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TRANSMISSION SYSTEM INCOMPATIBLE VEGETATION REMOVAL

FISCAL YEAR 2023

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared by:

TENNESSEE VALLEY AUTHORITY
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COVER SHEET

Transmission System Incompatible Vegetation Removal Fiscal Year 2023 Draft Environmental Assessment

Proposed Action: The Tennessee Valley Authority (TVA) has prepared this Environmental Assessment (EA) to address potential environmental, social, and economic impacts associated with the proposed removal of 400 acres of incompatible vegetation (trees and woody vegetation) within some existing active rights-of-way (ROW) that have not been routinely maintained.

Type of document: Draft Environmental Assessment

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Abstract:

TVA manages vegetation within its active ROWs to assure the safe and reliable operation of its transmission facilities. Routine assessment methods to establish a basis for vegetation control measures were evaluated in a programmatic Environmental Impact Statement (PEIS) released in 2019. This EA addresses the planned management of vegetation in Fiscal Year 2023 using routine methods established in the PEIS. This EA tiers from the PEIS providing a more site-specific review and analysis to address portions of some individual segments within existing ROWs of TVA's twelve managed ROW Sectors across TVA's power service area that have not been routinely maintained. TVA proposes to target the removal of about 400 acres of incompatible vegetation, specifically tree and woody vegetation, on the ROW margins that pose a risk to the transmission system.

The PEIS was prepared at the programmatic level to encompass ROW vegetation management across TVA's entire transmission system. A Record of Decision was issued in October 2019 indicating TVA's preferred vegetation management program would be to manage the full extent of the ROW to a meadow-like end-state. This would entail removing incompatible vegetation and managing the ROW as a mix of herbaceous and low-growing shrub species. Over time the intensity of maintaining the ROW is expected to be minimized.

The PEIS was issued after a ruling in *Sherwood v. TVA*, a case in the Federal 6th circuit, compelled TVA to take a hard look at the consequences of TVA's vegetation management practices. A resulting July 31, 2017 court injunction that limited certain tree clearing was lifted on November 25, 2020. The PEIS goal of meadow-like end-state would require the initial removal of trees and woody vegetation on 3 percent of the total transmission system ROW. The initial woody vegetation removal activities would entail the use of mechanical control (85 percent - e.g., chainsaw) and manual (15 percent - e.g., equipment mounted saws and other devices) methods. Where terrain conditions provide for higher clearances (i.e., ravines, steep slopes etc.), vegetation may not conflict with the safe and reliable operation of the transmission lines, and thus would not need to be removed. Additionally, compatible trees and shrubs would be allowed in areas maintained actively by others.

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Acronyms, Abbreviations, and Glossary of Terms Used

Acre	A unit measure of land area equal to 43,560 square feet.
Access Road	A dirt, gravel, or paved road that is either temporary or permanent, and is used to access the right-of-way and transmission line structures for construction, maintenance, or decommissioning activities.
ANSI	American National Standard Institute
BA	Biological Assessment
BMP	Best Management Practices
Border Zone	The border zone is the area located between the outside edge of the ROW and the wire zone. The width of this area varies based upon ROW width, voltage, structure type, and structure height.
CFR	Code of Federal Regulations
Compatible Vegetation	Compatible vegetation is that which will never grow sufficiently close to a conductor so as to violate the minimum clearance distances.
Conductors	Cables that carry electrical current
CWA	Clean Water Act
Danger Tree	Tree located on or off the ROW that, under maximum sag and blowout conditions, could strike a transmission line structure or come within an unsafe distance of a transmission line if it were to fall toward the line. For most transmission lines, this distance is five feet, but for higher voltage lines, the distance is generally 10 feet.
EA	Environmental Assessment
Easement	A legal agreement giving TVA the right to use property for a purpose such as a right-of-way for constructing, maintaining, and operating a transmission line.
EIS	Environmental Impact Statement
Endangered Species	A species in danger of extinction throughout all or a significant part of its range.
EO	Executive Order
EPA	U.S. Environmental Protection Agency
Ephemeral Stream	Watercourses or ditches that only have water flowing after a rain event; also called a wet-weather conveyance.
ESA	Endangered Species Act
Feller-Buncher	A piece of heavy equipment that grasps a tree while cutting it, which can then lift the tree and place it in a suitable location for disposal; this equipment is used to prevent trees from falling into sensitive areas, such as a wetland
Floor Work	Vegetation management activities typically consisting of mechanical control (e.g., brush hogging) and herbicide application which target previously cleared or maintained areas along the transmission rights-of-way to achieve an end-

	state vegetation community consisting of a mix of herbaceous and low-growing shrub species.
FY23	TVA's Fiscal Year 2023 runs from October 1, 2022 to September 30, 2023
Groundwater	Water located beneath the ground surface in the soil pore spaces or in the pores and crevices of rock formations.
Hazard	Vegetation at risk to the reliability of the transmission system and/or safety of the public. An *immediate hazard* is any vegetation that upon inspection potentially presents a jeopardy or risk to the public safety or the transmission system reliability during the period from the date of inspection or evaluation until the next scheduled Preventative Maintenance tree maintenance activity.
Incompatible Vegetation	Incompatible vegetation is that which has the potential to grow sufficiently close to a conductor so as to violate the minimum clearance distances.
Inspections	Periodic review of the condition of transmission system rights-of-way by means of aerial inspections, ground inspections, and as-needed, field inspections to determine maintenance needs, and any need to adjust the cycle of scheduled work due to emergent conditions.
IPaC	Information for Planning and Consultation. An information, planning and assessment database that can be used to help determine the potential impacts of a project to species regulated by the USFWS.
IVM	Integrated Vegetation Management
LiDAR	Light Detection and Ranging
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination
NPS	National Park Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NWI	National Wetland Inventory
O-SAR	Office-Level Sensitive Area Review
Outage	An interruption of the electric power supply to a user
PA	Programmatic Agreement
PEIS	Programmatic Environmental Impact Statement
Riparian	Related to or located on the banks of a river or stream
ROW	Right-of-way, a corridor containing an active transmission line in the TVA transmission system
Runoff	That portion of total precipitation that eventually enters a stream or river
Seral Stages	A series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage

SHPO	State Historic Preservation Office
SMZ	Streamside Management Zones
Structure	A pole or tower that supports a transmission line
Substation	A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user.
TCP	Traditional Cultural Properties
Threatened Species	A species likely to become endangered within the foreseeable future
Tree Work	Vegetation maintenance activities consisting of manual control (e.g., chainsaw) and mechanical control (e.g., equipment mounted saws and other devices) which focus on tree removal or tree trimming.
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
Wetland	A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife
Wire Zone	The wire zone includes the area directly under the lines

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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

The Tennessee Valley Authority (TVA) develops long-range vegetation management plans for its transmission system according to industry-wide North American Electric Reliability Corporation (NERC) standards. TVA's vegetation management planning process includes considerations regarding how and when TVA would control the vegetation growing within its active transmission system rights-of-way (ROW) to assure the safe and reliable operation of its transmission facilities. TVA has prepared this Environmental Assessment (EA) to address the proposed Fiscal Year 2023 (FY23) management of incompatible vegetation within existing ROW margins that have not been routinely maintained. This EA, which tiers from the broader bounding analysis within TVA's programmatic Transmission System Vegetation Management Environmental Impact Statement (PEIS) (TVA 2019), identifies for a more site-specific review and analysis, the individual ROW segments that typically undergo routine vegetation management in Cycle A of TVA's 3-year vegetation management cycle and provides a more site-specific review and analysis for the proposed vegetation management activities.

1.1 Purpose and Need

The purpose of TVA's transmission system vegetation management program is to strategically manage TVA's existing ROWs in a manner consistent with applicable laws, orders, standards, practices and guidance, while providing reliable electricity transmission to TVA's customers and protecting environmental resources to the extent possible. Failure to implement the transmission system vegetation management program could result in wildfires, major power outages, and injury to life or property. The need for the proposed action includes:

- Enhanced public safety through controlled vegetation management of TVA's ROWs.
- Effective management of vegetation that interferes with the safe, efficient, and reliable operation of transmission lines so TVA can continue to provide the public safe and reliable electric power in a cost-effective and environmentally sound manner.
- Compliance with NERC standards to maintain transmission lines in a safe and reliable operating condition.

1.2 Introduction and Background

1.2.1 TVA's Transmission System

TVA's transmission system consists of a network of more than 16,000 miles of electric transmission lines all contained within approximately 238,000 acres of utility ROW. Most of TVA's transmission system is located on private lands. TVA typically acquires easements that include the right to manage vegetation to protect transmission lines and the transmission system.

1.2.2 The Need for Transmission System Reliability

Reliability of TVA's transmission system is extremely important because interruptions can cause widespread and extended outages. For example, one high-voltage transmission line can support a primary substation, but if an interruption occurs on this transmission line, all other substations that depend on the primary substation also will be interrupted. The other secondary substations distribute power to homes, businesses, hospitals, and safety devices, such as traffic lights. Therefore, the loss of one primary substation can affect thousands of people.

NERC began enforcing its Reliability Standard FAC-003 Transmission Vegetation Management Program on June 18, 2007. The industry-wide reliability standard states that transmission systems, like the TVA system, must maintain adequate transmission line clearances as required by the National Electric Safety Code to be able to survive single-failure events while continuing to serve customer needs with adequate voltage. Because failure to address the vegetation clearance, compliance and monitoring requirements of FAC-003 can result in wildfires, major power outages, and injury to life or property, NERC can apply regulatory penalties for non-compliance, including mitigation and fines.

As such, TVA's ROW vegetation management is typically conducted on a three-year cycle (Cycles A, B, and C). Vegetation that is not managed properly contributes to unnecessary electrical transmission interruptions. On Local Power Company distribution lines, safe working clearance distances can be more easily maintained due to the lower voltages and corresponding electrical arc potential. On higher voltage transmission lines, conductive objects, such as trees and vegetation, pose a greater threat to interrupting the power system, because the higher energy levels enable the electricity to arc over greater distances to the object and then to the ground.

1.2.3 TVA's Vegetation Management Program

TVA's transmission system serves nearly ten million residents in a more than 82,000-square-mile area. For vegetation management purposes this area is divided into six regions consisting of a total of twelve sectors across TVA's power service area (Figure 1-1). TVA develops a yearly plan for each sector, using an Integrated Vegetation Management (IVM) approach, to identify roughly one-third of the transmission system which needs vegetation management. This area, shown on Figure 1-1, comprises the study area for this EA as this area is inclusive of all areas where TVA maintains ROW. Analysis of impacts to individual ROW segments that undergo vegetation management practices in the EA adopts a "Sector" area perspective.

TVA's transmission system vegetation management program along its ROW consists of the following basic components:

- *Inspections* – Periodic review of ROW condition to determine maintenance needs and any need to adjust the cycle of scheduled work due to emergent conditions.
- *Planning and Support* – The ROW manager develops plans to maintain his or her respective ROWs in a cost-effective, efficient, and environmentally responsible manner to minimize vegetation-related interruptions.
- *Communication* – Notification of, communication to and education for the property owner.

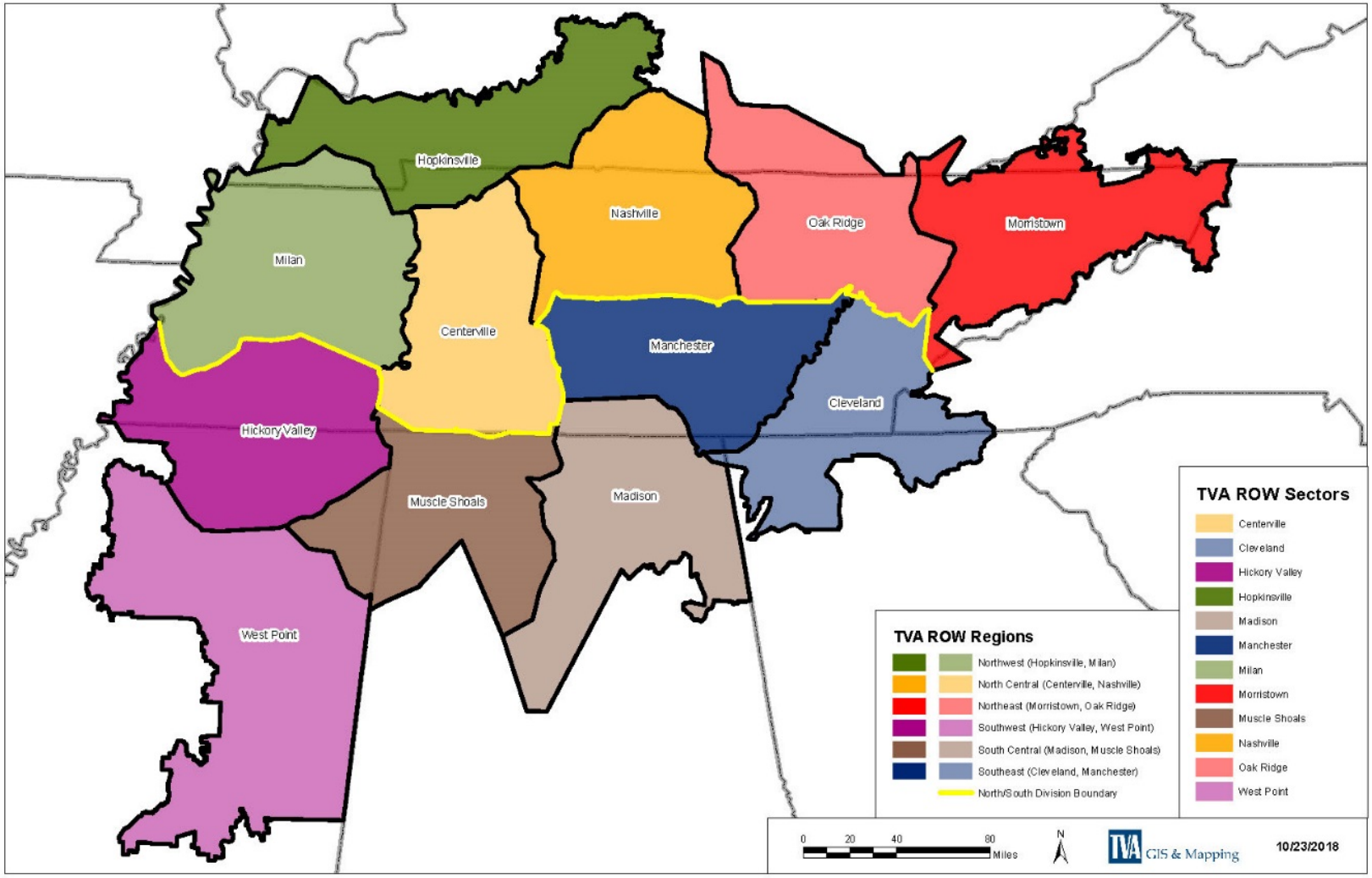

Figure 1-1. TVA's Transmission System Right-of-Way Vegetation Management Sectors and Regions

- *Floor work* – Vegetation maintenance activities which target previously cleared or maintained areas along the ROWs. Typically, floor activities consist of mechanical control (e.g., brush hogging, which is also known as bush hogging, and will be referred to as brush hogging in this document) and herbicide application.

- *Tree work* – Vegetation maintenance activities which focus on tree removal or tree trimming. Typically, tree activities consist of manual control (e.g., chainsaw) and mechanical control (e.g., equipment mounted saws and other devices).

- *Reliability and Compliance* – Vegetation management activities are one key element of maintaining the safety and reliability of the transmission system. Vegetation maintenance activities also must be compliant, where applicable, with the NERC Reliability Standard FAC-003. TVA's ROW can be classified into three broad categories based on the need for routine vegetation maintenance: lands primarily maintained by others (51.5 percent); lands subject to limited maintenance (2 percent); and lands actively maintained by TVA (46.5 percent). TVA has vegetation management rights for the entirety of the 238,000 acres of active ROW. TVA, however, only actively maintains approximately 46.5 percent or 110,752 acres because about 51.5 percent of the ROW is used as cropland, golf courses, orchards or similar uses that integrate compatible vegetation, which is primarily maintained by the landowner. Compatible vegetation is that which will never grow sufficiently close to a conductor so as to violate the minimum clearance distances. While the floor of the ROW is often maintained by others in these areas, TVA conducts routine inspection and vegetation management of ditch banks, fence rows, towers, and other features. Trees that are tall enough to either fall within a ROW or grow to an unsafe distance of transmission lines are managed on all lands within and adjacent to the TVA ROW. A relatively small amount of the TVA ROW (4,720 acres) does not require routine vegetation management by anyone. These areas include ROW that spans open water or deep valleys where vegetation growing at lower elevations cannot threaten the transmission line.

What is "compatible" and "incompatible" vegetation?

Compatible Vegetation: Vegetation will never grow sufficiently close to a conductor so as to violate the minimum clearance distances. Example: low-growing shrubs and herbaceous plants.

Incompatible Vegetation: Vegetation that has the potential to violate minimum clearance distances. Example: young woody trees.

TVA typically also manages danger trees on lands along and adjacent to the TVA ROW. A danger tree is a tree located either on or off the ROW that would strike a transmission line structure or come within an unsafe distance of a transmission line if it were to fall toward the line. For most transmission lines, this distance is five feet, but for higher voltage lines the distance is generally 10 feet. Danger trees that are or have the potential to be a risk to the safety and reliability of TVA's transmission line system must be removed (American National Standards Institute [ANSI] A300 Part 7 2012). Any reference to danger tree removal includes all trees that fit this definition.

What are "Danger" Trees?

Danger trees are trees located on and off the ROW that are tall enough to fall within an unsafe distance of transmission lines. For most transmission lines, this distance is five feet, but for higher voltage lines, the distance is generally 10 feet.

On July 31, 2017, the U.S. District Court for the Eastern District of Tennessee issued an injunction to TVA, pursuant to *Sherwood v. TVA*, No. 3-12-cv-156. TVA was enjoined from "maintain[ing] Buffer Zones on the edges of its ROW in a manner as described in its 1997 and 2008 Line Maintenance Manuals" until after completing an Environmental Impact Statement pursuant to the National Environmental Policy Act (NEPA) that analyzed TVA's ROW vegetation management program. TVA stopped removing woody vegetation, except for trees that were an immediate hazard to the reliability of the transmission system and/or safety of the public, as prescribed by the referenced Line Maintenance Manuals.

On August 30, 2019, TVA issued a PEIS to programmatically address vegetation management within the TVA power system's ROW, as required by the court, and released a Record of Decision on October 18, 2019 (84 FR 55995) identifying its preferred vegetation management alternative to manage the full extent of the ROW to a meadow-like end-state consisting of a mix of herbaceous and low-growing shrub species (TVA 2019). On November 25, 2020, the District Court dissolved the *Sherwood* injunction. On October 1, 2021, a notice of appeal was docketed with the Sixth Circuit Court of Appeals.

The PEIS and this EA share the goal of assessing the potential environmental effects entailed with removing incompatible vegetation in TVA ROWs, resulting over time in a meadow-like end-state. This end-state is then expected to minimize the intensity of maintaining the ROW. Meeting this goal would require the initial removal of incompatible vegetation (trees and woody vegetation) to the full width of the existing ROW easement over the first eight years of the program. About three percent of the total transmission system (8,094 of the total 238,196 acres of ROW) would require the initial removal of woody vegetation within the ROW. Within ROW normally subject to vegetation management during the Cycle A plot rotation, there are a total of 2,298 acres in which incompatible vegetation needs to be addressed during the planned 8-year program initiative. Where terrain conditions provide for higher clearances (i.e., ravines, steep slopes etc.), vegetation may not conflict with the safe and reliable operation of the transmission lines, and thus would not need to be removed. Compatible trees and shrubs would be allowed in areas actively maintained by others.

To satisfy the need for the safe and reliable operation of the transmission facilities while improving the effectiveness of vegetation management, TVA would leave grasses, forbs, and some small shrubs. Thereafter, the full extent of the ROW would be maintained to a low height on a recurring cycle as a meadow-like end-state (i.e., that which at maturity does not pose a risk of interference with electrical conductors). This end-state is expected over time to minimize the intensity of maintaining the ROW.

1.2.4 Vegetation Management Practices

The study area lies within TVA's approximately 238,000 acres of ROW easements within the transmission system. The study area supports a variety of vegetation including trees, brush, and herbaceous plants. TVA plans for needed vegetation management along ROWs on a three-year cycle (Cycles A, B, and C) so that approximately one-third of the transmission system is addressed each year. As described in TVA's broader bounding analysis in the PEIS (2019), vegetation management on the transmission system is necessary to ensure that safe and reliable electric power service is not interrupted by trees or other vegetation growing under or near the transmission lines. To protect public safety and maintain power reliability, TVA maintains different areas within a ROW (Figure 1-2):

- *Wire Zone* – Generally, the wire zone includes the area directly under the lines.
- *Border Zone* – The border zones are located between the wire zone and the outside edge of the ROW. The width of this area varies based upon ROW width, voltage, structure type, and structure height.

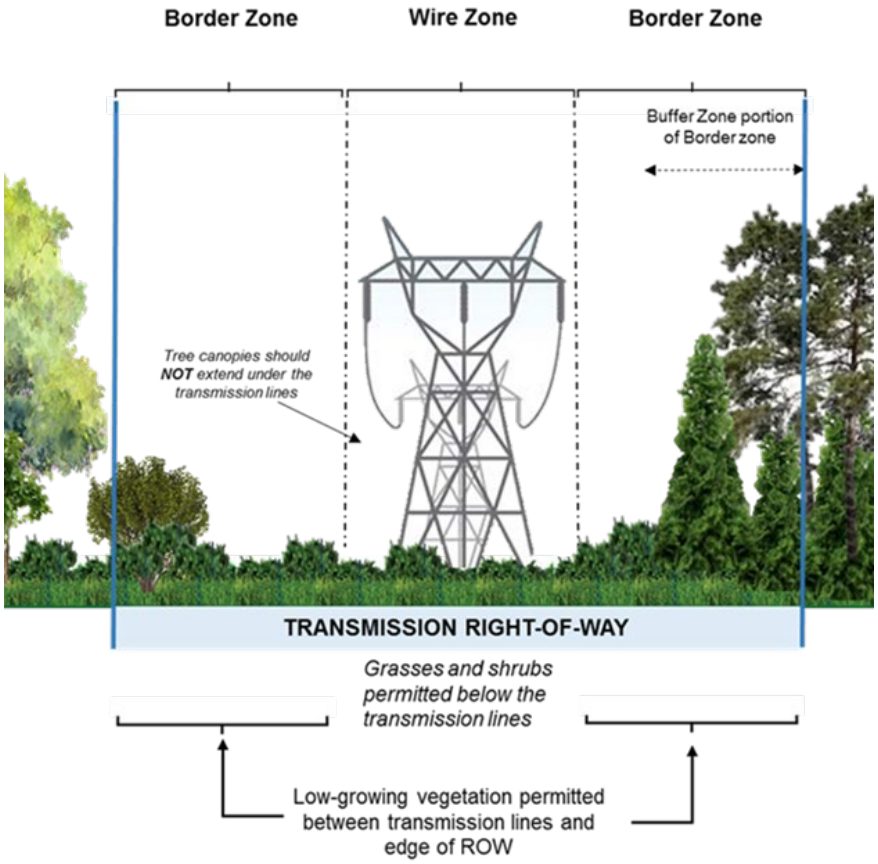

Figure 1-2. Transmission Line Rights-of-Way Zones

Within some of TVA's ROW easements, the full width of the ROW easement has in the past not been subjected to routine vegetation management. As a result, these areas contain vegetation incompatible with TVA's transmission system. To reduce the risk of trees or branches falling onto lines, or lines sagging or swaying into trees, incompatible vegetation would be removed. As indicated in the PEIS (2019) and described above, TVA plans to address the trees and woody vegetation that are a risk to the reliability of the transmission system as defined by ANSI A300 Part 7, B-3.1 (2012).

1.2.5 Emphasis on Integrated Vegetation Management

The Federal Energy Regulatory Commission and NERC both recognize the ANSI Tree, Shrub and Other Woody Plant Maintenance-Standard Practices for electric utility ROW as a best management practice (BMP) (ANSI 2012).

The concept of IVM is the basis of this standard and is defined as:

> A system of managing plant communities in which compatible and incompatible vegetation is identified, action thresholds are considered, control methods are evaluated, and selected control(s) are implemented to achieve a specific objective. Choice of control methods is based on effectiveness, environmental impact, site characteristics, safety, security, and economics.

TVA's IVM process consists of six elements (Figure 1-3).

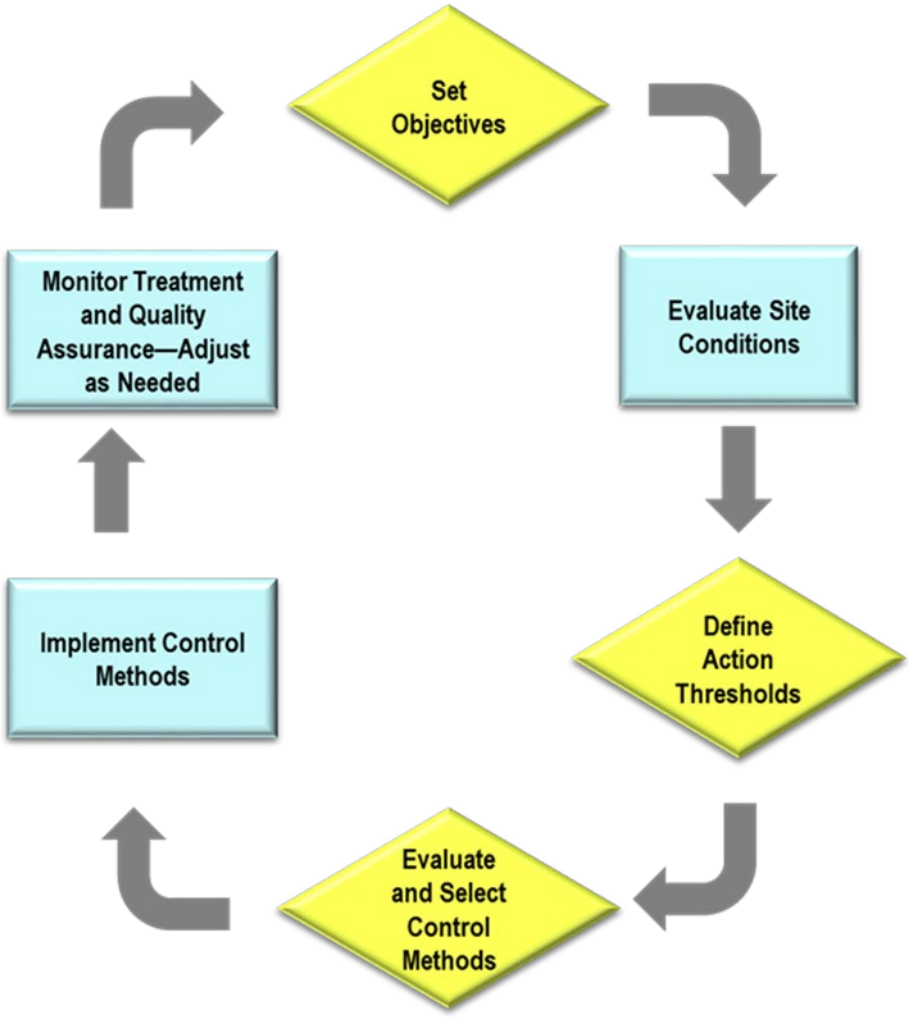

Figure 1-3. TVA Integrated Vegetation Management Process

The goal of IVM is to provide an integrated and balanced approach to vegetation management that considers the overall long-term effect on public health and safety, reliability of electric transmission, environmental stewardship, and cost. As vegetation growth is dynamic, the IVM planning and implementation process is iterative and continuous; this allows flexibility to adjust plans as needed.

Setting objectives, defining action thresholds and selecting site-specific application of tools to control vegetation are all considered in the IVM process. TVA believes that the IVM process provides the appropriate flexibility for making sound decisions regarding ROW vegetation management; thus, the alternatives considered in this EA are based on the IVM concept. Vegetation control methods are selected based upon a thorough consideration of the end-state and form of the plant communities that are subject to control, as well as an integrated application of TVA's office-level sensitive area review (O-SAR) process. The O-SAR process, described below in Section 2.2.2, prescribes the need for site-specific field surveys and particular tool use based on the documented or potential presence of sensitive environmental resources.

1.2.6 Selection of Vegetation Control Methods

The process for selecting from various vegetation management methods is determined based on location, the existing plant communities, prior site history, and the integration results of TVA's O-SAR process. The vegetation control methods or tools and their appropriate uses for various ROW conditions are identified and discussed in TVA's PEIS (2019).

Effective vegetation control along the ROW typically requires the use of a combination of methods depending on the target vegetation type. TVA uses herbicides predominantly during routine floor vegetation management and a mix of manual and mechanical methods to remove trees. Noxious or invasive plant species are controlled predominantly by a mix of methods dominated by mechanical techniques and herbicides. By comparison, tall-growing, incompatible trees and shrubs are typically controlled using a more balanced application of all techniques (manual, mechanical, and herbicide). TVA recognizes that each tool has inherent advantages and disadvantages (TVA 2019).

Setting objectives, defining action thresholds, and selecting site-specific application of tools to control vegetation all require consideration as part of the IVM process. Use by TVA of all the methods identified within the PEIS (manual, mechanical, and herbicide/growth regulators) is appropriate and necessary to ensure flexibility of application, increased environmental sensitivity, and cost effectiveness for each site-specific application.

Of the vegetation control methods available for ROW vegetation maintenance (e.g., manual, mechanical, and herbicide/growth regulators), the most suitable approach would be the one that best achieves the management objectives at each site within the ROW (see Table 1-1 for methods appropriate for removal of trees and woody vegetation). The site-specific selection of control methods (individually or in combination) is based on a range of factors including an understanding of environmental resources and their sensitivities, knowledge of specific site characteristics, safety, cost, and current land use issues. All applications of herbicides would be consistent with all applicable state and federal laws, regulations, and guidance, including but not limited to U.S. Environmental Protection Agency's (EPA) Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Occupational Safety and Health Administration regulations.

