McClellanville
115-kV Transmission Line Project

Final Environmental Impact Statement

Prepared for:

U.S. Department of Agriculture, Rural Utilities Service

Cooperating Agencies:

U.S. Army Corps of Engineers, Charleston District

U.S. Forest Service, Francis Marion National Forest

September 2024

USDA United States Department of Agriculture
Rural Development

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TABLE OF CONTENTS

LIST OF APPENDICES vi

LIST OF FIGURES vii

LIST OF TABLES ix

ACRONYMS AND ABBREVIATIONS xiii

EXECUTIVE SUMMARY 1

1.0 Project Purpose and Need 1-1
- 1.1 Introduction 1-1
- 1.2 Purpose and Need the Proposed Action 1-3
  - 1.2.1 Central Electric's Purpose and Need 1-3
  - 1.2.2 Reliability Issues in the McClellanville Service Area 1-6
  - 1.2.3 Winter Weather Operating Agreement 1-8
  - 1.2.4 Transmission Line Efficiency 1-9
- 1.3 Purpose and Need for Federal Action 1-10
  - 1.3.1 Rural Utilities Services 1-10
  - 1.3.2 U.S. Forest Service 1-11
  - 1.3.3 U.S. Army Corps of Engineers 1-11
  - 1.3.4 U.S. Fish and Wildlife Service 1-12
- 1.4 Project Background 1-12
- 1.5 Required Federal and State Agency Approvals 1-14
- 1.6 Public Participation 1-20

2.0 Proposed Action and Alternatives 2-1
- 2.1 Introduction 2-1
- 2.2 Development of Alternatives 2-1
  - 2.2.1 Alternative Technologies 2-1
  - 2.2.2 Alternative Locations 2-4
  - 2.2.3 Corridor Refinement 2-10
- 2.3 Description of Alternatives Evaluated 2-10
  - 2.3.1 No Action Alternative 2-10
  - 2.3.2 Proposed Action (Jamestown Corridor) 2-10
  - 2.3.3 Jamestown Alternative 2-11
  - 2.3.4 Charity Alternative 2-12
- 2.4 Elements Common to All Alternatives 2-15

2.4.1 Transmission Line Characteristics 2-15
2.4.2 Right-of-Way and Property Requirements 2-15
2.4.3 Transmission Line Right-of-Way 2-16
2.4.4 Distribution Line Right-of-Way 2-16
2.4.5 Pre-Construction Activities 2-16
2.4.6 Transmission Line Construction 2-16
2.4.7 Right-of-Way Clearing 2-19
2.4.8 Access Roads 2-20
2.4.9 Structures 2-20
2.4.10 Conductor and Ground Wire Installation 2-26
2.4.11 Substation Construction 2-27
2.4.12 Construction Schedule and Projected Workforce 2-27
2.4.13 Stormwater Permitting and Best Management Practices 2-28
2.4.14 Transmission Line Maintenance and Operation 2-28
2.4.15 Transmission Line Inspection 2-29
2.4.16 Vegetation Management 2-29
2.4.17 Structure Replacement 2-31
2.4.18 Substation Maintenance and Operation 2-31
2.4.19 Substation Inspection 2-32
2.4.20 Spill Prevention, Control, and Countermeasures 2-32
2.5 Environmental Impact Mitigation 2-32

3.0 Affected Environment and Environmental Consequences 3-1
3.1 Introduction 3-1
3.1.1 Analysis Area 3-2
3.2 Water Resources (Surface Water, Wetlands, and Floodplains) 3-3
3.2.1 Affected Environment 3-3
3.2.2 Environmental Effects 3-17
3.3 Biological Resources 3-23
3.3.1 Affected Environment 3-23
3.3.2 Environmental Effects 3-75
3.4 Soils and Geology 3-118
3.4.1 Affected Environment Geology 3-118
3.4.2 Environmental Effects 3-124
3.5 Air Quality and Greenhouse Gas Emissions 3-129
3.5.1 Affected Environment Air Quality Conditions 3-129
3.5.2 Environmental Effects 3-131
3.6 Cultural and Paleontological Resources 3-135
3.6.1 Affected Environment 3-136
3.6.2 Environmental Effects 3-151
3.7 Recreation and Land Use 3-153

3.7.1 Affected Environment 3-153
3.7.2 Environmental Effects 3-164
3.8 Visual Resources 3-169
3.8.1 Affected Environment 3-169
3.8.2 Environmental Effects 3-173
3.9 Socioeconomics 3-176
3.9.1 Affected Environment 3-176
3.9.2 Environment Effects 3-182
3.10 Environmental Justice 3-188
3.10.1 Affected Environment 3-188
3.10.2 Environmental Effects 3-189
3.11 Transportation 3-194
3.11.1 Affected Environment 3-194
3.11.2 Environmental Effects 3-195
3.12 Health and Safety 3-197
3.12.1 Affected Environment 3-197
3.12.2 Environmental Effects 3-200
3.13 Noise 3-203
3.13.1 Affected Environment 3-203
3.13.2 Environmental Effects 3-204

4.0 Cumulative Impacts and Other Required Considerations 4-1
4.1 Introduction 4-1
4.2 Cumulative Impacts 4-1
4.2.1 Cumulative Impacts Methodology 4-1
4.2.2 Cumulative Action Scenario 4-1
4.3 Cumulative Impacts Analysis 4-3
4.3.1 Water Resources 4-3
4.3.2 Biological Resources 4-3
4.3.3 Soils and Geology 4-4
4.3.4 Air Quality and Greenhouse Gas Emissions 4-4
4.3.5 Cultural and Paleontological Resources 4-4
4.3.6 Recreation and Land Use 4-5
4.3.7 Visual Resources 4-5
4.3.8 Socioeconomics 4-5
4.3.9 Environmental Justice 4-5
4.3.10 Transportation 4-5
4.3.11 Health and Safety 4-5
4.3.12 Noise 4-6
4.4 Unavoidable Adverse Impacts 4-6

4.4.1 Water Resources....4-6
4.4.2 Biological Resources....4-6
4.4.3 Soils and Geology....4-6
4.4.4 Air Quality and Greenhouse Gas Emissions....4-6
4.4.5 Cultural and Paleontological Resources....4-6
4.4.6 Recreation and Land Use....4-7
4.4.7 Visual Resources....4-7
4.4.8 Socioeconomics....4-7
4.4.9 Environmental Justice....4-7
4.4.10 Transportation....4-7
4.4.11 Health and Safety....4-7
4.4.12 Noise....4-8
4.5 Irreversible and Irretrievable Commitment of Resources....4-8
4.6 Relationship between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity....4-8

5.0 Consultation, Coordination, and Distribution....5-1
5.1 Preparers and Contributors....5-1
5.2 Distribution....5-3

6.0 References....6-1

LIST OF APPENDICES

Appendix A—Alternatives Evaluation Study

Appendix B—Revised Macro-Corridor Study Report

Appendix C—Independent Engineering Study

Appendix D—Supplemental Analysis On Private Lands

Appendix E—Supplemental DEIS Comment Response Summary

Appendix F—Santee Cooper Vegetation Management Program and Unit Plan

Appendix G—Priority Animal Species and Habitat Associations in the Coastal Plain Ecoregion of South Carolina

Appendix H—Priority Plant Species in the Coastal Plain Ecoregion of South Carolina

Appendix I—Forest Plan Strategies for FMNF SCC Species

Appendix J—Draft Programmatic Agreement for Section 106 Compliance

LIST OF FIGURES

Figure 1.1-1. Proposed Action and Alternatives 1-2
Figure 1.2-1. Existing Electric Infrastructure in the McClellanville Substation Service Area 1-5
Figure 2.2-1. Waters and Wetlands in the Vicinity of the Belle Isle Corridors (Evaluated in the 2019 SDEIS and Eliminated from Consideration) 2-8
Figure 2.2-2. Cultural Resources in the Vicinity of the Belle Isle Corridors (Evaluated in the 2019 SDEIS and Eliminated from Consideration) 2-9
Figure 2.3-1. Proposed Action (Jamestown Corridor) and Jamestown Alternative 2-13
Figure 2.3-2. Charity Alternative 2-14
Figure 2.4-1. COR-TEN Monopole Structure with Horizontal Post Insulators 2-15
Figure 2.4-2. HDD Drilling Exit Location with the Drilling Fluid Pit in the Foreground 2-18
Figure 2.4-3. Timber Mats Placed During Transmission Line Construction. 2-19
Figure 2.4-4. Transmission Line Structure—Tangent Horizontal Line Post 2-21
Figure 2.4-5. Transmission Line Structure—Vertical Double Dead End 2-22
Figure 2.4-6. TM-SPG—Stub Pole Guy Assembly 2-23
Figure 2.4-7. Direct Embedded Foundation Detail for Casing 2-24
Figure 2.4-8. Typical Line Switch 2-25
Figure 2.4-9. Project Schedule and Projected Workforce 2-28
Figure 3.2-1. Waters and Wetlands in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-6
Figure 3.2-2. Surface Waters in the Vicinity of the Charity Alternative 3-7
Figure 3.2-3. Impaired Stream Segments in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-10
Figure 3.2-4. Impaired Stream Segments in the Vicinity of the Charity Alternative 3-11
Figure 3.2-5. National Wetlands Inventory Data in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-14
Figure 3.2-6. National Wetlands Inventory Data in the Vicinity of the Charity Alternative 3-15
Figure 3.3-1. Ecosystems in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-26
Figure 3.3-2. Ecosystems in the Vicinity of the Charity Alternative 3-27
Figure 3.3-3. Occurrences of Federally Listed Threatened and Endangered Species and Designated Critical Habitat in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-38
Figure 3.3-4. Occurrences of Federally Listed Threatened and Endangered Species and Designated Critical Habitat in the Vicinity of the Charity Alternative 3-39

Figure 3.3-5. Occurrences of Wildlife Listed by South Carolina as Threatened, Endangered, or Species of Concern, or as FMNF SSCC, in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-59

Figure 3.3-6. Occurrences of Wildlife Listed by South Carolina as Threatened or Endangered, or Species of Concern, or as FMNF SCC, in the Vicinity of the Charity Alternative 3-60

Figure 3.4-1. Erodible Soils in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-121

Figure 3.4-2. Erodible Soils in the Vicinity of the Charity Alternative 3-122

Figure 3.4-3. Prime Farmland in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-125

Figure 3.4-4. Prime Farmland in the Vicinity of the Charity Alternative 3-126

Figure 3.6-1. Cultural Resources in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-149

Figure 3.6-2. Cultural Resources in the Vicinity of the Charity Alternative 3-150

Figure 3.7-1. Recreation Areas in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-155

Figure 3.7-2. Recreation Areas in the Vicinity of the Charity Alternative 3-156

Figure 3.7-3. Land Cover in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-161

Figure 3.7-4. Land Cover in the Vicinity of the Charity Alternative 3-162

Figure 3.8-1. Scenic Integrity Zones on the Francis Marion National Forest 3-171

Figure 3.8-2. View from Intersection of SC Highway 45 and Chicken Creek Road, Facing West 3-172

Figure 3.9-1. Annual Unemployment Rates, 2011–2021 3-178

Figure 3.10-1. Census Block Groups With Impoverished and Minority Populations in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative 3-191

Figure 3.10-2. Census Block Groups With Impoverished and Minority Populations in the Vicinity of the Charity Alternative 3-192

Figure 3.12-1. EMF Sources and Frequencies 3-198

Figure 3.12-2. Typical EMF Levels for Transmission Lines 3-201

Figure 3.13-1. Sound Levels of Typical Noise Sources and Noise Environments 3-203

LIST OF TABLES

Table ES-1. Corridor Length and Area of a Preliminary 75-foot ROW on NFS Lands 5
Table ES-2. Summary of Transmission Line Components 6
Table ES-3. Summary of Applicant-Proposed Mitigation Measures 7
Table ES-4. Summary of Environmental Impacts for the Action Alternatives 10
Table 1.2-1. Berkeley Electric System Growth—Active Members Services and Membership 1-8
Table 1.3-1. Corridor Length and Area of a Preliminary 75-foot ROW on NFS Lands 1-11
Table 1.4-1. Timeline of Planning Efforts for the Project 1-13
Table 1.5-1. Potential Statutes and Requirements Applicable to the Project 1-14
Table 1.5-2. Agency Actions Necessary for Regulatory Compliance and Project Approval .. 1-18
Table 2.5-1. Summary of Applicant-Proposed Mitigation Measures 2-33
Table 3.1-1. Ground Disturbance Assumption for Project Components 3-3
Table 3.2-1. Tally of Surface Water Crossed by the Proposed Action and Alternatives 3-3
Table 3.2-2. 303(d) Impaired Waters Locations 3-8
Table 3.2-3. Length (miles) of National Wetlands Inventory Features Crossed by the Proposed Action and Alternatives, and Percentage of Total Corridor Length 3-13
Table 3.2-4. Acreage of National Wetlands Inventory Features Crossed by the Proposed Action and Alternatives 3-13
Table 3.2-5. Water Resources Impact Context and Intensity 3-17
Table 3.3-1. Acreage of Ecosystems within a 600-foot-wide Corridor 3-28
Table 3.3-2. Federally Listed Species That may Occur in the Project Vicinity 3-34
Table 3.3-3. Species Listed as FMNF SCC, or by South Carolina as Threatened, Endangered, or Species of Concern, with Potential to Occur in the Project Vicinity and its Associated Ecosystems, and Known or Potential Occurrences in the Project Vicinity 3-48
Table 3.3-4. South Carolina's Priority Animal Species (or SGCN) in the Coastal Plain Ecoregion 3-69
Table 3.3-5. Duration and Intensity Definitions for Biological Resources 3-75
Table 3.3-6. Acreage of Ecosystems Within a Preliminary 75-foot ROW[a] 3-79
Table 3.3-7. Length (miles) of FMNF Management Areas Crossed by the Proposed Action and Alternatives 3-82
Table 3.3-8. Length (miles) and Percentage of the Proposed Transmission Line Parallel to Other Linear Features 3-84
Table 3.3-9. Information on Red-Cockaded Woodpecker Clusters in the Project vicinity 3-86

Table 3.3-10. FMNF SCC and State-Listed Species Groups, Their Associated Ecosystems, and the Affected Area Within the Project Area, on both NFS Lands and Nonfederal Lands 3-93
Table 3.3-11. FMNF SCC and State-Listed Species Associated with Upland Pine Woodlands 3-94
Table 3.3-12. FMNF SCC and State-Listed Species Associated with Forested Wetlands 3-98
Table 3.3-13. FMNF SCC and State-Listed Species Associated with Mesic to Wet Pine Savannas 3-103
Table 3.3-14. FMNF SCC and State-Listed Species Associated With Pond Cypress Savannas 3-107
Table 3.3-15. FMNF SCC and State-Listed Species Associated with Rivers and Streams 3-110
Table 3.3-17. FMNF SCC and State-Listed Species Associated With Calcareous Mesic Hardwoods 3-116
Table 3.4-1. Acreage of Prime Farmland, Hydric Soil, and Highly Erodible Soil within a 600-foot-wide Corridor 3-123
Table 3.4-2. Soils and Geology Impact Context and Intensity Definitions 3-124
Table 3.5-1. State and Federal Ambient Standards for Criteria Air Pollutants 3-129
Table 3.5-2. Air Quality Impact Context and Intensity Thresholds 3-131
Table 3.5-3. Transmission Line and Substation Construction Emissions Estimates and General Conformity *De Minimis* Thresholds 3-132
Table 3.6-1. Distribution of Previously Recorded Archaeological Sites and Historic Properties in the Study Area 3-146
Table 3.7-1. Acreage and Percentage of Land Cover Categories[a] within a within a 600-foot-wide Corridor 3-159
Table 3.7-2. Acreage and Percentage of Land Use Within a 600-foot-wide Corridor 3-160
Table 3.7-3. Length (miles) and Percentage of Landowner Types Within a Preliminary 75-foot ROW 3-163
Table 3.7-4. Percentage of Forest Cover by Landowner Type Within a Preliminary 75-Foot ROW[a] 3-163
Table 3.7-5. Zoning Classifications in the Project vicinity 3-164
Table 3.7-6. Recreation and Land Use Impact Context and Intensity Definitions 3-165
Table 3.7-8. Length of Wambaw Cycle Trail Intersected by the Proposed Action and Alternatives 3-166
Table 3.8-1. Visual Resources Impact Context and Intensity Definitions 3-174
Table 3.9-1. Population Change, 2010–2020 3-177
Table 3.9-2. Projected Population Estimates, 2015–2035 3-177
Table 3.9-3. Annual Employment 3-178
Table 3.9-4. Employment by Industry, South Carolina, Charleston, and Berkeley Counties, 2011–2021 3-180

Table 3.9-5. Annual Per Capita Personal Income (in $1,000s, 2021 Dollars) 3-181
Table 3.9-6. 2017-2021 Household Characteristics 3-181
Table 3.9-7. Value of Timber Delivered to Forest Product Mills in 2019 3-182
Table 3.9-8. Socioeconomic Impact Context and Intensity Definitions 3-182
Table 3.9-9. Residences in Proximity to the Alternative Corridors 3-185
Table 3.9-10. Property Tax Revenues to Study Area Counties Associated with the Alternative Corridors 3-186
Table 3.10-1. Census Block Groups with Residences in the Study Area, Impoverished and Minority Populations, 2016 3-190
Table 3.11-1. Average Annual Daily Traffic Volumes on Highways in the Project Vicinity 3-194
Table 3.11-2. Transportation Impact Context and Intensity Definitions..... 3-195
Table 3.11-3. Number of Roadway Crossings by Type for the Proposed Action and Alternatives 3-196
Table 3.12-1. Health and Safety Impact Context and Definitions 3-200
Table 3.13-1. Duration and Intensity Definitions for Project-related Noise 3-204
Table 3.13-2. Typical Construction Equipment Noise Levels 3-204
Table 4.6-1. Estimated Long-term Impacts (acres) on Resources within a Preliminary 75-foot ROW* 4-9

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ACRONYMS AND ABBREVIATIONS

ACSR	aluminum conductor steel reinforced
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
Applicant	Central Electric Power Cooperative, Inc.
ATV	all-terrain vehicle
Awendaw metering point	Existing point of Berkeley Electric Service from SCE&G
BA	biological assessment
Berkeley Electric	Berkeley Electric Cooperative, Inc.
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practices
Central Electric	Central Electric Power Cooperative, Inc.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
DA	Department of the Army
dB	decibel
dBA	A-weighted decibel
Dominion	Dominion Energy South Carolina, Inc.
EIS	environmental impact statement
EMF	electric and magnetic fields
E.O.	executive order
ESA	Endangered Species Act
°F	degree Fahrenheit
FEMA	Federal Emergency Management Agency
FMNF	Francis Marion National Forest
FR	Federal Register
GHG	greenhouse gas(es)
GIS	geographic information system

kV	kilovolt
kW	kilowatt
MBTA	Migratory Bird Treaty Act
McLCP	McClellanville Load Control Point
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NFS	[USDA U.S. Forest Service] National Forest System
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Services
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxide
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	ozone
O&M	operations and maintenance
OPGW	optical ground wire
PA	Programmatic Agreement
PCB	polychlorinated biphenyls
$PM_{2.5}$	particles with a diameter less than or equal to a nominal 2.5 micrometers
PM_{10}	particles with a diameter less than or equal to a nominal 10 micrometers
Project	McClellanville 115-kV Transmission Line Project
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
RCW	red-cockaded woodpecker
ROW	right(s)-of-way
RUS	U.S. Department of Agriculture, Rural Utilities Service
Santee Cooper	South Carolina Public Service Authority
SC	South Carolina
SCC	Species of Conservation Concern (U.S. Forest Service designation)
SCDES	South Carolina Department of Environmental Services
SCDHEC	South Carolina Department of Health and Environmental Control

SCDNR	South Carolina Department of Natural Resources
SCDOT	South Carolina Department of Transportation
SDEIS	supplemental draft environmental impact statement
SGCN	species of greatest conservation need
SHPO	South Carolina State Historic Preservation Office
SMS	Scenery Management System
SO_2	sulfur dioxide
SUP	special use permit
SWPPP	stormwater pollution prevention plan
TCP	Traditional Cultural Properties
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WMA	Wildlife Management Area
WNS	White Nose Syndrome

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EXECUTIVE SUMMARY

Central Electric Power Cooperative, Inc. (Central Electric, or the Applicant), a South Carolina (SC) transmission cooperative, proposes to construct and maintain a new 115-kilovolt (kV) transmission line between existing substation and a new Berkeley Electric Cooperative, Inc. (Berkeley Electric) McClellanville Substation near the town of McClellanville, SC. Central Electric is seeking financing from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS), for its Project; thus, RUS is required to complete an environmental analysis before making a decision on funding.

Central Electric plans to apply for a Project loan from the USDA Rural Utilities Service (RUS), which administers USDA's rural utilities programs. RUS has determined that a loan for the Project would be a federal action and is therefore subject to NEPA review, per 40 CFR 1500–1508 (42 United States Code [USC] 4321 et seq.; 7 CFR 1970.8). RUS has further determined that preparation of an EIS is required to evaluate the Applicant's planned request for funding (7 CFR 1970.9). RUS is serving as the lead federal agency, as defined in 40 Code of Federal Regulations (CFR) 1501.7, for preparing this EIS and complying with applicable laws, regulations, and Executive Orders. USFS and the U.S. Army Corps of Engineers (USACE), Charleston District, are cooperating agencies. This environmental impact statement (EIS) evaluates the potential environmental consequences of constructing, operating, and maintaining the new transmission line along the Jamestown corridor (Proposed Action), and two other alternatives that includes the Jamestown Alternative (a variation of the Proposed Action) and the Charity Alternative; plus the No Action Alternative, which provides a basis for comparing environmental impacts of the action alternatives.

Regardless of the potential financial assistance from RUS to fund the Applicant's proposed Project, a National Environmental Policy Act (NEPA) environmental review would still be required for the necessary permitting actions by USACE and USFS. USFS has the responsibility to issue special use authorizations for construction, operations, and maintenance of a transmission line on National Forest System (NFS) lands. USFS will use this analysis to decide on the approval of any Special Use Permit (SUP), which is required to construct, maintain, and operate a transmission line across the Francis Marion National Forest (FMNF). lands. USACE has the responsibility to issue permits for structure or work in, over, under, or otherwise affecting waters of the U.S., in order to regulate discharges dredged or fill material into jurisdictional waters.

Purpose and Need

Central Electric is proposing the 115-kV transmission line in order to improve system reliability in the McClellanville Service Area, including reducing the number and duration of power outages that occur; and reducing the number of cooperative members affected. Central Electric's Board of Trustees, which consists of the twenty cooperatives, identified the need to address system capacity, system reliability, human safety, and power quality issues resulting from the current use of an aging distribution line supplying electricity to Berkeley Electric and powering the McClellanville service area. Central Electric, as the wholesale power and transmission provider for Berkeley Electric, must address the strained electrical system to ensure reliable electric service and power quality. Since 1999, Central Electric has pursued establishing a transmission service point in McClellanville where Berkeley Electric owns a substation site. Approximately 1,000 residents in the area currently rely on an existing 40-mile-long distribution circuit that suffers from poor reliability and power quality This outdated network, combined with more intense hurricanes and ice storms due to climate change, results in substandard electric service that cannot accommodate existing or future demand. The current system fails to meet the N-1 contingency criterion, which is the threshold industry standard for acceptable system reliability. Independent studies recommend a new 115-kV transmission line and substation to meet long-term needs and improve reliability.

Public Involvement

Throughout the NEPA process, the public and various government agencies have had the opportunity to provide input and comment on the Project. On November 29, 2005, RUS announced its intent to hold public scoping meetings and prepare an environmental assessment (70 FR 71462). A public scoping open house meeting was held on December 14, 2005, and the public was notified of this event by letter and by radio and newspaper announcements. Nearly 200 people, mostly local residents, attended the open house. After the first scoping meeting in 2005, RUS decided to re-scope the Project because of a change in the need to prepare an EIS, changes in potential transmission line corridors, and changes in updated planning documents that incorporated new and updated data (i.e., the Alternatives Evaluation Study and Macro-Corridor Study Report).

On September 17, 2010, RUS announced its intent to hold a public scoping meeting and prepare an EIS (75 FR 56980). RUS also notified federal, state, and local agency representatives about the proposed Project by mail and invited them to attend an agency scoping meeting. A list of federally recognized Tribes with cultural interests near the Project area was compiled, and tribal leaders and Tribal Historic Preservation Officers were notified by mail and invited to attend the agency scoping meeting. A scoping meeting was held on September 29, 2010, at the Sewee Visitor and Environmental Education Center in Awendaw, SC. Fifteen agency participants, representing USFS, South Carolina Department of Natural Resources (SCDNR), USFWS, South Carolina Forestry Commission, and the town of McClellanville, attended the meeting. No representatives of federally recognized Tribes attended; however, representatives of the Catawba Indian Nation requested to be a consulting party under Section 106 of the NHPA, and the Eastern Shawnee Tribe requested to be informed if cultural materials were encountered as the Project progressed. The primary environmental issues of the proposed Project identified by comments were the effects of its construction and operation on surface water; forest stands; rare threatened and endangered species; aesthetics; surface water, specifically crossing the Santee River; wetlands; and cultural resources and the potential for spreading invasive species.

On May 29, 2014, RUS announced the issuance of a Draft EIS for the Project (79 FR 30805). A public meeting was held on June 3, 2014, at the St. James-Santee Elementary-Middle School in McClellanville to solicit comments on the Draft EIS. Based on public comments and because of updates to RUS environmental policies and procedures, as well as the publication of a revised FMNF Land Management Plan, RUS and Central Electric determined that an SDEIS would be necessary to evaluate other reasonable corridors, including two options that would originate from the Belle Island Substation, as evaluated in the Draft EIS, and new options originating from the Jamestown Substation and Charity Substation. In 2017, because of comments received from agencies and the general public, Central Electric commissioned, at the request of RUS, an independent engineering study to evaluate and supplement the previously developed studies and assess the merit of the proposed alternatives based on need, impacts, and cost; and to offer additional insight and information that may be relevant to assessing each potential solution.

On August 30, 2019, RUS announced the availability of the SDEIS for the Project (84 FR 45720), which included new analysis of the Jamestown and Charity corridors and two of the original Belle Isle corridors (Options B and C). On September 17 and 19, 2019, RUS conducted public meetings at St. James-Santee Elementary-Middle School in McClellanville and at Jamestown Baptist Church Life Center, respectively.

Proposed Action and Alternatives

Central Electric followed RUS (2016) guidance and used a phased approach to siting the proposed transmission line, including the consideration of alternative technologies. Through this process, the number of alternative corridors was systematically narrowed and the proposed Jamestown corridor was identified as the preferred corridor. As part of these investigations, Central Electric prepared two corridor-siting

documents: an Alternatives Evaluation Study (Central Electric 2010a) and the Macro-Corridor Study (Central Electric 2010b); and a supplemental routing of the transmission corridor across private lands (WSP 2024). The Alternatives Evaluation Study evaluated electrical alternatives that best meet the Project's purpose and need and explained each alternative in detail so that interested agencies and the public could gain an understanding of each alternative. It determined that a new transmission line is the preferred solution to provide power to the McClellanville service area. RUS, in coordination with Central Electric, also analyzed a range of technological alternatives to determine if they would be appropriate to meet the Project purpose and need. This included: (1) installing onsite generation at the proposed McClellanville Substation and energy storage; (2) rebuilding the existing distribution line system; (3) promoting and improving energy efficiency and conservation, and distributed renewables generation; and (4) providing battery storage in McClellanville. These alternatives were evaluated but are not considered as reasonable alternatives for meeting the Project's purpose and need, and were not carried forward for detailed analysis.

Once the Alternative Evaluation Study was complete and the transmission alternative was selected as the best method to meet the Project purpose and need, a Macro-Corridor Study was completed using an opportunities-and-constraints analysis that identified suitable areas (opportunities) for siting the transmission line and unsuitable areas (constraints) to be excluded or avoided based on environmental, engineering, economic, land use, and permitting constraints. Potential Project corridors were identified based on geographic information systems, aerial photography, and results from field reconnaissance. The corridors were situated to minimize effects on residences, sensitive habitats, conservation lands, and cultural and historical resources; and maximize paralleling of existing linear infrastructure and avoid circuitous paths.

The 2014 Draft EIS evaluated six potential Project corridors originating from the Belle Isle Substation, which roughly followed U.S. Highway 17 and crossed the Santee River. These corridors were chosen to minimize impacts on residences, sensitive habitats, conservation lands, and cultural resources. However, comments on the 2014 Draft EIS highlighted public concerns about cultural resources and environmental impacts of crossing the Santee River, which led Central Electric to revisit the alternatives. Based on internal and independent reviews, Belle Isle Options A, D, E, and F were eliminated due to greater environmental risks. An independent study highlighted the need for a solution meeting the N-1 contingency criterion to improve reliability in the McClellanville area. This criterion led to analyzing the Jamestown and Charity corridors, which would cross NFS lands and co-locate the proposed transmission line with existing roads and transmission rights-of-way.

In 2023, Central Electric conducted supplemental routing across private lands to further avoid and minimize overall project impacts. A routing team reviewed over 100 potential study segments in three locations with concentrations of private lands along the Jamestown and Charity corridors, using specific avoidance criteria. Metrics were calculated for each alterative corridor in six categories: constructability/engineering, water resources, wildlife habitat, cultural resources, the built environment, and land use/land cover. The routing process identified a preferred corridor that reduces the overall impact of the Project. The preference for this new alignment is captured by including it as part of the Proposed Action (Jamestown corridor), relative to the Jamestown Alternative or Charity Alternative.

This EIS evaluates three routes: the Jamestown corridor (Proposed Action), and two other alternatives that includes the Jamestown Alternative (a variation of the Proposed Action) and the Charity Alternative. The No Action Alternative is also evaluated, which provides a basis for comparing environmental impacts of the action alternatives. A specific ROW for the Project has not yet been determined. This EIS evaluates impacts within a 600-foot-wide corridor (300 feet on either side of the centerline). A 75-foot ROW could be located anywhere within this corridor. The Project area thus includes the 600-foot-wide corridor for the Proposed Action and two alternatives, plus the boundary of the proposed McClellanville substation site. Where finer-scale impacts are quantifiable using GIS or field surveys, calculations are presented within a

"preliminary 75-foot ROW." The 75-foot width is the maximum for construction and O&M but may be reduced to approximately 42.5 feet where it overlaps with existing road and utility ROWs.

No Action Alternative: Under the No Action Alternative, the Project would not be constructed, and physical, biological, and human impacts associated with the Project would not occur. The existing environment would remain the same, and no land would be used for transmission lines, facilities, or a substation. The customers of Berkeley Electric in the McClellanville service area would continue to have reliability issues and outages. In addition, future growth will add additional constraint to an already strained electrical system. The No Action Alternative does not meet the identified purpose and need for the Project.

Proposed Action: Under the Proposed action, Central Electric would construct and maintain a new 23.3-mile-long, 115-kV transmission line between the existing Jamestown Substation and Berkeley Electric's new McClellanville Substation. The corridor would begin at the Jamestown Substation and travel southwest alongside existing road and railroad ROWs just over a mile before turning southeast at Tiger Corner Road (USFS Road 157). The corridor would follow Tiger Corner Road for approximately 6.5 miles to Shulerville. The alignment line would turn east approximately one mile north of the intersection of Tiger Corner Road and Shulerville Road, traveling cross-country over private lands for approximately 2.8 miles until it would encounter the existing Winyah-Charity 230-kV transmission line and Carolina Gas pipeline ROW, and follow northeast along the utility ROW northeast towards the community of Honey Hill. After 1.3 miles alongside the existing utility ROW, the alignment would turn east to follow SC Highway 45 for approximately 7.5 miles to the McClellanville Substation near U.S. Highway 17.

Approximately 58 percent, or 13.5 of 23.3 miles, of a preliminary 75-foot ROW for the Proposed Action would be located on the FMNF (Table ES-1). The transmission line corridor encompasses a portion of the Santee River watershed, but would not cross the river. It would cross Wambaw Creek near the western boundary of the Wambaw Creek Wilderness Area, immediately east of SC Highway 45, but would not cross the wilderness boundary.

Jamestown Alternative: The Jamestown Alternative would follow the same alignment as the Proposed Action for 20.5 of its 26.1 miles, but would have a different alignment for the portion between Shulerville and Honey Hill. The first 8.9 miles of the Jamestown Alternative would follow the same route as the Proposed Action North of Shulerville, rather than cutting across private lands in this location, the Jamestown Alternative would continue along Tiger Corner Road until its intersection with Shulerville Road, and then follow Shulerville road south to Halfway Creek Road. The Jamestown Alternative would then angle northeast along Halfway Creek Road until the existing Winyah-Charity 230-kV transmission line. From this point, it would extend north along the existing transmission line for approximately 1.5 miles until merging back with the Proposed Action. The Jamestown Alternative would then follow the same alignment as the Proposed Action for 11.6 miles all the way to the McClellanville Substation.

Approximately 65 percent, or 17.0 of 26.1 miles, of a preliminary 75-foot ROW for the Jamestown Alternative would be located on the FMNF (Table ES-1).

Charity Alternative: The initial set of potential corridors identified as alternatives in the Macro-Corridor Study (Central Electric 2010b) included four separate Charity macro-corridors. These corridors were eliminated from further consideration evaluation in the Draft EIS; however, based on the independent engineering study (McGavran 2017) and corresponding agency consultation meeting of the study results, this corridor received renewed interest. The Charity 230/115 kV Substation is a very strong source because it is part of the Santee Cooper 230-kV system, making it the most reliable source in the Project area. However, McGavran (2017) also reported that this corridor poses challenges for long-term reliability because of its length and location. After reviewing the results and participating in the study report consultation meeting, the FMNF specifically recommended analyzing the Charity Alternative as a potential

solution because of preferences to co-locate the transmission line with other utility corridors within the FMNF.

The Charity Alternative would be approximately 31 miles long and begin at the Charity Substation, which is located immediately east of the Cooper River by the Nucor Steel Berkeley plant outside North Charleston, SC. The substation serves the large steel mill and thus has a very high reliability requirement; it is served by the major 230-kV line from the Santee Cooper Winyah steam plant. From the Charity Substation, the line would travel northeast alongside the existing Winyah-Charity 230-kV transmission line ROW for approximately 18 miles. It would cross SC Highway 41 and various roadways within the FMNF before intersecting the proposed Jamestown Alternative where the existing transmission ROW intersects Halfway Creek Road, approximately 1 mile north of Shulerville Road. From this point, the Charity Alternative would continue along the same alignment as the Jamestown Alternative to the McClellanville Substation, including following SC Highway 45 for 7.5 miles.

Approximately 69 percent, or 21.5 of 31.3 miles of a preliminary 75-foot ROW for the Charity Alternative is located on the FMNF (Table ES-1)). The corridor encompasses a portion of the Santee River watershed, but would not cross the North and South Santee River. The Charity Alternative would also cross Wambaw Creek near SC Highway 45 but would not cross the boundary of the Wambaw Creek Wilderness Area.

Table ES-1 summarizes the approximate length and area of a preliminary 75-foot right-of-way (ROW) for the Proposed Action, and Jamestown and Charity Alternatives, including the length and percentage on the FMNF. The ROW would be 75-feet wide (37.5 feet on both sides of a proposed centerline). The final ROW would be subject to modification based on site-specific engineering, and environmental and cultural resource surveys.

Table ES-1. Corridor Length and Area of a Preliminary 75-foot ROW on NFS Lands

Corridor	Corridor Length (miles)	Corridor Length on NFS Lands (miles)	Preliminary ROW Area on NFS Lands (acres)[a]	Percentage of Preliminary ROW on NFS Lands
Jamestown Corridor (Proposed Action)	23.3	13.5	123.2	58%
Jamestown Alternative	26.1	17.0	154.6	65%
Charity Alternative	31.1	21.5	195.5	69%

[a.] A preliminary 75-foot ROW is used for calculations in this EIS because 75 feet is the maximum ROW width for Project construction and operations and maintenance (O&M). However, the final ROW width could be less in places where it overlaps existing road and utility ROWs. The final ROW would be located based on site-specific engineering, and environmental and cultural resource surveys.

Project Components

The major components of the McClellanville 115-kV Transmission Line Project include transmission line facilities, substations, and communication systems. Typical design characteristics for the Project components are listed in Table ES-2. Final design characteristics would be determined during the detailed design phase of the Project.

Table ES-2. Summary of Transmission Line Components

Transmission Line Element	Description
Transmission line poles	Galvanized steel or COR-TEN steel, monopole structures carrying high voltage electrical conductors on insulators, with fiber optical shield wire overhead.
Typical structure height	70–80 feet
Typical span length	400 to 500 feet Up to 600 feet where necessary for crossing large rivers or large wetlands
ROW width	75 feet; approximately 42.5 feet alongside existing road, rail, and utility ROWs
Number of structures per mile	10–12 per mile
Voltage	115,000 volts or 115 kV
Temporary ground disturbance	20 x 20-foot workspace per structure 1 one-acre staging area
Permanent ground disturbance	6 feet in diameter per structure (0.001 acre)
Total number of structures	233 to 374 monopoles

Central Electric and/or its contractors would perform site-specific engineering and environmental surveys prior to construction of the transmission line. These surveys would consist of centerline location, profile, and access surveys, as well as a wetland delineation, pre-construction surveys for threatened and endangered species where necessary, and cultural resources. Geotechnical studies would also determine engineering requirements, involving truck-mounted augers drilling small-diameter boreholes to analyze soil characteristics, with minimal land disturbance (about 400 square feet) per site. Construction activities would follow a general sequencing—acquiring ROW access, establishing staging areas, installing poles, and installing conductors. The precise timing of construction would take into account factors including permit approvals, permit conditions (e.g., time of year restrictions), and available workforce.

Summary of Environmental Impacts

Potential impacts of the Project were identified and evaluated for each aspect of the affected natural and built environment, which includes the following resources: water resources, biological resources, soils and geology, air quality and greenhouse gas emissions, cultural and paleontological resources, recreation and land use, visual resources, socioeconomics, environmental justice, transportation, health and safety, and noise. Direct and indirect impacts are discussed for each resource immediately following the characterization of each resource's affected environment in Chapter 3 of this EIS. Impact analysis for each resource also assumes successful implementation of the environmental commitments and best management practices (BMPs) that Central Electric would follow (Table ES-3). Table ES-4 presents a summary comparison of potential impacts to resources analyzed in the EIS for each action alternative.

Table ES-3. Summary of Applicant-Proposed Mitigation Measures

ID	Mitigation Measure
Water Resources	
WR-1	Avoid impacts to wetlands to the maximum extent practicable. Wetlands will be delineated within the selected corridor and a USACE permit or Nationwide Permit verification letter will be obtained prior to conducting any work in waters of the U.S.
WR-2	Store construction equipment, fuels, chemicals, and materials outside of streams and wetlands.
WR-3	Use construction mats for all wetland crossings.
WR-4	Comply with riparian buffers required by the state and clearly mark all wetland and buffer boundaries along the ROW prior to the implementation of other perimeter BMPs and commencement of construction.
WR-5	Span wetland and riparian areas where possible. Low-water crossings may be used to access the ROW during construction and will be designed so as not to inhibit fish passage or create discharges.
WR-6	Install BMPs, such as silt fences, at all stream crossings and along the borders of wetlands to prevent sedimentation.
WR-7	Locate pole structures outside wetland areas where feasible.
WR-8	Comply with all requirements of state permits for storm water discharges for construction activities.
WR-9	Develop an SWPPP (Storm Water Pollution Prevention Plan) prior to construction
WR-10	Prevent accidental spillage of contaminants, debris, hazardous liquids, or other pollutants into streams, waterways, lakes, land, and underground aquifers. Such pollutants and waste include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.
WR-11	Develop a hazardous materials management and spill prevention plan to address storage, use, transportation, and disposal of hazardous materials.
WR-12	Develop an emergency response plan for accidental spills.
WR-13	Promptly clean up spills or equipment leaks to prevent materials from entering surface water.
WR-14	Schedule construction in river crossing areas during low water periods or winter, if feasible.
WR-15	Install culverts where necessary to accommodate the estimated peak flow of the stream. Disturbance to the stream banks will be minimized during construction and all disturbed areas will be regraded to original contours and revegetated in accordance with the mitigation measures listed for soil/vegetation resources. Annual monitoring will ensure the culverts are functioning as designed.
WR-16	Remove excavated material and other debris from flood-prone areas to prevent debris from clogging culverts or bridges and altering water flow and flood patterns.
WR-17	Do not stockpile excavated materials near or on stream banks or waterway perimeters unless the stockpile is protected from high water or stormwater runoff.
WR-18	Ensure wastewater discharge from construction operations does not enter streams, waterways, wetlands, or other aquatic resources without the appropriate permits.
WR-19	Avoid using fertilizers, pesticides, or herbicides in or near surface waterbodies.
Biological Resources	
BR-1	If temporary access roads are required, restore them to their natural condition with native vegetation after construction.
BR-2	Mark and secure holes drilled or excavated for foundation construction with temporary fencing if left unattended overnight to ensure safety for livestock, wildlife, and the public.
BR-3	Conduct construction operations to minimize unnecessary destruction, scarring, or defacing of natural surroundings, vegetation, trees, and native shrubbery.
BR-4	Develop a non-native invasive plant management plan addressing prevention, detection, and control of non-native invasive plants during construction activities.
BR-5	Inspect and clean construction equipment for seeds before mobilizing to the Project area.
BR-6	Prior to clearing woody vegetation and trees during the migratory bird nesting season, complete a survey of the final ROW to identify existing stick nests. Tree-clearing crews will also be trained to stop work and notify Environmental staff if they encounter an unanticipated nest.
BR-7	Design the Project according to the Avian Power Line Interaction Committee's guidelines—APLIC (2006) and APLIC (2012)—for avian protection and collision risk mitigation.
BR-8	Comply with any reasonable and prudent measures, and/or terms and conditions of an incidental take statement issued by the U.S. Fish and Wildlife Service during ESA section 7 consultation.

ID	Mitigation Measure
BR-9	Restore disturbed areas and construction staging areas upon completion to ensure surfaces drain naturally, blend with natural terrain, and are restored with native vegetation. Repair all destruction, scarring, and damage.
BR-10	Do not remove trees within 300 feet of active swallow-tailed kite nests or wood stork nesting colonies from April 1 through June 30 or until fledging is completed.
BR-11	Avoid suitable habitat for federally listed plants to the extent practicable. If suitable habitats cannot be avoided, species presence/absence surveys would be performed by a qualified biologist.
BR-12	Use optical ground wire or bird flight diverters in high bird use areas in consultation with the U.S. Fish and Wildlife Service to mitigate collision risks.
BR-13	Implement tree removal[1] restrictions during specific periods: winter torpor (December 15 to February 15) and pup season (May 1 to July 15). Prioritize tree clearing during the following work windows: 1) July 16 to December 14 (first choice), (2) February 16 to March 31 (second choice), and (3) April 1 to April 30 (third choice).
BR-14	Avoid using herbicides on NFS lands unless approved by the USFS.
BR-15	Avoid construction activities within a 200-foot buffer around red-cockaded woodpecker cavity trees during the nesting season (April 1 through July 31).
Soils and Geology	
SG-1	Confine construction activities to the Right of Way (ROW) and around structure locations for transmission structures.
SG-2	Stockpile topsoil removed during construction and use it for reclamation following construction.
SG-3	Re-grade, stabilize, and revegetate all disturbed areas to match pre-construction conditions.
SG-4	While not anticipated to be necessary, design temporary access roads to follow existing land contours where practical to minimize erosion, rather than creating straight paths across the ROW.
SG-5	Loosen compacted soils after construction to restore soil productivity and support agricultural operations.
SG-6	Water will be applied on roads and disturbed areas to minimize dust, as needed.
Air Quality and Greenhouse Gas Emissions	
AQ-1	Enforce speed limits on local gravel roads during construction to reduce dust.
AQ-2	Locate staging areas as close to the construction site as possible to minimize driving distance.
AQ-3	Dispose of all waste materials properly at permitted waste disposal areas or landfills.
AQ-4	Do not burn or bury waste materials on the Right of Way (ROW).
Cultural, Historical, and Paleontological Resources	
CHP-1	Conduct a cultural resource survey within the ROW for archaeology and the area of potential effects for aboveground resources before construction. Develop and implement mitigation measures as required by the Programmatic Agreement (PA).
CHP-2	Span and protect archaeological sites during construction when feasible, as identified in the PA. Address any designs that cannot span archaeological resources with phased surveys and resolution of adverse effects, as necessary.
CHP-3	Brief all workers on protocols for cultural resource discoveries during construction. Prohibit workers from removing artifacts from the project area, as outlined in the PA.
CHP-4	Suspend all construction activities within a 50-foot radius if any archaeological resources are discovered, as specified in the PA.
Land Use	
LU-1	Provide a schedule of construction activities to all landowners who could be affected.
LU-2	Acquire appropriate permits and easements from federal or state land management agencies for portions of the ROW traversing public lands.
LU-3	Plan construction activities to minimize temporary disturbance, displacement of crops, and interference with agricultural activities.
LU-4	Construct access roads to the minimum width required for the passage of construction vehicles.
LU-5	Repair or replace fences, gates, and similar improvements that are removed or damaged during

[1] The U.S. Fish and Wildlife Service has defined "tree removal" as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats (81 FR 1900).

ID	Mitigation Measure
LU-6	Reclaim deep ruts after construction that may be hazardous to farming operations and equipment movement. Level, fill, and grade ruts, scars, and compacted soils from construction activities in productive hay or crop lands using scarifying, harrowing, disking, or other appropriate methods. Correct damage to ditches, tile drains, terraces, roads, and other land features, and restore land contours and facilities as nearly as practical to their original conditions.
LU-7	Use gates exclusively to discourage access to the ROW across NFS lands and use hedges and gates to discourage access to the ROW across other lands.
Socioeconomics	
SE-1	Contact landowners during construction to minimize short-term impacts on agriculture.
Transportation	
T-1	Coordinate conductor stringing across roadways with the SC State Department of Transportation.
T-2	Coordinate with the Federal Aviation Administration prior to construction if the preferred corridor is near an airfield before construction begins.
Health and Safety	
HS-1	Prepare a construction plan in accordance with the National Electrical Safety Code and Occupational Safety and Health Administration regulations, as required by federal law, to ensure the safety of construction workers. The plan will include standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The plan will also identify procedures should a spill occur or hazardous materials be discovered. The plan will be reviewed with fire department personnel and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures.
HS-2	Identify existing utilities and coordinate with their owners/managers prior to construction to protect both facilities and construction workers during crossings.
HS-3	Conduct vehicle fueling in compliance with procedures designed to minimize fire risks and fuel spills.
HS-4	Secure all construction areas at the end of each workday to protect equipment, materials, and discourage public access.
Noise	
N-1	Equip all construction equipment with sound-control devices no less effective than those provided on original equipment.
N-2	Ensure all internal combustion engines used in construction are equipped with mufflers and spark arresters to minimize noise.
N-3	Conduct construction activities between 7:00 a.m. and 8:00 p.m. in residential areas

Table ES-4. Summary of Environmental Impacts for the Action Alternatives

Resource	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Water Resources (Surface Water and Water Quality)	Short- and long-term, moderate-intensity impacts on surface waters would occur due to potential sedimentation from erosion related to ground disturbance while placing transmission line poles, clearing land within the ROW, and placing construction mats. Project operations and maintenance (O&M) would also disturb soils during vegetation management. impacts would be avoided or minimized through the implementation of mitigation measures and compliance with permit conditions required by the U.S. Army Corps of Engineers and South Carolina Department of Environmental Services (SCDES).	Similar impacts as the Proposed Action but greater due to the same number of streams and one more waterbody being crossed.	Similar type of impacts as the Proposed Action but much greater because more than twice as many streams and waterbodies would be crossed and the length of waterbodies crossed would be more than twice as long.
Water Resources (Wetlands)	Short- and long-term, moderate-intensity impacts to wetlands and floodplains would occur due to the conversion of forested wetlands to scrub-shrub and/or emergent wetlands and from placing structures in wetlands and floodplains. The impacts from converting forested wetlands would be medium- to high-intensity, but it is anticipated that the impacts from the placement of poles in wetlands and floodplains would only be low-intensity because of the minimal area occupied by each structure and measures would be taken during construction to avoid and minimize wetland impacts.	Similar impacts as the Proposed Action but with slightly less extent.	Similar type of impacts as the Proposed Action but much greater because more than three time the length and area of wetlands would be crossed.
Water Resources (Floodplains)	Short-term, low-intensity impacts could occur where the corridor would traverse a small area of the 100-year floodplain of Wambaw Creek and Echaw Creek, but no long-term impacts because there would be no change in elevation and floodplains would be restored to preconstruction contours once construction is complete.	Similar impacts as the Proposed Action but with one less pole required within the Echaw Creek floodplain.	Similar impacts as the Proposed Action but with one more pole required within a regulatory floodplain.

Resource	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Biological Resources (Vegetation)	Short- and long-term, moderate-intensity impacts on vegetation would occur due to disturbance by heavy machinery and clearing of the ROW during Project construction and O&M. Forest communities within the ROW would be permanently converted to herbaceous and shrub vegetation and some forested wetlands would be cleared. In addition, a small amount of vegetation would be permanently lost due to the placement of transmission line structures. Low-intensity impacts could result from habitat fragmentation and nonnative invasive plants and animals could be introduced and displace native species, disrupt nutrient and fire cycles, and alter plant succession.	Similar impacts as the Proposed Action but over a slightly larger area.	Short- and long-term, moderate-intensity impacts on vegetation would be similar to those described under the Proposed Action but would occur over a larger ROW area. In comparison to the Proposed Action, there would be impacts to a similar acreage of Upland Longleaf and Loblolly Pine, and wet pine savannas and flatwoods, the two most impacted ecosystems. However, there would be substantially greater impacts to Forested Swamps and Floodplain Forests, Depressional Wetlands and Carolina Bays, and Pocosins.
Biological Resources (Wildlife)	Short-term, low- to moderate-intensity impacts on wildlife would occur due to disturbance from human presence, noise, and construction activity within and near the transmission line ROW during construction and O&M, and due to direct mortality of less mobile species from heavy equipment and vegetation removal activities. Effects related to permanent loss of forest habitat would be long-term and moderate-intensity to species that rely on forest habitats, although species would benefit that prefer grassland, shrublands, or forest edges. Effects on birds related to line collisions or electrocutions would be long-term and moderate- intensity, but would be minimized by following relevant guidelines and taking appropriate measures to avoid impacts and mitigate adverse effects.	Similar impacts as the Proposed Action but over a slightly larger area.	Short- and long-term, moderate-intensity impacts on wildlife would be similar to those described under the Proposed Action but would occur over a larger area. In comparison to the Proposed Action, there would be impacts to a similar acreage of habitat suitable for upland pine woodland associates and mesic to wet pine savanna associates. However, there would be substantially greater impacts to habitat used by species associated with forested wetlands and pond cypress savannas.

Resource	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Biological Resources (Federally listed and State-listed Species, and FMNF Species of Conservation Concern)	No potential impacts to 11 of 21 federally listed species with the potential to occur in in the Project vicinity (West Indian manatee, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, piping plover, red knot, seabeach amaranth, eastern black rail, Atlantic sturgeon, and shortnose sturgeon). Short-and long-term, low- to moderate-ntensity impacts to 7 of the 10 remaining federally listed or proposed/candidate species (frosted flatwoods salamander, wood stork, monarch butterfly, pondberry, American chaffseed, Canby's dropwort, and golden sedge). High-intensity impacts to 3 federally listed or proposed/candidate species (red-cockaded woodpecker, northern long-eared bat, and tricolored bat) due to the clearing of forests, wetlands, and other habitats that support known populations. Central Electric would avoid impacts to federally listed species to the greatest extent practicable, and limit impacts through time-of-year restrictions and preconstruction surveys if suitable habitat is unavoidable. Central Electric would also comply with any reasonable and prudent measures, and/or terms and conditions of an incidental take statement issued by the U.S. Fish and Wildlife Service during ESA section 7 consultation. With respect to impacts to FMNF Species of Conservation Concern (SCC), the Proposed Action would be consistent with the FMNF Revised Land Management Plan.	Similar impacts as the Proposed Action but over a slightly larger area.	Impacts would be the similar to those described under the Proposed Action with potential moderate-to high-intensity impacts to red-cockaded woodpecker, wood stork, northern long-eared bat, and tricolored bat. With respect to impacts to FMNF SCC, the Charity Alternative would be consistent with the FMNF Revised Land Management Plan.

Resource	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Soils and Geology	Short-term, low-intensity impacts would occur due to the displacement of soil and rock during construction activities, alteration of geologic features due to earth-moving activities during construction, alteration of topographical boundaries during construction, and an increased potential for erosion occurring to adjacent lands from either vehicle disturbances associated with construction activities or accelerated runoff resulting from the creation of impermeable surfaces. No geologic impacts would occur. Short-term, low-intensity impacts on erodible soils, hydric soils, and prime farmland. Soil impacts from Project O&M would be limited to continued soil compaction along access areas and in long-term operations areas (e.g., the McClellanville Substation) and soil disturbance from maintenance tasks.	Similar potential impacts as the Proposed Action, with comparable impacts on hydric soils, highly erodible soils, and prime farmland.	Similar potential impacts as the Proposed Action, but with over 40 percent greater potential impacts on hydric soils and nearly double the area of prime farmland.
Air Quality and Greenhouse Gas Emissions	Short-term, low-intensity impacts would occur due to a temporary increase in pollutant and greenhouse gas (GHG) emissions from equipment exhaust during construction, vehicle exhaust caused by travel to and from the Project, and fugitive dust from soil disturbance.	Impacts would be the same as those described under the Proposed Action.	Impacts would be the same as those described under the Proposed Action.
Cultural and Paleontological Resources	Potential unavoidable adverse effects on cultural and paleontological resources would include potential disturbance to archaeological sites due to ROW clearing and structure placement, and direct, visual impacts on the Old Georgetown Road, which is eligible for listing on the National Register of Historic Places (NRHP). Once the final ROW is determined, Central Electric would work with archaeologists to identify and avoid known archaeological site boundaries. If potentially significant sites are impacted by the selected ROW, additional investigations will be necessary to determine if those sites are eligible for listing on the NRHP and if any mitigation measures will be necessary. The Project could also alter the setting and feeling of historic structures, districts, or landscapes as well as properties, including TCPs, important to the Catawba Indian Nation, Gullah-Geechee Cultural Heritage Corridor Commission, and the Low Country Rice Culture Project, as well as other interested parties.	Impacts would be the same as those described under the Proposed Action.	Similar Impacts as the Proposed Action but to a slightly greater degree due to the longer length

Resource	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Recreation and Land Use	Short-term, low-intensity impacts would occur around the Honey Hill Recreation Area and New Hope Pond due to construction noise and ground disturbance, road closures, short-term closures of the recreation areas, reduced parking, impacts to wildlife viewing due to the temporary displacement of animals. No impacts to the Wambaw Creek Wilderness Area due to the dense vegetation near where the transmission line would cross near the wilderness boundary. Short-term, moderate-intensity impacts to land cover due to heavy machinery, cutting and grading within approximately 223 acres of forest land within a preliminary 75-foot ROW.	Similar impacts as the Proposed Action, with short-term impacts to the Wambaw Cycle Trail and limited long-term low-intensity impacts.	Similar impacts as the Proposed Action, with considerably greater impacts to recreationists using the Wambaw Cycle Trail.
Visual Resources	Long-term, high-intensity impacts to visual resources would occur due to the proximity to the Halfway Creek Road and SC Highway 45 and lack of vegetation buffer between the road and new transmission line ROW. The new line and structures would be visible to local residents, recreational users, and commuters for over half of the corridor.	Similar to the Proposed Action but with slightly higher intensity due to more road visibility, causing high visibility for residents and commuters.	Similar but lower-intensity visual impacts than the Proposed Action due to its route through forested areas and along existing transmission lines, though it would still cause high visibility impacts near SC Highway 45 and affect local residents and commuters.
Socioeconomics	Short-term, low-intensity impacts would occur due to temporary employment and economic activity, temporary increase in public service and housing demand. Long-term, low-intensity impacts due to loss of timber from ROW clearing and structure placement.	Similar impacts to the Proposed Action, with comparable effects on cropland and timber activities, and generating 11 percent more property tax revenue.	Similar impacts to the Proposed Action, with comparable effects on cropland and timber activities, and generating 32 percent more property tax revenue.
Environmental Justice	Short-term. low-intensity impacts would occur on environmental justice communities due to visual impacts from line placement and traffic, noise, and air quality impacts during construction.	Similar impacts to the Proposed Action, but greater potential adverse effects on minority and low-income communities due to its proximity to more residences.	Similar impacts to the Proposed Action, but less potential adverse effects on minority and low-income communities due to its proximity to fewer residences.
Transportation	Short-term, moderate-intensity impacts would occur due to increased traffic during construction and potential road and lane closures and traffic detours, including roads on the FMNF.	Similar impacts to the Proposed Action.	Similar impacts to the Proposed Action.

Resource	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Health and Safety	Short-term, low-intensity impacts would occur due to potential contaminant exposure during construction and risks to worker safety during construction. Hazardous waste would be managed in accordance with applicable regulatory requirements. No long-term risk associated with fire and severe weather, or increases in potential electromagnetic field (EMF) exposure.	Impacts would be the same as those described under the Proposed Action.	Impacts would be the same as those described under the Proposed Action. However, there would be additional safety risks because the transmission line would be built parallel to an existing 230-kV transmission line. Extra caution would be required during construction and maintenance The same safety measures as described under the Proposed Action would also avoid any accidental contact with an energized conductor, promote construction safety, and ensure that the Project does not pose any health or safety risks to life or property.
Noise	Short-term, low-intensity impacts would occur due to a temporary increase in noise levels from construction activities and Project traffic. Long-term, low impacts from Project O&M activities. No significant impacts to any receptors.	Similar impacts to the Proposed Action, despite the Jamestown Alternative having 60% more residences within a 600-foot-wide corridor.	Similar impacts to the Proposed Action, but slightly greater due to the longer length.

1.0 PROJECT PURPOSE AND NEED

1.1 Introduction

Central Electric Power Cooperative, Inc. (Central Electric, or the Applicant) proposes to construct and maintain a new 115-kilovolt (kV) transmission line between an existing Substation and a proposed Berkeley Electric Cooperative, Inc. (Berkeley Electric) McClellanville Substation near the town of McClellanville, South Carolina (SC). The substation would be constructed by Berkeley Electric on an existing cleared parcel in Charleston County (Figure 1.1-1). Due to the scope and potential impact of the Project, and the involvement and actions of multiple Federal agencies, an environmental impact statement (EIS) is being prepared to fulfill obligations specified under the National Environmental Policy Act (NEPA). Central Electric plans to apply for financing from RUS for the proposed McClellanville 115-kV Transmission Line Project (the Project). RUS has determined that a loan for the Project would be a major federal action and is therefore subject to NEPA review, per 40 CFR 1500-1508 (42 United States Code [USC] 4321 et seq.; 7 CFR 1970.8(c)). RUS has further determined that preparation of an EIS is required to evaluate the Applicant's planned request for funding (7 CFR 1970.9). RUS is serving as the lead federal agency, as defined at 40 CFR 1501.7, for the preparation of this EIS.

Central Electric, Berkeley Electric, RUS, USDA U.S. Forest Service (USFS), and U.S. Army Corps of Engineers (USACE) will use the analysis in this EIS to make decisions about approving, authorizing, or permitting various Project components. RUS, the lead agency, will determine whether to provide financial assistance for the Project. USFS and USACE are cooperating agencies on the EIS. USFS has the responsibility to issue special use authorizations for construction, operations, and maintenance of a transmission line on NFS lands. USFS will use this analysis to make decisions related to requirements for a Special Use Permit (SUP), which would be required to construct, maintain, and operate a transmission line through NFS lands. USACE is responsible for issuing permits for structures or work in, over, under, or otherwise affecting waters of the U.S., in order to regulate discharges dredged or fill material into jurisdictional waters.

This EIS was prepared in accordance with NEPA, and in compliance with all applicable regulations and laws, including the Council on Environmental Quality (CEQ), Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations (CFR) 1500) and USDA, Rural Development, Environmental Policies and Procedures (7 CFR 1970).

This chapter describes the purpose and need for the Project and the purpose and need for the U.S. Department of Agriculture (USDA), Rural Utility Service (RUS) action, other agency actions, authorizing actions, public participation, and a timeline of the National Environmental Policy Act (NEPA) process. It also describes the decision framework for the agencies involved, and the regulatory framework and authorizing actions that are pertinent to the Project. Furthermore, this chapter describes public participation activities that have occurred for the Project to date, including the role of public comments in the circumstances that necessitated a supplemental draft environmental impact statement (SDEIS) in 2019.

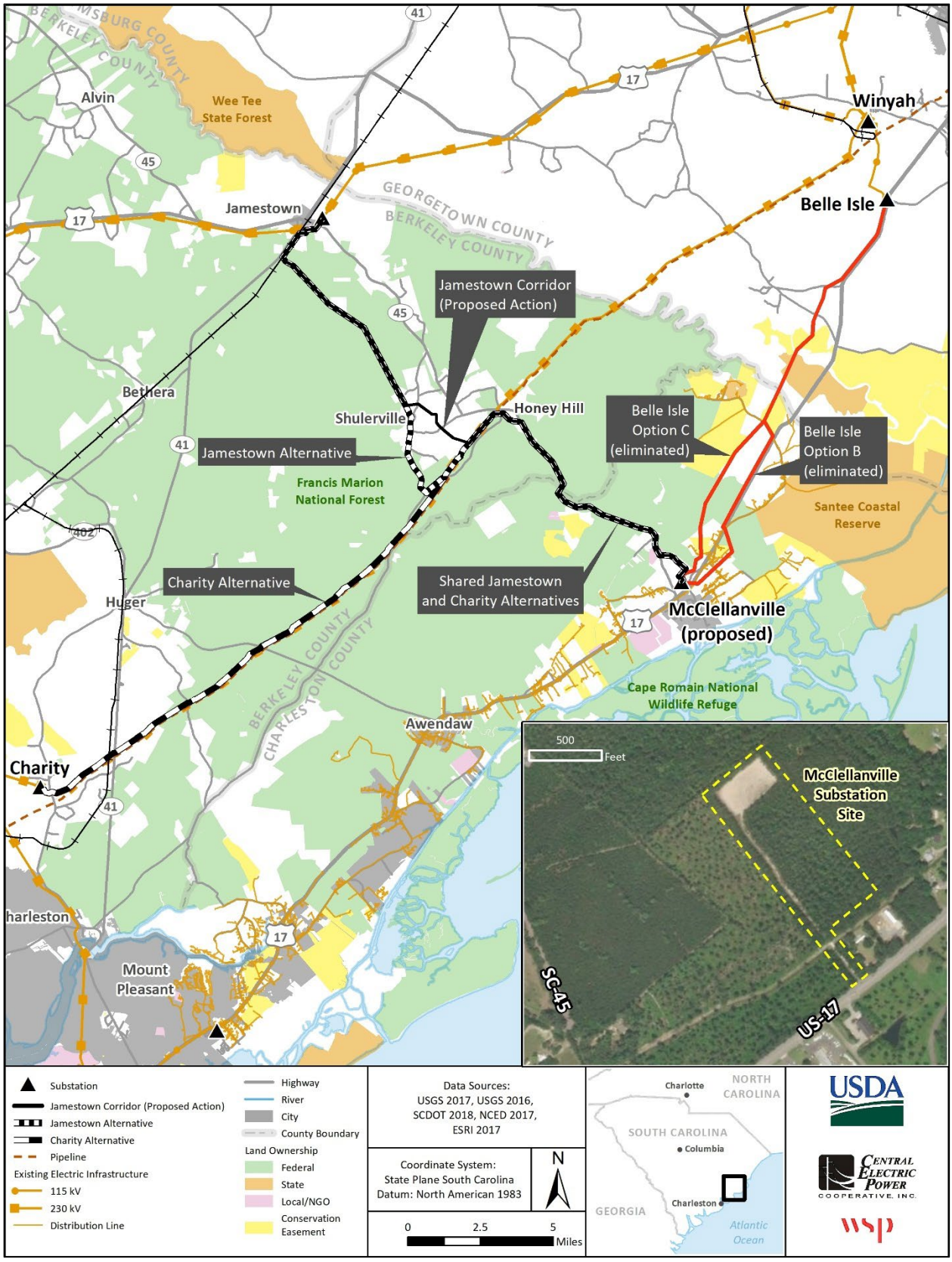


Figure 1.1-1. Proposed Action and Alternatives

1.2 Purpose and Need the Proposed Action

1.2.1 Central Electric's Purpose and Need

Central Electric is proposing the 115-kV transmission line in order to improve system reliability in the McClellanville Service Area, including reducing the number and duration of power outages that occur; and reducing the number of cooperative members affected. Central Electric is a not-for-profit electric generation and transmission cooperative that is the wholesale power supplier to its member-owners, South Carolina's 20 retail electric cooperatives that includes Berkeley Electric. Central Electric owns 799 miles of transmission lines, which are maintained by either Santee Cooper or New Horizon Electric Cooperative, Inc Organized in 1948, Central Electric designs and builds transmission lines that connect the state's bulk transmission system (the coordinated and integrated Central Electric/South Carolina Public Service Authority [Santee Cooper] system) and the member-cooperative system substations. The 20 electric cooperatives own Central Electric and are self-regulating for rates and follow state and federal construction standards.

South Carolina Code of Regulations, Chapter 103, Public Service Commission, §§104-304, states that no electrical utility supplying electric service to the public shall hereafter begin the construction or operation of any electric facilities, or of any extension thereof, without first obtaining from the commission a certificate that public convenience and necessity requires or will require such construction or operation. However, this regulation does not require electrical utilities to obtain a certificate for any extension within a municipality or district where they already operate, or for extensions within or to areas they already serve as part of their ordinary business, or for an extensions into contiguous areas not served by another electrical utility. Additionally, the commission issues certificates of Environmental Compatibility and Public Convenience and Necessity for transmission projects that are 125 kV or more. Central Electric's proposed transmission line is 115 kV.

Central Electric's Board of Trustees, which consists of the twenty cooperatives, identified the need to address system capacity, system reliability, human safety, and power quality issues resulting from the current use of an aging distribution line supplying electricity to Berkeley Electric and powering the McClellanville service area. Berkeley Electric must provide reliable electric service and power quality to all of its customers as equitably as practicable. Berkeley Electric is a not-for-profit electric distribution cooperative that was formed in 1940 to bring electric service to rural areas of coastal South Carolina. Berkeley Electric owns and operates more than 5,700 miles of distribution line, serving almost 100,000 member services in Berkeley, Charleston, and Dorchester counties.

Berkeley Electric currently takes electric service from a pole-mounted, metering point (the Awendaw metering point) near the town of McClellanville. The point is on a 22-mile-long, 23.9 kV distribution line owned and operated by Dominion Energy South Carolina, Inc. (Dominion). From the Awendaw metering point, Berkeley Electric's own distribution line runs an additional 18 miles. Together, Dominion and Berkeley Electric distribution lines are about 40 circuit miles. This one circuit provides service to around 1,500 of Berkeley Electric's cooperative members (Figure 1.2-1).

To provide service north of the Awendaw metering point, Berkeley Electric relies on an existing 40-mile-long circuit that suffers from issues related to poor reliability and power quality, including limitations from: (1) a winter weather operating agreement that forces Berkeley Electric to switch operations to meet system amperage limits, while putting residents at an elevated risk for outages and interrupted service, and (2) an outdated distribution network rather than higher efficiency transmission line service. It is also predicted that transmission lines in the area may be subject to more frequent and more intense hurricanes and ice storms due to climate change (Peters et al. 2006, Dumas et al. 2019, ASCE 2020, ClimateCentral.org 2022). Collectively, these factors result in substandard electric service for Berkeley Electric's cooperative

members in the McClellanville area. Additionally, the current level of system capacity cannot readily accommodate existing load demand nor future load growth in the McClellanville area. Studies of system reliability (Central Electric 2010a, McGavran 2017) indicate that a new 115-kV transmission line and associated substation is needed to serve the long-term needs of this area of coastal South Carolina by increasing capacity to distribute electricity and enhance the reliability of the delivery system.

It is for these reasons that Central Electric proposes to construct a new, 115-kV transmission line from the Jamestown Substation to energize the proposed McClellanville Substation. The existing 40-mile circuit would remain and provide redundant electric service to the area. The need for the Project is to address system capacity, system reliability, and power quality issues resulting from the current use of the aging distribution line, as detailed below.

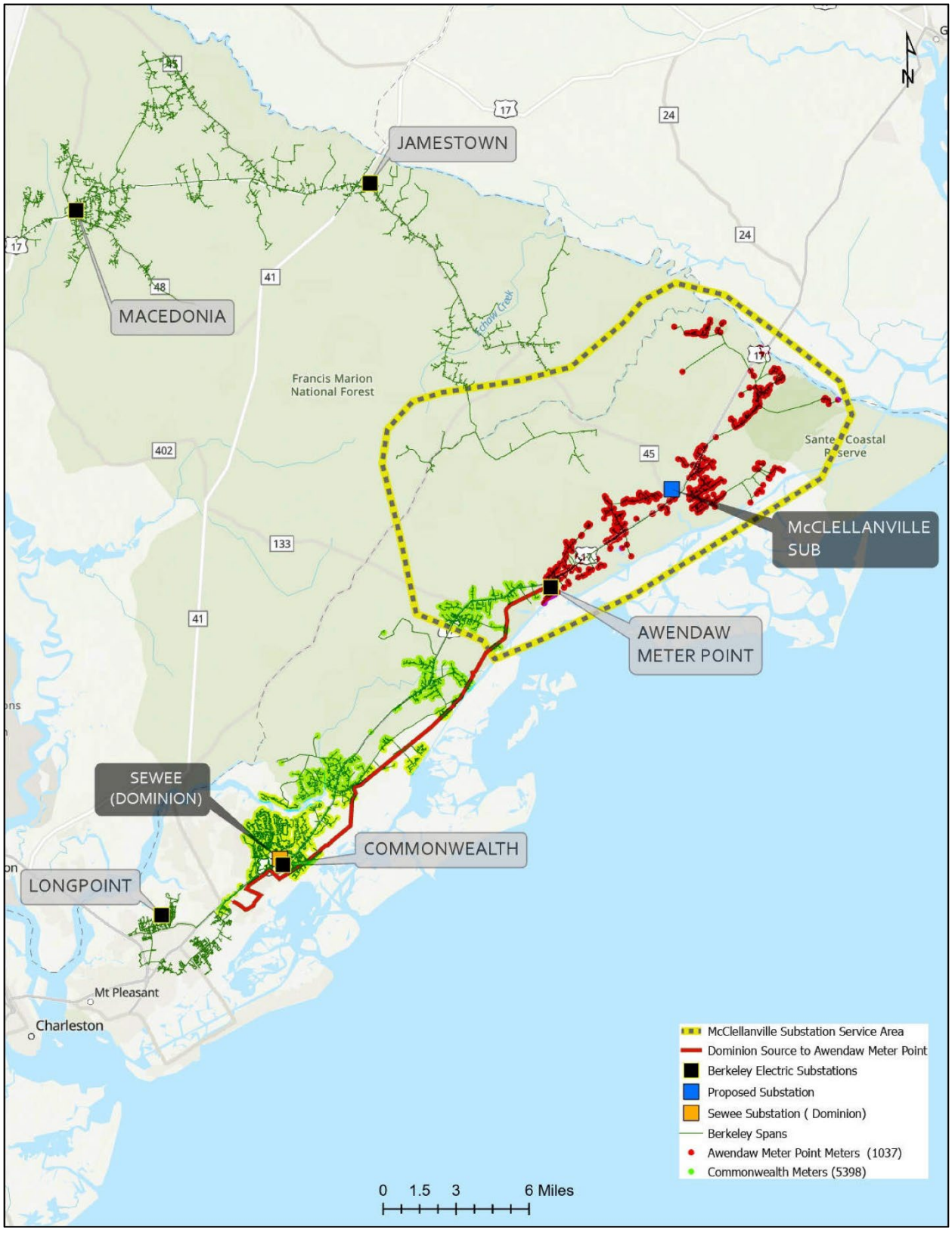


Figure 1.2-1. Existing Electric Infrastructure in the McClellanville Substation Service Area

1.2.2 Reliability Issues in the McClellanville Service Area

Central Electric has identified a number of root causes that have led to increased power outages, system capacity deficiencies and decreased service reliability to the Berkeley Electric customers in the McClellanville area. The Dominion line that currently serves the McClellanville area is built on wood poles and generally follows the route of U.S. Highway 17 north to McClellanville, more specifically, it parallels the Intracoastal Waterway just inland from the coastal barrier islands and the Atlantic Ocean, making it susceptible to reliability issues from storms, hurricanes and wind damage, and damage (or corrosion) from a high salt content environment. Other sections of the existing line parallel U.S. Highway 17 and many secondary roadways, thus exposing the line to traffic accidents. The long line exposure is through forested properties, increasing the likelihood of service interruption (tree fall, uncontrolled wildfire). Given that this is a single source of electricity to McClellanville, all these factors render this source inherently unreliable and fail to meet the N-1 contingency criterion, which is the threshold industry standard for acceptable power system reliability. N-1 contingency is defined by North American Electric Reliability Corporation and means that if any single component fails, the system will still operate as desired and maintain standard voltage. Although the analysis in this document does not use N-1 as criteria required for the Project, it was considered during the development of alternatives because it is the threshold industry standard for acceptable reliability.

It is also the case that, even if a new transmission line were built to replace this distribution line, Berkeley Electric would still be dependent on a Dominion resource that is, in turn, dependent on reliability in the Mount Pleasant area, as opposed to reliability throughout the Berkeley Electric and Central Electric-Santee Cooper area. Under the current system configuration, all power flows from Mount Pleasant to McClellanville, from Dominion's source. The Dominion 115-kV transmission system is not configured to supply network-level redundant service to the Dominion Substation at Hamlin, which is the Dominion source for Berkeley Electric.

McGavran (2017) reports that Berkeley Electric's outage information for each substation/metering point shows that 28 percent of all source outages throughout the system occur at the Awendaw metering point and that from November 2011 to November 2016, 40 separate outages inflicted 525,825 total member minutes that complete service was lost to the delivery point. More recently, Berkeley Electric reported 14 outages between 2017 and 2021 with over 1,212,785 total member minutes of outage during this time. McGavran (2017) reported that the most common reasons for the outages include, but are not limited to, complete line outages on the source line, outages that took out part of the line between the source, and the delivery which takes out the delivery point. McGavran (2017) concludes that these incidents and outages relate directly to long line length and location of the line.

Replacing the Awendaw metering point with a new substation served by a new, 115-kV transmission line would improve the reliability of electric service provided to cooperative members in this area to a level comparable to that experienced by other Berkeley Electric members. The proposed 115-kV transmission line would deliver power to the proposed McClellanville Substation. Berkeley Electric would then be able to separate the existing distribution line into three circuits to serve the customers in the McClellanville service area. Serving the same area with three circuits versus one circuit would reduce the number of customers affected by an outage on average and bring the frequency and duration of outages more in line with other circuits on Berkeley Electric's system.

This reduction would be possible for several reasons. First, because electric service to this area would be from a new, 115-kV transmission line, it is expected that this alone should bring an increase in reliability. Transmission lines are typically designed to a higher standard than distribution circuits; therefore, they should experience fewer outages than a typical distribution line. Second, because customers would be served by one of three new distribution circuits from the new substation, any outage on a single distribution

circuit would not affect the remaining circuits, effectively reducing the impacted number of customers by two-thirds for distribution related outage events. Third, the length of distribution line would be significantly less than the existing 40-mile-long line, enabling a quicker identification of the problem area and, therefore, a significantly quicker response.

Upon the rare case that the proposed 115-kV transmission line loses service, the Berkeley Electric distribution system would have back-up sources of electricity from the existing Awendaw metering point and from the existing Commonwealth Substation, both of which are served from a different transmission source (Dominion). Electric service could be restored from either or both of these backup sources, thus providing an N-1 contingency from the distribution perspective.

Between 2011 and 2021, the McClellanville Area Delivery Point has consistently had the lowest reliability (most outages) on the entire Berkeley Electric system. From 2011 to 2018, there were 1,182 total outage minutes at the McClellanville Area Delivery Point. Additionally, Berkeley Electric forecasts total load growth at the McClellanville Area Delivery Point to grow from 6,330 kW to over 7,700 kW, further challenging reliable service to Berkeley Electric's McClellanville residents.

1.2.2.1 Voltage Levels

Berkeley Electric is responsible for providing voltage levels within industry standards to its cooperative members. The most recent standard is American National Standards Institute C84.1-2006, the American National Standard for Electric Power Systems and Equipment—Voltage Ratings (60 Hertz). Berkeley Electric uses voltage regulators, which are electrical devices that automatically step voltages up or down to help keep voltages within the required ranges for members served from one of their distribution lines.

Typically, Berkeley Electric has one set of voltage regulators installed on each circuit at its substations. In the case of the Awendaw metering point and distribution line, two sets of voltage regulators installed by Dominion and Berkeley Electric boost line voltages to acceptable levels. This use of additional voltage regulators will become less effective with even the smallest amount of load growth in the McClellanville service area. In this service area, load growth on both Berkeley Electric's and Dominion's distribution lines directly affects the voltage level delivered to both utilities' customers.

A new transmission line would provide the needed voltage support so that the use of voltage regulators should be significantly reduced, if not eliminated, after construction. This would eliminate concerns regarding potential future reduction of effectiveness of these devices.

1.2.2.2 Voltage Sags

Voltage sags can occur when an object, such as a tree limb, contacts the distribution line. While every reasonable effort is made to keep distribution line ROWs as clear as possible, the number and magnitude of voltage sags are directly proportional to the length of the distribution line. This is due to the increased amount of "exposure" of the line to the environment and the technical characteristics of the conductor. When voltage sags occur, lights can either dim or go out, motors can stall or overheat, and computers can shut down or fail. As customers continue to add newer, more sensitive electronic equipment, voltage sags and power quality become greater concerns.

As stated above, a new transmission circuit would provide the needed voltage support so voltage sags, although still possible under certain outage scenarios, should be substantially reduced and brought in line with levels of service Berkeley Electric provides across their system.

1.2.2.3 Meter and Load Forecast

Since 2000, the number of member services served by Berkeley Electric has grown steadily by over 50 percent. Table 1.2-1 shows Berkeley Electric system growth trends. As the table shows, Berkeley Electric increased from 53,491 members in 2000 to 92,699 in 2020, while active member services increased from 63,293 to 109,241 during that period, an increase of 73 percent since 2020. This equates to an average annual growth rate of 3.7 percent.

Table 1.2-1. Berkeley Electric System Growth—Active Members Services and Membership

Year	Active Meters	Active Members
2021	115,154	97,189
2020	109,241	92,699
2019	104,779	88,649
2018	99,900	84,684
2017	98,304	80,590
2016	94,158	78,459
2015	90,395	75,826
2014	88,111	72,134
2013	85,307	71,451
2012	83,572	70,066
2011	82,322	68,619
2010	81,284	67,581
2009	75,156	66,257
2008	77,659	65,046
2007	76,526	63,818
2006	74,146	61,736
2005	73,044	60,059
2004	70,484	58,051
2003	67,593	56,479
2002	66,343	55,962
2001	64,891	54,384
2000	63,293	53,491

The Awendaw metering point tends to peak in the winter, driven by increased demand for electricity during severe weather conditions. The peak demand measured at the Awendaw metering point in 1994 was 3,453 kilowatts (kW). In 2000, that same demand was 4,505 kW. The largest peak demand maximum was 6,300 kW in 2014. The 2015 demand was 6,178 kW, and the 2016 peak was 5,579 kW. Peak demand growth is projected at about 2 percent annually (McGavran 2017).

1.2.3 Winter Weather Operating Agreement

In January 2017, since the publication of the Draft EIS in 2014, Berkeley Electric and Dominion entered into a Winter Weather Operating Agreement to provide reliable electric service to Berkeley Electric customers in the McClellanville area during periods of peak demand and to prevent system overload. The Winter Weather Operating Agreement indicates that Berkeley Electric load has grown to the point that in order to protect overload of Dominion facilities, Dominion must switch their feed from Berkeley Electric, forcing Berkeley Electric to source an alternate resource in real time to maintain service. This agreement states that Berkeley Electric, is allowed a maximum load threshold of 175 amps at the Awendaw metering

point. When temperatures are forecast to fall below 23 degrees Fahrenheit north of the Mount Pleasant and McClellanville areas, or if for any reason anticipated electrical demand is expected to exceed 175 amps per phase, Berkeley Electric will be dispatched to switch load off the Awendaw metering point and over to the Berkeley Electric Commonwealth substation via the circuit that ties with the Awendaw metering point. It is during these critical periods that the Berkeley Electric customers in the McClellanville area are most vulnerable and at the greatest risk of failure to receive service (when temperatures drop below 23 degrees Fahrenheit). The existing transmission line is a 23.9 kV L-L circuit that cannot deliver more than 175 amps to Awendaw. As such, the Project is justified by bringing in a resource with greater capacity that avoids having to do real-time switching to maintain system integrity. Although the Winter Weather Operating Agreement was developed to secure the greatest amount of reliable electric service during periods of the greatest demand, it subjects the Berkeley Electric customers in the McClellanville area to the greatest risk for outages and interrupted services during critical periods. Since the beginning of 2016, Berkeley Electric has had to switch the McClellanville system to Commonwealth 56 times.

1.2.4 Transmission Line Efficiency

The use of higher voltage lines to serve the customers of McClellanville would reduce line losses (energy lost during transmission) along the length of the line and increase the efficiency of power delivery to existing customers. Other operational advantages and efficiencies would be derived by adding the proposed substation. These advantages include the ability to shift load from other circuits or substations during outages or to handle growth in other areas.

1.3 Purpose and Need for Federal Action

Several agencies will use this EIS to inform decisions about funding, authorizing, or permitting various components of the Project. RUS, the lead federal agency, will determine whether or not to provide financial assistance for the Project. USFS, as a cooperating agency, will evaluate Central Electric's request for a ROW easement and an SUP to cross NFS lands. USACE, also a cooperating agency, will review the Applicant's wetland delineation, permit application, and compensatory mitigation plan for any unavoidable adverse impacts to wetlands and other waters of the U.S. in accordance with Section 404 of the Clean Water Act (CWA). The following sections describe the purpose and need for agency action, as considered for decision making by these federal agencies.

1.3.1 Rural Utilities Services

The Rural Electrification Act of 1936, as amended (7 USC §§901 et seq.), authorizes the Secretary of Agriculture to make loans for rural electrification and for the purpose of furnishing and improving electric and telephone service in rural areas. This Congressional Act authorizes the Secretary of Agriculture to make rural electrification and telecommunication loans, including specifying eligible borrowers, references, purposes, terms and conditions, and security requirements.

RUS is authorized to make loans and loan guarantees to finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Central Electric plans to apply for financing assistance from RUS for the Project. Financing for the purchase of the McClellanville Substation property was requested separately by Berkeley Electric and approved in 2003 prior to the initiation of the proposed transmission line. RUS's proposed federal action is to decide if providing financial assistance for the Project would impact environmental resources. Completing the NEPA process and addressing other technical and financial considerations are requirements for processing Central Electric's forthcoming application.

RUS's agency actions include:

- Providing independent engineering reviews of the purpose and need, engineering feasibility, and cost of the proposed Project;
- Ensuring that the proposed Project meets the borrower's requirements and prudent utility practices;
- Evaluating the financial ability of the borrower to repay its potential financial obligations to RUS;
- Reviewing and studying the alternatives to mitigate and improve transmission reliability issues;
- Ensuring that adequate transmission service and capacity are available to meet the proposed Project needs; and
- Ensuring that NEPA and other environmental requirements and RUS environmental policies and procedures are satisfied prior to taking a federal action.

RUS's decision regarding a request for financing assistance will be informed by the environmental analysis detailed in this EIS and RUS's technical concurrence or rejection of a project's need and/or applicant's selection of an electrical solution. Based on a project's need and proposed electrical solution that receives technical approval from RUS's engineering staff, Central Electric proposes the corridors(s) or locations, which are then evaluated by RUS. Program applicants typically propose and study multiple corridor

options. Because of planning and lead time, utilities may work to obtain easement agreements in advance. Disputes over the wording of an easement agreement are subject to state law because RUS does not regulate the siting of utility infrastructure, which includes transmission lines. After the conclusion of RUS's review processes, Central Electric may acquire easements through eminent domain proceedings with a court determining compensation under state law. This factor is outside the purview of RUS's NEPA process but may be considered by RUS decision-makers when making a financial assistance decision.

This EIS serves as a detailed written record of the environmental analysis completed for the Project and is intended to provide Agency officials with sufficient information to make a decision regarding the significance of the environmental impacts of its potential federal action. Publication of this EIS is not a decision on Central Electric's loan application and therefore not an approval of the expenditure of federal funds. Based on the analysis disclosed in this EIS, the RUS decision-maker will determine whether to provide financing assistance for the Project and, if issued, any Project-specific conditions established as part of the loan.

1.3.2 U.S. Forest Service

The proposed transmission line would cross a portion of the FMNF. Table 1.3-1 summarizes the acreage and length of a preliminary 75-foot ROW (37.5 feet on both sides of a proposed centerline) that would cross the FMNF. The USFS would need to issue a special use authorization for the Project to occupy NFS lands. Central Electric has applied to the FMNF for an SUP to construct and operate the Project on NFS lands, and USFS will use this analysis to make a decision related to the approval of an SUP. Any action taken by the Forest Supervisor must be consistent with the objectives of the FMNF Revised Land Management Plan (USFS 2017). The alternatives considered in detail in this EIS were reviewed for consistency with the standards and guidelines in this plan. Final routing would occur after completion of NEPA analysis when Central Electric would initiate design engineering.

Table 1.3-1. Corridor Length and Area of a Preliminary 75-foot ROW on NFS Lands

Corridor	Corridor Length (miles)	Corridor Length on NFS Lands (miles)	Preliminary 75-foot ROW Area on NFS Lands (Acres)[a]	Percentage of a Preliminary 75-foot ROW Area on NFS Lands[a]
Jamestown Corridor (Proposed Action)	23.3	13.5	123.2	58%
Jamestown Alternative	26.1	17.0	154.6	65%
Charity Alternative	31.1	21.5	195.5	69%

[a] A preliminary 75-foot ROW is used for calculations in this EIS because 75 feet is the maximum ROW width for Project construction and operations and maintenance (O&M). However, the final ROW width could be less in places where it overlaps existing road and utility ROWs. The final ROW would be located based on site-specific engineering, and environmental and cultural resource surveys.

The FMNF Forest Supervisor will issue a decision on whether to authorize an SUP to Central Electric.

1.3.3 U.S. Army Corps of Engineers

USACE has the responsibility to issue permits for structures or work in, over, under, or otherwise affecting navigable waters of the U.S. as defined at 33 CFR §322.2 and in authorization responsibility for applicants to discharge dredged or fill material into jurisdictional wetlands and other waters of the U.S. as defined at 33 CFR §323.2). The information gathered during the preparation of this EIS will be used by USACE when reviewing the proposed project. As described in Section 2.5, a wetland delineation will be conducted within the proposed ROW and adverse effects to wetlands and other waters of the U.S. will be avoided and minimized to the maximum extent practicable during the design phase of the proposed 115-kV transmission

project (measure WR-1). Based on the available information, adverse impacts to wetlands, navigable waters, and other waters of the U.S. cannot be avoided completely. Therefore, the Applicant will be required to submit an application for a Department of the Army (DA) pursuant to Section 404 of the CWA (33 USC §1251 et seq). Water resources and wetlands are discussed in Section 3.2.

1.3.4 U.S. Fish and Wildlife Service

USFWS regulates construction activities occurring in areas containing potentially suitable habitat for species protected under the ESA of 1973 (16 USC §§1531 et seq.). USFWS has been involved in interagency coordination as a participating agency for the Proposed Action and is responsible for ensuring compliance with the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). The ESA requires that any action that is authorized, funded, or carried out for this Project is not likely to jeopardize the continued existence of a species listed as threatened or endangered or result in the destruction or adverse modification of habitat of such species that is determined to be critical. RUS, as the lead Federal agency, is responsible for initiating consultation with the USFWS in accordance with section 7 of the ESA to determine the likelihood of effects on federally listed species. RUS has assessed the potential Project impacts on federally listed species and critical habitat as part of the EIS and prepared a biological assessment (BA) that analyzes the potential effects in more detail. The USFWS will review the BA and issue a biological opinion, if necessary. To offset any potential adverse effects of the Project on federally listed species, RUS could be required to further develop and carry out conservation programs to mitigate those effects.

1.4 Project Background

Identifying the route for the Project has undergone extensive planning for the evaluation of potential Project routes (corridors) and alternative technologies. A Draft EIS was initially prepared in 2014 and made available for public review and comment. An SDEIS was prepared in 2019 in response to comments on the 2014 Draft EIS. The preparation of an SDEIS was also necessary for three reasons: (1) the promulgation of new environmental regulations applicable to RUS on March 2, 2016 (7 CFR 1970 – Environmental Policies and Procedures), which replaced the former 7 CFR 1794; (2) the proposed alternatives would cross NFS lands and be subject to a revised FMNF Land Management Plan (USFS 2017); and (3) a new winter weather operating agreement (see Section 1.2.3) between Dominion and Berkeley Electric, which addresses load concerns during the winter months and increases the risk of system outages. Table 1.4-1 provides a timeline of planning efforts for the Project.

Based on the Alternatives Evaluation Study (Central Electric 2010a), it was determined that a new, 115-kV transmission line is the preferred alternative to provide the necessary electricity to the McClellanville area. In 2014, RUS issued a Draft EIS for the Project that evaluated six, 115-kV transmission line corridors originating from the Belle Isle Substation in Georgetown County, SC, and terminating in the McClellanville area of Charleston County. Following comments received from state, federal, and local agencies, and the general public, an independent engineering study was completed (McGavran 2017). This independent analysis supplemented previously developed studies and assessed the merit of the proposed alternatives based on need, impact, and cost, and offered insight into the most feasible power supply solution for the McClellanville service area. McGavran (2017) led to the elimination of four Belle Isle corridors, but two Belle Isle corridors (Options B and C) were retained and evaluated in the 2019 SDEIS. The Belle Isle corridors would traverse small areas of the FMNF and would cross the Santee River about one mile upstream of the U.S. Highway 17. However, as noted in section 1.1, the Belle Isle corridors have been eliminated from further consideration due to public opposition and potential impacts to the Santee Delta and cultural resources (see Section 2.2.2.4). Approximately 55 to 70 percent of the remaining alternative corridors that Central Electric evaluated would cross NFS lands, and therefore, required additional coordination with USFS concerning routing options that would cross NFS lands.

On March 31, 2017, FMNF issued a final Record of Decision approving its Revised Land Management Plan (USDA 2017), replaced the land management plan approved in 1996 and which was developed pursuant to the 2012 Forest Planning Rule. The 2017 land management plan established a strong commitment to an all-lands approach and emphasizes restoring the longleaf pine, maintaining habitats for at-risk plants and animals, and providing social opportunities and economic benefits to both forest visitors and local communities in coastal South Carolina. The new information contained in this plan was relevant to several resources potentially impacted by the Project, as well as some of the environmental concerns expressed by the public.

The development of alternative corridors for the Project is further described in Section 2.2 and a detailed description of the Proposed Action is provided in Section 2.3.2.

Table 1.4-1. Timeline of Planning Efforts for the Project

Date	Project Activity
November 2005	Central Electric prepared an *Alternatives Evaluation Study* (Central Electric 2005a) and *Macro-Corridor Study* (Central Electric 2005b)
November 29, 2005	RUS issued a *Notice of Intent to Hold Public Scoping Meetings and Prepare an Environmental Assessment* (70 FR 71462)
October 2007	RUS issued a scoping summary/decision report (RUS 2007)
September 2010	Central Electric revised the *McClellanville Power Supply Alternatives Evaluation Study* (Central Electric 2010a; Appendix A)
September 2010	Central Electric prepared a *Revised Macro-Corridor Study Report* (Central Electric 2010b; Appendix B)
September 17, 2010	RUS announced a notice of intent to hold a public scoping meeting and prepare an EIS (75 FR 56980)
September 29, 2010	RUS and USFS held a public scoping meeting in an open house format with a formal presentation at St. James-Santee Elementary-Middle School
February 2011	RUS prepared the McClellanville 115-kV Transmission Line Project Environmental Impact Statement Scoping Summary Report (RUS 2011a)
October 2011	RUS prepared the McClellanville Area 115-kV Transmission Line Project Environmental Impact Statement Addendum to Scoping Report (RUS 2011b)
May 29, 2014	RUS issued a Notice of Availability of a Draft Environmental Impact Statement and Notice of a Public Meeting (79 FR 30805)
June 3, 2014	RUS and USFS held an open house and public hearing at St. James Santee Elementary-Middle School regarding the Draft EIS
May 6 – June 23, 2014	Draft EIS public comment period
February 2017	Central Electric had an Independent Engineering Study (McGavran 2017) prepared (Appendix C)
2018 and 2019	Central Electric contracted wildlife and cultural resource studies on NFS lands within the corridors analyzed in this EIS
August 30, 2019	RUS issued a Notice of Intent and Availability of an SDEIS and Notice to Hold a Public Meeting (84 FR 45720)
September 17, 2019 September 19, 2019	RUS and USFS held public meetings on the SDEIS at the St. James-Santee Elementary-Middle School and Jamestown Baptist Church Life Center
July 2022	Central Electric filed for USFS Special Use Permit 299 to construct and occupy USFS lands for the Jamestown Alternative
January 2023 – May 2024	Central Electric performed a supplemental analysis of alternative corridors on private lands, including an assessment of RCW habitat, to further avoid and minimize potential impacts (Appendix D).

1.5 Required Federal and State Agency Approvals

Numerous federal, state, and local laws and regulations require that the Project obtain various permits, approvals, and coordination. Table 1.5-1 summarizes the statutes and requirements that would be applicable to the Project. Table 1.5-2 provides further detail about the agency actions that would be necessary for regulatory compliance. Central Electric would obtain necessary permits from counties and/or municipalities along the corridor (such as permits for road, highway, and flood channel encroachment and crossings and temporary use and occupancy permits). Central Electric would also obtain any necessary pipeline and utility crossing permits for crossings of natural gas pipelines and electrical transmission lines.

Table 1.5-1. Potential Statutes and Requirements Applicable to the Project

Requirement	Citation	Description
Potential Federal Requirements		
Archaeological Resources Protection Act	16 USC §470	The Act secures, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources and data which were obtained before October 31, 1979.
Bald and Golden Eagle Protection Act	16 USC §§668-668d	The Act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. A permitting program was established by USFWS Division of Migratory Bird Management. If activities require the removal or relocation of an eagle nest, a permit is required from the Regional Bird Permitting office.
Clean Air Act	42 USC §7401	The Act establishes NAAQS for certain pervasive pollutants. The Act establishes limitations on SO_2 and NOx emissions and sets permitting requirements. Authority for implementation of the permitting program is delegated to South Carolina Department of Environmental Services, Bureau of Air Quality.
Clean Water Act	32 USC §1251	The Act contains standards to address the causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. USEPA has delegated authority to the South Carolina Department of Environmental Services, Bureau of Water for certain sections of the CWA.
		Section 401 – Water Quality Certification for Wetlands. Requires certification for any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that the Project will not violate state water standards. Permits are issued by the South Carolina Department of Environmental Services, Bureau of Water.
	33 USC §1344	Section 404 of the CWA – Permits for Dredged or Fill Material. A Department of the Army (DA) permit is required for the discharge of dredged or fill material into wetlands and other waters of the U.S.. Permits are issued by USACE.

Requirement	Citation	Description
Coastal Zone Management Act	16 U.S.C. 1451 et seq.	The Act provides for the management of the nation's coastal resources, with a goal to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." Requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be consistent with enforceable policies of a State's federally-approved coastal management program.
Determination of No Hazard to Air Navigation	14 CFR §77	Requires that the Federal Aviation Administration issue a determination stating whether the proposed construction or alteration would be a hazard to air navigation and will advise all known interested persons.
Endangered Species Act	16 USC §§1531 et seq.	The Act aims to protect and recover imperiled species and the ecosystems upon which they depend. Section 7 of the Act requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species.
Farmland Protection Policy Act	7 USC §§4201 et seq.	The Act requires federal agencies to identify and quantify adverse impacts of federal programs on farmlands to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. The Act designates farmland as prime, unique, of statewide importance, and of local importance. The Act is overseen by USDA's National Resources Conservation Service.
Federal Highway Administration Encroachment Permits		The Department of Transportation's Federal Highway Administration requires encroachment permits for crossing federally funded highways.
Federal Insecticide, Fungicide and Rodenticide Act	7 USC §§136 et seq.	The Act registers and regulates pesticides.
Federal Land Policy Management Act	7 USC §§2801 et seq.	Requires that each federal land-managing agency have a program in place for controlling undesirable plant species and must implement cooperative agreements with the state. The Act requires that any environmental assessments or impact statements that may be required to implement plant control agreements must be completed within 1 year of the time the need for the document was established.
Federal Power Act	16 USC Chapter 12	Requires federal agencies to provide transmission service on non-discriminatory basis through compliance with established Tariffs.
Fish and Wildlife Conservation Act	16 USC §§2901 et seq.	The Act encourages federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. Mitigation methods should be designed to conserve wildlife and their habitats.
Fish and Wildlife Coordination Act	16 USC §§661 et seq.	The Act requires federal agencies to consult with USFWS, NMFS, and state resource agencies regarding the impacts on fish and wildlife resources if the Project affects water resources.
Magnuson-Stevens Fishery Conservation and Management Act	16 USC §1802	The act, as amended by the Sustainable Fisheries Act, requires the establishment of Essential Fish Habitat descriptions in federal fishery management plans and requires all federal agencies to consult with National Oceanic and Atmospheric Administration, Fisheries on activities that may adversely affect essential fish habitat.

Requirement	Citation	Description
Migratory Birds Treaty Act	16 USC §§703 et seq.	The Act protects birds that have common migration patterns between the U.S. and Canada. Under the Act, taking, killing or possessing migratory birds or their eggs or nests is unlawful. The Act requires a Special Purpose Permit when an applicant demonstrates a legitimate purpose to violate the Act.
National Environmental Protection Act	42 USC §§4321-4347	The Act requires agencies of the federal government to study the possible environmental impacts of major federal actions significantly affecting the quality of the human environment.
National Forest Management Act	16 USC §§1600-1614	The Act requires the Secretary of Agriculture to assess NFS lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the NFS. It is the primary statute governing the administration of NFS lands.
National Historic Preservation Act	16 USC §§470 et seq.	Section 106 of the Act requires federal agencies to take into account the effects of its undertakings on properties listed in or eligible for listing in the NRHP, including prehistoric or historic sites, and districts, buildings, structures, objects, or properties of traditional religious or cultural importance. The Act also requires federal agencies to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. The South Carolina State Historical Preservation Office must also provide consultation.
National Invasive Species Act	P.L. 104-332	The Act aims to prevent the introduction and spread of non-native invasive species. The primary focus of the Act is on ballast water management.
National Trails System Act	16 USC §§1241 et seq.	The Act requires federal agencies to conduct consultations in order to promote the preservation of public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the nation.
National Wild and Scenic Rivers Act	16 USC §§1271-1287	The Act requires that "In all planning for the use and development of water and related land resources, consideration shall be given by all federal agencies involved to potential national wild, scenic and recreational river areas." It further requires that "the Secretary of the Interior shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas shall be evaluated in planning reports by all federal agencies as potential alternative uses of water and related land resources involved."
Noise Control Act	42 USC §§4901-4918	The Act directs federal agencies to carry out programs in their jurisdictions “to the fullest extent within their authority” and in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.
Occupational Safety and Health Act	29 USC §§651 et seq.	The Act established regulations for the protection of worker health and safety. Central Electrics would be subject to Occupational Health and Safety Administration general industry standards and construction standards.
Pollution Prevention Act	42 USC §§13101 et seq.	The Act establishes a national policy for waste management and pollution control.
Resource Conservation & Recovery Act	42 USC §§6901 et seq.	The Act regulates the treatment, storage, and disposal of hazardous wastes. Central Electric would be required to manage hazardous wastes generated during construction or operation of the Project in accordance with the Act.

Requirement	Citation	Description
RUS Environmental Policies and Procedures	7 CFR §1970	RUS must make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. In assessing the potential environmental impacts of its actions, RUS will consult early with appropriate federal, state, and local agencies and other organizations to provide decision-makers with information on the issues that are significant to the action in question. Applicants are responsible for ensuring that proposed actions are in compliance with all appropriate RUS requirements. Environmental documents submitted by an applicant shall be prepared under the oversight and guidance of RUS. RUS will evaluate and be responsible for the accuracy of all information contained therein.
Potential Executive Orders (E.O.)		
E.O. 11593, Enhancement, Protection, & Management of the Cultural Environment		The executive order gives the federal government the responsibility for stewardship of our nation's heritage resources and charges federal agencies with the task of inventorying historic and prehistoric sites on their lands.
E.O. 11988, Floodplain Management		The executive order directs federal agencies to establish procedures to ensure that they consider potential effects of flood hazards and floodplain management for any action undertaken. Agencies are to avoid impacts to floodplains to the extent practical.
E.O. 11990, Protection of Wetlands		The executive order directs federal agencies to avoid short- and long-term impacts to wetlands if a practical alternative exists.
E.O. 12898, Environmental Justice		The executive order directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
E.O. 13007, Indian Sacred Sites		The executive order directs federal agencies, to the extent permitted by law and consistent with agency missions, to avoid adverse effects to sacred sites and to provide access to those sites to Native Americans for religious practices.
E.O. 13112, Invasive Species		The executive order directs federal agencies to prevent the introduction or to monitor and control invasive non- native species and provide for restoration of native species.
E.O. 13175, Consultation and Coordination with Indian Tribal Governments		The executive order directs federal agencies to establish meaningful consultation and collaboration with tribal governments to strengthen U.S. government- to-government relationships with Indian Tribes.
E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds		The executive order directs federal agencies to avoid or minimize the negative impacts of their actions on migratory birds, and to take active steps to protect birds and their habitats.
Potential State Requirements		
NPDES Permit		Central Electric must obtain a NPDES permit from South Carolina Department of Environmental Services for impacts greater than 1 acre in size.
State Road Crossing Permits		Central Electric must obtain permits from South Carolina Department of Transportation (SCDOT)
State Highway Crossing Permits		Central Electric must obtain permits from SCDOT
State Utility Occupancy Permits		Central Electric must obtain permits from SCDOT

Requirement	Citation	Description
Permits to Cross State Wildlife Management Areas		Central Electric must obtain permits from South Carolina Department of Natural Resources (SCDNR)
Consultation/ Approval regarding State-listed species of concern		Central Electric must obtain permits from SCDNR
Consultation regarding non-native invasive plants		Central Electric must obtain permits from SCDNR

Table 1.5-2. Agency Actions Necessary for Regulatory Compliance and Project Approval

Agency	Permit, Regulation, or Consultation	Agency Action
Rural Utilities Service	NEPA	• Review and approve NEPA documentation. • Ensure that all actions associated with the Project are in compliance with applicable federal, state, and local regulations, including section 7 consultation for threatened and endangered species, section 106 consultation for cultural resources, Clean Water Act permitting, and other statutes listed above in Table 1.5-2. • Decide whether to approve financing assistance for the Project. • Sign Record of Decision.
	Endangered Species Act	• Prepare and submit a biological assessment for consultation with USFWS and NMFS in accordance with the implementing regulations under section 7 the ESA.
	Coastal Zone Management Act	• Confirm that the project complies with the enforceable policies of the consistent to the maximum extent practicable with the enforceable policies of South Carolina's Coastal Zone Management Program..
	National Historic Preservation Act (NHPA) Section 106	• Lead agency under Section 106 responsible for leading consultation and development of a Programmatic Agreement (PA).
	7 CFR 1970 (Environmental Policies and Procedures)	• Consult with appropriate agencies to provide decision makers with information to ensure that decisions and actions are based on an understanding of environmental consequences.
	E.O. 11988, *Floodplain Management*	• Avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of flood plains.
	E.O. 11990, *Protection of Wetlands*	• Ensure that short- and long-term impacts on wetlands are avoided where practical alternatives exist.
	E.O. 13112, *Invasive Species*	• Do not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S.. • Implement all feasible and prudent measures to minimize risk of harm from introduction or spread of invasive species.
	E.O 13175	• Consultation and coordination with Indian Tribal representatives.
U.S. Army Corps of Engineers	Clean Water Act (CWA), Section 404	• Regulate and provide permits for the discharge of dredged or fill material in jurisdictional wetlands of waters of the U.S..
U.S. Forest Service	Federal Land Policy and Management Act	• Implement operating plans. • Grant easement for the ROW across lands within FMNF.
	National Forest Management Act	• Grant a special use permit for location of transmission line under the Revised Land Management Plan for the FMNF.

Agency	Permit, Regulation, or Consultation	Agency Action
	E.O 13007 *Indian Sacred Sites on Federal Lands*	• Avoid adverse effects to sacred sites. • Provide access to sacred sites to Native Americans for religious practices.
U.S. Fish and Wildlife Service/ National Marine Fisheries Service	Endangered Species Act Section 7	• Provide guidance for avoiding and minimizing impacts to threatened and endangered species and critical habitat. • Participate in section 7 consultation. • Review the biological assessment. • Provide a biological opinion, if necessary.
	Migratory Bird Treaty Act	• Avoid/minimize impacts to migratory birds and habitat.
	Bald and Golden Eagle Protection Act	• In accordance with the permitting program established by the Division of Migratory Bird Management, if activities require the removal or relocation of an eagle nest, a permit is required from the Regional Bird Permitting Office.
	Fish and Wildlife Conservation Act	• Ensure that mitigation measures conserve wildlife and wildlife habitat.
	Fish and Wildlife Coordination Act	• In coordination with South Carolina Department of Natural Resources, provide consultation if it is determined that the Project would affect water resources.
	CWA, Section 404	• Work with U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency to ensure regulation of discharge of dredged or fill material in jurisdictional wetlands of water of the U.S..
	National Invasive Species Act	• Prevent the introduction and spread of nonnative invasive species as a result of Project activities.
	Magnuson-Stevens Fishery Conservation and Management Act	• Provide consultation if the Project may adversely affect Essential Fish Habitat.
USDA-Natural Resources Conservation Service	Farmland Protection Policy Act	• Identify and quantify adverse impacts that the Project may have on farmlands. • Minimize contribution to the unnecessary and irreversible conversion of agricultural land to non- agricultural uses.
	Farmland Conversion Impact Rating	• Provide consultation to minimize farmland conversion impacts. • Issue an Impact Rating.
Department of Transportation, Federal Highway Administration	Encroachment Permits	• Issue road crossing permits. • Issue state highway crossing permits; Issue state utility occupancy permits.
U.S. Department of Labor	Occupational Safety and Health Act	• Ensure that Occupational Health and Safety Administration standards are met during the construction, maintenance, and operation of the Project.
Federal Aviation Administration	Determination of No Hazard to Air Navigation	• Issue a determination stating whether the Project would be a hazard to air navigation.
U.S. Environmental Protection Agency	NEPA	• Provide NEPA document review and rating.
	Federal Insecticide, Fungicide, and Rodenticide Act	• Ensure that the use of insecticides, fungicides, and rodenticides is done in compliance with federal Insecticide, Fungicide, and Rodenticide Act regulations.
	Pollution Prevention Act	• Ensure that the Project is designed to comply with national policies for waste management and pollution control.
	Resource Conservation and Recovery Act	• Ensure that the treatment, storage, and disposal of hazardous wastes associated with the Project would be handled in accordance with Resource Conservation and Recovery Act regulations.

Agency	Permit, Regulation, or Consultation	Agency Action
	Noise Control Act	• Ensure that the Project is designed in a manner that furthers the national policy of promoting an environment free from noise that may jeopardize health and welfare.
	Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*	• Identify and address disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.
SCDNR Wildlife and Freshwater Fisheries Biology & Management	Special use permit	• Issue permit for crossing state wildlife management area.
	State-listed species of concern	• Consultation and approval regarding state-listed species of concern.
	Non-native invasive plants	• Consultation regarding non-native invasive plants.
	Fish and Wildlife Coordination Act	• In coordination with the U.S. Fish and Wildlife Service, provide consultation if it is determined that the Project would affect water resources.
South Carolina Department of Environmental Services, Bureau of Water	Federal Water Pollution Control Act of 1972 (Public Law 92-500), as amended by the CWA of 1977 (Public Law 95-217), as amended by the Water Quality Control Act of 1987 (Public Law 100-4). [33 USC §§1251 et seq.], the Pollution Control Act (South Carolina Code of Laws, 1976, Title 48, Chapter 1)	• Ensure that the applicant has a Storm Water Pollution Prevention Plan as required under the South Carolina Pollutant Discharge Elimination System.
South Carolina Department of Environmental Services, Bureau of Coastal Management	South Carolina Coastal Management Act of 1977 and Federal Coastal Zone Management Act	• Coastal Zone Consistency certification.
South Carolina Department of Archives and History	National Historic Preservation Act (NHPA) Section 106	• Participate in Section 106 consultation with RUS (as lead agency) and other consulting parties.
South Carolina Department of Highways and Public Transportation	Encroachment Permits	• Issue road crossing permits. • Issue state highway crossing permits. • Issue state utility occupancy permits.
Berkeley and Charleston and Counties	Local Issuing Authority for National Pollutant Discharge Elimination System and Storm water Pollution Prevention Plan permit	• Issue Storm water Pollution Prevention Plan permits.

1.6 Public Participation

This section provides an overview of past public involvement efforts completed to date for the Project. On November 29, 2005, RUS announced its intent to hold public scoping meetings and prepare an environmental assessment (70 FR 71462). A public scoping open house meeting was held on December 14, 2005, and the public was notified of this event by letter and by radio and newspaper announcements. Nearly 200 people, mostly local residents, attended the open house. After the first scoping meeting in 2005, RUS decided to re-scope the Project because of a change in the need to prepare an EIS, changes in potential

transmission line corridors, and changes in updated planning documents that incorporated new and updated data (i.e., the Alternatives Evaluation Study [Appendix A] and Macro-Corridor Study Report [Appendix B]).

On September 17, 2010, RUS announced its intent to hold a public scoping meeting and prepare an EIS (75 FR 56980). In addition to the *Federal Register* notice, RUS notified federal, state, and local agency representatives about the Project by mail and invited them to attend an agency scoping meeting. A list of federally recognized Tribes near the Project area was compiled, and tribal leaders and Tribal Historic Preservation Officers were also notified by mail and invited to attend the agency scoping meeting. An agency scoping meeting was held on September 29, 2010, at the Sewee Visitor and Environmental Education Center, 5821 Highway 17 North, Awendaw, South Carolina 29429. Fifteen agency participants, representing USFS, SCDNR, USFWS, South Carolina Forestry Commission, and the town of McClellanville, attended the meeting. No representatives of federally recognized Tribes attended; however, representatives of the Catawba Indian Nation requested to be a consulting party under Section 106 of the National Historic Preservation Act (NHPA), and the Eastern Shawnee Tribe requested to be informed if cultural materials were encountered as the Project progressed.

More details about public participation prior to the 2014 Draft EIS can be found in the McClellanville 115-kV Transmission Line Project Scoping Report (RUS 2011a) and Scoping Addendum (RUS 2011b). The primary environmental issues of the Project identified by comments were the effects of its construction and operation on surface water; forest stands; rare threatened and endangered species; aesthetics; surface water, specifically crossing the Santee Delta Wildlife Management Area (WMA); wetlands; and cultural resources and the potential for spreading invasive species.

On May 29, 2014, RUS announced the issuance of a Draft EIS for the Project (79 FR 30805), informing the public and interested parties about the Project and inviting the public to comment on the scope, proposed action, and other issues addressed in the DEIS. A public meeting was held regarding the Draft EIS on June 3, 2014, at St. James-Santee Elementary-Middle School in McClellanville, South Carolina. RUS also held meetings about cultural resources for the purpose of consultation under Section 106 of the NHPA, and with cooperating agencies to solicit comments on the Draft EIS. Comments on the Draft EIS were due by June 23, 2014, and RUS received comments from the U.S. Environmental Protection Agency (USEPA), USACE, National Marine Fisheries Service (NMFS), USFWS, SCDNR, South Carolina Fish, Game and Forestry Committee, Coastal Conservation League, Ducks Unlimited, Historic Charleston Foundation, South Carolina Audubon Society, Avian Conservation Center (Center for Birds of Prey), South Carolina Chapter of the Wildlife Society, South Carolina Waterfowl Association, Cape Romain Bird Observatory, Lowcountry Open Land Trust, The Nature Conservancy, St. James-Santee Restoration and Preservation Committee, Evening Post Industries, White Oak Forestry Company, and 197 individuals. Scoping was previously conducted for the initial Draft EIS from December 2005 to January 2006.

