Document Type: EA-Administrative Record
Index Field: Draft EA
Project Name: Nolichucky Gate Project
Project Number: 2018-03

NOLICHUCKY DAM GATE ENVIRONMENTAL ASSESSMENT

Greene County, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
Knoxville, Tennessee

July 2018

To request further information, contact:
W. Douglas White
NEPA Compliance
Tennessee Valley Authority
400 W. Summit Hill Drive
Knoxville, Tennessee
Phone: 865-632-2252
E-mail: wdwhite0@tva.gov

This page intentionally left blank

Table of Contents

List of Tables

List of Figures

Symbols, Acronyms, and Abbreviations

ACS	American Community Survey
APE	Area of Potential Effect(s)
ARAP	Aquatic Resource Alteration Permit
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CO	Carbon Monoxide
CRA	Cultural Resource Analysts, Inc.
CWA	Clean Water Act
dB	Decibel
dBA	A-Scale Weighting Decibels
EA	Environmental Assessment
EJ	Environmental Justice
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ETSZ	East Tennessee Seismic Zone
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
HUC	Hydrologic Unit Code
HUD	U.S. Department of Housing and Urban Development
IBI	Index of Biotic Integrity
Ldn	Day-Night Sound Level
mg/L	Milligrams per Liter
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
NRM	Nolichucky River Mile
NWI	National Wetland Inventory
OSHA	Occupational Safety and Health Act
Pb	Lead
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter with Particle Sizes Less Than or Equal to 2.5 Micrometers
PM_{10}	Particulate Matter with Particle Sizes Less Than or Equal to 10 Micrometers
RLMP	Reservoir Land Management Plan
SHPO	State Historic Preservation Officer
SO_2	Sulfur Dioxide
SWPPP	Stormwater Pollution Prevention Plan
TCLP	Toxicity Characteristic Leachate Procedure
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resource Agency
USACE	U.S. Army Corps of Engineers

USCB	U.S. Census Bureau
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WLA	Waste Load Allocations
WMA	Wildlife Management Area
WWC	Wet Weather Conveyance
yd^3	Cubic Yard(s)

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

Nolichucky Dam is located at Nolichucky River Mile (NRM) 46, just east of Highway 107/70 (Asheville Hwy) and about 7.5 miles south of Greeneville, in Greene County, Tennessee (Figure 1-1). The Nolichucky Reservoir, also known as Davy Crockett Lake, extends about 6 miles upstream from the dam. The Nolichucky Dam is a decommissioned hydroelectric facility owned and maintained by Tennessee Valley Authority (TVA). The dam was originally constructed in 1913 as a hydropower facility by the Tennessee Eastern Electric Company to provide power to the surrounding areas. TVA acquired the facility in 1945.

Nolichucky Dam is a concrete, gravity overflow structure containing two primary water barrier structures – the non-overflow section and the spillway section. The non-overflow section is approximately 122 feet long and 94 feet high. Originally, the non-overflow section included four intake structures for the powerhouse. The spillway is 360 feet long and is comprised of a larger ungated section and a smaller “nonfunctioning” bulkhead gate (described below). Current spillway flow is unregulated and acts as a run-of-the river project. The powerhouse is located on the right descending bank of the river just downstream from the intake structures in the dam. The powerhouse was decommissioned in 1972.

In 1972, a 25-foot-wide by 10-foot-high vertical lift gate was constructed in the overflow spillway adjacent to the intake structure to permit limited drawdowns of the reservoir. In 1995, the gate opening was sealed with a reinforced concrete bulkhead upstream of the gate. Electrical power and the gate motor were removed at that time. In the current condition, there is no active means of controlling the Nolichucky Reservoir water level.

TVA is considering alternatives to replace the spillway gate to support management of reservoir levels and perform dam safety inspections or investigations within the spillway portion of the dam.

1.2 Purpose and Need

The purpose of this project is to design and construct a means to temporarily remove water from the downstream face of the dam to allow the downstream face and toe of the spillway portion of the dam to be observed and inspected. TVA needs to be able to manage the reservoir levels to perform dam safety inspections or investigations within the spillway portion of the dam to support the operation and maintenance of the TVA Reservoir System.

1.3 Decision to be Made

This environmental assessment (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 to replace the spillway gate so that reservoir levels can be lowered to allow for safe inspection and continued maintenance of the dam and spillway.

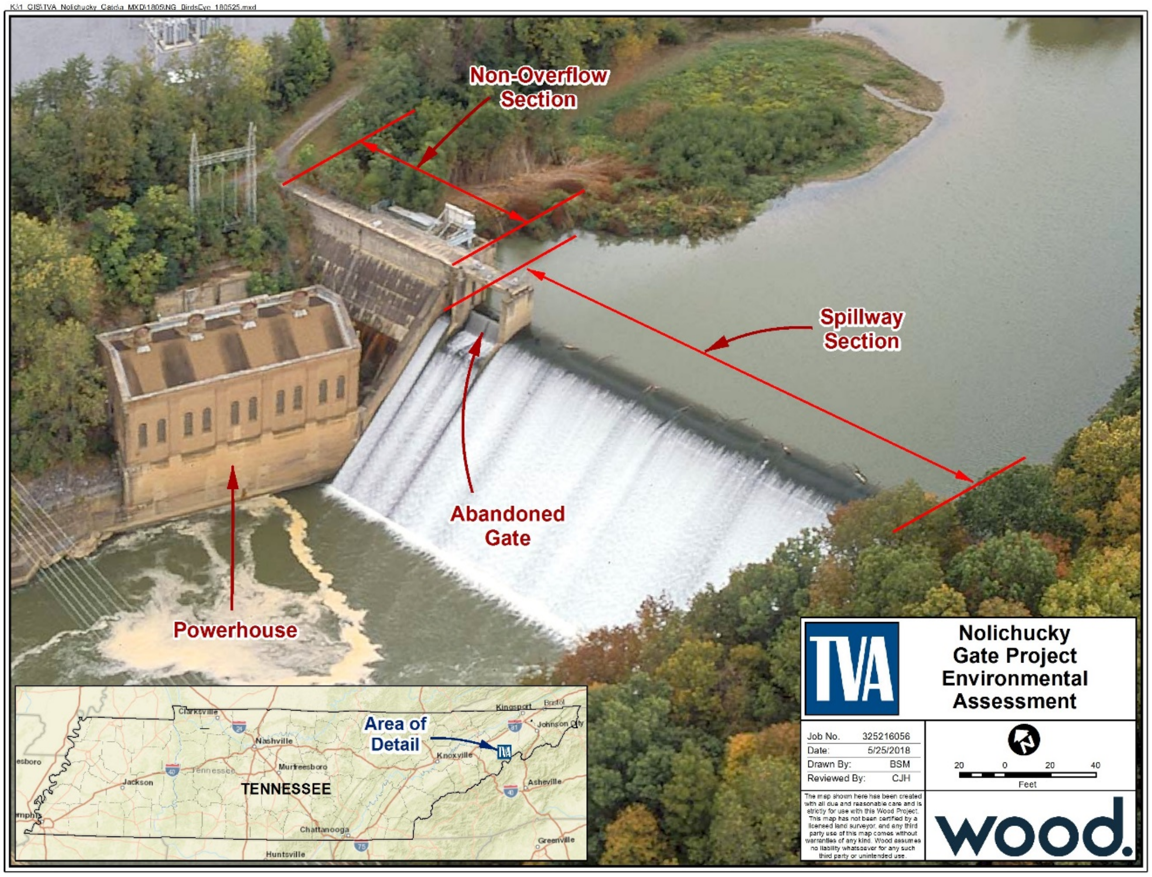


Figure 1-1. Nolichucky Dam Aerial View

1.4 Related Environmental Reviews

Several environmental reviews have been prepared for actions related to the operation of the Nolichucky Reservoir. The contents of these documents, which are described below, help describe the Nolichucky project area and are incorporated by reference.

Nolichucky Reservoir Flood Remediation Project, Final Environmental Impact Statement (TVA 2006). The Environmental Impact Statement (EIS) was prepared to identify and evaluate a range of alternative ways to address flooding effects of Nolichucky Dam and the accumulated sediment in Nolichucky Reservoir on land and property not owned by the federal government. In 1998, TVA began reviewing the areas around Nolichucky Reservoir that would be affected during flood events. Silt and sediment accumulations in the reservoir had raised the 100-year flood level by as much as 10 feet above historic levels in 1945. The EIS evaluated four alternatives including No Action, Acquire Landrights, Lower Nolichucky Dam, and Remove Nolichucky Dam. The No Action Alternative was ultimately selected as the preferred alternative. Under this alternative, TVA would provide information to agencies and individuals regarding flood risk and retain fee ownership of 1,400 acres of land and 370 acres of flowage easement around the reservoir. This alternative allowed TVA to maintain the reservoir's recreational uses including continuing existing agreements with the

Tennessee Wildlife Resources Agency and other agencies that provide for wildlife management, environmental education, and public parks.

Douglas-Nolichucky Reservoirs Land Management Plan and Environmental Impact Statement, Volume III, Nolichucky Reservoir (TVA 2010). This document is a study of the TVA-managed public land surrounding the Nolichucky Reservoir. It is one of two reservoir land management plans (RLMPs) associated with an EIS for the Douglas-Nolichucky tributary reservoirs. The RLMP was prepared to guide resource management and administration decisions on approximately 1,136 acres around the Nolichucky Reservoir, which are publicly owned and managed by TVA. It identifies the most suitable uses for 39 parcels of TVA public land, providing areas for project operations, sensitive resource management, natural resource conservation, industrial/commercial development, recreation, and shoreline access.

The description of the affected environment and the assessment of impacts contained in the documents listed above were used in support of this analysis, and are incorporated, as appropriate, into analyses for each environmental resource in Chapter 3.

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

This EA evaluates the potential environmental impacts of replacement of the spillway gate at the Nolichucky Dam. Two possible designs for the replacement of the spillway gate are being considered. One option would be to replace the gate with a system that is similar to what was in place when the gate was operational. A second option would be to replace the gate with two sluice gates. Because environmental impacts are expected to be similar regardless of which gate design is chosen, both designs are analyzed concurrently.

Over time sediment has built up on the upstream side of the dam, and as part of the proposed action, TVA is evaluating options to manage the sediment during replacement and operation of the gate. Options being evaluated include:

- Leaving built-up sediment on the upstream side of the dam in place allowing for some lost sediment during gate removal;
- Dredging and removal of built up sediment on the upstream side of the dam to be placed on-site; or
- Placement of small stone and riprap upstream of the dam in the reservoir and on shoreline to stabilize the sediment during gate construction and operation.

If needed, TVA would also construct a temporary access road to allow access to the upstream area of the dam. 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.

- Cultural and Historic Resources
- Geology and Soils
- Groundwater
- Surface Water
- Floodplains
- Vegetation
- Solid and Hazardous Waste
- Wildlife
- Aquatic Ecology
- Threatened and Endangered Species
- Wetlands
- Visual Resources
- Air Quality and Climate Change
- Natural Areas, Parks, and Recreation
- Environmental Justice
- Noise
- Public Health and Safety

TVA also considered potential effects related to socioeconomics, land use, prime farmland, and transportation. As described below, these resources were considered but eliminated from detailed consideration:

- *Socioeconomics*: Given the scope of the proposed actions, there would be no discernable impact to demographic and community characteristics as the surrounding workforce and regional economy are not expected to change as a result of the proposed action.
- *Land Use:* Removal and replacement of the spillway gate would not result in the conversion of any land uses as these actions are proposed on the existing dam structure. Under Alternative B1, dredge material would be removed and placed onsite on undeveloped land owned by TVA that is currently not accessible to the public and which supports an electric substation. Access roads already exist onsite; however, short-term impacts to land use from the construction of a temporary access road to the dam structure would be minor because this area would be restored to its previous state upon completion of construction activities. Placement of dredge material under Alternative B1 would involve clearing and grubbing of approximately 1.7 acres of land on the project site to be used for placement of dredge material. Sediment material would remain onsite where it would be graded, blended into existing contours, and stabilized in place and these areas would revert back to the original use.
- *Prime Farmland*: The 1981 Farmland Protection Policy Act (7 Code of Federal Regulations [CFR] Part 658) requires all federal agencies to evaluate impacts to prime and unique farmland prior to permanently converting to land use incompatible with agriculture. The proposed actions associated with placement of dredge material would not occur in areas having soils with prime farmland characteristics. Per the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). Approximately 0.2 acre located at the entrance to the project area that would be used as parking and laydown are mapped as prime farmland soils. However, this area is previously disturbed and therefore, the soils are not expected to exhibit prime farmland soil characteristics.

- *Transportation*: Traffic generated by the replacement of the Nolichucky Dam gate would consist of the construction workforce and shipments of materials and equipment. Construction activities are estimated to last 75 days (less than 4 months), and the expected workforce could be up 25 workers. It is assumed that these motorists would disperse throughout the transportation network and use interstate highways or major arterial roadways as much as possible. Therefore, given that the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and short-term, the impact to transportation would be negligible.

TVA's action would satisfy the requirements of Executive Order (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 (NHPA), Endangered Species Act (ESA), and Clean Water Act (CWA).

1.6 Public and Agency Involvement

TVA's public and agency involvement includes a public notice and a 30-day public review of the Draft EA. The availability of the Draft EA was announced in newspapers that serve the Greene 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 5 provides a list of agencies, tribes, and organizations notified of the availability of the Draft EA.

1.7 Necessary Permits or Licenses

TVA would obtain all necessary permits, licenses, and approvals required for the alternative selected. Depending on the decisions made respecting the proposed actions, TVA may have to obtain the following permits:

- A General Permit for Storm Water Discharges Associated with Construction Activities may be required for the disposal of dredge material under Alternative B1. A Stormwater Pollution Prevention Plan (SWPPP) would be required to detail sediment and erosion control best management practices (BMP).
- Clean Water Act Section 404 permit from the U.S. Army Corp of Engineers (USACE) and Section 401 Water Quality Certification/Aquatic Resource Alteration Permit (ARAP) from TDEC for the dredging of sediment under Alternative B1 and the placement of riprap under Alternative B3.

Other necessary permits will be evaluated based on site-specific conditions.

CHAPTER 2 – ALTERNATIVES

TVA considered several options for the replacement or refurbishment of the Nolichucky Dam gate. Through collaboration with TVA engineers and external experts, TVA determined that removal of the gate and replacement with a gate structure that would allow the water level to be managed was crucial to be able to observe and inspect the dam. This determination led TVA to move forward with detailed evaluation of Alternative B, which replaces the existing gate, but also addresses disposition of sediment that has built up on the upstream side of the dam that may be transported downstream during gate construction and operation. As a result, TVA is evaluating three variations to Alternative B as well as Alternative A, No Action, in this EA. These alternatives are described below. Other alternatives which were evaluated by TVA but dismissed from further consideration are also briefly discussed.

2.1 Description of Alternatives

Alternatives evaluated in this EA include:

- Alternative A – No Action Alternative
- Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir
- Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir
- Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

2.1.1 Alternative A – No Action Alternative

Under this alternative, TVA would not replace the Nolichucky Dam gate. Consequently, TVA would not be able to temporarily remove water from the downstream face of the dam to allow inspection of the spillway. This alternative would not satisfy the project purpose and need and, therefore, is not considered viable or reasonable. It does, however, provide a benchmark for comparing the environmental impacts of implementation of the proposed alternative.

2.1.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Alternative B1 consists of removing the existing concrete bulkhead, gate, and remaining hoisting system, and installing a new gate and hoisting system with installation of a concrete bulkhead in the spillway slot between the non-overflow training wall and existing spillway gate pier. There are two possible designs for the new gate. Option 1 would replace the gate with a system similar to the system that was formerly in operation; however, it would be 2 feet taller than the existing gate which would allow the gate to have additional height over the spillway crest during normal flows. The estimated discharge capacity of this alternative is the same as the gate formerly in operation (2,500 cubic feet per second) (cfs). A diagram of this design is provided in Figure 2-1.

A second option would replace the gate with two sluice gates. The discharge capacity of the sluice gates under this option is approximately 2,000 cfs. A diagram of this design is provided in Figure 2-2. Because environmental impacts are expected to be similar regardless of which gate design is chosen, both designs are analyzed concurrently.

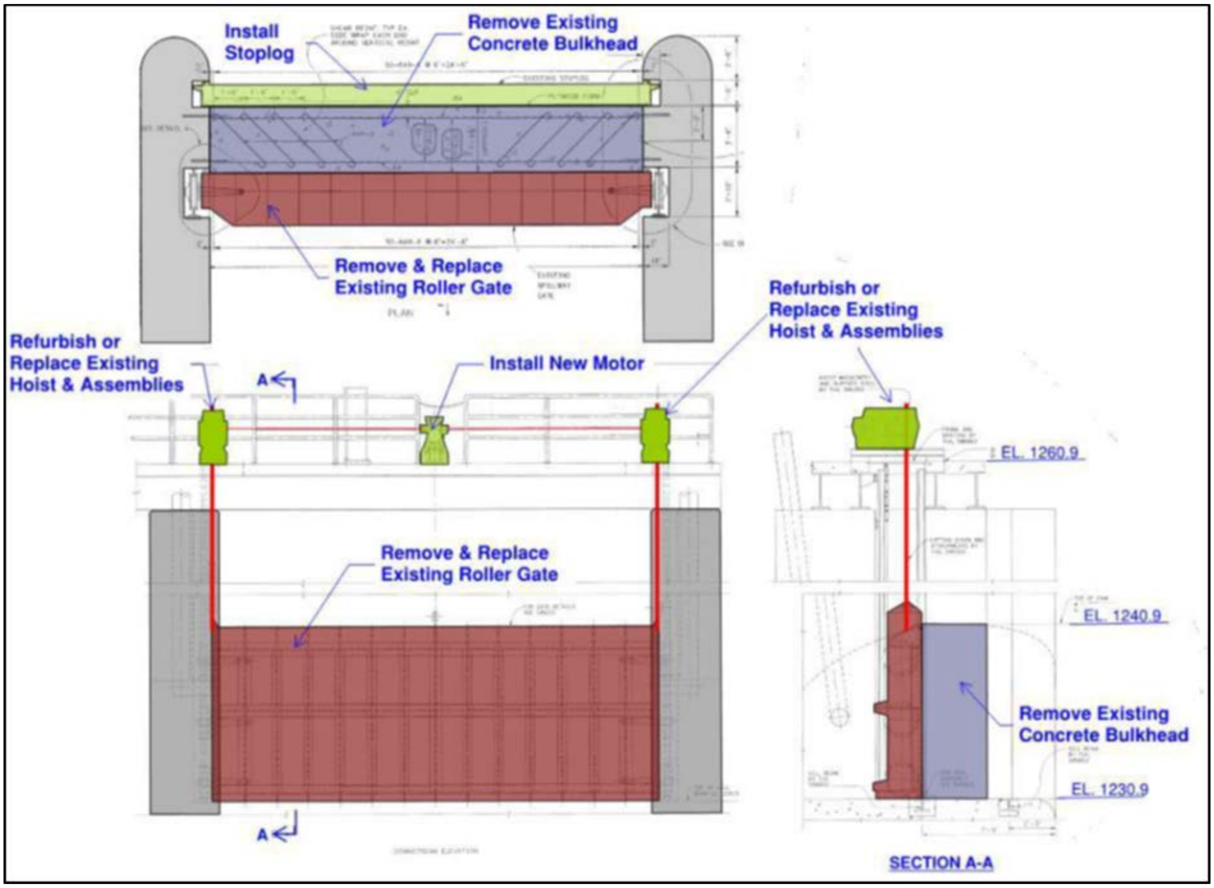


Figure 2-1. Alternative B1 – Option 1: Replace the Existing Gate with a Gate Similar to the Previously Operational System

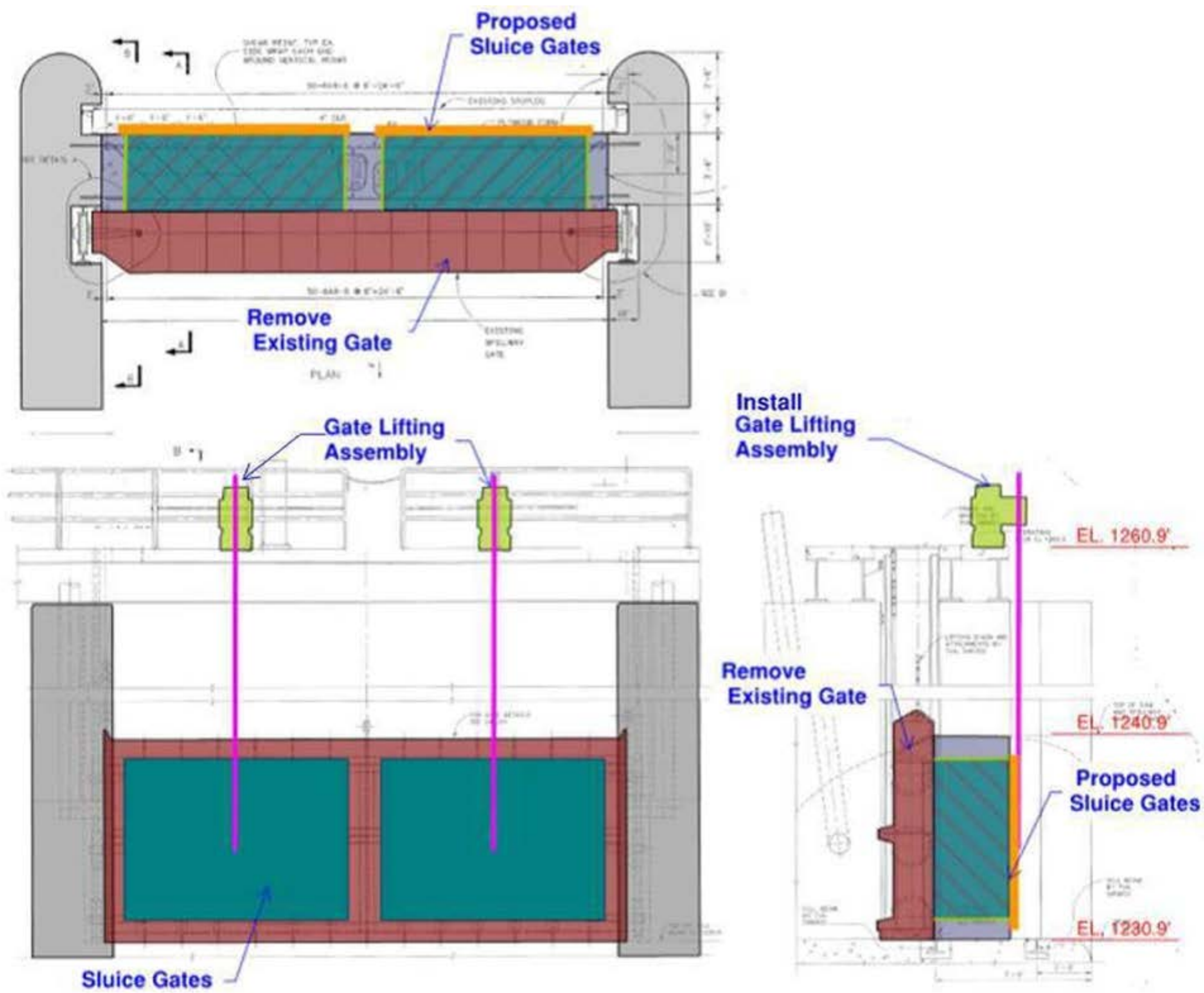


Figure 2-2. Alternative B1 – Option 2: Replace the Existing Gate with Two Sluice Gates

Over time, sediment has built up on the upstream side of the dam. During construction of the new gate, TVA would dredge the accumulated sediment in the southeast corner of the upstream side of the dam (Figure 2-3). Based on preliminary estimates, TVA has estimated that this option would entail the dredging of up to 10,000 cubic yards (yd^3) of sediment from the reservoir upstream of the dam.

In support of this alternative, construction activities would require construction of a temporary access road that would be located next to the dam (Area 3 on Figure 2-3). This ramp would be constructed with stone pushed to the edge of the reservoir and used as a service ramp for personnel and support equipment. A floating dredge would be used to remove the sediment upstream of the dam. The floating dredge would be placed in the water via the existing upstream boat ramp at Bird's Bridge Access located 5 miles upstream from the dam. No construction activities would be needed at the Birds Bridge access site.