Table 1-1. Methods Appropriate for Use on TVA Transmission System ROWs

	Vegetation Control Method		
	Manual	**Mechanical**	**Herbicide[1]**
Forested Areas	Manual methods appropriate for tree removal.	Appropriate for dense stands of.	Appropriate for target vegetation control (including invasive weeds), and stump treatments of deciduous trees.
Danger Trees Outside the ROW	Manual methods are appropriate for selective removal of danger trees.	Appropriate; however, mechanical methods tend to be non-selective and used for smaller tree heights.	Growth regulator may be appropriate to stunt growth of potential danger trees.

[1] All applications of herbicides would be consistent with all applicable state and federal laws, regulations and guidance including but not limited to the U.S. Environmental Protection Agencies Federal Insecticide, Fungicide, and Rodenticide Act and Occupational Safety and Health Administration regulations

1.3 Decision to be Made

The primary decision before TVA is whether to ensure safe and reliable electric power to TVA's power service area by strategically managing vegetation along its ROWs consistent with applicable laws, regulations, standards, practices and guidance, while protecting environmental resources to the extent possible. If the proposed vegetation management is to occur within ROWs, other secondary decisions are involved. These include the identification of 400 acres of incompatible vegetation to be removed in FY23 and the type and timing of vegetation control methods. TVA's decision would consider factors such as environmental impacts, cost, and the availability of resources.

1.4 Related Environmental Reviews

In 2019, TVA released the PEIS, which is incorporated by reference (TVA 2019). This review more broadly represented a comprehensive analysis of management activities and potential environmental impacts associated with TVA's vegetation management program across all sectors within the TVA power service area. Various vegetation management methods and tools were considered as part of the analysis. TVA issued a Record of Decision on October 18, 2019 identifying its preferred vegetation management program alternative as a condition-based control strategy with a goal of maintaining the ROW in a meadow-like end-state (84 FR 55995).

On November 9, 2020, TVA issued a final EA and finding of no significant impact for its Fiscal Year 2021 proposal to perform routine vegetation management on about one-third of the transmission system ROWs (TVA 2020). The management of vegetation within the ROW is needed to ensure the transmission system can continue to provide reliable power and to prevent outages related to incompatible vegetation. Site-specific effects of vegetation management were considered within twelve managed sectors in areas that had been previously and continuously maintained on a recurring cycle. The EA tiered from the PEIS which evaluated and analyzed TVA's vegetation management program (TVA 2019).

On October 1, 2021, TVA issued a final EA and finding of no significant impact for its proposal to perform routine vegetation management on about one-third of the transmission system ROWs in both FY22 and FY23 (TVA 2021). The management of vegetation within

the ROW is needed to ensure the transmission system can continue to provide reliable power and to prevent outages related to incompatible vegetation. Site-specific effects of vegetation management were considered within twelve managed Sectors in areas that had been previously and continuously maintained on a recurring cycle. The EA tiered from the PEIS which evaluated and analyzed TVA's vegetation management program (TVA 2019).

1.5 Public Involvement

As part of TVA's public communication plan for this project, TVA has developed a Web site as the primary platform for public outreach. The project Web site is intended to serve as the primary hub for distributing information to the public. Visitors to the page can navigate from the project Web site to other web sites for additional information pertaining to TVA's transmission system and current vegetation management. The Web site directs the public to submit comments via email, mail, or an online comment form accessed from the project Web site. TVA has also used local news outlets to notify members of the public of the proposed FY23 vegetation management plans to remove about 400 acres of incompatible vegetation within select ROW areas.

1.6 Prior Agency and Tribal Involvement

During the review of TVA's vegetation management program (TVA 2019), TVA contacted federal and state agencies, as well as federally recognized Native American tribes represented in the TVA power service area (see Appendix A). Pursuant to Section 7 of the Endangered Species Act (ESA), and in consultation with the U.S. Fish and Wildlife Service (USFWS), TVA prepared a programmatic Biological Assessment (BA) that evaluated impacts of a suite of TVA routine actions on federally listed bats present in the TVA power service area. This consultation was completed in April 2018 (Appendix B). TVA also has consulted with the USFWS on routine vegetation management activities carried out on TVA transmission system ROWs for all other threatened and endangered species. This consultation was completed in May 2019 (Appendix C).

Pursuant to Section 106 of the National Historic Preservation Act (NHPA), and in consultation with the Advisory Council on Historic Preservation; the state historic preservation officers (SHPO) of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia; and all federally recognized Indian tribes with an interest in the region, TVA prepared a Programmatic Agreement (PA) for existing TVA operation and maintenance activities, including vegetation management. This consultation was completed in February 2020 (Appendix D).

Further, TVA coordinated with other federal land management agencies in conjunction with the PEIS. During the PEIS, the National Park Service (NPS) and the U.S. Forest Service (USFS) served as cooperating agencies contributing on vegetation management practices on TVA transmission system ROWs crossing federal lands under their respective jurisdiction. Regardless, these agencies would be notified, and consulted with, as appropriate, concerning any ROW segments proposed for vegetation management in this EA. Additionally, TVA entered into a General Agreement with the NPS which addresses vegetation management for ROW easements and permits on NPS lands (Appendix E).

Following the release of the Final PEIS, copies or notices of its availability with instructions on access was provided to agencies, federally recognized Indian tribes represented in the TVA power service area, and individuals that had expressed interest in the project.

1.7 Scope of the Environmental Assessment and Issues to be Addressed

TVA prepared this EA in compliance with the NEPA statute, regulations promulgated by the Council on Environmental Quality, and TVA's NEPA regulations at 18 CFR 1318. This EA tiers from the broader bounding analysis within the PEIS (TVA 2019) and provides more site-specific review and analysis, as appropriate. TVA has identified ten individual ROW segments that typically undergo routine vegetation management in Cycle A of TVA's 3-year vegetation management cycle (Table 1-2). These segments which are located within five vegetation management Sectors would be considered for the removal of incompatible vegetation in FY23.

To facilitate "tiering," the PEIS established the process TVA considers when making decisions regarding vegetation management, identified potential environmental impacts associated with vegetation management tools, and established mitigation measures that would minimize environmental impacts (TVA 2019). This EA integrates the findings and conclusions of the PEIS analysis.

Table 1-2. TVA Transmission System Line Segments Proposed for Removal of Incompatible Vegetation in Fiscal Year 2023

SECTOR NAME	SECTOR ABBREVIATION	PRIMARY LINE NAME	TRANSMISSION LINE NUMBER
Cleveland	CL	Apalachia-Basin	L5942
Cleveland	CL	Apalachia-E Cleveland 1	L5179
Cleveland	CL	Apalachia-E Cleveland 2	L5741
Cleveland	CL	Sequoyah NP-Charleston 1	L5028
Hopkinsville	HK	Barkley-Hopkinsville	L5655
Manchester	MC	Widows Creek-Oglethorpe 1	L5751
Manchester	MC	Widows Creek-Oglethorpe 2	L5614
Manchester	MC	Widows Cr-Goose Pond	L5157
Morristown	MT	Douglas-Pigeon Forge 1	L5693
Oak Ridge	OR	Norris-Clinton	L5220

In the PEIS, TVA determined that the resources listed below could potentially be impacted by the alternatives considered (TVA 2019). These resources were identified based on internal scoping as well as comments received during previous public scoping periods for transmission line projects.

- Surface Water
- Aquatic Ecology
- Vegetation
- Wildlife
- Threatened and Endangered Species
- Wetlands
- Managed and Natural Areas, Parks and Recreation
- Archaeological and Historic Resources

Further, the PEIS concluded that the potential effects of vegetation management on ROWs would be minor, short-term, temporary, negligible, and/or none related to air quality and global climate change, geology, groundwater, hydrogeology, floodplains, socioeconomics and environmental justice, transportation, visual resources, land use and prime farmland, solid and hazardous waste, and public health and safety. Potential impacts resulting from vegetation management activities would be minimized for all resources with the implementation of BMPs (TVA 2017) and TVA guidance documents (TVA 2021). Further, all vegetation management activities would be implemented in accordance with applicable state and federal laws and regulations. Thus, any further analysis for effects to these resources was not deemed necessary.

TVA's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12372 (Intergovernmental Review), EO 12898 (Environmental Justice), EO 13112 as amended by 13751 (Invasive Species), EO 13653 (Preparing the U. S. for the Impacts of Climate Change), EO 13990 (Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis), EO 14008 (Tackling the Climate Crisis at Home and Abroad), and all applicable laws, including but not limited to the Farmland Protection Policy Act, the NHPA of 1966, ESA of 1973, as amended, Clean Water Act (CWA), and Clean Air Act.

1.8 Necessary Permits or Licenses

TVA maintains agency-wide state National Pollutant Discharge Elimination (NPDES) General Permits for Discharges from the Application of Pesticides. A Pesticide Discharge Management Plan is maintained annually that prescribes how the ROW herbicide applications comply with these permits. TVA would coordinate with USFS and NPS personnel and acquire any necessary permits prior to performing any vegetation management activities (e.g., for ROWs located within the Great Smoky Mountains NPS, TVA has been granted an IVM Special Use Permit that will allow for herbicide application).

CHAPTER 2 - ALTERNATIVES

2.1 Alternatives Including the Proposed Action

As described in Chapter 1, the scope of the potential alternatives is informed by the purpose and need of the proposed action, namely, the need to manage and/or eliminate vegetation that interferes with the safe and reliable operation of the transmission system. A description of the proposed action is provided below in Section 2.1.2. Additional background information about existing vegetation management practices, as well as the need to address future management within and along the ROW is also provided.

This chapter has five major sections:

1. A description of alternatives;
2. An explanation of the process of vegetation management;
3. A comparison of anticipated environmental effects by alternative;
4. Identification of mitigation measures; and
5. Identification of the preferred alternative.

2.1.1 Alternative A – No Action Alternative – Do Not Remove Incompatible Vegetation in Designated Areas of TVA Right-of-Way

Under the No Action Alternative, there would be no initial change to the current state of vegetation within ROWs. Individual ROW segments that TVA has identified in which vegetation management activities are needed to address incompatible vegetation would not undergo any such vegetation management.

As a result, the existing ROW would continue to contain vegetation that presents a risk to the reliability of TVA's transmission system. The volume of non-compatible woody vegetation within the ROWs increased due to the injunction in *Sherwood v. TVA* and would continue to pose an increasing risk to the transmission system.

The No Action Alternative does not adequately address the potential for service outages from trees growing into the transmission line or near enough to allow an electrical arc, falling into the line, or creating a fire hazard to the lines and structures, and thereby continues to create an increased risk to reliability. The No Action Alternative also does not adequately address the risk to public safety that can stem from wildfires caused by power lines. In addition, the No Action Alternative would lead to a marked increase in worker safety concerns, due to the increased risk of serious injuries and fatalities associated with the increased need to undertake manual removal of large danger trees.

In the PEIS, the net present value of the cost to maintain the ROW for the next 20 years under the No Action Alternative was estimated to be approximately $205 million (TVA 2019). However, tree work costs are higher for this alternative and would increase over time due to the inefficiencies inherent in removal of only those trees that pose a current risk to the transmission system, as opposed to removal of all incompatible trees and other woody vegetation. This increase would be a direct result of continued vegetation growth until the vegetation grows sufficiently to meet the definition of risk, which would necessitate addressing that imminent risk in the next maintenance cycle.

Consequently, this alternative would not satisfy the project purpose and need and, therefore, is not considered a viable or reasonable alternative. It does, however, provide a benchmark for comparing the environmental impacts of implementation of the Action Alternative.

2.1.2 Alternative B – Action Alternative – Remove Incompatible Vegetation in Designated Areas of TVA Right-of-Way

Under the Action Alternative, TVA proposes in FY23 to address the removal of approximately 400 acres of incompatible vegetation within its ROWs that are typically subject to routine vegetation management during the 3-year Cycle A rotation. Ten ROW segments within five of the TVA vegetation management Sectors in the TVA power service area would be targeted in FY23. The targeted areas are located within the Cleveland, Hopkinsville, Manchester, Morristown, and Oak Ridge sectors (see Figure 1-1). Removal would target trees and woody vegetation that remained within the ROW since construction of the transmission line. TVA would use an IVM approach to promote the establishment of a plant community "end-state" dominated by low-growing herbaceous and shrub-scrub species that do not interfere with the safe and reliable operation of the transmission system. All areas within the ROW thereafter would be managed as floor. The goal of this alternative would be to allow compatible vegetation to establish and propagate to reduce the presence of woody species to the full width of the existing ROW easement. TVA would continue to use all assessment techniques, including Light Detection and Ranging (LiDAR) data.

TVA's policy and direction for managing vegetation along its ROW integrates an IVM strategy allowing TVA to apply a range of methods depending on the target vegetation type. The proposed Action Alternative incorporates this IVM approach based on a carefully planned, multidimensional strategy developed in consultation with forestry and habitat experts. IVM aims to create conditions on the ROW that improve safety and prevent power outages by creating inherently more compatible and self-sustaining ecosystems while ensuring compliance with regulatory standards (Appendix F).

The proposed Action Alternative to manage vegetation is "context sensitive" within an overarching IVM approach in its selection of methods and in its incorporation of TVA's O-SAR process to avoid and minimize impacts (Figure 2-1). The scope of the potential alternative is constrained by the need for TVA to eliminate vegetation that interferes with the safe and reliable operation of the transmission system including both the conductor and structures. The establishment of a stable, low-growing plant community would reduce the intensity of vegetation control once the desired end-state in each location has been achieved.

TVA's routine vegetation management includes the identification and removal of vegetation within the ROW incompatible with TVA's desired end-state condition. Within ROWs primarily maintained by TVA, vegetation for most of the transmission system has routinely undergone floor work (i.e., that which is focused on the maintained herbaceous community) which is planned on an established cycle and would be controlled using a mixture of methods. However, the ROW areas proposed under this alternative have not been part of TVA's routine vegetation management cycles. As such, the areas identified for removal of incompatible vegetation present a potential risk to TVA's transmission system.

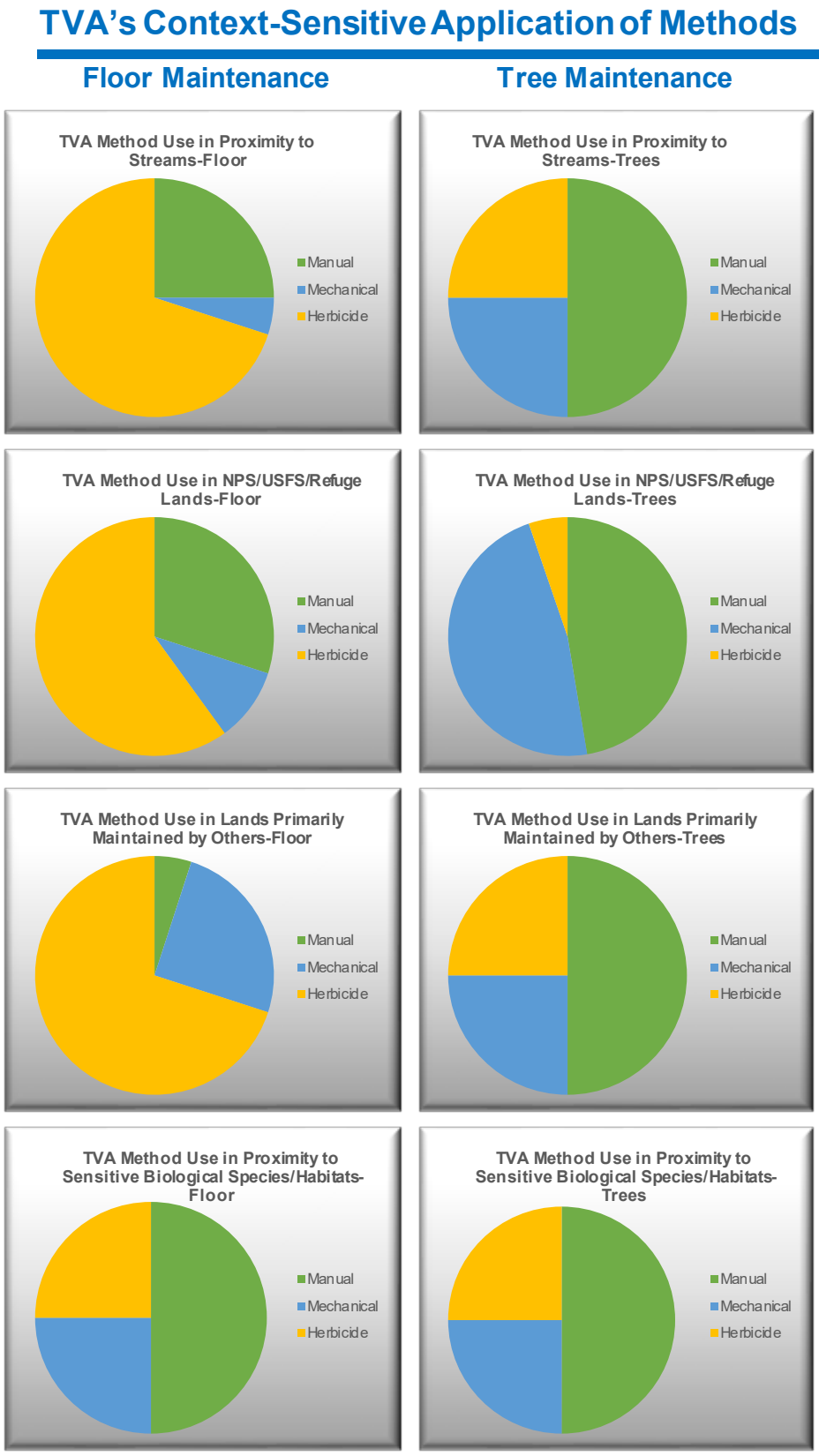

Figure 2-1. TVA's Context Sensitive Application of Vegetation Control Methods as of Fiscal Year 2022

However, the net effect of TVA's O-SAR process is to consider the site-specific sensitivity at a given location on the ROW in the development of a context sensitive approach to tools for vegetation management that influence the method selection for both floor and tree work (Figure 2-1).

By combining selective use of herbicides with physical vegetation removal, IVM can more thoroughly eradicate incompatible vegetation and allow more "compatible" species to fill in, making it harder for tall-growing vegetation to reestablish. These ecosystems foster beneficial, attractive, and low-maintenance habitat where incompatible vegetation is discouraged and other, more benign forms of vegetation can thrive.

As illustrated in Figure 2-2, TVA's method of vegetation control is addressed by the targeted type of vegetation. Tall-growing incompatible trees and shrubs typically are controlled using a balanced application of all techniques (manual, mechanical, and herbicide). In general, however, the proposed initial woody vegetation removal activities would entail the use of mechanical control (85 percent - e.g., chainsaw) and manual (15 percent - e.g., equipment mounted saws and other devices) methods.

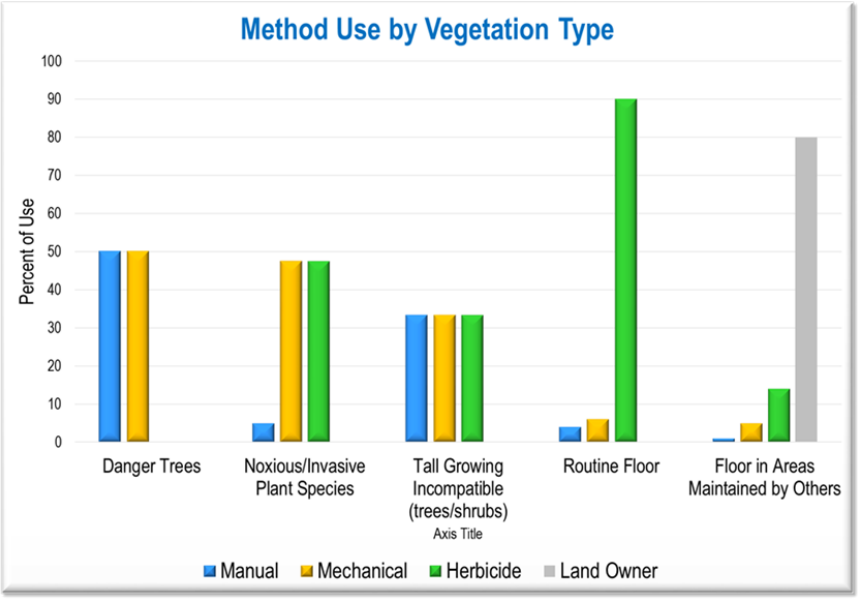

Figure 2-2. Relative Frequency of Method Use by Target Vegetation Type

Under the Action Alternative, compatible trees and shrubs would be allowed in areas maintained actively by others (such as residential lands, orchards, forest plantations, agricultural lands, or other similar areas).

The proposed alternative includes routine assessment methods to establish a basis for vegetation control measures. The assessment process is accomplished by a variety of methods including aerial inspections, ground inspections, as-needed field inspections, and information from TVA personnel, property owners, and the public.

Another powerful assessment technique available to TVA is aerial three-dimensional imagery to map areas of the ROW. This imagery is procured using aerial photography, remote sensing methods, photogrammetry, and LiDAR data. Using these techniques, the height of vegetation growing within the ROW (wire and border) can be measured and assessed to determine its potential to be a current or near-term (i.e., 5 to 10 years depending on growth rate of individual species) threat to transmission lines or structures and thus, to reliability. TVA uses information obtained by these techniques to determine planning needs to conduct both routine and recurring vegetation maintenance and for identifying incompatible vegetation for removal.

2.2 Process of Managing Vegetation within Transmission Line ROWs

2.2.1 Vegetation Management Framework

Each year TVA assesses vegetation conditions on and along its ROW to identify vegetation that potentially could interfere with the safe, efficient, and reliable operation of the existing transmission system, and public safety. TVA also must comply with the NERC Reliability Standard (FAC-003) where applicable. Maintaining adequate clearance between transmission line conductors and tall-growing vegetation is essential to reliability, safety, and compliance with applicable regulatory standards. As noted in Chapter 1, TVA's transmission system vegetation management responsibilities encompass approximately 238,000 acres of ROW. Only three percent of the total ROW (8,094 of the total 238,196 acres of ROW) would require initial vegetation removal, of which TVA proposes to address five percent in FY23 (about 400 of the total 8,094 acres of incompatible vegetation in the transmission system or, 0.002 percent of total acres of ROW).

As described in Section 1.2.4, the framework for TVA's vegetation management program within its transmission system consists of the following basic components:

a. Inspections
b. Planning and Support
c. Communication
d. Floor work
e. Tree work
f. Reliability and Compliance

The proposed Action Alternative would be focused on mostly the "tree work" component of the program with the removal of trees and woody vegetation. Tree work throughout TVA's transmission system (including lands primarily managed by others) focuses on removal of incompatible trees to maintain the safety and integrity of the transmission system. Tree work includes removal of trees that may become a risk to the reliability of the transmission system within the ROW easement and removal of danger trees outside of the ROW easement. Typically, trees are controlled through manual methods (e.g., chainsaw) and mechanical controls (e.g., equipment-mounted saws, mowers). Tree work throughout TVA's transmission system is directed by inspections and assessments that identify incompatible woody vegetation and guide control measures.

TVA would leave grasses, forbs, and some small shrubs which would then be maintained during "floor work" to a low height on a recurring cycle as a meadow-like end-state (i.e., that which at maturity does not pose a risk of interference with electrical conductors). Floor work on TVA's transmission system is routine and focused on periodic, repeated application of vegetation control measures. Floor work is used to maintain plant communities in an herbaceous or low-growing condition to prevent future incompatibility with transmission facilities, thereby promoting reliability and regulatory compliance.

As part of the process, each year TVA develops a vegetation removal plan specific to each transmission line project area based on local terrain conditions, species composition, growth form, and vegetative density. TVA has developed a stepwise process incorporated under all of the proposed vegetation management alternatives to ensure that vegetation management proactively protects environmental resources, considers land use and land ownership, and enhances health and safety. This process applies to planned vegetation maintenance activities and is not applicable to addressing emergency needs.

Under this approach TVA ensures the following steps are implemented:

1. **Identify the area of vegetation maintenance and type of required activity to ensure safety and reliability.**
    a. Floor work – Identify the types of vegetation that require control (invasive weeds, tall-growing vegetation).
    b. Tree Work – Tree removal of incompatible vegetation that would represent a current or future risk to the transmission system.
2. **Identify surrounding land use (i.e., urban, forested, agriculture, pasture, etc.) and landowners.**
    a. Address ROW vegetation maintenance within special use lands associated with NPS, USFS, tribal lands, or other special use/conservation lands in accordance with any existing agreements or regulations.
    b. Follow current TVA process for notifying property owners.
    c. Evaluate surrounding land uses to determine constraints on vegetation control. Incorporate appropriate BMPs as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities Revision 3-2017* (TVA 2017). The manual can be accessed *here*.

3. **Identify sensitive or natural resources within an area of activity and implement any special requirements associated with performing work in those areas.**
    a. Review and interpret O-SAR data (see Section 2.2.2 below).
    b. Identify appropriate mitigation measures as outlined in TVA's guide for environmental and best management practices (TVA 2017) for the following resources:
        - Streamside Management Zones (SMZ).
        - Wetlands.
        - Other sensitive resources which can include, but are not limited to, caves, federally and state-listed threatened, endangered or special status species (plants and animals), public water supplies, groundwater, critical or unique wildlife or habitat (e.g., trout streams, designated critical habitat, wading-bird nesting areas, heronries, sinkholes), and cultural resource features.
    c. Evaluate work area for safety factors in relation to TVA personnel and the general public.
    d. Identify areas with steep or unstable slopes (usually greater than 30 percent). Certain types of mechanical equipment may not be feasible in these areas.
    e. Ensure TVA personnel and contractors are properly trained for specific techniques required for special requirements.

Environmental Constraint: Streamside Management Zones

BMP Employed: When removing vegetation within an SMZ, TVA uses buffers of a minimum 50 feet on each side of the bank. Buffer width is predetermined based on waterway, primary use, topography, physical barriers, and resource sensitivity. Removal of vegetation within an SMZ is limited to only tall-growing, incompatible species, preserving the low-growing vegetation to minimize disturbance. Stumps must be left in place and all debris from vegetation removal must be removed from within the SMZ.

4. **Determine vegetation control methods.**
    a. Consider Steps 1 through 3.
    b. Consider safety.
    c. Consider cost.
    d. Incorporate appropriate BMPs and guidance as described in TVA's guide for environmental and BMPs (TVA 2017 or most current revision) and current TVA Vegetation Management Guidelines as described in Appendix F.
5. **Prepare appropriate environmental documentation. Determine if the work is within the parameters of the PEIS (2019).**
    a. If yes, determine if work is covered under an existing Categorical Exclusion or EA.
    b. If not, conduct further environmental review if anticipated impacts are substantially different from those evaluated in the PEIS.
    c. Monitor to determine whether follow-up treatments or mitigation measures are necessary.

6. **Determine appropriate debris management method and re-vegetation method if required.**
    a. Determine whether reseeding is necessary or appropriate under the circumstances.
    b. Determine appropriate debris management method considering Steps 1 through 3 above.
7. **Determine re-inspection requirements.**
    a. Determine steps needed to evaluate whether vegetation treatments and/or mitigation measures are working properly and to ensure that other resources are not being adversely affected.
    b. Monitor to determine whether follow-up treatments or mitigation measures are necessary.

2.2.2 TVA's Integrated Sensitive Area Review Process

The types of sensitive resources occurring in or near the ROW vary widely and include threatened and endangered plant and animal species, caves, heron/osprey rookeries, natural areas, and wetlands. To protect sensitive resources on ROWs, TVA developed the O-SAR process as an integral component of all its vegetation management practices and is discussed in greater detail in TVA's PEIS (2019).

As part of the O-SAR process, qualified biologists perform reviews of the entire transmission system every 3 years (Cycles A, B, and C). These desktop reviews use computer-based mapping programs and a wide array of digital data, in lieu of field surveys, to ascertain where sensitive resources may occur on TVA ROWs. Field verified data is added to the O-SAR data, when it becomes available. Sensitive resources identified as part of the review process are grouped into five general categories (Table 2-1). The more common widely available data sets used in desktop reviews include aerial photography, U.S. Geological Survey topographic maps, National Wetland Inventory (NWI) data, EPA Level 4 ecoregion maps, and Natural Resource Conservation Service soils maps. TVA's approach is unique in that it uses specific data as part of the O-SAR review that includes both transmission line/structure locations coupled with TVA's extensive Regional Natural Heritage database. This is a "living[1]" database that contains over 30,000 occurrence records for protected plants, animals, caves, heronries, eagle nests, and natural areas for the entire TVA study area.

[1] TVA adds records based on field survey findings, and TVA's Regional Natural Heritage database is periodically synced with both the USFWS federal listing of threatened and endangered species and state Natural Heritage programs.

Table 2-1. Elements of TVA's Office-Level Sensitive Area Review Database

Sensitive Resource Categories	Data Descriptions
Plants	Locations (documented or potential) of federally or state-listed plant species or unique plant communities.
Aquatic Animals	Locations (documented or potential) of federally or state-listed aquatic animal species.
Terrestrial Animals	Locations (documented or potential) of federally or state-listed terrestrial animal species, bald eagle nests, caves, heron rookeries, osprey nests, Indiana/northern long-eared bat habitat, and other unique resources.
Natural Areas	Locations of federal, state, local, or non-profit lands managed for ecological and/or recreational purposes. A few examples include National Parks, Federally Designated Critical Habitat, Tennessee Designated Natural Areas, state Wildlife Management Areas, and land trust properties.
Wetlands	Includes NWI wetlands; potential wetlands identified by TVA using topographic features, water bodies, soils boundaries, and proximity to NWI; and field verified wetlands delineated during TVA field surveys of ROW.