NEPA requires that agencies responsible for preparing environmental review documents provide the public with information about projects and offer the public the opportunity to identify important issues. The CEQ regulations (40 CFR Parts 1500-1508) stipulate that agencies shall prepare supplements to either draft or final EIS if: (1) the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (2) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts (40 CFR §1502.9[c]). The CFR for RUS provides specific guidance for supplemental EISs under 7 CFR §1970.155, *Supplementing EISs*. This guidance states that a supplement to a draft or final EIS will be announced, prepared, and circulated in the same manner (exclusive of meetings held during the scoping process) as a draft and final EIS (see 7 CFR 1970.154). In accordance with 7 CFR §1970.155(a), supplements to a draft or final EIS are to be prepared if:

1. There are substantial changes in the proposed action that are relevant to environmental concerns; or

2. Significant new circumstances or information pertaining to the proposal arise which are relevant to environmental concerns and the proposal or its impacts. RUS has prepared this EIS to meet its requirements under NEPA and CEQ and RUS regulations.

Following comments received from agencies and the general public, in 2017, Central Electric commissioned, at the request of RUS, the McClellanville 115-kV Transmission Line Independent Engineering Study (McGavran 2017, Appendix C) to evaluate and supplement the previously developed studies and assess the merit of the proposed alternatives based on need, impact, and cost as well as offer additional insight and information that may be relevant to assessing each potential solution. Section 2.2 provides further detail about the subsequent development of alternatives, including the identification of the preferred alternative.

On August 30, 2019, RUS announced the availability of the SDEIS for the Project (84 FR 45720), which included new analysis of the Jamestown and Charity alternatives and two of the original Belle Isle corridors. On September 17 and 19, 2019, RUS conducted public meetings at St. James-Santee Elementary-Middle School in McClellanville, South Carolina and at Jamestown Baptist Church Life Center near Jamestown, SC, respectively. Comments on the SDEIS were due by October 22, 2019, and RUS received comments from the USEPA, USACE, NMFS, USFWS, SCDNR, South Carolina Fish, Game and Forestry Committee, Coastal Conservation League, Ducks Unlimited, Historic Charleston Foundation, South Carolina Audubon Society, Avian Conservation Center (Center for Birds of Prey), South Carolina Chapter of the Wildlife Society, South Carolina Waterfowl Association, Cape Romain Bird Observatory, Lowcountry Open Land Trust, The Nature Conservancy, St. James-Santee Restoration and Preservation Committee, Evening Post Industries, White Oak Forestry Company, and 197 individuals. An analysis of all comments on the 2014 Draft EIS as well as the SDEIS are provided in this EIS in Appendix E.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

RUS regulations (7 CFR 1970.5 (b)(3)(iii)) require the utilities to "develop and document reasonable alternatives that meet their purpose and need while improving environmental outcomes." This chapter describes the Proposed Action and alternatives considered for the construction and operation of the McClellanville 115-kV Transmission Line. The existing distribution line, which also serves Dominion customers in the town of McClellanville, would remain in place and be maintained for service to these customers and serve as a potential backup supply source.

RUS considered and eliminated other reasonable alternatives to the Proposed Action. Project alternatives were screened at the time of the 2014 Draft EIS and 2019 SDEIS to determine their ability to meet the purpose and need and to provide a comparison of Project effects. The following sections describe the general process used to develop the alternatives, as well as the specific formulation of the alternatives; the alternatives that RUS eliminated from detailed study; and the alternatives evaluated in detail in this document.

2.2 Development of Alternatives

RUS has established guidance documents for determining whether a proposed project for which a loan or loan guarantee is both technically and financially feasible. Per RUS guidance in Rural Development (RD) Instruction 1970-O, a multi-stage alternatives development and screening process was conducted for the Project. Other potentially feasible alternative technologies were considered and alternative locations for the Project were evaluated. As stated in the Independent Engineering Study (McGavran 2017), to ensure quality of service, an ideal solution to poor power system reliability in the McClellanville area should meet N-1 criterion by providing multi-source service to the service area so that full service may be quickly restored with one source out of service. Therefore, the N-1 criterion was a primary factor considered in the evaluation of whether each alternative would be effective at addressing the system reliability problem. This evaluation, as well as other considerations, are detailed further below.

2.2.1 Alternative Technologies

First, Central Electric completed an Alternatives Evaluation Study (Central Electric 2005a), which determined that a new transmission line is the preferred solution to provide the necessary power to the McClellanville area. However, RUS, in coordination with Central Electric, also analyzed a range of technological alternatives to determine if they would be appropriate to meet the Project purpose and need.

Several electrical and system options were considered early in the Project development process to meet the purpose and need, including new on-site energy generation, distribution, and conservation options. While comments received on the 2014 Draft EIS recommended that these alternatives receive further consideration in lieu of the lines proposed in the Draft EIS to protect environmental, aesthetic, and cultural resources, these options were not carried forward for the reasons discussed below.

The McClellanville area suffers from a combination of load growth, poor electrical reliability, and poor power quality, which negatively impacts the Berkeley Electric customers in the McClellanville area. Studies to evaluate solutions to these issues considered distribution system upgrades, transmission and substation capital investment, and onsite generation. Of these, utilization of the McClellanville Substation and a new 115-kV transmission line from a reliable source resolves the Project necessity issues completely and

permanently. A distribution solution would only be temporary and require a transmission solution at some point (McGavran 2017).

Below is a brief discussion of these options considered in the Alternatives Evaluation Study (Central Electric 2010a) or Independent Engineering Study (McGavran 2017) that were not carried forward for further analysis.

2.2.1.1 New Generation at McClellanville Substation Site and Energy Storage

Installing onsite generation at the proposed McClellanville Substation was considered in lieu of building a new transmission line to energize the facility. Onsite generation could take two forms and have various functions. First, the nature of onsite generation could be either full load support and operation or confined to peaking and emergency times. A base load solution would mean running the generation system as the primary resource at all times. McGavran (2017) evaluated new generation as part of the Independent Engineering Study.

Three 2-megawatt diesel generators were considered for installation. These generators would be capable of serving up to 6 megawatts. Additional generator units would be installed as needed to serve load growth and so that existing individual units could be taken out of service temporarily for maintenance and repair.

Use of diesel or natural gas generators would introduce a new stationary source of air pollution in the McClellanville area, requiring state permitting under the Clean Air Act and limits on duration and frequency of operations in a new stationary source permit.

Additionally, the largest expense associated with onsite generation is the cost of fuel, which is not only expensive for generation purposes but also, as a commodity, fluctuates in price. McGavran (2017) estimated that the onsite diesel generation option could cost up to $20,000,000. Onsite generation is not an economical alternative for the identified electrical problem. This alternative would not guarantee or eliminate the need for a future transmission line to provide reliable service to the McClellanville area.

An alternative to diesel generators is onsite renewables and batteries (i.e., industrial solar and battery combination) designed to accommodate the forecasted load. Large-scale solar projects do provide carbon-free electricity to the grid and, when used in combination with battery storage solutions, can simulate baseload source. This option, however, does not provide full service because the size of the solar farm and the battery storage would need to be exceptionally large to provide multiple days of electricity if the current distribution lines were out of service. Onsite renewable generation does not meet N-1 criterion and utility scale solar is land intensive. Furthermore, this option does not address the evaluation criteria based on the purpose and need for the Project.

2.2.1.2 Rebuild Existing Distribution Line

Rebuilding the existing distribution line system serving the McClellanville area was evaluated. For planning purposes, the McClellanville Load Control Point (McLCP) was identified at the intersection of U.S. Highway 17 and Tibwin Road. The McLCP represents the point where rebuilt distribution lines supplying power to the McClellanville area from the Commonwealth and Jamestown substations would converge and from which distribution lines would branch out to serve the electrical load in the McClellanville area.

The distribution line rebuild alternative would require capital cost improvements associated with both rebuilding existing distribution line segments and constructing new distribution line segments serving the McLCP. This alternative would also require capital cost improvements at the existing Commonwealth and Jamestown substations. Improvements at both substations would be required so that the McClellanville area

could be served from Jamestown whenever an outage occurs either at Commonwealth Substation or somewhere along the distribution line connecting Commonwealth Substation with the McLCP.

A 30-year load growth projection was used to evaluate the requirements of the distribution line rebuild alternative. Per Central Electric's current Long-Range Engineering Plan, specific design features of this alternative would include:

- Installation of a second power transformer in both the Commonwealth and Jamestown substations to isolate the McLCP load and avoid disruptions to existing customers served from the Jamestown and Commonwealth substations.

- Installation of approximately 2 miles of new underground distribution line (D/C 1000MCM UG) through the FMNF to extend the existing Jamestown circuit to U.S. Highway 17.

- From the Jamestown Substation, installation by Berkeley Electric of 18 miles of additional new D/C 750MCM UG express conductors, with additional voltage regulators, electronic re-closers with Supervisory Control and Data Acquisition operability, and switches needed to address contingencies at the McLCP.

- From the Commonwealth Substation, rebuilding by Berkeley Electric 4 miles of D/C 477 aluminum conductor steel reinforced (ACSR) OH conductor to T/C 477 ACSR OH conductor, convert 14.5 miles of S/C 477 ACSR OH conductor to D/C 477 ACSR OH conductor, and construct 1.5 miles of new D/C 1000MCM UG conductor needed to complete the circuit along U.S. Highway 17. As with the Jamestown circuit, additional voltage regulators, electronic re-closers with Supervisory Control and Data Acquisition operability, and switches needed to address contingencies at the McLCP would be required.

This alternative would not meet the N-1 criterion as it would not provide redundant service. RUS estimated the capital costs for rebuilding the distribution to be $9,150,000[2] (Central Electric 2010a).). Because this alternative would cost significantly more to implement over the transmission line alternative and would not guarantee or eliminate the need for a future transmission line to provide reliable service to the McClellanville area, it was removed from further consideration.

2.2.1.3 Energy Conservation and Distributed Renewable Generation

Central Electric is working with Berkeley Electric and its other member distribution systems in South Carolina to promote and improve energy efficiency and conservation. For more than 30 years, Central Electric and its member-cooperatives, including Berkeley Electric, have invested in various voluntary demand side management and energy efficiency and conservation programs for cooperative members to participate in. Central Electric and Berkeley Electric will continue to pursue and promote energy efficiency improvements, increased conservation, use of renewable resources, and time of day rate adjustments. These efforts will reduce and better contribute to managing load growth, which can strain and challenge the existing distribution system. It is important to note that energy conservation and distributed renewables generation alone cannot reliably meet the forecasted load requirements and the continued load growth in the McClellanville area. The existing 40-mile distribution line will continue to experience outages, require voltage regulators, and still be susceptible to voltage sags. Energy conservation and renewable energy

[2] RUS's estimate in 2010 of $6.9 million was updated to 2022 dollars using https://www.usinflationcalculator.com/, which calculated a cumulative increase of 32.6 percent since then.

sources were removed from further consideration because reliability would continue to be an issue in the McClellanville service area.

2.2.1.4 Battery Storage in McClellanville

Another alternative to onsite generation is energy storage that would in effect act as a support system to the existing distribution system. McGavran (2017) evaluated three possible alternatives: (1) grid-level battery storage at the McClellanville site; (2) behind the meter technology at an individual member's premise; and (3) a mix of grid-level battery and behind the meter technology. Overall, McGavran (2017) concludes that each of these potential solutions have a number of drawbacks that do not address the need because each requires significant system upgrades; energy storage does not factor in growth; energy storage behind the meter would require major overhauls of Berkeley Electric member rules and regulations and forced compliance; and the estimated back up would only cover approximately two-thirds of all outages.

Burns & McDonnell (2020) conducted a high-level analysis of two battery energy storage system use cases: (1) peak shaving when loads approach or exceed the contractual current limits on the Dominion circuit, and (2) a larger battery energy storage system to accommodate the entire circuit in the event of an outage, commonly known as "islanding". Battery technologies investigated in the two use cases were lithium-ion or flow battery technology. Due to the nature of the use cases and battery technologies, Central Electric estimated a 24,200-kWh system for peak shaving and 75,000-kWh system for "islanding." Critical to either is the interconnection and reliability impacts. One of the challenges with solving islanding issues with a battery energy storage system is ensuring the circuits communicate so that the system or other circuits don't trip into faults resulting in loss of the entire islanded system. Appendix C also includes Central Electric's complete review of the use case, including updated cost information. In 2022, Burns & McDonnell (2022) provided updates on capital cost and applicable battery technologies.

2.2.2 Alternative Locations

Once the Alternative Evaluation Study was complete and the transmission alternative was selected as the best method to meet the purpose and need, a Macro-Corridor Study (Central Electric 2005b) was completed that identified suitable areas (opportunities) for siting the transmission line and unsuitable areas (constraints) to be excluded or avoided based on environmental, engineering, economic, land use, and permitting constraints. Central Electric followed the RUS (2016) macro-corridor study guidance by using a phased approach to siting the proposed transmission line.

Following public scoping and stakeholder input (see Section 1.6), the Macro-Corridor Study was revised (Central Electric 2010b, Appendix B) to include updated data and additional analysis that resulted in a new set of corridors that served as the basis for the Draft EIS. Accordingly, the Alternatives Evaluation Study was also revised (Central Electric 2010a). Both studies were reviewed and approved by RUS and were made available to the public and agencies for review and comment during the 2010 scoping period. The information and analyses from the Alternatives Evaluation Study (Appendix A) and the Revised Macro-Corridor Study (Appendix B) were incorporated by reference into the 2014 Draft EIS. Details about the Belle Isle corridors evaluated in the Draft EIS are provided below in Section 2.2.2.3.

In addition, potential Project corridors were developed using geographic information system (GIS) data sets, aerial photography, and a diverse routing team, which included representatives from RUS, Central Electric, USFS, Berkeley Electric, Louis Berger, and DiGioia Gray Associates. The potential corridors were developed to minimize effects on residences, sensitive habitats, conservation lands, and cultural and historical resources, maximize paralleling of existing linear infrastructure, and avoid circuitous paths.

2.2.2.1 New 230/115-kV Switching-Stations and Associated Transmission Infrastructure

The Honey Hill and Britton Neck 230/115-kV options considered in the Macro-Corridor Study (Central Electric 2010b) would require the construction of a new 230/115-kV transmission substation that would tap the existing Winyah-Charity 230-kV transmission line owned by Santee Cooper. New, 115-kV service (the required voltage to energize the McClellanville Substation) cannot be taken directly from a 230-kV source without "stepping down" the voltage, which is the purpose of the transformer and associated equipment installed in a 230/115-kV transmission substation. A new, 230/115 kV substation would require land clearing and grading of at least 10 acres of land adjacent to the Winyah-Charity 230-kV transmission line. In addition, tapping a 230-kV line requires owner (Santee Cooper) and state public service commission approvals as it could affect the reliability of the bulk transmission system in the region. Due to this potential impact on reliability, the tapping of a 230-kV line poses a recognizable security risk to the overall transmission system and would need to be considered and approved prior to this decision process considering it a reasonable alternative. As such, a new 230/115-kV transmission substation constructed to energize one new 115-kV transmission line and to serve one new 115/25-kV distribution substation is an expensive and unreasonable alternative that is typically not supported by public service commission's due to the relatively high costs to the rates customers would pay for relatively little additional transmission benefit, and therefore was eliminated from further consideration. A 230/115-kV substation normally serves several networked 115-kV substations, not just one.

2.2.2.2 Commonwealth Corridor

The Commonwealth corridor was suggested, during the scoping process and in comments on the Draft EIS, by stakeholders who recommended that a new transmission line be co-located with existing distribution corridors and major roads (specifically, U.S. Highway 17) to minimize effects on the natural environment. In addition to sharing similar engineering concerns as the Charity Alternative (relatively long line and contingency concerns), the Commonwealth corridor also originates from the same power source as the Awendaw metering point (the Dominion Hamlin Substation); thus, it is not providing an alternate source in case of voltage loss at Hamlin. The existing distribution line serving the McClellanville area originates from the Hamlin Substation, and a new transmission line originating from the same area would locate both lines into the same corridor and expose both the new transmission line and what would become the back-up distribution line to a common outage scenario (e.g., a hurricane or tornado). This design violates the N-1 criterion for designing transmission infrastructure because there would be no spare electric service option for the McClellanville area if there were to be an equipment failure at the Hamlin Substation. Furthermore, this corridor would be constructed in populated rights-of-way (ROWs) that are present in and around the Commonwealth Substation just outside the city of Mt. Pleasant, SC. This area is significantly urbanized with many residences, educational, medical, and commercial centers that make it difficult and costly to place transmission lines. This corridor would also pose cost and time problems during its operational phase relating to access for Project operations and maintenance (O&M). The total line length from Commonwealth to Awendaw is 24 miles plus an additional 3 miles of added line length back to Hamlin making a total of 27.11 miles of total exposure (second longest line exposure of any proposed corridor). McGavran (2017) estimates that the Commonwealth corridor would cost $10.99 million to construct. McGavran (2017) concluded that further consideration of this corridor is not merited because it does not meet the Project need criteria required by Central Electric and Berkeley. For these reasons, the Commonwealth alternative was eliminated from further consideration.

2.2.2.3 115-kV Belle Isle Corridors from the 2014 Draft EIS

The 2014 Draft EIS contained multiple corridors originating from the Belle Isle Substation, which roughly followed U.S. Highway 17 south, crossing the Santee River, to the proposed McClellanville Substation. In

addition to the corridors, members of the public requested that the corridor include an underground option to eliminate the overhead crossing of the Santee River. The elimination of these corridors from consideration as feasible Project alternatives is discussed below.

Belle Isle Corridor Options A, D, E, and F

Central Electric's initial Project proposal, as described in the 2014 Draft EIS, included six corridors; all of which would originate from the Belle Isle Substation. These corridors were initially selected from a wider range of potential routes because, when compared with other options, they reduce impacts to residences, sensitive habitats, conservation lands and cultural and historic resources while trying to address the Project need. However, comments on the 2014 Draft EIS highlighted public concerns about cultural resources and environmental impacts of crossing the Santee River, which led Central Electric to revisit the alternatives. In doing so, Central Electric convened its route selection committee and requested the committee evaluate the alternatives and select one or two corridors that should be included in the EIS. Based on Central Electric's internal review, which included engineering and environmental considerations, and the McGavran (2017) independent report, the Belle Isle corridor Options A, D, E, and F were eliminated from further consideration. Belle Isle Options E and F were the longest corridors (19.9 and 19.1 miles, respectively) and were eliminated due to greater environmental and line exposure risks. Belle Isle Options A and D are equal in length (16.1 miles); however, these corridors have considerably higher amounts of environmental resource impacts than B and C (e.g., greater forest within the Santee River delta, marine wetlands, prime farmland soil, archeological sites [Option A], and residences within 300 feet of the proposed line). Although McGavran's (2017) estimates did not directly correspond to the six corridors in the Draft EIS, the report estimated the cost to engineer and construct a new line from the Belle Isle Substation would cost between $2.2 million to $2.4 million.[3]

Belle Isle No. 2 Corridor (Underground)

The Belle Isle No. 2 corridor, as presented in the Central Electris (2010b) Macro-Corridor Study, involved the option of an underground crossing of the North and South Santee River adjacent to U.S. Highway 17, above the Santee Delta. Underground transmission lines are often recommended by the public or by resource agencies as a solution to potential visual impacts. During the scoping process, commenters recommended siting the new McClellanville Transmission Line underground because of the widespread damage incurred by the power grid during Hurricane Hugo, a Category 4 hurricane that came ashore in Charleston Harbor in September 1989. The most devastating wind and storm surge came ashore on the storm's northwestern quarter between the towns of Awendaw and McClellanville. The SCDNR (Santee Delta WMA) also recommended building any transmission line crossing the Santee Delta underground to minimize potential avian interaction (e.g., collision) issues.

Underground transmission lines are very expensive to construct. Distribution lines, however, are not the same as transmission lines, and more readily lend themselves to underground construction. Underground transmission is almost always found in severely constrained environments, such as the downtown business districts of large cities where insufficient room exists for overhead lines and their ROWs. Depending on the design, system operations requirements, and spatial issues, preliminary design of underground transmission suggests that costs can range from 8 to 15 times the cost of typical overhead construction. In its Macro-Corridor Study, Central Electric (2010b) estimates that building underground transmission lines at the Santee Delta would involve approximately 10 times the expense of typical overhead construction.

While it is true that a hurricane, tornado, or other contingency could damage an overhead transmission line easier than it can damage an underground line, an overhead line is relatively easy to repair compared to an

[3] RUS's estimate in 2017 of $1.9-2.1 million was updated to 2022 dollars using https://www.usinflationcalculator.com/

underground one. Over time, underground conductors deteriorate; and locating underground faults and then mobilizing the right personnel and equipment to the repair site to restore service is time-consuming and labor-intensive. This would also be the case if an underground transmission line were built across the Santee Delta. Furthermore, underground transmission line installation, repair, and replacement require specialized equipment and skills not available within Santee Cooper because of the very minimal use of underground transmission cable on the Central Electric and Santee Cooper system. An outside contractor would have to be hired to complete any of the repairs on the underground transmission line, which would further extend outage times or require a shift in source electricity. Underground transmission for radial line use is not preferred because of the longer restoration time issues referenced previously. Underground transmission should always have an alternative overhead transmission line to help minimize outage time in the event of a failure on the underground section of line. McGavran (2017) estimates the underground portion of the transmission line associated with the Belle Isle No. 2 corridor would cost an additional $3.3 million dollars.[4] For cost and maintenance reasons, not to mention the greater environmental impacts, the underground construction alternative for the Belle Isle No. 2 corridor and other corridors was not carried forward.

2.2.2.4 115-kV Belle Isle Corridors from the 2019 Supplemental Draft EIS

Two Belle Isle corridors originating from the Belle Isle Substation were carried forward for analysis in the SDEIS (Options B and C; Figure 1.1-1). Both corridors would extend north-south and generally follow U.S. Highway 17. They would cross the North and South Santee River channels and the Santee Delta Wildlife Management Area approximately 1.1 and 1.3 miles upstream (west) of the U.S. Highway 17 bridges, respectively. Although the length of Option B (16.3 miles) and Option C (15.6 miles) would be approximately two-thirds the length of the Jamestown corridor (Proposed Action), there were numerous concerns expressed by conservationists, historians and residents about crossing the ecologically sensitive and scenic Santee Delta. The acreage of potential wetland impacts from constructing and maintaining the Belle Isle corridors would be greater than the Proposed Action and would include extensive marshland and forested wetlands associated with a two-mile wide crossing of the Santee River (Figure 2.2-1). The Belle Isle corridor would also intersect numerous sites that are listed or eligible for listing on the National Register of Historic Places (NRHP), including Hopsewee Plantation and Peachtree Plantation (Figure 2.2-2). For these reasons, RUS eliminated these two Belle Isle corridors from further consideration.

[4] RUS's estimate in 2017 of $2.8 million was updated to 2022 dollars using https://www.usinflationcalculator.com/

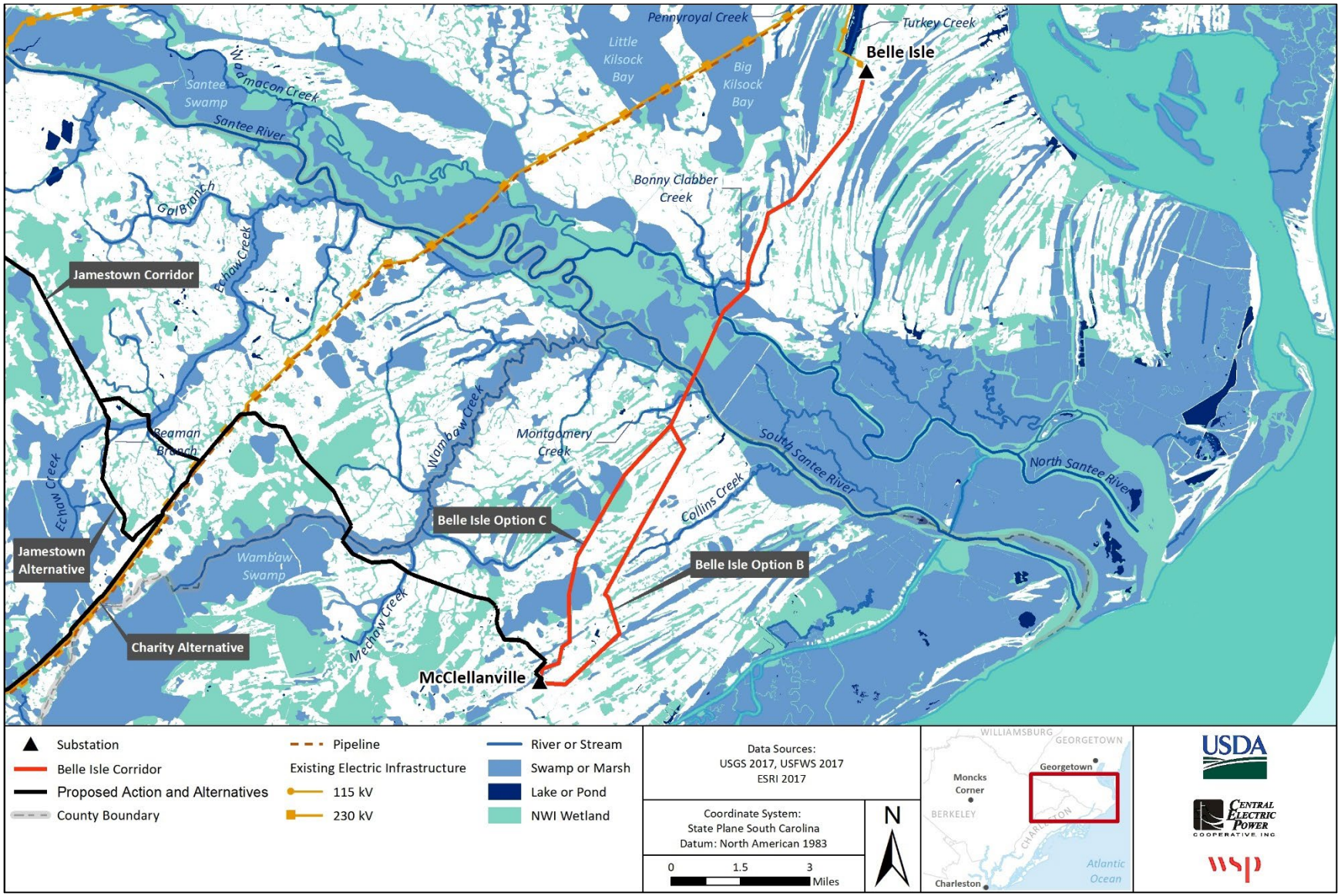


Figure 2.2-1. Waters and Wetlands in the Vicinity of the Belle Isle Corridors (Evaluated in the 2019 SDEIS and Eliminated from Consideration)

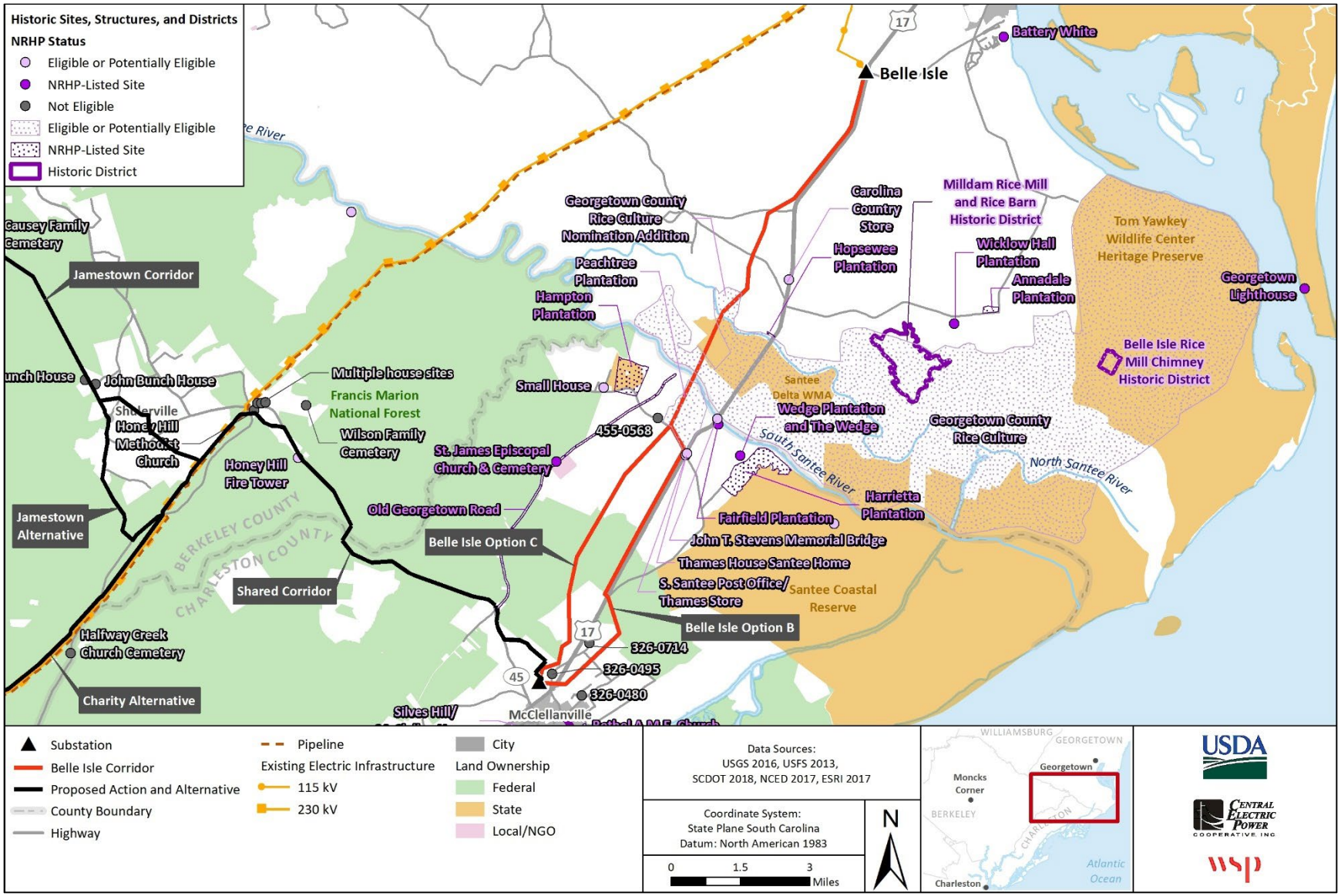


Figure 2.2-2. Cultural Resources in the Vicinity of the Belle Isle Corridors (Evaluated in the 2019 SDEIS and Eliminated from Consideration)

2.2.3 Corridor Refinement

In 2023, to further avoid and minimize Project impacts, Central Electric performed a supplemental routing of the transmission corridor across private lands (Appendix D). A routing team identified feasible transmission line corridors within three locations along the corridor with concentrations of private lands. An initial set of 103 study segments was reviewed and those with unacceptable constraints were eliminated, while others were refined based on avoidance criteria such as unevaluated NFS lands, buildings, cemeteries, historic sites, and residences. Fifty-nine segments were carried forward for further evaluation, which were linked to form end-to-end alternative corridors for analysis. To evaluate alternative corridors, a comprehensive suite of metrics was then calculated for each alterative corridor, covering six categories of routing factors, including: (1) constructability/engineering, (2) water resources, (3) wildlife habitat, (4) cultural resources, (5) built environment, and (6) land use/land cover. These metrics were determined based on the routing team's experience in previous successful transmission line studies, the routing considerations specified by RUS' (2015) *Design Manual for High Voltage Transmission Lines*, and the EPRI-GTC (2006) *Overhead Electric Transmission Line Siting Methodology*. Each routing factor was assigned a weight from 1 to 10 based on the importance of the metric to siting the transmission line. Weights were determined based on based on the routing team's experience and stakeholder input from past transmission projects in coastal South Carolina. This supplemental routing on private lands identified a more direct corridor between the Jamestown and McClellanville Substations that effectively reduces the overall Project impacts. The preference for this new alignment is captured by including it as part of the Proposed Action (Jamestown corridor), relative to the Jamestown Alternative or Charity Alternative.

2.3 Description of Alternatives Evaluated

This EIS evaluates three routes for the Project: the Jamestown corridor (Proposed Action), a variation of the Proposed Action (Jamestown Alternative), and another alternative corridor (Charity Alternative). The No Action Alternative is also evaluated, which provides a basis for comparing environmental impacts of the action alternatives.

2.3.1 No Action Alternative

Under the No Action Alternative, the McClellanville Transmission Line would not be constructed and the existing distribution line that serves Dominion customers in the town of McClellanville would remain in place and be maintained for service to these customers. The existing environment would remain the same, and no land would be used for transmission lines, facilities, or a substation. The customers of Berkeley Electric in the McClellanville service area would continue to have worsening reliability and increased outages. In addition, future growth will add additional constraint to an already strained electrical system. The No Action Alternative does not meet the identified purpose and need for the Project.

2.3.2 Proposed Action (Jamestown Corridor)

Central Electric proposes to construct and maintain a new McClellanville Substation and a new 23.3-mile long 115-kV transmission line that would connect it to the existing Jamestown Substation (Figure 2.3-1). This action is based on the good utility practice of adding a new source through transmission service when persistent reliability challenges exist (and cannot be corrected through distribution system improvements) and projected future load growth is expected to strain the current electrical system.

The proposed transmission line would begin at the Jamestown Substation and travel 0.8 miles southwest alongside an existing utility corridor used by the Winyah-Jefferies 230-kV transmission line, cross SC Highway 45 and leave the existing utility easement just before Greenleaf Drive. It would traverse alongside

Greenleaf Drive for approximately 600 feet before turning west until encountering the CSX railroad ROW (Andrews Subdivision). The transmission line would extend south along the railroad ROW for approximately 1.0 mile until reaching Tiger Corner Road (USFS Road 157), at which point it would angle southeast and remain on NFS lands as it follows Tiger Corner Road for approximately 6.5 miles, exiting the FMNF near Shulerville. The alignment line would turn east approximately one mile north of the intersection of Tiger Corner Road and Shulerville Road, traveling cross-country over private lands for approximately 2.8 miles until it would intersect and follow the existing Winyah-Charity 230-kV transmission line northeast towards the community of Honey Hill. The route would follow the existing ROW for approximately 1.3 miles and then turn east before the community and then turn southeast and follow SC Highway 45 for approximately 7.5 miles to the McClellanville Substation near U.S. Highway 17.

Approximately 13.5 miles (58 percent) of the Jamestown corridor is located on NFS lands administered by the FMNF (Table 1.3-1). The corridor follows Tiger Corner Road (USFS Service Road), SC Highway 41, SC-45, Shulerville Road, and Halfway Creek Road for 16.7 of the 18.5 miles, essentially lessening environmental impacts to the FMNF by up to 50 percent in those areas because the ROW may be able to overlap with the existing disturbed road corridor. The Jamestown corridor encompasses a portion of the Santee River watershed, but would not cross the river. It would cross the Wambaw Creek near the western boundary of the Wambaw Creek Wilderness Area, immediately east of SC Highway 45, but would not cross the boundary of the Wambaw Creek Wilderness Area.

The Jamestown corridor is the preferred transmission line route because of a combination of overall length, the amount parallel with existing ROW; and its avoidance of sensitive habitats, conservation lands, residences and other buildings, and cultural resources. Existing ROWs (roads and transmission lines) were used in designing the corridor as much as practicable. It is easily accessible via SC Highway 45 and paved local roads or forest service roads, which would minimize construction impacts and is important for Project O&M and emergency restoration. This corridor would avoid impacts to ecologically sensitive Carolina Bays on NFS lands in the vicinity of Halfway Creek Road by following the existing Winyah-Charity 230-kV transmission line. Additional details regarding the technical aspects of the transmission line and substation are presented in Section 2.4.

2.3.3 Jamestown Alternative

The Jamestown Alternative would also extend between the existing Jamestown Substation and a new McClellanville substation, similar to the Proposed Action; however, the Jamestown Alternative would use a different alignment between Shulerville and Honey Hill. Rather than cutting across private lands, the Jamestown Alternative would extend approximately 3 miles to the south following along Shulerville Road until its intersection with Halfway Creek Road. At this point, the Jamestown Alternative would angle northeast and follow Halfway Creek Road north towards Honey Hill until reaching the existing Winyah-Charity 230-kV transmission line ROW. It would turn and follow along the west side of the existing utility corridor for 1.5 miles until meeting with the Jamestown corridor (Proposed Action).

Approximately 17.0 miles (65 percent) of the Jamestown Alternative is located on NFS lands FMNF (Table 1.3-1). The corridor follows Tiger Corner Road (USFS Service Road), SC Highway 41, SC-45, Shulerville Road, and Halfway Creek Road for 16.7 of the 18.5 miles, essentially lessening environmental impacts to the FMNF by up to 50 percent in those areas because the ROW may be able to overlap with the existing disturbed road ROW. The Jamestown corridor encompasses a portion of the Santee River watershed, but would not cross the river. It would cross the Wambaw Creek near the western boundary of the Wambaw Creek Wilderness Area, immediately east of SC Highway 45, but would not cross the boundary of the Wambaw Creek Wilderness Area.

2.3.4 Charity Alternative

The initial set of potential corridors identified as alternatives in the *Revised Macro-Corridor Study Report* for the Project (Central Electric 2010a, 2010b) included four separate Charity macro-corridors. These corridors were eliminated from further evaluation in the Draft EIS; however, based on the Independent Engineering Study (McGavran 2017) and corresponding agency consultation meeting of the study results, this corridor received renewed interest. McGavran (2017) notes the Charity 230/115 kV Substation—the source for the proposed Charity Alternative—is a very strong source because it is part of the Santee Cooper 230-kV system, making it the most reliable source in the area. However, McGavran (2017) also reported that this corridor poses challenges for long-term reliability because of its length and location. After reviewing the results and participating in the study report consultation meeting, the FMNF specifically recommended analyzing the Charity Alternative as a potential solution because of preferences to co-locate the transmission line with other utility corridors within the FMNF.

The Charity Alternative would be approximately 31 miles long and begin at the Charity Substation, which is located immediately east of the Cooper River outside North Charleston, South Carolina (Figure 2.3-2). The substation serves a large steel mill that has a very high reliability requirement and is served by the major 230-kV line from the Santee Cooper Winyah steam plant. From the substation, the line would continue east along an existing Winyah-Charity 230-kV transmission line and Carolina Gas pipeline ROW for approximately 18 miles as it crosses SC Highway 41 and various roadways within the FMNF before joining Halfway Creek Road approximately 0.9 miles north of its intersection with Shulerville Road. From this point, it would continue along Halfway Creek Road and SC Highway 45 using the same alignment as the Jamestown Alternative to the McClellanville Substation (Figure 2.3-2).

Approximately 21.5 miles (69 percent) of the Charity Alternative is located on the FMNF (Table 1.3-1). The corridor encompasses a portion of the Santee River watershed, but would not cross the North and South Santee River. The Charity Alternative would also cross Wambaw Creek near SC Highway 45 but would not cross the boundary of the Wambaw Creek Wilderness Area.

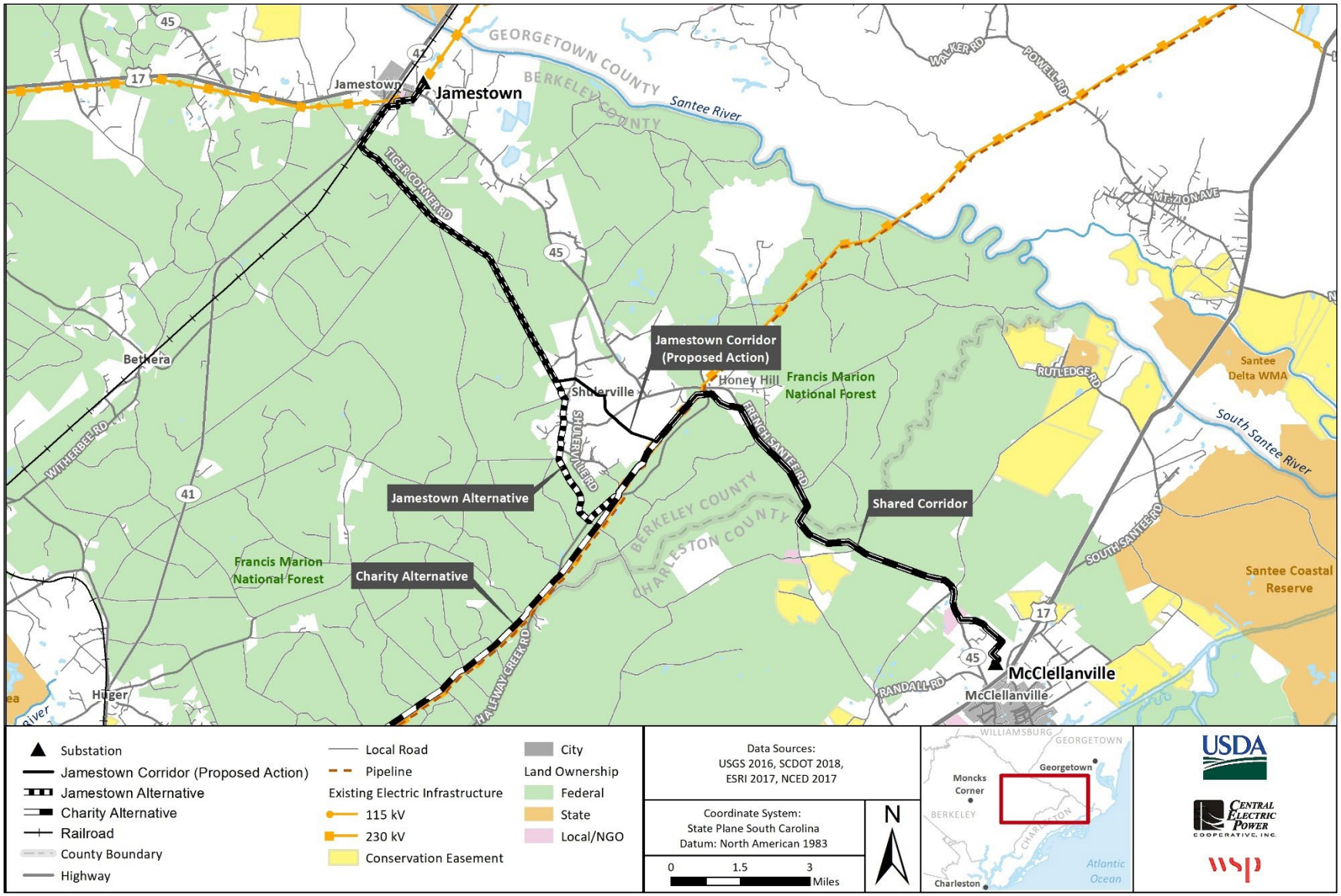


Figure 2.3-1. Proposed Action (Jamestown Corridor) and Jamestown Alternative

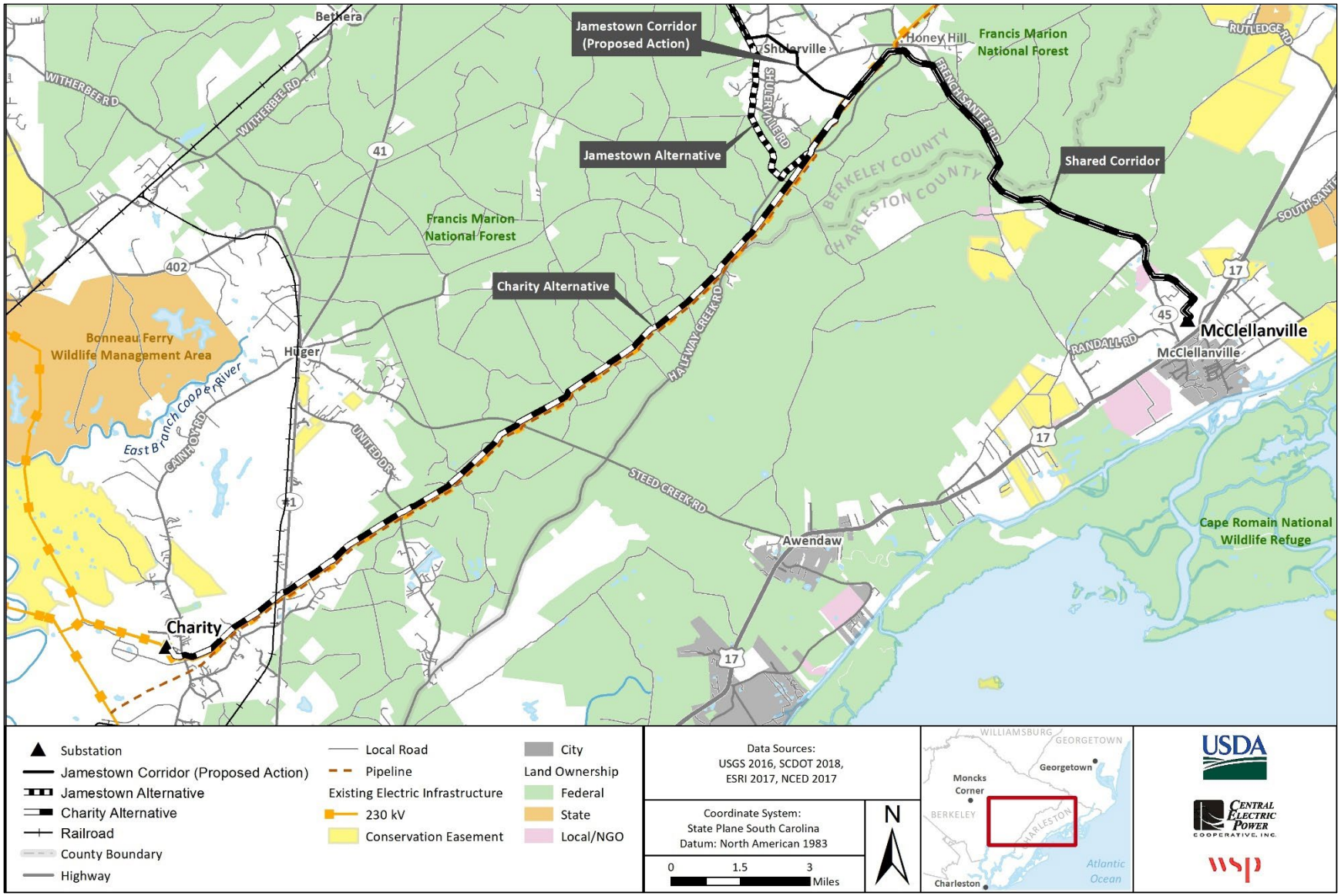


Figure 2.3-2. Charity Alternative

2.4 Elements Common to All Alternatives

Several elements are common to both action alternatives, including various transmission line components, construction techniques, and O&M procedures. These items are discussed in more detail in the following sections.

2.4.1 Transmission Line Characteristics

Transmission lines for all alternatives would include the following characteristics:

- A ROW requirement of 75 feet (37.5 feet on either side of centerline);
- Transmission pole structures, typically 70 to 80 feet above ground and spaced 400 to 500 feet apart, which could be longer when spanning large wetlands and/or rivers;
- Design features including galvanized steel or COR-TEN "weathering steel" pole structures carrying high voltage electrical conductors on insulators with an optical ground wire (OPGW) fiber optic shield wire overhead; and
- A basic overall configuration for the proposed transmission line similar to the structures shown in Figure 2.4-1.

Figure 2.4-1. COR-TEN Monopole Structure with Horizontal Post Insulators

2.4.2 Right-of-Way and Property Requirements

When a transmission line is placed across private land, a ROW agreement, typically an easement (not a fee title), is required. When a transmission line is placed entirely across private land, an easement for the entire 75-foot ROW would need to be acquired from the landowner(s). Central Electric has indicated a preference for locating poles as close to property division lines as reasonably possible to reduce the amount of ROW on a particular property. When a transmission line parallels roads, railroads, or other transmission lines, a landowner may be able to have a narrower easement. When paralleling existing roadways, for example, the general practice is to place the poles on the adjacent private property, a few feet outside the existing road ROW. So, although the pole is still located on private property, the transmission line can share some of the public ROW, thereby reducing the size of the easement required from the private landowner.

The SCDOT (2019) Utilities Accommodation Manual states the preferred location for all longitudinal utility installations within its ROWs is as close to the outside ROWs line as practical. Additionally, except in extreme cases, and then only with specific authorization, longitudinal installations of overhead lines on the highway ROW shall be limited to single-pole type construction.

2.4.3 Transmission Line Right-of-Way

In cross-country transmission line segments, Central Electric would acquire a 75-foot-wide (37.5 feet to either side of the centerline) ROW in the form of an easement. In the typical road-side alignment or along other cleared ROWs, transmission line structures are usually set about 5 feet outside the ROW; therefore, the transmission line would require 5 feet plus an additional 37.5 feet, for a total of 42.5 feet of new ROW alongside existing road, rail, and utility ROWs. In either case, the ROW would be cleared, including the trimming or removal of danger trees that are outside the ROW. Danger trees are trees or branches that are dead, weak, diseased, leaning toward the line, or otherwise capable of hitting the transmission line were they to fall. It would be necessary to maintain a cleared ROW and remove danger trees for the duration of the operational life of the proposed transmission line.

2.4.4 Distribution Line Right-of-Way

Three low-side distribution frames would be dedicated to Berkeley Electric with an additional low-side position dedicated to Dominion. Therefore, Berkeley Electric anticipates a total of four 3-phase distribution lines would be brought out to U.S. Highway 17 from the substation low-side along the access strip. The four distribution lines would exit the substation underground, and the conductors would likely be installed within conduit.

At U.S. Highway 17, the MV-04/ Dominion circuit would transition to overhead at a riser pole and tie into the existing Dominion distribution line. The three Berkeley Electric distribution lines would continue underground across U.S. Highway 17 and then follow an interior property line for an additional +/- 400 feet to arrive at an existing 3-phase distribution line. The MV-01, MV-02, and MV-03 circuits would transition from underground conduit via riser poles at this point. Circuit MV-03 would tie into the existing 3-phase distribution line running southeasterly toward Commonwealth Substation. Circuits MV-01 and MV-02 would transition overhead on a second riser pole, forming a double-circuited, 3-phase distribution line running northeasterly toward the intersection of River Road and State Highway S. At that intersection, Circuit MV-02 currently turns southeasterly, paralleling State Highway S, while Circuit MV-01 continues northeasterly along River Road.

2.4.5 Pre-Construction Activities

Central Electric and/or its contractors would perform site-specific engineering, and environmental and cultural resource surveys prior to construction of the transmission line. These surveys would consist of centerline location, profile, and access surveys. Pre-construction surveys would likely coincide with other pre-construction activities.

Geotechnical studies would be conducted along the transmission line ROW to determine engineering requirements for structures and foundations. Truck-mounted augers would be transported to selected locations to drill small-diameter boreholes, and borehole cuttings would be analyzed to determine specific soil characteristics. Minimal land disturbance (approximately 400 square feet) is anticipated for each geotechnical boring site. Additionally, small access trails may be required for some of the boring locations.

2.4.6 Transmission Line Construction

Construction activities are summarized below in the general sequence of occurrence—acquiring ROW access, establishing staging areas, installing poles, and installing conductors. The precise timing of construction would take into account factors including permit conditions (e.g., time of year restrictions), and available workforce.

2.4.6.1 Right-of-Way Access

Typically, existing roads or trails that run parallel or perpendicular to the transmission line would be used to access the actual transmission line ROW. Where use of private field roads or trails is necessary, permission from the property owner would be obtained prior to access. In some cases, new access roads may have to be constructed when no current access is available or existing access is inadequate for the heavy equipment used in construction.

2.4.6.2 Establishing Staging Areas

Construction materials would be stored at staging areas until they are needed for construction. To minimize the overall Project footprint, Central Electric would prioritize using the ROW for all material staging prior to construction. A one-acre of staging area would be required outside ROW, but within the 600-foot corridor. The staging area would be leased for the duration of construction, and at least some portion of that area would be fenced and secured. A previously disturbed area would be preferred to avoid vegetation clearing requirements and minimize resource impacts. If Central Electric were to establish temporary staging areas on private lands, permission would be obtained from landowners through rental agreements. Additional smaller staging areas would be located along the Project ROW to store construction materials immediately before installation. Staging areas would be located within the 75-feet ROW and all equipment would remain within the ROW for duration of use. The transmission line poles would be placed within the 75-foot ROW at the designated installation sites.

2.4.6.3 Grading

Transmission line structures generally would be installed at existing grades. Ground protection mats would be installed at the site and monopoles would be installed directly into the ground with a caisson. Due to the flat topography and type of structures involved, no grading would occur.

2.4.6.4 Transmission Pole Installation

To support the proposed transmission line, the number of poles required would range from 233 to 374, depending on the corridor. This is based on an expectation of using 10 to 12 poles per mile. These structures are detailed below in Section 2.4.10. During construction, a 20-foot by 20-foot area around each structure would be disturbed for the placement of temporary construction pads.

When sites are prepared for installation, the poles generally would be moved from the staging areas and delivered to the staked location and placed within the ROW. Insulators and other hardware would be attached while the pole is on the ground. The pole would be lifted, placed, and secured using a crane. In nearly all cases, the poles would be installed using vibratory caissons or direct embedment into the soil. Where single pole structures are under higher stress (medium angle, heavy angle, or dead-end structures) vibratory caisson foundations are required.

When vibratory caissons are required, the caisson will be vibrated into the earth to the appropriate depth. Then the interior of the caisson is excavated, the pole installed, and crushed rock is backfilled into the caisson. If the poles are directly embedded, holes approximately 4 to 6 feet in diameter would be augured or excavated. The hole would be partially filled with crushed rock, the pole set on top of the rock base, and the hole backfilled with crushed rock and/or soil. In poor soil conditions, a galvanized steel caisson may be installed vertically with the structure set inside as described above.

2.4.6.5 Conductor Installation

After pole placement, conductors would be installed in stringing setup areas located approximately every 2 miles along a Project corridor, either within the ROW or on temporary construction easements. Brief access to each structure would be needed to secure the conductor wire to the insulator hardware and the shield wire. Where the transmission line crosses streets, roads, highways, or other obstructions, temporary guard or clearance poles may be installed to protect conductors and to ensure safety during installation.

Compression dead-end connectors will be used to join conductors and dead-end hardware rather than hydraulic splices.

2.4.6.6 Underground Construction

Horizontal directional drilling (HDD) could be used in places where it may be required by the USFS for certain areas in the FMNF and as a condition to the SUP. HDD consists of installing a casing with conduits inside. It involves drilling a small diameter pilot hole from entry to exit, followed by a reamer that is pulled back to enlarge the pilot hole. Finally, the casing pipe is pulled into the enlarged hole. This method would require an extensive construction area on each side of the bore hole to handle the drilling equipment, the linear underground sections and manage the slurry (drilling fluid) that cools the drilling head. The amount of space required is typically proportional to the size, depth, and distance of the bore, which is not yet determined because it is unknown if undergrounding may be required anywhere. An example of the exit location at an underground transmission project that Central Electric completed in 2017 is shown in Figure 2.4-2.

Figure 2.4-2. HDD Drilling Exit Location with the Drilling Fluid Pit in the Foreground

2.4.7 Right-of-Way Clearing

In upland areas, trees in the ROW would be removed using heavy equipment to fell trees and understory trees and shrubs. Equipment with a shearing blade attachment designed to sever tree trunks at or near ground level may be used. Alternately, a "feller buncher," a standard heavy equipment base with attachments consisting of a tree-grabbing device and a circular saw or hydraulic shear that cuts trees off at or near the base may be used. Felled vegetation would be limbed up and removed or chipped. Stumps would be cut or ground down to a maximum height of 3 inches above the soil line. Except in wetland areas, slash (the coarse and fine woody debris generated during logging operations) would typically be chipped and broadcast as mulch or allowed to decompose on the ground.

On NFS lands, timber harvested would be subject to USFS timber sale contract clauses and provisions. Central Electric would comply with all terms and conditions of a Forest Service Special Use Authorization. On private property, timber would be sold or it may be chipped and broadcast across the ROW to serve as mulch. Except in wetland areas, slash would typically be chipped and broadcast as mulch.

Figure 2.4-3. Timber Mats Placed During Transmission Line Construction.

It is anticipated that most trees could be removed from the existing road ROW in places where the transmission line would follow existing roads. In wetlands, land clearing of the easement would be accomplished by methods that remove trees and tall-growing vegetation above the soil line and would not disturb the native wetland soils. On NFS lands, Central Electric would comply with the standards and guidelines in the USFS (2017) Land Management Plan. This may include using equipment with low ground pressure tires, typically less than < 10 pounds per square inch (psi), or by using similar equipment working from temporary load-dispersing mats (i.e., construction mats) to minimize rutting and mucking of wetland soils (Figure 2.4-3). Low-growing native plant materials that would not interfere with the installation, maintenance, and operation of the line would not be cleared. The purpose of using such methods is to avoid or minimize disturbance of native wetland soils and encourage the establishment of a scrub/shrub or emergent wetland within the proposed power line ROW. Felled material would not be pushed or dragged across a wetland. Rather, felled trees would be lifted or carried from the wetland by low ground pressure equipment or equipment working from construction mats. No material would be placed in stream channels or otherwise placed so as to interfere with stream flows or adjacent wetland hydrology.

A 30-foot natural buffer area would be established adjacent to all streams and at all jurisdictional wetlands. Central Electric would seek to avoid impacting wetlands to the greatest extent practicable by removing timber using a specialized logging equipment with an extendable boom that can reach out to grab cut trees. Appropriate sediment and erosion controls and best management practices (BMPs) would be implemented surrounding all wetland, stream, and waterbody boundaries.

There are currently no gates on existing transmission ROWs. If desired, Central Electric proposes to NFS lands road crossings on NFS lands to control public access along the proposed transmission line ROW. This kind of access control is often required to minimize trespassing, especially with off-road vehicles. Central Electric may honor private landowner requests for similar fencing and gates at road crossings.

2.4.8 Access Roads

Off-ROW access roads are existing roads that are not within the proposed transmission line ROW but may be needed for construction and O&M access. Off-ROW access may be acquired for construction and O&M on existing roads and/or existing utility easements. No new permanent roads would be constructed as a result of the transmission line construction.

Improvements to existing off-ROW roads may be required if it is determined that heavy transport requires such improvements. Improvements would typically involve re-grading of dirt roads if wear and tear of traffic requires it or adding rock (or additional rock) to un-paved roads. The need for roads improvements or maintenance during construction would depend on the nature of the existing transportation system in the area crossed by the preferred transmission line corridor. Improvements to existing roads would require permitting with the federal, state, or county authorities that own and maintain the roads.

The use of private roads may be required to access the transmission line easement. The right to use private roads for temporary or permanent access would be acquired through negotiation with property owners in the same manner as acquisition of the actual transmission line ROW. Similar improvements to those discussed above may be required before heavy transport can use private roads.

2.4.9 Structures

Central Electric anticipates that single pole (monopole) structures—typically 70 to 80 feet above ground and spaced 300 to 400 feet apart would be used to build the proposed 115-kV transmission line. Design features being considered include galvanized steel or COR-TEN “weathering” steel, monopole structures carrying high voltage electrical conductors on insulators, with a single fiber optic shield wire overhead.

Central Electric may use two poles or H-frame structures capable of achieving longer spans between structures in areas such as wetlands or other river crossings. Other types of structures that may be installed include minor angle monopole structures, three -pole major angle structures, self-supporting structures, and “dead end” structures (Figures 2.4-4 and 2.4-5). Dead end structures using horizontal strain insulators are required approximately every 2 miles of line length to prevent a cascading event due to a conductor failure. Conductors can be spliced and pulled to eliminate unnecessary dead-end structures. Conductors are connected at dead-end structures by a short conductor cable under tension at both ends. Angle and dead-end structures are typically guyed to counter and resolve vector forces that would otherwise cause angle structures and adjacent tangent structures to fail.

Finally, some angle structures which require guying cannot be guyed directly because the required angle(s) for guying would put the guy wires within roadways or other features (e.g., natural gas pipelines and water mains). In those cases, guyed stub poles (Figure 2.4-6) are set up on the other side of the road or feature and an overhead wire under tension is connected from the structure to the stub pole. The stub pole itself is then guyed to counter and resolve vector forces. Alternately, a vibratory caisson structure can be used in this type of situation (Figure 2.4-7), especially where both normal guying and use of stub poles is not practicable due to spatial considerations.

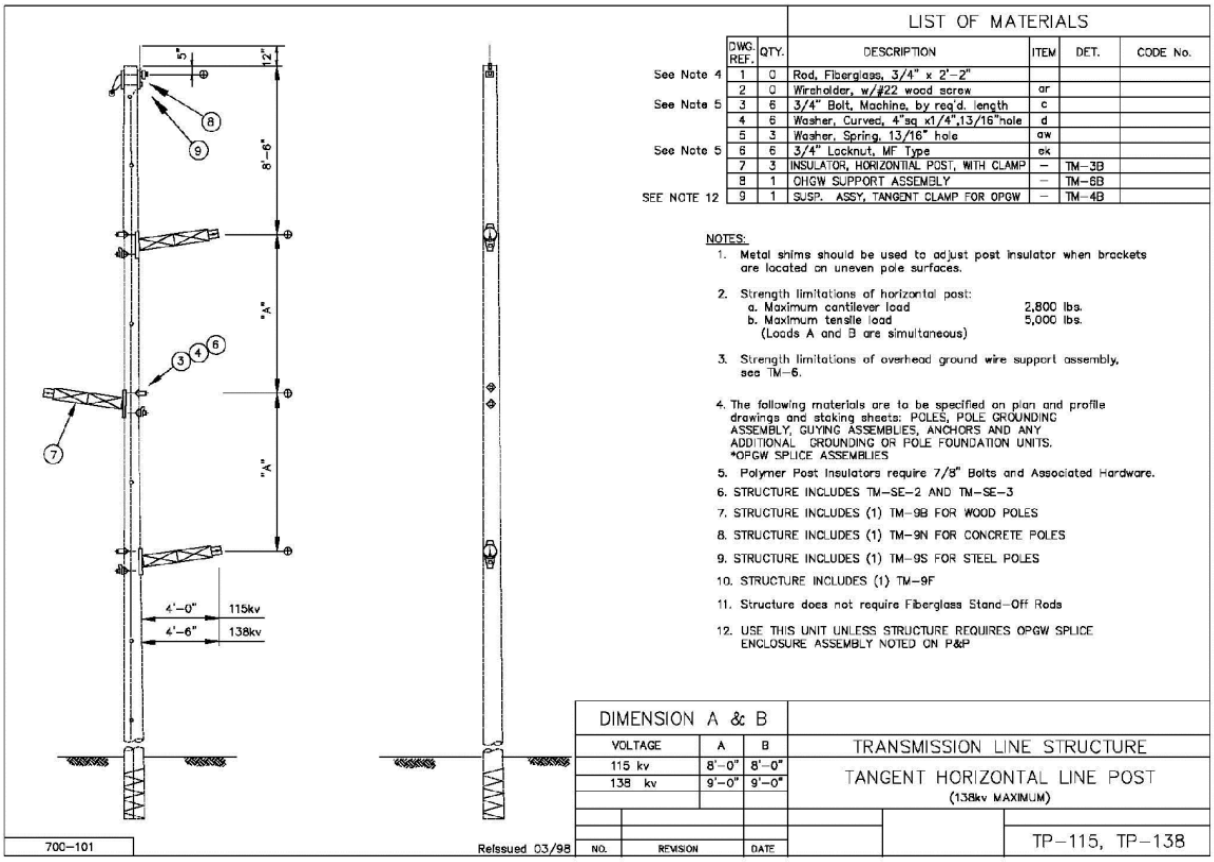
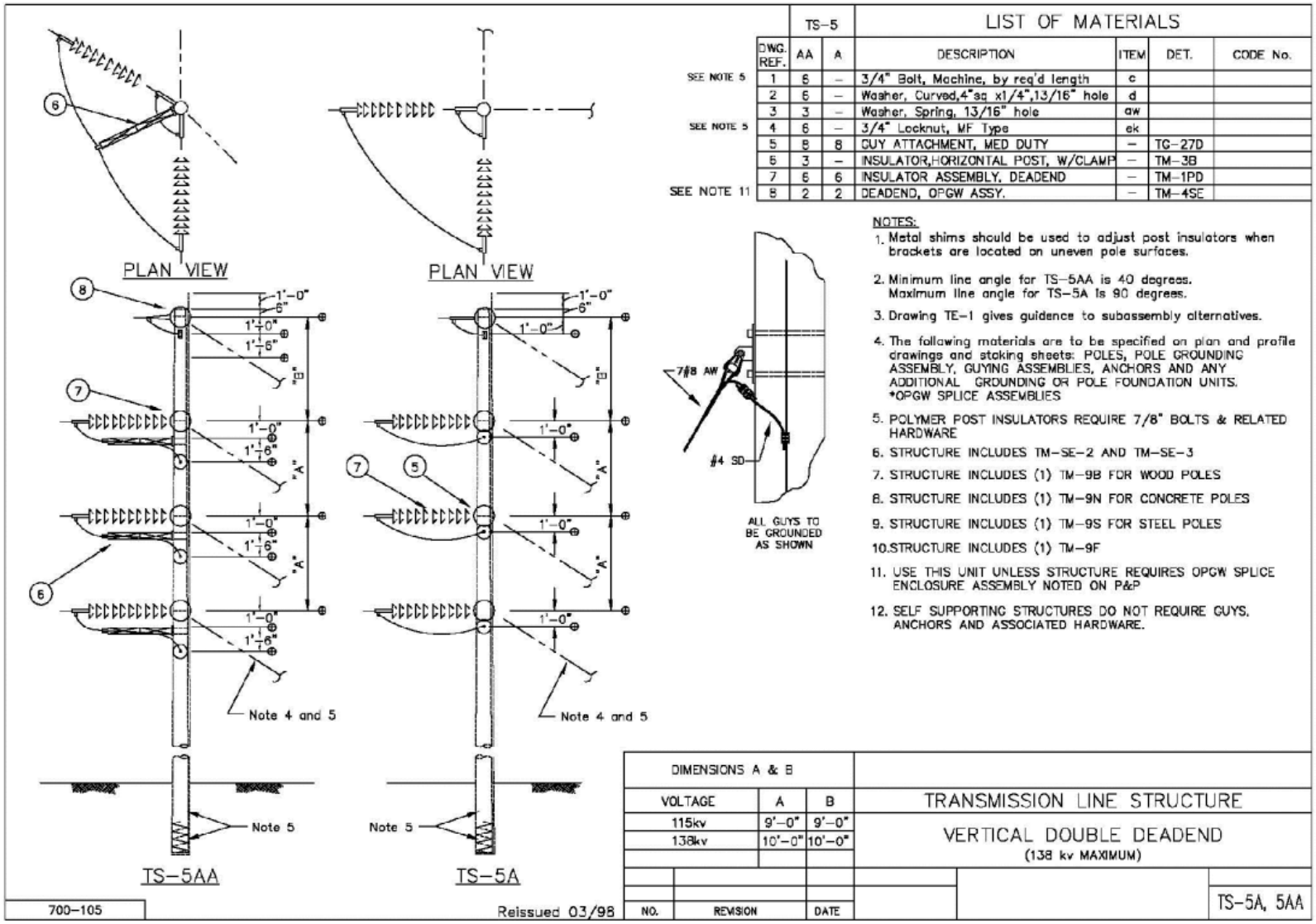


Figure 2.4-4. Transmission Line Structure—Tangent Horizontal Line Post



TS-5

LIST OF MATERIALS

	DWG. REF.	AA	A	DESCRIPTION	ITEM	DET.	CODE No.
SEE NOTE 5	1	6	–	3/4" Bolt, Machine, by req'd length	c		
	2	6	–	Washer, Curved,4"sq x1/4",13/16" hole	d		
	3	3	–	Washer, Spring, 13/16" hole	aw		
SEE NOTE 5	4	6	–	3/4" Locknut, MF Type	ek		
	5	8	8	GUY ATTACHMENT, MED DUTY	–	TG-27D	
	6	3	–	INSULATOR,HORIZONTAL POST, W/CLAMP	–	TM-3B	
	7	6	6	INSULATOR ASSEMBLY, DEADEND	–	TM-1PD	
SEE NOTE 11	8	2	2	DEADEND, OPGW ASSY.	–	TM-4SE	

NOTES:

1. Metal shims should be used to adjust post insulators when brackets are located on uneven pole surfaces.
2. Minimum line angle for TS-5AA is 40 degrees. Maximum line angle for TS-5A is 90 degrees.
3. Drawing TE-1 gives guidance to subassembly alternatives.
4. The following materials are to be specified on plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY, GUYING ASSEMBLIES, ANCHORS AND ANY ADDITIONAL GROUNDING OR POLE FOUNDATION UNITS. *OPGW SPLICE ASSEMBLIES
5. POLYMER POST INSULATORS REQUIRE 7/8" BOLTS & RELATED HARDWARE
6. STRUCTURE INCLUDES TM-SE-2 AND TM-SE-3
7. STRUCTURE INCLUDES (1) TM-9B FOR WOOD POLES
8. STRUCTURE INCLUDES (1) TM-9N FOR CONCRETE POLES
9. STRUCTURE INCLUDES (1) TM-9S FOR STEEL POLES
10. STRUCTURE INCLUDES (1) TM-9F
11. USE THIS UNIT UNLESS STRUCTURE REQUIRES OPGW SPLICE ENCLOSURE ASSEMBLY NOTED ON P&P
12. SELF SUPPORTING STRUCTURES DO NOT REQUIRE GUYS, ANCHORS AND ASSOCIATED HARDWARE.

DIMENSIONS A & B		
VOLTAGE	A	B
115kv	9'-0"	9'-0"
138kv	10'-0"	10'-0"

TRANSMISSION LINE STRUCTURE

VERTICAL DOUBLE DEADEND
(138 kv MAXIMUM)

NO.	REVISION	DATE

TS-5A, 5AA

Figure 2.4-5. Transmission Line Structure—Vertical Double Dead End

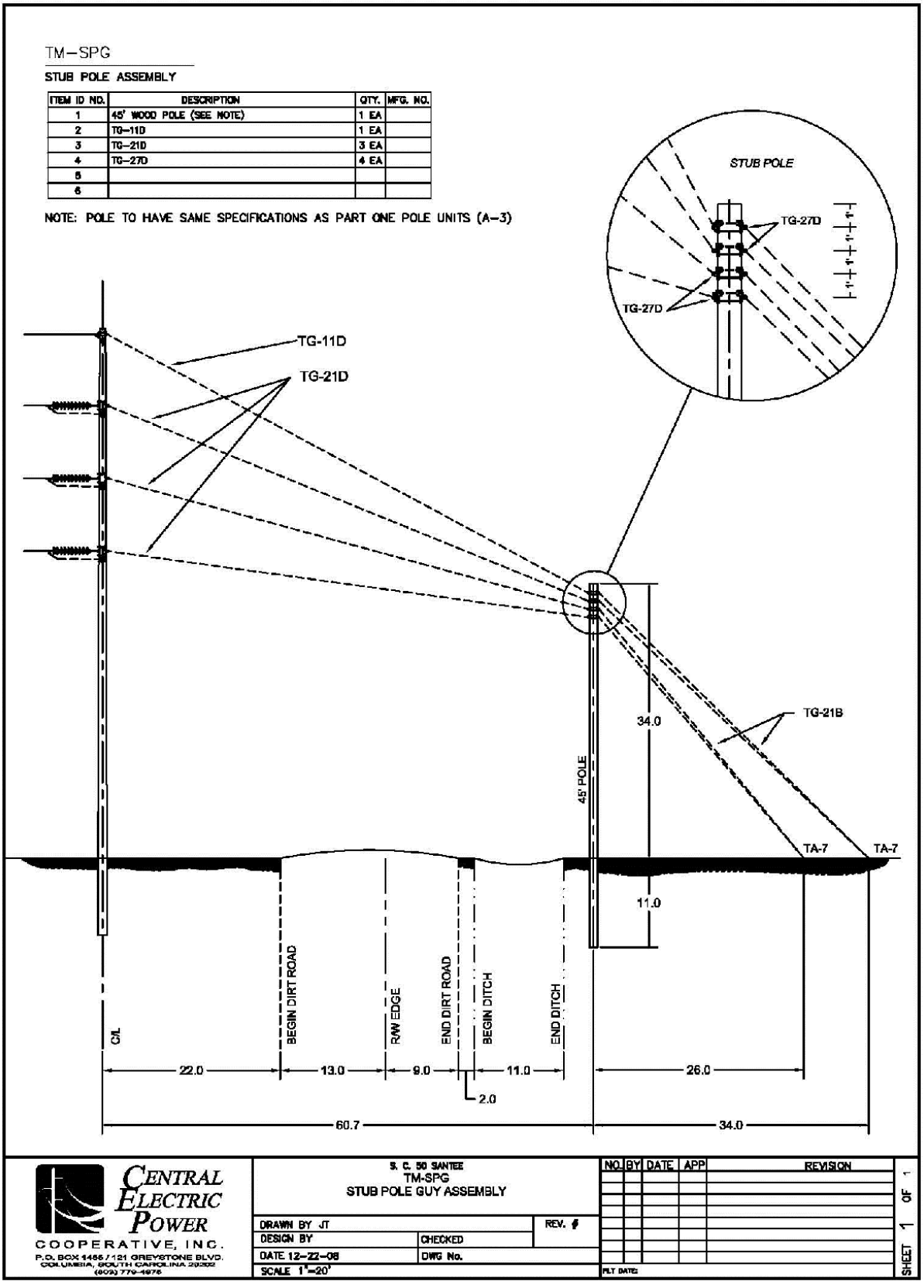


Figure 2.4-6. TM-SPG—Stub Pole Guy Assembly

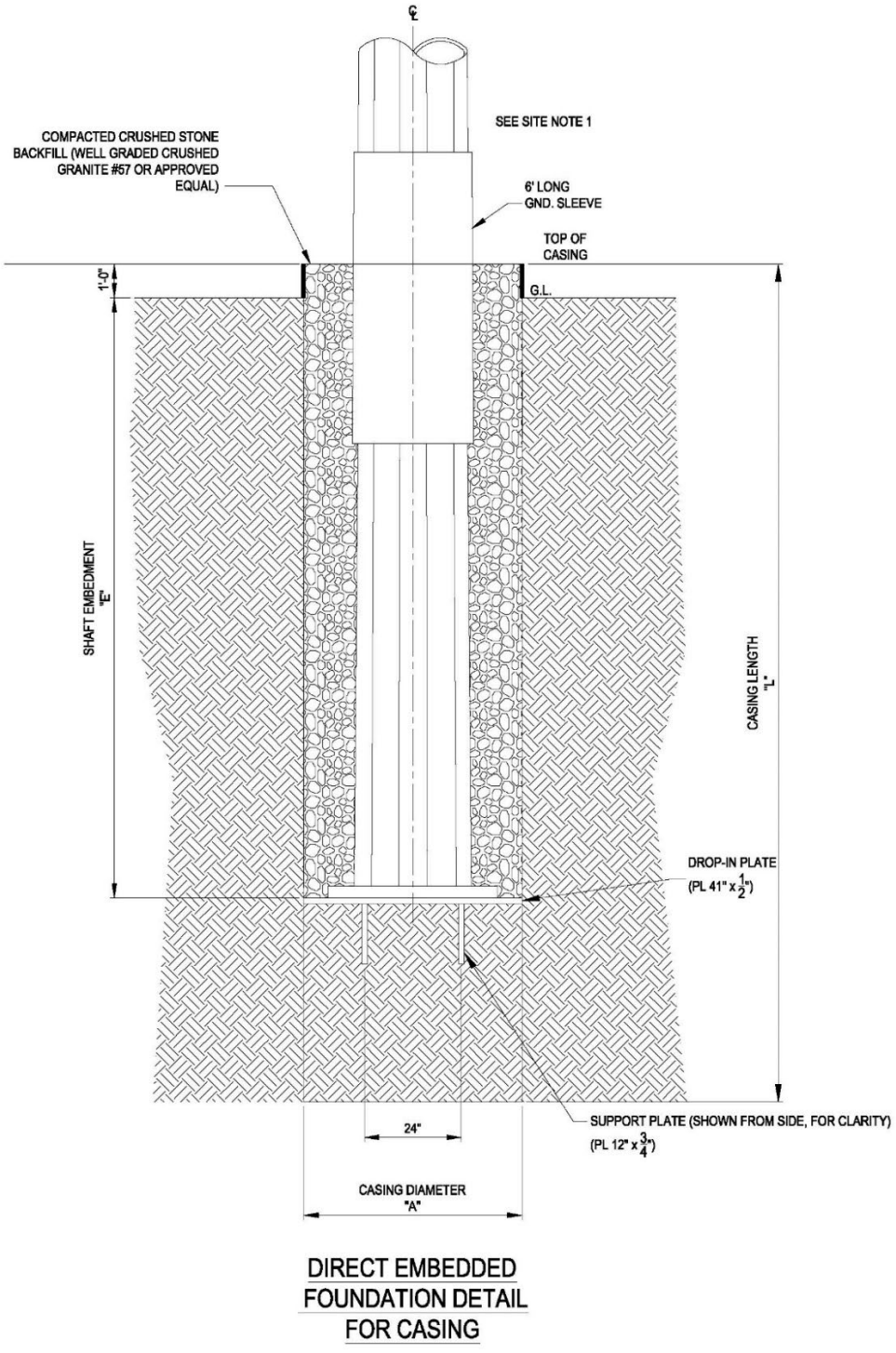


Figure 2.4-7. Direct Embedded Foundation Detail for Casing

To tap existing transmission lines, Central Electric's contractors would set new monopole structures within the phases of the existing transmission line and jumper the existing line around the structure in the direction where the tap "pulls off." Pole mounted line switches are normally installed close to the tap in all three resulting directions so that portions of the line can be isolated from faults and sectionalized so that they remain in service while repairs are carried out on damaged structures and/or spans. Sectionalizing is also useful when a utility needs to de-energize portions of the line to facilitate maintenance. Figure 2.4-8 shows a typical line switch.

Figure 2.4-8. Typical Line Switch

Because of poor soil conditions in the McClellanville area, Central Electric anticipates that the transmission line would be built using vibratory caissons. The length and diameter of the caisson would depend on the soil condition at each pole location. If soil conditions are favorable, direct embedded poles may be used. Direct embedded poles are tare augured to excavate a hole that is a minimum of 10 percent of overall pole length plus an additional 2 feet. For example, a structure designed to stand 80 feet tall out of the ground would require a monopole structure approximately 91 feet in overall length buried 11.1 feet deep (9.1 feet plus 2 feet). Crusher-run stone backfill may be placed at the bottom of the augured hole. Pole top assemblies would be fitted with attachments and insulators while on the ground, and the poles would be then lifted into position by a crane. The pole would be placed in the hole and set plumb. Additional stone would be placed and tamped to fill the void between the structure and the undisturbed earth.

Typically, wetlands are spanned by transmission lines and can span up to 600 feet. However, in coastal South Carolina, wetland crossings may be too wide to span, requiring structures to be installed within wetlands. In such cases, Central Electric anticipates that the transmission line would be constructed in a manner similar to construction on uplands with several notable differences. Equipment used in wetlands would be low ground pressure equipment that would comply with USFS guidelines and requirements, and/or equipment working on temporary construction mats to minimize rutting and mucking of wetland

soils (see Figure 2.4-3). An environmentally benign, biodegradable drilling mud that is reclaimed at each site and used for the next installation may be used to prevent deep augured holes from collapsing in soft, saturated wetland soils. Native wetland soils removed by augur would be carried from the wetland, relocated to upland areas, spread, and stabilized. Depending on soil conditions in the wetlands, holes may be augured somewhat deeper or somewhat wider depending on the specific soil engineering characteristics at each structure site. Such actions would be consistent with any guidance or permits from USACE and applicable state regulatory agency.

Central Electric anticipates that dead-end structures may be installed atop a vibratory-driven, hollow-steel piling (also known as a caisson piling). The vibratory-driven caisson is a +/- 3/8-inch-thick, hollow-steel piling that, once installed, extends about 2-4 feet above ground elevation and is set to a depth of about 30–40 feet. The top of this vibratory piling is typically fitted with a 2.5-inch-thick steel flange upon which the superstructure sections of the steel pole would be attached using steel bolts. If used in a wetland, equipment used to vibrate the dead-end structure caisson piling into place, attach the upper segment(s), and string conductors would be low ground pressure equipment or equipment working from temporary construction mats intended to minimize rutting and mucking of wetland soils.

2.4.10 Conductor and Ground Wire Installation

Steel-reinforced aluminum conductors would be strung and attached to the ends of the polymer post insulators using the tension method. Major equipment required for tension stringing includes reel stands, tensioner, puller, reel winder, pilot line winder, splicing cart, and pulling vehicle. Travelers would be attached to the bottom of each insulator, so the conductor can be pulled through multiple structures. At one end, a reel of conductor would be staged in line with the structures. At the other end, a puller would be stationed to pull the conductor from the reel through the travelers located on the structures. Once the proper tension on the conductor is achieved, the conductor would be attached to the insulator and the travelers removed. Similar methods would be used for pulling the overhead shield wire into place along the length of the transmission line.

Guy wires are steel cables under tension designed to stabilize transmission structures. One end of the cable would be attached to the structure, and the other attached to steel helix anchors driven into the ground at some distance from the structure's base. The number of guy wires and their configuration depend on the design of the structure (e.g., single steel or concrete poles versus lattice towers), soil conditions, and whether the structures are tangent structures (several structures in a straight line) or angle structures (structures where the direction of the transmission line is changed). It is common to clear a small additional area, called a guy flare, to install the ground anchors for the guying system. The additional land disturbance area required for guy flares would not likely be significant compared to the overall 75-foot-wide easement.

Based on past experience with building transmission lines in South Carolina's Coastal Plain, Central Electric anticipates that there may be +/- 2.1 dead-end structures per mile and +/- 1.4 swinging angle structures per mile. Dead-end structures require ahead-and-back guying as shown in Figure 2.4-5. In that figure, guy flares are labeled as 20 feet wide and 100 feet long. The 100-foot measurement is taken from the center of the pole. With a 75-foot-wide ROW, as proposed for cross-country potions of this Project, a 100-foot-long guy flare would require an additional +/- 65 feet of cleared area (35 feet of the 100-foot cleared area being already within the 75-foot-wide easement, an additional +/- 65 feet would make up the 100-foot dimension labeled in the figure). The additional area for each of the two guy flares would therefore be +/- 1,300 square feet, or +/- 2,600 square feet per dead-end structure.

Swinging angle structures require only one set of guy wires to support a small angle structure. These guys are set up along the exterior angle bi-sector, and the flares would also be 100 feet long by 20 feet wide. The additional cleared area would be 65 feet by 20 feet or 1,300 square feet.

As with guying and guy flares, the number of stub poles is unknown at this time. Stub poles are typically required when paralleling roads and may require 20-foot-wide and 100-foot-long guy flares. For road-side alignments, Central Electric estimates that one stub pole and guy flare may be required every 4 miles along U.S. Highway 17. As much as 2,000 square feet of clearing could be required to install stub poles and guys.

2.4.11 Substation Construction

The preferred McClellanville Substation site is a 16.87-acre parcel near the intersection of U.S. Highway 17 and SC Highway 45 near the town of McClellanville. The Substation is not located on NFS lands. The substation parcel is in the form of a flag lot and includes a +/- 1,415-foot-long, 20-foot-wide graveled access road within a cleared 60-foot-wide access strip. The substation would require an approximately 225-foot by 400-foot (2.1-acre) graded and fenced area with gravel and ground grid. Total land disturbance within the limits of clearing and grading would include about 4.4 acres. Figure 1.1-1 shows the location of the McClellanville Substation site in relationship to the overall Project area.

A 115-14.4/24.9 kV, 15/28 megavolt-ampere transformer and associated equipment would be installed within the substation fence. A high-side (transmission) frame would be installed within the substation to terminate the proposed McClellanville 115-kV Transmission Line. Three low-side distribution frames would be dedicated to Berkeley Electric with an additional low-side position dedicated to Dominion. Berkeley Electric anticipates four 3-phase distribution lines would be brought out to U.S. Highway 17 from the substation low-side along the access strip.

The four distribution lines would exit the substation underground, and the conductors would likely be installed within conduit. Once the underground circuits reach the existing distribution lines owned by the respective utilities, the circuits would transition to overhead configuration by means of riser poles set within the existing distribution lines.

Substation construction would take place on a previously graded site. Backhoes would be used to dig holes at certain locations and depths as designed, steel rebar cages would be placed in the holes, and concrete would be poured to create foundations to support the substantial weights of steel structures. These steel structures are needed to terminate the proposed transmission line and support the weights of the 115/25-kV electrical transformer, switches, bus work, and low-side (distribution voltage) frames. Trenching excavators would be used to place the conduit needed to operate switches and other equipment and to bring the four distribution lines out from the low-side structures.

2.4.12 Construction Schedule and Projected Workforce

Survey, ROW acquisition, and construction of the transmission line would occur over an approximate 36-month period after a Record of Decision is signed and an SUP is obtained. Figure 2.4-9 presents a timeline of the anticipated duration of each task and the projected workforce required to complete the tasks.

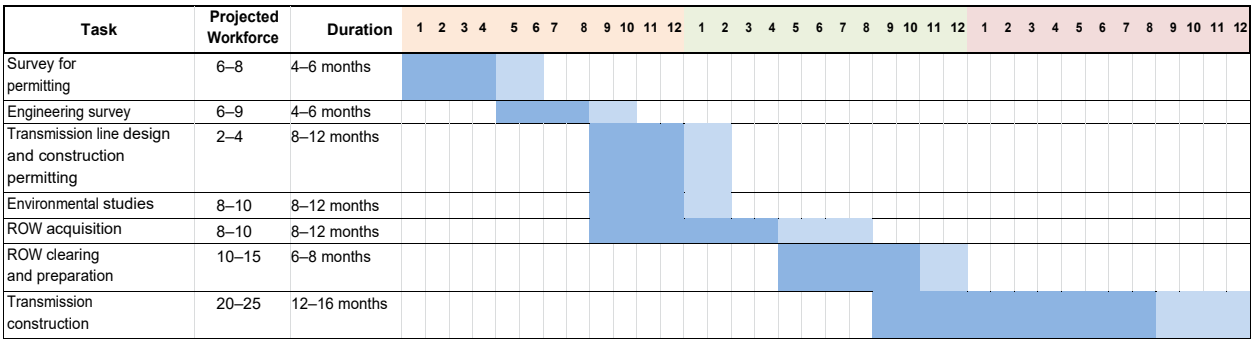


Figure 2.4-9. Project Schedule and Projected Workforce

2.4.13 Stormwater Permitting and Best Management Practices

Within South Carolina, the National Pollutant Discharge Elimination System (NPDES) General Permit within the state for Stormwater Discharges from Construction Activities (Permit No. SCR100000) is managed by the South Carolina Department of Environmental Services (SCDES) (formerly the South Carolina Department of Health and Environmental Control [SCDHEC]). The NPDES general permit requires compliance with the provisions of the South Carolina Pollution Control Act (South Carolina Code Sections 48-1-10 et seq., 1976) and with the provisions of the CWA, 33 USC §§1251 et. seq., as amended by the Water Quality Act of 1987, Public Law 100-4. Central Electric would file a Notice of Intent prior to commencing clearing and construction activities. Accordingly, appropriate controls and measures would be identified in a Storm Water Pollution Prevention Plan (SWPPP) to control erosion and prevent sedimentation from construction sites, and stabilize all portions of the construction site with permanent cover following completion of work. Central Electric would also comply with all nationwide or regional conditions set forth by a required CWA permit for impacts to wetlands and waters of the U.S.

Following transmission line construction on privately owned uplands, Central Electric anticipates the ROW would be seeded with a mixture of grasses and forbs suitable to the coastal South Carolina climate. Temporary mulch designed to provide cover and protect soils until the herbaceous vegetation is established may be used.

Within uplands on NFS lands, following transmission line construction, Central Electric would seed the easement areas with a mixture of mutually agreed upon, native, warm season grasses. The seed mixture also may be temporarily mulched to protect soils until the native warm season grasses are established.

2.4.14 Transmission Line Maintenance and Operation

Access to the transmission line ROW would be required to perform periodic inspections, conduct maintenance, and repair damage. Regular maintenance and inspections would be performed during the life of the transmission line to ensure its continued integrity. Inspections would be limited to the ROW and to areas where obstructions or terrain may require off-ROW access. All inspection and O&M activities would be conducted consistent with local, state, and federal regulations and permits including the FMNF Land Management Plan, and an SUP and associated operating plan/agreement for authorization on NFS lands. If problems are found during inspection, repairs would be performed, and the landowner would be compensated for any loss. Also, the ROW would be managed to control vegetation that interferes with the O&M of the transmission line (see Section 2.4.17).

Once installed, the right of ways of any portion(s) of the transmission line installed underground would require the same level of vegetation clearing as overhead lines, maintaining a visible clearing through the

vegetation above the underground line. Monitoring and detecting issues within underground sections can be more challenging than with overhead lines. In case of faults, repairs to underground cables is more difficult and time-consuming than overhead lines due to the complexity of locating faults and the need to dig up and replace sections of cable. Also, Central Electric does not keep underground transmission replacement parts on hand and would rely on global supply chains and shipping times to repair damaged underground portions of the line which could result in delays of service of months to local customers.

2.4.15 Transmission Line Inspection

Central Electric's transmission lines are inspected on a regular basis by Santee Cooper, under a contractual relationship. Regular periodic inspection is required to ensure that structures, insulators, conductors, shield and guy wires, and all other components previously identified are maintained in good condition.

2.4.16 Vegetation Management

Transmission line ROWs owned by or leased to Central Electric are also maintained by Santee Cooper, under a contractual relationship. Santee Cooper's ROW management program is called Transmission Vegetation Management Program and Unit Plan, and it includes a broad range of mechanical and chemical vegetation management. The plan was updated in 2022 and is included in Appendix F.

Vegetation management is the responsibility of multiple entities within Santee Cooper, including staff responsible for the mechanical re-clearing and soil stabilization of selected transmission line ROWs. ROW management is responsible for herbicide-related vegetation maintenance, encroachment enforcement, and administering Santee Cooper's transmission vegetation management program. Santee Cooper is responsible for all vegetation related maintenance throughout this portion of Central Electric's transmission system.

Central Electric's new transmission ROWs would be inspected by Santee Cooper to ensure that ROW conditions can be accepted by Santee Cooper's O&M staff. Danger trees, erosion, correct ROW widths, and stump levels are some of the major items that would be inspected. To determine if vegetation is encroaching on the transmission line, Santee Cooper would follow the vegetation clearance guide in the Transmission Vegetation Management Program and Unit Plan.

The majority of the proposed transmission line would be in forested areas, requiring tree maintenance to maintain the integrity of the transmission line. Approximately 91 percent follows established roads where the ROW clearing requirements would be significantly reduced due to ROW overlap. In these situations, existing road ROW would be utilized as a part of the ROW required, thus reducing the need for new clearing. On NFS lands, no herbicide use would be authorized unless specifically approved by the USFS, and vegetation management would comply with all USFS (2017) standards and guidelines. Off NFS lands, herbicide application for ROW maintenance could include applying granular herbicide at the base of selected transmission structures to reduce the potential for damage from wildfires and/or to facilitate ground rot inspections by line personnel. Also, crews treat wetland areas (i.e., areas where mowing equipment cannot traverse) with a foliar herbicide application, using a Marsh Master or similar equipment, to control woody vegetation.

The goal of Santee Cooper's herbicide program is to control vegetation that could interfere with the normal transmission of electricity, while promoting low-growing native vegetation. The current practice of applying herbicides is to selectively treat undesirable woody vegetation using a low volume methodology. Although the amount of herbicide applied depends on the species composition, density, and height ofthe vegetation that is present, the selective application approach results in less of the active ingredient being applied per acre, as compared to the broadcast method. Also, only USEPA-approved herbicides would be used within ROWs with each being applied in accordance with manufacturer labeling.

With respect to chemicals used, applications, and application rates, the following information has been submitted by Santee Cooper.

- Backpack application—Mix containing 4 percent Rodeo and 0.5 percent Polaris (average of 10 gallons of mix per acre is applied)

- Large all-terrain vehicle (ATV) application—Mix containing 4 percent Rodeo and 0.5 percent Polaris (average of 26 gallons of mix per acre is applied)

- Cut stump application—Mix containing 20 percent Triclopyr with the amount of mix applied dependent on the diameter of the stump because only the cambium layer is treated)

- Granular Application (applied by hand)—(2 pounds or less per pole (dependent on the density of vegetation around the pole and the radius of control that is needed)

Glyphosate, Imazapyr, and Metsulfuron—the primary products Santee Cooper uses in its foliar spray mix—are USFS-approved herbicides. Santee Cooper currently uses the following products that are commonly available on the market.

- Polaris (Imazapyr)—Labeled for upland and wetland/aquatic uses on utility ROWs, Polaris is delivered by backpack or ATV depending on ROW conditions.

- Rodeo (Glyphosate)—Labeled for upland and wetland/aquatic uses on utility ROWs, Rodeo is delivered by backpack or ATV depending on ROW conditions.

- Escort (Metsulfuron)—Used sparingly when vines and waxy vegetation require control. When used, it represents 3 to 5 ounces of a 100-gallon tank mix.

Granular applications would primarily be used around poles to eliminate woody plants and vines. Santee Cooper uses a special granular blend consisting of Topsite and SpraKil S-5 that is applied by hand. Tebuthiuron (SpraKil S-5) represents 5 percent of the active ingredient. Topsite is a blend of herbicides that includes Diuron (which represents 2 percent active ingredient) and Imazapyr (which represents 0.5 percent active ingredient).

Using a selective low volume approach, personnel equipped with backpacks would treat only undesirable vegetation along selected ROWs. Hardwoods, such as sweetgum, red maple, black willow, and various oaks that are tall growing and other prolific species like pines, would be targeted. By removing these trees, desirable plants (from an ROW perspective) such as grasses and forbs can better compete for nutrients, and once established, these low-growing species contribute substantially to long-term vegetation control in ROWs.

After initial herbicide application, Santee Cooper would conduct a post application inspection (e.g., aerial and/or ground) to identify any areas that may require follow-up treatment. Maintenance would take place on a three-year rotation. Because the density of undesirable vegetation would have been reduced, subsequent herbicide applications should require less herbicide to control vegetation.

In wetland areas, Santee Cooper ground crews use backpacks and/or an ATV (e.g., Argo and Marsh Master) equipped with a hydraulic spray system to foliar treat only the undesirable vegetation present. Current procedures dictate a selective, low volume herbicide approach that minimizes the amount of active ingredient applied per acre.

The herbicide products that would be used during wetland area spraying are determined by the species present and, to a great extent, by the location. In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites would be used. Wetland areas would be scheduled on a three- or four-year rotation depending on the vegetation species present, densities of woody vegetation, and height of conductors. Vegetation densities should decrease with subsequent applications requiring less herbicide to be applied.

Future vegetation management activities on ROWs crossing NFS lands are expected to be similar to vegetation management as described above except for the prohibition on using herbicides. Herbicides would not be used during land clearing or maintenance activities of the ROW crossing NFS lands unless approved by the USFS.

Transmission lines with tree limbs encroaching into the ROW that pose a problem for Project O&M would be scheduled for side trimming. Maintenance options would include removing encroaching limbs from the air or from the ground. Aerial operation would consist of using a set of belt driven saws, suspended from a helicopter, to cut over-hanging limbs back to the edge of the ROW. Ground operation would include using equipment, such as a Jarraff or Skytrim, to perform a similar function. These machines have an extendable boom with an attached circular saw that can reach and trim tree limbs high above the ground.

To manage and maintain danger trees, maintenance personnel would use an instrument called a clinometer that measures angles to determine whether a tree located off ROW is tall enough to hit the transmission line conductors if it were to fall. Depending on the species of tree, height, age, and site index, the tree would either be felled whole or topped. The decision to top or fell would be made by a forester in charge of the operation based on his or her opinion of tree survivability after topping. Felled trees are de-limbed and decked between the spans in which they were cut. The resulting slash (tree tops and limbs) would be left in the ROW to decay.

Reported erosion problems on the ROW typically would be rated from low to extreme based on soil type, topography, and proximity of eroded area to a transmission structure. This information is used to prioritize and schedule erosion control measures that would provide long-term control and ensure system reliability. Corrective action measures would include grading the eroded area and, if necessary, constructing water bars, which are berms created with mulch material, to divert surface waters across the ROW. Crews then would plant the area with an appropriate seed mix for the season and soil characteristics. To enhance stability and ensure that the terraces and repaired ROWs would not be affected by rains before grasses are established, hay bales, or other erosion control structures may be installed where appropriate to protect them.

2.4.17 Structure Replacement

In the event that one or more of the structures fail, they would be replaced in-kind as described in the preceding sections. Damaged structures and components would be recycled or landfilled.

2.4.18 Substation Maintenance and Operation

Berkeley Electric will follow the latest RUS guidelines in performing O&M procedures on its substation. Berkeley Electric will inspect its substation monthly to identify anything within the substation that may need attention and to collect operational data from electrical equipment such as transformers, breakers, reclosers, and voltage regulators. The physical condition of equipment, structures, fencing, gates, and signs will be recorded during inspections. The latest version of the National Electrical Safety Code will serve as the minimum requirement on items such as clearance and signage. Relay, infrared, and oil testing will be done per RUS and industry best practices to help ensure safe and reliable operation of the vital substation

equipment. Reclosers and voltage regulators will be changed out periodically so that maintenance can be performed in a controlled environment. Berkeley Electric will engage a third-party consulting firm to review its O&M practices every three to four years and submit the third-party inspections to Central Electric and RUS.

Routine maintenance would be conducted at substation locations, as required, to remove undesirable vegetation that may interfere with the safe and reliable operation of the substation.

2.4.19 Substation Inspection

Substations are inspected on a regular basis to ensure that transformers, high-side and low-side structures, bus work, and all other components are maintained in good condition.

2.4.20 Spill Prevention, Control, and Countermeasures

Electrical transformers used for the proposed McClellanville Substation would be filled with non-polychlorinated biphenyl (PCB) dielectric fluids needed for cooling and insulating the equipment. No other additional bulk storage of oils would be required onsite. Non-PCB mineral and vegetable-based oils typically used in new transformers display low direct toxicity because they do not contain the water soluble and multi-ringed polynuclear aromatic hydrocarbons typically found in the older PCB/petroleum-based oils. Nevertheless, the transformer at the proposed McClellanville Substation would be installed within a concrete containment area with 2-foot-high walls, forming a containment area with sufficient capacity to hold the transformer cooling/insulating fluids in the unlikely event of a leak or spill.

As required by USEPA, Berkeley Electric has developed and maintains an oil Spill Prevention Control and Countermeasures Plan to identify the quantities of oil at each substation and procedures to follow, in the event of a spill. The plan would give all pertinent information needed to effectively initiate clean-up of the spill, including all agency contact information required for notification purposes.

Knowledge of a spill would be immediate because the substation transformer would overheat and protective equipment would engage and shut down the power to the substation. Berkeley Electric would respond as quickly as practicable to assess the situation. Installation of a temporary or new transformer and recovery of the spilled fluids would be very high priorities. The site cleanup crew would implement the accidental release measures identified on the Material Safety Data Sheet for Mineral Oil and in the Spill Prevention Control and Countermeasures Plan. The containment area would prevent the spill from leaving the site and entering watercourses. The spilled dielectric fluid would be absorbed with appropriate inert materials or recovered using vacuum pumps, shovels, buckets, or other means and placed in drums or other suitable containers. Recovered material would be delivered to a company that handles the responsible and approved disposal or recycling of used transformer oils.

2.5 Environmental Impact Mitigation

Selecting either of the alternatives would require implementing mitigation measures to prevent or minimize both short- and long-term impacts on resources from construction and operation of the Project. Table 2.5-1 presents Central Electric's proposed mitigation measures for potentially affected resources. Central Electric proposes to implement these measures to avoid, minimize, or mitigate potential Project effects on water resources, biological resources, soils and geology, air quality, cultural resources, land use, socioeconomics, transportation infrastructure, health and safety, and the soundscape. These measures include generally accepted BMPs that Central Electric would implement prior to, during, and post construction to minimize overall Project effects. Central Electric would incorporate design elements to avoid areas with sensitive resources, such as suitable habitat for threatened and endangered species, or perform additional site-specific

surveys and implement measures to avoid or minimize such areas. Such measures could include: (1) structural measures, such as using construction mats for all wetland crossings and installing bird flight diverters; (2) geographic restrictions, such as confining construction activities to the ROW and around structure locations, and storing construction equipment, fuels, chemicals, and materials outside of streams and wetlands; (3) preventive measures, such as developing a non-native invasive plant management plan and inspecting construction equipment for seeds and thoroughly cleaning equipment before use; (4) scheduling measures, such as performing river crossings during low water periods or during winter, avoiding construction activities in proximity to nests of sensitive birds, and providing landowners with a schedule of construction activities; (5) procedural measures, such as briefing Project workers on the appropriate protocol in the event of a cultural resource discovery during construction, or cleaning up spills or equipment leaks; (6) regulatory measures, such as adhering to any additional mitigation measures identified by USFWS during ESA section 7 consultation or preparing a stormwater pollution prevention plan (SWPPP) and a construction plan in accordance with federal regulations; and (7) restoration measures, such as restoring disturbed area to existing conditions after construction.

Furthermore, Central Electric would comply with the USFS (2017) FMNF Land Management Plan standards and guidelines, and any terms and conditions of an SUP, on NFS lands to "achieve or maintain the desired condition or conditions, avoid or mitigate undesirable effects or meet applicable legal requirements." Lastly, after Central Electric finalizes the preferred corridor's ROW, additional site-specific surveys of areas subject to ground disturbance will be conducted with the permission of landowners where necessary, which will inform the development of additional avoidance and minimization measures. For example, floristic surveys would be conducted within suitable habitat for federally listed plants and any suitable habitat would be avoided. Mitigation measures that would be required by federal agencies as loan or permitting conditions would be included in the Record of Decision issued by each federal agency.

Table 2.5-1. Summary of Applicant-Proposed Mitigation Measures

ID	Mitigation Measure
Water Resources	
WR-1	Avoid impacts to wetlands to the maximum extent practicable. Wetlands will be delineated within the selected corridor and a USACE permit or Nationwide Permit verification letter will be obtained prior to conducting any work in waters of the U.S.
WR-2	Store construction equipment, fuels, chemicals, and materials outside of streams and wetlands.
WR-3	Use construction mats for all wetland crossings.
WR-4	Comply with riparian buffers required by the state and clearly mark all wetland and buffer boundaries along the ROW prior to the implementation of other perimeter BMPs and commencement of construction activities.
WR-5	Span wetland and riparian areas where possible. Low-water crossings may be used to access the ROW during construction and will be designed so as not to inhibit fish passage or create discharges.
WR-6	Install BMPs, such as silt fences, at all stream crossings and along the borders of wetlands to prevent sedimentation.
WR-7	Locate pole structures outside wetland areas where feasible.
WR-8	Comply with all requirements of state permits for storm water discharges for construction activities.
WR-9	Develop an SWPPP (Storm Water Pollution Prevention Plan) prior to construction
WR-10	Prevent accidental spillage of contaminants, debris, hazardous liquids, or other pollutants into streams, waterways, lakes, land, and underground aquifers. Such pollutants and waste include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.
WR-11	Develop a hazardous materials management and spill prevention plan to address storage, use, transportation, and disposal of hazardous materials.
WR-12	Develop an emergency response plan for accidental spills.
WR-13	Promptly clean up spills or equipment leaks to prevent materials from entering surface water.
WR-14	Schedule construction in river crossing areas during low water periods or winter, if feasible.
WR-15	Install culverts where necessary to accommodate the estimated peak flow of the stream. Disturbance to the

ID	Mitigation Measure
	stream banks will be minimized during construction and all disturbed areas will be regraded to original contours and revegetated in accordance with the mitigation measures listed for soil/vegetation resources. Annual monitoring will ensure the culverts are functioning as designed.
WR-16	Remove excavated material and other debris from flood-prone areas to prevent debris from clogging culverts or bridges and altering water flow and flood patterns.
WR-17	Do not stockpile excavated materials near or on stream banks or waterway perimeters unless the stockpile is protected from high water or stormwater runoff.
WR-18	Ensure wastewater discharge from construction operations does not enter streams, waterways, wetlands, or other aquatic resources without the appropriate permits.
WR-19	Avoid using fertilizers, pesticides, or herbicides in or near surface waterbodies.
Biological Resources	
BR-1	If temporary access roads are required, restore them to their natural condition with native vegetation after construction.
BR-2	Mark and secure holes drilled or excavated for foundation construction with temporary fencing if left unattended overnight to ensure safety for livestock, wildlife, and the public.
BR-3	Conduct construction operations to minimize unnecessary destruction, scarring, or defacing of natural surroundings, vegetation, trees, and native shrubbery.
BR-4	Develop a non-native invasive plant management plan addressing prevention, detection, and control of non-native invasive plants during construction activities.
BR-5	Inspect and clean construction equipment for seeds before mobilizing to the Project area.
BR-6	Prior to clearing woody vegetation and trees during the migratory bird nesting season, complete a survey of the final ROW to identify existing stick nests. Tree-clearing crews will also be trained to stop work and notify Environmental staff if they encounter an unanticipated nest.
BR-7	Design the Project according to the Avian Power Line Interaction Committee's guidelines—APLIC (2006) and APLIC (2012)—for avian protection and collision risk mitigation.
BR-8	Comply with any reasonable and prudent measures, and/or terms and conditions of an incidental take statement issued by FWS during ESA section 7 consultation.
BR-9	Restore disturbed areas and construction staging areas upon completion to ensure surfaces drain naturally, blend with natural terrain, and are restored with native vegetation. Repair all destruction, scarring, and damage.
BR-10	Do not remove trees within 300 feet of active swallow-tailed kite nests or wood stork nesting colonies from April 1 through June 30 or until fledging is completed.
BR-11	Avoid suitable habitat for federally listed plants to the extent practicable. If suitable habitats cannot be avoided, species presence/absence surveys would be performed by a qualified biologist.
BR-12	Use optical ground wire or bird flight diverters in high bird use areas in consultation with USFWS to mitigate collision risks.
BR-13	Implement tree removal[5] restrictions during specific periods: winter torpor (December 15 to February 15) and pup season (May 1 to July 15). Prioritize tree clearing during the following work windows: 1) July 16 to December 14 (first choice), (2) February 16 to March 31 (second choice), and (3) April 1 to April 30 (third choice).
BR-14	Avoid using herbicides on NFS lands unless approved by the USFS.
BR-15	Avoid construction activities within a 200-foot buffer around RCW cavity trees during the RCW nesting season (April 1 through July 31).
Soils and Geology	
SG-1	Confine construction activities to the right-of-way (ROW) and around structure locations for transmission structures.
SG-2	Stockpile topsoil removed during construction and use it for reclamation following construction.
SG-3	Re-grade, stabilize, and revegetate all disturbed areas to match pre-construction conditions.
SG-4	While not anticipated to be necessary, design temporary access roads to follow existing land contours where practical to minimize erosion, rather than creating straight paths across the ROW.

[5] USFWS has defined "tree removal" as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats (81 FR 1900).

ID	Mitigation Measure
SG-6	Water will be applied on roads and disturbed areas to minimize dust, as needed.
Air Quality and Greenhouse Gas Emissions	
AQ-1	Enforce speed limits on local gravel roads during construction to reduce dust.
AQ-2	Locate staging areas as close to the construction site as possible to minimize driving distance.
AQ-3	Dispose of all waste materials properly at permitted waste disposal areas or landfills.
AQ-4	Do not burn or bury waste materials on the Right of Way (ROW).
Cultural, Historical, and Paleontological Resources	
CHP-1	Conduct a cultural resource survey within the ROW for archaeology and the area of potential effects for aboveground resources before construction. Develop and implement mitigation measures as required by the Programmatic Agreement (PA).
CHP-2	Span and protect archaeological sites during construction when feasible, as identified in the PA. Address any designs that cannot span archaeological resources with phased surveys and resolution of adverse effects, as necessary.
CHP-3	Brief all workers on protocols for cultural resource discoveries during construction. Prohibit workers from removing artifacts from the project area, as outlined in the PA.
CHP-4	Suspend all construction activities within a 50-foot radius if any archaeological resources are discovered, as specified in the PA.
Land Use	
LU-1	Provide a schedule of construction activities to all landowners who could be affected.
LU-2	Acquire appropriate permits and easements from federal or state land management agencies for portions of the ROW traversing public lands.
LU-3	Plan construction activities to minimize temporary disturbance, displacement of crops, and interference with agricultural activities.
LU-4	Construct access roads to the minimum width required for the passage of construction vehicles.
LU-5	Repair or replace fences, gates, and similar improvements that are removed or damaged during construction.
LU-6	Reclaim deep ruts after construction that may be hazardous to farming operations and equipment movement. Level, fill, and grade ruts, scars, and compacted soils from construction activities in productive hay or crop lands using scarifying, harrowing, disking, or other appropriate methods. Correct damage to ditches, tile drains, terraces, roads, and other land features, and restore land contours and facilities as nearly as practical to their original conditions.
LU-7	Use gates exclusively to discourage access to the ROW across NFS lands and use hedges and gates to discourage access to the ROW across other lands.
Socioeconomics	
SE-1	Contact landowners during construction to minimize short-term impacts on agriculture.
Transportation	
T-1	Coordinate conductor stringing across roadways with the SC State Department of Transportation.
T-2	Coordinate with the Federal Aviation Administration prior to construction if the preferred corridor is near an airfield before construction begins.
Health and Safety	
HS-1	Prepare a construction plan in accordance with the National Electrical Safety Code and Occupational Safety and Health Administration regulations, as required by federal law, to ensure the safety of construction workers. The plan will include standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The plan will also identify procedures should a spill occur or hazardous materials be discovered. The plan will be reviewed with fire department personnel and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures.
HS-2	Identify existing utilities and coordinate with their owners/managers prior to construction to protect both facilities and construction workers during crossings.
HS-3	Conduct vehicle fueling in compliance with procedures designed to minimize fire risks and fuel spills.
HS-4	Secure all construction areas at the end of each workday to protect equipment, materials, and discourage public access.

ID	Mitigation Measure
Noise	
N-1	Equip all construction equipment with sound-control devices no less effective than those provided on original equipment.
N-2	Ensure all internal combustion engines used in construction are equipped with mufflers and spark arresters to minimize noise.
N-3	Conduct construction activities between 7:00 a.m. and 8:00 p.m. in residential areas

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter describes the existing environmental resources and potential impacts that the Project would have on those resources. The affected environment and potential impacts were determined through research and desktop analysis conducted by environmental specialists and from information provided in agency and public comments. Reconnaissance-level field surveys have been conducted on NFS lands and those data are provided in this section. However, because Central Electric does not have access rights, private lands were not surveyed. In these areas, publicly available information was used to describe the existing environment and characterize the potential effects. For each resource, some potential mitigation measures to reduce or avoid impacts are identified. The Applicant-proposed mitigation measures are detailed in Section 2.5 (see Table 2.5-1).

Based on RUS's review of the public scoping comments and ongoing coordination with agencies, the following resources have been identified as potentially being affected by the alternatives carried forward for detailed analysis:

- Water Resources
- Biological Resources
- Soils and Geology
- Air Quality and Greenhouse Gas Emissions
- Cultural and Paleontological Resources
- Recreation and Land Use
- Visual Resources
- Socioeconomics
- Environmental Justice
- Transportation
- Health and Safety
- Noise

NEPA requires that the environment of the area to be affected or created by the alternatives under consideration is sufficiently described (40 CFR §1502.15). The Affected Environment sections describe the resources that could be affected by implementation of the Proposed Action or either of the two action alternatives. The resource descriptions provided in this section serve as the baseline from which to evaluate the potential impacts of the Proposed Action.

The Environmental Effects sections analyze both beneficial and adverse impacts that would result from implementing the Proposed Action or either of the two action alternatives. NEPA requires agencies to assess

the direct, indirect, and cumulative impacts of a proposed action. Direct impacts are those that are caused by the Project and happen at the same location and time. Indirect impacts are those impacts that happen later in time and/or farther removed from the Project but are still reasonably foreseeable. A cumulative impact is defined as the "impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR §1508.7).

Where specific impacts affecting NFS lands can be addressed separately, they are called out and described in this analysis. In cases where impacts on NFS lands would not be unique from general effects on all lands (e.g., Project-related effects on regional air quality), such effects on NFS lands are addressed in the general analysis.

To determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts, timing, and the duration. Intensity refers to the severity of the impact. Intensity definitions have been developed to assess the magnitude of effects for all of the affected resource categories resulting from implementing the proposed action. Context in terms of duration of impact are estimated as either short-term or long-term. The definitions of intensity and duration are specific to each resource evaluated. Each affected resource impact analysis briefly describes the methodology used for analysis.

For each resource below, a general description of the existing conditions is described, followed by an examination of the potential effect on the resource under the no action alternative and three action alternatives.

3.1.1 Analysis Area

A specific ROW for the Project has not yet been determined this EIS is evaluates impacts within a 600-foot-wide corridor (300 feet on either side of the centerline). A 75-foot Project ROW could be located anywhere within the envelope of the 600-foot-wide corridors analyzed. The "Project area" for this EIS consists of the 600-foot-wide corridor for the Proposed Action and two action alternatives, plus the boundary of the proposed McClellanville substation site (Figure 1.1-1).

Where direct impacts are quantifiable at a finer scale, using GIS or field surveys (water resources, biological resources, and land use), calculations are presented within a "preliminary 75-foot ROW." Seventy-five feet is the maximum ROW width for both construction and O&M although the final ROW width could be less in places where it overlaps with existing road and utility ROWs. For example, as described in Section 2.4.3, the ROW clearing could be reduced from 75 feet down to approximately 42.5 feet alongside existing road, rail, and utility ROWs. Calculating potential Project impacts within both the corridor and a preliminary ROW provides two spatial scales for analysis even if the small-scale buffer (75-feet) does not represent the final ROW alignment. Once the transmission line design is complete, adjustments to the ROW within the 600-foot-wide corridor would be made based on constructability. These adjustments would include the locations for the placement of double-pole structures and the location for turn angles to provide a change in direction of the transmission line that would require temporary construction easements outside a 75-foot-wide ROW so that the conductor can be pulled through at an angle.

Table 3.1-1 summarizes the calculations and spatial dimensions that were used to estimate the ground disturbance that would be caused by the various Project components. For more information on each, refer to Section 2.4.

Table 3.1-1. Ground Disturbance Assumption for Project Components

Project Component	Description
Pre-construction activities	Minimal temporary disturbance (~400 sq ft) for each geotechnical boring sites.
ROW clearing	42.5 feet wide along existing road ROWs and 75 feet wide elsewhere
Staging Areas	One-acre staging area outside ROW, within the 600-foot corridor; smaller areas within the 75-foot ROW
Transmission pole Installation	20 feet by 20 feet (0.009 acres) of temporary vegetation disturbed around each structure for temporary construction pads
Conductor Installation	Temporary disturbance for stringing setup areas every 2 miles within the ROW or on temporary construction easements
Dead-end structures	Approximately 2.1 structures per mile, each requiring an additional 2,600 square feet of disturbance
Swinging angle structures	Approximately 1.4 structures per mile, each requiring an additional 1,300 square feet of disturbance
Stub poles	Approximately 1 structures per 4 miles alongside road ROWs, each requiring an additional 2,000 square feet of disturbance
Foundation ground disturbance	Permanent disturbance of 6 feet in diameter (28.3 square feet) per transmission pole
Access roads	No new access roads; improvements to existing off-ROW roads as needed
McClellanville Substation construction	4.4 acres of total land disturbance within the limits of clearing and grading

3.2 Water Resources (Surface Water, Wetlands, and Floodplains)

3.2.1 Affected Environment

3.2.1.1 Surface Water

The Project is located in the flat Atlantic Coastal Plain, which has abundant water resources. The Project vicinity includes numerous swamps, depressional wetlands, lime sinks, tidal estuaries, freshwater streams, lakes, and reservoirs. This section describes surface waters. Wetlands are discussed below in Section 3.2.1.3.

Table 3.2-1 quantifies the streams and waterbodies crossed a proposed centerline for the Proposed Action each alternative, as defined by channels identified in the National Hydrography Dataset. The Jamestown corridor would have the fewest number of stream and waterbody crossings in comparison to other alternatives,. The Charity Alternative has the most stream crossings. Figures 3.2-1 and 3.2-2 show the location of the streams crossed by each alternative. Several unnamed streams are classified as ditches and are used to drain wet areas. The named streams are discussed further below.

Table 3.2-1. Tally of Surface Water Crossed by the Proposed Action and Alternatives

Hydrology	Jamestown Corridor (Proposed Action)	Jamestown Alternative	Charity Alternative
Stream crossings (count)	10	10	20
Waterbody crossings (count)	9	10	22
Waterbody crossing length (miles)	1.1	1.1	2.7

Source: National Hydrography Dataset (USGS n.d.)

The Project is within the Santee and Cooper River basins. The Santee River Basin, as defined by SCDHEC (2013a), includes 8-digit hydrologic units 03050111 and 03050112 and flows southeast from the Upper

Coastal Plain Region to the Lower Coastal Plain and the Coastal Zone regions of South Carolina. The Cooper River (8-digit hydrological unit 03080201) is a tidal river system that discharges into Charleston Harbor.

Proposed Action (Jamestown Corridor)

Four named creeks would be crossed by the Jamestown corridor—Echaw Creek, Beaman Branch, Wambaw Creek, and Mechaw Creek (Figure 3.2-1). Echaw Creek and Beaman Branch are tributaries to the Santee River, whereas Wambaw and Mechaw creeks are tributaries to the South Santee River. These named creeks are described in greater detail below. In the far eastern portion of Project area near the proposed McClellanville Substation, approximately 1.5 miles of the shared corridor crosses the Jeremy Creek watershed, which flows directly into the Atlantic Ocean. The remaining stream crossings and waterbodies are unnamed. All streams be crossed by the Jamestown corridor are either direct or indirect tributaries to the Santee River system.

Echaw Creek—Echaw Creek would be crossed by the Jamestown corridor along an existing unimproved road on private lands, approximately 10.1 miles northwest of the proposed McClellanville Substation. This surface water flows in a northerly direction before draining into the Santee River, approximately 8.5 miles northeast of the proposed crossing.

Beaman Branch—Beaman Branch is a small tributary to Echaw Creek that would be crossed by the Jamestown corridor approximately 0.25 miles south of where it would cross Echaw Creek, near the intersection of Shulerville Road and School Bus Drive. This surface water flows in a northerly direction before draining into Echaw Creek, about 0.1 miles northeast of the proposed crossing.

Wambaw Creek—Wambaw Creek would be crossed by the Jamestown corridor about 6.1 miles northwest of the proposed McClellanville Substation. This surface water flows in a northeasterly direction before draining into the South Santee River, about 9 miles east of the proposed crossing.

Mechaw Creek—Mechaw Creek is a small tributary to Wambaw Creek that would be crossed by the Jamestown corridor approximately 3.9 miles northwest of the proposed McClellanville Substation. This surface water flows in a northerly direction before draining into Wambaw Creek, approximately 0.1 miles northeast of the proposed crossing.

Jamestown Alternative

The Jamestown Alternative would cross the same number of streams and one fewer waterbody than the Proposed Action (Table 3.2-1). The main difference is the location where Echaw Creek would be crossed. Rather than crossing along an unimproved private road where there is no bridge, the Jamestown Alternative would cross Echaw Creek along Shulerville Road where there is an existing bridge.

Charity Alternative

Five named creeks would be crossed by the Charity Alternative—French Quarter Creek, Quimby Creek, Cropnel Dam Creek, Wambaw Creek, and Mechaw Creek (Figure 3.2-2). French Quarter and Quimby creeks are tributaries to the East Branch Cooper River, whereas Cropnel Dam Creek is a small tributary to Quimby Creek. Wambaw and Mechaw creeks are tributaries to the South Santee River. These named creeks are described in greater detail below. The remaining stream crossings and waterbodies are unnamed. Other than the creeks crossed by its shared alignment with the Jamestown corridor, most of the streams crossed by the Charity Alternative are either direct or indirect tributaries to the Cooper River system.

French Quarter Creek—French Quarter Creek would be crossed by the Charity Alternative approximately 30.1 miles southwest of the proposed McClellanville Substation. This surface water flows in a northwesterly direction before draining into the East Branch Cooper River, approximately 6.1 miles northwest of the proposed crossing.

Quimby Creek—Quimby Creek would be crossed by the Charity Alternative approximately 23.8 miles southwest of the proposed McClellanville Substation. This surface water flows in a northwesterly direction before draining into the East Branch Cooper River, approximately 5.7 miles northwest of the proposed crossing.

Cropnel Dam Creek—Cropnel Dam would be crossed by the Charity Alternative approximately 21 miles southwest of the proposed McClellanville Substation. This surface water flows in a southerly direction before draining into Quimby Creek.

Wambaw Creek—Wambaw Creek would be crossed by the Charity Alternative adjacent to the SC Highway 45 bridge, at the same location as the Jamestown Alternative.

Mechaw Creek—Mechaw Creek would be crossed by the Charity Alternative adjacent to the SC Highway 45 bridge, at the same location as the Jamestown Alternative.

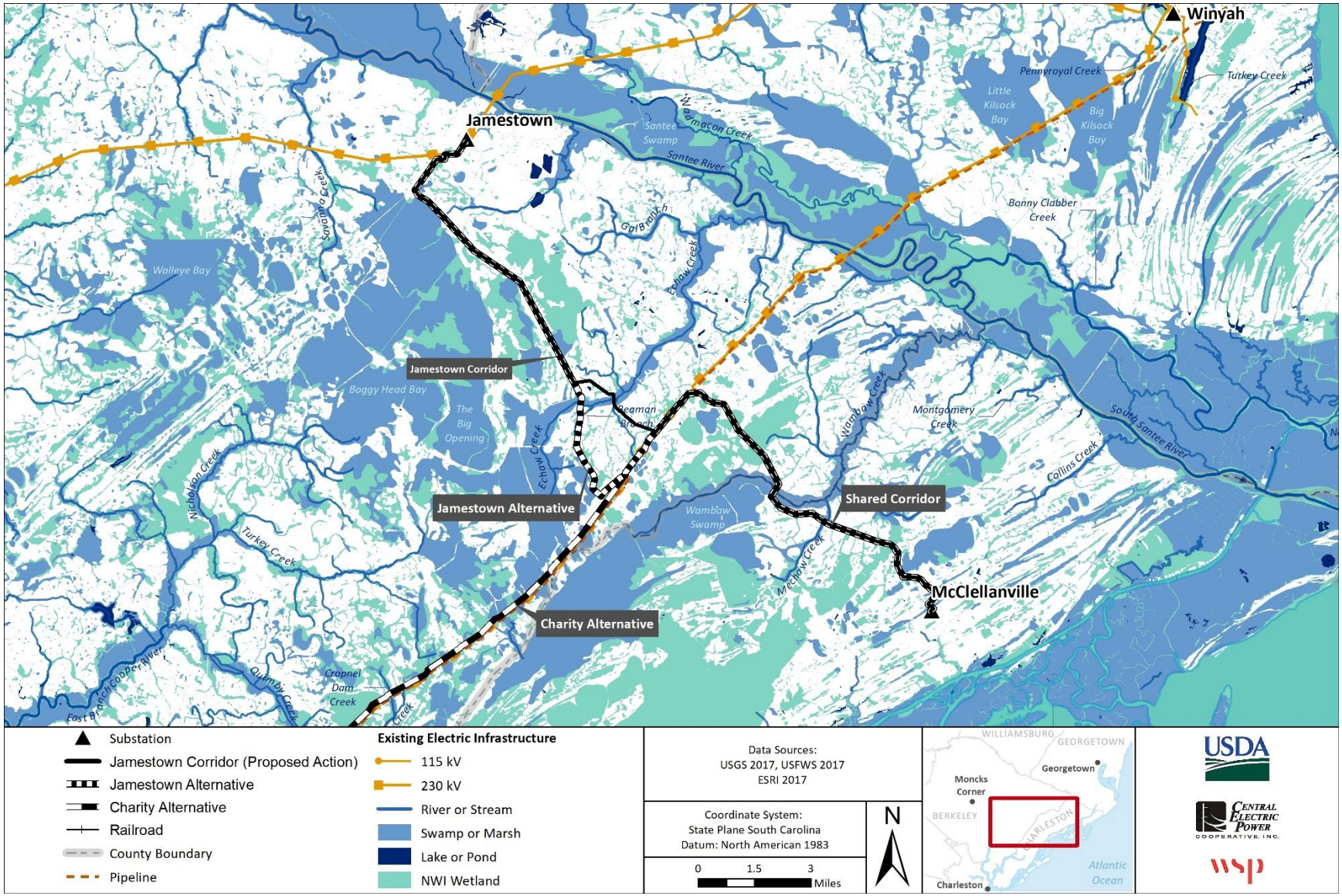


Figure 3.2-1. Waters and Wetlands in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

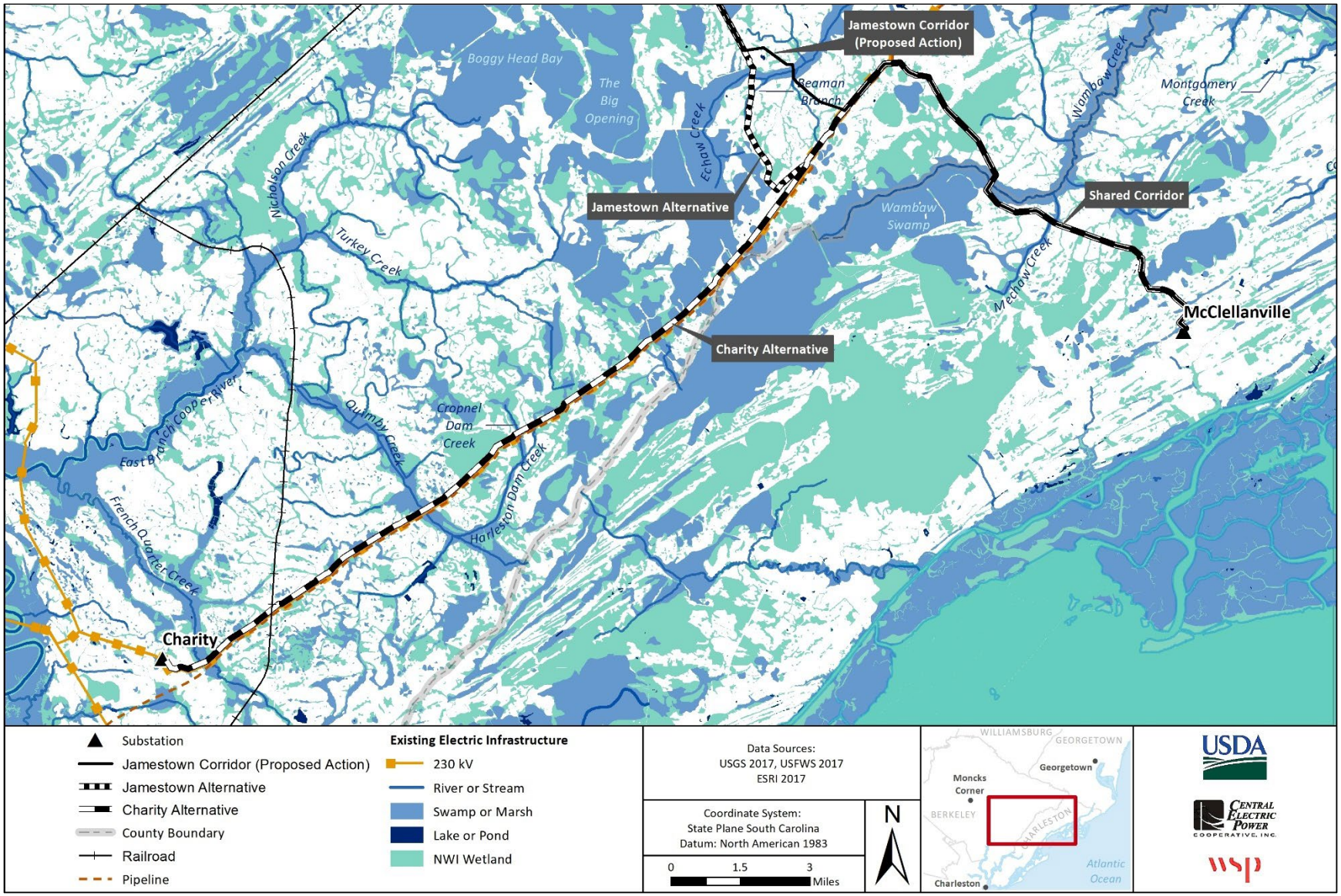


Figure 3.2-2. Surface Waters in the Vicinity of the Charity Alternative

3.2.1.2 Water Quality

As required by Section §303(d) of the CWA and federal regulation 40 CFR §130.7, states must establish water use classifications and water quality criteria to maintain, protect, and enhance public health, water uses, and water quality. SCDES, through South Carolina Regulation 61-68, *Water Classifications and Standards*, establishes these water uses and standards. The assessment of water quality is based on a comparison of monitoring data to state and federal standards and criteria for the classified use of the waterbody.

In accordance with federal and state regulations, the state also develops a list of waters that are impaired due to a failure to meet state water quality standards and to support one of the classified uses. In order for listed waterbodies to be removed from the 303(d) list, the water quality standard must be met, a total maximum daily load must be developed and accepted or an error in the list must be discovered. A total maximum daily load is the amount of a specified pollutant that is allowed in a waterbody without exceedance of the water quality criteria.

The state's most recent 303(d) list of impaired waters, *Integrated Report for 2016 Part I Section 303(d) List of Impaired Waters*, includes several locations close to the Project. Table 3.2-2 reports these 303(d) locations (SCDHEC 2022). Figures 3.2-3 and 3.2-4 show the locations of the water quality monitoring stations where impairments are reported.

Table 3.2-2. 303(d) Impaired Waters Locations

Monitoring Station	Use	Cause of Impairment	Stream
ST-005	Aquatic life, Fish consumption	Mercury, Phosphorus	North Santee River
ST-006	Recreation, Fish consumption	E.coli, Mercury	South Santee River
CSTL-593	Fish consumption	Mercury	North Santee River
CSTL-112	Recreation, Fish consumption	E.coli, Mercury	Wambaw Creek
RS-01056	Recreation	E.coli	Cedar Creek
RS-02483	Recreation	E.coli	Turkey Creek
CSTL-564	Fish consumption	Mercury	East Fork Cooper River
MD-203	Aquatic life, Recreation	Dissolved oxygen	Jeremy Creek

Source: SCDHEC (2022)

Proposed Action (Jamestown Corridor)

Impaired waters in the vicinity of the Jamestown corridor are identified at three monitoring stations. The first station (CSTL-112) is located in Charleston County on Wambaw Creek about 5 miles downstream of SC Highway 45. This location does support aquatic life; however, the increasing trend in turbidity and pH is significant. Wambaw Creek is characterized by naturally low dissolved oxygen conditions, and the substantially decreasing trend in 5-day biochemical oxygen demand suggests improving conditions (SCDHEC 2013b). Recreational uses are partially supported due to fecal coliform bacteria excursions. A fish consumption advisory is active for this location due to mercury in fish tissue (SCDHEC 2018).

The second station (RS-01056) is located in Charleston County on Cedar Creek just above its confluence with Wambaw Creek near the South Santee River. This location does support aquatic life; however, Cedar Creek is characterized by naturally low dissolved oxygen conditions (SCDHEC 2013c). Recreational uses are not supported due to fecal coliform bacteria excursions (SCDHEC 2018).

The third station (MD-203) is located on Jeremy Creek by the town of McClellanville, Berkeley County. Aquatic life uses are not supported due to dissolved oxygen excursions (SCDHEC 2018). Significant decreasing trends in total phosphorus concentration and fecal coliform bacteria suggest improving conditions for these parameters. Recreational uses are fully supported.

The Jamestown corridor would occur within 7 miles of stations CSTL-112 and RS-01056. Station MD-203, on Jeremy Creek in the town of McClellanville, is 1.4 miles from the proposed McClellanville Substation.

Figure 3.2-3 shows the locations of the water quality monitoring stations where impairments are reported in the vicinity of the Jamestown corridor.

Jamestown Alternative

Water quality within the Jamestown Alternative would be the similar to the Proposed Action because the same water bodies would be crossed. Figure 3.2-3 shows the locations of the water quality monitoring stations where impairments are reported in the vicinity of the Jamestown Alternative.

Charity Alternative

The state of South Carolina identifies impaired waters in the vicinity of the Charity Alternative at three monitoring stations. The first station (RS-02483) is located in Berkeley County on Turkey Creek near the East Branch Cooper River just west of SC Highway 41. This location does not support aquatic life because of dissolved oxygen and pH excursions (SCDHEC 2013d). Recreational uses are partially supported due to fecal coliform bacteria excursions (SCDHEC 2018).

The second station (CSTL-564) is located in Berkeley County on the East Branch Cooper River near the mouth of Quimby Creek. Because of mercury in fish tissue, a fish consumption advisory is active for this location (SCDHEC 2022).

The third station (MD-203) is the same station located on Jeremy Creek described above because it is 1.4 miles from the proposed McClellanville Substation.

Station MD-203, on Jeremy Creek in the town of McClellanville, is 1.4 miles from the proposed McClellanville Substation. Figure 3.2-4 shows the locations of the water quality monitoring stations where impairments are reported in the vicinity of the Charity Alternative.

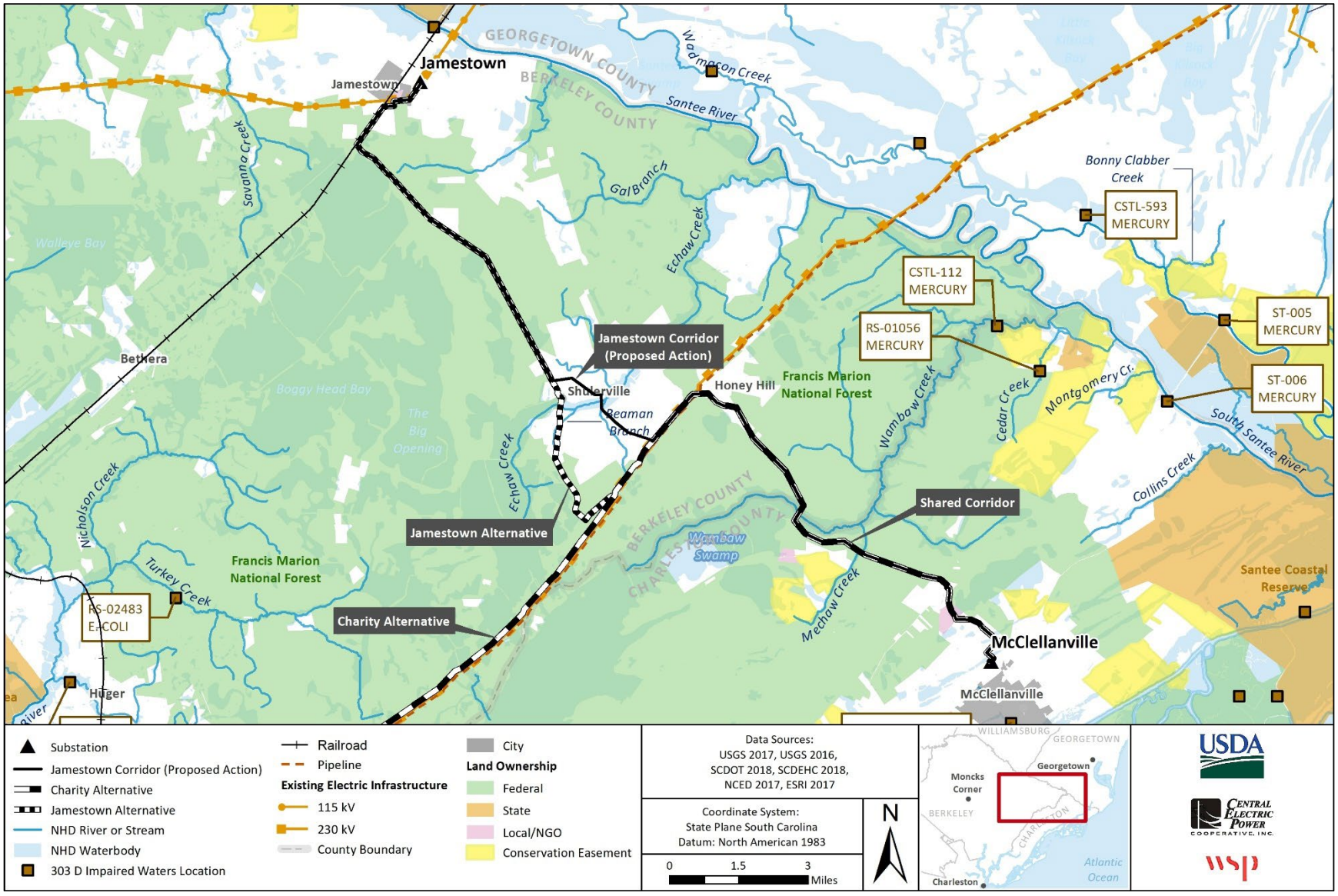


Figure 3.2-3. Impaired Stream Segments in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

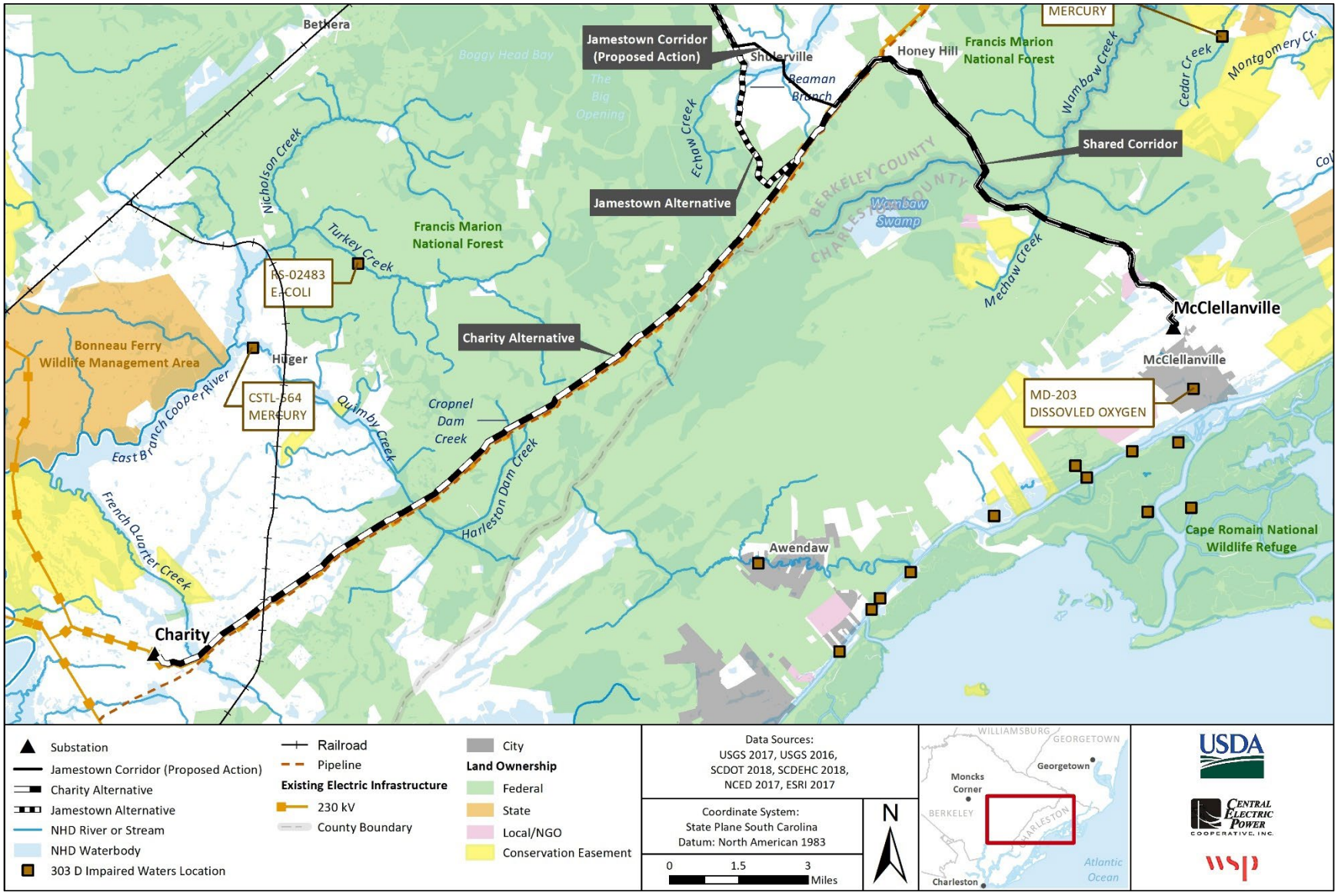


Figure 3.2-4. Impaired Stream Segments in the Vicinity of the Charity Alternative

Pesticides are used for agricultural, commercial, and domestic purposes to control harmful or non-native invasive plants, insects, fungi, or other organisms. In past sampling, pesticides have been detected in waterbodies within the Santee River Basin, with several exceeding water quality criteria for aquatic life use and/or human health (Maluk and Kelley 1998). However, recent data about monitoring to detect pesticide levels in waters within the Project vicinity were not found.

In addition to the turbidity and mercury issues found at locations in the Project vicinity, the U.S. Geological Survey (USGS) identified several high priority regional water-quality issues of concern to state and local water-resource managers. Issues included nitrogen and phosphorus enrichment leading to reduced dissolved oxygen concentrations, sediment erosion, urban stormwater runoff polluted with toxic trace elements and synthetic organic compounds, the presence of pesticides in surface water and groundwater, and fecal coliform contamination (Hughes et al. 2000). However, most of these additional issues occur on the lower Santee River upstream of the Project area, or downstream in the case of fecal contamination, and are associated with urban and/or agricultural land use.

3.2.1.3 Wetlands

Wetlands are generally defined as areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, under normal circumstances, a prevalence of hydrophytic vegetation. Many different types of wetlands exist and include fresh and tidal marshes, swamps, fens, bogs, and wet prairie.

The location of potential wetlands was determined by reviewing existing maps and geospatial data, including NWI, aerial photography, USGS topological maps, hydrography data, and Natural Resources Conservation Service (NRCS) soil surveys. USFWS does not ground-truth all of the NWI wetlands mapped. Classification of wetlands in the NWI database is based on the Cowardin Classification System (Cowardin et al. 1979), which considers both vegetated and non-vegetated areas in its assessment of wetlands.

Wetland types crossed by the proposed transmission line include freshwater palustrine emergent wetlands, freshwater palustrine forested/scrub shrub wetlands, freshwater ponds, and riverine wetlands. A description of each wetland type is provided below.

Table 3.2-3 shows the length of NWI wetlands that would be crossed by a preliminary centerline for the Proposed Action and alternatives. Further detail about the acreage of NWI wetlands crossed is provided Table 3.2-4, which quantifies the acreage at two scales: within a 600-foot-wide corridor and within a preliminary 75-foot ROW.

Figures 3.2-1 and 3.2-2, above, show the distribution of wetlands mapped by NWI in the vicinity of each alternative, and the classification of NWI habitat types is shown in Figures 3.2-5 and 3.2-6.

Table 3.2-3. Length (miles) of National Wetlands Inventory Features Crossed by the Proposed Action and Alternatives, and Percentage of Total Corridor Length

NWI Wetland Habitat Type	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Freshwater palustrine emergent	0 (0%)	0 (0%)	8.2 (26%)
Freshwater palustrine forested/shrub wetland	2.9 (12%)	3.1 (12%)	6.7 (22%)
Freshwater pond	0.1 (<1%)	0 (0%)	0 (0%)
Riverine	< 0.1 (<1%)	< 0.1 (<1%)	0.1 (<1%)
Total	**2.9 (12%)**	**3.1 (12%)**	**15.0 (48%)**

Source: NWI (USFWS 2018a)

Table 3.2-4. Acreage of National Wetlands Inventory Features Crossed by the Proposed Action and Alternatives

NWI Wetland Habitat Type	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
NWI Wetland acreage within a 600-foot-wide corridor			
Freshwater palustrine emergent	3.0	3.0	102.1
Freshwater palustrine forested/shrub wetland	254.0	255.6	655.6
Freshwater pond	1.2	1.2	0.8
Riverine	1.3	1.9	4.1
Total	**259.5**	**261.4**	**762.50**
NWI Wetland acreage within a preliminary 75-foot ROW[a]			
Freshwater palustrine emergent	0.1	0.1	42.9
Freshwater palustrine forested/shrub wetland	24.6	25.7	45.7
Freshwater pond	0	0	0
Riverine	0.2	0.2	0.5
Total	**24.9**	**26.0**	**89.1**

Source: NWI (USFWS 2018a)

[a] A preliminary 75-foot ROW is used for calculations in this EIS because 75 feet is the maximum ROW width for Project construction and O&M. However, the final ROW width could be less in places where it overlaps existing road and utility ROWs. The final ROW would be located based on site-specific engineering, and environmental and cultural resource surveys.

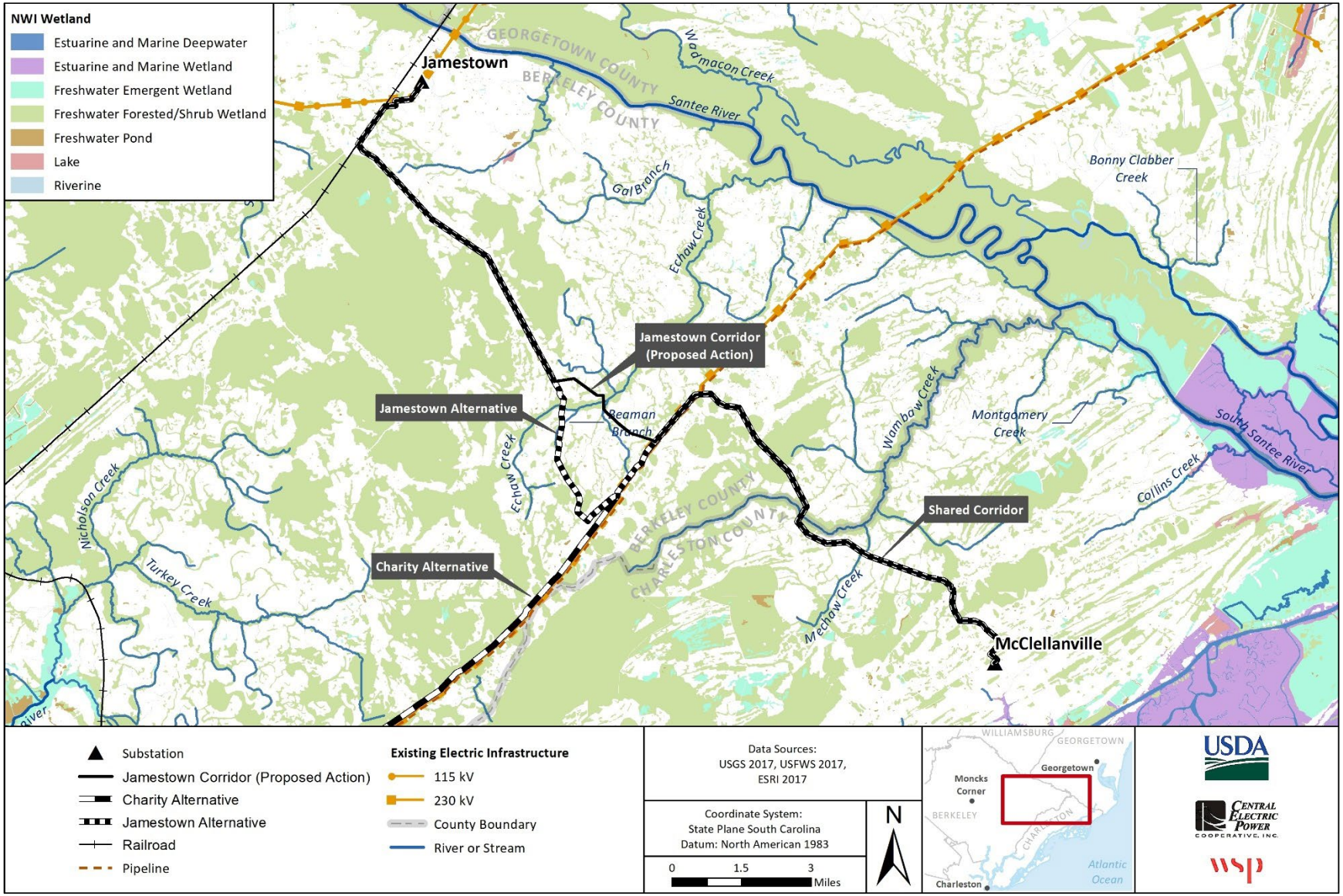


Figure 3.2-5. National Wetlands Inventory Data in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

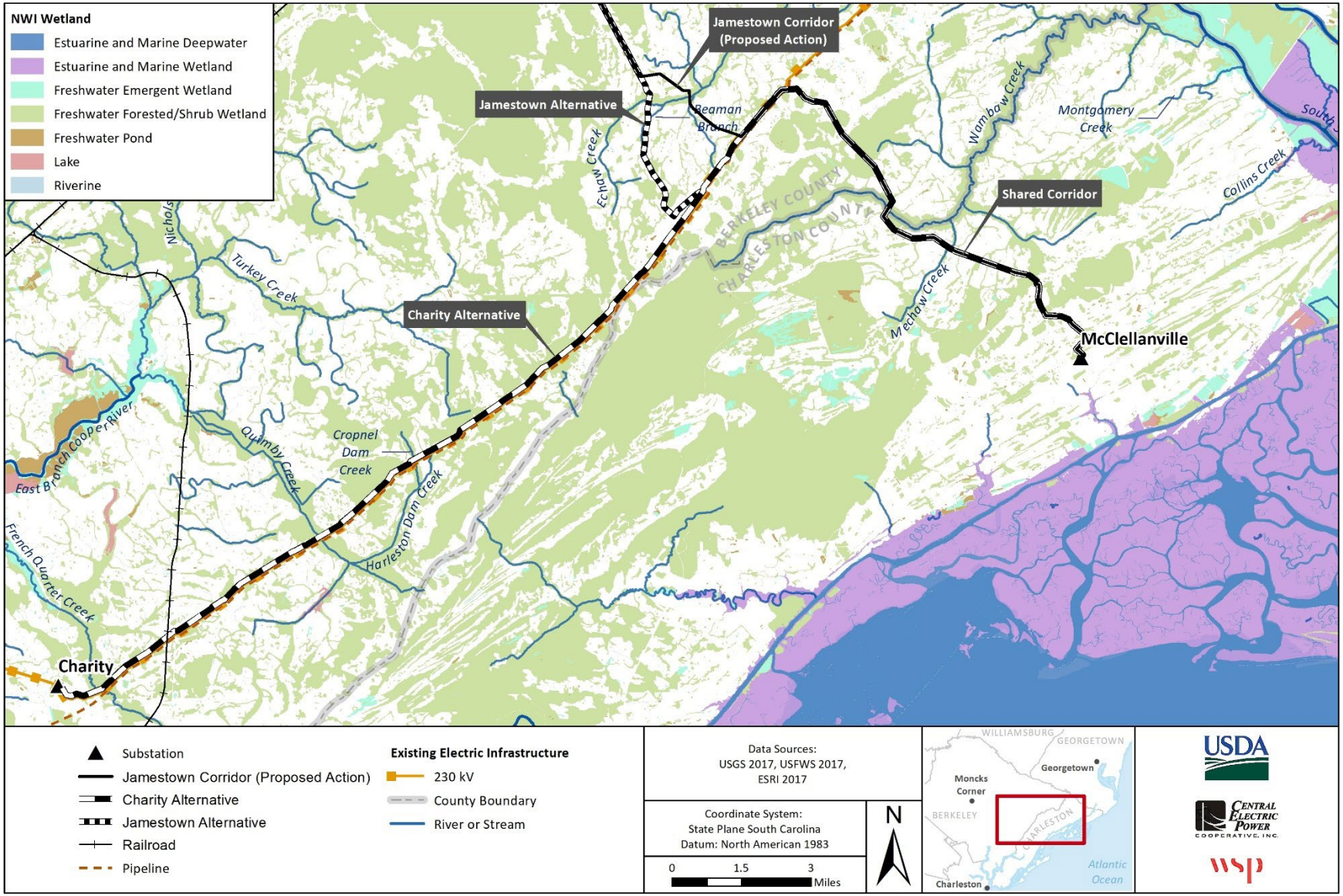


Figure 3.2-6. National Wetlands Inventory Data in the Vicinity of the Charity Alternative

Freshwater Palustrine Emergent Wetlands—Freshwater palustrine emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes (water-loving plants), excluding mosses and lichens. These plants are present for most of the growing season in most years. Freshwater emergent wetlands are usually dominated by perennial, non-woody plants. In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance and form for many years (Cowardin et al. 1979).

Freshwater Palustrine Forested/Shrub Wetlands—Freshwater palustrine forested/shrub wetlands are characterized as having a mix of forested and scrub-shrub wetlands. These wetlands are dominated by perennial, woody plants; trees are defined as being greater than 20 feet tall and shrubs are shorter than 20 feet (Cowardin et al. 1979). Forested wetlands are at risk of being affected by overhead transmission lines because the tall trees must be removed, so they cannot contact the transmission wires. This wetland classification type represents the greatest acreage of wetlands within the proposed corridors.

Freshwater Ponds—Freshwater palustrine unconsolidated bottom wetlands, or ponds, are primarily open water systems that have less than 30 percent of their area covered by vegetation. Additionally, their bottom material is composed of material that is smaller than stones (less than 10 inches across) and they have less than 25 percent stones (Cowardin et al. 1979). Very few freshwater ponds are located within the Project area.

Riverine Wetlands—Riverine wetlands include all wetlands and deepwater habitats contained within a river channel with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water-containing ocean-derived salts in excess of 0.5 part per thousand. A channel is defined as "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water." Riverine wetlands are bordered on the landward side by upland habitat, by the channel bank (including natural and human-made levees), or by wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens (Cowardin et al. 1979).

During a floristic inventory of NFS lands within the Jamestown and Charity alternatives, Gaddy (2017, 2018) identified eight major plant community types, six of which were wetland types. Three of these wetland plant community types—pond cypress lime sinks, pine savannas, and pond cypress savannas—are listed as noteworthy plant communities by SCDNR.

3.2.1.4 Floodplains

Floodplains are low-lying areas, as identified by the Federal Emergency Management Agency (FEMA), which are subject to inundation from heavy rains or storm surges. These areas are usually located near streams, rivers, coastal zones, and lakes and are a necessary component of water storage during flooding events. Placing structures in floodplains impairs a floodplain's ability to store water, which could cause flooding to occur beyond the natural extent of the floodplain.

Floodplains are classified by the potential to flood within a certain time frame and assigned a relevant identifying code. FEMA describes the various zones as follows:

- Zone A—Areas with a 1 percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones. These areas represent the 100-year floodplain.

- Zone AE—Areas with a 1 percent annual chance of flooding. This is the base floodplain where base flood elevations are provided. These areas represent the 100-year floodplain.

- Zone VE—Coastal areas with a 1 percent or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones. These areas represent the coastal 100-year floodplain.

- Zone X—Area of minimal flood hazard, usually depicted on Flood Insurance Rate Maps as above the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Unshaded Zone X is defined to be outside the 500-year flood.

The majority (95 percent) of the Jamestown corridor and Jamestown Alternative are located within Zone X, outside of the regulatory floodplain. Both corridors would cross the 100-year floodplain (Zones A and AE) of three waterways, at Wambaw Creek, Mechaw Creek, and Echaw Creek. The Charity Alternative would cross the Wambaw Creek and Mechaw Creek floodplain on its shared alignment with the Jamestown corridor, and would also cross the 100-year floodplain of Quimby Creek and French Quarter Creek. The remainder (95 percent) of the Charity Alternative is within Zone X, above the floodplain.

3.2.2 Environmental Effects

Potential impacts on water resources could result from the construction and O&M of the ROW, improvements to off-ROW access roads, and construction and restoration of staging areas. The majority of the impacts would occur during construction and would likely be temporary; however, permanent impacts are anticipated if structures are placed in wetlands or a floodplain. The following impact indicators were considered when analyzing impacts to water resources:

- The number of potential jurisdictional waterways to be crossed by the transmission line.

- The acres of potential disturbance within potential jurisdictional drainages.

- Potential impacts to groundwater resources due to Project construction or Project facilities.

- Potential changes in surface water contaminants of concern, including increases in sediment from erosion, compared to applicable state surface water standards and concentrations of groundwater contaminants of concern compared to applicable state groundwater standards.

- Potential impacts to floodplains measured as expected changes in surface flow capacities, velocities, and stages due to temporary or permanent disturbances; and expected changes in downstream channel morphology.

To determine whether the Project could potentially result in significant effects on water resources, it is necessary to consider both the duration and the intensity of the impacts. Table 3.2-6 presents the definitions for duration and intensity of water resources impacts established for this Project.

Table 3.2-5. Water Resources Impact Context and Intensity

Context (Duration)	Low-intensity	Moderate-intensity	High-Intensity
Surface Water and Water Quality			
Short-term: During construction period Long-term: Life of the	The effect on surface waters would be measurable or perceptible but small and	The effect on surface waters would be measurable or perceptible and could alter the	The impact would cause a measurable effect on surface waters and would modify

Context (Duration)	Low-intensity	Moderate-intensity	High-Intensity
line (50 years or more)	localized. The effect would not alter the physical or chemical characteristics of the surface water or aquatic influence zone resource.	physical or chemical characteristics of the surface water resource to an extent requiring mitigation but not to large areas. The functions typically provided by the surface water or aquatic influence zone would not be substantially altered.	physical or chemical characteristics of the surface water. The impact would be substantial and highly noticeable. The character of the surface water or aquatic influence zone would be changed so that the functions typically provided by the surface water or aquatic influence zone would be substantially altered.
Wetlands			
Short-term: Lasting less than two growing seasons Long-term: Lasting longer than two growing seasons.	The effect on wetlands would be measurable or perceptible but small in terms of area and the nature of the impact. A small effect on size, integrity, or connectivity would occur; however, wetland function would not be affected and natural restoration would occur if left alone.	The impact would cause a measurable effect on one of the three wetlands indicators (size, integrity, connectivity) or would result in a permanent loss of wetland acreage over small areas. However, wetland functions would be minimally affected.	The impact would cause a measurable effect on two or more wetlands indicators (size, integrity, connectivity) or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable. The character of the wetland would be changed so that the functions typically provided by the wetland would be substantially altered.
Floodplains			
Short-term: During construction period Long-term: Life of the line (50 years or more)	Impacts would result in a detectable change to natural and beneficial floodplain values, but the change would be expected to be small, of little consequence, and localized. No appreciable increased risk of flood loss would occur, including impacts on human safety, health, and welfare.	Impacts would result in a change to natural and beneficial floodplain values that would be readily detectable and relatively localized. Location of operations in floodplains could increase risk of flood loss, including impacts on human safety, health, and welfare.	Impacts would result in a change to natural and beneficial floodplain values that would have substantial consequences on a regional scale. Location of operations would increase risk of flood loss including impacts on human safety, health, and welfare.

3.2.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and no direct effects on surface waters, water quality, wetlands, or floodplains would occur.

3.2.2.2 Proposed Action (Jamestown Corridor)

Surface Water and Water Quality

During construction, soils would be disturbed while placing transmission line poles, clearing land within the ROW, and placing construction mats (see Figure 2.4-3), which would potentially cause erosion and pose a sedimentation risk or cause the possible introduction of other contaminants into surface waters. To minimize potential adverse impacts from stormwater pollution, Central Electric would implement erosion prevention and sediment control measures, which would be identified in a SWPPP. Also, prior to construction, a hazardous materials management and spill prevention plan and emergency response plan would be developed to address storage, use, transportation, and disposal of hazardous materials, including

how to deal with accidental spills, and promptly clean up spilled material to prevent them from entering surface waters (measure WR-11). Excavated material would not be stockpiled in flood prone areas or near stream banks, unless this material is protected from high water or stormwater runoff (measure WR-17). Trees that are removed would have their stumps left in place so that the soil around them remains in place. After construction, any areas with exposed soil would be revegetated to avoid runoff. A list of the applicant-proposed mitigation measures that pertain to water resources is provided in Table 2.5-1. For example, the Project would comply with all requirements of local and state permits for storm water discharges for construction activities (measure WR-8). There would be no use of herbicides on NFS lands unless approved by the USFS (measure BR-14) and vegetation management would comply with all USFS (2017) standards and guidelines. Herbicide use for ROW maintenance on nonfederal lands would not be expected to cause any degradation of any USEPA-classified impaired water in the Project vicinity. The Proposed Action would not contribute any measurable pollutants to adjacent waterways. Santee-Cooper would manage vegetation within the ROW on a 2.5- to 3-year cycle and use selective treatment as necessary in areas where vegetation is posing a threat to the transmission line and where allowed. Santee Cooper's 2022 Transmission Vegetation Management Program and Unit Plan is included in Appendix F. With the implementation of avoidance and minimization measures listed in Table 2.5-1, it is expected that the Proposed Action's impacts to surface waters and water quality would be short-term and low-intensity.

USACE has regulatory jurisdiction over waters of the U.S., including many lakes, rivers, streams, and wetlands, pursuant to Section 404 of the CWA. Wetland delineations would be conducted to identify wetlands after the final ROW is identified A Department of the Army permit would be required for any structures or work in, over, or under navigable waters of the United States or any discharges of dredged or fill material into wetlands or waters of the U.S. The Applicant will also need to obtain a Section 401 Water Quality Certification, a Coastal Zone Consistency Determination, and a permit for impacts to navigable waterways from SCDHEC.

Wetlands

Short-term, moderate-intensity impacts on wetland vegetation may occur in locations where construction crews need to access ROW areas through wetlands. In total, based on NWI data, a preliminary centerline for the Jamestown corridor would traverse 2.8 miles of wetlands, which is 12 percent of its total length (Table 3.2-3). A preliminary 75-foot ROW for the Jamestown corridor would encompass approximately 24.9 acres of wetlands (Table 3.2-4). Approximately 99 percent of these wetlands are classified as freshwater palustrine forested/shrub wetlands. Most notably, the Proposed Action would cross forested wetlands in proximity to Wambaw Creek and Echaw Creek. The Proposed Action was refined to avoid numerous deep wetlands and large Carolina bay-like depressions, and lime sinks alongside Halfway Creek Road between Honey Hill and Shulerville Road, which was recommended by the USFS and identified as ecologically sensitive areas to be avoided (Gaddy 2017).

Central Electric would avoid affecting wetlands when practicable (measure WR-1) and implement measures described in Section 2.5. All wetlands would be delineated and protective riparian buffers would be marked prior to construction (measure WR-4), and wetlands would be spanned (up to 600 feet), where feasible (measure WR-5). During construction, construction equipment, fuels, and chemicals would not be stored in wetlands. Central Electric would seek to avoid impacting wetlands to the greatest extent practicable by removing timber from wetlands using a specialized logging equipment with an extendable boom that can reach out to grab cut trees. Clearing in wetlands would comply with the SWPPP and any special requirements. No grubbing, disking, raking, grading, digging, filling, or any other soil disturbing activities, except to restore rutted areas, would be allowed.

Disturbance to wetland soils would be avoided by using construction mats for all wetland crossings or other locations where temporary impacts are unavoidable. Clearing would also be accomplished by using low-psi ground pressure equipment, as required by the FMNF.

Pole structures would be placed outside wetlands when possible, although some poles may be required within wetland spans greater than 600 feet. Based on NWI data and a maximum span length of 600 feet, eight poles would be required to be located within forested wetlands, including two poles in three wetlands and one pole within two wetlands. Approximately 0.01 acres (20 feet by 20 feet) of wetlands would be temporarily impacted during the installation of each pole and 0.001 acres of wetlands would be permanently impacted by the footprint of the pole. Therefore, temporary impacts from pole installation would total approximately 0.08 acres and permanent impacts to wetlands from pole locations would total less than 0.01 acre for the entire Project.

Forested wetlands within the ROW would need to be cleared of trees that are tall enough to interfere with the transmission wires. Tree root systems would be preserved to the maximum extent possible. No materials would be placed in any location or in any manner so as to impair surface water flow into, out of, or across a wetland area. and Specialize equipment would be used for clearing vegetation in these area and appropriate sediment and erosion control measures would be established at streambank boundaries to minimize the likelihood of upland soils being transported into wetlands. Large canopy trees and small sapling trees would be cut and removed, down to 3 inches or less above the soil/water surface. Stumps would be left in place and the root system would be preserved to the maximum extent practicable to stabilize the soils. No material would be placed in any location or in any manner so as to impair surface water flow into, out of, or across a wetland area; the natural flow of water would not be redirected. Wood chips would be hauled away and disposed of properly in upland locations. If required on National Forest System lands, some trees may be left in place to provide habitat complexity for aquatic wildlife. To avoid and minimize potential impacts, the Applicant would establish a 30-foot natural buffer area adjacent to all intermittent and perennial streams and all jurisdictional wetlands, and would comply with the USFS (2017) standards for riparian management zones on National Forest System lands (e.g., measure S22) and the terms and conditions of any Forest Service Special Use Authorization. Central Electric would obtain a DA permit for any impacts to waters of the U.S. and adhere to the terms and conditions of the permit, including any required compensatory mitigation.

Trees cleared in wetland areas would result in a permanent conversion of forested wetlands to either scrub-shrub or emergent wetlands. As a result, some functions and ecological services attributed to forested wetlands would be lost, causing long-term, moderate- to high-intensity impacts on forested wetlands in some locations. Field surveys would be required to delineate wetland boundaries and to determine the acreage of forested wetlands within the final ROW that would be converted into maintained ROW as scrub-shrub wetlands.

Central Electric would also minimize wetland impacts by complying with all conditions required by SCDES for a Construction General Permit. Field inspections of the Project would evaluate and verify compliance with permits and the CWA. Central Electric may be required to restore, establish, enhance, or preserve other aquatic resources in order to replace those impacted by a project. If required, a mitigation plan would be developed that would outline the proposed methods of mitigation for agency review and approval prior to Project construction. Mitigation, developed in consultation with USACE, could include several options such as mitigation banks, in-lieu fee programs, or permittee-responsible mitigation sites.

Impacts to wetlands associated with long-term maintenance of the cleared ROW would mostly derive from vegetation management activities. On non-National Forest System lands, ground crews would use backpacks and/or an ATV equipped with a hydraulic spray system to foliar treat only the undesirable vegetation present. ATVs used would be specifically designed with low-psi ground pressure tires to

distribute the mass of the vehicle. On National Forest System lands, herbicides would not be authorized unless approved by the USFS (measure BR-14) and vegetation management would be consistent with USFS (2017) desired conditions and objectives as documented in the USFS (2021a) final Environmental Assessment of Non-Native Invasive Plant Control on the Francis Marion National Forest. On nonfederal lands, current procedures dictate a selective, low-volume herbicide approach that minimizes the amount of active ingredient applied per acre when applied within the ROW. The herbicide products used during wetland-area spraying would be determined based on the species present and, to a great extent, the location. Central Electric proposes to avoid the use of fertilizers, pesticides, or herbicides in or near surface waterbodies (measure WR-19). In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites would be used. Wetland areas are scheduled on a 3- or 4-year rotation depending on the vegetation species that are present, densities of woody vegetation, and height of conductors. Vegetation densities should decrease with subsequent applications, requiring less herbicide to be applied.

Floodplains

The Proposed Action footprint would traverse minimal acreage of the 100-year floodplain where it crosses Wambaw Creek and Echaw Creek. The Wambaw Creek floodplain crossing would total approximately 3,100 feet, requiring installation of up to five transmission line poles within the floodplain, as the transmission line could span up to 600 feet between poles. The Mechaw Creek floodplain crossing would total approximately 1,100 feet, requiring one pole installed within the floodplain. The Echaw Creek floodplain crossing would total approximately 2,100 feet, requiring up to three poles installed within the floodplain. Project construction would not result in a change in floodplain elevations but would cause long-term impacts to the vegetation structure within the floodplain as described above for forested wetlands, which could cause long-term changes to floodplain functions.

During Project construction and O&M, measures to limit impacts would be similar to those used to minimize impacts on surface waters. To the extent practicable, equipment, fuels, and chemicals would not be stored in the floodplain, construction would not occur during periods of high water, and the use of pesticides would be limited to target areas. Central Electric would implement prevention measures to minimize impacts for the life of the Project. Thus, impacts on floodplains from Project construction and O&M under the Proposed Action would be short-term and low-intensity.

3.2.2.3 Jamestown Alternative

Potential water resource impacts from Project construction and O&M under the Charity Alternative would be similar to the Proposed Action because the construction actions and schedule would be similar in scope and duration.

Surface Water and Water Quality

As shown in Table 3.2-1, the Jamestown Alternative would cross the same number of streams and one more waterbody than the Proposed Action. Central Electric would avoid and minimize water pollution by implementing appropriate erosion prevention and sediment control measures. Overall impacts to water quality would be similar to the Proposed Action.

Wetlands

As shown in Table 3.2-3 and 3.2-4, the Jamestown Alternative would cross a slightly higher area of wetlands than the Proposed Action. The acreage of wetland conversion due to ROW clearing would be very similar to the proposed action, based on available NWI data. Overall impacts to wetlands would therefore not be measurably different from the Proposed Action. Also, the Jamestown Alternative could require the

same number of are potential transmission poles within wetlands, having approximately 0.08 acres of temporary impacts and less than 0.01 acre of permanent impacts from pole installation.

Floodplains

The Jamestown Alternative would cross the Wambaw Creek and Mechaw Creek floodplain at the same location as the Proposed Action, with up to five transmission line poles being required within the floodplain. At Echaw Creek, the floodplain crossing would be approximately 1,000 feet less under than the Proposed Action. At approximately 1,100 feet wide, the Echaw Creek crossing would require one pole within the floodplain, compared to three for the proposed action. Overall impacts to floodplains from Project construction and O&M would be short-term and low-intensity

3.2.2.4 Charity Alternative

Potential water resource impacts from Project construction and O&M under the Charity Alternative would be similar to the Proposed Action because the construction actions and schedule would be similar in scope and duration. However, as shown in Table 3.2-1, the number of streams and waterbodies crossed by the transmission line under the Charity Alternative would be more than double that of the Proposed Action, and the Charity Alternative would have correspondingly greater impacts to wetlands and floodplains.

Surface Water and Water Quality

The Charity Alternative would potentially have approximately twice the impacts to surface water and water quality than the Proposed Action based on the number of streams and waterbodies crossed. Moderate-intensity impacts would be avoided or minimized through implementation of avoidance and minimization measures (Table 2.5-1) and compliance with permit conditions required by USACE and SCDES.

Wetlands

Based on NWI data, the Charity Alternative would traverse approximately three times the length and area of wetlands in comparison to the Proposed Action and Jamestown Alternative (Tables 3.2-3 and 3.2-4). Approximately 32 percent the total length of a preliminary centerline crosses an NWI wetland, compared to 12 percent for the Proposed Action. Gaddy (2018) also estimated that the Charity Alternative would cross more wetlands than the Jamestown Alternative. Constructing and maintaining the Charity Alternative would therefore have substantially greater impacts to wetlands than the Proposed Action. Impacts to non-forested wetlands would be short-term and low-intensity but impacts to forested wetlands would be long-term and moderate- to high-intensity. Any DA permit conditions and mitigation requirements would be similar to the Proposed Action.

Floodplains

Most of the Charity Alternative is located outside the floodplain area with the exception of the larger stream crossings (Wambaw Creek, Mechaw Creek, Quimby Creek, and French Quarter Creek). The Wambaw Creek and Mechaw Creek floodplain crossings would be the same as under the Proposed Action, requiring installation of up to five transmission line poles within the floodplain. The Quimby Creek floodplain crossing would total approximately 2,100 feet, requiring up to three poles installed within the floodplain. The French Quarter Creek floodplain crossing would total approximately 750 feet, requiring one pole installed within the floodplain. Temporary low-intensity impacts would occur and, while there would be no topographic changes, long-term impacts to floodplain functions would result from changes in vegetation structure.

3.3 Biological Resources

3.3.1 Affected Environment

3.3.1.1 Vegetation and Ecosystems

The Proposed Action is located in the Coastal Plain Ecoregion (SCDNR 2005a). The Project area has three main types of habitats: pine forest and woodlands, grassland and early successional habitats, and river bottoms (SCDNR 2005a). All of these habitat types support diverse wildlife species. The FMNF represents the largest and most biodiverse forested landscape in South Carolina.

The majority of the transmission line would be constructed adjacent to existing ROWs that are maintained for other transportation infrastructure (highways, primary or secondary roads, railways, and driveways) or utilities (powerlines; telephone lines; and water, sewer, and natural gas pipelines). The plant community within the existing ROWs likely consists of fescue grass (*Festuca* spp.), Bermudagrass (*Cynodon* spp.), crabgrass (*Digitaria* spp.), and a variety of common herbaceous and woody species. The natural vegetation of the Project area is dominated by pine stands with longleaf pine (*Pinus palustris*) and/or loblolly pine (*Pinus taeda*) pine in upland and flatwoods areas, and by bald cypress (*Taxodium distichum*), pond cypress (*Taxodium ascendens*), swamp tupelo (*Nyssa biflora*), and red maple (*Acer rubrum*) in wetland areas. A summary of plant communities encountered within the Project Area is provided by Gaddy (2017) and Gaddy (2018).

Agriculture and timber harvesting have influenced vegetation and wildlife habitat in the Project area. Settlers and farmers cleared the uplands and better-drained terraces for fields, while extensive longleaf pine and swamp hardwood forests were cleared for timber. Timber harvesting still occurs on some private lands within the Project Area.

Proposed Action (Jamestown Corridor)

Plant communities in the vicinity of the Jamestown corridor include mixed age upland pine forests, pine-hardwood stands, and isolated sections with older pine stands of sparse canopy closure. Gaddy (2017) reported that hardwood swamp forests are frequent along the proposed corridor, and several blackwater stream crossings occur. Isolated seasonal, depressional wetlands are scattered along the alternative and include closed canopy pond cypress and swamp tupelo-dominated bays, some remnant grass-dominated, but fire-suppressed wetlands, as well as some apparent sinkhole ponds. Most uplands in the southeastern portion of the Jamestown corridor are low beach ridges dissected by mixed hardwood and cypress-dominated swamps and forested floodplains along creeks. Near the mid-portion of the corridor, sand hills that are 30 to 45 feet in elevation are present with numerous deep, cypress-filled lime sinks. From Shulerville northwest to the Jamestown area, pine flatwoods and low ridges are present, with mixed hardwood and cypress-tupelo–dominated depressions, forested swamps, and floodplain forests. Between Shulerville and Honey Hill, where the Jamestown corridor would traverse stands of pine forests that are managed for timber production.

Jamestown Alternative

Plant communities within the Jamestown Alternative are similar to the Jamestown corridor. However, the Jamestown Alternative would extend further south alongside the existing Winyah-Charity 230-kV transmission line and Carolina Gas pipeline ROW, where it would traverse longleaf and loblolly pine woodlands and pine flatwoods.

Charity Alternative

Plant communities in the vicinity of the Charity Alternative are similar to the Jamestown corridor. The upland natural vegetation is dominated by longleaf pine and loblolly pine in sandy uplands, and clay-based flatwood areas. Transitional areas are dominated by loblolly and pond pine. In wetland areas along the Charity Alternative, the dominant tree species are pond cypress, swamp tupelo, red maple, pond pine, other mixed hardwoods, and occasionally loblolly pine (Gaddy 2018).

Ecosystems

A map of ecosystem groups, hereafter called ecosystems, for the FMNF area was obtained from the USFS (2018a), which was used for the FMNF Revised Land Management Plan (USFS 2017). This map of potential natural vegetation types on the FMNF uses the NatureServe (2012) ecosystem framework. A description of each ecosystem is provided below. Figures 3.3-1 and 3.3-2 show the ecosystems that would be traversed by the Project.

Upland Longleaf and Loblolly Pine—Includes all pine-dominated forests throughout the region, including those occupying a variety of soil moisture characteristics, except floodplains. The canopy is dominated by one or several species of pine, generally loblolly, or longleaf pine, depending on elevation, soil type, and silvicultural history. Shrub and mid-story cover are low and groundcover is herbaceous and abundant (>65 percent cover) with diverse native wildflowers and legumes. Landscape-level; low-intensity fire averaging every 1 to 3 years is common during the dormant season. Fires burn the parts of herbs and shrubs that are above ground but have little effect on fire-tolerant trees.

Wet Pine Savannas and Flatwoods—Occurs on seasonally wet areas characterized by open-canopy woodland or savanna conditions that is created by periodic fire. Canopy closure is typically less than 60 percent. Wet Pine Savannas and Flatwoods are dominated by longleaf pine or pond pine and pond cypress on wetter sites. Open loblolly pine-dominated flatwoods and savannas may occur until conversion to longleaf pine can be complete on mesic sites and pond cypress or pond pine on the wettest sites. Where annual fire is present, grasses may be dominant with pitcher plants and orchids. This type is widely scattered in the study corridor and often harbors noteworthy plant species. Longleaf pine dominates where fire is present, while loblolly pine is found in wetter, less frequently burned stands. Most of the upland forests of the Project area are pine flatwoods. Some of these wetter sites are wetlands.

Pocosins—A wetland type dominated by predominantly dense evergreen shrubland and very shrubby open woodlands, ranging to nearly closed forests. Herbaceous associations are present only as small patches. Vegetation is typically zoned. The lowest stature vegetation occurs in the center of the system, with woodlands on the edges and in the smaller occurrences. Prescribed fire and flooding are the most important processes influencing the composition of these ecological systems. In the absence of prescribed fire, these ecosystems will succeed to tall pocosin, pond pine, and swamp forest ecosystems.

Oak Forests and Mesic Hardwood Forests—A forest type that includes both dry and dry to mesic oak forests and mesic slope forests. Occur in areas sheltered from frequent fires, such as slopes adjacent to river terraces, on islands in swamps. Mesic slope forests are influenced by marl or calcareous geology. Oak trees (turkey oak, runner oak, or blackjack oak) are the characteristic component but can be dominated by dominated by other hardwood trees or loblolly pine. This is a fairly uncommon ecosystem in the Project area.

Forested Swamps and Floodplain Forests—Includes forests within small blackwater river and stream floodplains, as well as broad non-riverine swamps and wet hardwood forests within large river floodplain forests, and tidal wooded swamps. Typically composed of a complex of hardwood and hardwood-pine communities, often dominated by swamp tupelo and red maple. On broader sites, bald cypress can become

an important canopy species. Tulip poplar, sweet gum, pond pine, loblolly pine, and laurel oak are common associates. Flooding is the most important ecological factor influencing associated ecosystems, though fire can vary from a minor to a significant influence on vegetation composition and structure.

Maritime Forests—Includes forests in the coastal zone and are found on barrier islands and mainland areas that are influenced by salt spray. Maritime forests are typically dominated by live oaks, southern magnolia, palmetto, coastal red cedar, and one or more species of pine. On the FMNF, nearly one-quarter of maritime forests are dominated by loblolly pine.

Salt Marsh—Includes coastal wetlands that are flooded and drained by salt water brought in by the tides. They are sometimes called tidal marshes and are generally characterized as expanses of grasses, rushes and sedges along coastlines of low wave energy and river mouths.

Grassland and Early Successional Areas—Includes grasslands or early successional fields with cover provided by grasses and/or weeds and with few, if any, trees. Also managed open areas such as meadows, pastures, golf courses, or expansive lawns with or without damp depressions. This habitat type occurs throughout the region due to timber harvest and is most extensive in areas surrounding human development and agriculture.

Rivers and Streams—Includes open water habitats that include rivers, streams, and estuaries.

Depressional Wetlands and Carolina Bays—Palustrine wetlands that contain a variety of vegetation types depending on fire regime and flooding depth and duration. Vegetation can be pond cypress and swamp tupelo ponds, pond cypress savannas and non-alluvial swamps, Pond cypress sinks and pond cypress savannas are most common. Typically found among Wet Pine Savannas and Flatwoods ecosystems. These wetlands range in size from 1 to 50 acres and are characterized by soils that are semi-permanently or permanently saturated from processes such as groundwater seepage, perched water tables, rainfall or beaver activity.

Developed Areas—Areas modified by human activities, including areas developed for residential, commercial, and industrial land uses, and where most ecosystem processes are regularly affected by humans. This includes buildings, paved areas, and other impervious surfaces.

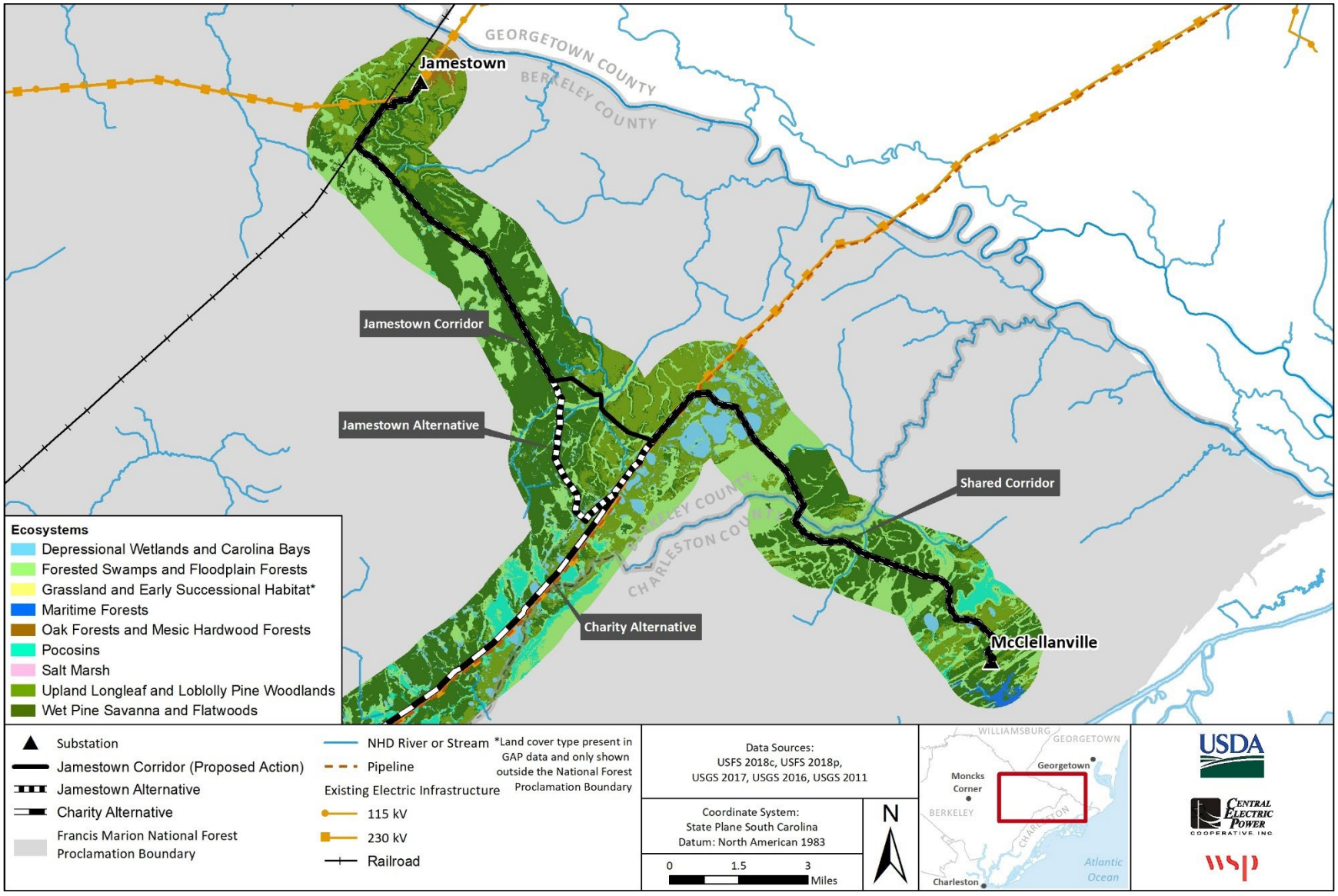


Figure 3.3-1. Ecosystems in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

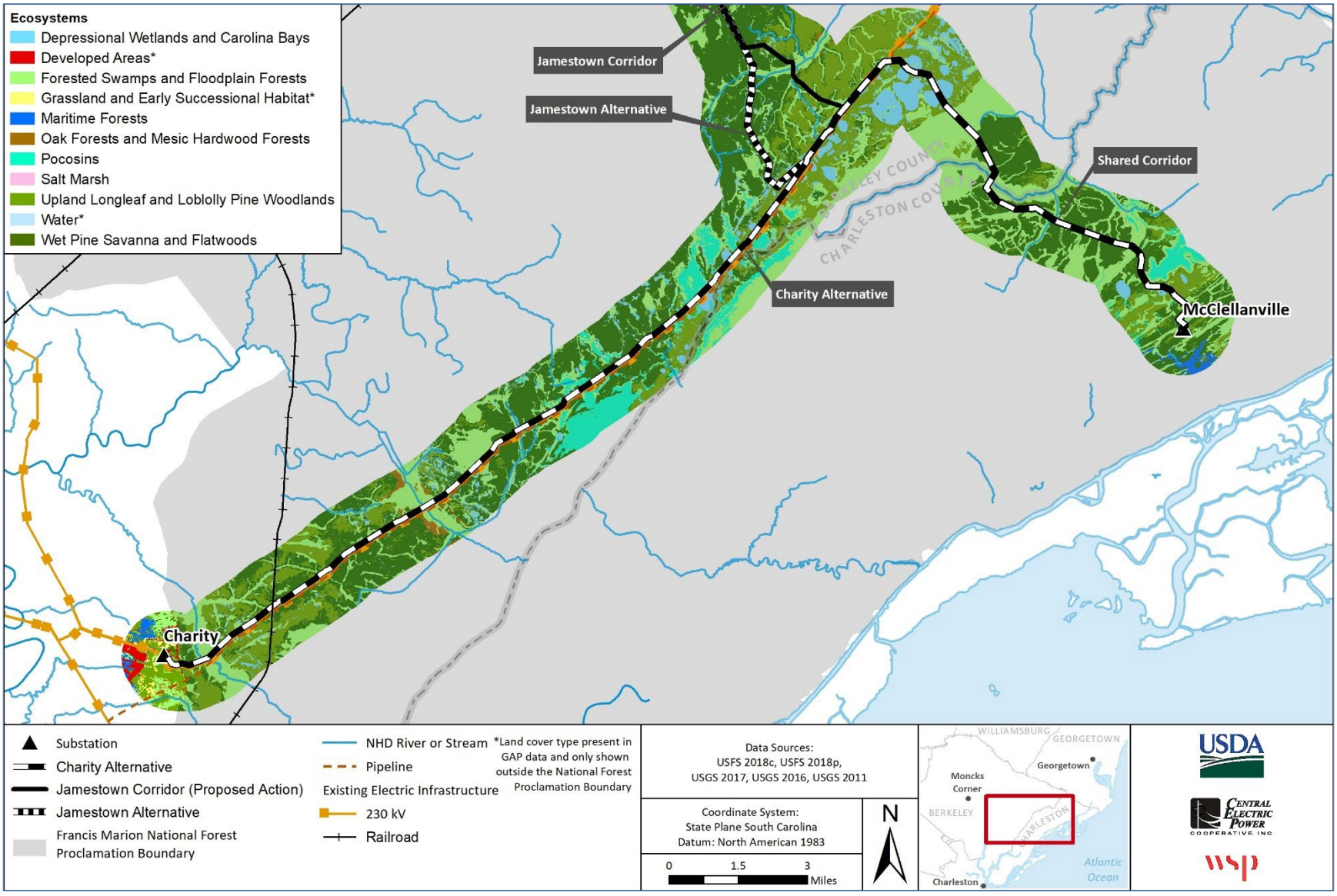


Figure 3.3-2. Ecosystems in the Vicinity of the Charity Alternative

Table 3.3-1 presents the percentage of each ecosystem within a 600-foot-wide corridor. The primary land cover within the Project area is forest.

Table 3.3-1. Acreage of Ecosystems within a 600-foot-wide Corridor

Ecosystem	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Upland Longleaf and Loblolly Pine	453.7 (27%)	536.2 (28%)	564.3 (25%)
Wet Pine Savannas and Flatwoods	824.0 (49%)	932.5 (49%)	923.2 (41%)
Oak Forests and Mesic Hardwood Forests	0.2 (0%)	0.2 (0%)	4.8 (0%)
Forested Swamps and Floodplain Forests	358.9 (21%)	349.9 (18%)	502.7 (22%)
Pocosins	0.9 (0%)	0.9 (0%)	93.5 (4%)
Depressional Wetlands and Carolina Bays	59.5 (3%)	81.6 (6)	174.8 (8%)
Maritime Forests	0 (0%)	0 (0%)	0 (0%)
Salt Marsh	0 (0%)	0 (0%)	0.3 (0%)
Grassland and Early Successional Areas	0 (0%)	0 (0%)	0.9 (0%)
Rivers and Streams (Open Water)	0 (0%)	0 (0%)	0 (0%)
Developed Areas	0 (0%)	0 (0%)	3.6 (0%)
Total	**1,697**	**1,901**	**2,268**

Source: USFS (2018a)

Non-native Invasive Plants

Non-native invasive plants are those plants introduced to an area outside their original range and that cause harm because they have no natural enemies to limit their reproduction. Non-native invasive plants usually spread rapidly and are recognized as one of the leading threats to biodiversity. Once established, non-native invasive plants impose enormous costs to agriculture, forestry, fisheries, and other human land uses. Typically, federal agencies, states, and county governments designate the most harmful non-native invasive plants with a status that requires their management or control.

Under the South Carolina Noxious Weed Act, a noxious weed is defined as: "any living stage of any plant including seed or reproductive parts thereof or parasitic plants or parts thereof which is determined by the Commissioner of Agriculture to be directly or indirectly injurious to public health, crops, livestock, or agriculture including but not limited to waterways and irrigation canals" (South Carolina Legislature, Title 46, Chapter 23). This law provides the South Carolina State Crop Pest Commission with the authority to seize, quarantine, treat, destroy, or apply other remedial measures to any noxious weed or any item that it has reason to believe contains or is contaminated with any noxious weed. In addition, the South Carolina Aquatic Plant Management Act created the South Carolina Aquatic Plant Management Program for the purpose of preventing, identifying, investigating, managing, and monitoring aquatic plant problems in public waters of South Carolina (South Carolina Legislature, Title 46, Chapter 9). SCDNR is designated as the state agency to administer this statute. Preventing the spread of non-native invasive species, and eliminating them where possible, is a high-priority conservation action of the South Carolina State Wildlife Action Plan (SCDNR 2015a).

Noxious weed surveys were not conducted in the Project area. According to Early Detection & Distribution Mapping System (EDDMapS 2018), there are 227 non-native invasive species known to occur in Charleston County and 215 in Berkeley County. Across the Southeast, of the 380-plus recognized non-native plants in southern forests and grasslands, 53 are rated high-to-medium risk for natural communities (Wear and Greis 2012).

The Project would require compliance with Executive Order (E.O.) 13112, *Safeguarding the Nation from the Impacts of Invasive Species*, to prevent the introduction and spread of non-native invasive species through. USFS has a National and Regional Invasive Species Strategies policy regarding invasive species and maintains lists of priority non-native invasive plant species. The University of Georgia Center for Invasive Species and Ecosystem Health maintains a list of non-native invasive plants of highest priority in the Southern Region at https://www.invasive.org/south/highpriority.html (USFS 2018b). The FMNF Revised Land Management Plan (USFS 2017, pp.212-221) describes the affected environment for invasive species on NFS lands, describes the vision for the prevention and control of them, and provides a list of known non-native invasive species infestations. The USFS maintains this information as an invasive plant species layer in GIS. USFS works in partnership with the South Carolina Exotic Pest Plant Council, and its websites list non-native invasive plant species posing greatest impacts to natural areas in the state. Lists are at: https://www.se-eppc.org/southcarolina/Publications/InvasivePlantsBooklet.pdf (Lund et al. 2015). A list including those recommended for early detection and rapid response efforts can be found at https://www.se-eppc.org/southcarolina/SCEDDR.pdf (South Carolina Exotic Pest Plant Council, no date).

Although a complete inventory of non-native invasive plants infestations has not been conducted on the FMNF, partial inventories and treatments have been conducted as documented in the maps in the USFS (2021a) final Environmental Assessment of Non-Native Invasive Plant Control on the FMNF. Vegetation surveys, covering approximately 47,231 acres (approximately 18 percent of the total FMNF acres), have documented 44 different non-native invasive plant species infesting approximately 3,969 acres (approximately 8.4 percent of acres inventoried). The most widespread species on the FMNF were Japanese climbing fern (*Lygodium japonicum*) (473 acres), sericea lespedeza (*Lespedeza cuneate*) (110 acres), Japanese honeysuckle (*Lonicera japonica* (60 acres), tall fescue (*Lolium arundinaceum*) (61 acres), and Chinese privet (*Ligustrum sinensis*) (39 acres). Chinese tallow (*Triadica sebifera*), which occupied 19 acres on the FMNF, is a primary threat around the FMNF boundary with Cape Romaine National Wildlife Refuge. Of the terrestrial and riparian non-native invasive plants known or likely to occur on the FMNF, cogongrass, common reed, and alligator weed are regulated as state or federal non-native invasive plant species (USFS 2017).

3.3.1.2 Wildlife, Including Neotropical Birds

The major wildlife habitat types in the Project area, as described above in Section 3.3.1.1, include longleaf and loblolly pine interspersed with wetlands that include forested swamps, pocosins, and Carolina bays. Bird species dependent upon pine habitats include the red-cockaded woodpecker (*Picoides borealis*), Bachman's sparrow (*Peucaea aestivalis*), brown-headed nuthatch (*Sitta pusilla*), Henslow's sparrow (*Ammodramus henslowii*), and painted bunting (*Passerina ciris*). Wetlands support high densities of numerous breeding neotropical migrants, including the Acadian flycatcher (*Empidonax virescens*), white-eyed vireo (*Vireo griseus*), prothonotary warbler (*Protonotaria citrea*), hooded warbler (*Wilsonia citrina*) and northern parula (*Parula americana*). Species found in grassland and early successional habitats, which are uncommon in the Project area but characterize the existing ROW, include the grasshopper sparrow (*Ammodramus savannarum*), loggerhead shrike (*Lanius ludovicianus*), painted bunting (*Passerina ciris*), and American woodcock (*Scolopax minor*) (SCDNR 2005a). Migratory birds are discussed further below.

Important game species include big game like black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), and wild turkey (*Meleagris gallopavo silvestris*); furbearers like bobcat (*Lynx*

rufus), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), river otter (*Lontra Canadensis*), mink (*Neovison vison*), long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale putorius*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*); small game like doves (*Zenaida* spp.); and other hunted species including American alligator (*Alligator mississippiensis*), coyote (*Canis latrans*), and feral hog (*Sus scrofa*) (SCDNR 2015a, 2024a).

Mammal species found in the Coastal Plain Ecoregion include: black bear, mink (*Neovison vison*), southern fox squirrel (*Sciurus niger niger*), eastern spotted skunk (*Spilogale putorius*), swamp rabbit (*Sylvilagus aquaticus*), eastern woodrat (*Neotoma floridana*), woodland jumping mouse (*Napaeozapus insignis*), Carolina red-backed vole (*Clethrionomys gapperi*), hairy-tailed mole (*Parascalops breweri*), meadow vole (*Microtus pennsylvanicus*), star-nosed mole (*Condylura cristata*), northern yellow bat (*Lasiurus intermedius*), eastern small-footed myotis (*Myotis leibii*), and Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) (SCDNR 2005a). The Project is located within the range of 9 of 14 species of bats commonly found in South Carolina (Ecological Solutions, Inc. 2017a).). Surveys for mammals, in general, have not been completed for the Project but surveys for bats were conducted on NFS lands along the Jamestown and Charity alternatives (Ecological Solutions, Inc. 2017a, Ecological Engineering, LLP 2018a). Surveys specifically targeted the federally endangered northern long-eared bat. The northern long-eared bat, tricolored bat, and other wildlife that are federally listed under the ESA are discussed below in Section 3.3.1.3. Other special-status species or species of conservation concern that could occur in the Project vicinity are discussed in Section 3.3.1.4, including Rafinesque's big-eared bat, southeastern bat (*Myotis austroriparius*) black bear, eastern woodrat, southern fox squirrel, star-nosed mole, and meadow vole.

The Project area includes diverse populations of amphibians and reptiles. Isolated, temporary wetlands such as Carolina bays and pocosins provide breeding habitat for numerous amphibians, including the federally listed frosted flatwoods salamander (*Ambystoma cingulatum*) and the state-listed Carolina gopher frog and broad-striped dwarf siren. According to SCDNR (2015a), the Coastal Plain Ecoregion of South Carolina contains 112 of the 144 species of amphibians and reptiles that occur in the state, and 49 of these species are endemic to the region, with longleaf pine habitat playing a vital role in the life history of many species. Common snakes in the region include the cottonmouth (*Agkistrodon piscivorus*), copperhead (*Agkistrodon contortrix*), eastern ribbonsnake (*Thamnophis sauritus*), common gartersnake (*Thamnophis sirtalis*), and banded snake (*Nerodia fasciata*). The eastern diamondback rattlesnake is a special-status species that is likely to occur within the Project area (see above), particularly within pine forest ecosystems. Several common lizards in the Project vicinity include the broadhead skink (*Plestiodon laticeps*), green anole (*Anolis carolinensis*), and little brown skink (*Scincella lateralis*).

Buhlmann and Gross (2018) conducted a herpetological habitat survey of the Jamestown Alternative to identify the occurrences of any rare or threatened amphibians and reptiles. Because the vast majority of the Jamestown Alternative would follow existing roads, vehicular surveys were conducted to encounter amphibians and reptiles crossing roads during both day and night, especially during the spring and immediately following rain events. For each observation, the adjacent habitat was assessed. To potentially detect fall- and winter-breeding amphibians, such as tiger salamanders or frosted flatwoods salamanders, several isolated wetlands along the alternative were surveyed with dipnets during both day and night in the winter of 2017–2018. Buhlmann and Gross (2018) also searched for reptiles and amphibians by uncovering logs and rocks and by deploying two arrays of coverboards (sheets of plywood or roofing): one in proximity to a lime sink habitat to detect migrating amphibians, and another within upland pine savanna habitat to detect the presence of pine snakes (*Pituophis melanoleucus*) or southern hognose snakes (*Heterodon simus*). Lastly, surveys for calling frogs at suitable wetland sites were performed by ear. To document the continued existence of gopher frog occurrences along Halfway Creek Road, researchers had planned to install sound recorders at two wetlands, but there was insufficient rainfall to fill the wetlands during their February through April 2018 breeding season. In total, 35 species of reptiles and amphibians were detected, including

16 species of frogs and toads (anurans), 5 species of salamander, 4 lizards, 5 snakes, 4 turtles, and the American alligator. All species detected are thought to be common and are not listed as special-status species in South Carolina. An additional 8 species records were obtained from previous researchers, several of which are rare or at-risk species discussed below in Section 3.3.1.4 and Section 3.3.1.5, including Carolina gopher frog (state-endangered), spotted turtle (state-threatened), northern pine snake, and black swamp snake (*Seminatrix pygaea*) (Buhlmann and Gross 2018).

Buhlmann (2019) conducted a herpetological habitat survey on NFS lands for the Charity Alternative to identify the occurrences of any rare or threatened amphibians and reptiles. Surveys began in July 2018 and continued through April 2019. Known occurrence records for target rare species in the Project vicinity (within 2 miles of the ROW) were obtained from the SCDNR Heritage Trust Program, and summer-fall surveys were conducted in July, August, and November 2018, while winter-spring surveys were conducted in February, March, and April 2019.

Buhlmann (2019) detected 39 species of reptiles and amphibians during a herpetological habitat survey of the Charity Alternative, including 19 species of frogs and toads (anurans), 3 species of salamander, 4 lizards, 9 snakes, 3 turtles, and the American alligator, totaling 39 species. No occurrences of the highest priority (i.e., rare) species were documented; notably absent was the frosted flatwoods salamander, Carolina gopher frog, pine snake, and southern hognose snake. SCDNR (2018a, 2024b) Heritage Trust Program records indicated no recent observations of frosted flatwoods salamanders within 2 miles of the proposed transmission line alternative corridors (records exist from 1953 to 1997) and gopher frogs (records exist from 1952 to 1999). There are also no records of Southern hognose snake in the immediate vicinity of alternative corridors, and only one recent pine snake record (2002).

Neotropical Birds

The primary federal wildlife laws that protect birds that are not federally listed under the ESA are the Migratory Bird Treaty Act (MBTA; 16 USC §§703–712) and the BGEPA. The MBTA is the cornerstone of migratory bird conservation and protection in the U.S., which implements four treaties that provide for international protection of migratory birds. It is a strict liability statute, meaning that proof of intent, knowledge, or negligence is not an element of an MBTA violation. The statute's language is clear that any action that results in a *take* or possession (permanent or temporary) of a protected species, in the absence of a USFWS permit or regulatory authorization, is a violation of the MBTA. The MBTA (16 USC §§703–712) makes it unlawful to take, kill, or possess migratory birds. In 2017, the U.S. Department of the Interior's Office of the Solicitor issued Memorandum M-370501 interpreting the take prohibition of the MBTA to apply only to actions that have the intent of taking or killing migratory birds, their nests, or their eggs, as opposed to take associated with otherwise lawful activities; however, mortality of migratory birds is still an impact to the human environment that must be considered in the NEPA review of a project (E.O. 13186, 66 FR 3853, January 17, 2001). Thus, there are substantial benefits to implementing measures to avoid and minimize impacts on migratory birds. USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13, which includes more than 1,000 species of migratory birds. This list excludes non-native species, such as pigeons (*Columba livia*), house sparrows (*Passer domesticus*), and European starlings (*Sturnus vulgaris*). The BGEPA prohibits the take, sale (or offer of sale), purchase, barter, transport, export, or import at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg. Similar to the MBTA, the BGEPA does not allow the permitting of the incidental take of eagles.

South Carolina's varied environments and habitats support a high diversity of birds during breeding, wintering, and migration. As of 2011, 427 species of birds have been documented in the state, of which more than 181 are classified as breeders (SCDNR 2015a). Because of their significance to migratory birds, the National Audubon Society and BirdLife International have designated 45 Important Bird Areas in South

Carolina, of which 3 are in the Project vicinity: the FMNF, the Santee Coastal Reserve, and the Washo Reserve (Audubon 2013c). The proposed transmission line would traverse through the FMNF Important Bird Area, which provides foraging, nesting, and wintering habitat to waterfowl, wading birds, and other bird species (Audubon 2013b.).

The FMNF provides essential stopover habitat for autumn and spring migrating birds, as well as critical breeding habitat. Four species known to occur regularly in the FMNF are state- or federally listed: the red-cockaded woodpecker (RCW), wood stork (*Mycteria americana*), bald eagle (*Haliaeetus leucocephalus*), and American swallow-tailed kite (*Elanoides forficatus*). Several highest-priority species of greatest conservation need (SGCN) that depend on pine savanna habitat in the Project area include the Bachman's sparrow, Henslow's sparrow, brown-headed nuthatch, pine warbler (*Dendroica pinus*), and the southeastern race of American kestrel (*Falco sparverius paulus*) (SCDNR 2015f). Approximately 100 pairs of American kestrel nest on the FMNF (Audubon 2013b). Numerous other species with high conservation priority such as the black-throated warbler (*Dendroica virens*), Swainson's warbler (*Limnothlypis swainsonii*), prothonotary warbler (*Protonotaria citrea*), worm-eating warbler (*Helmitheros vermivorus*), chuck-will's widow (*Caprimulgus carolinensis*), wood duck (*Aix sponsa*), and northern parula (*Setophaga americana*) have also been documented on the FMNF (USFS 2018 n.d.a). Because it is managed for old-growth longleaf pine forest habitat, the FMNF is critically important to the federally endangered RCW (see Section 3.3.1.3) and other special-status species that prefer similar pine forest habitat, such as Bachman's sparrow and brown-headed nuthatch. Lastly, the Tibwin Wetland Complex on the FMNF consistently records the highest concentration of migrating hawks along the southeastern coast (Audubon 2013b).

The Santee Coastal Reserve, located approximately 6 miles northeast of the proposed McClellanville Substation, is a large, state-owned undeveloped coastal ecosystem with diverse avifauna during all seasons. Several endangered and threatened species either breed or forage here, with notable species including the federally endangered RCW and wood stork, the federally protected bald eagle, and many other SCC such as the painted bunting, Bachman's sparrow, and brown-headed nuthatch. The Santee Coastal Reserve and Santee River delta provide critical habitat during migration, and overwintering habitat, for large numbers of waterfowl (SCDNR 2016b).

The Washo Reserve is another protected ecosystem to the northeast of the Project area on the western edge of the Santee Coastal Reserve and about 5 miles from the proposed McClellanville Substation . This property, owned by The Nature Conservancy, supports a rookery (i.e., nesting colony) for the federally endangered wood stork, with about 25 percent of the states breeding population (see *Federally Listed Threatened and Endangered Species* below). Also, more than a dozen osprey (*Pandion haliaetus*) nests are found here, and nesting wood ducks, prothonotary warblers, barred owls, and other cavity nesters find suitable habitat here (Audubon 2013a).

In addition to the three Important Bird Areas, SCDNR manages additional lands upstream of the Santee Coastal Reserve for wildlife habitat and conservation as the Santee Delta WMA. The Santee River WMA, located approximately 7.5 miles from the proposed McClellanville Substation, supports numerous migratory birds and provides high-quality habitat for wintering waterfowl such as green-winged and blue-winged teal, ring-necked duck, American widgeon, gadwall, and mallard. The area also hosts large numbers of colonial waterbirds, including anhinga, great blue heron, and great egret and an abundance of other wetland wildlife. The Santee Delta WMA consists of Santee Delta East, which is predominantly impounded remnant rice fields and Santee Delta West, which is impounded bottomland hardwood forest. The area also provides habitat for upland game and nongame species and provides recreational opportunities for the hunting and non-hunting public (SCDNR 2016c).

Avian Research and Conservation Institute (ARCI 2018a) performed surveys for all species of "large birds" within the proposed corridor for the Jamestown Alternative (May and July 2017), searching for hawks,

eagles, and large wading birds, and their nests with a combination of ground and aerial surveys. Particular attention was given to wood storks, bald eagles, RCWs, ospreys, swallow-tailed kites, and the larger species of wading birds. Species observed included: American kestrel, bald eagle, broad-winged hawk (*Buteo platypterus*), Cooper's hawk (*Accipiter cooperii*), Mississippi kite (*Ictinia mississippiensis*), osprey, RCW, red-tailed hawk (*Buteo jamaicensis*), swallow-tailed kite, and wood stork. ARCI (2018b) performed similar surveys for large birds along the proposed Charity Alternative in May 2018, reporting 9 of the 10 same species as observed for the Jamestown Alternative (except for bald eagle).

3.3.1.3 Federally Listed Threatened and Endangered Species

The information below is a summary of the federally listed threatened and endangered species that may be present near the Project. This section describes each species' status, description, habitat, life history, range, presence in the action area, and threats. The status of critical habitat designations is provided for each species and their general habitat is summarized.

USFWS regulates construction activities occurring in areas containing potentially suitable habitat for species protected under the ESA of 1973 (16 USC §§1531 et seq.). The ESA requires that any action that is authorized, funded, or carried out for this Project is not likely to jeopardize the continued existence of a species listed as threatened or endangered or result in the destruction or adverse modification of habitat of such species that is determined to be critical. To offset any potential adverse effects of the Project on federally listed species, RUS could be required to further develop and carry out conservation programs to mitigate those effects.

An official species list was obtained for a 600-foot corridor for the Proposed Action and alternatives from USFWS (2024) Information for Planning and Conservation (IPaC) website and the NMFS (2024) website on July 10, 2024. Table 3.3-2 lists the status and associated ecosystems of 22 federally threatened and endangered species identified by USFWS and NMFS that may occur in the Project area and indicates whether they could potentially occur within the proposed alternatives. This includes the monarch butterfly, which is a candidate for listing by USFWS, and the tricolored bat, which is proposed for listing as endangered. Of these species, 11 would not possibly be affected by the Project and are dismissed from further analysis. This includes four federally listed sea turtles, which nest on nearby beaches and use marine habitats but would not be found in the Santee River, or other waters potentially affected by the Project. Also, although the West Indian manatee, Atlantic sturgeon, and shortnose sturgeon could occur within downstream marine and estuarine waters of the Santee and Cooper river systems, there is neither suitable habitat within waters crossed by the Project nor potential direct or indirect effects from the Project to downstream water quality. Also, the federally threatened eastern black rail (*Laterallus jamaicensis* ssp. *jamaicensis*) has a limited distribution in South Carolina, with only two known occupied areas and an estimated 50-100 breeding pairs. Furthermore, in Berkeley or Charleston, from 2011 to 2016, there are no confirmed breeding records (i.e., an occurrence of a nest with eggs or young observed) of black rail although there are probable nesting records (i.e., occurrences between May 15 and August 31) (USFWS 2018b). Lastly, two federally listed shorebirds (piping plover [*Charadrius melodus*] and red knot [*Calidris canutus rufa*]), and one plant (seabeach amaranth [*Amaranthus pumilus*]) are found only on coastal beaches. At its nearest point, the proposed transmission line would be approximately 6 miles from any coastal beach habitat where these species could occur. The Bachman's warbler (*Vermivora bachmanii*) has not been officially observed in Berkeley or Charleston counties and the species has been removed from listing under the ESA due to extinction (88 FR 71644).

Information about federally listed threatened and endangered species on NFS lands was obtained primarily from the 2013 FMNF Land and Resource Management Plan (USFS 2013a), the 2017 Revised Land Management Plan (USFS 2017) and its appendix G: "Biological Assessment and Biological Evaluations."

Table 3.3-2. Federally Listed Species That may Occur in the Project Vicinity

Common Name (Scientific Name)	ESA Status[a]	Critical Habitat	Potential Occurrence[b] (If No, Rationale for Exclusion)	Habitat
Mammals				
Northern Long-eared Bat (*Myotis septentrionalis*)	FE[c]	None	Yes	All forest types, roosting alone or in colonies underneath bark, in cavities or in crevices (i.e., of both live and dead trees).
West Indian Manatee (*Trichechus manatus*)	FT	Final Designated, but outside Action Area	No (HAB)	Marine and estuarine waters, but there are historical records for the mammal several miles up the Santee River.
Tricolored bat (*Perimyotis subflavus*)	PE	N/A	Yes	All forest types, often in open woods and adjacent to water.
Birds				
Bachman's Warbler (*Vermivora bachmanii*)	DE	None	No (ORD)	Historically known from central Charleston County in bald cypress swamps and canebrakes, but it has not been seen in the county (or anywhere else) for decades and has been delisted due to extinction.
Eastern Black Rail (*Laterallus jamaicensis Jamaicensis*)	FT	None	No (HAB)	Coastal marshes with tall, dense vegetation, typically dominated by, cordgrass (*Spartina* spp.).
Piping Plover (*Charadrius melodus*)[d]	FT	Final Designated, but outside Action Area	No (HAB)	Coastal or estuarine beaches with sparse or no vegetation, and forages in intertidal zones of sand and mud. Occurs in South Carolina only during spring and fall migration.
Red Knot (*Calidris canutus rufa)*	FT	None	No (HAB)	Coastal beaches and rocky shores. Occurs in South Carolina only during spring and fall migration.
Red-cockaded Woodpecker (*Picoides borealis* syn. *Dryobates borealis*)	FE	None	Yes	Fire-maintained upland longleaf and loblolly pine-dominated woodlands.
Wood Stork (*Mycteria americana*)	FT	None	Yes	Nests in the upper branches of swamp tupelo or cypress trees that are in standing water. In South Carolina, colony sites are surrounded by extensive wetlands, in particular palustrine forested wetlands.
Reptiles				
Green Sea Turtle (*Chelonia mydas*)[e]	FT	Final Designated, but far outside the Project area	No (HAB)	Nest on coastal beaches and uses shallow waters such as lagoons, bays, inlets, shoals, estuaries and other areas with an abundance of marine algae and submerged aquatic vegetation.

Common Name (Scientific Name)	ESA Status[a]	Critical Habitat	Potential Occurrence[b] (If No, Rationale for Exclusion)	Habitat
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	FE	Proposed, but far outside the Project area	No (HAB)	Nest on coastal beaches and uses shallow coastal and estuarine waters, usually over sand or mud bottoms.
Leatherback Sea Turtle (*Dermochelys coriacea*)	FE	Final Designated, but far outside the Project area	No (ORD, HAB)	Rarely nest on South Carolina coastal beaches and uses deep pelagic waters.
Loggerhead Sea Turtle (*Caretta caretta*)[f]	FT	Final Designated, but far outside the Project area	No (HAB)	Nest on coastal beaches and occupy pelagic, nearshore, and estuarine waters.
Amphibians				
Frosted Flatwoods Salamander (*Ambystoma cingulatum*)	FT	Final Designated, but outside the Project area (> 1.2 miles away)	Yes	Closely associated with the longleaf pine savannas, which typically exhibit a sparse canopy of longleaf pine and a rich herbaceous understory. Breeds in isolated temporary ponds.
Insects				
Monarch Butterfly (*Danaus plexippus*)	C	N/A	Yes	Anywhere with milkweed and an abundance of native nectar plants
Plants				
Pondberry (*Lindera melissifolia*)	FE	None	Yes	Seasonally flooded wetlands such as floodplain/ bottomland hardwood forests and forested swales, on the bottoms and edges of shallow seasonal ponds in old dune fields, along the margins of ponds and depressions in pinelands, around the edges of sinkholes in coastal areas with karst topography, and along the borders of Sphagnum bogs.
American Chaffseed (*Schwalbea americana*)	FE	None	Yes	Occurs in acidic, sandy or peaty soils in open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannas, and other grass- and sedge-dominated plant communities.
Canby's Dropwort (*Oxypolis canbyi*)	FE	None	Yes	Occurs in Coastal Plain Ecoregion in habitats prone to long periods of inundation, including pond cypress swamps, grass-sedge dominated Carolina bays, wet pine savannas, shallow pineland ponds, and cypress-pine swamps or sloughs.

Common Name (Scientific Name)	ESA Status[a]	Critical Habitat	Potential Occurrence[b] (If No, Rationale for Exclusion)	Habitat
Golden sedge (*Carex lutea*)	FE	Final Designated, but outside Project area, in North Carolina	Yes	On sandy soils that are moist, saturated, or periodically inundated in the pine savannas characterized by an open to sparse canopy dominated by pond pine and usually with some longleaf pine and pond cypress.
Seabeach Amaranth (*Amaranthus pumilus*)	FT	None	No (HAB)	Occurs on barrier island beaches, where its habitat consists of overwash flats at accreting ends of islands and lower foredunes, and upper parts of non-eroding beaches.
Fish				
Atlantic Sturgeon (*Acipenser oxyrhinchus oxyrhinchus*)[g]	FE	Final Designated, within the Santee River	No (HAB)	Rivers and coastal waters. Migrate from inshore marine waters and enter coastal sounds, bays, and inlets to access freshwater rivers to spawn.
Shortnose Sturgeon (*Acipenser brevirostrum*)	FE	None	No (HAB)	Rivers and coastal waters. Migrate from tidal estuarine or brackish channels into freshwater rivers to spawn from tidal river reaches to as far inland as the fall line.

Sources: USFWS (2024), SCDNR (2018a, 2023, 2024b), USFS (2018c)

[a] ESA Status: FE = listed as endangered; FT = listed as threatened; C = Candidate for listing; PE = Proposed for listing as endangered; DE = Delisted due to extinction

[b] Exclusion Rationale Codes: ORD = outside of distributional range of the species; HAB = no habitat present in action area

[c] The reclassification to endangered become effective on March 31, 2023

[d] Atlantic Coast and Northern Great Plains populations

[e] North Atlantic Distinct Population Segment

[f] Northwest Atlantic Ocean Distinct Population Segment

[g] Carolina Distinct Population Segment

Red-cockaded Woodpecker

The RCW was federally listed as endangered in 1970 (35 Federal Register [FR] 16047). South Carolina also lists the species as endangered. The species was proposed for downlisting from endangered to threatened under the ESA in 2020 (85 FR 63474) but the proposed reclassification was reopened for public comment in 2022 and no decision has been announced (87 FR 6118). A recovery plan for the RCW was originally written in 1979 and has been revised twice (USFWS 2003). The RCW is a small, non-migratory woodpecker that resides in mature, fire-maintained pine forests in the southeastern U.S., especially longleaf pine forests, where it was historically common. Prime nesting habitat includes open, mature pine forests dominated by longleaf, loblolly, pond, slash, or other southern pine species with little understory vegetation. RCWs are cooperative breeders, whereby a group of birds occupy adjacent trees and help to raise nestlings. Groups typically consists of a breeding male and female and one or more helpers, usually male offspring from previous years; their grouping of cavity trees is referred to as a cluster, which may total up 20 or more trees (SCDNR 2005b). They excavate nest cavities in trees that are greater than 60 years of age. Ideal foraging habitat includes upland longleaf pine ecosystems and loblolly pine woodlands, as well as pine-dominated savannas and flatwoods that have been maintained by frequent natural fires and are 30 years of age or older (USFWS 2003).

In 2000, South Carolina was home to over 1,000 breeding groups of RCWs, including an estimated 133 groups on state-owned lands, 524 groups on federal land (including military bases), and 400 groups on private lands (USFWS 2003, SCDNR 2005b). The RCW population on the FMNF has since expanded in some areas of the forest, especially in locations that are burned frequently in Management Area 1. Areas that have been consistently burned on a two- to three-year return interval are lumped together and called the "core burn" area. In areas where forest management does not allow for prescribed fire, such as the wildland/urban interface, undesirable mid-story succession occurs and reduces habitat suitability for RCW (USFS 2017).

The FMNF is home to the third largest RCW population in the U.S. and is one of 13 designated core recovery populations (USFS 2017). Since 2007, the FMNF's RCW population has exceeded the recovery goal of 350 potential breeding groups, as specified in the RCW recovery plan (USFS 2017). In the 2013 nesting season, there were 457 active clusters (441 potential breeding groups, 16 single male groups, and 53 inactive clusters) on the FMNF. USFWS (2020) estimated the 2014 population size as 496 active clusters and classified the resilience of the population as 'high.' USFS (2021b) indicates there are an estimated 525 active RCW clusters on the FMNF and USFS (2024) indicates that 562 of 630 known clusters have an 'active' status. There has been a steady increase over the past few years and the FMNF has annually contributed 30 individual RCWs for translocation to augment growth of vulnerable small populations and for reintroduction (Costa pers. Comm. 2019). Figures 3.3-3 and 3.3-4 show locations of known RCW clusters with half-mile foraging partitions intersecting the Project area based on data from USFS (2018d, 2024) and SCDNR (2018a) Heritage Trust Program.

Wildlife Investigations, LLC (2018) conducted surveys for RCW clusters in 2017 and 2018 on NFS lands. All known clusters were visited during the RCW breeding season (April 15 to June 30) to determine breeding status and group composition (number of adults present). To determine group status, the clusters were visited in the early morning before the woodpeckers exited their roost cavities for the day, and a digital playback of the RCW calls was used to attract and count individuals. Also, following the breeding season, clusters were visited to determine the total number of cavity trees present and the number of trees that would be removed during ROW construction. To determine the number of trees that could be potentially removed, all trees within 150 feet of both sides of the existing ROW were counted.

No data on RCW occurrences is available on private lands. However, Central performed an assessment of RCW habitat suitability on private lands as part of a supplemental routing study on private lands in 2024, as detailed in Section 2.2.3. Appendix D, in figures 8, 9, and 10, shows suitable RCW nesting and foraging habitat within the evaluated alternative corridors. Except for one location on School Bus Drive, the assessment found that private land forest stands meeting the USFWS (2003) definition of RCW habitat were in poor condition and unlikely to be used by RCW due to the lack of active management (e.g., prescribed fire, thinning) leading to dense understory and midstory. Wildlife biologists found no evidence of RCW nesting and heard no RCW vocalizations on the private lands accessible from open public roads.

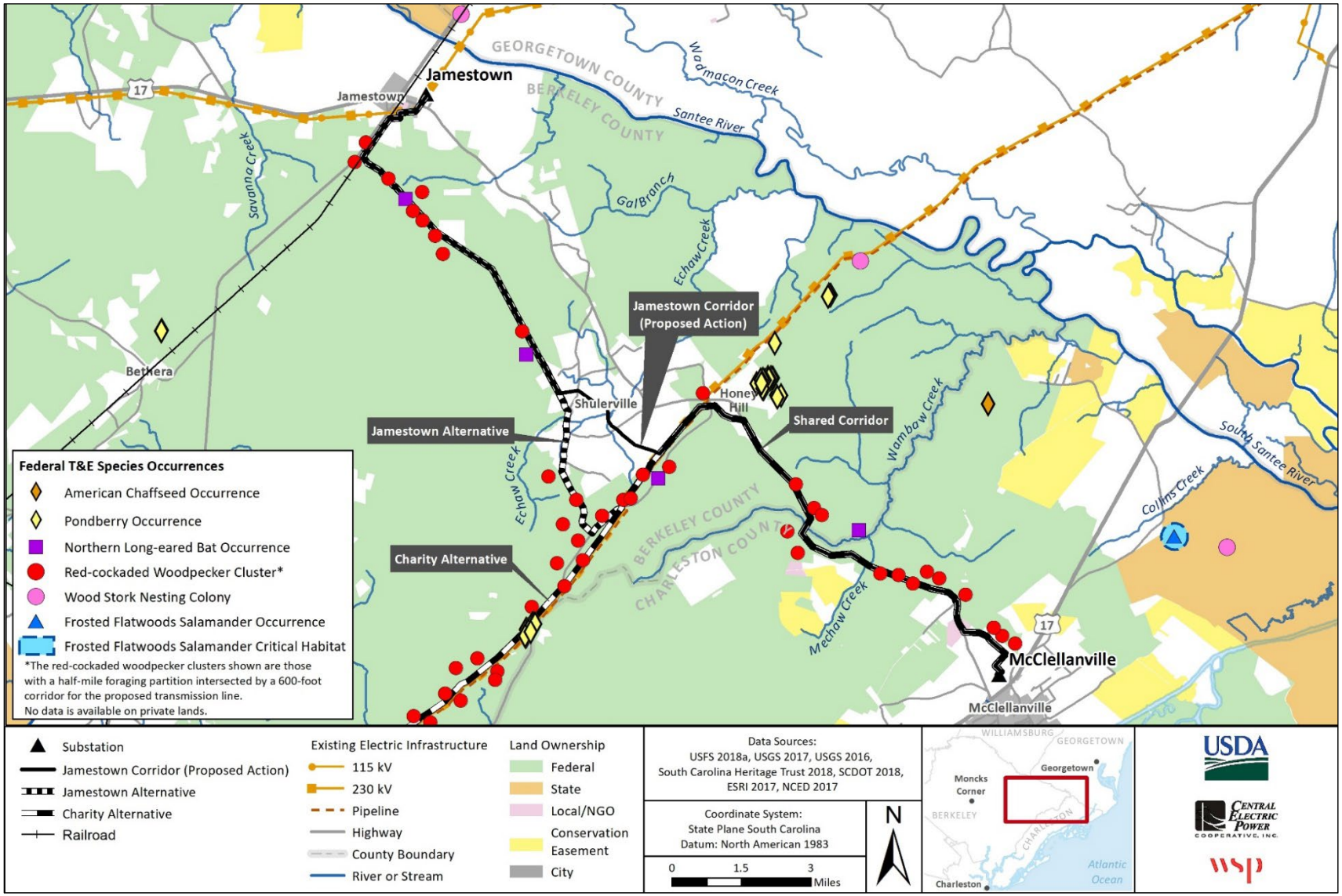


Figure 3.3-3. Occurrences of Federally Listed Threatened and Endangered Species and Designated Critical Habitat in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

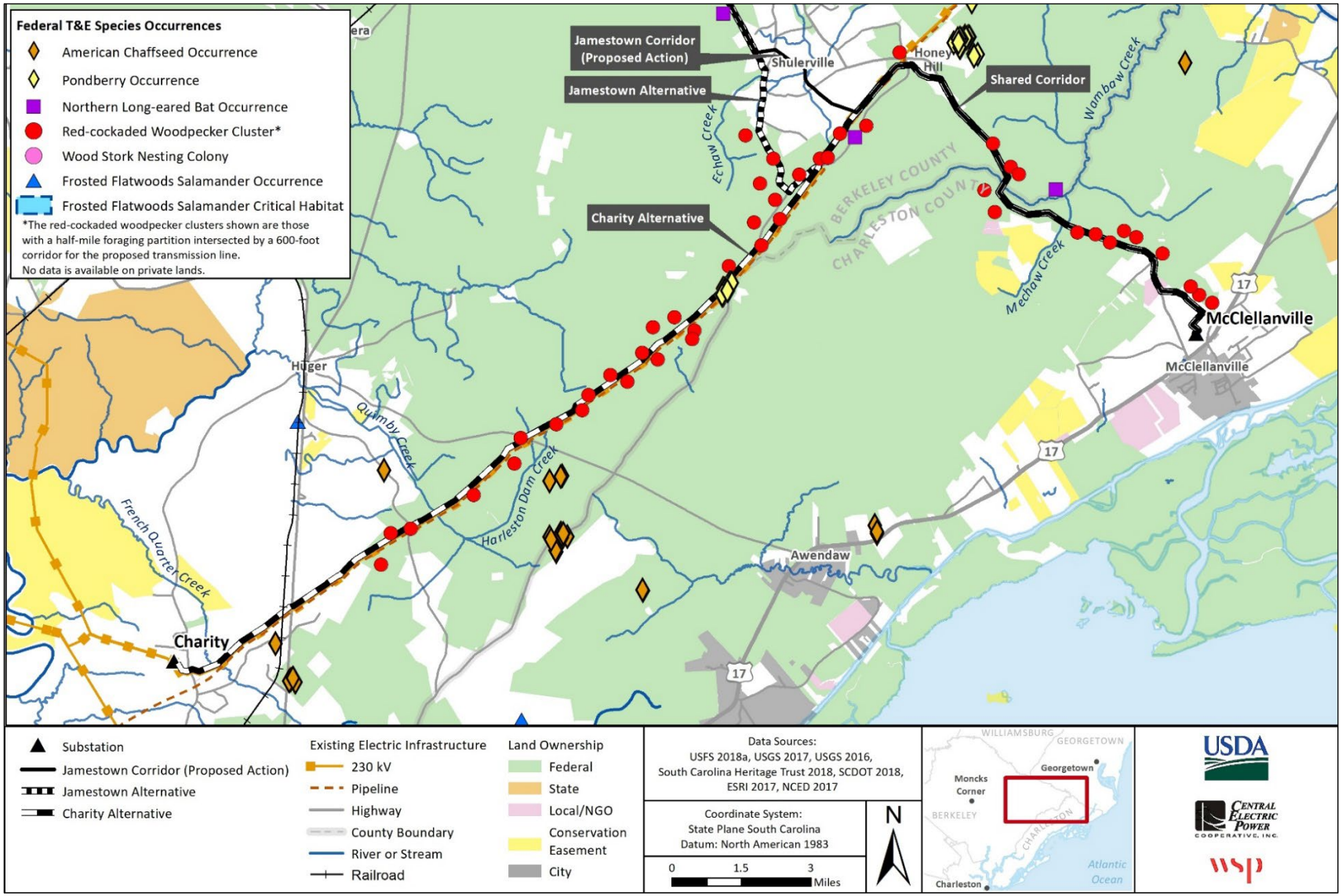


Figure 3.3-4. Occurrences of Federally Listed Threatened and Endangered Species and Designated Critical Habitat in the Vicinity of the Charity Alternative

Wood Stork

The wood stork is a large, long-legged wading bird. The wood stork was listed as endangered under the ESA in 1984 (49 FR 7332). USFWS reviewed its status in 2007, and, due to increasing populations, downlisted the species to threatened in 2014 (79 FR 37077). The species is also listed as endangered by the state of South Carolina (SCDNR 2015a). USFWS has not designated critical habitat for the species. Wood storks inhabit marshes, cypress swamps, and mangrove swamps and breed in colonies with other wading birds.