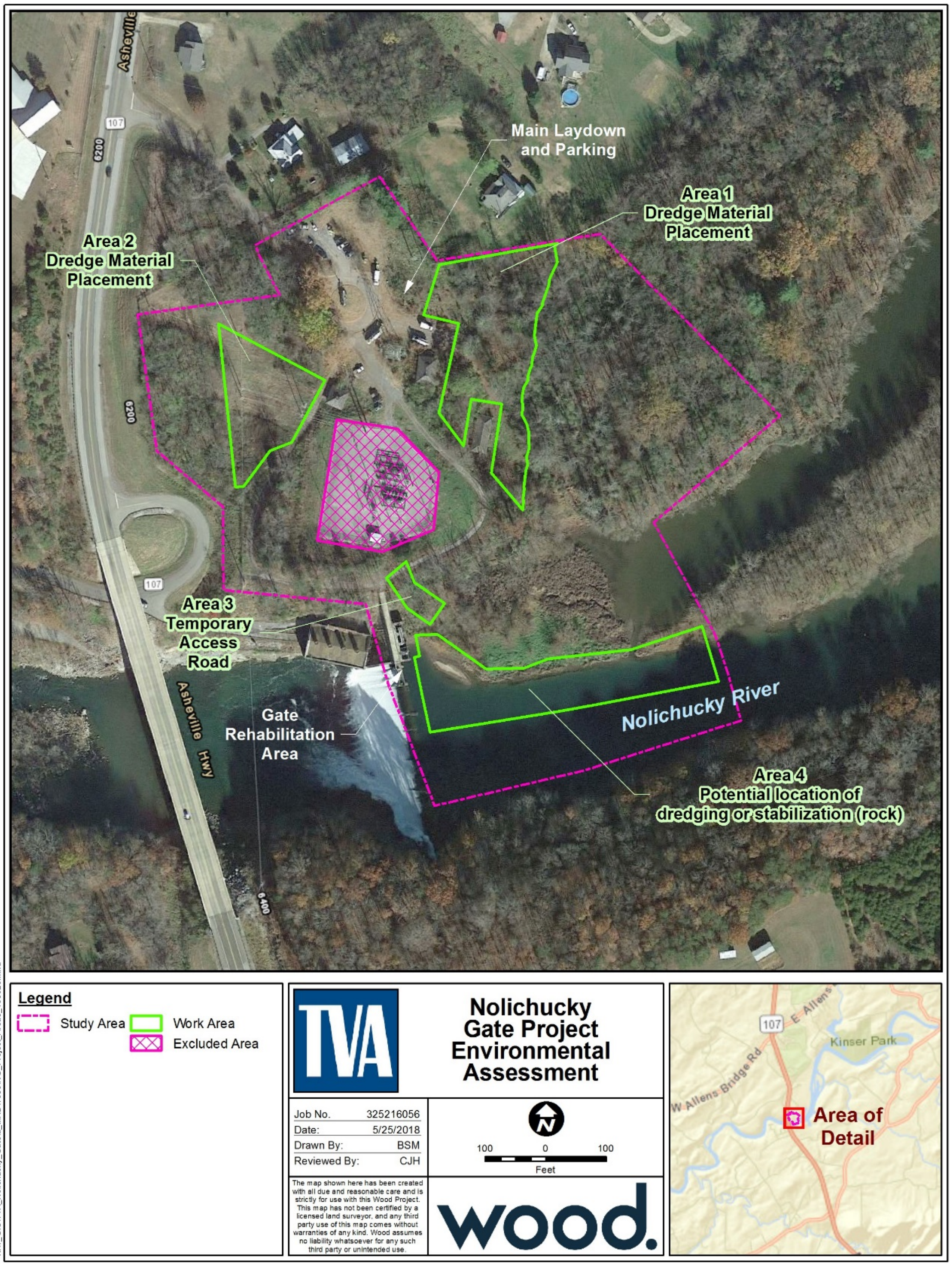


Figure 2-3. Project Areas Nolichucky Dam Replacement Project

The dredged sediment would be pumped into discharge piping which would extend from the dredging operation on the water to the one or both of the dredge material placement areas shown on Figure 2-3. Both placement areas are located on undeveloped TVA property that is currently used to access an existing substation and are not accessible to the public. Area 1 is a 1.1-acre site located east of the existing asphalt driveway loop, and Area 2 is a 0.6-acre site located west of the asphalt loop. Area 1 contains some forested cover, and Area 2 is bisected by an overhead transmission line corridor and is maintained in an herbaceous state. Site preparation would include clearing and grubbing of vegetation. The vegetation would be placed on the ground to aid in erosion and sediment control. All trees over 3 inches in diameter would be left in place. Previously disturbed, paved areas near the entrance of the property would be used for temporary laydown and parking.

Dredge discharge piping would be placed onsite alongside the existing asphalt roadway loop and secured in place with fence posts. Geotextile fabric tubes, or Geotubes, would be located in the dredge material placement areas and used to capture the sediment slurry coming out of the discharge pipe. The tubes are an effective dewatering technology which provide confinement of the fine solids inside the container, while allowing water to permeate through the textile. As the water drains, the solids continue to densify and consolidate over time. Once the solids are fully consolidated, the tubes would be cut and removed and the sediment material would remain onsite where it would be graded, blended into existing contours, and stabilized in place.

In addition to the replacement of the gate and sediment removal, TVA would raise the elevation of the spillway section that is located between the right gate pier and the non-overflow section of the dam. This 6-foot wide section would then match the top elevation of the proposed gate.

2.1.3 Alternative B2 – Replace the Existing Gate and No Dredging in the Nolichucky Reservoir

Under this alternative, TVA would replace the existing gate as described under Alternative B1. However, TVA would not dredge sediment on the upstream side of the dam. Therefore, implementation of this alternative would not impact Area 4 and would not include development or use of dredge disposal Area 1 or 2 . In addition, replacement of the dam gate under this alternative would utilize the existing access to the dam and would not require the construction of a temporary access road. Therefore there would be no impact to Area 3 (see Figure 2-3).

2.1.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

This alternative would be the same as Alternative B1; however, TVA would not dredge, and therefore implementation of this alternative would not include development or use of dredge disposal Area 1 or 2 . TVA would use an excavator to place smaller stone overlain by riprap upstream of the dam in the reservoir and on exposed banks identified as Area 4 on Figure 2-3. This alternative would require approximately 4,500 yd^3 of riprap which would be obtained from existing permitted quarries in the area. In support of this alternative, construction activities would require construction of a temporary access road that would be located next to the dam (Area 3 on Figure 2-3) as described for Alternative B1.

A summary of the proposed project activities is provided in Table 2-1.

Table 2-1. Primary Characteristics of the Proposed Project Activities, Nolichucky Dam Gate Replacement, Greene County, Tennessee

Project Feature	Characteristic	Area/Volume	Alternative			
			A	B-1	B-2	B-3
Dredge Placement Area 1	Proposed location for dewatering and placement of dredged material	1.1 acre		✓		
Dredge Placement Area 2	Proposed location for dewatering and placement of dredged material	0.6 acre		✓		
Temporary Access Road, Area 3	Temporary ramp for personnel and equipment access.	0.1 acre		✓		✓
Dredge Material, Area 4	Quantity of material dredged from the reservoir	Up to 10,000 yd^3		✓		
Riprap, Area 4	Quantity of riprap placed in the reservoir	4,500 yd^3				✓

2.2 Alternatives Considered but Eliminated from Further Discussion

2.2.1 Alternative C – Diversion Through Penstock

When the Nolichucky Dam was built, it was designed as a hydroelectric facility to produce power. Hydroelectric power facilities use the energy of flowing water to turn a turbine. To control the flow of water, an intake structure is built on the upstream side of a dam which directs water through a tunnel called a "penstock." The water moves through the penstock, through the power generating equipment, and is discharged on the downstream side of the dam. Nolichucky Dam has four decommissioned intake and penstock structures.

TVA considered repurposing one of the four existing intake structures and penstocks to move water from the upstream side of the dam to the downstream side. This would involve constructing a temporary cofferdam, rehabilitating or demolishing the power house, and modifying the plugged intake and discharge. Other tasks would include installation of trash racks, a sluice gate, air vent, and potentially an intake tower. A chute and energy dissipater would be required downstream of the intake to convey the water and provide scour protection.

The discharge capacity of this alternative is approximately 2,800 cfs (300 more cfs than the existing system would have).

TVA considered this alternative but is not pursuing it in detail in the EA for the following reasons:

- Large amount of ancillary activities and costs including deep dredging, penstock modifications, powerhouse rehabilitation or removal, construction of chute and stilling basin.

- Higher construction and unknown risks and costs associated with the penstock and bulkhead removal.
- Higher environmental impacts associated with additional sediment dredging.
- Potential to release large volumes of sediment.

2.2.2 Alternative D – Diversion Using a Crest Gate System

This alternative consists of installing a 5-foot-tall crest gate system on top of the main spillway section of the dam to restrict flow over portions of the spillway. The crest gate system may be operated by either an inflatable or a hydraulic arm system. Operating the crest gate from the left abutment would provide sufficient access to the downstream face and toe near the left abutment. However, the system may not work effectively for right downstream face and toe access due to the steep slopes near the left abutment which direct flow from the left abutment toward the right abutment. As a result, the toe along the right portion of the dam may experience higher concentrated flows from the left side and may preclude access to the right portion of the dam.

TVA considered this alternative but is not pursuing it in detail in the EA for the following reasons:

- Presents constructability and safety challenges that are not implicated with the other alternatives considered.
- Raising the crest gate on the right-abutment may not provide sufficient reduction of flow to allow inspection of this area of the spillway.

2.2.3 Other Alternatives Considered

Other alternatives considered included diversion using a flashboard system, siphon spillway, and pumps. The flashboard system would be a temporary structure and both siphon and pump systems do not provide enough discharge capacity to remove adequate amounts of water from the downstream face of the dam. Therefore, none of these alternatives would meet the purpose and need to provide a long-term method to manage the reservoir levels to safely perform dam safety inspections or investigations within the spillway portion of the dam and, therefore, were not considered viable alternatives.

2.3 Comparison of Alternatives

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

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

Resource	Alternative A – No Action	Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir	Alternative B2 – Replace the Existing Gate and No Dredging in the Nolichucky Reservoir	Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate
Air Quality	No impact.	Minor transient impact onsite. Offsite well below the applicable ambient air quality standard.	Minor, but less than Alternative B1.	Minor transient impact onsite. Offsite well below the applicable ambient air quality standard.
Climate Change	No impact.	Minor loss of carbon sequestration compared to sequestered carbon in the region. Would not increase regional greenhouse gas levels.	No impact.	Minor loss of carbon sequestration compared to sequestered carbon in the region. Would not increase regional greenhouse gas levels.
Groundwater and Geohydrology	No impact.	No impact.	No impact.	No impact.
Surface Water	No impact.	Temporary minor impacts resulting in an increase in suspended solids when gate is opened. Temporary impacts from initial resuspension of sediment during dredging and sediment loss from the Geotubes. Minor impact minimized with BMPs. Sediment loading from dredge operations would be temporary, and minor. Impacts would be mitigated under applicable CWA Section 401 and 404 permits.	Temporary minor impacts resulting in an increase in suspended solids when gate is opened.	Temporary minor impacts resulting in an increase in suspended solids when gate is opened. Sediment loading from placement of riprap would be temporary, and minor. Impacts would be mitigated under applicable CWA Section 401 and 404 permits.
Floodplains	No impact.	No impact.	No impact.	No impact.
Geology and Soils	No impact.	Minor and temporary impacts due to clearing and grubbing in dredge material placement areas and minor disturbance due to development of temporary access road. BMPs would minimize erosion. No impacts to geologic resources.	No impact.	Minor and temporary soil disturbance from development of temporary access road. BMPs would minimize erosion. No impacts to geologic resources.

Resource	Alternative A – No Action	Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir	Alternative B2 – Replace the Existing Gate and No Dredging in the Nolichucky Reservoir	Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate
Vegetation	No impact.	Minor impacts from clearing and ground disturbance in dredge material placement areas and temporary access road.	No impact.	Minor impacts from clearing and ground disturbance at temporary access road area.
Wildlife	No impact.	Minor impacts due to disturbance of habitat in dredge material placement areas and temporary access road area.	No impact.	Minor impacts due to disturbance of habitat in temporary access road area and permanent placement of riprap. Increase in foraging habitat for wildlife that occupy crevices.
Aquatic Ecology	No impact.	Minor direct impacts to aquatic habitat and benthic organisms living in substrate downstream of the dam when the gate is opened. Minimal impacts from dredging operations	Minor direct impacts to aquatic habitat and benthic organisms living in substrate downstream of the dam when the gate is open.	Minor direct impacts to aquatic habitat and benthic organisms living in substrate when the gate is opened. Minimal impacts from riprap placement.
Threatened and Endangered Species	No impact.	Potential affect to federally protected mussels within Nolichucky Dam tailwater. No impacts to terrestrial federally and state-listed species.	Potential affect to federally protected mussels within Nolichucky Dam tailwater. No impacts to terrestrial federally and state-listed species.	Potential affect to federally protected mussels within Nolichucky Dam tailwater. No impacts to terrestrial federally and state-listed species.
Wetlands	No impact.	No impact.	No impact.	No impact.
Visual Resources	No impact.	Minor impact during construction. Minor long-term impact.	Minor short-term impact during construction.	Minor short-term impact during construction.
Cultural and Historic Resources	No impact.	No impact.	No impact.	No impact.
Natural Areas	No impact.	Minor temporary indirect impacts from construction noise and transportation of dredge equipment downstream from the public boat launch.	Minor temporary impacts from construction noise.	Minor temporary impacts from construction noise.
Parks and Recreation	No impact.	Minor temporary impacts from reservoir drawdown and construction. Minor	Minor temporary impacts from reservoir	Minor temporary impacts from reservoir

Resource	Alternative A – No Action	Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir	Alternative B2 – Replace the Existing Gate and No Dredging in the Nolichucky Reservoir	Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate
		beneficial impact on recreation downstream from sediment removal upstream of the dam.	drawdown and construction.	drawdown and construction.
Solid and Hazardous Waste	No impact.	Minor impact from generation of solid waste during construction.	Minor impact from generation of solid waste during construction.	Minor impact from generation of solid waste during construction.
Noise	No impact.	Temporary minor impact during dredging, gate replacement, and inspections.	Temporary and minor impact during gate replacement and inspections.	Temporary and minor impact during gate replacement, placement of riprap, and inspections.
Environmental Justice	No impact.	No impact.	No impact.	No impact.
Public Health and Safety	No impact.	No impact.	No impact.	No impact.
Cumulative Effects	No impact.	No impact.	No impact.	No impact.

2.4 TVA's Preferred Alternative

TVA's preferred alternative is Alternative B2 - Replace the Existing Gate and No Dredging in the Nolichucky Reservoir. Recent sediment transport modeling (West 2018) indicated that opening the gate would probably result in localized scour at the gate for a brief period. Further, the concentration of suspended solids in the river as a result of the scour would be much less than existing conditions at natural higher flows. As such, transport of sediment downstream while the gate is open would be minimal, and dredging would not be required. Therefore, Alternative B2 is the preferred alternative as it would replace the inoperable gate with a new gate structure that would allow the water level to be managed to allow observation and inspection of the dam and would avoid additional environmental impacts associated with dredging and placement of riprap on the shoreline.

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. This EA evaluates the impacts related to the decision to replace the spillway gate at Nolichucky Dam so that reservoir levels can be lowered to allow for safe inspection and continued maintenance of the dam and spillway

TVA has identified the following BMPs that would be used to minimize impacts and restore areas disturbed during proposed project activities:

- Under Alternative B1, TVA would use applicable BMPs as described in the project-specific SWPPP and A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities (TVA 2017).
- TVA would use turbidity curtains or other protective measures during construction to minimize transport of sediment downstream.
- Consistent with EO 13751, disturbed areas would be seeded or sodded with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Air Quality

3.1.1 Affected Environment

Through passage of the Clean Air Act, Congress mandated the protection and enhancement of our nation's air quality resources and requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The following criteria pollutants have been set to protect the public health and welfare:

- Sulfur dioxide (SO_2)
- Ozone
- Nitrogen dioxide (NO_2)
- Particulate matter (PM) with particle sizes less than or equal to 10 micrometers (PM_{10})
- Particulate matter with particle sizes less than or equal to 2.5 micrometers ($PM_{2.5}$)
- Carbon monoxide (CO)
- Lead (Pb)

In accordance with the Clean Air Act Amendments of 1990, all counties are designated with respect to compliance, or degree of noncompliance, with the NAAQS. These designations are either attainment, nonattainment, or unclassifiable. An area with air quality better than the NAAQS is designated as "attainment;" whereas an area with air quality worse than the NAAQS is designated as "non-attainment." Non-attainment areas are further classified as extreme, severe, serious, moderate, or marginal. An area may be designated as unclassifiable when there is a lack of data to form a basis of attainment status. New or expanded emissions sources located in areas designated as nonattainment for a pollutant are subject to more stringent air permitting requirements

Greene County is in attainment with applicable NAAQS (EPA 2018b) and Tennessee ambient air quality standards referenced in the Tennessee Air Pollution Control Regulations Chapter 1200-3-3.

The proposed construction activities would be subject to both federal and state (Tennessee Division of Air Pollution Control) regulations. These regulations impose permitting requirements and specific standards for expected air emissions.

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not proceed with replacing the existing sealed spillway gate, and no project related impacts to air quality would occur.

3.1.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Air quality impacts associated with this alternative would occur from emissions during site preparation, use of vehicles by the construction workforce, and the operation of construction and dredging equipment. Site preparation and vehicular traffic over paved and unpaved roads at the project site would result in the emission of fugitive dust during active construction periods. Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of particulate matter, nitrogen oxides, carbon monoxide, volatile organic compounds, and sulfur dioxide during the site preparation and construction period. However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions. Additionally, it is expected that all vehicles and construction equipment would be properly maintained, which also would reduce emissions

Operation of vehicles and equipment could lead to increases in criteria pollutant emissions, but air quality impacts from construction activities and transportation of materials and the construction workforce to the project area would be temporary and relatively minor. Air quality impacts are dependent upon both man-made factors (e.g., intensity of activity, control measures, vehicle maintenance) and natural factors (e.g., wind speed, wind direction, soil moisture). However, even under unusually adverse conditions, emissions from construction activities would have, at most, a minor transient impact on onsite and offsite air quality and would be well below the applicable ambient air quality standard.

3.1.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in in the Nolichucky Reservoir

This alternative would be the same as Alternative B1; however, TVA would not dredge sediment from the Nolichucky Reservoir. Therefore, impacts to air quality would be minor, yet less than Alternative B1 as there would be no emissions associated with dredging equipment.

3.1.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

This alternative would be the same as Alternative B1; however, TVA would not dredge sediment but would place smaller stone overlain by riprap upstream of the dam in the reservoir and on exposed banks to prevent the existing sediment from washing downstream. Air quality impacts associated with this alternative would occur from emissions during site preparation, use of vehicles by the construction workforce, transport of riprap from quarries, and the operation of construction equipment. For the reasons described under Alternative B1, emissions from construction activities would have, at most, a minor transient impact on onsite and offsite air quality and would be well below the applicable ambient air quality standard.

3.2 Climate Change and Greenhouse Gases

3.2.1 Affected Environment

“Climate change” refers to any substantive change in measures of climate, such as temperature, precipitation, or wind lasting for an extended period (decades or longer) (EPA 2016). The 2014 National Climate Assessment concluded that global climate is projected to continue to change over this century and beyond. The amount of warming projected beyond the next few decades, by these studies, is directly linked to the cumulative global emissions of greenhouse gases (GHGs) (e.g., such as CO_2, and methane). By the end of this century, the 2014 National Climate Assessment concluded a 3°F to 5°F rise can be projected under the lower emissions scenario and a 5°F to 10°F rise for a higher emissions scenario (Melillo et al. 2014).

Climate change is primarily a consequence of excessive CO_2 in the atmosphere. CO_2 is the primary GHG emitted through human activities. Activities associated with the proposed action that produce CO_2 are primarily related to emissions from fossil-fuel-powered equipment (e.g., bulldozers, loaders, haulers, trucks, generators, etc.) used during the proposed activities.

Forested areas that absorb and store CO_2 from the atmosphere via a process known as carbon sequestration help to reduce levels of CO_2 in the atmosphere. Approximately 6 acres of forested land is present within the proposed project area, however, only 0.9 acre of forested land is present within the three areas identified for dredge disposal and access road construction.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

Under this alternative, TVA would not proceed with replacing the existing sealed spillway gate, and no project related impacts to climate change and GHGs would occur.

3.2.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

As discussed in Section 3.1, CO_2 emissions would occur from exhaust emission of fossil-fueled vehicles and construction equipment during construction activities. Due to the small number of vehicles and construction equipment involved, only a minor temporary increase in CO_2 emissions would be anticipated as a result of the construction of new gate and dredging of the Nolichucky River upstream of the gate. Such emission levels are *de minimis* in comparison to the regional and world-wide volumes of CO_2. Therefore, local and regional GHG levels would not be adversely impacted by emissions from construction activities.

The EPA has developed equations to estimate the amount of carbon sequestration that may be lost from the conversion of forested land. Assuming that all of the forested land (the land cover with the greatest potential carbon sink) within the areas identified for dredge disposal and access road construction (see Areas 1, 2 and 3 in Figure 2-3) are completely cleared to support construction activities, and the forest composition and age are typical for the region (i.e., Tennessee); the conversion of these forested areas would result in the loss of sequestered carbon equivalent to approximately 0.77 metric tons per year (EPA 2018a). In comparison, within a 5-mile radius of the dam, the existing local forested lands sequester approximately 14,209 metric tons of carbon per year. The loss of carbon storage related to the proposed construction activities is very small relative to the carbon sequestered in the local and regional forested areas. Overall, forest carbon sequestration in the region has increased due to net increases in forest areas (e.g., conversion of farmland to forested areas), improved forest management, as well as higher vegetation growth productivity rates and longer growing seasons. Because of the small forested area involved relative to the forest cover in the vicinity, the proposed construction and dredging is not anticipated to result in increases in regional GHG levels or impact climate change.

3.2.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

As described under Alternative B1, due to the small number of vehicles and construction equipment involved, only a minor temporary increase in CO_2 emissions would be anticipated as a result of the construction of a new gate. Such emission levels are *de minimis* in comparison to the regional and world-wide volumes of CO_2. Therefore, local and regional GHG levels would not be adversely impacted by emissions from construction activities.

In addition, under this alternative TVA would not dredge the sediment in the reservoir and as such would not disturb forested areas in the proposed dredge material placement areas or to support construction of the temporary access road (see Areas 1, 2 and 3 in Figure 3-3). Therefore implementation of this alternative is not anticipated to result in increases in regional GHG levels or impact climate change.

3.2.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Impacts to Climate Change and GHGs levels would be the similar to those associated with Alternative B2, however under this alternative forested area in the proposed dredge material placement areas would not be disturbed.

3.3 Groundwater/Geohydrology

3.3.1 Regulatory Framework for Groundwater

The regulatory framework established to protect groundwater is defined in the Safe Drinking Water Act of 1974, Wellhead Protection Program. The Safe Drinking Water Act of 1974 established the sole source aquifer protection program which regulates certain activities in areas where the aquifer (water-bearing geologic formations) provides at least half of the drinking water consumed in the overlying area.

3.3.2 Affected Environment

3.3.2.1 Regional Aquifers

Within the region, most of the precipitation runs off the land surface into streams that directly discharge to the Nolichucky River. Depending on factors such as land cover and slope, much of the remaining precipitation recharges the regional groundwater system. Groundwater infiltrates down through soil and bedrock until it either flows out onto the land surface as springs (ultimately discharges to the Nolichucky River) or enters deeper bedrock fractures.

In the Project Area, groundwater occurs in interconnected fractures and solution channels, mostly in limestone and dolomite sedimentary rocks. The complex fracturing, folding, and faulting of the formations in this area, accompanied by the presence of shale and siltstone beds in some areas (which can limit the movement of groundwater), has produced many small, independent, or poorly connected groundwater systems within the bedrock. In areas such as the Nolichucky Dam Project Area, complex geology controls groundwater occurrence, movement, and availability.

Based on boring data collected at the dam, depth to water was observed a few feet above the top of bedrock at an elevation of 1,230 feet mean sea level upstream of the dam and at elevations of 1,171 and 1,151 feet mean sea level on the downstream side of the dam. A list of active groundwater monitoring wells and groundwater quality monitoring data collected within the vicinity of the Project Area is not available (Stantec 2015).

The chemical quality of groundwater in the Valley and Ridge province is somewhat variable, but is generally suitable for municipal supplies and other purposes. The Valley and Ridge province typically consists of calcium-magnesium bicarbonate carbonate rock with moderate hardness, neutral pH, and total dissolved solids ranging from 150 to 300 milligrams per liter (mg/L) which is below the EPA secondary water quality standard of 500 mg/L for palatability of drinking water (TVA 2006). Groundwater in the region is used as a source for domestic and public water supplies (Brahana et al. 1986).

3.3.3 Environmental Consequences

3.3.3.1 Alternative A – No Action Alternative

Under Alternative A, no construction would occur. Consequently, no impacts to groundwater resources would occur under this alternative.

3.3.3.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Sediment dredged from the reservoir would be placed in Geotubes and allowed to dewater in placement areas identified on Figure 2-3. The water leaching from these Geotubes would percolate through the cleared overburden soils and likely discharge via groundwater back into the reservoir or to the river downstream of the dam. Since the water discharging from the Geotube has the same water quality as the groundwater discharging to the Nolichucky River, groundwater quality would not be impacted.

The access road would be constructed of offsite rock material and would not require excavation activities and as such there would be no impact to geological resources.

3.3.3.3 Alternative B2 – Replace the Existing Gate with No Dredging in in the Nolichucky Reservoir

Under Alternative B2, no dredging and dewatering of dredged material would occur. Other impacts would be the same as described in Alternative B1 and as such there would be no impacts to groundwater quality or quantity.

3.3.3.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Under Alternative B2, no dredging and dewatering of dredged material would occur. The application of riprap within the reservoir would have no impacts to geology or groundwater. Other impacts would be the same as described in Alternative B1 and as such there would be no impacts to groundwater quality or quantity.