Sensitive resources identified within the O-SAR database are defined as polygons and assigned a "Class" level with specific guidance governing ROW vegetation management planning efforts. Sensitive area class definitions for vegetation management activities are provided in Appendix G. The guidance that arises from the O-SAR database Class assignment may be informational or prescriptive and may result in limitations of vegetation control tools, requirements for notification to TVA biologists, and/or the need for site-specific field surveys to be performed by TVA biologists prior to work activities. This Class assignment guidance constitutes an important aspect of the implementation of BMPs to minimize environmental impact. The guidance is particularly important to clearly define what vegetation maintenance activities are permissible within sensitive areas, considering the specific sensitive resources that occur or might occur on a given section of ROW. It also provides certainty and flexibility to TVA ROW personnel, who develop vegetation control activities over large areas under schedule and budget constraints. On lands managed by NPS and USFS, additional reviews by appropriate agency staff are required prior to the implementation of vegetation management practices. Among other things, the need for additional review will be determined by TVA's respective property rights and/or any effective agreements. For instance, some NPS parcels on ROW may not have any chance of threatened or endangered plants or animals, but herbicide use is still not allowed because of specific guidance per the land manager. For ROWs located within the Great Smoky Mountains NPS, TVA has been granted an IVM Special Use Permit that will allow for herbicide application.

2.2.3 Programmatic Agreements and Consultations

TVA's formulation of vegetation management alternatives also integrates the content of PAs and consultations developed and executed in coordination with other federal and state agencies. TVA uses these program-level, regulatory-based determinations to avoid or minimize adverse effects of TVA actions.

As described in Section 1.6, and in accordance with Section 7 of the ESA, TVA consulted with the USFWS to assess, on a programmatic basis, the impact of 10 overarching TVA routine actions on four federally listed bat species (gray bat, Indiana bat, northern long-eared bat, Virginia big-eared bat) and their habitats. As part of this effort, TVA prepared a programmatic BA, which was submitted to USFWS on June 18, 2017. Within the BA, TVA analyzed the effects of 96 routine activities associated with the 10 routine actions. One of the routine actions was maintenance of existing electric transmission assets, which included vegetation management activities along ROWs.

TVA determined that 21 of the 96 activities will have no effect on Indiana bat or northern long-eared bat; 72 activities may affect, but are not likely to adversely affect these two species; and three activities are likely to adversely affect these two species. Potential adverse effects to Indiana bat and northern long-eared bat could result from tree removal (two of three activities) or prescribed fire (one of three activities). Of these, tree removal is identified as an activity that can occur during vegetation maintenance activities. The use of prescribed fire is limited to portions of TVA Reservoir Lands and would not be used during vegetation maintenance activities. TVA also determined that 21 activities covered under the programmatic BA will have no effect on gray bat or Virginia big-eared bat, and 75 activities may affect, but are not likely to adversely affect these two species.

As a component of the BA, TVA committed to implementing conservation measures to avoid and minimize impacts associated with routine actions, as well as to continue conducting conservation measures that may benefit or promote the recovery of the Indiana bat, northern long-eared bat, gray bat, and Virginia big-eared bat.

In response to TVA's programmatic BA on bats and routine actions, the USFWS prepared a programmatic Biological Opinion, concurring with TVA's "effects determinations" and proposed conservation measures. This programmatic consultation was completed in April 2018, and it will be carried out over a 20-year term. Documentation of this consultation including the USFWS Biological Opinion is included Appendix B.

TVA also consulted with the USFWS to assess the impacts of routine vegetation management activities associated with TVA's transmission system ROW vegetation management program on all species listed under the ESA (other than the four federally listed bat species addressed in the programmatic consultation) with potential to occur in the study area. This consultation was completed and the USFWS issued a Biological Opinion in May 2019 concurring with TVA's effects determinations. The Biological Opinion is included in Appendix C. BMPs and conservation measures developed in conjunction with this consultation to avoid and minimize effects to sensitive species will be integrated into TVA's ROW vegetation management procedures.

TVA also consulted with the Advisory Council on Historic Preservation, the SHPOs of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia (respectively), and all federally recognized Indian tribes with an interest in the region for existing TVA operation and maintenance activities, including vegetation management. Pursuant to Section 106 of the NHPA this consultation was completed in February 2020 (see Appendix D).

2.3 Comparison of Alternatives

The environmental impacts of each alternative under consideration are summarized in Table 2-2. These summaries are derived from the information and analyses vegetation maintenance methods provided in the Affected Environment and Environmental Consequences sections for each resource in Chapter 3 and/or in TVA's PEIS for resource issues that were determined to be minor, short-term, temporary, negligible, and/or none (TVA 2019).

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

No Action Alternative Do Not Remove Incompatible Vegetation	Action Alternative Remove Incompatible Vegetation in Designated Areas of TVA Right-of-Way
Reliability	
Increased risk of non-compliance with reliability standards.	Enhances compliance with reliability standards.
Vegetation	
No immediate change in baseline condition of one with more wooded/forested species.	Tree clearing would not significantly affect adjacent forest habitat. Removing trees using a feller-buncher or other similar machinery, typically results in minimal disturbance to the herbaceous layer and can promote herbaceous habitat dominated by native plant species. An increase in the rare habitat type could occur where a rare plant community is intersected.
Wildlife	
No immediate change in baseline condition.	Potential short-term disturbance and loss of some individuals. Long-term impacts include an increase in open herbaceous habitat and a decrease in mid- and late-successional woodlands and wooded wetland habitats. No significant impact to populations of migratory birds.
Aquatic Biology	
No change in baseline condition.	Potential short-term impacts associated with erosion/sedimentation during the removal of incompatible vegetation. Minimal impacts due to increased water temperatures. Overall impacts to aquatic biota would be avoided or minimized using TVA's O-SAR process and adherence to BMPs.
Threatened and Endangered Species	
No change in baseline condition.	Potential short-term and long-term impacts to threatened and endangered species/habitats. Beneficial impacts to federally listed plant species by increasing preferred habitat. Impacts would be minimized using TVA's O-SAR process and adherence to avoidance and minimization measures in TVA's ESA consultations and applicable BMPs.
Surface Water[1]	
No change in baseline condition.	Potential impacts associated with runoff and sedimentation during vegetation removal. Impacts avoided or with adherence to avoidance and minimization measures and BMPs.

No Action Alternative Do Not Remove Incompatible Vegetation	Action Alternative Remove Incompatible Vegetation in Designated Areas of TVA Right-of-Way
Wetlands	
No change in baseline condition.	The clearing of about 19.3 acres of forested wetland habitat and conversion to emergent/shrub-scrub habitat would result in a reduction of wetland function. Impacts would be minimized using TVA's O-SAR process and adherence to mitigation measures (including any required compensatory mitigation) and BMPs.
Natural Areas	
No change in baseline condition.	No change in baseline condition. Impact minimized using TVA's O-SAR process and adherence to mitigation measures and BMPs.
Cultural Resources	
No change in baseline condition.	Provides flexibility in the improvement and management of visual quality of historic properties. In limited cases where impacts exist during ROW vegetation management, those impacts would be minimized through adherence to BMPs and Section 106 or program alternative, such as the PA, where applicable.
Floodplains[1]	
No change in baseline condition.	Potential for floodplain impacts would be minimized by BMPs such that the impact of debris management on floodplains and flow alteration would be minor.
Geology, Groundwater and Soils[1]	
No change in baseline condition.	Increased, albeit limited, potential for soil disturbance and erosion in the long-term due to ROW vegetation management. Impacts would be avoided/minimized through adherence to avoidance and minimization measures and BMPs.
Land Use and Prime Farmland[1]	
No impact.	No impact to prime farmland. Minor potential impact to land use during vegetation management would be avoided or minimized through adherence to BMPs.
Visual Resources[1]	
No change in baseline condition.	Temporary, short-term impact during ROW incompatible vegetation removal. Long-term visual changes include more open views as ROW would be managed to a meadow-like state.
Health and Safety[1]	
Short- and long-term safety diminished for those who are working due to risks associated with manual processes required for individual tree removals.	Enhanced worker safety in the long-term by controlled vegetation management but safety enhancement is slightly less because some compatible trees would remain.
Public Health and Safety would be at increasing risk due to the increased numbers of violations of vegetation clearances in the transmission system and the decrease in system reliability.	Enhanced property owner safety and public health and safety due to TVA controlled vegetation management and reliability of the transmission system.

No Action Alternative Do Not Remove Incompatible Vegetation	Action Alternative Remove Incompatible Vegetation in Designated Areas of TVA Right-of-Way
Solid and Hazardous Waste[1]	
No change in baseline condition in the short-term as initially there would be less need for tree removal. But in the long-term there would be an ever-increasing volume of trees that would be identified as risks.	Temporary, short-term impact during ROW vegetation management as the ROW would be managed to a meadow-like state.
Transportation[1]	
No change in baseline condition.	Impacts to transportation during ROW vegetation management would be negligible.
Air Quality and Climate Change[1]	
No change in baseline condition.	Temporary, short-term increased impacts during ROW vegetation management.
Noise[1]	
No change in baseline condition.	Temporary, short-term increased impacts during ROW vegetation management.
Socioeconomics & Environmental Justice[1]	
No impact.	No impact.
Cumulative Effects	
No change in baseline condition.	Incremental benefits to habitat are negligible given the context of the study area.

[1] TVA previously determined potential effects to this resource would be minor, short-term, temporary, negligible, and/or none as a result of routine vegetation management activities (TVA 2019).

2.4 Summary of Mitigation Measures

Mitigation measures identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. Any additional project-specific mitigation measures, such as avoiding areas identified from desktop reviews as having a high probability of any sensitive resources, have been identified on a site-specific basis and are provided in Section 3.9.

TVA has prepared comprehensive standard BMPs that represent mitigation measures that are effective in avoiding, minimizing, rectifying, and compensating for effects of vegetation management activities. These BMPs are detailed in TVA's guide for environmental and best management practices (TVA 2017). Topics addressed in this manual include the following:

- BMPs for construction and maintenance activities including vegetation management;
- sensitive resources and buffer zones;
- structural controls, standards and specifications;
- seeding/stabilization techniques;
- practices and procedures are provided that directly relate to the vegetation management activities including initial woody vegetation removal, good housekeeping, waste disposal, herbicide use, and storm water discharge management; and
- integration of TVA's O-SAR process, as described in Section 2.2.2.

2.5 TVA's Preferred Alternative

TVA's preferred alternative is Alternative B, the Action Alternative – Remove Incompatible Vegetation in Designated Areas of TVA Right-of-Way, which would include the removal of trees and woody vegetation on 400 acres of the ROW that are deemed a risk to the transmission system. This alternative is considered to provide the best balance in enhancing system reliability and safety, minimization of environmental impacts, and striving for cost effectiveness.

Vegetation management under this alternative would be accomplished with an IVM approach to promote the establishment of low-growing herbaceous plant communities compatible with the safe and reliable operation of the transmission system. TVA would also use an approach that is condition-based for identification and removal of incompatible vegetation and danger trees that would use LiDAR and other assessment techniques.

Vegetation removal would include identification and removal of vegetation within select portions of the ROW that is incompatible with safely and reliably managing the transmission system. Thereafter, TVA would manage these areas of the ROW consistent with TVA's desired end-state condition consisting of a mix of herbaceous and low-growing shrub species. This vegetation community is more compatible with a transmission system and over time is expected to minimize intensity of maintaining the floor.

Under Alternative B, there would be greater coordination and interaction with local landowners to identify compatible vegetation than with the No Action Alternative. Although TVA would need to remove trees and woody vegetation identified as a risk to the transmission system, TVA would work with local property owners, when requested, to evaluate the compatibility of vegetation within or near the ROW. Vegetation compatible with the safe and reliable operation of the transmission system may be allowed to remain within the ROW. Relative to the No Action Alternative, this alternative would enhance compliance with reliability standards.

Impacts associated with this alternative primarily include temporary short-term impacts during vegetation management activities to most natural resources. Because vegetation removal activities would be conducted within previously established ROW, the overall effect on natural resources is moderate as the routine maintenance of vegetation would not destabilize the general ecological communities within the study area. Long-term impacts of this management alternative are related to the repeated cyclic disturbance within the ROW.

The effects of Alternative B include both short-term and long-term impacts; however, sound planning and the incorporation of TVA's O-SAR process and other BMP measures would avoid and minimize long-term impacts. Alternative B provides benefits in terms of habitat quality and management intensity based on the desired end-state.

Impacts on factors related to the human environment (land use, socioeconomics, air, noise, cultural resources, solid/hazardous waste, public and worker safety, etc.) are generally considered to be localized and temporary. This alternative keeps incompatible vegetation away from transmission lines, reducing the likelihood of devastating, and possibly fatal, wildfires. Consequently, this alternative reduces the risk to homeowners' safety.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides a description of the potentially affected environmental resources in the study area and the general impacts of vegetation control. As described in each of the following sections, and in the broader bounding analysis within TVA's PEIS (TVA 2019) which is incorporated by reference, each aspect of TVA's vegetation management program (vegetation control, debris management, restoration) vary with respect to their impact to environmental resources. A summary of broader impacts associated with each of the vegetation methods is provided in Appendix H. The descriptions below of the potentially affected environment are based on published and unpublished reports, the use of TVA's O-SAR process and on personal communications with resource experts. This information establishes the baseline conditions against which TVA decision makers and the public can compare the potential effects of implementing the alternatives under consideration.

The analysis of potential effects to endangered and threatened species and their habitats included records of occurrence within a three-mile radius for terrestrial animals, a five-mile radius for plants, and within 10-digit hydrologic unit code[2] (HUC) watershed for aquatic animals. The analysis of potential effects to aquatic resources included the local watershed but was focused on watercourses within or immediately adjacent to the proposed ROW and associated temporary access roads. The analysis of potential wetland presence was conducted at the ecoregion level (Level III, Omnerick 1987). Because wetland habitat and extent can vary across ecoregions, wetlands are discussed relative to typical wetland resources by ecoregion. The area of potential effect (APE) for architectural resources included all areas within a 0.5-mile radius from the proposed TL route, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource. The APE with respect to archaeological resources included the entire ROW width for the transmission line segments and the associated temporary access roads.

3.1 Vegetation

3.1.1 Affected Environment

The twelve Sectors that TVA uses to organize ROW vegetation management activities intersect nine distinct Level III ecoregions (Omernik 1987). The ecoregions support a diverse array of plant communities including deciduous, mixed evergreen-deciduous, and evergreen forest, as well as herbaceous vegetation (see Figure 3-1). Many types of specific plant communities occur throughout the TVA power service area including bottomland hardwood, mixed mesophytic, upland oak-hickory, and swamp forests along with an array of herbaceous communities (TVA 2019).

[2] The United States is divided and subdivided to into hydrologic units by the U. S. Geological Survey. There are six levels of classification. A 10-digit HUC is the fifth (watershed) level of classification.

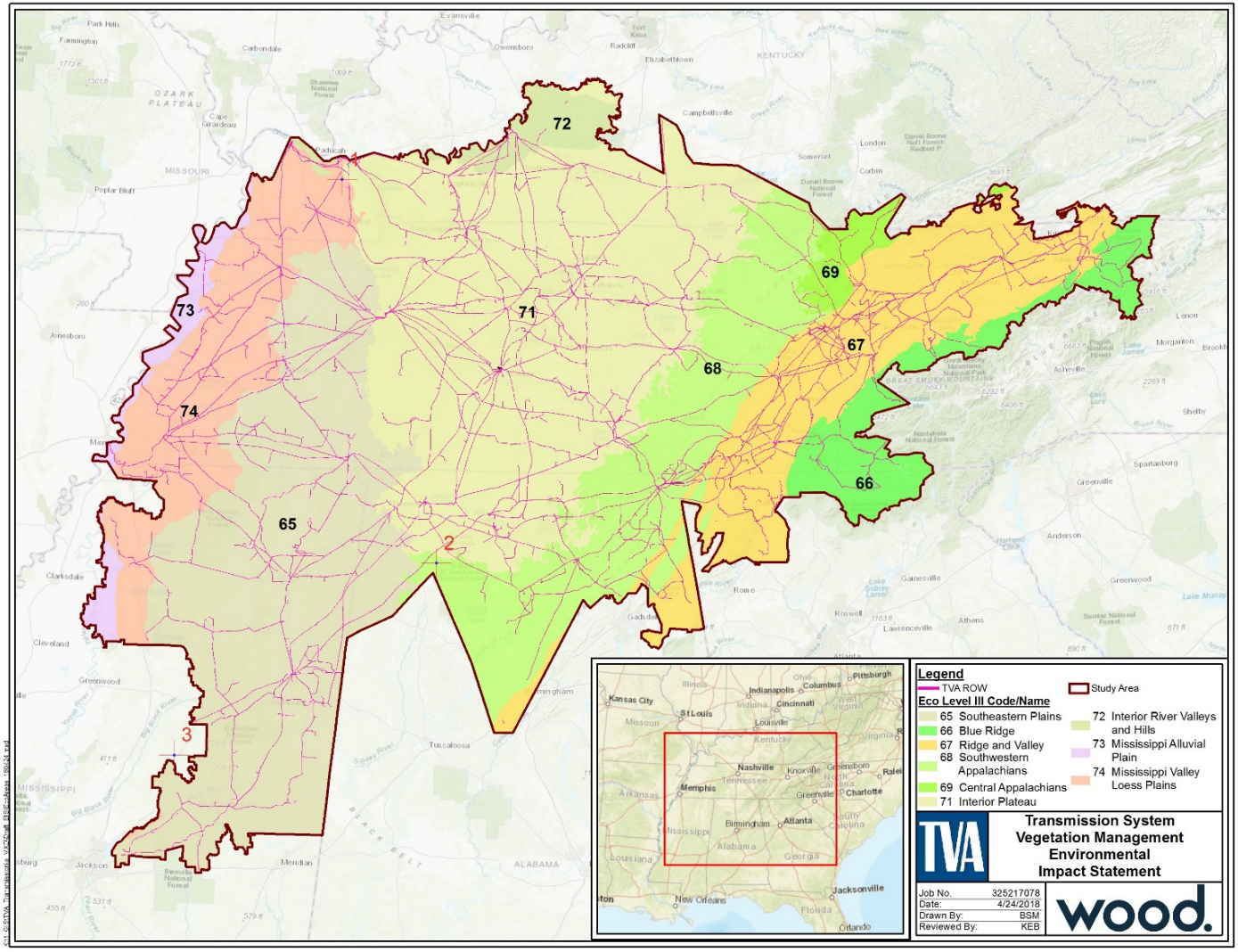

Figure 3-1. Level III Ecoregions within the TVA Study Area

Specific plant communities located on and adjacent to ROW vary greatly across the TVA power service area. Plant communities can range from highly disturbed, early successional habitats dominated by invasive species, to rich, diverse herbaceous communities that possess landscape level conservation importance. The relative quality of plant habitats found in any given ROW depends on a multitude of factors, including many that are unrelated to vegetation management decisions implemented by TVA. Factors outside of TVA control that influence plant communities include land use (previous and current), geology, landscape position, soil texture, depth to bedrock, aspect, and rainfall.

Many plant communities within and adjacent to ROW are heavily disturbed and dominated by weedy species found most often in pastures, lawns, and developed areas. However, there are also habitats that intersect the TVA transmission system that have regional conservation significance. Many of these communities are rare, restricted to very small geographic areas and/or are threatened by human activities. Examples include glades, prairies, barrens, marshes, bogs, fens, and seeps. A few generations ago, native grassland habitats were relatively abundant in portions of the southeastern U.S.; today they are rare (Noss 2013). Reasons for this decline in intact grasslands are many, but growth in agriculture, residential and commercial development, fire suppression, and colonization by invasive species are primary factors. As a result, a subset of maintained ROWs represents some of the only relatively intact grasslands remaining on the landscape. Approximately 20 globally rare herbaceous communities, as defined by NatureServe, have the potential to occur within ROWs (TVA 2019).

Within ROW plots proposed for tree and woody vegetation removal in FY 2023, important grassland habitat is most likely to occur in the Southern Table Plateaus ecoregion on Lookout and Sand Mountain in Alabama and Georgia, the Crawford-Mammoth Cave Uplands and adjacent Western Pennyroyal Karst Plain in Kentucky, dry ridgetops in the Blue Ridge Mountains of southeastern Tennessee, and small portions of the Ridge and Valley in Tennessee.

Invasive plants are well-established and widespread throughout the TVA power service area. While not well-established in most of the high-quality grassland habitat, these species are abundant across many ROWs, including those in Cycle A plots where incompatible vegetation removal is proposed. EO 13112 Invasive Species (February 3, 1999) directed TVA and other federal agencies to prevent the introduction of invasive species (both plants and animals), control their populations, restore invaded ecosystems, and take other related actions. EO 13751 issued on December 8, 2016, amends EO 13112 and directs actions by federal agencies to continue coordinated federal prevention and control efforts related to invasive species.

The relative proportion of invasive species on any given ROW is often determined by factors outside of TVA control. For example, the prior and current ROW land use can have a material effect on the potential for invasive species to gain a competitive advantage over native species. Land uses including high intensity grazing, agriculture, and residential or commercial development severely degrade natural communities. Vegetation management activities along ROW, as well as the ROW in general, serve as both vectors for invasive species and refugia for rare grassland communities and species.

3.1.2 Environmental Consequences for Vegetation

Tree and woody vegetation removal associated with clearing incompatible vegetation along the ROW margins would be accomplished using a combination of manual and mechanical methods (TVA 2019). Manual vegetation control methods, typically a chainsaw, are very targeted and usually have relatively little impact on non-target vegetation. Hand tools used in clearing activities are highly selective and can only be implemented on a small scale, because the equipment is labor intensive to employ and, therefore, costly to operate. Manual removal of vegetation along the margins of existing ROW would most often be used in situations where utilization of mechanical tools is not feasible. Chainsaws and other manual tools may be used in areas of steep terrain or other situations that preclude the use of mechanical means. Once trees and other incompatible woody vegetation are removed, the area would be maintained in an open herbaceous condition with subsequent cycles of vegetation control. On a landscape level, this would result in a small amount of forest conversion to herbaceous vegetation. When working in residential, commercial, agricultural, or other areas of highly disturbed vegetation, manual methods would have no appreciable impact on the surrounding plant community.

Track-hoe, skid steer, feller-buncher, or other comparable equipment are the mechanical tools most likely to be used to clear trees from areas where previous vegetation maintenance has been infrequent and woody plants have encroached into a ROW or in areas that had not been previously cleared. Removing trees using feller-bunchers or other similar machinery, which cut standing trees at ground level without disturbing the soil profile, typically results in minimal disturbance to the herbaceous layer. In drier portions of a ROW, particularly areas surrounded by forest, this method of removal can be very effective at promoting herbaceous habitat dominated by native plant species. These newly created areas of ROW floor would then be continually cleared during subsequent vegetation maintenance of the floor. If mechanical methods were implemented where a ROW intersects a rare plant community, the result would often be an increase in the rare habitat type. When combined with subsequent vegetation management, which most often includes selective application of herbicide, this type of mechanical tree removal can be compatible with maintaining quality herbaceous habitats relatively free of invasive weeds.

Once incompatible trees have been removed from the ROW margin, the resulting debris would be variously removed, mulched, or left in place (TVA 2019). Where ROW intersect residential areas, debris may be removed from the ROW entirely. The largest impact of this would be from equipment traffic needed to remove material to an off-site location. More often the material would be mulched or left on site. When mulched, the material degrades over time giving way to an herbaceous plant community. Depending on the time of year, native herbaceous species typically begin to emerge through the mulch layer in weeks to months after the work occurs. Trees are typically left in place in steeper terrain or remote areas where mulching is not feasible. When large portions of trees are left on-site, they typically take multiple years for the crowns and limbs to degrade to a point where most of the remaining material is on the ground. This may appear unsightly compared to mulched ROW, but the effects to plant habitats are not appreciably different in the long-term.

As described in Section 1.2.4, a total of 2,298 acres of incompatible vegetation needs to be addressed within ROW normally maintained within the Cycle A's plot rotation. Of this, TVA proposes the removal of trees and woody vegetation along approximately 400 acres in FY23. Removal of incompatible vegetation would often occur sporadically in FY23 along any given ROW identified in Table 1-2. In addition, tree clearing would be linear and often not extend more than 10 to 15 feet from the current ROW edge. To minimize impacts of this

work TVA would use the O-SAR process to avoid impacts to important plant habitats within ROW. Eight specific areas located on ROW plots in the Manchester Sector (transmission lines L5751 and L5614) are known to contain rare plant habitats. These areas are denoted in the O-SAR database. When vegetation maintenance is scheduled to occur in such locations, TVA biologists and operations staff would work together to ensure the habitats are protected. Sometimes the proposed work would not affect the plant communities found within the ROW, but other times operations staff augments the timing or method of proposed work to protect sensitive resources.

For tree and woody vegetation work proposed on Cycle A plots, the TVA botanist would coordinate individually with the Manchester Sector TVA Forester for all sites that contain rare plant habitat. This would ensure that the proposed work would not significantly important grassland habitats that intersect work areas. Tree clearing along ROW may occur next to high quality forested habitat, but the removal thin strips of trees along a ROW margin, often no more than 10 to 15 feet wide, would not significantly affect adjacent blocks of intact forest habitat.

3.2 Wildlife

3.2.1 Affected Environment

The proposed Action Alternative includes the removal of incompatible vegetation (trees and woody vegetation) in FY23 on about 400 acres of ROW within five managed Sectors across the TVA Region. Although described on a larger scale than the proposed project, the Affected Environment for this EA is as previously described in the Transmission System Vegetation Management PEIS (TVA 2019). Wildlife habitat within and around ROW segments proposed for tree and woody vegetation removal during FY23 within the Cycle A plots ranges from low to high quality. Low-quality habitat includes maintained lawns near residential and industrial areas, and disturbed forest fragments around power-generating facilities. Moderate-quality habitat comprises early successional and herbaceous communities within and along transmission lines bordered by forest edges (edge habitats). Higher-quality habitat includes contiguous blocks of forest along reservoir shorelines. Important habitats found within and along ROWs include riparian corridors, bluffs, swamps, grasslands, rivers and associated stream tributaries, reservoirs, islands, larger un-fragmented forested landscapes, and karst (cave) habitats.

ROW corridors are typically dominated by open herbaceous habitats. Undeveloped open lands are comprised of cultivated fields, hayland/pasture, shrub/scrub, and other non-forested cover types. Common species in herbaceous habitats include eastern meadowlark, hispid cotton rat, North American racer, and pollinator species such as black swallowtail butterfly. Habitat for these species would increase under the Action Alternative. Secondary growth, or young trees that have grown up since the last maintenance cycle and that are scattered in otherwise open herbaceous habitats within the ROW, may occur in sections of ROW that need vegetation maintenance. Secondary growth is important for many birds including field sparrow, chestnut sided warbler, golden-winged warbler, and yellow-breasted chat. Other species that may use this habitat type are eastern box turtle, five-lined skink, bobcat, and eastern spotted skunk. This habitat type and mature forest would decrease under the Action Alternative. Mature forested habitat may be present in ROWs under transmission lines that span valleys or steep mountain sides. Forested habitat is also present in some areas adjacent to the ROW but within the TVA easement. Species that use mature forests include cerulean warbler, wood thrush, eastern red bat, and southern two-lined salamander. Riparian and wetland habitats within and near ROW

corridors are associated with stream valleys, depressional areas, reservoir systems, and areas with localized groundwater discharge. Coupled with unique features such as vernal pools, oxbows, bluffs and islands, these areas provide a diverse array of nesting and foraging habitats for wildlife (TVA 2011a). Birds, mammals, reptiles, amphibians, and pollinators that are commonly found in these areas have been described in the PEIS (TVA 2019). Wooded wetlands provide habitat for species such as wood duck, barking treefrog, and mink and would decrease under the Action Alternative. Herbaceous wetlands would increase along with habitat for species such as red-winged blackbird, common muskrat, and least bittern.

Review of the TVA Regional Natural Heritage database in August 2021 indicated that no bald eagle nests, caves, heronries, or osprey nests exist within 50 feet of the ROWs analyzed for the proposed removal of 400 acres of incompatible vegetation during the FY23 within the Cycle A plots. Three caves are within 200 feet of these ROWs and one bald eagle nest, two osprey nests, and one heronry exist within 660 feet of these ROWs (see Table 3-1) No records of bat species and one state-listed terrestrial animal species (green salamander) is known within 50 feet of the proposed study areas.

Table 3-1. Total Number of Terrestrial Animal Resources from (A) Within 50 feet of TVA ROW or (B) Where O-SAR Restrictions Overlap TVA ROW where Cycle A Incompatible Vegetation Removal is Proposed in Fiscal Year 2023[1]

TVA Right-of-Way Vegetation Management Sectors	Terrestrial Animal Terrestrial Animal Resources							
	Caves		Osprey		Heronries		Bald Eagle	
	A	B	A	B	A	B	A	B
Cleveland	0	2	0	0	0	0	0	0
Hopkinsville	0	0	0	0	0	0	0	0
Manchester	0	0	0	1	0	0	0	1
Morristown	0	1	0	0	0	0	0	0
Oak Ridge	0	0	0	0	0	1	0	0

[1] Source: TVA Regional Natural Heritage Database, queried August 2021.

As described in Section 1.2.4, a total of 2,298 acres of incompatible vegetation needs to be addressed within ROW normally maintained within the Cycle A's plot rotation. Of this, about 400 acres would be removed in FY23. No bald eagle nests occur on a transmission line tower structure within 50 feet of these Cycle A plots. These large nests are typically built on the highest crossbeam of the tower structure. However, the majority of nests known within 660 feet of TVA transmission lines where the proposed Action Alternative would occur are located instead in trees adjacent to ROW. Eagle nest records in the TVA Regional Natural Heritage database include those recently used and those that haven't been used in a decade or more.

