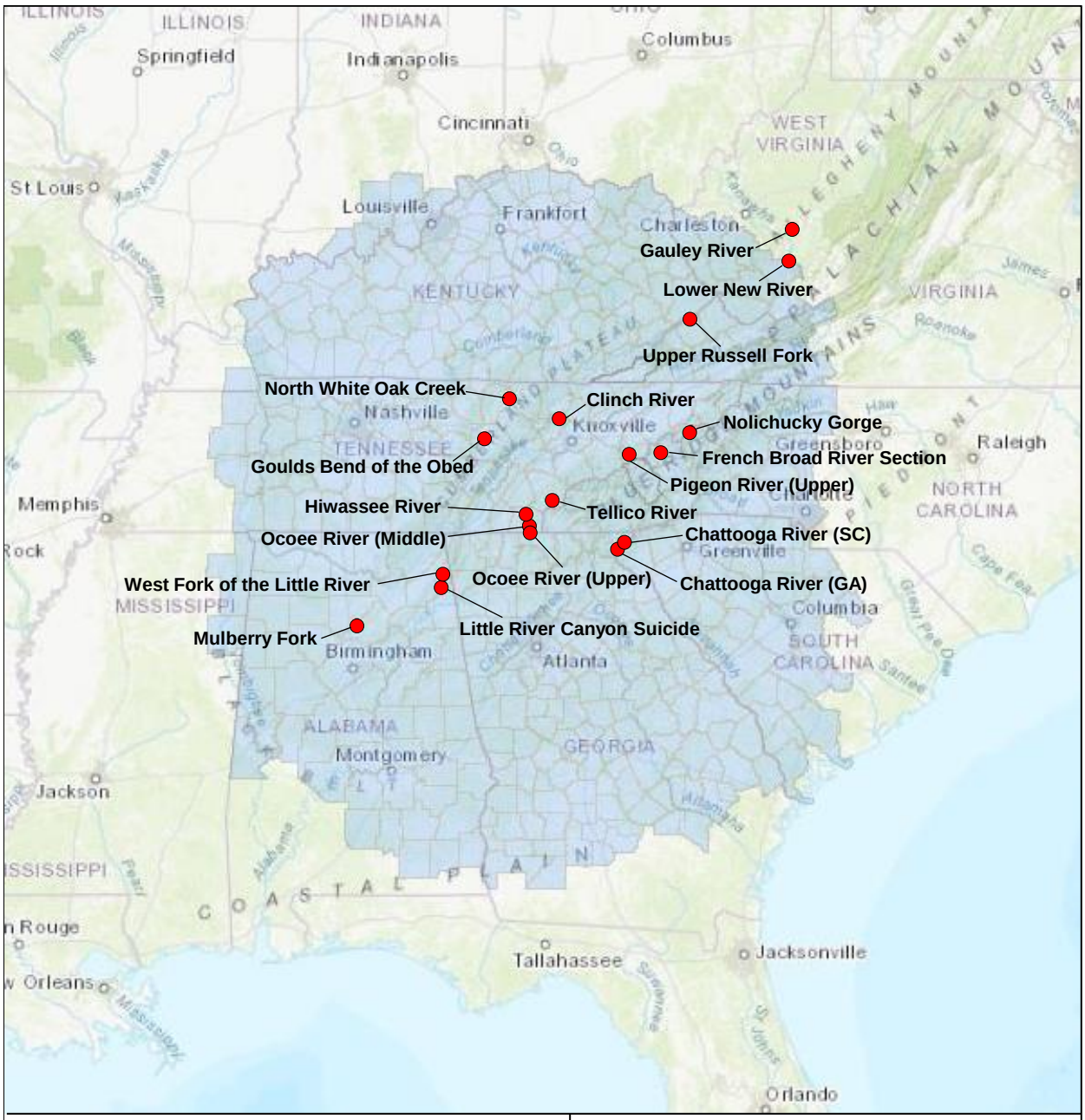

Figure 2: Origin Counties and Alternative Rafting Sites Specified in Economic Modeling

Distances and travel costs from the centers of these counties to the Ocoee River and other premiere eastern U.S. rafting destinations were calculated using truck routing software (PCMiler) and standard AAA per-mile travel costs. The quality of the Ocoee River and alternative premier rafting sites was specified using the site quality metrics of Hynes, Hanley, and Garvey (2007). Although a related econometric model was developed for whitewater opportunities in Ireland no similar studies of preferences in the U.S. are available. The relevant site quality metrics are whitewater quality, parking quality, crowding, water pollution, scenic quality and water level predictability.[3]

The alternate whitewater rafting sites identified were studied and assigned ratings in each category identified above (whitewater quality, parking, crowding, water pollution, scenic quality, and predictability of water level). Table 1 lists the sources of information used for rating each alternate whitewater site in these six categories.