Loss of feeding habitat from alteration of natural hydroperiods as a result of development, lowered water tables, and disturbance caused wood stork populations to decline substantially in South Florida in the 1980s. Populations in the Carolinas and Georgia increased during the same period as habitat in their historic breeding range has become degraded. South Carolina has become an important breeding area as well as an important feeding area during the nonbreeding season (SCDNR 2015b). In 2012, four known rookeries were located in Charleston County, and none were found in Berkeley County. SCDNR monitors the reproductive effort and success of wood storks nesting in South Carolina (SCDNR 2015b). SCDNR (2016a) found record high numbers of wood storks nesting in South Carolina from 2013 to 2016, with relatively high nesting success from 2011–2016.

The wood stork is not known to nest within the Project area and there are no wood stork rookeries documented within 2 miles of the proposed alternatives (SCDNR 2018a). There is a wood stork nesting colony at the Washo Reserve (Audubon 2013a), a bald cypress-dominated wetland managed by the Nature Conservancy, surrounded by the Santee Coastal Reserve. This occurrence is approximately 2.5 miles east of U.S. Highway 17 and about 2 miles south of the South Santee River (see Figure 3.3-3). These wood storks, and others in the vicinity, have been documented flying from their night roosts and breeding colonies upriver down to feeding areas in the lower Santee Delta, Santee Coastal Reserve, Cape Romain National Wildlife Refuge, and other nearby areas. They "often cross [U.S. Highway 17] barely above the treetop level over the Santee Delta, or at even lower altitude[s] as they fly along the North Santeeand South Santee River." In addition to the rookery on the Washo Reserve, USFS (2018c) and Tsai and Frederick (2000) report two additional wood stork colonies along the Santee River. One wood stork colony is located approximately 2 miles north of the Jamestown Substation, near the U.S. Highway 17 Alternate Bridge over the Santee River; another colony is found in a Carolina bay off of USFS Road 204F approximately 0.75 miles south of Pleasant Hill Landing on the Santee River (see Figure 3.3-3). In addition to these colonies along the Santee River, USFS (2018c) reports two additional wood stork occurrences in the Project vicinity: (1) an important roosting site at Buzzards Island Heritage Preserve, which is on the Copahee Sound more than 10 miles southeast of the Charity Substation; and (2) an important feeding site at Fairlawn Plantation, a conservation property on the Wando River, West of Awendaw, which is approximately 5 miles east of the proposed Charity Alternative.

Surveys of the proposed Jamestown Alternative detected 6 observations of wood storks within the proposed corridor. Three observations were of a pair, and 3 observations were single individuals (ARCI 2018a). Also, 3 observations of wood storks were foraging or flying within the Jamestown ROW, and the other 3 were soaring above the tree canopy. Surveys of the proposed Charity Alternative detected 15 observations of wood storks within the proposed corridor, divided among 11 ground observations, 2 helicopter observations, and 2 fixed-wing aerial observations. Two observations were single individuals, and 13 were multiple individuals in groups of up to 17 wood storks, totaling 92 individual birds. The 3 observations of more than 10 wood storks were all soaring high above the proposed transmission line corridor. However, the majority (8) of all other observations were wood storks flying along the corridor, perched on adjacent trees, or foraging within depressional wetlands.

Northern long-eared Bat

The northern long-eared bat (*Myotis septentrionalis*) was once one of the most common species of forest bats in the southeastern U.S., with an extensive range across the eastern half of the country (USFS 2014). Although this species is not considered migratory, many groups or individuals travel considerable distances to seasonal habitat. Northern long-eared bats predominantly overwinter in hibernacula that include caves and abandoned mines (USFS 2014), and these features are not known to exist in the Project vicinity. However, during summer, the species typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags.

In November 2022, the USFWS issued its final rule listing the northern long-eared bat as endangered (87 FR 73488), which became effective March 31, 2023, reclassifying it from its former threatened status and rescinding a "special take rule" under ESA section 4(d) of the ESA. The most significant range-wide threat to the northern long-eared bat and primary reason for the species' listing is white-nose syndrome (WNS), a lethal fungal disease responsible for drastic declines of some bats in the eastern and midwestern U.S.. WNS is spread while the species inhabits caves and mines during winter hibernation. WNS has spread across nearly 80 percent of the species' range and nearly all of its U.S. range since the original threatened listing in 2015. WNS depletes the fat reserves bats need to survive winter and is estimated to have caused northern long-eared bat population declines of 97-100 percent across 79 percent of the species' range. The fungus causing WNS is found in 43 states and 8 Canadian provinces, and there is no known mitigation technique to slow the spread of the fungus or to treat WNS in afflicted bats. The USFWS concluded that the acceleration of the northern long-eared bat's population decline from WNS leaves the species in danger of extinction.

While a section 4(d) rule no longer applies to the northern long-eared bat, USFWS provided a list of activities in the listing rule that are unlikely to result in a violation of the ESA section 9 prohibition on "take." These include, among other activities listed: minimal tree removal and vegetation management any time of the year outside of forested habitat and more than 5 miles from known or potential hibernacula, insignificant forested habitat removal during the hibernation period not negatively affecting an essential behavioral pattern, tree removal at any time of year in highly developed urban areas. USFS cautions, however, that the list is not comprehensive and take of northern long-eared bat that occurs during any of the listed activities may still result in legal liability.

Historically, in South Carolina, northern long-eared bats were only documented in Greenville, Oconee, and Pickens counties (NatureServe 2023a). However, in the fall of 2016, two northern long-eared bats, an adult female and sub-adult male, were captured in Beaufort County in the Coastal Plain of South Carolina. The SCDNR (2018a) Heritage Trust Program indicates four occurrences of northern long-eared bat documented in the Project vicinity from 2017 (see Figures 3.3-3 and 3.3-4). These locations are all located close to the proposed Jamestown Alternative.

Northern long-eared bats typically forage along forested ridges and hillsides, with occasional foraging over water, in open fields, and along forested roads. Size and connectivity of foraging/commuting corridors are important components of suitable foraging habitat for northern long-eared bats. Forest edges, higher elevations, riparian corridors, and narrow, tree-lined roads may be considered important commuting and foraging corridors for this species. Connectivity of forested areas and riparian corridors also allows access to other potential roosting and maternity areas (USFWS 2014a).

An initial species assessment of bats, focused on the northern long-eared bat, was conducted on NFS lands along the proposed Jamestown and Charity alternatives (Ecological Solutions, Inc. 2017a, Ecological Engineering, LLP 2018a). Within the proposed corridor for the Jamestown Alternative, mist net and telemetry surveys were conducted between June 11 and August 2, 2017. Nine northern long-eared bats, out

of 355 total bats of 7 species, were captured in mist nets at 30 survey sites during a total of 60 nights. This included 4 adult females, three adult males, and 2 juvenile females. Each was fitted with a transmitter and tracked for approximately 6–7 days each. Thirty roost trees were documented on the FMNF along the proposed Jamestown Alternative ROW, of which 20 were live pine species and eight were pine snags, and 2 were hardwoods (one live and one snag). One roost tree was located within the proposed corridor. The SC Highway 45 bridge over Wambaw Creek was surveyed to assess potential bat use, and although no evidence of bat activity was observed on this bridge, it is potential roosting habitat for bats.

Ecological Engineering, LLP (2018a) also conducted mist net surveys at 24 sites from May 30 to August 7, 2018 (total of 48 nights) along the Charity Alternative. Ten northern long-eared bats were captured, which consisted of 2 females (1 reproductive adult and 1 juvenile) and 8 males (7 adults and 1 juvenile). During the 2018 surveys, 28 roost trees were identified, 23 of which were live pine species including 18 loblolly, 9 longleaf pines, and 1 red maple. There is strong evidence of a reproducing population and potential maternity habitat within the FMNF. Suitable roosting, foraging, and commuting habitat for bats was observed throughout the Project area. Habitats included large areas of mixed pine-hardwood forest with both live trees and snags, exhibiting suitable roost tree diameter with cavities, broken branches, and sloughing bark (Ecological Engineering, LLP 2018a).

Tricolored Bat

In June 2016, the Center for Biological Diversity and Defenders of Wildlife (2016) petitioned the USFWS to list the tricolored bat as endangered due to dramatic population declines attributable to WNS. The USFWS proposed to list it as endangered in November 2022 (87 FR 56381). The tricolored bat is distributed from eastern Canada south through most of the eastern US and into Mexico, and west to Michigan, Minnesota and Texas. Before WNS was detected, the range of this species was expanding westward from South Dakota to Texas and New Mexico and northward into the central Great Lakes region. In South Carolina, they are distributed statewide. Other threats include wind turbines, pesticide use, deforestation, and global climate change (SCDNR 2020).

Summer maternity roosts and winter hibernacula are usually located in different areas (SCDNR 2020). Shute (2020) found that tricolored bat summer habitat use in Beaufort County, SC was distributed across most of the landscape, suggesting a generalist behavior. Tricolored bats selected summer roosts in hardwood trees with dense foliage and high densities of Spanish moss, which are most often found in maritime forests. Other studies (Ford et al. 2006, Morris et al. 2010) have reported that tricolored bats are associated with forest edges, high canopy closure, and low vegetation density. During winter, tricolored bats hibernate even when food is available in warmer climates, rarely leaving hibernacula, and they may be one of the earliest bats to arrive to hibernacula and the last to leave during this time. Hibernacula include highway culverts, tunnels, storm sewers, caves, and mines (SCDNR 2020). In the absence of caves and mines in coastal South Carolina, tricolored bats hibernate in trees or bridges and may be less susceptible to WNS than bats using subterranean hibernaculum roosts (Newman et al. 2021). Bridges were warmer and less humid than tree cavities, so bats used bridges on colder days. Shute (2020) documented a shift to bottomland forests, ponds, and fields more than salt marsh and upland forest habitat.

The tricolored bat potentially occurs within the Project area based on captured individuals along the Jamestown and Charity alternatives during initial species assessments. For the Jamestown Alternative, 16 individual tricolored bats were captured, accounting for 4.5 percent of 355 captured bats (Ecological Solutions, Inc. 2017a). For the Charity Alternative, 5 tricolored bats were captured, accounting for 1 percent of 471 captured bats (Ecological Engineering, LLP 2018a).

Frosted Flatwoods Salamander

The frosted flatwoods salamander is a large member of the mole salamander family. The frosted flatwoods salamander was listed as threatened under the ESA in 1999 (64 FR 15691). The species is also currently listed as endangered in South Carolina. Critical habitat (1,176 acres on the FMNF) for the frosted flatwoods salamander was proposed in 2008 (73 FR 47258) and designated in 2009 (74 FR 6700). As a fossorial animal, the frosted flatwoods salamander spends most of its adult life in burrows, crayfish holes, root channels, rodent burrows, under logs and decaying vegetation along the margins of ponds and swamps. They are found in wet, grassy flatwoods and are closely associated with the longleaf pine savannas of the lower Coastal Plain Ecoregion. Frosted flatwoods salamanders breed within seasonally flooded isolated wetlands within fire-maintained pine woodlands and savannas (USFS 2013a). Conservation measures for the species included in its listing are intended to address management activities within a 450-meter radius of known flatwoods salamander breeding ponds. Threats to frosted flatwoods salamanders include fire suppression, detrimental forestry practices that destroy the below-ground soil structure, and hydrologic changes from adjacent highways and roads that can alter the ecological functioning of breeding ponds and surrounding terrestrial habitat (USFS 2013a).

Thirty records for the frosted flatwoods salamander are known from five counties in South Carolina, including Berkeley and Charleston counties. In the past decade, this species has only been documented in Jasper and Berkeley counties. Despite intense survey efforts, very few occurrence records have been documented in the past two decades, consisting of one or two individuals at breeding ponds (SCDNR 2015c). USFS (2013a) reported that, over the preceding 20 years, only 8 adults and 12 larvae had been captured on the FMNF. USFS (2018c) reports 10 frosted flatwoods salamander occurrences in the Project vicinity, the majority of which are more than 2.25 miles away from the Project area in the Wando River area. The other occurrence, closer to the Project, was last documented in 1987 and is on the Santee Coastal Reserve. Approximately 162 acres of critical habitat are designated within 1,500 feet surrounding this occurrence (74 FR 6700. Another known population of frosted flatwoods salamander is outside of the Project area in the FMNF, along SC Highway 41 in Berkeley County. This population is located approximately 3 miles south of where the Charity Alternative would cross SC Highway 41. The Charity Alternative would come within approximately 2.25 miles of the nearest known frosted flatwoods occurrence in this area (see Figure 3.3-4). The frosted flatwoods salamander range can extend up to 1 mile from their breeding sites. Buhlmann and Gross (2018) and Buhlmann (2019) conducted herpetological habitat surveys of the proposed Jamestown and Charity alternatives to identify the occurrences of any rare or threatened amphibians and reptiles; they reported no occurrences of frosted flatwoods salamander but found suitable habitat.

Monarch Butterfly

The monarch butterfly is a “Candidate” species for federal listing. The USFWS determined in 2020 that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority actions (85 FR 81813). Candidate species are not required to be analyzed for ESA section 7 consultation, but the monarch butterfly is evaluated here should this species become listed in the future. Because the monarch butterfly is not listed under the ESA, no critical habitat is designated for the species. Monarchs depend on milkweed (*Asclepias* spp.); the adult butterflies lay eggs on the plant and the larva (caterpillars) feed exclusively on it. Adult butterflies also feed on other nectar-rich flowering plants. The monarch butterfly occurs throughout the U.S. during the summer months, migrating in successive generations from overwintering areas in central Mexico and coastal California to as far north as southern Canada. As they migrate north, monarch butterflies mate and deposit their eggs and die. The monarch butterfly can migrate up to 3,000 miles between summer and wintering grounds.

Suitable habitat is present within the Project area as host plants (i.e., milkweeds) were observed and one adult was also observed along the proposed Jamestown Alternative (Ecological Solutions, Inc. 2017b). During the annual FMNF Butterfly Count, the monarch butterfly has been documented every year since 1996, except none were observed in 2001 and 2004 (FMNF unpublished data). During the spring, summer, and fall, the species may be found anywhere that milkweed and an abundance of native nectar plants occur. Milkweed is commonly found along roadsides, forest edges, and wetlands, and grows in a variety of habitats from dry sandy areas to wet and marshy areas, as well as in sunny open areas to more shaded forested areas.

Threats identified in the petition to list monarch butterflies include loss and degradation of habitat and loss of milkweed resulting from herbicide application, conversion of grasslands to cropland, loss to development and aggressive roadside management, loss of winter habitats from logging, forest disease, and climate change (Center for Biological Diversity et al. 2014). The reduced availability, spatial distribution, and quality of milkweed and nectar plants associated with breeding and use of insecticides are most responsible for their decline (85 FR 81813). Monarch butterfly populations east of the Rocky Mountains, which is the largest of all populations, have declined by over 90 percent in the last three decades (Center for Biological Diversity et al. 2014, Xerces 2020). USFWS (2020b) estimated the Eastern North American population's probability of extinction in 60 years under current conditions ranges from 48 percent to 69 percent.

Pondberry

Pondberry is a small deciduous shrub, between 12 and 80 inches tall, that grows along the margins of lime sinks, or shallow seasonal ponds (i.e., depressional wetlands) (USFWS 1993). It was listed as endangered in 1986 (51 FR 27495). The plant also inhabits the margins of ponds within pinelands and recently burned open areas. There were 13 known populations of pondberry on the FMNF, as reported from 2010 monitoring (USFS 2012). The SCDNR (2018a) Heritage Trust Program has documented three occurrences of pondberry that are each approximately 450 to 500 feet from the existing transmission line and proposed adjacent Charity Alternative, in the vicinity of the intersection of Halfway Creek Road and Conifer Road (see Figure 3.3-4). Many pondberry occurrences are also located approximately 0.75 miles north of the shared corridor for the Proposed Action and alternatives, in proximity to the community of Honey Hill and north of SC Highway 45 (see Figure 3.3-3). Multiple lime sinks occur in this area and contain the largest concentration of pondberry in the world, and in 1993, comprised 64 of the 73 known colonies and 8,000 of the estimated 12,600 stems of pondberry in South Carolina (USFWS 1993).

No pondberry plants were found within wetlands crossed by the proposed Jamestown and Charity alternatives during a floristic inventory (Gaddy 2017, 2018), although depressions near known populations would be resurveyed by a professional botanist prior to Project construction.

In 2019 and 2020, pondberry was found in six populations. Threats noted at Honey Hill included woody encroachment, shade, lack of fire, and possibly hog damage. Portions of Honey Hill were thinned and prescribed burned in 2020. Male and female plants were planted at the Echaw Bay population in 2010, but in 2020 noted threats included woody plants, especially sweetgum saplings, and what appeared to be hog damage. Most of the plants at Whiddon Bay were on land versus in the water, and several were growing among dense Lyonia lucida shrubs where they were mostly small and difficult to see. At Conifer Road, several ponds were heavily flooded (USFS 2021b).

American Chaffseed

American chaffseed is a hemiparasitic herb, a plant that obtains some nourishment from various host plants but also undergoes photosynthesis. It requires frequent fire or other soil disturbance to persist. It grows in open, moist pine flatwoods, fire-maintained savannas, and along the margins of forests or woodlands.

USFWS (2008) reported 12 populations on the FMNF from 2008, but USFS (2012) also reported 4 populations known to occur on the FMNF in 2010.

The SCDNR (2018a) Heritage Trust Program has documented two American chaffseed populations within 1 mile of the existing Winyah-Charity 230-kV transmission line and proposed adjacent Charity Alternative, and several additional occurrences are found within the same area of the FMNF but farther away from the Project area (see Figure 3.3-4; USFS 2018c).

Numbers of American chaffseed plants declined by 60 percent on the FMNF between 2001 and 2008 due to a lack of frequent, 1–3 year fire regimes (USFS 2013b). In 2019 and 2020, when compared to prior surveys, there were small to moderate declines in numbers of American chaffseed plants on the FMNF in five of the six populations that had plants. Declines were most dramatic at one population due to roadside herbicide application by the county roadside maintenance contract. In addition to herbicide application, other threats include feral hog activity and, in a few occurrences, heavy litter accumulation. (USFS 2021b)

Canby's Dropwort

Canby's dropwort is a perennial herbaceous plant in the carrot family, listed as endangered in 1992 (57 FR 44703). According to USFS (2017), its optimal habitat is depressional wetlands or Carolina bays maintained as open and herbaceous by frequent wildfire. Eight sites are managed and protected range wide for Canby's dropwort, including one pond cypress savanna on the FMNF (Tibwin Savanna). However, only one Canby's dropwort plant was located there in 2006, and no plants have since been found at this site. The FMNF is working to enhance and reestablish other populations at known or historic sites for the plant on the forest. Threats to these potential sites include succession, lack of prescribed fire, woody competition from red maple and loblolly pine, and feral hogs (USFS 2017).

Suitable habitat for the species exists in the Project area; however, there are no known occurrences of Canby's dropwort within or in the vicinity of the Project area.

In 2019 and 2020, no plants were found at the three FMNF occurrences for Canby's dropwort, each representing a population. Water levels at the Echaw Road site were deep and there was evidence of hog activity. Habitat at Tibwin Savanna has improved with recent prescribed fires.

Golden Sedge

Golden sedge was recognized as a distinct species in 1994 and USFWS listed it as endangered in 2002 (67 FR 3120). Critical habitat was designated for the species in 2011 (76 FR 11086), which includes eight units within Onslow and Pender counties of North Carolina. Golden sedge is a perennial member of the sedge family (Cyperaceae). It can grow up to 40 inches tall but is typically less than 20 inches. It has yellowish green grass-like leaves. Fertile culms produce two to four flowering spikes (multiple flowering structure with flowers attached to the stem), with the terminal spike being male and the one to three lateral spikes being female. Golden sedge is most readily identified from mid-April to mid-June during flowering and fruiting. It is distinguished from other Carex species that occur in the same habitat by its bright yellow color (particularly the female spikes), by its height and slenderness, and especially by the out-curved crowded perigynia, the lowermost of which are reflexed (USFWS 2022b).

USFWS (2022c) describes golden sedge habitat as sandy soils overlying coquina limestone deposits, where the soil pH is unusually high for the region, typically between 5.5 and 7.2. Soils supporting the species are very wet to periodically shallowly inundated. It prefers the ecotone (narrow transition zone between two diverse ecological communities) between the pine savanna and adjacent wet hardwood or hardwood/conifer forest. Most plants occur in the partially shaded savanna/swamp where occasional to frequent fires favor

an herbaceous ground layer and suppress shrub dominance. Other species with which golden sedge grows include tulip poplar, pond cypress, red maple, wax myrtle, colic root, and several species of beakrush.

Until 2021, all known populations of golden sedge occur in the northeast Cape Fear River watershed in Pender and Onslow counties of North Carolina. In 2021, a USFS botanist found an occurrence of golden sedge on the FMNF; the identification was confirmed in the field by several botanists familiar with the species. FMNF botanists mapped 5 polygons around these golden sedge occurrences in 2022, with the nearest being located approximately 0.4 miles north of the Project Area, along SC Highway 45 (USFS 2022). USFWS is working to verify the genetics of those specimens. Also, 3 new populations were discovered in Florida, which are also subject to genetic testing (USFWS 2022b).

Populations of golden sedge are threatened by habitat alteration including fire suppression, conversion of its limited habitat for residential, commercial, or industrial development, highway and utility expansion, ROW management with herbicides, and wetland drainage activities associated with silviculture, agriculture and development projects. In addition, roadside and utility ROW populations are vulnerable to extirpation from herbicide application. Invasive species, small population size and drought are other threats to the species (USFWS 2014b).

3.3.1.4 FMNF Species of Conservation Concern and State-Listed Species

The State Code of Laws of South Carolina provides protection for threatened and endangered species under the 1976 South Carolina Nongame and Endangered Species Conservation Act. This law contains provisions for endangered species similar to those of the federal ESA. State-listed species are designated as either threatened or endangered by SCDNR. All federally listed species in the Project vicinity, as described above in Section 3.3.1.3, are also listed by South Carolina as either threatened or endangered, except for the Atlantic sturgeon and northern long-eared bat. South Carolina lists two additional animals as endangered in Berkeley and Charleston counties: the American swallow-tailed kite (*Elanoides forficatus*), and Carolina gopher frog (*Lithobates capito capito*). South Carolina lists six additional animals as threatened, including the bald eagle (*Haliaeetus leucocephal*us), southern hognose snake (*Heterodon simus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), broad-striped dwarf siren (*Pseudobranchus striatus*), spotted turtle (*Clemmys guttata*), and Carolina pygmy sunfish (*Elassoma boehlkei*).

In 1976, South Carolina's Heritage Trust Act gave SCDNR the authority to also conserve plants and to acquire habitat for its natural areas program. Under this statute, SCDNR maintains an additional list of both animals and plants that are thought to be rare, declining, or for which population status is unknown. These are termed "species of concern" (not to be confused with FMNF species of conservation concern) and correspond to the "Watch List" species in many other states. The species of concern list does not afford any legal protection and species are tracked by the SCDNR Heritage Trust Program for conservation purposes to assist in planning and to direct research and survey efforts. SCDNR lists 31 species in Berkeley and Charleston counties as species of concern. Most animals listed by South Carolina as threatened or endangered, or tracked by the South Carolina Heritage Trust as species of concern, are also classified as SCC by the FMNF. Table 3.3-3 provides a list of the state-listed species that could occur in the Project vicinity, within Berkeley and Charleston counties.

USFS develops and implements management practices to ensure that rare plants and animals do not become threatened or endangered and to ensure their continued viability on NFS lands. USFS policies dictate that it must analyze impacts on sensitive species to ensure that activities performed on NFS lands do not cause a trend toward federal listing or loss of a species' viability. USFS manages sensitive species under the authority of the National Forest Management Act, requiring the USFS to manage national forests for "viable

populations of native and desirable non-native species." A 2012 Planning Rule (36 CFR §219) contains guidance providing for sustainability (CFR §219.8) and diversity of plants and animals.

The 2012 Planning Rule identifies 3 categories of at-risk species: (1) federally listed threatened and endangered species under the ESA, (2) federally proposed and candidate species under the ESA, and (3) species of conservation concern (SCC). SCC is a special-status category required by the 2012 Planning Rule and replaced the Regional Forester's list of sensitive species. SCC are species, other than federally recognized threatened, endangered, proposed, or candidate species, that are "known to occur in the plan area and for which the regional forester has determined the best available scientific information indicates substantial concern about the species' capability to persist over the long term in the plan area" (36 CFR 219.9I). SCC may require special management emphasis to ensure their persistence and to preclude trends toward endangerment that would result in the need for federal listing. While the goal of both forest service special-status lists is to prevent species from being federally listed as threatened or endangered, the SCC list uses more comprehensive and defined criteria for inclusion than the Regional Forester sensitive species list, making it less likely that a species in need of conservation will be overlooked. Another difference between the lists is that the management approach for Regional Forester sensitive species was to manage forest resources to maintain species viability, which was often difficult to measure; however, under the 2012 Planning Rule, forest resources are to be managed to provide the type of habitat and other conditions that SCC need to persist (USFS 2015).

As required under the USFS Sensitive Species Program, USFS performs a biological evaluation for activities that could potentially affect Regional Forester sensitive species and SCC. A biological evaluation is similar to a BA for federally listed species. Another requirement of USFS Sensitive Species Program is a biological evaluation process (FSM 2672.4) to ensure species population viability of endangered, threatened, proposed, or sensitive species. The Regional Forester sensitive species list for Region 8, which includes the FMNF, was last updated by the Regional Forester in August 2001. However, as described above, that list for the FMNF was superseded by the list of SCC in the 2017 FMNF Revised Land Management Plan (USFS 2017). The FMNF recently conducted a biological evaluation for this plan (USFS 2017).

Table 3.3-3 lists the species designated by South Carolina as threatened, endangered, or species of concern (hereafter state-listed species), as well as the FMNF SCC that could potentially occur in the Project vicinity. The table also describes the associated ecosystems suitable to each species and their historical or documented presence in the Project vicinity. It identifies 55 special-status species that could be potentially affected by the Project due to either: (1) known occurrences in the Project vicinity based on occurrences tracked by SCDNR (2018a) Heritage Trust Program and USFS (2018c), or according to historic records evaluated by Buhlmann and Gross (2018), Buhlmann (2019), or Gaddy (2017, 2018); or (2) documented occurrence within the Project Area according to species-specific field surveys by ARCI (2018a,b), Buhlmann and Gross (2018), Buhlmann (2019), Ecological Solutions, Inc. (2017a,b), Gaddy (2017, 2018), Three Oaks Engineering (2017, 2018), or Wildlife Investigations, LLC. (2018) (Table 3.3-3). Figures 3.3-5 and 3.3-6 show the known occurrences of state-listed species and FMNF SCC found in the Project vicinity.

Table 3.3-3. Species Listed as FMNF SCC, or by South Carolina as Threatened, Endangered, or Species of Concern, with Potential to Occur in the Project Vicinity and its Associated Ecosystems, and Known or Potential Occurrences in the Project Vicinity

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Birds											
American Swallow-tailed Kite (*Elanoides forficatus*)	SE	SCC	--	--	--	X	X	--	--	--	Yes[f,g]
Bachman's Sparrow (*Aimophila aestivalis*)	Species of Concern	SCC	--	--	X	--	--	--	--	--	Yes[g]
Bald Eagle (*Haliaeetus leucocephalus*)	ST	SCC	--	--	--	--	X	--		X	Yes[f,g]
Barn Owl (*Tyto alba*)	Species of Concern	--	--	--	X	--	--	--	X	--	Yes[g]
Black-throated Green Warbler [*Wayne's subspecies*] (*Setophaga virens spp. wayneii*)	Species of Concern	--	X	X	X	--	--	--	--	--	Yes[g]
Common ground dove (*Columbina passerine*)	Species of Concern	--	--	--	X	--	--	--	X	--	No
Grasshopper Sparrow (*Ammodramus savannarumi*)	Species of Concern	--	--	--	X	X	--	--	X	--	No
Little blue heron (*Egretta caerulea*)	Species of Concern	--	--	--	--	X	X	X	--	X	No
Loggerhead Shrike (*Lanius ludovicianus*)	Species of Concern	--	--	--	--	--	--	--	X	--	No
Painted Bunting (*Passerina ciris*)	Species of Concern	--	--	--	X	--	--	X	X	--	No
Red-cockaded Woodpecker (*Picoides borealis*)	SE[d]	--	X	X	X	--	X	X	--	--	Yes[f,g]

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	Species of Concern	--	X	X	X	--	--	--	--	--	Yes[g]
Swainson's Warbler (*Limnothlypis swainsoni*)	Species of Concern	--	X	--	X	--	X	X	--	--	Yes[g]
Wood Stork (*Mycteria americana*)	SE[d]	--	--	--	--	--	X	X	--	X	Yes[f,g]
Mammals											
Black Bear (*Ursus americanus*)	Species of Concern	--	X	X	X	X	X	X	X	--	Yes[g]
Eastern Woodrat (*Neotoma floridana*)	Species of Concern	--	X	X	X	--	X	--	X	--	Yes[g]
Meadow Vole (*Microtus pennsylvanicus*)	Species of Concern	--	--	--	X	--	--	--	X	--	Yes[g]
Northern Yellow Bat (*Lasiurus intermedius*)	Species of Concern	--	X	X	X	X	X	X	--	--	No
Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*)	ST	SCC	X	X	--	X	X	--	X	X	Yes[f,g]
Southeastern Bat (*Myotis austroriparius*)	Species of Concern	SCC	--	--	X	X	X	--	--	--	Yes[f,g]
Star-nosed Mole (*Condylura cristata*)	Species of Concern	--	X	X	X	--	X	--	--	--	Yes[g]
Southern Fox Squirrel (*Sciurus niger niger*)	Species of Concern	--	X	--	X	--	X	--	--	--	Yes[g]
West Indian Manatee (*Trichechus manatus*)	--	SCC[e]	--	--	--	--	--	--	--	X	Yes[g]
Amphibians											
Bird-voiced Tree Frog (*Hyla avivoca*)	Species of Concern	--	--	--	--	--	X	--	--	--	No

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Broad-striped Dwarf Siren (*Pseudobranchus striatus*)	ST	SCC	--	X	--	--	--	--	--	--	Yes[g]
Eastern Tiger Salamander (*Ambystoma tigrinum*)	Species of Concern	--	X	X	X	X	--	--	--	--	Yes[g]
Frosted Flatwoods Salamander (*Ambystoma cingulatum*)	SE[d]	--	--	X	--	--	--	--	--	--	Yes[g]
Carolina Gopher Frog (*Lithobates capito capito*)	SE	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Northern Cricket Frog (*Acris crepitans*)	Species of Concern	--	--	--	--	X	--	--	--	--	Yes[g]
Pickeral Frog (*Rana palustris*)	Species of Concern	--	--	--	--	X	X	--	--	X	No
Reptiles											
Black Swamp Snake (*Seminatrix pygaea*)	Species of Concern	--	--	--	--	X	X	--	--	X	Yes[h]
Coral Snake [*Harlequin] (Micrurus fulvius*)	Species of Concern	--	X	X	X	--	--	--	--	--	No
Eastern Diamondback Rattlesnake (*Crotalus adamanteus*)	Species of Concern	SCC	--	X	X	X	X	--	--	--	Yes[g]
Florida Green Watersnake (*Nerodia floridana*)	Species of Concern	--	--	--	--	--	--	--	--	X	Yes[g]
Northern Pine Snake (*Pituophis melanoleucus*)	Species of Concern	--	X	X	X	--	--	--	--	--	Yes[g]
Southern Hognose Snake (*Heterodon simus*)	ST	SCC	--	X	X	--	--	--	--	--	Yes[g]

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Spotted Turtle (*Clemmys guttata*)	ST	SCC	--	X	--	--	X	--	--	X	Yes[f,g,h]
Timber Rattlesnake [canebrake] (*Crotalus horridus*)	Species of Concern	--	X	X	X	X	X	--	--	--	Yes[g,h]
Fish											
American Eel (*Anguilla rostrata*)	--	SCC	--	--	--	--	--	--	--	X	Yes[f,g]
Atlantic Sturgeon (*Acipenser oxyrinchus*)	Species of Concern[e]	--	--	--	--	--	--	--	--	X	Yes[g]
American Shad (*Alosa sapidissima*)	Species of Concern[e]	--	--	--	--	--	--	--	--	X	No
Blueback Herring (*Alosa aestivalus*)	Species of Concern[e]	--	--	--	--	--	--	--	--	X	No
Carolina Pygmy Sunfish (*Elassoma boehlkei*)	ST	--	--	--	--	--	--	--	--	X	No
Hickory Shad (*Alosa mediocris*)	Species of Concern[e]	--	--	--	--	--	--	--	--	X	Yes[g]
Shortnose Sturgeon (*Acipenser brevirostrum*)	SE[d]	--	--	--	--	--	--	--	--	X	Yes[g]
Insects											
Dusky Roadside Skipper (*Amblyscirtes alternata*)	--	SCC	--	--	X	X	--	--	--	--	No
Monarch Butterfly (*Danaus plexippus*)	--	SCC	--	X	X	X	X	--	--	--	Yes[f]
Berry's Skipper (*Euphyes berryi*)	--	SCC	--	--	--	X	X	--	--	--	Yes[f]
Okefenokee Zale Moth (*Zale perculta*)	--	SCC	--	--	--	--	X	--	--	--	No
Plants											
Coastal Plain False-foxglove (*Agalinis aphylla*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Incised Groovebur (*Agrimonia incisa)*	--	SCC	--	X	--	--	--	--	--	--	No
Elliott's Bluestem (*Andropogon gyrans var. stenophyllus*)	--	SCC	--	X	--	--	--	--	--	--	Yes[f,g,h]
Mohr's Bluestem (*Andropogon mohrii*)	--	SCC	--	--	--	X	X	--	--	--	No
Purple Silkyscale (*Anthaenantia rufa*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Savanna Milkweed (*Asclepias pedicillata*)	--	SCC	X	--	--	--	--	--	--	--	No
Black-stem Spleenwort (*Asplenium resiliens*)	--	SCC	X	--	--	--	--	--	--	--	No
Northern Burmannia (*Burmannia biflora*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Bearded Grass-pink (*Calopogon barbatus*)	--	SCC	--	X	--	--	--	--	--	--	No
Many-flower Grass-pink (*Calopogon multiflorus*)		SCC	--	X	--	--	--	--	--	--	Yes[h]
Widow Sedge (*Carex basiantha*)	--	SCC	X	--	--	--	--	--	--	--	No
Chapman's Sedge (*Carex chapmanii*)	--	SCC	--	--	--	--	X	--	--	--	No
Ravenfoot Sedge (*Carex crus-corvi*)	--	SCC	--	--	--	--	X	--	--	--	No
Elliott's Sedge (*Carex elliottii*)	--	SCC	--	--	--	X	X	--	--	--	No
Meadow Sedge (*Carex granularis*)	--	SCC	X	--	--	--	--	--	--	--	No
Tussock Sedge (*Carex stricta*)	--	SCC	--	X	--	--	--	--	--	--	No
Nutmeg Hickory (*Carya myristiciformis*)	--	SCC	X	--	--	--	--	--	--	--	No

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Shiny Spikegrass (*Chasmanthium nitidum*)	--	SCC	--	X	--	--	--	--	--	--	No
Twig-Rush (*Cladium mariscoides*)	--	SCC	--	X	--	--	--	--	--	--	No
Ciliate-leaf Tickseed (*Coreopsis integrifolia*)	--	SCC	--	--	X	--	X	--	--	--	No
Ravenel's Eryngo (*Eryngium aquaticum var. ravenelii*)	--	SCC	--	X	--	--	--	--	--	--	No
Florida Thorough-wort (*Eupatorium anomalum*)	--	SCC	--	--	--	X	X	--	--	--	No
Southeastern Sneezeweed (*Helenium pinnatifidum*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Small's Bog Button (*Lachnocaulon minus*)	--	SCC	--	X	--	--	--	--	--	--	No
Southern Twayblade (*Listera australis*)	--	SCC	X	--	--	--	--	--	--	--	No
Boykin's Lobelia (*Lobelia boykinii*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Lance-leaf Seedbox (*Ludwigia lanceolata*)	--	SCC	--	X	--	--	--	--	--	--	No
Lance-leaf Loosestrife (*Lysimachia hybrida*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Loomis' loosestrife (*Lysimachia loomisii*)	--	SCC	--	--	--	X	X	--	--	--	No
Carolina Bird-in-a nest *(Macbridea caroliniana*)	--	SCC	--	--	--	--	X	--	--	--	No
Yellow Carolina Milkvine (*Matelea flavidula*)	--	SCC	X	--	--	--	--	--	--	--	No
Piedmont Water-mlfoil (*Myriophyllum laxum*)	--	SCC	--	X	--	--	--	--	--	--	No

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Yellow Fringeless Orchid (*Platanthera integra*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Pineland Plantain (*Plantago sparsiflora*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Shadow-witch Orchid (*Ponthieva racemosa*)	--	SCC	X	--	--	--	--	--	--	--	Yes[g,h]
Crestless Plume Orchid (*Pteroglossapsis ecristata*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Bottomland Post Oak (*Quercus similis*)	--	SCC	--	--	--	--	X	--	--	--	No
Short-bristle Baldrush (*Rhynchospora breviseta*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Small bunched Beaksedge (*Rhynchospora cephalantha var. attenuata*)	--	SCC	--	X	X	--	--	--	--	--	No
Globe Beakrush (*Rhynchospora globularis var. pinetorum*)	--	SCC	--	X	--	--	--	--	--	--	No
Harper Beakrush (*Rhynchospora harperi*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Few-flowered Beakrush (*Rhynchospora oligantha*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Brown Beakrush (*Rhynchospora pleiantha*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Long-beaked Beaksedge (*Rhynchospora scirpoides*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g,h]
Chapman Beakrush (*Rhynchospora stenophylla*)	--	SCC	--	--	--	X	X	--	--	--	No
Limestone Petunia (*Ruellia strepens*)	--	SCC	--	--	--	--	X	--	--	--	No
Small-flowered Buckthorn (*Sageretia minutiflora*)	--	SCC	--	--	--	--	--	X	--	--	No
Lace-lip Ladies'-Tresses (*Spiranthes laciniata*)	--	SCC	--	X	--	--	--	--	--	--	No
Pineland Dropseed (*Sporobolus curtisii*)	--	SCC	--	X	--	--	--	--	--	--	No
Carolina Dropseed (*Sporobolus pinetorum*)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Chapman's Redtop (*Tridens chapmanii)*	--	SCC	X	--	--	--	--	--	--	--	No
Threebirds Orchid (*Triphora trianthophora*)	--	SCC	X	--	--	--	--	--	--	--	No
Greater Bladderwort (*Utricularia macrorhiza*)	--	SCC	--	X	--	--	--	X	--	--	No
Short-leaved Yellow-eyed Grass (*Xyris brevifol*i)	--	SCC	--	X	--	--	--	--	--	--	Yes[g]
Florida Yellow-eyed Grass (*Xyris difformis var. floridana*)	--	SCC	--	X	--	--	X	--	--	--	Yes[g,h]

Common Name (Scientific Name)	State Listing Status[a]	USFS Status[b]	Oak Forests and Mesic Hardwood Forests	Wet Pine Savannas and Flatwoods[c]	Upland Longleaf and Loblolly Pine	Pocosin	Forested Swamps and Floodplain Forests	Maritime Forests and Salt Marsh	Grassland and Early Succes-sional Habitats	Rivers and Streams	Documented Occurrence in the Project Vicinity[f] or Historic Record and Potential Occurrence[g,h]
Savannah Yellow-eyed Grass (*Xyris flabelliformis*)	--	SCC	--	X	--	--	--	--	--	--	No
Pineland Yellow-eyed Grass (*Xyris stricta*)	--	SCC	--	X	--	--	--	--	--	--	No

Sources: SCDNR (2015a, 2018a); USFS (n.d.a, 2017); ARCI (2018a,b); Ecological Solutions, Inc. (2017a,b); Gaddy (2017, 2018); Three Oaks Engineering (2017, 2018); Wildlife Investigations, LLC. (2018)

[a] State Listing Status: SE = State Endangered; ST = State Threatened; Species of Concern = No legal protection but tracked by SCDNR Heritage Trust Program

[b] USFS Status: SCC = FMNF Species of Conservation Concern

[c] Wet Pine Savannas and Flatwoods also include Depressional Wetlands and Carolina Bays, which are exclusively inhabited by the Elliot's bluestem, northern burmannia, southeastern sneezeweed, Boykin's lobelia, Piedmont water-milfoil, and crestless plume orchid

[d] Also federally listed as threatened or endangered under the ESA (see Table 3.3-2 above)

[e] American shad, blueback herring, and Hickory shad are not listed by SCDNR (2023), but are tracked as Species of Concern by the SCDNR (2018a) Heritage Trust Program

[f] Documented occurrence within the preliminary ROW for the proposed alternatives, according to species-specific field surveys by ARCI (2018a,b); Buhlmann and Gross (2018), Buhlmann (2019), Ecological Solutions, Inc. (2017a,b); Gaddy (2017, 2018); Three Oaks Engineering (2017, 2018); or Wildlife Investigations, LLC. (2018)

[g] Known occurrence within 1 mile (for plants) of the proposed alternatives, or within Berkeley and Charleston counties (for animals) according to historic records tracked by the SCDNR (2018a) Heritage Trust Program or USFS (2018c)

[h] Known occurrence within the preliminary ROW for the proposed alternatives, according to historic records evaluated by Buhlmann and Gross (2018), Buhlmann (2019), or Gaddy (2017, 2018)

The FMNF SCC and state-listed species potentially occurring in the Project vicinity are discussed in greater detail in the following section. This includes all animals in either special-status category with known occurrences within 5 miles of the proposed alternatives and plants within 1 mile of the proposed alternatives, according to records from the SCDNR (2018a) Heritage Trust Program and USFS (2018c). Thus, the discussion of species below is not comprehensive of all FMNF SCC and state-listed species that could occur within the proposed alternatives but includes only those for which known locations have been documented by state and federal wildlife managers or during targeted surveys.

American Swallow-tailed Kite

The American swallow-tailed kite is a migratory bird that is state-listed as endangered and could potentially occur within the Project area. This species of kite occupies a remnant breeding range of 7 southern states that historically included at least 21 states as far north as Minnesota. It is listed as a high priority species by Partners in Flight. The bird prefers large tracts of forested wetlands such as those found on the FMNF and along the Santee and Cooper rivers (SCDNR 2005c). An estimated 120 to 170 breeding pairs nest annually in South Carolina (SCWF 2017). The decline of the species in the U.S. is attributed to habitat disturbance and degradation including native grassland cultivation, wetland drainage, and logging of forests. Egg collecting and indiscriminate shooting have also contributed to the decline of this species. Primary threats to swallow-tailed kites in South Carolina are wetland loss and drainage. Swallow-tailed kite numbers on the FMNF seem to be stable (USFS 2021b).

The FMNF supports the northern-most concentration of breeding swallow-tailed kites, numbering around 50 pairs (Audubon 2013b). Suitable habitat for the American swallow-tailed kites exists within the Project area. American swallow-tailed kites could use rivers, swamps, marshes, and large rivers during nesting and pre-migration staging. They nest in the larger loblolly pines and cypress trees near or on the borders of forest openings and forested wetlands (SCDNR 2018b). Important features of the kite's habitat include forested areas with tall trees for nesting and open areas for foraging (NatureServe 2023b).

Although the SCDNR (2018b) does not report any known occurrences of American swallow-tailed kites in the Project vicinity, USFS (2018c) reports 3 observations nearby. During targeted surveys for large birds along the Jamestown and Charity alternatives, several swallow-tailed kites were observed . ARCI (2018a) observed single or multiple American swallow-tailed kites on 13 occasions during surveys of the proposed Jamestown Alternative, of which two were a group of three birds and one was a pair. One group of 3, in the vicinity of the intersection of Halfway Creek Road and Shulerville Road, was calling as if defending a nest; however, no nest was discovered. Five observations of swallow-tailed kites were reported along the Charity Alternative; all observations were single individuals, except one pair, foraging over the existing ROW or soaring in its vicinity.

Bachman's Sparrow

The Bachman's sparrow, not to be confused with the federally delisted Bachman's warbler (due to extinction), is a relatively large songbird associated with open pine woodlands. Because of widespread population declines, SCDNR identifies it as a species of concern (SCDNR 2015f; 2018a). Bachman's sparrows benefit from many of the same management practices as the federally listed RCW, such as prescribed fire (USFWS 2003). They nest on the ground, preferring areas where understory shrub encroachment is limited due to poor soils, fire, or other disturbance. Populations of forest birds in Southern forests from 1992–2004 show a decreasing trend in habitat usage by Bachman's sparrow (USFS 2017). It is not clear if the reported decrease fairly represents the FMNF (USFS 2021b). The FMNF has recorded one observation of Bachman's sparrow approximately 4.5 miles from the closest point on the proposed Charity Alternative. Central Electric has not performed species-specific surveys for Bachman's sparrow or other songbirds.

Bald Eagle

The bald eagle was federally delisted under the ESA in 2007. Populations are increasing in the U.S. due to the elimination of pesticide impacts (i.e., DDT) and regulatory protections. However, bald eagles remain listed as threatened by South Carolina and are considered an SCC by the FMNF. Bald eagles are also still protected under the Bald and Golden Eagle Protection Act (BGEPA; 16 USC §§668-668d), which prohibits the take, sale (or offer of sale), purchase, barter, transport, export, or import at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg.

The bald eagle is found near rivers, lakes, and coastlines, where there is an adequate supply of fish for food. In South Carolina, the bald eagle typically nests from October through May. Courtship and nest construction can begin as early as September and continue through February. Eaglets hatch during the winter and fledge as early as late-January and as late as May. The non-nesting season in the southeastern U.S. occurs from June through August (USFWS 2007).

SCDNR monitors bald eagle nests annually, and there are approximately 400 bald eagle nests in South Carolina (SCDNR 2018b). The FMNF has records of several bald eagle nests in the Project vicinity and over 100 observations in its SCC database (USFS 2018c). Most nesting territories are concentrated along the Santee River. Bald eagle numbers on the FMNF seem to be stable (USFS 2021b).

Two bald eagle nests, both active in 2018, are located in the Project vicinity. One is approximately 1.6 miles north of the proposed McClellanville Substation and the other is 2.6 miles west of the substation. One subadult bald eagle was observed during surveys on NFS lands for the proposed Jamestown Alternative, seen from a residential area in Honey Hill (ARCI 2018a). No bald eagles were observed during surveys for large birds along the proposed Charity Alternative (ARCI 2018b).

Barn Owl

The barn owl is a permanent resident in South Carolina. The species is identified as a species of concern by SCDNR because there is limited information available on the distribution or population size of barn owls in South Carolina. The barn owl is generally thought to be declining over much of its extensive range and is a priority in South Carolina due to concerns over the guild of grassland birds as a whole (SCDNR 2015g).

The barn owl prefers to forage in open grassland area and can be found in such disparate habitats as overgrown weedy urban lots, pastureland, fields, and other open, rural landscapes as well as in both fresh and salt water marshes. Barn owls naturally nest in tree cavities, but will also use human structures such as outbuildings, grain silos, duck blinds, and deer stands (SCDNR 2015g). Although not a target species, no barn owls were observed during surveys for large birds along the Jamestown and Charity alternatives (ARCI 2018a,b).

Black-throated Green Warbler

Two forms of the black-throated green warbler occur in South Carolina, both recognized as species of concern by SCDNR. The Wayne's race (or subspecies) is found in the Coastal Plain Ecoregion. Wayne's black-throated green warbler are considered a high priority landbird by Partners in Flight. Wayne's black-throated green warbler prefers stands of deciduous or cypress trees. They remain in areas around the slow-moving headwaters of blackwater creeks and the swamps and swamp borders that feed blackwater rivers and their tributaries. South Carolina colonies sometimes occur in isolated Cypress-Tupelo swamps amid drier pine-hardwoods habitat (SCDNR 2015h). The FMNF has recorded one observation of black-throated green warbler approximately 5 miles from the closest point on the proposed Charity Alternative. Central Electric has not performed species-specific surveys for black-throated green warblers, or other passerines.

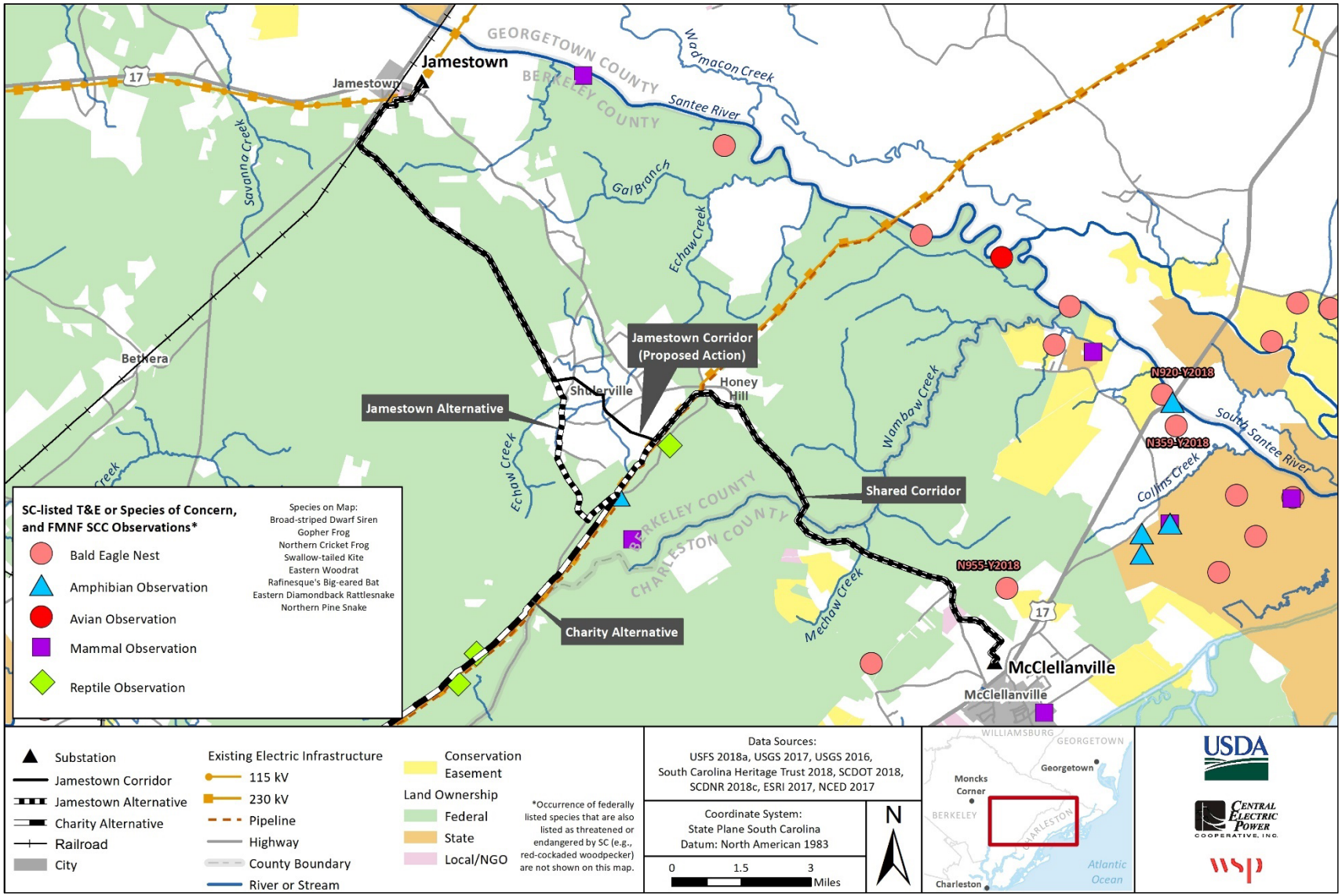


Figure 3.3-5. Occurrences of Wildlife Listed by the South Carolina as Threatened, Endangered, or Species of Concern, or as FMNF SSCC, in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

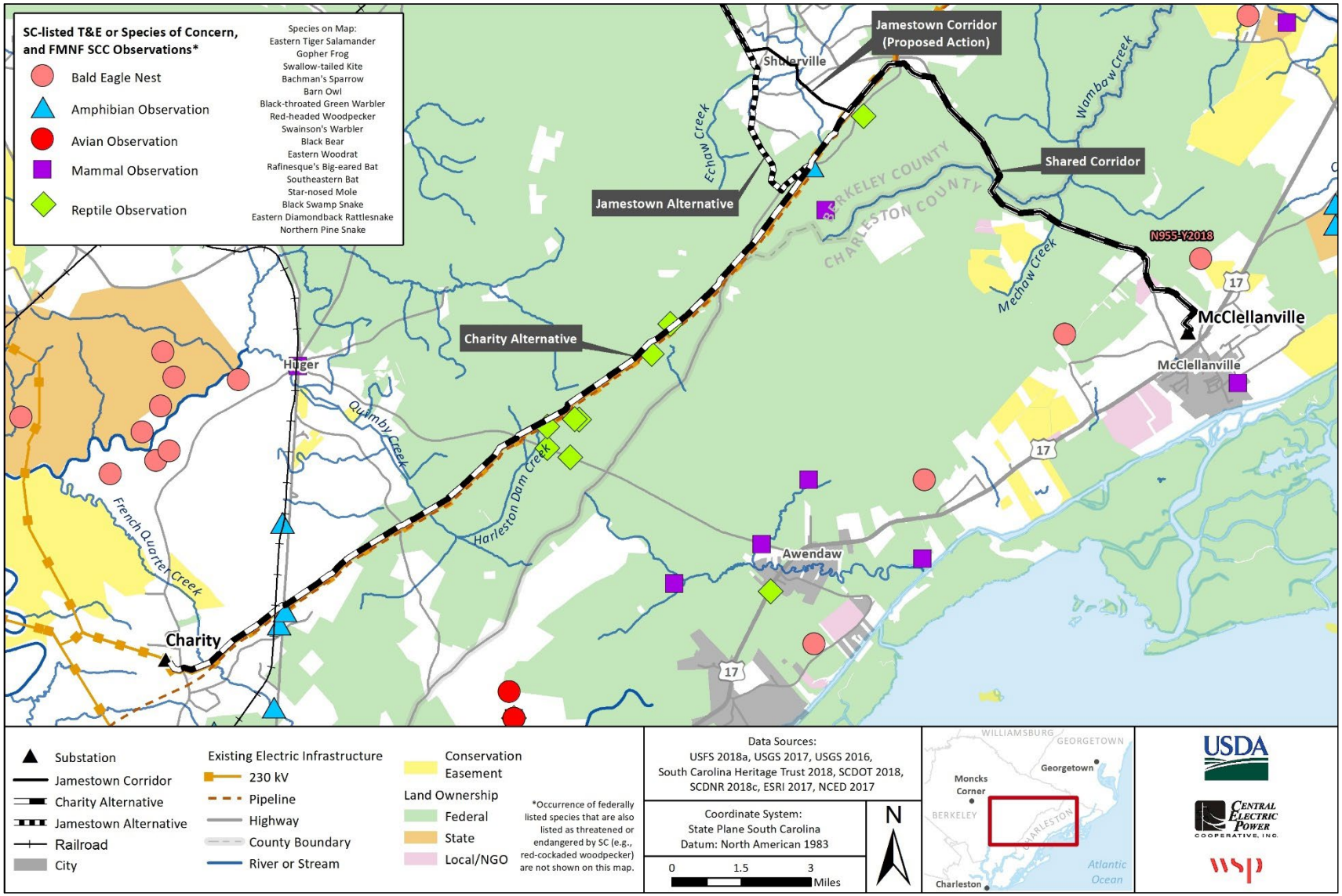


Figure 3.3-6. Occurrences of Wildlife Listed by South Carolina as Threatened or Endangered, or Species of Concern, or as FMNF SCC, in the Vicinity of the Charity Alternative

Red-headed Woodpecker

Red-headed woodpeckers are present year-round in the region. They prefer open, mature forests and woodlands with an abundance of dead trees in which to nest. The species is tracked by the SCDNR Heritage Trust Program as a species of concern and is categorized by SCDNR (2015a) as a state moderate priority species of greatest conservation need (Table 3.3-4). Red-headed woodpeckers are adapted to many forest types, so long as there are available cavities for nesting (SCDNR 2015i). Breeding bird survey data show a significant decline of over 2 percent per year since 1980(Sauer et al. 2017). Central Electric has not performed any species-specific surveys for red-headed woodpeckers, and USFS (2018c) reports one known occurrence approximately 5 miles from the closest point on the proposed Charity Alternative.

Swainson's Warbler

The Swainson's warbler is a small secretive bird that inhabits wet bottomland forests and swamp wetlands in the Coastal Plain region of South Carolina, where they do not typically use inundated areas but forage in wetter areas. They are sensitive to disturbance and are typically not found within narrow or small tracts of intact habitat (SCDNR 2015j). The Swainson's warbler is tracked by the SCDNR Heritage Trust Program as a species of concern and is categorized by SCDNR (2015a) as a high-priority SGCN. A four-decade trend suggests that Swainson's warbler breeding populations in South Carolina appear to be increasing within South Carolina, with a 6.8 percent population change per year from 1966 to 2010 (Sauer et al. 2017). Central Electric has not performed any species-specific surveys for Swainson's warblers but they breed in the FMNF (Audubon 2013b).

Black Bear

Black bears are large omnivores requiring large areas of relatively undeveloped habitat. In coastal South Carolina, bears typically use early successional areas, bottomland hardwood forests or mixed pine-hardwood forests, as well as Carolina bays. Areas used less often include upland hardwood forests and pine plantations (SCDNR 2005d). Any black bears found in the Project vicinity would be part of South Carolina's single coastal population that resides mostly to the north of the Project, in Georgetown and Horry counties. Based on limited population data, this population is estimated at 300 bears, which likely shares some connection to the black bear population in southeastern North Carolina. Human development along major river systems in the area appears to threaten this connection (SCDNR 2018c). Central Electric has not performed any species-specific surveys for black bears, and USFS (2018c) reports two known occurrences in the Project vicinity from the 1970s in the Little Wambaw Swamp Wilderness and I'on Swamp.

Eastern Woodrat

The eastern woodrat is a "packrat" that collects shiny objects to build its large stick nests. The species is categorized by SCDNR as a moderate priority SGCN. In the Coastal Plain, woodrats use floodplain and swamp forests, wet scrub thickets, logged areas, dry and mesic deciduous forests, and hardwood pine forests. Woodrats will use harvested woodlands if piles of woody debris are present but tend not to use timbered areas treated with herbicides within the previous five years. They are often found in, but are not limited to, rock outcrops, boulder fields, and cliffs. Coastal populations of eastern woodrats in South Carolina are impacted by habitat loss and isolation due to development (SCDNR 2005e). Central Electric has not performed any species-specific surveys for eastern woodrats. The FMNF (USFS 2018c) has five known occurrences of the eastern woodrat in the Project vicinity, all within approximately 4 miles of the Proposed Action and other action alternatives.

Meadow Vole

Meadow voles are a wide-ranging species across North America, and the subspecies found in South Carolina is thought to be secure. They are found across the upper Piedmont region of the state, although an isolated population(s) purportedly occurs in Charleston and southern Georgetown counties (SCDNR 2015k). Therefore, the subspecies is tracked by the SCDNR Heritage Trust Program as a species of concern and is categorized by SCDNR (2015a) as a high-priority SGCN. Any occurrences in the Project vicinity are apparently part of an isolated population of meadow voles that are not connected to the species distribution further north (SCDNR 2015k). Meadow voles depend on grassland habitat and prefer areas with dense, tall grass cover. In addition to habitat loss due to agricultural and suburban development, a primary threat to meadow voles is plant community succession as fields and meadows revert to pine or hardwood forest in the absence of wildfire (SCDNR 2015k). Central Electric has not performed any species-specific surveys for meadow voles, and USFS (2018c) reports one known occurrences in the Project vicinity on Cape Romain National Wildlife Refuge.

Rafinesque's Big-eared Bats

The Rafinesque's big-eared bat a colonial cavity roosting bat that has reportedly never been considered abundant. Its status is unknown because the species is extremely difficult to monitor (USFS 2013a). In South Carolina, Rafinesque's big-eared bat are permanent residents of the Coastal Plain and hibernate rather than move south during winter months (SCDNR 2015l). Rafinesque's big-eared bat colonies tend to be relatively small, inhabiting caves and mines, but tend to be smaller in the southern portions of the range where caves and mines are less abundant. Manmade structures such as abandoned buildings and bridges can be extremely important for species in this group (SCDNR 2005f). On the FMNF, this species has been observed under USFS bridges (USFS 2017). All four sightings occurred more than 15 years ago with no observations since then. This large bat has primarily been observed roosting and foraging in riparian areas, but it has also been seen foraging in the adjacent pine uplands. Although the SCDNR (2018a, 2024b) Heritage Trust Program does not report any known occurrences of Rafinesque's big-eared bats in the vicinity of the proposed alternatives, USFS (2018c) reports six observations in the Project vicinity since 1988, located on the Santee Coastal Reserve, Washo Reserve, Hampton Plantation, Wee Tee State Forest and Lake, and near Huger. No Rafinesque's big-eared bats were captured during mist net surveys of the proposed alternatives on NFS lands (Ecological Solutions, Inc. 2017a; Ecological Engineering, LLP 2018a).

Southeastern Bat

The southeastern bat inhabits bottomland hardwood forests where they share similar foraging habitats and structural resources for roosting, sometimes day and night-roosting communally with Rafinesque's big eared bats within the same structures, especially bridges and large-diameter hollow trees (Bat Conservation International and Southeastern Bat Diversity Network 2013). One subspecies occurs in South Carolina, and the southeastern bat is critically imperiled in the state (S1); it is also tracked by the SCDNR Heritage Trust Program as a species of concern and is designated an SCC by the FMNF, and it is categorized by SCDNR (2015a) as a highest priority SGCN. Southeastern bats prefer to roost over or near water, using forested swamps, Carolina bays, and mesic deciduous and mixed forests. The status of the species in South Carolina is unknown (SCDNR 2005f). One southeastern bat was captured during mist net surveys of the proposed Jamestown Alternative (Ecological Solutions, Inc. 2017a), and none were captured along the other proposed alternatives on NFS lands (Ecological Engineering, LLP 2018a).

Star-nosed Mole

The star-nosed mole is found in a variety of habitats with moist soils, where they dig networks of tunnels that sometimes even lead into water. They are found statewide in South Carolina, but in the Coastal Plain

their preferred habitats include pocosins, wetlands, saturated bottomland forests, and upland longleaf and loblolly pine forests, rarely more than 400 feet from water. Neither forest age nor successional stage has been reported as a critical factor determining habitat suitability for the star-nosed mole (SCDNR 2015m). The species is tracked by the SCDNR Heritage Trust Program as a species of concern and is categorized by SCDNR (2015a) as a high-priority SGCN. USFS (n.d.a) reports one known occurrence of star-nosed mole in the Project vicinity approximately 5 miles from the Charity Alternative in the upper Wando River watershed in Charleston County.

Southern Fox Squirrel

The southern fox squirrel is the only fox squirrel native to South Carolina, found across most of the state but common in the Coastal Plain. The FMNF did not categorize the fox squirrel as an SCC but it is tracked by the SCDNR Heritage Trust Program as a species of concern due to the lack of information on distribution, abundance, and ecology. Southern fox squirrels select more pine-dominated habitats compared to the deciduous habitats selected by other subspecies of fox squirrel, using fire-maintained upland pine woodlands, Oak Forests and Mesic Hardwood Forests, and bottomland forested habitats. They utilize tree cavities, as well as leaf nests, and the absence of suitable cavity trees may be a critical factor to their survival. Forest management practices that reduce dense understory vegetation and promote retention of mature mast-producing hardwoods are beneficial to fox squirrels (SCDNR 2015n). USFS (2018a,b) reports two observations of southern fox squirrel in the Project vicinity more than 13 miles from the Jamestown and Charity alternatives: one near the coast on Bull Island in Charleston County and another approximately 40 miles inland in Georgetown County.

Broad-striped Dwarf Siren

The broad-striped dwarf siren is an entirely aquatic, eel-like salamander that retains larval characteristics into adulthood. They are found within stagnant wetlands with mud bottoms and little to no flow that are free of predatory fish such as bass, pickerel, or sunfish (SCDNR 2015c). Broad-striped dwarf sirens are considered secure throughout their range but have begun to decline in South Carolina. The FMNF reported one occurrence from 2016 (USFS 2017). Although not confirmed, the dwarf siren could occur within the project corridors because suitable habitat is available. No dwarf sirens were detected during a herpetological habitat survey on NFS lands for the proposed Jamestown Alternative during winter and spring 2018, which included dipnetting within suitable wetland habitats (Buhlmann and Gross 2018). Additionally, Buhlmann (2019) found no broad-striped dwarf siren during a herpetological habitat survey on NFS lands for the Charity Alternative, but suitable habitat occurs in Wet Pine Savannas and Flatwoods, and depressional wetlands and Carolina bays.

Eastern Tiger Salamander

The eastern tiger salamander is the largest terrestrial salamander in the eastern U.S.. Little is known about the population biology of this species in South Carolina; hence, the species is tracked by the SCDNR Heritage Trust Program as a species of concern and categorized by SCDNR as a highest-priority SGCN. As with the broad-striped dwarf siren, Carolina gopher frog, and northern cricket frog, tiger salamanders typically breed or live in isolated, temporary freshwater wetlands that are referred to as breeding ponds. Outside of the breeding season, metamorphosed adults inhabit crayfish holes, root channels, rodent burrows, and other subterranean structures and only return to ponds to breed (SCDNR 2015c). USFS (n.d.a) reports two observations of eastern tiger salamander in the Project vicinity, one located approximately 0.2 miles from where the Jamestown Alternative would cross SC Highway 41 and the other located two miles further south near French Quarter Creek. No tiger salamanders were detected from surveys of the proposed Jamestown Alternative during winter and spring 2018 but observed suitable breeding habitat (Buhlmann and Gross 2018). Buhlmann (2019) found no tiger salamanders during a herpetological habitat survey on

NFS lands for the Charity Alternative. However, they documented wetlands that could be used as breeding sites for tiger salamanders in the northern section of the Charity Alternative, consisting of deep sinkhole ponds.

Carolina Gopher Frog

The Carolina gopher frog is a medium-sized frog that closely resembles a toad, and similarly spends most of its life in terrestrial habitats, but underground in holes (burrows) created by crayfish and small mammals such as the southeastern pocket gopher and other burrowing rodents, or stump holes and root tunnels (USFS 2013a). The Carolina gopher frog is listed as endangered by the state of South Carolina, categorized by SCDNR as a highest-priority SGCN, and classified as an SCC by the FMNF. Carolina gopher frogs generally emerge during night to feed. They breed after late winter or early spring rains, between February and April, and travel up to a mile to find an isolated ephemeral pond or other wetlands site. After they mate, females will deposit large egg masses of up to 2,000 eggs underwater, and tadpoles will develop into adults after four to seven months. Newly metamorphosed individuals move away from breeding wetlands into the surrounding uplands and only return to these wetlands to breed.

The Carolina gopher frog was documented from 13 isolated wetlands on the FMNF in 1997. Since 2006, the species has been observed acoustically or visually from 8 isolated wetlands on the FMNF, including a previously undocumented breeding wetland along Halfway Creek Rd that was discovered during 2013 (USFS 2013a). A breeding event was documented most recently on the FMNF in 2017, but some years have been hampered by the lack of rain events in late winter to early spring. The FMNF initiated a head-starting program in 2019 with frogs hatched at Bears Bluff Fish Hatchery to release Carolina gopher frogs back onto the FMNF in future years (USFS 2021b).

There are two known Carolina gopher frog occurrences in the vicinity of the Jamestown Alternative, off Halfway Creek Road. Surveys by Buhlmann and Gross (2018) attempted to confirm the continued presence at those sites, but the wetlands failed to fill with water during the breeding season, and gopher frogs do not migrate to those ponds if there is insufficient rainfall. Buhlmann (2019) did not observe any Carolina gopher frogs during surveys of NFS lands for the Charity Alternative , which were conducted when the frogs are expected to breed during February to early April. None were heard calling during visits to likely and historic sites along the ROW, and none were heard after analysis of the automated recordings. Buhlmann (2019) did observe a potential gopher frog burrow within the proposed corridor for the Charity Alternative, near Steeds Creek Road, but could not confirm its occupancy. Other researchers in the region also detected very few gopher frog breeding occurrences in 2019, and none were detected by other researchers on the FMNF; however, gopher frogs remain the most likely rare species to be found near the ROWs.

Northern Cricket Frog

Northern cricket frogs are relatively common in the Piedmont and Southern Appalachians of the Carolinas where they live on the shores of streams, rivers, and marshes. They are active nearly year-round and call during mating and when temperatures exceed 80 degrees Fahrenheit (°F). Populations of the northern cricket frog in the Coastal Plain Ecoregion are known to exist near Charleston. The species is common to relatively abundant throughout South Carolina (SCDNR 2015c). One occurrence record shows the northern cricket frog is known to exist along the South Santee River along U.S. Highway 17. It is possible, however, that this record is a misidentification of a southern cricket frog (*Acris gryllus*), which is more common and typically found at higher elevations in the Piedmont Ecoregion in South Carolina. Buhlmann and Gross (2018) reported no known occurrences of northern cricket frog along the proposed Jamestown Alternative and did not find the species during a herpetological habitat survey of the corridor. They reported 12 records of southern cricket frogs during surveys on NFS lands for the proposed Jamestown Alternative. Buhlmann

(2019) reported southern cricket frogs to occur throughout the Charity Alternative but did not find any northern cricket frogs.

Eastern Diamondback Rattlesnake

The eastern diamondback rattlesnake is the largest venomous snake in the U.S.. The species is not listed by the FMNF as an SCC but is tracked by the SCDNR Heritage Trust Program as a species of concern and categorized as a high-priority SGCN. Eastern diamondback rattlesnakes are most commonly associated with mesic longleaf communities, including longleaf pine flatwoods. They use underground shelters, such as stump holes, rodent burrows, root channels and gopher tortoise burrows, especially during the colder months. The conservation or restoration of longleaf pine woodlands, which provide open canopies with abundant stump holes, is beneficial to diamondback rattlesnakes (SCDNR 2015o). USFS (2017) reported 12 diamondback rattlesnake observations from 2016. No occurrences were reported from a herpetological habitat survey on NFS lands for the proposed Jamestown Alternative (Buhlmann and Gross 2018), or Charity Alternative (Buhlmann 2019).

Florida Green Watersnake

The Florida green watersnake is a large to moderately sized snake that was considered a subspecies of the green watersnake (*Nerodia cyclopion*) until recently when it was classified as a separate species. The species is found within wetlands such as Carolina bays, lakes, and old flooded rice fields. Sites where the Florida green watersnake has been reported typically have open water with little or no canopy of trees and an abundance of aquatic plants like lily pads (*Nymphaeaceae*), lotus or water shield (*Brasenia schreberi*) (SCDNR 2015p). USFS (2018c) reports no known occurrences of Florida green watersnake in the Project vicinity, and no observations of the species were reported from herpetological habitat surveys on NFS lands for the proposed Jamestown Alternative (Buhlmann and Gross 2018) or Charity Alternative (Buhlmann 2019).

Northern Pine Snake

The northern pine snake (SCDNR 2015o) is a large non-venomous snake that prefers the relatively open canopy and xeric conditions found in upland longleaf and loblolly pine woodlands. The northern pine snake is tracked by the SCDNR Heritage Trust Program as a species of concern and is considered a highest priority SGCN, but the FMNF does not categorize it as an SCC. USFS (2017) reports one known occurrence of northern pine snake approximately 750 feet from the shared corridor for the Proposed Action and other action alternatives, in proximity to the intersection of Halfway Creek Road and Shadowmoss Lane. Buhlmann and Gross (2018) reported one known occurrence of northern pine snake along the proposed Jamestown Alternative, but did not detect any individuals beneath coverboards targeting the species at one site within suitable upland pine savanna habitat. Buhlmann and Gross (2018) reported one additional recent record of northern pine snakes observed by other researchers, within well-drained upland longleaf pine savanna along Halfway Creek Road but did not detect any individuals via coverboard surveys. Buhlmann (2019) reported one relatively recent northern pine snake record (2002) near the proposed Charity Alternative but detected no individuals during a herpetological habitat survey on NFS lands.

Southern Hognose Snake

The southern hognose snake is less common and smaller than the related eastern hognose snake. The species is associated with upland pine and pine flatwoods ecosystems, typically drier than those inhabited by eastern diamondback rattlesnake (SCDNR 2015o). Southern hognose snakes are considered a highest priority SGCN by the SCDNR and is listed as threatened by South Carolina. The FMNF also lists it as an SCC. USFS (2017) reported seven southern hognose snake observations by the Amphibian and Reptile Conservancy in 2016 at unspecified locations. There are no known occurrences of southern hognose snake

along the proposed Jamestown Alternative and Buhlmann and Gross (2018) did not find any southern hognose snakes beneath coverboards targeting the species at one site within suitable upland pine savanna habitat. Likewise, Buhlmann (2019) detected no southern hognose snakes during coverboard surveys of suitable habitat along the proposed Charity Alternative.

Spotted Turtle

The spotted turtle is listed as threatened by South Carolina and is designated an SCC by the FMNF. It was petitioned for listing under the ESA in 2015, with the Center for Biological Diversity (2012) petition indicating that the pet trade, habitat destruction and fragmentation, predation, road mortality, and inadequate protections are threats that will be further evaluated as part of a current status review by USFWS (80 FR 37568). Spotted turtles lay eggs in well-drained soil of marshy pastures, in grass or sedge tussock or mossy hummocks, in open areas (e.g., dirt path or road) at the edge of thick vegetation, or similar sites exposed to sun. Sandy, sparsely vegetated strips and washouts along agricultural field edges are favorable for nesting. According to NatureServe (2023c), in South Carolina, gravid females spent a considerable amount of time on or at the edge of a power line ROW, and they nested on the edge of the power line and in relatively recent clearcuts. USFS (2017) reported four spotted turtle observations by the Amphibian and Reptile Conservancy in 2016 at unspecified locations in forested swamp wetland habitats, as well as multiple other sightings by USFS personnel. The SCDNR Heritage Trust Program currently ranks this species as a moderate-priority SGCN and as secure in both South Carolina (S5) and globally (G5), but its state-listing as threatened is based on the growing popularity and price of the spotted turtle in the pet trade and the fact that most of South Carolina's neighboring states already protect this species (SCDNR 2015q). Buhlmann and Gross (2018) reported one known occurrence of spotted turtle documented by other researchers along the proposed Jamestown Alternative. Buhlmann (2019) identified suitable swamp forest habitat for spotted turtle along the Charity Alternative but found no individuals during a herpetological habitat survey on NFS lands.

Fish

The Carolina pygmy sunfish is a small freshwater fish for which only a few populations have been identified in South Carolina. It is listed as threatened by the state of South Carolina and is a federal species of concern. It is reported from the Santee River drainage, but no records are known for the lower Santee River, according to the SCDNR geographic database. The nearest known population to the Project area is found in remnant rice field ditches near Georgetown. No records for the species are known for the lower Santee River, although it is suspected that additional survey efforts in the Santee River Basin will likely lead to the discovery of additional populations (SCDNR 2015r). No occurrences of the species were detected by electrofishing surveys of waterbodies crossed by the proposed Jamestown and Charity alternatives (Three Oaks Engineering 2017, 2018).

American eels are classified as SCC by the FMNF and categorized by SCDNR (2015a) as a highest priority SGCN (SCDNR 2015s). Following two separate petitions to list the American eel under the ESA, USFWS reviewed the status of the species in 2007 (72 FR 4967) and 2015 (80 FR 60834) and found both times that protection under the ESA was not warranted (80 FR 60834). American eels were detected by electrofishing surveys of several waterbodies crossed by the proposed Jamestown and Charity alternatives. Eels were captured in 6 waterbodies during surveys for the Jamestown Alternative: (1) an unnamed tributary to Echaw Creek; (2) Wambaw Creek; (3) Mechaw Creek; (4) an unnamed tributary to Mill Branch; (5) another unnamed tributary to Mill Branch; and (6) an unnamed tributary to Jeremy Creek (Three Oaks Engineering 2017). Two eels were captured at only 1 of 12 waterbodies sampled for the proposed Charity Alternative, in Quinby Creek (Three Oaks Engineering 2018).

Insects

Four insects are listed by the FMNF as SCC: the dusky roadside skipper (*Amblyscirtes alternata*), monarch butterfly (*Danaus plexippus*), Berry's skipper (*Euphyes berryi*), and Okefenokee zale moth (*Zale perculta*). Central Electric conducted an assessment of the potential presence of host plants for these species on NFS lands within the proposed corridor for the Jamestown Alternative (Ecological Solutions, Inc. 2017b) and Charity Alternative (Ecological Engineering, LLP 2018b). Searches for host plants and associated lepidopteran included broadleaf beardgrass (*Gymnopogon ambiguus*) for dusky roadside-skipper, milkweeds (*Asclepias* spp.) for monarch butterfly, pickerelweed (*Pontederia cordata*) for Berry's skipper, and climbing fetterbush for Okefenokee zale moth.

USFS (2017) reported one documented occurrence of dusky roadside skipper on the FMNF. The dusky roadside-skipper was documented during the annual FMNF butterfly count in 2000, 2003, and 2014 (FMNF, unpub. data in Ecological Solutions, Inc. 2017b). This butterfly is thought to produce two broods from March to August. The larval host plant is the broadleaf beardgrass and possibly other grasses. Broadleaf beardgrass occurs in acidic, sandy soils within dry and open, pine, oak, or pine/oak forest, sandy savannas, sandhill communities within longleaf pine, rocky prairies or barrens, and floodplains (NatureServe 2023d). Ecological Solutions, Inc. (2017b) reported no observations of adults, larvae or instar stages of the dusky roadside-skipper or host plant broadleaf beardgrass within the proposed corridor for the Jamestown Alternative. Likewise, Ecological Engineering, LLP (2018b) reported no occurrences of dusky roadside-skipper along the proposed Charity Alternative. However, large populations of broadleaf beardgrass were found primarily in fire-maintained upland pine stands at 9 of 16 survey areas, although no plants showed obvious evidence of insect damage.

The monarch butterfly relies on milkweed as a food plant for its larvae, which is commonly found along roadsides, forest edges, and wetlands, and grows in a variety of habitats from dry sandy areas to wet and marshy areas, as well as in sunny open areas to more shaded forested area. The North American Butterfly Association documented 38 monarch butterflies on the FMNF in 2015, and the Carolina Butterfly Society documented 41 monarchs in 2005, 19 in 2007 and 2011, 20 in 2010, and 5 in 2015 (USFS 2017). Ecological Solutions, Inc. (2017b) reported numerous milkweed plants throughout the proposed Jamestown Alternative, as well as one adult monarch butterfly. Within the proposed corridor for the Charity Alternative, no adult or larval monarch butterflies were observed during field surveys by Ecological Engineering, LLP (2018b). Numerous populations of five milkweed species were observed in various habitats at half (8 of 16) the survey areas: *Asclepias perennis*, *A. tuberosa*, *A. lanceolata*, *A. amplexicaulis*, and *A. humistrata.*

The Berry's skipper is typically found in coastal plain habitats that consist of wet areas such as, marshes, wet savannas, depressions, savannas with pitcher plants, and areas associated with ponds and swamps. A Berry's skipper was documented during the annual FMNF Butterfly Count in 2008 (FMNF, unpub. data in Ecological Solutions, Inc. 2017b). Although the adults are known to take nectar from pickerelweed, an emergent aquatic plant usually found in areas associated with shallow water, the host plant for the larvae is unknown. Pickerelweed is usually found in permanent, shallow, and quiet water. Surveys by Ecological Solutions, Inc. (2017b) reported two adult Berry's skippers within the proposed corridor for the Jamestown Alternative, foraging on pickerelweed within a wet ditch adjacent to a forest of swamp tupelo and bald cypress. Pickerelweed were observed in many locations of the Jamestown Alternative. Within the proposed corridor for the Charity Alternative, no adult or larval Berry's skipper were observed during field surveys by Ecological Engineering, LLP (2018b). Numerous specimens of pickerelweed were observed in open and forested wet habitats at 5 of 16 survey areas.

The host plant for Okefenokee zale moth, climbing fetterbush, is found in forested wetlands such as pond cypress swamps on the bark of pond cypress trees. Habitat and populations for climbing fetterbush are thought to be stable on the FMNF (USFS 2017). USFS (2017) reported occurrences of the Okefenokee zale moth approximately 0.75 miles apart from two locations in bald cypress swamps. USFS (2018c) reports three other known occurrences that are within 1 mile of the shared corridor for the Proposed Action and other action alternatives, 1.5 miles northwest of the proposed McClellanville Substation; the nearest known population is approximately 950 feet away.

Floristic surveys of the proposed Jamestown and Charity alternatives reported finding no occurrences of climbing fetterbrush or Okefenokee zale moth but found suitable habitat in many places (Ecological Solutions, Inc. 2017b; Gaddy 2017, 2018).

Plants

There are 56 plant species designated as SCC on the FMNF, excluding the three federally listed species discussed above under "Federally Listed Threatened and Endangered Species." Thirteen of these plant SCC have known occurrences in the Project vicinity, determined by locations tracked by SCDNR (2018a) Heritage Trust Program and USFS (2018c) within 1 mile of the proposed alternative corridors (Table 3.3-3). This includes: (1) Coastal Plain false-foxglove (*Agalinis aphylla*), (2) Elliott's bluestem (*Andropogon gyrans* var. *stenophyllus*), (3) yellow fringeless orchid (*Platanthera integra*), (4) pineland plantain (*Plantago sparsiflora*), (5) shadow-witch orchid (*Ponthieva racemose*), (6) crestless plume orchid (*Pteroglossapsis ecristata*), (7) short-bristle baldrush (*Rhynchospora breviseta*), (8) Harper beakrush (*Rhynchospora harperi*), (9) Few-flowered beakrush (*Rhynchospora oligantha*), (10) brown beakrush (*Rhynchospora pleiantha*), (11) long-beaked beaksedge (*Rhynchospora scirpoides*), (12) short-leaved yellow-eyed grass (*Xyris brevifoli*), and (13) Florida yellow-eyed grass (*Xyris difformis* var. *floridana*). In addition, a floristic inventory was conducted on NFS lands within the proposed corridor for the Jamestown and Charity alternatives (Gaddy 2017, 2018).

According to Gaddy (2017), there are known occurrences of nine FMNF SCC within the Project area, including purple silkyscale (*Anthenantia rufa*), crestless plume orchid, brown beakrush, Coastal Plain false-foxglove, Elliott's bluestem, northern burmianna (*Burmannia biflora*), southeastern sneezeweed (*Helenium pinnatifidum*), long-beaked beaksedge, and Florida yellow-eyed grass. Gaddy (2017) also reported that the 600-foot-wide corridors would include records of 10 state-listed or tracked vascular rare plant species, including: pondspice (*Litsea aestivalis*), climbing fetterbush (*Pieris phyllireifolia*), awned meadowbeauty (*Rhexia aristosa*), sun-facing coneflower (*Rudbeckia heliopsidis*), blue maidencane (*Amphicarpum muhlenbergianum*), slender gayfeather (*Liatris gracilis*), longstem adder's-tongue fern (*Ophioglossum petiolatum*), horned beaksedge (*Rhynchospora careyana*), drowned hornwort (*Rhynchospora inundata*), and Tracy's beaksedge (*Rhynchospora traceyi*). During a floristic inventory for the proposed Jamestown Alternative, Gaddy (2018) observed one FMNF SCC (Elliott's bluestem) and two tracked species (pondspice and southeastern tickseed [*Coreopsis gladiate*]).

According to Gaddy (2018), there are known occurrences of 10 FMNF SCC within the 600-foot-wide corridor for the Charity Alternative, including Elliot's bluestem, northern burmianna (*Burmannia biflora*), many-flowered grass pink (*Calopogon multiflorus*), southeastern sneezeweed, lanceleaf loosestrife (*Lysimachia hybrida*), shadow-witch orchid, crestless plume orchid, Harper's beakrush, and brown beakrush. Gaddy (2018) also reported that the 600-foot-wide corridors would include records of 12 state-listed or tracked vascular rare plant species, including Coastal Plain false-foxglove, blue maidencane, southeastern tickseed pine lily (*Lilium catesbaei*), pondspice, spoon flower, (*Peltandra sagittifolia*), climbing fetterbush, awned meadowbeauty, sweet pitcher plant (*Sarracenia rubra*), Carolina fluff grass (*Tridens carolinianus*), and Elliott's yellow-eyed grass (*Xyris elliottii*). During an inventory of the proposed

Charity Alternative, Gaddy (2017) observed no FMNF SCC and three tracked species (pondspice, southeastern tickseed, and blue maidencane).

3.3.1.5 State Priority Species

Table 3.3-4 below provides a list of 173 vertebrate species that are listed by SCDNR (2005a, 2015a) as priority species in the Coastal Plain Ecoregion. Each species is categorized into one of three groups based on their conservation need: Highest, High and Moderate Priority. Plants are not categorized due to the large number of species and the limited knowledge for those species. This list of SGCN includes 99 birds; 15 mammals, including 9 bats; 9 amphibians; 21 reptiles; and 28 fish (SCDNR 2015a).

Table 3.3-4. South Carolina's Priority Animal Species (or SGCN) in the Coastal Plain Ecoregion

Common Name	Scientific Name	Highest Priority	High Priority	Moderate Priority
Birds				
Acadian Flycatcher	*Empidonax virescens*		X	
American Avocet	*Recurvirostra americana*		X	
American Bittern	*Botaurus lentiginosus*	X		
American Black Duck	*Anas rubripes*	X		
American Coot	*Fulica americana*			X
American Golden Plover	*Pluvialis dominica*	X		
American Kestrel	*Falco sparverius*	X		
American Woodcock	*Scolopax minor*			X
Anhinga	*Anhinga*			X
Bachman's Sparrow	*Peucaea aestivalis*	X		
Bald Eagle	*Haliaeetus leucocephalus*		X	
Barn Owl	*Tyto alba*			X
Belted Kingfisher	*Ceryle alcyon*			
Black-and-white Warbler	*Mniotilta varia*		X	
Black-crowned Night Heron	*Nycticorax*		X	
Black-throated Green Warbler	*Setophaga virens*	X		
Blue Grosbeak	*Passerina caerulea*			X
Blue-winged Teal	*Anas discors*			X
Broad-winged Hawk	*Buteo platypterus*			X
Brown Thrasher	*Toxostoma rufum*		X	
Brown-headed Nuthatch	*Sitta pusilla*			X
Buff-breasted Sandpiper	*Tryngites subruficollis*	X		
Carolina Chickadee	*Poecile carolinensis*			X
Carolina Wren	*Thryothorus ludovicianus*			X
Chimney Swift	*Chaetura pelagica*		X	

Common Name	Scientific Name	Highest Priority	High Priority	Moderate Priority
Chuck-will's-widow	*Caprimulgus carolinensis*		X	
Common Gallinule	*Gallinula galeata*			X
Common Ground-Dove	*Columbina passerina*	X		
Dark-eyed Junco	*Junco hyemalis*			X
Dickcissel	*Spiza americana*			X
Downy Woodpecker	*Picoides pubescens*			X
Eastern Kingbird	*Tyrannus*		X	
Eastern Meadowlark	*Sturnella magna*		X	
Eastern Towhee	*Pipilo erythrophthalmus*		X	
Eastern Wood-Pewee	*Contopus virens*		X	
Field Sparrow	*Spizella pusilla*			
Glossy Ibis	*Plegadis falcinellus*			X
Golden-crowned Kinglet	*Regulus satrapa*			X
Grasshopper Sparrow	*Ammodramus savannarum*	X		
Great Blue Heron	*Ardea herodias*			X
Great Egret	*Ardea alba*		X	
Green Heron	*Butorides virescens*	X		
Henslow’s Sparrow	*Ammodramus henslowii*	X		
Hooded Warbler	*Wilsonia citrina*			X
Horned Grebe	*Podiceps auritus*	X		
Indigo Bunting	*Passerina cyanea*			X
Kentucky Warbler	*Oporornis formosus*	X		
King Rail	*Rallus elegans*	X		
Least Bittern	*Ixobrychus exilis*	X		
Least Sandpiper	*Calidris minutilla*		X	
Little Blue Heron	*Egretta caerulea*	X		
Loggerhead Shrike	*Lanius ludovicianus*	X		
Long-billed Dowitcher	*Limnodromus scolopaceus*			X
Louisiana Waterthrush	*Parkesia motacilla*		X	
Mallard	*Anas platyrhynchos*	X		
Mottled Duck	*Anas fulvigula*			X
Northern Bobwhite	*Colinus virginianus*	X		
Northern Parula	*Parula americana*			X
Northern Pintail	*Anas acuta*	X		
Orchard Oriole	*Icterus spurius*			X

Common Name	Scientific Name	Highest Priority	High Priority	Moderate Priority
Painted Bunting	*Passerina ciris*	X		
Pectoral Sandpiper	*Calidris melanotos*			X
Pied-billed Grebe	*Podilymbus podiceps*	X		
Pileated Woodpecker	*Dryocopus pileatus*			X
Pine Warbler	*Dendroica pinus*			X
Prairie Warbler	*Dendroica discolor*		X	
Prothonotary Warbler	*Protonotaria citrea*			X
Purple Gallinule	*Porphyrio martinica*	X		
Purple Martin	*Progne subis*		X	
Red-bellied Woodpecker	*Melanerpes carolinus*			X
Red-cockaded Woodpecker	*Picoides borealis*	X		
Red-headed Woodpecker	*Melanerpes erythrocephalus*			X
Red-shouldered Hawk	*Buteo lineatus*			X
Ring-necked Duck	*Aythya collaris*			X
Roseate Spoonbill	*Platalea ajaja*			X
Rusty Blackbird	*Euphagus carolinus*	X		
Sedge Wren	*Cistothorus platensis*	X		
Snowy Egret	*Egretta thula*			X
Sora	*Porzana carolina*		X	
Spotted Sandpiper	*Actitis macularia*			X
Stilt Sandpiper	*Calidris himantopus*		X	
Summer Tanager	*Piranga rubra*			X
Swainson's Warbler	*Limnothlypis swainsonii*		X	
Swallow-tailed Kite	*Elanoides forficatus*	X		
Tricolored Heron	*Egretta tricolor*		X	
Upland Sandpiper	*Bartramia longicauda*	X		
Whip-poor-will	*Caprimulgus vociferus*		X	
White Ibis	*Eudocimus albus*	X		
White-eyed Vireo	*Vireo griseus*			X
White-rumped Sandpiper	*Calidris fuscicollis*			X
Wilson's Snipe	*Gallinago gallinagodelicata*		X	
Wood Duck	*Aix sponsa*		X	
Wood Stork	*Mycteria americana*	X		
Wood Thrush	*Hylocichla mustelina*		X	
Yellow-billed Cuckoo	*Coccyzus americanus*		X	

Common Name	Scientific Name	Highest Priority	High Priority	Moderate Priority
Yellow-breasted Chat	*Icteria virens*		X	
Yellow-crowned Night Heron	*Nyctanassa violacea*	X		
Yellow-throated Vireo	*Vireo flavifrons*			X
Yellow-throated Warbler	*Setophaga dominica*			X
Mammals				
Big Brown Bat	*Eptesicus fuscus*	X		
Black Bear	*Ursus americanus*			X
Eastern Woodrat	*Neotoma floridana*			X
Hoary Bat	*Lasiurus cinereus*	X		
Meadow Vole	*Microtus pennsylvanicus*		X	
Mink	*Mustela vison*		X	
Northern Yellow Bat	*Lasiurus intermedius*	X		
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*	X		
Red Bat	*Lasiurus borealis*	X		
Seminole Bat	*Lasiurus seminolus*	X		
Silver-haired Bat	*Lasionycteris noctivagans*	X		
Southeastern Bat	*Myotis austroiparius*	X		
Southern Fox Squirrel	*Sciurus niger*			X
Star-nosed Mole	*Condylura cristata*		X	
Tri-colored Bat	*Perimyotis subflavus*	X		
Amphibians				
Bird-voiced Treefrog	*Hyla avivoca*			X
Chamberlain's Dwarf Salamander	*Eurycea chamberlainii*	X		
Flatwoods Salamander (Frosted)	*Ambystoma cingulatum*	X		
Carolina Gopher Frog	*Rana capito*	X		
Mud Salamander (Gulf Coast)	*Pseudotriton montanus flavissimus*		X	
Northern Cricket Frog	*Acris crepitans*			X
Pickerel Frog	*Rana palustris*		X	
Tiger Salamander	*Ambystoma tigrinum*	X		
Upland Chorus Frog	*Pseudacris feriarum*			X
Reptiles				
American Alligator	*Alligator mississippiensis*			X
Black Swamp Snake	*Seminatrix pygaea*		X	
Broad-striped Dwarf Siren	*Pseudobranchus striatus*	X		
Chicken Turtle	*Deirochelys recticularia*			X

Common Name	Scientific Name	Highest Priority	High Priority	Moderate Priority
Coral Snake (Harlequin)	*Micrurus fulvius*	X		
Eastern Box Turtle	*Terrapene carolina*			X
Eastern Diamondback Rattlesnake	*Crotalus adamanteus*		X	
Florida Cooter	*Pseudemys floridana*			X
Florida Green Watersnake	*Nerodia floridana*	X		
Gopher Tortoise	*Gopherus polyphemus*	X		
Island Glass Lizard	*Ophisaurus compressus*	X		
Northern Pine Snake	*Pituophis melanoleucus*	X		
Pine Woods Snake	*Rhadinaea flavilata*		X	
River Cooter	*Pseudemys concinna*			X
Slender Glass Lizard	*Ophisaurus attenuatus*			X
Snapping Turtle (Common)	*Chelydra serpentina*			X
Southern Hognose Snake	*Heterodon simus*	X		
Spotted Turtle	*Clemmys guttata*		X	
Striped Mud Turtle	*Kinosternon baurii*			X
Timber Rattlesnake	*Crotalus horridus*		X	
Yellow-bellied Slider	*Trachemys scripta*		X	
Fish				
Shortnose Sturgeon	*Acipenser brevirostrum*	X		
Atlantic Sturgeon	*Acipenser oxyrinchus*	X		
Blueback Herring	*Alosa aestivalis*	X		
Hickory Shad	*Alosa mediocris*	X		
American Shad	*Alosa sapidissima*	X		
Snail Bullhead	*Ameiurus brunneus*			X
American Eel	*Anguilla rostrata*	X		
White Catfish	*Ameiurus catus*			X
Flat Bullhead	*Ameiurus platycephalus*			X
Swampfish	*Chologaster cornuta*			X
Satinfin Shiner	*Cyprinella analostana*			X
Fieryblack Shiner	*Cyprinella pyrrhomelas*			X
"Thinlip" Chub	*Cyprinella sp. (c.f. zanema)*	X		
Carolina Pygmy Sunfish	*Elassoma boehlkei*	X		
Everglades Pygmy Sunfish	*Elassoma evergladei*			X
Bluebarred Pygmy Sunfish	*Elassoma okatie*	X		
Blackbanded Sunfish	*Enneacanthus chaetodon*		X	

Common Name	Scientific Name	Highest Priority	High Priority	Moderate Priority
Banded Sunfish	*Ennaecanthus obesus*			X
Savannah Darter	*Etheostoma fricksium*	X		
Sawcheek Darter	*Etheostoma serrifer*			X
Striped Bass	*Morone saxatilis*			X
Notchlip Redhorse	*Moxostoma collapsum*			X
Bridle Shiner	*Notropis bifrenatus*	X		
Ironcolor Shiner	*Notropis chalybaeus*			X
Bannerfin Shiner	*Notropis leedsi*		X	
"Broadtail" Madtom	*Noturus spp. (c.f. insignis)*	X		
Piedmont Darter	*Percina crassa*		X	
Lowland Shiner	*Pteronotropis stonei*			X

Source: SCDNR (2005a, 2015a), SCDNR (2018a)

Appendix G provides a complete list of South Carolina's priority vertebrate animal species that occur in the Coastal Plain Ecoregion, providing their federal- or state-listing status, their conservation status according to NatureServe (2023e), and their specific habitat requirements. Appendix H lists an additional 136 plants that are also listed as SGCN by the SCDNR (2015a).

Potential habitat could exist within the Project area for most SGCN that are listed by South Carolina for the Coastal Plain Ecoregion. However, the SCDNR (2018a) Heritage Trust Program and USFS (2018c) do not track occurrences for all SGCN and have only documented known occurrences for those species tracked by the SCDNR Heritage Trust Program as species of concern.

3.3.1.6 Aquatic Wildlife

Aquatic species are abundant in South Carolina, with 146 fish species known to inhabit its freshwaters and/or are seasonally dependent on freshwater habitats to complete their life cycle. A diversity of fish, reptile, and amphibians occupy the Coastal Plain Ecoregion, within large fertile blackwater rivers, backwater ponds and seasonally flooded swamps, and estuarine creeks and bays. The Project crosses or occurs near several ponds, streams, swamps, and rivers. Some of these aquatic habitats are in the FMNF and include the lower Santee and Wando rivers, North and South Santee River, along with several tributaries.

Several species of diadromous (i.e., catadromous and anadromous) fish use the Santee River-Cooper system, of which the North and South Santee River are a part. These species include blueback herring (*Alosa aestivalus*), American shad (*Alosa sapidissima*), striped bass, hickory shad (*Alosa mediocris*), shortnose sturgeon, and Atlantic sturgeon (SCDNR 2013). Of these, the blueback herring, hickory shad, and American shad are fairly common but are tracked by the SCDNR Heritage Trust Program as a species of concern and are ranked with the highest conservation priority in South Carolina (Table 3.3-4), while the shortnose sturgeon and Atlantic sturgeon are federally listed as endangered species (see Section 3.3.1.3).

Stream surveys by SCDNR indicate that American eel, Banded sunfish (*Ennecanthus obesus*), and Ironcolor shiner (*Notropis chalybaeus*) occur within Wambaw and Mechaw creeks, which intersect the

Jamestown Alternative (SCDNR 2018A). SCDNR lists these species as Species of Conservation Need and the Heritage Trust Program tracks their occurrences as a species of concern.

Initial surveys of fish were performed at the flowing streams crossed by the proposed Jamestown and Charity alternatives (Three Oaks Engineering 2017; 2018). For the Jamestown Alternative , a total of 31 freshwater and three estuarine fish species were found during electrofishing surveys of 12 streams crossed by the proposed corridor, and at specific wetland crossings that were determined in the field to have potential to support a fish community. The largest water body sampled (Wambaw Creek) had the highest number of species recorded (28), followed by Mechaw Creek (21), the easternmost tributaries to Mill Branch (15 and 13), and Keepers Branch (14). The majority of the species observed are considered fairly common throughout their respective ranges; however, two species are identified in the South Carolina's 2015 State Wildlife Action Plan as priority species (SCDNR 2015a), the American eel (highest priority) and the Flat Bullhead (moderate priority). The Eastern Mosquitofish (*Gambusia holbrooki*) was the most ubiquitous species found in waters crossed by the Jamestown Alternative, and at most sites, was the most abundant species encountered. The Flier (*Centrarchus macropterus*) and Redfin Pickerel (*Esox americanus*) were also found at a large number (nine) of sites and were generally common. Other than the Coastal Shiner, Spottail Shiner, and Golden Shiner, the shiners as a group were very underrepresented. Also, darter species were conspicuously absent from the sampling effort, likely attributed to the scarcity of riffle and swift flowing habitats in the sampled segments. However, neither the Swamp Darter (*Etheostoma fusiforme*) nor the Sawcheek Darter (*E. serrifer*), which often occur in slow-moving waters, were detected. Three estuarine species, Fat Sleeper, Freshwater Goby, and Hogchoker were found, and other estuarine species are also likely present in the Project vicinity at various times (Three Oaks Engineering 2017).

For streams and wetlands crossed by the proposed Charity Alternative, 20 fish species were found during electrofishing surveys of 10 sites. Collectively, the sampled species diversity in these waterbodies was considerably less than what was found within the waterbodies crossed by the Jamestown Alternative. As observed during the fish surveys for the Jamestown Alternative, the number of species observed at a site was correlated with waterbody size. In the majority of the waterbodies surveyed (7), 4 or less species were found. The 3 other waterbodies (Quinby Creek and 2 channels of Cropnel Dam Creek) produced 15, 8, and 10, species, respectively. Two species, Everglades Pygmy Sunfish (*Elassoma evergladei*) and Blackbanded Sunfish (*Enneacanthus chaetodon*), were found within waters crossed by the Charity Alternative but were not detected within waters crossed by the Jamestown Alternative (Three Oaks Engineering 2018).

3.3.2 Environmental Effects

To complete the analysis of potential effects on vegetation and wildlife, including special-status species, the potentially affected habitats were analyzed. Potential impacts would result from both the construction of the transmission Project, and its O&M. Table 3.3-5 provides definitions for duration and intensity developed for this Project, divided among vegetation, wildlife, and special-status species.

Table 3.3-5. Duration and Intensity Definitions for Biological Resources

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Vegetation and Non-native Invasive Plants			
Short-term: Lasting less than two growing seasons Long-term: Lasting	Impacts to native vegetation would be detectable but discountable and would not alter natural conditions measurably. Infrequent disturbance to individual	Impacts to native vegetation would be detectable and/or measurable. Occasional disturbance to individual plants could be expected. These disturbances could affect local	Impacts to native vegetation would be measurable and extensive. Frequent disturbances of individual plants would be expected with negative impacts to both local

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
longer than two growing seasons	plants could be expected but without affecting local or range-wide population stability. Infrequent or insignificant one-time disturbance to local populations could occur, but sufficient habitat would remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of non-native invasive plants would be detectable but discountable. There would be some minor potential for increased spread of non-native invasive plants.	populations negatively but would not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat would remain functional to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native invasive plants would be detectable and/or measurable. There would be some moderate potential for increased spread of non-native invasive plants.	and regional population levels. These disturbances could negatively affect local populations and could affect range-wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native invasive plants would be measurable and extensive. There would be major potential for increased spread of non-native invasive plants.
Wildlife			
Short-term: Lasting one to two breeding seasons, depending on length of breeding season Long-term: Lasting beyond two breeding seasons	Impacts to native species, their habitats, or the natural processes sustaining them would be detectable, but discountable, and would not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected but without interference to feeding, reproduction, resting, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species.	Impacts to native species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Occasional responses to disturbance by some individuals could be expected with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat would retain function to maintain the viability of the species both locally and throughout its range.	Impacts to native species, their habitats, or the natural processes sustaining them would be detectable, and would be extensive. Frequent responses to disturbance by some individuals would be expected with negative impacts to feeding, reproduction, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts would occur during critical periods of reproduction or in key habitats and would result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines.
Federally listed and State-listed Species, and FMNF SCC			
Short-term: Lasting one breeding season Long-term: Lasting beyond one breeding seasons	Impacts to sensitive species, their habitats, or the natural processes sustaining them would be detectable, but discountable, and would not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected	Impacts to sensitive species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Some alteration in the numbers of sensitive or candidate species, or occasional responses to disturbance by some individuals could be expected with some negative	Impacts to sensitive species, their habitats, or the natural processes sustaining them would be detectable and would be permanent. Substantial impacts to the population numbers of sensitive or candidate species, an impact to the population numbers of any federally listed species, or

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
	but without interference to feeding, reproduction, resting, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors might occur. However, some impacts might occur during critical reproduction periods or migration for a species but would not result in injury or mortality. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species. No take of federally listed species or impacts to designated critical habitat is expected to occur. Impacts would likely result in a *May Affect, Not Likely to Adversely Affect* determination.	impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat would remain functional to maintain the viability of the species both locally and throughout its range. No mortality or injury of federally listed species is expected; however, some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts would likely result in a *May Affect, Not Likely to Adversely Affect* determination.	interference with their survival, growth, or reproduction would be expected. There would be direct or indirect impacts on candidate or sensitive species populations or habitat, resulting in substantial reduction to species numbers, take of federally listed species numbers, or the destruction or adverse modification of designated critical habitat. Impacts would likely result in an adverse effect determination.

3.3.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and there would be no new effects on biological resources.

3.3.2.2 Proposed Action (Jamestown Corridor)

Under the Proposed Action, the 115-kV transmission line would cross a variety plant communities and wildlife habitat occupied by numerous species. While construction and O&M of the transmission line may affect vegetation and wildlife, mitigation measures would reduce the severity of any adverse effects. Potential effects could include the following:

- Disturbance or change to plant communities as a result of clearing and construction within the ROW
- Introduction and spread of non-native invasive plants during construction of the transmission line
- Removal of forested wetland vegetation within the ROW
- Removal of wildlife habitat within the ROW
- Fragmentation of wildlife habitat
- Temporary disturbance to wildlife from human presence and disruption to habitat
- Disturbance to aquatic habitats from construction activities
- Changes in predator-prey relationships due to habitat changes (e.g., increased predation by raptors due to the presence of transmission structures for perching)

The Project's potential impacts on vegetation are discussed first, followed by the impacts on wildlife in general, on at-risk species, and on aquatic species. At risk species include: (1) federally threatened endangered species, (2) FMNF SCC and state-listed species, and (3), other special-status species.

Vegetation

The 75-foot ROW would be cleared of trees, including the trimming or removal of hazard trees that are outside the ROW (hazard trees are trees or branches that are dead, weak, diseased, leaning toward the proposed transmission line, or otherwise capable of hitting the line were they to fall).

Affected Ecosystems—Effects from vegetation clearing of the ROW would vary depending upon the type of vegetation to be cleared. As presented above in Table 3.3-1, the Jamestown corridor would cross predominantly forested ecosystems, including both upland and wetland areas. The Proposed Action would affect little to no developed land, as it crosses almost entirely undeveloped and uncultivated vegetation. Construction through forested areas would require the removal of any trees or large shrubs that would interfere with transmission line safety, equipment access, and operation. Clearing forested areas would have a long-term, moderate-intensity effect on vegetation because it would result in a permanent conversion. The desired condition for plant communities within the ROW would be low-growing native species in an early-seral stage of development, whereby woody vegetation that could interfere with the transmission line would

be controlled. Disturbed portions of the ROW will be restored with native plants and free of non-native invasive plants as directed by applicable USFS standards and guidelines on NFS lands.

As shown in Table 3.3-6, a preliminary 75-foot ROW for the proposed alternatives would encompass different proportions of various ecosystems. Conversion of forested ecosystems to non-forested wetlands within the ROW, would alter plant community composition and alter wildlife habitat values. The acreage of ROW clearing required in the final ROW would be less than the acreage in Table 3.3-6 because micrositing would favor nonforested locations, where practicable, and the ROW could be reduced from 75 feet down to approximately 42.5 feet in locations alongside existing road, rail, and utility ROWs.

Table 3.3-6. Acreage of Ecosystems Within a Preliminary 75-foot ROW[a]

Ecosystem	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Upland Longleaf and Loblolly Pine	57.7	66.5	71.2
Wet Pine Savannas and Flatwoods	103.5	119.0	117.7
Oak Forests and Mesic Hardwood Forests	0	0	0.6
Forested Swamps and Floodplain Forests	44.5	42.9	63.1
Pocosins	0.2	0.2	10.3
Depressional Wetlands and Carolina Bays	6.0	8.9	19.8
Maritime Forests	0	0	0
Salt Marsh	0	0	0
Grassland and Early Successional Areas	0	0	0
Rivers and Streams (Open Water)	0	0	0
Developed Areas	0	0	0.2
Total	**211.9**	**237.5**	**283.2**

Source: USFS (2018a)

[a] A preliminary 75-foot ROW is used for calculations in this EIS because 75 feet is the maximum ROW width for Project construction and O&M. However, the final ROW width could be less in places where it overlaps existing road and utility ROWs. The final ROW would be located based on site-specific engineering, and environmental and cultural resource surveys.

Over 95 percent of a preliminary 75-foot ROW for the Jamestown corridor would traverse forested ecosystems. This includes Upland Longleaf and Loblolly Pine Forests (27 percent), Wet Pine Savannas and Flatwoods (49 percent), and Forested Swamps and Floodplain Forests (21 percent) (Table 3.3-6). Therefore, the Proposed Action's impacts on forested plant communities, especially wet forested habitats, would be moderate to high. Further discussion of the species affected within each ecosystem is provided below under *FMNF Species of Conservation Concern and State-Listed Species*.

Impacts from Project Construction—Potential adverse effects on vegetation from Project-construction would include short- and long-term effects varying in intensity from low to moderate, to high. In addition to ROW clearing, construction effects would include localized disturbance to plant communities caused by construction equipment and vehicles during site preparation, such as trampling damage to vegetation from vehicle tires, placement of timber mats in wetlands, and minimal grading. If the transmission line were required to be installed underground anywhere, a greater amount of ground disturbance would occur in the

short-term but potential impacts to adjacent forest vegetation from overhead lines would be avoided. Installing underground transmission lines requires extensive excavation and soil disturbance, which could change the soil structure and cause compaction, negatively impacting the growth of vegetation or altering natural drainage patterns.