The osprey nest documented in Table 3-1 is not located on a transmission tower structure. While osprey can and do build nests anywhere on the tower structures with a suitable platform, the majority are built on the highest crossbeam of the towers.

Herons tend to build nests in the lower sections of the towers where beams intersect. Therefore, they are typically closer to the ground where routine floor vegetation maintenance could occur. There is one known heronry in trees within 660 feet of the ROW proposed for maintenance.

Review of the Information for Planning and Consultation (IPaC) database on USFWS's website in April 2021 resulted in the identification of 26 migratory bird species of conservation concern that have the potential to occur in the proposed FY23 Cycle A project study area. Of these species, seven only have the potential to occur in the action area during migration (bobolink, lesser yellowlegs, red-throated loon, ruddy turnstone, semipalmated sandpiper, willet, yellow rail). Three others are only found in the action areas during winter or migration (LeConte's sparrow, rusty blackbird, yellow-bellied sapsucker). Twelve species could be in the action area during the breeding season: American kestrel, bald eagle, blue-winged warbler, Canada warbler, eastern whip-poor-will, golden eagle, Kentucky warbler, least tern, prairie warbler, prothonotary warbler, red-headed woodpecker, and wood thrush (Table 3-2). Four additional species (black-billed cuckoo, cerulean warbler, golden-winged warbler, and Henslow's sparrow) rarely breed in the area.

Table 3-2. Migratory Birds of Conservation Concern with Potential to Occur within 50 feet of ROW Proposed for Cycle A Incompatible Vegetation Removal in Fiscal Year 2023[1]

Species	CL[2]	HK	MC	MT	OR
American Kestrel		X			
Bald Eagle	X	X	X	X	X
Black-billed Cuckoo	X		X	X	X
Blue-winged Warbler		X	X		
Bobolink	X		X	X	X
Canada Warbler	X		X	X	X
Cerulean Warbler	X	X	X	X	X
Eastern Whip-poor-will	X	X	X	X	X
Golden Eagle	X				
Golden-winged Warbler	X		X	X	X
Henslow's Sparrow		X	X	X	
Kentucky Warbler	X	X	X	X	X
LeConte's Sparrow			X		
Least Tern		X			
Lesser Yellowlegs		X	X		
Prairie Warbler	X	X	X	X	X
Prothonotary Warbler		X			
Red-headed Woodpecker	X	X	X	X	X
Red-throated Loon		X			
Ruddy Turnstone		X			
Rusty Blackbird	X	X	X	X	X
Semipalmated Sandpiper		X	X		
Willet		X			
Wood Thrush	X	X	X	X	X
Yellow-belled Sapsucker	X		X	X	X
Yellow Rail		X			

[1] Source: TVA Regional Natural Heritage database and USFWS IPaC, queried April 2021
[2] ROW Sector Abbreviations: CL = Cleveland, HK = Hopkinsville, MC = Manchester, MT = Morristown, OR = Oak Ridge.

3.2.2 Environmental Consequences for Wildlife

The removal of incompatible vegetation (trees and woody vegetation) on the approximately 400 acres of Cycle A ROW plots has the potential to impact wildlife species and their habitats directly and indirectly. Tree clearing and soil/ground disturbance by machinery and heavy equipment could directly impact species in the path of the machinery by loss of life, should they be unable to flee from the vegetation or burrows in the ground being impacted. Increased levels of noise could also stress nearby individuals leading to expenditure of energy and temporary disruption of feeding, mating, resting, and other activities. Disturbance would be temporary and impacts to populations are not expected to be significant. Ground disturbance resulting in sedimentation or contamination could permanently impact sensitive cave systems deep underground. Long-term impacts include a decrease in forested habitat and an increase in herbaceous habitat.

TVA has several practices in place that minimize impacts to sensitive wildlife/terrestrial ecology. BMPs are used near all regulated aquatic features, including the use of mats in wetlands and the use of EPA-registered herbicides determined to be safe for use near aquatic environments (TVA 2017). TVA also uses TVA's O-SAR process to avoid impacts to important terrestrial animals and their habitats by limiting the use of certain practices altogether or during sensitive times of year. Some ROWs proposed for the removal of incompatible vegetation during FY23 Cycle A transect one or more O-SAR buffers which define a sensitive resource. These buffers identify potential modifications to TVA ROW vegetation management actions to minimize impacts to sensitive resources.

The following standardized O-SAR buffers would be applied near sensitive wildlife resources associated with the Cycle A removal of incompatible vegetation during FY23:

- Cave - 200 feet - No herbicide use within 200 feet of cave due to potentially sensitive subterranean aquatic resources. Hand clearing or small machinery clearing only (i.e.: chainsaws, brush hog, mowers). Vehicles and equipment confined to existing access roads. Avoid entering cave.
- Osprey nest - 660 feet - EITHER 1) Assume presence. No broadcast spraying. Only use brush hogs or mowers for vegetation removal or selective herbicide spraying between March 1 and July 31 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nest is active.
- Heronry - 660 feet - EITHER 1) Assume presence. No broadcast spraying. Only use brush hogs or mowers for vegetation removal or selective herbicide spraying between February 1 and July 15 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nests are active.
- Bald Eagle nest - 660 feet - EITHER 1) Assume presence. No disturbance, spraying, or vegetation clearing would occur between December 1 and July 1 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nest is active.
- In rare instances in which restricted actions need to take place while osprey or heron nests are active, TVA would coordinate with U.S. Department of Agriculture Wildlife Services (USDA-WS) to ensure any actions comply with the conditions specified under USDA's "Take" permit.

Migratory bird species (other than ospreys, herons, and bald eagles addressed above) also have the potential to be impacted by the proposed actions. While the USFWS IPaC database identified 26 species as having the potential to occur in the action area (USFWS 2021), seven of those species are only likely to be found in the action area during migration (Cornell 2021). Migration stopovers are typically used on a short-term basis (one to several days) only in spring and fall. Many of these migratory species are shorebirds and would be found on mudflats along the edges of lakes and rivers where no tree removal or woody vegetation removal would be needed, and where TVA BMPs would be applied to minimize impacts to the aquatic resources.

Three other species (LeConte's sparrow, rusty blackbird, yellow-bellied sapsucker) have the potential to occur in the action area during migration and during winter (non-breeding) months. Individuals of these species would be able to flush if disturbed due to their presence in the action area during non-nesting months. Although the removal of incompatible vegetation would remove forested habitat, similar suitable habitat is common throughout the TVA Power Service Area and is often present adjacent to the areas being cleared. Some of these species inhabit grassland and shrub habitat and would benefit from creation of additional herbaceous areas.

Sixteen species could be in the action area during the breeding season when they are more sensitive to disturbance. Special precautions are taken around bald eagle nests using the O-SAR process mentioned above and described in previous documents (TVA 2019). No nesting golden eagles are known to occur in the action area or immediate surroundings. Therefore, this species likely only has the potential to be affected should it be foraging in ROWs at the time of the proposed actions. Golden eagles are expected to flush when disturbed by noise indicating oncoming clearing actions. Least terns nest on sandbars and open areas with little to no vegetation. There is almost no potential for incompatible vegetation removal to occur in nesting habitat for least tern. As mentioned above, black-billed cuckoo, cerulean warbler, golden-winged warbler, and Henslow's sparrow are uncommon breeders in the proposed action area. Therefore, the potential to impact individuals of these species while they are immobile (i.e., eggs, nestlings) is lower than some of the other species. Those species that nest in expanses of herbaceous growth in the ROWs such as Henslow's sparrow and Kentucky warbler would be at risk although herbaceous growth is not the target of the proposed actions. Direct impacts to these species could result from movement of machinery through an area. Those species that nest around bodies of water such as prothonotary warbler could be avoided due to TVA's BMPs around aquatic features. Species that nest on forested edges in shrubs or young trees such as black-billed cuckoo, blue-winged warbler, golden-winged warbler, and prairie warbler have the greatest potential to be impacted by the proposed actions. Several additional species nest in the interior of forests including American kestrel, Canada warbler, cerulean warbler, eastern whip-poor-will, red-headed woodpecker, and wood thrush. The potential to impact nests of these species would be confined to the removal of trees near the ROW edges should actions occur during nesting months. Immobile individuals (i.e., eggs, nestlings) could be impacted as incompatible vegetation is removed occur during the nesting season. Proposed actions are not expected to significantly impact populations of migratory birds. As required under EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, TVA is currently developing a Memorandum of Understanding in coordination with the USFWS as well as an Avian Protection Plan. In the interim, consistent with EO 13186, TVA implements measures for the conservation of migratory bird populations.

The outcome of the proposed FY23 Action Alternative would be an increase in 400 ROW acres that are dominated by herbaceous species. These types of wildlife habitats would otherwise disappear due to forest regeneration should these areas be left unmaintained. This type of herbaceous habitat is often unavailable anywhere else across the landscape (See Section 3.2) and provides habitat for wildlife that are becoming imperiled such as pollinator species and some species of migratory birds. Similarly, areas of ROW with some young woody regrowth provide needed habitats for other species of migratory birds. These habitats are normally ephemeral due to forest regeneration, but ROW vegetation maintenance actions provide the repeated disturbance and sun exposure needed for some of these fast-growing woody species to regenerate. Therefore, while impacts could occur to those terrestrial animal species using these ROW habitats should they be present during the actions, it is the ROW creation itself that allows the habitat for these species of wildlife to persist in the long-term. The proposed actions would result in a net increase in herbaceous habitat that would benefit species that rely on this habitat. Removal of incompatible vegetation would cause a shifting of edge habitat and a narrowing of interior forested habitat. Young growth of woody species would be removed, negatively impacting species that require this habitat. Many species use two or more seral stages (successional plant communities) and impacts to these habitat generalists are expected to be minimal.

3.3 Aquatic Ecology

3.3.1 Affected Environment

TVA's twelve ROW vegetation management Sectors encompass portions of several major watersheds that support high aquatic biotic diversity. Tennessee is reported to support approximately 319 fish species, including native and introduced species (Etnier and Starnes 1993) and 132 freshwater mussels (Parmalee and Bogan 1998). The Tennessee and Cumberland rivers have the highest number of endemic fish, mussel, and crayfish species in North America (Schilling and Williams 2002). The other major drainages within the TVA region share a diversity of aquatic life equal to or greater than the Tennessee River drainage (TVA 2015). There are approximately 42,000 miles of perennial streams and 46 TVA managed reservoirs in the study area (TVA 2011b and 2017). Most beneficial uses (as designated by the states) are supported in most water bodies in the study area including for fish and aquatic life support.

Fish species within the twelve Sectors are represented by approximately 30 families with the largest (>90 species) being the perch family, followed by minnows (>80 species), catfish (>20 species), suckers (21 species), and sunfishes (>20 species). The most diverse watershed within the twelve Sectors is the Tennessee River watershed with an estimated 205 native species (Etnier and Starnes 1993).

As described in the PEIS, TVA has been monitoring the health of the major reservoirs within the Tennessee River system since 1990 to evaluate the ecological conditions. A multi-metric approach known as the Reservoir Fish Assemblage Index is used to evaluate ecological conditions for fish communities because of their importance in the aquatic food web and because fish life cycles are long enough to integrate conditions over time. Though altered from human activity, main stream reservoirs support healthy fish communities and generally rate good or fair based on attained Reservoir Fish Assemblage Index scores (McDonough and Hickman 1999). The number of species ranged from around 50 to 90 species per reservoir (TVA 2004).

Stream habitats in the study area include very large rivers (e.g., lower Tennessee), large rivers (e.g., lower Cumberland and upper Tennessee), medium rivers (e.g., lower Hiwassee and Clinch), small rivers (e.g., Ocoee), and numerous perennial, intermittent, and ephemeral streams (Meyer et al. 2007). Each of these stream habitat types have a characteristic fish composition with diversity generally increasing downstream along a gradient of increasing stream size, habitat heterogeneity, and habitat availability (Schlosser 1987). Therefore, larger streams and rivers are the most diverse systems in the study area. However, smaller streams (e.g., headwater streams and tributaries) are the most likely to be encountered during TVA vegetation maintenance activities due to their abundance throughout the study area. Smaller streams are characterized by small-bodied species such as small minnows, madtom catfishes, darters, and sculpins (Schlosser 1987). Darter species contribute heavily to the overall fish diversity in headwater streams.

Benthic (bottom dwelling) macroinvertebrate populations typically found in TVA's reservoir system and non-reservoir aquatic environments are described in the PEIS (TVA 2019). Because benthic macroinvertebrates are relatively immobile, negative impacts to aquatic ecosystems can be detected earlier in benthic macroinvertebrate communities than in fish communities. Benthic invertebrates are a vital part of the food chain of aquatic ecosystems. Benthic invertebrate communities are strongly affected by seasonal thermal stratification in reservoirs, varying dissolved oxygen concentrations and large water level fluctuations. Poor benthic community ratings are typical of tributary reservoirs. Macroinvertebrate communities of reservoirs are generally low in diversity and comprised of tolerant taxa.

In contrast, benthic macroinvertebrate populations in non-reservoir aquatic environments are often comprised of assemblages representative of lotic habitats. Composition and quality of such communities are often correlated with stream size and placement within the watershed, surrounding land uses and proximity to point source and non-point source discharges. Within rural portions of TVA's transmission system, smaller streams may be expected to be composed of benthic invertebrates that are less tolerant of low dissolved oxygen levels and representative of a wide range of sub-habitats. For example, higher gradient riffle environments may be expected to support greater abundances of organisms that are clingers or swimmers. Smaller headwater streams within ROW may be dominated by only a few species, though all classes of invertebrates may be found.

The overall native mussel community has decreased from 42 species to 21 species (four of which invaded post-dam construction) due to loss of flow-sensitive species (Sickel et al. 2007).

Reservoir tailwaters are areas of highest mussel diversity in the regulated TVA system. Remaining riverine mussel species reach greater abundance and diversity in flowing main stream reaches, but their status remains only fair due to overall low diversity, low abundances, and low reproductive success for some species (TVA 2004). Dennis (1984) provided a detailed account of the distribution of mussels by stream size throughout the Tennessee River watershed (see Table I-19 in Dennis 1984). The greatest number of mussels (approximately 70 percent of species) are found in medium to large streams. Only six species were common to all stream sizes and found throughout the study area including: threeridge, purple wartyback, deertoe, mucket, pocketbook, and kidneyshell.

3.3.2 Environmental Consequences for Aquatic Ecology

In FY23, TVA proposes the removal of incompatible vegetation along ROW edges comprising about 400 acres divided across multiple Sectors. Potential effects include ground disturbing activities that could result in minor and temporary erosion, sedimentation, increased water temperatures, and leaks of oil or fuel that could alter water quality. However, these impacts are expected to be rare, and effects minimal, because TVA employs a host of BMPs that are designed to minimize environmental impacts like soil disturbance/erosion, stream bank destabilization, instream deposition of woody debris, and damage to instream habitats (vehicle/ equipment traffic). Additionally, when working near aquatic features TVA uses EPA-registered herbicides determined to be safe for use near aquatic environments. The use of the O-SAR process to identify stream locations prior to work activities and the proper implementation of BMPs would ensure that any potential impacts to streams and their aquatic ecology would be minor and insignificant.

3.4 Threatened and Endangered Species

The TVA study area provides habitat for numerous species of plants and animals that have declining populations or are otherwise rare and considered to be endangered, threatened, or of special concern at the national and/or state level.

3.4.1 Regulatory Framework for Threatened and Endangered Species

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

There are state laws protecting listed species in all seven states in the study area. In a few states, protection is limited to species listed under the ESA, but in other states, legal protections are extended to additional species designated by the state as endangered, threatened, or other classifications such as “in need of management.”

Conservation measures and avoidance and minimization measures identified in the following sections, as well as routine use of BMPs and project planning and environmental review processes, in some cases apply to state-listed species and habitats as well as to federally listed species and habitats. TVA has consulted with USFWS, per Section 7(a)(2) of the ESA, concerning the potential impacts of routine vegetation maintenance activities to affect federally threatened and endangered species within the study area. This consultation was completed and the USFWS issued a Biological Opinion in May 2019 concurring with TVA’s effects determinations (Appendix C). TVA had previously consulted with USFWS on a suite of TVA routine actions on federally listed bats present in the TVA power service area. This consultation was completed in April 2018 (Appendix B).

3.4.2 Threatened and Endangered Species in the TVA Study Area

According to the USFWS IPaC database (USFWS 2017a) and the TVA Regional Natural Heritage database, 168 species listed under the ESA as endangered, threatened, proposed for listing, or candidates for listing have been reported from within the TVA power service area. In addition, about 1,350 individual plant and animal species have been formally listed as protected species by one or more of the states, or otherwise identified as a species of conservation concern. Additionally, critical habitats for 43 federally listed species are located within the TVA power service area (USFWS 2017a; TVA 2019).

Of the nine ecoregions within the TVA power service area, the highest concentrations of terrestrial and aquatic species federally listed under the ESA occur in the Blue Ridge ecoregion (see Figure 3-1). Relatively few listed species occur in the Mississippi Alluvial Plain ecoregion. The taxonomic groups within the power service area with the highest proportion of species listed under the ESA are fish and mollusks. Factors contributing to the high proportions of vulnerable species in these groups include the high number of endemic species within the study area and the alteration of their habitats that increased the risk to these species. River systems with the highest numbers of listed aquatic species include the Tennessee, Cumberland and Coosa rivers (TVA 2015).

Population status trends for federally listed species in the TVA study area are variable (i.e., increasing, stable, or decreasing). For example, populations of a few listed species have increased, primarily because of conservation efforts, to the point where they are no longer listed under the ESA (e.g., bald eagle, peregrine falcon, Tennessee coneflower and snail darter). Other species have had their listing status downgraded from endangered to threatened (e.g., large-flowered skullcap and small whorled pogonia) due to increased population estimates and habitat protections. Among the federally listed species with populations that continue to decline are the American hart's tongue fern, Indiana bat, and northern long-eared bat. The formerly common northern long-eared bat recently was federally listed as threatened under the ESA due to dramatic population declines caused by white-nose syndrome. This pathogen was first reported in the TVA study area in 2009, and signs of mortality were first observed in 2011 (Samoray 2011). Population trends of many of the other listed species in the TVA study area are poorly understood.

The major habitats supporting federally listed species in the TVA power service area include free-flowing rivers and streams, caves, limestone cedar glades, high elevation areas, shorelines, and bluff/rock outcrops. TVA has taken multiple actions to minimize the adverse effects of vegetation management on federally listed species (e.g., seasonal restrictions on select activities to avoid impacts to federally listed roosting bats and nesting turtles) (TVA 2011a) and has taken steps to conserve listed species occurring in other habitats (TVA 2015).

Many species listed under the ESA occur in the immediate vicinity of ROW and could potentially be affected by its vegetation management. A summary of federally and state-listed species occurrences within 50 feet of TVA ROW where FY23 planned removal of incompatible vegetation is proposed is provided in Table 3-3. Appendix I includes a report of these federally and state-listed species occurrences identified from the TVA Regional Natural Heritage database.

Table 3-3. Total Number of Federally Listed and State-Protected Species Occurrences Previously Reported from Within 50 feet of TVA ROW Where Removal of Incompatible Vegetation is Proposed in Fiscal Year 2023[1]

TVA Right-of-Way Vegetation Management Sectors	Federally and State-listed Species				
	Plants	Terrestrial Animals			Aquatic Animals
		Bat	Eagle	Other	
Cleveland	0	0	0	0	4
Hopkinsville	0	0	0	0	1
Manchester	13	0	0	1	0
Morristown	0	0	0	0	0
Oak Ridge	0	0	0	0	0

[1] Source: TVA Regional Natural Heritage Database, queried August 2021. Tally includes all federally listed and species tracked by individual states.

3.4.3 Affected Environment of Threatened and Endangered Species

3.4.3.1 Plants

An April 2021 query of the TVA Regional Natural Heritage database indicated that 13 occurrences of 11 state-listed plants are known to occur within 50 feet of ROWs proposed for incompatible vegetation removal on Cycle A plots in FY23 (Table 3-3). No known populations of federally listed plant species occur along these ROW areas. A complete list of species known to be present within and immediately adjacent to ROWs can be found in Appendix I. TVA records known locations of these species in the O-SAR database so vegetation management activities can be planned in a manner to avoid and/or minimize impacts in those areas. There are about 2,500 documented or potential sites for federally or state-listed plant species recorded in the O-SAR database occurring within TVA ROW across the entire power service area. As described in Section 2.2.2, TVA uses this information to assign class rankings to sensitive areas that are used to guide management decisions regarding vegetation maintenance activities in the vicinity of recorded features.

Within the Cycle A ROW plots where incompatible vegetation removal is proposed, state-listed plant species are most likely to occur where ROW plots intersect regions that support intact grassland habitat. All state-tracked plant species previously documented from with 50 feet of a TVA ROW are situated on plots on and adjacent to Sand Mountain in Alabama and Georgia. These areas have been delineated in the O-SAR database.

3.4.3.2 Terrestrial Animals

Review of the TVA Regional Natural Heritage database in August 2021 indicated that there are records of one state-listed terrestrial animal species (green salamander) that occurs within 50 feet of the 400 acres of ROWs proposed for removal of incompatible vegetation (trees and woody vegetation) during the FY23 within the Cycle A plots (See Appendix I). Two additional federally listed species have O-SAR polygons and associated restrictions that apply to ROW segments proposed for vegetation removal in Cycle A (Indiana bat and northern long-eared bat See Table 3-4). Review of the USFWS IPaC database system indicated three additional federally listed species may have the potential to be impacted by the proposed actions (painted snake coiled forest snail, Carolina northern flying squirrel, and gray bat) (USFWS 2021).

Table 3-4. Federally Listed Terrestrial Animal Species with O-SAR Restrictions Impacting Cycle A TVA ROW Where Incompatible Vegetation Removal is Proposed[1]

Common Name	Scientific Name	Federal Status[2]	O-SAR Polygons	Sector[3]
TERRESTRIAL ANIMALS				
Northern Long-eared Bat	*Myotis septentrionalis*	LT	8	CL, HK, MC, MT, OR
Indiana Bat	*Myotis sodalis*	LE	13	CL, HK, MC, MT, OR

[1] Source: TVA Regional Natural Heritage Database, queried August 2021.
[2] Status Codes: LE = Listed Endangered; LT = Listed Threatened.
[3] ROW Sector Abbreviations: CL = Cleveland, HK = Hopkinsville, MC = Manchester, MT = Morristown, OR = Oak Ridge.

Species specific information comes from Cornell (2021), Natureserve (2021), Tennessee Wildlife Resources Agency (2021) and Scott and Redmond (2021).

Painted snake coiled forest snail can be found within crevices or under ledges of limestone in areas with karst topography. These snails prefer areas with dense, mature forest and moist conditions, but tend to avoid areas with heavy moss growth. IPaC identified that ROW Cycle A plots proposed for removal of incompatible vegetation may occur within the species range in the Manchester Sector. The painted snake coiled forest sail is listed as a federally threatened species.

Green salamanders, primarily considered a rock-crevice dwelling species, typically inhabit shaded rock outcrops in mixed mesophytic forests between 500 and 1,300 meters in elevation. Breeding females require cool, clean and moist horizontal crevices or narrow chambers to suspend their eggs from an overhead substrate. One record of this state-listed species has been recorded within 50 feet of ROW Cycle A plots proposed for removal of incompatible vegetation in the Manchester Sector.

Bald eagles are federally protected under the Bald and Golden Eagle Protection Act. This species is associated with large mature trees capable of supporting their massive nests. Bald eagles are also often found on the highest crossbeam of transmission structures. These are usually found near large waterways where the eagles forage. The nearest bald eagle record is a nest within 660 feet of proposed areas of activity in the Manchester (one nest) Sector.

Carolina northern flying squirrels are a federally listed as endangered species that lives at high elevations in the Appalachian Mountains and were identified by IPaC in the Cleveland and Morristown Sectors. It feeds on lichens that grow on trees (live, dead, standing, or fallen). The lichens are very slow growing and require specific moisture levels and substrate to grow.

Gray bats are a federally listed as endangered species associated year-round with caves, roosting in different caves throughout the year. Bats disperse from colonies at dusk to forage along waterways. IPaC database identified that this species may be present in all TVA managed Sectors except West Point.

Indiana bats inhabit caves during winter and then migrate to roost during summer under exfoliating bark and within cavities of trees (typically greater than or equal to 5 inches in diameter). Foraging occurs along riparian areas and along the tops of trees such as along a forested edge or tree line. Some habitat requirements overlap between Indiana bat and northern long-eared bat, which roosts in caves or cave-like structures in winter and utilizes cave-like structures as well as live and dead trees with exfoliating bark and crevices in the summer. ROW Cycle A plots proposed for removal of incompatible vegetation intersect 35 O-SAR buffers for Indiana and 24 for northern long-eared bat located across all sectors except West Point.

3.4.3.3 Aquatic Animals

TVA's Regional Natural Heritage database documented one federally listed fish (snail darter) and one state-listed mussel (pink mucket) that are known to occur within 50 feet of ROW where Cycle A incompatible vegetation removal would occur (Table 3-5). The watersheds of the Tennessee, Cumberland, and Coosa rivers support an unusually diverse group of aquatic animals, but human activities have resulted in adverse impacts to the streams and aquatic organisms therein (Etnier 1998). Previous evidence suggests that the pristine stream habitats in the Tennessee River system had been inhabited by 91 freshwater mussel species (Parmalee and Bogan 1998). Mussels were beginning to be affected by human activities by the mid-1800s, and many of these freshwater mussels were already extirpated before the Tennessee River mainstream impoundments (dams) were constructed (TVA 2011a). The lack of early fish collections does not allow a similar comment about the impact of these activities to Tennessee River fish assemblages, but there likely were species of Tennessee River fish that became extinct before they were known to science (TVA 2011a). Diversity was higher in the study area in the past. However, exceptional species diversity is still observed in fish, mollusks, crayfish, aquatic insects, and various other invertebrate groups.

Table 3-5. Federally and State-Listed Aquatic Animal Species Known to Occur Within 50 feet of Proposed Vegetation Management in Fiscal Year 2023[1]

Common Name	Scientific Name	Federal Status[2]	State Status[2]	State Rank[3]
FISH				
Snail Darter	*Percina tanasi*	DM	T	S2S3
MUSSELS				
Pick Mucket	*Lampsilis abrupta*	E	E	S1S2

[1] Source: TVA Regional Natural Heritage database, queried on 04/06/2021
[2] Status Codes: DM = Delisted but still Monitored; E = Listed Endangered; T = Listed Threatened
[3] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S#S# = Range Rank.

3.4.4 Environmental Consequences for Threatened and Endangered Species

3.4.4.1 Plants

As described above in Section 3.1, tree and woody vegetation removal would be accomplished using a combination of manual and mechanical methods (TVA 2019). Once the trees are removed, the area would be maintained in an open herbaceous condition with subsequent cycles of vegetation control. On a landscape level, this would result in a small amount of forest conversion to herbaceous vegetation. When working in residential, commercial, agricultural or other areas of highly disturbed vegetation, manual methods would have no appreciable impact on the surrounding plant community.

Track-hoe, skid steer, feller-buncher, or other comparable equipment are the mechanical tools most likely to be used. Minimal disturbance to the herbaceous layer is expected with the use of feller-bunchers to remove trees. In drier portions of a ROW, particularly areas surrounded by forest, this method of removal can be very effective at promoting herbaceous habitat dominated by native plant species. These areas would then be continually cleared during subsequent vegetation maintenance of the floor. If mechanical methods were implemented where a ROW intersects a rare plant community, the result would often be an increase in the rare habitat type. When combined with subsequent vegetation management, which most often includes selective application of herbicide, this type of mechanical tree removal can be compatible with maintaining quality herbaceous habitats relatively free of invasive weeds.

The largest impact of debris removal would be from equipment traffic needed to remove material to an off-site location. More often the material would be mulched or left on site. When mulched, the material degrades over time giving way to an herbaceous plant community. Depending on the time of year, native herbaceous species typically begin to emerge through the mulch layer in weeks to month after the work occur. Trees are typically left in place in steeper terrain or remote areas where mulching is not feasible. When large portions of trees are left on-site, they typically take multiple years for the crowns and limbs to degrade to a point where most of the remaining material is on the ground. This may appear unsightly compared to mulched ROW, but the effects to plant habitats are not appreciably different in the long-term.

All thirteen occurrences of state-tracked species previously documented from within 50 of TVA ROW in the study area proposed for FY23 activities are located at eight specific sites on Manchester Sector ROW plots L5751 and L5614. These areas are denoted as Class 2 sites in the O-SAR database. When vegetation management is scheduled to occur in such locations, TVA biologists and Transmission's ROW operations staff work together to ensure the species are protected. Sometimes the proposed work would not affect the listed plants found in the ROW, but other times operations staff augments the timing or method of proposed work to protect sensitive resources. TVA's PEIS (2019) outlined several examples of how the O-SAR database is used to avoid negative impacts to federally or state-listed plants species. Methods likely to be used during incompatible vegetation clearing efforts include:

- Timing – Transmission Operations would shift the timeframe of vegetation management to avoid impacting a federally or state-listed plant species.
- Flagging – TVA botanists would perform field surveys to delineate specific areas where state-listed plants occur on ROW. Sites would be marked in the field with flagging tape and maps would be provided to field crews, along with instructions on how work should be conducted in these spans.