Table 1
Sources of Information for Rating Whitewater Rafting Sites

Category	Source of Information
Whitewater quality	American Whitewater (2017a, 2017b), Eddlemon (2014a, 2014b), print and online media articles. Based on published information, the Ocoee River receives the highest rating on the scale (5) because of its whitewater class and people's enjoyment of Ocoee whitewater trips.
Parking quality	Published reports, aerial views from Google Earth.
Crowding	Published reports. A rating of "5" means that a site is not crowded with whitewater rafters.
Water quality	Published water quality reports from Tennessee Department of Environment & Conservation (TDEC) and other states' environmental agencies.
Scenic rating	Published reports, including Eddlemon (2014a, 2014b).
Predictability of water level	American Whitewater (2017a, 2017b), Eddlemon (2014a, 2014b), published reports (including gauge readings).

Table 2 includes the site quality information specified in the model.

[3] Rafters may consider additional factors including safety and run length. Factors that are omitted from this specification are effectively assumed to be constant across rafting sites.

Table 2
Site Quality Ratings

Site	Whitewater Quality	Parking Quality	Not Crowded	Water Quality	Scenic Rating	Reliability of Water Level
Ocoee River (Middle), TN	5	4	1	3	4	5
Gauley River, WV	5	3	1	4	5	5
Ocoee River (Upper), TN	5	2	1	3	4	5
Little River Canyon Suicide, AL	5	4	3	4	4	4
Nolichucky Gorge, TN	5	2	4	4	4	3
Lower New River, WV	4	2	3	4	5	5
Mulberry Fork, AL	4	2	3	3	3	5
French Broad River Section 9 to Hot Springs, NC	4	2	3	3	5	4
West Fork of the Little River, AL	4	3	4	5	4	3
Upper Russell Fork, VA	4	3	3	4	5	3
Pigeon River (Upper), TN	4	2	3	4	4	3
Chattooga River, GA	4	4	5	4	5	2
North White Oak Creek, TN	4	2	4	4	3	2
Hiwassee River, TN	3	2	3	5	4	4
Tellico River, TN	3	2	4	4	4	3
Chattooga River, SC and GA	3	1	5	4	5	2
Goulds Bend of the Obed, TN	3	3	4	4	4	2

This information (population, travel costs, site characteristics) was combined in a commercial rafting site-choice demand model that is used to characterize the "demand" for eastern U.S. rafting. This modeling structure is professionally accepted, useful for policy-simulation predictions, consistent with economic theory, and capable of identifying resource values.[4] The site choice model identifies the probability of selecting each rafting site based on the site characteristics of all relevant choices for rafters (e.g., distance from the rafters' home to each river and river quality). In the site choice framework, a rafter chooses a site by comparing characteristics across all sites. The mathematical structure is presented in Equation 1 below.

$$P_i(j) = \frac{\exp(V_{ij})}{\sum_{j=1}^{J} \exp(V_{ik})} \quad \textbf{(1)}$$

This equation represents the probability that on any particular recreation choice occasion, a recreator (identified by *i*) will choose to visit a particular site (identified by *j*). This likelihood,

[4] The statistical basis for choice theory is the standard conditional logit model.

identified by *Pi(j)*, is determined on the basis of both site characteristics and parameters representing the values recreators hold for those site characteristics. To estimate total trips for any given site *j*, *Pi(j)* is summed over all recreators' choice occasions.[5]

Changes in trips and resource values are evaluated by developing an equivalent structure with site characteristics modified to represent differences between alternatives. finding the difference in trips between this policy simulation model and the base case. Equation 2 presents the mathematics for an individual.

$$AnnualChoiceOccasions_i \left[\frac{\exp(V_{ij})}{\sum_{j=1}^{J} \exp(V_{ik})} - \frac{\exp(\overline{V}_{ij})}{\sum_{j=2}^{J} \exp(\overline{V}_{ik})} \right] \quad \textbf{(2)}$$

Aggregating over individuals identifies changes in trips for each alternative.

When distance is converted to travel cost, the site-choice framework supports the calculation of monetary changes in value associated with changes in site characteristics. Equation 3 presents the mathematical structure used to evaluate the change in annual value that a recreator attributes to the policy.

$$CV_i = \frac{AnnualTrips_i}{\varphi_i} \left[\ln\left(\sum_{j=1}^{J} e_{ij}^{V} \right) - \ln\left(\sum_{j=1}^{J} e_{ij}^{\overline{V}} \right) \right] \quad (3)$$

CV_i refers to the compensating variation or economic benefit rafter i has for the change.[6]

2.2 Supply of Ocoee River Commercial Rafting

Ocoee River rafting trips are "supplied" by companies that provide guided rafting trips on a per-person fee basis. The supply curve or "supply" for Ocoee River guided rafting trips represents the amount of trips each rafting company is willing and able to provide at a given price.