3.4 Surface Water

3.4.1 Affected Environment

The Nolichucky River watershed includes parts of Avery, Mitchell, and Yancey counties in western North Carolina, and parts of Cocke, Greene, Hamblen, Jefferson, Unicoi, and Washington counties in eastern Tennessee. The portion of the Nolichucky River Watershed in Tennessee (HUC [Hydrologic Unit Code] 06010108) occupies approximately 1,129 square miles and has approximately 1,920 miles of streams.

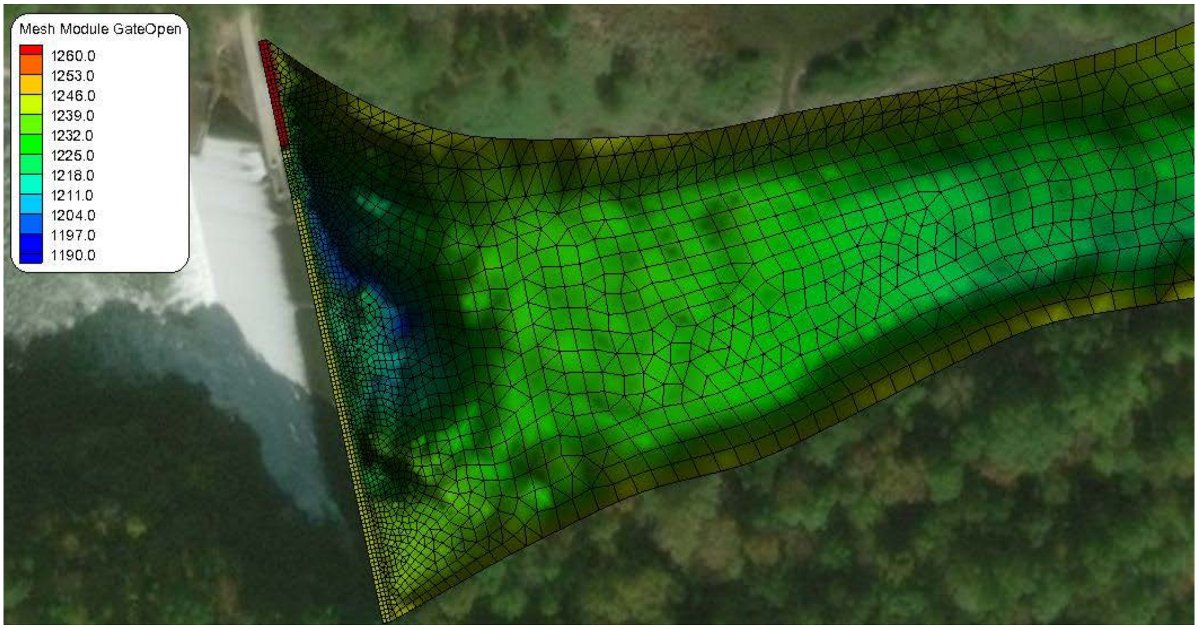
Nolichucky Dam is located at NRM 46, just east of Highway 107/70 (Asheville Hwy) and about 7.5 miles south of Greeneville, in Greene County, Tennessee. Nolichucky Reservoir, also known as Davy Crockett Lake, extends upstream about 6 miles from the dam (TVA 2006) and occupies 383 acres (Tennessee Department of Environment and Conservation [TDEC] 2008).

This Nolichucky Dam Gate Project will primarily take place in the immediate vicinity of Nolichucky Dam. This section of the Nolichucky River is in HUC 060101080707 using the EPA designations. The TDEC refers to the section upstream of Nolichucky Dam as TN 06010108DCROCKETT_1000 or Davy Crockett Reservoir/Lake.

Large amounts of sand and silt have existed in the river and reservoir upstream from Nolichucky Dam for many years historically because of mining operations. Since mining operations have been more regulated recently, other causes such as grazing in riparian or shoreline zones, unrestricted cattle access, irrigated crop production, and municipal urbanized high density areas have continued to cause sedimentation/siltation in the Nolichucky River watershed.

TVA has taken measurements of the bottom surface elevation in and along Nolichucky Reservoir to estimate how much sediment has been deposited. In 1999 the sediment deposits were estimated at about 19,000 acre-feet (30.6 million cubic yards). This accumulated sediment occupied about 90 percent of the total reservoir volume at elevation 1,240.9 feet (TVA 2006).

Recently, potential sediment transport in the Nolichucky Reservoir (Davy Crockett Lake) was modeled focusing within the first mile of the lake upstream of the dam. The report (West 2018) identified sediment accumulation up to elevation 1,231 feet for 20 to 25 feet immediately behind the dam. The report also identified a scour area upstream of that accumulation that extends 100 to 110 feet upstream along the thalweg (low point of the river valley). The scour area has sediment elevations ranging from 1,200 to 1,209 feet. Then from approximately 140 feet upstream of the dam, there is a sediment wedge that rapidly rises to an elevation of 1,228 and then gradually drops to elevation 1,213 feet over an additional 760 feet extending upstream. These sediment and river bottom features are graphically shown on Figure 3-1. It was estimated that this sediment wedge contained approximately 2,600,000 cubic feet (96,296 yd^3) of material (West 2018).



Source: West 2018

Figure 3-1. Graphic Depiction of Bathymetry Upstream of Nolichucky Dam

TVA has no ability to manipulate reservoir water levels upstream of the dam and the dam presently offers virtually no downstream flood control benefit. Nolichucky River flows in the vicinity of the dam are largely determined by rainfall events in its watershed and all water goes over the top of the dam's spillway.

The designated uses for the majority of the Nolichucky River in Tennessee (Mile 7.7 downstream of the dam to Mile 100.8 at the North Carolina-Tennessee line) include: domestic water supply, industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, and irrigation.

The TDEC online public data viewer map shows the Nolichucky River from immediately downstream of the dam to the mouth of Little Chucky Creek at NRM 23.5 as meeting its designated uses. This reach includes the HUC sections of the Nolichucky River which are meeting their designated uses in TDECs 2018 proposed final 303(d) report which are listed in Table 3-1.

Table 3-1. Sections of the Nolichucky River Downstream of Nolichucky Dam (NRM 46) Which Meet Designated Uses

HUC	County Location	Size (miles)
TN06010108005_1000	Cocke, Hamblen	9.4
TN06010108005_2000	Greene, Cocke, Hamblen	6.6
TN06010108005_3000	Greene, Cocke	6.4

Source: TDEC 2018a proposed final 303(d) report

Several sections of the Nolichucky River downstream of NRM 23.5 to its confluence with the French Broad River (Douglas Reservoir) are listed as impaired (not meeting their designated uses) in TDECs 2018 proposed final 303(d) report. These are listed in Table 3-2.

Table 3-2. Impaired Sections of the Nolichucky River downstream of Nolichucky Dam (NRM 46)

HUC	County Location	Size (miles)	Cause	Source
TN06010108001_1000	Cocke, Hamblen	4	Sedimentation/ siltation	Irrigated crop production
TN06010108001_2000	Greene, Cocke, Hamblen	7.7	Sedimentation/ siltation	Irrigated crop production
TN06010108001_3000	Greene, Cocke	9	Sedimentation/ siltation	Grazing in riparian or shoreline; sources outside state jurisdiction

Source: TDECs 2018a

The entire 383 acres of the Nolichucky Reservoir (Davy Crockett Lake) are listed as impaired or not meeting one or more of its designated uses. TDECs 2018 proposed final 303(d) report lists the primary cause as sedimentation/siltation from grazing in riparian or shoreline zones and sources outside State jurisdiction or borders. TDEC developed a total maximum daily load (TMDL) for sedimentation/siltation which was finalized in 2008 (TDEC 2008). Several of the tributaries to Davy Crockett Lake including Flag Branch, Richland Creek, Mutton Creek, and Johnson Creek are also listed as impaired. (TDEC 2018a and TDEC 2008).

The 9.4-mile section of the Nolichucky River immediately upstream of the reservoir (Davy Crockett Lake) (HUC TN06010108010_1000) is also listed as impaired from sedimentation/siltation caused by sources outside the state jurisdiction, grazing in riparian or shoreline zones, and irrigated crop production. However, the next upstream section (HUC TN06010108010_2000) of the Nolichucky River is not listed as impaired.

At the time the TMDL was prepared, approximately 61 percent of the land in the Nolichucky River watershed (HUC 06010108) was forested, approximately 28 percent was in pasture/hay, and about 7 percent was in row crops (TDEC 2008).

Jurisdictional streams and wetlands were delineated within the project area in March 2018 and are identified in Figure 3-2 (Wood 2018). Wetlands are described in Section 3.12. The field survey identified one wet weather conveyance (WWC) within the project area. No other stream resources, other than the Nolichucky River, were located within the project area. The WWC only experiences water flows in indirect response to rainfall runoff.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, the proposed upgrades to the spillway gate system would not be implemented and no impacts would occur to surface water. However, without the replacement of the gate, TVA would not be able to manage water levels and safely and effectively inspect the dam.

3.4.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Under this alternative, TVA is proposing to dredge built up sediment in the area upstream of the dam and remove it so that it would not be released downstream during gate replacement and operation. Before dredging, TVA is proposing to install a temporary sediment containment system, such as turbidity curtains, to prevent sediment from moving downstream.

TDEC developed waste load allocations (WLAs) during their TMDL process for sedimentation/siltation in the Nolichucky River watershed in 2008. WLAs were developed for National Pollutant Discharge Elimination System (NPDES) Regulated Construction Activities Point source discharges of storm water from construction activities (including clearing, grading, filling, excavating, or similar activities) that result in the disturbance of one acre or more of total land area. WLAs for construction storm water discharges are technology based and are specified as allowable erosion loads from construction sites. For construction activities the TMDL set WLAs equal to (a) an average annual erosion load from the construction site of 6,000 pounds/acre/year and (b) the allowable daily erosion load per unit area per inch of precipitation (pounds/acre/inch precipitation). For the project area which is in HUC 06010108_0504; the TMDL WLAs for Construction Activities are an Annual Average Load equal to 6,000 pounds/acre/year and a Daily Maximum Load equal to 139.2 pounds/acre/inch of precipitation (TDEC 2008).

The two proposed dredge material storage areas total approximately 1.7 acres. Therefore, the potential TMDL WLA would potentially be 6,000 pounds x 1.7 acres per year or 10,200 pounds/year. On a rainfall event basis, the potential TMDL WLA could be 139.2 pounds x 1.7 acres or 236.64 pounds per inch of rain. (TDEC 2008). However, the specific project NPDES construction storm water permit and its Storm Water Pollution Prevention Plan would establish the actual limitations required to protect the water quality of the Nolichucky River.

Before the proposed dredging would begin, appropriate BMPs to control erosion and runoff would also be installed, and TVA would clear and grub the small vegetation in the proposed dredge material capture/storage area. The vegetation would be left in place to aid in erosion and sediment control. These BMPs could include silt fences, check dams, and or filter rings.

The proposed action includes dredging the accumulated sediments behind the Nolichucky Dam utilizing a hydraulic type dredge on a barge. The leading edge of the dredge, referred to as a cutterhead, rotates and excavates the sediment from the reservoir bottom. Conservative estimates of cutterhead dredge resuspension factors range from 0.02 to 0.5 percent of the fine silt and clay fraction in the sediments. The current estimate is that a maximum of 10,000 yd^3 would need to be dredged. At resuspension factors of 0.02 to 0.5 percent, 2 yd^3 to a maximum of 50 yd^3 of sediment could resuspended if 10,000 yd^3 is dredged. Additional resuspension could occur if there are significant quantities of debris mixed in with the sediments.

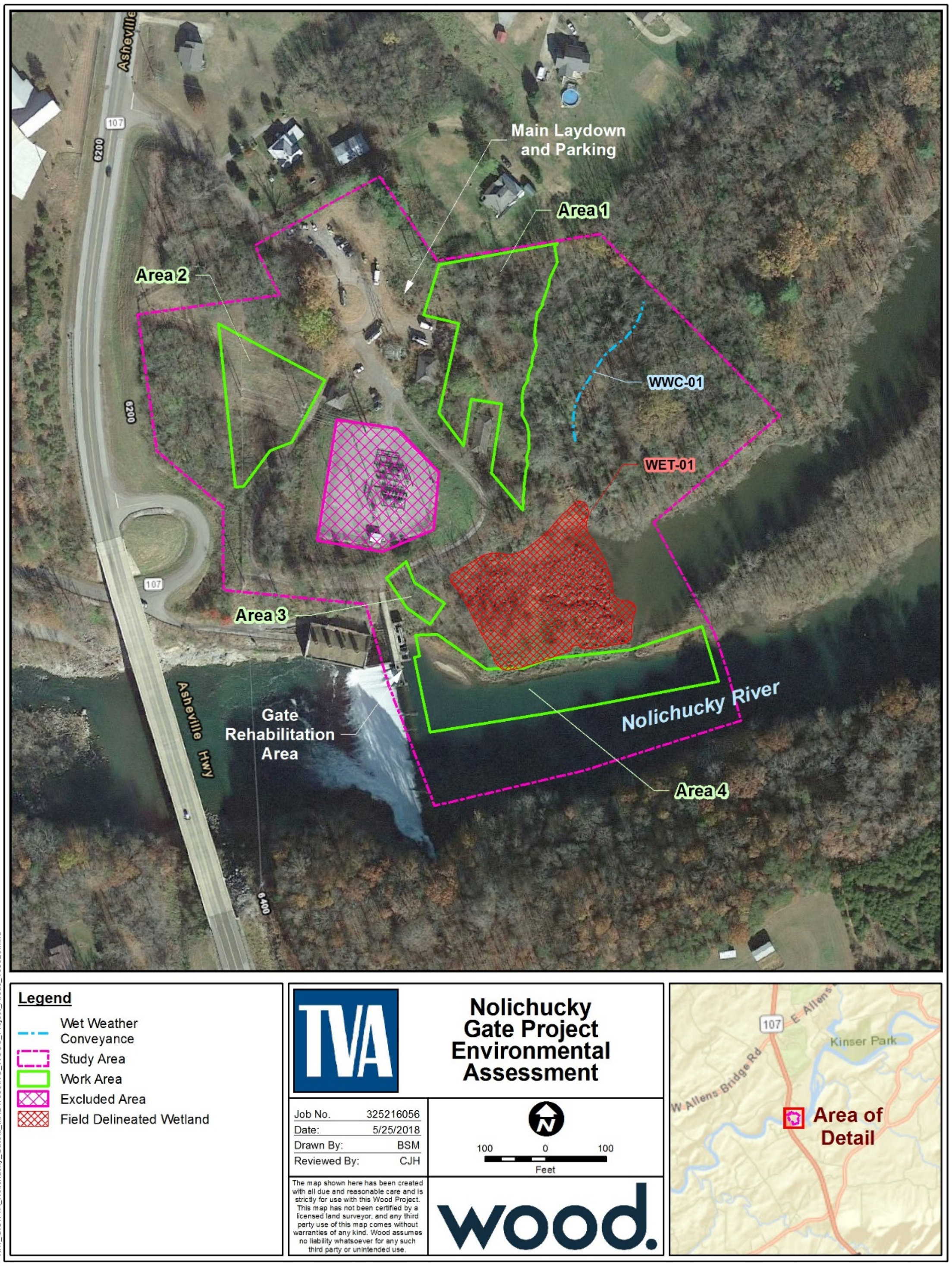


Figure 3-2. Stream and Wetland Resources Identified in the Project Area

The U.S. Department of Agriculture's NRCS publishes estimates of moist bulk density by texture type. These range from 1.4 to 1.8 grams/cubic centimeter for sandy clays to coarse sands (USDA 2018). For potential cutterhead losses of 2 to 50 yd^3, that would mean a weight of 608 to 15,200 pounds of sediment could be released at the cutterhead over the total dredging period. If necessary, additional control measures such as modifying the dredge operation or installing silt curtains could be implemented. Because of the existing sediment loads in the Nolichucky River, sediment losses at the cutterhead should only provide a small temporary increase and have no lasting impact on surface water quality.

Sediment Toxicity Characteristic Leachate Procedure (TCLP) testing showed that the sediments did not contain significant amounts of toxic metals and would not need to be disposed as hazardous wastes. Therefore, dredged sediment could be safely disposed of onsite or hauled to a permitted sanitary landfill.

Because of the dredging, this alternative may require a Clean Water Act Section 404 permit from the USACE and Section 401 Water Quality Certification/Aquatic Resource ARAP from TDEC. If it does, any direct impacts to the Nolichucky River would be mitigated under the terms of that permit. Therefore, any impacts to surface waters from dredging would be temporary and minor.

Based on the Sediment Transport Modeling (West 2018), opening the gate at flows of approximately 1,900 cfs would probably result in very small scour at the gate to a maximum depth of two feet. This could potentially result in initial concentrations of 100 milligrams per liter (mg/L) of total suspended solids (TSS). However, West estimated that the TSS concentrations would probably quickly decrease to 50 mg/L at 5 hours, 30 mg/L at 10 hours and only 20 mg/L at 24 hours.

Therefore, minor adverse impacts to water quality are expected immediately after the gate is opened and the small scour hole develops. These adverse impacts are anticipated to be of short duration as the scour stabilizes. Additionally, the temporarily elevated TSS concentration is well below the existing conditions at natural high flows. West (2018) estimated TSS concentration during those natural higher flows (approximately 13,000 cfs) at 600 mg/L as well as much larger sediment loads. No additional NPDES permit related to gate operation would be required.

<u>Shore-Based Geotube Sediment Dewatering</u>

The proposed action includes pumping the dredged sediments into Geotube fabric containment/dewatering system on the sediment capture/storage areas identified in Figure 2-3. These tubes would be used to capture the sediment slurry coming out of the dredge discharge pipe and allow the material to dewater. The tubes are an effective dewatering technology fabricated from a textile which provides confinement of the fine solids inside the container, while allowing water to permeate through the textile. As the water drains, the solids continue to densify and consolidate over time. Once the solids are fully consolidated, the bags would be removed and disposed of per the manufacturer's guidelines or if possible would be left in place to biodegrade. After the Geotube bags are removed, the dewatered sediment material would be graded for final placement and contours. Then the dredge capture area would be stabilized with mulch and vegetation.

Estimates of solids retention in Geotube dewatering systems ranges from 95 percent (Mastin & Lebster 2007) to 99 percent (TenCate 2013) which implies that 1 to 5 percent of the dredged sediments could leave the fabric Geotubes. Therefore, based on estimates of up to 10,000 yd^3 of dredged material, up to 500 yd^3 (10,000 x 0.05) of dredged sediment could potentially leave the Geotubes over the total project period. The maximum potential of 500 yd^3 could be up to 1,520,000 pounds of sediment loss from the Geotubes over the total project duration.

Sediment control measures would already be in place around the sediment disposal area to further contain and control the sediments leaving the Geotubes. These could include silt fences, check dams, and filter rings. Additional control measures, such as the addition of polymers to aid in sediment binding, could be added to the dredged material before placement into the Geotubes if needed to control runoff.

For the proposed action, TVA would apply appropriate erosion prevention and sediment controls and BMPs as specified in the General NPDES Permit for Storm Water Discharges Associated With Construction Activity. This permit requires the development and implementation of a site-specific SWPPP prior to the commencement of construction activities. The SWPPP must be prepared in accordance with good engineering practices and the latest edition of the Tennessee Erosion and Sediment Control Handbook (TDEC 2012). Additionally, the SWPPP must identify potential sources of pollution at a construction site that would affect the quality of storm water discharges and describe practices to be used to reduce pollutants in those discharges. The permit would ensure discharges that would meet State water quality standards. (TDEC 2008)

Due to the limited losses of sediment from the sediment tubes and the construction BMPs identified in the project's SWPPP, any discharges from the shore-based sediment dewatering and disposal area would only have temporary, minor impacts to surface water quality.

3.4.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in in the Nolichucky Reservoir

The gate replacement portion of this alternative would be the same as Alternative B1. However, TVA would not dredge sediment on the upstream side of the dam. Therefore under this alternative adverse impacts to water quality are expected immediately after the gate is initially opened and the small scour hole develops. As described above, this impact would be minor.

3.4.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

The gate replacement portion of this alternative would be the same as Alternative B1 and therefore would be minor. However, TVA would not dredge any sediment but would place smaller stone overlain by riprap upstream of the dam in the reservoir and on exposed banks to stabilize the sediments during gate construction and operation.

The estimated area to be stabilized is roughly 1.1 acre. The impact to the reservoir as a result of placement of the riprap would be minimal as the area impacted would be less than 1 percent of the total surface area of the reservoir. Sediment loading increases would be minor and would occur during initial construction activities.

Because this alternative would involve placing the riprap in the river and on the exposed banks, this alternative would require a USACE Clean Water Act Section 404 permit and

Section 401 Water Quality certification from TDEC. Any direct impacts to the Nolichucky River would be mitigated under the terms of that permit, and appropriate BMPs would be installed if required by these permits.

Since those permits are designed to be protective of local water quality, surface water quality impacts from the placement of riprap as part of this alternative would be temporary and minor.

3.5 Floodplains

3.5.1 Affected Environment

A floodplain is the relatively level land area along a stream or river that is subject to periodic flooding. The area subject to a one percent chance of flooding in any given year is normally called the 100-year floodplain or 1-percent-annual-chance floodplain. The area subject to a 0.2 percent chance of flooding in any given year is normally called the 500-year floodplain.

The proposed project would be located at NRM 46.0 adjacent to the Nolichucky Reservoir (Davy Crockett Lake), in Greene County, Tennessee. At this location, the 100- and 500-year flood elevations would be 1260.3 and 1266.3 feet, respectively, referenced to National Geodetic Vertical Datum 1929. The 100-year floodplain in the project area is shown on Figure 3-3.

3.5.2 Environmental Consequences

As a federal agency, TVA adheres to the requirements of 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" (EO 11988, Floodplain Management). 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 (U.S. Water Resources Council 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

3.5.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not proceed with replacing the existing sealed spillway gate. There would be no change to the existing conditions found within the local floodplains.

3.5.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

The project would consist of a laydown and parking area, two separate disposal areas for dredged material, dredging within Nolichucky Reservoir, replacement of the existing sealed spillway gate with an operable spillway gate, and an access road from the reservoir to the existing roadways onsite.

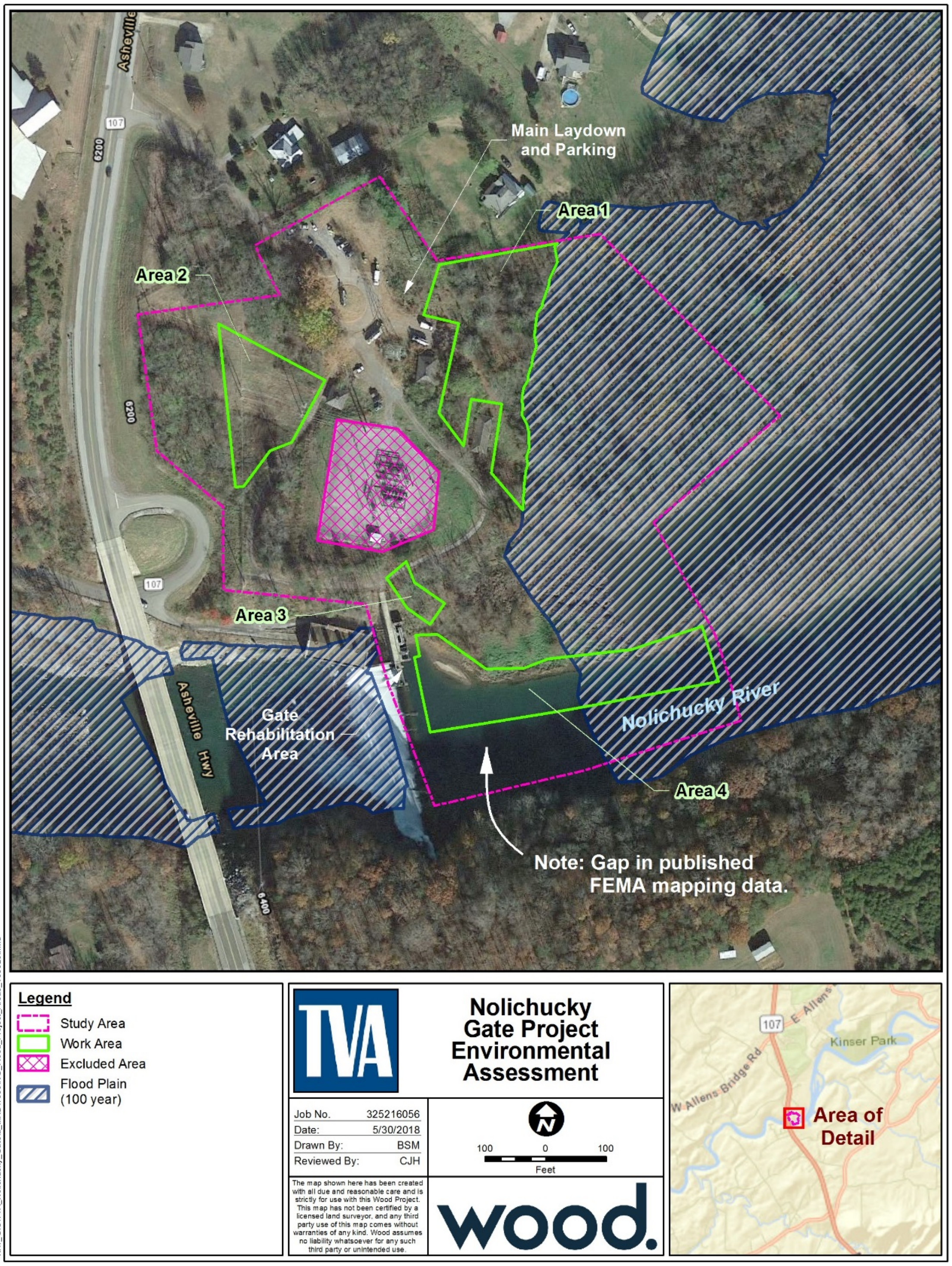


Figure 3-3. Floodplain Identified in the Project Area

Based on the project map, the laydown and parking area and the two separate disposal areas for dredged material would be located outside the 100-year floodplain. As such, this alternative would be consistent with EO 11988. The dredging would be consistent with EO 11988 because the dredged material would be placed within upland areas outside the 100-year floodplain. The access road would be a repetitive action in the 100-year floodplain.