During preparation of the PEIS (TVA 2019), TVA consulted with the USFWS on the TVA ROW Vegetation Management program on the potential effects of the program on all federally listed plants and animals. In May 2019, the USFWS signed a Biological Opinion entitled *Programmatic Strategy for Right-of-Way Vegetation Management that May Affect Endangered or Threatened Plants in the Tennessee Valley Authority Service Area* (see Appendix C). In that document the USFWS concurred that the TVA vegetation management program, which includes clearing ROW to the full width, is *Likely to Adversely Affect*, but *Not Likely to Jeopardize* the 18 federally listed plant species under consideration. However, none of those species are known to occur in or adjacent to the

Cycle A ROW plots analyzed here. The proposed work would not have an appreciable impact on federally listed plant species. Impacts to state-listed species would be reduced or eliminated using the O-SAR process.

3.4.4.2 Terrestrial Animals

The proposed actions could impact all federally and state-listed terrestrial animal species recorded within 50 feet of the Action Alternative study area; however, the severity of those impacts range greatly. Other federally listed species with potential to be impacted have been identified by IPaC based on species range and/or TVA's O-SAR system for potentially suitable habitat and will also be addressed.

The federally listed as threatened painted snake coiled forest snail was identified by an IPaC review of the potential ROW areas proposed for FY23 removal of incompatible vegetation in the Manchester Sector. Because this species prefers dense, mature forests, they may be impacted vegetation removal activities that intersect the species' range. However, this species is confined to a narrow range within the Crow Creek Valley drainage. The closest Cycle A ROW plots are approximately 10.9 miles away from known records and would not affect this snail.

Green salamanders, because of their preference for shaded rock outcrops and their habitat in rock crevices are likely to be sheltered from direct impacts from tree clearing. Outcrops that are currently shaded, may become exposed to the sun rendering them unsuitable. While individuals and small areas of habitat may be impacted, populations are not expected to be impacted by the proposed project.

Bald eagle nests on and adjacent to ROW are tracked by the TVA heritage program. A 660-foot protective buffer is placed in the O-SAR database around all known eagle nests. Bald and Golden Eagle Protection Act guidelines would be followed at these sites. BMPs would be implemented to prevent impacts to eagle foraging habitat. This species would not be impacted by the proposed actions.

Carolina northern flying squirrel habitat is delineated in the O-SAR database. However, FY23 vegetation removal activities in Cycle A plots would not intersect occupied areas and this project would have no impact on this species.

Pursuant to Section 7(a)(2) of the ESA, TVA entered into consultation with the USFWS in 2014 to programmatically assess the impact of 96 routine TVA actions on the four federally listed bat species known to occur in the TVA study area: Indiana bat, northern long-eared bat, gray bat and Virginia big-eared bat. This consultation included activities associated with transmission system ROW vegetation management. TVA determined that none of the activities associated with vegetation management have the potential to adversely affect gray bat. Vegetation management activities (primarily tree removal) were determined to be likely to adversely affect Indiana bat and northern long-eared bat. The USFWS issued a Biological Opinion in April 2018, concurring with TVA's effects determinations and issued an Incidental Take Statement that authorizes TVA's ROW vegetation management practices over a 20-year term (Appendix B).

TVA consulted with the USFWS to assess the impacts of routine activities associated with TVA's transmission system ROW vegetation management program on all species listed under the ESA (other than the four federally listed bat species addressed in the programmatic consultation) with potential to occur in the study area. This consultation was completed and the USFWS issued a Biological Opinion in May 2019 concurring with TVA's effects determinations (see Appendix C). In addition to implementing BMPs, TVA routinely uses the O-SAR process to identify sensitive areas for federally listed species and to modify proposed vegetation management actions to minimize the potential for impacts (seasonal restrictions, restricted activities) to federally listed species. These practices resulted in a may affect, but not likely to adversely affect determination by the USFWS for all federally listed terrestrial animal species (excluding bats).

3.4.4.3 Aquatic Animals

TVA reviews ROWs prior to annual maintenance activities and identifies appropriate vegetation control methods, appropriate conservation activities, BMPs, and avoidance and minimization measures to guide vegetation maintenance actions based on the known or likely occurrence of sensitive species or habitats within ROWs.

TVA's O-SAR screening process identifies potential impacts appropriate vegetation control methods and restrictions (hand-clearing, mechanical clearing or spot application of herbicides, seasonal avoidance) within streamside management zones or unique/ important aquatic habitats. For work proposed for the FY23 Cycle A incompatible vegetation removal, the TVA biologist would coordinate with Transmission's operations staff for each ROW that contains O-SAR aquatic zones recorded in O-SAR. This would ensure that the proposed work would not have significant impacts to the aquatic the aquatic sensitive species or their habitats. Species- and/or group-specific (e.g., SMZs) restrictions and guidance have been developed for all federally listed and most state-listed species in the study area. Therefore, no impacts are anticipated from the proposed FY23 vegetation management activities.

3.5 Surface Water

3.5.1 Affected Environment

The quality of the region's water is critical to protection of human health and aquatic life. Water resources provide habitat for aquatic life, recreation, domestic and industrial water supplies, and other benefits. Major watersheds in the TVA study area (Figure 3-2) include most of the Tennessee River, the Cumberland River basins, portions of the lower Mississippi, Green, Pearl, Tombigbee, and Alabama/Coosa River basins, and a small portion of the lower Ohio River basin.

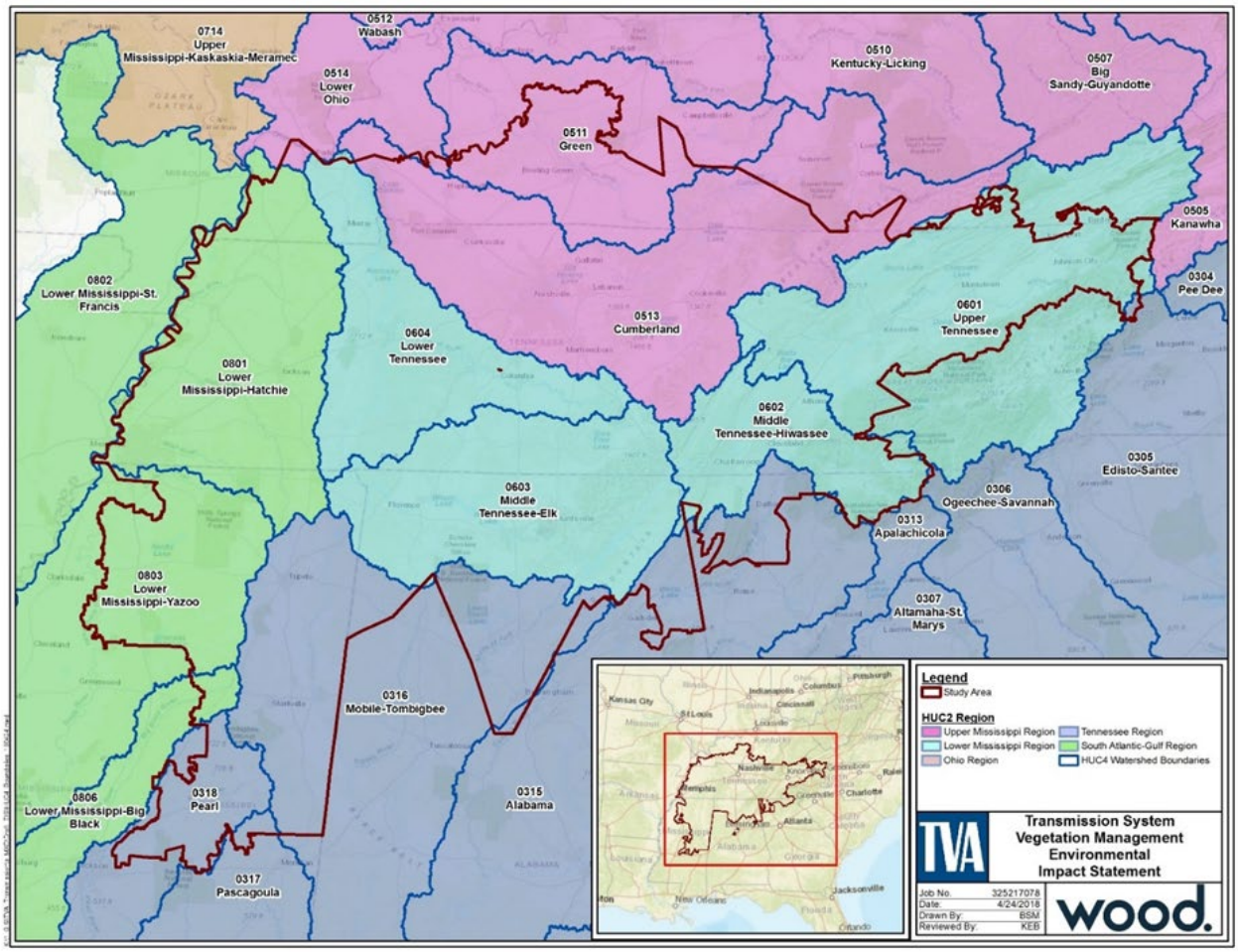

Figure 3-2. Major Watersheds of the TVA Study Area

As indicated in Section 3.3, stream habitats in the proposed 2023 project study area include very large rivers (e.g., Tennessee), large rivers (e.g., lower Cumberland and upper Tennessee), medium rivers (e.g., lower Hiwassee and Clinch), small rivers (e.g., Ocoee), and numerous perennial, intermittent, and ephemeral streams. As such, the typical stream makeup of riffles, runs, and pools would be expected to be encountered with width and depth dependent on the size of the water body crossed by the ROW. The Tennessee River basin makes up a large, centralized portion of the TVA study area (see Figure 3-2). The Tennessee River begins where the Holston and French Broad Rivers join in Knoxville, Tennessee, 652 river miles from where it empties into the Ohio River near Paducah, Kentucky. The Cumberland River is formed by the junction of the Poor and Clover Forks in Harlan County, Kentucky, about 693 miles above its confluence with the Ohio River near Smithland, Kentucky. The drainage area of the Cumberland is 17,598 square miles. Affected watersheds crossed by transmission lines proposed for incompatible vegetation removal in FY23 and their corresponding 10-digit HUCs are identified in Table 3-6. The general locations of the transmission lines where the proposed activities will occur can be found in Appendix J.

Table 3-6. Watersheds (and the 10-digit Hydrologic Unit Codes) Crossed by the Transmission System Line Segments Proposed for Removal of Incompatible Vegetation in Fiscal Year 2023

HYDROLOGIC UNIT CODE (HUC)	WATERSHED NAME	STATES	TVA SECTOR NAME	TRANSMISSION LINE NUMBER
0602000104	Wolftever Creek	GA, TN	Cleveland	L5028
0602000209	Spring Creek-Hiwassee River	NC, TN	Cleveland	L5741, L5179, L5942
0602000213	Candies Creek	TN	Cleveland	L5028
0602000214	Chickamauga Lake-Hiwassee River	TN	Cleveland	L5028, L5741, L5179
0602000302	Ocoee River	GA, NC, TN	Cleveland	L5741, L5179, L5942
0513020505	Upper Little River	KY	Hopkinsville	L5655
0513020506	Lower Little River	KY	Hopkinsville	L5655
0513020507	Eddy Creek-Cumberland River	KY	Hopkinsville	L5655
0513020508	Livingston Creek-Cumberland River	KY	Hopkinsville	L5655
0514020501	Upper Tradewater River	KY	Hopkinsville	L5655
0602000110	Chattanooga Creek	GA, TN	Manchester	L5751, L5614
0602000111	Lookout Creek	AL, GA, TN	Manchester	L5751, L5614
0602000112	Nickajack Lake-Tennessee River	AL, GA, TN	Manchester	L5751, L5614
0603000102	Widows Creek-Tennessee River	AL, GA, TN	Manchester	L5157, L5751, L5614
0601010701	Douglas Lake-French Broad River	TN	Morristown	L5693
0601010702	West Prong Little Pigeon River	NC, TN	Morristown	L5693
0601010703	Little Pigeon River	NC, TN	Morristown	L5693
0601010704	French Broad River	TN	Morristown	L5693
0601020511	Norris Lake-Clinch River	TN	Oak Ridge	L5220
0601020704	Clinch River	TN	Oak Ridge	L5220

Fresh water abounds in much of the TVA study area and generally supports most beneficial uses, including fish and aquatic life, public and industrial water supply, waste assimilation, agriculture, and water-contact recreation, such as swimming. Water quality in the TVA region is generally good.

The federal Water Pollution Control Act, commonly known as the CWA, is the primary law that affects water quality. It establishes standards for the quality of surface waters and prohibits the discharge of pollutants from point sources unless a NPDES permit is obtained. Section 404 of the CWA further prohibits the discharge of dredge and fill material to waters of the United States, which include most wetlands, unless authorized by a permit issued by the U.S. Army Corps of Engineers (USACE).

The seven states in the TVA power service area have enacted laws regulating water quality and implementing the CWA. As part of this, the states classify water bodies according to their uses or designations and establish water quality criteria specific to these uses. Each applicable state law includes an anti-degradation statement containing specific conditions for regulated actions and designed to maintain and protect current uses and water quality conditions.

3.5.2 Environmental Consequences for Surface Water

The potential for impacts to surface water resources centers on the evaluation of alterations to surface water quality. The clearing of vegetative cover within the study area has the potential to cause minor and temporary effects on surface water quality, regardless of the methods used for clearing (TVA 2019). These alterations could be caused by small increases in sediment laden storm water runoff, small increases in stream temperatures and decreases of dissolved oxygen from the loss of tree cover; the alteration of nutrient levels; small increases of pollutants, such as solid wastes from litter and chemical pollutants from leaking vehicles and heavy equipment; and the minor increase of concentrated storm water flows from reduced vegetation cover. The evaluation of the surface water resources including designated uses and whether they are high quality or impaired (listed on the State 303(d) list) is considered to determine the appropriate control measures. Compliance with all applicable federal, state and local environmental laws and regulations would be followed including State Regulatory Storm Water Construction Permits, USACE 404/401 permitting, and Water Quality Certifications. A State-specific Storm Water BMP Plan, if required, would be drafted and would identify specific BMPs to address vegetation maintenance-related activities that would be adopted to minimize storm water impacts per state guidelines. Appropriate BMPs (TVA 2017) would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized.

In addition to the removal of vegetative cover, the use of herbicides for the control of vegetation has the potential to affect the water quality of streams. Therefore, any pesticide/herbicide use as part of vegetation maintenance activities would have to comply with the NPDES General Permit for Application of Pesticides, which also requires a pesticide discharge management plan if certain thresholds are met. In areas requiring chemical treatment, only EPA-registered and TVA approved herbicides would be used in accordance with label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic and water quality impacts. Proper implementation and application of these products would be expected to have no significant impacts to surface waters. No cumulative impacts are anticipated.

3.6 Wetlands

3.6.1 Affected Environment

Wetlands are those areas inundated or saturated by surface or groundwater such that vegetation adapted to saturated soil conditions is generally prevalent. Due to their landscape position, vegetation structure, and influence on downstream hydrology, wetlands provide a suite of benefits valued by society. These include toxin absorption and sediment retention for improved water quality, storm water impediment and attenuation for flood control, shoreline buffering for erosion protection, and provision of fish and wildlife habitat for commercial, recreational, and conservation purposes. Examples of wetland habitats include bottomland forests, swamps, wet meadows, isolated depressions, and shoreline fringe along watercourses or impoundments.

The TVA power service area crosses nine ecoregions (Level III, EPA 2017a) where wetland habitats comprise palustrine systems (non-tidal or freshwater complexes, dominated by trees, shrubs, or persistent emergent vegetation) (Cowardin et al. 1979). Palustrine wetlands across the TVA region can include bottomland hardwood forests (forested wetlands), scrub-shrub wetlands, beaver ponds (aquatic-bed or emergent wetlands), wet meadows and marshes (emergent wetlands), and highland bogs (forested, scrub-shrub, or emergent wetlands that have organic soil). NWI maps over two million acres of wetland across the TVA region, with 6,751 acres occurring on ROWs (TVA 2019).

On ROWs where conductor clearance is necessary, vegetation management aims to maintain low-stature wetland vegetation. Therefore, wetland communities on ROWs consist predominantly of emergent (erect, rooted, or floating) non-woody vegetation representing meadow-like wetland habitat crossed by ROWs. This typically may include water lilies, cattails, grasses, rushes, bulrushes, sedges, smartweeds, reeds, and other hydrophytic (wet site) species. Scrub-shrub wetland habitats contain woody plants less than 20 feet tall. These wetland communities may comprise woody vegetation with a limited growth potential, such as buttonbush or tag alder, or successional communities comprised of tree saplings (EPA 2017b). These communities develop when saplings invade emergent wetland habitat. However, ROW vegetation management program aims to deter threatening woody vegetation growth. Therefore, the presence of successional scrub-shrub wetland communities would be lacking within ROWs maintained on a 3-year cycle.

Forested wetlands may persist on ROWs in spanned valleys (deep ravines) or where the maintenance footprint does not extend to the full extent of the ROW. It is the unmaintained ROW area where forested wetland could occur wherever conditions are conducive to wetland presence. These forested wetland communities are commonly an extenuation of the adjacent maintained emergent wetland habitat within the ROW. Forested wetland communities across the TVA power service area are characterized by an overstory of trees with a species composition that may include red maple, lowland oaks, sweetgum, sugarberry, willow, cypress, etc.; an understory of woody wetland saplings or shrubs; and a ground layer comprised of shade tolerant wetland species.

As discussed in the PEIS (2019), TVA plans to remove incompatible vegetation (trees and woody vegetation) on the ROW margins across the TVA transmission system over an 8-year span. The ROW area within the Cycle A rotation comprises 2,298 acres divided across five Sectors (see Table 3-7). TVA's FY23 proposed project would entail the removal of about 400 acres of this incompatible vegetation within segments maintained in the Cycle A rotation. To evaluate wetland presence within these ROW sectors, TVA utilizes the NWI (USFS 1977-2017) coupled with O-SAR using higher resolution and more current aerial imagery, hydrology data, and soils information to map additional potential wetlands. In addition, the O-SAR dataset references all wetland delineations within a given ROW that have been physically verified. Accordingly, an estimated total of 230 acres of potential forested wetland areas has been identified for removal within the Cycle A plots. This wetland area represents 10 percent of the total area currently proposed for removal of incompatible vegetation and conversion to an herbaceous habitat to reclaim the full extent of the specified ROWs (Table 3-7). Of the 230 mapped forested wetland acres containing incompatible vegetation proposed for removal, there is an estimated 19.31 acres of forested wetland within the clearing plots proposed for FY23, representing 8 percent of the total estimated forested wetland area within the Cycle A clearing plots (Table 3-7).

Table 3-7. Mapped Wetland Acreage by Right-of-way Sector within Cycle A Vegetation Management Plots Proposed for Removal of Incompatible Vegetation in Fiscal Year 2023 on the Margin Edges

ROW Sector	Ecoregion Location[1]	Total Cycle A ROW Acreage Remaining with Incompatible Vegetation	NWI Acres	O-SAR Wetland Acres	Ground Truthed Wetland Acres[2]	Total Cycle A Mapped Wetland Acres	Percent of Total Cycle A Mapped Wetland	FY23 Cycle A Mapped Wetland Acreage for Removal	FY23 Percent of Cycle A Mapped Wetland Acreage for Removal
Centerville	IP	195	0.05	6.51	0.02	6.58	0.03	0	0
Cleveland[3]	BR, R&V, SW App	413	1.05	5.71	0.10	6.86	0.02	3.69	54
Hickory Valley	MSV LP, SE Plains	152	7.96	8.97	0.95	17.88	0.12	0	0
Hopkinsville[3]	IP, IRV&H, MSV LP	161	3.05	15.63	1.14	19.82	0.12	2.57	13
Madison	IP, R&V, SW App	95	6.67	11.46	0.13	18.26	0.19	0	0
Manchester[3]	IP, R&V, SW App	455	15.54	30.76	3.97	50.27	0.11	12.20	24
Milan	IP, MS AP, MSV LP, SE Plains	133	10.30	17.03	1.82	29.15	0.22	0	0
Morristown[3]	BR, R&V	56	0.39	3.54	0	3.93	0.07	0.63	16
Muscle Shoals	IP, SE Plains, SW App	131	13.51	3.39	0.33	17.23	0.13	0	0
Nashville	IP	125	2.24	7.42	0	9.66	0.08	0	0
Oak Ridge[3]	IP, R&V, SW App	126	1.21	4.7	0.26	6.17	0.05	0.22	4
West Point	SE Plains	256	40.94	3.40	0.05	44.39	0.17	0	0
	TOTAL	**2,298**	**102.91**	**132.05**	**8.77[2]**	**230.20**	**10**	**19.31[4]**	**8**

[1]Ecoregion Level III (EPA 2017a): BR=Blue Ridge; IP=Interior Plateau; IRV&H=Interior River Valley and Hills; R&V=Ridge and Valley; MS AP=Mississippi Alluvial Plan; MSV LP=Mississippi Valley Loess Plains; SE Plains= Southeast Plains; SW App=Southwestern Appalachians.
[2] This number represents what has been ground truthed prior to November 2021. Actual acreage could change once field surveys are complete and will be included in the final environmental assessment.
[3]Cycle A Sectors where Fiscal Year 2023 incompatible vegetation is proposed to be removed.
[4] This number is based on known acreage from the National Wetland Inventory, O-SAR database, and previously ground truthed field surveys. It excludes riverine wetlands included in the National Wetland Inventory database. Actual acreage could change once field surveys are complete and will be included in the final environmental assessment.

The Cleveland and Morristown sectors are located predominantly in east Tennessee, with portions in northeast Georgia. Within Cycle A plots, these sectors contain an estimated total of 7 acres and 4 acres of forested wetland proposed for removal, which represents 2 percent and 7 percent of these ROW sectors' incompatible vegetation, respectively. In FY23, approximately four wetland acres of the Cleveland Sector and less than one wetland acre of the Morristown Sector are proposed for tree clearing, representing 54 percent and 16 percent of the total affected wetland area within these plots, respectively. East Tennessee and northeast Georgia comprise portions of the Southwestern Appalachians, Blue Ridge, and Ridge and Valley ecoregions. The steep topography of the Blue Ridge Mountains is not conducive to wetland development due to the high rate of runoff; therefore, wetlands are relatively smaller in size and generally form along drainages or wherever runoff can otherwise pool for sufficient development of wetland habitat (Weakley and Schafale 1994). The Ridge and Valley region is characterized by gentler topography, with wetland habitat most common in floodplains of stream and river systems in the valley flats; although seepage fens containing rare species are known from this ecoregion as well. Wetlands in the Southwestern Appalachians are in valley floors where undulating low mountain terrain allows for water retention. Due to the topography of the area crossed by these ROW sectors, wetlands in narrow valley bottoms can be spanned by conductors with structures located on upland rises between drainages, leaving forested wetlands within the valleys intact. Wetlands in wider valley flats may contain forested wetland along unmaintained ROW borders where spanning these valleys could not be engineered.

The Oak Ridge, Madison, and Manchester sectors extend from east Tennessee into central Tennessee, south central Kentucky, and north central Alabama. These sectors contain an estimated total of 6 acres, 18 acres, and 50 acres of forested wetland proposed for incompatible vegetation removal on Cycle A plots, which represents 5 percent, 19 percent, and 11 percent of these sectors' ROW vegetation removal areas, respectively. In FY23, less than one wetland acre in the Oak Ridge Sector, no wetland area on the Madison sector, and 12 wetland acres of the Manchester Sector are proposed for tree clearing, representing 4 percent, 0 percent, and 24 percent of the total affected wetland area within these plots, respectively. Central Tennessee, south central Kentucky, and north central Alabama comprise portions of the Southwestern Appalachians, as described above, and the Interior Plateau. The Interior Plateau ecoregion contains the entirety of the Centerville and Nashville sectors, as well. These Sectors contain 7 acres and 10 acres of mapped forested wetland, comprising 3 percent and 8 percent of each of these Cycle A ROW sectors' incompatible vegetation; although no mapped wetland acreage occurs within the FY23 affected plots on these sectors. The Interior Plateau is characterized by karst geology underlying lower elevation hills and plains. ROW Sectors crossing this ecoregion would encounter forested wetland habitat formed in sinkhole depressions, limestone seeps, and along river valleys. A portion of the Hopkinsville Sector is located across southwest Kentucky and north central Tennessee in the Interior Plateau ecoregion, where similar wetland habitat and occurrence regime would be anticipated. This sector extends into the Mississippi Valley Loess Plains, described below. Hopkinsville Sector ROW clearing footprint contains 20 mapped potential forested wetland acres, comprising 12 percent of the proposed Cycle A ROW area proposed for incompatible vegetation removal. Only 2.5 acres, or 13 percent of the total mapped wetland area on the Hopkinsville Sector, contains incompatible vegetation proposed for removal during FY23.

The Muscle Shoals Sector is located between northwest Alabama and northeast Mississippi, crossing the Interior Plateau and Southern Appalachians ecoregions, as described above, and extending across the Southeastern Plains. This sector contains 17 mapped forested wetlands acres, comprising 13 percent of this sector's Cycle A ROW with incompatible vegetation proposed for removal; although none of this acreage is located within the FY23 affected plots. All the West Point Sector and portions of the Milan and Hickory Valley sectors are in the Southeastern Plains across Mississippi, west Tennessee, and western Kentucky. Both Milan and Hickory Valley sectors extend into the Mississippi Valley Loess Plains, and Hickory Valley extends further west into the Mississippi Alluvial Plain ecoregion. Mapped potential wetland features within Cycle A ROW area comprises 17 percent of the West Point's Sector totaling an estimated 44 acres, 12 percent of Hickory Valley's Sector totaling 18 acres, and 22 percent of Milan's Sector totaling 29 acres. The higher percentage of wetland across these sectors is anticipated due to the flatter lands and lower gradient drainage basins typical of these ecoregions. Wetlands encountered in these ROWs would be extensive across wide floodplain wetland complexes typical of these regions. None of this mapped wetland acreage is located within the FY23 affected plots.

The mapped wetland location data sets used to determine wetland occurrence within the affected environment are based on coarse scale aerial imagery and similar office level resources. Within Cycle A ROWs, 4 percent of the total estimated 230 forested wetland acres has been verified by field survey. Only field surveys can accurately identify wetland presence, absence, extent, and condition. Therefore, the actual extent of affected wetland area would require field determinations wherever incompatible vegetation removal is proposed along ROWs where environmental conditions are favorable to wetland development.

3.6.2 Environmental Consequences for Wetlands

Activities in wetlands are regulated by state and federal agencies to ensure no more than minimal impacts to the aquatic environment and no net loss of wetland resources. Under CWA Section 404, activities resulting in the discharge of dredge or fill material in jurisdictional wetlands, and any secondary wetland impacts, such as forested wetland clearing, may be authorized by the USACE through a Nationwide, Regional, or Individual Permit. CWA Section 401 mandates state water quality certification for projects requiring USACE approval and permitting. Lastly, EO 11990 requires federal agencies such as TVA to minimize wetland destruction, loss, or degradation, and preserve and enhance natural and beneficial wetland values, while carrying out agency responsibilities. Compliance with USACE and state permits is required for regulated activities within jurisdictional waters of the U.S., which could require mitigation to compensate for loss of wetland function, based on a regulatory review of TVA's proposed forested wetland removal impacts.

As described in Section 3-7, predictive forested wetland occurrence within ROW areas proposed for incompatible vegetation removal was conducted utilizing NWI data and supplemented with an O-SAR review that incorporates aerial imagery and overlays indicative of wetland presence. The use of office-level materials for wetland identification runs the inherent risk of inaccuracies (Tiner 1997); therefore, limitations of this data must be considered. For example, there may be wetlands present for which no mapped evidence or other data currently exists and are, thus, undetectable via office-level review. Actual presence or absence of forested wetland resources could only be verified through field surveys to accurately determine wetland extent and condition.

As described in the PEIS (2019), forested wetland within areas of ROW designated for the proposed removal of incompatible vegetation (trees and woody vegetation) would result in an estimated 230 acres of habitat conversion. Of this, 8 percent, or nearly 20 acres, would occur in FY23. These wooded wetland habitats would be converted to emergent, meadow-like habitat within the ROW and maintained as-such long-term, for as long as the ROW remains in place. Forested wetland vegetation, in general, have deeper root systems and contain greater biomass (quantity of living matter) per area than do emergent wetlands which do not grow as tall. As a result, forested wetlands tend to provide higher levels of wetland functions, such as sediment retention, carbon storage, and pollutant retention and transformation (detoxification), all of which support better water quality. Consequently, the clearing and conversion of forested wetlands to lower-growing wetland habitat reduces wetland functions that would otherwise support healthier and improved downstream water quality (Wilder and Roberts 2002; Ainslie et al. 1999; Scott et al. 1990). Although the converted emergent wetland habitat would provide the same suite of wetland functions as their previously wooded counterpart, it would be at a reduced level due to the removal of woody vegetation.

Tree removal in wetlands may be conducted with handheld cutters, such as chainsaws, or accomplished with a feller-buncher to sever above ground vegetation while leaving all vegetative structure below ground undisturbed. A feller-buncher is a machine that grasps the tree trunk while shearing it near the ground surface, then removing it to a suitable location outside the wetland. Chainsaws and feller-bunchers leave the root ball intact and result in minimal soil if access is conducted using wetland BMPs (TVA 2017).

Potential regulated activities within wetlands to accommodate tree and other woody vegetation removal could include the temporary placement of wetland mats for access, leaving woody debris from tree falls, and other associated activities deemed jurisdictional by the regulatory agencies. Section 404b of the CWA directs regulatory agencies to consider secondary impacts of regulated activities, such as loss of wetland functions from forested wetland clearing and habitat conversion. Therefore, forested wetland loss is subject to the authority of the regulatory agencies to ensure no net loss of wetland functions and values, per the directive of the CWA and the federal no net loss of wetland policy (EPA 1990). The CWA authorizes regulatory oversight for these impacts. The USACE and States exert this oversight through an established permitting process that ensures maintenance of the physical, biological, and chemical integrity of the nation's waters, including wetlands, and the objectives of the CWA are upheld. The permitting process involves a demonstration of wetland avoidance, minimization of disturbance, and compensation for loss of wetland functions and values within the larger watershed basin. TVA would obtain the necessary Section 404/401 CWA permits and required compensatory mitigation to ensure the proposed wetland impacts are compensated to the extent deemed appropriate such that wetland functions and values remain at current capacity and no further degradation to water resources occurs within larger affected basins. Required compensatory mitigation would be purchased through an approved wetland mitigation bank to ensure no more than minimal impacts to the aquatic environment and the objectives of the CWA are met.