There is not a readily available source that includes the detailed cost information needed to compose the supply curve for Ocoee rafting. Evaluation of IMPLAN (an economic impact modeling platform) data indicates that approximately 91 percent of revenues in the rafting category for a particular zip code could be accounted for by Ocoee rafting companies. Costs for these companies include employee compensation (24 percent of the total revenue), facility

[5] In the simulation context, this is accomplished by multiplying the likelihood of selecting each site (equation 1) by the total number of trips.

[6] This information is useful for evaluating changes via a utilitarian perspective, such as benefit-cost analysis.

(6 percent of the total revenue) and others (20 percent of the total revenue) with the remainder going to a large number of small categories.

Supply conditions were characterized by developing a representation of per-trip costs with total average trip costs ranging from $45 to $55. Capacity is specified to be rafting trips provided by each company as indicated by the outfitter data. Average cost is specified to be lower for larger companies. This comes from lower average facility and labor costs. Ordering these from lowest cost to highest cost results in a market marginal cost curve—the "supply" of rafting.

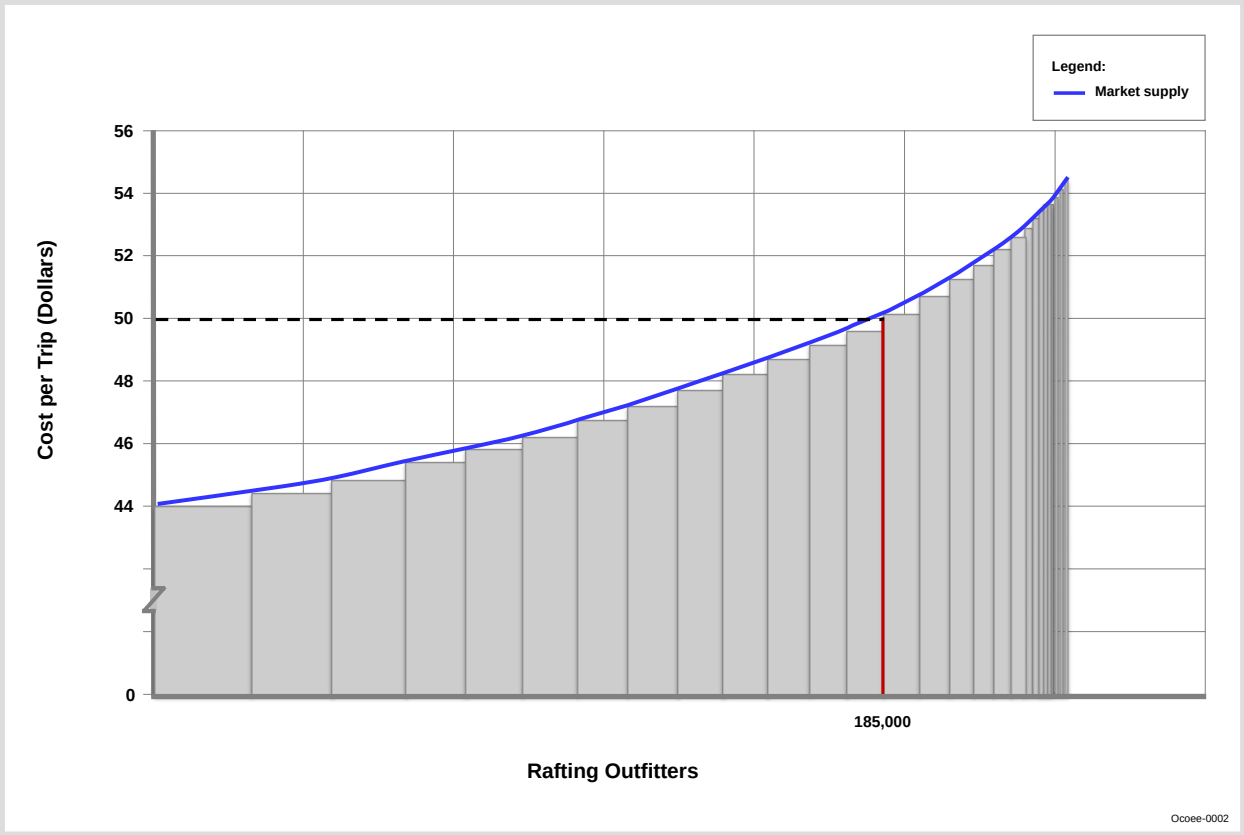

Figure 3: Supply of Rafting on the Ocoee River

To complete the characterization of the baseline rafting market the representation of supply is integrated with the demand model by specifying that the average price of rafting is $50. The market model is then calibrated to replicate the 184,518 guided rafting trips to the Ocoee River. This is consistent with guided rafting trips for the most recent year with available information (2016).