Replacing the inoperable spillway gate with an operable gate would be a functionally dependent use of the floodplain. Once replaced, the gate would be operated only to lower the reservoir pool below the spillway crest to allow for inspection of the spillway.

There are two options for replacing the spillway gate. One option would be to replace the gate with one gate that would discharge 2,500 cfs. The second option would be to replace the gate with two sluice gates that would discharge a total of 2,000 cfs. There would be no increase in flood risk because the gate would only be used for inspections and would discharge no more water than the original spillway gate. Except during inspections, water within Nolichucky Reservoir would continue to flow over the spillway crest as it does under existing conditions. Alternative B1 would have no significant impact on floodplains and their natural and beneficial values.

3.5.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Replacement of the gate would be the same as described for Alternative B1. Therefore, there would be no significant impact on floodplains and their natural and beneficial values.

3.5.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

This alternative would be the same as Alternative B1; however, TVA would not dredge sediment and would place smaller stone overlain by riprap upstream of the dam in the reservoir and on exposed banks to prevent the existing sediment from washing downstream.

Approximately 4,500 yd^3 of stone and riprap fill would be placed in Nolichucky Reservoir upstream of the dam. Under this alternative there would be no practicable alternative to locating the stone and riprap fill in the floodplain because the material it is designed to protect is currently within the floodplain. The amount of fill would be necessary minimize the amount of sediment just upstream of the proposed spillway gate from washing downstream. To minimize adverse impacts, the least amount of fill necessary to minimize sediment from washing downstream would be used. Therefore, Alternative B3 would be consistent with EO 11988. Alternative B3 would have no significant impact on floodplains and their natural and beneficial values.

3.6 Geology and Soils

3.6.1 Affected Environment

3.6.1.1 Regional Geology

The Nolichucky Dam Project Area is situated in the Valley and Ridge Physiographic Province of Eastern Tennessee. This area exhibits alternating valleys and ridges which reflect the varying strata’s resistivity to folding and faulting. Tectonic activity during the

Paleozoic Era formed long synclinal (a fold where younger layers are closer to the center) structures within the project site which generally trend from the southwest to the northeast. However, no significant faults or tectonic activity has occurred in recent geologic time near the Project Area.

3.6.1.2 Site Geology

According to a 2015 field geotechnical exploration the project site is underlain by limestone and shales of the Middle to Upper-Cambrian Age. Bedrock formations are part of the Conasauga and Knox Groups (Stantec 2015).

Dominant units within the Conasauga Group at the site include:

- The Rogersville Shale which consists of shale, siltstone and dolomite.
- The Maryville Limestone, light to dark gray, thin- to thick-bedded limestone, with evenly spaced dolomite and siltstone banding, and dolomite in lower portions of the formation.
- The Nolichucky Shale formation, interbedded shale, siltstone, and limestone. The upper member has an abundance of thin-bedded calcareous siltstone and thickly laminated limestone, while the middle member is massive-bedded oolitic limestone, and the lower member contains dominantly shale and siltstone.
- The Maynardville Limestone, thick to massive-bedded, (siltstone and dolomite) nodular limestone that is light-gray and fine grained.

The dominant geologic unit in the study area belonging to the Knox Group is the Conococheague Limestone/Dolomite formation composed of limestone with interbedded dolomite. The limestone is light to medium gray, medium to massive bedded and coarse grained, and the dolomite is medium to massive bedded, dark grayish-blue, silty, and fine grained.

Regional dip of the formations in the area is reported to be near vertical (dipping 81 to 89 degrees to the south-southeast). This was confirmed during previous bedrock coring activities at the dam. Onsite observations of exposed rock also indicate that the strata surrounding the dam is dipping near vertical and striking nearly perpendicular to the dam axis. Micro folds were also observed downstream of the left abutment which generated various dip directions. This complex geology (folds, faults, fractures, and dip) within the Project Area controls groundwater occurrence, movement, and availability.

3.6.1.3 Geologic Hazards

Karst Topography
"Karst" refers to a type of topography that is formed when rocks with a high carbonate (CO_3) content, such as limestone and dolomite, are dissolved by groundwater to form sink holes, caves, springs and underground drainage systems. Karst topography forms in areas where limestone and dolomite are near the surface.

The Nolichucky Dam is underlain by the Nolichucky Shale consisting of interbedded shale, siltstone, and limestone at near vertical dip. This geologic setting would be considered non-conducive to the formation of a karst environment. In addition, sinkholes or karst features are not identified on the U.S. Geological Survey (USGS) 7.5-Minute Davy Crockett Lake, TN-NC 2016 Quadrangle nor were they observed during previous field reconnaissance.

Fractures, Faults, and Folds

The Nolichucky Dam Project Area is situated within the Pulaski thrust sheet, which extends from south of the dam where the thrust is truncated by the frontal Blue Ridge fault system northeastward to north of Roanoke, Virginia. The Pulaski is a major thrust fault in the Valley and Ridge Province. At least two thrust faults have been mapped northwest of Nolichucky Dam. These include the Dunham Ridge fault and an unnamed fault, which may be a splay or secondary branch of the Dunham Ridge fault. These faults do not have large displacement (Stantec 2015).

Seismic Events

The East Tennessee Seismic Zone (ETSZ) and the Southern Appalachian Seismic Zone, make up a geographic band stretching from northeastern Alabama to southwestern Virginia that is subject to frequent small earthquakes. The ETSZ is one of the most active earthquake zones in the eastern United States. Most earthquakes in the ETSZ are small and are detected only with instruments. A few damaging earthquakes have occurred in the ETSZ; the largest historic earthquakes measured 4.6 magnitude (Richter scale), occurring in 1973 near Knoxville, Tennessee. The USGS estimates that earthquakes as large as magnitude 7.5 on the Richter scale are possible in the ETSZ. Events of magnitude 5 to 6 are estimated to occur once every 200 to 300 years.

Greeneville, Tennessee, which is located 8 miles north of the Nolichucky Dam, has recorded a total of seven earthquakes since 1931 ranging from magnitude 1.6 to 3.6. The USGS database shows that there is a 4.28 percent chance of a major earthquake within 30 miles of Greeneville, Tennessee within the next 50 years. The largest recorded earthquake within 30 miles of Greeneville, Tennessee was a magnitude in 2005 (Homefacts.com). The “Geologic Hazards Map of Tennessee – Environmental Geology Series No. 5” developed and published by the TDEC, Division of Geology and compiled by Robert Miller (1978) classifies the Nolichucky Dam Project area as Risk Zone 2 (moderate risk, moderate damage possible).

Fault and Liquefaction Potential

There are two general categories of earthquake hazards: primary and secondary. Primary hazards include fault ground rupture and strong ground shaking. If an earthquake is larger than about magnitude 5.5, ground rupture may occur on the fault. The amount of displacement generally increases with the magnitude of the earthquake.

Secondary hazards include liquefaction/lateral spreading, landsliding, and ground settlement. Liquefaction is essentially loss of strength in generally granular, saturated materials, including alluvial and fluvial deposits subjected to ground shaking. Liquefaction can result in ground settlement, and where there is a free face, such as river bank, can result in ground spreading toward the free face. Liquefaction can also damage foundations, pavement, and pipelines and underground utilities.

3.6.1.4 Soils

According to the NRCS’s Web Soil Survey (NRCS 2018), most of the soils in the proposed project area are loams. The extent of soils mapped within the project area are shown in Table 3-3 by the designated areas of project activity shown in Figure 2-3.

Table 3-3. Soils Mapped Within the Nolichucky Gate Project Area

Soil Map Unit (Symbol) Name	Study Area (Acres)	Area 1 (Acres)	(Area 2) (Acres)	Area 3 (acres)	Area 4 (acres)
(Wc) Waynesboro loam, eroded hilly phase	5.8	0.9	0.3	0.1	0.01
(Wd) Waynesboro loam, eroded rolling phase	5.0	0.2	0.3		
(We) Waynesboro loam, undulating phase	0.2				
(W) Water	4.0				1.1
Dam	0.1				
Total	**15.1**	**1.1**	**0.6**	**0.1**	**1.1**

Source: NRCS 2018

The Waynesboro soil series, which is found throughout the project area, consist of very deep, well drained, and moderately permeable soils. These soils have formed in old alluvium or unconsolidated material of sandstone, shale, and limestone origin on uplands and high terraces. Typical soil texture in the surface layers is loam with clay in the lower horizons. Topography for Waynesboro soils is dominantly rolling and hilly, but ranges from undulating to steep (NRCS 2018).

3.6.2 Environmental Consequences

3.6.3 Alternative A – No Action Alternative

Under Alternative A, TVA would not replace the dam gate. Therefore, there would be no impacts to geological or soil resources.

3.6.4 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Replacement of the dam gate would involve removal of river sediment by dredging near the upstream portion of the dam gate to prevent transport of the sediment downstream during construction of the new gate. Material dredged from the reservoir would be pumped to Geotubes located within dredge material placement Areas 1 and 2. Once the spoils are dewatered, the Geotubes would be removed and the newly deposited sediments on these upland areas would be graded and revegetated

Approximately 1.2 acres of surface soils located in the dredge material placement areas, access road area and dredge site locations would be impacted under this alternative. The proposed clearing and grubbing activities would have minor impacts to soil resources as no excavation or grubbing of tree roots is planned. BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2017) and as outlined in the project specific SWPPP would be implemented to minimize erosion during land clearing and access road construction. When the dewatering is complete, the dredged material would be graded for proper drainage and reseeded with grass to help promote soil stability, native soil biota, and re-establishment of soil functions.

None of the proposed actions would involve deep excavations and as such would not impact bedrock formations. Geological related operational impacts are associated with the potential effect of earthquakes on the proposed project site. Based on the seismic history of the ETSZ and local low frequency/low magnitude seismic occurrences, and as no faults have been mapped on the site, the potential for surface fault rupture as well as secondary hazards related to liquefaction is considered to be low. Accordingly, seismic impacts are expected to be negligible.

3.6.4.1 Alternative B2 – Replace the Existing Gate with No Dredging in in the Nolichucky Reservoir

This alternative replaces the gate with no dredging activities; therefore, there would be no clearing for sediment/spoils dewatering and placement. Existing laydown and parking areas are currently heavily disturbed and therefore there would be no impact.

3.6.4.2 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Under this alternative, TVA would not dredge any sediment but would place smaller stone overlain by riprap upstream of the dam in the reservoir to stabilize the sediments. The estimated area to be stabilized is roughly 1.1 acres. During construction, soils within the exposed banks would be disturbed. This impact would be temporary and minor given the relatively small size of the area to be disturbed and once riprap is placed soils would be stabilized.

3.7 Vegetation

3.7.1 Affected Environment

Nolichucky Dam and the immediate surrounding areas are located within the Southern Limestone/Dolomite Valleys and Low Rolling Hills, a subregion of the Ridge and Valley ecoregion. Landcover in this region includes a mixture of intensive agriculture in the valleys and less steep terrain, urban and industrial areas, and areas of thick forest often in areas not readily suited for development due to steeper terrain. White oak forests, bottomland oak forests, and sycamore-ash-elm riparian forests are the common forest types. There are some grassland barrens and cedar-pine glades scattered in this region (Griffith et al., 2001).

The vegetation within a 5-mile radius surrounding the Nolichucky Dam Project Area was evaluated with land use/land cover information obtained from the National Land Cover Database (Homer et al. 2015). Land cover within the Nolichucky Dam Project Area was also mapped in the field during a site visit conducted in March 2018. Land cover is summarized in Table 3-4 and illustrated in Figure 3-4 and Figure 3-5.

Land cover in the vicinity is primarily hay/pasture (30,546 acres), followed by deciduous forest (13,865 acres), and developed open space (2,953 acres) (see Table 3-4). Land cover in the approximately 15-acre project area consists primarily of deciduous forest (6.2 acres) followed by herbaceous (2.2 acres) and developed land (1.8 acres).

Table 3-4. Land Cover of the Proposed Nolichucky Dam Project Area and Within the Vicinity of the Nolichucky Dam

Land Cover Type	Study Area	5-mile Radius (acres)
Barren Land	0.1	68
Cultivated Crops	0	357
Deciduous Forest	6.2	13,865
Developed, Low Intensity	1.8	469
Developed, Medium Intensity	0	11
Developed, Open Space	0	2.953
Evergreen Forest	0	1,731
Hay/Pasture	0	30,546
Herbaceous	2.2	638
Mixed Forest	0	886
Open Water	0	342
Shrub/Scrub	0.9	131
Emergent Herbaceous Wetland	1.1	0
Woody Wetlands	0	235
Open Water	2.8	0
Totals	**15.1**	**52,232**

Source: Homer et al. 2015

Figure 3-4. Land Cover Within the Nolichucky Dam Project Area

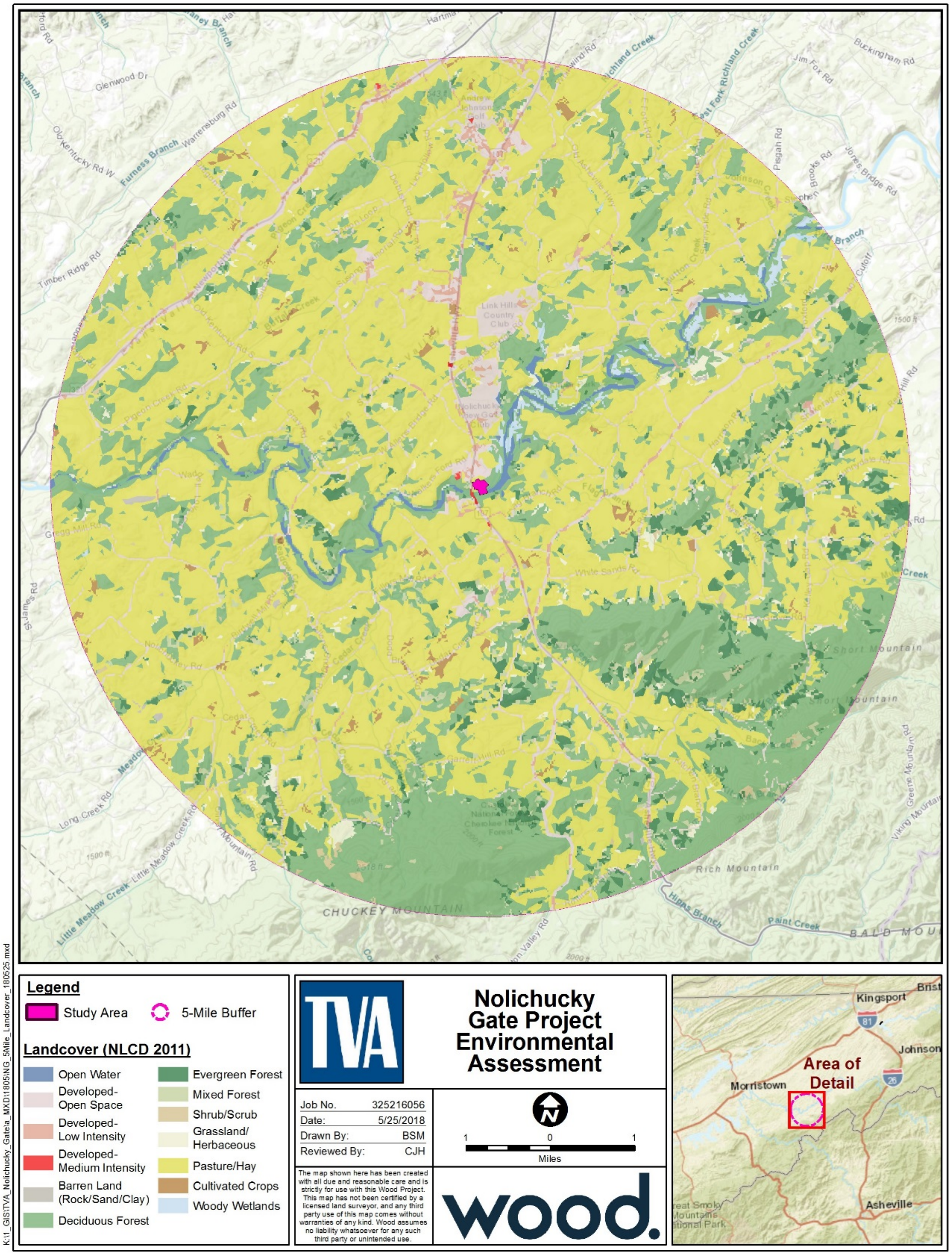


Figure 3-5. Land Cover Within the Vicinity of Nolichucky Dam

Vegetation observed during the project site visit conducted in March 2018 are shown on Table 3-5.

Area 1 consists primarily of previously disturbed deciduous forest with a small amount of herbaceous area. This area contains upland forests that begin transitioning into the bottomland forested areas near the shoreline of Nolichucky Reservoir (Old Hickory Lake). Common species in the upland areas include southern red oak and tulip poplar. Poison ivy was common in the understory and climbing many of the trees in this area.

Area 2 consists of shrub/scrub vegetation with an area of developed/maintained grasses. Common trees and shrubs in this area include black locust, sawtooth oak, black cherry, Chinese privet, and bush honeysuckle.

Area 3 consists primarily of previously disturbed deciduous forest. This area is on a relatively steep slope, and the forest cover is sparse due to previous disturbance. Common species in this area included black willow and boxelder.

The area upstream of the dam where potential dredging and/or stabilization is proposed consists of open water, with a small amount of sparsely vegetated land on the shoreline of the reservoir.

Executive Order 13112 (Invasive Species), as amended by EO 13751, 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 plants are common in and near the project area. Some of the common invasive plants observed in the study area during the March 2018 site visit include autumn olive, Chinese privet, Japanese honeysuckle, Callery pear, bush honeysuckle, reed canary grass, and Johnson grass. All these species have the potential to affect the native plant communities adversely because of their ability to spread rapidly and displace native vegetation.

No rare plant communities are known to occur within the study area.

Table 3-5. Vegetation Observed Within the Nolichucky Dam Project Area

Common Name	Scientific Name	Common Name	Scientific Name
	Trees and Shrubs		
American elm	*Ulmus americana*	Eastern red cedar	*Juniperus virginiana*
Autumn olive	*Elaeagnus umbellata*	Hawthorne	*Crataegus sp.*
Beech	*Fagus grandifolia*	Multiflora rose	*Rosa multiflora*
Black cherry	*Prunus serotina*	Red bud	*Cercis canadensis*
Black locust	*Robinia pseudoacacia*	Sawtooth oak	*Quercus acutissima*
Black walnut	*Juglans nigra*	Southern red oak	*Quercus falcata*
Boxelder	*Acer negundo*	Spicebush	*Lindera benzoin*
Bush honeysuckle	*Lonicera maackii*	Sugarberry	*Celtis laevigata*
Callery pear	*Pyrus calleryana*	Sycamore	*Platanus occidentalis*
Chinese chestnut	*Castanea mollissima*	Tree of heaven	*Ailanthus altissima*
Chinese privet	*Ligustrum sinense*	Tulip poplar	*Liriodendron tulipifera*
Common persimmon	*Diospyros virginiana*	Virginia pine	*Pinus virginiana*
Cornelian cherry dogwood	*Cornus mas*	White pine	*Pinus strobus*
	Herbaceous Plants		
Annual fleabane	*Erigeron annuus*	Johnsongrass	*Sorghum halepense*
Black raspberry	*Rubus occidentalis*	Nodding fescue	*Festuca subverticillata*
Bluegrass	*Poa pratensis*	Openflower rosette grass	*Dichanthelium laxiflorum*
Broadleaf cattail	*Typha latifolia*	Panicled aster	*Symphyotrichum lanceolatum*
Carolina crane's bill	*Geranium carolinianum*	Periwinkle	*Vinca minor*
Chickweed	*Stellaria media*	Red henbit	*Lamium purpureum*
Claspleaf pennycress	*Microthlaspi perfoliatum*	Reed canarygrass	*Phalaris arundinacea*
Cleavers	*Galium aparine*	Sedge	*Carex* sp.
Common blue violet	*Viola sororia*	Sericea	*Lespedeza cuneata*
Common vetch	*Vicia sativa*	Spiderwort	*Tradescantia* sp.
Creeping Charlie	*Glechoma hederacea*	Spikerush	*Eleocharis* sp.
Crownvetch	*Securigera varia*	Spotted knapweed	*Centaurea stoebe*
Curly dock	*Rumex crispus*	Sulfur cinquefoil	*Potentilla recta*
Daffodil	*Narcissus pseudonarcissus*	Sweetclover	*Melilotus* sp.
Dandelion	*Taraxacum officinale*	Tall boneset	*Eupatorium altissimum*
Early wood buttercup	*Ranunculus abortivus*	Tall fescue	*Schedonorus arundinaceus*
Eastern gamagrass	*Tripsacum dactyloides*	Virginia Wildrye	*Elymus virginicus*
Giant cane	*Arundinaria gigantea*	White avens	*Geum canadense*
Hairy bittercress	*Cardamine hirsuta*	White clover	*Trifolium repens*
Hairy Wildrye	*Elymus villosus*	White wood aster	*Eurybia divaricata*
Hairy woodland brome	*Bromus pubescens*	Whitegrass	*Leersia virginica*
Hairyfruit chervil	*Chaerophyllum tainturieri*	Wild carrot	*Daucus carota*
Indian strawberry	*Duchesnea indica*	Wild garlic	*Allium vineale*
Ivyleaf speedwell	*Veronica hederifolia*	Yellow fumewort	*Corydalis flavula*
Japanese honeysuckle	*Lonicera japonica*		
	Woody Vines		
Alabama supplejack	*Berchemia scandens*	Wild grape	*Vitis* sp.
Poison ivy	*Toxicodendron radicans*		

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not replace or refurbish the Nolichucky Dam gate and no work would be conducted that would result in ground disturbance or removal of vegetation. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within the project area. Therefore, there would be no impacts to vegetation with this alternative.

3.7.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Potential impacts to vegetation are based on vegetation clearing, and ground disturbance (e.g., placement of dredge material and grading). Table 3-6 summarizes land cover alterations for each alternative under consideration.

Table 3-6. Impacts to Land Cover from Each Project Alternative

	Alternative			
Land Cover Type	**A (No Action)**	**B-1**	**B-2**	**B-3**
Deciduous Forest	0	0.86	0	0.09
Herbaceous	0	0.33	0	0
Developed, Low Intensity	0	0.03	0	0.01
Shrub/Scrub	0	0.55	0	0
Barren Land	0	0.04	0	0.04
Open Water	0	1.03	0	1.03
Total	0	2.85	0	1.17

Vegetation in the dredge disposal areas would be impacted by the project due to the placement of the material over the areas currently covered by herbaceous and shrub-scrub vegetation. Site preparation may include cutting and or grinding of ground vegetation and understory vegetation. However, trees greater than 3 inches in diameter would not be removed from these areas. The dredge disposal Areas 1 and 2 are both previously disturbed habitats containing common plant species and an abundance of invasive species. After the Geotubes used to dewater the dredged materials are removed, the dredge spoils will be graded into the contours of the area and seeded and mulched to establish permanent vegetation cover over the areas.

The project area is previously disturbed, and invasive plants are present. BMPs consisting of erosion control measures and use of approved seed mixes designed to establish desirable vegetation would mitigate the potential spread of invasive species. In addition, the dredge spoil sites would be revegetated with native or non-native, non-invasive species such as perennial ryegrass, redtop and timothy. As such, the potential for the project to contribute to the spread of invasive plant species would be minimized, in accordance with EO 13112, and EO 13751.

There are no special plant communities within the project footprint. Additionally, the understory plant communities impacted by the project are dominated by disturbed herbaceous and shrub/scrub vegetation, and in the long term, would be replaced by replanted herbaceous vegetation that will gradually return to similar understory cover conditions. Therefore, potential impacts to vegetation are minor relative to the abundance of similar cover types within the vicinity.

3.7.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in in the Nolichucky Reservoir

Under Alternative B2, gate replacement would not require removal of vegetation from the site nor any ground disturbing activities (see Table 3-6). Therefore, there would be no impacts vegetation under this alternative.

3.7.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Under Alternative B3, approximately 1.2 acres of vegetation within Area 3 and Area 4 would be would be impacted to allow placement of riprap. As with Alternative B-1, the potential impacts to vegetation are minor relative to the abundance of similar cover types within the vicinity.