Wetland habitat located in areas proposed for heavy equipment travel could experience minor and temporary impacts during ROW vegetation removal activities. TVA would minimize wetland disturbance through adherence to wetland BMPs for any and all work necessary within delineated wetland boundaries (TVA 2017). The following BMPs (TVA 2017) would be implemented within locations where mapped NWI and O-SAR wetlands are present and vegetation management activities are necessary:

- Soils ruts would not exceed 12 inches; if necessary, use low ground pressure equipment, such as rubberized tracks, wide tires, or lightweight equipment (ATVs) in mapped wetlands to adequately minimize soil rutting/compaction/disturbance.
- Erosion control techniques would be implemented within 50 feet of wetland boundary where soil disturbance is proposed.
- Adhere to dry season schedule (September to mid-November) when practicable.
- Vehicular traffic would be limited to narrowed access corridors along the ROWs as needed.

The wetland review process provides locations for potential and known wetland locations across TVA's ROWs proposed for vegetation management. This represents an estimated total of 230 acres, or 10 percent of the ROW area proposed for removal of incompatible vegetation within Cycle A ROW Sector plots, of which nearly 20 acres, or 8 percent of total estimated Cycle A wetland acreage, could be cleared in FY23. A wetland delineation would be performed wherever wetland resources intersect ROW clearing areas to ensure appropriate wetland compliance is achieved. The wetland mandates enforced by agency permit requirements are in place to ensure wetland impacts do not result in cumulative loss. Therefore, in compliance and accordance with the CWA, directives of EPA's no net loss of wetland policy, TVA's federal obligation under EO 11990, and USACE and state regulations ensuring no more than minimal adverse effects on the aquatic environment, the potential forested wetland conversion to accommodate the described ROW tree clearing actions would have no significant direct or cumulative adverse wetland impacts.

3.7 Natural Areas (Managed & Conservation Sites)

3.7.1 Affected Environment

Numerous areas across the TVA region are recognized and, in many cases, managed for their recreational, biological, historic, and scenic resources. Natural areas include managed areas and conservation sites. Managed areas encompass a broad range of lands and typically include federal, state, county, or city park lands; national or state forests, wilderness areas, scenic areas, conservation easements, wildlife management areas, recreational areas, greenways, trails, Nationwide Rivers Inventory (NRI) streams, and designated Wild and Scenic Rivers. These areas consist of lands held in public ownership that are managed by an entity (e.g., TVA, NPS, USFS, state or county, or land trust) to protect and maintain certain ecological and/or recreational features. A management plan, or similar document, defines what types of activities are compatible with the intended use of the managed areas. Conservation sites are either tracts of privately owned land that are recognized by resource biologists as having important environmental resources or are identified tracts of lands that are ecologically distinct in attributes or character but are not specifically managed by a public or private entity. NRI streams are free-flowing segments of rivers recognized by the NPS as possessing remarkable natural or cultural values that may potentially qualify them as part of the National Wild and Scenic River System.

Managed areas and conservation sites are typically managed for one or more of the following objectives:

- Recreation - managed for outdoor recreation or open space. Examples include national, state and local parks and recreation areas, reservoirs (TVA and other), picnic and camping areas, trails and greenways, and TVA small wild areas.

- Species/Habitat Protection - places with endangered or threatened plants or animals, unique natural habitats, or habitats for valued fish or wildlife populations. Examples include national and state wildlife refuges, mussel sanctuaries, TVA habitat protection areas and nature preserves.

- Resource Production/Harvest - lands managed for production of forest products, hunting and fishing. Examples include national and state forests, state game lands and wildlife management areas and national and state fish hatcheries.

- Scientific/Educational Resources - lands protected for scientific research and education. Examples include biosphere reserves, research natural areas, environmental education areas, TVA ecological study areas and federal research parks.

- Historic Resources - lands with significant historic resources. Examples include national battlefields and military parks, state historic sites and state archeological areas.

- Scenic Resources - areas with exceptional scenic qualities or views. Examples include national and state scenic trails, scenic areas, wild and scenic rivers, NRI streams and wilderness areas.

- Agricultural Resources - lands with significant local agricultural production and open space value, often in areas where suburban development is increasing. Examples include working family farms protected by conservation easements

The Natural Area data housed within TVA's Regional Natural Heritage database includes the type, location, management entity, and contact information for each site, and may include pertinent rare species and habitat information. An August 2021 query of the Heritage database indicated the five ROW sectors where incompatible vegetation removal has been proposed include numerous managed areas and conservation sites. A total of 36 Natural Areas are either located within the ROW areas proposed for incompatible vegetation removal or are immediately adjacent to them (Table 3-8).

Table 3-8. The Number of Natural Areas Located within each Sector of Cycle A Right-of-Way Planned for Incompatible Vegetation Removal Activities

Sector	Number of Natural Areas Potentially Encountered in FY23
Cleveland	19
Hopkinsville	2
Manchester	1
Morristown	6
Oak Ridge	8
TOTAL	**36**

Appendix K includes a complete list of Natural Areas, by sector, that are crossed by or adjacent to ROW within Cycle A plots considered for the proposed removal of 400 acres of incompatible vegetation in FY23. Areas crossed by ROW include NPS units, USFS areas, National Wildlife Refuges, and numerous state wildlife management areas, state parks, state forests, local parks, and conservation easements.

3.7.2 Environmental Consequences for Natural Areas

In addition to recreational and scenic opportunities, many Natural Areas within TVA's Power Service Area contain sensitive resources. These resources can include designated critical habitat for federally listed terrestrial and aquatic species, refuges, sanctuaries, protection planning sites, Outstanding Resource Waters, nature preserves, habitat protection areas, small wild areas, national parks, etc. Natural Areas information is used as part of TVA's O-SAR process, in conjunction with the ROW clearing spatial data, to develop site-specific guidance for each Natural Area that is to be used during ROW vegetation management activities.

Mitigation measures to minimize impacts to managed and natural areas, parks, and recreation include:

- Follow procedures outlined in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities Revision 3-2017* (TVA 2017).
- Contact the appropriate land manager before implementing vegetation maintenance activities to coordinate timing of the ROW maintenance such to minimize impacts to visitors, park operations, scheduled hunting, etc.
- Seek opportunities to partner with natural area managers to plan and conduct vegetation management that would meet multiple natural resource management objectives.
- Where available, utilize existing site-specific vegetation management plans for ROWs that cross managed lands.

Prior to implementing the planned FY23 ROW vegetation management activities, ROW crews review the natural areas O-SAR dataset and ensure standard BMPs are followed within all natural areas. Where indicated, the crew would consult with natural areas land managers, and coordinate activities as warranted. Utilizing the mitigation measures listed above no significant impacts to natural areas are associated with the FY23 ROW removal of incompatible vegetation.

3.8 Archaeological and Historic Resources

3.8.1 Affected Environment

3.8.1.1 Regulatory Framework

Federal agencies, including TVA, are required by the NHPA (16 USC 470) and by NEPA to consider the possible effects of their undertakings on historic properties. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act (16 USC 469-469c), Archaeological Resources Protection Act (16 USC 470aa-470mm) and the Native American Graves Protection and Repatriation Act 925 USC 3001-3013).

TVA executed a PA with the Advisory Council on Historic Preservation, seven SHPOs and all federally recognized Indian tribes with an interest in the region. The PA establishes a program alternative for compliance with Section 106 of the NHPA that would allow compliance to be achieved more efficiently through consultation at the programmatic level. The PA set forth procedures and criteria for an alternative process for all existing TVA operation and maintenance activities that are similar and repetitive in nature. Most of the activities associated with ROW vegetation management are covered within this PA.

3.8.1.2 Archaeological Resources

3.8.1.2.1 Background

The history of human activity throughout the study area spans thousands of years. The earliest groups to leave a definitive material record of their presence were early Paleoindians who entered the region during the Late Pleistocene glacial epoch at least 12,000 years ago. Their descendants and the descendants of other Native American groups who migrated to the area occupied the region for the next 11 millennia. This long pre-contact era lasted until the arrival of Europeans explorers in the sixteenth and seventeenth centuries. Cultural change is a slow and continual process. Archaeological researchers divide the pre-contact human history of the study area into six distinct cultural periods; Paleoindian (10,000-8000 B.C.), Archaic (8000-1000 B.C.), Gulf Formational/Early Woodland (1000-100 B.C.), Middle-Late Woodland (100 B.C.-A.D. 900), Mississippian (A.D. 900-1540), and Contact/Protohistoric period (A.D. 1540-1672) (Anderson and Sullivan 2013; Hudson 2002).

The Paleoindian period is characterized by small nomadic groups who exploited a variety of resources across the landscape including the hunting of now extinct mega-fauna. Artifacts attributed to this period often include large, fluted stone projectiles of the Clovis tradition. The Archaic period spans approximately seven millennia in which many cultural changes occurred. The early part of the Archaic period was much like that of the Paleoindian; mobile groups exploiting an increasing number of new environmental niches as the climate began to warm at the end of the ice age. Then the archaeological record became more diverse. Lithic projectile point forms recovered include those of the Eva, Morrow Mountain, White Springs, and Benton clusters (Justice 1987). Groundstone tools became more complex with the development of grooved axes, bannerstones and netsinkers during the Middle Archaic period. The first evidence of the spear thrower also appeared in the form of atlatl weights (Sassaman 1996). Deep storage pits, post molds (structures), and burials as well as evidence of the collection of arboreal nut crops and other cultigens, such as hickory nuts and wild plant remains such as goosefoot, maygrass, and knotweed are present at later Archaic sites (Gremillion 1996).

A main attribute that separates the Gulf Formational/Early Woodland period from the Archaic is the introduction of ceramics or pottery. The first pottery appeared in the western portion of the Middle Tennessee Valley between 1,000 and 800 B.C. largely in the form of undecorated fiber- and sand-tempered wares. Smaller lanceolate shaped, notched, and stemmed projectile of the Adena Stemmed, Gary Contracting Stemmed, Motley, and Wade types have been recovered from Early and Middle Woodland period sites (Justice 1987). Later Woodland period sites include undecorated and decorated chert-, quartz-, and more prominently grog- and limestone-tempered pottery (Faulkner 2002). More complex varieties of structural and storage features indicating increased emphasis on horticulture of native plants and sedentary lifeways also are evident at later Woodland sites. Small triangular Hamilton and small notched projectile types occur and mark the introduction of bow and arrow technology, a key cultural marker throughout the Tennessee Valley.

The Mississippian period throughout the TVA study area was dominated by chiefdom level societies, which influenced the surrounding tribal groups, arguably the most radical shift in social organization in the pre-contact era (Harle et al. 2013). Elaborate mortuary practices involving burial pits, mounds, and more extravagant grave goods evolved during this time. Large, planned villages are often fortified. The villages contain extensive midden deposits and a high density of features. Rectangular, wall trenched dwellings with raised clay fire basins are also evident. In addition, many inhabitants were dispersed into farming hamlets throughout the landscape.

The beginning of the Contact/Protohistoric period in the Southeast is commonly marked by the de Soto expeditions deep into interior portions of the Southeast (A.D.1544-1543). From the period of initial European contact to the Historic period, the archaeological and ethnohistoric record indicates a steady decline of the Native American population and extensive movement of many tribes. Introduced disease, especially smallpox, may have been a major catalyst for this decline (Smith 2002). The Mississippian pattern of large towns surrounded by smaller hamlets continued to operate in some areas even during the latter part of the Protohistoric when there were influxes of Native Americans from outside groups who were displaced by Euroamerican encroachment (Davis 1990). Eventually, these villages declined in number.

European influx only increased throughout the eighteenth century, and following the Revolutionary War, settlement further west beyond the Appalachian Mountains began in earnest. This resulted in the forced cessation of Native American lands throughout the Tennessee River Valley, including those belonging to the Chickasaw, Choctaw, Muscogee, Seminole, and Cherokee to name a few. In 1830, Congress passed the Indian Removal Act resulting in the forced removal of tens of thousands of Native Americans westward, known as the 'Trail of Tears.' Today, TVA regularly consults 23 federally recognized Indian tribes (Tribes) that have ancestral claims to the Tennessee Valley region. These tribes include: Absentee Shawnee Tribe of Indians of Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Cherokee Nation, The Chickasaw Nation, The Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Delaware Nation, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Jena Band of Choctaw Indians, Kialegee Tribal Town, Mississippi Band of Choctaw Indians, Monacan Indian Nation, The Muscogee Nation, Osage Nation, Peoria Tribe of Oklahoma, Poarch Band of Creek Indians, The Quapaw Tribe of Indians, The Seminole Nation of Oklahoma, Shawnee Tribe, Thlopthlocco Tribal Town, and United Keetoowah Band of Cherokee Indians in Oklahoma. Two additional Tribes

The American Industrial Revolution occurred within subsequent decades, resulting in marked growth of urban centers, large plantations, and smaller subsistence farming homesteads throughout the study area. The construction of railroads furthered the growth of industry in the Valley. The Civil War played a significant role in the development of the region. The Reconstruction Era of the late nineteenth century and the influx of European immigrants during the turn of the nineteenth and early twentieth century also had a major impact to settlement and the economy of the Valley.

Pre-contact Archaeological sites located within the TVA study area can take many forms. These can range from low-density lithic artifact scatter to extensive village occupations that contain rich archaeological deposits. Pre-contact sites are most often discovered within sub-surface deposits or below ground. Near surface deposits have often been previously disturbed by historic plowing activities, but intact cultural deposits can occur below what is termed the 'plowzone.' Earlier pre-contact sites, namely Paleoindian and earlier Archaic sites, are less common and are characterized by low density lithic artifact scatters across a variety of topographical settings; both upland and along lower elevated landforms along river drainages. In general, Middle and Late Archaic sites are more numerous across the study area landscape. Later Woodland and Mississippian period as well as Protohistoric sites are common along terrace sequences of major rivers, including the Tennessee River. Historic era archaeological sites throughout the study area are predominately associated with industrial, military, and domestic activities dating to the late eighteenth, nineteenth, and early twentieth centuries.

TVA's Power Service Area represents a diverse cultural landscape that held special meaning to its past inhabitants and to their descendants. Some of these places can be considered Traditional Cultural Properties (TCP). A TCP is defined as a property that is eligible for inclusion on the National Register of Historic Places (NRHP) because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King 1998). Similarly, a cultural landscape is defined as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (Birnbaum 1996). It should be noted that TVA does not disclose to the public any sensitive information regarding the location or other information such as sacred sites or TCPs identified by consulting tribes. Some examples of TCPs within the study area include mound sites, segments of the Trail of Tears, as well as stacked stone features. The Congressionally designated Trail of Tears National Historic Trail is a prominent cultural resource within TVA's Power Service Area. The Trail of Tears consisted of many routes and sub-routes that involved the removal of Native Americans from their ancestral homelands.

3.8.1.2.2 Archaeological Sites

Only portions of the ROWs within TVA's Power Service Area have undergone systematic Phase I archaeological surveys since the mid-1990s in association with compliance with Section 106. As a result, numerous archaeological sites within the ROWs have been identified and evaluated with respect to their eligibility status for listing on the NRHP. Much of the survey work is conducted at the planning stages and prior to new construction of transmission lines.

Within the current study area seven cultural resource surveys have been previously conducted (Table 3-9). Although all the ROWs within the current study area have not been subjected to systematic archaeological surveys, 19 archaeological sites have been previously recorded in the current study area as a result of systematic archaeological surveys, optimistic studies, or archival research (Table 3-10). Most of these sites are pre-contact lithic scatters/open habitation sites that were previously determined ineligible for the NRHP. Portions of three Cherokee Towns: Chestoe/Rabbit Place (40BY42), Long Savannah Town (40HA109), Chatata (40BY43) are within the study area. The sites were recorded based on archival data and encompass large areas and have not been subjected to archaeological testing. There are three instances where the study area crosses locations associated with the trail of tears/removal routes. An archaeological survey was conducted within the boundaries of one of the crossings (40BY166) and no intact deposits associated with the resource were identified. The remaining two crossings follow paved roads, however, these locations have not been subjected to archaeological testing. In addition, one historic road was identified within the survey area. The site was originally recommended as ineligible, but because the entire site was not evaluated, for the purpose of this review TVA is considering the site undetermined. No previously recorded historic cemeteries or above ground historic sites were recorded within the study area.

Table 3-9. Cultural Resources Surveys Previously Conducted within each Sector of Cycle A Transmission Line Right-of-Way Planned for Incompatible Vegetation Removal Activities

Transmission Line Number	Sector	Survey	Portion of the Right-of-Way Surveyed
L5028	Cleveland	Hockersmith and Burr 2013	Partial
L5028	Cleveland	McKee et al. 2013	Partial
L5179	Cleveland	Hunter et al. 2013	Complete
L5741	Cleveland	Hunter et al. 2013	Partial
L5942	Cleveland	Meeks 1998	Partial
L5655	Hopkinsville	Barrett and Karpynec 2008	Partial
L5655	Hopkinsville	Hunter 2021	Partial

Table 3-10. Previously Recorded Cultural Resources within each Sector of Cycle A Right-of-Way Planned for Incompatible Vegetation Removal Activities

Transmission Line Number	Sector	Site	Description	Eligibility	Mechanized Equipment Restrictions
L5028	Cleveland	40HA109	Cherokee Town	Potentially Eligible	Yes
L5028	Cleveland	40BY166	Trail of Tears/ Removal Route	Potentially Eligible	No
L5179	Cleveland	40BY42	Cherokee Town	Potentially Eligible	Yes
L5179	Cleveland	40BY43	Cherokee Town	Potentially Eligible	Yes
L5179	Cleveland	40PK283	Pre-contact lithic scatter	Unassessed	No
L5741	Cleveland	40PK273	Pre-contact open habitation	Unassessed	No
L5942	Cleveland	40PK651	Rock Shelter	Potentially Eligible	Yes
L5942	Cleveland	40PK562	Pre-contact lithic scatter	Not Eligible	No
L5942	Cleveland	40PK563	Pre-contact lithic scatter	Potentially Eligible	No
L5942	Cleveland	40PK564	Pre-contact lithic scatter	Not Eligible	No
L5942	Cleveland	40PK210	Pre-contact lithic scatter	Not Eligible	No
L5942	Cleveland	40PK545	Historic Road	Undetermined	Yes
L5655	Hopkinsville	15CA69	Pre-contact lithic scatter	Not Eligible	No
L5655	Hopkinsville	15CH279	Pre-contact open habitation	Unassessed	No
L5655	Hopkinsville	Princeton Road	Trail of Tears/Removal Route	Potentially Eligible	No
L5655	Hopkinsville	15CA127	Pre-contact lithic scatter	Ineligible	No
L5655	Hopkinsville	15CA128	Pre-contact lithic scatter	Ineligible	No
L5655	Hopkinsville	15LY182	Pre-contact lithic scatter	Ineligible	No
L5655	Hopkinsville	15CH795	Mid-twentieth historic scatter	Ineligible	No
L5655	Hopkinsville	15CH796	Mid-late nineteenth century/ indeterminate pre-contact	Ineligible	No
L5614/5751	Manchester	Highway 11	Trail of Tears/ Removal Route	Unassessed	Yes

3.8.2 Environmental Consequences for Archaeological and Historic Resources

As described above, a range of cultural resources have the potential to be present within the study area including pre-contact Native American archaeological sites, post-contact archaeological sites, and TCPs. Most vegetation management activities within the ROW have little to no potential to affect cultural resources. Activities that have the potential to cause soil disturbance can disturb sub-surface cultural deposits related to both pre-contact and historic era archaeological sites. However, this potential effect would be low as activities are focused on maintaining vegetation within ROW. The use of spot or localized herbicides as a method to control vegetation within the study area, would not adversely affect cultural resources. Methods involving manual vegetation activities include the use of hand tools for either pulling or cutting vegetation and have a low potential for disturbance of subsurface cultural resources given that vegetation would be cut and not actually removed from the soil. The use of machinery within the ROW has the potential to disturb sensitive above-ground historic resources, if present.

TVA executed a PA in consultation with the Advisory Council on Historic Preservation, seven SHPOs, and all federally recognized Indian tribes with an interest in the region. The purpose of the PA is to establish a program alternative for compliance with Section 106 of the NHPA that would allow compliance to be achieved more efficiently through consultation. The PA set forth procedures and criteria for an alternative process for all existing TVA operation and maintenance activities that are similar and repetitive in nature. Most of the activities associated with ROW vegetation management are covered within the PA.

3.8.3 Mitigation Measures for Impacts to Archaeological and Historic Resources

TVA executed a PA with the seven state SHPOs and all federally recognized Indian tribes with an interest in the region. TVA released the PA for public comment in December 2018. The PA covers the majority of TVA vegetation management activities that are subject to the PEIS (TVA 2019), categorizing them in the PA into Appendix A and B activities. Appendix A activities are those activities that have been determined through the PA consultation process as being unlikely to affect historic properties and are therefore excluded from further Section 106 review. Appendix A activities include the “use of herbicides (except for aerial applications), brush hog, mulcher, mower, and other light-duty equipment to control vegetation and establish or maintain ROW width that involve no new ground disturbance, with the exception of activities occurring within cemeteries or other previously flagged sensitive archaeological sites.” Archaeologically sensitive areas (including known Trail of Tear/Removal routes with the potential for intact deposits) and cemeteries would be restricted to hand clearing only and no mechanized equipment would be allowed within the boundaries. A list of the sites identified with such restrictions is listed in Table 3-10. If activities are proposed that fall outside of those described in the PA’s Appendix A then TVA would follow the Section 106 process as set forth by the PA for those portions of the ROW.

3.9 Summary of Method Impacts and Mitigation Measures

As described in each of the preceding sections, and in the broader bounding analysis within TVA’s PEIS (TVA 2019) which is incorporated by reference, each aspect of TVA’s vegetation management program (vegetation control, debris management, restoration) vary with respect to their impact to environmental resources. A summary of broader impacts associated with each of the vegetation methods is provided in Appendix H.

TVA employs standard practices when constructing, operating, and maintaining transmission lines, structures, and the associated ROW and access roads. These can be found on TVA's transmission website (TVA 2021). Some of the more specific routine measures applied to reduce the potential for adverse environmental effects during the proposed vegetation management of ROW are as follows:

- O-SAR Process
- To minimize the introduction and spread of invasive species in the ROW, access roads and adjacent areas, TVA would follow standard operating procedures consistent with EO 13112 (Invasive Species) for revegetating with noninvasive plant species (TVA 2017).
- Only EPA-registered and TVA approved herbicides determined to be safe for use near aquatic environments would be used in accordance with label directions.

The following O-SAR buffers would be applied near sensitive wildlife resources associated with the FY23 vegetation management actions:

- Cave - 200 feet - No herbicide use within 200 feet of cave due to potentially sensitive subterranean aquatic resource. Hand clearing or small machinery clearing only (i.e.: chainsaws, brush hog, mowers). Vehicles and equipment confined to existing access roads. Avoid entering cave.
- Osprey nest - 660 feet - EITHER 1) Assume presence. No broadcast spraying. Only use brush hogs or mowers for vegetation removal or selective herbicide spraying between March 1 and July 31 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nest is active.
- Heronry - 660 feet - EITHER 1) Assume presence. No broadcast spraying. Only use brush hogs or mowers for vegetation removal or selective herbicide spraying between February 1 and July 15 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nests are active.
- Bald Eagle nest - 660 feet - EITHER 1) Assume presence. No disturbance, spraying, or vegetation clearing would occur between December 1 and July 1 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nest is active.
- In rare instances in which restricted actions need to take place while osprey or heron nests are active, TVA would coordinate with USDA-WS to ensure any actions comply with the conditions specified under USDA's "Take" permit.

Wetland BMPs (TVA 2017) would be implemented within locations where mapped NWI and O-SAR wetlands are present and vegetation management activities are necessary:

- Work in wetland areas would occur on a dry season schedule (September to mid-November) when practicable.
- Soils ruts would not exceed 12 inches; if necessary, low ground pressure equipment would be used, such as rubberized tracks, wide tires, or lightweight ATVs in mapped wetlands to adequately minimize soil rutting/compaction/disturbance.
- Woody wetland vegetation should be cut less than 12 inches from ground level.

- Woody debris would be removed outside identified wetland area.
- Stumps would be left intact, no grubbing.
- Only aquatic approved herbicide would be permissible.
- Water flow into or out of mapped wetlands would not be restricted during work activities.
- Erosion control techniques would be implemented within 50 feet of identified wetland areas where soil disturbance is proposed.
- Existing contours within wetlands would be restored to preconstruction specifications.
- Disturbed and exposed wetland soils would be seeded upon completion of work (or within 14 days, whichever comes first).

Natural Areas mitigation measures to minimize impacts to include:

- The appropriate land manager would be contacted before implementing vegetation maintenance activities to coordinate timing of the ROW maintenance such to minimize impacts to visitors, park operations, scheduled hunting, etc.
- Opportunities would be sought to partner with natural area managers to plan and conduct vegetation management that would meet multiple natural resource management objectives.
- Where available, existing site-specific vegetation management plans would be utilized for ROWs that cross managed lands.

Archaeologically sensitive areas (including known trail of tear routes with the potential for intact deposits) and cemeteries would be restricted to hand clearing only and no mechanized equipment would be allowed within the boundaries. If such activities are proposed that fall outside of those described in the PA's Appendix A, then TVA would follow the Section 106 process as set forth by the PA for those portions of the ROW.

3.10 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 avoid, minimize, or compensate for potential environmental impacts. Managing vegetation requires controlling the growth of plants within the ROW, which is an adverse effect. However, this adverse effect is needed to promote the safe, efficient, and reliable operation of the existing transmission system. Sound planning, the incorporation of TVA's O-SAR process as a BMP measure, and the incorporation of other established TVA ROW vegetation management BMPs identified in this EA would reduce adverse effects associated with vegetation management practices.

The presence of humans and noise from vegetation maintenance activities has the potential to temporarily disturb wildlife located within the ROW. However, it is anticipated that wildlife would avoid areas when work is underway, and TVA employs mitigation measures as described in Section 3.2.2 for specific animals and habitats. These adverse effects would be temporary, short-term, and localized.

Additional unavoidable adverse impacts would be dependent on the specific vegetation control method selected. Although each vegetation control method creates unavoidable adverse impacts, TVA considers the environmental setting as well as cost effectiveness in its selection of control method.

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

3.11 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. For the purposes of this EA, vegetation maintenance activities including controlling vegetation within ROWs are considered a short-term use of the environment. Long-term productivity relates to converting the natural productivity of the land to some developed use including transmission lines.

Under the Action Alternative, TVA would remove incompatible vegetation and manage vegetation height within the ROW. The long-term productivity of lands within ROWs has already been affected by construction of the existing facilities. The use of ROWs for transmitting power precludes the use of the land for some activities (e.g., mining, timber production) and the implementation of a vegetation management program would not affect long-term productivity.

3.12 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 vegetation maintenance activities, including labor and fossil fuels for vehicles and equipment, would be irreversibly lost regardless of the alternative selected. However, it is unlikely that their limited use in TVA's vegetation management program would adversely affect the overall future availability of these resources.

Land and natural resources within TVA's ROWs were previously committed to uses compatible with safe and reliable electric transmission at the time the transmission lines were constructed. While this commitment is long-term, it is not irretrievable as transmission lines may be decommissioned and lands re-committed to other uses. Additionally, uses of lands primarily maintained by others would be unaltered with any alternative as the productivity of croplands, orchards and other related lands would not be modified. No new transmission lines would be constructed as part of the No Action or the proposed Action Alternative. Vegetation management would not impact potential future uses of the land should the transmission lines be removed. Therefore, no additional areas of land or natural resources would be irretrievably committed under any alternative.

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CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Anita E. Masters

Education:	M.S., Biology/Fisheries; B.S., Wildlife Management
Project Role:	NEPA Project Manager, NEPA Coordinator, NEPA Compliance, Document Preparation, and Technical Editor
Experience:	33 years in Project Management, Managing and Performing NEPA Analyses; ESA Compliance; CWA Evaluations; Community/Watershed Biological Assessments

Bryan Wells

Education:	B.S., Civil Engineering
Project Role:	Manager, Environment, Transmission Projects – Environmental Support
Experience:	30 years in environmental compliance and permitting and related project and program management

4.2 Other Contributors

Shane Beasley

Education:	M.S. and B.S., Civil Engineering
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Paul Anthony Clampet

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Christopher Shea Gaither

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Project Role: Aquatic Ecology; Threatened and Endangered Aquatic Animals
Experience: 15 years Sampling and Hydrologic Determinations for Streams and Wet-Weather Conveyances; 10 years in Environmental Reviews

William A. Sanders
Education: B. S., Biology
Project Role: Program Manager, Right-of-Way
Experience: 10 years Utility Vegetation Management

Chloe K. R. Sweda
Education: B.S., Earth and Environmental Sciences
Project Role: Natural Areas
Experience: 5 years of experience in Natural Resource Management

Jesse Troxler
Education: M.S., Wildlife and B.S. Biology
Project Role: Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Terrestrial Animals
Experience: 8 years in Biological Data Collection, 5 years in Environmental Reviews

CHAPTER 5 – LITERATURE CITED

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Appendix A – Federal and State Agencies, and Federally Recognized Native American Tribes Represented in the TVA Power Service Area that were Recipients of the Programmatic Transmission System Vegetation Management Environmental Impact Statement

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Agencies and Tribal Recipients of the Programmatic Transmission System Vegetation Management Environmental Impact Statement

Following is a list of the federal and state agencies, and federally recognized Native American tribes represented in the TVA power service area who received copies of the Transmission System Vegetation Management EIS (PEIS) or notices of its availability with instructions on how to access the PEIS on the project web page.