2.3 Tourism Effects

Rafting trips result in tourism expenditure. Expenditure and trip data on the Ocoee River from Morse (2013a) indicates that 59 percent of visits to the Ocoee River are day visits. The remaining 41-percent are overnight visits that stayed within 60 miles of the Ocoee River. Of the overnight visits, hotel stays accounts for 40 percent of overnight trips, while 30 percent of overnight trips stay in rented cabins or homes, 21 percent stay with friends or relatives, and 9 percent stay at campgrounds. When combined, day trips account for 59 percent of total annual trips, overnight trips spent with friends and family account for 8 percent of annual trips, overnight trips spent at a hotel are 17 percent of total annual trips, overnight trips spent at a rented cabin or house are 13 percent of total annual trips, and overnight trips spent at a campground are 4 percent of total annual trips to the Ocoee River.

Table 3 presents the breakdown of average spending by Ocoee River whitewater rafters in 2012 (Morse 2013a). Rafting trip and fees are the highest expenditures. This is because both day and overnight visitors spend money in these categories.

Table 3
Breakdown of Average Spending Per Person

Expenditure Category	Per Person Spending (2017 dollars)
Rafting trip and fees	$41.30
Lodging	$29.37
Food and beverage	$23.33
Transportation	$16.34
Retail, souvenirs, etc.	$9.95
Total	$120.29

Source: Morse (2013a)

For this analysis, these expenditure rates are further broken down by trip type and average per-day expenditures. Table 4 presents the expenditure breakdown by trip type. For example, day visitors spend about $90 per visitor. Because these visitors come from nearby, this $90 does not include lodging expenditures.

Overnight visitors spend between $118 and $219 per visit per person. Overnight visitors who stay with friends and family do not spend money on lodging. When these specifications are made, overnight visitors who stay with friends and family spend an average of $124.49. Overnight visitors who stay in hotels, rented cabins or houses, and at private or public campgrounds have lodging costs. Visitors who stay at hotels or motels spend about $219 per trip, followed by visitors

who stay in rented cabins or homes at approximately $197, and lastly, visitors who stay in private or public campgrounds, with an average spending per trip of approximately $118.

Day visitors and overnight visitors who stay with friends and relatives spend the most on costs associated with the rafting trip, followed by food and beverage, transportation, and souvenirs/retail. Overnight visitors who stay at hotels spend the most on the rafting trip relative to the other expenditure categories. Overnight visitors who stay in rented cabins or homes spend the most on lodging. Visitors who stay in private or public campgrounds spend the most on the rafting trip.

Table 4
Expenditures by Sector and Trip Type (2017 Dollars)

		Overnight Visitors			
Expenditure Category	**Day Visitors**	**Relatives or Friends**	**Hotel or Motel**	**Rented Cabin or House**	**Private or Public Campground**
Rafting trip and fees	$47.43	$57.06	$70.67	$63.80	$44.24
Lodging	—	—	$50.35	$68.52	$12.34
Food & beverage	$17.99	$29.07	$42.73	$31.07	$25.57
Transportation	$14.58	$27.75	$32.67	$20.63	$23.85
Retail, souvenirs, etc.	$9.73	$10.61	$22.35	$13.06	$11.62
Average spending per visitor	$89.73	$124.49	$218.77	$197.09	$117.61

Source: Morse (2013a)

Each expenditure category in Table 4 comprises a variety of sectors. Rafting trips and fees include recreation fees, parking fees, and outfitter fees (e.g., Ocoee River Outfitters). Lodging includes hotels, rental cabins and homes and private or public campgrounds. The food and beverage category includes full-service restaurants, limited-service restaurants, and all other food and drinking places (e.g., mobile food concession stands). Transportation includes expenditures at gas stations and car rentals. Souvenir/retail expenditures are spent at souvenir shops, health and personal care stores (e.g., pharmacies) and general merchandise stores (e.g., Walmart).

Per-trip expenditures by category from Table 4 were used to identify per-trip direct, indirect and induced economic impacts under the baseline condition. Table 5 presents the economic impacts associated with baseline conditions based on expenditures from the 2012 Morse study, trips and inter-market relationships in IMPLAN from 2016. Total Industrial Output refers to the dollar value of goods and services produced. Value-added impacts are employee compensation, proprietor and property type income, and tax on production and imports. Indirect Business Tax

includes excise taxes, property and sales tax paid by businesses, fees, fines, licenses, and permits. Labor Income is the sum of employee compensation and proprietor income.