3.8 Wildlife

3.8.1 Affected Environment

Wildlife likely to occur in the project area are those species common to the ecoregion and with available habitats. The Nolichucky Dam is in the Ridge and Valley Ecoregion of Tennessee. Vegetation types in the ecoregion are mostly deciduous forests and mixed evergreen-deciduous forests among intense agriculture and urban land use. Various caves, seepages, streams, temporary ponds, and forested wetlands also provide unique wildlife habitat. Much of the original vegetation has been cleared for agriculture and most forested ridges have been previously harvested for timber—creating patches of open grasslands and edge habitats (transition zones between habitats). The Nolichucky Reservoir is managed by TVA and Tennessee Wildlife Resource Agency (TWRA) as a waterfowl sanctuary and provides additional riparian and wetland habitats (Field and Allen 1985). As described in Section 3.7, plant communities in the project footprint are classified as early successional herbaceous plants (i.e., shrub/scrub) and some deciduous forests. Edge habitats and riparian areas adjacent to the reservoir are also available.

Deciduous forests and deciduous riparian areas provide habitat for common reptiles including: eastern fence lizard, ground skink, five-lined skink, eastern box turtle, common garter snake, eastern worm snake, black racer, and ring-necked snake. Numerous bird species also nest in deciduous forests including: wild turkey, whip-poor-will, ruby-throated hummingbird, red-eyed vireo, wood thrush, gray catbird, black-throated green warbler, black-and-white warbler, ovenbird, hooded warbler, and scarlet tanager. The U.S. Fish and Wildlife Service (USFWS) has determined that two species of migratory birds of conservation concern may occur in the project area. They are the red-headed woodpecker and yellow-bellied sapsucker. Both species have the potential to forage in the deciduous forest within the project area. Mammals that inhabit mixed forests within the region include: white-tailed deer, black bear, eastern mole, and southern bog lemming. Mature trees and trees with cavities and exfoliating bark found in these forests can also provide summer-roosting habitat for common bats including big brown bats, evening bats, and red bats.

The riparian and wetland habitats around the Nolichucky Reservoir are also habitat for amphibians including: American toad, Fowler's toad, spring peeper, chorus frog, green frog, northern cricket frog, spotted salamander, red salamander, mud salamander, northern zigzag salamander, northern slimy salamander, and dusky salamander. Riparian corridors along tributary streams provide nesting habitat for Acadian flycatcher, northern parula, and Louisiana waterthrush. Mink, muskrat, raccoon, and American beaver are mammals commonly found in riparian areas near large waterbodies.

The Nolichucky Reservoir and its management as a waterfowl sanctuary results in an influx of breeding and overwintering waterfowl including wood ducks and great blue herons (Field and Allen 1985). A heronry (i.e., groups of heron/egret nesting in trees) is located 2.8 miles downstream of the Nolichucky Dam (TVA 2018). Shallow backwaters with emergent vegetation also provide quality habitat for waterfowl such as Canada geese and mallards. Exposed mudflats along the margins of the reservoir provide foraging habitat for shorebird species such as least sandpiper, killdeer, pectoral sandpiper, and spotted sandpiper. The reservoir also provides aquatic habitats for reptiles including: northern water snake, common snapping turtle, and painted turtle.

Wildlife diversity increases within edge habitats, especially between deciduous forests and successional habitats that are common in the project area. Birds commonly found along edge habitats include: wild turkey, great crested flycatcher, white-eyed vireo, Carolina wren, blue-gray gnatcatcher, brown thrasher, blue-winged warbler, prairie warbler, common yellowthroat, yellow-breasted chat, indigo bunting, eastern towhee, field sparrow, song sparrow, and orchard oriole. Birds common to early successional habitats include: eastern bluebird, northern mockingbird, eastern meadowlark, American crow, American kestrel, and red-tailed hawk. Some of these bird species may be year-round residents such as wild turkey, Carolina wren, sparrows, American crow, American kestrel, and red-tailed hawk, while others are more migratory such as warblers, indigo bunting, white-eyed vireo, common yellow throat, yellow-breasted chat, eastern towhee. Mammals expected at edges habitats and in early successional habitats include eastern cottontail, woodchuck, eastern harvest mouse, red fox, coyote, long-tailed weasel, and striped skunk

Other geologic features such as caves can provide unique wildlife habitat. According to the TVA Heritage database, 14 caves are located within 5 miles of the Nolichucky Dam. The closest cave is a small cave located 660 feet from the project area on the south bank of the Nolichucky Reservoir just downstream of the dam. The cave was surveyed in 2000, and no record of occurrence of threatened and endangered species was noted.

A survey of the project area was conducted in April 2018. A total of 13 bird species were identified during the survey. All observed species are common in the area (Table 3-7). The federally protected bald eagle was observed, but only as a flyover. No nesting habitats were found within the project site (as identified above, the one known heronry is outside of the project area). The same survey also observed white-tailed deer and grey squirrel, two mammal species common to the study area (see Table 3-7). No suitable bat roosting habitat or caves were observed on site during the field survey. No other observations of wildlife were documented as part of the 2018 field survey.

Table 3-7. Wildlife Observed Within the TVA Nolichucky Dam Project Area, April 2018

Common Name	Scientific Name
Birds	
American crow	*Corvus brachyrhynchos*
American robin	*Turdus migratorius*
Bald eagle[1]	*Haliaeetus leucocephalus*
Bluejay	*Cyanocitta cristata*
Carolina chickadee	*Poecile carolinensis*
Dark-eyed junco	*Junco hyemalis*
Eastern bluebird	*Sialia sialis*
European starling	*Sturnus vulgaris*
Great blue heron[1]	*Ardea herodias*
Northern cardinal	*Cardinalis*
Northern mockingbird	*Mimus polyglottos*
Tufted titmouse	*Baeolophus bicolor*
Turkey vulture[1]	*Cathartes aura*
Mammals	
Eastern gray squirrel	*Sciurus carolinensis*
White-tailed deer	*Odocoileus virginianus*

[1] Observed as a flyover.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

TVA would not replace or refurbish the Nolichucky Dam gate; therefore, Alternative A would have no impact to terrestrial wildlife.

3.8.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Potential impacts to terrestrial wildlife are based on loss of habitat via vegetation removal required for construction of the temporary access road, placement of dredge material, and grading.

Direct effects could include displacement of wildlife and potential loss of less mobile species. More mobile species could be displaced, but loss is less likely since they will likely disperse from the areas where vegetation is removed or where dredge material is placed and reestablish themselves once construction is complete. Most of the vegetation clearing and areas identified for dredge material placement would be on small, previously disturbed lands within the project site. These areas are primarily deciduous forest with some herbaceous and scrub/shrub cover. Tree trimming would take place along existing paved access roads on the project site. Previously developed and maintained areas on the project site are of lower quality habitats and are not likely to harbor an abundance of wildlife. During gate construction, most wildlife present within the project site would likely avoid the construction site and disperse to adjacent and/or similar habitats. Direct impacts to less mobile fauna would be expected.

No impacts are anticipated to the single cave outside of the project area. No other caves were observed during the field visit. However, should caves be identified during the project activities, they would be examined for use by wildlife, including threatened and endangered species. Precautions would be taken and the scope of the project reevaluated if threatened and endangered species are observed in any previously undocumented caves.

Over time, disturbed wildlife habitats would return to pre-construction conditions and are anticipated to eventually provide similar wildlife habitat as present conditions. Riparian conditions would take longer to return to pre-project condition, but would provide early-successional forest habitats in the interim (Swanson et al. 2011). Restoration seeding or planting that would be used to stabilize the dredged sediment in place would speed recovery of wildlife habitat. During the interim, other quality habitats outside of the project area could serve as refuge for any displaced wildlife from the small affected areas.

While the proposed project would result in alteration of habitats and displacement of resident wildlife species, impacts to wildlife are not expected to result in notable large-scale habitat alteration or destabilization of any wildlife species. Therefore, impacts to wildlife resulting from implementation of Alternative B1 would be minor.

3.8.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Under Alternative B2, TVA would not dredge the Nolichucky Reservoir and no ground disturbance or vegetation removal would occur. Therefore, there would be no wildlife habitat alteration and no impacts to terrestrial wildlife.

3.8.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Impacts associated with replacement of the existing gate and development of the access road would be the same as Alternative B1. However, under this alternative, TVA would place riprap along the banks of the Nolichucky Reservoir adjacent to the project area which could potentially affect wildlife populations in this area.

Impacts to terrestrial wildlife would be associated with shoreline disturbance due to permanent placement of riprap. Direct effects would include displacement of wildlife that would not be able to access the shoreline over piled rock. For example, shoreline birds would not be able to forage on exposed mudflats covered by riprap. However, these foraging habitats would be available along the shoreline adjacent to the project area. Additionally, the riprap could provide habitat for wildlife that occupy crevices between large rocks such as snakes, lizards, and small mammals (Fischenich 2003). Direct impact to wildlife during placement of the riprap is unlikely because most shoreline species are highly mobile, a consequence of their adaption exposure in these habitats. However, less mobile species such as hibernating reptiles and amphibians or nesting turtles could be inadvertently covered by riprap. Additionally, riprap results in a reduction of streamside vegetation, so less riparian vegetation could reduce long-term wildlife diversity. However, the section of shoreline impacted is relatively small relative to the available shoreline. Consequently, impacts to wildlife are anticipated to be minor.

3.9 Aquatic Ecology

3.9.1 Affected Environment

The Nolichucky Dam is located in Greene County, Tennessee at approximately river mile 45.8, in the Southern Limestone/ Dolomite Valleys and Low Rolling Hills level IV sub-ecoregion of the Ridge and Valley level III ecoregion (Griffith et al. 2009). The proposed activities would occur in the Cove Creek - Nolichucky River (0601010807) 10-digit HUC watershed.

The TVA Water Permitting, Compliance and Monitoring group conducts Index of Biotic Integrity (IBI) surveys in waterbodies across the Power Service Area to monitor stream health and detect long term trends. An IBI sample site on the Nolichucky River at NRM 42.3 was conducted in 2000, and scored good/ excellent indicating a healthy aquatic community. The most common fish collected was the highland shiner, spotfin shiner, and mimic shiner. An IBI sample site at NRM 50.3 (above the dam) conducted in 2000, scored poor/fair. The most common fish collected at this site was spotfin shiner, mimic shiner, and redbreast sunfish.

A sediment analysis report was conducted to survey the river bottom behind the dam and to determine what level of sediment could be transported by various flows over and through the dam (West 2018). The survey of the river bottom indicated that there is a small accumulation of sediment immediately at the dam, followed by a large scour hole caused by the turbulence of the flowing river hitting the dam. The scour hole extends approximately 100-110 feet upstream. Then, upstream of that scour hole is a large sediment deposit, referred to as a sediment wedge, that extends 760 feet upstream. The sediment wedge was estimated to contain approximately 96,296 yd^3 of accumulated sediments.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not replace or refurbish the Nolichucky Dam gate. Changes to aquatic ecology would likely occur within the watershed over the long term due to factors such as the continuation of land use activities and population growth. However, no impacts to aquatic ecology would occur as a result of TVA actions.

3.9.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Under Alternative B1, the existing concrete bulkhead, gate would be removed and a new gate and hoisting system would be installed. Over time, sediment has built up on the upstream side of the dam. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of fish and mussel species (Brim Box and Mossa 1999; Sutherland et al. 2002). Temporary sediment containment BMPs would be installed during dredging to prevent sediment from moving downstream. Under this alternative, TVA would dredge up to 10,000 yd^3 of built up sediment from the reservoir. As this area is mostly silted in from decades of sediment deposit, it provides minimal habitat for aquatic species. As the area of impact is relatively small given the overall size of the reservoir and given the depleted nature of the habitat, the dredge removal of sediment below the water line in this area would have minimal impacts to aquatic species and their habitats. Additionally, with proper implementation of dredging BMPs around the dredging operation, impacts to the aquatic ecology within the project area would be minimal.

A small area immediately behind the gate would not be able to be dredged due to safety and access concerns. The sediment analysis (West 2018), determined that due to the low shear stress values of the sediment behind the dam, the amount of scour from the opening of the gate would be only a few feet with the maximum scour after 3 days estimated to be less than 1.9 feet. Because the amount of sediment projected to be mobilized to downstream areas is relatively small and transported by relatively high current velocities, it is expected that deposition of sediments would be more widespread and not result in the burial of aquatic biota. Additionally, the model showed that the natural high flow scenario of 13,000 cfs generated much higher TSS concentrations (600 mg/L) and much higher sediment loads than the estimated TSS concentration associated with the proposed release of sediment. Therefore, the release of a minor amount of sediment when the gate is initially opened would cause minor impacts to aquatic species. However, these impacts would be of short duration and deposition is not expected to be widespread.

Water levels behind the dam would be lowered to facilitate dam safety inspections. However, the reservoir would only be lowered a minimal amount and for short durations. Therefore, there would be insignificant impacts to aquatic species and habitats upstream of the dam during gate operation.

3.9.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in in the Nolichucky Reservoir

This alternative would be the same as Alternative B1. However, TVA would not dredge sediment on the upstream side of the dam. As described in Alternative B1, the small accumulation of sediment immediately behind the dam, would pass through the gate once it was opened. Impacts to the aquatic ecology downstream of the dam would mirror and be similar to those described for Alternative B1.The sediment transport analysis indicated that normal flows over the sediment deposit upstream of the dam would not erode when the gate was brought back into service. Water levels would be manipulated as described in Alternative B1 to facilitate dam safety inspections, and impacts would be insignificant.

3.9.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

This alternative would be the similar to Alternative B1. However, TVA would not dredge and would place smaller stone overlain by riprap upstream of the dam in the reservoir and on exposed banks identified in the sediment transport study to stabilize the sediment. As this area is mostly silted in from decades of sediment deposit, it provides minimal habitat for aquatic species. As the area of impact is relatively small given the overall size of the reservoir and the depleted nature of the habitat, the placement of riprap below the water line in this area would have minor impacts to aquatic species and their habitats. Water levels would be manipulated as described in Alterative B1 to facilitate dam safety inspections, and impacts would be insignificant.

As described in Alternative B1, the small buildup of sediment immediately behind the dam however, would pass through the gate once it was opened. Impacts to the aquatic ecology downstream of the dam would be similar to those described for Alternative B1 and minor.

3.10 Threatened and Endangered Species

3.10.1 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. Section 7 of the ESA requires federal agencies to consult with the USFWS when their proposed actions may affect endangered or threatened species and their critical habitats. To assist this process, the USFWS Information for Planning and Conservation (IPaC) tool was created as an initial desktop search for federally-listed species and critical habitats that potentially occur near a proposed project.

The State of Tennessee provides additional protections for species considered threatened, endangered, or deemed in need of management within the state beyond those species 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 state-protected species is managed by the Tennessee Department of Environment and Conservation (TDEC). Additionally, TVA maintains databases of aquatic and terrestrial animal species that are considered threatened, endangered, of special concern, or are otherwise tracked because the species is rare and/or vulnerable within the state. This repository of information is called the TVA Regional Natural Heritage database.

A review of the federal, state, and TVA databases was conducted to determine the presence or potential occurrence of threatened or endangered species within a 5-mile radius of the project area for plants and a 3-mile radius for wildlife. In addition to the database searches, a field survey of the project area was conducted in March 2018. Table 3-8 presents the results of database searches and shows animal species of Conservation Concern in Greene County and those listed by the USFWS as threatened or endangered. Plants species of Conservation Concern are shown in Table 3-9. Of the species listed in the table, those that have suitable habitat present in the project area (i.e., a ‘P’ in the ‘Suitable Habitat Present’ column) are discussed in the following sections. All others have no known records of occurrence and no suitable habitat in the project area.

.

Table 3-8. Federally Listed Animal Species Reported from Greene County, Tennessee and Other Species of Conservation Concern Within 5 Miles of the Nolichucky Dam Project Area or Within the Cove Creek-Nolichucky River HUC Watershed (0601010807)

Common Name	Scientific Name	Status: Federal[1]	Status: State Rank[2,3]	Suitable Habitat Present in Project Area[4]
Amphibians				
Hellbender	*Cryptobranchus alleganiensis*	--	D (S3)	N
Pygmy Salamander	*Desmognathus wrighti*	--	D (S2S3)	N
Crustaceans				
a Cave Obligate Isopod	*Caecidotea nortoni*	--	Rare (S1S2)	N
Birds				
Barn Owl	*Tyto alba*	--	D (S3)	P
Common Raven	*Corvus corax*	--	T (S2)	N
Mammals				
Eastern Small-footed Bat	*Myotis leibii*	--	D (S2S3)	P
Gray Bat	*Myotis grisescens*	LE	E (S2)	P
Hairy-tailed mole	*Parascalops breweri*	--	D (S3)	P
Indiana Bat	*Myotis sodalis*	LE	E (S1)	P
Little Brown Bat	*Myotis lucifugus*	--	Rare (S3)	P
Northern Long-eared Bat	*Myotis septentrionalis*	LT	Rare (S1S2)	P
Smoky Shrew	*Sorex fumeus*	--	D (S4)	N
Southern Bog Lemming	*Synaptomys cooperi*	--	D (S4)	N
Tri-colored Bat	*Perimyotis subflavus*	--	Rare (S2S3)	P
Insects				
Carabid Beetle	*Trechus caliginis*	--	Rare (S1)	N
Carabid Beetle	*Trechus hydropicus beutenmuelleri*	--	Rare (S2S3)	N
Carabid Beetle	*Trechus inexpectatus*	--	Rare (S1)	N
Carabid Beetle	*Trechus vandykei*	--	Rare (S3)	N
Diana Fritillary	*Speyeria diana*	--	Rare (S3)	P
Rusty Patched Bumble Bee	*Bombus affinis*	LE	Rare (S1)	N
Fishes				
Blue Sucker	*Cycleptus elongates*		T (S2)	PD
Highfin Carpsucker	*Carpiodes velifer*		D (S2S3)	PD
Tangerine Darter	*Percina aurantiaca*		D (S3)	PD
Mussels				
Birdwing Pearlymussel	*Lemiox rimosus*	LE	E (S1)	PD
Cumberland Bean	*Villosa trabalis*	LE	E (S1)	PD
Cumberlandian Combshell	*Epioblasma brevidens*	LE	E (S1)	PD
Fluted Kidneyshell	*Ptychobranchus subtentus*	LE	(S2)	PD
Oyster Mussel	*Epioblasma capsaeformis*	LE	E (S1)	PD
Pink Mucket	*Lampsilis abrupta*	LE	E (S2)	PD
Rayed Bean	*Villosa fabalis*	LE	(S1)	PD

Common Name	Scientific Name	Status: Federal[1]	Status: State Rank[2,3]	Suitable Habitat Present in Project Area[4]
Slabside Pearlymussel	*Pleuronaia dolabelloides*	LE	(S2)	PD
Spectaclecase	*Cumberlandia monodonta*	LE	(S2S3)	PD

Sources: TDEC 2018b, TVA 2018, and USFWS IPaC 2018

[1] Federal Status Codes:
LE = Listed Endangered
LT = Listed Threatened; -- = Not Listed by USFWS

[2] State Status Codes:
E = listed endangered
T = listed threatened D = deemed in need of management
Rare = rare, but not state listed CE = commercially exploited

[3] State Rank:
S1 = critically imperiled S2 = imperiled
S3 = vulnerable S4 = apparently secure
S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

[4] Habitat Codes:
Y = Yes, species has been documented in existing habitats in study area and suitable habitat is present
N = No, no records of species within study area and no suitable habitat is present
P = Potentially suitable habitat is present, but no records of species in study area
PD = Potentially suitable habitat is present downstream of dam, but no records of species in study area

Table 3-9. Habitat Requirements for Plant Species of Conservation Concern Within Surrounding Counties and Within 5 Miles of the Nolichucky Dam

Common Name	Habitat Requirements	Habitat Within Project Area[8]
American Barberry	Open woods, bluffs and cliffs, and river banks[1]	P
American Ginseng	Occur in rich, cool, moist woods under a closed canopy. Primarily occur on slopes or ravines in hardwood-dominated or mixed forest[1]	N
American Water-Pennywort	Marshes, swamps, forest floodplains, and seeps[2]	N
Appalachian Waterleaf	Moist woods, floodplains[2]	P
Ash-Leaved Bush-Pea	Roadsides and dry open woods[1]	N
Blue Ridge St. John's Wort	Seepage slopes and spray areas near falls at higher elevations[1]	N
Branching Whitlow Grass	Dry sandy or rocky soil, prairies, rock outcrops, roadsides[2]	N
Broadleaf Bunchflower	Oak forest[3]	N
Broad-Leaved Tickseed	Rich, hardwood forested mountain coves and slopes; well-drained, shady sandy loams[1]	N
Choke Cherry	Moist coves and slopes in thin stands as dense thickets or individually in open forest clearings[3,4]	N
Climbing Fumitory	Dry to moist hardwood or coniferous woods[5]	N
Cow-Parsnip	Bottomland woodlands, terraces of floodplain woodlands, borders, riverside prairies, thickets, streambanks, and partially shaded roadsides[6]	P
Dwarf Rattlesnake-Plantain	Moist conifer/rhododendron woods[3]	N
Eastern Turkeybeard	Dry oak-hickory with component of piney woods, mountain woods[1,3]	N
Fowl Bluegrass	Wet balds[3]	N
Fringed Black Bindweed	Dry rocky woods, thickets, dry disturbed soil, open fields[2,3]	N
Giant Blue Cohosh	Mixed deciduous forest, open oak-hickory-dogwood forest, sugar maple forest[1]	N
Green-and-Gold	Dry woods and openings[3]	N
Hairy Willow-Herb	Mountain balds[3]	N
Large Purple Fringed Orchid	Cool moist woods, wet meadows, swamp edges[7]	P (limited)
Liverwort	Deeply shaded, wet, noncalcareous rocks in montane habitat. Usually by waterfalls or cascades or on dripping rocks[1]	N
Marsh Bellflower	Wet meadows, swamps, along shores, bogs[1,2]	N

Common Name	Habitat Requirements	Habitat Within Project Area[8]
Marsh Marigold	Wet habitats such as marshes, fens, wet woods, swamps, or ditches[3]	N
Minniebush	Heath balds and cliffs[3]	N
Mountain Witch Alder	Dry ridgetop forests of middle elevation ridges in mountains[1]	N
Northern Long Sedge	Wet soils, wetlands[3]	N
Northern Starflower	Mountain hardwood forests[3]	N
Ovate Catchfly	Open or forested sandy or pebbly habitats including floodplains[1]	N
Pale Corydalis	Dry or rocky woods, boreal forests, lake shores[2,3]	N
Piratebush	Mountain woods at lower elevations with variety of habitats including pine and acidic mixed-oak forests[1]	N
Purple Milkweed	Fields, thickets, open woods, along shores[2]	N
Ramps	Mesic deciduous woodlands and wooded bluffs[6]	N
Rosy Twisted-Stalk	Moist woods and thickets in mountains often in hemlock stands[1]	N
Running Bittercress	In seepages, on mountain streambanks[1,3]	N
Small Purple Fringed Orchid	Moist woods, swamps, marshes, wet meadows, shorelines[2]	N
Spreading Rockcress	Moist rocky woods, limestone outcrops, and shady riverbanks[1]	N
Swamp Lousewort	Swamps, fens, seeps and springs, sedge meadows, wet sand prairies, and sandy ditches[6]	N
Sweet Pinesap	Upland woods, usually in acidic soil[7]	N
White-leaved Sunflower	Shade of hardwood forests or at their edges, and generally on steep slopes[1]	N

Sources:
[1] NatureServe
[2] Minnesota Wildflowers
[3] Tennessee Department of Environment and Conservation
[4] NRCS
[5] Wisconsin Department of Natural Resources
[6] Illinois Wildflowers
[7] Lady Bird Johnson Wildflower Center
[8] Habitat Codes:

Y = Yes, species has been documented in existing habitats in study area and suitable habitat is present
N = No, no records of species within study area and no suitable habitat is present
P = Potentially suitable habitat is present, but no records of species in study area

3.10.1.1 Terrestrial Animals

3.10.1.2 Birds

One bird species, the barn owl, has potential habitat in the study area (TDEC 2018), but no observations have been made at or near the proposed project (TVA 2017). The barn owl prefers open and partly open country including grasslands, deserts, marshes, agricultural fields, strips of forests, woodlots, ranchlands, brushy fields, and suburbs and cities (Cornell Lab of Ornithology 2017). The open fields and patches of forest in the project area are suitable habitat for the barn owl, however, no known records occur within 3 miles of the Nolichucky Dam. Additionally, none of the birds observed during the March 2018 project-site visit was a state- or federally-listed species (see Section 3.8 Wildlife).

3.10.1.3 Mammals

Six bat species and one other mammal species, the hairy-tailed mole, have potential habitat in the study area (TDEC 2018; USFWS 2018), but no capture records exist for these species within 3 miles of the proposed project (TVA 2017). Although no summer or winter habitat exists throughout the project area for most of the listed bat species, there is available suitable foraging habitat within the project area for all of the listed bat species along the Nolichucky River and the adjacent wetland located to the river.