Federal Agencies

USDA Forest Service, Region 8, Atlanta, GA
U.S. Environmental Protection Agency, Washington, DC
U.S. Environmental Protection Agency, Region 4, Atlanta, GA
Department of Interior, Atlanta, GA
U.S. Fish and Wildlife Service, Southeast Region Office, Atlanta, GA
U.S. Fish and Wildlife Service, Frankfort, KY
U.S. Fish and Wildlife Service, Asheville, NC
U.S. Fish and Wildlife Service, Abingdon, VA
U.S. Fish and Wildlife Service, Cookeville, TN
U.S. Fish and Wildlife Service, Gloucester, VA
U.S. Fish and Wildlife Service, Daphne, AL
U.S. Fish and Wildlife Service, Athens, GA
U.S. Army Corps of Engineers, Savannah District
U.S. Army Corps of Engineers, Nashville District
U.S. Army Corps of Engineers, Memphis District
U.S. Army Corps of Engineers, Wilmington District
U.S. Army Corps of Engineers, Vicksburg District
U.S. Army Corps of Engineers, Mobile District
Economic Development Administration, Atlanta, GA
Advisory Council on Historic Preservation

Federally Recognized Tribes

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

State Agencies

Alabama

Department of Agriculture and Industries
Department of Conservation and Natural Resources
Department of Economic and Community Affairs
Department of Environmental Management
Department of Transportation
Alabama Historic Commission
Top of Alabama Regional Council of Governments
North-Central Alabama Regional Council of Governments
Northwest Alabama Council of Local Governments

Georgia

Georgia State Clearinghouse
Historic Preservation Division

Kentucky

Department for Local Government
Department for Environmental Protection
Energy and Environment Cabinet
Department for Energy Development and Independence
Department for Natural Resources
Kentucky Heritage Council

Mississippi

Northeast Mississippi Planning and Development District
Department of Finance and Administration
Department of Environmental Quality
Department of Wildlife, Fisheries, and Parks
Historic Preservation Division

North Carolina

North Carolina State Clearinghouse
Office of Archives and History

Tennessee

Department of Environment and Conservation
Office of Policy and Planning
Tennessee Historical Commission
Tennessee Wildlife Resources Agency
First Tennessee Development District
East Tennessee Development District
Southeast Tennessee Development District
Upper Cumberland Development District
South Central Tennessee Development District
Greater Nashville Regional Council
Southwest Tennessee Development District
Memphis Area Association of Governments
Northwest Tennessee Development District

Virginia

Office of Environmental Review
Department of Historic Resources

Appendix B – USFWS Correspondence and Consultation on Federally Listed Bat Species on Routine TVA Actions

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Appendix C – USFWS Correspondence and Consultation on Federally Listed Threatened and Endangered Species (Except Bats) on the Impacts of Routine Vegetation Management Activities

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Appendix D – National Historic Preservation Act Programmatic Agreement on TVA Operation and Management Activities

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Appendix E –General Agreement Addressing TVA Right-of-Way Easements and Permits on National Park Service Lands

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United States Department of the Interior

NATIONAL PARK SERVICE
Southeast Regional Office
Atlanta Federal Center
1924 Building
100 Alabama St., SW.
Atlanta, Georgia 30303

IN REPLY REFER TO:
1.A.2 (SERO-PC)

APR 10 2019

Tricia Roelofs
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37901

Dear Ms. Roelofs:

Enclosed is a signed General Agreement between the Tennessee Valley Authority and the National Park Service (NPS) which addresses vegetation management for electric transmission and distribution line right-of-way easements and permits on NPS lands. If you have any questions, please contact Anita Barnett at Anita_Barnett@nps.gov or 404-507-5706.

Sincerely,

Robert A. Vogel
Regional Director

Enclosure

GENERAL AGREEMENT
ON VEGETATION MANAGEMENT FOR POWERLINE RIGHTS-OF-WAY

Between

TENNESSEE VALLEY AUTHORITY

and

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

I. Purpose

This General Agreement (GA) is entered into by the Tennessee Valley Authority (TVA) and the National Park Service (NPS) and addresses vegetation management for electric transmission and distribution line right-of-way (ROW) easements and permits (referred to throughout this GA as powerline ROWs) on NPS lands. The GA will help facilitate cooperation and coordination among TVA and the NPS regarding vegetation management within and immediately adjacent to existing and future powerline ROWs and associated facilities. Specifically, the GA will expedite implementation of cost-effective and environmentally sound vegetation management plans, procedures, and practices for powerline ROWs that will identify and, if possible, reduce any potential adverse environmental and cultural impacts while enhancing the ability of utilities to provide uninterrupted electrical service to customers and address public safety, including the public safety risks that may arise from wildfires caused by inadequate vegetation management.

This GA does not substitute for park-specific agreements, which should be established, or updated where existing, between TVA and individual NPS parks to address issues specific to that park unit, including consideration and/or protection of cultural resources, protection of state and federally listed species and habitats, and other similar relevant issues.

II. Authorities

TVA is a federal agency and instrumentality of the United States, created by and existing pursuant to the TVA Act (1933) to foster the social and economic welfare of the people in the Tennessee River Valley, promote stewardship of the region's natural resources, provide low cost energy, and improve flood control and navigation of the Tennessee River and its tributaries. In furtherance of that mission, TVA operates and maintains the nation's largest public power system, including hydropower, coal, gas, nuclear, solar and wind generation facilities, auxiliary structures and electrical distribution lines and facilities. Also in furtherance of that mission, TVA maintains approximately 237,000 acres of transmission line ROW powerline easements, collectively over 16,200 circuit miles.

The NPS is directed to manage all national park lands to protect and preserve natural and cultural resources, pursuant to the National Park Service Organic Act, 54 U.S.C. 100101. The NPS is

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responsible for managing nearly 84 million acres with over 400 units of the National Park System. The mission of the NPS is to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of current and future generations. The NPS also has management responsibilities over other areas, including parts of the National Wild and Scenic Rivers System, National Trails System, National Heritage Areas, and NPS Affiliated Areas, which are closely linked in importance and purpose to those areas directly managed by the NPS. Each park unit has its own enabling legislation that defines the purpose of the park and other specifics related to resource protections. Management, including the issuance of permits, for each NPS unit is directed by each unit's superintendent.

III. Coordination and Cooperation

A number of TVA's powerline easements pass through NPS land. Therefore, coordination and cooperation between TVA and the NPS is important to enhance electric transmission reliability, increase maintenance efficiencies, reduce management costs, prevent the spread of invasive plants, reduce fuel loads, reduce the risk of wildfires, and minimize other potential environmental and cultural resource impacts and human safety risks. This coordination and cooperation should include each party's best efforts toward the following goals:

A. Completion of natural resource surveys to identify sensitive habitats and threatened and endangered flora within TVA ROWs on NPS land where appropriate.
B. Sharing data on state and federal listed species and protected habitats within and adjacent to ROWs to ensure that ROW access and management within ROWs protects sensitive species and habitats to the full extent possible.
C. Development of vegetation management plans that identify vegetation control prescriptions within a given year for each powerline ROW on NPS land. Such vegetation management plans must comply with applicable federal mandates and policies, be consistent with operations and maintenance plans for each powerline, and consider requirements for Federal reliability standards.
D. Develop protocols for maintenance, access, and safety. This includes protocols for wildfire management and response.

IV. Roles and Responsibilities

A. Both TVA and the NPS will:
    a. Facilitate coordination with each other at the local level to develop vegetation management plans, and cooperate to complete any necessary vegetation surveys for plan development. In addition, the Parties will work together on any necessary land use authorizations for powerline ROWs on NPS lands.
    b. Promote safety during vegetation management activities associated with powerline ROWs on NPS lands. The parties to this GA acknowledge that:
        i. In general, the safety of electric utility workers and the public at transmission and distribution facilities is the responsibility of TVA. Moreover, TVA will conduct their operations in accordance with applicable National Electrical Safety Code (NESC) and Occupational Safety and Health Administration (OSHA) standards, and the terms and

conditions in the ROW authorizations, and other worker protection standards where applicable.

ii. The NPS will coordinate with TVA to develop appropriate measures to ensure personal and public safety and protection of NPS lands and resources during vegetation management activities.

c. Address the management of trees that have the potential to interfere with the reliable operation of TVA's transmission system in all vegetation management plans and authorizations.
d. Prevent and control the spread of invasive species through a proactive and integrated management approach along powerline ROWs on NPS lands.
e. Work together to identify resource protection needs or cooperative resource management opportunities within TVA ROWs on NPS lands, such as pollinator enhancement projects and/or establishment of early successional habitat through the use of selective herbicide application or other methods.
f. Coordinate their efforts to comply with Section 106 of the National Historic Preservation Act. NPS and TVA will work together to address any cultural or tribal resources potentially affected by vegetation management and seek ways to balance and integrate cultural and natural resource management, including working together to identify opportunities for selective herbicide use to avoid potential impacts to cultural resources
g. Coordinate measures to protect sensitive species or habitats.
h. Consider the impacts of various vegetation management strategies on other resources, such as potential impacts to water quality from herbicide use or soil erosion.
i. Consider wetland impacts, both permanent and temporary, from vegetation management actions, such as use of heavy equipment, changes to the plant community and potential hydrology alterations.
j. Work together to establish site-specific wildfire prevention and response plans.

B. TVA will:

a. Provide the NPS with the necessary information for development of the proposed or revised vegetation management plan for ROWs on NPS lands. The information will include vegetation surveys, proposed treatment procedures and herbicide or pesticide use, maps, best management practices, and mitigation measures.
b. Develop site-specific vegetation management plans collaboratively with the NPS.
c. Collaborate and coordinate with the NPS on vegetation management activities associated with the powerline ROW with individual parks.
d. Ensure that TVA employees and contractors are informed on the terms and conditions of applicable ROW permits and approved vegetation management plans to best ensure compliance and avoid unauthorized boundary encroachment and resource damage.
e. Ensure this GA is disseminated to appropriate TVA staff and contractors within three months of the effective date.

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C. NPS will:

a. To the extent practicable and consistent with other NPS obligations and priorities, strive to review requests for any required, non-emergency vegetation management for powerline ROWs on NPS lands within 60 calendar days of receipt from TVA.
b. Review and provide park-level input on draft vegetation management plans, including wildlife protection requirements and mitigation measures.
c. When necessary, the NPS will use information provided by TVA to develop permit terms and conditions.
d. Ensure this GA is disseminated to all appropriate units of the National Park System within three months of the effective date.
e. Identify cultural resources on NPS lands that may need to be addressed in ROW vegetation plans and any related resource protection requirements; information regarding certain cultural resources, including their exact location, may be legally protected under Federal law and require safeguarding.

V. Principal Contacts

The principal contacts for this GA are:

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VI. Implementation, Amendments, and Termination

This GA will become effective on the date it is fully executed and will remain in effect for five years, unless it is terminated in writing by TVA or NPS prior to its expiration. This GA may be amended with the written consent of TVA and NPS.

VII. Non-Fund-Obligating Document

Each party will fund its own participation under this GA and will carry out its separate activities in a coordinated and mutually beneficial manner. Nothing in this Agreement obligates the NPS

to expend in any one fiscal year any sum in excess of appropriations made by Congress, or to involve the NPS in any contract or other obligation for the further expenditure of money in excess of such appropriations or allocations.

Although TVA is committed to cooperating with the NPS to the full extent possible, nothing in this Agreement shall obligate TVA to spend funds in excess of its annual ROW vegetation management budget.

VIII. Limitations

This GA is not intended to and does not create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity, by a party against the United States, its agencies, its officers, or any person. This GA has no legal effect on existing or future land use authorizations for powerline ROWs on NPS lands.

Nothing in this Agreement obligates TVA or the NPS to expand their respective legal obligations under the National Environmental Policy Act, the Endangered Species Act, National Historic Preservation Act, or any other law or regulation applicable to their respective activities on TVA ROW powerline easements.

IX. Authorized Representatives

In Witness Hereof, the Parties hereto have signed their names and executed this General Agreement.

Tricia L. Roelofs
Senior Manager
Tennessee Valley Authority

5.2.19
Date

Robert A. Vogel
Southeast Regional Director
National Park Service

4-10-19
Date

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Appendix F – TVA Vegetation Management Guidelines

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Transmission Environmental Protection Procedures
Right-Of-Way Vegetation Management Guidelines

1.1 Overview

A. The Tennessee Valley Authority (TVA) must manage the vegetation on its rights-of-way and easements to ensure emergency maintenance access and routine access to structures, switches, conductors, and communications equipment. In addition, TVA must maintain adequate clearance, as specified by the National Electrical Safety Code, between conductors and tall growing vegetation and other objects. This requirement applies to vegetation within the right-of-way (ROW) as well as to trees located off the right-of-way.

B. Each year TVA assesses the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections, ground inspections, periodic field inspections, aerial photography, LiDAR / Phodar data and information from TVA personnel, property owners and the general public. TVA utilizes this data to evaluate vegetation clearances and identifies vegetation on and off ROW that does, or could potentially pose a risk to reliability.

C. TVA transmission foresters develop a vegetation re-clearing plan that is specific to each line segment and is based on terrain conditions, species mix, growth, and density.

2.1 Right-of-Way Management Methods

A. TVA takes an Integrated Vegetation Management (IVM) approach that is based on a carefully planned, multidimensional strategy developed in consultation with forestry and habitat experts. Integrated vegetation management aims to improve safety and prevent power outages by creating healthy and self-sustaining ecosystems in ROWs while ensuring compliance with regulatory standards (NERC 2006). These ecosystems foster beneficial, attractive and low-maintenance habitat where tall trees won't grow and other, more benign forms of vegetation can thrive. Integrated vegetation management encourages early successional native habitats that pose less threat to power reliability yet offer safe havens for desirable plants and animals. By combining selective use of herbicides with physical removal, integrated vegetation management can more thoroughly eradicate problem vegetation and allow more compatible species to fill in, making it harder for tall-growing trees to reestablish.

TVA executes its transmission vegetation maintenance on a 2-, 3-, or 4-year cycle based on data that is acquired by various inspection methods. Photogrammetry, LiDAR, ground inspection and aerial inspection data are utilized to evaluate the next year's scheduled work to determine the annual vegetation maintenance work scope. LiDAR and Photogrammetry technologies provide a detailed vegetation threat analysis that can be used to assess risk as well as prioritize vegetation management work plans. This detailed analysis supports TVA's efforts to target incompatible species as well as promote the growth of compatible vegetation. This precision management approach is effective in reducing overall environmental impact by limiting work to specific areas of incompatibility.

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B. TVA uses a variety of herbicides specific to the species present with a variety of possible application techniques. Herbicides are selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers. Any herbicides used are applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the United States Environmental Protection Agency (USEPA) are used.

C. In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks, and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Health and Safety Administration. For that reason, TVA utilizes low volume herbicide applications in these areas when feasible.

D. TVA does not encourage tree re-clearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and electrical safety considerations for untrained personnel that might do the work.

E. Mechanical mowers not only cut the tall saplings and seedlings on the right-of-way, they also shatter the stump and the supporting near surface root crown. The tendency of resistant species is to re-sprout from the root crown and shattered stumps can produce a multi-stem dense stand in the immediate area. Repeated use of mowers on short cycle re-clearing with many original stumps re-growing in the above manner can create a single species thicket or monoculture. With the original large root system and multiple stems, the resistant species can produce re-growth at the rate of 5-10 feet in a year. In years with high rainfall, the growth can reach 12-15 feet in a single year. These dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity, little wildlife food or nesting potential, and become a property owner concern. Selective herbicide application may be used to control monoculture stands.

3.1 Herbicide Program

A. TVA has worked with universities (such as Mississippi State University, University of Tennessee, Purdue University and others), chemical manufacturers, other utilities, U.S. Department of Transportation, U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS) personnel to explore options for vegetation control. The results have been strong recommendations to use species-specific, low volume herbicide applications in more situations. Research, demonstrations, and other right-of-way programs show a definite improvement of rights-of-way treated with selective low-volume applications of new herbicides using a variety of application techniques and timing. Table 1 below identifies herbicides currently used on TVA rights-of-way. Table 2 identifies pre-emergent herbicides currently being used on bare ground areas on TVA rights-of-way and in substations. Table 3 identifies TGRs that may be used on tall trees that have special circumstances that require trimming on a regular cycle, e.g., restrictions on complete removal. The rates of application utilized are those listed on the U.S. Environmental Protection Agency (USEPA) approved label and consistent with utility standard practice throughout the Southeast.

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Table 1 - Herbicides Currently Used on TVA Rights-of-Way

Trade Name	Active Ingredient	Label Signal Word
Accord/Accord XRT II	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Clearstand	Imazapyr/Metsulfuron Methyl/Liquid	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Habitat	Imazapyr/Liquid	Caution
Krenite S	Fosamine Ammoinium	Caution
Milestone VM	Aminopyralid/Liquid	Caution
Pathfinder II	Triclopyr/RTU	Caution
Rodeo	Glyphosate/Liquid	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Streamline	Aminocyclopyrachlor/ Metsulfuron Methyl/Liquid	Caution
Transline	Clopyralid/Liquid	Caution
Viewpoint	Imazapyr/Aminocyclopyrachlor/ Metsulfuron Methyl/Liquid	Caution

Table 2 - Pre-Emergent Herbicides Currently Used for Bare Ground Areas On TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Arsenal 5G	Imazapyr/Granule	Caution
Sahara	Diuron/Imazapyr	Caution
SpraKil SK-26	Tebuthiuron/Diuron/Granules	Caution
SpraKil S-5	Tebuthiuron/Granules	Caution
Topsite	Diuron/Imazapyr	Caution

Table 3 - Tree Growth Regulators (TGRs) Currently Used On TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Profile 2SC	TGR-paclobutrazol	Caution
TGR	Flurprimidol	Caution

B. The herbicides listed in Table 1 and 2 and TGRs listed in Table 3 have been evaluated in extensive studies in support of registration applications and label requirements. Many have been reviewed in the USFS vegetation management environmental impact statements (EISs), and those

evaluations are incorporated here by reference (USFS 1989a, 1989b, 2002a, and 2002b). Electronic copies can be accessed at https://cdxnodengn.epa.gov/cdx-enepa- public/action/eis/search. The result of these reviews has been a consistent finding of limited environmental impact beyond that of control of the target vegetation. All the listed herbicides have been found to be of low environmental toxicity when applied by trained applicators following the label and registration procedures, including prescribed measures, such as buffer zones, to protect threatened and endangered species.

C. Low volume herbicide applications are recommended since research demonstrates much wider plant diversity after such applications. There is better ground erosion protection and more wildlife food plants and cover plants develop. In most situations there is increased development of wild flowering plants and shrubs. In conjunction with herbicides, the diversity and density of low-growing plants provide control of tall-growing species through competition.

D. Herbicides are used in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains ground cover year around with a better mix of food species and associated high-protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber-tired equipment).

E. Best Management Practices (BMPs) governing application of herbicides are contained within *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2016) which is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation. Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. "Applicators" must be trained, licensed, and follow manufacturers' label instructions, USEPA guidelines, and respective state regulations and laws.

F. When herbicides are used, their potential adverse impacts are considered in selecting the compound, formulation, and application method. Herbicides that are designated "Restricted Use" by USEPA require application by or under the supervision of applicators certified by the respective state control board. Applications are done either by TVA or by contractors in accordance with the following guidelines identified in the TVA BMP manual (Muncy 2016):

1. The sites to be treated are selected and application directed by the appropriate TVA official.
2. A preflight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.
3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed 5 miles per hour, in areas of fog, or during periods of temperature inversion.
4. Pellet application will normally not be made when the surface wind speeds exceed 10 miles per hour, or on frozen or water saturated soils.
5. Liquid application is not performed when the temperature reaches 95 degrees Fahrenheit or above.

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6. Application during unstable, unpredictable, or changing weather patterns is avoided. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.
7. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZ) adjacent to perennial streams, ponds, and other water sources. Hand application of certain herbicides labeled for use within SMZs is used only selectively.
8. For aerial inspections, buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.
9. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits (b) off the right-of-way and (c) during rainy periods or during the 48- hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters, when soil active herbicides are used.

G. TVA currently uses primarily low volume applications of foliar and basal applications, e.g., Accord (Glyphosate), Arsenal (Imazapyr), Clearstand (Imazapyr / Metsulfuron Methyl), Milestone VM (Aminopyralid) and Streamline (Aminocyclopyrachlor / Metsulfuron Methyl).

4.1 Benefits

A. Proper maintenance—including vegetation management—of ROW and its supporting facilities is crucial to ensuring the reliable transmission of affordable electrical power. Unmanaged and poorly maintained vegetation can cause electricity outages, wildfires, soil erosion, and water quality issues. Utility companies that adopt long-term IVM approaches often benefit from significant vegetation management cost savings, which can be reflected in customer rates.

B. ROW also provide important wildlife habitats. As wildlife habitats in the United States are lost to development, these ROW become increasingly important. The IVM approach can create natural, diverse, and sustaining ecosystems, such as a meadow transition habitat. A variety of wildlife species (including threatened and endangered species) consider these habitats home, such as butterflies, songbirds, small mammals, and deer. These habitats also encourage the growth of native plant species and can increase plant diversity.

C. Invasive and exotic species are often a problem on ROW, and, consequently, the surrounding land. IVM techniques (such as selective herbicide application) can minimize this problem, while ensuring native and endangered species are not affected.

5.0 References

Integrated Vegetation Management (IVM) on Rights-of-Way Fact Sheet. (2012, May) Retrieved from http://www.epa.gov/pestwise/htmlpublications/row_fact_sheet.html

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Appendix G – Sensitive Areas Class Definitions for Re-clearing

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TVA Sensitive Areas Class Definitions for Right-of-Way Re-clearing

Plants

Class 1: No broadcast herbicide application. Alternatives are: 1) Select spray woody plants, 2) Mechanical or hand-clearing, 3) Request field surveys by TVA botanist to determine if species exists in the subject area.

Class 2: Contact TVA botanist at least three weeks before conducting maintenance activities in subject areas to determine if the proposed activities require restrictions.

Natural Areas

Class 1: No broadcast herbicide application. Alternatives are: 1) Select spray woody plants, 2) Mechanical or hand-clearing, 3) Request field surveys by TVA Biological Compliance staff to determine if species exists in the subject area.

Class 2: Must contact area land manager prior to entering or conducting maintenance in subject area. No broadcast herbicide application. Alternatives are: 1) Select spray woody plants, 2) Mechanical or hand-clearing, 3) Request field surveys by TVA Biological Compliance staff to determine if species exists in the subject area.

Class 3: Contact TVA Natural Areas biologist at least three weeks before conducting maintenance activities to determine if the proposed activities require restrictions.

Wetland Areas

Class 1: Wetland/potential wetland- Refer to "Wetlands ROW Re-clearing and Pole Replacement Guidelines" for restrictions.

Terrestrial Animal Areas

Class BALDEAGLE: Bald Eagle nest- Either 1) Assume presence. No disturbance, spraying or vegetation clearing between Dec. 1 - July 1 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nest is active.

Class CAVE: Cave - No herbicide use within 200 ft of cave due to potentially sensitive subterranean aquatic resource. Hand or small machinery clearing only (ie: chainsaws, bush hog, mowers). Vehicles and equipment confined to existing access roads. Avoid entering cave.

Class HERONOSPREY: Heronry and Osprey - Either 1) Assume presence. No broadcast spraying. Only use bushogs or mowers for vegetation removal or selective herbicide spraying between February 1 and July 15 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nests are active.

Class HERONRY: Heronry - Either 1) Assume presence. No broadcast spraying. Only use bushogs or mowers for vegetation removal or selective herbicide spraying between February 1 and July 15 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nests are active.

Class IBAT: Potential Indiana Bat Summer Roosting Habitat - Cut trees with exfoliating bark Nov 15 - Mar 31. If cutting necessary outside of time restriction a bat and/or habitat survey is required.

Class IBATNLEBAT: Potential Indiana Bat and Northern Long-Eared Bat Summer Roosting Habitat-Cut trees with exfoliating bark during the following seasons differentiated by state: VA, KY, TN and NC = Nov 15-Mar 31; AL, MS and GA = Dec 1 - Mar 15. If cutting necessary outside of time restriction a bat and/or habitat survey is required.

Class NLEBAT: Potential Northern Long-Eared Bat Summer Roosting Habitat - Cut trees with exfoliating bark during the following seasons differentiated by state: VA and KY = Nov 15 - Mar 31; TN and NC = Oct 15 - Mar 31; AL, MS, and GA = Dec 1 - Mar 15. If cutting necessary outside of time restriction a bat and/or habitat survey is required.

Class OSPREY: Osprey nest - Either 1) Assume presence. No broadcast spraying. Only use bushogs or mowers for vegetation removal or selective herbicide spraying between March 1 and July 15 within 660 feet of nest site; OR 2) Request seasonal field survey to determine if nests are active.

Class SPECIAL: Special Circumstance - Contact TVA Terrestrial Zoologist at least three weeks before conducting maintenance activities in buffered area to determine if the proposed activities require restrictions.

Aquatic Animal Areas

Class 1: No broadcast herbicide application. Alternatives are: 1) Select spray woody plants, 2) Mechanical or hand-clearing, 3) Request field surveys by TVA aquatic biologist to determine if species exists in the subject area.

Class 2: Contact TVA aquatic biologist at least three weeks before conducting maintenance activities in subject areas to determine if the proposed activities require restrictions.

ROW ACCESS

O-SAR data is appropriate and applicable to projects where all vehicular access to or within the ROW is existing and no access road improvements are required. The data provided in O-SAR does not apply to work involving road building, upgrading, improvement, or repair, such as but not limited to additional fill greater than 0.10 -acre, new or upgraded stream crossings, and vegetation removal outside the originally cleared ROW footprint. In such cases, a separate environmental review is necessary.