Table 5
Baseline Annual Economic Impacts from Commercial Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total industrial output	$18,413,162	$3,578,289	$4,056,327	$26,047,778
Total value added	$9,777,943	$1,762,641	$2,402,532	$13,943,116
Indirect business tax	$1,946,492	$148,233	$250,578	$2,345,303
Labor income	$5,830,918	$1,163,662	$1,565,430	$8,533,010
Employment	320.4	32.0	32.5	384.9

The estimated level of direct expenditures by rafters in baseline conditions is approximately $22.67 million. Retail expenditures are specified to be gross retail sales (i.e., purchaser prices) as opposed to gross retail margin (i.e., producer prices). IMPLAN applies the appropriate margin to the gross retail sales; therefore, the output results only reflect the margined value. All non-transportation expenditures are modeled to occur in the local market which is specified to be the counties which border the Upper and Middle Ocoee (Polk and Bradley) counties. Only half of the transportation expenditures are specified for these counties to account for origin or in route gas purchases. After these adjustments are made, the estimated level of direct expenditures in baseline conditions is approximately $18.41 million. This expenditure level is responsible for about $9.78 million in value-added economic effects of which $1.95 million are indirect business taxes and 320 employees making $5.83 million in labor income in Polk and Bradley Counties. The total federal, state, and local indirect business taxes do not include personal income tax or social security taxes.

The indirect output (i.e., amount of inter-industry transactions from supplying industries) is $3.58 million. This output is associated with 32 jobs receiving a total of $1.16 million in labor income. The induced effects (i.e., amount of local spending that result from income in the directly and indirectly affected industry sectors) are estimated to be $4.06 million in industrial output. This output is associated with almost 33 jobs, receiving a total of $1.57 million in labor income. In total, under the baseline conditions the expenditures by rafters of the Ocoee River results is close to $26.05 million in industrial output, $13.94 million in value-added impacts, $2.35 million in indirect business taxes, and almost 385 jobs receiving a total of $8.53 million in labor income.

3. Evaluation of Alternatives

Three potential actions for Ocoee flow were evaluated. These include Alternative A the "No Action" alternative in which flow reverts to only being used to produce electricity, Alternative B the "Proposed Action" in which there is a slight reduction in available flow (5 September weekdays less than current conditions) and rafting costs increase by approximately $5 per and Alternative C "Current" which is identical to Alternative B with additional water release days.

The most economically important features of the alternatives are the changes in the availability/reliability of Ocoee River flow and changes in the direct cost of Ocoee River rafting. Changes to availability and reliability of rafting occur as planned releases are eliminated under Alternative A or curtailed under Alternative B. Changes to the direct cost of Ocoee River rafting occur for both Alternatives B and C as per-rafter fees increase by approximately $5 to account for facility maintenance costs that were previously provided by the State.

These effects are evaluated by first adjusting the rafting supply and demand conditions to reflect the proposed changes in water release schedules and cost. Changes in availability and reliability are identified by developing models that are calibrated to produce the trip numbers associated with the changes. Implications for consumer surplus are developed as output from the model. Changes in cost are evaluated by changing the cost structure of rafting outfitters and observing the model-produced changes in trip numbers and consumer surplus.

Implications for expenditures are derived based on the number and type (overnight or not) of rafting trips for each alternative. Expenditures by sector for each alternative are an input to the local economic impact model. These direct expenditures are used to identify the total local economic impact (direct, indirect, induced) effect on expenditures and employment.

3.1 Alternative A – No Action

3.1.1 Rafting-Related Economic Impacts

Under the No Action Alternative there is no agreement on water releases for recreation purposes. TVA would operate the Ocoee dams as it does its other assets – as part of an overall system to manage water for flood control, hydroelectric power generation, recreation, water supply, water quality, aquatic habitat, and other uses. Without predictable flow, all self-guided and commercially guided rafting on previous release days is expected to be unsustainable.

Based on 2016 rafter counts this would result in the loss of approximately 200,000 annual rafting trips: 181,438 commercially-guided trips and 18,598 recreational trips. The economic model used for this analysis estimates that the present value of the losses in economic benefits

(consumer surplus) associated with these lost rafting trips over a 15-year time period is approximately $289 million ($19.3 million in annual losses).

This is the lost value to those 200,000 recreators who would have preferred to take rafting trips on the Ocoee River, but the river would no longer support rafting. Consequently they either have to go to another location that is either farther away, is of lower quality than the Ocoee, or both. The economic value measure reflects how much more they would prefer to take their trips to the Ocoee River than to the other farther away and/or lower quality rafting sites.

Private rafting and kayaking would still exist under this alternative when conditions are favorable during periods of rain/high flow that would produce excess non-turbine flow. Private rafting and kayaking is expected to be driven by local opportunistic recreators. This is not expected to result in a trip differential related to experience or desirability. Accordingly, there is no change to these rafters' well-being or expenditures.