Bats

Eastern small-footed bat is primarily found in hilly or mountainous forests. This species forages over ponds and riparian areas, as well as in upland habitats such as open forests, clearings, strip mines, and ridgetops. Warm season roosts are generally in cracks and crevices of rocks along talus slopes or rocky outcroppings. Eastern small-footed bat is also known to use manmade structures for warm season roosts. This species is known to return to the same summer roosts annually (NatureServe, 2018). No summer roost habitat or winter hibernation habitat is present within the project area, but this species may be found foraging in or near the project area along the Nolichucky River and the adjacent wetland.

Gray bat almost exclusively roosts in large caves found in Alabama, Arkansas, Kentucky, Missouri, and Tennessee with some smaller populations found in nearby states. This species is sometimes found roosting in mines or buildings. Adults and their young require forested areas along banks, streams, or lakes near the entrance to their cave roosts. Suitable roosting habitat for gray bat is not present within the proposed project area, however, there is a cave approximately 660 feet from the project area. Records indicate that no threatened and endangered bats occur here. Along the Nolichucky River and the adjacent wetland within the project area, there is potential foraging habitat available to the gray bat.

The Indiana bat is listed as federally endangered by the USFWS (Pruitt 2007). The species overwinters in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour and Davis 1974). The Indiana bat disperses from wintering caves to areas throughout the eastern United States. This species ranges from New York and New Hampshire in the north to Alabama, Georgia, and Mississippi in the south, and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with suitable exfoliating bark represent suitable summer roosting habitat. Use of living trees, especially species such as shagbark hickory, mature white oaks, and other trees with suitable roost characteristics near suitable snags, has also been documented. Multiple roost sites are generally selected.

The availability of trees of a sufficient bark condition, size, and sun exposure is another important limiting factor in how large a population an area can sustain (Tuttle and Kennedy 2002; Harvey 2002; Kurta et al. 2002). No summer roost habitat and winter hibernation habitat is present within the project area, but the Indiana bat may be found foraging in or near the project area along the Nolichucky River and the adjacent wetland.

The little brown bat is found throughout the majority of the United States. This species uses a wide range of habitats for summer roosting including hollow trees, and man-made structures. During the winter, the little brown bat has been seen hibernating in caves, tunnels, and abandoned mines. Foraging habitats requirements are generalized and include areas over water, along the margins of lakes and streams, or in woodlands near water. Within the project area, no potential suitable summer or winter habitat exists for the little brown bat; however, foraging habitat is available in the Nolichucky River and in the adjacent wetland within the project limits.

Northern long-eared bat is found in the United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming, and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and with high humidity and minimal air currents. During summer, this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter greater than or equal to 3 inches). Males and non-reproductive females may also roost in cooler places, like caves and mines. In general, habitat use by northern long-eared bat is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2016). No summer roost habitat and winter hibernation habitat is present within the project area, but the northern long-eared bat may be found foraging in or near the project area along the Nolichucky River and the adjacent wetland.

Tri-colored bat is found in the United States from Maine to Florida and westward through New Mexico. This species is found in forested landscapes where they forage near trees and along waterways. During summer roosting season, this species can be found mainly in dead or live tree foliage, caves, mines, rock crevices, and man-made structures. In the winter, hibernation occurs in caves, mines, or cave-like tunnels especially near forested areas (NatureServe, 2018). Within the project area, very limited potential suitable summer habitat is present in dead and live tree foliage, but no winter habitat exists for the tri-colored bat. Foraging habitat is available in the Nolichucky River and in the adjacent wetland within the project limits.

A March 2018 field survey was conducted to determine the potential bat habitat suitability of the Nolichucky Dam project area. Based on this survey, it was determined that the trees on-site do not represent suitable summer roosting habitat for the Indiana little brown bat, or northern long-eared bat (Wood 2018). Trees and snags located within the forested areas of the project area did not exhibit exfoliating bark, cracks, or hollows and therefore were not suitable bat roosting habitat. A limited amount of potential summer habitat exists for the tri-colored bat due to tree foliage. No suitable winter roosting or hibernacula sites are present within the project area for any of the bat species. There is one cave located approximately 660 feet downstream from the proposed project area, however there are no records of threatened and endangered species occurring here. Higher quality foraging habitats are available in and near the Nolichucky River and the adjacent wetland within the study area.

Other Mammals

The hairy-tailed mole prefers habitats in deciduous woodlands with thick humus and is adapted to second growth stands, old fields, and hedgerows (NatureServe 2018). There may be some potential habitat within the deciduous forests in the project area, but the potential suitable habitat is limited. There are no records of the hairy-tailed mole occurring within 3 miles of the project area.

3.10.1.4 Insects

Diana fritillary is a butterfly that breeds in deciduous and mixed forests with violets in the understory. Most habitats are generally mesic, such as cover forests and sometimes bottomlands. Additional habitat includes adjacent fields, pastures, shrublands, and grasslands. Within the project area, forest edges and openings, as well as grasslands provide suitable habitat for the Diana fritillary.

3.10.1.5 Aquatic Animals

A total of nine federally listed mussels and three additional state-listed fish are known to occur within the Cove Creek-Nolichucky River 10-digit HUC watershed (0601010807) (Table 3-8). The TWRA, as part of their annual mussel recovery activities, translocated the birdwing pearlymussel, Cumberlandian combshell, oyster mussel, and fluted kidneyshell in 2017 at approximately river mile 29.3.

The habitat requirements for each of the listed aquatic species generally include swift currents with riffles, sand, gravel or cobble substrates and well oxygenated waters. These general conditions occur downstream from the Nolichucky Dam in the “run” sections of the Nolichucky River. However, due to the impoundment, aquatic conditions upstream of the dam consist of slower water and a sediment laden substrate and are not generally suitable to support these listed species.

3.10.1.6 Plants

A review of the TVA Regional Natural Heritage database indicated that no federally listed plants occur in Greene County, Tennessee, however, plants listed by TDEC as threatened, endangered, or species in need of management are shown in Table 3-9. Preferred habitat for each species and the possibility of habitat within the project area are addressed in Table 3-9. Sixteen listed plant species have habitat requirements that overlap with the habitats present in the study area (TDEC 2018). Branching whitlow grass (or whitlow wort) is the only protected plant species documented within 5 miles of the proposed project (TVA 2018), but it does not have suitable habitat in the project area. Although some of the listed plant species habitat requirements overlap with habitats within the project area, a vegetation reconnaissance survey in March 2018 found no protected species within the project area (Wood 2018). Additionally, those listed species that have habitat requirements that include wetland areas are likely not to occur in the emergent wetland found within the project area because the wetland was of low floristic quality.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not replace or refurbish the Nolichucky Dam gate. Therefore, no impacts to threatened or endangered species, species of conservation concern, or critical habitat would occur under this alternative.

3.10.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Potential impacts to terrestrial protected species could result from vegetation clearing and ground disturbance (e.g., placement of dredge material and grading). Direct effects could include displacement and incidental take of protected species. Of the federally or state-listed animal and plant species with potentially suitable habitat present in the study area, seven species may have habitat requirements that potentially overlap with the habitats of study area.

Lack of rocky outcrops and sandy soils means the potential occurrence of branched whitlow grass is low. The barn owl, hairy-tailed mole, tri-colored bat and Diana fritillary, have potential suitable habitats in the project area; however, no listed species are known to occur within the project area. Three plant species have habitat requirements that overlap with habitat within the project area; however, no threatened and endangered species were identified during the 2018 vegetation survey of the area. Additionally, the project area has been previously disturbed and the likelihood of threatened and endangered species occurring in the project area is low. Similar and/or higher quality habitats with characteristics that are consistent with the published habitats of these species is readily available in the vicinity of the project area.

For potential suitable bat habitat, field surveys conducted in March 2018 confirmed that no potential suitable summer roosting habitat is available within the project limits, except for tri-colored bats, which could use dead or live foliage as roosting habitat. There are no previous records of this species within the project area. Bat foraging habitats may be impacted by vegetation clearing, but only 0.1 acre of riparian forests (to allow construction of the access road) would be disturbed. For all threatened and endangered bat species that could potentially occur around the project area, there is potential suitable foraging habitat over the Nolichucky River and the adjacent wetland in the project area. As discussed in Section 3-4, sediment deposition due to the project is expected to be minimal and widespread, and is therefore not expected to reduce foraging habitat, or have any substantial impacts on population of prey species consumed by bats.

A cave exists 660 feet downstream from the Nolichucky dam; however, there are no records of any threatened and endangered species occurring within the cave. Although the cave's elevation is not documented, it is noted to occur along the Nolichucky River, and therefore could occur along the edge of the Nolichucky River. Short term effects of sediment deposition may occur downstream in the cave, if it is at an elevation that allows direct water flow into the cave. If the cave opening(s) are above the flood elevation of the river and only groundwater connections occur, impacts due to sediment deposition would not be likely. As sediment transport downstream is expected to be minimal and no known records of listed species occur in the cave, the project is not expected to result in impacts to listed cave dwelling species.

Over time, sediment has accumulated on the upstream side of the dam. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of fish and mussel species (Brim Box and Mossa 1999; Sutherland et al. 2002). A temporary sediment containment system would be installed during construction to prevent sediment from moving downstream. Under this alternative up to 10,000 cubic yards of sediment would be dredged and removed to prevent it from being released downstream through the new gate when it is opened. However, a small amount of sediment has built up immediately against the dam which cannot be dredged due to safety and access concerns. Based on the sediment transport study, the amount of scour from this deposit against the dam from the opening of the gate is expected to be limited to less than 1.9 feet.

Suitable habitat for the aquatic species listed within Table 3-8 does not occur upstream of the dam within the areas that dredging would occur, and therefore no species would be impacted directly from the dredge operations The TWRA mussel recovery site is located approximately 17 river miles downstream from Nolichucky Dam. Because of the potential presence of species of concern in the tailwater area, and the potential for limited transport and deposition of sediments during the initial gate opening process, TVA has determined the proposed actions in Alternative B1 “May Affect, Not Likely to Adversely Affect” federally protected mussels that may occur within the Nolichucky dam tailwater. This determination is pending consultation with the USFWS.

No impacts are expected for terrestrial federally and state-listed species whose habitat requirements are not consistent with site conditions. For those species that are reported to have more generalized habitat preferences that overlap with some of the habitats within the project area, no impacts are expected for several reasons. First, there are no known records of these species within the area. Second, the size of the impact area is small which further reduces the likelihood of impacting individuals or populations of these species. Lastly, the existing habitats within the project impact areas have been previously disturbed and no high quality or unique habitats currently exist. Finally, following completion of the project, similar habitats will become reestablished in the impacted areas thus providing similar conditions in the long term.

3.10.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Under this alternative no dredging or sediment placement would occur and no listed terrestrial species are known to occur within the project area. Therefore no impacts to terrestrial state or federally listed species would occur.

For aquatic species, the results of the sediment transport model indicated that the large sediment “wedge” located behind the dam would not scour or erode under normal flows. However, the small amount of sediment immediately upstream of the dam would be released when the gate is opened. The sediment transport study indicated a scour depth of 1.9 feet. Similar to Alternative B1, because of the potential presence of species of concern in the tailwater area, and the potential for limited transport and deposition of sediments during the initial gate opening process, TVA has determined the proposed actions “May Affect, Not Likely to Adversely Affect” federally protected mussel species. This determination is pending consultation with the USFWS.

3.10.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Impacts under this alternative to terrestrial threatened and endangered species would be similar to those described for Alternative B1.

As suitable habitat for state and federally listed threatened and endangered species does not exist upstream of the dam, there will be no impacts from the application of up to 4,500 yd^3 of riprap within the reservoir.

The sediment adjacent to the dam would be released when the gate is opened as described in Alternatives B1 and B2. Consequently, TVA has determined the proposed actions under this alternative “May Affect, Not Likely to Adversely Affect” federally protected mussel species. This determination is pending consultation with the USFWS.

3.11 Wetlands

3.11.1 Affected Environment

The USACE regulates the discharge of fill material into waters of the United States, including wetlands, pursuant to Section 404 of the CWA (33 United States Code 1344). Additionally, EO 11990 (Protection of Wetlands) requires federal agencies to avoid, to the extent possible, adverse impacts to wetlands and 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, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands and wetland fringe areas also can 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.

The National Wetland Inventory (NWI) identifies 4.7 acres of open water within the project area and does not identify any vegetated wetland areas. A field delineation within the project area was performed in March 2018 and identified one emergent wetland (Wood 2018). Potential jurisdictional wetlands were evaluated in accordance with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) and TVARAM protocol. The delineated wetland is located behind the dam where the accumulation of alluvial sediment has resulted in a transition from open water to an emergent wetland (see Figure 3-2). Final determinations regarding jurisdiction and mitigation measures will be identified by USACE during the Section 404 permitting process, if needed.

Land use/land cover data within a 5-mile radius of the project area shows that wetlands comprise approximately 0.4 percent (235 acres) of the surrounding lands and are comprised entirely of forested wetlands (see Section 3.7).

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not replace or refurbish the Nolichucky Dam gate. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within the project area. Therefore, there would be no impacts to wetland resources under this alternative.

3.11.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

There are no wetland resources located within the area proposed for dredging or within the three proposed work areas identified in Figure 3-2. Therefore, there would be no temporary or permanent impacts to wetlands under this alternative. However, potential indirect impacts could include erosion and sedimentation into the field delineated wetland from stormwater runoff during site preparation, dredge material placement and construction of the access road. BMPs in accordance with site-specific erosion control plans would be implemented to minimize this impact and as such, indirect impacts to wetland areas due to construction activities would be short-term and minor.

3.11.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Implementation of this alternative would not include placement of dredged material or construction of the access road. Therefore there would be no impacts to wetlands...

3.11.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Placement of riprap would avoid the wetland and therefore there would be no direct impacts to the wetland within the project area. However, potential indirect impacts resulting from the proposed work could include erosion and sedimentation from stormwater runoff during construction of the access road. Therefore, impacts to wetlands under this alternative would be short-term and minor.

3.12 Visual Resources

3.12.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service (USFS) and integrated with planning methods used by TVA. The classification process is also based on fundamental methodology and descriptions adapted from Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook Number 701 (USFS 1995).

Visual resources are evaluated based on a number of factors including existing landscape character and scenic integrity. Landscape character is an overall visual and cultural impression of landscape attributes, and scenic integrity is based on the degree of visual unity and wholeness of the natural landscape character. The varied combinations of natural features and human alterations both shape landscape character and help define their scenic importance. The subjective perceptions of a landscape's aesthetic quality (scenic attractiveness) and sense of place is dependent on where and how it is viewed.

Views of the landscape are described in terms of three distance contexts: foreground, middleground, and background. In the foreground, an area within 0.5 mile of the observer, individual details of specific objects are important and easily distinguished. In the middleground, from 0.5 to 4 miles from the observer, object characteristics are distinguishable but their details are weak and they tend to merge into larger patterns. In the distant part of the landscape, the background, details and colors of objects are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. In this assessment the background is measured as 4 to 10 miles from the observer. Visual and aesthetic impacts associated with a particular action may occur as a result of the introduction of a feature that is not consistent with the existing viewshed. Consequently, the character of an existing site is an important factor in evaluating potential visual impacts.

The affected environment includes the study area and encompasses all of the identified work areas as well as the physical and natural features of the landscape. The river corridor is wooded with steep rocky banks. The study area is relatively flat and slopes towards the river. Prominent visual features of the study area are the dam, powerhouse, the Nolichucky substation and overhead transmission lines and the State Route 70 bridge. The study area is surrounded by low density residential development to the north, undeveloped land to the east and west, the Nolichucky River to the south. Some residential and agricultural lands are located on the south side of the Nolichucky River. Thus, this area combines natural elements (including rolling hills of forested areas) with industrial elements (including the substation, the dam, overhead electrical transmission towers and wires), which creates a disjointed visual experience for the observer. As such, scenic attractiveness in this area is common, scenic integrity is low. Limited parts of the river can be viewed by motorists at the bridge crossing where the river is in the immediate foreground and middleground. This site is also viewed by recreational boaters and the bridge crossing and dam are seen in the foreground. However, the proposed work dredge material placement areas, laydown and parking areas would not be visible from the reservoir given the change in elevation and forest cover.

3.12.2 Environmental Consequences

3.12.2.1 Alternative A – No Action

Under Alternative A, no gate modifications would be constructed by TVA resulting in no changes to the existing visual environment.

3.12.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Dredging and replacing the gate would include heavy equipment use and increased truck traffic. As such there would be some visual discord from the existing condition due to an increase in personnel and equipment including the hydraulic dredge in the area. This increase in visual discord would be temporary and only last until construction is completed.

Removal of existing trees to support the access road and clearing and grubbing of some vegetation on the dredge material placement areas would affect the scenic integrity of the site as it would alter the naturally appearing landscape character. These disruptions would only be viewed in the foreground by workers accessing the substation as public access to the site is restricted. This disruption would not be discernable to local residents, motorists using the bridge or recreational boaters as views of these areas are obstructed by trees and the dredge material placement areas are already disturbed sites and as such the change in visual discord would be minor.

The new or refurbished gate would replace the existing inoperable gate and as such there would be no change in the visual landscape. Periodic drawdown of the reservoir to allow inspection of the spillway would expose rock and soil surrounding the river that would be visible to recreational boaters in the immediate vicinity of the project area. However, inspections are not anticipated to last longer than one day and would only occur one to two times per year. Therefore, the impact would be minor and temporary.

Overall, the proposed construction activities and long-term operation of the gate would result in a minor temporary impact on visual resources. Long-term impacts would be minor given existing industrial nature and limited visibility of the proposed dredge disposal sites. In addition, the new or refurbished gate would replace the existing abandoned gate and would not change the visual integrity of the existing dam.

3.12.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Adoption of this alternative would involve construction activity at the dam site which would result in changes in the visual setting of the area as described under Alternative B1. However, TVA would not dredge the reservoir and therefore there would be no long term visual change to the project area resulting from the dredge spoil areas. Impacts to visual resources would be temporary and minor, yet less than Alternative B1.

3.12.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Under Alternative B3, the increase in visual discord associated with the replacement of the gate and placement of riprap would be similar to that described for Alternative B1 and as such would be temporary and minor.

Permanent impacts would include minor discernible alterations that would be viewed in the foreground of boaters on the reservoir as well as motorists using the bridge. However, the riprap would be similar to the existing viewshed of the site given the presence of the dam and powerhouse. Therefore, visual impacts under this alternative would be minor.

3.13 Cultural and Historic Resources

3.13.1 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 a 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 defined as the affected environment for purposes of this EA. TVA defined the APE to be the following: the footprint and viewshed of the Nolichucky hydroelectric facility, including the dam, powerhouse, and adjacent dam reservation where laydown, parking, dredge disposal, and access is proposed. This APE includes a 0.5-mile radius with direct line of sight to surrounding land tracts to account for visual effects to historic structures.

TVA is unaware of previous systematic archaeological surveys within the APE, but prehistoric and historic archaeological sites may exist within the APE. In May of 2018, TVA contracted with Cultural Resource Analysts, Inc. (CRA) to perform an archaeological survey of the 14.7-acre project footprint. CRA documented the results in a report titled Phase I Archaeological Survey at Nolichucky Dam Reservation, Greene County, Tennessee (Bradbury and Ross 2018). CRA identified one archaeological site consisting of a scatter of prehistoric stone tool manufacturing debris and historic artifacts. TVA has determined the site to be ineligible for the NRHP.

A review of the Tennessee Historical Commission Viewer and TVA’s Integrated Cultural Database indicates that the Nolichucky hydroelectric facility, determined eligible for listing in the NRHP lies within the APE. The Tennessee Historical Commission has determined the Nolichucky hydroelectric facility to be eligible for listing in the NRHP under the Pre-TVA Hydroelectric Development in Tennessee, 1901-1933 multiple property submission.

TVA considers effects to historic properties pursuant to Section 106 of the NHPA. Historic photographs and documentation indicate that the existing gate was installed between 1972 and 1975, as a part of improvements and rehabilitation to the site associated with the development of a waterfowl sanctuary combined with an environmental education and nature study program. TVA finds that the Nolichucky facility remains eligible despite alterations to the powerhouse and dam. As a key component of the historic function and operation of the facility, the dam is a contributing resource of the NRHP-eligible Nolichucky facility.

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.

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action

As Alternative A would not authorize any changes to the design or operation of the dam, this alternative would have no effect to historic properties.

3.13.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

The proposed gate improvements under Alternative B1 would involve the replacement of the existing gate within the existing concrete support with either one door or two sluice gates. With either design, it will be similar to the design and function of the current gate and will be a replacement of non-historic elements of the dam. However, the gate replacements are not expected to adversely affect the dam as a key component of the historic function and operation of the facility, or its contribution to the NRHP-eligibility of the Nolichucky facility.

Alternative B1 includes the area subjected to archaeological survey where no NRHP-listed or eligible archaeological sites were identified; therefore, Alternative B1 would have no effect to NRHP-eligible or listed archaeological sites. Therefore, Alternative B1 will have no adverse effect to historic properties.

3.13.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Similar to Alternative B1, Alternative B2 will involve the replacement of the existing gate with one of two design options—either a single gate or two sluice gates. As such, impacts to historic properties from gate replacement are similar to those described for Alternative B1. Therefore, Alternative B2 will have no adverse effect to historic properties.

3.13.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Similar to Alternatives B1 and B2, Alternative B3 will involve the replacement of the existing gate with one of two design options. As such, impacts to historic properties from gate replacement are similar to those described for Alternative B1. Therefore, Alternative B3 will have no adverse effect to historic properties.

TVA is currently in the process of consulting with the Tennessee SHPO for concurrence with TVA's effect 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, Kialegee Tribal Town, Muscogee (Creek) Nation, Thlopthlocco Tribal Town, and the United Keetoowah Band of Cherokee Indians in Oklahoma.

3.14 Natural Areas

3.14.1 Affected Environment

Natural areas include managed areas, ecologically significant sites, and Nationwide Rivers Inventory (NRI) 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 NRI 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 and managed areas that are on, immediately adjacent to (within 0.5 mile), or within the vicinity of the project area (5-mile radius). As noted in Table 3-10 and illustrated in Figure 3-6, several natural and managed areas are located within 5 miles of the Nolichucky Dam.

Table 3-10. Natural and Managed Areas Within the Vicinity of Nolichucky Dam

Natural Area	Managing Agency
Davy Crockett Lake Potential National Natural Landmark	National Park Service
Nolichucky State WMA	TWRA
North Cherokee National Forest	USDA Forest Service
North Cherokee WMA	TWRA
Tobacco Agricultural Experiment Station	University of Tennessee

Source: TVA 2018

A review of the TVA Natural Heritage Database indicated two managed areas are located immediately adjacent to the project area. These include the Nolichucky State Wildlife Management Area (WMA) and the Davy Crockett Lake Potential National Natural Landmark. In addition, the University of Tennessee Tobacco Agricultural Experiment Station, North Cherokee National Forest, and North Cherokee WMA are located within the vicinity of the project area. There are no NRI steams in the vicinity of the Nolichucky Reservoir.

The 1,000-acre Nolichucky State WMA is located along the banks of the Nolichucky River from below Asheville. A Highway downstream to Birds Bridge Road upstream. This area is managed for waterfowl, small game, and big game hunting and provides opportunities for wildlife observation (TWRA 2017).

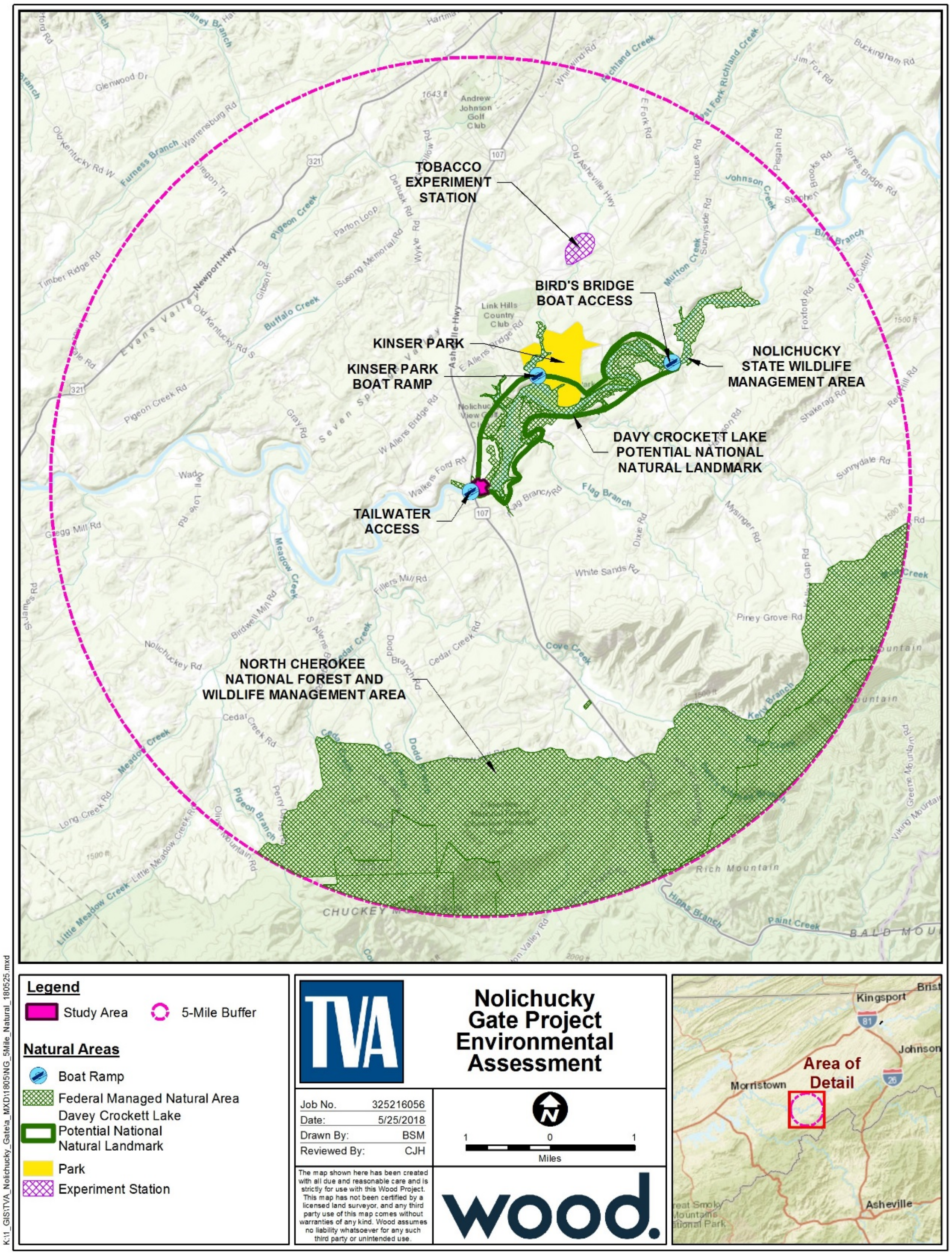


Figure 3-6. Natural Areas, Managed Areas, and Recreation Resources Within 5 Miles of Nolichucky Dam

The Davy Crockett Lake (Nolichucky Reservoir) Potential National Natural Landmark is an approximately 1,000-acre area that extends from the Nolichucky Dam upstream to Birds Bridge Road. This area has approximately the same limits as the Nolichucky WMA and was proposed as a Potential National Natural Landmark for its combination of wetland and floodplain communities that occur around the reservoir and the migrating waterfowl these habitats protect. While Davy Crockett Lake is conserved to meet the listing criteria, it has not been registered as a National Natural Landmark at this time (TVA 2010).