Damage to vegetation in the ROW from construction equipment and vehicles would be considered a short-term, low-intensity effect. Upon completion of all work, all disturbed areas and construction staging areas would be restored so that all surfaces drain naturally, blend with the natural terrain, and are restored with native vegetation. Natural regeneration would generally be preferred but there could be specific sites where targeted restoration actions are needed, such as areas with suitable habitat for rare plants. Any seed used would be free of any viable non-native invasive plant seeds. Central Electric would comply with the FMNF requirements for the restoration of ground disturbance during construction on NFS lands. All destruction, scarring, damage, or defacing of the landscape resulting from construction would be repaired.

The Project would cause minimal permanent long-term vegetation loss at transmission line structures locations. Assuming 10 to 12 transmission line poles per mile, the Proposed Action would require from 233 to 280 poles. The foundation size of the transmission line structures would not be known until engineering is farther along; however, it is expected they would be relatively small in size with less than an 6-foot diameter per structure. As such, permanent impacts from vegetation loss due to structures would be approximately 0.15 to 0.18 acres. During construction, a 20-foot by 20-foot area of vegetation around each structure would be disturbed for the placement of temporary construction pads. Assuming 10 to 12 poles per mile, the Proposed Action would thus cause approximately 2.14 to 2.57 acres of impacts for temporary construction pads during pole installation. Additional vegetation clearing (1 acre) could occur if a construction staging area is located in an uncleared location; however, Central Electric would prefer to find a site that is already developed or disturbed. Berkeley Electric would construct the proposed McClellanville Substation on a parcel that has been prepared with gravel, so the 4.4-acre of ground disturbance would have no direct effect on vegetation. The potential introduction of non-native invasive plants is discussed further below.

During construction, off-ROW access may be necessary. Off-ROW access may be acquired for construction and O&M on existing roads and/or existing utility easements. Improvements to existing off-ROW roads may be required and improvements would typically involve restoration of dirt roads if wear and tear of traffic requires it or adding rock (or additional rock) to unpaved roads. No new permanent roads would be constructed as a result of the transmission line construction and any new temporary access roads would be minimal. Any required temporary access roads would be restored to their natural condition with native vegetation after construction (measure BR-1). Therefore, effects on vegetation from access road improvement or construction is expected to be negligible. If any new temporary access roads are required, they would be restored to the natural condition after construction is completed. Therefore, effects on vegetation from the construction of access roads would be short-term and low-intensity.

Project construction activities could introduce or spread non-native invasive plants through ground disturbance and seed attachment to construction equipment, which could potentially displace native species and alter plant community composition and function, threaten wildlife habitat and affect human uses by altering fire regimes, and change nutrient cycling and water availability. Additionally, some invasive plants are toxic to both wildlife and humans. Precautions would be implemented to prevent the introduction and spread of invasive plants during construction and restoration, including restoring disturbed areas to existing conditions after construction. Central Electric would develop a non-native invasive plant management plan to address their potential spread during construction activities, consistent with the USFS (2017) desired conditions and objectives as documented in the USFS (2021a) final Environmental Assessment of Non-Native Invasive Plant Control on the FMNF. The plan would include strategies for prevention, detection,

and control of non-native invasive plants. Construction equipment would be inspected for seeds and thoroughly cleaned before mobilizing to the Project area (Table 2.5-1, measures BR-4 and BR-5).

Impacts of Project construction on sensitive plant communities could be lessened by avoiding wetlands within the final Project ROW where possible. Where not possible to avoid wetlands, impacts would be minimized by performing land clearing within the ROW using methods that remove trees and tall-growing vegetation above the soil line and do not disturb soils. Central Electric would seek to avoid impacting wetlands to the greatest extent practicable by using a specialized logging equipment with an extendable boom and low ground pressure equipment (10 psi or less), and working from temporary construction mats to minimize rutting and mucking of wetland soils. Low-growing native plant materials that would not interfere with the installation, maintenance, and operation of the transmission line would not be cleared. Wetland impacts are discussed above in Section 3.2.2.

Short-term, low-intensity effects on vegetation are anticipated within the ROW in grassland and early successional areas, although they compose a very small percentage of a preliminary 75-foot ROW for the Jamestown corridor.

Impacts from Project Operations and Maintenance—Following construction, the ROW would be managed to remove woody vegetation that could interfere with the normal transmission of electricity while promoting low-growing native vegetation, on a 2.5- to 3-year cycle (4 to 5 years in wetlands), using medium to heavy four-wheel drive tractors with associated mowing implements. On NFS lands, no herbicide would be used and vegetation management would be performed solely by mechanical means (measure BR-14). One exception to the use of chemicals on NFS lands is where FMNF policy permits herbicides for the control of non-native invasive plants per the USFS (2017) standards and guidelines (see Chapter 4.2, USFS 2017). In accordance with USFS policy per Section 512 of Federal Land Policy and Management (43 USC 1772), Central Electric would be required to develop an operating plan for powerline facilities on NFS lands, including how Central Electric would address inspection, O&M, and vegetation management within the ROW and felling and pruning of hazard trees on NFS lands adjacent to either side of the ROW.

On nonfederal lands, herbicides may be used for ROW maintenance, including foliar applications and granular herbicide at the base of selected transmission structures to reduce the potential of damage from wildfires and/or facilitate ground rot inspections by line personnel. Also, crews would treat wetland areas (i.e., areas where mowing equipment cannot traverse) with a foliar herbicide application, using a Marsh Master or similar equipment, to control woody vegetation. Applying herbicides would selectively reduce undesirable woody vegetation using a low volume methodology. Although the amount of herbicide applied depends on the species composition, density, and height of the vegetation that is present, the selective application approach results in less of the active ingredient being applied per acre, as compared to the broadcast method. Only herbicides approved by USEPA are used within ROWs with each being applied in accordance with manufacturer labeling. Vegetation management activities on ROWs crossing NFS lands are expected to be similar to vegetation management as described above, except for the prohibition on herbicides unless approved by the USFS.

The construction of a new transmission line could affect opportunities for conducting prescribed fire to benefit native ecosystems, especially at-risk plants and animals that depend on fire to create suitable habitat. However, approximately 90 percent of the Jamestown corridor would follow alongside existing ROWs that may already serve as fire breaks and would not limit the FMNF's ability to implement prescribed fire. This could be the case, in particular, within the FMNF Management Area 1, which emphasizes the maintenance and restoration of native fire-maintained ecosystems and habitats. Approximately 6.6 miles, or 28 percent, of the Jamestown corridor is within Management Area 1; 6.2 miles are within Management Area 2, which emphasizes fuel reduction and timber management where frequent prescribed fire is unlikely to be

practiced. Table 3.3-7 summarizes the length of the Proposed Action on within both Management Areas on NFS lands. Based on the above discussion, vegetation maintenance under the Proposed Action would have a long-term, moderate impact on vegetation communities.

Table 3.3-7. Length (miles) of FMNF Management Areas Crossed by the Proposed Action and Alternatives

FMNF Management Area	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Management Area 1	6.6	9.7	15.1
Management Area 2	6.2	6.5	5.6

Wildlife, Including Neotropical Birds

Impacts from Project Construction—The Proposed Action would cross a variety of different habitat areas used by many wildlife species. Short-term effects on wildlife from Project construction would include temporary disturbance within and near the transmission ROW due to noise and human activities construction activity. Wildlife could be displaced from their habitat or animal movement and behaviors may be disrupted. Construction noise could interfere with the hearing of songbirds, mating and alarm calls in amphibians and ground squirrels, and could disturb raptor foraging activities (Madsen 1985, Van der Zande et al. 1980, Fyfe and Olendorff 1976). The effects of temporarily elevated noise levels can range from mild disturbance to severe auditory damage or death. Percussive sounds such as those typically involved with installation of piling or with blasting are typically the loudest construction-related sounds. The Project is not expected to require piling or blasting. Effects to wildlife would be largely short-term, of low- to moderate-intensity, and typically limited to the construction period and times when workers and equipment are regularly present.

Noise levels would be elevated within the Project ROW during the installation of transmission structures, but the sound levels would decrease to ambient conditions within a relatively short distance from the construction area. Some temporary displacement of wildlife from otherwise usable habitat would likely occur in the immediate vicinity of construction sites during the construction period, but displaced animals would likely return following Project construction. The degree of displacement would generally be proportional to the change in noise levels and the type of activity. If wildlife species were temporarily displaced at a critical time, such as during the breeding season, it could result in effects to reproductive success. For this reason, temporary construction-related noise effects would be expected to have a short-term, moderate effect on wildlife species.

Operation of heavy equipment and vegetation removal activities could result in direct mortality of less mobile species of wildlife that are present in the Project ROW. Larger, more mobile species that are able to leave the area, such as birds and medium and large mammals, would probably do so. Small mammals, amphibians, and reptiles that typically retreat to shallow burrows or other hiding places to escape danger would be most likely to suffer direct mortality. Additionally, wildlife species could fall into holes that have been drilled for structure placement. Holes are typically not left open with direct imbedded poles; however, when foundations are required, Central Electric would mark holes drilled for foundations that are left unattended overnight and would secure the area with temporary fencing to reduce the potential for livestock and wildlife to enter the holes, and for public safety (Table 2.5-1, measure BR-2).

Potential, temporary effects on raptors and waterfowl may occur during Project construction. Foraging areas for some species would be temporarily disturbed during ROW clearing and general construction activities. Noise, human disturbance, and collisions with transmission lines or equipment during construction could

also affect some individuals. Time of year restrictions to protect bats during the pup season (May 1 to July 15) would minimize potential disturbance during much of breeding season for birds and other wildlife. Central Electric would make every effort to also avoid tree removal during April to further protect bats. Effects on foraging areas due to construction activities would be short-term and of low- to moderate-intensity. During ROW clearing and preparation, habitat loss may occur for grassland and forest bird species, causing temporary displacement of local populations. When construction is completed, grassland species would be expected to return to the area as grassland is restored and construction disturbance ceases. Therefore, effects related to temporary habitat loss and displacement for grassland species would be short-term and of low- to moderate-intensity. Forest-dwelling species would likely move into neighboring forested areas adjacent to the ROW during construction and operation of the line. Species dependent on woodland habitat would experience a permanent loss of habitat within the ROW. Effects related to permanent loss of forest habitat would be long-term and of moderate-intensity. Per mitigation measure BR-6 (Table 2.5-1), Central Electric would complete a survey to identify existing stick nests prior to any clearing of woody vegetation and trees during migratory bird season. Tree-clearing crews will also be trained to stop work and notify Environmental staff if they encounter an unanticipated nest. Any identified active nest will be avoided during the nesting season.

The primary long-term effect from Project construction would be the permanent conversion of forested upland and wetland habitat to grassland or shrub habitat. Impacts on wildlife that use grassland and early successional areas would be short-term and low-intensity because the ROW would provide suitable habitat. The removal of forested habitat for the Project ROWs would provide a potential reservoir of grassland and shrubland habitat for wildlife species, especially birds that breed in this habitat type (King and Byers 2002). Several special-status grassland birds, such as the common ground-dove, barn owl, loggerhead shrike (SCDNR 2015g), and mammals such as the meadow vole, would potentially benefit from increased early successional habitats. Some forested areas that are cleared during construction would be quickly revegetated with dense shrubs and young trees, which would also benefit species that prefer woodland margins and shrub thickets, such as eastern towhee, field sparrow, northern bobwhite, and state species of concern such as the painted bunting. In addition, some raptors would likely have increased foraging habitat in areas where forested habitats are converted to low-growing vegetation, including state species of concern such as the barn owl.

Species dependent on forested habitat types would experience a permanent loss of habitat within the ROW, resulting in a long-term, low- to moderate-intensity impacts to wildlife. Wildlife species that rely on forested vegetation could lose cover, and nesting and foraging habitat, and be replaced by early successional wildlife species. Forest conversion could lead to an increased likelihood of starvation and an increased likelihood of predation due to an increase in songbird predators and a reduction in protective covering (DeGregorio et al. 2014). For example, Forested Swamps and Floodplain Forests are important habitat for many bird species during the critical over-wintering period. Central Electric would establish an approximate 30-foot natural buffer around all streams and wetlands to retain riparian habitat and comply with the USFS (2017) standards for riparian management zones on NFS lands (e.g., measure S22).

If the transmission line were required to be installed underground anywhere, potential impacts to forested upland and wetland habitats could be less due to a reduction in the amount of vegetation clearing along the ROW compared to overhead lines. However, the ROW would still have to be cleared for maintenance, and the extent of any reduced habitat impacts would depend on the length of the underground section(s). On the other hand, digging trenches and laying cables would cause extensive disturbance to soil, plants, and other features that wildlife depend on. Noise, vibrations, and increased human activity during the installation of underground lines would also cause greater disturbance to wildlife and disruption to forest ecosystems than the installation of overhead lines.

The amount of forest that would be converted to ROW is relatively small, with plentiful comparable habitat available nearby where vegetation would remain undisturbed. However, habitat fragmentation can cause ecological impacts in addition to the effects of loss of habitat. Habitat fragmentation occurs when formerly continuous tracks of habitat, particularly forest, are broken up into smaller parcels. Limiting the amount of interior forest fragmented by avoiding large tracks of forest and paralleling existing linear features, such as roads or other utility lines, reduces the effects of habitat fragmentation. Table 3.3-8 shows the percentage of each alternative that is parallel to another linear feature. Overall, the Jamestown corridor would be parallel to roads and/or other transmission lines for approximately 89 percent of its length, primarily including two-lane roads with relatively low levels of rural traffic.

Table 3.3-8. Length (miles) and Percentage of the Proposed Transmission Line Parallel to Other Linear Features

Metric	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Parallel to Existing Roads[a]	17.7 (76%)	20.7 (80%)	9.7 (37%)
Parallel to Existing Railroads	1.0 (4%)	1.0 (4%)	0 (0%)
Parallel to Existing Transmission Lines and/or Pipelines	2.1 (9%)	3.5 (13%)	20.9 (58%)
Total Length and Percentage of Entire Corridor	20.8 (89%)	25.2 (97%)	30.6 (98%)

[a] See Section 3.11 for further detail about roads in the Project area

The Proposed Action would result in 23.3 miles of transmission line, of which approximately 9 percent would be collocated with existing transmission lines. The remaining length would present a new collision risk to raptors and other large birds where there are no existing transmission lines. The Project would use low-profile structures that are 70 to 80 feet tall, which is below the estimated height of the tree line, so birds flying above more-visible tree line would generally avoid the transmission line (APLIC 2012).

Based on the above discussion, the Proposed Action would have long-term, moderate-intensity impacts on wildlife due to habitat fragmentation. This impact would be minimized, however, because the Project ROW would remove forest at the edge of existing roads and utility corridors, thus not affecting interior (i.e., unfragmented) forest and limiting the amount of new edge habitat created. If the Project ROW is permitted to overlap with the existing county road or highway ROWs, less forest clearing would be required.

Impacts from Project O&M—Project operation would present the potential for avian collisions with the transmission line, particularly for larger, less maneuverable species. Avian collisions with the proposed transmission line could occur under certain conditions, including high wind, fog, or poor light. Such collisions would be expected most often with the overhead shield wire, which is smaller and less visible than the actual conductor. The Project would be designed in accordance with Avian Power Line Interaction Committee (APLIC) recommendations contained in the most recent APLIC (2012) publication. After further consultation and with the USFWS, Central Electric, as determined appropriate, would use OPGW or mark the shield wire(s) with flight diverters in areas showing high potential for avian collisions. Effects on birds related to line collisions during Project O&M would be long-term and moderate-intensity.

Electrocutions of large avian species, particularly raptors, have been known to occur from contact with energized lines. Electrocutions are primarily due to the close vertical or horizontal separation of conductors and other equipment often found in distribution lines. APLIC (APLIC 2006) states that transmission lines rarely electrocute birds because of the larger separation distance. The separation of conductors on transmission lines is well beyond the separation found in most distribution lines. APLIC and USFWS (2005) recommends a separation of 60 inches on distribution and transmission lines. Because the Project

would be built in accordance with APLIC and USFWS (2005) guidelines and other APLIC (2006, 2012) guidance, the potential for bird to be electrocuted by the proposed transmission line would be minimized.

The presence of the utility line structures may also affect raptor predator-prey relationships by providing additional locations from which raptors can hunt (perches). However, the Project area already contains plentiful perching opportunities and changes to raptor predator-prey relationships are expected to be low-intensity.

As discussed under vegetation, above, following construction, the ROW would be maintained every 2.5 to 3 years (4 to 5 years in wetlands) through mowing and herbicide application. Wildlife habitat would be maintained in a grassland/shrub state, continuing to provide habitat to wildlife species that use these habitat types. During maintenance, wildlife would temporarily leave the area, using adjacent habitat for temporary shelter. Because the duration of vegetation maintenance in any one area is relatively short, wildlife would move back into the ROW after maintenance. Central Electric would apply herbicides following USEPA guidelines and use a low volume, selective treatment approach to application. As such, it is unlikely that herbicides would affect wildlife populations and would have a long-term, low-intensity impact. Herbicides would not be used during land clearing or ROW maintenance activities on NFS lands unless approved by the USFS. In areas that have standing water and are connected to a larger aquatic system (e.g., river or swamp), only USEPA-approved herbicides registered for use in wetland or aquatic sites would be used. As such, there would be negligible direct toxic effects to fish from herbicide applications because of the small size of the treatment sites; the precautions that would be taken to prevent runoff in rainwater; the lack of offsite drift from the backpack, hand, or ground-based boom sprayers that would be used; and the generally rapid degradation of the herbicides after application. Effects from Project O&M activities on aquatic resources would be long-term and low-intensity.

Federally Listed Threatened and Endangered Species

Ten federally listed or proposed species could potentially occur within the proposed Project corridor (RCW, wood stork, northern long-eared bat, tricolored bat, frosted flatwoods salamander, monarch butterfly, pondberry, American chaffseed, Canby's dropwort, and golden sedge) (Table 3.3-2). Five of the species have been detected within the Project area, including the RCW, wood stork, northern long-eared bat, tricolored bat, and monarch butterfly.

Red-cockaded Woodpecker—Forest clearing and associated noise and human activity during Project construction may cause temporary disturbance to adjacent RCW colonies. If these activities take place during nesting season, it could disrupt nesting activities, decrease feeding and brooding rates, and cause nest abandonment.

Based on USFS (2018d, 2024) and SCDNR (2018a) Heritage Trust Program data, the Jamestown corridor would intersect the foraging partitions of 23 RCW clusters. A preliminary 75-foot ROW would traverse through approximately 108 acres of foraging partitions, which is approximately 51% of the total ROW area (Table 3.3-9). The acreage of forest clearing for a 75-foot ROW would be approximately 1.5% of the total acreage of those foraging partitions. With respect to the Standard for Managed Stability (SMS) described in the RCW Recovery Plan (USFWS 2003), this acreage of potential tree removal would be discountable. All affected RCW foraging partitions would contain enough remaining pine habitat to sustain the minimum habitat suitable for the SMS, avoiding adverse impacts to foraging habitat.

Nine RCW clusters would have one or more cavity tree located within 200 feet of a 75-foot ROW, totaling 49 cavity trees. However, the proposed transmission line has been sited on the opposite side of the road to avoid potential removal of RCW cavity trees. Cluster 168A is the only RCW cluster where potential removal of an RCW cavity tree—within a preliminary 75-foot ROW—would be required. This cluster has

active cavity trees on both sides of Highway 45. Impacts would be minimized by locating the Project ROW on the north side of the of Highway 45. The removal of 4 of 10 total cavity trees would not adversely affect this cluster because the ROW is located on a side of the road where there are few cavity trees (Wildlife Investigations, LLC 2017). Cluster 168A has numerous known cavity trees available, totaling 15 (7 active, 2 inactive, 1 unsuitable, and 5 with unknown status). At this location, the ROW is proposed to be located on the north side of Highway 45 and the majority (13 of 15) cavity trees for cluster 168A are located on the other side of the highway.

To quantify impacts to RCW clusters within the final ROW during final design, Central Electric would hire a qualified biologist to perform surveys for RCW in accordance with the USFWS (2003) survey protocol. If any potential adverse impacts cannot be avoided due to cavity tree removal, Central Electric would provide compensatory mitigation that would include installing artificial cavities in suitable trees within suitable nesting habitat.

Table 3.3-9. Information on Red-Cockaded Woodpecker Clusters in the Project vicinity

Description	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Number of RCW foraging partitions intersecting a preliminary 75-foot ROW	23	31	39
Acreage (and percentage) of a preliminary 75-foot ROW within an RCW foraging partition	108.2	144.5	183.1
Number of RCW cavity trees within 200 feet of a preliminary 75-foot ROW	49	88	71
Number of RCW cavity trees within a 75-foot ROW	1[a]	12[b]	8[c]

Note: RCW occurrence data are lacking on private lands due to the lack of surveys, which comprise approximately 22 percent of the Jamestown Alternative; and 25 percent of the Charity Alternative.

a Includes trees from the following RCW cluster: 168A.
a Includes trees from the following four RCW clusters: 161A, 161D, 161E, and 168A.
b Includes trees from the following three RCW clusters: 161D, 161E, and 168A

In addition to potential impacts to RCW cavity trees, forest clearing for Project construction within RCW could indirectly impact RCW clusters. Noise and ground disturbance from construction activities could disturb woodpeckers, which could displace individuals or cause them to expend more energy while avoiding the disturbance. Central Electric would minimize impacts by avoiding construction activities within a 200-foot buffer around RCW cavity trees during the RCW nesting season (April 1 through July 31) (measure BR-15). This measure would protect the 49 cavity trees that occur within 200 feet of a preliminary 75-foot ROW, and would cover 9.8 acres, or 4.6 percent of the 212-acre ROW.[6] Central Electric would further avoid impacts to RCW through the proposed time of year restrictions for tree clearing to protect bats during winter torpor (December 15 to February 15) and the pup season (May 1 to July 15).

The proposed Project is not expected to cause fragmentation to RCW habitat because the 75-foot ROW would not cause the separation of any RCW cavity trees from foraging habitat by more than 200 feet (USFWS 2003). Following construction, RCWs would likely continue to use habitat in the vicinity of the ROW, as evidenced by active clusters adjacent to roads and existing transmission line ROWs on the FMNF

[6] 200 feet is the buffer distance that USFWS (2003) specifies to protect cavity trees.

On NFS lands, Central Electric would follow applicable USFS (2017) standards to ensure protection of RCWs, including:

(1) S32: "Ensure each RCW in an active cluster has a suitable cavity, but maintain a minimum of 4 suitable cavities at all times;"

(2) S33: "Retain all potential red-cockaded cavity trees (pines greater than 60 years in age) within RCW clusters, unless pine basal area is above 50 square feet per acre and all trees are above 60 years within the clusters; protect RCW cavity trees by shielding cavities with restrictors, painting known cavity trees with highly visible paint, or replacing lost cavities with artificial ones;" and

(3) S38: "Cutting of active RCW cavity trees is prohibited unless removal is needed for public or employee safety. Written authorization by USFWS is required after project consultation. Prior to cutting an active RCW tree, it must be replaced with an artificial cavity."

Two additional USFS (2017) Land Management Plan guidelines would apply to this Project, which include:

(1) G36: "Mechanical activities within active RCW clusters are not allowed during the nesting season (April 1– July 31). Exceptions may be made at the Project level with written authorization from USFWS after project consultation;" and

(2) G42: "Ensure forest management activities are consistent with the most up-to-date recovery plan for the RCW at the time of the activities. In some instances, there may be a need to deviate from The RCW Recovery Plan to provide long-term benefits for the RCW and its habitat (e.g., longleaf pine restoration or timber harvest which could reduce foraging below the Managed Stability Standard in the RCW Recovery Plan). Consult with USFWS."

Because the Project ROW would potentially require the removal of active cluster trees or could alter foraging areas potentially being used by the species, the Proposed Action would have high-intensity impacts to the RCW. Any required measures by USFWS to avoid potential take of any RCW would be implemented (Table 2.5-1, measure BR-8).

Wood Stork—Forested wetlands suitable for wood stork foraging could be directly impacted by the Proposed Action due to the removal of trees and other tall woody vegetation within the transmission line ROW, as there are approximately 25 acres of forested/shrub wetland within a preliminary 75-foot ROW for the Jamestown corridor (Table 3.2-4). This could cause long-term, moderate-intensity impacts to these wetlands. However, potential impacts to wetlands that could be used by wood storks would be avoided or minimized by several measures listed in Table 2.5-1 that Central Electric has proposed to protect water resources. Following construction, the ROW would continue to provide foraging opportunities for wood storks and the removal of canopy trees may increase the suitability of foraging for wood storks through an increase in accessibility and prey availability, as wood storks prefer foraging within herbaceous wetlands and ponds with little or no canopy (Coulter and Bryan 1993). Coulter and Bryan's study suggested that open canopies may contribute to detection of the sites and more importantly may allow storks to negotiate landing more easily and take flight quickly to avoid predators when compared to closed-canopy sites. It should also be noted that several observations of wood storks during initial surveys were foraging in non-forested wetlands within the existing road and 230-kV transmission line ROWs, and using the ROWs as travel corridors.

To avoid or minimize potential adverse impacts to wood storks from the proposed transmission line, Central Electric would design the Project according to guidelines provided by Avian Power Line Interaction

Committee (APLIC) and USFWS (2005) and APLIC's *Reducing Avian Collisions with Power Lines: The State of the Art in 2006* (APLIC 2006) and APLIC (2012) (Table 2.5-1, measure BR-7). If determined necessary during consultation with USFWS, Central Electric would employ a qualified biologist to perform a survey once the final ROW is determined, documenting to what degree and magnitude wood storks may use the final ROW (breeding, foraging, and travel) and how construction and operation of the Project could affect the species. If wood storks are found nesting or roosting in trees within the Project ROW and the trees require removal, Central Electric would coordinate with USFWS and RUS through ESA section 7 consultation, and as appropriate, implement mitigation to minimize adverse effects to individuals or disturbance to rookery sites. In coordination with USFWS, areas would be identified that have a high potential for avian collisions (i.e., river crossings). Central Electric would implement mitigation measures in these areas, including using marking the shield wire(s) with bird flight diverters to enable birds to see the line at a distance and avoid it. Central Electric would also avoid or minimize adverse impacts around wetlands potentially used by wood stork by marking the boundaries of wetlands within the ROW prior to construction. Construction equipment, fuels, and chemicals would not be stored in wetlands; construction mats would be used for all wetland crossings; clearing would be accomplished by using low ground pressure equipment (10 psi or less); and structures would be placed outside wetland where possible. Lastly, appropriate sediment and erosion control measures would be implemented. Based on the above discussion, the Proposed Action is expected to have short-term, low- to moderate-intensity impacts to the wood stork. After the creation of a new ROW, or expansion of existing ROWs for the Project, wood storks could use the transmission line as a travel corridor to access new foraging areas, which could potentially benefit the species.

Northern long-eared Bat and Tricolored Bat—Suitable roosting, foraging, and commuting habitat for bats was observed throughout the proposed corridor for the Jamestown corridor, as summarized by Ecological Solutions, Inc. (2017a). Habitats included large areas of mixed pine-hardwood forest with both live trees and snags, exhibiting suitable roost tree diameter with cavities, broken branches, and sloughing bark. In addition, riparian corridors, including perennial streams and creeks, as well as small ponds, swamps and wetlands, crossed by the proposed Project provide high-quality flyway and foraging habitat for northern long-eared bats and tricolored bats. Direct impacts to foraging, flyway, and roosting habitats within the proposed Project ROW may result in a loss of suitable habitat for the northern long eared bat and tricolored bat. Tree removal could likely impact suitable roosting habitat. However, the number of suitable roost trees that could be removed is inconsequential relative to the numerous loblolly and longleaf pines available in the surrounding forests. Once constructed, the Project ROW would not likely provide suitable roosting sites for northern long-eared bats and tricolored bats, but could provide potential flyways for bats that are commuting between suitable roosting and foraging areas.

Due to the high-quality flyway, foraging, and roosting habitat found within the Project Area, the Proposed Action would have high-intensity, short-term impacts to the northern long-eared bat and tricolored bat. Central Electric has committed to performing tree removal outside of the winter torpor season (December 15 to February 15) and pup season for bats (May 1 to July 15) by clearing trees during three prioritized work windows: 1) July 16 to December 14 (first choice), (2) February 16 to March 31 (second choice), and (3) April 1 to April 30 (third choice) (Table 2.5-1, measure BR-13). The population of northern long-eared bats in coastal SC are estimated to give birth earlier than populations further north, between late April and early May (Kindel 2019), so the proposed time of year restrictions on tree clearing would be protective of maternity roosts and non-volant pups. Central Electric would also follow FMNF standard S28, which stipulates that surveys would be conducted for at-risk bats before man-made structures are modified or demolished, and if bats are found, then consider installing bat gates and/or erecting bat houses. Also, ESA section 7 consultation/conference with the USFWS is being conducted and any non-discretionary reasonable and prudent measures and implementing terms and conditions will be followed to minimize potential take of

northern long-eared bat and tricolored bat incidental to Project construction and O&M (Table 2.5-1, measure BR-8).

Monarch Butterfly—Potential direct effects on monarch butterfly from the Proposed Action include collision risk with construction equipment and vehicles. Potential effects could occur during Project construction in the vicinity of milkweed and other native nectar plants that provide suitable monarch butterfly habitat. While adult monarch butterflies have the mobility to avoid construction equipment, larval stages could be vulnerable to being crushed by construction equipment, particularly during land clearing and ground excavation. Some adult monarch butterflies could also be impacted by vehicle collisions (McKenna et al. 2001, Kantola et al 2019). Also, there is limited evidence that monarch caterpillars exposed to highway noise for short periods had elevated heart rates, a sign that they may experience stress along loud roadsides (Davis et al. 2018).

While the Proposed Action could potentially affect a small number of monarch butterflies, impacts are anticipated to be low-intensity and limited to behavioral avoidance of construction activity. Collision with Project vehicles and equipment is unlikely because there would not be a noticeable increase in traffic. Suitable habitat is not widespread in the Project area and the Project would not cause an increase in noise to the extent that it would adversely affect monarch butterflies. If any adult butterflies were disturbed by Project activities, they would likely utilize adjacent habitat and repopulate these areas once construction ceases. Based on this information, potential effects on monarch butterflies from construction vehicles would be unlikely, or insignificant and temporary if they were to occur; and population-level effects are not expected.

Following completion of construction, temporarily disturbed monarch butterfly habitat would be restored to pre-existing conditions with appropriate native vegetation, including nectar plants,. If suitable monarch butterfly habitat is present within the Project ROW, the small permanent loss of habitat would be considered insignificant and population-level effects would not occur. Additionally, construction of the proposed transmission line would convert some shrub or forested areas to herbaceous areas, potentially resulting in beneficial effects to monarch butterfly by creating suitable breeding, nectaring, and other habitats.

Frosted Flatwoods Salamander—Construction of the proposed transmission line would involve mechanical ground disturbance that could result in adverse hydrological impacts to breeding sites that are critical to frosted flatwoods salamander, especially within at a 1-mile radius from the edge of suitable depressional wetlands and ponds. The use of herbicides to manage vegetation on nonfederal lands within the Project ROW is not likely adversely affect suitable habitat for frosted flatwoods salamanders.

While there are no known occurrences in the vicinity of the Jamestown corridor, frosted flatwoods salamanders can be difficult to detect, and often require multiple surveys, because they are mostly fossorial and do not migrate to their isolated breeding wetlands every year to breed. Previous surveys in the Project area have not found the flatwoods salamander, but a historic site from 1987 is known in the Santee Coastal Reserve, approximately 4.5 miles northeast of the proposed McClellanville Substation. The species is known to usually travel less than 1 mile from breeding sites to forage and burrow (FR 74 6725), so individuals from this population are unlikely to occur within the Jamestown corridor.

Frosted flatwoods salamander populations are highly susceptible to local extirpation without proper protection and habitat management (USFS 2013a). Because the species could occur in the Project area, prior to construction, Central Electric would survey the final Project ROW for signs of species presence and to document potential frosted flatwoods salamander breeding habitat and foraging areas that could be affected by the Project. Central Electric would also avoid refueling vehicles within 100-feet of the edge of water features to minimize the potential for hazardous-materials spills reaching a waterway. To minimize

potential erosion runoff into waterways, Central Electric would adhere to the conditions of a DA permit, develop an SWPP (measure WR-9) and implement BMPs such as silt fence or other appropriate measures at all stream crossings and along the borders of wetlands to prevent sedimentation. To avoid or minimize the adverse effects of herbicides (on nonfederal lands), Central Electric would avoid the use of fertilizers, pesticides, or herbicides in or near surface waterbodies (measure WR-19), and would use only USEPA-approved herbicides registered for use in wetland or aquatic sites. With these measures in place, the Proposed Action would comply with all applicable USFS (2017) standards and guidelines and have low-intensity impacts to the frosted flatwoods salamander.

Pondberry—Pondberry is the only federally listed (endangered) plant species known to occur in the general area of the proposed Project. It has been found in sinks in the Honey Hill area. The construction of the Jamestown corridor would require the disturbance of depressional wetlands that are potential habitat for this species, in proximity to known populations. Central Electric would follow FMNF standards S26 and S35 by not constructing temporary or permanent roads within population sites for at-risk plant species. The final design would avoid suitable habitat to the extent practicable. If suitable habitats cannot be avoided, species presence/absence surveys would be performed by a qualified biologist (measure BR-11). Thus, the Proposed Action is expected to have low-intensity impacts to pondberry.

American Chaffseed, Canby's Dropwort, and Golden Sedge—The Proposed Action would require the clearing of tall, woody vegetation to establish the Project ROW, which could disturb or destroy potential habitat for federally listed plants. However, it could increase suitable habitat for American chaffseed. Direct impacts are not expected because occurrences (populations) are well-known and there are no known records of American chaffseed, Canby's dropwort, or golden sedge within the proposed Jamestown corridor, based on occurrence data from SCDNR (2018a, 2024b) Heritage Trust Program, USFS (2018c), and initial floristic surveys. Suitable habitat exists within the ROWs, but there is low likelihood for new populations of these three plants to be found due to the lack of specific habitat requirements (e.g., regular fire or specific soil conditions). Central Electric would follow FMNF standards S26 and S35 by not constructing temporary or permanent roads in population sites for at-risk plant species. The final design would avoid suitable habitat to the extent practicable. If suitable habitats cannot be avoided, species presence/absence surveys would be performed by a qualified biologist (measure BR-11). Thus, the Proposed Action is anticipated to have a low-intensity impact, if any, on American chaffseed, Canby's dropwort, and golden sedge.

Summary of Effects on Federally Listed Species—The Proposed Action would have high-intensity impacts to RCW, northern long-eared bat, and tricolored bat because there are known occurrences of each species along the Jamestown corridor and tree removal within the Project ROW would affect their habitat and potentially disturb individuals. Potential impacts to all other federally listed species with suitable habitat within the Jamestown corridor would be low- to moderate-intensity, if impacts were to occur at all. Potential effects on marine/aquatic species would be negligible.

In accordance with section 7 of the ESA, a BA was submitted to the USFWS to evaluate the potential effects of the Proposed Action on listed and proposed species, and designated and proposed critical habitat. Based on the best available scientific and commercial information, RUS concluded that the Proposed Action would have no effect on the West Indian manatee, eastern black rail, piping plover, red knot, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, monarch butterfly, seabeach amaranth, Atlantic sturgeon, and shortnose sturgeon; and may affect, is not likely to adversely affect the wood stork, frosted flatwoods salamander, pondberry, American chaffseed, and golden sedge. Also, the proposed may affect, is likely to adversely affect the northern long-eared bat, tricolored bat, and red-cockaded woodpecker. The BA details several field surveys, summarized above. After RUS decides to potentially finance the Project, additional site surveys will be conducted with the permission of landowners. Because the Proposed Action may adversely affect the northern long-eared bat, tricolored bat, and red-

cockaded woodpecker, RUS requested formal consultation with the USFWS under section 7 of the ESA. At the conclusion of this consultation, Central Electric will comply with any reasonable and prudent measures, and/or terms and conditions of an incidental take statement issued by the USFWS biological opinion (Table 2.5-1, measure BR-8).

FMNF Species of Conservation Concern and State-Listed Species

The potential impacts of the proposed Project on FMNF SCC were analyzed to ensure consistency with the FMNF Revised Land Management Plan (USFS 2017). The FMNF SCC that could potentially occur within the Project area are summarized in Table 3.3-3.

Constructing the proposed Project could affect FMNF SCC and state-listed species through the same stressors as discussed above for wildlife in general. However, because of the rarity of these species, their declining trend, or their sensitivity to disturbance, any Project effects could be magnified. For the purpose of analysis in this section, these species include animals and plants that are: (1) designated as SCC by FMNF; or (2) listed by South Carolina as threatened, endangered, or tracked by the SCDNR Heritage Trust Program as species of concern (i.e., state-listed species) (Table 3.3-3). State-priority species (i.e., SGCN) were not included in this analysis, although the above criteria includes most at-risk taxa that are categorized by SCDNR (2015a) as high- or highest-priority. The effects of O&M maintenance of the proposed Project on FMNF SCC, and state-listed species, would also be similar to those discussed above under "wildlife" species. Likewise, due to their rarity, declining trend, or sensitivity, Project O&M could have a disproportionate impact on certain special-status species.

Analysis of Project Effects—To evaluate the potential effects of each alternative on FMNF SCC and state-listed species, a "coarse filter" (i.e., ecosystem-based) approach was used, similar to that used by the FMNF Revised Land Management Plan (USFS 2017). Where necessary, based on suitable habitat or known occurrences of FMNF SCC, additional "fine filter" (i.e., species-based) analysis is performed to evaluate Project impacts on the locations of sensitive resources, which will be incorporated into final line siting/selection of the selected corridor.

This analysis of impacts on FMNF SCC tiers to the Revised Land Management Plan (USFS 2017), which provides further context about species and their habitats across the FMNF. Accordingly, a project-level evaluation requires a review of the proposed Project to ensure that it is consistent with the plan (36 CFR 219.15). A project is consistent with the plan's desired conditions, objectives, or goals if it:

1. Maintains or makes progress toward attaining one or more of the plan's desired conditions, objectives, or goals applicable to the project;

2. Has no effect or only a negligible adverse effect on the maintenance or attainment of applicable desired conditions, objectives, or goals;

3. Does not foreclose the opportunity to maintain or achieve any of the applicable desired conditions, objectives, or goals over the long term, even if the project (or an activity authorized by the project) would have an adverse short-term effect on one or more desired conditions, objectives, or goals; or

4. Maintains or makes progress toward attaining one or more of the plan's desired conditions, objectives, or goals, even if the project or activity would have an adverse but negligible effect on other desired conditions, objectives, or goals.

All species listed as FMNF SCC and state-listed species (Table 3.3-3) were grouped into 6 ecological associations (i.e., "species groups") based on their known habitat requirements, habitat drivers and threats,

and prior grouping by the FMNF (USFS 2017). For each species, the potential impacts were evaluated to ensure that the proposed Project is consistent with the FMNF Revised Land Management Plan (USFS 2017), in accordance with 36 CFR 219.15. This includes a review of the FMNF's desired conditions, objectives, and standards and guidelines.[7] Appendix I provides these desired conditions as they pertain to the FMNF SCC that could potentially be impacted by the Project. At the "coarse filter" scale, GIS data for species occurrences maintained by USFS (2018c) were evaluated; at the "fine filter" scale, field survey data for the applicable SCC species were evaluated.

Table 3.3-10 summarizes the ecosystems associated with each species group and the potential acreage of each ecosystem within the Project area, on both NFS lands and other (nonfederal) lands. The acreage presented greatly exceeds the area that would actually be directly affected within the final 75-foot-wide ROW.

[7] To protect habitat for SCC, Section 2.1.1 of the USFS (2017) Revised Land Management Plan specifies the desired future conditions for each ecosystem on the FMNF. Section 3.1 of the plan describes the objectives that the FMNF strives to meet, and the management strategies it will potentially take to achieve the desired future conditions. Lastly, Section 4.2 of the Revised Land Management Plan (USFS 2017) describes the standards and guidelines for the FMNF, with which the Project must be consistent for the USFS to authorize an SUP for the Project.

Table 3.3-10. FMNF SCC and State-Listed Species Groups, Their Associated Ecosystems, and the Affected Area Within the Project Area, on both NFS Lands and Nonfederal Lands

Species Group	Associated Ecosystems	Jamestown Corridor Acreage (% of Corridor)	Jamestown Alternative Acreage (% of Corridor)	Charity Alternative Acreage (% of Corridor)
Upland Pine Woodland Associates	Upland Longleaf and Loblolly Pine	NFS: 176.1 acres (10.4%)	NFS: 302.1 acres (15.9%)	NFS: 298.5 acres (13.2%)
		Nonfederal: 277.6 acres (16.4%)	Nonfederal: 234.1 acres (12.3%)	Nonfederal: 265.8 acres (11.7%)
Forested Wetland Associates	Forested Swamps and Floodplain Forests	NFS: 241.2 acres (14.2%)	NFS: 259.9 acres (13.7%)	NFS: 379.2 acres (16.7%)
		Nonfederal: 117.7 acres (6.9%)	Nonfederal: 90.0 acres (4.7%)	Nonfederal: 123.5 acres (5.4%)
Mesic to Wet Pine Savanna Associates	Wet Pine Savannas and Flatwoods	NFS: 564.5 acres (33.3%)	NFS: 652.7 acres (34.4%)	NFS: 664.1 acres (29.3%)
		Nonfederal: 259.5 acres (15.3%)	Nonfederal: 279.8 acres (14.7%)	Nonfederal: 259.1 acres (11.4%)
Pond Cypress Savanna Associates	Depressional Wetlands and Carolina Bays	NFS: 17.1 acres (1.0%)	NFS: 42.9 acres (2.3%)	NFS: 134.8 acres (5.9%)
		Nonfederal: 42.4 acres (2.5%)	Nonfederal: 38.1 acres (2.0%)	Nonfederal: 40.0 acres (1.8%)
Calcareous Mesic Hardwood Associates	Oak Forests and Mesic Hardwood	NFS: 0 acres (0%)	NFS: 0 acres (0%)	NFS: 4.8 acres (0.2%)
		Nonfederal: 0.2 acres (0%)	Nonfederal: 0.2 acres (0%)	Nonfederal: 0.2 acres (0%)

Sources: SCDNR (2015a), USFS (2017)

Upland Pine Woodland Associates—Threats to FMNF SCC and state-listed species in this group include habitat destruction and fragmentation from human development and habitat loss due to the lack of disturbance, especially the lack of wildfire. Upland longleaf and loblolly pine ecosystems that support a high diversity of rare and endemic native species. Fires during the growing season maintain a herbaceous ground cover and keeps young pines and shrubs from establishing. With a frequent fire regime, old trees and diverse herbaceous groundcover provide suitable habitat to many rare, threatened and endangered species. Such habitats provide the best potential habitat for RCWs, discussed previously under *Federally Listed Threatened and Endangered Species*, and are especially important to several rare snakes.

A 600-foot-wide corridor for the Jamestown corridor encompasses approximately 450 acres of Upland Longleaf and Loblolly Pine and over half (277 acres) of those ecosystems within the corridor would occur on NFS lands (Table 3.3-10). At a finer scale, approximately 58 acres of Upland Longleaf and Loblolly Pine occur within a preliminary 75-foot ROW (Table 3.3-6), suggesting the general area of affected habitat that may be suitable to upland pine woodland associates.

The FMNF SCC associated with upland pine woodlands that were observed during initial field surveys of the proposed Project include:

- RCW
- Monarch butterfly

Additionally, the Project could affect 12 other FMNF SCC and state-listed species, shown in Table 3.3-11, based on SCDNR (2018a, 2024b) Heritage Trust Program and USFS (2018c) records in the Project vicinity.

Table 3.3-11. FMNF SCC and State-Listed Species Associated with Upland Pine Woodlands

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
1	Bird	*Picoides borealis*	Red-cockaded Woodpecker	FE	SE	SCC	Highest
2	Bird	*Aimophila aestivalis*	Bachman's Sparrow	--	Species of Concern	SCC	Highest
3	Bird	*Tyto alba*	Barn Owl	--	Species of Concern	--	Moderate
4	Bird	*Columbina passerine*	Common ground Dove	--	Species of Concern	--	Highest
5	Bird	*Ammodramus savannarumi*	Grasshopper Sparrow	--	Species of Concern	--	Highest
6	Bird	*Melanerpes erythrocephalus*	Red-headed Woodpecker	--	Species of Concern	--	Moderate
7	Mammal	*Sciurus niger*	Southern Fox Squirrel	--	Species of Concern	--	Moderate
8	Reptile	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake	--	ST	SCC	Highest
9	Reptile	*Heterodon simus*	Southern hognose Snake	--	--	SCC	Highest
10	Reptile	*Pituophis melanoleucus*	Northern Pine Snake	--	Species of Concern	--	Highest
11	Insect	*Amblyscirtes alternata*	Dusky Roadside Skipper	--	--	SCC	No
12	Insect	*Danaus plexippus*	Monarch Butterfly	--	--	SCC	No

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
13	Vascular Plant	*Pteroglossapsis ecristata*	Crestless Plume Orchid	--	--	SCC	No
14	Vascular Plant	*Schwalbea americana*	American Chaffseed	FE	--	SCC	Highest

Sources: SCDNR (2015a), USFS (2017)
[a] Federal Listing Status: FE = Federally Endangered; FT = Federally Threatened
[b] State Listing Status: SE = State Endangered; ST = State Threatened; Species of Concern = No legal protection but tracked by SC Heritage Trust Program
[c] USFS Status: SCC = FMNF Species of Conservation Concern
[d] State species of greatest conservation need (SGCN) are assigned one of 3 priorities (Moderate, High, or Highest)

Habitat loss due to tree removal could occur for individuals of tree-dwelling species, such as RCW, red-headed woodpecker, southeastern fox squirrel, and barn owl. At-risk snakes could be killed or temporarily displaced during construction, such as eastern diamondback rattlesnake, southern hognose snake, and northern pine snake. However, these species were not detected during surveys by Buhlmann and Gross (2018) or Bulhmann (2019). The Bachman's sparrow, grasshopper sparrow, common ground dove, and other ground-nesting birds could be adversely affected by heavy equipment and vehicles during Project construction, and to lesser degree during Project O&M, which could result in the physical destruction of nests. Following construction, the ROW vegetation would continue to provide suitable habitat for most upland pine woodland associates. Vegetation management of the ROW to limit shrub and tree encroachment would benefit nesting grasshopper sparrows and Bachman's sparrows because they prefer areas with limited shrubs. The maintenance of early successional/open habitat conditions within the ROW would benefit most other upland pine woodland associates. Central Electric would seek to maximize benefits for these species within the Project corridor by restoring disturbed areas with preferable native grasses and forbs.

Indirect effects to wildlife habitat would result from changes due to the Proposed Action. For example, utility line structures may affect raptor predator-prey relationships by providing additional locations from which raptors can hunt (perches), which could adversely affect the aforementioned snakes and bobwhite quail (a highest priority SGCN) and benefit American kestrel (a highest-priority SGCN). Project O&M could also negatively affect upland pine woodland associates by fragmenting fuel sources needed to carry fire. However, the proposed transmission line would follow alongside existing ROWs that would already serve as fire breaks and would not limit the ability to implement prescribed fire.

Two vascular plants listed as FMNF SCC, and closely associated with upland longleaf and loblolly pine woodlands, could occur within the Project area. The crestless plume orchid has 14 documented occurrences on the FMNF (USFS 2017) and six occurrences are within 1 mile of the Proposed Action. No observations of crestless plume orchid were recorded during initial floristic surveys (Gaddy 2017, 2018), but additional surveys would be necessary to confirm its absence from the Project area. Potential Project effects to American chaffseed are discussed above under *Federally Listed Threatened and Endangered Species*. Lastly, there were no observations of the dusky roadside-skipper or its host plant, broadleaf beardgrass on NFS lands, but additional surveys for both would be completed prior to construction. Likewise, monarch butterflies are known to occur along the proposed Jamestown corridor, and its milkweed host plants were observed within the preliminary Project ROW (Ecological Solutions, Inc. 2017b, 2018). Given both potential adverse and beneficial effects, the Proposed Action would have low-intensity, long-term impacts to upland pine woodland associates.

Of the 33 FMNF SCC species identified as potentially occurring on NFS lands within the proposed Project, five are associated with Upland Longleaf and Loblolly Pine, and include:

- Bachman's sparrow

- eastern diamondback rattlesnake
- southern hognose snake
- monarch butterfly
- crestless plume orchid

For these species, upland longleaf and loblolly pine savanna that contain relatively widely spaced old trees and a diverse herbaceous groundcover are maintained by growing season fires to promote diverse groundcover and keep young pines and scrub oaks from establishing. The FMNF objectives and management strategies to manage habitat for these species include: apply prescribed fire on at least 30,000 acres per year to maintain or restore fire-adapted ecosystems including longleaf pine woodlands, savannas and flatwoods, Carolina bays and depression ponds, and narrow river floodplains and swamps (OBJ-ECO-2); and maintain or restore upland longleaf and mesic Wet Pine Savannas and Flatwoods ecosystems and loblolly pine forest (OBJ-ECO-3).

In addition to the mitigation measures provided above in Table 2.5-1, on NFS lands, Central Electric would adhere to the USFS (2017) standards and guidelines, including but not limited to the following that are pertinent to FMNF SCC species associated with upland pine woodlands:

- S26 – No firelines, temporary roads, or log landings in population sites for at-risk plant species, except as needed to protect facilities, private property, or public safety.
- S34 – Require equipment cleaning practices on equipment, using equipment cleaning clauses in contracts, permits and agreements, when moving equipment from areas infested with non-native invasive plants (FSM 2903).
- S35 – No new permanent roads, trails, or recreational sites are allowed in rare plant communities and population sites for at-risk plant species.
- S36 – Use plant materials that contain genetically appropriate native plant species when maintaining and restoring vegetation. Use of non-native plants is allowed only when in compliance with USFS native plant policy (FSM 2070).
- S37 – Maintain stands meeting criteria for old growth during project planning using criteria in the Region 8 Old Growth Guidance. Consider the contribution of old growth communities to the future network of small and medium-sized areas of old growth conditions including the full diversity of ecosystems across the landscape.
- S39 – Use low-psi ground pressure logging equipment when operating in these ecosystems and special areas: depressional wetlands, Carolina bays, pocosins, and at-risk plants population sites.
- S40 – Do not use soil active herbicides (imazapyr, imazapic) in population sites for at-risk plant species.
- S41 – Within Management Area 1, prescribe burn habitat for fire-adapted at-risk species associates and rare communities at desired seasons (growing vs. dormant) and fire return intervals for associated ecosystems.

- G31 – Stumps, standing snags, and den trees should be retained during vegetation management activities. Exceptions may be made where necessary to control insects or disease outbreaks or to provide public and employee safety.

- G32 – Unpaved system roads should be considered for seasonal to permanent closure to conserve at-risk wildlife species sensitive to road use.

- G35 – Guidelines and recovery objectives in the most up-to-date recovery plan should be implemented for all federally listed species, when available and feasible. If site-specific conditions preclude implementing recovery tasks, consult with the USFWS field office using the appropriate consultation tool. Collaborate with USFWS in the conservation of at-risk species.

- G40 – Encourage use of weed-free materials to limit the introduction and spread of non-native invasive plant species.

- G41 – Commercially purchased seed mixes should be tested by a certified seed laboratory for purity, viability, and non-native invasive plant seed.

Opening the forest canopy of this ecosystem within the Project ROW could have some beneficial impacts on upland pine woodland associates. Project O&M would prevent the growth of trees and other woody vegetation, which would promote a diverse herbaceous groundcover and relatively open overstory within the ROW. Under certain conditions, this could result in an overall increase in habitat quality and diversity for the five FMNF SCC associated with Upland Longleaf and Loblolly Pine ecosystems along the proposed Jamestown corridor. However, minimizing groundcover trampling and preventing invasive plant invasions in disturbed areas would require careful monitoring. Therefore, the Proposed Action is consistent with the FMNF Revised Land Management Plan (USFS 2017) by maintaining ecological conditions that support viable populations of FMNF SCC associated with upland pine woodlands.

Forested Wetland Associates—This group of species are found within Forested Swamps and Floodplain Forests, and are linked to FMNF desired conditions and management objectives associated with the following ecosystems: large river floodplain forests and tidal swamps; narrow non-riverine swamp and wet hardwood forests; and broad non-riverine swamp and wet hardwood forests. Forested wetlands would be affected by the proposed powerline due to their large extent and the need to clear the transmission ROW of their defining structural characteristic of tall trees to avoid contacting the transmission wires.

The Proposed Action would affect Forested Swamps and Floodplain Forests and impacts on associated FMNF SCC species could be lasting due to tree removal. A 600-foot-wide for Jamestown corridor encompasses approximately 360 acres of Forested Swamps and Floodplain Forests and approximately 67 percent of that area would occur on NFS lands (Table 3.3-10). At a finer scale, Table 3.3-6 shows that a preliminary 75-foot ROW for the Jamestown corridor would traverse approximately 45 acres of Forested Swamps and Floodplain Forests.

Six forested wetland associates were observed on NFS lands during field surveys of the proposed alternatives, including:

- American swallow-tailed kite

- Bald eagle

- Wood stork

- Southeastern bat
- Spotted turtle
- Okefenokee zale moth

Table 3.3-12 shows 16 additional FMNF SCC or state-listed species that the Proposed Action could affect, based on SCDNR (2018a, 2024b) Heritage Trust Program and USFS (2018c) records in the Project vicinity.

Table 3.3-12. FMNF SCC and State-Listed Species Associated with Forested Wetlands

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
1	Bird	*Egretta caerulea*	Little Blue Heron	--	Species of Concern	SCC	Highest
2	Bird	*Elanoides forficatus*	American Swallow-tailed Kite	--	SE	SCC	Highest
3	Bird	*Haliaeetus leucocephalus*	Bald Eagle	--	ST	SCC	High
4	Bird	*Limnothlypis swainsonii*	Swainson's Warbler	--	Species of Concern	--	High
5	Bird	*Mycteria americana*	Wood Stork	FT	SE	SCC	Highest
6	Mammal	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat	--	ST	SCC	Highest
7	Reptile	*Clemmys guttata*	Spotted Turtle	--	ST	SCC	High
8	Mammal	*Myotis austroriparius*	Southeastern Bat	--	ST	SCC	Highest
9	Insect	*Euphyes berryi*	Berry's Skipper	--	--	SCC	--
10	Insect	*Zale perculata*	Okefenokee Zale Moth	--	--	SCC	--
11	Vascular Plant	*Andropogon mohrii*	Mohr's Bluestem	--	--	SCC	--
12	Vascular Plant	*Carex chapmanii*	Chapman's Sedge	--	--	SCC	High
13	Vascular Plant	*Carex crus-corvi*	Ravenfoot Sedge	--	--	SCC	--
14	Vascular Plant	*Carex elliottii*	Elliott's Sedge	--	--	SCC	Moderate
15	Vascular Plant	*Coreopsis integrifolia*	Ciliate-leaf Tickseed	--	--	SCC	High
16	Vascular Plant	*Eupatorium anomalum*	Florida Thorough-wort	--	--	SCC	Moderate
17	Vascular Plant	*Lysimachia loomisii*	Loomis' Loosestrife	--	--	SCC	--
18	Vascular Plant	*Macbridea caroliniana*	Carolina Bird-in-a Nest	--	--	SCC	High
19	Vascular Plant	*Ponthieva racemosa*	Shadow-witch Orchid	--	--	SCC	--
20	Vascular Plant	*Quercus similis*	Bottomland Post Oak	--	--	SCC	Moderate
21	Vascular Plant	*Rhynchospora stenophylla*	Chapman Beakrush	--	--	SCC	--
22	Vascular Plant	*Ruellia strepens*	Limestone Petunia	--	--	SCC	Moderate

Sources: SCDNR (2015a), USFS (2017)
[a] Federal Listing Status: FE = Federally Endangered; FT = Federally Threatened
[b] State Listing Status: SE = State Endangered; ST = State Threatened; Species of Concern = No legal protection but tracked by SCDNR Heritage Trust Program
[c] USFS Status: SCC = FMNF Species of Conservation Concern
[d] State species of greatest conservation need (SGCN) are assigned one of 3 priorities (Moderate, High, or Highest)

The Project could adversely impact forested wetland associates by affecting wetland hydrology due to altered drainage patterns, soil compaction, and vegetation removal, which would vary from a minor to a significant influence on hydrologic function. Construction activities could directly affect individuals of FMNF SCC and state-listed species, listed in Table 3.3-12, via timber harvest that decrease shading of wetlands by trees and structural diversity. Project O&M could negatively affect individuals through mechanical removal of vegetation and, on nonfederal lands, herbicide application to control non-native

invasive plants; however, protective would be implemented and impacts would be short-term and low-intensity.

Several observations of American swallow-tailed kites occurred in proximity to the Proposed Action, in addition to other known occurrences. While no nests were documented, the Project could have long-term, moderate-intensity adverse effects on swallow-tailed kites if their nesting habitat is lost because of permanent conversion of forested wetlands, herbaceous wetlands, and/or grassland ecosystems. Temporary disturbance during the nesting season could have long-term impacts because the species shows strong site fidelity, returning to previously used sites every year. Indirect impacts could occur due to increased grasslands and shrublands providing increased foraging opportunities for great horned owls (*Bubo virginianus*), which are a major predator of swallow-tailed kites (SCDNR 2015t). However, in some upland areas, vegetation clearing for the Project ROW could provide swallow-tailed kites with additional foraging opportunities of beetles, grasshoppers, and other terrestrial insects. Central Electric would consider the locations of suitable nesting habitat when designing the final footprint and avoid these areas to the extent practicable. Central Electric would follow FMNF standard S31 and mitigation measure BR-17 (Table 2.5-1), which stipulates no tree clearing or cutting of vegetation during the migratory bird nesting season (April through August). Given this conservation measure, the proposed Project would have long-term, low-intensity impacts on American swallow-tailed kites. Furthermore, per mitigation measure BR-6 (Table 2.5-1), Central Electric would complete a survey to identify existing stick nests prior to any clearing of woody vegetation and trees during migratory bird season. Tree-clearing crews will also be trained to stop work and notify Environmental staff if they encounter an unanticipated nest. Any identified active nest will be avoided during the nesting season.

Bald eagles were observed during surveys on NFS lands in the vicinity of residences in the Honey Hill area (ARCI 2018a) and bald eagle nest in the Project vicinity, mostly along the Santee River and its delta. Bald eagles are particularly sensitive to human disturbance during the first few months of their nesting period. If a bald eagle nest or roosting area is located near the preferred alternative, Project construction noise and the permanent conversion of forested areas could result in a long-term, low- to moderate-intensity impact to the bald eagle, depending upon the proximity of the nest or roost and the time of year. USFWS (2007) recommends constructing utility lines at least 660 feet from active bald eagle nests. No known bald eagle nests are located within 660 feet of the Project area but suitable habitat occurs where the transmission line would cross open water (e.g., Wambaw Creek). Also, on NFS lands, Central Electric would follow FMNF standard S25, and if required, not permit helicopter use within 500 vertical feet and 1,000 horizontal feet of active bald eagle nests October through May. Therefore, no bald eagle nests would be adversely affected by the Proposed Action. As noted above, pre-construction surveys would be performed to identify any potential bald eagle nests and if avoidance is not possible, consultation with USFWS would occur.

The potential Project effects on wood storks are discussed above under *Federally Listed Threatened and Endangered Species*.

The Rafinesque's big-eared bat is likely to occur in proximity to the Project, although they were not detected by an initial species assessment of bats (Ecological Solutions, Inc. 2017a, Ecological Engineering, LLP 2018a). Surveyors did capture several southeastern bats. These species roost in cavity trees, but also roost in bridges, and forage around forested wetlands. Project construction could impact both species through the removal of roost trees or other forest features that affect the foraging preferences or insect abundance around forested wetlands. Vegetation management within the Project ROW and selective herbicide use during Project O&M could further reduce habitat quality for both bat species. It is likely, however, that the bat would use other nearby areas to forage and the local population would not be affected. The Proposed Action would thus have long-term, moderate-intensity impacts to Rafinesque's big-eared bats and southeastern bats. If bats are found during pre-construction surveys, Central Electric would consider installing bat houses, in coordination with USFS.

The spotted turtle could occur in the Project vicinity and Buhlmann and Gross (2018) reported one known occurrence, documented by other researchers in the Project Area. The spotted turtle is sensitive to harm due to off-road vehicles, heavy equipment, horses, and human traffic (USFS 2017). Short-term effects could occur during the clearing and construction of the ROW due to direct mortality. Long-term effects include the conversion of forested wetland habitat to emergent marsh; however, spotted turtles are found in a wide variety of habitat types found along the proposed transmission line and would benefit from more open canopy conditions that allow more sunlight to penetrate forested wetlands (Buhlmann 2019). Because the proposed Project would span wetlands, adverse effects to the spotted turtle would be short-term and low-intensity.

Two adult Berry's skippers were observed within the proposed corridor for the Jamestown Alternative, and its host plant, pickerelweed, was also observed throughout the area. The observed Berry's skippers were foraging on pickerelweed within a wet ditch adjacent to a black gum and bald cypress dome (Ecological Solutions, Inc. 2017b). Project construction could adversely affect pickerelweed, and other plants listed in Table 3.3-12, through habitat destruction or ground disturbance that alters hydrology. As detailed above in Section 3.2.2, Central Electric would implement several measures to avoid or minimize any impacts on wetland plant communities.

Suitable habitat for Okefenokee zale moth and its associated host plant, climbing fetterbrush, was observed within the proposed corridor for the Jamestown Alternative. This includes older cypress gum swamps, where climbing fetterbush grows on pond and bald cypress (USFS 2013b). Effects to the species would be avoided by performing additional surveys of suitable habitat prior to construction of the proposed transmission line. During Project O&M, vegetation management would not be expected to negatively affect the species as long as all herbicide label and forest plan standards are followed. Coordinating Project construction with USFS would provide for additional input about any new records of Okefenokee zale moth prior to Project construction.

Six vascular plants listed as FMNF SCC, and closely associated with forested wetlands, could be impacted by the Proposed Action. These plants were not observed during initial floristic surveys (Gaddy 2017, 2018), but additional focused surveys would be necessary to confirm their absence from the Project area.

Of the 33 FMNF SCC species identified as potentially occurring on NFS lands within the proposed Project, seven species are associated with Narrow Forested Swamps and Blackwater Stream Forests, and Broad Forested Swamps and Large River Floodplain Forests, and include:

- American swallow-tailed kite
- bald eagle
- Rafinesque's big-eared bat
- southeastern bat
- spotted turtle
- monarch butterfly
- Berry's Skipper

Strategies to restore or maintain many forested wetland habitats are similar to strategies described for mesic to wet pine savanna associates, including fire return intervals from 2 to 10 years (USFS 2017). The open

canopy conditions created by fire could be partially provided by the ROW via occasional low-intensity prescribed fire, mechanical vegetation management, and/or herbicide (on nonfederal lands), provided that ground disturbance impacts are minimized, and the ROW is monitored for invasive plants.

In addition to the mitigation measures provided above in Table 2.5-1, on NFS lands, Central Electric would adhere to USFS (2017) standards and guidelines, including but not limited to the following that are pertinent to FMNF SCC species associated with forested wetlands:

- S25 – Do not permit helicopter use within 500 vertical feet and 1,000 horizontal feet of active bald eagle nests October through May.

- S28 – Survey for at-risk bats before buildings, bridges, wells, cisterns and other man-made structures are structurally modified or demolished. If bats are found, then consider installing bat gates and/or erecting bat houses. Once the bat houses are being use, then demolish or replace structures.

- S31 – Conduct no logging within 300 feet of known active American swallow-tailed kite nests from April 1 through June 30 or until fledging is completed. When nests are found in timber removal areas, logging will be coordinated with timber purchasers to protect the kite nesting site. Inactive nest-site trees may be harvested.

- S35- Within Management Area 1, prescribe burn habitat for fire-adapted at-risk species associates and rare communities at desire.

- S37 – Maintain stands meeting criteria for old growth during project planning using the criteria in the Region 8 Old Growth Guidance. Consider the contribution of old growth communities to the future network of small and medium-sized areas of old growth conditions including the full diversity of ecosystems across the landscape.

- S41 – Within Management Area 1, prescribe burn habitat for fire-adapted at-risk species associates and rare communities at desired seasons (growing vs. dormant) and fire return intervals for associated ecosystems.

- G8 – Low-ground pressure equipment, activity suspension or other soil protection measures, such as mats, bridges, woody fill should be used to minimize the effects of soil compaction, rutting and puddling during activities when saturated or wet soil conditions cannot be avoided. Indicators that may signal caution include the following:

    - The water table is within 18 inches of the surface;
    - Difficulty in walking across the site without compacting, seeing, or hearing surface or groundwaters under foot;
    - The presence of wetland indicator plant species, hydric soils and/or saturated or flooded hydrologic conditions during activity; and
    - Events which flood or saturate soils.

- G9 – Skid trails, log landings, and log ramps should not be located on wet sites, except where necessary. They should be designated only by a forest officer using the following criteria:

    - Locate permanent log landings on elevated terrain generally at 0.5-mile intervals;

  - Construct log ramps on the best drained sites to facilitate access to log landings from system roads; and
  - The number of log landings will be the minimum needed to harvest any area.

- G31 – Stumps, standing snags, and den trees should be retained during vegetation management activities. Exceptions may be made where necessary to control insects or disease outbreaks or to provide public and employee safety

- G32 – Unpaved system roads should be considered for seasonal to permanent closure to conserve at-risk wildlife species sensitive to road use.

- G34 – Within Swallowed-tail kite habitat, clumps of canopy trees should be retained during timber harvest treatments to provide for current and/or future nesting/roosting needs. Swallowed-tail kite nest trees should be protected from high-intensity prescribed fire by implementing protection measures such as raking leaves and woody debris from around the nest tree.

- G35 – Guidelines and recovery objectives in the most up-to-date recovery plan should be implemented for all federally listed species, when available and feasible. If site-specific conditions preclude implementing recovery tasks, consult with the USFWS field office using the appropriate consultation tool. Collaborate with USFWS in the conservation of at-risk species.

The adherence to these USFS (2017) standards and guidelines, in combination with the mitigation measures provided in Table 2.5-1, would avoid or minimize impacts to the degree that they would be low- to moderate-intensity and not likely adversely affect populations over the long term. Therefore, the Proposed Action is consistent with the FMNF Revised Land Management Plan (USFS 2017) by maintaining ecological conditions that support viable populations of FMNF SCC associated with forested wetlands.

Mesic to Wet Pine Savanna Associates—This group of special-status species occurs within Wet Pine Savannas and Flatwoods ecosystems, which provides habitat for 26 FMNF SCC or state-listed species potentially occurring in the Project vicinity. This includes the federally threatened frosted flatwoods salamander and endangered RCW. One mesic to wet pine savanna associate was observed during field surveys of NFS lands, including:

- RCW

Project effects on RCWs are discussed above under *Federally Listed Threatened and Endangered Species.*

A 600-foot-wide corridor for the Proposed Action encompasses approximately 824 acres of Wet Pine Savannas and Flatwoods ecosystems and approximately 69 percent (566 acres) of those ecosystems within the corridor would occur on NFS lands (Table 3.3-10). At a finer scale, Table 3.3-6 shows that a preliminary 75-foot ROW for the Jamestown corridor would traverse approximately 104 acres of Wet Pine Savannas and Flatwoods that may be suitable for these species.

Table 3.3-13 shows 29 additional FMNF SCC or state-listed species that the Proposed Action could affect, based on SCDNR (2018a, 2024b) Heritage Trust Program and USFS (2018c) records in the Project vicinity.

Table 3.3-13. FMNF SCC and State-Listed Species Associated with Mesic to Wet Pine Savannas

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
1	Bird	*Picoides borealis*	Red-cockaded Woodpecker	FE	SE	SCC	Highest
2	Bird	*Aimophila aestivalis*	Bachman's Sparrow	--	Species of Concern	SCC	Highest
3	Amphibian	*Ambystoma cingulatum*	Frosted Flatwoods Salamander	FT	SE	SCC	Highest
4	Amphibian	*Lithobates capito*	Carolina Gopher Frog	--	SE	SCC	Highest
5	Amphibian	*Pseudobranchus striatus*	Broad-striped Dwarf Siren	--	ST	SCC	Highest
6	Reptile	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake	--	ST	SCC	Highest
7	Vascular Plant	*Asclepias pedicillata*	Savanna Milkweed	--	--	SCC	--
8	Vascular Plant	*Agalinis aphylla*	Coastal Plain False-Foxglove	--	--	SCC	Moderate
9	Vascular Plant	*Anthaenantia rufa*	Purple Silkyscale	--	--	SCC	--
10	Vascular Plant	*Calopogon barbatus*	Bearded Grass-pink	--	--	SCC	--
11	Vascular Plant	*Calopogon multiflorus*	Many-flower Grass-pink	--	--	SCC	Moderate
12	Vascular Plant	*Carex stricta*	Tussock Sedge	--	--	SCC	Moderate
13	Vascular Plant	*Chasmanthium nitidum*	Shiny Spikegrass	--	--	SCC	High
14	Vascular Plant	*Cladium mariscoides*	Twig-rush	--	--	SCC	Moderate
15	Vascular Plant	*Eryngium aquaticum var. ravenelii*	Ravenel's Eryngium	--	--	SCC	Moderate
16	Vascular Plant	*Lachnocaulon minus*	Small's Bog Button	--	--	SCC	Moderate
17	Vascular Plant	*Ludwigia lanceolate*	Lance-leaf Seedbox	--	--	SCC	High
18	Vascular Plant	*Lysimachia hybrida*	Lance-leaf Loosestrife	--	--	SCC	Moderate
19	Vascular Plant	*Platanthera integra*	Yellow Fringeless Orchid	--	--	SCC	Moderate
20	Vascular Plant	*Rhynchospora breviseta*	Short-bristle Baldrush	--	--	SCC	Moderate
21	Vascular Plant	*Rhynchospora cephalantha var. attenuata*	Small bunched Beaksedge	--	--	SCC	--
22	Vascular Plant	*Rhynchospora oligantha*	Few-flowered Beakrush	--	--	SCC	--
23	Vascular Plant	*Rhynchospora globularis var. pinetorum*	Beakrush	--	--	SCC	Moderate
24	Vascular Plant	*Sporobolus curtisii*	Pineland Dropseed	--	--	SCC	High
25	Vascular Plant	*Sporobolus pinetorum*	Carolina Dropseed	--	--	SCC	High
26	Vascular Plant	*Xyris brevifolia*	Short-leaved Yellow-eyed Grass	--	--	SCC	Moderate
27	Vascular Plant	*Xyris flabelliformis*	Savannah Yellow-eyed Grass	--	--	SCC	Moderate
28	Vascular Plant	*Xyris stricta*	Pineland Yellow-eyed Grass	--	--	SCC	Moderate
29	Vascular Plant	*Agrimonia incisa*	Incised Groovebur	--	--	SCC	High
30	Vascular Plant	*Plapntago sparsiflora*	Pineland Plantain	--	--	SCC	High

Sources: SCDNR (2015a), USFS (2017)
[a] Federal Listing Status: FE = Federally Endangered; FT = Federally Threatened
[b] State Listing Status: SE = State Endangered; ST = State Threatened; Species of Concern = No legal protection but tracked by SCDNR Heritage Trust Program
[c] USFS Status: SCC = FMNF Species of Conservation Concern
[d] State species of greatest conservation need (SGCN) are assigned one of 3 priorities (Moderate, High, or Highest)

Rare species of amphibians and reptiles that could be affected within this ecosystem are found using seasonal isolated wetlands that are characterized by relatively open tree canopy, grass-dominated basins, and have a history of being maintained by wildfire during the growing season. Such habitat conditions are

rare, largely due to a history of fire suppression, or winter-only fire, logging, agriculture, and draining of wetlands. Short-term effects of the Project could occur during the clearing and construction of the ROW due to direct mortality. Long-term effects include the conversion of forested wetland habitat to emergent marsh.

No special-status amphibians or reptiles associated with this ecosystem were encountered during a herpetological habitat survey of NFS lands.. Tree removal within Wet Pine Savannas and Flatwoods ecosystems during construction could temporarily reduce water quality and alter hydrology due to rutting by heavy equipment, or lead to soil compaction, if conducted during wet periods. Thus, Central Electric would seek to avoid construction during wet periods and would minimize ground disturbance as much as possible within Wet Pine Savannas and Flatwoods ecosystems.

Twenty-one vascular plants listed as FMNF SCC could be impacted by the Proposed Action where the Jamestown corridor would intersect mesic to wet pine savanna ecosystems. These plants were not observed during initial floristic surveys (Gaddy 2017, 2018) and additional surveys would be necessary to confirm their absence from the Project area. Measures to avoid or minimize impacts on these at-risk plants include pre-construction surveys and mitigation measures listed in Table 2.5-1.

Of the 33 FMNF SCC species identified as potentially occurring on NFS lands within the proposed Project, 14 species are associated with Wet Pine Savannas and Flatwoods, and include:

- broad-striped dwarf siren (state threatened)
- Carolina gopher frog
- eastern diamondback rattlesnake
- coastal plain false-foxglove
- Elliott’s bluestem
- purple silkyscale
- many-flower grass-pink
- lance-leaf loosestrife
- pineland plantain
- yellow fringeless orchid
- short-bristle baldrush
- few-flowered beakrush
- Carolina dropseed short-leaved
- yellow-eyed grass

For these species, upland longleaf and loblolly pine savanna that contain relatively wide-spaced, mature trees, and a diverse herbaceous groundcover are maintained by growing season fires to promote diverse

groundcover and keep young pines and scrub oaks from establishing. Thus, the FMNF objectives and management strategies to manage habitat for these species include: apply prescribed fire on at least 30,000 acres per year to maintain or restore fire-adapted ecosystems including longleaf pine woodlands, savannas and flatwoods, Carolina bays and depression ponds, and narrow river floodplains and swamps (OBJ-ECO-2); maintain or restore upland longleaf and mesic Wet Pine Savannas and Flatwoods ecosystems and loblolly pine forest (OBJ-ECO-3); maintain, improve, or restore pond cypress savannas within Carolina bays and depressional wetlands (OBJ-ECO-4); and maintain or restore ecological conditions needed to provide stable to increasing populations for at-risk species on at least 25,000 acres per year (OBJ-SCC-3).

In addition to the mitigation measures provided above in Table 2.5-1, on NFS lands, Central Electric would adhere to USFS (2017) standards and guidelines, including but not limited to the following that are pertinent to FMNF SCC species associated with mesic to wet pine savannas include:

- S26 – No firelines, temporary roads, or log landings in population sites for at-risk plant species, except as needed to protect facilities, private property, or public safety.

- S29 – Do not issue forest product permits for collection of carnivorous plants, orchids, or at-risk plant species unless for scientific and educational purposes and approved by a forest or district biologist/botanist.

- S30 – Use only aquatically labeled herbicides and surfactants within designated critical habitat for frosted flatwoods salamander and known habitat for Carolina gopher frog.

- S34 – Require equipment cleaning practices on equipment, using equipment cleaning clauses in contracts, permits, and agreements, when moving equipment from areas infested within non-native invasive species (FSM 2903).

- S35 – No new permanent roads, trails, or recreational sites are allowed in rare plant communities and population sites for at-risk plant species.

- S36 – Use plant materials that contain genetically appropriate native plant species when maintaining and restoring vegetation. Use of non-native plants is allowed only when in compliance with USFS native plant policy (FSM 2070).

- S37 – Maintain stands meeting criteria for old growth during project planning using criteria in the Region 8 Old Growth Guidance. Consider the contribution of old growth communities to the future network of small- and medium-sized areas of old growth conditions including the full diversity of ecosystems across the landscape.

- S39 – Use low-psi ground pressure logging equipment when operating in these ecosystems and special areas: depressional wetlands, Carolina bays, pocosins, and at-risk plants population sites.

- S40 – Do not use soil active herbicides (imazapyr, imazapic) in population sites for at-risk plant species.

- S41 – Within Management Area 1, prescribe burn habitat for fire-adapted at-risk species associates and rare communities at desired seasons (growing vs. dormant) and fire return intervals for associated ecosystems.

- G8 – Low-ground pressure equipment, activity suspension or other soil protection measures, such as mats, bridges, woody fill should be used to minimize the effects of soil compaction, rutting and

puddling during activities when saturated or wet soil conditions cannot be avoided. Indicators that may signal caution include the following:

- The water table is within 18 inches of the surface;
- Difficulty in walking across the site without compacting, seeing, or hearing surface or groundwaters under foot;
- The presence of wetland indicator plant species, hydric soils and/or saturated or flooded hydrologic conditions during activity; and
- Events which flood or saturate soils.

- G9 – Skid trails, log landings, and log ramps should not be located on wet sites, except where necessary. They should be designated only by a forest officer using the following criteria:
  - Locate permanent log landings on elevated terrain generally at 0.5-mile intervals;
  - Construct log ramps on the best drained sites to facilitate access to log landings from system roads; and
  - The number of log landings will be the minimum needed to harvest any area.
- G31 – Stumps, standing snags, and den trees should be retained during vegetation management activities. Exceptions may be made where necessary to control insects or disease outbreaks or to provide public and employee safety
- G32 – Unpaved system roads should be considered for seasonal to permanent closure to conserve at-risk wildlife species sensitive to road use.
- G35 – Guidelines and recovery objectives in the most up-to-date recovery plan should be implemented for all federally listed species, when available and feasible. If site-specific conditions preclude implementing recovery tasks, consult with the USFWS field office using the appropriate consultation tool. Collaborate with USFWS in the conservation of at-risk species.
- G40 – Encourage use of weed-free materials to limit the introduction and spread of non-native invasive plant species.
- G41 – Commercially purchased seed mixes should be tested by a certified seed laboratory for purity, viability, and non-native invasive plant seed.

The adherence to the USFS (2017) standards and guidelines, in combination with the mitigation measures provided in Table 2.5-1, would avoid or minimize impacts to the degree that they would be low- to moderate-intensity and would not likely adversely affect populations in mesic to wet pine savannas over the long term. Therefore, the Proposed Action is consistent with the FMNF Revised Land Management Plan (USFS 2017) by maintaining ecological conditions that support viable populations of FMNF SCC associated with mesic to wet pine savannas.

Pond Cypress Savanna Associates—Suitable habitat for most species associated with pond cypress savannas is maintained where there is open canopy and abundant herbaceous groundcover due to periodic disturbance. These species are threatened by the lack of frequent prescribed fire, succession by woody

species, and in some cases, illegal ATV use (USFS 2013b). SCDNR lists pond cypress savannas as noteworthy plant communities. Although these areas dry out during low rainfall periods, they provide crucial habitat to numerous amphibians and reptiles, and provide high-quality foraging and roosting habitat for bats. In addition, depressional wetlands and Carolina bays provide suitable habitat for populations of the federally listed as endangered pondberry and Canby's dropwort, discussed above under *Federally Listed Threatened and Endangered Species*.

A 600-foot-wide corridor for the Proposed Action would encompass approximately 60 acres of depressional wetlands and Carolina bays, and approximately 29 percent (17 acres) of those ecosystems within the corridor would occur on NFS lands (Table 3.3-10). At a finer scale, approximately 6 acres of Depressional Wetlands and Carolina Bays occur within a preliminary 75-foot ROW (Table 3.3-6), suggesting the general area of affected habitat that may be suitable to pond cypress savanna associates.

The pond cypress savanna associates found during field surveys of the proposed Project include:

- Spotted turtle
- Elliott's bluestem

Table 3.3-14 shows 19 additional FMNF SCC or state-listed species that the Proposed Action could affect, based on SCDNR (2018a, 2024b) Heritage Trust Program and USFS (2018c) records in the Project vicinity.

Table 3.3-14. FMNF SCC and State-Listed Species Associated With Pond Cypress Savannas

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
1	Amphibian	*Ambystoma cingulatum*	Frosted Flatwoods salamander	FT	SE	SCC	Highest
2	Amphibian	*Lithobates capito*	Carolina Gopher frog	--	SE	SCC	Highest
3	Amphibian	*Pseudobranchus striatus*	Broad-striped Dwarf Siren	--	ST	SCC	Highest
4	Amphibian	*Ambystoma tigrinum*	Eastern Tiger Salamander	--	Species of Concern	--	Highest
5	Reptile	*Nerodia floridana*	Florida Green Watersnake	--	Species of Concern	--	Highest
6	Reptile	*Clemmys guttata*	Spotted Turtle	--	ST	SCC	High
7	Bird	*Setophaga virens waynei*	Black-throated Green Warbler (Wayne's)	--	Species of Concern	--t	Highest
8	Vascular Plant	*Andropogon gyrans var. stenophyllus*	Elliott's Bluestem	--	--	SCC	Moderate
9	Vascular Plant	*Anthaenantia rufa*	Purple Silkyscale	--	--	SCC	--
10	Vascular Plant	*Burmannia biflora*	Northern Burmannia	--	--	SCC	--
11	Vascular Plant	*Helenium pinnatifidum*	Southeastern Sneezeweed	--	--	SCC	--
12	Vascular Plant	*Lindera melissifolia*	Pondberry	FE		SCC	Highest
13	Vascular Plant	*Lobelia boykinii*	Boykin's Lobelia	--	--	SCC	Moderate
14	Vascular Plant	*Myriophyllum laxum*	Piedmont Water-Milfoil	--	--	SCC	High
15	Vascular Plant	*Oxypolis canbyi*	Canby's Dropwort	FE		SCC	Highest
16	Vascular Plant	*Rhynchospora harperi*	Harper Beakrush	--	--	SCC	Moderate
17	Vascular Plant	*Rhynchospora pleiantha*	Brown Beakrush	--	--	SCC	High
18	Vascular Plant	*Rhynchospora scirpoides*	Long-beaked Beaksedge	--	--	SCC	Moderate
19	Vascular Plant	*Spiranthes laciniata*	Lace-lip Ladies'-Tresses	--	--	SCC	Moderate

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
20	Vascular Plant	*Utricularia macrorhiza*	Greater Bladderwort	--	--	SCC	--
21	Vascular Plant	*Xyris difformis var. floridana*	Florida yellow-eyed Grass	--	--	SCC	--

Sources: SCDNR (2015a), USFS (2017)
[a] Federal Listing Status: FE = Federally Endangered; FT = Federally Threatened
[b] State Listing Status: SE = State Endangered; ST = State Threatened; Species of Concern = No legal protection but tracked by SCDNR Heritage Trust Program
[c] USFS Status: SCC = FMNF Species of Conservation Concern
[d] State species of greatest conservation need (SGCN) are assigned one of 3 priorities (Moderate, High, or Highest)

The construction of the Project could directly affect individuals of FMNF SCC and state-listed species, listed in Table 3.3-14, via timber harvest and the use of heavy equipment. The clearing of a ROW for the Project would open the forest, allowing these habitats to become more productive and potentially benefit amphibian and reptiles. Impact avoidance and minimization measures would be implemented (see Section 2.5), which include storing construction equipment, fuels, chemicals, and materials outside of wetlands, and using construction mats over wetland areas to avoid vehicle rutting and minimize soil compaction. Project O&M could negatively affect individuals through mechanical removal of vegetation and herbicide application (not on NFS lands) to control non-native invasive plants. However, Central Electric would implement measures to minimize any adverse effects, and the maintenance of an open ROW would benefit pond cypress savanna associates by maintaining an open canopy and reducing woody shrubs and small trees.

Of the 33 FMNF SCC species identified as potentially occurring on NFS lands within the proposed Project, 7 species are associated with depressional wetlands and Carolina bays, and include:

- broad-striped dwarf siren
- Carolina gopher frog
- spotted turtle
- Elliott's bluestem
- northern burmannia
- southern sneezeweed
- Boykin's lobelia
- harper beakrush
- brown beakrush
- Long-beaked beaksedge
- Florida yellow-eyed grass

In addition to the mitigation measures provided above in Table 2.5-1, on NFS lands, Central Electric would adhere to USFS (2017) standards and guidelines, including but not limited to the following that are pertinent to FMNF SCC species associated with Pond Cypress Savannas:

- S26 – No firelines, temporary roads, or log landings in population sites for at-risk plant species, except as needed to protect facilities, private property, or public safety.

- S30 – Use only aquatically labeled herbicides and surfactants within designated critical habitat for frosted flatwoods salamander and known habitat for Carolina gopher frog.

- S34 – Require equipment cleaning practices on equipment, using equipment cleaning clauses in contracts, permits, and agreements, when moving equipment from areas infested with non-native invasive plants (FSM 2903).

- S35 – No new permanent roads, trails, or recreational sites are allowed in rare plant communities and population sites for at-risk plant species.

- S36 – Use plant materials that contain genetically appropriate native plant species when maintaining and restoring vegetation. Use of non-native plants is allowed only when in compliance with USFS native plant policy (FSM 2070).

- S37 – Maintain stands meeting criteria for old growth during project planning using the criteria in the Region 8 Old Growth Guidance. Consider the contribution of old growth communities to the future network of small- and medium-sized areas of old growth conditions including the full diversity of ecosystems across the landscape.

- S39 – Use low-psi ground pressure logging equipment when operating in these ecosystems and special areas: depressional wetlands, Carolina bays, pocosins, and at-risk plants population sites.

- S40 – Do not use soil-active herbicides (imazapyr, imazapic) in population sites for at-risk plant species.

- S41 – Within Management Area 1, prescribe burn habitat for fire-adapted at-risk species associates and rare communities at desired seasons (growing vs. dormant) and fire return G8 – Low-ground pressure equipment, activity suspension or other soil protection measures, such as mats, bridges, woody fill should be used to minimize the effects of soil compaction, rutting and puddling during activities when saturated or wet soil conditions cannot be avoided. Indicators that may signal caution include the following:

    - The water table is within 18 inches of the surface;

    - Difficulty in walking across the site without compacting, seeing, or hearing surface or groundwaters under foot;

    - The presence of wetland indicator plant species, hydric soils and/or saturated or flooded hydrologic conditions during activity; and

    - Events which flood or saturate soils.

- G9 – Skid trails, log landings, and log ramps should not be located on wet sites, except where necessary. They should be designated only by a forest officer using the following criteria:

  - Locate permanent log landings on elevated terrain generally at 0.5-mile intervals;
  - Construct log ramps on the best drained sites to facilitate access to log landings from system roads; and
  - The number of log landings will be the minimum needed to harvest any area.

- G32 – Unpaved system roads should be considered for seasonal to permanent closure to conserve at-risk wildlife species sensitive to road use.
- G35 – Guidelines and recovery objectives in the most up-to-date recovery plan should be implemented for all federally listed species, when available and feasible. If site-specific conditions preclude implementing recovery tasks, consult with the USFWS field office using the appropriate consultation tool. Collaborate with USFWS in the conservation of at-risk species.
- G40 – Encourage use of weed-free materials to limit the introduction and spread of non-native invasive plant species.
- G41 – Commercially purchased seed mixes should be tested by a certified seed laboratory for purity, viability, and non-native invasive plant seed.

Adherence to these USFS (2017) standards and guidelines, in combination with the mitigation measures provided in Table 2.5-1, would avoid or minimize impacts to the degree that they would be low-intensity and would not likely adversely affect populations of pond cypress savanna associates. Therefore, the Proposed Action is consistent with the FMNF Land Management Plan (USFS 2017) by maintaining ecological conditions that support viable populations of FMNF SCC associated with pond cypress savanna ecosystems.

River and Stream Associates—The FMNF SCC or state species associated with rivers and streams crossed by the proposed Project that were found during field surveys include:

- wood stork
- bald eagle
- spotted turtle
- American eel

Table 3.3-15 shows an additional eight FMNF SCC or state-listed species that the Proposed Action could affect, based on SCDNR (2018a, 2024b) Heritage Trust Program and USFS (2018c) records in the Project vicinity. Project effects on wood stork, West Indian manatee, shortnose sturgeon, and Atlantic sturgeon are discussed above under *Federally Listed Threatened and Endangered Species*. Bald eagle and spotted turtle are also discussed previously in this section under *Forested Wetland Associates*.

Table 3.3-15. FMNF SCC and State-Listed Species Associated with Rivers and Streams

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
1	Bird	*Egretta caerulea*	Little Blue Heron	--	Species of Concern	SCC	Highest

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status[a]	State Listing Status[b]	USFS Status[c]	State Priority[d]
2	Bird	*Mycteria americana*	Wood Stork	FT	SE	SCC	Highest
3	Bird	*Haliaeetus leucocephalus*	Bald Eagle	--	ST	SCC	High
4	Mammal	*Trichechus manatus*	West Indian Manatee	FT	SE	SCC	Highest
5	Amphibian	*Acris crepitans*	Northern Cricket Frog	--	Species of Concern	--	Moderate
6	Reptile	*Clemmys guttata*	Spotted Turtle	--	ST	SCC	High
7	Fish	*Anguilla rostrata*	American Eel	--	--	SCC	Highest
8	Fish	*Acipenser brevirostrum*	Shortnose Sturgeon	FE	SE	SCC	Highest
9	Fish	*Acipenser oxyrinchus*	Atlantic Sturgeon	FE	SE	SCC	Highest
10	Fish	*Alosa sapidissima*	American Shad	--	Species of Concern	--	Highest
11	Fish	*Alosa aestivalus*	Blueback Herring	--	Species of Concern	--	Highest
12	Fish	*Elassoma boehlkei*	Carolina Pygmy Sunfish	--	Species of Concern	--	Highest
13	Fish	*Alosa mediocris*	Hickory Shad	--	Species of Concern	--	Highest

Sources: SCDNR (2015a), USFS (2017)
[a] Federal Listing Status: FE = Federally Endangered; FT = Federally Threatened
[b] State Listing Status: SE = State Endangered; ST = State Threatened; Species of Concern = No legal protection but tracked by SCDNR Heritage Trust Program
[c] USFS Status: SCC = FMNF Species of Conservation Concern
[d] State species of greatest conservation need (SGCN) are assigned one of 3 priorities (Moderate, High, or Highest)

The American eel is the only FMNF state-listed species found during electrofishing surveys of streams and other waterbodies on NFS lands in the Project Area. It is assumed, however, that many species were not detected, and the potential exists for other aquatic FMNF SCC or state-listed fish to occur within the Project ROW. The proposed Project would span wetlands, rivers, and streams; thus, long-term adverse effects to some species listed in Table 3.3-15 would be limited to the conversion of forested wetland habitat to emergent marsh within the proposed ROW. Construction activities could result in the direct mortality of a limited number of individual amphibians or turtles, resulting in short-term, moderate-intensity impacts. Most fish would avoid the area and only experience low-intensity impacts from increased sedimentation.

The proposed Project would not require any instream work, and measures would be implemented during construction and O&M to avoid or minimize potential impacts (see Section 2.5). Measures would include storing equipment, fuels, and chemicals outside of surface waters; placing silt fences and other appropriate prevention devices along all stream crossings; developing a stormwater pollution prevention plan prior to construction; developing a hazardous materials management and spill prevention plan and emergency response plan to deal with accidental spills; promptly cleaning up spilled material to prevent it from entering surface waters; and avoiding stockpiles of excavated materials near or on stream banks or other waterway perimeters unless protected from high water or stormwater runoff. BMPs would limit soil erosion and runoff; sedimentation; water quality changes; or contamination of water from herbicides, fuels, and other spills that could harm aquatic species. Furthermore, culverts and other drainage structures would be designed and installed so as not to inhibit fish passage or create upstream or downstream habitat changes. Effects related to installation of water crossing structures would be short-term and low-intensity. To avoid or minimize adverse impacts, Central Electric would establish a 30-foot natural buffer area adjacent to all intermittent and perennial streams and at all jurisdictional waters. On NFS Lands, Central Electric would also comply with the USFS (2017) standards for riparian management zones (e.g., measure S22) and other applicable FMNF standards and guidelines. Appropriate sediment and erosion control measures would be established at streambank boundaries. Therefore, the Proposed Action would be consistent with the FMNF

Revised Land Management Plan (USFS 2017) by maintaining ecological conditions that support viable populations of FMNF SCC associated with river and stream ecosystems.

Aquatic Wildlife

Construction-related effects on fish and other aquatic species would be limited because the Project would span all streams and, where feasible, wetlands and riparian areas. Central Electric also plans to use existing access roads, which would limit the need for temporary culverts in streams. Measures would be implemented during Project construction and O&M activities to prevent soil erosion and runoff; sedimentation; water quality changes; and contamination of water from herbicides, fuels, and other spills that could harm aquatic species (see Section 2.5). If necessary, temporary low-water crossings or culverts would be installed at ditches, streams, or other watercourses to provide access to the ROW for construction vehicles. Installation of low-water crossings or culverts may require a permit from USACE and/or the state of South Carolina. Central Electric would coordinate with these entities before installing low-water crossings or culverts regarding permitting requirements and construction conditions. Structures would be designed and installed so as not to inhibit fish passage or create upstream or downstream habitat changes. Because improperly installed culverts are a major source of aquatic habitat fragmentation, Central Electric would use open-bottom or arch culverts, where feasible, to maintain hydrologic connectivity over waterways. Effects related to installation of water crossing structures would be short-term and low-intensity. To avoid or minimize adverse impacts, wetland areas would be identified and marked prior to construction along the ROW.

Central Electric would establish an upland buffer area adjacent to all intermittent and perennial streams and at all jurisdictional wetlands. Wetland clearing methods would be used in these buffer areas to minimize any upland soils transport into wetlands. Appropriate sediment and erosion control measures would be established at streambank boundaries. As described above for river and stream associates, the Project would adhere to strict erosion control standards, resulting in short-term, low-intensity impacts on aquatic wildlife.

3.3.2.3 Jamestown Alternative

Vegetation

The Jamestown Alternative would traverse approximately 26.1 miles, affecting approximately 12 percent more area than the Proposed Action (23.3 miles). A preliminary 75-foot ROW would encompass approximately 238 acres. Similar to the Proposed Action, over 95 percent of a preliminary 75-foot ROW would traverse forested ecosystems, including includes Upland Longleaf and Loblolly Pine Forests (28 percent), Wet Pine Savannas and Flatwoods (50 percent), and Forested Swamps and Floodplain Forests (18 percent) (Table 3.3-6). The proportions of ecosystems that would be impacted by the Jamestown Alternative would be similar to the Proposed Action. The Jamestown Alternative would also parallel roads and/or other transmission lines for the majority of its length, thereby minimizing the ecological effects of fragmentation.

The Jamestown Alternative would cause slightly greater permanent impacts than the Proposed Action due to a greater number of transmission poles required. Assuming 10 to 12 transmission line poles per mile, the Jamestown Alternative would require from 261 to 314 poles. With a 6-foot diameter per structure, total permanent impacts from monopoles would be approximately 0.17 to 0.20 acres. Temporary impacts from construction pads during pole installation would total 2.39 to 2.88 acres. In total, the Jamestown Alternative would have moderate impacts on vegetation, and not measurably greater than the Proposed Action.

Wildlife, Including Neotropical Birds

The Jamestown Alternative would have low-intensity impacts on wildlife similar to the Proposed Action, but would impact approximately 12 percent more habitat. Time of year restrictions to protect bats during

the pup season (May 1 to July 15) would minimize potential disturbance during much of breeding season for birds and other wildlife. Central Electric would make every effort to also avoid tree removal during April to further protect bats. The additional 2.8 miles would result in slightly greater collision risk for birds but impacts would be avoided by following APLIC guidelines for Project design (measure BR-7) and performing surveys for bird nests if tree clearing is performed during the migratory bird nesting season (measure BR-6).

Federally Listed Threatened and Endangered Species

Red-cockaded Woodpecker—The Jamestown Alternative would have greater potential impacts to RCWs than the Proposed Action. Approximately 61% (144.5 acres) of the ROW would be located within one of 31 RCW foraging partition (Table 3.3-9). Twelve RCW clusters would have one or more cavity tree located within 200 feet of a 75-foot ROW, totaling 88 cavity trees. Up to 12 RCW cavity trees could potentially require removal—within a preliminary 75-foot ROW—under the Jamestown Alternative. Cluster 161A could be impacted because it has very few potential cavity trees and low forage availability (Wildlife Investigations, LLC. 2018). As under the proposed action, Central Electric would provide compensatory mitigation, if necessary, and impacts would be avoided by a restricting construction activities within a 200-foot buffer around RCW cavity trees during the RCW nesting season (April 1 through July 31) (measure BR-15), as well as time of year restrictions for bats. This measure would protect the 49 cavity trees that occur within 200 feet of a preliminary 75-foot ROW, and would cover 9.8 acres, or 4.6 percent of the 212-acre ROW.[8] Central Electric would further avoid impacts to RCW through the proposed time of year restrictions for tree clearing to protect bats during winter torpor (December 15 to February 15) and the pup season (May 1 to July 15).

Wood stork—The potential impacts on wood storks under the Jamestown Alternative would be similar to the Proposed Action due to the similarity of affected habitats and the proximity of surrounding rookeries. Because the species could potentially occur in the Project ROW, the Jamestown Alternative would be expected to have moderate-intensity impacts to the wood stork. Central Electric would reduce impacts by implementing the same measures as described for the Proposed Action and listed in Table 2.5-1.

Bats—Based on the findings from initial bat surveys, the impacts to northern long-eared bat under the Jamestown Alternative are anticipated to be the same as under the Proposed Action, which would be high-intensity and short-term. Similarly, in the absence of detailed survey data, impacts to the tricolored bat are assumed to be high-intensity. As under the Proposed Action, impacts to active roosts would be avoided by restricting tree removal during winter torpor and the pup season.

Frosted Flatwoods Salamander—The extent of habitat suitable for frosted flatwoods salamander, and the species' very low likelihood of occurrence within the proposed corridor for the Jamestown Alternative, is similar to that of the Jamestown Alternative. Thus, the potential for impacts to frosted flatwoods salamander under the Jamestown Alternative would be the same as under the Proposed Action, which would be low-intensity in the short and long term.

Monarch Butterfly—The potential impacts on Monarch butterflies under the Jamestown Alternative would be similar to the Proposed Action due to the similarity of affected habitats and the known occurrence of suitable habitat for adults and larvae. Impacts are anticipated to be limited to behavioral avoidance of construction activity.

Federally Listed Plants—As under the Proposed Action, the Jamestown Alternative would contain suitable habitat for pondberry, American Chaffseed, and Canby's Dropwort, and Golden Sedge. Due to the lack of

[8] 200 feet is the buffer distance that USFWS (2003) specifies to protect cavity trees.

known occurrences and Central Electric's commitment to pre-construction surveys if suitable habitats cannot be avoided, the Jamestown Alternative would have no impacts or low-intensity impacts to federally listed plants.

FMNF Species of Conservation Concern and State-Listed Species

The Jamestown Alternative would impact FMNF SCC and state-listed species similar to the Proposed Action, but would impact approximately 12 percent more habitat. The acreage of ecosystems and abundance of species potentially affected impacted by the Jamestown Alternative would be very similar to the Proposed Action. Central Electric would adhere to USFS (2017) standards and guidelines, along with the mitigation measures in Table 2.5-1, which would avoid and minimize impacts to the degree that they would be low- to moderate-intensity and not likely adversely affect populations over the long term. With respect to FMNF SCC, the Jamestown Alternative would be consistent with the FMNF Land Management Plan (USFS 2017).

Aquatic Wildlife

The Jamestown Alternative would have similar potential impacts on fish and other aquatic biota as the Proposed Action as the same streams and waterbodies would be crossed and a similar acreage of wetlands could be affected.

3.3.2.4 Charity Alternative

Vegetation

The Charity Alternative would traverse approximately 31.1 miles, affecting approximately 33 percent more area than the Proposed Action Alternative (23.3 miles). A preliminary 75-foot ROW for the Charity Alternative would encompass 283 acres (Table 3.3-6). The proportions of ecosystems that would be impacted by the Charity Alternative would be similar to the Proposed Action and Charity Alternative, although a substantially greater proportion of wetland vegetation would be affected. Also, similar to the Proposed Action, the Charity Alternative would parallel roads and/or other transmission lines for greater than 90 percent of its length, of which approximately 58 percent (20.9 miles) would follow the Winyah-Charity 230-kV transmission line and Carolina Gas pipeline ROW, thereby minimizing the ecological effects of fragmentation (Table 3.3-8).

The Charity Alternative would cause greater permanent impacts than the Proposed Action due to a greater number of transmission poles required. Assuming 10 to 12 transmission line poles per mile, the Charity Alternative would require from 311 to 374 poles. With a 6-foot diameter per structure, total permanent impacts from monopoles would be approximately 0.20 to 0.24 acres. Temporary impacts from construction pads during pole installation would total 2.86 to 3.43 acres. In total, the Jamestown Charity would have moderate impacts on vegetation, and not measurably greater than the Proposed Action.

Wildlife, Including Neotropical Birds

The Charity Alternative would also have similar potential effects on wildlife and birds as the Proposed Action, but as described above, would impact approximately 34 percent more habitat. Of the 31.1 miles of new transmission line, 20.9 miles would be collocated with the existing utility ROW. This would minimize habitat disturbance and fragmentation. The lines would be at similar height and below the tree line, reducing collision risk for birds (APLIC 2012). In total, the collision risk to raptors and other large birds under the Charity Alternative would be low low-intensity impact.

Federally Listed Threatened and Endangered Species

Red-cockaded Woodpecker—As under the Proposed Action, the Charity Alternative would intersect habitat known to be used by the RCW, wood stork, northern long-eared bat, tricolored bat, and monarch butterfly, and provides potentially suitable habitat for five additional federally listed species (the frosted flatwoods salamander, pondberry, American chaffseed, and Canby's dropwort, and golden sedge).

The Charity Alternative would have similar impacts to RCWs as the Proposed Action. Based on RCW data tracked by USFS (2018d) and SCDNR (2018a) Heritage Trust Program, the Charity Alternative would intersect potential foraging range of slightly more cluster centers than the Proposed Action and Jamestown Alternative, and cross a greater length of RCW cluster partitions (0.5–mile buffer of cluster center points) (Table 3.3-9). However, a 600-foot-wide corridor intersects cavity trees from one fewer cluster and approximately 20 percent fewer cavity trees than for the Jamestown Alternative.

Field surveys by Wildlife Investigations, LLC (2018) found that the preliminary ROW of the Charity Alternative could impact 15 of 16 surveyed RCW clusters within the Charity ROW on NFS lands by removal of cavity trees, potential cavity trees, and/or foraging habitat). Four of those clusters would be within the shared corridor for the Proposed Action and alternatives (157D, 168B, 159E, and 162C) (Table 3.3-10). Wildlife Investigations, LLC. (2018) concluded that three of the clusters could be significantly impacted in the future due to low forage and few potential cavity trees (174A, 174B, and 161E), but impacts could be minimized by placing the ROW on the opposite side of the road from the cavity trees. As under the Proposed Action, the final ROW would avoid RCW clusters to the maximum extent practicable and Central Electric would avoid ROW clearing and construction activities within a 200-foot radius of cluster trees during the nesting season (April through July). Central Electric would also coordinate with RUS, USFWS, and FMNF on NFS lands, to mitigate adverse effects to the species. Therefore, while the Charity Alternative would have moderate-intensity impacts to the RCW, impacts to the species on NFS lands would comply with the USFS (2017) standards and guidelines.

Wood Stork—The potential impacts on wood storks under the Charity Alternative would be similar to the Proposed Action due to the similarity of affected habitats and the proximity of surrounding rookeries. Because the species could potentially occur in the Project ROW, the Charity Alternative would be expected to have moderate-intensity impacts to the wood stork. Central Electric would reduce impacts by implementing the same measures as described for the Proposed Action and listed in Table 2.5-1.

Bats—Based on the findings from initial bat surveys, the impacts to northern long-eared bat under the Charity Alternative are anticipated to be the same as under the Proposed Action, which would be high-intensity and short-term. Similarly, in the absence of detailed survey data, impacts to the tricolored bat are assumed to be high-intensity. As under the Proposed Action, impacts to active roosts would be avoided by restricting tree removal during winter torpor and the pup season.

Frosted Flatwoods Salamander—The extent of habitat suitable for frosted flatwoods salamander, and the species' very low likelihood of occurrence within the proposed corridor for the Charity Alternative, is similar to that of the Proposed Action. Thus, the potential for impacts to frosted flatwoods salamander under the Charity Alternative would be the same as under the Proposed Action, which would be low-intensity in the short and long term.

Monarch Butterfly—The potential impacts on Monarch butterflies under the Charity Alternative would be similar to the Proposed Action due to the similarity of affected habitats and the known occurrence of suitable habitat for adults and larvae. Impacts are anticipated to be limited to behavioral avoidance of construction activity.

Federally Listed Plants—As under the Proposed Action, the Charity Alternative would contain suitable habitat for pondberry, American Chaffseed, and Canby's Dropwort, and Golden Sedge. The closest known federally listed plant is an American chaffseed population nearly 2,300 feet from the proposed corridor for the Charity Alternative. No occurrences were documented during floristic inventories of the corridor by Gaddy (2018). Due to the lack of known occurrences and Central Electric's commitment to pre-construction surveys if suitable habitats cannot be avoided, the Charity Alternative would have no impacts or low-intensity impacts to federally listed plants.

FMNF Species of Conservation Concern and State-Listed Species

Impacts to FMNF SCC under the Charity Alternative would be similar to those described under the Proposed Action. Table 3.3-6 shows the acreage of ecosystems within a preliminary 75-foot ROW, which provides a high-level assessment of potentially impacted habitat for FMNF SCC and State-Listed species groups. Most notably, the Charity Alternative would potentially impact approximately 20 more acres of Forested Swamps and Floodplain forest. It would also cross the greatest number of rivers and streams, as identified by the National Hydrography Dataset (Table 3.2-1). Therefore, the Charity Alternative would have greater adverse effects on forested wetland associates than the Proposed Action, which include the American swallow-tailed kite, bald eagle, wood stork, southeastern bat, spotted turtle, and Okefenokee zale moth. Relative to the Proposed Action, a preliminary 75-foot ROW for the Charity Alternative would also potentially impact 14 additional acres of habitat suitable for pond cypress savanna associates, such as spotted turtle, broad-striped dwarf siren, and Carolina gopher frog.

The Charity Alternative could potentially affect a small acreage of Oak Forests and Mesic Hardwood Forest, which would not be impacted by the Proposed Action or Jamestown Alternative (Tables 3.3-6 and 3.3-10). This ecosystem support several associated species.

Calcareous Mesic Hardwood Associates—Several at-risk plants are associated with high-calcium soils that support mesic slope forests and river floodplain forests. Table 3.3-17 lists nine vascular plants that could be potentially affected by the Project based on SCDNR (2018a, 2024b) Heritage Trust Program and USFS (2018c) records in the Project vicinity. During field surveys on NFS lands, Gaddy (2017, 2018) found no occurrences of these plants.

Table 3.3-16. FMNF SCC and State-Listed Species Associated With Calcareous Mesic Hardwoods

#	Taxonomic Group	Scientific Name	Common Name	Federal Listing Status	State Listing Status	USFS Status[a]	State Priority[b]
1	Vascular Plant	*Asplenium resiliens*	Black-stem Spleenwort	--	--	SCC	Moderate
2	Vascular Plant	*Carex basiantha*	Widow Sedge	--	--	SCC	No
3	Vascular Plant	*Carex granularis*	Meadow Sedge	--	--	SCC	No
4	Vascular Plant	*Carya myristiciformis*	Nutmeg Hickory	--	--	SCC	No
5	Vascular Plant	*Listera australis*	Southern Twayblade	--	--	SCC	No
6	Vascular Plant	*Matelea flavidula*	Yellow Carolina Spinypod	--	--	SCC	No
7	Vascular Plant	*Tridens chapmanii*	Chapman's Redtop	--	--	SCC	No
8	Vascular Plant	*Triphora trianthophora*	Threebirds Orchid	--	--	SCC	Moderate
9	Vascular Plant	*Matelea flavidula*	Yellow Carolina Milkvine	--	--	SCC	No

Sources: SCDNR (2015a), USFS (2017)
[a] USFS Status: SCC = FMNF Species of Conservation Concern
[b] State species of greatest conservation need (SGCN) are assigned one of 3 priorities (Moderate, High, or Highest)

Of the 33 FMNF SCC species identified as potentially occurring on NFS lands within the proposed Project, 1 species is associated with Oak and Mesic Hardwood Forest:

- shadow-witch orchid

In addition to the mitigation measures provided above in Table 2.5-1, on NFS lands, Central Electric would adhere to the USFS (2017) standards and guidelines, including but not limited to the following that are pertinent to FMNF SCC species associated with calcareous mesic hardwood forests:

- S26 – No firelines, temporary roads, or log landings in population sites for at-risk plant species, except as needed to protect facilities, private property, or public safety.

- S29 – Do not issue forest product permits for collection of carnivorous plants, orchids, or at-risk plant species unless for scientific and educational purposes and approved by a forest or district biologist/botanist.

- S34 – Require equipment cleaning practices on equipment, using equipment cleaning clauses in contracts, permits, and agreements, when moving equipment from areas infested with non-native invasive plants (FSM 2903).

- S35 – No new permanent roads, trails, or recreational sites are allowed in rare plant communities and population sites for at-risk plant species.

- S36 – Use plant materials that contain genetically appropriate native plant species when maintaining and restoring vegetation. Use of non-native plants is allowed only when in compliance with USFS native plant policy (FSM 2070).

- S37 – Maintain stands meeting criteria for old growth during project planning using criteria in the Region 8 Old Growth Guidance. Consider the contribution of old growth communities to the future network of small- and medium-sized areas of old growth conditions including the full diversity of ecosystems across the landscape.

- S39 – Use low-psi ground pressure logging equipment when operating in these ecosystems and special areas: depressional wetlands, Carolina bays, pocosins, and at-risk plants population sites.

- S40 – Do not use soil-active herbicides (imazapyr, imazapic) in population sites for at-risk plant species.

- S41 – Within Management Area 1, prescribe burn habitat for fire-adapted at-risk species associates and rare communities at desired seasons (growing vs. dormant) and fire return intervals for associated ecosystems.

- G40 – Encourage use of weed-free materials to limit the introduction and spread of non-native invasive plant species.

- G41 – Commercially purchased seed mixes should be tested by a certified seed laboratory for purity, viability, and non-native invasive plant seed.

Application of these USFS (2017) standards and guidelines, in combination with the mitigation measures provided in Table 2.5-1, would avoid or minimize impacts to the degree that they would be low-intensity and would not likely adversely affect populations of calcareous mesic hardwood associates. Therefore, the Charity Alternative would be consistent with the FMNF Land Management Plan (USFS 2017) by maintaining ecological conditions that support viable populations of FMNF SCC associated with calcareous mesic hardwood ecosystems.

Aquatic Wildlife

The Charity Alternative would have similar potential impacts on fish and other aquatic biota as the Proposed Action. However, the potential for harm to aquatic species from any sedimentation or contamination due to runoff, herbicides, fuels, and other spills would be greater because more than twice as many streams and waterbodies would be crossed and the length of waterbodies crossed would be more than twice as long as the Jamestown Alternative.

3.4 Soils and Geology

3.4.1 Affected Environment Geology

The proposed Project is located entirely in the Coastal Plain physiographic province of the Atlantic Plain division. The Coastal Plain, which is the flattest of all of the physiographic provinces in the U.S., is divided into the Upper and Lower Coastal Plain; however, the entire Project area is located in the Lower Coastal Plain.

3.4.1.1 Coastal Plain

The Lower Coastal Plain is characterized by low, flat topography with much less relief than the Upper Coastal Plain; this characterization of topography is reflected in the nearly level slopes within the Project area (USDA-NRCS 2010a, 2011).

The Coastal Plain is underlain by material from three geologic periods: Cretaceous (65 to 144 million years ago), Tertiary (1.8 to 65 million years ago), and Quaternary (present to 1.8 million years ago) (McReynolds 2008). Although material from the Cretaceous and Tertiary periods has been carried by rivers to the Project area, the dominant geology consists of Quaternary aged material (SCDNR 2024c).

3.4.1.2 Topography

Topography is the physical features of a landscape, such as mountains and valleys, the steepness of slopes, and the shapes of landforms (Chernicoff and Whitney 2002). South Carolina is divided into two major regions: the upcountry, which lies within the Piedmont Plateau, and the Low Country, which forms part of the Atlantic Coastal Plain. The Piedmont region is characterized by rolling hills and elevations ranging from 400 to 1,200 feet above sea level. The border between these two regions, which is called the "Fall line," indicates where the upland rivers drain to the Atlantic Coastal Plain (Netstate 2016).

The Atlantic Coastal Plain region accounts for two-thirds of South Carolina. Land in this region rises gradually from the southeast to the northwest. The Lower Coastal Plain extends about 70 miles inland and is considerably flat; the Project area is located entirely within the Lower Coastal Plain. Topography within the Project area is very low and extremely flat. Elevations range from 0 foot to approximately 95 feet above mean sea level. The highest elevations occur in the forested hills near Jamestown in the northwestern portion of the Project area and in the uplands on either side of the Santee River. The lowest elevations occur in the floodplains of the North Santee and South Santee Rivers (USGS 2018).