In addition to losses in economic value resulting from lost trips under the No Action Alternative, there would also be economic impacts resulting from the lost trips. The analysis uses IMPLAN to assess the economic impacts resulting from the lost trips. To use the IMPLAN model, per-trip expenditures by category from Table 4 were used to identify per-trip indirect and induced economic impacts. Table 6 presents the economic impacts associated with implementation of Alternative A. Under Alternative A, all economic impacts associated with baseline conditions are lost because managed water releases for recreation purposes would be eliminated.

Table 6
Alternative A – Estimated Annual Economic Losses from Whitewater Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total Industrial Output	$18,413,162	$3,578,289	$4,056,327	$26,047,778
Total Value Added	$9,777,943	$1,762,641	$2,402,532	$13,943,116
Indirect Business Tax	$1,946,492	$148,233	$250,578	$2,345,303
Labor Income	$5,830,918	$1,163,662	$1,565,430	$8,533,010
Employment	320.4	32.0	32.5	384.9

3.1.2 Cost of Power

Under the No Action Alternative water previously released in support of rafting would be made available as needed by TVA to generate electricity at the No. 2 and No. 3 Powerhouses. As such, the higher cost of generation of replacement power under the baseline condition would not be passed on to TVA rate payers under the No Action Alternative.

3.2 Alternative B – Proposed Action

3.2.1 Rafting-Related Economic Impacts

Under the proposed action, TVA would operate the dams similarly to current operations but with a slight reduction in release days. The current facility maintenance fee of $0.50 per rafter charged to commercial rafting operations would be increased. The new fee is expected to be about 10 percent of current per-rafter revenue of $45 to $55 per-trip and would be used to support the State's operation, maintenance and administrative costs which are estimated to be $450,000 in 2019.

This increase in maintenance fees shifts some ongoing cost from taxpayers to some mixture of operators and customers. To evaluate the implications of the rafting cost increase the supply demand framework described above was applied. Because the cost increase would apply evenly to all rafting companies, a per-trip price increase equivalent to the cost increase was added to the supply curve (described above). The resulting simulation indicates that adding $5 per trip to the overall costs experienced by rafters results in an annual reduction of 8,050 trips, which represents a 4.4 percent reduction in trips annually. In addition, the five days in September where rafting is eliminated accounts for approximately 400 trips, for a total impact of a loss of 8,445 trips (4.7percent of total trips).

The present value of the loss in economic benefits (commercial surplus) to recreators associated with 8,445 lost trips over a 15-year time period is approximately $12.2 million (approximately $813,000 in annual losses). These are losses to recreators who would have preferred to take rafting trips to the Ocoee River, but the increased costs of Ocoee River trips or the lack of availability during those five days has them either going to another location that is of lower quality or not rafting at all. The economic value measure reflects how much more they would prefer to take their trips to the Ocoee River than to other lower quality rafting sites or to not raft at all.

In addition to losses in economic value to recreators resulting from lost trips under Alternative B, there would also be impacts to the economy resulting from the lost trips. The analysis uses IMPLAN to assess the economic impacts resulting from the lost trips. To use the IMPLAN model, per-trip expenditures by category from Table 4 were used to identify per-trip indirect and induced economic impacts.

Table 7 presents the economic impacts associated with implementation of Alternative B.

Table 7
Estimated Annual Economic Losses from Whitewater Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total Industrial Output	$857,055	$166,554	$188,805	$1,212,414
Total Value Added	$455,122	$82,043	$111,828	$648,993
Indirect Business Tax	$90,601	$6,900	$11,663	$109,164
Labor Income	$270,148	$54,164	$72,864	$397,176
Employment	14.9	1.5	1.5	17.9

The estimated level of direct expenditures by the 8,445 rafters in Alternative B is approximately $1.06 million. After adjustments are made to retail and transportation expenditures, the estimated level of direct expenditures that will be lost under Alternative B is approximately $857,000. This expenditure level is responsible for about $455,000 in value-added impacts of which $91,000 are indirect business taxes and 15 employees making $270,000 in labor income in Polk and Bradley counties. The total federal, state, and local indirect business taxes do not include personal income tax or social security taxes.

The indirect losses (i.e., changes in inter-industry transactions as supplying industries respond to decreased demand from the directly affected industries) is $167,000 in output. This output is associated with approximately two jobs receiving a total of $54,000 in labor income. The induced losses (i.e., changes in local spending that result from income changes in the directly and indirectly affected industry sectors) are estimated to be $189,000 in industrial output. This output is associated with approximately two jobs, receiving a total of $73,000 in labor income. In total, the expenditures by rafters of the Ocoee River results in close to $1.21 million in lost industrial output, $649,000 in lost value-added impacts, $109,000 in lost indirect business taxes, and almost 18 lost jobs receiving a total of $397,000 in labor income.