The Tobacco Agricultural Experiment Station is located 2.8 miles northeast of Nolichucky Dam. This 500-acre area is owed by the UT and is used for tobacco production and beef cow production research (TVA 2010).

The North Cherokee National Forest is located 3 miles southeast from Nolichucky Dam, along the border between Tennessee and North Carolina. This area covers approximately 350,000 acres and is cooperatively managed by the TWRA as the North Cherokee WMA (USFS 2018). The North Cherokee National Forest and WMA provides outdoor recreation and habitat for fish and wildlife, among other uses.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not replace or refurbish the Nolichucky Dam gate and existing conditions would be maintained. Therefore, there would be no impact on natural or managed areas under this alternative.

3.14.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

The Tobacco Agricultural Experiment Station and North Cherokee National Forest and WMA would not be impacted by the proposed actions as both areas are far removed from the project and would not experience any direct or indirect impacts. In addition, actions associated with this alternative would not alter the characteristics for which Davy Crockett Lake (Nolichucky Reservoir) was proposed as a Potential National Natural Landmark. Therefore, there would be no impacts to the Davy Crockett Lake Potential National Natural Landmark.

Under this alternative, there would be no direct impacts to the Nolichucky State WMA, but there may be minor indirect impacts from noise associated with construction activities and from the transportation of equipment downstream from Bird’s Bridge boat ramp for dredging. However, considering the temporary nature of the proposed action, this impact would be minor and would not impact the use or enjoyment of this area.

3.14.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

As described for Alternative B1, replacement of the gate would not alter the characteristics for which Davy Crockett Lake (Nolichucky Reservoir) was proposed as a Potential National Natural Landmark. Construction noise associated with replacement of the gate may result in minor, indirect impacts to use of the Nolichucky State WMA. Given the temporary nature of construction, this impact would be minor and would not impact the use or enjoyment of this area. to natural areas under this alternative.

3.14.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Direct impacts under this alternative would be the same as described for Alternatives B1 and B2. Similarly, Noise during replacement of the gate and placement of riprap would be minor and temporary and would not impact the use or enjoyment of the Nolichucky State WMA.

3.15 Parks and Recreation

3.15.1 Affected Environment

Developed recreation includes campgrounds, picnic areas, scenic overlooks, playgrounds, sports fields, lodges, marinas, boat launching ramps, swimming pools and beaches, and golf courses. Developed recreation resources within 5-miles of the Nolichucky Dam are listed by management agency in Table 3-11 and shown on Figure 3-5. Dispersed recreation occurs in an undeveloped setting and includes informal activities such as hunting, hiking, nature observation, primitive camping, backpacking, horseback riding, cycling, whitewater rafting, canoeing, fishing, rock climbing, off-road all-terrain vehicle use, and driving for pleasure.

Table 3-11. Developed Recreation Resources Within 5 miles of the Nolichucky Dam

Recreation Area	Managing Agency
Joe Johnson/Birds Bridge Access Ramp	TWRA
Kinser Park	Greene County and City of Greeneville
Tailwater Access Boat Ramp	Tennessee Department of Transportation and TVA

Recreation opportunities within the vicinity of Nolichucky Dam consist of a combination of developed and dispersed recreation. The Nolichucky Reservoir (Davy Crockett Lake) and the Nolichucky River downstream and upstream of the Nolichucky Dam are local recreation resources. Downstream boat access to the Nolichucky River is provided by the Tailwater Access Boat Ramp located on the west side of Asheville Highway at River Mile 46. Upstream boat ramps are located at River Mile 47.4, Kinser Park and along Birds Bridge Road at River Mile 50.3. The portions of the Nolichucky River and Reservoir near the project area are frequented by smaller boats and canoes, while larger boats typically utilize the larger, more open reservoirs within the region, such as Douglas and Cherokee Reservoirs.

Bank fishing and fishing from small watercraft are common upstream and downstream of the Nolichucky Dam. Typical species sought by anglers in the vicinity include all species of black bass, rock bass, and muskellunge (TVA 2010). In addition, hunting is a popular activity in the vicinity of the Nolichucky Dam. The Nolichucky WMA provides hunting opportunities for small game, large game, and waterfowl. Hunting for a variety of game species and trapping of small game is also available at the North Cherokee WMA (TWRA 2018).

Kinser Park is relatively large County Park located on the Nolichucky River and offers a campground, boat ramp, pool, picnic area, golf course, putt-putt golf, ball fields, badminton, horseshoes, and playgrounds (Greene County Partnership 2018).

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not replace or refurbish the Nolichucky Dam gate and existing conditions would be maintained. Therefore, there would be no change in current recreation use under this alternative.

3.15.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

TVA would use the Birds Bridge Road boat ramp to access the Nolichucky Reservoir and move equipment to the project area. Recreators who use this boat ramp may be temporarily impacted from increased traffic and noise. However, additional boat ramps are available in the area and use of this boat ramp would still be possible during the dredging operation as equipment will be located at the dam. In addition, this boat ramp would only be used to launch the dredging equipment into the water and remove it. As such, the impacts to users of this boat ramp are anticipated to be minor and temporary.

Kinser Park is located adjacent to the Nolichucky Reservoir and would not be directly impacted under this alternative. Equipment would be transported downstream from the Birds Bridge Road boat ramp and pass by the campground at Kinser Park. Recreators at the campground may experience indirect noise impacts during equipment transport. However, equipment transportation would occur during normal working hours and would be temporary in nature. Therefore, indirect impacts to Kinser Park would be minor.

During replacement of the new gate, the Nolichucky Reservoir would be naturally drawn down as the gate opening would allow water to pass through freely until the reservoir elevation is below the opening. As a result, water-based recreation in close proximity to the dam may be temporarily impacted as these areas may be inaccessible. In addition, construction noise may indirectly impact fishing, boating, hunting, and wildlife viewing in the areas immediately adjacent to the Nolichucky Dam. However, due to the temporary nature of construction (estimated as up to three months) and availability of additional areas for recreation upstream and downstream of the Nolichucky Dam, impacts are expected to be minor.

In addition, TVA would dredge built up sediment in the southeast corner of the upstream side of the dam so that it would not be released downstream when the new gate is opened. This would provide a long-term beneficial impact to users of the Tailwater Access boat ramp and anglers downstream of the Nolichucky Dam by improving water quality. For routine inspections, TVA would draw down the Nolichucky Reservoir 1 to 2 feet by opening the gate to inspect the spillway. Inspections would be short term and are not anticipated to last longer than one day at a time and would occur one to two times per year. Upon closure of the gate, reservoir levels would return to normal. Therefore, impacts on recreation from spillway inspections are anticipated to be minor and temporary.

Overall, impacts to recreation under this alternative are anticipated to be temporary and minor. Recreators would be indirectly impacted during gate replacement and dredging and during spillway inspections. However, these activities are short term in nature and would not have a long-term impact on recreation in the vicinity of Nolichucky Dam. In addition, there would be a minor beneficial impact on recreation downstream of the Nolichucky Dam from removal of built up sediment upstream of the gate.

3.15.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Under this alternative, TVA would not dredge sediment located upstream of the gate and therefore, there would be no impact to the Birds Bridge Road boat ramp or Kinser Park. During construction there may be indirect impacts to recreators downstream of Nolichucky Dam, including users of the Tailwater Access boat ramp, from the release of sediment downstream upon opening the gate. However, this would be temporary and would not have a long-term impact on recreation in this area. Therefore, impacts would be temporary and minor.

Impacts associated with reservoir drawdown during spillway inspections would be the same as those identified under Alternative B1. Therefore, impacts to recreation under this alternative would be minor.

3.15.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Impacts from implementation of this alternative are anticipated to be the same as those for Alternative B2. Therefore, impacts to recreation under this alternative would be minor.

3.16 Solid and Hazardous Waste

3.16.1 Affected Environment

In Tennessee, requirements for management of solid wastes are focused on solid waste processing and disposal under Rule 0400-11-.01. Solid wastes are defined in the rule as garbage, trash, refuse, abandoned material, spent material, byproducts, scrap, ash, sludge and all discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial and agricultural operations, and from community activities. Subtitle D Resource Conservation and Recovery Act (RCRA) and its implementing regulations establish minimum federal technical standards and guidelines for nonhazardous solid waste management.

In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment. Hazardous materials are regulated under a variety of federal laws including Occupational Safety and Health Administration (OSHA) standards, Emergency Planning and Community Right to Know Act (EPCRA), the RCRA, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and the Toxic Substances Control Act.

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not replace the Nolichucky Dam gate; therefore, there would be no impacts to solid waste and hazardous waste generation under this alternative.

3.16.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Under this alternative TVA would demolish the existing gate and construct a new gate. In addition to demolition debris from the existing gate, demolition and construction activities would generate typical construction debris and small volumes of solid wastes summarized below:

- Paper, wood, glass, and plastics would be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers during project construction.
- Scrap metal would result from welding, cutting, framing and finishing operations, electrical wiring, disposal of packing materials and empty nonhazardous chemical containers.
- A limited amount of soils would result from grading and excavation related to foundation construction.

Construction waste and debris would be placed in roll-offs and disposed of at a permitted offsite construction and demolition landfill. TVA would manage all solid wastes generated in accordance with applicable state regulations and following procedures outlined in TVA's current Environmental Procedures and applicable BMPs (TVA 2017).

A small amount of landscaping wastes would also result from grubbing and land clearing operations to prepare the dredge material placement areas. These landscaping wastes would be placed on the ground to aid in erosion and sediment control. Woody vegetation cleared to allow construction of the temporary access road, would be stockpiled or removed from the site. All materials removed from the site would be properly managed and disposed of at approved solid waste facilities or recycled in compliance with applicable pertinent federal, state and local requirements. TVA would coordinate material removal using TVA standard BMPs (TVA 2017).

The dredging operation would remove a slurry of sediment and water from the reservoir which would be dewatered using Geotubes as described in Section 2.1.2. The dewatered sediment would remain on existing TVA property in the dredge material placement area 1 or 2 (see Figure 2-3) and the used Geotubes would be disposed as solid waste in accordance with applicable state regulations. Sediments upstream of the gate were sampled in 2017 to identify constituents of potential concern that may occur once the sediment is exposed and dewatered. The samples were tested for poly-chlorinated biphenyls (PCBs) and heavy metals. Levels of all contaminants analyzed were below residential EPA Regional Screening Levels (RSLs), with the exception of arsenic. While arsenic exceeded the residential soil screening level, it did not exceed the composite worker screening level applicable to exposure by workers during construction. TCLP testing was then performed for the heavy metals to simulate leaching potential. The TCLP results for all metals indicate the concentrations were below the EPA allowable limits for disposal as non-hazardous waste (Stantec 2015).

Hazardous waste generated during site preparation and construction may include limited quantities of fuels, lubricating oils, solvents, paints, adhesives, welding material, and other hazardous materials. Appropriate spill prevention, containment, and disposal requirements for hazardous materials would be implemented to protect construction and plant workers, the public, and the environment. A permitted third-party waste disposal facility would be used for ultimate disposal of the wastes.

Solid and hazardous wastes generated at TVA facilities are managed in accordance with established procedures and applicable regulations, and wastes generated by equipment maintenance would be managed under existing programs. Therefore, no impacts from solid waste and hazardous waste generation are anticipated.

3.16.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Under this alternative, the solid waste and minor hazardous waste generated during the demolition of the old gate and construction of the new gate will be the same as Alternative B1. The solid waste from the disposal of the Geotubes would not be generated using this alternative and no clearing and grubbing would occur. Wastes generated during demolition and construction would be managed as described under Alternative B1. Therefore, no impacts from solid waste and hazardous waste generation are anticipated.

3.16.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

The solid waste and hazardous waste generated under this alternative will be the same and the Alternative B2. Rip rap would be obtained from existing permitted quarries and therefore no additional solid waste would be generated as a result of implementation of this alternative. Therefore, no impacts from solid waste and hazardous waste generation are anticipated.

3.17 Noise

3.17.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. Noise is further defined as sound that disrupts normal activities and diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs. For instance, higher sensitivities to noise would be expected during the quieter overnight periods at noise sensitive receptors such as residences. Other receptors might include developed sites where frequent human use occurs such as churches and schools.

Sound is measured in units of decibels (dB) on a logarithmic scale. Because not all noise frequencies are perceptible to the human ear, A-scale weighting decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments. A noise level change of 3 dBA or less is barely perceptible to average human hearing. However, a 5 dBA change in noise level is clearly noticeable. A 10 dBA change is perceived as a doubling or halving of noise loudness; whereas a 20 dBA change is considered a “dramatic change” in loudness.

Ambient noise in the area is anticipated to range between a Day-Night Sound Level (Ldn) of 35 and 50 dB, which are typical background day/night noise levels for rural areas whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (EPA 1974). Common indoor and outdoor noise levels are listed in Table 3-12.

The EPA 1974 guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985). For traffic-related noise, the Federal Highway Administration (FHWA) has set a threshold of 67 dBA as the sound level at which noise abatement should be considered (FHWA 2011). The Tennessee Department of Transportation has adopted this same threshold for projects in Tennessee.

Table 3-12. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 meters (16.4 feet)
Jet Flyover at 300 meters (984.3 feet)		
	100	
		Inside Subway Train (New York)
Gas Lawn Mower at 1 meter (3.3 feet)		
	90	
		Food Blender at 1 meter (3.3 feet)
Diesel Truck at 15 meters (49.2 feet)		Garbage Disposal at 1 meter (3.3 feet)
	80	
		Shouting at 1 meter (3.3 feet)
Gas Lawn Mower at 30 meters (98.4 feet)	70	Vacuum Cleaner at 3 meters (9.8 feet)
Commercial Area		Normal Speech at 1 meter (3.3 feet)
	60	
		Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	
		Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: Arizona DOT 2008.

3.17.1.1 Noise Receptors

The Nolichucky Dam Gate project area is rural with some low-density residential uses located to the north and to the south across the Nolichucky River. Overall, the surrounding area is largely undeveloped with agricultural and rural residential uses throughout. The project area is bordered by wooded ridges to the north which separate it from several single-family residences. The Nolichucky River and Reservoir (Davy Crocket Lake) borders the site to the south and the western boundary is the Asheville Highway. Areas to the east are predominantly undeveloped and forested and also include the reservoir.

Nearby noise sensitive receptors include single-family residences north of the project area and south across the Nolichucky River as well as recreational boaters on the reservoir. The closest sensitive receptors to the project site are two homes, one located approximately 725 feet north, and one located approximately 630 feet south.

3.17.1.2 Sources of Noise

The former hydroelectric facility, Nolichucky Dam, has been decommissioned since 1972 and the site is not in use, but is maintained by TVA. Noise sources in the project area would include traffic noise from Asheville Highway, and vehicles and equipment used in maintaining the existing buildings and vegetation on the site, water flowing over the dam, Noise from recreational boaters would be minor as due to its small size and narrow with, big boats, water skiers and personal watercraft do not frequent the Nolichucky Reservoir (TVA 2006) and the boaters are primarily small boats or canoes. Overall, the site is maintained in a quiet state.

The level of construction noise is dependent upon the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels due to operation of construction equipment onsite and the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities would increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. Construction noise is generally temporary and intermittent in nature as it generally occurs on weekdays during daylight hours which minimizes the impact to receptors.

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not proceed with replacing the existing spillway gate and no project related impacts from noise would occur.

3.17.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

Noise impacts under this alternative would be associated with construction operations during gate removal and replacement, dredging and pumping to the Geotubes on site and construction-related traffic (construction workforce) to and from the project site.

Typical heavy construction equipment would be used for the gate removal and replacement. Typical noise levels from this equipment is expected to be 85 dBA or less at a distance of 50 feet from the construction equipment (FHWA 2016). Based on straight line noise attenuation, it is estimated that noise levels from these sources would attenuate to

65 dBA at the nearest residence approximately 630 feet south of the project area, and 64 dBA at the nearest residence approximately 725 north of the project area. However, the actual noise would probably be lower in the field, where objects, topography, and water flow at the dam would cause further noise reduction. This level is higher than the EPA noise guideline for Ldn of 55 dBA and just below and equal to the HUD guideline for Ldn of 65 dBA. Given the temporary and intermittent nature of construction noise and the existing background sound from water flow at the dam, the impact of noise generated from the construction and dredging activities would be minor

TVA estimates the peak construction workforce to be 25 workers per day. As such construction-related traffic on local roads near the project site would be negligible and, therefore, these additional vehicles would result in a negligible noise impacts.

Once constructed, in order to allow for periodic inspections of the spillway, TVA would open the gate to lower the water level in the reservoir. Noise generated from the release of water would be short term (anticipated to occur 1 to 2 times per year) and would attenuate with distance. However, inspections are not anticipated to last longer than one day and would only occur 1 to 2 times per year. Therefore the impact would be minor and temporary.

3.17.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Under Alternative B2, noise associated with the dam gate removal and replacement would be the same as for Alternative B1. However, no dredging would occur and therefore, no noise would be generated from the mobilization of dredging equipment, the actual dredging operation, and pumping of sediment to the disposal sites. Given the temporary and intermittent nature of construction noise and the existing background sound from the water flow at the dam, the impact of noise generated from the construction activities is expected to be minor, yet less than Alternative B1.

3.17.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Noise associated with the dam gate removal and replacement operation under Alternative B3 would be the same as Alternative B2. However, additional noise would be experienced during the installation of riprap material upstream of the dam from transportation of the material to the site. Heavy construction equipment would be used for this operation. Given the temporary and intermittent nature of construction noise and the existing background sound from water flow at the dam, the impact of noise generated from the construction activities is expected to be minor.

3.18 Environmental Justice

3.18.1 Affected Environment

Given the nature of the proposed action, the spatial extent for the environmental justice (EJ) analysis was defined as the four census block groups which encompass and are immediately adjacent to Nolichucky Dam: Block Group1, Census Tract 910; Block Group 3, Census Tract 905; Block Group 3, Census Tract 906; and Block Group 2, Census Tract 911. Included as secondary geographic areas of reference are Greene County and the State of Tennessee. Comparisons at multiple spatial scales provide a more detailed picture of populations that may be affected by the proposed actions including any EJ populations (e.g., minority and low income). Demographic and economic characteristics of resident populations were assessed using the 2012-2016 American Community Survey (ACS) 5-year estimates provided by the U.S. Census Bureau (USCB 2018a).

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 2017) 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. Although TVA is not one of the agencies subject to this order, TVA routinely considers EJ impacts as part of the project decision-making process.

Guidance for addressing EJ is provided by the CEQ's Environmental Justice Guidance under the National Environmental Policy Act (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 2016 USCB Poverty Thresholds states the poverty threshold as an annual household income of $24,563 for a family of four (USCB 2018b). For an individual, an annual income of $12,228 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.

Environmental Justice characteristics of the study area are summarized in Table 3-13.

Table 3-13. Environmental Justice Characteristics

Geography	Total Population	Percent Minority Population	Percent of Population in Poverty
Block Group 1, Census Tract 910, Greene County, Tennessee	2,112	1.2%	24.0%
Block Group 3, Census Tract 905, Greene County, Tennessee	1,450	5.1%	3.8%
Block Group 3, Census Tract 906, Greene County, Tennessee	1,564	2.3%	16.0%
Block Group 2, Census Tract 911, Greene County, Tennessee	1,638	--	18.8%
Greene County, Tennessee	68,502	7.6%	18.6%
Tennessee	6,548,009	27.2%	17.2%

Source: USCB 2018a

Minority populations within the selected block groups range from zero to 5.1 percent of the population. Comparatively, minorities comprise 7.6 percent of the population of Greene County and 27.1 percent of the population of Tennessee. The selected block groups do not exceed EJ thresholds for any minority population when compared to the reference geographies.

Poverty rates within the selected block groups range from 3.8 to 24 percent. While Block Group 1, Census Tract 910 has a poverty rate higher than both Greene County (18.6 percent) and Tennessee (17.2 percent), the average poverty rate within the selected block groups, 16.4 percent minority, is comparable to the reference geographies. The selected block groups do not exceed EJ thresholds for poverty when compared to the reference geographies.

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not proceed with replacement of the Nolichucky Dam gate. No populations subject to EJ consideration were identified within the specified block groups. Hence, there would be no impacts to EJ populations under this alternative.

3.18.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

No populations subject to EJ consideration were identified within the specified block groups. Therefore, no disproportionate impacts to environmental justice populations are expected to occur as a result of implementation of Alternative B1.

3.18.2.3 Alternative B2 – Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Impacts under this alternative would be the same as identified for Alternative B1. Therefore, no disproportionate impacts to environmental justice populations are expected to occur as a result of implementation of Alternative B2.

3.18.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Impacts under this alternative would be the same as identified for Alternative B1. Therefore, no disproportionate impacts to environmental justice populations are expected to occur as a result of implementation of Alternative B3.

3.19 Public Health and Safety

3.19.1 Affected Environment

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. The Occupational Safety and Health Act (OSHA) is the main statute protecting the health and safety of workers in the workplaces TVA has a robust safety conscious culture that is focused on awareness and understanding of workplace hazards, prevention, intervention, and active integration of BMPs to avoid and minimize hazards.

General guidelines for work place safety that are communicated to work crews include the following:

- *Pre-Job Brief* – Allows the worker to think through a job and use that knowledge to make the job as safe as possible.
- *Two-Minute Rule* (situational awareness) – Take time before starting a job to familiarize yourself with the work environment and to identify conditions that were not identified during the pre-job brief.
- *Stop When Unsure* – When confronted with a situation that creates a question and what to do is uncertain, stop and get help.
- *Self-Check* – Use of “STAR” acronym to promote self-check awareness: **S**top and focus, **T**hink what will happen with right or wrong action, **A**ct correctly, **R**eview that the results are as expected
- *Procedure Use and Adherence* – Allows for proper application of procedures and work packages based on expected activities
- *Flagging and Operational Barriers* – Key to ensure control of the work zones and avoidance of exposure to work hazards by public
- *Three-Way Communication* – Essential for all job tasks to ensure they are completed safely and productively.

TVA’s Safety Standard Programs and Processes would be strictly adhered to during the proposed actions. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations and programs. It also establishes responsibilities for implementing OSHA and state requirements.

It is TVA’s policy that contractors have a site-specific health and safety plan in place prior to conducting construction activities at TVA properties. The contractor site-specific health and safety plans address the hazards and controls as well as contractor coordination for various construction tasks. A health and safety plan would also be required for workers responsible for operations after construction is complete.

The potential offsite consequences and emergency response plan are discussed with local emergency management agencies. These programs are audited by TVA no less than once every three years and by EPA periodically.

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not replace the existing gate at the Nolichucky Dam. As there is no active means of controlling the Nolichucky Reservoir level, TVA would remain unable to perform dam safety inspections of the spillway portion of the dam. Safety inspections are necessary to ensure the ongoing structural integrity of the spillway, and if not inspected, over time this could potentially threaten public safety. Therefore, implementation of this alternative would have a negative impact on public safety.

3.19.2.2 Alternative B1 – Replace the Existing Gate and Dredge in the Nolichucky Reservoir

During construction of the gate and dredging in the Nolichucky Reservoir, customary industrial safety standards as well as the establishment of applicable BMPs and job site safety plans would describe how job safety would be maintained. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping, and personal protective equipment are in place; the establishment of programs and procedures for right-to-know, hearing conservation, equipment operations, excavations, grading, and other activities; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazardous. Construction debris and wastes would be managed in accordance with federal, state, and local requirements.