3.4.1.3 Soils

Soil is the top layer of the earth's surface, consisting of rock and mineral particles mixed with organic matter. Soil contains both mineral and organic material (typically decaying vegetation) along with water and air. A soil's parent material and climate are factors important in determining the nature of the soil. A soil's parent material is the bedrock or sediment from which the soil develops. An area's climate—the

amount of precipitation it receives and its prevailing temperature—controls the rate of chemical weathering (i.e., erosion) and consequently the rate of soil formation (Chernicoff and Whitney 2002). Topography and vegetation are also factors important to determining the nature of soil.

Composition and texture are soil properties used to determine bearing capacity (a soil's resistance to penetration from a weighted object), internal drainage, erodibility, and slope stability. Composition refers to materials that make up soil, with four constituents: mineral particles, organic matter, water, and air. Texture is used to describe the composite sizes of particles in a soil sample (Marsh 2005).

Major Soil Types

More than 70 different soil map units are crossed by the Project area. Most of these soil types comprise less than or equal to 5 percent of the total length of the proposed transmission line. Soils were assessed for their erodibility, hydric status, and whether they are considered prime farmland or farmland of statewide importance. Predominant soil types (those soils that represent more than 5 percent of the total length) are described below and include: Chipley loamy fine sand, Lakeland sand, Levy silty clay loam, Rutlege loamy fine sand, Cainhoy fine sand, and Seewee complex.

Chipley Loamy Fine Sand (Cm)—Soils in the Chipley loamy fine sand map unit formed in thick deposits of sandy marine sediments. This map unit consists of deep, moderately well drained, very rapid or rapidly permeable soils on uplands in the lower Coastal Plain. It occurs in areas where the slope ranges from 0 to 8 percent. These soils are moderately well drained, with very rapid or rapid permeability and slow runoff potentials. Natural vegetation consists of slash pine, longleaf pine, blackjack oak, turkey oak, post oak, several bluestem species, low panicums, and purple lovegrass. Major uses include cropland, pasture, and hay (USDA-NRCS 2007).

Lakeland Sand (LaB)—Soils in the Lakeland sand map unit formed in thick beds of eolian or marine sands, and its parent material consists of alluvium sediment. The map unit tends to occur in areas with a slope of 0 to 6 percent. It is well drained and has a rapid/very rapid permeability rate. The associated natural vegetation includes blackjack oak, turkey oak, post oak; scattered long leaf pine; and an understory of creeping bluestem, sandy bluestem, lopsided indiangrass, hairy panicum, fringeleaf paspalum, and native annual forbs. Peanuts, watermelons, peaches, corn, and tobacco are grown in this soil type. Areas with Lakeland series are also used for improved pasture (USDA-NRCS 2013a).

Levy Silty Clay Loam (19)—Soils in the Levy silty clay loam map unit formed in marshes and shallow floodplains. Its parent material consists of fluvial sediments. It tends to occur in areas with a slope between 0 and 2 percent. Soils in this map unit are very poorly drained, have slow permeability, and negligible surface runoff rates. The dominant vegetation associated with this soil includes water tupelo, sweetgum, and bald cypress (USDA-NRCS 2003a).

Rutlege Loamy Fine Sand (Rg)—Soils in the Rutlege fine loamy sand map unit formed in upland flats or depressions and floodplains, and its parent material consists of marine or fluvial sediments. These soils tend to occur in areas with a slope between 0 and 2 percent. Soils in this map unit are very poorly drained, have rapid permeability, and negligible surface runoff rate. The natural vegetation associated with this soil includes blackgum, Carolina ash, red maple, sweetbay, tulip poplar, water oak, pin oak, pond pine, slash pine, and loblolly pine. The understory vegetation includes huckleberry, wax myrtle, greenbriar, grasses, and sedges. Some ponded areas consist entirely of grasses and sedges. Corn, soybeans, blueberries, and hay are cultivated in areas where this soil occurs (USDA-NRCS 1999, 2003b).

Cainhoy Fine Sand (CaB)—Soils in the Cainhoy fine sand map unit formed in sandy marine sediments. These soils tend to occur on nearly level to sloping landscapes in the Lower Coastal Plain in areas with slopes between 0 and 10 percent. Soils in this map unit are very deep, excessively drained, have rapid

permeability, and slow surface runoff. Native vegetation is longleaf pine, live oak, post oak, white oak, bluejack oak, turkey oak, persimmon, and southern red oak. A small acreage is cleared and is used for growing soybeans, corn, small grain, and pasture grasses (USDA-NRCS 1999).

Seewee Complex (Sm)—Soils in the Seewee complex map unit formed in sandy marine sediments. These soils tend to occur on level or nearly level broad ridges and flats at elevations of 5 to 25 feet above sea level along the Atlantic Coast in areas with a slope between 0 and 2 percent. Soils in this map unit are somewhat poorly drained, have moderately rapid permeability, and a slow surface runoff rate. The natural vegetation associated with this soil includes loblolly pine, longleaf pine, sweetgum, and water oak. Tomatoes, snapbeans, cucumbers, soybeans, and pasture are all cultivated in areas where this soil occurs (USDA-NRCS 1999).

Potentially Highly Erodible Soils

The NRCS identifies the erodibility of soils using what it defines as the K factor. The K factor can be expressed as that of the whole soil (Kw) or of the fine soil particles (Kf); in most cases, Kw and Kf are the same value, and Kw is chosen to express erodibility. Erodibility relates the effects of rainfall, soil characteristics, length and steepness of slope, cover practices, and prevention measures to the soil's erosion rate. Soils with clay textures adhere to each other, thus they have a relatively low Kw factor. Soils with sandy textures also have low erosion rates; although they are easily detached, sandy soils have low erosion rates because of low runoff potentials. Medium-textured soils such as loams and silt loams have moderate erosion rates. Soils dominated by silt have the highest erosion rates because they do not adhere to each other and they are highly susceptible to runoff. Kw factors range between 0 and 0.69. For this analysis, the Kw factor for surface soils was reviewed; Kw factors between 0 and 0.2 were assigned a low risk of erosion, between 0.2 and 0.4 were assigned a moderate risk of erosion, and above 0.4 were assigned a high risk of erosion (USDA-NRCS 2002).

The majority of the entire Project area is underlain by soils with a low risk of erosion. Figures 3.4-1 and 3.4-2 show the distribution of erodible soils units in the Project vicinity, and Table 3.4-1 quantifies the distribution of erodible soils.

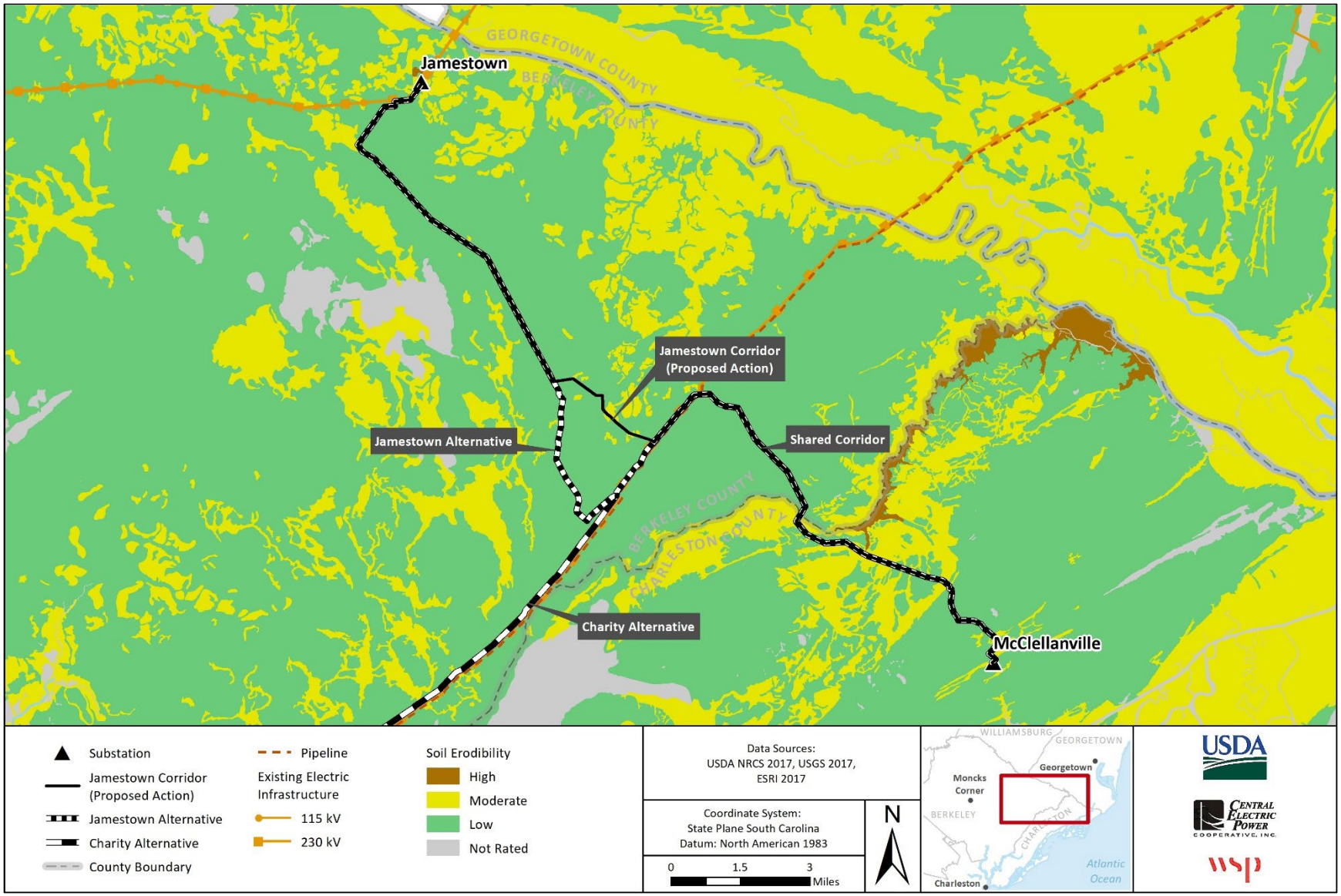


Figure 3.4-1. Erodible Soils in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

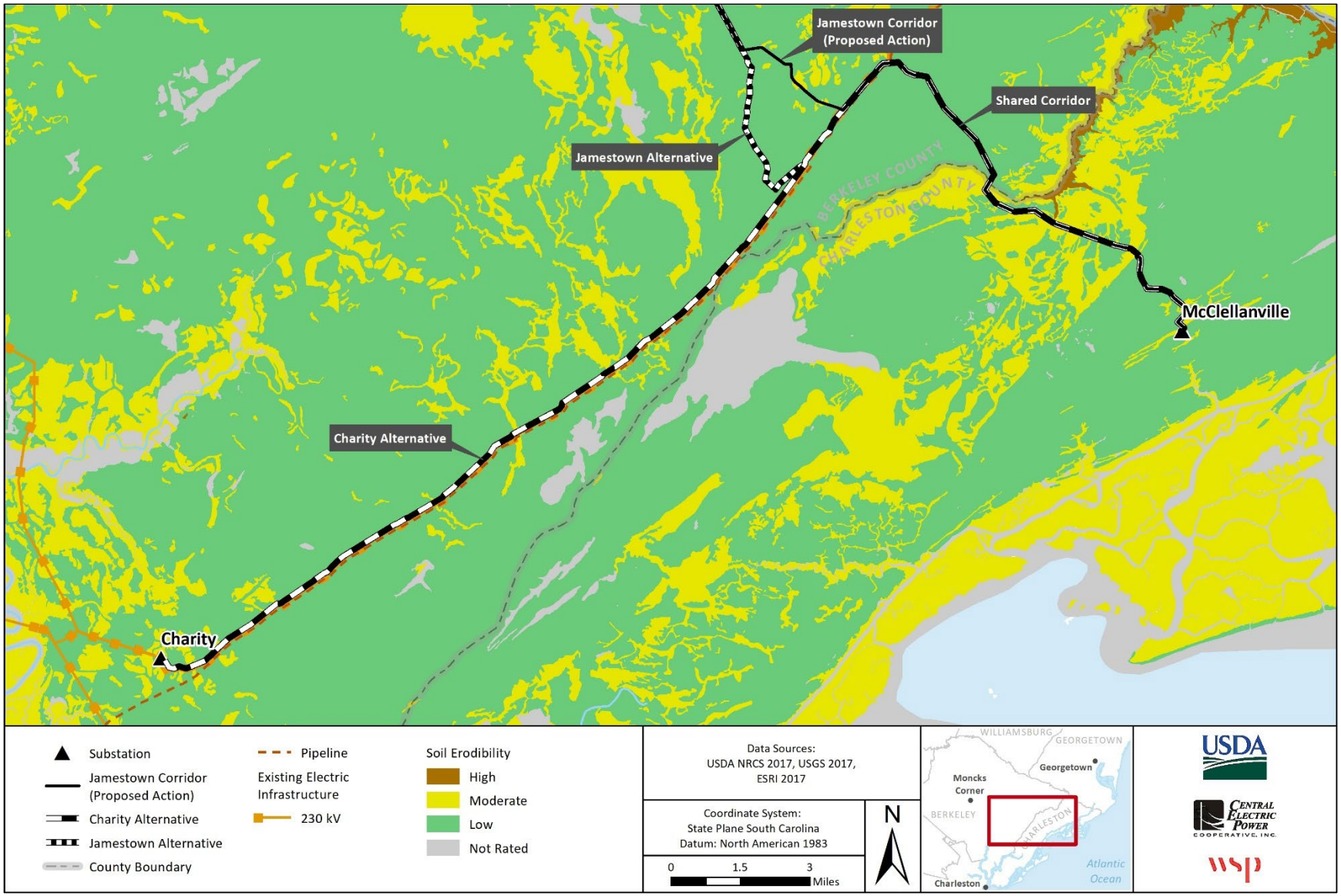


Figure 3.4-2. Erodible Soils in the Vicinity of the Charity Alternative

Table 3.4-1. Acreage of Prime Farmland, Hydric Soil, and Highly Erodible Soil within a 600-foot-wide Corridor

Soil Type	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Farmland (acres)			
Prime Farmland	126.4	104.5	222.2
Farmland of Statewide Importance	818.4	819.7	643.0
Prime if Drained	227.0	288.7	212.7
Not Prime Farmland	525.3	688.3	1.190.0
Hydric Soils (acres)[a]	604.5.	634.0	870.3
Erodibility (acres)			
Low risk of erosion	1,462.6	1,696.9	2,013.7
Moderate risk of erosion	234.4	204.2	254.2
High risk of erosion	0	0	0

[a] [i]Hydric soils include those categorized as 'All Hydric (100%)' or 'Predominantly Hydric (66-99%)'

Hydric Soils

Hydric soils form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil (USDA-NRCS 2010b). Hydric soils develop under conditions sufficiently wet to support growth and regeneration of hydrophytic vegetation; however, presence or absence of hydrophytic vegetation does not determine whether a soil is hydric. Soils that express hydric indicators because of artificial measures are also considered hydric soils; also, soils in which the hydrology has been artificially modified are hydric if the soil, in an unaltered state, was hydric in the upper part (USDA-NRCS 2010b). Some soil series designated as hydric have phases that are not hydric depending on water table, flooding, and ponding characteristics. The majority of soils within the Project area are classified as hydric soils. Table 3.4-1 quantifies the distribution of hydric soils within the Project area 600-foot-wide corridor for the Proposed Action and two action alternatives.

Prime Farmland

Prime farmland and farmland of statewide importance are special categories of highly productive cropland recognized by USDA. Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. In some cases, soils may not be considered prime farmland in their natural condition; however, with engineering practices to overcome limitations, these soils could become prime farmland. When this is the case, USDA places a caveat on the classification. Soils that do not meet the USDA prime farmland category may be important to states. Under these circumstances, soils that are agriculturally important to states are classified as farmland of statewide importance (USDA-NRCS n.d.).

Figures 3.4-3 and 3.4-4 show the distribution of prime farmland and farmland of statewide importance in the Project vicinity. Table 3.4-1 quantifies the acreage of prime farmland and farmland of statewide importance within the Project area 600-foot-wide corridor for the Proposed Action and two action alternatives.

3.4.2 Environmental Effects

The proposed Project would impacts soils and geology during construction and maintenance of the ROW, improvements to off-ROW access roads, and construction and restoration of staging areas. Most impacts would occur during construction and would likely be temporary; however, permanent impacts would be anticipated if structures are placed within prime farmland or farmland of statewide importance (Figures 3.4-3 and 3.4-4).

This section discusses the potential effects of the proposed Project on the soil and geological resources. To determine whether the proposed Project would have the potential to result in significant impacts, it is necessary to consider both the duration and the intensity of the impacts. Table 3.4-2 describes definitions for duration and intensity of soil and geological resources impacts established for this Project.

Table 3.4-2. Soils and Geology Impact Context and Intensity Definitions

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During construction period Long-term: Life of the line (50 years)	Disturbance to geology or soils from construction and operation would be detectable but localized and discountable. Erosion and/or compaction would occur from construction and operation in localized areas.	Disturbance would occur over a relatively wide area from construction and operation of the Project. Impacts to geology or soils would be readily apparent and result in short-term changes to the soil character or local geologic characteristics. Erosion and compaction impacts would occur over a wide area.	Disturbance would occur over a large area from construction and operation of the Project. Impacts to geology or soils would be readily apparent and would result in short-term and long-term changes to the character of the geology or soils over a large area both in and out of the Project boundaries. Erosion and compaction would occur over a large area.

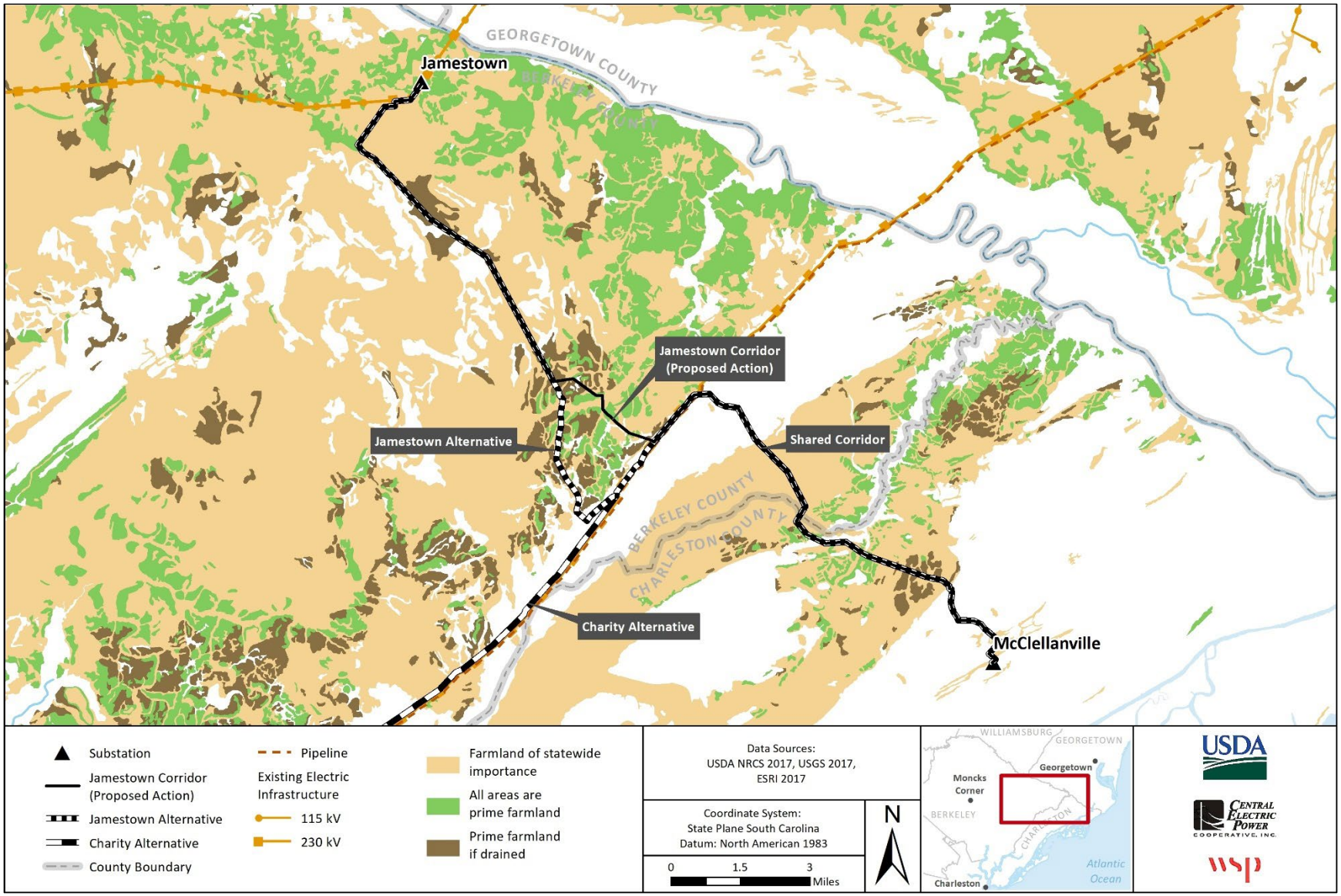


Figure 3.4-3. Prime Farmland in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

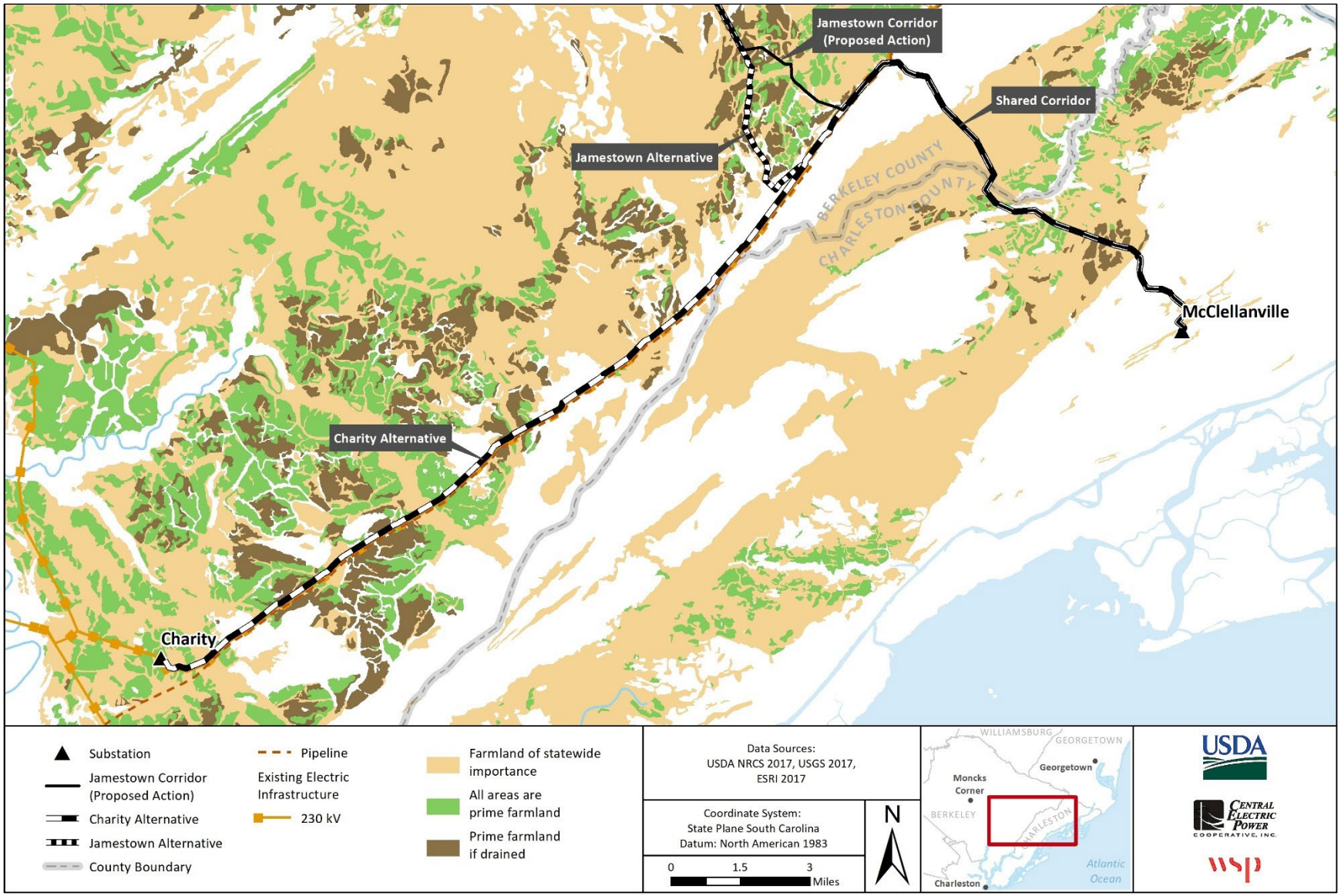


Figure 3.4-4. Prime Farmland in the Vicinity of the Charity Alternative

3.4.2.1 No Action Alternative

Under the No Action Alternative, there would be no construction or maintenance of an overhead transmission line. Direct and indirect impacts to geological formations and soils would not be anticipated.

3.4.2.2 Proposed Action (Jamestown Corridor)

Geology and Topography

Under the Proposed Action, construction of an overhead transmission line would not create a major disturbance to soils and geology. Although the Project would traverse a long distance (25.8 miles), the actual installation of structures would only occur sporadically across the length of the Project and at predetermined locations where the construction or installation of facilities are required (such as for the construction of substations and switchyards). Tower structures would be located approximately 300 to 400 feet apart. Generally, Project construction would require little disturbance to surface soil and would neither be large enough or deep enough to have any type of impacts on geologic formations.

Consequently, impacts on surface geology would be limited to the sites selected for the erection of structures. At these locations, geologic impacts would be limited to minimal disturbances of subsurface rock during drilling and use of augers to prepare foundation holes. Potential impacts resulting from this activity include: displacement of soil and rock during construction activities, alteration of geologic features due to earth-moving activities during construction, alteration of topographical boundaries during construction, and an increased potential for erosion occurring to adjacent lands from either vehicle disturbances associated with construction activities or accelerated runoff resulting from the creation of impermeable surfaces.

Where possible, Central Electric would use existing access roads to minimize the impacts to geology and topography from building new access roads. The need for grading and excavation that is associated with constructing access roads would be minimized. Borings may be taken prior to construction to identify geologically sensitive areas; Central Electric would avoid placing structures in those areas to further minimize the effects on geology and topography. Thus, by incorporating these measures into the Proposed Action, impacts to geological resources would be short-term and low-intensity.

Erodible Soils

As stated in the affected environment section, very few acres of the Project area cross highly erodible soils; the majority of the soils have a low risk of erosion (Table 3.4-1). Building the transmission line would require vegetation clearing from the proposed ROW, driving construction vehicles, installing a temporary 20-foot by 20-foot construction pads around each pole, laying down equipment, and installing transmission structures. These ground-disturbing activities may increase the erosion potential, even on soils with a low risk of erosion, because roots help to hold soil in place, and low-lying vegetation impedes the velocity of surface flow of water. By minimizing the removal of grasses, forbs, and shrubs, and leaving the stumps of removed saplings and trees in place, erosion potential from vegetation removal would be minimized.

Central Electric would implement numerous measures to reduce soil erosion (see Section 2.5). Specific BMPs to control erosion and prevent sedimentation from construction sites would be determined based on site conditions but would likely include silt fencing and hay bales, erosion control matting, minimizing the time soils are left bare, minimizing work time on wet soil, reclaiming topsoil, placing vegetation covers on loose piles of soil, revegetating bare areas, and grading the area to its original grade after construction. Additionally, Central Electric would use existing access roads, to the extent practicable, which would reduce the amount of soil moved. Although impacts to soils from erosion are anticipated, implementing appropriate erosion prevention measures would likely make them short-term and low-intensity.

Hydric Soils

Hydric soils are susceptible to compaction and erosion because they are often wet and, thus, more fluid. BMPs similar to those used in wetlands could be employed to reduce the amount of compaction and erosion that would occur during construction and maintenance. These practices could include leaving in place the stumps of cut trees so that soils are not disturbed, not working in saturated soils to avoid compaction and rutting, using load-dispersing mats and/or machinery with load-dispersing tires to reduce compaction and rutting, revegetating bare areas, and aerating compacted areas. Employing these measures would likely result in short-term, low-intensity impacts to hydric soils.

Prime Farmland

It is likely that prime farmland and farmland of statewide importance would be impacted by the proposed Project (Table 3.4-1). Permanent loss of prime farmland at the location of the tower foundations is expected; additionally, temporary compaction impacts from heavy machinery are possible. Central Electric proposes that each structure would use a 400-square-foot construction area, which would be restored immediately following construction. The only permanent impacts to the prime farmland and farmland of statewide importance would come from the actual structure; however, because this type of construction rarely impacts more than 0.001 acre per pole, permanent impacts to prime farmland and farmland of statewide importance would be less than 0.5 acre for the entire Project.

Based on the likelihood that each tower would not be located in prime farmland or farmland of statewide importance, the total area lost to the proposed Project would be less than 1 acre. To minimize impacts to prime farmland and farmland of statewide importance, Central Electric would implement measures such as reclaiming topsoil, aerating compacted lands, and using existing access roads. The farming of low-growing vegetation would still be allowed in easements while there may be restrictions in farm operation practices within easements (e.g., no center pivot irrigation). Impacts to prime farmland and farmland of statewide importance would be both long-term and short-term but would be low-intensity.

3.4.2.3 Jamestown Alternative

Potential soil and geology impacts from Project construction and O&M under the Jamestown Alternative would be similar to those described under the Proposed Action. In general, the Project actions and schedule under both action alternatives would be similar in scope and duration. The proposed corridor for the Jamestown Alternative would traverse a similar acreage of hydric soils as the Proposed Action (Table 3.4-1). Little to no areas with soils categorized as highly erodible would be impacted by the Jamestown Alternative. Potential impacts to soils classified as prime farmland under the Jamestown Alternative would be comparable to the Proposed Action.

3.4.2.4 Charity Alternative

Potential soil and geology impacts from Project construction and O&M under the Charity Alternative would be slightly greater than those described under the Proposed Action. In general, the Project actions and schedule under both action alternatives would be similar in scope and duration. The proposed corridor for the Charity Alternative would traverse approximately 44 percent more acreage mapped as hydric soils than the Proposed Action (Table 3.4-1). Little to no areas with soils categorized as highly erodible would be impacted by the Charity Alternative. Nearly double the area of prime farmland occurs within the Charity corridor compared to the Proposed Action, but impacts would still be low-intensity.

3.5 Air Quality and Greenhouse Gas Emissions

3.5.1 Affected Environment Air Quality Conditions

3.5.1.1 Regional Setting

The proposed Project is in eastern South Carolina and occupies portions of Berkeley and Charleston counties. The Project area is primarily rural, and the major existing contributing sources of air emissions/criteria pollutants result from shipping activities along the Cooper River north of Charleston and individual automobiles, trucks, and farm equipment, as well as industrial emissions produced from an industrial gas supplier in the western portion of the Project area. Vehicles are responsible for tailpipe emissions including nitrogen oxides (No_x), carbon monoxide (CO), and sulfur dioxide (SO_2). The primary pollutant produced by farm equipment is No_x from the combustion of fuel. In addition to existing contributions to air emissions, farming, timber harvesting, and vehicles using unpaved roads are sources of fugitive dust.

3.5.1.2 National Ambient Air Quality Standards/Attainment

USEPA defines ambient air in 40 CFR §50 as: "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, USEPA has promulgated National Ambient Air Quality Standards (NAAQS). NAAQS were enacted for the protection of public health and welfare, allowing for an adequate margin of safety. The Clean Air Act established two types of national air quality standards.

Primary standards set limits to protect public health, including the health of "sensitive" populations such as children, the elderly, and those suffering from asthma. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. To date, USEPA has issued NAAQS for seven criteria pollutants: CO, particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), particles with a diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), ozone (O_3), nitrogen dioxide (NO_2), lead and SO_2.

Areas that do not meet NAAQS are called non-attainment areas. While $O_3$is monitored for ambient air quality levels, regulations limit No_x and volatile organic compound emissions, which are O_3precursors. Table 3.5-1 displays the primary NAAQS for each criteria pollutant as well as state standards for ambient air quality. All counties in South Carolina are currently in attainment for all criteria pollutants (USEPA 2023a).

Table 3.5-1. State and Federal Ambient Standards for Criteria Air Pollutants

Pollutant	Period	State Air Quality Standard	Federal Primary Air Quality Standard	Federal Secondary Air Quality Standard
CO	1-hour average (maximum)	Same as Federal	35 ppm	No standard
	8-hour average (maximum)	Same as Federal	9 ppm	No standard
PM_{10}	24-hour average (maximum)	Same as Federal	150 µg/ m3	150 µg/ m3
	Annual average	Same as Federal	No standard	No standard
$PM_{2.5}$	24-hour average (based on 98th percentile)	Same as Federal	35 µg/ m3	35 µg/ m3
	Annual average	Same as Federal	12 µg/ m3	15 µg/m3

Pollutant	Period	State Air Quality Standard	Federal Primary Air Quality Standard	Federal Secondary Air Quality Standard
O_3	8-hour average (based on 4th highest daily maximum)	Same as Federal	0.070 ppm	0.070 ppm
NO_2	1-hour average (based on 98th percentile)	Same as Federal	100 ppb	No standard
	Annual average	Same as Federal	53 ppb	53 ppb
Lead	Rolling 3-month Average	Same as Federal	0.15 µg/m3	0.15 µg/m3
	Quarterly Average	No standard	1.5 µg/m3	1.5 µg/m3
SO_2	1-hour average (based on 99th percentile)	Same as Federal	75 ppb	No standard
	3-hour average (maximum)	Same as Federal Secondary Standard	No standard	0.5 ppm

Sources: SCDHEC (2017); USEPA (2023b)

Notes: ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter

Ambient air quality is monitored throughout South Carolina by stations meeting USEPA's design criteria for state and local air monitoring stations and national air monitoring stations. There are three historic monitoring stations near the Project area: the Cape Romain station located south of Awendaw; the Bushy Park Pump Station located near the Naval Weapons Station in North Charleston; and the Howard High School #3 station located in Georgetown. Of these, the Cape Romain station is still currently monitoring ozone levels (SCDHEC 2023) During the most recent years for which annual air quality data are published by SCDES, these monitoring stations reported that levels of air pollutants fell within federal and state standards (SCDHEC 2019, 2023).

To regulate Project emission levels, federal actions located in non-attainment areas are required to demonstrate compliance with the general conformity guidelines established in Determining Conformity of Federal Actions to State or Federal Implementation Plans (40 CFR §93). Section 93.153 of this rule sets the applicability requirements for projects subject to it through the establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant non-attainment area designations. Projects below the *de minimis* levels are not subject to the rule. Those at or above the levels are required to perform a conformity analysis as established in the rule. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the action.

The Proposed Action is not located within a non-attainment area; therefore, a General Conformity Rule applicability analysis is not warranted.

Outside the nonattainment areas, the Clean Air Act includes programs to maintain the air quality in attainment areas and ensure that new sources of criteria pollutants do not detrimentally affect air quality. Programs established include: New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, Prevention of Significant Deterioration (PSD), and Title V Operating Permits. None of these programs are likely applicable to the Project.

Congress set aside special land classifications where existing good air quality is especially important. These areas include, but are not limited to, national parks, and wilderness areas, all of which are defined as Class I areas. All other areas are designated as Class II areas. There is one Class I area in South Carolina—the Cape Romain Wilderness Area—located about 2 miles to the southeast of the Project.

PSD increments were established for Class I and Class II areas to ensure that air quality is maintained in attainment areas. If it is determined that a project is subject to PSD, the ground-level air concentrations from the project must be below these increment values in attainment areas. In addition, all facilities must meet NAAQS with an appropriate background value added to the source impact concentration.

3.5.1.3 Greenhouse Gases

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Human activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the increase in greenhouse gas (GHG) emission rates above background levels and the accumulation of additional GHGs, such as carbon dioxide, in our atmosphere above pre-industrial natural levels of those gases. An increase in human GHG emissions is said to result in an increase in the earth's average surface temperature, commonly referred to as global warming or climate change. Climate change is expected in turn to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates. The Intergovernmental Panel on Climate Change estimates that the average global temperature rise between 2000 and 2100 could range from 1.1°F (with no increase in GHG emissions above year 2000 levels) to 9.2°F (with a substantial increase in GHG emissions). Even small increases in global temperatures could have considerable detrimental impacts on natural and human environments (IPCC 2022).

3.5.1.4 Regional Haze

The Regional Haze Rule (Clean Air Act 169A and 169B, 40 CFR §51, Subpart P) was intended to protect and improve visibility in areas of the country known as federal Class I areas (primarily National Parks and National Wilderness areas). Several facilities in South Carolina were subject to a regional haze analysis per 40 CFR §51.308, known as the Best Available Retrofit Technology analyses. These analyses applied to facilities in 26 source categories (mainly power plants) that were constructed between approximately 1962 and 1977 (years prior to the Clean Air Act Amendments of 1977).

Utilities are the most common facilities that met the requirements under the Best Available Retrofit Technology rules. Facilities constructed before or after 1962 through 1977 may be subject to reasonable progress requirements. South Carolina has developed a State Implementation Plan that includes controls and emission limits required by the Best Available Retrofit Technology and Reasonable Progress analyses to improve visibility in Class I areas. South Carolina has a single Class I area, Cape Romain Wilderness, which encompasses most of the Cape Romain National Wildlife Refuge and is located approximately 2.5 miles from the proposed McClellanville Substation.

3.5.2 Environmental Effects

This section discusses potential impacts on air quality and GHGs, their duration, and intensity resulting from construction and operation of the proposed Project, including the No Action Alternative. Definitions for context and intensity are described in Table 3.5-2.

Table 3.5-2. Air Quality Impact Context and Intensity Thresholds

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During construction period	The impact on air quality associated with emissions from the operation, maintenance and construction	The impact on air quality would be measurable and localized but have the potential to result in regional impacts. Emissions of criteria	The impact on air quality would be measurable on a local and regional scale. Emissions from operation,

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Long-term: Life of the line (50 years)	is measurable, but localized and small such that emissions do not exceed USEPA's de minimis criteria for a general conformity analysis, or the USEPA mandatory reporting threshold for GHG emissions.	pollutants associated with operation, maintenance and construction would be at the USEPA's *de minimis* criteria levels for general conformity analysis and the USEPA mandatory reporting threshold for GHG emissions.	maintenance and construction are high, such that they would exceed USEPA's de minimis criteria levels for a general conformity analysis and the USEPA mandatory reporting threshold for GHG emissions.

3.5.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and current air quality conditions would remain. There would be no impacts on air quality or any contribution to GHGs as a result of the No Action Alternative.

3.5.2.2 Proposed Action (Jamestown Corridor)

The Proposed Action would impact air quality as a result of Project construction and O&M, including increases in fugitive dust caused by construction activity, vehicles, and equipment and emissions from construction vehicles and equipment. The primary construction impact on air quality would come from fugitive dust, which could result from increases in traffic on roads in the Project vicinity from construction workers. Site preparation for the proposed transmission line and associated projects would require above ground tree removal and mulching using low pressure ground equipment to minimize soil disturbance. Earthmoving and grading activities can expose soils, increasing the potential for wind erosion. In addition, as a result of grading activities, the transportation of soil and other construction debris in uncovered trucks could also contribute to fugitive dust. The primary concern over fugitive dust would occur during the warmer, drier months when soils are not as compacted and are more prone to dust generation. Impacts from fugitive dust are expected to be short-term and only occurring during the construction period. Based on the relatively small size of the affected area and current air quality conditions, it is expected that the Proposed Action will result in low impacts on air quality.

Other impacts on air quality as a result of construction activities come from emissions from construction vehicles and heavy equipment used in the construction process. Emissions stemming from vehicles and equipment would emit hydrocarbons, particulate matter, and carbon dioxide. Emissions resulting from the construction activities would be highly localized in the immediate Project area and ROW and would be similar or less than to those created as a result of agricultural activities taking place in most of the Project area. Air emissions as a result of construction are expected to be minimal because these activities are not excessive in nature. Table 3.5-3 lists estimated emissions. Therefore, emissions stemming from the Proposed Action would not reduce air quality in the Project area, would not exceed USEPA *de minimis* thresholds, and would not affect the current attainment status of South Carolina resulting in short-term, low impacts.

Table 3.5-3. Transmission Line and Substation Construction Emissions Estimates and General Conformity *De Minimis* Thresholds

Pollutant	Emissions (tons)	Emissions (tons/year)	General Conformity De Minimis Threshold
Nox	6.0	3.0	100
Volatile organic compounds	0.5	0.2	100

Pollutant	Emissions (tons)	Emissions (tons/year)	General Conformity De Minimis Threshold
PM2.5	0.8	0.4	100
SO2	0.2	0.1	100
CO	2.1	1.1	100

Emissions potentially impacting air quality during operation of the transmission line and substation would only occur as a result of atmospheric interactions with the energized conductors, and negligible GHG emissions from maintenance vehicles and equipment. These minor emissions consist of O_3 and Nox and occur near the conductor from development of a corona. These emissions relative to NAAQS would be negligible and not approach current *de minimis* standards, resulting in low impacts on air quality.

A potential area of concern regarding proposed air quality impacts associated with the Proposed Action is the proximity of the proposed transmission line to the Cape Romain Wilderness, a federal Class I airshed. The proposed transmission line would be approximately 2.5 miles from the Cape Romain Wilderness. Class I areas are sensitive areas with determined important visual qualities and are protected from air pollutants that can potentially cause visibility impairments. Visibility can be affected by several air pollutants including PM_{10}, $PM_{2.5}$, sulfates, nitrates, and sulfuric acid mist.

Potential pollutants occurring as a result of construction activities from the Proposed Action with the potential to impact visibility are both particulate matters. However, based on the limited amount of emissions resulting from construction activities, its highly localized short-term nature, and the implementation of measures to control emissions and fugitive dust, construction emissions would not cause visibility impairments to the Class I area. Also, based on a USEPA memo, construction emissions are not a consideration in determining if PSD requirements apply to a source (Reich 1978). Because the construction of the proposed transmission line and associated structures is not a major stationary source, this Project does not come under PSD review. In addition, all emission limits established would be followed, and any contribution to visual haze would not be significant based on the proposed Project (SCDHEC 2007).

GHG emissions resulting from the construction of the transmission line were calculated for two types of activities: construction of the transmission line and ongoing annual O&M for its estimated 50-year-long operational life. GHG emissions associated with construction activities would occur over a period of approximately 2 years. Based on existing data, it is assumed that an average of 25 people located throughout the Project area would work on the Project daily during its construction, including site preparation and restoration work. The transportation components of GHG emissions were estimated based on the approximate number of vehicles that would be used during Project construction and the approximate distance those vehicles would travel. The number of round trips was conservatively estimated using the following assumptions.

- All workers would travel in separate vehicles to and within the Project area each day.
- A maximum number of workers (25) would be required to construct the Project.
- The round-trip distance in the Project area is approximately 100 miles, depending on the exact location of workers within the Project area.

- Fuel consumption is based on the average fuel economy for standard pickup trucks of 18 miles per gallon. This is likely an overestimate because more efficient vehicles may be occasionally used. Average helicopter fuel mileage is anticipated to be around 1 mile per gallon.

Fuel consumption and GHG emissions would also result from operation of onsite heavy construction equipment. Heavy construction equipment may include augers, bulldozers, excavators, graders, heavy-duty trucks, and front-end loaders. It is also expected that the majority of heavy construction equipment use would occur during peak construction. Assumptions included a maximum of 20 equipment machines in operation during peak construction and 10 equipment machines during off-peak. It was also assumed that the average size of equipment would not exceed 250 horsepower and would operate at maximum power for 8 hours per day 5 days a week, which is a significant overestimation because equipment commonly operates in idle or reduced power.

The Proposed Action would require the permanent removal of trees and other vegetation because of road construction and ROW clearing. Although permanent tree removal would not immediately emit GHGs, it would reduce the level of solid carbon storage in the area. Tree growth and future carbon sequestration rates are highly variable and dependent on several factors, including, the species of the tree, the age of the tree, climate, forest density, and soil conditions. In the Southeast Region, the average carbon storage associated with forests is 125,000 pounds per carbon acre (USFS 1992). The acres of forest that would be removed total approximately 160 acres. Assuming each affected acre contains the average carbon content for the Southeast Region, the net carbon footprint associated with the removal of forested area would be an estimated 9,200 metric tons. Given this estimate, the impact of vegetation removal on GHG emissions would be low. This impact would be low-intensity, especially in the context of the surrounding FMNF where carbon stocks have increased by about 22 percent between 1990 and 2013, and negative impacts on carbon stocks caused by disturbances have been modest and exceeded by forest growth (Dugan and McKinley 2019).

During O&M of the transmission line, routine patrols, maintenance of roads and structures, and aerial inspections by helicopter would occur once per year. Emergency maintenance and natural resource review would occur on average once every 4 years, with all activities estimated to incur within 100 miles round trip. Emissions from Project O&M are estimated for the 50-year life span of the transmission line.

Based on the above assumptions, the Project would result in an estimated total of between 4,689 and 9,231 metric tons per year of carbon dioxide equivalent (CO_2e) emissions during construction and a total of an estimated 30 metric tons of CO_2e emissions for ongoing O&M activities over the 50-year lifespan of the line. To provide context for this level of emissions, the USEPA mandatory reporting threshold for large sources of GHGs is 25,000 metric tons of CO_2e emitted annually (74 FR 56260).

This threshold is approximately the amount of CO_2e generated by 4,400 passenger vehicles per year. Comparatively, the emissions during Project construction would be equivalent to the emissions generated by about 1,146 passenger vehicles per year.

Project O&M activities would translate into CO_2e emissions about equal to that of five passenger vehicles per year. Overall, contributions of Project construction, operation, and maintenance on GHG concentrations would be low.

3.5.2.3 Jamestown Alternative

Potential air quality and GHG impacts from Project construction and O&M under the Jamestown Alternative would be the similar to those described under the Proposed Action because the construction actions and schedule would be similar in scope and duration. Emissions due to construction activities would

be similarly temporary, and cease when construction stops. Air quality impacts from Project O&M under the Jamestown Alternative would also be similar to the Proposed Action.

3.5.2.4 Charity Alternative

Potential air quality and GHG impacts from Project construction and O&M under the Chrity Alternative would be the similar to those described under the Proposed Action because the construction actions and schedule would be similar in scope and duration. Emissions due to construction activities would be similarly temporary, and cease when construction stops. Air quality impacts from Project O&M under the Chrity Alternative would also be similar to the Proposed Action.

3.6 Cultural and Paleontological Resources

This section of the EIS identifies known cultural and paleontological resources in the Project vicinity. Cultural resources will continue to be identified as consultation under Section 106 of the NHPA and implementation of the Project specific Programmatic Agreement (PA) proceeds.

Cultural resources include archaeological sites, defined as locations "that contain the physical evidence of past human behavior that allows for its interpretation;" buildings; structures; historic districts; objects; cultural landscapes; and traditional cultural properties (TCPs) (NPS 1997). Those cultural resources that qualify for listing in the National Register of Historic Places (NRHP) are defined as historic properties and must meet at least one of the established criteria for evaluation, defined below.

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association. A resource may be eligible that:

- Criterion A: is associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B: is associated with the lives of persons significant in our past; or
- Criterion C: embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Criterion D: yields, or may be likely to yield, information important in prehistory or history (NPS 1997).

In general, these cultural resources must also be greater than 50 years in age. Cultural resources less than 50 years of age must be exceptionally important to be considered eligible for listing on the NRHP, as outlined in NRHP Bulletin Number 22 (Sherfy and Luce 1998).

The NRHP is a commemorative listing of those resources significant to the American past. Those cultural resources listed in, or eligible for listing in, the NRHP are designated "historic properties." Under NHPA, "historic property" means "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" including artifacts, records, and material remains related to such a property or resource (16 USC §470w; amended 2006). In accordance with Section 106 of NHPA, 16 USC §470f, RUS is required to take into account the effects of its undertakings on historic properties. The regulation, "Protection of Historic Properties" (36 CFR §800),

implementing Section 106 establishes the process through which RUS and other federal agencies consider effects to historic properties in their decision-making.

3.6.1 Affected Environment

Central Electric approached RUS for financial assistance to construct the Project, thereby making the proposed Project an undertaking subject to review under Section 106 of the NHPA and its implementing regulation (36 CFR §800). As the lead agency, RUS is coordinating compliance of the Section 106 procedures and the steps taken to meet the NEPA requirements as set forth in 36 CFR §800.3(b). As such, studies and analyses conducted to comply with the NEPA, including this EIS, will be used and expanded as appropriate by RUS to meet the requirements of Section 106. Pursuant to 36 CFR §800.2(d)(3), RUS has used its NEPA procedures to meet its requirements for public involvement under 36 CFR §800.

In coordinating Section 106 compliance and NEPA, RUS has developed a project specific PA among RUS, USFS, and the South Carolina State Historic Preservation Office (SHPO). The PA is included as Appendix J.

This Project requires use of a project-specific PA because Central Electric will not be able to complete the entire Section 106 process prior to the federal agencies signing of a Record of Decision. The Project has not been precisely staked yet. Once Central Electric selects the final 75-foot ROW within the 600-foot-wide corridor, cultural resource surveys and studies will be carried out and focused on the APE of the selected corridor.

3.6.1.1 Geographic Scope

Pursuant to 36 CFR §800.16(d), the area of potential effects (APE) is defined as the area within which the proposed Project has the potential to either directly or indirectly affect historic properties that may be present. RUS has identified an APE that extends up to 0.5 mile in each direction from the preliminary centerline of each alternative corridor. This standard for the geographic scope of visual effects is consistent with thresholds established by the Federal Communications Commission (2004) NPA. Given the height of the proposed structures and the requirement to maintain an alignment cleared of vegetation, the proposed Project could alter a historic property's integrity by diminishing the visual integrity of the property's historic features.

3.6.1.2 Study Area

The study area for archaeological and paleontological resources includes the entirety of the 600-foot-wide corridor for the Proposed Action and two action alternatives. For above-ground cultural resources, the study area is a mile-wide corridor, extending 0.5 miles from the Project centerline for potential visual effects.

3.6.1.3 Consultation

This section describes the consultation process for the proposed Project, which is ongoing. The required NEPA/Section 106 coordination effort provides information to assist in the selection of corridors to analyze in this EIS. In addition, these efforts help to determine the appropriate level of effort needed to identify and evaluate historic properties and resolve concerns about providing comparable information for analysis across alternatives.

An initial consultation meeting was held in September 2021. Attending parties included USFS, the SHPO, White Oak Forestry, James-Santee Brick Church, the Village Museum, the Historic Charleston Foundation, the Southern Environmental Law Center, the Low Country Land Trust, and the SC Coastal Conservation

League. Indian Tribes, including the Eastern Shawnee Tribe of Oklahoma, the Catawba Indian Nation, and Muscogee (Creek) Nation, and the town of McClellanville were invited to participate but did not attend. Comments during and after the meeting focused on two topics: opposition to the Belle Isle corridors and a request for more in-depth surveys for cultural resources.

3.6.1.4 History of the Study Area

The proposed 115-kV transmission line would cross Berkeley and Charleston counties. Of the coastal counties in South Carolina, Berkeley and Charleston counties have probably experienced more cultural resource surveys as a result of the urbanization and the presence of the FMNF. The prehistory of the counties is similar. The data on prehistoric adaptations in the Coastal Plain of South Carolina presented below are derived mainly from USFS archaeological research within the boundaries of the FMNF, with additional information from the research conducted on behalf of the South Carolina Department of Transportation (SCDOT). The historic background section draws on a variety of resources including county-wide historical properties surveys, cultural resources reports, and other publications housed at the South Carolina Institute of Archaeology and Anthropology and the South Carolina Department of Archives and History.

3.6.1.5 Prehistoric Background

This summary of the region's Native American prehistory provides information on cultural chronology, typology, and interpretation of the Coastal Plain's Native American archaeological record.

Archaeologists divide South Carolina's prehistory into the following periods: Paleoindian/Lithic (ca. 12,000–8000 BC), Early Archaic (ca. 8000–6000 BC), Middle Archaic (ca. 6000–3000 BC), Late Archaic (ca. 3000–1000 BC), Early Woodland (ca. 1000–500 BC), Middle Woodland (ca. 500 BC–AD 500), Late Woodland (ca. AD 500–1000), and Mississippian (ca. AD 1000–1540). These cultural divisions signal technological and social adaptations of Native American peoples to southeastern North America's changing natural environment since the end of the last glaciation, approximately 14,000 years ago (Adams and Young 2010, Anderson and Logan 1981, Anderson et al. 1982, Trinkley 1990).

Paleoindians represent the first known human populations to occupy the region that is presently South Carolina. Paleoindian populations have been characterized by archaeologists as small nomadic or seminomadic bands with settlement/subsistence strategies based on hunting and the collection of wild foods. Archaeological markers of the Paleoindian period (12,000 to 8000 BC) consist chiefly of distinctive projectile point types, such as Clovis, Cumberland, Dalton, Hardaway, Simpson, and Suwannee points (Coe 1964, Goodyear 1974, 1982). Goodyear et al. (1979) note that formal variability among Paleoindian point types may reflect chronological or spatial differences. A marked preference for high-quality cryptocrystalline lithic raw materials is also evident in Paleoindian toolkits.

The Archaic period (8000 to 1000 BC) is divided by archaeologists into three sub-periods: Early Archaic (8000 to 7000 BC), Middle Archaic (7000 to 3000 BC), and Late Archaic (3000 to 1000 BC). As the southeastern climate moderated from late glacial conditions into more modern and temperate ranges, Archaic peoples developed a more diversified subsistence economy (Watts 1970, 1980; Whitehead 1965, 1973). They focused on seasonal hunting, fishing, and collecting wild plant foods. The increased efficiency in resource exploitation resulted in the gradual development of more complex societies, regional variability in cultures, trade and exchange networks, and population growth (Caldwell 1958). Paralleling this expansion of adaptive strategies was an enlargement and elaboration of material culture and sites occupied. A wider variety of raw materials was used in the production of both flaked-stone and groundstone tools. Over the course of the Archaic period, sea levels rose gradually from their low point in the last ice age,

reaching modern level around 6,000 years ago. It was not, therefore, until the Middle Archaic period that the coast of South Carolina reached something like its modern configuration.

The Early Archaic sub-period (ca. 8000 to 7000 BC) is interpreted as a continuation of the preceding Paleoindian period in terms of settlement and subsistence patterns. The period is marked primarily by adaptations to changing environmental circumstances and an increased use of smaller species of fauna. Diagnostic artifact types of the Early Archaic include Taylor, Big Sandy, Palmer, Kirk, LeCroy, and St. Albans projectile points (Chapman 1975, Coe 1964). The remainder of the Early Archaic toolkit includes a variety of scrapers, wedges, and perforators. Edgefield-type side scrapers are regarded as a hallmark of the period.

Native populations and territoriality gradually increased during the Middle Archaic sub-period (ca. 7000 to 3000 BC). Stemmed projectile points of the Stanly, Morrow Mountain, and Guilford varieties are diagnostic of this period, and locally available quartz was the most common lithic material utilized (Blanton and Sassaman 1989, Tippett 1992). Nonlocal lithic resources were not extensively used.

Relative to the preceding Early Archaic period, when settlement patterns encompassed broad linear territories that crosscut geophysical zones to exploit specific seasonal resources, Middle Archaic settlement patterns reflect limited movement between regions. In contrast to Early Archaic groups, Middle Archaic populations expanded their settlement ranges within geophysical regions and exploited more diverse resources.

Settlement and artifact data from this period suggest "a strategy of small co-resident group size, frequent residential movements, generalized subsistence, low-investment technology, and social flexibility" (Sassaman et al. 1990). Sassaman (1988) and others assert that Middle Archaic populations were mobile and moved residential locations frequently to take advantage of specific resources as they became available. He suggests that tools used in resource procurement and processing were expedient forms manufactured from local materials. In the Piedmont, one such local resource was quartz. This degree of mobility and expedient technology exhibited by the Middle Archaic populations is reflected by sites that consist principally of quartz debitage scatter.

Trends toward increasing population, group size, organizational complexity, and sedentism characterize the Late Archaic sub-period (3000 to 1000 BC). Diagnostic artifacts of the period include Savannah River and Otarre stemmed projectile points (Coe 1964, Keel 1976). Perforated soapstone slabs, three-quarter–groove groundstone axes, and grinding basins are also common. Another hallmark of the period is the introduction of ceramic technology around 2500 BC. Stallings Island pottery represents the earliest ceramic type in the region. Variety is tempered with fiber and occasionally exhibits surface treatment, such as punctations and incising. Sand-tempered Thom's Creek pottery represents a later variety and displays the same kinds of surface treatments. In general, Stallings pottery is believed to pre-date the Thom's Creek pottery, but some investigators believe that the two pottery wares were produced by contemporaneous Coastal Plain peoples (Trinkley 1980a). Ceramic technology has important implications for social dynamics. Ceramic vessels provide an efficient means of storing food, thereby permitting lengthier occupations at residential camps and offsetting seasonal fluctuations in food availability.

Subsistence data from the Late Archaic period suggest that aquatic resources formed significant proportions of the Late Archaic diet. Sassaman (1993) notes that shellfish constituted a principal food source; also, turtles were important dietary resources during this period. Large shell middens and shell rings developed near tidal marshes in the vicinity of the Project during this time. Deer and a variety of other terrestrial fauna were also consumed. Sassaman (1993) also cites evidence that marine resources were utilized along the Middle Savannah River. Such resources likely included anadromous fish that were obtained by inland

populations, although it is possible that marine resources were acquired through trade with coastal populations.

Wetmore and Goodyear (1986) suggest that the use of grasses, chenopodium, sumpweed, squash, gourds, and sunflowers by 2500 BC is evidence of incipient horticulture.

Beginning in the Woodland period (1000 BC to AD 1000), populations in the Coastal Plain adopted a mixed hunting, gathering, and farming subsistence strategy (Trinkley 1980a, 1990). Semi-permanent to permanent villages were established in riverine settings. The use of ceramics, introduced during the Late Archaic, became widespread for storage and cooking (Anderson et al. 1982; Sassaman 1993; Trinkley 1980b). A number of sequential cultural complexes or phases have been distinguished for the Early Woodland subperiod (1000 BC to AD 1). These cultures, which include the Refuge phase, the Deptford phase, and the Deep Creek phase, are known primarily from the coastal sections of the state and the Savannah River Valley (Trinkley 1990).

Evidence from Marlboro County and Sumter County (Blanton et al. 1986) suggests that northern groups, who produced fabric-impressed and cordmarked pottery, interacted with southern groups of a carved-paddle tradition (Caldwell 1958). In general, the Early Woodland period is characterized by Yadkin series (quartz-tempered) ceramics (Coe 1964). Triangular points also appear during the period.

Subsistence strategies of the Early Woodland were expanded to include locally available floral and faunal resources. Shellfish, although still a part of the diet, were not exploited in such great quantities as during the Late Archaic. In the Coastal Plain, Early Woodland settlement is characterized by residential camps located on the coast. These camps are represented by shell middens located near tidal marshes and ceramic and lithic scatters in a variety of environmental zones. Group organizations appear to be based on semi-permanent occupation of shell midden sites, with short-term use of Inner Coastal Plain sites (Gardner and Roberts 1993).

The Middle Woodland subperiod (AD 1 to 500) includes a continuation of Yadkin pottery, and Deptford pottery becomes more common during this subperiod (Caldwell and McCann 1941; Caldwell and Waring 1939). Specifically, ceramic decorative modes from outside locales were being incorporated into Deptford ceramics and may indicate expansion of groups into other areas (Caldwell 1958). In addition, McClellanville/Santee series pottery has been recovered from sites in the vicinity of the study area (Anderson et al. 1982, Trinkley 1981).

Sassaman et al. (1990) have suggested that an increased use of areas around small tributaries occurred during the period as a response to the decreased productivity of maturing river floodplains. Middle Woodland subsistence strategies continued to rely on wild foods; there is no clear evidence of the use of cultivated plants during the period.

Food production intensified, supporting locally concentrated population aggregates. Large-scale storage is also evident (Sassaman et al. 1990). Mobility and settlement patterns resulted in numerous short-term occupations across the Coastal Plain landscape.

The Late Woodland sub-period (AD 500 to 1000) in the Coastal Plain is poorly understood. Few sites of this period have been recorded or excavated, and little information exists about sub-period chronology. Moreover, the relationship between the Late Woodland and later periods is vague. Trinkley (1990) suggests that little change in adaptation occurred between the Middle Woodland period and the development of the South Appalachian Mississippian complex. Thus, the Late Woodland period may be considered an extension of the preceding era.

Stuart (1975) has developed a chronology for the Wateree Basin that is most applicable to this area. In this chronology, the Deptford/Yadkin pottery tradition gives way to the Camden ceramic series around AD 700. This series, produced until approximately AD 1100, is known by grit-tempered wares with check-stamped, simple-stamped, or incised surface decorations. Anderson and Schuldenrein (1985) suggest that evidence of intensive use of floodplains first appears during the Late Woodland. Such occupations are marked by pits, hearths, posts, and scatters of shell. Trinkley (1990) states that there are few indications of agricultural activity during this period in South Carolina, and if domestic plants were at all available, they constituted an insignificant proportion of the subsistence base. Sassaman et al. (1990) note, however, that maize agriculture was being practiced locally by the Late Woodland.

During the Mississippian period (AD 1000–1540), South Carolina's native peoples developed into a complex chiefdom-level society. These new sociopolitical structures may have been imposed locally by elites immigrating into the region from the west (Sassaman et al. 1990). The Mississippian period is characterized by large village sites located on floodplains, as well as earthen mounds, settlement hierarchy, evidence of ranked social hierarchy, and an economy based on agriculture. The economic basis of these developments involved intensive maize agriculture. Sassaman et al. (1990) note that maize was being grown locally prior to the emergence of Mississippian polities in South Carolina. Corn, squash, and other cultigens were grown extensively in stream bottoms. Hunting and gathering of wild foods supplemented domesticated foods.

Mississippian populations throughout the Southeast facilitated agricultural production and the exploitation of wild foods by settling in floodplains that combined the advantages of easily tilled soils and access to rich sources of fish and waterfowl in oxbow lakes. Mississippian sites in the region are most often situated along major drainages and appear to reflect these settlement-subsistence trends (Anderson 1989).

Hallmarks of Mississippian sites include ceramic types that are distinguished on the basis of elaborate decorative motifs and rim treatments. These complicated stamped ceramics contrast with the plain, cordmarked, fabric-impressed, and simple stamped ceramics that characterized the preceding Woodland period (Anderson 1989). Distinct Mississippian ceramic phases are recognized for the region (Anderson et al. 1982, Anderson 1989). In coastal South Carolina, the Early Mississippian period is marked by the presence of Jeremy-phase (AD 1100–1400) ceramics, including Savannah Complicated Stamped, Savannah Check Stamped, and Mississippian Burnished Plain types. Poplin et al.'s (1993) excavations at the Buck Hall Site (38CH644) produced radiocarbon dates around AD 1000 for complicated stamped ceramics similar to the Savannah series, which represents the earliest date for complicated stamped wares in the region and may indicate an earlier appearance of Mississippian types than previously assumed (Poplin et al. 1993).

Sites of the period in the region include shell middens, sites with apparent multiple- and single-house shell middens, and oyster processing sites (e.g., 38CH644 [Poplin et al. 1993]). Adaptation during this period apparently saw a continuation of the generalized Woodland hunting-gathering-fishing economy, with perhaps a growing importance on horticulture and storable foodstuffs. Anderson suggests that environmental unpredictability premised the organization of hierarchical chiefdoms in the Southeast beginning in the Early Mississippian period; the redistribution of stored goods (i.e., tribute) probably played an important role in the Mississippian social system (Anderson 1989). Maize was recovered from a feature suggested to date to the Early Mississippian period from 38BK226, near St. Stephen (Anderson et al. 1982).

During the Late Mississippian Period (AD 1400–1550), the regional chiefdoms apparently realigned, shifting away from the Savannah River centers to those located in the Oconee River Basin and the Wateree-Congaree Basin. As in the Early Mississippian, the Charleston Harbor area apparently lacked any mound centers, although a large Mississippian settlement was present on the Ashley River that may have been a

"moundless" ceremonial center (South 2002). Regardless, it appears that the region was well removed from the core of Cofitachequi, the primary chiefdom to the interior (Anderson 1989, DePratter 1989).

3.6.1.6 Historic Background

The early portion of the historic period (from AD 1540 to 1730), also referred to as the Protohistoric period, extends from the end of the Mississippian period through the initial contact between Native Americans and Europeans and into, the Colonial period. The settlement patterns of the Native Americans who were living in the vicinity of the study area during the early historic period represents a continuation from the Late Woodland and Mississippian periods. The ethnohistoric record from the South Carolina coast suggests that Native Americans continued to move in a seasonal pattern, involving summer aggregation in villages where domesticated crops were planted and harvested followed by dispersal into small (one to three) family settlements for the rest of the year (Waddell 1980). The social framework and the regional occupation by various Tribes remained stable through the 1660s (Waddell 1980).

During the seventeenth century, the British increasingly colonized areas of the New World as the Spanish empire waned. After the Spanish left South Carolina, the British established their first permanent settlement in South Carolina at Charles Town around 1670, which later became Charleston (Edgar 1998). After 1670, the British settlement of South Carolina resulted in changes to Native American settlement patterns. Tribes that occupied areas desired by the British were displaced farther inland. For example, three Tribes (the Etiwan, the Wando, and the Sampa) who had lived near the site of Charles Town migrated north to occupy the Wando River; a fourth Tribe (the Sewee) occupied the coast south of the Santee River (Waddell 1980). In 1687, a colony of Huguenots (French Protestants) was established on the Santee River with the backing of the British proprietors; this community endured for several generations.

Additional social migration resulted when the Cherokee consolidated their control of the Piedmont during the late 1600s forcing some Tribes to move toward the coast (Waddell 1980). For this reason, when John Lawson traveled up the Santee River from the Atlantic Ocean in 1701 he encountered first the Sewee and then the Santee (Milling 1940). It appears that the Santee originally lived in areas much farther inland (Waddell 1980) but had relocated upstream from the Sewee on the Santee River's south side by the time of Lawson's visit (Milling 1940).

The British were initially content with settling the coastal areas and made treaties with local Tribes that yielded control of the back country to the Yemassees and other Tribes. However, peace between the local Indians and new settlers did not last long. The need for grazing lands led many British cattlemen to encroach upon the territory legally controlled by the Yemassees. Deceived by the British colonists, the Yemassees led an uprising of Carolina Indians in 1715. After 3 years of bloody war, the British were able to remove the Yamassee and other Tribes forcibly and open the entire upcountry to settlement by 1719 (Edgar 1998).

Trade between Native Americans and the British began in the 1670s, but mutual suspicion largely surrounding trade practices soon led to war between the two groups. The Tuscarora Tribe and its Native American allies united in war against the English from 1711–1713. The South Carolina Assembly sent troops to aid North Carolina's British residents, bringing an end to the hostilities. Among these troops were approximately 500 Native Americans, including members of the Santee, Sewee, Wateree, and Winyah Tribes (Milling 1940). Not long after the end of the Tuscarora War, the settlement of the Port Royal Sound region and years of abuse from traders led to the outbreak of the Yamassee War (1715–1727), which threatened the continuance of the British colony in South Carolina. Although the Yamassee, Apalachicola, and Apalachee were the primary Tribes involved in this war, any southeastern Native American Tribe that had been mistreated by the British took part to some extent. As a result of the conflict and under continuing military pressure from the English, the Yamassee, Apalachicola, and Apalachee Tribes left the region.

The early colonial settlement in the study area was guided by the Lord Proprietors (Edgar 1998). The proprietors were given vast power over the colony of Carolina by Charles II following his restoration to the English throne in 1660. Several of the proprietors owned plantations on the island of Barbados, and it is from there that many of the earliest colonists and enslaved Africans originated. The plantation system was quickly introduced to South Carolina, and the labor necessary for the operation of plantations was initially supplied by Native Americans and enslaved Africans.

The slave trade operating through the port of Charleston supplied increasing numbers of Africans to the labor pool resulting in a black majority by the first decades of the eighteenth century (Edgar 1998, Littlefield 1995). Colony-wide black to white ratios are believed to have been two blacks to every white after 1720. The black majority population of some parishes reached as high as 79 percent during the eighteenth century. It is estimated that 40 percent of all African-Americans living in the U.S. today are decedents of enslaved Africans that entered North America through the port of Charleston (NPS 2005). These statistics form a basis for understanding the later development of the Gullah culture of South Carolina's low-country (Edgar 1998, Littlefield 1995, Pollitzer 2005).

The plantation economy of early South Carolina was based on production of naval stores, indigo, and rice. The development of inland rice fields was labor intensive due to the construction of fresh water rice field impoundments, dikes, canals, and other water control structures. Edgar (1998) notes that the importation of enslaved Africans from the rice-growing regions of the Niger delta increased after 1730 as plantation owners expanded rice production and experimented with the cultivation of indigo. Sea Island cotton began to be cultivated during this period, displacing rice as the favored low-country cash crop after 1790 (Edgar 1998).

Berkeley and Charleston counties played important roles during the American Revolutionary War. Fort Moultrie, which guarded Charleston Harbor, was attacked by British naval forces on June 28, 1776. This first attempt to subdue the patriot faction in South Carolina failed. While invasion threatened the coast, the back country of South Carolina was ablaze with war between loyalist and patriot militias. War returned to the low-country of coastal South Carolina in 1778 after the fall of Savannah to British forces. The fall of Savannah precipitated the Southern Campaign of 1778–1781. One of the important battles of that campaign was the surrender of the American army garrisoning Charleston to the British in April 1780. During much of this period, British supply lines to interior bases at Camden and Ninety-Six were threatened by Francis Marion operating out of the inland swamps surrounding Charleston and Georgetown.

Rice cultivation experienced a limited renaissance after the Revolutionary War with the introduction of a new method of cultivation, particularly in what is now Georgetown County (Joseph et al. 2006). The change from inland, swamp-based rice cultivation to tidal cultivation changed the plantation settlement pattern in the low-country. Many inland plantations were abandoned during this period in favor of those located closer to the coast (Edgar 1998, Joseph et al. 2006). A formidable system of dikes, ditches, canals, and gates was required to irrigate the fields during the planting season and protect the fields from winter flood events and tropical storms (Agha et al. 2011). These engineered structures were built by enslaved African-Americans using only hand tools and whatever aid could be rendered by mule power. The rice fields located along the banks of the North and South Santee River are of the tidal variety.

By 1820, cultivation of rice in the low country was in steep decline as a result of international competition. Planters in search of a replacement cash crop turned to the cultivation of cotton (Edgar 1998). After the invention of the cotton gin by Eli Whitney in 1793, cotton became the chief staple of the South. During the nineteenth century, a mixed planter economy existed in what is today Charleston and Georgetown counties, with wealthy rice plantations that employed slave labor existing along with yeoman farmers. As the demand for cotton increased during the nineteenth century, large plantations operated by slave labor dominated South Carolina's agricultural economy.

Most residents in the low country welcomed South Carolina's secession from the Union in December 1860, but the Civil War proved utterly disastrous for the area. Union forces occupied the Sea Islands within the first year of the war and used Beaufort and Hilton Head as the command base of the South Atlantic Blockading Squadron and headquarters for the U.S. Army, Department of the South (Edgar 1998). Despite this, most of what is now Charleston County remained under control of Confederate forces until late in the war defended by its formidable curtain of earthworks and fortifications.

Eventually, Berkeley and Charleston counties were abandoned by the Confederates when the area found itself within the path of General William T. Sherman's army marching north from Savannah. Following his March to the Sea in Georgia, Sherman proposed a similar plan for South Carolina and received approval from General Grant and President Lincoln. On February 1, 1865, Sherman left Savannah with 60,000 troops and headed north with two singular strategic purposes: to destroy all resources in his path and to make his way through the Carolinas into Virginia. Once in Virginia, he would converge on Robert E. Lee's Army of Northern Virginia, then besieged at Petersburg by Grant. A third, non-strategic reason for the destructive march through South Carolina was to punish the state for its leading role in secession (McPherson 1988).

After the Civil War, the average size of farms began to decline. In 1860, the average farm in South Carolina encompassed about 570 acres, and by 1880 the average had dropped to 143 acres. By 1900, the average farm was only 90 acres in size. This average continued to decline during the first two decades of the twentieth century (Dodd and Dodd 1973). Smaller farms meant more intensive farming practices with little fertilization or crop rotation, which led to soil depletion and heavy erosion. In 1880, about one half of the state's farms were owner-operated, but by 1900 only 38 percent of the state's farmers owned their own land. This situation resulted in a vast class of tenants who fulfilled annual contracts with landowners.

Under the system of tenancy, landowners received either a share of the crops, with generally one third to one half claimed by the tenant, or cash rent. In most sharecropping cases, landowners provided a house on the parcel of land the tenant was to farm, implements, working livestock, feed, and seed, while the tenant provided all the labor. In 1910, the average tenant holding was 44 acres (Kovacik and Winberry 1987).

Historically, the overwhelming majority (78 percent) of tenants or sharecroppers was African-American (Edgar 1998). In many instances, the system fostered a lifestyle of poverty wherein the tenant became indebted to the landowner or local merchants but was prevented by law from abandoning the farm while indebted. World War I and the healthy business climate of the early 1920s brought agricultural prosperity by encouraging production and high prices for farm products. Many tenant farmers, however, having invested in livestock, machinery, and additional land, found themselves in debt in the late 1920s and 1930s, when agricultural prices plummeted because of a continued wartime production rate operating without the wartime demand (Bloomer 1993).

During the late nineteenth century and well into the twentieth century, the primary commercial enterprises in the low country consisted of phosphate mining, naval stores – which left numerous tar kilns in the Project vicinity – and timber harvesting. This economic base was augmented by the presence of the Charleston Naval Base. The rural population declined as agricultural pursuits centered on subsistence and truck farming, and this economic pattern persisted into the post-World War II period after which Charleston County developed a strong tourism industry.

3.6.1.7 Gullah Community History and Culture

The inland and tidal rice fields of Berkeley and Charleston counties were constructed by enslaved Africans from various ethnic groups from west and central Africa (Littlefield 1995, NPS 2005, Pollitzer 2005). Forced to work on South Carolina's coastal plantations, enslaved Africans met other enslaved Africans from many ethnic groups. The population of early colonial South Carolina included, among others,

indentured European servants, enslaved Native Americans, French Huguenot refugees, and planters from the island of Barbados, as well as enslaved Africans. Faced with the challenges of life on the Carolina frontier, these communities borrowed cultural practices from each other to form a creole society.

The mixing of African cultures, languages, and religions on coastal plantations generated a culture that was African in origin but unique to the New World (NPS 2005). This culture and language represented by its decedent modern day low country communities is known as Gullah in South Carolina and Geechee in neighboring Georgia (Barnes and Steen 2012). The development of Gullah culture and language was made possible by the isolation of enslaved and then freed African-Americans in remote coastal areas separated from the mainland by marshes, creeks, and rivers.

The contributions of enslaved Africans and their Gullah decedents to the economy of coastal South Carolina during the Antebellum Period were great. The clearing of inland rice fields and the construction of water control structures during the tidal rice revolution involved extremely difficult and dangerous labor. Once the systems of dams, floodgates, ditches, dikes, and other hydraulic control structures had been built, they had to be maintained. These hydraulic systems were complex and required experience and skill to operate (Pollitzer 2005). Rice planters sought and obtained enslaved Africans from the rice growing regions of West Africa to create and manage the physical infrastructure of large-scale rice cultivation (Littlefield 1995).

Following emancipation and the collapse of the plantation system, the Gullah of coastal South Carolina turned to subsistence farming, timber harvesting, and fishing to sustain their families (NPS 2005). These activities augmented by hunting and gathering wild foods and medicinal plants ensured a strong sense of community inter-dependence and self-sufficiency (Barnes and Steen 2012). Since World War II, coastal South Carolina has experienced an influx of new residents with subsequent development of residential subdivisions, commercial enterprises, and golf course vacation resorts. These changes caused the National Park Service to undertake *The Low Country Gullah Cultural Special Resource Study*. A document designed to assist the public, state, and federal agencies, and most importantly the Gullah themselves in determining how best to preserve Gullah language and culture in the face of modern development pressures (NPS 2005). In 2006, Congress created the Gullah-Geechee Cultural Heritage Corridor based on its *Special Resource Study*. That corridor extends 30 miles inland along estuarine boundaries from the Cape Fear River in North Carolina to the Saint Johns River in Florida. Both proposed alternatives are within the boundaries of the Cultural Heritage Corridor.

3.6.1.8 Paleontology

The sedimentary stratigraphy of the South Carolina Coastal Plain was deposited during transgressive and regressive cycles of sea level change (Ward et al. 1991). Sedimentary sequences of Pliocene and Pleistocene (Plio-Pleistocene) age have been documented and mapped in South Carolina by analyzing the lithological characteristics of the deposits coupled with a biostratigraphic framework based primarily on invertebrate marine fauna like mollusks, ostracodes, and foraminifers (Ward et al. 1991).

Cyclic sea level change in response to eustatic loading of continental land masses was a gradual process that allowed development of Coastal Plain landforms like bays, estuaries, and barrier island chains. These landforms provided habitats for marine and terrestrial vertebrates, which left a rich fossil record embedded in Coastal Plain sediments.

Marine fossils found in near-surface sedimentary deposits associated with the Cooper, Pee Dee, and Black Mingo formations in Berkeley and Charleston counties include but are not limited to extinct mollusks, whale skeletal elements, and shark teeth. A variety of Plio-Pleistocene land mammals are included in the fossil record of the Coastal Plain, including but not limited to skeletal elements of extinct horses, camels,

mastodons, mammoths, beavers, rodents, and various extinct predators. Near-surface disturbance of fossil-bearing strata by dredging drainage canals, excavating borrow pits, road construction, and other ground-disturbing activities frequently brings fossils to the surface. The South Carolina State Museum houses a large collection of fossils from the low country.

3.6.1.9 Previous Cultural Resource Investigations

Several cultural resource surveys have included portions of each alternative. This section briefly outlines those surveys.

Proposed Action (Jamestown Corridor)

Between 1970 and 2017, a total of 40 cultural resource surveys have included the Jamestown study area. Most of these were reconnaissance surveys conducted by FMNF, some of which do not meet current standards for cultural resource survey. The most recent study was conducted by Brockington and Associates in 2017 (James and Philips 2017). The study covered those segments of the proposed Jamestown corridor that had not been previously subjected to archaeological survey and were not on private land. The 2017 survey utilized a 300-foot APE on either side of the ROW centerline. Included in the survey corridor was the shared alignment of the Jamestown and Charity alternatives along SC Highway 45 between Honey Hill and the proposed McClellanville Substation. The Jamestown Alternative was also covered by county-wide architectural surveys, which inventoried cultural resources but found only one to be eligible for listing on the NRHP, the Old Georgetown Road, which is now listed on the NRHP. The Honey Hill Fire Tower is also eligible for listing on the NRHP. In addition, there are nine previously recorded archaeological sites that are unevaluated for listing on the NRHP in the Jamestown study area.

Jamestown Alternative

The data on cultural surveys and cultural resources within the Jamestown Alternative is essentially the same as for the Jamestown corridor. The only two known resources eligible for the NRHP are Old Georgetown Road and the Honey Hill Fire Tower, and there are nine unevaluated archaeological sites along this route.

Charity Alternative

At least 42 cultural resource surveys have included the proposed corridor for the Charity Alternative, although not all of them meet current standards for survey under Section 106. In June 2018, Brockington and Associates conducted a survey of the Charity Alternative from the Charity substation to Honey Hill. The survey covered a 150-foot-wide area that generally paralleled the existing Winyah-Charity 230-kV transmission line corridor, along Charity Church Road and Halfway Creek Road into the community of Honey Hill. The surveyors recommended additional investigation at several sites and light-detection and ranging (LiDAR) reconnaissance to assess the presence of structures related to rice plantations. In addition to the Georgetown Road and the Honey Hill Fire Tower, there are 12 previously recorded archaeological sites that are unevaluated for listing on the NRHP within the Charity study area.

3.6.1.10 Previously Recorded Cultural Resources

Research on the cultural resources of the Project area began with a search of the available records at the SHPO and South Carolina Institute of Archaeology and Anthropology. Data in the state's on-line cultural resource information system includes mapping of known historic and archaeological sites in GIS format. This data was downloaded and stored on a secure server to maintain the confidentiality of archaeological site locations. The GIS-based search was conducted along the length of each corridor for 300 feet on either side of each corridor's centerline. Analysis of archaeological data was carried out by a senior archaeologist who meets the *Secretary of the Interior's Standards and Guidelines* for conducting archaeological

investigations. Additional data on existing cultural resources has since been obtained through consultation under the Section 106 process.

These investigations had two objectives. The first objective was to identify previously recorded cultural resources located within the study area including buildings, structures, sites, objects, or districts, as well as properties of religious and cultural significance to Native Americans. The second objective was to identify previous cultural resource studies that have been conducted within the study area. Identification of the cultural resources included, to the extent possible, establishing whether the resource has been determined eligible for inclusion in, or was already included in, the NRHP. Both designations are historic properties (36 CFR §800.16[l][1]) and afford the same considerations and protections under NHPA and its implementing regulations, 36 CFR §800. The search results were compiled into tables that list all the recorded cultural resources and previous studies within the study area.

Following is a summary of the previously recorded cultural resources identified along the Jamestown and Charity alternatives. Figures 3.6-1 and 3.6-2 illustrate the historic properties found within each of the two study areas. This information has been shared with the Section 106 consulting parties, with appropriate restrictions on data concerning the locations of archaeological sites. The data are not considered to be complete because a full Phase I cultural resource survey has not been completed for either alternative. Appropriate additional surveys, as agreed to within the Section 106 process, will be carried out once a final corridor is selected. After the inventory is complete, consultation will continue if there are effects to historic properties or to discuss impacts to lands of religious and cultural significance to the Catawba Indian Nation and other consulting parties such as the Gullah-Geechee Cultural Heritage Corridor Commission and the Lowcountry Rice Culture Project. Consultation will continue until the Section 106 process is complete, which may include fulfilling stipulations of any agreement documents.

The *South Carolina Standards and Guidelines for Archaeological Investigations* (Council of South Carolina Professional Archaeologists et al. 2005, updated 2013) recognize two classes of archaeological sites that are 50 years or older: sites and isolated finds. Sites are defined as "an area yielding three or more historic or prehistoric artifacts within a 30-meter radius and/or an area with visible or historically recorded cultural features (e.g., shell middens, cemeteries, rock shelters, chimney falls, brick walls, piers, earthworks). Isolated finds are defined as "no more than two artifacts found within a 30-meter radius." The SHPO recognizes buildings, structures, sites, objects, or districts that are 50 years or older as historic resources.

In addition to these resources, the state of South Carolina also recognizes and protects historic cemeteries and burials that may or may not be eligible for listing on the NRHP. State protections of cemeteries include 16-17-600, SC Code of Laws titled "Destruction or Desecration of Human Remains or Repositories Thereof."

Table 3.6-1 summarizes the number and distribution of cultural resources located in the study area.

Table 3.6-1. Distribution of Previously Recorded Archaeological Sites and Historic Properties in the Study Area

Corridor	Archaeological Sites	Unevaluated Archaeological Sites	Historic Properties
Jamestown Corridor	25	9	2
Jamestown Alternative	25	9	2
Charity Alternative	29	12	2

Note: All of these cultural resources and historic properties fall within the boundaries ofthe Gullah Geechee Cultural Heritage Corridor. With the exception of the prehistoric archaeological sites, all of these resources could be considered as contributing features of the corridor.

Proposed Action (Jamestown Corridor)

Twenty-nine cultural resources have been previously recorded within the 600-foot-wide corridor for the Jamestown corridor. The count includes those resources located along the shared alignment of the Jamestown and Charity alternatives that runs from south of Honey Hill to the proposed McClellanville Substation; those resources are also discussed below for the Charity Alternative. Of the 25 known archaeological sites located along the Jamestown corridor, 16 have been determined not eligible for inclusion in the NRHP, and nine have not yet been evaluated for listing in the NRHP.

Four above-ground cultural resources have been previously identified along the Jamestown corridor. The Marvin Bunch House and the John Bunch House have both been determined not eligible for listing in the NRHP. The Honey Hill Fire Tower is a NRHP-eligible resource, and Old Georgetown Road is formally listed on the NRHP. The Honey Hill Fire Tower is located in Berkeley County and was constructed in the 1930s. The Old Georgetown Road, located in Charleston County, has followed the same route since the eighteenth century and represents the historic landscape of the region. The shared corridor for the Proposed Action and other action alternatives passes quite close to the Honey Hill Fire Tower and its eastern extent crosses Old Georgetown Road about 2 miles north/northwest of the proposed McClellanville Substation; it would have a direct, visual impact on both resources.

Four archaeological sites have been recorded within the 600-foot-wide corridor for the proposed route following the existing 230-kV line. All of these sites are considered unevaluated for listing on the NRHP.

No TCPs have yet been identified in the Project APE or the 1-mile wide study corridor for the Proposed Action. NRHP Bulletin Number 38 defines a TCP as a historic property where "significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices" and that these resources may be eligible for inclusion in the NRHP because of their "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" (NPS 1992). Limited consultation has taken place with three Indian nations, and they have provided no input on potential TCPs. Additional consultation with all the Tribes that regularly work with the FMNF is planned. In addition to local communities and stakeholders, RUS is consulting with the Gullah-Geechee Cultural Heritage Corridor Commission and the Lowcountry Rice Culture Project regarding possible TCPs within the study area.

Jamestown Alternative

The cultural resources for the Jamestown Alternative are the same as those listed above for the Jamestown corridor. Two resources eligible for listing on the NRHP are within the study area for this alternative. The Honey Hill Fire Tower, located in Berkeley County, was constructed in the 1930s. The Old Georgetown Road, located in Charleston County, has followed the same route since the eighteenth century and represents the historic landscape of the region. The shared corridor for the Proposed Action and other action alternatives passes quite close to the Honey Hill Fire Tower and its eastern extent crosses Old Georgetown Road about 2 miles north/northwest of the proposed McClellanville Substation; it would have a direct, visual impact on both resources.

Charity Alternative

Twenty-nine archaeological sites are known to be present within the 600-foot-wide corridor for the Charity Alternative, including those also within the shared corridor for the Proposed Action and Jamestown Alternative. Of those, 17 have been found not eligible for inclusion in the NRHP and 12 are considered unevaluated.

Nine historic structures have also been recorded in the Charity study area. All the resources except two have been determined not eligible for listing in the NRHP. The Honey Hill Fire Tower is a NRHP-eligible resource, and Old Georgetown Road is formally listed on the NRHP. The shared corridor for the Proposed Action and action alternatives passes quite close to the Honey Hill Fire Tower and its eastern extent crosses Old Georgetown Road about 2 miles north/northwest of the proposed McClellanville Substation; it would have a direct, visual impact on both resources.

No TCPs have yet been identified in the Project APE or the 1-mile wide study corridor for the Charity Alternative. Further consultation with the Tribes that regularly work with the FMNF is planned.

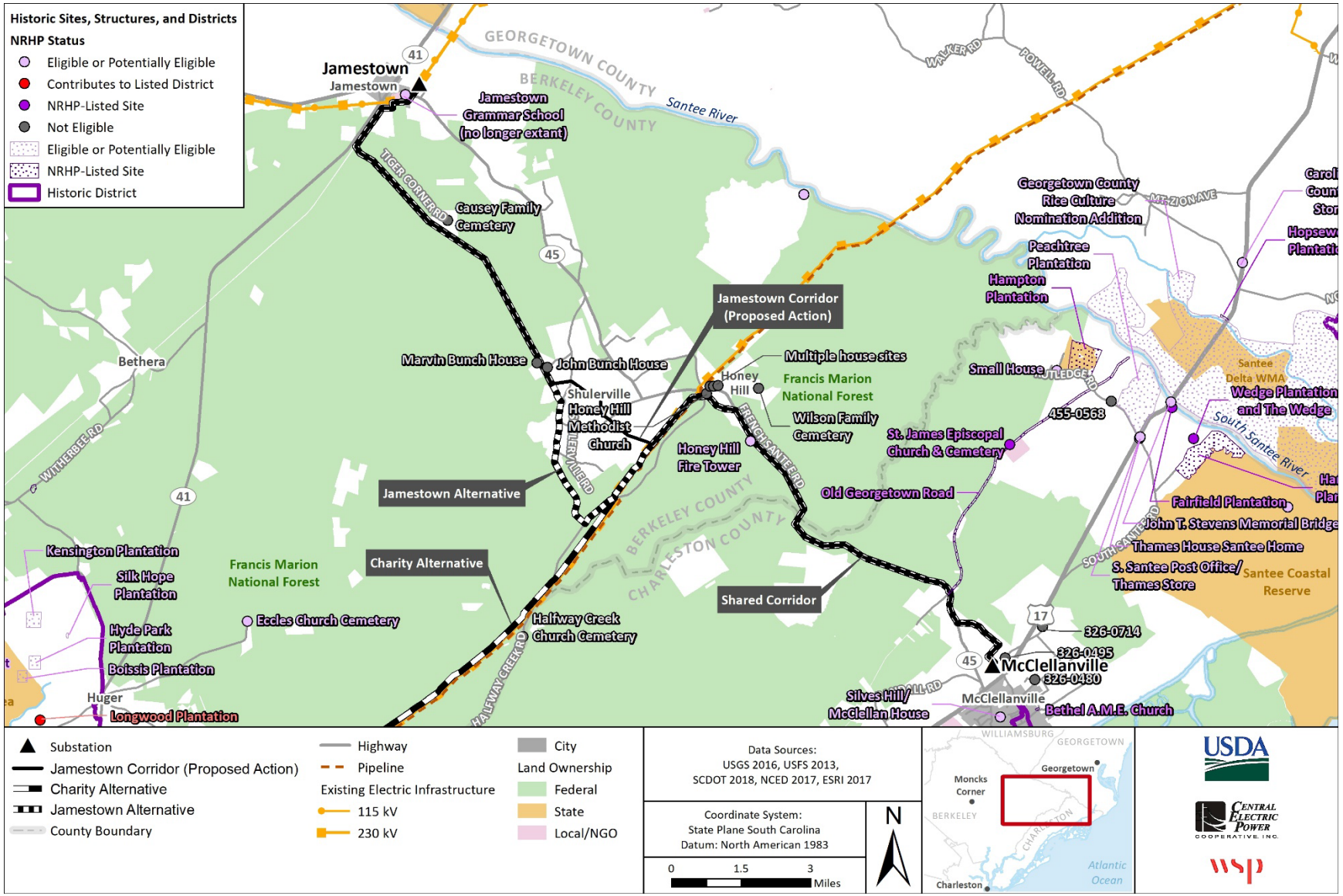


Figure 3.6-1. Cultural Resources in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

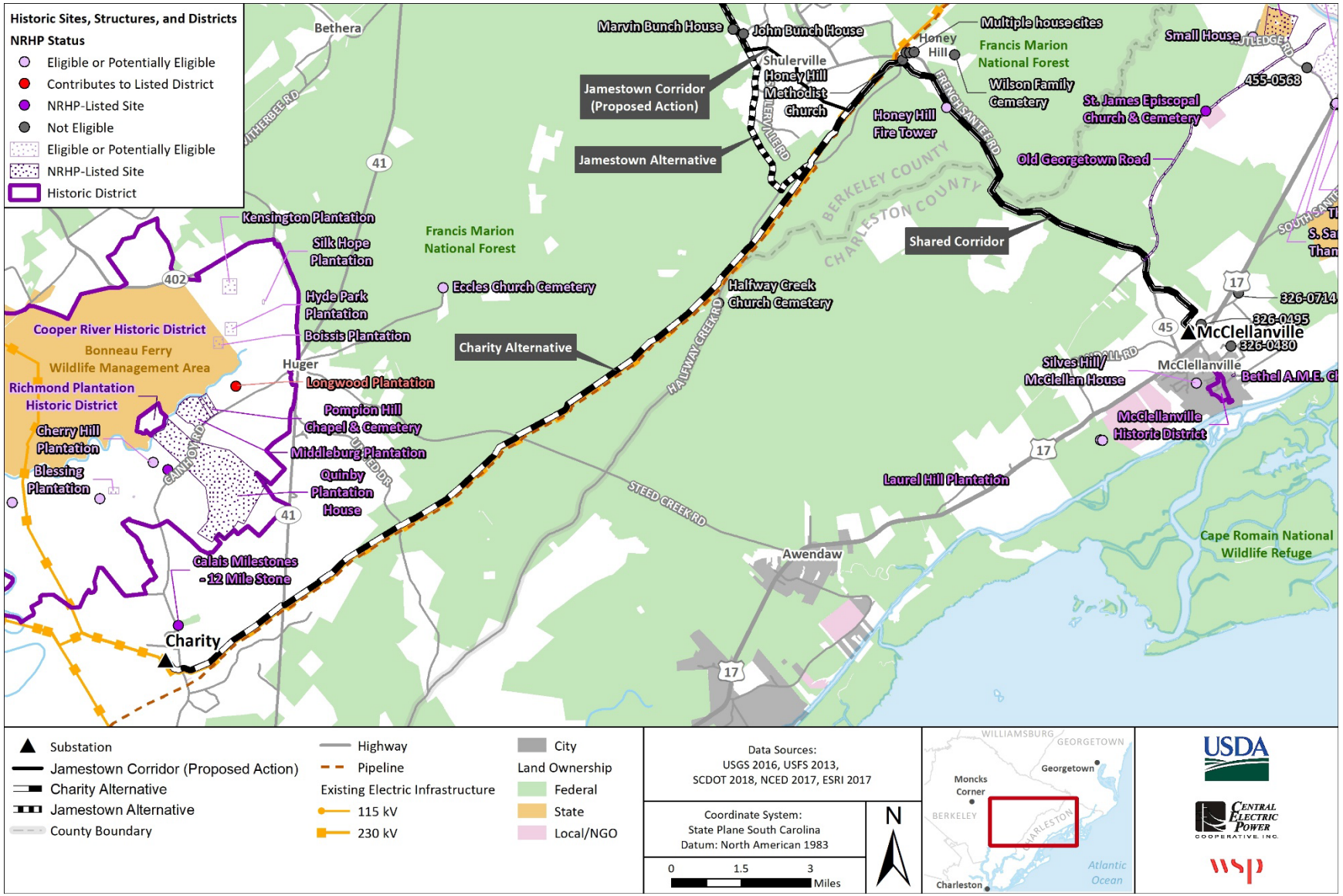


Figure 3.6-2. Cultural Resources in the Vicinity of the Charity Alternative

3.6.2 Environmental Effects

3.6.2.1 No Action Alternative

The No Action Alternative would not impact existing cultural resources either directly or indirectly and would allow for existing conditions to remain. Archaeological and historic resources would neither be preserved in another manner nor damaged under the No Action Alternative.

3.6.2.2 Proposed Action (Jamestown Corridor)

The construction of new transmission line facilities (e.g., pole locations, substation modifications, pull sites, improvements to existing access roads, and staging areas) could affect previously recorded historic properties and currently unidentified cultural resources present along the proposed Jamestown corridor, including on state, local, and federal lands. Once historic properties are identified, RUS, in consultation with the consulting parties, would determine if there are effects and if those effects are adverse (36 CFR §§800.4 and .5). Any adverse effects on cultural resources must be resolved in accordance with 36 CFR §800.6. RUS has developed a PA with consulting parties to govern compliance with Section 106 of the NHPA. This project-specific PA is a legally binding document. This PA records the outcome of consultation, the effects of the Project on cultural resources, and the way in which the adverse effects will be minimized or mitigated (Appendix J).

Portions of the transmission line, with its pole installation and substation modification (excluding the substation that has already been surveyed), has the potential to have an effect on archaeological sites through ground-disturbing activities. Once the Project ROW selected, Central Electric would work with archaeologists, who meet or exceed the Secretary of the Interior's Guidelines and Standards, to identify and avoid known site boundaries within the APE for direct effects. This action represents a good faith effort to minimize construction impacts on archaeological resources. Additional above-ground surveys will likely also be required following *South Carolina Standards and Guidelines for Archaeological Investigations* (Council of South Carolina Professional Archaeologists et al. 2005, updated 2013), particularly in Shulerville/Honey Hill, where there are structures related to local African American history that may not have been adequately evaluated in the older architectural surveys (measure CHP-1).

The proposed Project could also alter the setting and feeling of historic structures, districts, or landscapes as well as properties, including TCPs, important to the Tribes, Gullah-Geechee Cultural Heritage Corridor Commission, and the Low Country Rice Culture Project, as well as other interested parties.

In areas not previously disturbed by construction or by extractive industries, (e.g., near large lakes, river crossings, historic roads, and rice fields), unrecorded archaeological sites, landscapes, historic districts, or TCPs may be affected during construction of transmission line and associated infrastructure. Landscape character associated with historic buildings or other properties may be impacted by the height of the new transmission structures and infrastructure.

Possible impacts on archaeological resources that would apply to the proposed Project include: (1) subsurface excavations necessary to install structures; (2) disturbance to soils throughout the corridor as a result of heavy construction vehicle equipment operation; and (3) disturbance to soils through grubbing, stump removal, and grading; and (4) disturbance to soils through long-term O&M activities. All workers would be briefed on the appropriate protocol in the event of a cultural resource discovery during construction (measure CHP-2). All workers are prohibited from removing artifacts from the Project area, as identified in the PA. All construction activities would be suspended within a 50-foot radius if any archaeological resources are discovered, as identified in the PA (measure CHP-4).

Archaeological Sites

A total of 29 archaeological sites have been identified within the 600-foot-wide corridor for the Proposed Action. Because six of those sites have been determined not eligible for listing in the NRHP, the Project would have no impact on those resources. Four archaeological sites have not been evaluated for inclusion in the NRHP. Additional archaeological evaluation would be necessary to evaluate the eligibility of those eleven sites for listing in the NRHP. Additional archaeological surveys may identify additional sites for evaluation for eligibility for the NRHP (measure CHP-1), following *South Carolina Standards and Guidelines for Archaeological Investigations* (Council of South Carolina Professional Archaeologists et al. 2005, updated 2013. It may be possible to avoid some sites entirely during construction and Project O&M. Archaeological sites will be spanned and protected during construction when feasible, as identified in the PA. Where designs are unable to span an archaeological resource, these instances would be addressed in the PA with phased surveys and resolution of adverse effects, where necessary (measure CHP-2). Any unevaluated sites that would be impacted by this corridor would require additional archaeological testing. In addition, any PA for the Project would have provisions for the treatment of any post-review archaeological discoveries.

Historic Structures

One historic structure, the Honey Hill Fire Tower, is within the potential impact area of the Jamestown corridor. The fire tower was constructed in the 1930s, and while it has not been individually evaluated, the Forest Service has issued guidance indicating that all fire towers constructed in the New Deal period should be treated as NRHP-eligible. Mitigation for this impact will be worked out through the Section 106 consultation process. In addition, any PA for the Project would have provisions for the treatment of any post-review structure discoveries.

Landscape and Transportation Resources

The Old Georgetown Road, linking coastal plantations and settlements with Georgetown and Charleston, has been in existence since the eighteenth century. The section of the road in Charleston County is listed on the NRHP. The Jamestown corridor, as presently configured, crosses this historic property. Thus, the Proposed Action would have a direct, visual impact on Old Georgetown Road. Mitigation for this impact will be worked out through the Section 106 consultation process. The impact can be reduced through careful placement of transmission line structures outside the road's existing ROW. This would minimize impacts to existing trees which line portions of the Old Georgetown Road. Another possible mitigation measure would be the planting of additional trees to serve as visual buffers.

Gullah-Geechee Cultural Heritage Corridor

The Alternatives currently under consideration do not include known resources related to historic rice cultivation or other sites directly tied to Gullah-Geechee heritage. However, the entire Project APE is within the Gullah-Geechee Cultural Heritage Corridor (Gullah Geechee Heritage Corridor Commission 2012). The additional cultural resource surveys that will be required for completion of the Project will consider the possibility that features related to rice agriculture or other remnants of the labor of enslaved Africans may be present. If any are identified, their potential to be identified as TCPs related to Gullah-Geechee culture will be considered, in consultation with the Gullah-Geechee Cultural Heritage Corridor and other consulting parties.

Paleontological Resources

Fossilized marine and terrestrial skeletal elements may be encountered along the proposed Jamestown corridor during the course of transmission line construction. If fossilized animal remains are encountered during construction, Central Electric's construction inspectors would be notified immediately. Upon

notification, Central Electric's Project managers may wish to inform the South Carolina State Museum of the discovery so that the staff paleontologist may assess its significance. In addition, any PA for the Project would have provisions for the treatment of unanticipated paleontological discoveries.

3.6.2.3 Jamestown Alternative

The Jamestown Alternative could affect previously recorded historic properties and currently unidentified cultural resources present along the Project ROW, in a manner similar to the Proposed Action. The resources are the same as for the Proposed Action.

3.6.2.4 Charity Alternative

The Charity Alternative could affect previously recorded historic properties and currently unidentified cultural resources present along the Project ROW, in a manner similar to the Proposed Action. A total of 34 archaeological sites have been identified within the 600-foot-wide corridor for the Charity Alternative. Six of these sites have been determined not eligible for listing on the NRHP. The remaining 28 sites have not been evaluated. Additional archaeological testing would be necessary to evaluate the eligibility of those 28 sites for listing in the NRHP and impacts would be mitigated as required by Section 106 consultation.

3.7 Recreation and Land Use

3.7.1 Affected Environment

The proposed Project area is situated in the low country of South Carolina and includes portions of Berkeley and Charleston counties. The region surrounding the proposed Project is largely rural, undeveloped lands characterized as low-lying topography covered in forest, with smaller areas of croplands and pockets of residential development.

3.7.1.1 Recreation

Public lands and waterways in the South Carolina low country provide plentiful opportunities for outdoor recreation. Popular outdoor recreation activities primarily include fishing, hunting, swimming, picnicking, boating, hiking, camping, and wildlife observation. The FMNF, USFWS, SCDNR, SCDOT, and private conservation groups all provide outdoor recreation areas. Free-flowing waterways, like the Santee River, allow for a number of water-based recreation activities. Figures 3.7-1 and 3.7-2 show the locations of the major recreation opportunities in the Project vicinity.

Recreation opportunities are described in four categories based on the ownership and management of each recreation area: federal, state, city/county, and private/non-governmental organization.

Federal

Federal recreation areas in the Project vicinity include the FMNF, managed by USFS, and the Cape Romain National Wildlife Refuge, managed by USFWS. Both areas provide for a number of outdoor recreation opportunities as follows.

The FMNF comprises 259,625-acres of NFS lands in Berkeley and Charleston counties, with a small area crossing U.S. Highway 17 and sharing a border with the Santee Coastal Reserve (discussed in detail below) (USFS 2015). The FMNF provides dispersed recreation opportunities in a range of recreation opportunities in a variety of settings, from remote and challenging to easily travelled and convenient, thus appealing to various user preferences. Semi-primitive areas and designated wilderness areas allow visitors to experience

solitude and unconfined recreation in ecosystems that are rare in South Carolina's Lowcountry. The FMNF is one of the largest publicly available areas for hunting and fishing in South Carolina (USFS 2017). USFS (2017) seeks to provide for sustainable recreation, which includes improving ecological integrity and the quality of outdoor experiences within areas that have been impacted by declining ecosystem health or physical impacts. For example, restored longleaf pine ecosystems provide opportunities to see and explore the region's rich biodiversity. Several trail systems focus on access to water-based trails, such as Wambaw Creek, for fishing, boating, canoeing, and kayaking

The Proposed Action and alternatives would pass through the FMNF, in the vicinity of three wilderness areas, each described below, from north to south.

Hellhole Bay Wilderness—According to the FMNF, the 2,125-acre Hellhole Bay Wilderness may take its name from a large forest opening possibly formed by early wildfire behavior in the area. A shallow canoe trail a little over a mile long and often less than a foot deep crosses the bay and is passable during the wetter times of the year. But in dryer months it becomes a muddy trail and can be difficult to hike. There is no boat ramp but users can access the wilderness from Hell Hole Road. The Jamestown corridor would pass within approximately 0.8 miles of Hellhole Bay Wilderness, south of Jamestown and east of Shulerville (Figure 3.7-1).

Between the wilderness boundary and Tiger Corner Road (USFS Road 157), the FMNF has designated a "semi-primitive area" between Hell Hole Road and Horse Island Road. This area seeks to offer a higher degree of solitude for recreation visitors and restoration of native ecosystems (USFS 2017). The Jamestown corridor would be adjacent to this semi-primitive area as it follows Tiger Corner Road.

Wambaw Swamp Wilderness—The 4,815-acre Wambaw Swamp Wilderness does not have any trails. The wilderness is comprised of bottomland hardwood forest and is edged with small pine stands. The wilderness offers very little dry land and water levels are usually too low for boating. The Charity alternative corridor would pass within approximately 0.7 miles of this wilderness area (Figure 3.7-2).

Wambaw Creek Wilderness—The 1,825-acre Wambaw Creek Wilderness protects 11 miles of Wambaw Creek from SC Highway 45 to its confluence with the Santee River. The main feature of the wilderness is Wambaw Creek, which is designated as eligible to be listed as a Wild and Scenic River under the Wild and Scenic Rivers Act. The creek varies in width from 20-80 feet and canoe users will need a tide table as proximity to the Atlantic Ocean causes the creek to be greatly altered by the tides. During low tide, the upper creek, especially the first two miles, starting from SC Highway 45 bridge (mile 0), can be blocked by logs. Formal FMNF recreation access to the Wambaw Creek Canoe trail is provided at mile 5 and canoers can go upstream or downstream from this launch, which is discussed in more detail in the section below. Informal canoe launches could occur at the SC Highway 45 bridge; however no formal parking area or trail head is designated at this time in this location. The shared corridor for the Proposed Action and action alternatives would follow SC Highway 45 near the boundary of the Wambaw Creek Wilderness Area (Figure 3.7-1).

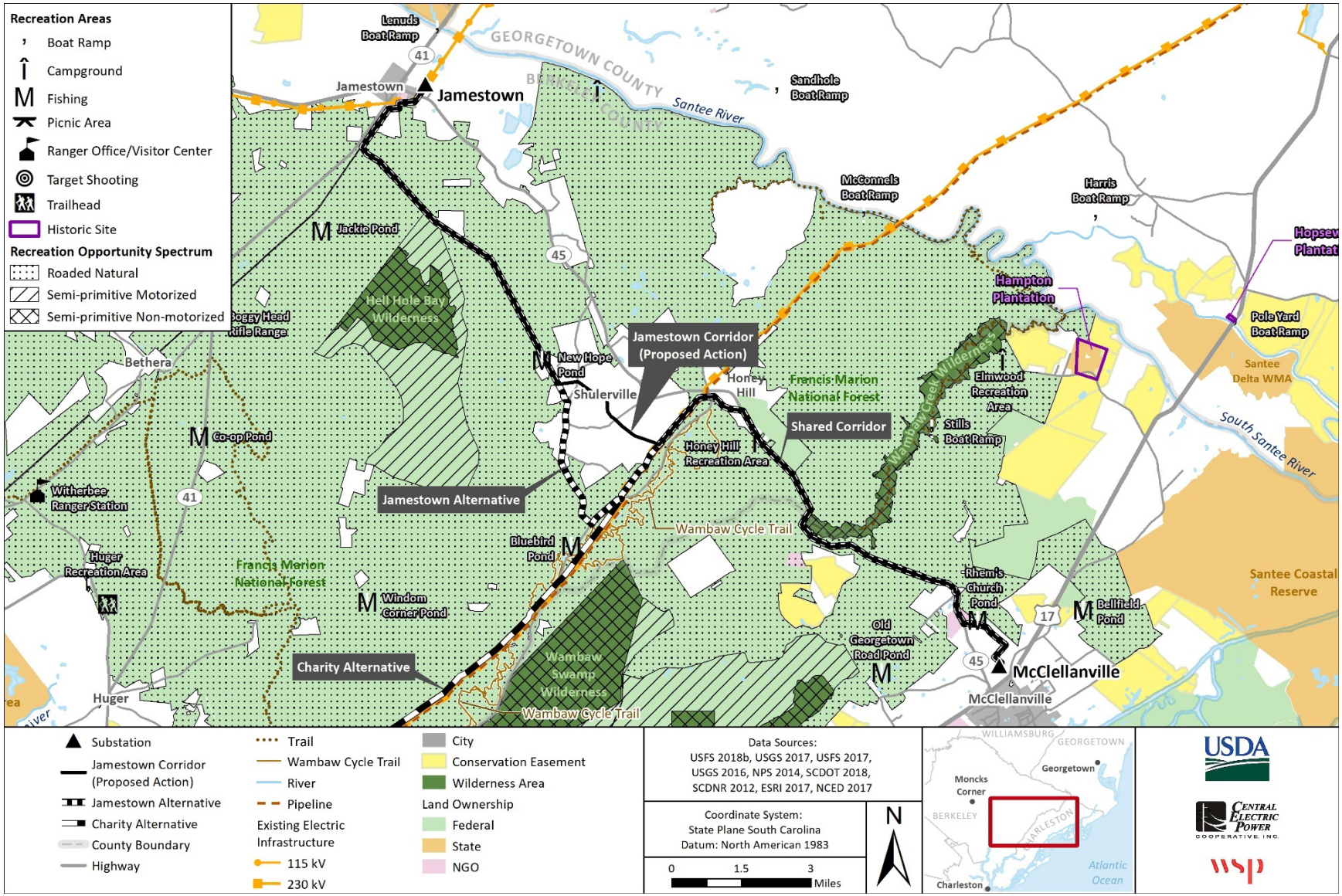


Figure 3.7-1. Recreation Areas in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

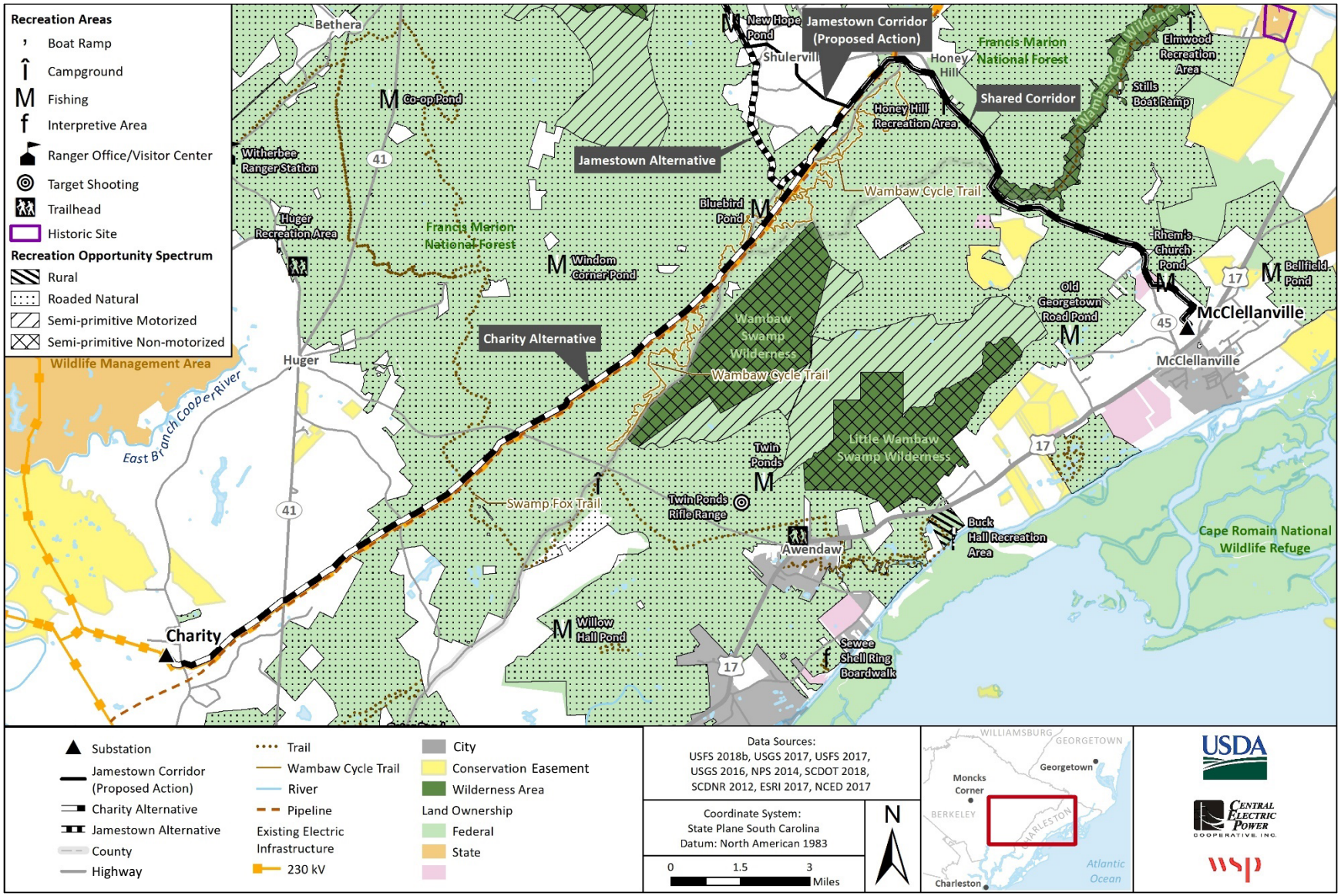


Figure 3.7-2. Recreation Areas in the Vicinity of the Charity Alternative

The FMNF provides a number of recreation opportunities in addition to Wilderness Areas. The FMNF maintains approximately 160 of trails that offer hiking, horseback riding, motorcycling, off-highway vehicle riding, mountain biking, and canoeing. Two trails, the Wambaw Creek Wilderness Canoe Trail and Wambaw Cycle Trail, would be crossed by both action alternatives. In addition, The Swamp Fox Trail would be crossed by the Charity Alternative.