3.2.2 Cost of Power

In conjunction with Alternative B, TVA would continue to release water from Ocoee No. 3 and No. 2 dams to support commercial rafting. Consequently, TVA would reduce the amount of hydropower generation and would have to shift loads to other generation facilities at a higher production cost. However, in accordance with renewed agreements for water supply TVA would be compensated for the differential cost of power. As such, TVA consumers would not bear the marginal cost associated with reduced hydropower generation under this alternative.

3.3 Alternative C – Current Management Regime

3.3.1 Rafting-Related Economic Impacts

Under this alternative, TVA would continue to release water from Ocoee No. 3 and No. 2 dams to support commercial rafting similar to the baseline condition. However, the existing fee of $0.50 per rafter charged to commercial rafting operations would be increased as described under Alternative B.

As described under Alternative B, this increase from existing costs would fall on some mixture of operators and customers and result in an annual reduction of 8,050 trips, which represents a 4.4 percent reduction in trips annually. There would be no change in the current release schedule and therefore no additional loss in rafting trips.

The present value of the loss in economic benefit (commercial surplus) to recreators associated with these lost rafting trips over a 15-year time period is approximately $11.6 million (approximately $775,000 in annual losses).

Table 8 presents the impacts to the economy associated with Alternative C.

Table 8
Alternative C – Estimated Annual Economic Losses from Whitewater Rafters on the Ocoee (2017 Dollars)

Economic Indicator	Direct	Indirect	Induced	Total
Total Industrial Output	$818,944	$159,148	$180,409	$1,158,501
Total Value Added	$434,884	$78,395	$106,855	$620,134
Indirect Business Tax	$86,572	$6,593	$11,145	$104,310
Labor Income	$258,135	$51,755	$69,624	$379,514
Employment	14.2	1.4	1.4	17.0

The estimated level of direct expenditures by the 8,050 rafters in Alternative C is approximately $1.01 million. After adjustments are made to retail and transportation expenditures, the estimated level of direct expenditures that will be lost under Alternative C is approximately $819,000. This expenditure level is responsible for about $435,000 in value-added impacts of which $87,000 are indirect business taxes and 14 employees making $258,000 in labor income in Polk and Bradley Counties. The total federal, state, and local indirect business taxes do not include personal income tax or social security taxes.

The indirect losses (i.e., changes in inter-industry transactions as supplying industries respond to increased demands from the directly affected industries) is $159,000 in output. This output is associated with over one job receiving a total of $52,000 in labor income. The induced

losses (i.e., changes in local spending that result from income changes in the directly and indirectly affected industry sectors) are estimated to be $180,000 in industrial output. This output is associated with over one job, receiving a total of $70,000 in labor income. In total, the expenditures by rafters of the Ocoee River results in close to $1.16 million in lost industrial output, $620,000 in lost value-added impacts, $104,000 in lost indirect business taxes, and almost 17 lost jobs receiving a total of $380,000 in labor income.

3.3.2 Cost of Power

In conjunction with Alternative C, TVA would continue to release water from Ocoee No. 3 and No. 2 dams to support commercial rafting. Consequently, TVA would reduce the amount of hydropower generation and would have to shift loads to other generation facilities at a higher production cost. In accordance with renewed agreements for water supply TVA would be compensated for the differential cost of power for all recreational days extending through August. However, no compensation would be provided for the five additional release days scheduled in September. As such, TVA consumers would not bear the marginal associated with reduced hydropower generation under this alternative for most of the recreational season, but would bear the fractional cost associated with the loss of hydropower generation in September.

4. Summary of Economic Effects

Recreational rafting on the Ocoee River has an impact on the local economy, individual rafters and TVA consumers. Economic impacts from rafting occur as rafters spend money in local economies. Rafters receive benefits when the amount they are willing to pay for commercial rafting on the Ocoee River exceeds actual cost (commercial surplus) and the costs incurred by TVA to provide replacement power on recreational release days are absorbed by TVA consumers.

Total impacts to the economy (annual losses), impacts to the recreator and impacts to the TVA rate payer are summarized in Table 9 for each of the proposed alternatives.

Table 9
Summary of Environmental Consequences

	Alternative A	Alternative B	Alternative C
Lost Rafting Trips	200,000	8,445	8,050
Total Annual Losses			
Total Industrial Output	$26,047,778	$1,212,414	$1,158,501
Total Value Added	$13,943,116	$648,993	$620,134
Indirect Business Tax	$2,345,303	$109,164	$104,310
Labor Income	$8,533,010	$397,176	$379,514
Employment	384.9	17.9	17.0
Impact to Recreator			
Total Loss of Economic Benefit (15 years)	$289 million	$12.2 million	$11.6 million
Annual Loss of Economic Benefit	$19.3 million	$813,000	$775,000
Impact to TVA Consumer			
Cost of Replacement Power	No cost	No cost	Cost associated with five release days in September

Under Alternative A, the loss of approximately 200,000 rafting trips would result in approximately $26.05 million in lost expenditures in the local economy. This would result in a $13.94 million in lost value-added impacts, $2.35 million in lost indirect business taxes, and almost 385 lost jobs receiving a total of $8.53 million in labor income. In addition the losses in economic benefits to rafters (consumer surplus) associated with these lost rafting trips over a 15-year time period is approximately $289 million ($19.3 million in annual losses). The estimated impact to the local economy and to rafters would be significant.