Appendix H – Summary of Vegetation Management Method Impacts

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Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Vegetation	Potential impact on non-target vegetation; may result in benefits to some herbaceous species due to improved light penetration. Tree removal may result in conversion of forest or tree dominated communities to herbaceous communities.	May result in substantial impacts to non-target vegetation, potential and increase the spread of invasive species due to soil disturbance. Some methods may reduce adverse effects by minimizing soil disturbance. Repeated mowing may promote dense regrowth of woody stems that suppress herbaceous species.	Direct effects to targeted vegetation. Spot or localized spraying result in reduced impacts to non-target vegetation and may result in some positive effects on species composition. Broadcast and aerial application methods may have high potential for negative impacts to vegetation, including non-target vegetation.	Some methods may hinder or impede plant growth and restoration of treated areas.	Little potential to negatively affect transmission ROW vegetation because standard BMPs would dictate revegetation efforts to avoid the use of invasive weed species.
Wildlife	Lower potential for toxic inputs; less disturbing to soils; short-term noise and odor disturbance; disruptive to wildlife due to more frequent treatments; potential for localized direct injury to wildlife.	Promotes early successional habitat favorable to wildlife; less disruptive to wildlife due to less frequent treatments; short-term disturbance of wildlife; habitat alteration, impact to less mobile biota; short-term soil disturbance.	Use can create low-growing habitat beneficial to some wildlife; less disruptive to wildlife due to less frequent treatments; potential for herbicide toxicity to non-target wildlife, soil, and water.	Leaving debris can be beneficial by creating cover, nutrient recycling, and erosion control; leaving debris increases wildfire fuel load and can harbor tree diseases and pests; debris piles alter habitat; offsite debris removal involves mechanical equipment that increases wildlife disturbance and erosion.	Minor temporary impacts associated with increased erosion and potential for fuel oil leaks or spills. Impacts minimized with standard BMPs. Overall long-term benefit to habitat.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Aquatic Ecology	Minor potential for sedimentation; minor chance of chainsaw oil/fuel leaks/spills; likely no impacts to aquatic biota.	Minor potential for sedimentation and stream bank destabilization from soil-disturbing mechanical equipment; minor amounts of cut debris reaching streams; minor chance of oil/fuel leaks/spills; minor potential for altered water quality and impacts to aquatic biota. Minimized through the use of BMPs.	Minor potential for sedimentation from equipment; minimized through the use of BMPs. Potential for herbicides to reach waterways (rarely at toxic concentrations); potential acute and chronic impacts minimized through BMPs, prior planning, proper herbicide mixtures, and advanced technology to reduce or eliminate drift during application.	Minor impacts to aquatic biota as TVA manages placement of debris to avoid placement proximate to streams or other aquatic environments. Minor positive impact as large woody debris can provide fish habitat; wood chips and mulch can reduce erosion.	Minor potential for sedimentation from soil-disturbing equipment; minor amounts of cut debris reaching streams. Overall long-term benefit to the aquatic environment due to reduced erosion and sedimentation.
Threatened and Endangered Species[1]	TVA uses the Office-Level Sensitive Area Review (O-SAR) process to avoid and minimize impacts to federally and state-listed species that are known to occur on transmission ROWs and select methods that are least likely to negatively impact those resources.	TVA uses the O-SAR process to avoid impacts to federally and state-listed species that are known to occur on transmission ROWs and select methods that are least likely to negatively impact those resources.	Similar to Vegetation, Wildlife, and Aquatic Ecology impacts. TVA uses the O-SAR process to avoid impacts to federally and state-listed species that are known to occur on transmission ROWs and select methods that are least likely to negatively impact those resources.	TVA uses the O-SAR process to avoid impacts to federally and state-listed species that are known to occur on transmission ROWs and select methods that are least likely to negatively impact those resources.	Minor temporary impacts associated with increased erosion and potential for fuel oil leaks or spills. Impacts minimized with standard BMPs and SMZs. Overall long-term benefit to habitat.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Surface Water	Temporary, minor impacts from potential sedimentation; less impact relative to mechanical control.	Temporary, minor impacts from potential fuel/lubricant leaks and spills and sedimentation from soil-disturbing heavy equipment. Minimized through use of BMPs.	Minor potential for herbicides to reach surface waters through leaching, drift, or runoff and potential for sedimentation from heavy equipment. No significant impact expected due to BMPS, prior planning, proper implementation, and proper application of herbicides.	Excess vegetation debris in surface water may alter flows; potential fuel/lubricant leaks and spills; sedimentation from soil-disturbing heavy equipment. Impacts expected to be temporary and minor through use of BMPs.	Minor, temporary impacts from the use of soil disturbing equipment. Overall long-term benefit to water quality due to reduced erosion and sedimentation.
Wetlands	Little/no impact on non-target wetland areas. Tree removal may result in conversion of wetland type and reduction in wetland function; forested wetland conversion may be considered a jurisdictional activity by wetland regulatory agencies.	Minor potential for vehicular rutting and disturbance of wetland soils. Impact minimized with the use of BMPs such as matting, low ground pressure equipment, and dry season work. Tree removal may result in conversion of wetland type and reduction in wetland function; forested wetland conversion may be considered a jurisdictional activity by wetland regulatory agencies.	Impacts to non-target wetland areas due to runoff, leach, or drift of herbicides. Conversion of forest to emergent wetland may result in reduction of wetland function.	Debris left in wetlands may be considered a regulated fill by wetland regulatory agencies due to potential for obstructing flow, altering existing contours, changing water storage, and/or conversion to upland.	Positive benefit to wetlands as restoration would prevent the spread of invasive weeds within the wetlands, promote the establishment of low-growing vegetation, and promote wildlife habitat.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Floodplains	No impact.	No significant impact; greater impact relative to manual or selective herbicide. Impacts mitigated through the use of BMPs and measures taken to comply with EO 11988 and the National Flood Insurance Program.	No significant impact Impacts mitigated through the use of BMPs and measures taken to comply with EO 11988 and the National Flood Insurance Program.	Debris left in floodplains can impede the flow of water and create obstructions in the floodplain and floodway. Impacts mitigated through the use of BMPs and measures taken to comply with EO 11988 and the National Flood Insurance Program.	No impact.
Geology/Soils	No impact.	No impact to geology. Potential for localized soil disturbance and erosion.	No impact to geology or soils.	No impact on geology. Potential beneficial impact in erosion control.	No impact on geology. Potential beneficial impact in erosion control.
Groundwater	No impact.	Potential impact associated with contaminant release in proximity to groundwater recharge zones. Impact would be mitigated by BMPs and are anticipated to be minor.	Potential impact associated with contaminant release in proximity to groundwater recharge zones. Impact would be mitigated by BMPs and are anticipated to be minor.	Potential impact associated with contaminant release in proximity to groundwater recharge zones. Impact would be mitigated by BMPs and are anticipated to be minor.	Potential impact associated with contaminant release in proximity to groundwater recharge zones. Impact would be mitigated by BMPs and are anticipated to be minor.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Land Use and Land Ownership/ Management	No impact to land use, potential short-term disruption of character of lands. Vegetation management on state and federal lands must adhere to existing Land and Resource Management Plans, Special Use Permits, as well as programmatic or related agreements.	No impact to land use, potential short-term disruption of character of lands. Vegetation management on state and federal lands must adhere to existing Land and Resource Management Plans, Special Use Permits, as well as programmatic or related agreements.	No impact to land use, potential short-term disruption of character of lands. Vegetation management on state and federal lands must adhere to existing Land and Resource Management Plans, Special Use Permits, as well as programmatic or related agreements.	No impact to land use, potential short-term disruption of character of lands. Vegetation management on state and federal lands must adhere to existing Land and Resource Management Plans, Special Use Permits, as well as programmatic or related agreements.	No impact to land use. Vegetation management on state and federal lands must adhere to existing Land and Resource Management Plans, Special Use Permits, as well as programmatic or related agreements.
Prime Farmland	No impact	Localized potential for disturbance or degradation of prime farmland soils from use of mechanized equipment. Minimized using BMPs.	No impact.	No impact.	No impact.
Natural Areas, Parks, Recreation	Minor, short-term impacts from equipment noise and presence of work crews.	Minor, short-term impact from equipment noise and work crews associated with trimming. Impacts from clearing would be greater as the character of vegetation could change.	Potential impacts from noise and odors from application of selective targeting herbicides. Minor beneficial impact associated with erosion protection, enhanced wildlife food and cover, and greater diversity. Greater minor, temporary impact from aerial application	Minor impacts from large debris left in place as it could interfere with recreation activities. Short-term impacts from burning due to presence of smoke and work crews.	Minor temporary impact associated with increased pedestrian traffic and noise. Long-term benefit due to enhancement of Natural Areas.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
			indiscriminate treatment of vegetation.		
Cultural	No impact on subsurface cultural deposits when cutting methods are employed. Pulling methods have the potential to disturb cultural deposits depending on size of plant and root ball. Caution should be used when cutting or pulling near aboveground historic remains (i.e. foundations, cemeteries) and sacred sites.	If machinery causes soil disturbance, subsurface cultural deposits could be affected. Impacts would be minimized through adherence to BMPs and Section 106 program alternatives, such as the PA, where applicable. Activities that would have the potential to effect historic properties would require Section 106 review on an individual basis.	No impact to subsurface cultural deposits.	No impact to subsurface deposits.	No impact to subsurface deposits.
Visual Resources	Pruned trees and shrubs, exposed stumps, and the resulting debris may seem unsightly to some viewers.	Can leave swaths of disturbed areas that can contrast with surrounding vegetation.	Areas of browned vegetation can be unsightly. However, the impact would be temporary as vegetation would eventually reestablish.	Felled logs and scattered branches can contrast with the surrounding landscape; stacking as windrows can reduce the unkempt look. Mulching and chipping can improve the visual landscape by covering bare earth with woodchips.	Minor, temporary visual discord due to the presence of additional personnel and equipment. Long-term improvement aesthetic condition.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Public and Worker Health & Safety	Minimal impact on public safety, minor potential for worker safety in conjunction with type and frequency of tool use and environmental conditions.	Minor potential for public safety issues, improved worker safety in proportion to treated area.	Low potential for public exposure to herbicides; selectively higher risk to workers based on herbicide active ingredient, tool use, and environmental conditions. Potential adverse effects mitigated and minimized by training, safety equipment, and adherence to labeling guidelines.	Debris left in place has potential implications on worker safety. Burning has potential minor localized effects on public and worker health and safety.	Additional workforce increases short-term safety risk. Long-term increase in worker safety through development of a plant community that is compatible to ROW management.
Solid and Hazardous Waste	Low impact. Minor generation of waste oil/fluids from maintenance of equipment.	Maintenance on equipment generates waste oils/fluids. Potential spills/releases of fuel/fluids. Generation of waste containers.	Potential accidental releases/spills. Generation of waste containers for herbicides.	Low impact related to use of mechanized equipment. Reduction in solid waste when debris is left to compost.	Low impact related to use of mechanized equipment.
Transportation	Little to no impact.	No impact with side-wall trimming (from air). Minor traffic volume generated by construction workforce.	No impact with aerial spraying of herbicides. Minor traffic volume generated by construction workforce.	Short-term increase in traffic volumes due to additional haul trucks needed for debris transport. No impact when debris is managed on site.	Minor traffic volume generated by construction workforce.

Appendix Table H-1. Summary of Impacts Associated with Vegetation Management Methods as Assessed in TVA's 2019 Programmatic Environmental Impact Statement

Resource	Manual	Mechanical	Herbicides	Debris Management	Restoration
Air Quality and Climate Change	No impact to overall air quality; mobilization of work crews to and from project sites represents a negligible increase in roadway traffic.	No impact to overall air quality; mobilization of work crews to and from project sites, represents minimal localized and temporary emissions from combustion engines.	No impact to overall air quality; in addition to crew mobilization, minor impacts may be from mechanical methods and airborne herbicide constituents.	Chipping, mulching, etc. would have impacts similar to manual control methods; pile burning would produce local smoke and particulate emissions; overall minor impacts to air quality would be temporary and local.	No impact to overall air quality; in addition to crew transport-related impacts minimal localized and temporary emissions from combustion engines.
Noise	Loud intermittent and short-term noise from use of chainsaws.	Loud intermittent and short-term increase in noise from transport of equipment and crews and use of chainsaws and mechanized equipment.	Limited and minor noise from crews on foot. Loud intermittent noise from aerial spraying.	Loud noise from transport of equipment and crews and use of heavy mulchers and chippers.	Intermittent and short-term increase in noise from transport of equipment and crews and use of chainsaw and mechanized equipment.
Socioeconomics and Environmental Justice	Minor short-term impact to local economies due to increased workforce.	Minor short-term impact to local economies due to increased workforce.	Minor short-term impact to local economies due to increased workforce.	Minor short-term impact to local economies due to increased workforce.	Minor short-term impact to local economies due to increased workforce.

Appendix I – List of Threatened and Endangered Species

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Appendix Table I-1. Federally Listed and State-Protected Animal and Plant Species Occurrences Previously Reported from Within 50 feet of TVA ROW Where Vegetation Management is Proposed in Fiscal Years 2023[1]

Common Name[2]	Scientific Name[2]	Federal Status[3]	State	State Status[3]	State Rank[4]	Sites	Sector[5]
AQUATIC ANIMALS							
Snail Darter	*Percina tanasi*	DM	TN	T	S2S3	4	CL
Pink Heelsplitter	*Potamilus alatus*	-	MS	-	S2	1	HV
PLANTS							
Yellow Giant-hyssop	*Agastache nepetoides*	-	AL	STNS	S1	1	MC
Yellow Giant-hyssop	*Agastache nepetoides*	-	GA	STNS	S1	1	MC
Nuttall's Rayless Golden-rod	*Bigelowia nuttallii*	-	AL	SLNS	S3	1	MC
Bastard Toad-flax	*Comandra umbellata*	-	AL	STNS	S1	1	MC
Dwarf Larkspur	*Delphinium tricorne*	-	GA	STNS	S2?	1	MC
Dutchman's Breeches	*Dicentra cucullaria*	-	AL	STNS	S2	1	MC
Longleaf Sunflower	*Helianthus longifolius*	-	AL	STNS	S1S2	2	MC
Barrens St. Johnswort	*Hypericum sphaerocarpum*	-	GA	STNS	S1	1	MC
Cumberland Rosinweed	*Silphium brachiatum*	-	AL	STNS	S2	1	MC
Mohr's Rosin-weed	*Silphium mohrii*	-	AL	STNS	S1	1	MC
Eggleston's Violet	*Viola egglestonii*	-	GA	STNS	S2	1	MC
TERRESTRIAL ANIMALS							
Green salamander	*Aneides aeneus*	-	AL	SP	S3	1	MC

[1] Source: TVA Regional Natural Heritage database, queried August 2021.
[2] Species can be listed in the table multiple times if they occur more than one state.
[3] Status Codes: DM = Delisted but still Monitored; STNS = State Tracked, no status assigned; SP = State Protected; T = Listed Threatened;
[4] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S? = Inexact or uncertain; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
[5] ROW Sector Abbreviations: CL = Cleveland, HK = Hopkinsville, MC = Manchester, MT = Morristown, OR = Oak Ridge

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Appendix J – Fiscal Year 2023 – Watersheds by 10-digit Hydrologic Units Crossed by Cycle A Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal

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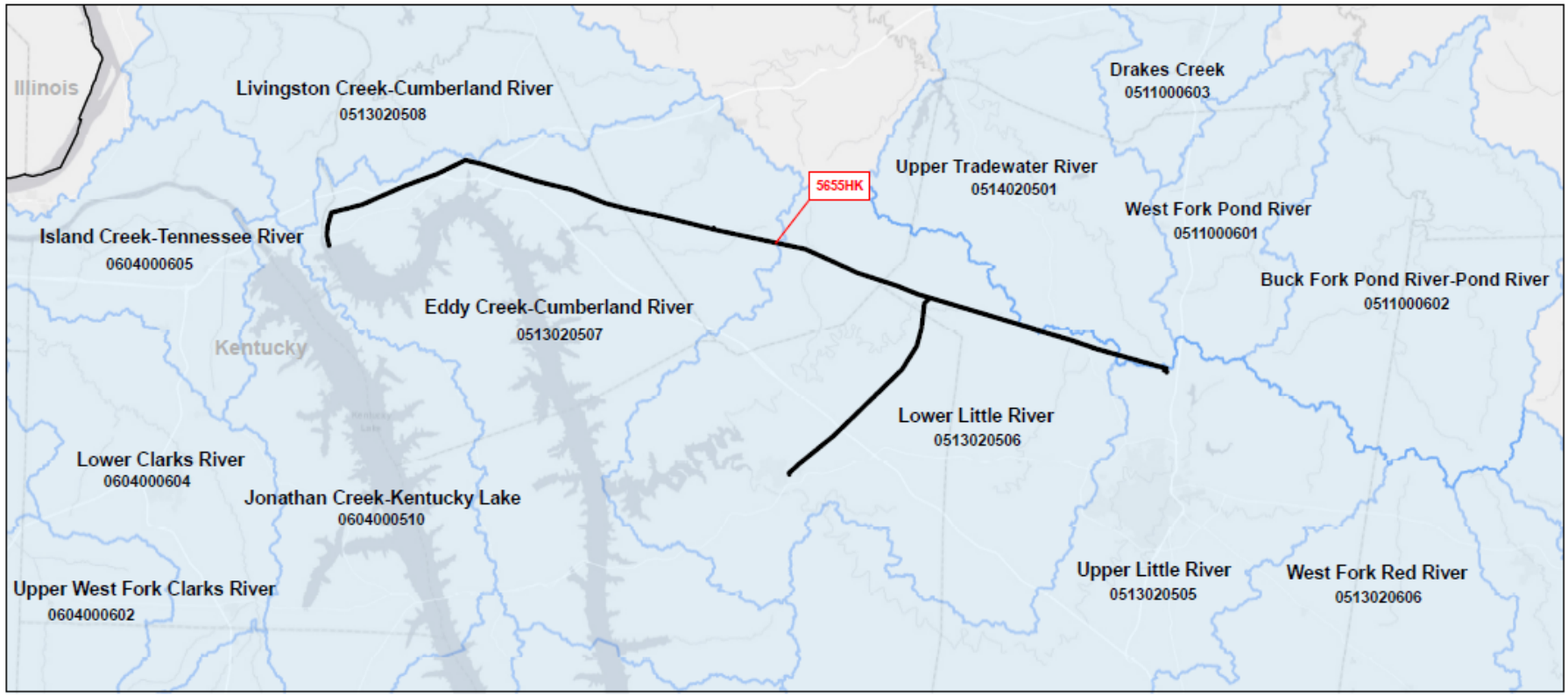
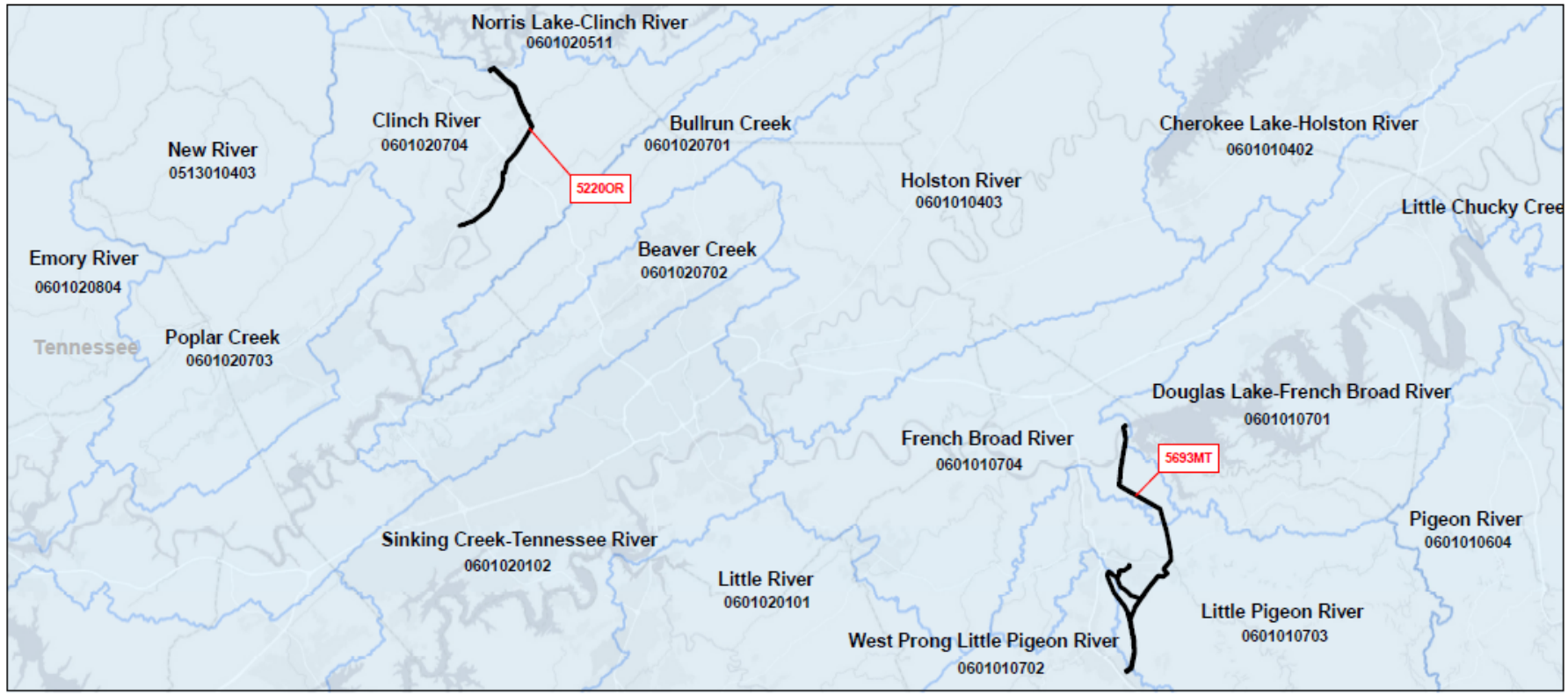
FY23 INCOMPATIBLE VEGETATION REMOVAL



FY23 INCOMPATIBLE VEGETATION REMOVAL



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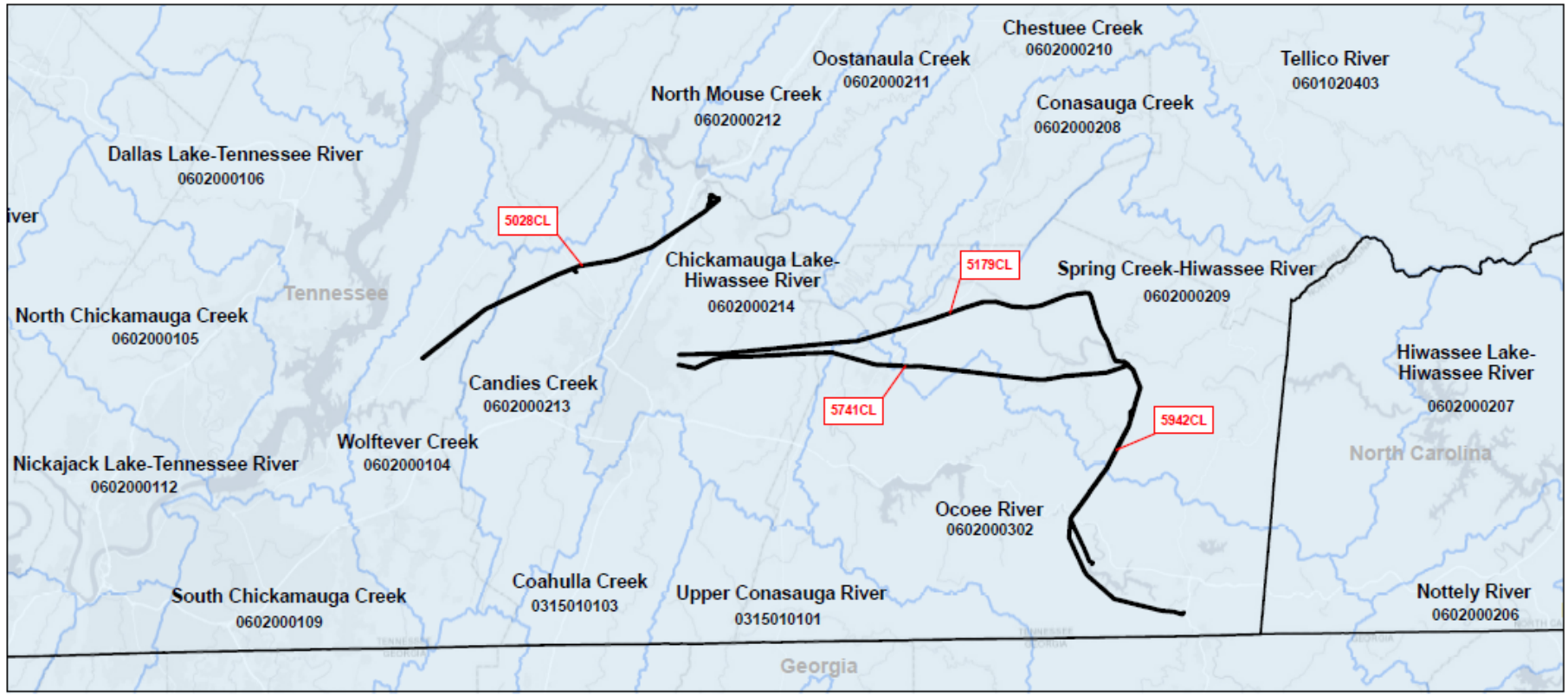
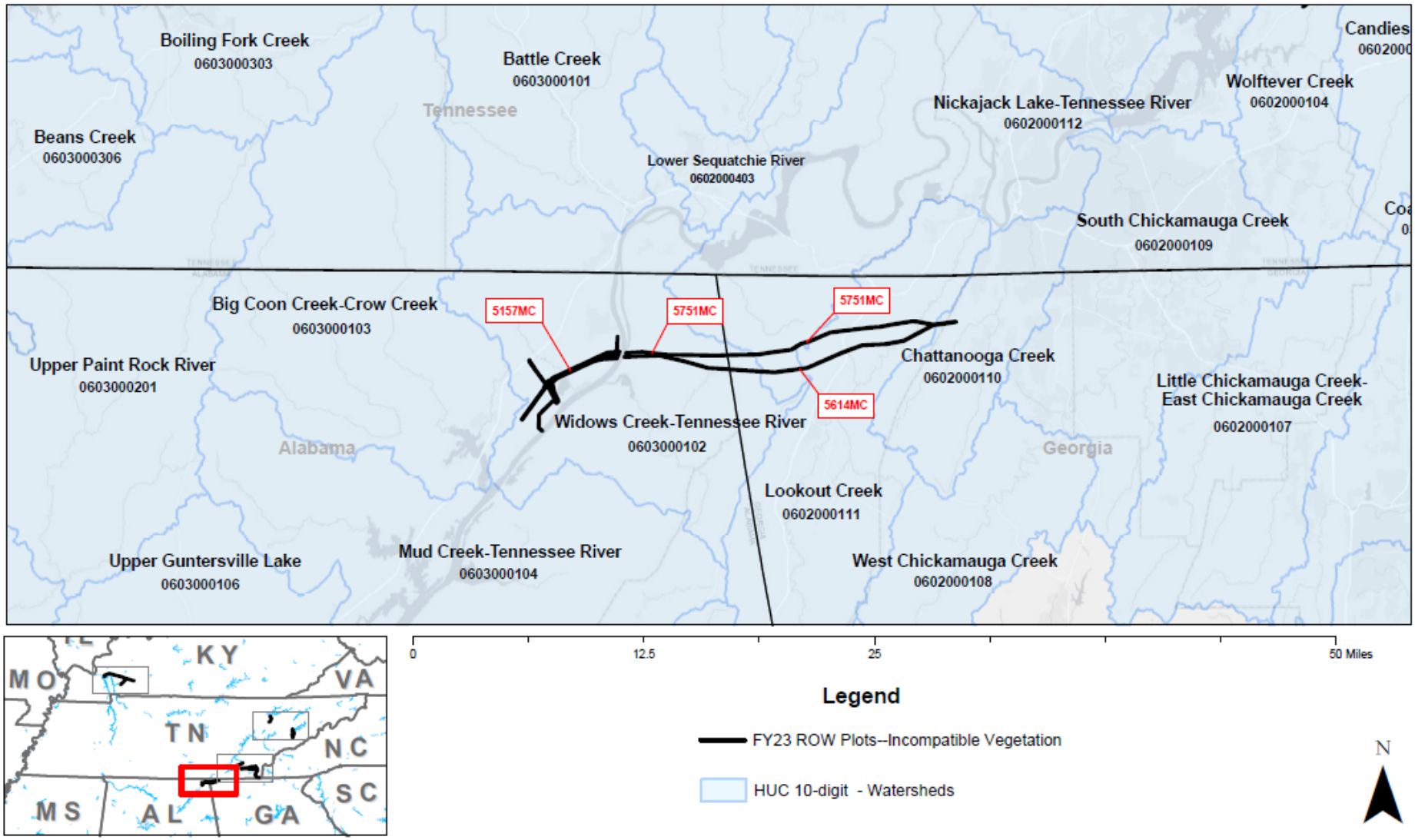


FY23 INCOMPATIBLE VEGETATION REMOVAL



Appendix K – Fiscal Year 2023 - Natural Areas Crossed by or Occurring within 50 Feet of Cycle A Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal

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Appendix Table K-1. Fiscal Year 2023 - Natural Areas Crossed by or Occurring within 50 Feet of Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal in the Cleveland Sector

CLEVELAND SECTOR	NAME	ACRES	COUNTY	STATE
CL	Apalachia Reservoir Reservation	1,453.68	Multiple	Multiple
CL	Fourth Fractional Township Wildlife Management Area	829.55	Polk (TN)	TN
CL	Ocoee No. 3 Reservoir Reservation	51.95	Polk (TN)	TN
CL	Cherokee National Forest Ownership Boundaries	656,051.28	Multiple	Multiple
CL	Ocoee No. 2 Dam Reservation	153.42	Polk (TN)	TN
CL	Cherokee (South) State Wildlife Management Area	312,955.21	Multiple	Multiple
CL	Cherokee National Forest	656,051.29	Multiple	Multiple
CL	Ocoee State Bear Reserve	18,191.27	Multiple	Multiple
CL	Ocoee River/Ruths Golden Aster Protection Planning Site	1293.3	Polk (TN)	TN
CL	Ocoee River	N/A	Polk (TN)	TN
CL	Chilhowee Dairy Farm	220.28	Polk (TN)	TN
CL	South Cherokee National Forest and Wildlife Management Area	290,765.61	Multiple	Multiple
CL	John Muir National Recreation/State Scenic Trail	168.37	Polk (TN)	TN
CL	Ocoee No. 2 Reservoir Reservation	153.42	Polk (TN)	TN
CL	Ocoee River Gorge	1,293.3	Polk (TN)	TN
CL	DCH Fluted Kidneyshell (TN)	15839.57	Multiple	Multiple
CL	DCH Slabside Pearlymussel (TN)	13851.4	Multiple	Multiple
CL	Hiwassee River	N/A	Multiple	Multiple
CL	Hiwassee River State Mussels Sanctuary	161.39	Polk (TN)	TN

Appendix Table K-2. Fiscal Year 2023 - Natural Areas Crossed by or Occurring within 50 Feet of Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal in the Hopkinsville Sector

HOPKINSVILLE SECTOR	NAME	ACRES	COUNTY	STATE
HK	Barkley Reservoir Reservation	81,082.86	Multiple	Multiple
HK	Pace-00055 Purchase of Agricultural Easement Corporation KY - Conservation Easement	605.74	Trigg (KY)	KY

Appendix Table K-3. Fiscal Year 2023 - Natural Areas Crossed by or Occurring within 50 Feet of Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal in the Manchester Sector

MANCHESTER SECTOR	NAME	ACRES	COUNTY	STATE
MC	Georgia - Alabama Land Trust - Conservation Easement	1,671.61	Multiple	GA

Appendix Table K-4. Fiscal Year 2023 - Natural Areas Crossed by or Occurring within 50 Feet of Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal in the Morristown Sector

MORRISTOWN SECTOR	NAME	ACRES	COUNTY	STATE
MT	Lower French Broad and Lower Holston Nonessential Experimental Population Status	4,790.05	Multiple	TN
MT	Trotter Bluff TVA Small Wild Area	43.18	Sevier (TN)	TN
MT	Douglas Dam Reservation	123.7	Sevier (TN)	TN
MT	TVA Programmatic Agreement 2003 (French Broad)	1,956.42	Multiple	TN
MT	DCH Fluted Kidneyshell (TN)	15,839.57	Multiple	Multiple
MT	French Broad River (west)	N/A	Multiple	TN

Appendix Table K-5. Fiscal Year 2023 - Natural Areas Crossed by or Occurring within 50 Feet of Transmission Line Right-of-Way Segments Proposed for Incompatible Vegetation Removal in the Oak Ridge Sector

OAK RIDGE SECTOR	NAME	ACRES	COUNTY	STATE
OR	Norris Songbird Trail State Wildlife Observation Area	58.9	Multiple	TN
OR	Melton Hill Dam Reservation	1,063.86	Anderson (TN)	TN
OR	Norris Dam State Resort Park	2,799.85	Multiple	TN
OR	Norris Dam Reservation	114.55	Multiple	TN
OR	Norris Municipal Watershed	2,257.36	Anderson (TN)	TN
OR	Clinch River 1	N/A	Multiple	TN
OR	Eagle Bend Hatchery State Wildlife Observation Area	43.96	Multiple	TN
OR	Eagle Bend State Fish Hatchery	43.96	Anderson (TN)	TN