Through its safety programs, TVA would foster a culture of safety-minded employees. Construction and dredging activities would adhere to TVA guidance and be performed consistent with standards established by OSHA; therefore, public health and safety during construction and dredging would be maintained. Overall, worker and public health and safety during construction would be maintained and there would be no impact to public health and safety.

In addition, implementation of this alternative would allow TVA to manage the reservoir levels to temporarily remove water from the downstream face of the dam and perform safety inspections within the spillway. Routine safety inspections ensure the dam continues to meet regulations and maintains public safety in the vicinity. Therefore, impacts to public health and safety under this alternative are beneficial relative to Alternative B1.

3.19.2.3 Alternative B2 –Replace the Existing Gate with No Dredging in the Nolichucky Reservoir

Impacts to public health and safety under this alternative would be similar to those identified under Alternative B1. Therefore, impacts to public health and safety under this alternative are beneficial.

3.19.2.4 Alternative B3 – Replace the Existing Gate and Place Riprap Upstream of the Gate

Impacts to public health and safety would be the same as those identified under Alternatives B1 and B2. Therefore, impacts to public health and safety under this alternative are beneficial.

3.20 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 project. 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 conditions. The impact analyses summarized in preceding sections are based on baseline conditions and either explicitly or implicitly already have cumulated the impacts of past and present actions with those of the proposed action.

3.20.1 Geographic Area of Analysis

The appropriate geographic area over which past, present, and future actions could reasonably contribute to cumulative effects is variable and dependent on the resource evaluated. Based upon the defined list of resources potentially affected by cumulative effects, the land and water resources within a 5-mile radius of the Nolichucky Dam was considered appropriate for consideration in this analysis.

3.20.2 Identification of "Other Actions"

Past, present, and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-14. These actions were identified within the geographic area of analysis as having the potential to, in aggregate, result in larger and potentially significant adverse impacts to the resources of concern.

Table 3-14. Summary of Other Actions in the Vicinity of the Nolichucky Dam Project Site

Actions Description	Description	Timing and Reasonable Foreseeability
Cessation of upstream mining	Reduction in sedimentation effects to the river	Past
Sand harvesting operation	A sand mining operation is located on the upper Nolichucky Reservoir	Past, Present, Reasonably Foreseeable Future
Decommissioning of the Nolichucky Powerhouse	TVA decommissioned the powerhouse in 1972	Past
Sealing the lift gate	TVA sealed the vertical lift gate in 1995	Past
Greeneville Bypass	Tennessee Department of Transportation (TDOT) is considering alternatives for construction of a bypass around Greeneville Tennessee	Reasonably Foreseeable Future
Removal of the Nolichucky Powerhouse	Demolition and removal of the existing powerhouse	Reasonably Foreseeable Future

Actions that have a timing that is “past” or “present” inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. Because these actions are part of the baseline, they are not addressed separately in the cumulative effects analysis. Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis. For example, TDOT has identified a need for two bridge construction projects within the vicinity of the Nolichucky Dam. These include the Newport Highway Bridge over the Nolichucky River, approximately 5.5 miles west of the Nolichucky Dam, and the Links Mill Road Bridge over Richland Creek, a tributary to the Nolichucky River, located approximately 2.4 miles northeast of the Nolichucky Dam. These projects are not considered to be reasonably foreseeable as they only have been discussed on a conceptual basis.

3.20.2.1 Sand Harvesting Operations

Over the years, various businesses have harvested sand from the Nolichucky River and Nolichucky Reservoir and it is expected that dredging of sand from the reservoir upstream of the dam would continue to occur intermittently in the future. Permits issued for these operations identify specific BMPs designed to minimize impacts from the dredging operations and the impact of this action contributes to the existing base condition and is therefore not considered in the analysis of cumulative impacts.

3.20.2.2 Greeneville Bypass

TDOT is currently considering four alternatives for construction of a bypass around Greeneville in Greene County, Tennessee. The alternatives considered include widening and/or traffic management on U.S. 11E and construction of a new roadways north of exiting U.S. 11E (TDOT 2018), each of which are located over 8 miles north of the Nolichucky Dam. Tennessee transportation projects are developed in four phases: Planning and Environmental, Design, Right-of-Way and Construction. The proposed Greeneville Bypass is currently in the early stages of the Environmental phase of the process. After completion of this phase, anticipated timelines for remaining project development phases will be determined. Therefore, given the distance from the dam and the uncertain timeline, this project is not considered in the analysis of cumulative impacts.

3.20.2.3 Demolition and Removal of the Existing Powerhouse

TVA is currently evaluating plans for the removal of the existing powerhouse at the Nolichucky Dam. The demolition of this facility could occur within the next fiscal year. This action has the potential to, in aggregate, result in larger adverse impacts to the resources of concern.

3.20.3 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the project area was considered in conjunction with the environmental impacts presented in Chapter 3. These combined impacts are defined by the CEQ as “cumulative” in 40 CFR 1508.7 and may include individually minor, but collectively significant actions taking place over a period of time.

Primary adverse effects of the proposed action as described in the preceding sections of Chapter 3 are related to temporary and localized effects associated with air and noise emissions from construction vehicles and construction-related impacts to surface water quality and aquatic ecology. Accordingly, primary adverse cumulative effects of the proposed actions are related to the potential additive and overlapping effects on these resources.

3.20.3.1 Air and Noise

There is a potential for construction-related air and noise emissions from the proposed action and the demolition of the powerhouse to overlap. However, due to the relatively minor and temporary nature of construction related impacts, and the implementation of BMPs to minimize impacts, cumulative effects of the proposed action are considered to be negligible.

3.20.3.2 Surface Water and Aquatic Ecology

The potential for cumulative effects to surface water quality are largely driven by the release of sediment downstream when the gate is opened. As described in Section 3.4, the TSS released when the gate is opened is minimal and is anticipated to dissipate quickly. Levels of suspended solids would be less than those which occur under existing conditions at natural high flows. Demolition of the powerhouse may also result in release of sediment into the river. However, sediment controls implemented during the demolition of the powerhouse would minimize the impact on surface water quality, and cumulative impacts would be minor.

Under Alternative B1, TVA would dredge sediment on the upstream side of Nolichucky Dam and pump it to one or both dredge material placement areas prior to replacement of the gate. Over the total project period, approximately 500 yd^3 of dredged sediment could potentially leave the Geotubes. If the demolition of the powerhouse overlaps with dredging there would be a potential for a cumulative impact to surface water quality. However, TVA would implement appropriate erosion prevention and sediment controls and BMPs to prevent the runoff of dredged materials into the Nolichucky River. Therefore, no adverse cumulative impacts are anticipated.

Under Alternative B3, TVA would not dredge any sediment upstream of Nolichucky Dam, but would place small stone overlain by riprap upstream of the dam in the reservoir and on exposed banks. Minor increases in sediment loading are anticipated during initial construction activities. Any direct impacts to the Nolichucky River would be mitigated under the terms of that permit, and appropriate BMPs would be installed if required by these permits; therefore cumulative impacts would be minor

The deposition of sediment released when the gate is opened under all alternatives would cause minor sort term impacts to aquatic species. Sediment releases from the demolition of the powerhouse would be of short duration and would be minimized with implementation of the appropriate BMPs and adverse cumulative impacts to aquatic species would be minimal.

3.21 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 BMPs have been applied. Mitigation measures and BMPs 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 activities have the potential to cause unavoidable adverse effects to natural and human environmental resources.

Specifically, sediment accumulated on the upstream side of the dam would be released downstream when the gate is replaced and operated to allow inspection of the spillway. However, the amount of sediment that would be released would be relatively small and is less than what flows down the river during natural periods of high flow. Other unavoidable impacts during construction would be associated with the use of construction equipment. Activities associated with the use of construction equipment may result in varying amounts of dust, air emissions, noise, and vibration. Emissions from construction activities and equipment are minimized through implementation of mitigation measures, including proper maintenance of construction equipment and vehicles.

Under Alternative B1, dredged spoils would be placed in one or both of the dredge disposal areas. Site preparation may include the cutting or grinding of vegetation within these areas. However, impacts to vegetation would be minor as trees greater than 3 inches in diameter would not be removed from these areas and vegetation has been previously disturbed. In addition, temporary impacts to water quality from sediments leaving the Geotubes during dewatering could impact the Nolichucky Reservoir. Sediment controls and BMPs to minimize erosion would be implemented and water released by construction activities would meet permit limits.

Under Alternative B3, riprap would be placed in the reservoir. This impact would be minimal as the area impacted represents a very small percentage of the total reservoir area

With the application of appropriate BMPs and adherence to permit requirements, these unavoidable adverse effects would be minor.

3.22 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 analyses of environmental impacts associated with the replacement of a gate at the Nolichucky Dam. For the purposes of this section, these activities are considered short-term uses of the environment, and the long-term impacts to site productivity are those that last beyond the life of the project.

Most environmental impacts during construction activities would be relatively short-term and would be addressed by BMPs and mitigation measures. Construction activities would have a limited, yet favorable short-term impact to the local economy through the creation of construction jobs and associated revenue.

Under Alternative B1, dredged material would be placed in one or both of the dredge material placement areas. Preparation of these areas involves clearing and grubbing of small vegetation, and some wildlife may be displaced. However, the dredge spoil sites would be revegetated and would eventually provide wildlife habitat which would have a beneficial impact on long-term productivity.

3.23 Irreversible and Irretrievable Commitments of Resources

A resource commitment is considered irreversible when impacts from its use would limit future use options and the change cannot be reversed, reclaimed, or repaired. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources and to those resources that are renewable only over long time spans, such as soil productivity. A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for use by future generations until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production, harvest, or natural resources and are not necessarily irreversible.

Resources required by construction activities, including labor and construction materials, would be irretrievably lost. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. However, it is unlikely that their limited use in these projects would adversely affect the overall future availability of these resources.

CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Dolly Novak**
Education:	M.S. in Engineering Management, B.S. in Civil Engineering
Project Role:	TVA Project Manager
Experience:	14 years of experience in engineering and project management

Name:	**W. Douglas White**
Education:	B.S. Forestry
Project Role:	TVA NEPA Project Manager
Experience:	15 years of experience in water resources management and NEPA compliance.

Name:	**Karen Boulware**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	Wood Project Manager
Experience:	25 years of professional experience in NEPA.

Name:	**Bill Elzinga**
Education:	M.S. and B.S., Biology
Project Role:	Wood Technical Manager
Experience:	34 years of experience managing and performing NEPA analyses for electric utility industry, and state/federal agencies; ESA compliance; CWA evaluations.

4.2 Other Contributors

TENNESSEE VALLEY AUTHORITY

Name:	**James Bryant**
Education:	B.S. Civil Engineering with structural emphasis
Project Role:	Senior Program Manager, Dam Safety/Engineering Manager
Experience:	24 years of analysis, design, and project management experience of varying size and complexity in the fields of civil engineering and dam safety.

Name:	**Hallie Hearnes**
Education:	M.A. in Public History with emphasis in Historic Preservation, B.S. in Historic Preservation
Project Role:	Cultural Resources, Architectural Historian
Experience:	10 years of experience in historic preservation, cultural resource management, and local history

Name	**Charles L. McEntyre**
Education:	M.S. Environmental Engineering, B.S. Biology
Project Role:	Surface Water
Experience:	Over 40 years of experience in various environmental engineering disciplines, focusing in water quality, wastewater treatment, water regulations, and NEPA.
Name	**Craig Phillips**
Education	M.S. and B.S., Wildlife and Fisheries Science
Project Role:	Aquatic Ecology and Threatened and Endangered Species
Experience:	7 years sampling and hydrologic determination for streams and wet-weather conveyances; 5 years in environmental reviews.
Name:	**Ted Wells**
Education:	M.A. and B.S. Anthropology
Project Role:	Cultural Resources
Experience:	15 years in Archaeology and Cultural Resources Management
Name:	**Lori Whitehorse**
Education:	B.S. Plant and Soil Science
Project Role:	TVA Environmental Program Manager
Experience:	15 years in environmental regulatory compliance; 2 years in NEPA compliance.
Name:	**A. Chevales Williams**
Education:	B.S. Environmental Engineering
Project Role:	Surface Water
Experience:	12 years of experience in water quality monitoring and compliance; 11 years in NEPA planning and environmental services.

Wood

Name:	**Jonathan Allen**
Education:	M.S. Biosystems Engineering Technology, B.S. Natural Resources Management
Project Role:	Wetlands
Experience:	12 years of experience in environmental permitting and stream/wetland delineations
Name:	**Karen Boulware**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	NEPA Lead.
Experience:	25 years of professional experience in NEPA.

Name:	**Joel Budnik**
Education:	M.S. and B.S., Wildlife and Fisheries Sciences
Project Role:	T&E Species, Wildlife and Vegetation Review
Experience:	19 years of experience in environmental planning, NEPA analysis and documentation, ecological studies, and preparation of technical documents.
Name:	**Ray Finocchiaro**
Education:	Ph.D. Soils, M.S. Nat. Resources Management /Wetland Ecology, B.A. Biology
Project Role:	Soils
Experience:	14 years' experience in ecological studies.
Name:	**Linda Hart**
Education:	B.S., Business/Biology
Project Role	Technical Editing
Experience:	30 years of experience in production environmental documents (technical editing, formatting, and assembling).
Name:	**Connie Heitz**
Education:	M.P.A. Environmental and Natural Resource Management, B.S. Public Affairs
Project Role:	Technical Review, Noise
Experience:	25 years in environmental and land use planning
Name:	**Tom Hensel**
Education:	1984 B.S. Science (Major Geology)
Project Role:	Geology and Groundwater
Experience:	28 years of experience as a professional geologist for geologic, geotechnical, and environmental projects
Name:	**Emily Kinzinger**
Education:	B.S., Environmental Science
Project Role:	Socioeconomic, EJ, Naturals Areas, Parks and Recreation, Public Health and Safety
Experience:	4 years of experience in NEPA
Name:	**Christopher Mausert Mooney**
Education:	B.S., Biology
Project Role:	Vegetation
Experience:	9 years of experience in ecology and botany studies
Name:	**Brian Mueller**
Education:	B.S. Limnology/Fisheries-1996 ESRI Certified (ArcInfo), January 26, 1996 GIS
Project Role:	GIS
Experience:	Conducted and managed GIS applications over the past 31 years for large NEPA studies, major groundwater remediation projects, and DOD projects.

Name	**Keara Pringle**
Education	M.S., Environmental Science and B.S., Biology
Project Role	Wildlife, Vegetation
Experience:	2 years of professional experience providing wetland delineations, vegetation surveys, T&E species habitat assessments, fish surveys, and water quality analysis

Name:	**Glenn Scherer**
Education:	M.S., Geology, B.S., Geology
Project Role:	Solid and Hazardous Waste
Experience:	27 years conducting geological studies

CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

U.S. Department of Agriculture, Natural Resource Conservation Service
U.S. Department of Agriculture, Forest Service (Cherokee National Forest)
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers

5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Cherokee Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Shawnee Tribe
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies

- Tennessee Department of Environment and Conservation
  - Bureau of Parks and Conservation
  - Bureau of Environment
  - Division of Nature Areas
  - Division of Natural Heritage
  - State Parks
- Tennessee Historical Commission
- Tennessee Wildlife Resources Agency

5.4 Individuals and Organizations

Greene County, Mayor
Greene County Chamber of Commerce

CHAPTER 6 – LITERATURE CITED

Arizona Department of Transportation. 2008. Common Indoor and Outdoor Noise levels. Retrieved from http://azdot.gov/docs/default-source/planning/noise_common_indoor_and_outdoor_noise_levels.pdf?sfvrsn=4 (accessed May 2018).

Barbour, R.W. and W.H. Davis. 1974. Mammals of Kentucky. The University Press of Kentucky, Lexington, Kentucky.

Brahana, John V., Mulderink, D. Macy, JoAnn, Bradley, Michael W. 1996. Preliminary Delineation and Description of the Regional Aquifer of Tennessee-The East Tennessee Aquifer System. Nashville Tennessee. 1986.

Brim Box, Jayne and Joann Mossa. 1999. Sediment, land use, and freshwater mussels: prospects and problems. J. n. Am. Benthol. Soc., 1999, 18(1):99-117.

Council on Environmental Quality (CEQ). 1997. Environmental Justice Guidance under the National Environmental Policy Act, Executive Office of the President, Washington, DC. Retrieved from https://www.epa.gov/sites/production/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf (accessed May 2018).

EPA (U.S. Environmental Protection Agency). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA-550/9-74-004, Washington, DC.

_____. 2016. Climate Change Indicators in the United States. Fourth edition. Retrieved from https://www.epa.gov/climate-indicators (accessed March 2018).

_____. 2017. Environmental Justice. Retrieved from: https://www.epa.gov/environmentaljustice/learn-about-environmental-justice (accessed February 2018).

_____. 2018a. Greenhouse gases equivalencies calculator- calculations and references. Retrieved from https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references (accessed May 2018).

_____. 2018b. Tennessee Nonattainment/Maintenance Status for Each County by Year for all Criterial Pollutants (Green Book). Retrieved from https://www3.epa.gov/airquality/greenbook/anayo_tn.html (accessed May 2018).

Federal Highway Administration (FHWA). 2011. Highway Traffic Noise: Analysis and Abatement Guidance. FHWA-HEP-10-025. December 2011.

_____. 2016. Construction Noise Handbook. Retrieved from http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm (accessed May 2018).

Field, R.J. and R.T. Allen. 1985. Development and Management of Riparian Wildlife Habitat by the Tennessee Valley Authority1. General technical report RM-Rocky Mountain Forest and Range Experiment Station, United States, Forest Service (USA).

Fischenich, J.C. 2003. Effects of Riprap on Riverine and Riparian Ecosystems. U.S. Army Corp of Engineers, Engineer Research and Development Center, Vicksburg, MS Environmental Lab. Retrieved from http://www.dtic.mil/docs/citations/ADA414974 (accessed April 2018).

Greene County Partnership. 2018. Kinser Park. Retrieved from http://www.visitgreenevilletn.com/accommodations/kinser-park/ (accessed April 2018).

Griffith, G., J. Omernik, J., and S. Azevedo. 2001. Ecoregions of Tennessee (color poster with map, descriptive text, summary tables, and photographs: Reston, Virginia, U.S. Geological Survey (map scale 1: 940,000).

Harvey, M. J. 2002. Status and Ecology in the Southern United States. Pages 29-34 in Kurta, A. and J. Kennedy (Eds.). The Indiana Bat: biology and management of an endangered species (A. Kurta and J. Kennedy, Eds.). Bat Conservation International, Austin, Texas.

Homer, C.G., J.A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N.D. Herold, J.D. Wickham, and K. Megown, K. 2015. Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v. 81, no. 5, p. 345-354. Retrieved from http://www.mrlc.gov/nlcd2011.php (accessed May 2018).

HUD (U.S. Department of Housing and Urban Development) 1985. The Noise Guidebook, HUD-953-CPD Washington, D.C., Superintendent of Documents, U.S. Government Printing Office.

Kurta, A, S.W. Murray, and D.H. Miller. 2002. Roost selection and movements across the summer landscape. In Kurta, A. and J. Kennedy, eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Lady Bird Johnson Wildflower Center. 2018. Native Plant Database. Retrieved from https://www.wildflower.org/plants/ (accessed April 2018).

Mastin, B.J. and Lebster, G.E. 2007. Use of Geotube Dewatering Containers in Environmental Remediation. Retrieved from https://www.westerndredging.org/phocadownload/ConferencePresentations/2007_WODA_Florida/Session9A-SedimentDewateringTreatmentAndDisposal/2%20-%20Mastin,%20Lebster%20-%20Use%20of%20Geotube%20Dewatering%20Containers%20in%20Environmental%20Dredging.pdf) (accessed April 2018).

Melillo, Jerry M., Terese (T.C) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J) Z31WJ2/.

Miller, Robert A. 1978. "Geologic Hazards Map of Tennessee" State of Tennessee, Department of Geology.

Minnesota Wildflowers. 2018. Minnesota Plant List. Retrieved from https://www.minnesotawildflowers.info/page/plants-by-name (accessed April 2018).

NRCS. 2017. Natural Resources Conservation Service, United States Department of Agriculture, Web Soil Survey. Retrieved from https://websoilsurvey.sc.egov.usda.gov (accessed April 2018).

NatureServe. 2018. NatureServe Explorer: An Online Encyclopedia of Life [Web Application]. Arlington, VA: NatureServe. Retrieved from http://explorer.natureserve.org/ (accessed April 2018).

Pruitt, L. ed. 2007. Indiana bat (*Myotis sodalis*) draft recovery plan: first revision. Department of the Interior, U.S. Fish and Wildlife Service, Great Lakes-Big Rivers Region, Region 3.

Stantec. 2015. Field Investigation and Laboratory Testing Report (FILTR), Stability Evaluation Nolichucky Dam, Greene County, Tennessee.

Sutherland, A.B., J.L. Meyer and E.P. Gardiner. 2002. Effects of land cover on sediment regime and fish assemblage structure in four southern Appalachian streams. Institute of Ecology, University of Georgia, Athens, GA, U.S.A. Freshwater Biology (2002) 47, 1791-1805.

Swanson, M.E., J.F. Franklin, R.L. Beschta, C.M. Crisafulli, D.A. DellaSala, R.L. Hutto, D.B. Lindenmayer, and F.J. Swanson. 2011. The forgotten stage of forest succession: early-successional ecosystems on forest sites. Frontiers in Ecology and the Environment, 9(2): 117-125.

TenCate Geotube. 2013. Environmental Dredging and Remediation, TenCate Geotube Case Studies

Tennessee Department of Environment and Conservation (TDEC). 2008. Total Maximum Daily Load (TMDL) For Siltation and Habitat Alteration In The Nolichucky River Watershed (HUC 06010108) Cocke, Greene, Hamblen, Hawkins, Jefferson, Unicoi, and Washington, Counties, Tennessee, Final April 18, 2008.

_____. 2012. Sediment and Erosion Control Handbook, 4th edition, August 2012.

_____. 2018a. 303(d) list of impaired streams. Retrieved from https://www.tn.gov/environment/program-areas/wr-water-resources/water-quality/water-quality-reports---publications.html) (accessed April 2018)

_____. 2018b. Rare Species by County. Retrieved from http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:0 (accessed April 2018).

Tennessee Department of Transportation (TDOT). 2018. Greenville Bypass. Retrieved from: https://www.tn.gov/tdot/projects/projects-region-1/greeneville-bypass.html. (Accessed June 2018).

Tennessee Valley Authority (TVA). 2006. Nolichucky Reservoir Flood Remediation Project. Final Environmental Impact Statement. October 2006

_____. 2010. Douglas-Nolichucky Tributary Reservoirs Land Management Plan and Environmental Impact Statement Volume III. Nolichucky Reservoir. August 2010.

_____. 2017. A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 3. Edited by G. Behel, S. Benefield, R. Brannon, C. Buttram, G. Dalton, C. Ellis, C. Henley, T. Korth, T. Giles, A. Masters, J. Melton, R. Smith, J. Turk, T. White, and R. Wilson. Chattanooga, TN. Retrieved from https://www.tva.gov/file_source/TVA/Site%20Content/Energy/Transmission/Transmission-Projects/pdf/BMP%20Manual%20Revision%203.0_FINAL_8-4-17.pdf (accessed April 2018).

_____. 2018. Tennessee Regional Natural Heritage Program Database (accessed March 2018).

Tennessee Wildlife Resources Agency (TWRA). 2017. 2017-2018 Hunting &Trapping Guide. Wildlife Management Areas. Retrieved from https://www.tn.gov/content/dam/tn/twra/documents/huntguide.pdf (accessed April 2018).

Tuttle, M.D., Kennedy, J. 2002. Thermal Requirements During Hibernation. In Kurta, A. and J. Kennedy, eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas

U.S. Census Bureau (USCB). 2018a. American Community Survey 2012-2016. Detailed Tables. Retrieved using American FactFinder: http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t (accessed April 2018).

_____. 2018b. Poverty Thresholds for 2016. Detailed Table. Retrieved from: http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html (accessed February 2018).

U.S. Department of Agriculture. NRCS. 2018. Soil Survey Staff, Natural Resources Conservation Service. Web Soil Survey. Retrieved from U.S. Forest Service. 1995. Landscape Aesthetics, *A Handbook for Scenery Management,* Agriculture Handbook Number 701.

_____. 2018. Cherokee National Forest Ranger Districts. Retrieved from https://www.fs.usda.gov/main/cherokee/about-forest/districts (accessed April 2018).

USFWS. 2018. National Wetlands Inventory (NWI) website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Retrieved from http://www.fws.gov/wetlands/ (accessed April 2018).

U.S. Water Resources Council. 1978. Guidelines for Implementing Executive Order 11988, Floodplain Management.

West Consultants. 2018. Davy Crockett Lake Sediment Transport Modeling Final Report. Greene County Tennessee, May 2018.

Wood Environment and Infrastructure Solutions, Inc. 2018. Waters of the U.S. Delineation Report for the Tennessee Valley Authority Nolichucky Dam, Greeneville, Greene County, Tennessee. April 2018.