Wambaw Creek Wilderness Canoe Trail—The Wambaw Creek Wilderness Area hosts a 9-mile canoe trail along Wambaw Creek, a blackwater tributary of the South Santee River that is eligible for listing as a Wild and Scenic River. Large cypress and gum trees line the creek, which flows down the middle of the slender wilderness area between Route 45 and the south Santee River. There are no hiking trails in this wilderness area, and visitation requires use of a canoe. The proximity to the ocean causes the creek to be greatly influenced by the tides; during low tide, the upper 2 miles can be impassable because of shallow depths and logs. FMNF provides formal access to the canoe trail at Stills Landing and Echaw Road (USFS Road 204).

Wambaw Cycle Trail—The Wambaw Cycle Trail is the FMNF's only motorcycle and off-road vehicle trail. The trail network covers over 40 miles and winds through pine woodlands with a mix of hardwoods. While the trail is designed for motorcycles, it can accommodate vehicles under 50 inches wide. Jeeps, Hummers, and other 4x4 vehicles are not permitted. The Wambaw Cycle Trail is located along Halfway Creek Road, to the south of Honey Hill, and would be crossed multiple times by the Charity alternative.

Swamp Fox Trail—The Swamp Fox Trail, also known as the Swamp Fox Passage, is the longest section of the cross-state Palmetto Trail in South Carolina. It covers a distance of approximately 47 miles and is accessed from 3 trailheads, none of which are within the Project vicinity. The Swamp Fox Trail would be crossed by the Charity Alternative approximately 500 feet north of where the existing Winyah-Charity 230-kV transmission line crosses South Hampton Road.

Additional recreation facilities in the forest include shooting ranges, fishing ponds, boat launches (motorized and non-motorized), campgrounds, educational centers, and interpretive trails. Four named 'recreation areas' lie within the FMNF in the Project vicinity. These areas include (from northwest to southeast): New Hope Pond, Bluebird Pond, Honey Hill Recreation Area, and Rhem's Church Pond.

New Hope Pond– New Hope Pond is located in the FMNF about 1 mile north of Shulerville off Tiger Corner Road (USFS Road 157). The approximately 4-acre pond provides good fishing for bass, bream, and catfish (USFS n.d.b). New Hope Pond is approximately 150 feet from Tiger Corner Road, alongside which the Jamestown corridor is proposed.

Bluebird Pond – Bluebird Pond is located in the FMNF about 4 miles southwest of Shulerville at the junction of USFS Road 169 and Halfway Creek Road. The pond covers approximately 3 acres and provides good fishing for bass, bream, and catfish. Bluebird Pond is approximately 1,000 feet from the existing Winyah-Charity 230-kV transmission line, along which the Charity Alternative is proposed.

Honey Hill Recreation Area—Honey Hill Recreation Area is a primitive camping facility is located between McClellanville and Honey Hill. The site includes 12 fairly large camp sites with picnic tables, grills, and vault toilets (USFS n.d.c). Honey Hill Recreation Area is located next to SC Highway 45, near its intersection with Thompson Branch Road. Both the Jamestown and Charity alternatives would pass by Honey Hill Recreation Area where the corridors are proposed alongside SC Highway 45.

Rhem's Church Pond – Rhem's Church Pond is located 3 miles north of McClellanville on USFS Road 5084 off SC Highway 45. The approximately 1-acre pond provides good fishing for bass, bream, and catfish (USFS n.d.b). Rhem's Church Pond is approximately 1,600 feet from SC Highway 45, alongside both the Jamestown and Charity alternatives are proposed.

While not within the Project area, Cape Romain National Wildlife Refuge is an area located southeast of the FMNF along the Atlantic Ocean, approximately two miles from the proposed McClellanville Substation. The Refuge is part of the National Wildlife Refuge System managed by USFWS. Cape Romain National Wildlife Refuge is about 66,300 acres encompassing a 22-mile segment of the Atlantic coast and includes barrier islands, salt marshes, intricate coastal waterways, sandy beaches, and maritime forests (USFWS 2010). Recreation opportunities at the Refuge include hiking, hunting, freshwater and saltwater fishing, wildlife viewing, photography, and environmental education (USFWS 2010).

State

The state of South Carolina manages two public land areas and two boat ramps within the Project vicinity. Both the Santee Delta WMA and Santee Coastal Reserve are managed by the SCDNR. SCDOT manages the two boat ramps.

Santee Delta Wildlife Management Area—The Santee Delta WMA is located between the North and South Santee Rivers, near where U.S. Highway 17 and approximately 7.5 miles north of the proposed McClellanville Substation. The WMA provides habitat for wintering waterfowl and other wetland wildlife including wood storks, wading birds, ospreys, and bald eagles. The WMA is divided into two areas: Santee Delta East and Santee Delta West. Santee Delta East is mostly impounded remnant rice fields while Santee Delta West is impounded bottomland hardwood forest. Within the Santee Delta WMA is the Santee Delta Waterfowl Area. This expanse is a Category I waterfowl area, meaning that it is a high quality, intensively managed habitat. The 1,721 acres of wetlands are home to large concentrations of waterfowl. The abundance of waterfowl and migratory birds allows for a number of avian-based recreation activities including birding, photography, and hunting (SCDNR 2016c).

Santee Coastal Reserve—The Santee Coastal Reserve, located approximately 6 miles northeast of the proposed McClellanville Substation, is a WMA managed by SCDNR. The reserve encompasses 24,000 acres and includes trails and boardwalks for walking, hiking, biking, wildlife viewing and photography (SCDNR 2016b, South Carolina Department of Parks, Recreation and Tourism 2023). The North Santee River runs along portions of the northern border of the reserve and the South Santee River runs through it. These rivers provide opportunities for motorized and non-motorized boating and fishing.

Boat Ramps—SCDOT owns two boat Ramps in the Project vicinity that provide access to the Santee River although neither action alternative would cross the Santee River. These ramps include the Pole Yard and Lenuds Boat Ramps.

The Pole Yard boat ramp is on the north bank of the North Santee River in Georgetown County directly across from the Santee Delta WMA. This site has a two-lane ramp, courtesy dock, and paved parking for about 23 vehicles with trailers and can accommodate non-motorized and motorized watercrafts.

The Lenuds boat ramp is in Berkeley County, on the Santee River adjacent to SC Highway 41. It is a two-lane concrete ramp with a paved parking area and can accommodate non-motorized and motorized watercrafts.

Neither the Santee Delta WMA and Santee Coastal Reserve, nor the boat ramps discussed above would be crossed by the proposed Project and are not discussed further.

City/County

Boat Ramps—Georgetown County owns two boat launches over 10 miles north of the proposed McClellanville Substation: Harris Boat Ramp and Sandhole Boat Ramp. Harris Boat Ramp, northeast of the FMNF, provides access to the North Santee River and has one lane and parking for about 20 vehicles.

Sandhole Boat Ramp, northwest of the Harris Boat Ramp along Wadamon Creek, also has one lane, limited parking, and provides access to Wadamon Creek. These boat ramps would not be crossed by the proposed Project and are not discussed further.

Private

Conservation Easements—Ducks Unlimited holds the Oaks (204 acres), Crow Hill (274 acres), and Commander Island (373 acres) plantations in conservation easements. These privately owned and neighboring plantations encompass about 850 acres along the North Santee River in Georgetown County west of U.S. Highway 17. The Oaks Plantation operates as a private hunting club while the other two plantations do not offer any known recreation opportunities. These lands would not be crossed by the proposed Project and are not discussed further.

3.7.1.2 Land Use

Land Cover

The USGS (2021) National Land Cover Database (NLCD) land cover categories were quantified within the Project area. Table 3.7-1 shows the acreage and percentage of NLCD land cover type within a 600-foot-wide corridor for the Proposed Action and alternatives.

Table 3.7-1. Acreage and Percentage of Land Cover Categories[a] within a within a 600-foot-wide Corridor

Land Cover Category[a]	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Evergreen Forest	925 (55%)	1,060 (56%)	951 (42%)
Woody Wetlands	385 (23%)	374 (20%)	990 (44%)
Developed, Open Space	260 (15%)	330 (17%)	170 (8%)
Shrub/Scrub	50 (3%)	35 (2%)	70 (3%)
Herbaceous	32 (2%)	45 (2%)	40 (2%)
Developed, Low-Intensity	21 (1%)	28 (1%)	16 (1%)
Developed, Medium-Intensity	6 (<1%)	6 (<1%)	8 (<1%)
Pasture/Hay	6 (<1%)	10 (<1%)	3 (<1%)
Cultivated Crops	5 (<1%)	4 (<1%)	0 (0%)
Barren Land	4 (<1%)	4 (<1%)	3 (<1%)
Deciduous Forest	1 (<1 %)	1 (<1 %)	4 (<1%)
Open Water	1 (<1%)	1 (<1%)	3 (<1%)
Emergent Herbaceous Wetlands	1 (<1%)	1 (<1%)	8 (<1%)
Developed, High-Intensity	0 (0%)	1 (<1%)	2 (<1%)
Mixed Forest	0 (0%)	0 (0%)	1 (<1%)
Total	1,697	1,901	2,268

Source: USGS (2021)

[a] Percentages calculated from the NLCD are not always accurate due to the large cell size.

Figures 3.7-3 and 3.7-4 show land cover data for the Project vicinity.

To apply land cover categories as a surrogate for land use, categories were combined based on the similarities among many categories (Table 3.7-2). Lands within the 600-foot-wide corridors are

predominantly forested followed by the open water/wetland type habitats. Forest is the dominant land use, composing 42 to 57 percent of a 600-foot corridor for the Proposed Action and other action alternatives. Open water and wetlands compose approximately 20 to 44 percent of the corridors. Much smaller amounts of the land are developed, shrub/scrub and grassland/herbaceous. There is a negligible amount of pasture/hay and cultivated crops grown in the area.

Table 3.7-2. Acreage and Percentage of Land Use Within a 600-foot-wide Corridor

Land Cover Category[a]	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Forested	926 (57%)	1,063 (56%)	956 (42%)
Open water and wetlands	387 (23%)	376 (20%)	1,001 (44%)
Shrub/scrub and grassland/herbaceous	82 (5%)	80 (4%)	110 (5%)
Developed (open, low, medium and high)	291 (17%)	368 (19%)	198 (9%)
Pasture/hay and cultivated crops	11 (<1%)	14 (<1%)	3 (<1%)

Source: USGS (2021)

[a] Percentages calculated from the NLCD are not always accurate due to the large cell size.

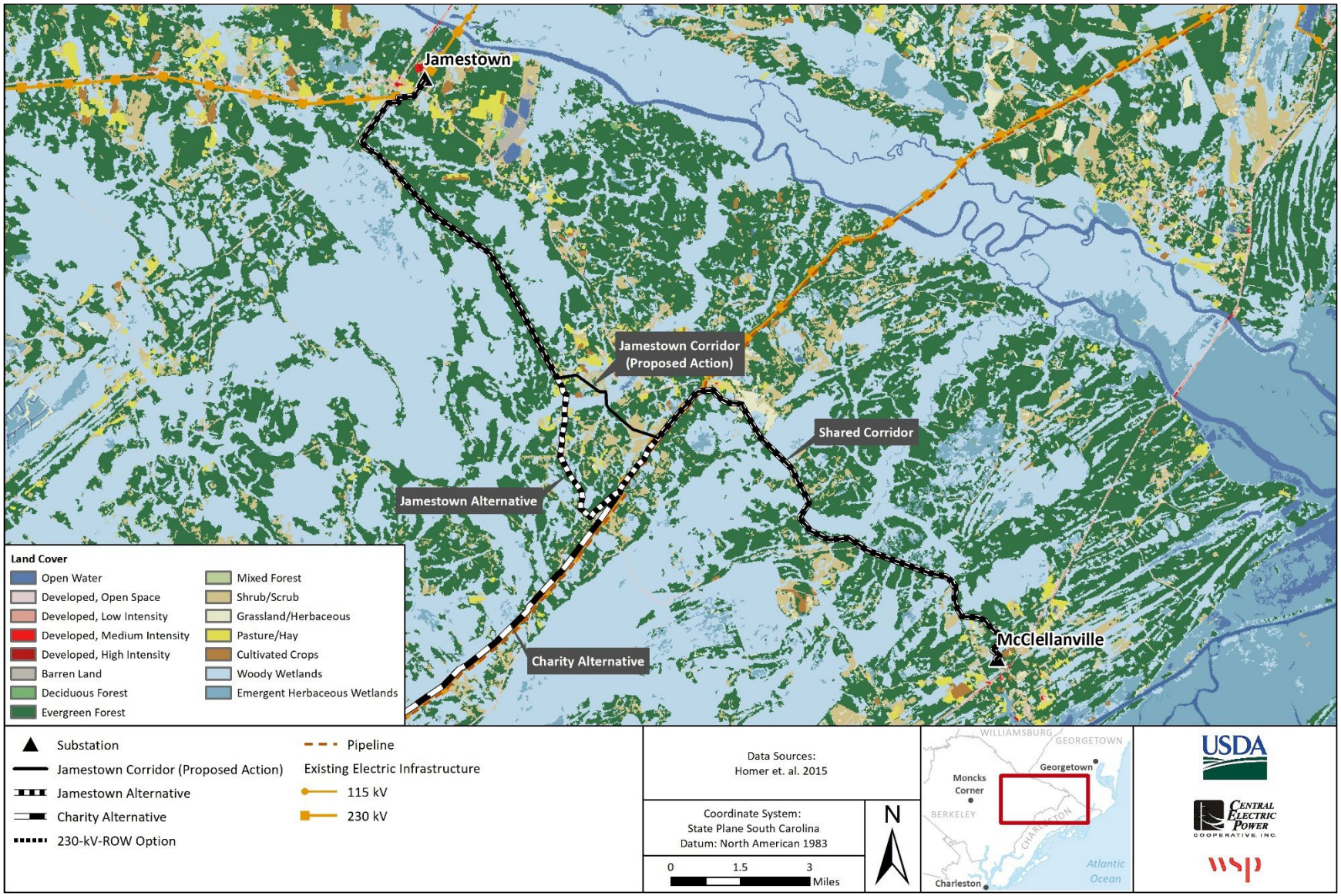


Figure 3.7-3. Land Cover in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

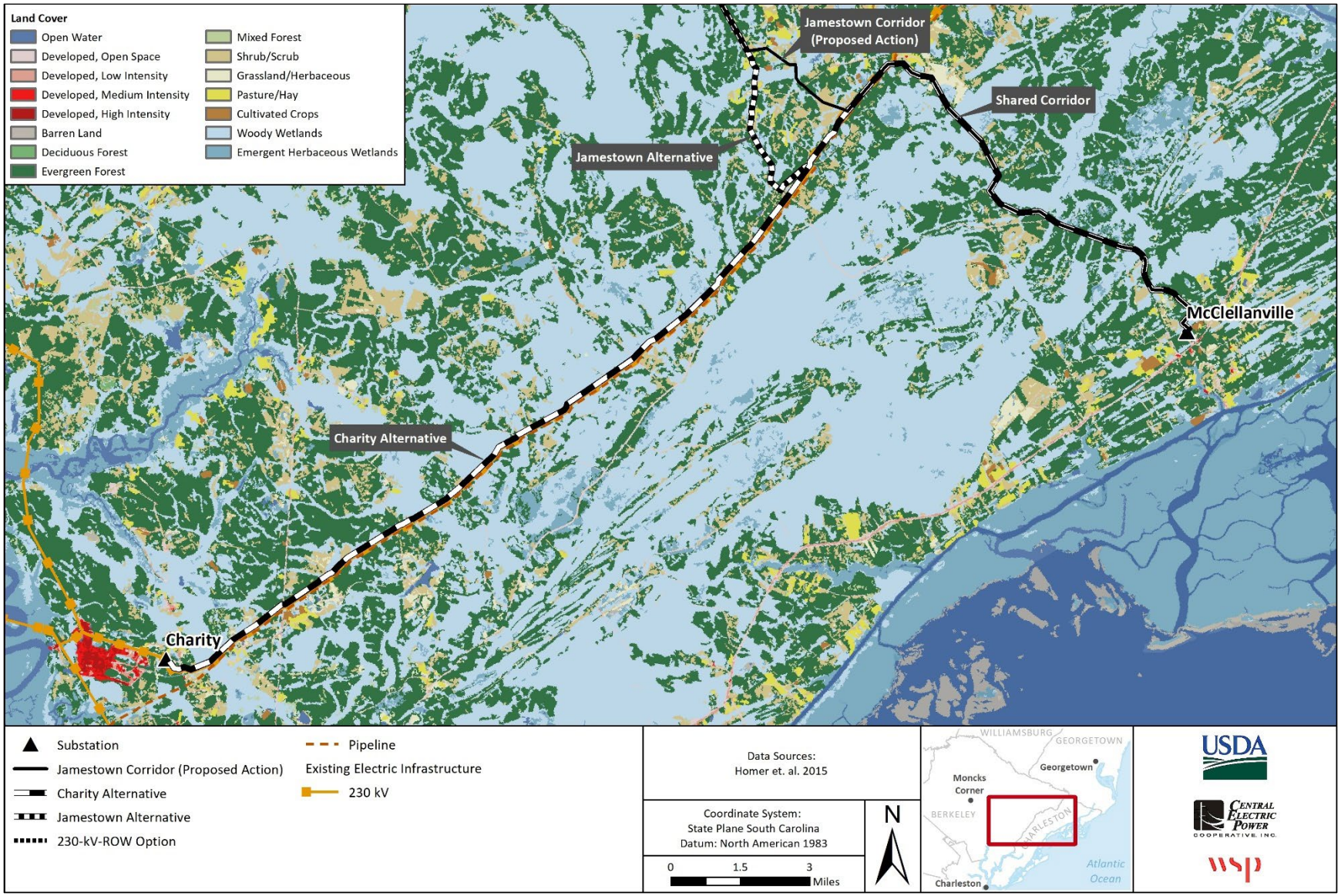


Figure 3.7-4. Land Cover in the Vicinity of the Charity Alternative

Land Ownership

Land ownership and jurisdiction within the Project area includes predominantly private lands and public, NFS lands. Public lands within proximity to the proposed Project include the FMNF, Santee Delta WMA, Santee River, and Santee Coastal Reserve. Private lands set into conservation easements are also identified on Figures 3.7-1 and 3.7-2 and include plantations.

Table 3.7-3 summarizes land ownership crossed a preliminary centerline for each alternative. Both the Jamestown and Charity alternatives are primarily made up of NFS lands in the FMNF.

Table 3.7-3. Length (miles) and Percentage of Landowner Types Within a Preliminary 75-foot ROW

Landowner	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
NFS lands	123.2 (58%)	154.6 (65%)	195.5 (69%)
State Land	0 (0%)	0 (0%)	0 (0%)
NGO/Private conservation lands	3.8 (2%)	3.8 (2%)	0 (1%)
Privately owned lands	85.0 (40%)	79.1 (30%)	83.3 (30%)

Table 3.7-4 summarizes the amount of forest cover by landowner type.

Table 3.7-4. Percentage of Forest Cover by Landowner Type Within a Preliminary 75-Foot ROW[a]

Landowner Type	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Forest Cover Total (Acres)	83.3	125.6	238.3
Percentage on NFS lands	44%	57%	69%
Percentage on State Land	0%	0%	0%
Percentage on NGO lands	5%	5%	3%
Percentage on NGO/Private conservation lands (easement)	0%	0%	0%
Percentage on Privately owned lands	51%	38%	28%

Source: USGS (2021)

[a] A preliminary 75-foot ROW is used for calculations in this EIS because 75 feet is the maximum ROW width for Project construction and O&M. However, the final ROW width could be less in places where it overlaps existing road and utility ROWs. The final ROW would be located based on site-specific engineering, and environmental and cultural resource surveys.

Conservation Easements—Ducks Unlimited holds the Oaks (204 acres), Crow Hill (274 acres), and Commander Island (373 acres) Plantations in conservation easements. These privately owned and neighboring plantations encompass about 850 acres along the North Santee River in Georgetown County west of U.S. Highway 17. The easements restrict the type and amount of development that may take place on the property and are also tailored to the needs and interest of the landowner. Ducks Unlimited states the plantations are managed in cooperation with the goals of the North American Waterfowl Management Plan. Ducks Unlimited's Lowcountry Initiative targets the conservation of the area for its outstanding ecological value. The easements' long-term protection will conserve large, undeveloped upland and wetland ecosystems for the benefit of water birds, other wildlife, and the threatened and endangered species that occur in the low country of South Carolina. The Nature Conservancy protects numerous parcels throughout the low country, including 494 acres of lands owned by White Oaks Forestry Corporation along the South Santee River in Charleston County and about 1,160 acres surrounding the Hampton Plantation. The Low

Country Openspace Trust is another non-profit, land preservation focused group that controls conservation easements throughout South Carolina's low country including lands associated with FairfieldPlantation.

Zoning

Counties and towns organize development within their jurisdictions through a number of tools based on land use planning and zoning classifications. Zoning is used to separate uses that are thought to be incompatible with surrounding uses and as a means to prevent new development from interfering with lesser uses, such as an industrial use constructed near existing residential uses. Zoning is also used to preserve the character of a community. Often these regulations dictate the types of uses allowed on a lot, the height of buildings, the amount of space structures may occupy, the location of a structure on a lot, set-backs, and other factors related to land uses. Table 3.7-5 shows the types of zoning classifications common to areas near the Project.

The Charleston County Comprehensive Plan (Charleston County Planning Commission 2018) establishes a vision for the county and includes goals and objectives for land use, economic development, natural resources, cultural resources, population, housing, transportation, community facilities, and energy. The Berkeley County Comprehensive Plan of 2010 establishes a vision that values history while furthering economic development and promoting sustainability (Berkeley County Planning Commission 2010). The Plan includes goals and objectives for diverse communities, effective and efficient infrastructure management, historical resources, recreation opportunities, and streamlined processes.

Table 3.7-5. Zoning Classifications in the Project vicinity

Charleston County	Berkeley County
Agricultural Preservation	Manufactured Residential
Agricultural/Residential	Rural Single Family Residential
Resource Management	Exempt Governmental Districts
	Agricultural District

Sources: Charleston County (2022) Official Zoning Map; Berkeley County (2022) Municipal Zoning Classifications.

Infrastructure

Infrastructure visible within the Project area includes water intakes, electrical supply lines, and roadways. Not readily apparent within Table 3.7-5 is the amount and distribution of various infrastructure (e.g., roadways, gas lines, and overhead transmission and distribution lines) throughout the area. This infrastructure is necessary to support everyday needs of the population such as water delivery and treatment and electrical distribution. Many of these lines and ROWs are visible throughout the Project area. South Carolina coastal policies prefer the siting and placement of new infrastructure within or adjacent to existing ROWs to minimize new corridors that can contribute to sprawl, bisecting property and the diminishment of cohesive planning blocks and cumulative impacts to coastal resources. Roadways are discussed below in Section 3.11.

3.7.2 Environmental Effects

This section discusses potential impacts, their duration, and intensity on recreation and land use from construction and operation of the proposed Project, including the No Action Alternative. The effects from the proposed Project on many of these factors are mostly limited to the construction (short-term) period, which includes clearing of the ROW, construction of the towers, and stringing the lines. Impacts over the life of the Project (long-term) include the maintenance of the cleared ROW and the impact the new structure

has on recreationists and land use. Definitions for duration and intensity developed for this Project are shown in Table 3.7-6.

Table 3.7-6. Recreation and Land Use Impact Context and Intensity Definitions

Context—Duration	Low-intensity	Moderate-Intensity	High-Intensity
Recreation			
Short-term: During construction period Long-term: Life of the line (50 years)	Few recreationists may experience temporary construction-related disturbances including temporary area closures, noise, traffic delays, and visual impacts. Over the life of the Project, few recreationists would be impacted by the aesthetic of new transmission infrastructure. Intermittent, infrequent interruptions to recreation may occur due to Project O&M.	Nearly half of the recreationists in the area may experience temporary construction-related disturbances including temporary area closures, noise, and visual impacts from machinery. Over the life of the Project, approximately half of the recreationists would be impacted by the aesthetic of new transmission infrastructure. Minimal interruptions to recreation may occur due to Project O&M.	Nearly all recreationists in the area would experience construction-related disturbances including temporary area closures, noise, traffic delays, and visual impacts. Over the life of the Project, most recreationists would be impacted by the aesthetic of new transmission infrastructure. Regular interruptions to recreation may occur due to Project O&M.
Land Use			
Short-term: During construction period Long-term: Life of the line (50 years)	Other than at the footprint of Project features (transmission tower structures, access roads, etc.) previous land uses would continue without interruption. Existing land uses such as agriculture, grazing, timber, or agricultural uses may experience temporary construction- related disturbances and intermittent, infrequent interruptions due to Project O&M. There would be no conflicts with local zoning.	Previous land uses (e.g., agriculture, grazing, and timber management) would be diminished or required to change on a portion of the Project area to be compatible with the Project. Only a few parcels within the Project area would require zoning changes to be consistent with local plans. Some parcels within the Project area (transmission right-of- way, access roads, etc.) may require a change in land ownership through purchase or condemnation.	More than 25 percent of the Project area (transmission right-of- way, access roads, etc.) would require a change in land ownership through purchase or condemnation. All land use (e.g., agriculture, grazing, and timber management) on these parcels would be discontinued. Most parcels of land within the Project area would require zoning changes to be consistent with local plans.

3.7.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and there would be no direct impacts on recreation or land use as a result of the Project. The No Action Alternative would have indirect impacts for failing to meet the stated Project purpose and would not provide dependable electrical supply to area residences and businesses.

3.7.2.2 Proposed Action (Jamestown Corridor)

Recreation

NFS Lands— Starting near the town of Jamestown at the Jamestown substation, the Jamestown corridor would cross approximately 13.5 miles of NFS lands, which composes approximately 58 percent of the proposed transmission line length. With the proper permits obtained, development of utility ROWs is generally consistent with the stated management goals and objectives stated in the FMNF Land Management Plan (USFS 2017). These goals aim to minimize impacts from utility lines by placing new lines alongside existing road ROWs and existing utility ROWs. Nearly 90 percent of the corridor would parallels a state highway, transmission line, or railroad (Table 3.7-7).

The federal recreation areas that the Jamestown corridor would pass in close proximity to include Hellhole semi-primitive area (lands surrounding Hellhole Wilderness), New Hope Pond, Wambaw Cycle Trail, Honey Hill Recreation Area, and Wambaw Creek Wilderness Area and Canoe Trail. At each of these areas, the proposed ROW would occupy the opposite side of the roads to maximize the distance away from the recreation sites and users. Short-term impacts may occur during the construction period due to the generation of noise, ground disturbance, short-term road closures, short-term closures of the recreation areas, reduced parking, and impacts to wildlife viewing due to the potential displacement of flora and fauna. All of these impacts could affect recreation users' experiences. Short-term impacts are expected to be moderate-intensity. Because the construction of the transmission line in this area would occur along an existing road, on the opposite side of the recreation sites, and existing vegetation consisting primarily of evergreen pine forests would largely shield the transmission line from view, it is not expected that its presence would have a significant adverse effect on the experience of recreationists at these areas. Over the life of this Project, O&M activities may result in temporary, intermittent disruptions near the recreation areas listed above; however, because the ROW would be across the road from all of these recreation areas, recreation users would unlikely experience direct impacts from these activities. Therefore, impacts to recreation as a result of this alternative would be low-intensity.

The shared corridor for the Proposed Action and action alternatives would parallel SC Highway 45, which is the approximate boundary for the Wambaw Creek Wilderness Area and a potential put-in (mile 0) of the Wambaw Creek Canoe Trail. In this area the transmission line would be constructed to span Wambaw Creek on the west/south side of the highway, opposite the designated wilderness boundary. FMNF recreation materials suggest that winter is the preferred season to use the canoe trail due to more favorable conditions that coincide with leaf-off conditions for deciduous vegetation in the area, increasing the likelihood the proposed line could be visible to recreationists. Although the proposed transmission could be visible from the informal put-in where Route 45 crosses Wambaw Creek, it would not likely be visible downstream from within the wilderness area given the dense, mature evergreen vegetation in this location, and the distance from the SC Highway 45 bridge to the wilderness boundary. Paddlers in Wambaw Creek could paddle upriver under the existing bridge and potentially under the transmission line; however the number of potentially affected users would be quite low because very few paddlers travel the shallow creek this far upstream from the more popular canoe segment between Still Landing and Echaw Road.

The Proposed Action would not impact users of the Wambaw Cycle Trail because the Jamestown corridor would be located 900 feet or more away from the trail. The proposed transmission line would be buffered from the trail by a continuous forested buffer between the 230-kV ROW and Halfway Creek Road.

Table 3.7-8. Length of Wambaw Cycle Trail Intersected by the Proposed Action and Alternatives

	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Trail Length (miles) within a 600-foot-wide	0	0.7	5.6

	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Corridor			
Trail Length (miles) within a Preliminary 75-Foot ROW[a]	0	0.1	0.6

[a] A preliminary 75-foot ROW is used for calculations in this EIS because 75 feet is the maximum ROW width for Project construction and O&M. However, the final ROW width could be less in places where it overlaps existing road and utility ROWs. The final ROW would be located based on site-specific engineering, and environmental and cultural resource surveys.

Cape Romain National Wildlife Refuge—The Jamestown corridor does not pass through any part of the Cape Romain National Wildlife Refuge. Therefore, there would be no impacts to recreation at this federally managed site.

*State Land*s—The Jamestown corridor would not cross state lands. Therefore, there would be no impacts to recreation on state lands.

Private Property—The Proposed Action would involve disturbances from heavy equipment that would result in forest cover losses within the ROW during construction and O&M, which could have temporary effects on nature-based recreation such as hunting. However, any impacts would be low-intensity and there would be no long-term adverse impacts to recreation.

Land Use

Land Cover—The proposed corridor for the Proposed Action is dominated by forest. Implementing the Proposed Action would mean converting woodlands to grass- and shrub-dominated ecosystems, as there is approximately 83 acres of forest land within a preliminary 75-foot ROW (Table 3.7-4). However, the majority of the corridor would parallel roads and/or other transmission lines that have already had a ROW clearing. Conversion of land use already neighboring ROW clearings would expand the existing road clearing by approximately 42.5 feet (see section 2.4.3). This clearing would constitute a negligible change in land use type compared to a new ROW clearing through the middle of a parcel or property. For the remainder of the corridor, timber would have to be removed from the ROW to accommodate the transmission line. This would result in short-term, moderate-intensity impacts to land cover due to heavy machinery, cutting and grading. Over the long term, moderate-intensity impacts to land cover would be low-intensity as a result of altering the land use type to accommodate the transmission line for the small portion of the corridor that does not run parallel to an existing road.

NFS Lands—The Proposed Action would pass through the FMNF. USFS authorizes transmission siting on NFS lands under Title V of the Federal Land Policy and Management Act or 1976 under a special use authorization. This authorization would allow for the Project to be implemented on NFS lands without affecting land ownership. Thus, there would be no impact to land ownership on NFS lands as a result of this Project. The Jamestown corridor would not pass through any other type of federal land.

State Lands—Nearly the entire Jamestown corridor would follow existing roads. When constructing utility lines along South Carolina roadways, developers must obtain a utility agreement from SCDOT. Once authorization is granted, the developer is allowed to construct a utility within the road ROW under the provisions of the agreement. This process does not involve changing land ownership during the construction of the transmission line. Therefore, the proposed Project would have no impact on SCDOT land ownership.

Private Lands—For private lands, the Proposed Action would require ROW easements from private property owners, which could encumber the ROW area with land use restrictions. Each transmission line easement would specify the present and future right to clear the ROW and to keep it clear of all trees, whether natural or cultivated, all structure-supported crops, other structures, brush, vegetation, and fire and

electrical hazards (non-structure-supported agricultural crops less than 10 feet in height would still be allowed within the ROW). Conversion of land ownership already neighboring ROW clearings would have a marginal change compared to a new ROW clearing through the middle of a parcel or property. Central Electric would coordinate with landowners to obtain easements for the preferred transmission line ROW. A change in landownership through purchase or condemnation would not be necessary. As a result, the anticipated short- or long-term impacts on land ownership for all the alternatives would be low-intensity.

Zoning—The Proposed Action would cross lands located in zoning districts where transmission line ROW is not prohibited. Under applicable zoning ordinances and comprehensive plans, transmission lines are either a permitted or conditional use in all jurisdictions crossed by the ROW. All applicable zoning and land use approvals must be obtained before construction. Therefore, there would be no impacts to zoning as a result of this Project.

Infrastructure—Table 3.3-8 shows the length and percentage of the Proposed Action and Alternatives that would parallel other existing linear infrastructure. Approximately 89 percent of the Jamestown corridor would parallel existing roads. Construction activities could impact local roads during construction due to possible road closures. Road closures would be temporary and intermittent. Because nearly the entire length of the Project runs alongside roads, potential impacts to roads is classified as moderate-intensity. Over the life of the Project, road closures may occur due to periodic O&M of the proposed transmission line. These temporary closures would be infrequent and brief, resulting in low-intensity impacts to infrastructure as a result of the implementation of this alternative.

Potential impacts to roads could also result directly from the construction-related traffic and heavy machinery using the roads to access the Project. The number of construction-related vehicles and truck trips is estimated well within the design of the local transportation network and road surface standards. The locations most at risk of exhibiting impacts to the road surface are at intersections between ROW access roads and the paved public roads because construction-related vehicle trips can track mud and debris onto the asphalt when transitioning from non-paved surfaces to paved surfaces. Additionally, the change in surface is more susceptible to cracking and wear as vehicles use it during the construction period. Overall, impacts from vehicle trips are expected to be greatest during the construction period and negligible during routine O&M once the line is operational. As such, direct impacts to local roads from vehicle trips are expected to be negligible and unnoticeable relative to the volume of traffic the roads already receive.

3.7.2.3 Jamestown Alternative

The Jamestown Alternative would follow a similar route as the Proposed Action and traverse the same recreation areas on the FMNF as the Proposed Action. However, rather than traversing private lands between Shulerville and Honey Hill, the Jamestown Alternative would extend further south along Shulerville Road to Halfway Creek Road and then follow existing Winyah-Charity 230-kV transmission line for a longer distance. The Jamestown Alternative would intersect the Wambaw Cycle Trail along Halfway Creek Road between Shulerville Road and Murphy Road (USFS Road 156), with 0.7 trail miles intersecting a 600-foot-wide corridor (Table 3.7-7). Although Project construction could have short-term, moderate intensity impacts to recreationists on using the Wambaw Cycle Trail, there would be limited low-intensity impacts over the long term. Overall impacts to land Use and recreation under the Jamestown Alternative would be similar to the Proposed Action.

3.7.2.4 Charity Alternative

The Charity Alternative would run through the FMNF parallel to SC Highway 45 and Halfway Creek Road and then alongside the existing Winyah-Charity 230-kV transmission line ROW owned by Santee Cooper. Impacts from the Charity Alternative would be the same as those described above for the Proposed Action

for the segments that overlap, which includes potential impacts to the Honey Hill Recreation Area, Wambaw Creek Wilderness Area and Canoe Trail, and Rhem's Church Pond. The Charity Alternative would have no potential to impact the Hellhole semi-primitive area or New Hope Pond. Wambaw swamp is also not likely to be impacted by the Charity Alternative because it is nearly one mile away from the proposed corridor. However, because Bluebird Pond is so close to Halfway Creek Road, users of the pond could experience noise and temporary impacts during construction and potentially see the lines (depending on the final tower placement) while using the fishing pond once construction is complete.

Potential impacts to recreational users on the Wambaw Cycle Trail would be considerably greater than those described for Proposed Action and Jamestown Alternative due to the additional length of overlap of the proposed corridor and the Wambaw Cycle Trail. In total, for the Charity Alternative, approximately 5.6 miles of the Wambaw Cycle Trail occurs within a 600-foot-wide corridor and 0.6 miles of trail occurs within a preliminary 75-foot ROW (Table 3.7-7). These 5.6 miles compose approximately 13 percent of the entire 42-mile cycle trail. However, impacts would be limited because the new transmission line would follow the existing transmission ROW and the aesthetic of another transmission line would not impact most recreationists. The exact number of crossings and tower placement would be determined during the engineering design phase and would seek to avoid direct impacts to the trail and minimize the impact to trail users. Additionally, the Charity Alternative would cross the Swamp Fox Trail at a location where the trail is already crossed by a larger 230-kV transmission line, so the additional 75 kV line would not have a noticeable impact on recreational users of this trail. Based on this discussion and similar to the Proposed Action, the Charity Alternative would have short-term, moderate intensity impacts to trail users; however, long-term impacts would be low-intensity.

Land use impacts, including land cover, land ownership, zoning, and infrastructure, for the Charity alternative would be similar in nature to those described above for the Proposed Action. The Charity Alternative would occur primarily adjacent to 45 and the existing Winyah-Charity 230-kV transmission line. Therefore, short- and long-term impacts to land cover would be low-intensity because the majority of the Project would take place along an existing ROW and changes in land would be minimal. During the construction period, there would be no disruption to the existing transmission line and power transmission would continue as normal. For the roads, there may be possible road closures at periods during the construction period. Similar to the Proposed Action, road closures due to periodic maintenance of the proposed transmission line would be infrequent and brief, resulting in low-intensity impacts.

3.8 Visual Resources

3.8.1 Affected Environment

USFS's *Landscape Aesthetics: A Handbook for Scenery Management*, defining a Scenery Management System (SMS) (USFS 1995) is the specific manual for evaluating existing landscape character and assessing potential impacts to visual resources. The SMS was developed to provide a standard approach and vocabulary for determining the value, importance, and management of scenery and landscapes within National Forests (USFS 1995). The SMS replaced the Visual Management System, which was completed in 1974 by USFS. Given that the FMNF is crossed by the proposed Project, this section references and follows SMS principles and concepts to analyze visual impacts. The FMNF Land Management Plan (USFS 2017) contains specific scenic integrity objectives for various management areas within the forest.

As described in the SMS, there are three main components to scenery management, which include: landscape character (including scenic attractiveness), scenic integrity, and visual sensitivity (USFS 1995). Scenic attractiveness is typically mapped and classified as Class A (Distinctive), Class B (Typical), and Class C (Indistinctive). The landscape character of a given area consists of the landforms, vegetation, water features, and cultural modifications (physical changes caused by human activities) that impart an overall

visual impression of the area's landscape. Scenic integrity is the degree to which the landscape character deviates from a natural-appearing landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As man-made incongruities are added to the landscape the scenic integrity diminishes. Visual sensitivity incorporates the concept of "viewer groups", including the frequency and distance from which a landscape is viewed and the distance from which elements can be seen. While an area may have a high scenic attractiveness value, if it is not visible to anyone or if the scenic integrity is low, then its visual resource value may not be as high.

3.8.1.1 Francis Marion National Forest

The USFS (2017) Revised Land Management Plan for the FMNF describes four Resource Integration Zones: Coastal (which contains 5,843 acres designated as having "High" scenic integrity); Wambaw (which contains 46,606 acres designated as having "High" scenic integrity and 46,606 acres designated as having "Very High" scenic integrity); Santee (which contains 22,319 acres designated as having "High" scenic integrity); and Wando (which contains 17,288 acres designated as having "High" scenic integrity). Project activities would not occur in the Santee Resource Integration Zone. Scenic integrity zones for these portions of the FMNF are depicted in Figure 3.8-1.

3.8.1.2 Description of Landscape Character

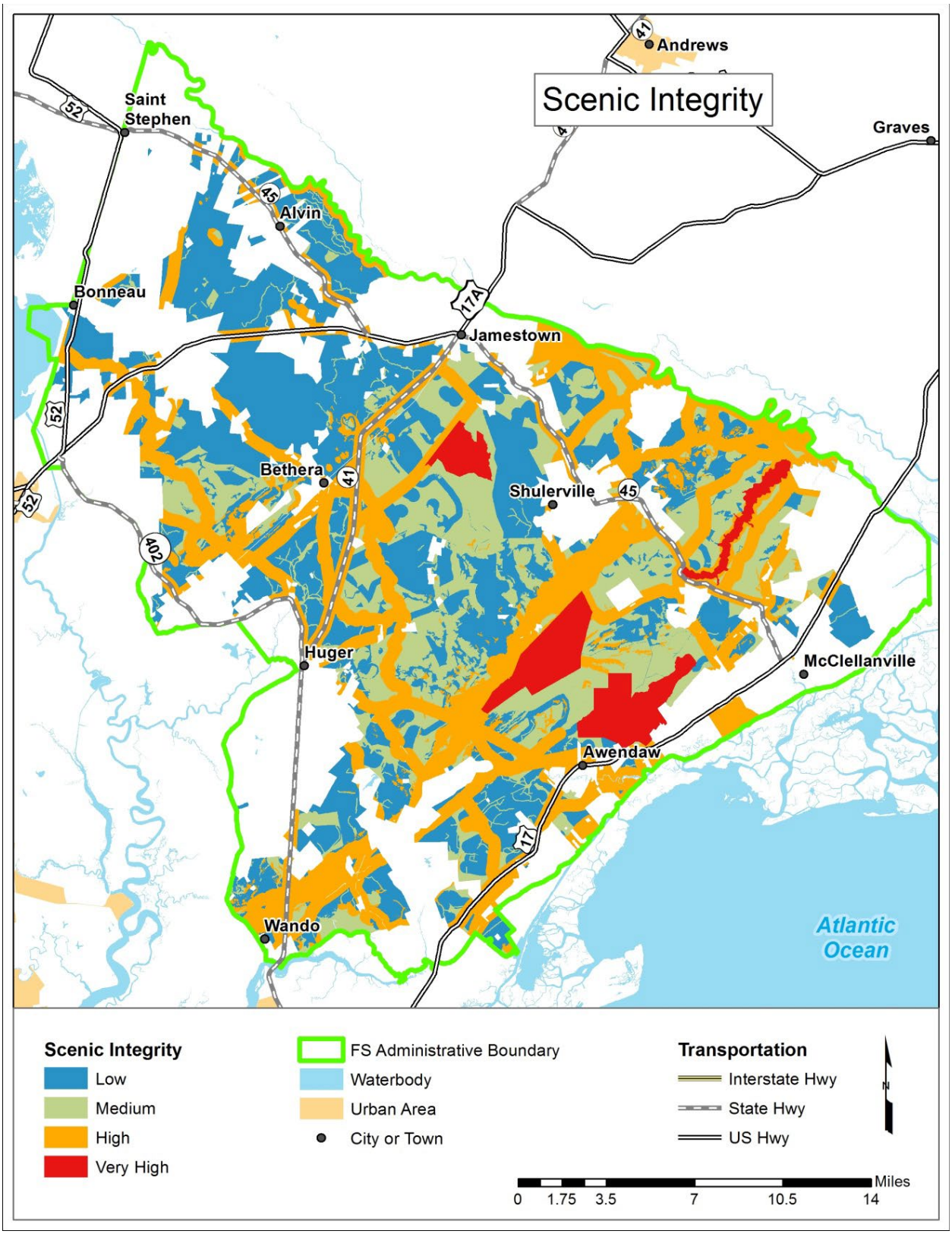
Visual character encompasses the patterns of landform (topography), vegetation, land use, and aquatic resources (i.e., open water, streams, and wetlands). The visual character is influenced both by natural systems, human interactions, and use of land. In natural settings, the visual character attributes are natural elements such as forested hillsides, open grasslands, or scenic rivers and lakes, whereas rural or pastoral/agricultural settings may include manmade elements such as fences, walls, barns and outbuildings, and occasional residences. In a more developed setting, the visual character may include commercial or industrial buildings, manicured lawns, pavement, and other infrastructure. The most scenic or visually sensitive areas within the Project area include the North and South Santee River and associated boat ramps, U.S. Highway 17, the Santee Delta WMA, and residential communities.

The Project is located in the Coastal Plain Ecoregion with three main natural environments (grasslands, pine woodlands, and river bottom) (SCDNR 2005a). Given the coastal location of the Project, there is little topographic relief, which allows for wide views of the landscape; however given the dense forest cover (including forested wetlands), long views are typically not offered due to intervening vegetation, which limits views from a viewer standing at ground level.

Places where the viewshed is greatest are areas where there is a natural break in the vegetation (rivers and waterways), areas where forest cover has been cleared (agricultural clearings, residential, or commercial uses), or a human created ROWs (roads, bridges, or utility infrastructure).

Patches of agricultural and residential development exist throughout the Project area, with areas of higher concentration near Shulerville and McClellanville. The remainder of the Project area is primarily evergreen forests, forested wetlands, and coastal marshes. Land uses transition from forest and agriculture to low density residential and commercial uses toward the Cooper River north of Charleston. Visually sensitive areas typically include areas of high visitor use, such as popular recreation areas, areas of high visibility, such as major roadways or residential areas, and natural undisturbed settings, such as wilderness areas.

SC Highway 45 also traverses along portions of the Proposed Action from Jamestown to McClellanville. Figure 3.8-2 shows the view of SC Highway 45 from the intersection of Chicken Creek Road and Highway 45.



Source: USFS (2017), Figure E-3

Figure 3.8-1. Scenic Integrity Zones on the Francis Marion National Forest

Figure 3.8-2. View from Intersection of SC Highway 45 and Chicken Creek Road, Facing West

3.8.1.3 Scenic Integrity

Some landscapes have a greater ability to absorb alterations with limited reduction in scenic integrity. The character and complexity, as well as environmental factors, influence the ability of a landscape to absorb changes in landscape. A new transmission line next to an existing line provides less contrast, and therefore can be absorbed into that visual landscape better than introducing a transmission line as a new feature in a previously undeveloped area. Scenic integrity refers to the degree of intactness and wholeness of the landscape character. New transmission and substation facilities in areas where facilities already exist are more consistent with the scenic integrity. The siting of new transmission lines adjacent to existing lines allows the new lines to "blend-in" with its surroundings.

3.8.1.4 Visual Sensitivity and Viewer/User Groups

The viewer and visual distance zones are two factors that influence the potential visual impact of a new corridor. A viewer is defined as not only the person who is viewing the line, but also as their expectations, activities, and frequency of viewing the line. Three types of viewers were identified within the Project area.

Local Residents

Local residents are those people who live in the area of the proposed transmission line. Residents may view the line from their yards or homes, while driving on local roads, or during other activities in their daily lives. The sensitivity of local residents to the visual impact of the line may be mitigated by frequent exposure to existing transmission lines and other dissonant features already within the viewshed.

Commuters and Travelers

Commuters and travelers are people who travel by the transmission line on their way to other destinations. Typically, drivers would have limited views of the transmission line where vegetation or buildings provide screening and where the line crosses high above the road surface. Under these conditions, the visual perception of the line for commuters and travelers is anticipated to be relatively low because they are typically moving and have a relatively short duration of visual exposure to the line. When new visual features persist in the immediate vicinity or directly parallel to the road over long distances, longer visual exposure can be expected.

Recreational Users

Recreational users include primarily local residents involved in recreational activities at the North and South Santee River, the Santee Delta WMA, and other sites described above in Section 3.7. Scenery and visual quality may or may not be an important recreational experience for these viewers. For some recreational users, scenery may be an important part of their experience because their activities may include attentiveness to views of the landscape for long periods. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change.

To provide an additional level of interpretation to this analysis, impacts to visual resources were also considered with respect to visual distance zones (as described in the USDA *Forest Service Landscape Aesthetics Manual* [USFS 1995]). Distance zones are described below:

- Immediate foreground—This distance zone is 0 to 300 feet from the viewer. At this distance, viewers can discern individual elements of plants (leaves, twigs, and flowers), small mammals and birds, and slight movement. At this level, details are important, and all elements of a transmission line would be visible.

- Foreground—This distance zone is 0 to 0.5 miles from the viewer. At this distance, viewers can discern masses of plant elements (clusters of leaves, tree trunks, large limbs, and masses of flowers), medium-sized mammals, and larger birds. At this level, movement from the wind is discernible at tree boughs and treetops. Individual forms are important, and the conductors, insulators, and structures of the transmission line would be visible.

- Middleground—This distance zone is 0.5 to 4.0 miles from the viewer. At this distance, viewers can discern silhouettes of landscape elements such as tree forms, large boulders, fields of flowers, and small rock outcroppings. Form, texture, color, and pattern are important at this level. In addition, the silhouette of the transmission line structures and ROW clearing would be visible.

- Background—This distance zone is 4.0 miles and beyond to the horizon. At this distance, viewers can discern tree groves, large forest openings, and large rock outcroppings. At this level, vertical distinctions of landforms and horizon lines provide the controlling visual character. The ROW clearing could be visible and possibly the mass of the transmission line structures above the tree canopy in areas where there is no background behind the structure such as along ridge tops. Throughout most of the Project area, this distance zone would not be visible due to vegetation cover.

- Seldom-seen areas—Seldom-seen areas are an important factor when discussing routing for transmission lines. Topography, vegetation, and lack of access prevent some areas from being seen by most viewers and user groups. People such as hunters, off-trail hikers, utility workers, and oil and gas personnel may occasionally view these areas while traveling off the beaten track.

3.8.2 Environmental Effects

3.8.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and there would be no direct impacts on visual resources as a result of the Project. The purpose and need for the Project would not be met, and direct and indirect impacts to visual resources would not be anticipated.

3.8.2.2 Proposed Action (Jamestown Corridor)

The level of visual intrusion created by the Project infrastructure is described with respect to the different distance zones, types of observers, and observation points. Additionally, thresholds are used to assess the level of impacts each alternative would have on visual resources. The context and intensity definitions established for this Project are listed in Table 3.8-1.

Table 3.8-1. Visual Resources Impact Context and Intensity Definitions

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During construction period Long-term: Life of the line (50 years)	Proposed changes could attract attention but would not dominate the view or detract from current user activities.	Proposed changes would attract attention, and contribute to the landscape, but would not dominate. User activities would remain unaffected.	Changes to the characteristic landscape would be considered significant when those changes dominate the landscape and detract from current user activities.

General Visual Impacts on Non-Forest Service Lands

As described in Section 2.4.1, the transmission line structures would be single-pole and between 70 to 75 feet tall. Construction using COR-TEN "weathering steel" would reduce impacts to visual resources, allowing for the structures to blend into the natural setting because they weather to colors more associated with the surrounding natural environment.

Initially, the color of COR-TEN "weathering steel" structures may be a rust orange color; however, after 2 to 3 years the structures will self-rust to a burnt orange to dark brown color. In the short-term, the towers may be more visually obtrusive due to the unnatural color introduced to the landscape; however, in the long term, the colors of the structures would be more consistent with the natural setting of pine and deciduous forests. If concrete and galvanized steel structures were used, they would have a greater impact on visual resources because the structures would be a tan or gray color and would contrast against the natural darker colored forested vegetation.

Pine forests in South Carolina typically grow between 60 and 120 feet in height. The proposed transmission structures would be on average 70 to 75 feet tall; largely below the tree line. If the transmission line is sited in a way that provides a tree buffer between highly visible areas such as roadways, and agricultural or residential areas, it is likely that the transmission lines would be blocked to viewers by intervening vegetation.

Long-term, high-intensity impacts to visual resources on non-Forest Service would occur due to the proximity to the Halfway Creek Road and SC Highway 45 and lack of vegetation buffer between the road and new transmission line ROW. The new line and structures would be visible to local residents, recreational users, and commuters for over half of the corridor.

Visual Impacts on Forest Service Lands

The proposed alignment of the Jamestown corridor is located in largely wooded areas of the FMNF Wambaw Resource Integration Zone, which is designated as an area of high scenic integrity. The Jamestown corridor leaves the Jamestown residential area and shares the ROW with the CSX Andrews Subdivision ROW for approximately one a mile before turning and paralleling Tiger Corner Road southeast to Shulerville across NFS lands. It would also cross NFS lands where it would parallel alongside SC Highway 45. Paralleling existing infrastructure is a preferred routing practice and helps to minimize impacts

to visual resources by conserving the scenic integrity of the area. The new transmission line would be placed next to a previously impacted landscape, to the extent practical. Building the new transmission line parallel to an existing transmission line ROW does not create a new ROW scar; it only incrementally expands the existing visual impacts as opposed to creating new visual impacts. Because the ROW would parallel existing roads, many of the visual impacts would be observed by drivers on the roads or by recreational users in close proximity to the corridor. Impacts to recreation resources are discussed in section *3.7, Recreation and Land Use*.

There are five FMNF recreation sites where users could potentially see the proposed lines which include (from north to south): New Hope Pond, Wambaw Cycle Trail, Honey Hill Recreation Area, Wambaw Creek Wilderness Canoe Trail put-in, and Rhem's Church Pond. The Jamestown corridor would parallel SC Highway 45, which is approximately 100 feet from the Wambaw Creek Wilderness boundary at the SC Highway 45 bridge over Wambaw Creek, which is also eligible for designation as a Wild and Scenic River. Although this bridge is represented as the put-in for the Wambaw Creek Canoe Trail (mile 0) there is not a designated parking area, pull off or trail head marker near the bridge. Recreation use is likely highest during winter when weather would be more comfortable, which coincides with leaf off condition for many deciduous trees within the creek corridor; thus, long-term, moderate-intensity impacts to visual resources would occur to paddlers in this area. Also, the Jamestown corridor would follow Tiger Corner Road for 0.5 miles where the Hellhole semi-primitive area abuts the road, but could be located on the opposite side of the road and could be obscured by a vegetation buffer between the road and new transmission line ROW. Other recreational users on the FMNF, including the Wambaw Cycle Trail, would also generally experience long-term, moderate impacts to visual resources. If the transmission line were required to be installed underground anywhere, it would reduce visual impacts compared to overhead lines because the lines would not be visible; however, the cleared ROW adjacent to the road would still be visible.

Temporary impacts to visual resources would result during construction from the presence of large construction equipment in the Project vicinity and on roadways, and brightly colored signage and flagging. The transmission line ROW would require clearing but Central Electric would seek to keep the provide a vegetation buffer to limit the visibility of the transmission line, resulting in short-term, low-intensity impacts to visual resources. If the transmission line were required to be installed underground anywhere, impacts to visual resources would be greater during construction because due to the larger area and greater equipment requirements for HDD (Figure 2.4-2). Therefore, the Proposed Action would have short-term impacts during construction ranging from low- to high-intensity on proximity to existing travel corridors.

Following Project construction, residents, recreational users, and commuters on SC Highway 45 could have limited views of the transmission line, through breaks in vegetation. Conversely, in some locations, the transmission line ROW could be cleared up to the edge of the road, with no vegetation buffer between the edge of the ROW and the roadway, resulting in high visibility of the transmission line to all viewers traveling on these corridors. Given the proximity to the Halfway Creek Road and SC Highway 45 and potential lack of vegetation buffer between the road and new line ROW, the transmission line would be highly visible to local residents, recreational users, and commuters, resulting in long-term, high-intensity impacts to visual resources for over half of the corridor. However, as noted above, visual impacts would be reduced if any underground sections are installed. The cleared ROW adjacent to the road would still be visible and the extent of any reduced habitat impacts would depend on the length of the underground section(s).

3.8.2.3 Jamestown Alternative

The Jamestown Alternative would have very similar visual impacts as described for the Proposed Action but at a slightly higher intensity because a greater portion of the corridor would be located along roads. Without vegetation buffers, locating the proposed transmission line along roads like SC Highway 45,

Halfway Creek Road, and Shulerville road would have a high visibility, affecting residents, recreational users, and commuters. Across NFS lands, the Jamestown Alternaitve would follows existing infrastructure to minimize new visual scars, but will still cause moderate long-term impacts.

3.8.2.4 Charity Alternative

The Charity Alternative would have similar visual impacts as described for the Proposed Action but at a lower intensity because greater portion of the corridor would be located away from the major roadways. It would be located in largely forested areas of the FMNF in both the Wando and Wambaw Resource Integration Zones, both of which are designated as having high scenic integrity. The Charity Alternative follows the existing Winyah-Charity 230-kV transmission line ROW for 18 miles, up to the Halfway Creek Road, at which point it shares the same alignment as the Proposed Action and Jamestown Alternative alongside Halfway Creek Road and SC Highway 45 towards the McClellanville Substation near U.S. Highway 17. The transmission structures would be in the middleground intermittently visible from those traveling on SC Highway 41, resulting in long-term, low- to moderate-intensity impacts to visual resources. For the new line alongside Halfway Creek Road and SC Highway 45, the transmission line ROW would be cleared up to the edge of the road, with no tree buffer between the edge of the ROW and the roadway, resulting in high visibility of the transmission line to all viewers traveling on Highway 45 with long-term, high-intensity impacts to visual resources. The Charity Alternative is located west of the residential development of McClellanville and will not cross U.S. Highway 17. Overall, the Charity Alternative would minimize long and short-term impacts on visual resources by paralleling existing infrastructure through a forested area and minimizing visual exposure to the largest number of viewers (residential communities, SC Highway 41, and recreation users). Given the proximity to the existing roadways and lack of vegetation buffer between the road and new line ROW, the transmission line would be highly visible to local residents, recreational users, and commuters, resulting in long-term, high-intensity impacts to visual resources for over half of the Charity Alternative.

3.9 Socioeconomics

3.9.1 Affected Environment

The Project is located in a mostly rural area encompassing Berkeley and Charleston counties, South Carolina. The towns of McClellanville, Jamestown, and the community of Shulerville in Berkeley County are the nearest locations to the Project. The population residing in the Project vicinity is only a small fraction of the total population in these counties. Berkeley Electric provides electricity to the rural communities in Charleston, Berkeley, and Dorchester counties in South Carolina.

For the socioeconomic analysis, Berkeley and Charleston counties are the study area, which includes the city of Charleston and the towns of McClellanville and Moncks Corner. This area represents the primary region where socioeconomic impacts may occur from the implementation of the Proposed Action. The city of Charleston, which is the county seat of Charleston County and located 40 miles southwest of McClellanville, is not close to the proposed Project corridors. The town of Moncks Corner, which is the county seat of Berkeley County and located approximately 17 miles northwest of the Project, also does not fall within the boundaries of the proposed transmission line corridors.

Population Characteristics

In 2010, the total population for the study area (Berkeley and Charleston counties) was 512,442 residents. Between 2010 and 2020, the study area population increased by 125,654, or 24.5 percent. Statewide populations grew from 4,625,364 in 2010 to 5,118,425 in 2020, an increase of 493,061 residents or 10.7 percent (U.S. Census 2020). As Table 3.9-1 shows, Charleston County has a higher population than

Berkeley County. Berkeley County's population grew at a much faster rate than Charleston County, and the state of South Carolina, during this period. Charleston County's population grew at nearly double the rate of the state of South Carolina and the city of Charleston experienced a greater level of population growth than Charleston County during this period. The population of McClellanville increased by 21.2 percent from 2010 to 2020.

Table 3.9-1. Population Change, 2010–2020

County/Town	2010 Census	2020 Census	Population Change 2010–2020	Percent Change 2010–2020
Charleston County	350,209	408,235	58,026	16.6%
City of Charleston	120,083	150,227	30,144	25.1%
Town of McClellanville	499	605	106	21.2%
Berkeley County	162,233	229,861	67,628	41.7%
Jamestown	72	68	4	-5.6%
Town of Moncks Corner	7,885	13,297	5,412	68.6%
Study Area	512,442	638,096	125,654	24.5%
South Carolina	4,625,364	5,118,425	493,061	10.7%

Source: U.S. Census (2010, 2020)

Overall, these counties are largely rural: in 2010, Charleston County had an average population density of 382.3 persons per square mile, and Berkeley County an average of 161.8 persons per square mile (U.S. Census 2010).

The population of South Carolina is expected to increase 27 percent, from 4,892,253 in 2015 to 6,223,085 by 2035 (Table 3.9-2). Over this same period, the population in the study area is anticipated to increase from 592,334 in 2015 to a total of 834,855 in 2035, a 41.03 percent increase in the total population (South Carolina Revenue and Fiscal Affairs Office 2022).

Table 3.9-2. Projected Population Estimates, 2015–2035

County	Estimate	Projected Estimates				Numerical Change	Percent Change
	2015	2020	2025	2030	2035	2015-2035	2015-2035
Charleston County	389,299	418,965	450,895	480,890	508,730	119,431	30.7%
Berkeley County	203,035	232,400	261,625	293,125	326,125	123,580	60.9%
Study Area	592,334	651,365	712,520	774,015	834,855	243,011	41.03%
South Carolina	4,892,253	5,213,370	5,542,140	5,881,710	6,223,085	1,330,832	27.9%

Source: South Carolina Revenue and Fiscal Affairs Office (2022)

Employment and Income

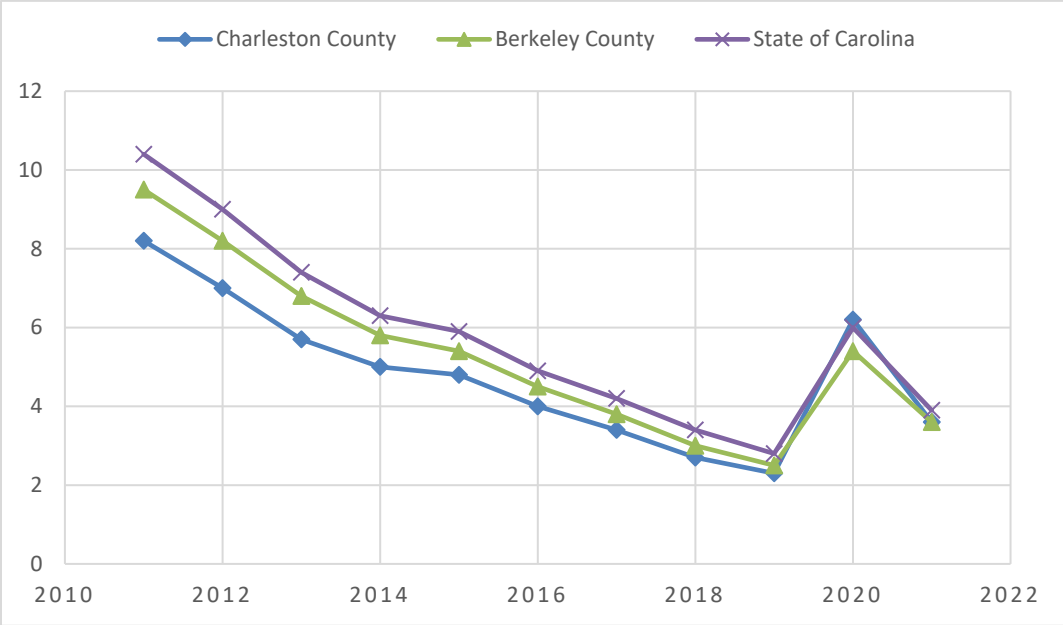
The annual employment levels in the three counties for 2012 and 2022 are shown as a comparison with state figures in Table 3.9-3. Charleston County has a relatively large metropolitan area of Charleston and therefore has a larger number of employed persons compared to Berkeley County. Total employment in the study area and the state increased between 2011 and 2021. Berkeley County had the largest percent increase in annual employment at 32.3 percent, even higher than that of the state at 15.5 percent over this period.

Table 3.9-3. Annual Employment

Geography	Total Employment			
	2011	2021	Numeric Change 2011–2021	Percent Change 2011–2021
Charleston County	168,779	203,337	34,558	20.5%
Berkeley County	78,035	103,265	25,230	32.3%
Study Area	246,814	306,602	59,788	24.2%
South Carolina	1,957,493	2,261,060	303,567	15.5%

Source: U.S. Bureau of Labor Statistics (2021a

Charleston County's annual unemployment rates have generally been lower than Berkeley County and the rest of the state between 2011 and 2021. The unemployment rate in Berkeley County has been similar to the state's average. All geographic areas have had similar trends during this period, with a peak unemployment rate occurring in 2010 coinciding with the recovery of the national economic downturn that occurred between 2008–2009. Figure 3.9-1 shows unemployment trends in the study area and the state.



Source: U.S. Bureau of Labor Statistics (2021a)

Figure 3.9-1. Annual Unemployment Rates, 2011–2021

Employment by industry is presented in Table 3.9-4. Private sector industries in 2010 with the highest employment in the study area include retail trade, professional, scientific, and technical services, health care and social assistance, and accommodation and food services. Between 2010 and 2020, Retail trade increased by 21 percent in the study area and accounted for approximately 10 percent of total employment. Joint Base Charleston, a combination of the U.S. Air Force, Charleston Air Force Base, and the U.S. Navy Naval Support Activity Charleston, is the largest public sector employer in the Charleston metropolitan area, with 22,000 employees. The city of Charleston is also home to the Medical University of South Carolina, which employs 13,000 people. Boeing South Carolina is the largest private industry employer in Charleston County (Charleston Regional Development Alliance 2022).

Per-capita personal income is the income received by all persons from all sources, including labor earnings, investment income, and transfer payments, divided by the total midyear population. Table 3.9-5 summarizes per capita personal income for the study area and South Carolina for 2011 and 2021. In 2021, Charleston County had a per capita personal income of $73,032, while Berkeley County's was $48,919. Statewide, annual per capita personal income was $52,467. Charleston County's annual per capita personal income grew by a rate of 61 percent between 2011 and 2021.

Table 3.9-4. Employment by Industry, South Carolina, Charleston, and Berkeley Counties, 2011–2021

Type of Employment	South Carolina			Charleston			Berkeley		
	2011	2021	% Change	2011	2021	% Change	2011	2021	% Change
Total employment	2,427,409	2,904,842	20%	294,495	360,815	23%	58,366	92,590	59%
Farm employment	29,052	26,725	-8%	471	439	-7%	410	362	-12%
Forestry, fishing, and related activities	10,904	12,074	11%	542	670	24%	(D)	222	N/A
Mining	3,291	4,185	27%	300	238	-21%	(D)	201	N/A
Utilities	12,227	11,717	-4%	638	701	10%	(D)	417	N/A
Construction	126,578	174,169	38%	13,927	20,834	50%	4,205	7,754	84%
Manufacturing	224,294	259,957	16%	13,473	16,378	22%	5,849	7,791	33%
Wholesale trade	72,614	83,065	14%	6,736	8,456	26%	1634	2,631	N/A
Retail trade	273,746	309,576	13%	30,186	34,062	13%	6,024	10,105	68%
Transportation and warehousing	64,728	125,584	94%	10,343	16,146	56%	(D)	6,563	N/A
Information	32,540	34,527	6%	4,333	5,559	28%	1,539	2,506	63%
Finance and insurance	108,373	132,045	22%	11,127	14,998	35%	1,832	3,219	76%
Real estate and rental and leasing	110,553	146,442	32%	18,465	26,244	42%	2,611	4,643	78%
Professional, scientific, and technical services	124,429	166,766	34%	20,508	31,836	55%	6,302	8,150	29%
Management of companies and enterprises	16,855	29,565	75%	1,637	3,736	128%	57	507	789%
Administrative and waste management services	186,716	228,015	22%	25,092	25,481	2%	2,787	6,836	145%
Educational services	39,577	45,304	14%	4,826	6,047	25%	852	1,001	17%
Health care and social assistance	203,011	246,851	22%	27,583	34,130	24%	3,018	4,888	62%
Arts, entertainment, and recreation	48,039	56,629	18%	6,264	8,036	28%	1,219	2,007	65%
Accommodation and food services	199,340	238,870	20%	28,037	34,251	22%	3,151	6,145	95%
Other services, except public administration	148,535	170,352	15%	13,529	17,104	26%	4,903	6,935	41%
Federal, civilian	32,817	36,174	10%	8,720	11,066	27%	1,025	794	-23%
Military	53,685	47,846	-11%	11,767	6,479	-45%	799	861	8%
State and local	305,505	318,404	4%	35,991	37,924	5%	7,492	8,052	7%

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2021a)

Table 3.9-5. Annual Per Capita Personal Income (in $1,000s, 2021 Dollars)

Geography	Income		
	2011	2021	Percent Change 2011-2021
Charleston County	$45,263	$73,032	61%
Berkeley County	$32,527	$48,919	50%
South Carolina	$34,479	$52,467	52%

Source: U.S. Department of Commerce, Bureau of Economic Analysis 2021b
[a] All dollar estimates are in thousands of current dollars (not adjusted for inflation).

3.9.1.1 Housing Resources

In 2021, Charleston County had more housing units than Berkeley County, with a majority of the households residing outside the city of Charleston. Approximately 16 percent of all households in Charleston County were vacant, while Berkeley County had vacancy rates of approximately 8 percent. McClellanville had a vacancy rate of 23 percent, and the cities of Charleston and Moncks Corner had vacancy rates of 13 and 4 percent, respectively (Table 3.9-6).

Table 3.9-6. 2017-2021 Household Characteristics

Geography	Total Housing Units	Vacant Housing Units	Percent Vacancy Rate
Charleston County	198,768	30,915	16%
City of Charleston	73,412	9,652	13%
Town of McClellanville	342	78	23%
Berkeley County	91,604	7,519	8%
Jamestown	59	0	0%
Town of Moncks Corner	4,937	204	4%
South Carolina	2,325,248	348,801	15%

Source: U.S. Census (2021)

3.9.1.2 Property Taxation

In South Carolina, each class of property is assessed at a ratio unique to that type of property. The assessment ratio is applied to the market value of the property to determine the assessed value of the property. Utility property, such as transmission lines, has an assessment ratio of 10.5 percent. Utility property is assessed by the South Carolina Department of Revenue, which applies a state mill levy to the assessed value to property taxes. For the 2020–2021 year, utility, railroad and pipeline assessments accounted for 6.7 percent of the assessed value for all types of property in the state (South Carolina Department of Revenue 2021). Berkeley and Charleston counties had millage rates of C, in the year 2022 (South Carolina Association of Counties 2022).

3.9.1.3 Timber

In 2020, there were approximately 12,849,182 acres of forestland in the state of South Carolina with a stumpage timber value of $446.7 million. There were approximately 281,730 acres of forestland in Charleston County and 564,533 acres of forestland in Berkeley County, representing 2.2 and 4.4 percent of the total forestland in the state of South Carolina, respectively. In 2020, stumpage timber had a value of $6,859,463 in Charleston County and $29,635,594 in Berkeley County, which represented 1.5 and 2.2 percent of the total stumpage timber value in the state of South Carolina in 2020 (South Carolina Forestry Commission 2022). Table 3.9-7 summarizes these figures.

Table 3.9-7. Value of Timber Delivered to Forest Product Mills in 2019

Geography	Acres of Forestland Acres (percent of state total)	Stumpage Timber Value Dollars (percent of state total)
Charleston County	281,730 (2.2)	$6,859,463 (1.5)
Berkeley County	564,533 (4.4)	$29,635,594 (2.2)
South Carolina	12,849,182	$446,725,870

Source: South Carolina Forestry Commission (2022)

3.9.2 Environment Effects

Impacts on socioeconomic resources include how the proposed Project could potentially affect elements of the human environment such as population, employment, income, property values, housing, and public services. The effects from the proposed Project on many of these factors are not limited to the ROW, but would result in impacts across the wider geographic area, affecting the three-county study area. However, some effects, such as property values, would likely only affect residences within proximity to the proposed Project. The majority of potential Project-induced impacts on social and economic conditions would occur during the construction stage of Project, and therefore, are generally short-term and low-intensity when compared to all the activities distributed across the larger regional area.

This section discusses the potential effects of the proposed Project on the various social and economic characteristics throughout the study area. Economic impacts include impacts that individuals, groups, properties, and businesses would experience from a change in business and economic activity as a result of the proposed Project. Social impacts are borne by individuals or groups who could experience a change in their social structure and context.

The intensity of impacts on socioeconomic conditions can be described through the thresholds described in Table 3.9-8.

Table 3.9-8. Socioeconomic Impact Context and Intensity Definitions

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During construction period Long-term: Life of the line (50 years)	A few individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be minor and limited to a small geographic area. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be readily apparent and detectable across a wider geographic area and could have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be readily detectable and observed; extend to a wider geographic area, possibly regionally; and would have a substantial influence on social and/or economic conditions.

3.9.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed. There would be no change in socioeconomic conditions due to the construction of the Project because direct and indirect revenues and tax receipts from construction of the Project would not be realized (construction wages, spending in the communities, and property taxes, among others).

Under the No Action Alternative, improved electric reliability and power quality in the Project area would not be achieved. The transmission line would not be built, and the current aging distribution line would result in inadequate and unreliable electric service. The load growth would be capped at the projected 2015 load level, no new load growth could be accommodated, and transmission system reliability would decrease. The No Action Alternative would indirectly impact existing socioeconomic conditions because local communities and the region would not benefit from the improved electric reliability and power quality anticipated from the Project. This could lead to increasing frequency and duration of power outages in the region.

3.9.2.2 Proposed Action (Jamestown Corridor)

Construction and operation of the Project under the Proposed Action would result in socioeconomic impacts, including:

- Improved electric reliability and increased capacity for existing and future customers.
- Temporary increase in population as a result of the influx of construction workers.
- Temporary increase in demand for temporary lodging facilities as a result of the influx of construction workers.
- Temporary increase in demand associated with spending on local goods, services, and construction materials.
- Potential changes to property values.
- Minimal reductions in timber production would occur from loss of land for structure placement and ROW clearing to maintain appropriate electrical clearances.

Average construction costs for engineering, materials, equipment, and labor are estimated to be $1,500,000 per mile plus an additional $2,216,000 per mile for additional requirements for river crossings. An annual average workforce of approximately 25 workers would occur over the 3-year life of Project implementation. The types of Project tasks and associated jobs include engineering surveys, permitting, environmental surveys and studies, ROW acquisition and easements, ROW clearing and preparation, and construction of the transmission line and substation. The actual construction activity would occur during the last 12 to 16 months of the 3-year Project implementation period.

Most Project workers are likely to temporarily relocate to the Project area because transmission Project construction requires a specialized expertise and workforce. A small number of local construction workers could be retained for more general activities. Only a few workers would be hired locally, and permanent jobs are not anticipated to be introduced to the area as a result of the operation of the proposed Project.

It is likely that workers would temporarily reside in the cities of Georgetown or Charleston during construction and commute to the various locations of the Project area as construction proceeds. Total earnings of the 25 construction workers would be approximately $1.5 million annually, based on average earnings for construction jobs in study area counties (U.S. Bureau of Labor Statistics 2021b).[9]

[9] Average earnings for construction workers of $50,662 to $69,917 in 2021, the latest year for which employment data are available, was based on data available for Berkeley and Charleston counties.

Because construction workers spend their money in the local area, revenues would likely increase for some local businesses, such as hotels, restaurants, gas stations, and grocery stores, supporting jobs and incomes for these businesses and their employees. Because construction and other Project workers are not anticipated to be permanent residents of the study area, induced spending would be considerably less than locally residing employees because construction workers would send a portion of their earnings to their home area. Overall, the spending would be short-term and is likely to have low socioeconomic impacts on the overall region with no detectible changes in socioeconomic conditions in the study area.

The study area has experienced an increase in population over the past decade with the addition of 97,207 new residents between 2010 and 2020, a 22.5 percent increase (U.S. Census 2010, 2020). Over the 3-year construction period, there would be a temporary average population increase of 21 people with a peak of 40 workers in the study area as a result of the Project. Larger municipalities in proximity to the Project, including Charleston and Georgetown, are likely to house the temporary residents in housing rentals, hotels or motels, or other housing accommodations in these cities. Temporary population changes in local communities would be low, particularly compared to the total population in the study area.

During construction activities, short-term impacts on nearby residents as a result of the proposed Project would include increased noise, visual presence of construction equipment, and potential traffic resulting from the movement of heavy material haul trucks that would likely slow vehicular movements and may close lanes during specific types of transmission line work. Long-term impacts on nearby residents as a result of operation of the proposed Project would include minor, infrequent disturbance during ROW maintenance or repair activities. Impacts on property values are discussed below.

New ROWs for the construction and maintenance of the action alternatives would be required to support the proposed Project. Existing access roads would be used where possible. Central Electric would pay market value to non-federal landowners, as established through the appraisal process, for any new land rights and easements necessary to support the development of the Project. The appraisal process considers all factors affecting land value, including the impact of transmission lines on property value. The appraisals may reference studies conducted on similar properties to support their conclusions. The strength of any appraisal depends on the individual analysis of the property, using neighborhood-specific market data to determine market value.

The impact of introducing a new ROW for transmission structures and lines can vary dramatically depending on the placement of the ROW in relation to the property's size, shape, and location of existing structures. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property and subsequently alters existing land use patterns. These factors as well as any other elements unique to the property are taken into consideration to determine any loss in value within the easement area, as well as outside the easement area in cases of severance.

Whenever land use changes, the concern is often raised about the effect the change may have on property values nearby. The question of whether nearby transmission lines can affect residential property values has been studied extensively in the U.S. and Canada over the last 20 years or so, with mixed results. In general, the impacts are difficult to measure, vary among individual properties, and are influenced by a number of interplaying factors, including:

- Proximity of residential properties to transmission line structures
- Type and size of high-voltage transmission line structures
- Appearance of easement landscaping

- Surrounding topography (Jackson and Pitts 2010)

Pitts and Jackson (2007) summarize the following conclusions on the impacts of high- voltage transmission lines.

- When negative impacts are present, studies report an average decline of prices from 1 to 10 percent.
- Value diminution is attributable to the visual unattractiveness of the lines, potential health hazards, disturbing sounds, and safety concerns.
- Where property value impacts were present, the effect dissipated with time and distance.
- Impacts diminish as the distance between the high-voltage transmission lines and the affected properties increase, and generally disappear at a distance of 200 feet from the lines (when views are obstructed).
- Where views of transmission lines and towers are completely unobstructed, negative impacts can extend up to 0.25 miles.
- If high-voltage transmission-line structures are at least partially screened from view by trees, landscaping, or topography, any negative effects are reduced considerably.
- Value diminution attributed to high-voltage transmission-line proximity is temporary and usually decreases over time, disappearing completely in 4 to 10 years.

A recent study of sales of rural land parcels in central Wisconsin between 2002 and 2008 found small, but not statistically significant negative price effects on the sale of properties encumbered by a transmission line easement (Jackson 2010). Studies of impacts during periods of physical change, such as new transmission line construction or structural rebuilds, generally reveal greater short-term impacts than long-term effects. However, most studies have concluded that other factors (e.g., general location, size of property or structure, improvements, irrigation potential, condition, amenities, and housing supply and demand factors in a specific market area) are far more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

Some impacts on property values (and salability) might occur on an individual basis as a result of the new transmission line. Table 3.9-9 compares the number of residential structures within various proximities to the Project. Under the Proposed Action, there are 39 residences within 500 feet of a preliminary centerline for the Jamestown corridor, and 215 residences within 0.25 miles.

Table 3.9-9. Residences in Proximity to the Alternative Corridors

Residence Distance	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity
Residences within 100 feet	4	4	4
Residences within 300 feet	23	37	29
Residences within 500 feet	39	57	34
Residences within 0.25 miles	215	244	165

Source: Microsoft (2024)

Where the transmission lines pass within a few hundred feet of residences, the existing highway and its current developed character would diminish the visual effects associated with the transmission line. Residences located farther from the highway generally have partially obscured views of the highway because of forest cover, further reducing visual impacts on these residences. Nevertheless, the Proposed Action would likely result in low adverse effects on property values. These impacts would be highly variable, individualized, and unpredictable. Most of these losses would be temporary in nature because property value effects associated with transmission lines tend to dissipate with time.

The construction, operation, and maintenance of the proposed Project would generate additional property tax revenues to counties where the transmission line would be sited. The state of South Carolina would assess property taxes on the transmission line based on the value of the property, using the unit valuation method.

The unit valuation method includes a cost- and income-based assessment to determine property taxes. It is likely that the cost-based approach would be used for the first few years at the end of construction and initial operation of the line, and income-based and cost-based approaches (through reconciliation) would be used for the majority of the operation of the line (Ingram 2013). The cost-based approach to valuation would decrease as the constructed cost is depreciated over time. The first year's property taxes would range from $48,000 to $78,000, depending on the corridor. As the line becomes operational, the values would be depreciated, with annual decreases in property tax receipts, and eventually the annual receipts would approach those of the income-based approach. Table 3.9-10 summarizes these tax receipts to county governments that would be associated with the transmission line of the proposed Project. Additional property taxes would be associated with the substation.

Table 3.9-10. Property Tax Revenues to Study Area Counties Associated with the Alternative Corridors

Corridor	Miles	Construction Period and Initial Operation (Annual)	Income-Based Approach (Annual)
Jamestown Corridor (Proposed Action)			
Berkeley County	16.9	$40,985	$4,508
Charleston County	6.4	$18,226	$2,005
Study Area Counties	23.3	$59,211	$6,513
Jamestown Alternative			
Berkeley County	19.7	$47,775	$5,526
Charleston County	6.4	$18,226	$2,005
Study Area Counties	26.1	$66,001	$7,260
Charity Alternative			
Berkeley County	24.7	$59,901	$6,590
Charleston County	6.4	$18,226	$2,005
Study Area Counties	31.1	$78,127	$8,594

Source: Ingram (2013)
Note: Assumptions: Berkeley and Charleston counties had millage rates of 0.0505 and 0.0593, respectively, in the year 2015 (South Carolina Association of Counties 2022); Assessment Ratio: 0.105; Capitalization Rate: 0.11.

Construction and operation of the Proposed Action would result in very minimal short- and long-term impacts on agricultural land, which is very limited along the Jamestown corridor. During construction, potential short-term impacts within the ROW would include crop damage (depending on the time of year for construction across specific fields), soil disturbance, and potential loss of production for one growing season as a result of construction activities and the transport of construction equipment and vehicles restricting or preventing planting of lands within or adjacent to the ROW. However, very little cultivated cropland exists in the Project vicinity. Most impacts would be short-term and occur during construction.

Similarly, there is very little grassland and pasture/hay land in the study area. Construction activities are expected to have a short-term impact on cattle grazing because cattle may need to be moved during construction activities in areas where the ROW would cross grassland or pasture.

As Table 3.7-4 shows, around 80 acres of a preliminary 75-foot ROW for the Jamestown corridor would cross through forested areas and require tree clearing. Additional danger trees located outside of the ROW may also require clearing. All tall-growing vegetation would be cut to prevent vegetation from coming close enough to the conductor to cause an electric arc. There would be some positive economic effects associated with the timber harvest associated with the ROW clearing. However, it is likely that this effect would be minimal and short-term. Where the ROW crosses private lands, Central Electric would compensate landowners for the reduced timber production at fair market value for the timber and other land values.

Impacts associated with the construction of the proposed Project is anticipated to be short-term and would cease once the transmission line is in service. Because of the temporary nature of construction activities, few to no families are expected to accompany construction workers to the study area. As a result, there would be negligible impacts on schools and enrollment.

The Proposed Action would provide an increase in the load-serving capacity to accommodate the long-term electrical needs of the region. The continued reliability of electric service to the region is also necessary to serve the current and future needs of businesses, housing, and infrastructure to allow the economy of the area to continue to operate. Projected load growth would be accommodated, and the reliability of the regional transmission system would be maintained, continuing to serve the electricity needs of the area.

Capital expenditures for improvements to electric-utility infrastructure are investments made to serve customers. Central Electric's customers primarily include 20-member rural electric systems, all located in the state of South Carolina. Capital expenditures can be passed on to customers in the form of increased rates. At this time, not all costs for development of the proposed Project are known; therefore, Central Electric cannot predict what the rate increase may be as a result of this Project. In addition to electrical support for the area, Project construction would itself generate a certain amount of economic activity. While minimal when compared to the current sales throughout the region, the presence of approximately 21 construction workers over a 3-year period would generate additional sales of food, fuel, lodging, and services (primarily vehicle and equipment repairs).

Construction activity would also require concrete, aggregate, lumber, and hardware items. Many of these materials would likely be purchased locally, contributing further to local sales. Most materials for the transmission structures and conductors would be shipped from manufacturers outside the region. However, many of these materials would be subject to sales and taxes payable to local governments.

The Proposed Action would not influence long-term employment in the study area. Non-residential construction workers would spend a portion of their earnings in the study area, contributing to jobs and income across the region. Because these workers will only be in the area temporarily and are likely to be primarily from outside the region, induced employment and income is expected to be short-term and low-intensity. No long-term employment would be necessary to support the operation of the proposed Project. The local population would increase temporarily, with low and short-term impacts on socioeconomic conditions.

3.9.2.3 Jamestown Alternative

The Jamestown Alternative would have similar socioeconomic impacts as described for the Proposed Action. Although it is 2.8 miles longer than the Jamestown corridor, the Jamestown Alternative would

impact a similar amount of cropland and forested areas, so would have similar impacts to agricultural production and timber activities as the Proposed Action. Compared to the Proposed Action, the Jamestown Alternative would generate 11 percent more property tax revenue (Table 3.9-10). In total, socioeconomic impacts would be low-intensity over both the short- and long-term.

3.9.2.4 Charity Alternative

The Charity Alternative would have similar socioeconomic impacts as described for the Proposed Action. In spite of being approximately 7.8 miles longer than the Proposed Action, the number of residential properties crossed by the Charity Alternative would be slightly less (Table 3.9-9). It would traverse a small acreage of developed lands, similar to both the Proposed Action and Jamestown Alternative (Table 3.7-1). Also, the Charity Alternative would impact a similar amount of cropland and forested areas as the Proposed Action, so would have similar impacts to agricultural production and timber activities. Compared to the Proposed Action, the Charity Alternative would generate 32 percent more property tax revenue (Table 3.9-10). In total, socioeconomic impacts would be low-intensity over both the short- and long-term.

3.10 Environmental Justice

3.10.1 Affected Environment

On February 11, 1994, President Clinton issued E.O. 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. E.O. 12898 directs agencies to address environmental and human health conditions in minority and low-income communities to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. The general purposes of this executive order are to:

- Focus the attention of federal agencies on human health and environmental conditions in minority communities and low-income communities with the goal of achieving environmental justice.
- Foster nondiscrimination in federal programs that substantially affect human health or the environment.
- Improve data collection efforts on the impacts of decisions that affect minority communities and low-income communities and encourage more public participation in federal decision-making by ensuring documents are easily accessible (e.g., available in multiple languages and made readily available).

As defined by the Environmental Justice Guidance Under NEPA (CEQ 1997), “minority populations” include persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Race refers to census respondents’ self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, and Central or South American.

A potential environmental justice minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. For this analysis, meaningfully greater represents a population that is 10 percent higher than the benchmark or reference region; in this case, the reference or benchmark geographic area is the county within which the census block group resides.

On April 21, 2023, President Biden issued E.O. 14096, “Revitalizing Our Nation's Commitment to Environmental Justice for All,” updating President Clinton's EO 12898 that was issued in 1994. E.O. 14096

broadens the scope of the Clinton order and offers agencies specific guidance on how to take EJ-related concerns into consideration while fulfilling their statutory mandates, including under NEPA. Under E.O. 14096, "environmental justice" means "the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment so that people: (i) are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and (ii) have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices." This definition adds "Tribal affiliation" and "disability" to the protected categories and expands the scope of effects, risks, and hazards to be protected against.

Potential environmental justice low-income populations are identified using the Census Bureau's statistical poverty threshold, which is based on income and family size. The Census Bureau defines a "poverty area" as having 20 percent or more of its residents below the poverty threshold. A block group is a statistical division within a census tract, which is a small geographic subdivision of a county, and typically contains between 600 and 3,000 persons (U.S. Census 2022). The study area for the environmental justice analysis is defined by Census block groups for the most recent Census data available at the time of this writing, the 2020 American Community Survey 5-year estimates. Any direct and indirect impacts on low-income or minority populations that may be associated with the implementation of the Proposed Action are assessed at this geographic level. The reference region, or region of comparison, for this analysis is Berkeley and Charleston counties.

There are 378 Census block groups within Berkeley and Charleston counties (117 in Berkeley and 261 in Charleston). In 2020, 97 of these block groups had at least 20 percent of their population living below the poverty level. These 97 block groups represent approximately 25 percent of all block groups within these counties.

In 2020, both counties had a combined total of 144 block groups with minority populations where the percentage of respondents identifying themselves as a minority either exceeded 50 percent of the total population of the block group or made up a proportion of the block group population that was at least 10 percent or higher than the minority population at the respective county level. These 144 block groups represented approximately 39 percent of all block groups within the two counties. For comparison, according to the U.S. Census Bureau, an estimated 16 percent of South Carolina's population experienced poverty compared to the national average of 14 percent.

The Project would strengthen electrical reliability to over 1,000 households surrounding McClellanville as well as provide additional reliability to the rest of Berkeley Electric's membership via a strengthened transmission system (see Section 1.2).

3.10.2 Environmental Effects

The duration and intensity of impacts to environmental justice populations established for this Project are the same as described in Table 3.9-8 for impacts on socioeconomics.

3.10.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed. As described in Chapter 1, the McClellanville circuit experiences more reliability issues than does the average Berkeley electric circuit, adversely affecting populations in the study area. The No Action Alternative would continue this condition and result in continued adverse impacts to the region. Therefore, because the service area of the

McClellanville circuit is made up of predominantly minority and low-income communities, as described below, there would be a disproportionate adverse impact on minority and/or low-income populations as a result of the No Action Alternative resulting in a long-term environmental justice impact.

3.10.2.2 Proposed Action (Jamestown Corridor)

The Project would be located within four block groups in Berkeley and Charleston counties. All of these block groups contain both potential impoverished and minority environmental justice populations. These block groups are identified in Table 3.10-1 and Figures 3.10-1 and 3.10-2.

Table 3.10-1. Census Block Groups with Residences in the Study Area, Impoverished and Minority Populations, 2016

Block Groups by County	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity
Residences within a 1,000-foot-wide corridor			
Berkeley County			
45.015.020401.1	51	84	23
45.015.020405.1	0	0	0
Charleston County			
45.019.005000.3	0	0	0
45.019.005000.4	17	17	17
TOTAL	68	101	40
Residences within a 0.5-mile-wide corridor			
Berkeley County			
45.015.020401.1	146	181	63
45.015.020405.1	0	0	20
Charleston County			
45.019.005000.3	0	0	0
45.019.005000.4	51	51	51
TOTAL	197	232	134

Source: U.S. Census (2016b), Microsoft (2024)

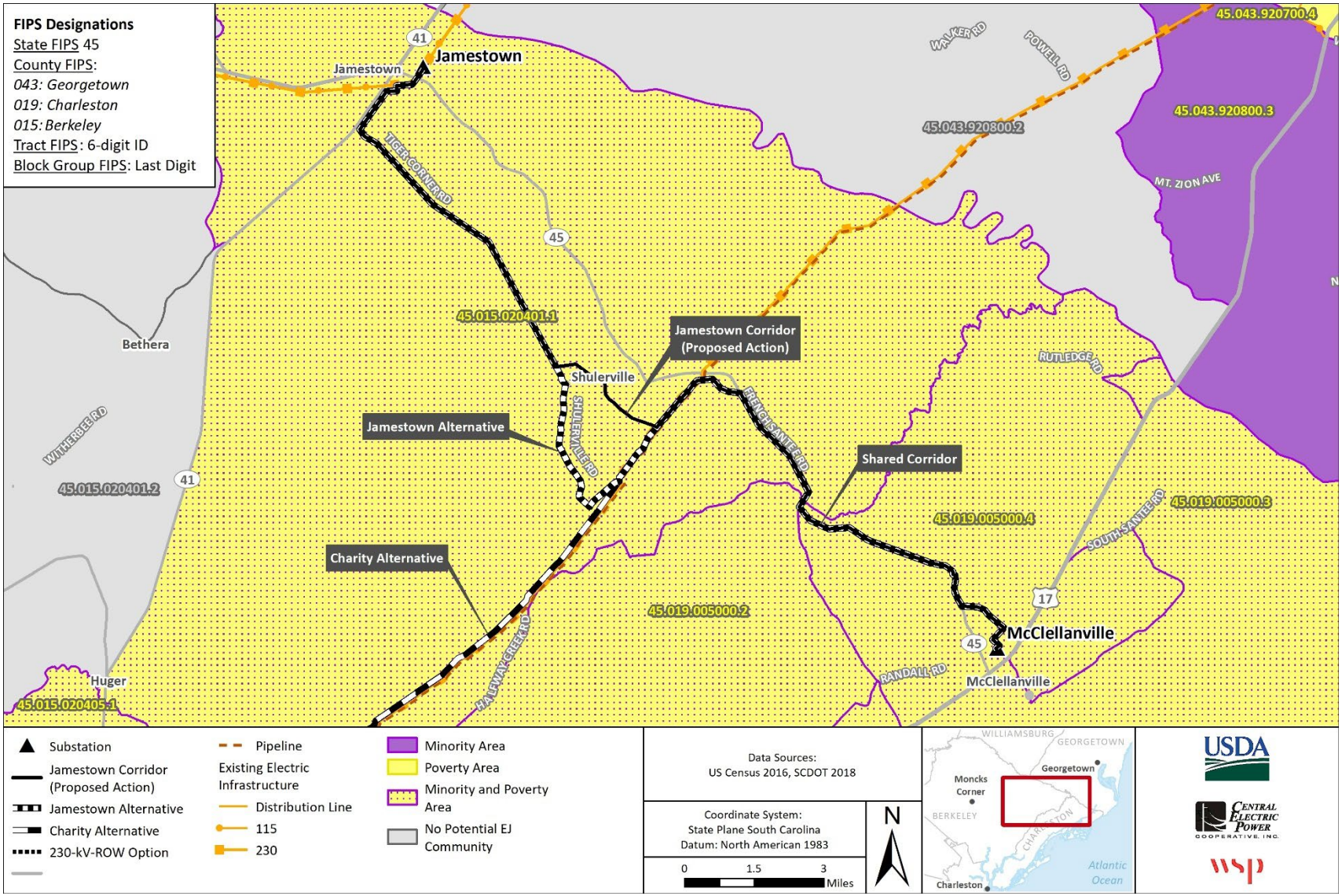


Figure 3.10-1. Census Block Groups With Impoverished and Minority Populations in the Vicinity of the Proposed Action (Jamestown Corridor) and Jamestown Alternative

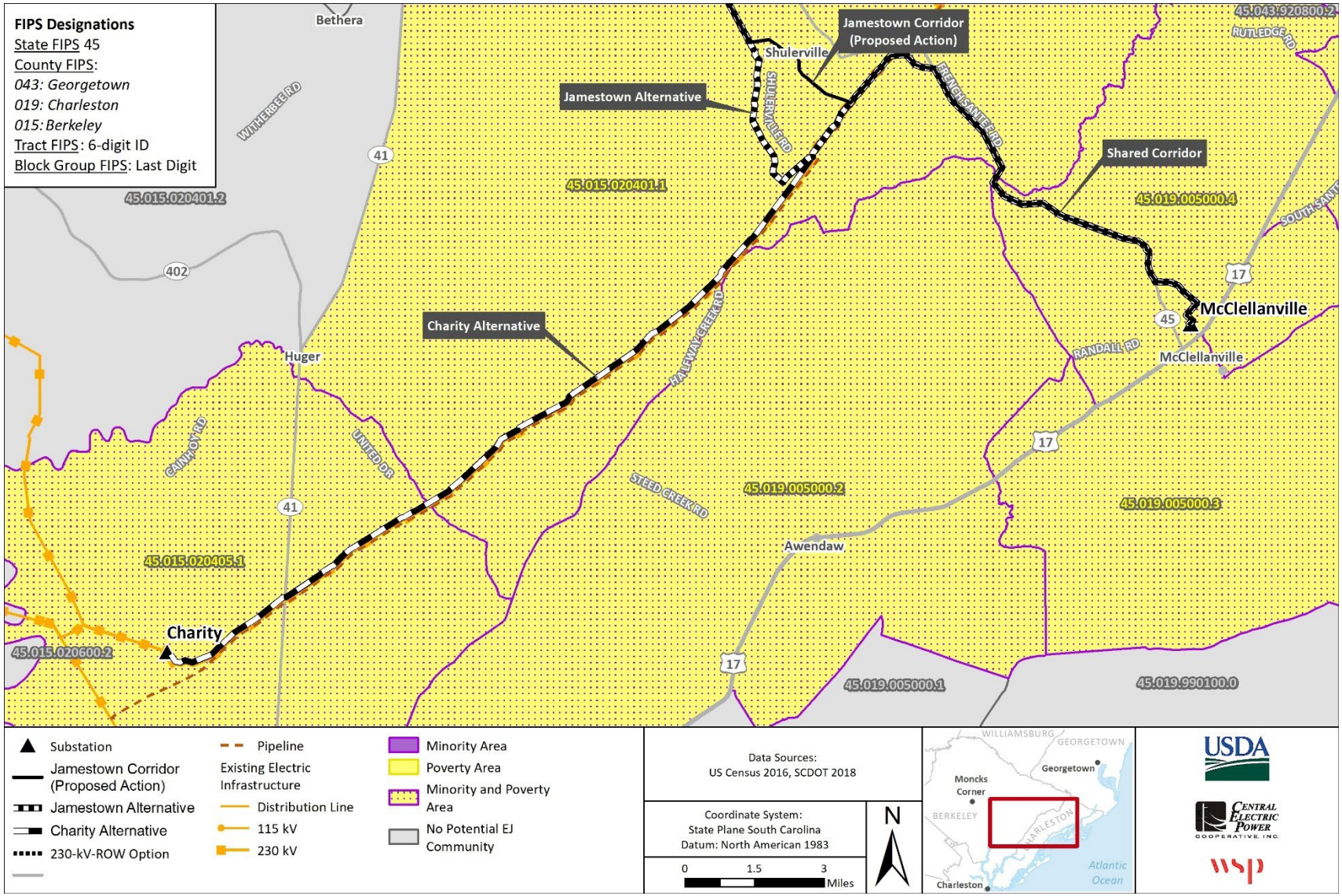


Figure 3.10-2. Census Block Groups With Impoverished and Minority Populations in the Vicinity of the Charity Alternative

The Proposed Action would likely contribute positively to all populations, including minority and low-income communities, through additional fiscal receipts to counties. Additionally, these populations would benefit from improved electricity reliability and power quality as the entire transmission network would have increased redundancy built in with the addition of this new line. However, these populations also could be adversely affected by potential Project-induced impacts on additional resources (e.g., visual resources).

Air quality, noise, and traffic impacts are anticipated to be short-term with air emission dispersion limited to the vicinity of construction activities. However, construction activities may cause some short-term disproportionate adverse impacts to minority and low-income communities. Not all residences within the block groups identified as having statistically impoverished or minority populations would be considered as an impoverished or minority household. It is therefore likely that fewer residences than those identified in Table 3.10-1 would experience potential environmental justice impacts. Impacts resulting from the construction of the line would be temporary and occur only during the construction period. As portions of the transmission line are constructed, the area of impact would transition down the line to the next construction site, resulting in impacts that would be less than if the entire population along the line were impacted during the whole construction period.

Following construction, impacts would primarily be limited to land use restrictions within the ROW and the presence of the transmission line and structures on properties. It is possible that some residents would experience adverse visual impacts from construction of the new transmission line. Central Electric could mitigate these impacts with adjustments to alignment to provide a forested buffer between the highway and the transmission line and/or by providing landscaping or vegetation features.

As discussed in Section 3.9, the property value of residences within 0.25 miles of the alternative lines could be impacted as a result of the view of the transmission line from the residence. However, most of the visual impacts from residences would be obscured from forest and other dense vegetation along the corridors. The transmission line will be visible from some residences in the vicinity of existing roadways, although the existing roads and developed character would diminish the adverse visual effects associated with the transmission line. Therefore, disproportionate adverse impacts could occur to potential environmental justice populations, although these impacts are expected to be low and highly variable, individualized, and unpredictable. The majority of these losses would be temporary in nature because property value effects associated with transmission lines tend to dissipate with time.

3.10.2.3 Jamestown Alternative

The Jamestown Alternative would impact minority and low-income communities similar to the Proposed Action. While these populations would benefit from improved electrical reliability, the Project would also cause short-term adverse impacts such as air quality, noise, and traffic disruptions during construction; and visual impacts and potential property value decreases in the long term. Under the Jamestown Alternative, the proposed transmission line would pass in close vicinity to more residences with potentially impoverished and minority people than the Proposed Action or Charity Alternative, having the highest potential for environmental justice impacts in comparison to other corridors analyzed in this EIS (Table 3.10-1).

3.10.2.4 Charity Alternative

The Charity alternative would have similar impacts to environmental justice as described for the Proposed Action, which would be mostly low-intensity and short-term. However, according to the above Table 3.10-1, there are 30 percent fewer households to impact. Also, since the Charity Alternative is along an already

existing 230-kV transmission line the cumulative visual impacts are going to be marginal since the existing line has already impacted the visual landscape and property values

3.11 Transportation

3.11.1 Affected Environment

Much of the traffic in the area is concentrated on primary and secondary roadways; however, area residents use smaller, more rural roadways. No off-highway vehicle corridors occur in the Project area. As shown in Figures 2.3-1 and 2.3-2, many roadways are located relatively near the proposed Project.

Primary roadways within the Project area include U.S. Highway 17, SC Highway 41, and SC Highway 45. U.S. Highway 17 generally runs north-south paralleling the coast connecting the major cities of Myrtle Beach and Charleston as well as the towns of Georgetown and McClellanville. U.S. Highway 17 is a four-lane, divided highway to the east of the McClellanville Substation and not crossed by the action alternatives.

SC Highway 41 generally runs north-south and originates in the town of Mt. Pleasant connecting central Charleston County to the town of Jamestown. The highway ends at the South Carolina state line and continues north as North Carolina State Highway 41. SC Highway 45 originates in the town of McClellanville and generally runs east-west connecting to the interior of South Carolina serving as the main thoroughfare in northern Berkeley County to the town of Jamestown.

Portions of some of the alternatives were designed to parallel roadways and other linear infrastructure (e.g., gas pipelines) to minimize potential new disturbances (Table 3.3-8). SC Highway 45 parallels the shared corridor for the Proposed Action and action alternatives for approximately 9.2 miles.

Most of the roads in the Project area are rural roads and do not have average annual daily traffic estimates available. Table 3.11-1 shows the roads in the Project area with available average annual daily traffic data. For comparison, U.S. Highway 17 north of Georgetown along the coast near the town of Murrells Inlet has average annual daily traffic estimates of more than 30,000 vehicles per day; comparison of these numbers illustrates the rural nature of the overall Project area (SCDOT 2021a).

Table 3.11-1. Average Annual Daily Traffic Volumes on Highways in the Project Vicinity

County	Roadway	Average Annual Daily Traffic (vehicles/day)	Station ID
Berkeley	SC Highway 41 (Clements Ferry Rd to SC 402)	3,900	151
Berkeley	SC Highway 41 (Charleston Co. line to Clements Ferry Rd)	15,1400	152
Berkeley	SC Highway 41 (SC Highway 402 to SC Highway 45	2,600	153
Berkeley	SC Highway 45 (SC Highway 41 to School Bus Dr)	750	159
Berkeley	SC Highway 45 (School Bus Dr to Charleston Co. Line)	375	161
Charleston	U.S. Highway 17 (Fifteen Mile Landing Rd to Tibwin Rd)	10,900	137
Charleston	U.S. Highway 17 (Tibwin Rd to SC 45)	10,100	138
Charleston	SC Highway 45 (Berkeley Co. Line to 0.06 miles south of Turner Sullivan Road)	375	197
Charleston	SC Highway 45 (Old Georgetown Rd to Randall Rd)	500	199
Charleston	SC Highway 45 (Randall Rd to U.S. Highway 17)	900	201

Source: SCDOT (2021a, 2021b)

There are no airports in close proximity to be considered potentially affected by the Project. The Charity Alternative would cross over a railroad that parallels SC Highway 41, approximately 5.5 miles south of the town of Huger.

3.11.2 Environmental Effects

This section discusses potential impacts, their duration, and intensity on transportation resulting from construction and operation of the proposed Project, including the No Action Alternative. Definitions for duration and intensity developed for this Project are shown in Table 3.11-2.

Table 3.11-2. Transportation Impact Context and Intensity Definitions

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During construction period Long-term: Life of the line (50 years)	Negligible increase in daily traffic volumes resulting in perceived inconvenience to drivers but no actual disruptions to traffic. Perceived inconvenience to drivers due to routine inspections by small vehicles or pickup trucks.	Detectable increase in daily traffic volumes (with slightly reduced speed of travel) resulting in slowing down traffic and delays, but no change in level of service. Short service interruptions (temporary closure for a few hours) to roadway traffic.	Extensive increase in daily traffic volumes (with reduced speed of travel) resulting in an adverse change in level of service to worsened conditions. Extensive service disruptions (temporary closure of one day or more) to roadways. Permanent physical change in transportation system. Permanent change in traffic patterns along primary roadways including U.S. Highway 17 with an adverse change in level of service to worsened conditions.

The following section provides an overview of potential impacts associated with the Project alternatives.

3.11.2.1 No Action Alternative

No construction activities would occur under the No Action Alternative, and the Project would not occur. However, traffic volumes are anticipated to continue to increase in areas experiencing growth. Without construction of the Project, businesses and residences in the area would continue to be limited by lack of reliable electric service.

3.11.2.2 Proposed Action (Jamestown Corridor)

Construction

During construction, the Proposed Action could have short-term impacts on the transportation network. Delivery of equipment and material and general construction traffic would increase wear and tear on area roads and highways. There would not be any construction of new roadways to access the transmission line because existing roadways would be used. Potential short-term, direct, and adverse effects to traffic would include increased traffic volume and travel time. Construction of the transmission line could include temporary lane or road closures when the line is being constructed across a roadway. The extent of such impacts would depend on location of the road, lane closures, and traffic detours and the duration of the closures or detours. In addition to closures, increased travel time could occur from movement of construction equipment and materials. On roads that currently have very little traffic an increase in traffic

during construction could occur if workers use these roads as access roads. Long-term beneficial impacts to roadways and traffic would occur if road improvements were required.

Construction activities associated with the Project would result in short-term impacts on the roadway network in areas where road and lane closures and traffic detours may be required. The Proposed Action would not cross or run parallel to U.S. Highway 17, the busiest roadway in the Project area. It would run parallel to SC Highway 45 for approximately 9.2 miles, or 39 percent of its length. This rural roadway is much less traveled than other highways in the Project vicinity.

Closures and detours may be necessary to string transmission lines across roads. Table 3.11-3 shows the types of roads that would be crossed by the action alternatives. Short traffic delays may occur to facilitate the movement of material haul trucks. Longer traffic delays would occur on higher volume roadways. Roadway closures would be planned well in advance and timed during off-peak travel times to minimize adverse effects. Appropriate notification would be posted in and around affected areas to alert motorists of planned closures and detours. Overall, based on the above discussion, Project construction would have low-intensity impacts on transportation.

Table 3.11-3. Number of Roadway Crossings by Type for the Proposed Action and Alternatives

Roadway Type	Proposed Action (Jamestown Corridor)	Jamestown Alternative	Charity Alternative
Local Roads	17	21	24
State Highways	6	6	6
U.S. Highways	--	--	--
Total	23	27	30

As the proposed Project is further refined, Central Electric would work with the appropriate entities and municipal officials to minimize potential adverse impacts by identifying potential traffic corridors, limitations, and improvements associated with the road network.

Transportation Impacts within the Francis Marion National Forest

Approximately 58 percent of the Jamestown corridor is primarily within the FMNF. Within the national forest, the corridor largely runs parallel to SC Highway 45, Halfway Creek Road, and SC Highway 41. As tabulated in Table 3.11-3, it would also intersect several local and rural roads on NFS lands, including Turner Sullivan Road, Honey Hill Road, Old Cemetery Road, Round Pond Road B, Shulerville Road, Yellow Jacket Road, Ackerman Drive, Murphy Road (USFS Road 156), Rd (School Bus Drive, Tiger Corner Road, Hell Hole Road, and McKay House Road. While most of the corridor is proposed within the ROW for SC Highway 45, Halfway Creek Road, and SC Highway 41, appropriate notifications would be posted in and around all affected areas to alert motorists of planned closures and detours. The impacts of the Proposed Action on the transportation network within the FMNF would be short-term and low-intensity.

Maintenance and Operation

Long-term impacts on roadways in the Project area are not anticipated as a result of the proposed Project. All crossings of roadways would be in compliance with National Electrical Safety Code clearance requirements. Central Electric would coordinate with agencies and obtain all necessary permits for road crossings. Once in operation, there would be periodic maintenance of the transmission line and supporting facilities; however, such activities are not anticipated to adversely affect roadway traffic volumes or patterns. According to the SCDOT accommodations policy, construction of the transmission line should be

at least 30 feet from the pavement edge and outside of the clear roadside area (SCDOT 2019). As such, Proposed Action should have no effect on the upkeep of the roadway ROW. Road or land closures are not anticipated during the routine O&M of the transmission line.

Once in operation, the Project is not anticipated to result in any long-term, adverse effects. Maintenance activities associated with the transmission line would occur primarily within the proposed Project ROW and avoid disrupting traffic patterns. While maintenance vehicles would need to access locations where repairs or other activities are necessary, these movements would not occur on a regular basis and are not anticipated to adversely affect traffic patterns over the long term.

3.11.2.3 Jamestown Alternative

The Jamestown Alternative would have similar low-intensity impacts on transportation as described for the Proposed Action. The proposed corridor would parallel existing roads for a similar length (Table 3.3-8) and cross just a few additional local roads (Table 3.11-3).

3.11.2.4 Charity Alternative

The Charity Alternative would parallel existing roads for approximately half as long as the Proposed Action and Jamestown Alternative. As under the Proposed Action, the Charity Alternative would run parallel to SC Highway 45 for approximately 9.2 miles, where impacts would to . The Charity Alternative would intersect several local and rural roads on NFS lands, including Round Pond Road B, State Road S-8-608, State Road S-8-172, Blue Bird Road, Conifer Road, Buckle Island Road, Halfway Creek Road B, Farewell Corner Road A, Cumbee Road A, Bob Morris Road, Steed Creek Road, Northampton Road, North Hampton Road C, United Driver and Ipco Keystone Road (Table 3.11-3). As with the Jamestown corridor, appropriate notifications would be posted in and around all affected areas to alert motorists of planned closures and detours. The impacts of the Charity Alternative on the transportation network within the FMNF and elsewhere would be short-term and low-intensity.