However, there would be a minor beneficial impact under the No Action Alternative as the cost of generation of replacement power under the baseline condition would not be passed on to TVA rate payers.

The estimated level of expenditures in the local economy that would be lost due to the loss of 8,445 rafting trips (4.7 percent of total trips) as a result of the fee increase and loss of five recreational release days in September under Alternative B is approximately $1.2 million. This expenditure level is responsible for about $650,000 in value-added impacts of which $109,000 are indirect business taxes and 18 employees making $397,000 in labor income. The impact to individual rafters over a 15-year time period is approximately $12.2 million (approximately $813,000 in annual losses). This would be a minor impact relative to the No Action Alternative, (Alternative A).

Under Alternative B, TVA would be compensated for the cost of replacement power which would have a beneficial impact on TVA consumers.

The estimated level of expenditures in the local economy that would be lost due to the loss of 8,050 rafting trips (4.4 percent of total trips) as a result of the fee increase under Alternative C is approximately $1.1 million. This expenditure level is responsible for about $620,000 in value-added impacts of which $104,000 are indirect business taxes and 17 employees making $379,000 in labor income. The impact to individual rafters over a 15-year time period is approximately $11.6 million (approximately $775,000 in annual losses). This would be a minor impact relative to the No Action Alternative, although incrementally less than Alternative B.

Under Alternative C, TVA would be compensated for the differential cost of power for all recreational days extending through August. However, no compensation would be provided for the five additional release days scheduled in September. As such, TVA consumers would bear the fractional cost associated with the loss of hydropower generation during this period. Therefore there would be minor impact to TVA consumers relative to Alternatives A and B.

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Appendix D – Coordination

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee ES Office
446 Neal Street
Cookeville, Tennessee 38501

November 1, 2017

John T. Baxter, Jr.
Manager
Endangered Species Act Compliance
Tennessee Valley Authority
400 W Summit Hill Dr.
Knoxville, Tennessee 37902

Subject: FWS# 2018-I-0056 & 2018-CPA-0064. Tennessee Valley Authority – Ocoee River 2018 Whitewater Rafting Agreements in Polk County, Tennessee.

Dear Mr. Baxter:

Thank you for your correspondence dated October 25, 2017, regarding the Tennessee Valley Authority's (TVA) proposal to amend the current agreements that govern recreational whitewater releases from Ocoee No. 2 Dam (Middle Ocoee) and Ocoee No. 3 Dam (Upper Ocoee), which expire in 2018. The proposed amendment would eliminate releases currently occurring on five weekdays in late September from the Middle Ocoee. No changes are proposed for the Upper Ocoee. The agreement would authorize the amended operation schedule for a term of 15 years. In addition to the amended release schedule, TVA would grant a 30-year easement on three (3) parcels of land (approximately 27.2 acres) to the state of Tennessee. The area is currently developed for recreational purposes. There is no anticipation of construction associated with this land transaction. U.S. Fish and Wildlife Service (Service) personnel have reviewed the submitted information, and we offer the following comments.

TVA has identified the snail darter (*Percina tanasi*), gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), Ruth's golden aster (*Pityopsis ruthii*), and white fringeless orchid (*Platanthera integrilabia*) as federally threatened or endangered species that could occur within the action area, using the Service's IPaC database. TVA has determined that the proposed action may affect, but is not likely to adversely affect Ruth's golden aster. Based upon the provided information, the Service concurs with this determination. Furthermore, TVA has determined that the proposed action would have no effect on the snail darter, gray bat, Indiana bat, northern long-eared bat, and white fringeless orchid. The Service acknowledges and agrees with this determination. We note, however, that collection records available to the Service may not be all-inclusive. Our database is a compilation of collection records made available by various individuals and resource agencies. This information is seldom based on comprehensive surveys of all potential habitat and thus does not

necessarily provide conclusive evidence that protected species are present or absent at a specific locality. Obligations under section 7 of the Act must be reconsidered if (1) new information reveals impacts of the action that may affect listed species or critical habitat in a manner not previously considered, (2) the action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated that might be affected by the action.

Thank you for the opportunity to comment on this proposed action. If you have any questions regarding the information which we have provided, please contact Dustin Boles of my staff at 931/525-4984, or by email at *dustin_boles@fws.gov.*

Sincerely,

Mary E. Jennings

Mary E. Jennings
Field Supervisor