3.12 Health and Safety

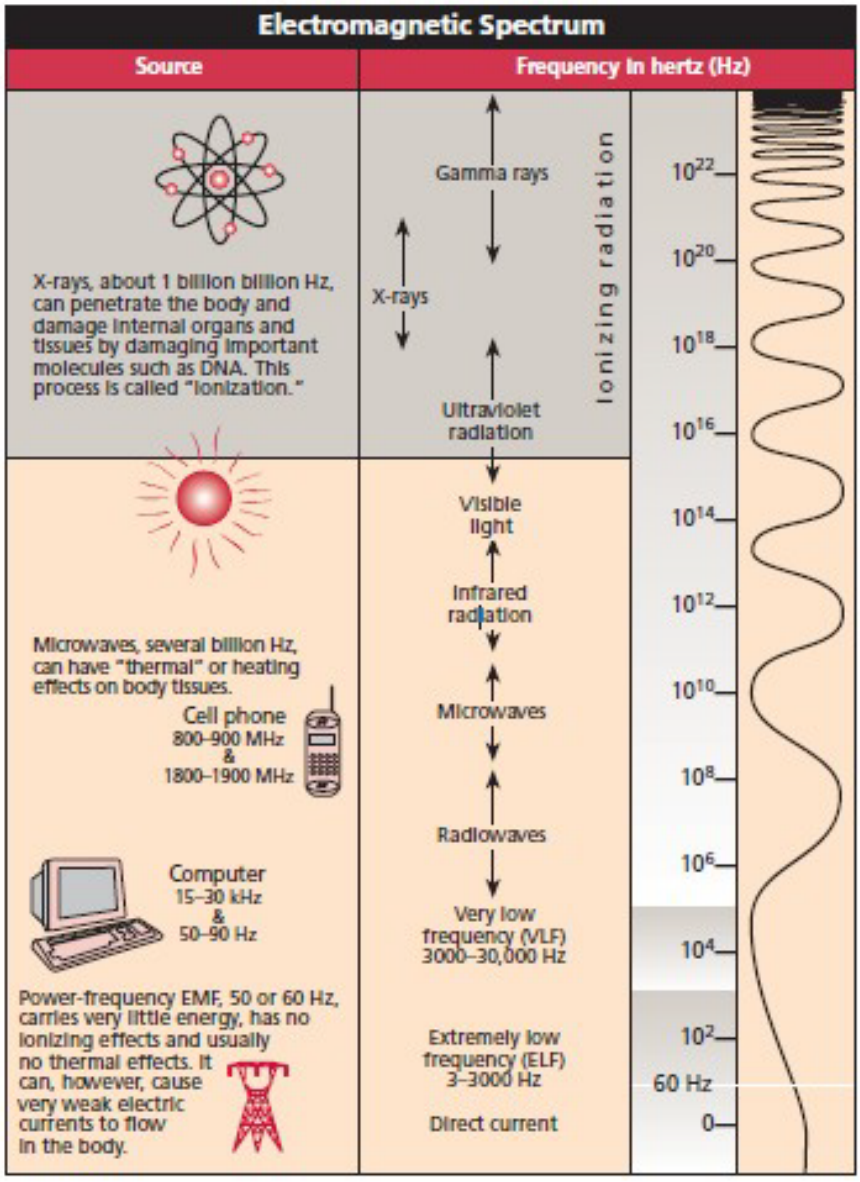
3.12.1 Affected Environment

Potential human health and safety impacts are related to Project construction and operation, and impacts would be confined to within 300 feet of the ROW centerline.

3.12.1.1 Electric and Magnetic Fields

The following overview of electric and magnetic fields (EMF) comes from the National Institute of Environmental Health Sciences (NIEHS) manual *Electric and Magnetic Fields Associated with the Use of Electric Power* (2002).

EMF is a type of energy associated with electric power that includes two fields: the electric field and the magnetic field. The electric field is produced by the voltage of the power source and increases as voltage increases. Magnetic fields are produced from the current flowing through the conductor and increase as the current increases. Both electric and magnetic fields decrease as distance from the source increases (NIEHS 2002). EMF, as it pertains to power lines is considered extremely low frequency electric and magnetic fields. Power frequency is in the range of 50–60 hertz for transmission line facilities. Figure 3.12-1 illustrates the different types of sources that emit EMF and their associated frequency. Power frequency is at the bottom of the spectrum.



Source: NIEHS (2002)

Figure 3.12-1. EMF Sources and Frequencies

EMF associated with transmission lines is emitted from a variety of equipment including the transmission lines coming into the substation, transformers, reactors, and capacitor banks. As such, EMF is strongest around substation facilities and decreases rapidly with distance from the source (NIEHS 2002).

The primary concern related to transmission lines and other electrical equipment is the potential negative health effects from exposure to EMF, in particular an increase in cancer, leukemia, and other diseases. Over the last several decades, several epidemiological studies have been conducted to assess potential impacts of EMF as it relates to cancer and other diseases. In 1998, Congress asked NIEHS to complete a study of the possible health effects associated with EMF. The following is an excerpt from that report:

> The NIEHS believes that the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm. The scientific evidence suggesting that extremely low frequency EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies, although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemias in experimental animals has been observed (NIEHS 1999).

Additional organizations have also completed their own analysis. The findings from some of these studies are captured below

USEPA:

> Scientific studies have not clearly shown whether exposure to EMF increases cancer risk. Scientists continue to conduct research on the issue. There is no clear scientific evidence that electromagnetic fields affect health (USEPA 2023c).

National Research Council:

An earlier National Research Council assessment of the available body of information on biologic effects of power-frequency magnetic fields (National Research Council 1997) led to the conclusion:

> …that the current body of evidence does not show that exposure to these fields presents a human health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects. The new, largely unpublished contributions of the EMF-RAPID program are consistent with that conclusion. We conclude that no finding from the EMF-RAPID program alters the conclusions of the previous NRC review on the Possible Effects of Electromagnetic Fields on Biologic Systems.

In 1999, the National Research Council followed up by stating:

> In view of the negative outcomes of EMF-RAPID replication studies, it now appears even less likely that EMFs in the normal domestic or occupational environment produce important health effects, including cancer (National Research Council 1999).

Implantable Medical Devices:

Pacemakers are used to treat arrhythmias, which are problems associated with the rate or rhythm of the heartbeat. The pacemaker can relieve some of the irregular symptoms and sense abnormal heart rhythms

and uses electrical pulses to prompt the heart to beat at a normal rate (U.S. Department of Health and Human Services 2022).

Pacemakers and other cardiac electronic devices rely on complex micro-circuitry and use electromagnetic waves for their communication with the programmers. As a result, they are susceptible to interference from surrounding electromagnetic fields.

Electromagnetic interference can be defined as any signal, biological or not, that falls within a frequency spectrum that is being detected by the sensing circuitry of the pacemaker. This can interfere with the device's optimal function and is often a concern for patients (Lakshmanadoss et al. 2004).

At present, there is no standardized guidance regarding acceptable levels of EMF for pacemakers. However, the American Conference of Governmental Industrial Hygienists has prepared recommendations for occupational exposures including EMFs. These guidelines are designed to identify levels that nearly all workers may be exposed to repeatedly without adverse effect. For EMF, the recommendations suggest that persons with pacemakers or similar devices limit their exposure to electric fields to 1 kV/m and magnetic fields to 1,000 milligauss (American Conference of Governmental Industrial Hygienists 2011). The expected EMF levels on this Project would be significantly below these recommendations.

3.12.2 Environmental Effects

This section discusses potential impacts, their duration, and intensity on health and safety of the public resulting from the construction and operation of the proposed Project. Definitions for duration and intensity associated with safety and public health developed for this Project are described in Table 3.12-1.

Table 3.12-1. Health and Safety Impact Context and Definitions

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During construction period Long-term: Life of the line (50 years)	Construction of the proposed Project would not result in: 1) exposure of contaminated media to construction workers and/or 2) incidents associated with the installation of the transmission line and supporting infrastructure. Operation of the proposed Project would not result in an increase of EMF levels that would rise to a level of concern with regard to public health and safety.	Construction of the proposed Project may result in exposure of contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. The potential for incidents associated with the installation of the transmission line and supporting infrastructure would increase. Operation of the proposed Project would increase EMF levels, but not to a level that would adversely affect public health and safety.	Construction of the proposed Project would result in exposure of contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. Incidents associated with the installation of the transmission line and supporting infrastructure would likely result. Operation of the proposed Project would increase EMF levels to a level high enough to adversely affect public health and safety.

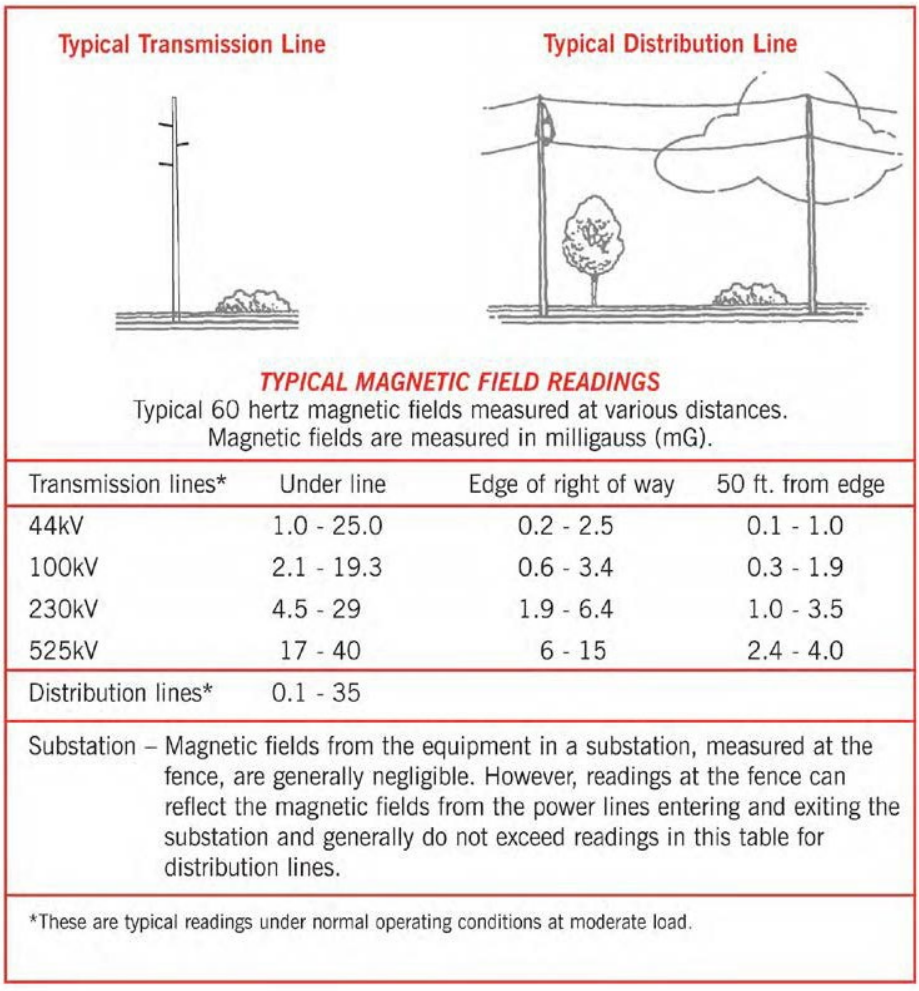
3.12.2.1 No Action Alternative

Under the No Action Alternative, the transmission line would not be constructed. Therefore, there would be no increase in the amount of EMF or any related impacts on human health and safety. Although the Winter Weather Operating Agreement was developed to secure the greatest amount of reliable electric service during periods of the greatest demand, the Berkeley Electric customers in the McClellanville service

area would continue to receive the greatest risk of failure to receive service during critical periods (when temperatures drop below 23 degrees Fahrenheit).

3.12.2.2 Proposed Action (Jamestown Corridor)

The ROW for the Project would be 75 feet. Figure 3.12-2 illustrates the levels of EMF associated with various transmission line voltages. For this Project, the EMF range would be between 100 and 230 kV. At the edge of the ROW, the EMF level would be approximately 3.4 to 6.4 milligaus. At a distance of 50 feet from the ROW, the level would decrease to 1.9 to 3.5 milligaus. These levels are significantly below the thresholds set out by the International Commission on Non-Ionizing Radiation Protection, which revised its reference levels in 2010 to 2,000 milligaus. Therefore, the operation of the Project under the Proposed Action would not result in an adverse impact on public health and safety as a result of the slight increase in EMF levels.



TYPICAL MAGNETIC FIELD READINGS

Typical 60 hertz magnetic fields measured at various distances.
Magnetic fields are measured in milligauss (mG).

Transmission lines*	Under line	Edge of right of way	50 ft. from edge
44kV	1.0 - 25.0	0.2 - 2.5	0.1 - 1.0
100kV	2.1 - 19.3	0.6 - 3.4	0.3 - 1.9
230kV	4.5 - 29	1.9 - 6.4	1.0 - 3.5
525kV	17 - 40	6 - 15	2.4 - 4.0
Distribution lines*	0.1 - 35		

Substation – Magnetic fields from the equipment in a substation, measured at the fence, are generally negligible. However, readings at the fence can reflect the magnetic fields from the power lines entering and exiting the substation and generally do not exceed readings in this table for distribution lines.

*These are typical readings under normal operating conditions at moderate load.

Source: Central Electric (2014)

Figure 3.12-2. Typical EMF Levels for Transmission Lines

Electrical Contact Safety

Direct contact with an energized conductor poses the most serious risk of injury or death from a high-voltage transmission line. The transmission structures would be designed to prevent any accidental contact with an energized conductor. Poles would be designed to discourage and prevent climbing, which should also prevent accidental contact even during most acts of vandalism. By designing these structures to the requirements of the National Electrical Safety Code, there would be little danger from contact injuries.

In the event of an extreme event such as a catastrophic storm, which could drop a conductor, safety controls within the substations would immediately open circuit breakers, shutting down the line to prevent accidental exposure.

Construction Safety

Heavy equipment would be used during the construction of the transmission line and include the use of oil and gas for fueling. At this time, no onsite storage of hazardous materials is planned, and, in the event of a spill, appropriate measures outlined in Table 2.5-1 would be implemented. Adherence to normal safety procedures associated with heavy construction would ensure no danger to utility construction or maintenance workers.

Landowner Concerns

Transmission lines are designed to automatically trip in the event the line comes in contact with trees or other surfaces. Typically, this occurs during storm events or when a tree falls into the transmission line. Santee Cooper would be responsible for maintaining the transmission line ROW once the Project is constructed. A copy of the Santee Cooper Vegetation Management Program and Unit Plan is included in Appendix F. In addition, herbicides may be used during the maintenance of the transmission line ROW (with the exception of NFS lands unless approved by the USFS). Santee Cooper would be responsible for complying with all federal and state laws for herbicide application.

The Proposed Action would cross some agricultural land. The presence of transmission poles in timber plantations or agricultural fields may be difficult to farm around in some locations and may present a hazard to farmers operating large equipment. Central Electric would work with affected landowners as the preferred alternative is identified to mitigate any potential effect on agricultural operations.

3.12.2.3 Jamestown Alternative

As under the Proposed Action, the Jamestown Alternative would not result in an adverse impact on public health and safety as a result of the slight increase in EMF levels. The same safety measures as described under the Proposed Action would also avoid any accidental contact with an energized conductor, promote construction safety, and ensure that the Project does not pose any health or safety risk to private lands.

3.12.2.4 Charity Alternative

As under the Proposed Action, the Charity Alternative would not result in an adverse impact on public health and safety as a result of the slight increase in EMF levels. The same safety measures as described under the Proposed Action would also avoid any accidental contact with an energized conductor, promote construction safety, and ensure that the Project does not pose any health or safety risk to private lands. The Charity Alternative would parallel an existing 230-kV transmission line, and extra caution would be required during construction and maintenance if this alternative were selected. Even with the new proposed 115-kV line shut down, induced voltage from a parallel transmission such as the adjacent 230-kV

transmission line could induce unsafe conditions for utility workers when servicing the new line. Central Electric would coordinate with the owner of the transmission line (South Carolina Public Service Authority) for outages and safety protocols. With appropriate safety protocols in place, future maintenance could be performed safely on the new line.

3.13 Noise

3.13.1 Affected Environment

Noise is generally defined as unwanted sound. Sound is all around; it becomes noise when it interferes with normal activities such as speech, concentration, or sleep. Ambient noise (the existing background noise environment) can be generated by a number of noise sources, including mobile sources, such as automobiles and trucks; and stationary sources such as construction sites, machinery, or industrial operations. In addition, there is an existing and variable level of natural ambient noise from sources such as wind, streams and rivers, wildlife, and other sources.

The standard measurement unit of noise is the decibel (dB), which represents the acoustical energy present. Noise levels are measured in A-weighted decibels (dBA), a logarithmic scale that approaches the sensitivity of the human ear across the frequency spectrum. The human ear responds to noise in the audible frequencies in a similar way in most individuals. A 3- to 5-dBA increase, which is equivalent to doubling the sound pressure level, is barely perceptible to the human ear. A 6-dBA is a readily perceptible change, and a 10-dBA is doubling of the apparent loudness. Figure 3.13-1 provides examples of sound levels of typical noise sources and noise environments (U.S. Department of Labor, Occupational and Health Safety Administration n.d.).

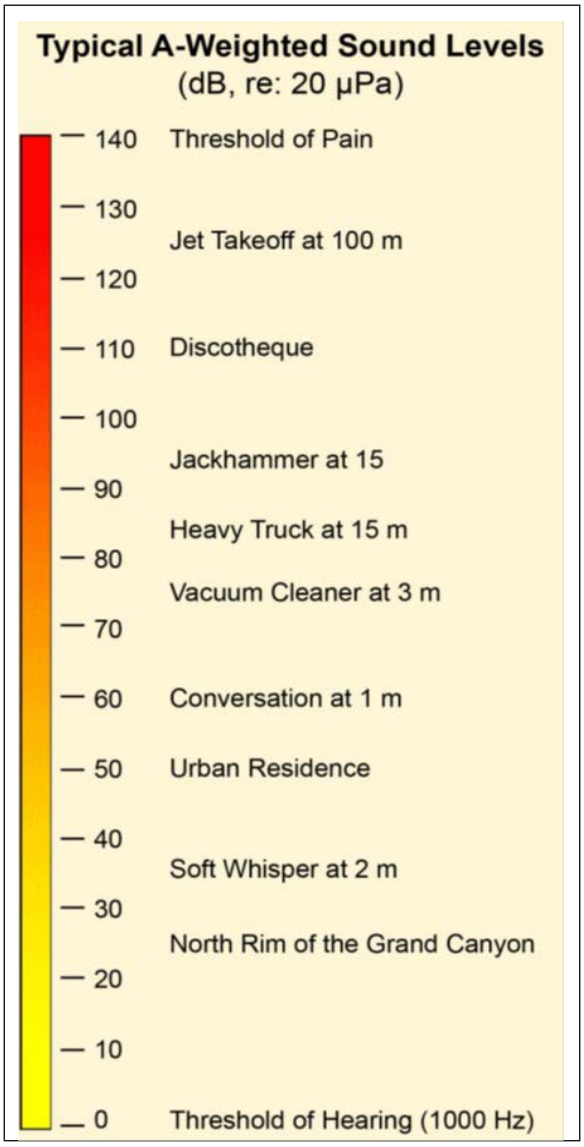


Figure 3.13-1. Sound Levels of Typical Noise Sources and Noise Environments

3.13.1.1 Ambient Noise and Sources in the Project Area

Ambient noise within the Project area can originate from a variety of sources. Most of the Project area is forested and consists sparse rural development trending toward more industrial uses at the extreme western extent of the Project area. Within the Project area, numerous tracts of land are used for timber harvesting. At any given time, timber may be logged and transported, which would include the use of logging equipment and large trucks moving the timber down U.S. Highway 17 and SC Highways 41 and 45. Logging equipment can often operate at 80 dBA and above, depending on the specific type of equipment used. In the rural development areas, ambient noise would typically be less than 50 dBA (the level normally associated with urban development). In addition, several highways traverse the Project area, and noise levels increase adjacent to the highways. Roadway noise can vary due

to the type of vehicles, speed at which the vehicles are traveling, and the density of surrounding vegetation. In general, an ambient noise level of approximately 70 dBA occurs throughout the Project area.

3.13.2 Environmental Effects

This section discusses potential impacts, their duration, and intensity of impacts to the soundcape resulting from construction and operation of the proposed Project, including the No Action Alternative. Definitions for duration and intensity developed for this Project are shown in Table 3.13-1.

Table 3.13-1. Duration and Intensity Definitions for Project-related Noise

Context (Duration)	Low-intensity	Moderate-Intensity	High-Intensity
Short-term: During the construction period Long-term: Life of the line (50 years)	Noise impacts could attract attention but would not dominate the soundscape or detract from current user activities.	Noise impacts would attract attention, and contribute to the soundscape, but would not dominate. User activities would remain unaffected.	Impacts on the characteristic soundscape would be considered significant when those impacts dominate the soundscape and detract from current user activities.

3.13.2.1 No Action Alternative

Under the No Action Alternative, the Project would not be constructed, and there would be no new sources of noise from the Project. Existing and reasonably foreseeable trends and actions would continue to generate ambient noise in the analysis area. However, current and anticipated land use of the analysis area is projected to primarily remain as developed, forested, or agricultural uses. Future development would occur similar to existing land cover trends, but this conversion would be limited in nature. Therefore, vehicle traffic along intersecting and adjacent roadways, forestry, and agricultural equipment use (e.g., chainsaws, fellers, bunchers, log loaders, tractors, forage harvesters, and other loud machinery) are anticipated to remain the main sources of noise. These sources could generate 40 dBA to 100 dBA in intermittent, localized traffic and equipment activity.

3.13.2.2 Proposed Action (Jamestown Corridor)

Under the Proposed Action, construction equipment and vehicles would use highways and local roadways to access the Project ROW. Large equipment including, drill rigs, cranes, low boys, large trucks, bucket trucks, and pulling and tensioning equipment would be required to construct the transmission line. Table 3.13-2 gives the equipment noise levels for some of the equipment that may be used for the Project.

Table 3.13-2. Typical Construction Equipment Noise Levels

Type of Equipment	Maximum Level (dBA) at 50 feet
Bulldozer	85
Heavy Truck	88
Backhoe	80
Pneumatic Tools	85
Crane	85
Combined Equipment	89

Source: Thalheimer (1996)

Noise related to construction activities would occur along the length of the transmission line for the duration of construction, which is anticipated to take 12 to 16 months. The increase in noise from construction activities would only be an issue in areas with residences, schools, churches, libraries, or where there are other sensitive noise receptors. The majority of the Project area is forested, with the majority of the residential development located around the communities of Jamestown, Shulerville, and Honey Hill, and near the proposed McClellanville Substation. Existing ambient noise levels typically vary between 40 to 50 dB for areas that are not adjacent to developed areas. This level is generally considered quiet. For this analysis, dB levels above 50 dBA would be considered moderate and below 50 dBA would be considered low. The Proposed Action would parallel SC Highway 45 and other low-volume county roads for the majority of its length. There are 23 residences within the 600-foot-wide corridor (Table 3.9-9). Construction-related noise impacts to these receptors would also be moderate but short in duration.

Noise impacts during Project O&M are expected to be negligible. Noise from maintenance activities would only occur in the event a maintenance activity must be performed on the transmission line. Typically, maintenance activities are short in duration and can be accomplished with a bucket truck and several pick-up trucks.

Operation of transmission lines are known to result in corona-generated noise from the conductors. Changes to local atmospheric pressure may result in a hissing or cracking sound that may be heard directly under or a few feet from the transmission line ROW. The noise generated depends on weather, altitude, and system voltage and dissipates with distance from the transmission line. The level of corona-generated noise at 115 kV is so low that it generally is not detectable to the human ear at ground level and 35-feet from the line (edge of ROW). Therefore, no corona noise impacts are anticipated during operation of this new line.

3.13.2.3 Jamestown Alternative

Noise impacts from the Jamestown Alternative would be similar to the Proposed Action in intensity and duration. Although the Jamestown Alternative would contains approximately 60 percent more residences within a 600-foot-wide corridor than the Proposed Action, construction-related noise impacts to these receptors would also be short-term and moderate-intensity. The impacts from Project O&M would be short-term and low-intensity, and no impacts from corona noise are anticipated.

3.13.2.4 Charity Alternative

Noise impacts from the Charity Alternative would be similar to the Proposed Action in intensity and duration. The Charity Alternative contains 29 residences within a 600-foot-wide corridor, six more than the Proposed Action. Construction-related noise impacts to these receptors would also be moderate but short in duration. The impacts from Project O&M would be short-term and low-intensity, and no impacts from corona noise are anticipated.

4.0 CUMULATIVE IMPACTS AND OTHER REQUIRED CONSIDERATIONS

4.1 Introduction

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertake such other actions" (40 CFR 1508.7). Assessment of cumulative impacts in NEPA documents is required by CEQ regulations (CEQ 1987). Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that form the basis of cumulative impacts analysis. The utility sector is characterized by considerable uncertainty because economic and technological factors determining the course of utility infrastructure development are often unpredictable. For this reason, cumulative impacts analysis is a particularly challenging undertaking in the context of such a dynamic and changing utility environment.

This chapter addresses the cumulative impacts of the Project and any reasonably foreseeable future actions in the vicinity outside the scope of this Project. It also describes irreversible or irretrievable commitment of resources and the relationship between short-term uses of the environment and long-term productivity.

4.2 Cumulative Impacts

The cumulatively considerable past, present, and reasonably foreseeable actions and events considered in this analysis are the continuing population growth and development in the region, including timber harvesting; actions associated with the FMNF Revised Land Management Plan; and current ongoing recovery efforts related to hurricane Florence which made landfall in September 2018. These actions and events are described below. The following analysis then characterizes cumulative effects for each topic covered in this EIS.

4.2.1 Cumulative Impacts Methodology

To provide guidance on how cumulative impacts are assessed in environmental impact analysis, CEQ developed a handbook *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997). CEQ's handbook offers the most comprehensive and useful information to date on practical methods for addressing cumulative effects in NEPA documents. The methodology for cumulative impacts in this section takes its direction from this guidance. The following analysis of cumulative impacts focuses on the specific resources and ecological components that can be affected by the incremental effects of the Proposed Action and other past, present, and reasonably foreseeable actions and events occurring in the same geographic area.

4.2.2 Cumulative Action Scenario

4.2.2.1 FMNF Land Management Plan

The FMNF completed revising its Land Management Plan in 2017 (USFS 2017), as all national forests are periodically required to do. The purpose of the plan is to guide the general management direction of the

FMNF during the next 15 years. This document, developed under the 2012 planning regulations outlined in 36 CFR 291, is a second revision of the original forest management plan prepared in 1985 under the National Forest Management Act. USFS's 2012 Planning Rule directly addresses the ability of a forest to respond to climate change and other stressors.

4.2.2.2 Hurricanes

In recent years, Berkeley and Charleston counties have faced multiple significant storm events. In 2016, Hurricane Matthew caused severe flooding and wind damage in Charleston and Berkeley counties. It led to a FEMA disaster declaration, providing federal assistance for recovery efforts, including debris removal, infrastructure repair, and individual assistance for affected residents. In 2018, Hurricane Florence caused significant flooding in Charleston and Berkeley counties that also included a FEMA disaster declaration. In 2019, hurricane Dorian brought strong winds, storm surge, and heavy rainfall to these counties, causing power outages, flooding, and property damage, and a FEMA disaster declaration. In 2022, Hurricane Ian resulted in extensive damage due to wind and flooding and a FEMA disaster declaration included Charleston County.

4.2.2.3 Cainhoy Plantation Development

The 9,238-acre Cainhoy Plantation property is being planned and developed as a mixed-use community with homes, public schools, retail shops, restaurants, and office space located within the City of Charleston and Berkeley County. The development of this Project will result in unavoidable impacts to freshwater jurisdictional wetlands (approximately 200 acres). According to preliminary plans, approximately 50 percent of the property (4,500 acres) will be preserved property that provides vital habitat and connectivity for plant and animal species, with the centerpiece being the more than 500-acre Point Hope Nature Sanctuary. Cainhoy Plantation is a large development; however, it represents continued load growth pressures for Berkeley Electric as the greater Charleston and Mt. Pleasant areas remain popular.

4.2.2.4 Sea Level Rise

Warming oceans and melting glaciers and ice sheets are contributing to rising sea levels and contributing to increased risks and frequencies of coastal flooding. Modest 3-foot increases in sea levels above current high water marks can have dramatic effects along the South Carolina coast and hydrologically connected areas such as the Santee River and into Wambaw Creek. National Oceanic and Atmospheric Administration modeling and model viewers show extensive expansion of sea levels in these areas. Similar model results published by the City of Charleston for the Charleston and Mt. Pleasant areas show increased flood risk and needs for understanding and planning for potential changes in land uses and risks to the populations in these areas.

4.2.2.5 Dominion's Interest in Interconnection with McClellanville Substation

Although nothing has been proposed as of this writing, it is likely foreseeable that Dominion could pursue an interconnection to the McClellanville Substation to further enhance electrical reliability throughout their territory in the local area. Electrical reliability and service are not unique to Central Electric or Berkeley Electric customers and the areas surrounding greater McClellanville suffer from some of the lowest reliability standards and greatest risks to outages throughout South Carolina. Securing electrical reliability for Berkeley Electric customers would further strengthen Dominion's network of transmission and distribution throughout the region providing benefits to its customers.

4.3 Cumulative Impacts Analysis

4.3.1 Water Resources

Long-term, moderate- to high-intensity impacts on forested wetlands would be expected to occur where trees and other woody vegetation would need to be removed within the ROW. The cumulative contribution of Project-related impacts to water resources would be minor when considered within the context of continuing population growth and development in the region such as the Cainhoy Plantation development. Within the Project area as a whole, vegetation removal occurs at a regional scale as the human population continues to increase in Berkeley and Charleston counties. Impacts of flooding associated with Hurricane Florence on wetlands and floodplains within the Project area have yet to be determined. Project activities under the Proposed Action would not result in a significant contribution to these storm-related effects. Development and use of forest resources within areas of the FMNF is guided by USFS' (2017) Revised Land Management Plan. Specific use of NFS lands is managed for the protection of resources and planned development is limited in order to reduce impacts to the extent feasible. Impacts from sea level rise and increased storm surges will continue to impact water resources throughout coastal South Carolina. When taken in the regional context, the incremental contribution to cumulative effects of water resources impacts associated with the Project would be minor.

4.3.2 Biological Resources

The proposed alignments contain a combination of NFS lands, residential, agricultural, and undeveloped areas. When combined with the continuing population growth and development in the region, additional vegetation removal along the road right of ways as proposed would contribute modest adverse cumulative effects to individual animals, populations, and even ecosystem conditions. Significant adverse effects to biological resources from habitat fragmentation associated with residential development and related infrastructure would be exacerbated by tree clearing associated with the proposed Project. In addition, nonnative invasive plants and animals could be introduced and displace native species, disrupt nutrient and fire cycles, and alter plant succession. Although populations of common wildlife species would not be adversely affected, threatened, endangered, or other at-risk species could be negatively affected by increased human development. The future of most of these sensitive species depends on active restoration and management, in particular via prescribed fire. The potential for increasing human development in the McClellanville area could further limit areas where prescribed fires are possible. The *Southern Forest Resource Assessment* (Wear and Greis 2002) details these threats. However, forested habitat that is managed via natural disturbance (i.e., fire) is abundant in the Project area, and the FMNF would continue to implement forest management activities that would have beneficial long-term effects to fire-dependent ecosystems and associated at-risk wildlife species. Localized effects would occur to RCW and other wildlife species dependent on large areas of undisturbed habitat. Any additional land development within or adjacent to known clusters could have substantial adverse effects on this species. Moreover, as the human population continues to increase in Berkeley and Charleston counties, wildlife road mortality is expected to continue to increase as more vehicles are on the roads. Some heavily traveled paved roads on the FMNF cause significant amphibian and reptile mortality (USFS 2013a). In summary, impacts to vegetation and wildlife from the Proposed Action would contribute cumulatively to effects already occurring to biological resources in the McClellanville area.

4.3.3 Soils and Geology

Short-term impacts to soils and geology are anticipated to occur as a result of ground disturbances associated with the Proposed Action. When taken in the regional context, such impacts would not contribute significantly to cumulative effects on soil resources in the Project area.

4.3.4 Air Quality and Greenhouse Gas Emissions

Short-term impacts to air quality would be expected during Project construction. However, the incremental contribution of impacts to air quality associated with the Project to overall cumulative air quality and GHG emissions at the regional level would be negligible.

4.3.5 Cultural and Paleontological Resources

When taken in combination with effects from regional development associated with population growth and development in the region, including timber harvesting, forest service plans or ongoing recovery efforts related to Hurricane Florence, no cumulative contribution to impacts on cultural and paleontological resources is anticipated to occur as a result of the Proposed Action.

The Gullah Geechee Cultural Heritage Corridor Commission's Cultural Heritage Corridor Management Plan (Gullah Geechee Cultural Heritage Corridor Commission 2012) provides an overview of past, present, and reasonably foreseeable threats to traditional lands and cultural sites used by the Gullah Geechee. This information was extrapolated in a general context to assess potential cumulative effects to cultural resources. The Project is moving forward according to the provisions of the PA implemented by RUS. Archaeological and architectural surveys, and evaluations to identify additional historic properties, will be completed prior to Project implementation for compliance with Section 106 of the NHPA. The identification of additional and potentially significant historic properties may result in changes to Project design to avoid, minimize, or mitigate adverse effects on historic properties. Cultural resource surveys and evaluations will occur after Central Electric selects the proposed Project's Alternative, and prior to Project implementation.

In the late twentieth century, large estate real estate development occurred in the coastal southeastern U.S. in the form of resorts, subdivisions, golf courses, golf communities, and recreational facilities. The Project area contains a combination of public land, residential communities, agricultural and cropland, and undeveloped areas. According to the South Carolina Revenue and Fiscal Affairs Office (2022), the population of Berkeley and Charleston counties in this region is anticipated to grow by more than 40 percent from 2015 to 2035. This is broadly consistent with the patterns of steady growth observed in the area during recent decades. The increase in population and its associated development may have resulted in loss of lands and sites of cultural importance. Within and adjacent to the proposed corridors, however, there is a substantial amount of public and private lands held in conservation easements. These areas were established to conserve natural and cultural resources and have been effective in protecting these resources from development.

Some of the Gullah Geechee communities referenced in the Cultural Heritage Corridor Management Plan (e.g., South Santee, Germantown, Tibwin, Buck Hall, and Awendah) are communities that would benefit directly from the operation of the proposed Project.

By supplying adequate levels of power reliably, the proposed Project has the potential to contribute to the preservation and maintenance of these traditional communities.

4.3.6 Recreation and Land Use

No cumulative impacts to recreation and land use are anticipated. When taken in combination with effects from regional development associated with population growth and development in the region, including timber harvesting, forest service plans or ongoing recovery efforts related to Hurricane Florence, no cumulative contribution to impacts on recreation and land use is anticipated to occur as a result of the Proposed Action.

4.3.7 Visual Resources

The cumulative contribution of Project-related impacts to visual resources would be minor when considered within the context of continuing population growth and development in the region. Timber harvesting currently occurs and is expected to occur in the future in the area of the Project. Cumulative impacts associated with visual impacts are anticipated to be short-term and minor in the Project area. The contribution of the Project to these cumulative effects would be negligible.

4.3.8 Socioeconomics

No cumulative impacts to socioeconomics are anticipated. The proposed Project would improve electrical reliability and power quality in the McClellanville service area, which would support further economic development within the region. Positive cumulative impacts from the proposed Project include increased electrical reliability to the residents and businesses in the greater McClellanville area. Improved electrical reliability and conversely decreased outages would be an improvement over the current conditions experienced in the region.

4.3.9 Environmental Justice

No adverse cumulative impacts to environmental justice communities are anticipated. Adverse cumulative impacts from Project construction and operation, would not disproportionately affect environmental justice communities. Positive cumulative impacts from the proposed Project include increased electrical reliability to the residents and businesses in the greater McClellanville area and throughout the general area from more reliable service. Improved electrical reliability and conversely decreased outages would be an improvement over the current conditions experienced in the region.

4.3.10 Transportation

Negligible short-term cumulative impacts to transportation would be expected during Project construction. Timber harvesting currently occurs and is expected to occur during the construction period in the area of the Proposed Action. Cumulative impacts associated with construction and timber harvesting traffic, and associated road closures, would be temporary in duration, and Project-related contributions to cumulative impacts would be negligible.

4.3.11 Health and Safety

No cumulative impacts to health and safety are anticipated.

4.3.12 Noise

No cumulative impacts to noise are anticipated. Once operational, the Project would not contribute significantly to existing ambient noise in the Project area.

4.4 Unavoidable Adverse Impacts

4.4.1 Water Resources

Although it is likely that there would be moderate-intensity, short-term impacts to surface waters and water quality, wetlands, and floodplains, these impacts would be minimized and mitigated. Long-term, permanent impacts to wetlands and floodplains are anticipated from the conversion of forested wetlands to scrub-shrub and/or emergent wetlands, and from placing structures in wetlands and floodplains. The impacts from converting forested wetlands would be moderate- to high-intensity, but it is anticipated that the impacts from the placement of poles in wetlands and floodplains would only be low-intensity because of the minimal area occupied by each structure. Any mitigation necessary to address unavoidable adverse impacts would be performed in compliance with any DA permit obtained for the Project.

4.4.2 Biological Resources

Depending upon the alternative chosen, between approximately 83 acres and 238 acres of forest cover would be permanently converted to shrubland or grassland. In addition, a small amount of vegetation would be permanently lost due to the placement of transmission line structures. Moderate- to high-intensity impacts would occur to 3 federally listed or proposed/candidate species (RCW, northern long-eared bat, and tricolored bat) due to the clearing of forests, wetlands, and other habitats that support known populations.

4.4.3 Soils and Geology

Potential unavoidable effects on geology and soil resources would include the permanent loss of prime farmland and/or farmland of statewide importance. The permanent loss of these lands would lead to a reduced yield if they were currently being used for agricultural or silvicultural practices. Although landowners would be compensated, a permanent loss in production would still occur.

4.4.4 Air Quality and Greenhouse Gas Emissions

Potential unavoidable impacts on air quality and GHGs stem from emissions associated with construction and construction activities. Although measures would be implemented to reduce the amount of emissions emitted, emissions would still occur.

4.4.5 Cultural and Paleontological Resources

Previously recorded archaeological sites and historic buildings have been identified within the proposed study area through records research and previous cultural resource surveys. Additional archaeological and architectural surveys and evaluations to identify additional historic properties will be completed prior to Project implementation. The identification of additional and potentially significant historic properties may result in changes to Project design to avoid, minimize, or mitigate adverse effects on historic properties. A project-specific PA, executed among RUS, USFS, and the SHPO, and may include the Advisory Council on Historic Preservation, will outline the path forward to perform cultural resource surveys to identify

resources within the Project area and will include consultation with federally recognized Tribes to identify and protect burial and sacred sites. Consultation with the SHPO and other parties with interest in the area have been conducted during the creation and implementation of the PA.

4.4.6 Recreation and Land Use

The conversion of forest cover to maintained (cleared) ROW would permanently change the land use along the transmission line. The Jamestown corridor parallels the existing road network essentially the entire route. Construction of the transmission line opposite the Wambaw Creek Wilderness boundary would minimize the potential impact to the recreation designated lands. Construction of overhead transmission lines or underground portions of the lines would have the same amount of vegetation clearing and right of way maintenance adjacent to the existing road network. Total amounts of forest cover that would be converted are shown above in Table 3.7-3.

4.4.7 Visual Resources

While impacts to visual resources can be minimized by locating the transmission line adjacent to existing infrastructure, away from scenic resources and residential areas, they cannot be completely avoided since the Project requires the addition of overhead transmission lines or cleared ROW for underground segments. Despite minimizing overall impacts to visual resources, the transmission line would parallel the existing road network which would be visible to drivers along the corridor. Construction of overhead transmission lines or underground portions of the lines would have the same amount of vegetation clearing and right of way maintenance adjacent to the existing road network. In the long term, visual impacts are anticipated to be low, adverse, and highly variable.

4.4.8 Socioeconomics

Potential unavoidable impacts on socioeconomic resources would include the loss of timber due to right of way clearing and structure placement. Although landowners would be compensated for the easements, a loss in farming or timber production would still occur.

4.4.9 Environmental Justice

Potential unavoidable impacts on environmental justice communities would include visual impacts from line placement and traffic, noise, and air quality impacts during construction. Although many of these impacts would be short-term, adverse and disproportionate impacts to potential environmental justice communities could occur during the short term, although impacts are expected to be low. Therefore, there could be disproportionate adverse effects to environmental justice communities in proximity to the transmission line associated with visual resources, property values, traffic, noise, and airquality.

4.4.10 Transportation

Potential unavoidable impacts on transportation would include low-intensity, short-term disturbances such as detours affecting local roadways and traffic patterns. Once constructed, the new line would not result in new traffic or roadway congestion, closures or any adverse effects to transportation in the Project vicinity.

4.4.11 Health and Safety

No unavoidable adverse impacts to health and safety are expected to result from the Proposed Action.

4.4.12 Noise

No unavoidable adverse noise impacts are expected to result from the Proposed Action.

4.5 Irreversible and Irretrievable Commitment of Resources

An irreversible or irretrievable commitment of resources refers to impacts to or losses of resources that cannot be recovered or reversed as a result of the proposed project. Examples include permanent conversion of wetlands and loss of cultural resources, soils, wildlife, agricultural production, or socioeconomic conditions. *Irreversible* is a term that describes the loss of future options. It applies primarily to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time. *Irretrievable* is a term that applies to the loss of production, harvest, or use of natural resources for a period of time (whether long or short). For example, if farmland is used for a non-agricultural event, some or all of the agricultural production from an area of farmland is lost irretrievably while the area is temporarily used for another purpose. The production lost is irretrievable, but the action is not irreversible.

The following is a list of the anticipated potential irreversible and irretrievable commitment of resources to be experienced over the life of the C-HC Project:

- Water Resources—consumption of water for equipment washdown/cleanup during construction
- Wetlands and floodplains—conversion of forested wetlands to herbaceous wetlands, and installation of a small number of transmission poles within wetlands and floodplains
- Biological resources—destruction of terrestrial and aquatic vegetation and wildlife habitat, including forested habitat that could support RCW, northern long-eared bat, and tricolored bat
- Land use and ownership—consumption of land for transmission line ROW and substations
- Construction materials and labor—consumption of non-recyclable building materials such as concrete, steel, wiring, etc., and the human effort to plan, construct, and operate the phases of the proposed project
- Energy resources—consumption of fossil fuels such as gas, oil, and diesel fuel by construction equipment and employee vehicles
- Visual resources—alteration to the viewshed by clearing land and constructing transmission line structures
- Financial resources—permanent loss of the cost to implement the proposed project

4.6 Relationship between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

NEPA legislation requires that an EIS describe "the relationship between local short- term uses of man's environment and the maintenance and enhancement of long-term productivity." Construction of the Project would have short-term impacts on environmental resources associated with construction of the transmission line, including installation of poles, conductors, any use of construction staging areas, and use of the area

as a transmission line ROW during the life span of the transmission line and its associated facilities. As indicated in the discussion under the individual resources, the small permanent footprint of the transmission line and the limited resource impacts indicate that operation of the facility would not likely affect regional natural resources to any significant degree. However, the land occupied by transmission towers would be an impact for the life of the transmission line, possibly exceeding 50 years. Additional land would be needed for transmission ROW and any needed access roadways.

Temporary impacts from construction activities are discussed in Chapter 3. Central Electric would be required to restore the ROW, temporary work spaces, potential access roads, abandoned ROW, and other lands affected by construction of the Project. During the restoration process, Central Electric would work with landowners, SCDNR, USFS, and local wildlife management programs to ensure that the ROW is restored.

Construction and operation of the Project would result in long-term impacts on vegetation, limited to the permanent conversion of vegetated lands to utility land uses (transmission structures); conversion of forested or wooded vegetated cover to herbaceous cover; and disturbance related to maintenance activities (mowing, herbicide application, tree trimming, and dangerous tree removal). Long-term (permanent) impacts would also accrue to prime and important farmland soils where transmission line structures are placed. The area of these resources within a preliminary 75-foot ROW is summarized in Table 4.6-1. However, as noted throughout this EIS, these impacts are presented based on a preliminary centerline, and the final ROW would be located based on site-specific engineering and environmental and cultural resource surveys during the engineering design phase. As such, sensitive resources like wetlands and prime farmland would generally be avoided by the final ROW. If avoidance is not possible, they would be spanned (up to 600 feet). Any impacts would constitute a small fraction of total lands within the proposed Project ROW. The affected resources would not return to productive, pre-disturbance conditions until the transmission line and associated facilities are removed.

Table 4.6-1. Estimated Long-term Impacts (acres) on Resources within a Preliminary 75-foot ROW*

Resource	Jamestown Corridor (Proposed Action)	Jamestown Alternative	Charity Alternative
ROW (acres)	211.9	237.5	283.2
Forest cover (acres)	83.3	125.6	238.3
Prime Farmland (acres)	15.6	13.8	28.2
Wetlands (Freshwater emergent [acres])	0.1	0.1	42.9
Wetlands (Forested/Shrub [acres])	24.6	25.7	45.7

* The final ROW width could be reduced from 75 feet down to approximately 42.5 feet alongside existing road, rail, and utility ROWs, resulting in substantially less ROW area than presented.

Unavoidable adverse impacts to aquatic resource functions and ecological services, such as the conversion of forested wetlands to shrub/scrub or emergent wetlands, would be mitigated through the purchase of compensatory mitigation credits from an approved mitigation bank within the same watershed as the impact site or the implementation of a permittee responsible mitigation plan (See 33 CFR Parts 325 and 332). Potential mitigation activities may include the restoration, enhancement, establishment, or preservation of aquatic resources. For all other resources identified in the EIS, long-term impacts beyond the Project lifetime of 50 years are either not anticipated or expected to be avoided through mitigation measures.

5.0 CONSULTATION, COORDINATION, AND DISTRIBUTION

Organizations and Persons Consulted

Consultation with Tribes and federal and state agencies has been ongoing. Various federal and state interagency meetings were conducted to share Project information and determine the scope of the EIS and throughout the development of the draft EIS and SDEIS.

Cooperating Agencies

RUS (lead agency) was assisted by USFS and USACE as cooperating agencies and by Central Electric and Berkeley Electric as Project proponents in preparing this EIS.

Federal Agencies Contacted

- U.S. Forest Service, Francis Marion National Forest
- U.S. Army Corps of Engineers, Charleston District, Regulatory Division
- U.S. Fish and Wildlife Service, South Carolina Ecological Services Field Office
- National Ocean and Atmospheric Administration, National Marine Fisheries Service
- National Park Service

South Carolina Agencies Contacted

- South Carolina Department of Natural Resources
- South Carolina State Historic Preservation Office
- South Carolina Forestry Commission
- SCDES Bureau of Water, and Office of Ocean and Coastal Resource Management

Tribes Contacted

- Muscogee (Creek) Nation
- Catawba Indian Nation
- Eastern Shawnee Tribe of Oklahoma

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5.2 Distribution

a) Federal Agencies:

U.S. Forest Service

U.S. Army Corps of Engineers

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

National Ocean and Atmospheric Administration, National Marine Fisheries Service

b) Tribal Governments and Agencies:

Absentee Shawnee Tribe

Catawba Indian Nation

Cherokee Nation

Eastern Shawnee Tribe of Oklahoma

Muscogee (Creek) Nation

Shawnee Tribe

United Keetoowah Band of Cherokee

c) South Carolina State Agencies

South Carolina Department of Natural Resources

South Carolina Department of Transportation

South Carolina State Historic Preservation Office

South Carolina State Parks

d) Local Units of Government

Berkeley County Council

Charleston County Council

Georgetown County Council

McClellanville Public Library

The town of McClellanville

Online at https://www.rd.usda.gov/resources/environmental-studies/impact-statements/mcclellanville-115kv-transmission-line.

6.0 REFERENCES

Adams, N.P. and S. Young. 2010. A Cultural Resources Survey of the Phase II Pulpwood Harvest in Wando-I'on Analysis Area, Francis Marion National Forest. Report on file at the South Carolina Institute of Archaeology and Anthropology, Columbia, SC.

Agha, A., C.F. Phillips, Jr., and J. Fletcher. 2011. Inland Swamp Rice Context, c. 1690–1783 (Berkeley, Charleston, Dorchester Counties). National Register of Historic Places Multiple Property Documentation Form. Available: http://nationalregister.sc.gov/SurveyReports/HC08003.pdf. Accessed December 12, 2022.

American Conference of Governmental Industrial Hygienists. 2011. TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. Cincinnati, OH.

Anderson, D.G. 1989. The Mississippian in South Carolina. In: Studies in South Carolina Archaeology. A.C. Goodyear III and G.T. Hanson (eds.), pp. 101-132. South Carolina Institute of Archaeology and Anthropology Anthropological Studies 9. Columbia, SC.

Anderson, D.G., C.E. Cantley, and A. L. Novick. 1982. The Mattassee Lake Sites: Archaeological Investigations along the Lower Santee River in the Coastal Plain of South Carolina. U.S. Department of the Interior, National Park Service, Southeast Regional Office, Atlanta, GA.

Anderson, D.G. and P.A. Logan. 1981. Francis Marion National Forest Cultural Resources Overview. U.S. Department of Agriculture, Forest Service, Columbia, SC.

Anderson, D.G., and J. Schuldenrein (editors). 1985. Prehistoric Human Ecology along the Upper Savannah River: Excavations at the Rucker's Bottom, Abbeville, and Bullard Site Groups. Prepared for the National Park Service, Archaeological Services Branch, by Commonwealth Associates, Inc., Jackson, MI.

APLIC (Avian Power Line Interaction Committee). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

APLIC. 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C. Available: http://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions_2012watermarkLR.pdf. Accessed April 25, 2023.

APLIC and USFWS (U.S. Fish and Wildlife Service). 2005. Avian Protection Plan Guidelines. Available: https://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf. Accessed April 25, 2023.

ARCI (Avian Research and Conservation Institute). 2018a. "Final Report [for the Jamestown Route]." Prepared by Ken Meyer, Ph.D, Executive Director. Submitted to Ralph Costa. January 11, 2018. 4 pp.

ARCI. 2018b. "Final Report [for the Charity Route]." Prepared by Ken Meyer, Ph.D, Executive Director. Submitted to Ralph Costa. August 21, 2018. 9 pp.

ASCE (American Society of Civil Engineers). 2020. Failure to Act: Electric Infrastructure Investment Gaps in a Rapidly Changing Environment. Report Prepared by: EBP US, with technical analyses by Daymark Energy Advisors, for the American Society of Civil Engineers. Available: https://infrastructurereportcard.org/wp-content/uploads/2021/03/Failure-to-Act-Energy-2020-Final.pdf. Accessed November 28, 2022.

Audubon (National Audubon Society). 2013a. "Washo Reserve Site Profile." In: Important Bird Areas in the U.S. (online). Available: https://netapp.audubon.org/iba/Reports/2669. Accessed August 9, 2018.

Audubon. 2013b."Francis Marion National Forest." In: Important Bird Areas in the U.S. (online). Available: https://netapp.audubon.org/iba/Reports/921. Accessed April 25, 2023.

Audubon. 2013c. "Important Bird Areas, South Carolina." Audubon South Carolina." Available: https://sc.audubon.org/birds/important-bird-areas. Accessed August 9, 2018.

Barnes, J.A. and C. Steen. 2012. Archaeology of the Gullah Past: A Community Scale Analysis. South Carolina Antiquities 44:85–95.

Bat Conservation International and Southeastern Bat Diversity Network. 2013. A Conservation Strategy for Rafinesque's Big-Eared Bat (*Corynorhinus rafinesquii*) and Southeastern Myotis (*Myotis austroriparius*). Prepared by M.L. Lacki and M.L. Bayless. Bat Conservation International, Austin, TX. Available: https://sbdn.org/wp-content/uploads/2018/08/ConservationPlanforCORAandMYAU_2014.pdf. Accessed December 12, 2022.

Berkeley County. 2022. Berkeley County and Municipal Zoning Classifications. Berkeley County GIS Department. Available: https://gis.berkeleycountysc.gov/samples.html. Accessed August 21, 2018.

Berkeley County Planning Commission. 2010. Comprehensive Plan. *Planning the Future while Preserving the Past.* 2010. Available: https://berkeleycountysc.gov/dept/planning/comprehensive-plan/. Accessed December 18, 2017.

Blanton, D.B., C.T. Espenshade, and P.E. Brockington, Jr. 1986. An Archaeological Study of 38SU83: A Yadkin Phase Site in the Upper Coastal Plain of South Carolina. Prepared for the South Carolina Department of Transportation, Columbia, SC.

Blanton, D.B. and K.E. Sassaman. 1989. Pattern and Process in the Middle Archaic Period in South Carolina. In: Studies in South Carolina Archaeology. A.C. Goodyear III and G.T. Hanson (eds.). pp. 53-72. South Carolina Institute of Archaeology and Anthropology Anthropological Studies 9. Columbia.

Bloomer, K.A. 1993. Agricultural Tenancy in 1930s America. Hanover Historical Review (Hanover College) 1(spring):n.p. Available: http://history.hanover.edu/hhr/hhr93_4.html. Accessed April 25, 2023.

Buehler, D.A. 2022. "Bald Eagle (*Haliaeetus leucocephalus*)." The Birds of North America Online. A. Poole (ed.). Ithaca: Cornell Lab of Ornithology. Available: https://birdsna.org/Species-Account/bna/species/baleag. Accessed May 9, 2023.

Buhlmann, K.A. 2019. Final Report 2019, Charity/Belle Isle Project Central Electric ROW Herpetology Habitat Survey. Buhlmann Ecological Research Consulting, LLC. June 28, 2019. 39 pp.

Buhlmann, K.A. and A. Grosse. 2018. "Final Report: Central Electric Herpetology Survey McClellanville to Jamestown, SC." May 14, 2018. 26 pp.

Burns & McDonnell. 2020. McClellanville Battery Energy Storage Study. Prepared for Central Electric Power Cooperative, Inc., Columbia, SC. Revision A, dated May 1 2020. Prepared by Burns & McDonnell Engineering Company, Inc. Kansas City, MO. 32 pp.

Burns & McDonnell. 2022. McClellanville Battery Energy Storage Study. Letter from Kieran McInerney, Project Manager, Energy Storage Development, to Scott Motsinger, Director, Reliability and Asset Management, Central Electric Power Cooperative, Inc. Dated November 1, 2022. 12 pp.

Caldwell, J.R. 1958. Trend and Tradition in the Prehistory of the Eastern United States. Memoirs of the American Anthropological Association 88.

Caldwell, J.T. and C. McCann. 1941. The Irene Mound Site (with a section on physical anthropology by Frederick S. Hulse). On file, Department of Anthropology, University of Georgia, Athens.

Caldwell, J.T. and A.J. Waring. 1939. Pottery Type Descriptions. Newsletter of the Southeastern Archaeological Conference 1(6).

Center for Biological Diversity. 2012. Petition to List 53 Amphibians and Reptiles in the United States as Threatened or Endangered Species Under the Endangered Species Act. July 11, 2012. Available: https://ecos.fws.gov/docs/tess/petition/509.pdf. Accessed April 28, 2023.

Center for Biological Diversity, Center for Food Safety, The Xerces Society, and Dr. L. Brower. 2014. Petition to Protect the Monarch Butterfly (*Danaus plexippus plexippus*) Under the Endangered Species Act. Available: https://ecos.fws.gov/docs/tess/petition/814.pdf. Accessed April 28, 2023.

Center for Biological Diversity and Defenders of Wildlife. 2016. Petition to list the tricolored bat *Perimyotis Subflavus* as threatened or endangered under the Endangered Species Act. June 14, 2016. Available: https://www.biologicaldiversity.org/species/mammals/tricolored_bat/pdfs/TricoloredBatPetition_06-14-2016.pdf. Accessed August 30, 2022.

Central Electric (Central Electric Power Cooperative, Inc.). 2005a. McClellanville Power Supply Alternatives Evaluation. June 22, 2005. 26 pp. Available: https://www.rd.usda.gov/sites/default/files/UWP_SC50cepci_alteval.pdf. Accessed September 27, 2022.

Central Electric. 2005b. Macro-Corridor Study Report for the McClellanville 115-kV Transmission Line. Prepared by Mangi Environmental Group, Inc. for the Central Electric Power Cooperative, Inc. 46 pp. November 2005. Available:

https://www.rd.usda.gov/sites/default/files/UWP_SC50cepci_macrocorridor.pdf. Accessed September 27, 2022.

Central Electric. 2010a. McClellanville Power Supply Alternatives Evaluation Study. September 2010. 15 pp.

Central Electric. 2010b. Revised Macro-Corridor Study Report for the McClellanville 115-kV Transmission Line. Prepared by Mangi Environmental Group, Inc. for the Central Electric Power Cooperative, Inc. September 2010. 64 pp.

Central Electric. 2014. McClellanville 115 kV Transmission Project Draft Environmental Impact Statement. Prepared for the U.S. Department of Agriculture, Rural Utilities Service, in Cooperation with the U.S. Army Corps of Engineers and U.S. Forest Service. April 2014.

CEQ (Council on Environmental Quality). 1987. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. 40 CFR Parts 1500 - 1508.

CEQ. 1997. Environmental Justice: Guidance under the National Environmental Policy Act. Executive Office of the President, Washington, D.C.

Chapman, J. 1975. Rose Island and the Bifurcate Tradition. Report of Investigations 14. Department of Anthropology, University of Tennessee, Knoxville.

Charleston County. 2022. Charleston County Official Zoning Map. Charleston County. Available: https://ccgisapps.charlestoncounty.org/public_search/. Accessed May 9, 2023.

Charleston County Planning Commission. 2018. Charleston County Comprehensive Plan. Available: https://www.charlestoncounty.org/departments/zoning-planning/files/comp/Chas-Co-Comprehensive-Plan.pdf?v=62. Accessed April 25, 2023.

Charleston Regional Development Alliance. 2022. County and City Profiles, Leading Employers. Available: https://www.crda.org/local-data/employers-industry/. Accessed April 20, 2023.

Chernicoff, S. and D. Whitney. 2002. Geology. Third Edition. Houghton Mifflin Company, Boston, MA.

ClimateCentral.org. 2022. Surging Weather-related Power Outages. Climate Matters [online September 14, 2022. Available: https://www.climatecentral.org/climate-matters/surging-weather-related-power-outages. Accessed November 28, 2022.

Coe, J.L. 1964. Formative Cultures of the Carolina Piedmont. Transactions of the American Philosophical Society 54(5).

Costa, R. 2019. Personal communication between Ralph Costa, Wildlife Biologist, Ralph Costa's Woodpecker Outfit, LLC., and Central Electric, regarding comments about red-cockaded woodpeckers and their analysis in the 2019 draft supplemental EIS prepared for the McClellanville Project. November 10, 2019.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States.

Coulter, M.C., and A.L. Bryan, Jr. 1993. Foraging ecology of wood storks (*Mycteria americana*) in east-central Georgia: Characteristics of foraging sites. *Colonial Waterbirds* 16(1):59-70.

Davis, A. K., H. Schroeder, I. Yeager, and J. Pearce. 2018. Effects of simulated highway noise on heart rates of larval monarch butterflies, *Danaus plexippus*: Implications for roadside habitat suitability. *Biology Letters* 14(5). May 2018. Available: https://doi.org/10.1098/rsbl.2018.0018. Accessed April 28, 2023.

DeGregorio, B.A., P.J. Weatherhead, and J. Sperry. 2014. "Power lines, roads, and avian nest survival: effects on predator identity and predation intensity." Ecology and Evolution 4(9): 1589–1600.

DePratter, C.B. 1989. Cofitachequi: Ethnohistorical and Archaeological Evidence. In: Studies in South Carolina Archaeology: Essays in Honor of Dr. Robert L. Stephenson. A.C. Goodyear III and G.T. Hanson (eds.). South Carolina Institute of Archaeology and Anthropology Anthropological Studies. Columbia, SC. 133−156 pp.

Dodd, D.B. and W.S. Dodd. 1973. Historical Statistics of the South, 1790−1970. University of Alabama Press, Tuscaloosa.

Dumas, M., Binita Kc, and C.I. Cunliff. 2019. Extreme Weather and Climate Vulnerabilities of the Electric Grid: A Summary of Environmental Sensitivity Quantification Methods. U.S. Department of Energy publication ORNL/TM-2019/1252. 26 pp. Available: https://info.ornl.gov/sites/publications/Files/Pub128663.pdf. Accessed November 28, 2022.

Ecological Engineering, LLP. 2018a. "Protected Bat Species Survey Report for Northern Long-eared Bat (*Myotis septentrionalis*), Central Electric Transmission Line Berkeley and Charleston Counties, South Carolina." Prepared by D. Brown, Ecological Engineering, LLP. Cary, NC. October 2018. 440 pp.

Ecological Engineering, LLP. 2018b. "Lepidopteran Species of Concern Host Plant Assessment for Monarch Butterfly (*Danaus plexippus*), Okefenokee Zale Moth (*Zale perculta*), Berry's Skipper (*Euphyes berryi*), and the Dusky Roadside-Skipper (*Amblyscirtes alternata*), Central Electric Transmission Line Berkeley and Charleston Counties, South Carolina." Prepared by D. Brown and D.G. Cooper, Ecological Solutions, Inc., Cary, NC. October 2018. 76 pp.

Ecological Solutions, Inc. 2017a. "Protected Bat Species Survey Report for Northern Long-eared Bat (*Myotis septentrionalis*), Central Electric Transmission Line Berkeley and Charleston Counties, South Carolina." Prepared by D. Brown and D. Smith, Ecological Solutions, Inc. Roswell, GA. September 2017. 117 pp.

Ecological Solutions, Inc. 2017b. "Lepidopteran Species of Concern Host Plant Assessment for Monarch Butterfly (*Danaus plexippus*), Okefenokee Zale Moth (*Zale perculta*), Berry's Skipper (*Euphyes berryi*), and the Dusky Roadside-Skipper (*Amblyscirtes alternata*), Central Electric Transmission Line Berkeley and Charleston Counties, South Carolina." Prepared by D. Brown and M. Nugent, Ecological Solutions, Inc., Roswell, GA. October 2017. 89 pp.

EDDMapS. 2018. Early Detection & Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. Available: http://www.eddmaps.org/. Accessed August 2, 2018.

Edgar, W. 1998. South Carolina: A History. University of South Carolina Press, Columbia, SC.

Ellerbee, J. and J. Fowler. 2005. *Cultural Resources Survey of Improvements to the Georgetown County Airport Tract, Georgetown County, South Carolina*. Brockington & Associates.

Federal Communications Commission. 2004. Nationwide Programmatic Agreement for Review of effects on Historic Properties for Certain Undertakings Approved by the Federal Communications Commission. FCC 04-222.

Flick, S. 1992. Charleston County Historical and Architectural Survey: Survey Report. Copy on file at the South Carolina Department of Archives and History, Columbia, SC.

Folk, M. 2017. "Preliminary Wetland Survey Results: Central Electric Transmission Line Project Shulerville & Alternatives Route Berkeley & Charleston Counties, South Carolina." Prepared for Central Electric Power Cooperative, Inc., Columbia, SC.

Ford, M.W., J.M. Menzel, M.A Menzel, J.W. Edwards, and C. Kilgo. 2006. Presence and absence of bats across habitat scales in the upper coastal plain of South Carolina. Journal of Wildlife Management 70:1200–1209.

Fyfe, R.W. and R.R. Olendorff. 1976. Minimizing the Dangers of Nesting Studies to Raptors and Other Sensitive Species. Canadian Wildlife Service, Information Canada. Catalogue No. CW69-1/23. Ottawa, Canada.

Gaddy, L.L. 2017. "Preliminary Inventory of Endangered, Threatened, and Otherwise Noteworthy Vascular Plants, Significant Natural Plant Communities, and Wetlands of the Proposed Shulerville Electric Transmission Corridor, Charleston and Berkeley County, South Carolina." Unpublished report for Central Electric Power Cooperative. Columbia, SC. October 2017.

Gaddy, L.L. 2018. "Preliminary Inventory of Endangered, Threatened, and Otherwise Noteworthy Vascular Plants, Significant Natural Plant Communities, and Wetlands of the Proposed Charity/U.S. Forest Service Survey Corridor, Charleston and Berkeley County, South Carolina." Unpublished report for Central Electric Power Cooperative. Columbia, SC. June 2018.

Gardner, J.W. and M. Roberts. 1993. Archaeological Evaluation of 38DN68, 38DN71, and 38ML67, Dillon and Marlboro Counties, South Carolina. Prepared for the South Carolina Department of Transportation, Columbia, by Brockington and Associates, Charleston, SC.

Goodyear, A.C. 1974. The Brand Site: A Techno-functional Study of a Dalton Site in Northeast Arkansas. Arkansas Archaeological Survey, Research Series No. 7. Arkansas Archaeological Survey, Little Rock, AR.

Goodyear, A.C. 1982. The Chronological Position of the Dalton Horizon in the Southeastern United States. American Antiquity 47:382−395.

Goodyear, A.C., J.H. House, and N.W. Ackerly. 1979. Laurens-Anderson, An Archaeological Study of the Interriverine Piedmont. Anthropological Studies 4. Occasional Papers of the Institute of Archaeology and Anthropology, University of South Carolina, Columbia, SC.

Gullah Geechee Cultural Heritage Corridor Commission. 2012. Gullah Geechee Cultural Heritage Corridor Management Plan. Prepared and published by the National Park Service, Denver Service Center, Denver, CO.

Hughes, W.B., T.A. Abrahamsen, T.L. Maluk, E.J. Reuber, and L.J. Wilhelm. 2000. Water Quality in the Santee River Basin and Coastal Drainages, North and South Carolina, 1995–98: U.S. Geological Survey Circular 1206. 32 pp. Available: http://pubs.water.usgs.gov/circ1206/.

Ingram, T. 2013. Personal Communication with Taylor Ingram, Specialist in Utilities Property Tax Assessment, State of South Caroline Department of Revenue. October 29, 2013.

IPCC (Intergovernmental Panel on Climate Change). 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp. Available: https://www.ipcc.ch/report/ar6/wg2/. Accessed April 27, 2027

Jackson, T. 2010. Electric Transmission Lines: Is there an Impact on Rural Land Values? Right of Way, (November/December). Available: http://www.real-analytics.com/Transmission%20Lines%20and%20Rural%20Land.pdf. Accessed April 25, 2023.

Jackson, T.O. and J. Pitts. 2010. The Effects of Electric Transmission Lines on Property Values: A Literature Review. Journal of Real Estate Literature 18(2), 239–259: 258.

James, L. 2020. Cultural Resources Literature Review for the McClellanville to Belle Isle Section of the Proposed Charity-Jamestown-Belle Isle Transmission Line Corridor, Charleston and Georgetown Counties, South Carolina. Prepared for Central Electric by Brockington and Associates.

James, L. and C. Philips. 2017. An Intensive Archaeological Survey of the Proposed Central Electric Transmission Line, Charleston and Berkeley Counties, South Carolina. Francis Marion and Sumter National Forests Cultural Resource Management Report #2017−13.

Joseph, J.W., S. Ciomek, B. Bostwick, K. Serio, M.B. Reed, and N. Adams. 2006. Historic Resources Survey of Georgetown County, South Carolina. Copy on file at the South Carolina Institute of Archaeology and Anthropology, Columbia, SC.

Kantola, T., J.L. Tracy, K.A. Baum, M.A. Quinn, and R.N. Coulson. Spatial risk assessment of eastern monarch butterfly road mortality during autumn migration within the southern corridor. *Biological Conservation* 231: 150–160. Available: https://www.sciencedirect.com/science/article/abs/pii/S0006320718310772. Accessed April 28, 2023.

Keel, B.C. 1976. Cherokee Archaeology. University of Tennessee Press, Knoxville, TN.

Kindel, J. 2019. Northern long-eared bat project at Santee Coastal Reserve and Wildlife Management Area and The Nature Conservancy Washo Reserve. 2018–2019 General Report for South Carolina Department of Natural Resources. 32 pp. Available at

https://dc.statelibrary.sc.gov/bitstream/handle/10827/33650/DNR_Northern_Long_Eared_Bat_Project_2019.pdf?sequence=1&isAllowed=y. Accessed April 28, 2023.

King, D.I. and B.E. Byers. 2002. "An Evaluation of Powerline Rights-of-way as Habitat for Early-successional Shrubland Birds." Wildlife Society Bulletin 30(30):868-874.

Kovacik, C.F. and J.J. Winberry. 1987. South Carolina: A Geography. Westview Press, Boulder, CO.

Lakshmanadoss, U., P. Chinnachamy, and J.P. Daubert. 2004. Electromagnetic Interference of Pacemakers. Available: http://cdn.intechopen.com/pdfs/13783/InTech-Electromagnetic_interference_of_the_pacemakers.pdf. Accessed April 25, 2023.

Littlefield, D.C. 1995. Rice and the Making of South Carolina. South Carolina Department of Archives and History, Columbia, SC.

Lund, M., D. Soriano, L.S. Pile, S.D. Thomas, and G.G. Wang. 2015. Invasive Plant Species of South Carolina. Clemson Cooperative Extension. Clemson, SC. 76 pp.

Madsen, J. 1985. Impact of Disturbance on Field Utilization of Pink-footed Geese in West Jutland, Denmark. Biological Conservation 33:53–64.

Maluk, T.L. and R.E. Kelley. 1998. Pesticides in Surface Waters of the Santee River Basin and Coastal Drainages, North and South Carolina. USGS Fact Sheet FS007-98. South Carolina Water Science Center Publications: FS007-98. Available: https://pubs.usgs.gov/fs/1998/fs007-98/. Accessed April 25, 2023.

Marsh, W.M. 2005. Landscape Planning Environmental Applications, 4th Edition. John Wiley & Sons.

McGavran (McGavran Engineering, P.C.). 2017. McClellanville 115 kV Transmission Line. Independent Engineering Study for Central Electric Power Cooperative, Inc., Columbia, SC. February 2017. Available: https://www.rd.usda.gov/sites/default/files/McClellanville_TransmissionLine_INDEPENDENTSTUDY.pdf. Accessed April 28, 2023.

McKenna, D.D., K. M. McKenna, S.B. Malcom, and M. Barenbaum. 2001. Mortality of *Lepidoptera* along roadways in Central Illinois. *Journal of the Lepidopterists' Society* 55(2):63–68. Available: https://images.peabody.yale.edu/lepsoc/jls/2000s/2001/2001-55(2)63-McKenna.pdf. Accessed April 28, 2023.

McPherson, J. 1988. Battle Cry of Freedom, The Civil War Era. Ballantine Books, New York, NY.

McReynolds, T. 2008. Geology. In: Woodland Pottery Sourcing in the Carolina Sandhills. J. Herbert, and T. McReynolds (eds.). Research Report 29 Research Laboratories of North Carolina. University of North Carolina, Chapel Hill, NC.

Microsoft. 2024. Microsoft Bing Maps AI-extracted building footprints. Available: https://github.com/microsoft/GlobalMLBuildingFootprints. Accessed July 15, 2024.

Milling, C.J. 1940. Red Carolinians. University of North Carolina Press, Chapel Hill.

Morris, A.D., D.A. Miller, and M.C. Kalcounis-Rueppell. 2010. Use of forest edges by bats in a managed pine forest landscape. *Journal of Wildlife Management* 74:26–34.

National Research Council. 1997. Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems. Board on Radiation Effects Research. Commission on Life Sciences. National Academy Press, Washington, D.C.

National Research Council. 1999. Research on Power-Frequency Fields Completed under the Energy Policy Act of 1992, by Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems, Board on Radiation Effects Research, Commission on Life Sciences, and National Research Council. National Academy Press, Washington, D.C.

NatureServe. 2012. "Field Key to Ecological Systems of Francis Marion National Forest, Atlantic Coastal Plain, South Carolina, United States." NatureServe Terrestrial Ecology Department.

NatureServe. 2023a. "NatureServe Explorer: An Online Encyclopedia of Life [Online]. Species report for *Myotis septentrionalis*—Northern Long-eared Bat." NatureServe, Arlington, VA. Available: http://explorer.natureserve.org/servlet/NatureServe?searchName=Myotis+septentrionalis+. Accessed April 28, 2023.

NatureServe. 2023b. "NatureServe Explorer: An Online Encyclopedia of Life [Online]. Species report for *Elanoides forficatus*—Swallow-tailed Kite." NatureServe, Arlington, Virginia. Available: http://explorer.natureserve.org/servlet/NatureServe?searchName=Elanoides+forficatus. Accessed April 28, 2023.

NatureServe. 2023c. "NatureServe Explorer: An Online Encyclopedia of Life [Online]. Species report for *Clemmys guttata*—Spotted Turtle." NatureServe, Arlington, Virginia. Available: http://explorer.natureserve.org/servlet/NatureServe?searchName=Clemmys+guttata. Accessed April 28, 2023.

NatureServe. 2023d. "NatureServe Explorer: An Online Encyclopedia of Life [Online]. Species report for *Amblyscirtes alternata*—Dusky Roadside-Skipper." NatureServe, Arlington, Virginia. Available: http://explorer.natureserve.org/servlet/NatureServe?searchName=Amblyscirtes+alternata. Accessed April 28, 2023.

NatureServe. 2023e. "Definitions of NatureServe Conservation Status Ranks." NatureServe Explorer Website. Available: https://help.natureserve.org/biotics/content/record_management/Element_Files/Element_Tracking/ETRACK_Definitions_of_Heritage_Conservation_Status_Ranks.htm. Accessed April 28, 2023.

Netstate. 2016. The Geography of South Carolina. Available: http://www.netstate.com/states/geography/sc_geography.htm. Accessed April 25, 2023.

Newman, B.A., S.C. Loeb, and D.S. Jachowski. 2021. Winter roosting ecology of tricolored bats (*Perimyotis subflavus*) in trees and bridges. *Journal of Mammalogy* 102(5):1331–1341.

NIEHS (National Institute of Environmental Health Sciences, National Institutes of Health). 2002. Electric and Magnetic Fields Associated with the Use of Electric Power. Questions. Answers. Available:

https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf. Accessed April 26, 2023.

NIEHS. 1999. Research on Power-Frequency Fields Completed under the Energy Policy Act of 1992, by Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems, Board on Radiation Effects Research, Commission on Life Sciences, and National Research Council. National Academy Press, Washington, D.C.

NMFS (National Marine Fisheries Service). 2024. South Carolina Threatened and Endangered Species and Critical Habitats Under NOAA Fisheries Jurisdiction in South Carolina. NMFS Southeast Region website. Last updated by Southeast Regional Office on August 16, 2023. Available at: https://www.fisheries.noaa.gov/southeast/consultations/south-carolina. Accessed July 10, 2024.

NPS (National Park Service). 1992. National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties. Available: https://www.nps.gov/subjects/nationalregister/upload/NRB38-Completeweb.pdf. Accessed September 1, 2023.

NPS. 1997. National Register Bulletin: How to Apply the Criteria for Eligibility. Available: https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf. Accessed April 25, 2023.

NPS. 2005. Low Country Gullah Culture: Special Resource Study and Final Environmental Impact Statement. National Park Service, Southeast Regional Office, Planning and Compliance Division, Atlanta. Copy on file at the South Carolina State Historic Preservation Office, Columbia, SC.

Peters, G., A.M. DiGioia, Jr, C. Hendrickson, and J. Apt. 2006. Transmission Line Reliability: Climate Change and Extreme Weather. Carnegie Mellon Electricity Industry Center Working Paper CEIC-05-06. Available: https://www.cmu.edu/ceic/assets/docs/publications/working-papers/ceic-05-06.pdf. Accessed April 28, 2023.

Pitts, J.M. and T.O. Jackson. 2007. Power Lines and Property Values Revisited. The Appraisal Journal. Fall 2007. 3 pp.

Pollitzer, W. 2005. The Gullah People and Their African Heritage. The University of Georgia Press, Athens and London, GA.

Poplin, E.C., C.T. Espenshade, and D.C. Jones. 1993. Archaeological Investigations at the Buck Hall Site (38CH644), Francis Marion National Forest, South Carolina. Prepared by Brockington and Associates, Inc. Prepared for the U.S. Department of Agriculture, Forest Service. Columbia, SC.

Reed, Mary Beth, Summer Ciomek, Patrick Sullivan. 2016.Charleston County Historic Resources Survey Update Charleston County, South Carolina. Report prepared by New South and Associates for the Charleston County Zoning and Planning Department.

Reich, E.E. 1978. PSD Applicability—Temporary Emissions. Memo from Edward E. Reich, Director Division of Stationary Source Enforcement, U.S. Environmental Protection Agency, to Anita B. Turpin, Chief Technical Support Section (6AAHAT) Region VI, dated December 11, 1978.

RUS (U.S. Department of Agriculture, Rural Utilities Service). 2007. McClellanville 115 kV Transmission Line Proposal December 2005–January 2006 Scoping Period Summary Report/Environmental Decision. Prepared by Mangi Environmental Group for the USDA RUS. October 2007. Available: https://www.rd.usda.gov/sites/default/files/UWP_SC50SC50McTLscp1007.pdf. Accessed April 28, 2023.

RUS. 2011a. McClellanville 115-kV Transmission Line Project Environmental Impact Statement Scoping Summary Report. Prepared by Mangi Environmental Group, Inc. February 2011. Available: https://www.rd.usda.gov/sites/default/files/UWP_SC50-SouthCentral_McClellanville_ScopingRpt-Summary.pdf. Accessed April 28, 2023.

RUS. 2011b. McClellanville Area 115 kV Transmission Line Project Environmental Impact Statement Addendum to Scoping Report. Prepared by Mangi Environmental Group, Inc. October 2011. Available: https://www.rd.usda.gov/sites/default/files/UWP_SC50-SouthCentral_McClellanville_ScopingRpt-Addendum.pdf. Accessed April 28, 2023.

RUS. 2014. McClellanville 115 kV Transmission Project Draft Environmental Impact Statement. Prepared for U.S. Department of Agriculture, Rural Utilities Service. April 2014. Available: https://www.rd.usda.gov/sites/default/files/UWP_SC50-SouthCentral_McClellanville_DEIS.pdf. Accessed April 28, 2023.

RUS. 2016. RD Instruction 1970-O, Exhibit D-8, DRAFT Guidance for Creating a Macro-Corridor Study. https://www.rd.usda.gov/sites/default/files/Macro-CorridorStudyGuidance.pdf. Accessed May 20, 2024.

Sassaman, K.E. 1988. The Mid-Holocene Archaeological Record of the Middle Savannah River Valley. Ms. in the possession of the author.

Sassaman, K.E., M.J. Brooks, G.T. Hanson, and D.G. Anderson. 1990. Native American Prehistory of the Middle Savannah River Valley, A Synthesis of Archaeological Investigations on the Savannah River Site, Aiken and Barnwell Counties, South Carolina. Savannah River Archaeological Research Papers 1, Occasional Papers of the Savannah River Archaeological Research Program. South Carolina Institute of Archaeology and Anthropology, Columbia, SC.

Sassaman, K.E. 1993. Mims Point 1992, Archaeological Investigations at a Prehistoric Habitation Site in the Sumter National Forest, South Carolina. Francis Marion and Sumter National Forests Cultural Resource Management Report 93-16 and Savannah River Archaeological Research Papers 4, Occasional Papers of the Savannah River Archaeological Research Program, South Carolina. South Carolina Institute of Archaeology and Anthropology, Columbia, SC.

Sauer, J.R., D.K. Niven, J.E. Hines, D.J. Ziolkowski, Jr., K.L. Pardieck, J.E. Fallon, and W.A. Link. 2017. The North American Breeding Bird Survey, Results and Analysis 1966–2015. Version 2.07.2017 USGS Patuxent Wildlife Research Center, Laurel, MD. Available: https://www.mbr-pwrc.usgs.gov/bbs/bbs.html.

SCDHEC (South Carolina Department of Health and Environmental Control). 2007. Regional Haze—State Implementation Plan for South Carolina Class I Federal Areas.

SCDHEC. 2013a. Watershed Water Quality Assessment Santee River Basin. South Carolina Department of Health and Environmental Control, Bureau of Water. Technical Report No. 0620-13. Columbia, SC. Available: https://scdhec.gov/sites/default/files/media/document/Santee%20WWQA_2013.pdf. Accessed December 12, 2022.

SCDHEC. 2013b. Watershed Water Quality Evaluation: Watershed 03050112-00350. Bureau of Water, Columbia, SC. Available: https://scdhec.gov/environment/your-water-coast/watersheds-program/archived-watershed-water-quality-assessments. Accessed December 12, 2022.

SCDHEC. 2013c. Watershed Water Quality Evaluation: Watershed 03050112-060. Bureau of Water, Columbia, SC. Available: https://scdhec.gov/environment/your-water-coast/watersheds-program/archived-watershed-water-quality-assessments. Accessed December 12, 2022.

SCDHEC. 2013d. Watershed Water Quality Evaluation: Watershed 03050201-040. Bureau of Water, Columbia, SC. Available: https://scdhec.gov/environment/your-water-coast/watersheds-program/archived-watershed-water-quality-assessments. Accessed December 12, 2022.

SCDHEC. 2017. Air Pollution Control Regulations and Standards. Last revised August 25, 2017. Available: https://scdhec.gov/sites/default/files/Library/Regulations/R.61-62.pdf. Accessed April 26, 2023.

SCDHEC. 2019. Ambient Air Quality Monitoring Data Summaries. Available: http://www.scdhec.gov/HomeAndEnvironment/Air/AmbientAir/. Accessed April 25, 2023.

SCDHEC. 2022. The State of South Carolina's 2020 and 2022 Integrated Report (IR) Part 1: Section 303(d) Listing of Impaired Waters. Available: https://scdhec.gov/sites/default/files/media/document/South%20Carolina%202020-2022%20303%28d%29%20List_1.pdf. Accessed June 29, 2024.

SCDHEC. 2023. South Carolina Air Monitoring Network. Available: https://gis.dhec.sc.gov/monitors/. Accessed April 28, 2023.

SCDNR (South Carolina Department of Natural Resources). 2005a. Comprehensive Wildlife Conservation Strategy. South Carolina Department of Natural Resources. Columbia, SC. Available: https://dc.statelibrary.sc.gov/handle/10827/27469. Accessed April 25, 2023.

SCDNR. 2005b. "Red-cockaded Woodpecker." Online Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: https://www.dnr.sc.gov/swap/supplemental/birds/redcockadedwoodpecker2015.pdf. Accessed May 9, 2023.

SCDNR. 2005c. "Swallow-tailed Kite." Online Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: https://www.dnr.sc.gov/swap/supplemental/birds/swallowtailedkite2015.pdf. Accessed May 9, 2023.

SCDNR. 2005d. "Black Bear." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: https://www.dnr.sc.gov/swap/supplemental/mammals/blackbear2015.pdf. Accessed May 9, 2023.

SCDNR. 2005e. "Eastern Woodrat." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: https://www.dnr.sc.gov/swap/supplemental/mammals/easternwoodrat2015.pdf. Accessed June 18, 2018.

SCDNR. 2005f. "Colonial Cavity Roosting Bats Guild." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: https://www.dnr.sc.gov/swap/supplemental/mammals/colonialcavityroostingbatsguild2015.pdf. Accessed May 9, 2023.

SCDNR. 2013. "Santee Cooper Anadromous Fish Passage & Restoration." Produced in partnership with the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers. Columbia, SC. Available: http://www.dnr.sc.gov/fish/fishlift/images/fishlift.pdf. Accessed April 28, 2023.

SCDNR. 2014. DNR Managed Lands Regulations. Tom Yawkey Wildlife Center. Available: http://www.dnr.sc.gov/mlands/specregshp.html. Accessed on April 25, 2023.

SCDNR. 2015a. South Carolina's State Wildlife Action Plan (SWAP) 2015. Columbia, SC. Available: http://dnr.sc.gov/swap/index.html. Accessed April 28, 2023.

SCDNR. 2015b. "Wood Stork." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. Available: http://dnr.sc.gov/swap/supplemental/birds/woodstork2015.pdf. Accessed April 28, 2023.

SCDNR. 2015c. "Pond Breeding Amphibians Guild." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. Available: http://dnr.sc.gov/swap/supplemental/reptilesandamphibians/pondbreedingamphibiansguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015d. "Sturgeons Guild." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. Available: http://dnr.sc.gov/swap/supplemental/diadromousfish/sturgeonsguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015e. "Florida manatee." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. http://www.dnr.sc.gov/swap/supplemental/mammals/floridamanatee2015.pdf. Accessed April 28, 2023.

SCDNR. 2015f. "Pine Savannah Bird Guild." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. http://www.dnr.sc.gov/swap/supplemental/birds/pinesavannahbirdsguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015g. "Grassland Birds Guild." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. http://www.dnr.sc.gov/swap/supplemental/birds/grasslandbirdguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015h. "Black-throated Green Warbler (nominate and Wayne's)." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. Available: http://www.dnr.sc.gov/swap/supplemental/birds/black-throatedgreenwarbler2015.pdf. Accessed April 28, 2023.

SCDNR. 2015i. "Cavity Nesting Birds Guild." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/birds/cavitynestingbirdsguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015j. "Forested Wetland Birds Guild." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/birds/forestedwetlandsbirdsguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015k. "Meadow Vole." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/mammals/meadowvole2015.pdf. Accessed April 28, 2023.

SCDNR. 2015l. "ACE Basin Characterization Study: Species Gallery, Rafinesque's Big-eared Bat." Online project report. Available: http://www.dnr.sc.gov/marine/mrri/acechar/speciesgallery/Mammals/RafinesquesBig-earedBat/index.html. Accessed April 28, 2023.

SCDNR. 2015m. "Mole's Guild." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/mammals/molesguild2015.pdf. Accessed April 28, 2023.

SCDNR. 2015n. "Southern Fox Squirrel." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/mammals/southernfoxsquirrel2015.pdf. Accessed April 28, 2023.

SCDNR. 2015o. "Longleaf Pine Reptile Guild." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/reptilesandamphibians/longleafpinereptilesguild2015.pdf. Accessed April 23, 2023.

SCDNR. 2015p. "Florida Green Watersnake." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/reptilesandamphibians/floridagreenwatersnake2015.pdf. Accessed April 23, 2023.

SCDNR. 2015q. "Spotted Turtle." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/reptilesandamphibians/spottedturtle2015.pdf. Accessed April 28, 2023.

SCDNR. 2015r. "Carolina Pygmy Sunfish *Elassoma boehlkei*." In: South Carolina's State Wildlife Action Plan, Supplemental Volume: Species of Conservation Concern. Columbia, SC. Available:

http://dnr.sc.gov/swap/supplemental/freshwaterfish/carolinapygmysunfish2015.pdf. Accessed April 28, 2023.

SCDNR. 2015s. "American Eel." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/diadromousfish/americaneel2015.pdf. Accessed April 28, 2023.

SCDNR. 2015t. "Swallow-tailed Kite." Species Account for South Carolina's Comprehensive Wildlife Conservation Strategy. Available: http://dnr.sc.gov/swap/supplemental/birds/swallowtailedkite2015.pdf. Accessed April 28, 2023.

SCDNR. 2016a. "Conservation of Water, Shore and Seabirds in South Carolina. Final Performance Report, South Carolina State Wildlife Grant Project T-41-R." Prepared by F. Sanders, C. Hand, J. Thibault, and M.C. Martin. Available: http://dnr.sc.gov/swap/grants/T-41.pdf. Accessed August 18, 2018.

SCDNR. 2016b. Santee Coastal Reserve Wildlife Management Area (webpage). Available: https://www2.dnr.sc.gov/ManagedLands/ManagedLand/ManagedLand/61. Accessed April 25, 2023.

SCDNR. 2016b. Santee-Delta Wildlife Management Area (webpage). Available: https://www2.dnr.sc.gov/ManagedLands/ManagedLand/ManagedLand/62. Accessed April 25, 2023.

SCDNR. 2018a. Personal communication. GIS data provided by Joseph Lemeris, Jr., Geospatial Analyst, SC Heritage Trust Program, South Carolina Department of Natural Resources, to Phillip Baigas, Wildlife Biologist, Louis Berger. Regarding SC Rare, Threatened & Endangered Species Data. August 3, 2018.

SCDNR. 2018b. "South Carolina's Bald Eagles—Nest Locations." Google Earth (KML) data (Online). South Carolina Department of Natural Resources. Columbia, SC. Available: http://www.dnr.sc.gov/wildlife/baldeagle/locations.html. Accessed December 12, 2022.

SCDNR. 2018c. "A Report on Black Bear Harvest and Hunting in South Carolina." June 2018. Report of the Department of Natural Resources. On Act 71 122nd Session of the South Carolina General Assembly (2017). Available: http://www.dnr.sc.gov/wildlife/bear/2018SCDNRBearReporttoGeneralAssembly.pdf. Accessed September 6, 2018.

SCDNR. 2020. South Carolina Bat Conservation Plan. Columbia, South Carolina. 206 pp. Available: https://www.dnr.sc.gov/wildlife/bats/batconsplan.html. Accessed August 23, 2022.

SCDNR. 2023. Rare, Threatened, and Endangered Species of South Carolina—by County. Available: https://experience.arcgis.com/experience/af61ba156d054cc7b3e27d09a0c35c0f.Accessed May 9, 2022.

SCDNR. 2024a. Hunting – Game Species. Available: https://www.dnr.sc.gov/hunting.html. Accessed June 18, 2024.

SCDNR. 2024b. Request for Threatened and Endangered Species Consultation Report. Requested on Wednesday, June 19, 2024 by Phil Baigas, Wildlife Biologist, WSP USA. https://schtportal.dnr.sc.gov/portal/apps/sites/#/natural-heritage-program.

SCDNR. 2024c. South Carolina General Geology. Available: http://www.dnr.sc.gov/GIS/descggmsl.html. Accessed June 26, 2018.

SCDOT (South Carolina Department of Transportation). 2019. Utilities Accommodation Manual. Available: https://www.scdot.org/business/pdf/rightofway/SCDOT_Utility_Accommodations_Manual_revised_2019.pdf. December 12, 2022.

SCDOT. 2021a. Traffic Counts Comparison Application. Available: https://scdot.maps.arcgis.com/apps/MapSeries/index.html?appid=fe2e97641eac493094342c502369814b. Accessed June 11, 2022.

SCDOT. 2021b. Traffic Counts. Available: https://www.scdot.org/travel/travel-trafficdata.aspx. Accessed June 1, 2022.

Sherfy, M. and W.R. Luce. 1998. National Register Bulletin Number 22: Guidelines for Evaluating and Nominating Properties that Have Achieved Significance within the Past Fifty Years. U.S. Department of the Interior, National Park Service, Washington, D.C.

Shute, K.E. 2020. Habitat relationships of bat species of conservation concern in Coastal South Carolina. M.S. Thesis. Clemson University. August 2020.

South, S.A. 2002. Archaeological Pathways to Historic Site Development. Kluwer Academic/Plenum Publishers, New York, NY.

South Carolina Association of Counties. 2022. County Profiles. Available: https://www.sccounties.org/sites/default/files/uploads/resources/property_tax_rates_by_county_2022.pdf. Accessed April 19, 2023.

South Carolina Department of Parks, Recreation and Tourism. 2023. Santee Coastal Reserve. Available: https://discoversouthcarolina.com/products/81. Accessed April 25, 2023.

South Carolina Exotic Pest Plant Council. No date. South Carolina Early Detection and Rapid Response Target Species. Available: https://www.se-eppc.org/southcarolina/SCEDDR.pdf. Accessed April 28, 2023.

SCWF (South Carolina Wildlife Federation). 2017. "Swallow-tailed Kites." By Ray Wade. April 1, 2017. Available: http://www.scwf.org/swallowtailed-kites/. Accessed April 28, 2023.

South Carolina Department of Revenue. 2021. Annual Report 2020-2021. Available: https://dor.sc.gov/resources-site/publications/Publications/2020-2021%20Annual%20Report.pdf#search=Annual%20Report. Accessed April 25, 2023.

South Carolina Forestry Commission. 2021. Value of SC's Timber Delivered to Mills in 2019. https://dc.statelibrary.sc.gov/bitstream/handle/10827/43529/SCFC_Value_of_SC%27s_Timber_2022-02.pdf?sequence=1&isAllowed=y Accessed: April 19, 2023.

South Carolina Revenue and Fiscal Affairs Office. 2022. South Carolina population estimates from 2000-2018 and population projections from 2019-2035: County totals. Available: https://rfa.sc.gov/data-research/population-demographics/census-state-data-center/population-estimates-projections. Accessed April 25, 2023.

Council of South Carolina Professional Archaeologists, South Carolina State Historic Preservation Office, and South Carolina Institute of Archaeology and Anthropology, and. 2005. South Carolina Standards and Guidelines for Archaeological Investigations. Updated August 2013. Available: https://dc.statelibrary.sc.gov/handle/10827/44655. Accessed September 1, 2023.

Stuart, G. 1975. The Post-Archaic Occupation of Central South Carolina. Unpublished Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

Thalheimer, E. 1996. Construction noise control program and mitigation strategy at the central artery tunnel project. INCE Noise Control Conference. Seattle, WA.

Three Oaks Engineering. 2017. "Freshwater Fish Surveys for Central Electric Project Francis Marion National Forest, Berkeley and Charleston Counties, South Carolina." Prepared for Milliken Forestry. November 28, 2017. Durham, NC. 34 pp.

Three Oaks Engineering. 2018. "Freshwater Fish Surveys for Central Electric Project: Belle Isle and Charity Routes, Francis Marion National Forest, Berkeley and Charleston Counties, South Carolina." Prepared for Milliken Forestry. August 2018. Durham, NC. 14 pp.

Tippett, J.L. 1992. "The Spatial Distribution of Lithic Materials: Implications for the Early and Middle Archaic Hunter-Gatherer Mobility in South Carolina." Unpublished thesis presented for the Master of Arts Degree, University of Tennessee, Knoxville, TN.

Trinkley, M. 1978. *Archaeological Reconnaissance of the Proposed S-857 Widening*. South Carolina Department of Highways and Public Transportation.

Trinkley, M. 1980a. Investigations of the Woodland Period Along the South Carolina Coast. Unpublished PhD dissertation, Department of Anthropology, University of North Carolina, Chapel Hill, NC.

Trinkley, M. 1980b. A typology of Thom's Creek pottery for the South Carolina coast. South Carolina Antiquities. 12:1-135.

Trinkley, M. 1981. The Jeremy-Pee Dee Ceramic Series Along the South Carolina Coast. South Carolina Antiquities 13(1-2):1-12.

Trinkley, M. 1990. An Archaeological Context for the South Carolina Woodland. Chicora Foundation Research Series No. 22. Prepared for South Carolina Department of Archives and History, Columbia, SC.

Tsai, J-S. R. and P. Frederick. 2000. Finding Wood Stork Habitat and Conserving the Right Features. Google Earth (KML) data (Online). University of Florida Department of Wildlife Ecology and Conservation. Available: http://www.wec.ufl.edu/faculty/frederickp/woodstork/files/Wood%20Stork%20Colonies%20in%20the%20Southeastern%20US.kmz. Accessed August 7, 2018.

U.S. Bureau of Labor Statistics. 2021a. Local Area Unemployment Statistics. Geographies: State of South Carolina; Counties of Charleston and Georgetown, SC. Years: 2011-2021. Available: https://data.bls.gov/PDQWeb/la. Accessed April 20, 2023.

U.S. Bureau of Labor Statistics. 2021b. Average Annual Pay in Private Construction for All establishment sizes. Geographies: State of South Carolina; Counties of Charleston and Georgetown, SC. Years: 2011-2021. Available: https://data.bls.gov/cgi-bin/dsrv. Accessed April 20, 2023.

U.S. Census (U.S. Census Bureau). 2010. Decennial Census. Available at https://data.census.gov/cedsci/. Accessed April 25, 2023.

U.S. Census. 2016b. Census ACS 2012-2016 5 Year Estimates. Tables: X03 and X17. Geography: All Census Block Groups in the state of South Carolina. Available: http://factfinder.census.gov. Accessed August 21, 2018.

U.S. Census.2020. Decennial Census. Available at https://data.census.gov/cedsci/. Accessed April 25, 2023.

U.S. Census (2021) U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates. Table DP04. Selected Housing Characteristics.

U.S. Census. 2022. Glossary - Block Groups. Available: https://www.census.gov/programs-surveys/geography/about/glossary.html. Accessed April 28, 2023.

USDA-NRCS(U.S. Department of Agriculture, Natural Resources Conservation Service). n.d. National soil survey handbook, title 430-VI. Available: https://www.nrcs.usda.gov/resources/guides-and-instructions/national-soil-survey-handbook. Accessed April 28, 2023.

USDA-NRCS. 1999. Cainhoy Soil Series Official Description. Available: https://soilseries.sc.egov.usda.gov/OSD_Docs/C/CAINHOY.html. Accessed April 25, 2023.

USDA-NRCS. 2002. Technical Guide to RUSLE in Michigan. Available: http://www.iwr.msu.edu/rusle/kfactor.htm. Accessed April 26, 2023.

USDA-NRCS. 2003a. Levy Soil Series Official Description. Available: https://soilseries.sc.egov.usda.gov/OSD_Docs/L/LEVY.html. Accessed April 25, 2023.

USDA-NRCS. 2003b. Rutlege Soil Series Official Description. Available: https://soilseries.sc.egov.usda.gov/OSD_Docs/R/RUTLEGE.html. Accessed April 25, 2023.

USDA-NRCS. 2010a. Soil Survey Geographic (SSURGO) database for Georgetown County Area, South Carolina. Available: https://websoilsurvey.nrcs.usda.gov/app/.

USDA-NRCS. 2010b. Field Indicators for Hydric Soils in the United States. A guide for identifying and delineating hydric soils. Version 7.0.

USDA-NRCS. 2011. Soil Survey Geographic (SSURGO) database for Charleston County Area, South Carolina. Available: https://websoilsurvey.nrcs.usda.gov/app/.

USDA-NRCS. 2018a. Chipley Soil Series Official Description. Available: https://soilseries.sc.egov.usda.gov/OSD_Docs/C/CHIPLEY.html. Accessed October 2013.

USDA-NRCS. 2018b. Lakeland Soil Series Official Description. Available: https://soilseries.sc.egov.usda.gov/OSD_Docs/L/LAKELAND.html. Accessed October 2013.

U.S. Department of Commerce, Bureau of Economic Analysis. 2021a. Total Full-Time and Part-Time Employment by NAICS Industry. Geographies: State of South Carolina, Counties of Berkeley, Charleston, and Georgetown, SC. Years: 2011, 2021. Available: https://apps.bea.gov/itable/?ReqID=70&step=1#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNF0sImRhdGEiOltbIlRhYmxlSWQiLCIzMyJdXX0=. Accessed April 20, 2023.

U.S. Department of Commerce, Bureau of Economic Analysis. 2021b. Personal income and employment by major component. Geographies: State of South Carolina, Counties of Berkeley, Charleston, and Georgetown, SC. Years: 2011, 2021. Available: https://apps.bea.gov/itable/?ReqID=70&step=1#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNF0sImRhdGEiOltbIlRhYmxlSWQiLCIzMCJdXX0=. Accessed April 20, 2023.

U.S. Department of Health and Human Services. 2022. What are Pacemakers? Available: http://www.nhlbi.nih.gov/health/health-topics/topics/pace/. Accessed April 25, 2023.

U.S. Department of Labor, Occupational Health and Safety Administration. n.d. Occupational Noise Exposure, NIOSH Noise Meter. Available: http://www.osha.gov/SLTC/noisehearingconservation/. Accessed April 25, 2023.

USEPA (U.S. Environmental Protection Agency). 2023a. Greenbook. South Carolina Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants. Available: https://www3.epa.gov/airquality/greenbook/anayo_sc.html. Accessed October 5, 2023.

USEPA. 2023b. U.S. Environmental Protection Agency. National Ambient Air Quality Standards (NAAQS). Available: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed October 5, 2023.

USEPA. 2023c. Electric and Magnetic Field (EMF) Radiation from Power Lines. Available: https://www.epa.gov/radtown/electric-and-magnetic-fields-power-lines. Last updated September 27, 2022. Accessed October 5, 2023.

USFS (U.S. Department of Agriculture, Forest Service). n.d.a. Plants and Wildlife on the Francis Marion National Forest. Available: https://www.fs.usda.gov/detail/scnfs/about-forest/?cid=stelprdb5253642. Accessed April 29, 2023.

USFS. n.d.b. Francis Marion and Sumter National Forests. Elmwood Recreation Area (website). Available: https://www.fs.usda.gov/recarea/scnfs/recarea/?recid=47297. Accessed April 25, 2023.

USFS. n.d.c. Francis Marion and Sumter National Forests. Honey Hill Recreation Area (website). Available: https://www.fs.usda.gov/recarea/scnfs/recarea/?recid=47299. Accessed April 25, 2023.

USFS. 1992. Carbon Storage and Accumulation in the United States Forest Ecosystems. Gen. Tech. Rep. WO-59. US Department of Agriculture, Forest Service, Washington Office, Washington DC, p 51. Available: https://www.nrs.fs.usda.gov/pubs/gtr/gtr_wo059.pdf. Accessed April 27, 2023.

USFS. 1995. Landscape Aesthetics: A Handbook for Scenery Management. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5412126.pdf. Accessed April 28, 2023.

USFS. 2011. South Carolina's Forests. Available: https://www.srs.fs.usda.gov/pubs/rb/rb_srs208.pdf. Accessed April 25, 2023.

USFS. 2012. "Fiscal Year 2011 Monitoring and Evaluation Annual Report." Francis Marion National Forest Revised Land and Resource Management Plan. United States Department of Agriculture, Forest Service, Southern Region August 8, 2012. 73 pp.

USFS. 2013a. "Francis Marion National Forest Draft Forest Plan Assessment, Section 5.4: Threatened, endangered, proposed and candidate species." Francis Marion National Forest, Berkeley and Charleston Counties, South Carolina.

USFS. 2013b. Francis Marion National Forest Draft Forest Plan Assessment, Section 5.1-5.3: At Risk Species. Francis Marion National Forest, Berkeley and Charleston Counties, South Carolina. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5446514.pdf. Accessed July 8, 2018.

USFS. 2014. Biological Assessment for Activities Affecting Northern Long-Eared Bats on Southern Region National Forests. Prepared by R. Whalen and D. Krusac. U.S. Forest Service Southern Region Regional Office. Atlanta, GA. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3837288.pdf.

USFS. 2015. "Species of Conservation Concern Frequently Asked Questions." U.S. Forest Service Pacific Southwest Region. July 2015. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3848211.pdf. Accessed April 25, 2023.

USFS. 2017. Francis Marion National Forest Final Environmental Impact Statement for the Revised Land Management Plan. January 2017. 3Columbia, SC. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd530181.pdf. Accessed April 25, 2023.

USFS. 2018a. Personal Communication. GIS Data Provided by Andy Maceyka, GIS Specialist, USFS Francis Marion National Forest Supervisor's Office, to Phillip Baigas, Wildlife Biologist, Louis Berger. Regarding Ecosystems Mapping on the Francis Marion National Forest. July 19, 2018.

USFS. 2018b. High Priority Nonnative Invasive Species of Southern Forest and Grassland Ecosystems, June 2008 – DRAFT. Compiled by the USDA Forest Service Regional Task Force for the Assessment of Nonnative Invasive Species of Southern Forests. Available: https://www.invasive.org/south/highpriority.html. Accessed April 28, 2023.

USFS. 2018c. Personal Communication. GIS Data Provided by Andy Maceyka, GIS Specialist, USFS Francis Marion National Forest Supervisor's Office, to Phillip Baigas, Wildlife Biologist, Louis Berger. Regarding Rare, Threatened & Endangered Species Occurrence Data. August 6, 2018.

USFS. 2018d. Personal Communication. GIS Data Provided by Geoff Holden, GIS Program Manager, USFS Francis Marion National Forest Supervisor's Office, to Phillip Baigas, Wildlife Biologist, Louis Berger. Red-cockaded Woodpecker Occurrence Data. August 13, 2018.

USFS. 2021a. Non-Native Invasive Plant Control on the Francis Marion National Forest Environmental Assessment. Berkeley and Charleston Counties, South Carolina. Francis Marion and Sumter National Forests Francis Marion Ranger District September 2021. Available: https://www.fs.usda.gov/project/?project=59365. Accessed August 22, 2023.

USFS. 2021b. Biennial Monitoring Evaluation Report Francis Marion National Forest Specialists Report for Years 2019 and 2020. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd951a168.pdf. Accessed April 27, 2023.

USFS. 2022. Personal communication between Jestin Clark, Wildlife Biologist with the Francis Marion National Forest, and Phillip Baigas, Wildlife Biologist with WSP. Regarding FMNF Golden Sedge Spatial Data. September 28, 2022.

USFS. 2024. GIS Data Provided by Jestin Clark, Wildlife Biologist, USFS Francis Marion National Forest, to Suzanne Kopich, USDA Rural Utilities Service, regarding Red-cockaded Woodpecker data for the McClellanville 115-kV Transmission Line Project. February 5, 2024.

USFWS (U.S. Fish and Wildlife Service). 1993. Recovery Plan for Pondberry (*Lindera melissifolia* [Walt.]Blume). Prepared by L. Delay, R. O'Conner, J. Ryan, and R.R. Currie. U.S. Fish and Wildlife Service, Southeast Region, Atlanta, GA. September 23, 1993. 43 pp. Available: https://ecos.fws.gov/docs/recovery_plan/930923a.pdf. Accessed April 28, 2023.

USFWS. 2003. Recovery Plan for the Red-cockaded Woodpecker (*Picoides borealis*): Second Revision. U.S. Fish and Wildlife Service, Atlanta, GA. 296 pp. Available: https://ecos.fws.gov/docs/recovery_plan/030320_2.pdf. Accessed April 28, 2023.

USFWS. 2007. National Bald Eagle Management Guidelines. Revision of Bald Eagle Monitoring Guidelines Issued September 2006. September 2007. Available: https://www.fws.gov/sites/default/files/documents/bald-eagle-monitoring-guidelines-2007.pdf. Accessed April 28, 2023.

USFWS. 2008. American Chaffseed (*Schwalbea americana*) 5−Year Review: Summary and Evaluation. Northeast Region, New Jersey Field Office, Pleasantville, NJ. Available: https://ecos.fws.gov/docs/tess/species_nonpublish/1597.pdf. Accessed April 28, 2023.

USFWS. 2010. Cape Romain National Wildlife Refuge Comprehensive Conservation Plan. USFWS Southeast Region. October 1, 2010. Available: https://www.fws.gov/media/cape-romain-national-wildlife-refuge-comprehensive-conservation-plan. Accessed April 28, 2023.

USFWS. 2014a. Northern Long-eared Bat Interim Conference and Planning Guidance, USFWS Regions 2, 3, 4, 5, & 6. January 6, 2014. Available: https://www.fws.gov/sites/default/files/documents/Northern%20Long%20Eared%20Bat%20Interim%20Conference%20and%20Planning%20Guidance.pdf. Accessed April 28, 2023.

USFWS. 2014b. Recovery plan for golden sedge (*Carex lutea*). Prepared by D. Suiter, Raleigh Ecological Services Field Office, and R. LeBlond, North Carolina Natural Heritage Program, for the USFWS Southeast Region. Atlanta, GA. Available: https://ecos.fws.gov/docs/recovery_plan/20140507%20Carex%20lutea%20Recovery%20Plan%20Final.pdf. Accessed August 23, 2022.

USFWS. 2018a. "National Wetlands Inventory." Available at https://www.fws.gov/wetlands/data/Mapper.html. Accessed June 2018.

USFWS. 2018b. Species status assessment report for the eastern black rail (*Laterallus jamaicensis jamaicensis*), Version 1.2. June 2018. Atlanta, GA. Available: https://ecos.fws.gov/ServCat/DownloadFile/154242. Accessed August 11, 2021.

USFWS. 2020a. Species Status Assessment Report For the Red-cockaded Woodpecker (*Picoides borealis*) Version 1.3. April 2020. U.S. Fish and Wildlife Service. Atlanta, GA. Available: https://ecos.fws.gov/ServCat/DownloadFile/188805. Accessed May 26, 2023.

USFWS. 2020b. Monarch (*Danaus plexippus*) Species Status Assessment Report, version 2.1. September 2020. Available: https://ecos.fws.gov/ServCat/DownloadFile/191345. Accessed April 28, 2023.

USFWS. 2020c. Species Status Assessment for the Frosted Flatwoods Salamander (*Ambystoma cingulatum*) Version 1.0. Panama City Field Office. Panama City, FL. Available: https://ecos.fws.gov/ServCat/DownloadFile/196953. Accessed April 27, 2023.

USFWS. 2022a. South Carolina Field Office Project Review Guide. South Carolina Ecological Services Field Office. Available: https://www.fws.gov/office/south-carolina-ecological-services/project-review-south-carolina-field-office. Accessed April 28, 2023.

USFWS. 2022b. Golden Sedge. USFWS species webpage. Available: https://www.fws.gov/species/golden-sedge-carex-lutea. Accessed August 23, 2022.

USFWS. 2022c. Golden Sedge (*Carex lutea*) Status Review: Summary and Evaluation. USFWS Southeast Region Raleigh Ecological Services Field Office Raleigh, North Carolina. June 2022. Available: https://ecos.fws.gov/docs/tess/species_nonpublish/3896.pdf. Accessed April 28, 2023.

USFWS. 2024. "Information for Planning and Conservation (IPaC)." Available: https://ecos.fws.gov/ipac/. Accessed July 10, 2024.

USGS (U.S. Geological Survey). n.d. National Hydrography Dataset. Available: http://nhd.usgs.gov/data.html. Accessed April 25, 2023.

USGS. 2018. National Elevation Dataset. Available: https://www.usgs.gov/publications/national-elevation-dataset. Accessed May 9, 2023.

USGS. 2021. National Land Cover Database (NLCD) 2019 Products (ver. 2.0, June 2021): U.S. Geological Survey. Release date: June 4, 2021. Available: https://www.sciencebase.gov/catalog/item/60cb3b86d34e86b938a305cb. Accessed April 22, 2023.

Van der Zande, A.N., W.J. ter Keurs, and W.J. Van der Weijden. 1980. The Impact of Roads on the Densities of Four Bird Species in an Open Field Habitat—Evidence of a Long Distance Effect. Biological Conservation 18:299–321.

Waddell, E. 1980. Indians of the South Carolina Low Country, 1562-1751. The Reprint Company, Spartanburg, SC.

Ward, L.W., Bailey, R.H., and Carter, J.G. 1991. Chapter 16—Pliocene and Early Pleistocene Stratigraphy, Depositional History, and Mulluscan Paleobiography of the Coastal Plain. In: Horton, J.W.J. and Zullo, V.A., eds., The Geology of The Carolinas—Carolina Geological Society Fiftieth Anniversary Volume. University of Tennessee Press, Knoxville, TN. p. 406.

Watts, W.A. 1970. The Full Glacial Vegetation of Northern Georgia. Ecology 51(1).

Watts, W.A. 1980. Late Quaternary Vegetation History at White Pond on the Inner Coastal Plain of South Carolina. Quaternary Research 10.

Wear, D.N., and J.G. Greis. 2002. Southern Forest Resource Assessment - Technical Report. Gen. Tech. Rep. SRS-53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 635 pp.

Wear, D.N. and J.G. Greis. 2012. The Southern Forest Futures Project: Summary Report. General Technical Report SRS-168, Southern Research Station, Asheville, NC. 54 pp.

Wetmore, R.Y. and A.C. Goodyear. 1986. Archaeological Investigations at Nipper Creek (38RD18): An Archaic Fall-Line Site. Research Manuscripts Series No. 201. South Carolina Institute of Archaeology and Anthropology, Columbia, SC.

Wildlife Investigations, LLC. 2018. “Red-cockaded Woodpecker (RCW) Cluster Surveys for Central Electric Powerline Right-of-Way.” Prepared by L.A. Wood. Wildlife Investigations, LLC. McClellanville, SC. 3 pp.

Whitehead, D.R. 1965. Palynology and Pleistocene Phytogeography of Unglaciated Eastern North America. In: The Quaternary of the United States, H.E. Wright, Jr. and D.G. Frey (eds.). Princeton University Press, Princeton, NJ.

Whitehead, D.R. 1973. Late Wisconsin Vegetational Changes in Unglaciated Eastern North America. Quaternary Research 3:621-631.

WSP (WSP USA, Inc.). 2024. McClellanville 115-kV Transmission Line: Project Supplemental Analysis on Private Lands. July 2024. Prepared for Central Electric Cooperative. Prepared by WSP USA.

Xerces (Xerces Society for Invertebrate Conservation). 2020. The Xerces Society Western Monarch Thanksgiving Count 1997-2019 [online]. Available: https://xerces.org/blog/tag/western-monarch-thanksgiving-count. Accessed February 21, 2022.

APPENDIX A
ALTERNATIVES EVALUATION STUDY

APPENDIX B
REVISED MACRO-CORRIDOR STUDY REPORT

APPENDIX C
INDEPENDENT ENGINEERING STUDY

APPENDIX D
SUPPLEMENTAL ANALYSIS ON PRIVATE LANDS

APPENDIX E
COMMENT RESPONSE SUMMARY

APPENDIX F
SANTEE COOPER VEGETATION MANAGEMENT PROGRAM AND UNIT PLAN

APPENDIX G
PRIORITY ANIMAL SPECIES AND HABITAT ASSOCIATIONS IN THE COASTAL PLAIN ECOREGION OF SOUTH CAROLINA

APPENDIX H
PRIORITY PLANT SPECIES IN THE COASTAL PLAIN ECOREGION OF SOUTH CAROLINA

APPENDIX I
FOREST PLAN STRATEGIES FOR FMNF SCC SPECIES

APPENDIX J
DRAFT PROGRAMMATIC AGREEMENT FOR SECTION 106 COMPLIANCE